AN ARCHAEOLOGICAL ASSESSMENT OF PRE-COLUMBIAN FAUNA IN THE ROANOKE RIVER BASIN

Amber VanDerwarker

Research Report No. 21
Research Laboratories of Archaeology
The University of North Carolina at Chapel Hill

2001

AN ARCHAEOLOGICAL ASSESSMENT OF PRE-COLUMBIAN FAUNA IN THE ROANOKE RIVER BASIN

by

Amber VanDerwarker

Vincas P. Steponaitis
and
R. P. Stephen Davis, Jr.
Principal Investigators

Research Report No. 21
Research Laboratories of Archaeology
The University of North Carolina at Chapel Hill

2001

TABLE OF CONTENTS

ACKNOWLEDGMENTS

The analyses reported herein were funded by the U.S. Fish and Wildlife Service. I would like to acknowledge Kevin Moody and John Ellis from the Fish and Wildlife Service for their interest and unwavering support of this project. I also want to thank Joe Hightower and Wilson Laney for their comments on an earlier draft of this report. Sincere thanks are extended to Steve Davis and Vin Steponaitis at the Research Laboratories of Archaeology for giving me the opportunity to conduct this research. Steve Davis was especially instrumental in facilitating analysis and deserves special recognition for his patience, insightful advice, and keen editorial comments. I am indebted to Celeste Gagnon and Amanda Tickner for assisting in primary data collection and data entry. I also with to thank Elizabeth Reitz for allowing me access to the zooarchaeological comparative collections housed at the Museum of Natural History at the University of Georgia in Athens, as well as providing her expert opinion on various faunal specimens. Finally, I am eternally grateful to Tom Whyte of Appalachian State University for commenting on different versions of this presentation and for sharing his expertise in fish identification by verifying identifications of sturgeon, channel catfish, largemouth bass, and walleye.

All archaeological collections studied by this project are housed at the Research Laboratories of Archaeology, University of North Carolina at Chapel Hill.

MANAGEMENT SUMMARY

Between 1999 and 2001, personnel at the Research Laboratories of Archaeology analyzed catalogued archaeological specimens in their collections to determine the pre-Columbian distribution and abundance of fish and other animals in the Roanoke River basin in North Carolina and Virginia. Approximately 84,000 faunal specimens from seven excavated sites (Gaston, Vir 150, Stockton, Gravely, Dallas Hylton, Koehler, and Leatherwood Creek) dating to the Late Woodland period (A.D. 800–1600) were studied. Data from two additional sites (Jordan's Landing and Lower Saratown), representing almost 50,000 analyzed specimens, were also considered.

The resulting data, interpreted and presented in tabular form, are intended for use by the U.S. Fish and Wildlife Service to develop: (1) fishery management plans for the basin and in other areas; (2) administrative records used in regulatory proceedings; (3) restoration plans for threatened and endangered species (either currently listed or future) according to the Endangered Species Act of 1973; and (4) management plans for federal lands and for federal involvement in managing the human environment.

Significant findings of the study include: (1) a disparity in Late Woodland vertebrate subsistence practices between sites located along the Roanoke River and those located along its tributaries which may be tied to differences in local catchment zones; (2) the identification of sturgeon[1] at both Vir 150 and the Gaston site, indicating that this fish swam further upriver to spawn in prehistoric times than is possible today; and (3) evidence that the native ranges of largemouth bass, channel catfish, and walleye may have extended into the Roanoke River.

INTRODUCTION

Zooarchaeology has much to offer biogeographical studies concerning the prehistoric distribution of fauna across the landscape. Modern environmental management requires an understanding of both past and present distributions of plant and animal communities, and zooarchaeology is pivotal to achieving this understanding. In addition to documenting the presence and relative abundance of prehistoric fauna, zooarchaeology informs us regarding changing human-animal relationships. The impact that humans had on their environment in the past undoubtedly played an integral role in shaping the composition of the modern natural world.

This report provides the basis for a consideration of these issues by presenting zooarchaeological data from seven Late Woodland (A.D. 800–1600) sites: Gaston, Vir 150, Stockton, Gravely, Dallas Hylton, Koehler, and Leatherwood Creek. These sites are located in the Piedmont of Virginia and North Carolina along the Roanoke River and its tributaries (Figure 1 and Table 1). During the fall of 1999, the Research Laboratories of Archaeology undertook an ambitious project initiated by the U. S. Fish and Wildlife Service to document the prehistoric distribution and abundance of faunal communities in the Roanoke River basin. This report represents the culmination of these efforts.

The primary aim of this report is twofold: (1) to present the data collected as part of this project and consider spatial differences in Late Woodland subsistence in the Piedmont, and (2) to address biogeographical issues concerning the prehistoric distribution of fauna, particularly fish, in the Roanoke River basin. I begin with an overview of the project goals as conceived by the U.S. Fish and Wildlife Service. This is followed by a consideration of local environmental setting, as well as a description of the study sites. After a detailed discussion of the zooarchaeological methods employed throughout identification and analysis, the faunal data are presented and compared with data from the Jordan's Landing and Lower Saratown sites.

PROJECT GOALS

The U.S. Fish and Wildlife Service enlisted the UNC Research Laboratories of Archaeology (RLA) in the spring of 1999 to initiate an analysis of extant collections of faunal and botanical materials excavated and stored by the RLA. Specifically, they were interested in describing the distribution of pre-Columbian flora and fauna in the Roanoke River valley to inform policy regarding fishery management plans, recovery plans for threatened and endangered species, federal land management plans, and dam re-licensing. Thus far, only analyses of faunal remains have been funded, but it is the intention of both organizations to expand analysis to archaeobotanical collections from this river basin in the future.

One of the primary concerns of the U.S. Fish and Wildlife Service regards the present abundance and distribution of Atlantic and shortnose sturgeons in the coastal waters of Virginia and North Carolina. Shortnose sturgeon is currently classified as endangered, and recent U.S. Fish and Wildlife Service efforts have focused on

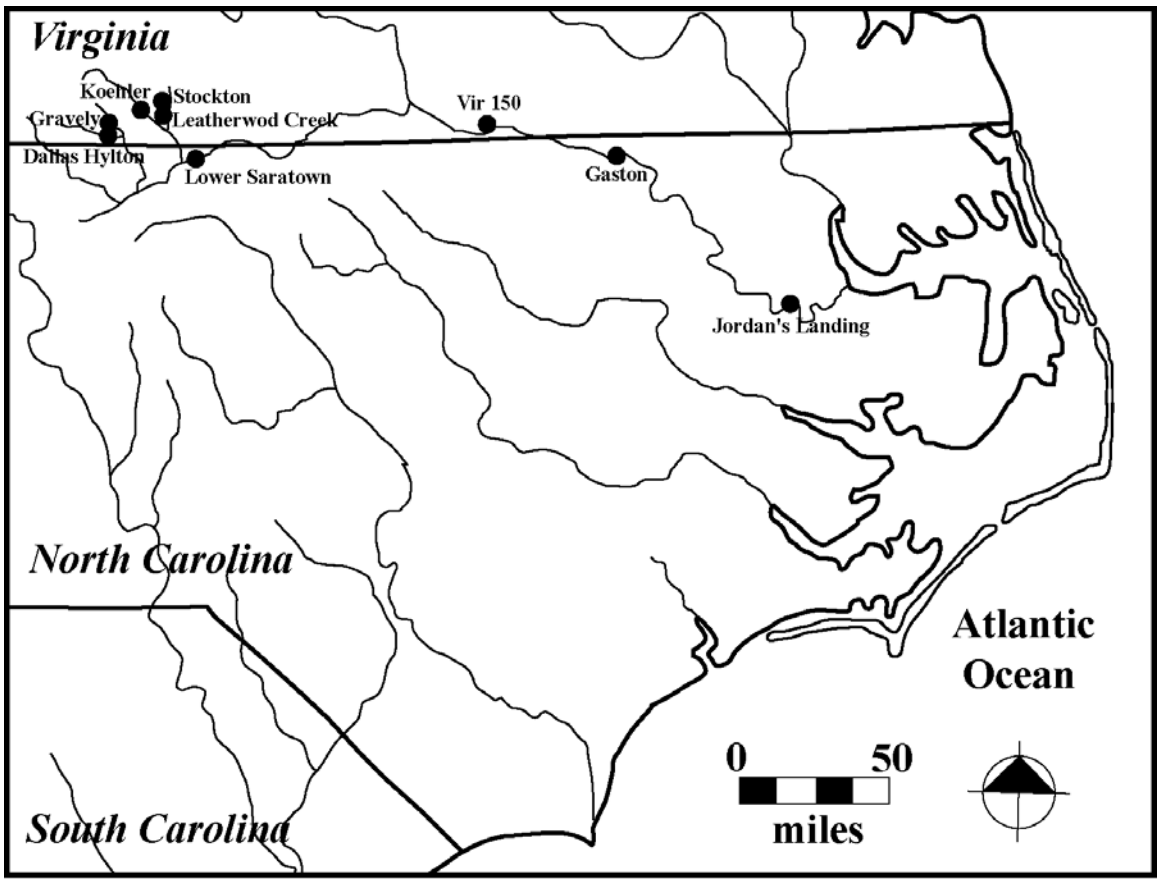

Figure 1. Map locating the archaeological sites considered in the study.

Table 1. Dates of Occupation and Recovery for the Study Sites.

Site	Dates of Occupation	Type of Recovery	Mesh Size (inches)
Gaston	1000 B.C. –A.D.1600	screened	3/8
Vir 150	A.D. 1000–1400	screened	3/8
Stockton	A.D. 1000–1450	hand recovery	
Gravely – UNC excavations	A.D. 1250–1450	screened	1/16
Dallas Hylton	A.D. 1250–1450	hand recovery	
Koehler – Gravely excavations	A.D. 1250–1450	hand recovery	
Koehler – Clark excavations	A.D. 1250–1450	screened	1/16?
Leatherwood Creek	A.D. 1250–1450	hand recover	

determining whether this species is still present in the Roanoke River. In order to spawn, sturgeon leave the coastal waters and swim inland. It is probable that, prior to massive dam construction in the 1950s and 1960s, sturgeon swam much further upriver than is possible today. We suspect that these dams have severely impacted the natural breeding habitats of the Atlantic and shortnose sturgeons. Analyzing prehistoric faunal materials from the Roanoke and other river basins in the region is one way to test this hypothesis. If indeed sturgeon remains are identified in prehistoric contexts upriver from present-day dams, then the U.S. Fish and Wildlife Service will have a more solid basis for requiring mitigation of these man-made constructions on the federally-listed shortnose and imperiled Atlantic sturgeons. For example, fishways or other means of upstream travel may ultimately be used to restore access to historic spawning habitat.

ENVIRONMENTAL SETTING[2]

All of the sites included in this analysis are located along the Roanoke River or its tributaries in the Piedmont of North Carolina and Virginia. The Piedmont is bordered to the east by the coastal plain and to the west by the Blue Ridge Mountains, and is best characterized by rolling hills and low ridges. The vegetation consists primarily of oak-hickory forests, although pine species also were present. The climate of the region is considered humid subtropical, with hot, humid summers and short, mild winters. Annual average rainfall is 40–50 inches, and is heaviest in mid-summer and lightest during the fall. During the period from 1430–1850, a period characterized as the "Little Ice Age" altered the climate of the region, resulting in harsher winters and fewer frost-free days (Lamb 1963; Rountree 1989). These conditions would have resulted in a shorter growing season (Rountree 1989). The latter occupations at several of the sites discussed here may have overlapped slightly with the beginning of this phenomenon.

SITE DESCRIPTIONS

The Gaston Site (31Hx7)

The Gaston site now lies beneath Roanoke Rapids Lake in Halifax County, North Carolina. This site was excavated in 1955 by Stanley South and Lewis Binford of the RLA as part of a brief project designed to survey and salvage archaeological sites threatened by the construction of Roanoke Rapids Reservoir. Due to time constraints, the plow zone was stripped with road graders in order to expose subsurface archaeological features. Features identified at Gaston include houses, pits, 14 human burials, and several dog burials.

As part of his Master's thesis at the University of North Carolina, Stanley South conducted a seriation of the Gaston site ceramics to establish site chronology. South recognized three consecutive occupations: the Vincent phase (1000 B.C.–A.D. 300), the Clements phase (A.D. 300–1000), and the Gaston phase (A.D. 1000–1600) (Coe 1964; South 1959). Many of the features with faunal remains, however, did not yield ceramic materials and were not included in this seriation. Because a large portion of the Gaston

site faunal assemblage could not be assigned to phase, I consider faunal distributions by site only.

All contexts from the Gaston site were dry-screened through 3/8-inch mesh. These recovery methods, while ensuring the systematic recovery of larger animals and larger elements, undoubtedly biased the assemblage against the recovery of smaller animals, including fish. For the purposes of the analysis reported here, the faunal remains from all excavated contexts are considered.

Vir 150 (44Mc645)

Vir 150 is located in Mecklenburg County, Virginia, and lies beneath Lake Gaston. This site was excavated in 1962 by Ed Dolan and Bennie Keel of the RLA as part of a survey of Virginia Power and Light Company's proposed Gaston Reservoir. Numerous archaeological features were exposed, including structures, pits, 29 human burials, and one dog burial. Due to a lack of funding and resources, the collections from this site have never been analyzed and, thus, a site chronology has not been established. Despite this need for a firm chronology, a cursory examination of the ceramic materials suggests an occupation span of approximately A.D. 1000–1400. As with the Gaston site, all excavated soil was dry-screened through 3/8-inch mesh, which is too large to ensure the recovery of small animal bones, including small mammals and fish. Faunal remains from all contexts were analyzed and are reported here.

The Stockton Site (44Hr35)

The Stockton site is located is located in eastern Henry County, Virginia, near the headwaters of Leatherwood Creek, a tributary of Smith River. The site was excavated in 1969 and 1970 by Richard P. Gravely, Jr. and members of the Patrick-Henry Chapter of the Archeological Society of Virginia. The plow zone was removed by hand excavation in 5-ft by 5-ft blocks to expose subsurface features. The excavations at the Stockton site documented numerous archaeological features, including structures, pits, and at least 25 human burials. Chipped-stone projectile points from the Stockton site indicate two minor early occupations: an Archaic occupation (ca. 7,000–1,000 B.C.) and a Middle Woodland occupation (A.D. 1–1000). Radiocarbon dates indicate that the site was also occupied twice during the Dan River phase (A.D. 1000–1450), and that most of the features date to the latter occupation during the fourteenth century. Most artifact classes (i.e., clay, stone, bone, and shell artifacts, in addition to pottery) have been analyzed and are reported in Davis et al. (1997a).

Recovery methods employed during the excavations at the Stockton site were limited to hand recovery of artifacts and ecofacts. That is, no screening or flotation techniques were used. Generally, artifacts and ecofacts were only collected from feature contexts, resulting in minimal recovery of materials from plowed soil. Thus, the recovered samples are systematically biased toward feature contexts as well as larger, more complete artifacts and ecofacts. Because of this, we can expect that bones from smaller animals and smaller elements will be underrepresented in these samples. For the purposes of the zooarchaeological analysis reported here, only faunal remains from feature contexts were analyzed.

The Gravely Site (44Hr29)

The Gravely site is located along North Mayo River in Henry County, Virginia. The site dates to the late Dan River phase (ca. A.D. 1250–1450), represents a late prehistoric village occupation, and has been the subject of two excavations. Both excavations, as well as the artifact analyses, are reported in detail in Davis et al. (1997b). Richard Gravely of the Archeological Society of Virginia conducted the first excavation in 1969. Gravely established a grid of 5-ft by 5-ft squares in the northern portion of the site and excavated a total of 64 such units. Several features were encountered in the western portion of the excavated area and were mapped in plan. Postholes, however, were not identified or mapped during excavations. Most of the features that were identified were classified as trash pits (designated as TPs). No screening or flotation was conducted during the first excavation, and the resulting faunal samples are therefore biased toward larger animals and elements.

The second excavation was conducted by the University of North Carolina's archaeological field school in 1991. The field school was directed by H. Trawick Ward, R. P. Stephen Davis, Jr., and Timothy P. Mooney of the UNC Research Laboratories of Archaeology. The field school excavated 2,800 sq ft of the site, uncovering 23 additional features. Eighteen of these features were excavated. All plowed soil was screened through 1/2-inch mesh. Flotation samples were taken from each zone of each feature, and the remaining feature fill was water-screened through a series of 1/2-inch, 1/4-inch, and 1/16-inch mesh screens. Thus, the recovery of faunal remains from this second excavation was quite thorough, likely resulting in the representation of small species. For the purposes of the analysis reported here, only faunal remains from the UNC excavations are considered.

The Dallas Hylton Site (44Hr20)

The Dallas Hylton site is located along South Mayo River in Henry County, Virginia, less than a mile from the Virginia–North Carolina border. As with the Gravely site, the Dallas Hylton site represents a late prehistoric village dating to the late Dan River phase (ca. A.D. 1250–1450). The site was also excavated twice, in 1968 and 1973, by Richard Gravely of the Archeological Society of Virginia. The first excavation was limited, but the second excavation uncovered nearly 200 archaeological features, including pits and hearths. At least 128 of these features were mapped and excavated. According to Davis et al. (1998:1), "the distribution of features suggests a village configuration, common during late prehistory in Piedmont Virginia and North Carolina, consisting of a central plaza surrounded by a ring of houses." The Dallas Hylton excavations and artifactual analyses are reported in detail in Davis et al. (1998).

Recovery methods employed during the excavations at the Dallas Hylton site were limited to hand recovery of both artifacts and ecofacts. No screening or flotation was conducted during either excavation, thus resulting in faunal samples biased against smaller animals and elements. Only faunal remains from features or trash pits were analyzed.

The Koehler Site (44Hr6)

The Koehler site is located along Smith River, six miles west of Martinsville, Virginia. The site also dates to the late Dan River phase (ca. A.D. 1250–1450) and has been the subject of two excavations. The details of the excavations and artifact analyses for both excavations are reported in Coleman and Gravely (1992). The first excavation was conducted by Richard Gravely and members of the Archeological Society of Virginia in 1968 and was concentrated in the northwest section of the site. Thirty-one 5-ft by 5-ft squares were excavated and several types of archaeological features were uncovered, including refuse pits, storage pits, hearths, and two human burials. No screening or flotation was conducted during the first excavation, likely resulting in a faunal sample biased against smaller species.

The second excavation was conducted in 1976 and directed by Wayne Clark, assistant archaeologist for the Virginia State Library. The project was primarily a salvage operation, as the site was in the path of a proposed sewage treatment facility. Due to time constraints, a road grader was employed to remove the topsoil and expose subsurface features. Once uncovered, all features were mapped and excavated. Features identified at the site include refuse pits, food preparation hearths, hearths, post molds, and eight human burials. All feature fill was dry screened, and most also was water-screened through fine mesh screens.[3] Thus, smaller species and elements are expected to be better represented in the second versus the first excavation of the Koehler site. Preliminary analyses of the faunal remains were conducted by Coleman and his laboratory assistants, and the results are reported in Coleman and Gravely (1992). A more thorough analysis of the faunal remains from the second excavation, in addition to an analysis of the faunal remains from the first excavation, was conducted by the author. For the purposes of this report, only fauna from features and trash pits (designated as TPs) were analyzed.

The Leatherwood Creek Site (44Hr1)

The Leatherwood Creek site is located adjacent to Leatherwood Creek, a tributary of Smith River, in eastern Henry County, Virginia. The site was occupied twice during the late Dan River phase (ca. A.D. 1250–1450) and was excavated by Richard Gravely and members of the Archeological Society of Virginia in 1968 and 1969. A site grid of 5-ft by 5-ft squares was established, and excavations uncovered seven structures, 16 pit features, and nine human burials. No screening or flotation was conducted at the site, biasing the recovered faunal assemblage against the remains of small animals or elements. Only faunal remains from features and structures were analyzed.

ANALYTICAL PROCEDURES

Primary Data Collection

Most of the primary data collection was conducted by Amber VanDerwarker between fall 1999 and spring 2001. During fall 1999 and spring 2000, Amanda Tickner

assisted with basic counts and weights and entered data. Celeste Gagnon assisted in the collection of primary data during fall 2000 and identified the turtle remains.

Primary data collection includes the observations recorded by the analyst when working with the faunal specimens. For the purposes of this project, these data include the recording of provenience (i.e., site designation, specimen catalog number, and feature or trash pit number), animal class, genus and species, element, percentage and portion of the element represented, number of specimens, side of element (when applicable), observations regarding age of the animal, bone modification (whether natural or cultural), weight in grams, and recovery method.

Each specimen was first assigned to the appropriate animal class whenever possible (e.g., mammal, bird, etc.). When the specific taxon of the animal could not be determined, the analyst attempted to assign the specimen to a size class (e.g., small, medium, or large mammal). The anatomical element was recorded when identified. When the element could not be identified, it was placed either in an Unidentified or Unidentifiable category. Unidentified refers to specimens that are likely identifiable, but that the analyst was unable to identify.[4] Unidentifiable refers to specimens too small or too fragmented to exhibit distinguishing characteristics. Data collected regarding age included information on cranial fusion, long bone fusion, and tooth eruption, in addition to qualitative observations regarding bone porosity. Observations made with respect to bone modification included the presence or absence of burning and calcination, tool modification, discoloration not associated with burning, cut marks, and carnivore and rodent gnawing. Specimens were not systematically examined for evidence of butchering and gnawing, due to time constraints and the nature of the project goals. Observations of butchering/gnawing were made without the use of magnification and were recorded as presence/absence data.

Specimens that could not be identified with reference to the comparative collections at the UNC Research Laboratories of Archaeology were taken to the Zooarchaeology Collection at the University of Georgia Natural History Museum for comparison. Some of the fish specimens, including the remains of sturgeon, channel catfish, largemouth bass, and walleye, were also sent to Dr. Thomas Whyte at Appalachian State University for a second opinion.

Quantitative Measures

Throughout this analysis, I employ standard zooarchaeological measures to estimate the relative abundance of different taxa in each assemblage. The most basic statistic in zooarchaeology is the Number of Identified Specimens (NISP). NISP is the count of identified specimens per taxon (Grayson 1984). For example, if the analyst identifies 71 bones or fragments of bones representing white-tailed deer (*Odocoileus virginianus*), then the NISP for deer equals 71. NISP can be quantified at different scales as well—there can be an NISP for deer, mammals, by feature, or by site.

While NISP is relatively easy to calculate, there are disadvantages to using it to estimate the relative abundance of different taxa in an assemblage. Different taxa vary in the number of elements that compose their skeletons, and NISP is unable to control for this (Grayson 1984). Another problem with NISP is that is does not account for differential preservation or bone fragmentation (Grayson 1984; Klein and Cruz-Uribe

1984). Clearly, the bones of one white-tailed deer have more surface area than those of one fox squirrel (*Sciurus niger*) and are thus more likely to fragment into more pieces, significantly inflating the NISP of the deer relative to the squirrel. Thus, NISP may over-estimate the contribution of larger animals relative to smaller animals.

To adjust for the problems of NISP in estimating the relative contribution of different animals in the diet, zooarchaeologists have developed alternative measures that are often used in addition to NISP. Perhaps the most widely used is the Minimum Number of Individuals (MNI). The Minimum Number of Individuals is a secondary measure based in part on NISP. As such, MNI is estimated for each animal by calculating the occurrence of the most abundant element of the animal, while accounting for the side of the element, portion represented, and relevant age information (Grayson 1984). For example, if the most abundant element of a white-tailed deer is the proximal end of a femur (n=12), and 8 derive from the right side of the animal and 4 from the left side, then the Minimum Number of deer would be 8.

MNI has several advantages over NISP, the primary one being that it provides units that are independent of each other (Grayson 1973). While NISP does not account for the fact that different taxa are composed of varying numbers of skeletal elements, MNI is totally unaffected by this problem. Moreover, MNI is much less affected by the problems of fragmentation and preservation than NISP.

As with NISP, however, there are also disadvantages to using MNI, including the inflation of rarer species in the assemblage and the problem of aggregation (Grayson 1984; Holm 1994). NISP and MNI can best be understood as separate ends of a spectrum in which NISP represents the *maximum* number of individuals identified in an assemblage. As such, NISP overestimates the importance of larger, more common taxa. At the other end of the spectrum, MNI (through setting a minimum) has the opposite effect and overestimates *rarer* species. Moreover, MNI calculations can vary based on how the analyst aggregates the data. There are many ways that the data can be grouped and MNI values calculated—by site, feature, feature type, stratigraphic level, etc. For the purposes of this analysis, I calculate MNI by site, and when applicable, by excavation.[5]

RESULTS

The Gaston Site (31Hx7)

The faunal assemblage from the Gaston site consists of 13,845 bone fragments representing a minimum of 108 individuals (Table 2). Mammals contributed 78.7% of the total NISP, and white-tailed deer (*Odocoileus virginianus*) was by far the most abundantly represented mammal, contributing 13.6% of the NISP and 31.6% of the MNI. Various other mammalian taxa were identified in the Gaston site assemblage, including opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), domestic dog (*Canis familiaris*), gray fox (*Urocyon cinereoargentus*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). Aside from deer, domestic dog was the only other mammal that contributed significantly to the assemblage. Most of the dog remains, however, derive from burial contexts and thus did not contribute significantly to the diet

Table 2. Summary of Faunal Remains from the Gaston Site (31Hx7).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	24	0.2	2	1.7
rabbit	*Sylvilagus* sp.	11	0.1	3	2.6
squirrel	*Sciurus* sp.	17	0.1	2	1.7
beaver	*Castor canadensis*	55	0.4	2	1.7
muskrat	*Ondatra zibethicus*	27	0.2	3	2.6
domestic dog	*Canis familiaris*	1,229	8.9	9	7.7
gray fox	*Urocyon cinereoargentus*	2	0.0	1	0.9
black bear	*Ursus americanus*	6	0.0	1	0.9
raccoon	*Procyon lotor*	121	0.9	4	3.4
white-tailed deer	*Odocoileus virginianus*	1,887	13.6	37	31.6
striped skunk	*Mephitis mephitis*	2	0.0		
unident. mammal		7,526	54.3		
Birds					
ducks	Anatidae	2	0.0		
Canada goose	*Branta canadensis*	1	0.0	1	0.9
turkey	*Meleagris gallopavo*	152	1.1	8	6.8
unidentified bird		736	5.3		
Reptiles					
snapping turtle	*Chelydra serpentina*	40	0.3	1	0.9
mud turtle	*Kinosternon* sp.	6	0.0	1	0.9
painted/slider	*Chrysemys* sp.	76	0.5	1	0.9
map turtle	*Graptemys* sp.	2	0.0	1	0.9
cooter	*Pseudemys* sp.	4	0.0	1	0.9
box turtle	*Terrapene carolina*	331	2.4	4	3.4
unidentified turtle		1,011	7.3		
unidentified snake		6	0.0		
Amphibians					
toad/frog		1	0.0		
Fish					
sturgeon	*Acipenser* sp.	63	0.5	1	0.9
gar	*Lepisosteus* sp.	59	0.4	1	0.9
bowfin	*Amia calva*	10	0.1		
sturgeon/bowfin		1	0.0		
minnows	Cyprinidae	3	0.0		
suckers	Catostomidae	2	0.0		
sucker	*Catostomus* sp.	2	0.0	2	1.7
redhorse	*Moxostoma* sp.	36	0.3	5	4.3

Table 2 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
catfish	Ictaluridae	3	0.0		
snail bullhead	*Ameiurus brunneus*	1	0.0	1	0.9
channel catfish	*Ictalurus punctatus*	3	0.0	2	1.7
bass, sunfish	Centrarchidae	46	0.3		
Roanoke bass	*Ambloplites cavifrons*	4	0.0	1	0.9
largemouth bass	*Micropterus salmoides*	10	0.1	9	7.7
bass	Percichthyidae	3	0.0		
striped bass	*Morone saxatilis*	1	0.0	1	0.9
temperate bass	*Morone* sp.	5	0.0	2	1.7
walleye	*Stizostedion vitreum*	2	0.0	1	0.9
unidentified fish		248	1.8		
Unidentified		68	0.5		
Total		13,845		108	

of the site's residents. No commensal mammals (mice and voles, for example) were identified, likely a result of recovery.

Birds make up only 6.4% of the Gaston assemblage by NISP and are represented by nine individuals and three taxa. Wild turkey (*Meleagris gallopavo*) was by far the most well-represented, contributing eight of the individuals. Other birds identified in the assemblage include Canada goose (*Branta canadensis*) and two specimens from the duck family (Anatidae).

Reptiles contributed 10.7% of the total NISP and are represented by six taxa. Box turtle (*Terrapene carolina*) is the most well-represented, accounting for 2.4% of the NISP. Other turtles include snapping turtle (*Chelydra serpentina*), mud turtle (*Kinosternon* sp.), painted turtle/pondslider (*Chrysemys* sp.), map turtle (*Graptemys* sp.), and cooter (*Pseudemys* sp.). Six fragments from an unidentified snake were also identified, although given the burrowing nature of some snakes, it is unlikely that these specimens represent refuse from food-related activities. Amphibians make up less than 1% of the NISP and are represented by a single toad/frog (*Bufo* sp./*Rana* sp.) specimen.

Fish identified in the Gaston site assemblage include sturgeon (*Acipenser* sp.), gar (*Lepisosteus* sp.), bowfin (*Amia calva*), minnows (Cyprinidae), suckers (Catostomidae), catfish (Ictaluridae), bass/sunfish (Centrarchidae), bass (Percichthyidae), and walleye (*Stizostedion vitreum*), making up 3.6% of the NISP and yielding a total of 26 individuals. Suckers include two genera (*Catostomus* sp., *Moxostoma* sp.), and catfish are represented by snail bullhead (*Ameiurus brunneus*) and channel catfish (*Ictalurus punctatus*). Centrarchidae is represented by Roanoke bass (*Ambloplites cavifrons*) and largemouth bass (*Micropterus salmoides*), and Percichthydae includes striped bass (*Morone saxitilis*) and temperate bass (*Morone* sp.).

To get a better idea of the animals that were most heavily exploited by the residents of the Gaston site, the top five species were ranked in order of importance by

Table 3. Top Five Ranked Taxa from the Gaston Site.

Rank	NISP	MNI
1	white-tailed deer	white-tailed deer
2	wild turkey	muskrat
3	box turtle	wild turkey
4	muskrat	**squirrel**
5	raccoon	raccoon, box turtle

both NISP and MNI (Table 3). In terms of MNI, when more than one taxon yielded the same number of individuals, those taxa were assigned to the same rank—thus the top five ranks based on MNI might include more than five taxa. In addition, bold-face type is used to highlight non-overlapping taxa between the two measures of rank-order abundance. Although the rank *order* of the top five taxa for the Gaston site varies depending on NISP or MNI, the same taxa (with the addition of squirrel when rank is determined based on MNI) ranked in the top five for both NISP and MNI. These taxa include white-tailed deer, wild turkey, box turtle, muskrat, and raccoon.

Vir 150 (44Mc645)

The faunal assemblage from Vir 150 consists of 47,878 bone fragments representing 239 individuals (Table 4). Mammals contributed 87.6% of the total NISP. White-tailed deer (*Odocoileus virginianus*) was the most well-represented species, contributing 14.6% of the NISP and 38.2% of the MNI. Other mammalian taxa identified at the Gaston site include opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), woodchuck (*Marmota monax*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), domestic dog (*Canis familiaris*), gray fox (*Urocyon cinereoargentus*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). The only commensal mammal recovered was white-footed mouse (*Peromyscus leucopus*) which was represented by two specimens.

Birds make up only 3% of the NISP from the Vir 150 site assemblage and are represented by 24 individuals and three taxa. As at the Gaston site, wild turkey (*Meleagris gallopavo*) was most numerous, contributing 23 of the individuals. Other birds identified in the assemblage include Canada goose (*Branta canadensis*) and six specimens from the duck family (Anatidae).

Reptiles contributed 8.3% of the total NISP and are represented by eight taxa. Box turtle (*Terrapene carolina*) is most numerous, followed by painted turtle/pondslider (*Chrysemys* sp.), painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentina*), mud turtle (*Kinosternon* sp.), pondslider (*Chrysemys scripta*), map turtle (*Graptemys* sp.), and cooter (*Pseudemys* sp.). Amphibians make up less than 1% of the NISP and are represent by toad (*Bufo* sp.) and toad/frog (*Bufo* sp./*Rana* sp.) specimens.

A similar set of fish were identified at Vir 150 as at the Gaston site, including sturgeon (*Acipenser* sp.), gar (*Lepisosteus* sp.), bowfin (*Amia calva*), minnows (Cyprinidae), suckers (Catostomidae), catfish (Ictaluridae), bass/sunfish (Centrarchidae), and bass (Percichthyidae). Fish make up 0.8% of the NISP, representing 21 individuals.

Table 4. Summary of Faunal Remains from Vir 150 (44Mc645).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	118	0.2	9	3.6
rabbit	*Sylvilagus* sp.	50	0.1	6	2.4
woodchuck	*Marmota monax*	19	0.0	3	1.2
squirrel	*Sciurus* sp.	138	0.3	12	4.8
beaver	*Castor canadensis*	57	0.1	3	1.2
white-footed mouse	*Peromyscus leucopus*	2	0.0	2	0.8
muskrat	*Ondatra zibethicus*	313	0.7	24	9.6
domestic dog	*Canis familiaris*	132	0.3	5	2.0
gray fox	*Urocyon cinereoargentus*	1	0.0	1	0.4
black bear	*Ursus americanus*	5	0.0	1	0.4
raccoon	*Procyon lotor*	172	0.4	10	4.0
white-tailed deer	*Odocoileus virginianus*	6,983	14.6	96	38.2
striped skunk	*Mephitis mephitis*	26	0.1	9	3.6
unident. mammal		34,000	70.9		
Birds					
unidentifed duck	Anatidae	6	0.0		
Canada goose	*Branta canadensis*	4	0.0	1	0.4
turkey	*Meleagris gallopavo*	515	1.1	23	9.2
unidentified bird		935	1.9		
Reptiles					
snapping turtle	*Chelydra serpentina*	59	0.1	2	0.8
mud turtle	*Kinosternon* sp.	30	0.1	3	1.2
painted turtle	*Chrysemys picta*	81	0.2	1	0.4
pondslider	*Chrysemys scripta*	19	0.0	1	0.4
painted/slider	*Chrysemys* sp.	169	0.4		
map turtle	*Graptemys* sp.	6	0.0	1	0.4
cooter	*Pseudemys* sp.	6	0.0	2	0.8
box turtle	*Terrapene carolina*	459	1.0	2	0.8
unidentified turtle		3,154	6.6		
Amphibians					
toad	*Bufo* sp.	3	0.0	1	0.4
toad/frog		3	0.0		
Fish					
sturgeon	*Acipenser* sp.	5	0.0	1	0.4
gar	*Lepisosteus* sp.	18	0.0	5	2.0
bowfin	*Amia calva*	15	0.0	2	0.8
minnows	Cyprinidae	23	0.0		

Table 4 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
suckers	Catostomidae	5	0.0		
sucker	*Catostomus* sp.	1	0.0	1	0.4
silver redhorse	*Moxostoma anisurum*	1	0.0	1	0.4
redhorse	*Moxostoma* sp.	18	0.0	4	1.6
catfish	Ictaluridae	7	0.0		
bullhead	*Ameiurus* sp.	1	0.0	1	0.4
channel catfish	*Ictalurus punctatus*	12	0.0	2	0.8
bass, sunfish	Centrarchidae	72	0.2		
Roanoke bass	*Ambloplites cavifrons*	3	0.0	1	0.4
largemouth bass	*Micropterus salmoides*	4	0.0	1	0.4
bass	Percichthyidae	2	0.0		
striped bass	*Morone saxatilis*	2	0.0	1	0.4
temperate bass	*Morone* sp.	5	0.0	1	0.4
unidentified fish		181	0.4		
Unidentified		38	0.1		
Total		47,878		239	

Table 5. Top Five Ranked Taxa from Vir 150.

Rank	NISP	MNI
1	white-tailed deer	white-tailed deer
2	wild turkey	muskrat
3	**box turtle**	wild turkey
4	muskrat	**squirrel**
5	raccoon	raccoon

Suckers include two genera (*Catostomus* sp*., Moxostoma sp*.) in addition to silver redhorse (*Moxostoma anisurum*). Catfish are represented by bullhead (*Ameiurus* sp.) and channel catfish (*Ictalurus punctatus*), and sunfish include Roanoke bass (*Ambloplites cavifrons*) and largemouth bass (*Micropterus salmoides*). Bass from the Percichthyidae family include striped bass (*Morone saxitilis*) and temperate bass (*Morone* sp.).

Four taxa from Vir 150 consistently ranked in the top five taxa for NISP and MNI—white-tailed deer, wild turkey, muskrat, and raccoon (Table 5). Box turtle ranked third based on NISP, but did not place in the top five MNI. Squirrel, which did not rank highly based on its NISP value, was the fourth most abundant taxa based on MNI.

The Stockton Site (44Hr35)

The faunal assemblage from the Stockton site consists of 4,029 bone fragments representing 76 individuals (Table 6). Mammals contributed 61.6% of the total NISP. White-tailed deer (*Odocoileus virginianus*) was by far the most well-represented mammal, contributing 19% of the NISP and 19.7% of the MNI. Other mammalian taxa identified in the Stockton site assemblage include opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), woodchuck (*Marmota monax*), chipmunk (*Tamias striatus*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), domestic dog (*Canis familiaris*), gray fox (*Urocyon cinereoargentus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). No commensal mammals were identified, likely a result of recovery methods.

Birds represent 14.6% of the Gaston assemblage by NISP and are represented by 30 individuals and eight species. Passenger pigeon (*Ectopistes migratorius*) is the most numerous, yielding 20 individuals and accounting for 6.1% of the total NISP. Wild turkey (*Meleagris gallopavo*) was also identified, contributing four of the individuals. Other birds identified in the assemblage include hawk (*Buteo* sp.), ruffed grouse (*Bonasa umbellus*), bobwhite quail (*Colinus virginianus*), common crow (*Corvus brachyrhynchos*), flicker (*Colaptes* sp.), and blue jay (*Cyanocitta cristata*).

Reptiles contributed 14.7% of the total NISP and are represented by five taxa. Box turtle (*Terrapene carolina*) is by far the most numerous, accounting for 8.3% of the total NISP. Other turtles include snapping turtle (*Chelydra serpentina*), mud turtle (*Kinosternon* sp.), painted turtle/pondslider (*Chrysemys* sp.), and cooter (*Pseudemys* sp.). Three fragments from an unidentified snake were also identified, although snakes were likely commensal species and were probably not used for food. Amphibians make up 2% of the NISP and are represented by 81 specimens of toad/frog (*Bufo* sp./*Rana* sp.).

Fish make up 1.9% of the Stockton site NISP, yielding a total of five individuals. They include suckers (Catostomidae) and bass/sunfish (Centrarchidae). Suckers are represented by two genera (*Catostomus* sp., *Moxostoma* sp.) and bass/sunfish by one genus (*Ambloplites* sp.).

In terms of both NISP and MNI, the most important taxa exploited from the Stockton site include white-tailed deer, box turtle, passenger pigeon, wild turkey, and squirrel (Table 7). In terms of MNI, passenger pigeon represents the most important species at the site. Additional taxa were added to the MNI ranking, including rabbit and two fish taxa (*Catostomus* sp., *Moxostoma sp*.).

The Gravely Site (44Hr29)

The faunal assemblage from the Gravely site consists of 4,247 bone fragments representing 16 individuals (Table 8). Unfortunately, most of the assemblage was highly fragmented and hence unidentifiable (76.4%). Mammals contributed 19.8% of the total NISP. White-tailed deer (*Odocoileus virginianus*) was the most numerous mammal, contributing 6.7% of the NISP and 31.3% of the MNI. Four other mammals were identified at the Gravely site and include rabbit (*Sylvilagus sp*.), chipmunk (*Tamias striatus*), squirrel (*Sciurus sp*.), and gray fox (*Urocyon cinereoargentus*).

Table 6. Summary of Faunal Remains from the Stockton site (44Hr35).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	6	0.1	1	1.3
rabbit	*Sylvilagus* sp.	14	0.3	2	2.6
rodents	Rodentia	1	0.0		
woodchuck	*Marmota monax*	7	0.2	1	1.3
chipmunk	*Tamias striatus*	11	0.3	1	1.3
squirrel	*Sciurus* sp.	56	1.4	7	9.2
beaver	*Castor canadensis*	7	0.2	1	1.3
muskrat	*Ondatra zibethicus*	1	0.0	1	1.3
domestic dog	*Canis familiaris*	7	0.2	1	1.3
gray fox	*Urocyon cinereoargentus*	3	0.1	1	1.3
raccoon	*Procyon lotor*	8	0.2	1	1.3
white-tailed deer	*Odocoileus virginianus*	764	19.0	15	19.7
striped skunk	*Mephitis mephitis*	6	0.1	1	1.3
unident. mammal		1,592	39.5		
Birds					
-	Ardeidae	1	0.0		
hawk	*Buteo* sp.	1	0.0	1	1.3
ruffed grouse	*Bonasa umbellus*	2	0.0	1	1.3
bobwhite quail	*Colinus virginianus*	2	0.0	1	1.3
wild turkey	*Meleagris gallopavo*	111	2.8	4	5.3
common crow	*Corvus brachyrhynchos*	1	0.0	1	1.3
passenger pigeon	*Ectopistes migratorius*	246	6.1	20	26.3
flicker	*Colaptes* sp.	1	0.0	1	1.3
blue jay	*Cyanocitta cristata*	2	0.0	1	1.3
unidentified bird		221	5.5		
Reptiles					
snapping turtle	*Chelydra serpentina*	4	0.1	1	1.3
mud turtle	*Kinosternon* sp.	2	0.0	1	1.3
painted/slider	*Chrysemys* sp.	1	0.0	1	1.3
cooter	*Pseudemys* sp.	1	0.0	1	1.3
box turtle	*Terrapene carolina*	336	8.3	4	5.3
unidentified turtle		246	6.1		
unidentified snake		3	0.0		
Amphibians					
toad/frog		81	2.0		
Fish					
suckers	Catostomidae	5	0.1		

Table 6 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
sucker	*Catostomus* sp.	7	0.2	2	2.6
redhorse	*Moxostoma* sp.	4	0.1	2	2.6
bass	*Ambloplites* sp.	1	0.0	1	1.3
unidentified fish		76	1.9		
Unidentified		191	4.7		
Total		4,029		76	

Table 7. Top Five Ranked Taxa from the Stockton Site.

Rank	NISP	MNI
1	white-tailed deer	passenger pigeon
2	box turtle	white-tailed deer
3	passenger pigeon	squirrel
4	wild turkey	wild turkey, box turtle
5	squirrel	**rabbit, sucker (*Catostomus* sp.), redhorse (*Moxostoma* sp.)**

Table 8. Summary of Faunal Remains from the Gravely site (44Hr29).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
rabbit	*Sylvilagus* sp.	1	0.0	1	6.3
chipmunk	*Tamias striatus*	1	0.0	1	6.3
squirrel	*Sciurus* sp.	24	0.6	2	12.5
gray fox	*Urocyon cinereoargentus*	1	0.0	1	6.3
white-tailed deer	*Odocoileus virginianus*	283	6.7	5	31.3
unident. mammal		529	12.5		
Birds					
bobwhite quail	*Colinus virginianus*	1	0.0	1	6.3
wild turkey	*Meleagris gallopavo*	31	0.7	1	6.3
passenger pigeon	*Ectopistes migratorius*	7	0.2	1	6.3
blue jay	*Cyanocitta cristata*	2	0.0	1	6.3
unidentified bird		20	0.5		

Table 8 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Reptiles					
box turtle	*Terrapene carolina*	13	0.3	1	6.3
unidentified turtle		29	0.7		
unidentified snake		44	1.0		
Fish					
gar	*Lepisosteus* sp.	1	0.0	1	6.3
unidentified fish		16	0.4		
Unidentified		3,244	76.4		
Total		4,247		16	

Table 9. Top Five Ranked Taxa from the Gravely Site.

Rank	NISP	MNI
1	white-tailed deer	white-tailed deer
2	wild turkey	**chipmunk**
3	squirrel	ALL OTHERS
4	box turtle	
5	passenger pigeon	

Birds represent only 1.4% of the Gravely assemblage by NISP and are represented by four individuals and four taxa. Wild turkey (*Meleagris gallopavo*) was most abundant, followed by passenger pigeon (*Ectopistes migratorius*), blue jay (*Cyanocitta cristata*), and bobwhite quail (*Colinus virginianus*).

Reptiles contributed 2% of the total NISP and are represented solely by box turtle (*Terrapene carolina*). No amphibians were identified, and gar (*Lepisosteus* sp.) was the only fish identified at the Gravely site.

The top five ranked species by NISP for the Gravely site include white-tailed deer, wild turkey, squirrel, box turtle, and passenger pigeon (Table 9). In terms of MNI, all species identified at the site ranked in the top five. Nevertheless, white-tailed deer appears to be the most heavily-exploited mammal and the most important vertebrate food resource.

The Dallas Hylton Site (44Hr20)

The faunal assemblage from the Dallas Hylton site consists of 6,992 bone fragments representing 135 individuals (Table 10). Mammals contributed 66.2% of the

Table 10. Summary of Faunal Remains from the Dallas Hylton Site (44Hr20).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	10	0.1	2	1.5
rabbit	*Sylvilagus* sp.	107	1.5	4	3.0
woodchuck	*Marmota monax*	2	0.0	2	1.5
squirrel	*Sciurus* sp.	126	1.8	12	8.9
beaver	*Castor canadensis*	25	0.4	3	2.2
hispid cotton rat	*Sigmodon hispidus*	1	0.0	1	0.7
muskrat	*Ondatra zibethicus*	1	0.0	1	0.7
domestic dog	*Canis familiaris*	9	0.1	1	0.7
black bear	*Ursus americanus*	2	0.0	1	0.7
raccoon	*Procyon lotor*	57	0.8	2	1.5
white-tailed deer	*Odocoileus virginianus*	1,618	23.1	22	16.3
cow	*Bos taurus*	1	0.0	1	0.7
goat	*Capra hirca*	1	0.0	1	0.7
striped skunk	*Mephitis mephitis*	1	0.0	1	0.7
mountain lion	*Felis concolor*	1	0.0	1	0.7
unident. mammal		2,669	38.2		
Birds					
bobwhite quail	*Colinus virginianus*	6	0.1	2	1.5
turkey	*Meleagris gallopavo*	513	7.3	18	13.3
rail	Rallidae	1	0.0	1	0.7
screech owl	*Otus asio*	1	0.0	1	0.7
common crow	*Corvus brachyrhynchos*	1	0.0	1	0.7
passenger pigeon	*Ectopistes migratorius*	402	5.7	32	23.7
pileated woodpecker	*Dryocopus pileatus*	1	0.0	1	0.7
red-bellied woodpecker	*Melanerpes carolinus*	1	0.0	1	0.7
blue jay	*Cyanocitta cristata*	2	0.0	1	0.7
rufous-sided towhee	*Pibilo erythropthalamus*	1	0.0	1	0.7
unidentified. bird		490	7.0		
Reptiles					
snapping turtle	*Chelydra serpentina*	8	0.1	2	1.5
painted/slider	*Chrysemys* sp.	4	0.1	1	0.7
box turtle	*Terrapene carolina*	429	6.1	10	7.4
unidentified turtle		294	4.2		
Amphibians					
toad	*Bufo* sp.	2	0.0	1	0.7
frog	*Rana* sp.	4	0.1	1	0.7
toad/frog		17	0.2		

Table 10 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Fish					
suckers	Catostomidae	2	0.0		
sucker	*Catostomus* sp.	3	0.0	1	0.7
redhorse	*Moxostoma* sp.	1	0.0		
catfish	Icataluridae	1	0.0		
sunfish	*Lepomis* sp.	1	0.0	1	0.7
rock bass	*Ambloplites rupestris*	1	0.0	1	0.7
Roanoke bass	*Ambloplites cavifrons*	1	0.0		
largemouth bass	*Micropterus salmoides*	3	0.0	1	0.7
bass	*Ambloplites* sp.	1	0.0	1	0.7
temperate bass	*Morone* sp.	1	0.0	1	0.7
unidentified fish		72	1.0		
Unidentified		97	1.4		
Total		6,992		135	

total NISP. As with the other sites, white-tailed deer (*Odocoileus virginianus*) was the most abundant mammal, contributing 23.1% of the NISP and yielding 22 individuals. Other mammals identified at Dallas Hylton include opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), woodchuck (*Marmota monax*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), domestic dog (*Canis familiaris*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and mountain lion (*Felis concolor*). One commensal mammal, hispid cotton rat (*Sigmodon hispidus*), was also identified. In addition, two Old World species, cow (*Bos taurus*) and goat (*Capra hirca*), were identified at the Dallas Hylton site. Represented by one specimen each, cow and goat likely represent intrusions from a later occupation.

Birds represent 20.3% of the Dallas Hylton assemblage by NISP and are represented by 59 individuals and nine species. Wild turkey (*Meleagris gallopavo*) is represented by the most specimens (n=513) and passenger pigeon (*Ectopistes migratorius*) by the most individuals (MNI=32). Other birds identified in the assemblage include bobwhite quail (*Colinus virginianus*), screech owl (*Otus asio*), common crow (*Corvus brachyrhynchos*), pileated woodpecker (*Dryocopus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*), blue jay (*Cyanocitta cristata*), and rufous-sided towhee (*Pibilo erythropthalamus*).

Reptiles contributed 10.5% of the NISP and are represented by three turtle species. Box turtle (*Terrapene carolina*) is the most abundant, making up 6.1% of the total NISP. Other turtles include snapping turtle (*Chelydra serpentina*) and painted turtle/pondslider (*Chrysemys* sp.). Amphibians account for less than 1% of the assemblage by NISP and are represented toad (*Bufo* sp.), frog (*Rana* sp.), and 17 specimens assigned to a toad/frog (*Bufo* sp./*Rana* sp.) category.

Table 11. Top Five Ranked Taxa from the Dallas Hylton Site (44Hr20).

Rank	NISP	MNI
1	white-tailed deer	passenger pigeon
2	wild turkey	white-tailed deer
3	box turtle	wild turkey
4	passenger pigeon	squirrel
5	squirrel	box turtle

Fish make up 1.2% of the Dallas Hylton site NISP, yielding a total of 6 individuals. Fish taxa include suckers (Catostomidae), catfish (Ictaluridae), bass/sunfish (Centrarchidae), and bass (Percichthyidae). Suckers are represented by two genera (*Catostomus* sp., *Moxostoma* sp.). Bass/sunfish species include rock bass (*Ambloplites rupestris*), Roanoke bass (*Ambloplites cavifrons*), largemouth bass (*Micropterus salmoides*), and temperate bass (*Morone* sp.).

The same taxa ranked in the top five for both NISP and MNI at the Dallas Hylton site. These species include white-tailed deer, wild turkey, box turtle, passenger pigeon, and squirrel (Table 11). As with the Stockton site, passenger pigeon was the highest ranked species by MNI, indicating its importance as a major vertebrate food resource at Dallas Hylton.

The Koehler Site (44Hr6)

The Gravely Excavations. The faunal assemblage from the first excavation of the Koehler site consists of a scant 663 bone fragments representing 27 individuals (Table 12). Mammals contributed 67.9% of the total NISP, and white-tailed deer (*Odocoileus virginianus*) was the most abundant mammal, contributing 16% of the NISP and 18.5% of the MNI. Other mammalian taxa also were identified in the assemblage from the early excavations of the Koehler site, including woodchuck (*Marmota monax*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), gray fox (*Urocyon cinereoargentus*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), pig (*Sus scrofa*), and cow (*Bos taurus*). Bones of these latter two species came from a discrete feature that represents a colonial cellar and are thus unrelated to the Late Woodland component at the site. No commensal mammals (mice and voles, for example) were identified, likely a result of recovery.

Birds make up 11.8% of the Koehler assemblage from the Gravely excavations and are represented by six individuals and three taxa. Wild turkey (*Meleagris gallopavo*) was the most well-represented, contributing four of the individuals. Other birds identified in the assemblage include bobwhite quail (*Colinus virginianus*) and passenger pigeon (*Ectopistes migratorius*).

Reptiles contributed 11.6% of the NISP and are represented by box turtle (*Terrapene carolina*) only. Amphibians make up less than 1% of the NISP and are represented by three toad (*Bufo* sp.) specimens. Only one species of fish, a sunfish (*Lepomis* sp.), was identified in the assemblage from this first excavation.

Table 12. Summary of Faunal Remains from the Gravely Excavations at the Koehler Site (44Hr6).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
woodchuck	*Marmota monax*	2	0.3	1	3.7
squirrel	*Sciurus* sp.	16	2.4	3	11.1
beaver	*Castor canadensis*	2	0.3	1	3.7
gray fox	*Urocyon cinereoargentus*	2	0.3	1	3.7
black bear	*Ursus americanus*	1	0.2	1	3.7
raccoon	*Procyon lotor*	9	1.4	1	3.7
pig	*Sus scrofa*	17	2.6	1	3.7
white-tailed deer	*Odocoileus virginianus*	106	16.0	5	18.5
cow	*Bos taurus*	1	0.2	1	3.7
unident. mammal		294	44.3		
Birds					
bobwhite quail	*Colinus virginianus*	1	0.2	1	3.7
wild turkey	*Meleagris gallopavo*	33	5.0	4	14.8
passenger pigeon	*Ectopistes migratorius*	2	0.3	1	3.7
unidentified bird		42	6.3		
Reptiles					
box turtle	*Terrapene carolina*	51	7.7	4	14.8
unidentified turtle		26	3.9		
Amphibians					
toad	*Bufo* sp.	3	0.5	1	3.7
sunfish	*Lepomis* sp.	1	0.2	1	3.7
unidentified fish		13	2.0		
Unidentified		41	6.2		
Total		663		27	

Table 13. Top Five Ranked Taxa from the Gravely Excavations at the Koehler Site (44Hr6).

Rank	NISP	MNI
1	white-tailed deer	white-tailed deer
2	box turtle	wild turkey, box turtle
3	wild turkey	squirrel
4	pig	ALL OTHERS
5	squirrel	

The top five ranked species by NISP for the Gravely excavations of the Koehler site include white-tailed deer, box turtle, wild turkey, pig, and squirrel (Table 13). The pig remains were restricted to one context that significantly post-dates the other contexts at the site. Thus, the high ranking of pig relative to the other taxa recovered at the site is misleading. While all the species identified at the site ranked in the top five by MNI, four of the top five taxa by NISP ranked the highest, including white-tailed deer, wild turkey, box turtle, and squirrel.

The Clark Excavations. The second excavation of the Koehler site yielded a faunal assemblage consisting of 5,006 bone fragments representing 83 individuals (Table 14). In addition, 329 faunal specimens from several flotation samples were also analyzed. The faunal remains from the flotation samples will be discussed separately. Mammals contributed 32.5% of the total NISP. White-tailed deer (*Odocoileus virginianus*) was the most abundant mammal, contributing 7.7% of the NISP and yielding five individuals. Other mammals identified from the second excavation of the Koehler site include opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), woodchuck (*Marmota monax*), chipmunk (*Tamias striatus*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), domestic dog (*Canis familiaris*), gray fox (*Urocyon cinereoargentus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). In addition, one Old World species, cow (*Bos taurus*), was identified in the second set of excavations conducted at the Koehler site. Represented by one specimen, cow likely represents an intrusion from a later occupation.

Birds make up only 4.7% of the Koehler assemblage by NISP and are represented by 15 individuals and nine species. Wild turkey (*Meleagris gallopavo*) is represented by the most specimens (n=57) and passenger pigeon (*Ectopistes migratorius*) by the most individuals (MNI=5). Other birds identified in the assemblage include turkey vulture (*Cathartes aura*), bobwhite quail (*Colinus virginianus*), crow (*Corvus* sp.), pileated woodpecker (*Dryocopus pileatus*), blue jay (*Cyanocitta cristata*), robin (*Turdus migratorius*), and white-crowned sparrow (*Zonotricia leucophrys*)..

Reptiles contributed 18.4% of the NISP and are represented solely by box turtle (*Terrapene carolina*) and snapping turtle *(Chelydra serpentina*). Box turtle is the most abundant, accounting for 3.1% of the total NISP. Amphibians make up 3.4% of the assemblage by NISP and are represented toad (*Bufo* sp.), frog (*Rana* sp.), and eastern spadefoot toad (*Scaphiopus holbrooki*). Though only represented by 23 specimens, eastern spadefoot yielded the highest MNI (n=14) for these excavations.

Fish make up 23.5% of the NISP, yielding a total of 18 individuals. Fish taxa include gar (*Lepisosteus sp*.), minnows (Cyprinidae), suckers (Catostomidae), catfish (Ictaluridae), bass/sunfish (Centrarchidae), and bass (Percichthyidae). Suckers are represented by two genera (*Moxostoma* sp*., Minytrema* sp.). Bass/sunfish species include rock bass (*Ambloplites rupestris*), Roanoke bass (*Ambloplites cavifrons*), largemouth bass (*Micropterus salmoides*), and temperate bass (*Morone* sp.).

Faunal remains identified in the flotation samples consist entirely of fish (Table 14). Although many fish were identified only to family (Catostomidae, Ictaluridae), several basses were identified to species, including rock bass (*Ambloplites rupestris*), Roanoke bass (*Ambloplites cavifrons*), largemouth bass (*Micropterus salmoides*), and temperate bass (*Morone* sp.). Rock bass, however, was the most abundantly represented.

Table 14. Summary of Faunal Remains from the Clark Excavations at the Koehler site (44Hr6).

		Features				Flotation	
Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI	NISP	MNI
Mammals							
opossum	*Didelphis virginianus*	6	0.1	1	1.2		
rabbit	*Sylvilagus* sp.	6	0.1	1	1.2		
rodents	Rodentia	11	0.2				
woodchuck	*Marmota monax*	5	0.1	1	1.2		
chipmunk	*Tamias striatus*	7	0.1	2	2.4		
squirrel	*Sciurus* sp.	49	1.0	8	9.6		
beaver	*Castor canadensis*	9	0.2	1	1.2		
domestic dog	*Canis familiaris*	1	0.0	1	1.2		
gray fox	*Urocyon cinereoargentus*	3	0.1	1	1.2		
raccoon	*Procyon lotor*	13	0.3	2	2.4		
white-tailed deer	*Odocoileus virginianus*	386	7.7	5	6.0		
cow	*Bos taurus*	1	0.0	1	1.2		
striped skunk	*Mephitis mephitis*	3	0.1	1	1.2		
unident. mammal		1,117	22.3				
Birds							
turkey vulture	*Cathartes aura*	1	0.0	1	1.2		
bobwhite quail	*Colinus virginianus*	5	0.1	1	1.2		
wild turkey	*Meleagris gallopavo*	57	1.1	3	3.6		
crow	*Corvus* sp.	1	0.0	1	1.2		
passenger pigeon	*Ectopistes migratorius*	54	1.1	5	6.0		
pileated woodpecker	*Dryocopus pileatus*	1	0.0	1	1.2		
blue jay	*Cyanocitta cristata*	3	0.1	1	1.2		
robin	*Turdus migratorius*	1	0.0	1	1.2		
white-crowned sparrow	*Zonotricia leucophrys*	1	0.0	1	1.2		
unidentified bird		111	2.2				
Reptiles							
snapping turtle	*Chelydra serpentina*	3	0.1	1	1.2		
box turtle	*Terrapene carolina*	153	3.1	6	7.2		
unidentified turtle		626	12.5				
unidentified snake		128	2.6				
unidentified reptile		8	0.2				
Amphibians							
toad	*Bufo* sp.	6	0.1	3	3.6		
frog	*Rana* sp.	1	0.0	1	1.2		

Table 14 continued.

Common Name	Taxonomic Name	Features NISP	%NISP	MNI	%MNI	Flotation NISP	MNI
toad/frog		163	3.3				
eastern spadefoot	*Scaphiopus holbrooki*	23	0.5	14	16.9		
Fish							
gar	*Lepisosteus* sp.	5	0.1	1	1.2		
minnows	Cyprinidae	23	0.5				
suckers	Catostomidae	3	0.1			1	
redhorse	*Moxostoma* sp.	2	0.0	1	1.2		
sucker	*Minytrema* sp.	1	0.0	1	1.2		
catfish	Icataluridae	2	0.0				
bass, sunfish	Centrarchidae	17	0.3			8	
sunfish	*Lepomis* sp.	17	0.3	7	8.4	20	4
rock bass	*Ambloplites rupestris*	30	0.6	3	3.6	13	3
Roanoke bass	*Ambloplites cavifrons*	2	0.0	1	1.2		
largemouth bass	*Micropterus salmoides*	8	0.2	2	2.4		
bass	*Ambloplites* sp.	27	0.5			5	
temperate bass	*Morone* sp.	10	0.2	2	2.4		
unidentified fish		1,024	20.5			282	
Unidentified		872	17.4				
Total		5,006		83		329	7

Table 15. Top Five Ranked Taxa from the Clark Excavations at the Koehler Site (44Hr6).

Rank	NISP	MNI
1	white-tailed deer	**eastern spadefoot**
2	box turtle	squirrel
3	**wild turkey**	**sunfish (*Lepomis* sp.)**
4	passenger pigeon	box turtle
5	squirrel	white-tailed deer, passenger pigeon

The top five ranked species by NISP for the Clark excavations of the Koehler site include white-tailed deer, box turtle, wild turkey, passenger pigeon, and squirrel (Table 15). Four of these taxa remained in the top five by MNI—white-tailed deer, box turtle, passenger pigeon, and squirrel. Eastern spadefoot and sunfish (*Lepomis sp*.) were added to the top five species ranked by MNI, while wild turkey dropped out. It is interesting that eastern spadefoot is represented by the most individuals at the site. However, given

(1) the burrowing nature of toads, (2) that most of the remains derive from a single context, and (3) that most skeletal elements are represented, it is likely that the eastern spadefoot represents a commensal species rather than a food resource.

The Leatherwood Creek Site (44Hr1)

The faunal assemblage from the Leatherwood Creek site consists of 1,372 bone fragments representing 38 individuals (Table 16). Mammals contributed 73.4% of the total NISP. White-tailed deer (*Odocoileus virginianus*) was the most abundant mammal, contributing 22.3% of the NISP and yielding nine individuals. Other mammals identified at Leatherwood Creek include opossum (*Didelphis virginianus*), rabbit (*Sylvilagus* sp.), woodchuck (*Marmota monax*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), gray fox (*Urocyon cinereoargentus*), raccoon (*Procyon lotor*), and bobcat (*Lynx rufus*). One commensal mammal, white-footed mouse (*Peromyscus leucopus*), was also identified.

Birds represent 13.4% of the Leatherwood Creek assemblage by NISP and are represented by nine individuals and three species. Wild turkey (*Meleagris gallopavo*) is the most well-represented, yielding five individuals and accounting for 4% of the NISP. Passenger pigeon (*Ectopistes migratorius*) was also identified at the site (MNI=3), followed by blue jay (*Cyanocitta cristata*).

Reptiles contributed 10.5% of the NISP and are represented by box turtle (*Terrapene carolina*) and snapping turtle (*Chelydra serpentina*). Amphibians account for less than 1% of the assemblage by NISP and are represented by two specimens assigned to a toad/frog (*Bufo* sp./*Rana* sp.) category. Few fish remains were identified in the Leatherwood Creek assemblage and were restricted to suckers (Catostomidae). In addition to two sucker specimens assigned to family, a redhorse (*Moxostoma* sp.) was also identified.

The same taxa ranked in the top five by both NISP and MNI at the Leatherwood Creek site (Table 17). These species include white-tailed deer, box turtle, wild turkey, squirrel, and passenger pigeon. Raccoon was added to the top five ranked species when taxa were ranked according to MNI. There appears to be a great deal of consistency in species ranks at Leatherwood Creek.

SITE COMPARISONS

The data reported above demonstrate considerable overlap between these sites in terms of the exploitation of native fauna. This section considers this overlap in more detail through assemblage comparisons. In making comparisons across these sites, I first consider the relative abundance of different animal classes using %NISP. This statistic was calculated by site and is displayed as a series of bar graphs (Figure 2).

Generally, the graphs from all of the excavations yielded a similar pattern, with the exception of the second excavation of the Koehler site. The second Koehler assemblage yielded more remains of birds and reptiles relative to mammals than any other assemblage in this study. This deviation may be attributable to the fine-screen recovery employed throughout the second excavation. The recovery methods used

Table 16. Summary of Faunal Remains from the Leatherwood Creek Site (44Hr1).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	2	0.1	1	2.6
rabbit	*Sylvilagus* sp.	7	0.5	1	2.6
woodchuck	*Marmota monax*	1	0.1	1	2.6
squirrel	*Sciurus* sp.	36	2.6	4	10.5
beaver	*Castor canadensis*	4	0.3	1	2.6
white-footed mouse	*Peromyscus leucopus*	1	0.1	1	2.6
muskrat	*Ondatra zibethicus*	1	0.1	1	2.6
gray fox	*Urocyon cinereoargentus*	1	0.1	1	2.6
raccoon	*Procyon lotor*	9	0.7	2	5.3
white-tailed deer	*Odocoileus virginianus*	306	22.3	9	23.7
bobcat	*Lynx rufus*	1	0.1	1	2.6
unident. mammal		638	46.4		
Birds					
wild turkey	*Meleagris gallopavo*	55	4.0	5	13.2
passenger pigeon	*Ectopistes migratorius*	20	1.5	3	7.9
blue jay	*Cyanocitta cristata*	1	0.1	1	2.6
unidentified bird		108	7.9		
Reptiles					
snapping turtle	*Chelydra serpentina*	12	0.9	1	2.6
box turtle	*Terrapene carolina*	58	4.2	4	10.5
unidentified turtle		72	5.2		
unidentified snake		2	0.1		
Amphibians					
toad/frog		2	0.1		
Fish					
suckers	Catostomidae	2	0.1		
redhorse	*Moxostoma* sp.	1	0.1	1	2.6
unidentified fish		6	0.4		
Unidentified		26	1.9		
Total		1,372		38	

Table 17. Top Five Ranked Taxa from the Leatherwood Creek Site (44Hr1).

Rank	NISP	MNI
1	white-tailed deer	white-tailed deer
2	box turtle	wild turkey
3	wild turkey	squirrel, box turtle
4	squirrel	passenger pigeon
5	passenger pigeon	**raccoon**

during the UNC excavation of the Gravely site also included fine-screening down to 1/16-inch mesh. The resulting bar graph for the Gravely site, however, mirrors the other graphs, indicating a focus on mammals. This suggests that there may be other factors at work in addition to differences in recovery. The drastic differences between the bar graphs for the two Koehler site samples also suggests that the faunal assemblages from these different excavations may derive from different contexts at the site.

Of all of the assemblages considered in this analysis, the Gaston site and Vir 150 yielded the lowest %NISP of bird remains. This is likely attributable to the lack of passenger pigeon recovered from Gaston and Vir 150, a species that is well represented at the other sites. There also appears to be less diversity in terms of the recovered bird taxa at Gaston and Vir 150 than in the other assemblages. These differences in the bird assemblages may be a result of site location. Gaston and Vir 150 are located along the Roanoke River, whereas the other sites are located along tributaries of this river. Differences in local catchments, as well as site location relative to migrational flyways, may have been factors affecting the exploitation of bird taxa at these different sites.

To further explore these differences, I consider the top five ranked taxa for each site. These data were presented above in individual tables for each site, but are presented here as two tables (for NISP and MNI) which incorporate data from all seven sites (Tables 18 and 19). The first table includes the top five species ranked by NISP. Three taxa—deer, turkey, and box turtle—consistently rank in the top five for all seven sites. Moreover, these three taxa ranked in the top three at all sites but Stockton and Gravely. Perhaps more interesting are the highly-ranked taxa that differ from site to site. In addition to the three top taxa (deer, turkey, and box turtle), muskrat and raccoon ranked in the top five at Gaston and Vir 150, whereas squirrel and passenger pigeon ranked in the top five at the other sites.[6] This disparity between the different sites further suggests that site location with respect to local topography and waterways (e.g., the Roanoke river versus its tributaries) was an important factor conditioning the exploitation of local fauna.

The second table includes the top five species ranked by MNI. As with the NISP rankings, deer and turkey consistently rank in the top five for all sites. With the exception of Vir 150, box turtle also consistently ranks in the top five. In contrast to the NISP rankings, squirrel ranks in the top five by MNI for all sites. The difference between the sites in terms of passenger pigeon noted above is reflected in the MNI ranks—passenger pigeon appears to have been an important vertebrate resource for sites located along tributaries to Roanoke River, but not for sites (e.g., Gaston and Vir 150) along the Roanoke itself.

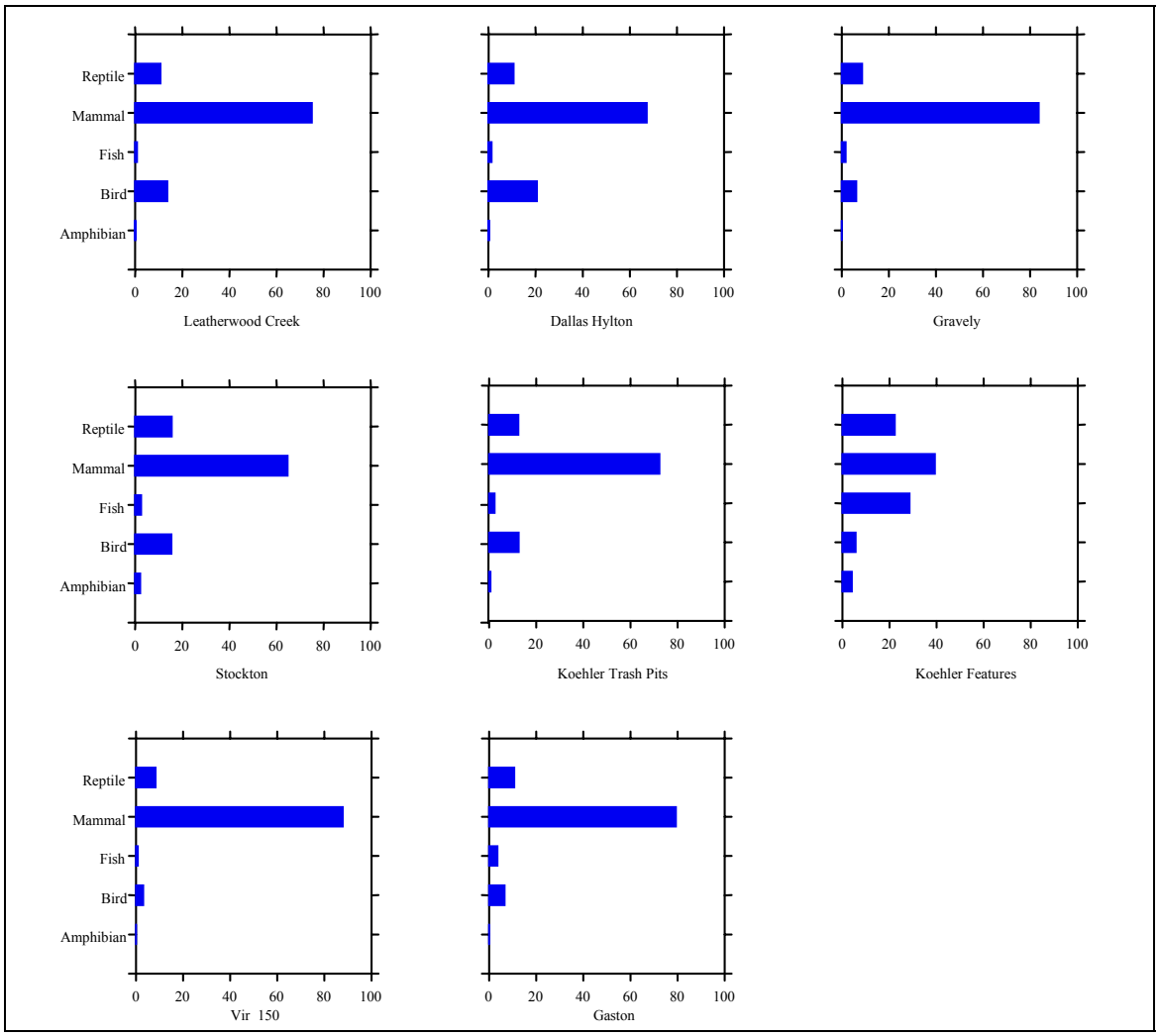

Figure 2. Comparison of the relative abundance of different animal classes using %NISP.

Table 18. Top Five Taxa Ranked by NISP for Each Site.

	Gaston	Vir 150	Stockton	Gravely	Dallas Hylton	Koehler (Trash Pits)	Koehler (Features)	Leatherwood Creek
1	**deer**	**deer**	**deer**	**deer**	**deer**	**deer**	**deer**	**deer**
2	**turkey**	**turkey**	**box turtle**	**turkey**	**turkey**	**box turtle**	**box turtle**	**box turtle**
3	**box turtle**	**box turtle**	passenger pigeon	squirrel	**box turtle**	**turkey**	**turkey**	**turkey**
4	muskrat	muskrat	**turkey**	**box turtle**	passenger pigeon	pig	passenger pigeon	squirrel
5	raccoon	raccoon	squirrel	passenger pigeon	squirrel	squirrel	squirrel	passenger pigeon

Table 19. Top Five Taxa Ranked by MNI for Each Site.

	Gaston	Vir 150	Stockton	Gravely	Dallas Hylton	Koehler (Trash Pits)	Koehler (Features)	Leather-wood Creek
1	**deer**	**deer**	passenger pigeon	**deer**	passenger pigeon	**deer**	e. spadefoot	**deer**
2	muskrat	muskrat	**deer**	chipmunk	**deer**	**turkey** box turtle	**squirrel**	**turkey**
3	**turkey**	**turkey**	**squirrel**	ALL OTHERS	**turkey**	**squirrel**	*Lepomis* sp.	**squirrel** box turtle
4	**squirrel**	**squirrel**	**turkey** box turtle		**squirrel**	ALL OTHERS	box turtle	passenger pigeon
5	raccoon box turtle	raccoon	rabbit *Catostomus* sp. *Moxostoma sp*		box turtle		**deer** passenger pigeon	raccoon

While the faunal assemblages from all the sites considered here are broadly similar, closer analysis has revealed important differences that are likely related to differences in local catchment zones. In particular, the major disparities identified thus far are between the sites located along Roanoke River (Gaston and Vir 150) and those located along its tributaries which include Leatherwood Creek, North Mayo River, South Mayo River, and Smith River. If indeed site location relative to the Roanoke River was a significant factor conditioning past vertebrate exploitation, then we would expect this to be reflected in the fish remains as well.

With this in mind, I turn my attention to the fish remains. Although all seven sites yielded roughly comparable fish assemblages in terms of suckers, catfish, and bass, there are disparities between the sites based on the locational distinction defined above. For example, sturgeon, bowfin, and channel catfish were identified only at Gaston and Vir 150.[7] The presence of sturgeon this far inland is significant and will undoubtedly affect current environmental policy regarding dam management. That sturgeon was identified only at the sites located along Roanoke River and not along its tributaries is interesting. This finding suggests that in the past, sturgeon may have restricted its travel inland to large river channels.

This assumption may apply to channel catfish as well. While it is generally believed that the pre-Columbian distribution of channel catfish did not extend into the Roanoke River (Lee et al. 1980), this study has demonstrated that channel catfish formed a small part of the diet of the residents at Gaston and Vir 150. Perhaps the range of channel catfish included Roanoke River in the past as well as the present. The osteological evidence provides cause to re-evaluate the prehistoric biogeography of this catfish.

The identification of walleye in the Gaston site assemblage is also important for revising what we know about the pre-Columbian distribution of fish.[8] As with channel catfish, it is believed that Roanoke River falls outside the walleye's natural range (e.g., Lee et al. 1980). However, the presence of two walleye dentaries at the Gaston site suggests that walleye may also have been native to the Roanoke.

The identification of largemouth bass at four of the study sites was also unexpected. Like channel catfish and walleye, the pre-Columbian distribution of largemouth bass was not believed to have extended into Roanoke River (Lee et al. 1980). Indeed, Whyte (1994) has suggested that specimens of Roanoke bass have been mistakenly identified and reported as largemouth bass in the archaeological literature for the Roanoke River basin. Roanoke bass and largemouth bass are similar osteologically and are often difficult to distinguish. Nevertheless, they can be distinguished by a few key elements (Whyte 1994), and based on these criteria, Whyte (1999) identified both Roanoke and largemouth basses at the Buzzard Rock site in Roanoke, Virginia.

I consulted with Whyte regarding specimens from Vir 150 and the Gaston site that I tentatively identified as largemouth bass. Whyte concurred that some specimens were indeed largemouth bass, but identified Roanoke bass as well. Thus, it would appear that largemouth bass, though perhaps over-identified in archaeological sites along Roanoke River, was present in this river in prehistory.

Unfortunately, there is a dearth of archaeological literature pertaining to native fishing practices along the Roanoke River. Although Binford's (1991) published dissertation models the exploitation of anadromous fish for interpreting past human-ecological adaptation in coastal Virginia and North Carolina, his study deals specifically with the Chesapeake Bay. Thus, Binford's study is not pertinent to the assemblages reported here.

ADDITIONAL ASSEMBLAGES

It is important to consider these analyses within the context of previous zooarchaeological studies that have been conducted in the region. This includes the analyses of faunal assemblages from the Jordan's Landing and Lower Saratown sites.

The Jordan's Landing Site (31Br7)

The Jordan's Landing site is located along Roanoke River approximately 30 miles upriver from Albemarle Sound and dates to the Cashie phase (approx. A.D. 800–1650). This places the site further downriver from Gaston and Vir 150. The faunal assemblage from this site derives from four features and was analyzed by John Byrd (1997). With the exception of Feature 1, a refuse-filled ditch adjacent to the stockade which surrounded the village, all feature fill was screened through 1/16-inch mesh. The soil from Feature 1 was screened through 1/4-inch mesh, and random samples of soil were fine-screened as well. With the exception of the fine-screen samples from Feature 1, all faunal remains were analyzed and reported by John Byrd (1997).

For the purposes of this report, I summarize Byrd's (1997) data below (Table 20). In calculating MNI for the Jordan's Landing site, Byrd aggregated his data by plot level within each feature. In terms of the study sites, however, data were aggregated by site in order to calculate MNI. Thus, the MNI values reported by Byrd are not comparable to the MNI values calculated for the study sites.

The Jordan's Landing faunal assemblage differs from the study sites in terms of animal class percentages. Based on NISP, fish overwhelmingly dominate the Jordan's Landing assemblage, accounting for 70% of the recovered faunal remains (Figure 3).

Table 20. Summary of Faunal Remains from Jordan's Landing (31Br7).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	40	0.2	11	3.7
eastern cottontail	*Sylvilagus floridanus*	5	0.0	4	1.3
gray squirrel	*Sciurus carolinensis*	10	0.1	3	1.0
squirrel	*Sciurus* sp.	40	0.2	11	3.7
beaver	*Castor canadensis*	7	0.0	4	1.3
muskrat	*Ondatra zibethica*	13	0.1	8	2.7
gray wolf	*Canis cf. lupus*	1	0.0	1	0.3
gray fox	*Urocyon cinereoargenteus*	2	0.0	1	0.3
black bear	*Ursus americanus*	11	0.1	5	1.7
raccoon	*Procyon lotor*	48	0.3	13	4.3
white-tailed deer	*Odocoileus virginianus*	418	2.6	24	8.0
striped skunk	*Mephitis mephitis*	2	0.0	2	0.7
bobcat	*Felis rufus*	2	0.0	2	0.7
unidentified mammal		878	5.4		
Birds					
ducks	Anatidae	1	0.0	1	0.3
bobwhite quail	*Colinus virginianus*	1	0.0	1	0.3
wild turkey	*Meleagris gallopavo*	24	0.1	9	3.0
unidentified bird		83	0.5		
Reptiles					
snapper	*Chelydra serpentina*	127	0.8	17	5.7
cooter	*Pseudemys* sp.	10	0.1	5	1.7
box turtle	*Terrapene carolina*	37	0.2	9	3.0
unidentified turtle		1,258	7.7		
corn snake	*Elaphe guttata*	3	0.0	2	0.7
water snake	*Nerodia* sp.	3	0.0	1	0.3
cottonmouth	*Agkistrodon piscivorus*	8	0.0	3	1.0
unidentified snake		88	0.5		
Amphibians					
bullfrog	*Rana catesbeiana*	2	0.0	2	0.7
unident. amphibian		16	0.1		
Fish					
sturgeon	*Acipenser* sp.	8	0.0	3	1.0
gar	*Lepisosteus* sp.	222	1.4	18	6.0
bowfin	*Amia calva*	354	2.2	37	12.4
minnows	Cyprinidae	1	0.0		
redhorse	*Moxostoma* sp.	1	0.0	1	0.3

Table 20 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
catfish	Ictaluridae	136	0.8		
white catfish	*Ameiurus catus*	46	0.3	16	5.4
yellow bullhead	*Ameiurus natalis*	47	0.3	17	5.7
brown bullhead	*Ameiurus nebulosus*	6	0.0	3	1.0
bass, sunfish	Centrarchidae	11	0.1		
sunfish	*Lepomis* sp.	8	0.0	4	1.3
largemouth bass	*Micropterus salmoides*	2	0.0	1	0.3
bass	*Micropterus* sp.	1	0.0	1	0.3
bass	Moronidae	129	0.8		
white perch	*Morone americanus*	16	0.1	7	2.3
striped bass	*Morone saxatilis*	28	0.2	7	2.3
pikes	Esocidae	6	0.0		
pickerel	*Esox* sp.	15	0.1	3	1.0
yellow perch	*Perca flavescencs*	10	0.1	3	1.0
American eel	*Anguilla rostrata*	9	0.1	5	1.7
Atlantic croaker	*Micropogonias undulatus*	72	0.4	34	11.4
Herring family	Clupeidae	302	1.8		
unidentified fish		6,058	37.1		
Unidentified		5,700	34.9		
Total		16,326		299	

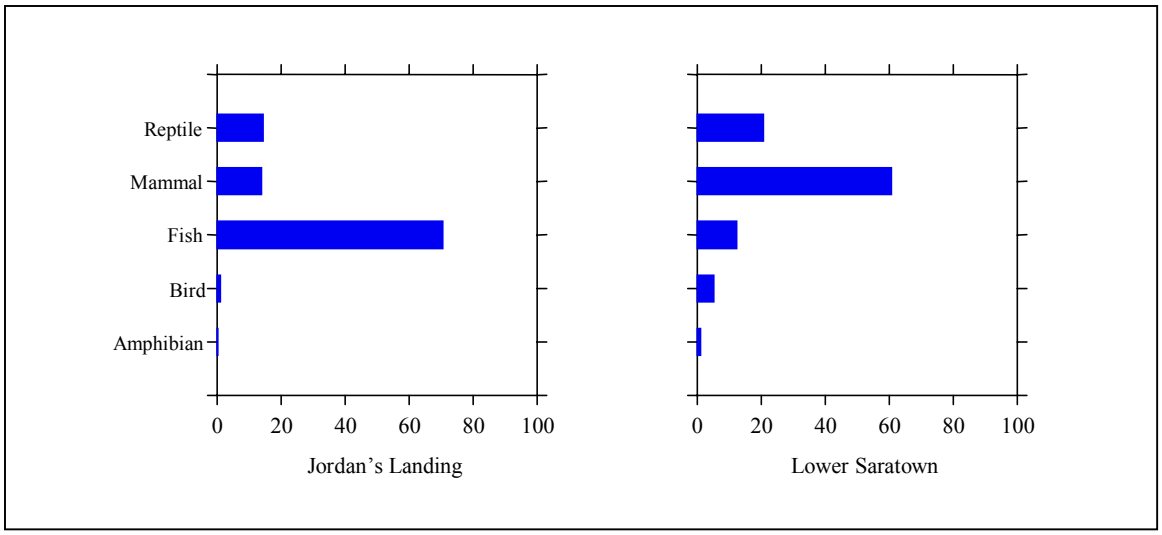

Figure 3. Comparison of the relative abundance of different animal classes for Jordan's Landing and Lower Saratown using %NISP.

Table 21. Top Five Taxa from Jordan's Landing (31Br7).

Rank	NISP
1	deer
2	bowfin
3	gar
4	snapping turtle
5	Atlantic croaker

Moreover, three of the top ranked taxa by NISP are fish species (Table 21). Two of these, bowfin and gar, were also high-ranking fish at Gaston and Vir 150. As with Gaston and Vir 150, the remains of sturgeon and muskrat were identified at Jordan's Landing as well. Thus, there appear to be slight similarities between the sites located along the Roanoke River. Perhaps if the recovery methods employed during excavations at Gaston and Vir 150 had used mesh sizes comparable to those used at Jordan's Landing, the overall faunal patterns would be even more similar.

The Lower Saratown Site (31Rk1)

The Lower Saratown site is located along Dan River in Rockingham County, North Carolina. The site is characterized by two occupations, the first during the Dan River phase (A.D. 1000–1450) and the second during the historic middle Saratown phase (A.D. 1620–1670) (Ward and Davis 1993). The faunal remains from this site were analyzed by Mary Ann Holm and are reported in Ward and Davis (1993). All of the faunal remains included in Holm's analysis derived from feature contexts and were fine-screened through 1/16-inch mesh. Given the fine-grained recovery methods used in the excavations at Lower Saratown, this site provides a nice comparison against which the study sites can be assessed in terms of recovery bias. Because only a small portion of the assemblage dates to the Dan River phase (n=618), I consider the middle Saratown component as it provides a much larger sample (n=32,975) that is more suitable for such comparisons (Table 22).

Generally, the recovery methods used in the excavation of Lower Saratown resulted in the collection and identification of a set of smaller-sized species not identified in the study sites. Even though soil from the Gravely site and the second excavation of the Koehler site was fine-screened, small mammals like mice and voles were not identified in those faunal samples. The sample sizes for these sites are much smaller than for Lower Saratown, however, which may account for these differences.

The top five ranked taxa from Lower Saratown are broadly similar to those from the study sites (Table 23). As with the study sites, white-tailed deer, box turtle, and wild turkey were clearly important food resources at Lower Saratown. The differences between Lower Saratown and the study sites in terms of ranking, however, may be more telling. That gar ranked second for NISP and white-footed mouse ranked fifth for MNI provides more evidence regarding differences in recovery between Lower Saratown and the study sites that were not fine-screened.

Table 22. Summary of Faunal Remains from the Middle Saratown Phase Component at the Lower Saratown Site (31Rk1).

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
Mammals					
opossum	*Didelphis virginianus*	10	0.0	2	1.3
shrews	Soricidae	2	0.0	1	0.6
cottontail	*Sylvilagus* sp.	15	0.0	1	0.6
gray squirrel	*Sciurus carolinensis*	23	0.1	2	1.3
fox squirrel	*Sciurus niger*	33	0.1	3	1.9
squirrel	*Sciurus* sp.	148	0.4		
beaver	*Castor canadensis*	32	0.1	1	0.6
white-footed mouse	*Peromyscus leucopus*	50	0.2	7	4.4
hispid cotton rat	*Sigmodon hispidus*	8	0.0	2	1.3
meadow vole	*Microtus pennsylvanicus*	17	0.1	2	1.3
muskrat	*Ondatra zibethicus*	1	0.0	1	0.6
mice, voles	Cricetidae	15	0.0		
wolf, dog, fox	Canidae	2	0.0		
gray fox	*Urocyon cinereoargenteus*	4	0.0	1	0.6
black bear	*Ursus americanus*	15	0.0	1	0.6
raccoon	*Procyon lotor*	136	0.4	5	3.2
white-tailed deer	*Odocoileus virginianus*	2,050	6.2	26	16.5
striped skunk	*Mephitis mephitis*	3	0.0	1	0.6
mountain lion	*Felis concolor*	1	0.0	1	0.6
bobcat	*Lynx rufus*	5	0.0	2	1.3
unidentified mammal		4,744	14.4		
Birds					
lesser scaup	*Aytha affinis*	1	0.0	1	0.6
wild turkey	*Meleagris gallopavo*	172	0.5	11	7.0
passenger pigeon	*Ectopistes migratorius*	7	0.0	2	1.3
yellow-shafted flicker	*Colaptes auratus*	4	0.0	2	1.3
cardinal	*Richmondena cardinalis*	2	0.0	1	0.6
unidentified bird		437	1.3		
Reptiles					
snapping turtle	*Chelydra serpentina*	56	0.2	1	0.6
mud turtle	*Kinosternon subrubrum*	600	1.8	14	8.9
musk turtle	*Sternotherus oderatus*	13	0.0	2	1.3
cooter	*Pseudemys concina*	1	0.0	1	0.6
box turtle	*Terrapene carolina*	880	2.7	31	19.6
soft-shelled turtle	*Trionyx* sp.	25	0.1	1	0.6
unidentified turtle		274	0.8		
water snake	*Natrix* sp.	63	0.2	1	0.6
non-poisonous snakes	Colubridae	204	0.6		

Table 22 continued.

Common Name	Taxonomic Name	NISP	%NISP	MNI	%MNI
poisonous snakes	Crotalidae	66	0.2	1	0.6
unidentified snake		312	0.9		
Amphibians					
spadefoot toad	*Scaphiopus holbrooki*	46	0.1	5	3.2
American toad	*Bufo americana*	7	0.0	2	1.3
toad	*Bufo* sp.	4	0.0		
bullfrog	*Rana catesbeiana*	4	0.0	1	0.6
toad/frog	*Bufo* sp./*Rana* sp.	65	0.2		
Fish					
bowfin	*Amia Calva*	15	0.0	1	0.6
gar	*Lepisosteus* sp.	946	2.9	1	0.6
white shad	*Alosa sapidissima*	28	0.1	1	0.6
suckers	Catostomidae	183	0.6		
white sucker	*Catostomus commersoni*	11	0.0	2	1.3
redhorse	*Moxostoma* sp.	2	0.0	1	0.6
catfish	*Ictalurus* sp.	30	0.1	5	3.2
American eel	*Anguilla rostrata*	6	0.0	1	0.6
bass, sunfish	Centrarchidae	31	0.1		
sunfish	*Lepomis* sp.	47	0.1	4	2.5
darters	Perciformes	42	0.1	6	3.8
unidentified fish		152	0.5		
Unidentified		20,925	63.5		
Total		32,975	1	158	1

Table 23. Top Five Taxa from Lower Saratown (31Rk1).

Rank	NISP	MNI
1	white-tailed deer	box turtle
2	gar	white-tailed deer
3	box turtle	mud turtle
4	mud turtle	wild turkey
5	wild turkey	white-footed mouse

The Lower Saratown faunal sample also yielded a greater %NISP of fish remains relative to other animal classes than the study sites (although the second excavation of the Koehler site is a notable exception) (Figure 3). This difference in %NISP of fish is also likely due to differences in recovery methods. Given the Lower Saratown figures for fish, we can hypothesize that the %NISP for fish remains from the study sites underestimates the contribution of fish by 10–15%. This is indeed a significant bias that highlights the importance of fine-screening for future excavations in this region.

CONCLUDING REMARKS

In addition to presenting data that represent the culmination of two years of analysis, this report has addressed a variety of issues. First, this report has demonstrated a disparity in Late Woodland vertebrate subsistence practices between sites located along the Roanoke River and those located along its tributaries. This disparity may be tied to differences in local catchment zones.

Another major issue considered here regards the relevance and suitability of zooarchaeology for addressing problems concerning modern wildlife management. The identification of sturgeon at both Vir 150 and the Gaston site indicates that this fish swam further upriver to spawn in prehistoric times than is possible today. The zooarchaeological data are thus consistent with the hypothesis that dam construction has disrupted its reproductive cycle.

This study also provides information regarding the prehistoric distribution of largemouth bass, channel catfish, and walleye. The evidence presented here indicates that the native range of these taxa extended into the Roanoke River.[9] This information will likely become important for future fishery management. The partnership between the UNC Research Laboratories of Archaeology and the U.S. Fish and Wildlife Service has proven to be tremendously fruitful. It is both exciting and significant that this project extends beyond the reconstruction of past subsistence practices and ecological conditions to address current environmental policy.

ENDNOTES

[1] Based on discussions with zoologists from the North Carolina Museum of Natural History, making specific determinations for osteological sturgeon remains (i.e., Atlantic versus shortnose) seems doubtful. Moreover, given the sturgeon elements identified at the Gaston site and Vir 150, speciation was not possible.

[2] The information summarized regarding the regional ecology of the Piedmont draws heavily upon Holm's (1994) synthesis of this material.

[3] Mesh size for either dry- or water-screening was not indicated in Coleman and Gravely (1992).

[4] The author does not plan to pursue identification of these specimens as their identification is unlikely to affect the findings of this study.

[5] As stated in the site descriptions, the Koehler site was excavated twice, first by Richard P. Gravely and second by the Research Laboratories of Archaeology. I analyzed faunal materials from both excavations and aggregate them separately because of differences in recovery methods.

[6] The Koehler site trash pits (Gravely excavations) are an exception given the abundance of pig remains.

[7] The remains of sturgeon, channel catfish, walleye, and largemouth bass were sent to Thomas Whyte at Appalachian State University for a second opinion. He concurred that these species were present at Gaston and Vir 150.

[8] Elizabeth Reitz assisted in the identification of the walleye (*Stizostedion vitreum*) specimens while the author was visiting the comparative collections at the University of Georgia Natural History Museum.

[9] It is highly unlikely that the bones of these species arrived at their respective sites through trade. Moreover, the contexts from which the bones were recovered strongly suggest that they are culturally and temporally associated with the Late Woodland period.

REFERENCES CITED

Byrd, John E.
1997 *Tuscarora Subsistence Practices in the Late Woodland Period: The Zooarchaeology of the Jordan's Landing Site*. North Carolina Archaeological Council Publication No. 27.

Coe, Joffre L.
1964 *The Formative Cultures of the Carolina Piedmont*. Transactions of the American Philosophical Society (n.s.) 54(5). Philadelphia.

Coleman, Gary N., and Richard P. Gravely, Jr.
1992 Archaeological Investigations at the Koehler Site (44Hr6). *Quarterly Bulletin of the Archeological Society of Virginia* 47:1–41.

Davis, R. P. Stephen, Jr., Jane Eastman, Thomas O. Maher, and Richard P. Gravely, Jr.
1997a *Archaeological Investigations at the Stockton Site, Henry County, Virginia*. Research Report 14. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1997b *Archaeological Investigations at the Gravely Site, Henry County, Virginia*. Research Report 17. Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

1998 *Archaeological Investigations at the Dallas Hylton Site, Henry County, Virginia*. Research Report 18. Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

Grayson, Donald K.
1973 On the Methodology of Faunal Analysis. *American Antiquity* 38(4):432–439.

1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, New York.

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

Klein, Richard G., and K. Cruz-Uribe
1984 *The Analysis of Animal Bones from Archaeological Sites*. University of Chicago Press, Chicago.

Lamb, Hubert H.
1963 On the Nature of Certain Climatic Epochs Which Differed from the Modern (1900-1939) Normal. In *Changes of Climate: Proceedings of the Rome Symposium*, pp. 125-150. UNESCO, Paris.

Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr.
1980 *Atlas of North American Freshwater Fishes*. North Carolina State Museum of Natural History, Raleigh.

Roundtree, Helen C.
1989 *The Powhatan Indians of Virginia: Their Traditional Culture*. University of Oklahoma Press, Norman.

South, Stanley A.
1959 *A Study of the Prehistory of the Roanoke Rapids Basin*. Unpublished Masters thesis, Department of Sociology and Anthropology, University of North Carolina, Chapel Hill.

Ward, H. Trawick, and R. P. Stephen Davis, Jr.
1993 *Indian Communities on the North Carolina Piedmont, A.D. 1000 to 1700*. Monograph 2. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

Whyte, Thomas R.
1994 Archaeological Records of the Roanoke Bass, Ambloplites cavifrons Cope, 1868 (Pisces, Centrarchidae). *Southeastern Archaeology* 13(1):77–80.

1999 Ichthyofaunal Remains from the Buzzard Rock site (44RN2), Roanoke, Virginia. Report submitted to the Virginia Department of Historic Resources, Richmond, Virginia.

APPENDIX 1

FUTURE RESEARCH NEEDS
by
R. P. Stephen Davis, Jr.

As originally conceived, this project sought to provide pre-Columbian environmental data from extant archaeological collections from the Roanoke River valley. The analysis described in this report concerns only one of three potential relevant data sets, namely vertebrate faunal remains. Two other classes of remains—freshwater mollusks and carbonized plant remains—were not studied during this phase of the project. The decision to focus initially on vertebrates was made for several reasons, but a significant factor was the condition of the archaeological samples and the methods by which they were acquired. Of the seven sites that were studied, all but one were excavated as an emergency salvage project, excavated by non-professional archaeologists, or both. Also, most of these sites were excavated during the 1950s and 1960s, before archaeologists were strongly interested in reconstructing subsistence practices and past environments, and before issues of sampling to address such questions were carefully scrutinized.

Despite the biases inherent in the study samples, animal bones generally were collected systematically and above a certain size threshold (as determined by screen size) can be considered to reflect what was present at a site. Even with the under representation of smaller species (including small mammals, reptiles, amphibians, birds, and fish), their presence in the archaeological collections attest to their presence in the pre-Columbian environment, though little can be said of their relative abundance in that environment.

Shell and plant remains, on the other hand, were not systematically collected during the excavation of these sites and therefore have much more limited analytical value. Shell samples, representing primarily species of mussels and snails, tend to be fragmentary and, in most cases, have deteriorated significantly during the years since they were first collected.

With the exception of the UNC excavation at the Gravely site (where standard-sized soil samples were subjected to a flotation process to retrieve wood charcoal and charred seeds), carbonized plant remains usually were collected only when found in concentrations and then were retrieved for their potential use in radiocarbon dating rather than as environmental or subsistence data. The primary analytical value of such samples, aside from dating, would be to identify specific tree species (based on wood charcoal and possibly carbonized nut fragments) that were exploited by pre-Columbian peoples. Fortunately, additional botanical samples exist from contact-period sites within the upper Roanoke drainage not considered by this study, and these samples can and have been used to address environmental reconstruction in this region (see Gremillion 1989, 1993a, 1993b).

Aside from the paleobotanical data just mentioned, further archaeological research into the pre-Columbian environment of the Roanoke drainage in general, and the lower Roanoke drainage in particular, will require samples from newly excavated sites

where modern data recovery techniques have been employed. Several potential sites, dating to the Dan River and Clarksville phases (A.D. 1000–1450), exist above the confluence of the Dan and Staunton rivers, and Cashie phase (A.D. 800–1600) sites can be found along Roanoke River below Roanoke Rapids; however, few archaeological sites are accessible in the intervening area because of the construction of Roanoke Rapids Reservoir, Gaston Reservoir, and John H. Kerr Reservoir.

SUMMARY OF FUTURE RESEARCH NEEDS

Analysis of Mollusk Remains

Three previously excavated sites within the upper Roanoke River basin yielded substantial, systematically collected mollusk samples. All of these sites—Hairston (31Sk1), Upper Saratown (31Sk1a), and Lower Saratown (31Rk1)—are situated along Dan River and date to the protohistoric or contact periods. Each was excavated by the University of North Carolina, and samples were obtained by dry-screening or waterscreening (through 1/16" mesh) archaeological soils. Analysis of these samples would provide new information about the mollusk population within this river prior to Euroamerican settlement.

Analysis of Carbonized Wood

Previous analyses of plant material from archaeological sites within the Roanoke drainage have focused on subsistence remains, namely charred seeds and nut fragments. The majority of charcoal found, representing primarily expended wood fuel, has not been studied. An analysis of these remains would be useful in determining the composition of forests surrounding these sites. Since most of the village sites in the study are situated in floodplain environments, such an analysis would be particularly helpful in reconstructing forests adjacent to the major rivers of the Roanoke basin.

The three sites mentioned above—Hairston (31Sk1), Upper Saratown (31Sk1a), and Lower Saratown (31Rk1)—have substantial, systematically collected samples of wood charcoal and should be studied in addition to the samples from Gaston, Vir 150, Stockton, Gravely, Dallas Hylton, Koehler, and Leatherwood Creek.

New Field Investigations

The greatest problem with the extant environmental data from pre-Columbian archaeological sites in the Roanoke River basin is the lack of well-excavated samples within the middle and lower portions of the basin (i.e., between the confluence of the Dan and Staunton rivers and the lower reaches of Roanoke River above Albemarle Sound). This problem is highlighted by VanDerwarker's comparisons of the Lower Saratown and Jordan's Landing faunal samples with samples from the study sites.

To correct this problem and provide fine-scale data for analysis, additional sites need to be excavated. Three sites have been identified which have a high potential for yielding rich assemblages of well-preserved vertebrate, mollusk, and floral remains.

There are undoubtedly others that could also yield sufficient samples. Brief descriptions of these sites follow.

31Hx19. This late precontact village site is located on a bluff overlooking Roanoke River, just south of Halifax, Halifax County, North Carolina. It lies about 22 miles downstream from the Gaston site. Artifacts collected from the surface indicate that it dates to the Cashie phase (A.D. 800–1600); auger testing at the site by the author in 2000 indicates further that it contains rich refuse deposits with an abundance of faunal and floral remains. It is owned by Champion International Corporation, and access for archaeological testing is not expected to be a problem. This site would be particularly useful for characterizing pre-Columbian environmental resources just below the fall line.

Elm Hill (44Mc78). Elm Hill is a multi-component site located along Roanoke River about a mile below John H. Kerr Dam in Mecklenburg County, Virginia. It lies about 45 miles upstream from the Gaston site and about 12 miles above Vir 150. Elm Hill is listed on the National Register of Historic Places and is owned by the State of Virginia. Test excavations by Howard MacCord in 1964 indicate that the site is stratified with Middle Woodland and Late Woodland occupations of the Clements and Clarksville phases (ca. A.D. 500–1600) and contains substantial occupation debris, including well-preserved subsistence remains (MacCord 1968). Unfortunately, no subsistence remains were saved from MacCord's excavation. This site would be particularly useful for characterizing pre-Columbian environmental resources just above the fall line and would complement data from the Gaston site and Vir 150.

Conner's Midden (44Ha11). The Conner's Midden site is located on Staunton River just above the upper end of John H. Kerr Reservoir in Halifax County, Virginia. It was excavated by Robert Carroll and John Reeves in the mid-1950s, and they regarded it as perhaps the best-preserved site in Halifax County because it was deeply buried (Carroll and Reeves 1955). Abundant subsistence remains (i.e., animal bone, shell, and carbonized plant remains) were reported, and associated artifacts indicate that the site represents a village of the Dan River or Clarksville phases (A.D. 1000–1500). Conner's Midden is privately owned, and the owners appear amenable to site excavation. Sampling of this site would provide important pre-Columbian environmental information for a portion of the Roanoke River drainage (i.e., near the confluence of the Dan and Staunton rivers) where such data are lacking.

REFERENCES CITED

Carroll, Robert P., and John H. Reeves, Jr.
1955 Conner's Midden, A Halifax County, Virginia Indian Site. *Quarterly Bulletin of the Archeological Society of Virginia* 10(2).

Gremillion, Kristen J.
1989 *Late Prehistoric and Historic Period Paleoethnobotany of the North Carolina Piedmont*. Unpublished Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

1993a Botanical Remains [from Lower Saratown]. In *Indian Communities on the North Carolina Piedmont, A.D. 1000 to 1700*, by H. Trawick Ward and R. P. Stephen Davis, Jr., pp. 213–220. Monograph 2. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1993b Botanical Remains [from the William Kluttz Site]. In *Indian Communities on the North Carolina Piedmont, A.D. 1000 to 1700*, by H. Trawick Ward and R.P. Stephen Davis, Jr., pp. 314–315. Monograph 2. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

MacCord, Howard A.

1968 The Elm Hill Site, Mecklenburg County, Virginia. *Quarterly Bulletin of the Archeological Society of Virginia* 23(2):63–83.