EMERGENCE & EVOLUTION OF CAROLINA'S
Colonial Cattle Economy

THE CHARLESTON MUSEUM

Archaeological Contributions 52

Emergence and Evolution of Carolina's Colonial Cattle Economy

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Foreword, Preface, Acknowledgments

Martha Zierden and Elizabeth Reitz have collaborated for decades on the excavation and study of archaeological sites in Charleston, analyzed cultural materials from those sites, and selected faunal samples for study. The resulting interpretation is summarized in the 2016 volume, *Charleston: An Archaeology of Life in a Coastal Community.* The present study of the colonial cattle economy proceeds from this research, and involves a number of scholars who have worked with them over the years, or have interests/expertise that mesh with theirs. The scholars include zooarchaeologists, biogeochemists, environmental archaeologists, and environmental historians. Other collaborators work in public education and interpretation.

Martha Zierden serves as curator of the archaeological collections held at The Charleston Museum, including the majority of faunal samples used in this study. She worked to select specimens for study, and to use these specimens and other archaeological materials in interpretations at the Museum, at the Heyward-Washington House, and in social media posts. She coordinated with Stephanie Thomas, Chief of Education, and Heather Rivet, Historic House Manager, to plan the Museum's outreach efforts, including development of two new Bragg Boxes and new interpretations at the Heyward-Washington House.

Elizabeth Reitz directs the Zooarchaeology Laboratory at the Georgia Museum of Natural History, University of Georgia. She has conducted, or directed, all of the zooarchaeological analyses that form the basis for this study. For the present project, she chose the cow teeth used in the biogeochemical study and coordinated analysis of additional faunal remains from Heyward-Washington and Mary Musgrove's Cowpens. She also conducted use wear analysis of the teeth selected for stable isotope study. Taesoo Jung completed most of the identification and analysis of faunal remains from the Heyward-Washington House under her direction.

Carla S. Hadden, University of Georgia, is Director of the Center for Applied Isotope Studies and the lead Principal Investigator for the project. She supervised AMS/^{14}C dating for soil cores and isotope analysis on the teeth.

Barnet Pavão Zuckerman is a zooarchaeologist and professor of anthropology at University of Maryland. She worked with the Musgrove Cowpens materials, and supervised graduate student Cameron Walker in analyzing additional materials from this site.

Laurie Reitsema, Associate Professor in the Department of Anthropology, University of Georgia, directed graduate students in the stable isotope laboratory. She is the principal author of the 2015 pilot study of materials from Charleston.

Katherine Reinberger, Department of Anthropology, University of Georgia, worked as a graduate student on the isotope analysis. She conducted most of the sample preparation for isotopic analysis using the facilities of the Center for Applied Isotope Studies.

Hayden R. Smith, College of Charleston, is an environmental historian and serves as project historian. His expertise focuses on the landscape consequences of inland swamp rice production; here he linked these changes to the earlier free-range cattle economy. He also explored the marketing networks linking Charleston to the hinterland.

Grant Snitker is an environmental archaeologist and ORISE postdoctoral researcher with the Center for Forest Disturbance Science at the USDA Forest Service's Southern Research

Station. He designed and implemented the coring project to study the effects of fires and grazing on Lowcountry environments.

Angelina G. Perrotti, Brown University, analyzed pollen and non-pollen palynomorphs in the sediment core taken from Hell Hole Swamp.

KC Jones is with PaleoResearch Institute, Golden, Colorado. She authored the story line for the graphic activity book. The book is bilingual (English and Spanish) and is one in a series of such books in the Center for Applied Isotope Studies' series of educational activity books designed to communicate archaeological science concepts and discoveries to young audiences.

James Burns is a graphic designer and animator in Athens, Georgia. James has created 3D animations for numerous clients. He writes and draws comic books and a weekly comic strip for Atlanta's "Sunday Paper." He created the comic book for CAIS.

Elise Reagan continued the work of Stephanie Thomas, Chief of Education at The Charleston Museum. They designed the Bragg Boxes based on project methods and results. Reagan and Zierden worked with Heather Rivet, Mateo Merida, Chad Stewart, and Jennifer McCormick on reinterpretation at Heyward-Washington and commemoration of the 250th anniversary of the House.

Sarah Platt completed her Ph.D. at Syracuse University and joined the Anthropology department faculty at the College of Charleston. As part of her dissertation research, conducted from January 2017 to 2019, she spent countless hours re-analyzing the legacy Heyward-Washington collections. Her dissertation improvement grant provided funding for stable isotope analysis on teeth from the Heyward-Washington collection, expanding our database for the present study. She focused on the mid-eighteenth century, and explored the lives of gunsmiths John Milner Sr and John Milner Jr., providing critical documentary and archaeological data to ground the present zooarchaeological study.

Outreach and Consultants

The project was centered in a museum setting, one that shares the results of zooarchaeological analysis on a regular basis, through exhibitions, lectures, and publications. Therefore, the present project was shared with that same audience, from application to approval, to implementation and conclusion. The project includes three "broader impact" projects prepared at the conclusion of the research. These include a bilingual graphic comic describing the science of the project, produced through the CAIS comic series, two traveling educational trunks complete with artifacts and lesson plans, as part of The Charleston Museum's Bragg Box program, and new interpretation and signage at the Museum's Heyward-Washington House, a focus of faunal analysis, stable isotope sampling, and new archaeological analysis.

But, the new research was also part of the Museum's ongoing outreach efforts from its inception through its conclusion. Two temporary exhibitions on foodways, both called "The Bountiful Coast," one in 1988 and another in 2004, were followed by a smaller exhibit on zooarchaeology, "To the Bone," mounted in 2017. With the launch of the National-Science Foundation funded project in 2019, the Museum shared the research in news and social media coverage, before, during and after the project. Through social media, during the pandemic, as well as in-person conferences and lectures (before and after Covid, of course) we kept our audience informed. One positive result is that we were in contact with people interested in the project from a variety of angles. This ongoing, outreach and information sharing led us to a number of interesting and informative conversations with colleagues and guests.

Over the past couple of years, blog readers sent us stories, commented on social media posts, and responded kindly to emails out of the blue. As part of our collective background research, we reached out to colleagues that have published pertinent data or have a mutual interest in the topic. Anyone interested in cattle in any way was welcome to join the conversation. Because much of our project time fell during Covid-19 quarantine, many of these conversations were virtual, or digital. Still other consultants were solicited by their special knowledge.

A stated goal of the comic book story line was diversity and inclusion, allowing descendants of past marginalized people to present their voice and perspective on the publication. Meredith Hardy, Archaeologist with the National Park Service, Southeast Archaeological Center and member of the Gullah Geechie Heritage Corridor Commission provided perspective on people of African descent. Turner Hunt, Tribal Historic Preservation Officer of the Muscogee (Creek) Nation of Oklahoma provided guidance on portrayal of Indigenous people, particularly Creek people at Musgrove's cowpen and in Charleston.

Three eminent historians added to the project, outside of their published sources. A brief email to Joshua Piker, following publication of *The Four Deaths of Acorn Whistler*, to inquire about sources on Mary Musgrove led to longer conversations with Steven Hahn of St. Olaf College, author of the *The Life and Times of Mary Musgrove* in July 2020. Dr. Hahn's volume contains some description of the location of tracts owned by Johnny and Mary Musgrove in Pon Pon, St. Bartholomew's Parish, prior to their move to Yamacraw Bluff in the Georgia colony in 1732. Dr. Hahn shared several plats of the Musgrove properties, and piqued our interest in one day finding and studying this site.

Through fortuitous contacts, Hayden Smith was able to arrange a virtual conversation with eminent environmental historian Mart Stewart of Western Washington University. Dr. Stewart is the author of numerous books and articles relevant to this study, including *"What Nature Suffers to Groe," Life, Labor, and Landscape on the Georgia Coast, 1680-1920* in 1996 and the most pertinent 2007 article, "From King Cane to King Cotton: Razing Cane in the Old South" in *Environmental History.* A Zoom conversation with Dr. Stewart by Zierden and Reitz, facilitated by Smith, gave us a chance to gauge his response to ideas put forth in the study. Dr. Stewart reiterated the significance of cane stands as a resource for cattle in the Southeast during the colonial period.

Recently, Emma Hart of the University of Pennsylvania has published on Charleston's built environment and its economy, and her publications, particularly her *William and Mary Quarterly* article, "From Field to Plate," and most recently, *Trading Spaces: The Colonial Marketplace and the Foundations of American Capitalism*, were critical to the present narrative. She graciously shared notes on Samuel Eveleigh and on others involved in the cattle trade. An invitation to participate in an Atlantic World conference (cancelled by Covid) led to a longer conversation and shared interpretations.

Interest in the Big Opening and Hell Hole Swamp as a grazing commons arose with Hayden Smith's research on inland swamp rice production for his own dissertation, and later book, *Carolina's Golden Fields*. Interest increased with the addition of Grant Snitker to the research team. We began by reaching out to Citadel Professor emeritus Richard Porcher, well known in South Carolina for his knowledge of plants, of environmental settings, and of the history and use of those environments, particularly for rice and cotton production in the eighteenth and nineteenth centuries. With the aid of fire management and cultural heritage staff at the Francis Marion National Forest, Smith and Zierden worked with Dr. Porcher to revisit the Great Opening and to discuss the evolution of this natural feature, through fire, grazing, and public use. A visit to the Hell Hole area followed from several conversations. The guidance from

Dr. Porcher segued into core sampling by Snitker, with additional funding from the US Forest Service. Bob Morgan was instrumental in that work and in obtaining funding for the pollen analysis; Jason Moser and Christy Stewart continued Bob's work after his retirement.

The allure of the Big Opening and Hell Hole Swamp also led us to literature of the early twentieth century by local writers who described the area and the people who made their home nearby. Author and historian Harlan Greene recommended *Po'Buckra* by Gertrude Shelby and Samuel Gaillard Stoney (1930) and *So Shall They Reap* by John Bennett (1944), and loaned copies from his personal library. Likewise, author and historian William P. Baldwin relayed a number of stories and local lore he collected involving feral (formerly free-range) cattle in the twentieth century. He adapted the memorable tale of an attack by a wild bull into his 1993 novel *The Hard to Catch Mercy*, but also shared more mundane stories of local woods full of feral cattle, gradually hunted out and sold by local butchers.

Research on the Big Opening and Hell Hole Swamp led us to the dissertation research of Katherine Parker of the University of Tennessee. Katherine is studying moonshining and illicit activity on the Francis Marion National Forest, excavating sites associated with known families and activities. As moonshining was the principal activity in Hell Hole, beyond cattle grazing, our research efforts meshed seamlessly. Katherine recommended several memoirs that covered the Hell Hole area in the twentieth century.

Bud Hill and Randy McClure of the Village Museum in McClellanville were always welcoming and often extremely helpful. They provided information and photos on Hell Hole, on the McCay family, and other local cattle ranching locations. Randy, in turn, shared our story with historical research Suzannah Miles, who provided many details.

Several local residents reached out to us following news or social media posts about our project. Bonny and Elizabeth McConnell of Awendaw called the Museum to relay stories of cattle ranching on Daniel Island. Mr. McConnell also authored a reminiscence of life in the Awendaw/Highway 17 area, centered on McConnell's store that is still open (but offers little in the way of general merchandise), entitled *McConnell Remembers: General Stores, Motor Lodges, and East Cooper Adventures*. This is but one of several small memoirs published by the Village Museum in McClellanville, SC, and each proved helpful in fleshing out the story of Lowcountry lands north of Charleston in the late nineteenth-early twentieth centuries. Ritchie Belser, owner of Fairlawn Plantation and Tim Penninger, owner of Sewee Restaurant gave us a tour of the remarkable rice fields on Fairlawn and shared stories of free-range cattle on the Wando and the Santee in the 1950s.

We reached out to rangeland specialists familiar with cattle grazing environments in the Southeast. Via a zoom call, we joined Kelsey Roberts and Mary Powers of the Center for Heirs Property and Bob Franklin of the Longleaf Alliance. Kelsey Roberts was raised on a cattle ranch in Ohio, and is familiar with the particulars of raising Angus beef cattle. Mary Powers is a specialist in rangeland management in the western US, and a consultant forester for the Center. Both helped us understand the grazing habits of cattle, the amount of acreage required per head, and the general environmental conditions necessary to support cattle in the Southeast. Bob Franklin is Coordinator of the SoLoACE Longleaf Partnership for the Longleaf Alliance and former Forestry and Wildlife Extension Agent for Clemson University. He is author of the 2008 manual *Stewardship of Longleaf Pine Forests: A Guide for Landowners* that includes the discussion "Woodland grazing in the longleaf pine forest." Mr. Franklin was a wealth of knowledge on the particulars of southeastern woodland habitat, from both research and personal experience.

Clemson graduate student Earl “Chip” Byrd shared details of his thesis research on fire seasonality and available forage, centered at Nemours Plantation (Wildlife Foundation) on the Combahee. Rita Kernan, member of the Hilton Head archaeological society and volunteer at the Audubon Newhall Preserve at Hilton Head provided details of cattle husbandry on that tract. Finally, Bertha Booker, owner of Botany Bay Sea Salt on Wadmalaw Island worked with us to explore salt production in the Lowcountry.

Following our presentation at the Southeastern Archaeological Conference in Durham, NC in October 2021, Bertha Booker raised the important issue of salt sources for colonial cattle. Ms. Booker founded Botany Bay Sea Salt in 2010, and researches colonial salt production as she pursues this enterprise in the same location.

Our historian colleagues Nic and Christina Butler always have insights, no matter the historical question posed. For the purposes of this study, their research covered animals in Charleston, both alive and dead. Christina Butler is preparing a manuscript on draft animals in the city, while her recently published work *Lowcountry at High Tide: A History of Flooding, Drainage, and Reclamation in Charleston, South Carolina* provides important, if unsettling, insights into the use of offal and animal remains as fill throughout the town. Nic Butler provided many details on the affairs of John Milner at the Heyward-Washington property. His many blog posts, by the Charleston Time Machine, provided important details on a range of subjects. Katherine Saunders Pemberton of the Walled City Task Force and the Powder Magazine helped with newspaper research and provided guidance on navigating Charleston’s archives and documents.

Contact with Jon B. Marcoux, Director of the Clemson Graduate program in Historic Preservation led us to student Ben Thomas, who undertook a landscape modeling topic for his thesis. His study, *Colonial Cowpens and Savannas: Analyzing the Distribution of Colonial Cattle Grazing Sites using GIS and Predictive Modeling* provided a map of optimal cattle foraging locations that closely matches those described in historical documents. Two Clemson graduate students, Ben Thomas and Emma Grace Sprinkle, prepared maps for the project, using their GIS skills.

And, for the Heyward-Washington property, project staff relied on the knowledge and research of Sarah Platt, Ph.D. candidate at Syracuse University. Sarah began reanalysis and research on the Heyward-Washington property, particularly the Milner occupations, in 2018. Funds from her Dissertation Improvement Grant facilitated a pilot isotope study of 15 teeth from Heyward-Washington contexts. Her continued analysis of colonowares, gun hardware and other small finds, and documentary records provided critical new context for the Heyward-Washington faunal analysis and the stable istope study.

Sarah Platt’s research, in turn, brought us to other artifacts from the Milner assemblage, particularly the colonowares and distinct Native American vessels recovered there. Sarah Platt, Ron Anthony, and Martha Zierden, along with longtime Museum volunteers Juliana Falk and Barbara Aldrich, reanalyzed the colonoware collection, as part of a conference and edited volume chaired by Jon B Marcoux and Corey A.H. Sattes. Our analysis, in turn, drew on the 1993 Neutron Activation study by Brian Crane, as part of his dissertation research. The new analysis revealed an extensive collection of pottery fragments that were clearly Native American, in addition to the traditional colonoware varieties described by Anthony and others. The wares included vessels and fragments that were clearly Yamasee and Creek, as well as several more ambiguous sherds. Questions posed to Nic Butler led to several colonial era documents that describe John Milner entertaining “visiting Indian delegations.” No tribal groups are mentioned by name, but a visit to Milner for gun repair was evidently part of the annual visits. This project, concurrent with the colonial cattle study, highlights the ongoing role of Native people in the economy and daily affairs of Charleston.

The ongoing story of cattle in Charleston, and the role of the market in relation to home husbandry, received an addition from an unexpected source. In 2021 Martha Zierden was contacted by Ms. Lahnice Hollister, who was editing and publishing the autobiography of Dr. John A. McFall, her grandfather's brother. Dr. McFall, an African American man, was born in Charleston in 1878 and described his efforts to battle Jim Crow laws and the practices hampering the economic and political gains of freed people after Emancipation. But Dr. McFall's story of his childhood describes in great detail the keeping of cattle in the city, and how that practice changed through the years. Coincidentally, Ms. Hollister's father, Mr. Thomas McFall, helped research the same issue for the Museum's East Side study in 1987. Dr. McFall's autobiography provides a rare description of urban livestock and its continued role in the twentieth century.

And, finally, we all drew inspiration from the great body of work by the late Dr. Charles (Charlie) Hudson. Dr. Hudson is the author of several scholarly works on the greater Southeast. But he also wrote several historical novels, including *The Packhorseman* (2009), *Conversations with the High Priest of Coosa* (2003), and, pertinent to our story, *The Cow Hunter: A Novel*, published by University of South Carolina Press in 2014. If you want a readable, alternative summary of our present project, get yourself a copy of *The Cow Hunter*.

A Memorial

At the heart of this project are two fine field archaeologists that are no longer with us. Though their stories are different, both did good, solid fieldwork under difficult conditions, leaving collections worthy of more research, and in a condition that they can be studied. And they both left the world prematurely, with research left to do. We salute their lives and their work, and hope that this report honors their memory.

Dr. Elaine Herold (University of Chicago) excavated the Heyward Washington House as a volunteer project for The Charleston Museum, when she arrived with her husband, Museum Director Don Herold, in 1973. Elaine completed a preliminary report in 1978 and always envisioned completing a site report. She continued analysis after her departure from Charleston in 1982, but widowhood and the necessity to work on paying projects delayed her progress, until poor health made it no longer possible. Though using the collections posed challenges, Elaine left the massive collection completely labeled. This has proven to be the most illustrative archaeological assemblage in the collections of The Charleston Museum, providing data for a host of research projects.

Chad O. Braley (Florida State University), a principal in Southeastern Archeological Services in Athens, GA, excavated the site of Mary Musgrove's cowpens in Savannah in 2002-2004, in advance of site destruction by the Georgia Ports Authority. Working under a stringent deadline, he uncovered significant features and recovered cultural and faunal remains remarkable for their state of preservation, as well as their association with one of the most significant women in southeastern colonial history. The site exceeded expectations in many ways, including the number of materials encountered. Working against many obstacles, including his own health challenges, Chad produced a final report in 2013. He shared data with a range of scholars, including zooarchaeologists and historians. The Musgrove materials are curated at University of Georgia Laboratory of Archaeology, where they remain available for continued research. Chad sadly passed away after a long illness as this project was nearing completion, but we take comfort in knowing that he knew that the project was ongoing, and that his work continues.

Assistance from our Colleagues

We were able to extract three soil column samples from sites across the Lowcountry, thanks to the US Forest Service, South Carolina State Parks, and the Lane family at Willtown. We appreciate their enthusiasm and access to these properties. Cattle teeth for the stable isotope study were loaned by a number of institutions, and we appreciate their help. Eric Poplin and Jeff Sherard of Brockington and Associates located samples from ongoing projects at Ashley Hall and The Ponds. Sarah Stroud Clarke and Corey Heyward Sattes facilitated loans of specimens from Drayton Hall. Nick Honerkamp located specimens from the Telfair site in Savannah in collections curated at the Jeffrey L. Brown Institute of Archaeology at the University of Tennessee-Chattanooga. Maureen Hays of the College of Charleston provided samples from St. Paul's parsonage, excavated by Kim Pyszka of Auburn University-Montgomery. David Jones, Stacey Young, and Nicole Isenbarger of South Carolina Department of Parks, Recreation and Tourism provided samples from Charles Towne Landing State Historic Site, Colonial Dorchester State Historic Site, and Hampton Plantation State Historic Site. Tammy Herron of the Savannah River Archaeological Research Program, SCIAA, successfully located samples from the Catherine Brown cowpen and Fort Moore, important Fall Line sites. The Bartley family, through Tammy Herron of SRARP, loaned specimens from the Meyer household at New Windsor. The Georgia Ports Authority, University of Georgia Laboratory, and Chad Braley of Southeastern Archeological Services, Inc. made the loan of materials from Mary Musgrove's Cowpens possible. Martha Middleton Wallace excavated her parents' home at 86 Church Street, and loaned samples from that study.

At The Charleston Museum, nearly everyone on staff assisted with the various outreach efforts. Chief of Collections Jennifer McCormick oversaw changes at the Heyward-Washington House, including the updated interpretive panels and the addition of faux foods to the dining table and kitchen. Exhibits Designer Sean Money photographed the artifacts and bones, and designed the exhibit panels and the report cover. Curator of History Chad Steward joined the Museum staff in time to develop the faux foods and a new menu for the Heyward Washington House. Education Director Stephanie Thomas planned the Bragg Boxes, and this effort continues under Elise Reagan. Curator of Natural Sciences Matt Gibson prepared bones for hands-on use and crafted the soil core for the Bragg Boxes. Director Carl Borick made participation in this project a Museum priority.

Several important bone specimens, including the horn core that matches a Spanish colonial example, were copied for the Bragg Boxes. The University of Georgia Laboratory of Archaeology, under the direction of Amanda Thompson, produced excellent 3-D scans, painted to match the original bones exactly.

Analysis of the faunal material from Historic Charleston Foundation's Nathaniel Russell House was facilitated by Museum Director Grahame Long. Two University of Maryland graduate students analyzed the materials, Charles Cameron Walker and Valerie Hall. Analysis of the Heyward-Washington faunal material was conducted by Taesoo Jung, with assistance from Claire Brandes and Isabell Skipper.

Funding for the 2008 study of the Musgrove faunal assemblage was provided by the Georgia Port Authority. We are grateful to Southeastern Archeological Services, Inc., especially Chad Braley, for the opportunity to study these materials. The original study was conducted by Kelly L. Orr and Gregory S. Lucas with the assistance of J. Matthew Compton, Rhonda Cranfill, and Glenn Thomas. The 2022 analysis was assisted by support and advice from Valarie M. J. Hall, Elizabeth A. McCague, Daniella M. C. Kawa, and George Hambrecht.

For the tooth wear study, special thanks are due to Michael Kennerty, who initiated the study in 2011. Katie Dalton, Shelby F. Jarrett, Maran E. Little, Gregory S. Lucas, Kelly L. Orr, Barnet Pavão-Zuckerman, and McKenna Waite also contributed to this research.

At the Center for Applied Isotope Studies, Carla Hadden was assisted in the lab by several individuals. Graduate students Katherine Reinberger and Jana Carpenter prepared tooth samples for stable isotope analysis, and the samples were measured by associate research scientist Doug Dvoracek and staff scientist Tom Maddox. Research technicians Sarah Gentile and Hong Sheng assisted with preparing samples for AMS dating, and the samples were measured by senior research scientists Alexander Cherkinsky and G. V. Ravi Prasad.

Jennifer O'Keefe aided in non-pollen palynomorph identification. Grant Snitker was assisted by Matt Molini for the charcoal analysis and Matt Levi with soil descriptions.

This work was funded in part by National Science Foundation Award Number BCS 1920835 to Carla S. Hadden (University of Georgia), Barnet Pavão-Zuckerman (University of Maryland), Laurie Reitsema (University of Georgia), and Elizabeth J. Reitz (University of Georgia). Additional funding was provided by the U.S. Forest Service, Francis Marion National Forest for the pollen and non-pollen palymorph study of the Hell Hole Core. A National Science Foundation Graduate Research Fellowship to Sarah Platt provided funds for analysis of teeth from the Heyward-Washington House.

Organization of this Study

The Colonial Cattle Economy project involved fifteen scholars and educators from three different states, with funding from two separate institutions. While the team of scholars met regularly, in person and later remotely, throughout the project, each portion of the project was conducted and reported separately. For this reason, the present comprehensive report is a compilation of individual project reports, though all references are merged into a single References Cited section. Appendices I-VI provide supplemental information on the sites involved in the study and study's products.

The study is divided into four sections. Section I, the first five chapters, set the stage for the scientific analyses. This *Background* section, authored by Reitz, Smith, and Zierden with help from their colleagues, establishes the objectives of the study and summarizes the environmental setting and history of Charleston and the Lowcountry before and after European settlement, in addition to a review of colonial Charleston's markets and animal economy. The focus is on human and animal impacts to the environmental over the last four centuries and the history of cattle production the southeastern United States from the perspective of Charleston and the Lowcountry.

Section II, *Cattle and the Environment*, includes the results of a multi-proxy study of cattle sources and husbandry, beginning with Chapter VI, which summarizes the sites and samples selected for the studies and the rationale for their selection. Chapters VII through IX report on a multi-isotope study of archaeological cattle teeth from the Lowcountry, soil and charcoal morphology, and pollen and non-pollen palynomorphs.

Section III, *Studying Cattle in the Lowcountry*, summarizes zooarchaeological and tooth wear analyses of cattle from Charleston and the Lowcountry, with particular emphasis on the two largest assemblages: Heyward-Washington House and Mary Musgrove's Cowpen.

Section IV, *Results*, presents the broader outreach products of the project and the conclusions of the scientific study. Because the background archaeological research and most of the archaeological collections are housed in a museum that also operates historic houses, sharing the project with a wider audience was part of the project from the beginning. Several outreach projects were completed and are described in Chapter XIII, including a graphic comic produced by the Center for Applied Isotope Studies, Bragg Boxes for area schools from The Charleston Museum's Education Department, and new interpretive panels and props at the Heyward-Washington House. These projects are summarized in Chapter XIII. The broader interpretations from the project and suggestions for future research are found in Chapter XIV.

Chapter I
Emergence and Evolution of a Colonial Urban Economy

Introduction

We focus on cattle because their remains dominate the archaeological record for all social groups in both urban and rural locations from the colony's foundation in 1670 into the post-colonial 1800s (Zierden and Reitz 2016). The study of cattle from documented sites and constrained time periods contributes to wider anthropological and historical debates about social and economic forces during the North American colonial period (e.g., Anderson 2004; Silverman 2002). By expanding the study to include stable isotopes, sediments, charcoal, pollen, and fungal spores, we are able to evaluate the impact of cattle and their management on the landscape as well as on local and regional economies. The combination offers new perspectives on colonial economies, urbanization, urban-rural interactions, animal husbandry, trade, and landscape changes, all critical ingredients in the development of complex societies (e.g., Zeder 1991).

Recent scholarship investigates symbiotic relationships between people and commoditized environments (most notably, LeCain 2017). Specifically, environmental historians document the commodification of land and natural resources accompanying the development of Britain's North American colonies (e.g., Donahue 2004; Edelson 2007; Stewart 1991; Whitney 1994). Despite this scholarship, little understanding exists of the impact settlers and the associated growth of urban centers had on rural landscapes and vice versa. Here we explore the emergence and evolution of one colonial urban center, Charleston, South Carolina, from the perspective of its animal economy to clarify relationships between the colony's rural and urban communities, and the impact these had on the colony's economy and landscape. We argue that the success of the colony was linked, in part, to its foundational animal economy, which had both cultural and environmental consequences. This is the perspective explored with the support of National Science Foundation Award Number BCS 1920835 to Carla S. Hadden (University of Georgia), Barnet Pavao-Zuckerman (University of Maryland), Laurie Reitsema (University of Georgia), and Elizabeth J. Reitz (University of Georgia).

The project builds on three decades of collaborative research in Charleston and the southeastern Atlantic seaboard by merging archaeological excavations, archival research, and environmental studies to examine the city and its rural neighbors. The resulting robust archaeological and historical record for the eighteenth-century is particularly well-suited to exploring Charleston as a commercial node in local, regional, and global economies. This record enables us to explore the emergence and evolution of Charleston's urban economy by examining the flow of animal products from rural and urban producers to urban consumers.

Much of the wealth and many of the resources used in urban centers derives from the countryside. Animal economies and provisioning systems draw from rural areas and those who dwell in these hinterlands, meaning urban centers have a broad reach and play a substantial role in reorganizing environments and livelihoods far from urban metropoles (Anderson 2004; Lewis 1999; Zeder 1991). Boundaries between urban and rural are not static, however. With changing settlement patterns and economic goals, urban centers expand or contract, the borders between them shift, and the frontier zone migrates (Brownell and Goldfield 1977:12; Cressey et al. 1982). Transactions in animal products between rural and urban centers clearly were important in many early colonies, though the production and distribution of animal products between and within rural and urban centers was highly variable (e.g., Bowen 1992, 1994; Carson et al. 2008;

deFrance et al. 2016; Grau-Sologestoa et al. 2016; Landon 1996:125-126; Mrozowski 1987; O'Connor 2003; Thomas 2013; Walsh et al. 1997). Crosby (1986) argues that many colonial outcomes have direct or indirect ecological components. Changes, both intentional and unintentional, facilitated landscape and cultural transformations favoring European interests (Smalley 2017).

European Settlements in the Carolina Lowcountry

South Carolina has a long colonial history. The southeastern Atlantic coast, including the tidal reaches of the Carolina coast (the "Lowcountry"), is illustrated on maps as early as 1502 and is shown on the Waldseemüller map of 1507 (Hoffman 1990:3, 60, 58, 91, 158). Waves of French-, Spanish-, and British-sponsored colonies in the Lowcountry impacted an environment previously managed by Native Americans. France and Spain both established outposts in the Lowcountry in the 1560s and Spain continued to claim the Lowcountry after the British Carolina colony was founded in 1670. Throughout this region, colonists extracted furs and hides, naval stores, and other products, encouraged non-indigenous livestock and plants, drained and cleared land for cultivation, and enslaved or displaced Native American populations.

Many aspects of the cattle economy were managed by people who were unfree, whether they served as herd managers in the Lowcountry swamps or as butchers in the city markets. Thus, our project involves the lives of people of African descent. While planters attempted to define boundaries between plantations and the wilderness, enslaved people served as the "middling" between two environments. Everyday exposure to the environment enabled these people to put the landscape to work for their own benefit. Whether actively herding animals for their owners or escaping into the wilderness for a brief reprieve, early cattle-hands moved easily among the colony's pineland savannahs and the cypress bottomlands (Edelson 2006:22, 24, 27; Otto 1987:15-20; Sluyter 2012:136-138; Smith 2020; Ver Steeg 1975:106).

Native people were central to trade throughout the colonial period, including that involving livestock (Bowne 2005; Marcoux 2010; Oatis 2004; Plane 2010; Ramsey 2008; VanDerwarker et al. 2013; Waddell 1980). Groups such as the Escamacu, Kiawah, Edisto, Kussoe, and Seewee had lived in this area for generations. French and Spanish settlement in the sixteenth century set in motion the movement and realignment of these peoples; for example, groups such as the Westo, Yamassee, and Tuscarora moved closer to Carolina after 1670 to trade with British-sponsored settlements.

An additional source of landscape changes after the fifteenth century is climate instability associated with the Little Ice Age. Multiple proxies associate a North American "megadrought" with the failure of the Spanish Jesuit mission in the 1500s, the collapse of the Lost Colony (Roanoke, VA) in 1580-1587, and the failure of Jamestown (VA; Blanton 2000; Blanton and Thomas 2008; Harding et al. 2010; Stahle and Cleaveland 1994; Stahle et al. 1998; Stahle et al. 2000; Willard et al. 2003). Growth increments in bald cypress (*Taxodium distichum*) on the lower Altamaha River (GA) show oscillating periods of wetter-drier/warmer-colder conditions in both the 1600s and 1700s (Anderson et al. 1995; Blanton 2004; Blanton and Thomas 2008). At the same time, colonists altered the landscape through timbering, setting fires, overgrazing, and altering drainage patterns. Thus, colonists faced a number of ecological challenges, some of their own making.

Charleston's Economy

Edgar (1998:131) summarizes the Carolina colony in a single sentence: "Everyone involved in the founding of South Carolina planned on making money out of the venture."

Although this was not true for people brought to the colony in bondage, it nonetheless was true for most European colonists. During the eighteenth century, Charleston was similar in population size to Boston and New York City yet wealthier and more involved in the Atlantic trade than either city (Burnard and Hart 2012). Patterns of urbanization between northern and southern cities did not diverge significantly until the nineteenth century (Fraser 1989; Rosenwaike 1972). By 1750 Charleston had grown from a small, walled, coastal town into a crowded commercial hub linking regional trade networks with global markets through maritime imports and exports (Fraser 1989**;** Greene et al. 2001; Zierden 2000; Zierden and Calhoun 1986, 1990). Charleston's population increased from 800 in 1690 to 3,500 in 1706 to 12,800 in 1776 (Coclanis 1989:113; Fraser 1989:8, 28, 135). Between 1700 and 1769, it was a bustling seaport, the fourth largest city in the British American colonies, and the wealthiest per capita (Garrett 1999:3; Edgar 1998:153; Savage and Leath 1999:55).

An early profitable enterprise was trade with Native Americans for foodstuffs and other necessities, as well as commodities such as skins and furs, particularly deerskins (Barker 2001; Martin 1994). By the early 1700s, a lucrative economy based on ranching and naval stores had emerged. Production of salted meat, tar, and pitch for domestic consumption and export were the first major economic enterprises of the Carolina colony. During much of the eighteenth century, meat was one of the colony's top four exports, behind rice, deerskins, and indigo (Edgar 1998:134). Charleston found a ready market for livestock, meat, and other animal products in the Caribbean, where sugar production monopolized the available land. The Carolina colony shipped thousands of barrels of salt meat to Barbados in 1680. In 1712, Charleston exported 1,963 barrels of beef (Clowse 1971:83, 129). By the mid-eighteenth century, a third of the ships leaving Charleston carried animal products to the Caribbean (Hart 2016). Eventually the dominant role of forest products and cattle diminished, replaced by commodities such as indigo, rice, tobacco, and, ultimately, cotton. Nonetheless, beef was far more abundant than pork in colonial Charleston, from the earliest site to the latest, and cattle products other than meat were important in the city's raw material industries (e.g., Poplin and Salo 2009; Zierden et al. 2009; Zierden and Reitz 2016).

Figure 1-1: The Southeast Atlantic Coast.

Wealth generated by this trade enabled some Charlestonians to obtain exotic goods from around the world. Native American ceramics originating ca. 600 km west of the city, Chinese porcelains, European stonewares, Spanish majolicas, several different styles of colonowares, and Venetian glass are but a few of the exotic items recovered from the city (Zierden 2009; Zierden and Reitz 2016; Zierden et al. 2017). Exotic imports also include animals: South American Muscovy ducks (*Cairina moschata*), a parrot (*Amazona* cf. *aestiva*), and a guinea pig (*Cavia porcellus*; Zierden et al. 2019). Furs, lumber, naval stores, enslaved Native Americans, hides, tallow, leather, game, livestock, staple crops, and other materials obtained through interregional trade flowed into and through Charleston, fueling the city's rise as a trans-Atlantic commercial hub.

Highly regulated public markets were visible symbols of municipal government in action and served as showcases for local agricultural productivity (Hart 2016; Walsh et al. 1997:83). Charleston's first market, known as the Beef Market, was established just inside the city gates in 1692 (Calhoun et al. 1984; Zierden and Reitz 2005). A second market, the Lower Market, was built on the wharves in 1750, followed by the Fish Market (1770), also on the wharves (Butler et al. 2012). Nearby plantations often focused on produce to sell in Charleston instead of, or in addition to, commercial export crops such as rice and indigo (Morgan 1998). Laws and ordinances set aside market stalls specifically for rural planters to sell livestock, meat, or produce in town (Eckhard 1844:137; Edwards 1802:39).

Only a few people could afford to rent market stalls (Walsh et al. 1997:84). Members of disenfranchised groups, particularly Black women, operated active street vending economies (e.g., Hart 2016; Olwell 1996). By the early eighteenth century, informal street vendors competed with Charleston's formal markets. These entrepreneurs, almost all of whom were enslaved, drove much of the supply and price of goods in the city. Charleston's markets created specialized opportunities for Black men, as well. References to enslaved men who were butchers range from those who butchered on plantations for white landowners to those who earned wages as butchers in the city markets (Morgan 1998:55).

Cattle ranching was a major source of income in the 1600s and 1700s (Arnade 1961; Bushnell 1978; Dunbar 1961; Groover and Brooks 2003; Otto 1986, 1987). As summarized by Jeff Crane (2015:41-42), "cattle accompanied or led colonists every step of the way." He notes that, while providing dairy products, cattle were particularly important for trade to coastal markets, and to more distant ports. In the case of Charleston, those ports were the Caribbean sugar islands. Cattle and pigs were an easy avenue to currency. Crane (2015) suggests that the natural abundance of the colonial landscape led to wasteful practices. Construction and improvement of roads to coastal markets and incursions into Indigenous lands and hunting grounds were two immediate and long-lasting environmental impacts of colonial livestock economies. Cattle required more land than subsistence farming, and an expanding livestock economy hastened geographic expansion. Furthermore, a free-range herding system required more feed and reduced manure concentrations that could be harvested to fertilize fields. Ranching and trade in white-tailed deer (*Odocoileus virginianus*), timber, and other forest products led to landscape changes as large tracts of land were timbered and grazed. Fires set to clear land and improve grazing were additional sources of landscape change.

The ability of cattle to do well in the region was important for the success of the enterprise. Little is known about these animals other than that they flourished, that Spanish cattle were said to be larger than Carolina cattle, and that cattle epidemics were widespread by the mid-1700s (e.g., Bierer [1939] 1974:2; Haygood 1986; Stewart 1991). Pursuing archival evidence for the origins of cattle is unlikely to clarify this question given the multinational, multiethnic composition of each colony, hostilities among them, and documentary gaps (e.g., Gremillion

2002; Hann 1988; Reitz and Ruff 1994; Rouse 1977:73-77, 89-90; Stewart 1996). The fluid and diverse origins of colonists and raids between Spanish and British colonies ensured that cattle lineages were mixed and potentially more diverse than geopolitical labels suggest (see Decker et al. 2012; Boyd et al. 1951 in Milanich 1998:174; Jordan 1993:173; Stewart 1991:5; Zierden and Reitz 2002:114).

The role of markets in feeding urban dwellers is a central issue for early colonies. Zeder's classic 1991 study, *Feeding Cities: Specialized Animal Economy in the Ancient Near East* reveals that the distribution of meat and other animal products is a fundamental urban process and a barometer for the economic development of urban centers (Zeder 1991:250-254). She argues that as commitment to urbanization increases, some portion of the human population no longer raises animals, relying instead on indirect distribution channels. Zeder identifies characteristics that distinguish animal products procured through a direct distribution system from those obtained via a specialized economy. Degree of skeletal completeness is one of the key lines of evidence. If animal products were procured directly, butchery likely occurred near the point of consumption, leaving behind all carcass portions. If animal products were obtained indirectly, with several intervening steps between the point of origin (e.g., the herd) and the point of consumption (e.g., the household), carcass portions and associated skeletal remains deemed undesirable would be discarded elsewhere. The distribution of animal products becomes more specialized, regulated, and unequal the more removed the producer is from the consumer.

The usual zooarchaeological approach to assessing the distribution of animal products in complex societies distinguishes "meat-bearing" from "non-meat-bearing" portions of a carcass, on the assumption that most, if not all, consumables were purchased from markets. High-quality skeletal portions are defined as those from the upper body, elements generally associated with large amounts of meat and fat. Low-quality skeletal portions are those from the head and the lower legs. If meat was obtained only from markets or street vendors, faunal assemblages from an upper-status household should contain more high-valued specimens from the upper body than would an assemblage from a less-affluent household. Neither assemblage should yield high skeletal completeness because butchering waste is presumed to be deposited at a distant slaughter location.

The Charleston data do not conform to this pattern (e.g., Reitz et al. 2006; Reitz and Zierden 1991; Zierden and Reitz 2009, 2016). When skeletal representation in Charleston is quantified, we find similar proportions of high-quality and low-quality cattle specimens, with low-quality specimens averaging 58% of the cattle specimens, closely approximating the percentage (60%) in an unmodified, complete cattle skeleton. This is characteristic of most faunal assemblages regardless of time period, status, ethnicity, or function, suggesting that people obtained animal products through direct (home-slaughter) acquisition and indirect (market) acquisition. Upper-status households may have supplemented purchases with their own livestock, wild game, and produce from their plantations.

Many urban dwellers in early Charleston were, at least to some extent, feeding themselves and not relying exclusively on markets, however. The contrasting zooarchaeological and preliminary isotopic data bring to the forefront several questions about the role of markets in early American cities. Who relied on markets and who did not? Did the sources of market commodities change over time?

The historical record lends support to both home-slaughter and market acquisition as sources of meat. On one hand, Smith's (2007) analysis of Sarah Reeves Gibbes journal, written in Charleston between 1807 and 1809, suggests that daily marketing was common. On the other hand, more than half of many early urban lots was used for crops, livestock, and other farming activities. This land-use pattern diminished as the city grew (Joseph 2002) and we expect that fewer animals were foddered within the immediate urban area over time.

Preliminary isotopic data from the Beef Market and residential sites confirm that town dwellers did not rely solely on markets for meat (Kornmayer 2018, Kornmayer et al. 2018). Reitsema et al. (2015) used stable carbon and nitrogen isotope evidence from cattle bones excavated from residential and market sites within Charleston to examine whether markets pooled or segregated access to cattle drawn into the city from the broader landscape. Though their study was preliminary, stable isotope values were varied, indicating cattle came to Charleston from more than one ecoregion. Differences exist among sites, however. Data from two low-status/dual-function contexts differ from markets and high-status residential data. A preliminary interpretation is that lower-status/dual-function sites in their study had a different "catchment" for cattle products than either markets or upper-status residences but did not procure their beef at markets. Isotopic variation at two market sites was high, pointing to multiple sources of beef for Charleston markets. Reitsema et al. (2015) were able to discern some change through time, reflecting the movement of Carolina cattle and cowpens from the Lowcountry into other portions of the coastal plain by the 1720s.

Research Design

The 2019-2022 NSF-funded study that informs this volume builds upon these earlier studies. The research design tests several hypotheses: (1) animal products were drawn from urban, suburban, and rural pastures; (2) the sources of market commodities, specifically cattle and cattle products, changed over time; (3) herd management was based on production goals; and (4) landscape modifications associated with European-sponsored colonization reflect, in part, the regional animal economy. Charleston and the Lowcountry are ideal for this study because the rich archaeological, archival, and zooarchaeological record provides context within which to elaborate upon and assess multi-proxy data. Merging diverse sources of information about the region's economic and environmental history enables us to trace connections among people in the emerging economy in an unprecedented way.

Potentially, animal products could be from one of the four distinct ecoregions. The Fall Zone at the edge of the North American tectonic plate separates the upland Piedmont from the low-lying coastal plain. The comparatively flat coastal plain is divided into an inner (or upper) portion and an outer (or lower) coastal plain, each with slightly different elevations, topography, drainage systems, and vegetation. The coastal plain becomes increasingly flat, sandy, and low-lying, and elevations as it approaches the Atlantic coast (Platt and Brantley 1997; SC SWAP 2020). At the coast, freshwaters and oceanic waters mix to form a tidal zone. Tidal influence extends ca. 60 km inland along coastal streams into the lower coastal plain, defining the Carolina Lowcountry (e.g., Porcher 1995:5). The lower coastal plain supports abundant, year-round C_4 forage, including salt hay or cordgrass (*Spartina patens*) in the tidewater zone, vegetation which was important in the early cattle industry (Porcher 1995:12). Charleston lies within the Lowcountry, as did many of the early rural settlements.

Interconnected data enable us to trace cattle through the supply chain from rural pastures to urban consumers. Geochemical data clarify what is meant by "local" and "distant" provisioning sources by linking animals to grazing ecologies. Zooarchaeological information about the slaughter age of cattle and geochemical evidence for the sources of these cattle clarify herd management decisions in the context of rural-urban trade networks. The slaughter age at production centers and within Charleston highlight differences in rural and urban herd management objectives. Sediment cores show an increase in fungi associated with herbivore (i.e., cattle) dung and fire activity during the colonial era. Some of these fires likely were set by colonists to clear land, facilitate timbering, and advance cattle production. Vegetation changes also point to human-induced landscape changes associated with deforestation, overgrazing, and transitions to export commodities such as rice. Documentary records indicate that enslaved laborers drew upon their experiences with free-range cattle to turn degraded wetlands into rice fields. By the late 1700s, rice production, dependent on a large enslaved labor force, dominated the economy with long-term social and environmental consequences. We argue that this process began in 1670, when timbering, fires, and free-range cattle, among other forces, displaced Indigenous peoples and began degrading wetlands.

Combining data from these diverse sources provides an unprecedented opportunity to determine whether provisioning shifts occurred as the city matured, and, by extension, to consider implications of provisioning on the city's global connections between 1670 and the nineteenth century. These diverse sources of information clarify how the colonial Carolina Lowcountry landscape developed in response to the dramatic cultural and technological changes that transformed the region.

Materials and Methods

The study builds upon available data from multiple nodes in the animal economy, e.g., markets, dwellings, workyards, cowpens, and plantations, augmented with new archival, archaeological, and environmental data. Urban and rural data for the first decade of the colony (1670-1680), before Charles Town moved to its present location, are limited, as are those from the early decades of the peninsular town (1680-1710). Data from the 1710-1750 period, associated with economic stability and physical growth of the city and region, are more robust. The fourth period (1750-1820) marks the city's years as a leading seaport and center of wealth. The data are drawn primarily from closed contexts within Charleston dating from the 1690s into the late 1800s (Appendix IV; Zierden and Reitz 2016: Appendix 6). Rural data begin with Charles Town (1674). Closed contexts are those that appear to have been relatively undisturbed since the original deposition and have relatively tight depositional dates. Dates are based on excavation records, integrity of the site's stratigraphy, site architecture, Terminus Post Quem (TPQ), ceramic dates, other material culture, documents such as probate records, insurance records, and deeds, location, specific site events; and general trends in Lowcountry history. A full list of the urban and rural sites in this study is available in Appendix II.

We place particular emphasis on two Lowcountry sites closely associated with Charleston's early commercial network: an urban residence and commercial venue (the Heyward-Washington property) and a rural trading post and cowpen (The Musgrove Cowpens). The two sites, separated by ca. 170 km, are examples of functionally distinct enterprises operating within much the same local, regional, and global commercial provisioning networks. Heyward-Washington and the Musgrove Cowpens are unique commercial cattle processing sites, occupying different ends of the trajectory from producer to consumer. Both are well-documented, with archaeological remains remarkable in their clarity, content, and associated dates of deposition. The materials from these sites represent a period of significant growth in the city and both sites show clear signs of involvement in marketing cattle products.

The Heyward-Washington property is a commercial and residential site with a large vertebrate zooarchaeological collection (Herold 1978; Zierden 1993; Zierden and Reitz 2007). The property is notable as the 1772 townhome of Thomas Heyward, who signed the Declaration of Independence, and as the quarters of President George Washington during his 1791 Tour of the Southern States. Of importance to our study, the property was the location of John Milner Sr.'s gunsmith in the 1730s. His gunsmith burned in 1740, but he and his son, John Milner Jr., continued the business. Upon his father's death in 1749, the younger Milner built a brick single house and outbuildings on the property. The features of the elder Milner are separated from those of his son by a distinct zone of ash from the 1740 fire. Recent analysis by Platt suggests that an even earlier component can be isolated in level 8, probably associated with the ownership of Joseph Ellicott (ca. 1694-1720; Platt 2022). Today, The Charleston Museum operates the property as a house museum.

A large vertebrate assemblage from the Heyward-Washington property was studied previously (Manzano 2007; Reitz and Colaninno 2007) and additional Heyward-Washington studies were conducted by Taesoo Jung and Elizabeth Reitz as part of the present NSF-funded project. Both studies followed long-established zooarchaeological protocols used to maintain consistency in the study of all collections from Charleston and the Carolina Lowcountry (Appendix III). Some Heyward-Washington samples were used in the Reitsema et al. (2015) study. Subsequently, 11 Heyward-Washington cattle teeth were included in an unpublished isotopic study funded by a National Science Foundation Graduate Research Fellowship to Sarah Platt (Platt 2019, 2022). Those 11 specimens, plus additional samples are included in the present isotope study.

Figure 1-2: Example of selected specimen from the Heyward-Washington House collection.

The Cowpens (Grange Plantation [9Ch137]) was a trading post and cowpen operated by Mary Musgrove on the Savannah River between 1732 and 1751 (Hahn 2012, 2013). The site was excavated in 2002-2003 by Southeastern Archeological Services, Inc., under contract with the Georgia Ports Authority. Vertebrate remains were recovered using ¼-in-meshed screen (Braley 2003). Feature 7 was a rectangular pit (6.2-x-3.8 m) interpreted as a cellar with a mean ceramic date of 1741 (Braley 2013:108). Feature 231 was a 5-m^2 cellar with a mean ceramic date of 1740 (Braley 2013:116-121, 240). Feature 231 was probably the cellar of a house built in 1734 and likely was filled by 1763. Some ceramics from the two separate features cross-mend; indicating they were filled at the same time. Feature 7 contained 30,465 specimens and the portion of Feature 231 previously studied contained 15,321 specimens (Orr and Lucas 2007; Orr et al. 2008). Additional Musgrove Cowpen vertebrate remains were studied by Charles Cameron Walker and Barnet Pavao-Zuckerman as part of the NSF study reported here.

Our study takes advantage of microenvironmental variations in Carolina ecoregions to test broadly whether the animal economy used, or perhaps even relied upon, products from sources beyond the city or even beyond the Lowcountry. Similar isotopic ratios in cattle teeth recovered from both rural and urban contexts would suggest cattle originated within or near Charleston, enabling us to consider direct or indirect procurement of cattle and cattle by-products from a relatively restricted area. Of more significance would be *differences* suggesting that animals did not originate from within the Lowcountry biogeographic region. Differences might suggest that the animal economy reached into the Piedmont and more distant locations, such as Creek and Cherokee towns (e.g., Ethridge 2003:162; Groover 1994; Groover and Brooks 2003; Hahn 2012; Lewis 2017; Piker 2004), or to trans-Atlantic sources, with implications for our understanding of this and other early colonial economies.

The geochemical study by Carla Hadden, Laurie Reitsema, and Katherine Reinberger of cattle teeth clarifies what is meant by "local" and "distant" provisioning sources, enabling us to link animals in urban deposits to grazing ecologies and trace them through the supply chain from pasture to consumer. Stable isotopes of carbon, nitrogen, oxygen, strontium, and lead in the tooth enamel and dentine provides information about the ecogeographic sources of the cattle and herd management strategies (e.g., Guiry et al. 2014; Reitsema et al. 2015; Sharpe et al. 2016). Carbon and nitrogen are derived from diet, and oxygen from consumed water. These stable isotopes reflect the grazing opportunities of free-ranging animals, or possibly fodder provided to penned animals. Overgrazing, forest clearing, drainage projects, and replacement of C_3 plants by C_4 plants can be seen in variations in carbon and nitrogen isotopes (e.g., Bogaard et al. 2007; Britton et al. 2008; Drucker et al. 2008; Grogan et al. 2000; Han et al. 2008; Noe-Nygaard et al. 2005; Tieszen 1991; vanKlinken et al. 2000). Oxygen isotopes in cattle teeth reflect the hydrological, geographical and climatological characteristics of consumed water. Strontium and lead isotope ratios may distinguish among possible sources of cattle products because the isotopic signatures of these elements in rocks, soils, and waters vary among regions (Keller et al. 2016; Price et al. 2002).

Patterned variability in the wear of the occlusal surface of cow teeth provides evidence for those aspects of herd management related to slaughter age. Production designed to maximize dairy products, meat and other post-mortem products, or livestock typically yield cattle age profiles dominated by distinct age cohorts. It is possible that both the rural and urban herds were managed to meet a diversified, multi-purpose strategy that largely met local needs. Over time, rural production centers transitioned from a diversified production strategy to specialized production that catered to urban and overseas markets. This transition might include both a temporal component, as well as a spatial one, with early rural sites located near Charleston making different choices than those made at later sites located further from the city.

Detailed analysis of, pollen, fungal spores, and sediments in three 1.6-m sediment cores enable us to reconstruct long-term landscape-scale fire histories, vegetation change, and fungal evidence associated with the early cattle industry in the Carolina Lowcountry through a reconstruction of environmental change within Hell Hole Swamp and two other cattle ranching sites for which there are accompanying archaeological and geochemical data (Stobo Plantation at Willtown and the Spencer Settlement at Hampton Plantation). Grant Sniker's sedimentary studies and charcoal analysis, and Angelina Perrotti's study of pollen and non-pollen palynomorphs provide evidence of human-induced landscape changes associated with fires, deforestation, grazing, and farming. They conclude that cattle and the land-use practices associated with free-ranging cattle were detectable in the ecological record and that the emergence of the colonial cattle economy in rural areas related to changes in fire and vegetation in flatwood ecosystems. This portion of the project focuses on the environmental history of the Carolina Lowcountry, while seeking to understand how intentional burning may have played a role in supporting free-ranging cattle between 1670 and 1900 (see Sluyter 2012:26).

Hayden Smith's research focuses on the city, the final destination for the cattle trade. Smith examined the lands on Charleston Neck that served as holding pens for cattle trailed to the city, and as commons for urban livestock. This enables him to trace the path of cattle commodities from field to market in Charleston, and changes in these locations as the city expanded. Using primary and secondary historical sources, Smith investigates early colonization and resulting landscapes, building on his own previous research. He explores how European and African cultural interpretations of the land influenced decisions about landscape modifications, building upon the preexisting changes initiated by Native Americans. Smith considers how topography's role in people's perceptions of land use changed in the face of shifting market patterns and demand for commodities. Documentary research provides comparative analysis for understanding changes in both the economy and the landscape, particularly the landscape consequences of inland swamp rice production and its relationship to colonial cattle ranching. Historical investigations elaborate upon the connection between early colonial enterprises and intensive monocrop enterprises. Rice cultivation, in particular, resulted in widespread landscape manipulation. Prior to rice cultivation, these same tracts supported free-range cattle (Smith 2012, 2020).

Status, Ethnicity, etc., in Charleston

The Carolina colony was multiethnic and socially stratified, which makes it difficult to discuss animal use and consumer choices without considering status. We define status broadly as the relative standing of individuals, households, ethnic groups, professions, and communities in a social hierarchy. Status is not based on a single characteristic, but instead on a montage of attributes such as ability, kinship, national origin, type and location of residence, occupation, amount of income, source of income, authority, power, associates, gender, religion, and conduct (Warner 1962). Rank may be based on conformity to the norms and roles associated with one's perceived place in this hierarchy. These tangible and intangible attributes are abstract when applied to urban animal remains; thus, we merge them here under the term "status," acknowledging that status has different attributes and meanings in every social interaction.

Discerning status in Charleston relies on subtle interpretations to accommodate the colony's social complexity. Owners of record might not live on their property, people of different status were not spatially isolated, and properties could serve residential, commercial, and public functions at the same time (Zierden and Reitz 2016). Wealthy slave-owning families shared their townhouse properties with enslaved household workers, singly and in families, sometimes numbering three dozen. Wealthy urban householders might operate a business from the lower level of the house. Modest-status urban households also might have an enslaved staff, though a smaller one. In addition, the occupants and functions of these properties changed over time. Elegant townhouses might be built on properties that previously were occupied by a modest home and a gun-making shop. A planter's home in the late eighteenth century could become a boarding house in the nineteenth century. An imposing townhouse might be an elegant residence in the first half of the 1800s and continue to be owned and occupied by the same family after the Civil War (1861-1865), but without its pre-war fortune and staff, though not its prestige. After 1865, outbuildings on upper-status properties might be rented for commercial enterprises, such as bakeries, or be converted into schools and multi-family dwellings.

Despite these complications, each site, or temporal component of a site, in Charleston is assigned to one of four social categories based on the above criteria and a broad interpretation of status in this particular setting (Appendix II; Zierden and Reitz 2016).

- People living at public sites, such as theaters, taverns, tanneries, and military installations, were probably members of Charleston's urban poor and data from these sites form a lower-status category.
- Assemblages from properties used for mixed residential and commercial activities, often by tradesmen and craftspeople who lived above their small shops, are combined into a modest-status category, along with small residential sites. Toward the end of the 1800s, some of these residences were occupied by people of African descent.
- Townhouse sites are merged into an upper-status category. Occupants of townhouse sites included a few members of the wealthy family and a large number of employees, indentured servants, and enslaved people. The term "townhouse" is used interchangeably with "upper-status" to denote these large, mixed households or sites.
- The fourth status group consists of two markets, the Beef Market on Broad Street and the Lower Market on the Bay. These were probably non-residential though likely with watchmen in attendance. Pipe stems, wine bottles, and beverage glasses indicate that public consumption of food and drink took place at these markets, probably by vendors and their customers. Both markets ceased operations by the end of the eighteenth century. We have no data from the nineteenth-century market, opened in 1807 as the Centre Market.

Archaeological Collections and Curation

The majority of the materials used in this study are curated in The Charleston Museum's permanent collections. Considered the oldest private-funded museum in the United States, The Charleston Museum was founded on January 12, 1773, by members of the Charleston Library Society, while South Carolina was still a British colony. Through the centuries, the Museum has been affiliated with the Charleston Library Society, the Literary and Philosophical Society, the Medical College of South Carolina, and the College of Charleston, before becoming a private non-profit institution in 1915. The Charleston Museum maintains collections relating to the social and natural history of the South Carolina Lowcountry, including archival (photographs and documents), history (decorative arts and textiles), natural history (fossil, geology, botanical and animal) collections. The Museum's collections exceed 2 million specimens, maintained through the PastPerfect Museum software system (Borick 2022).

The Charleston Museum's archaeological collections contain artifacts from professional surveys and excavations, conducted primarily under Museum auspices in the twentieth and twenty-first centuries, and small collections donated or purchased from collectors in the nineteenth and early twentieth centuries. This has created a diverse collection of objects used in exhibits telling the story of Lowcountry cultural history and by researchers from around the world and many disciplines.

It was with the rise of historical archaeology that the archaeological collections were managed, first under an anthropology department, and later an archaeology department. These newer collections came largely from controlled, professional digs and include the ancillary parts of archaeological excavation such as field notes, field photographs, soil samples, and botanical and faunal specimens. The bulk of the archaeological collections are from sites in downtown Charleston and rural sites across the region. Although the majority of the post-colonial collections housed at The Charleston Museum were excavated by Museum archaeological staff, the collections include materials excavated by consulting firms and other institutions accepted into the collections based on relevant provenience, research and exhibition value, and available storage space.

The collections gathered in a controlled manner since 1970 are the focus of the present study. Scientific excavation began in 1974 with Dr. Elaine Herold's excavation of the Heyward-Washington house. Soils were excavated by level, or by defined feature limits, and materials were screened through ½-inch mesh. Field notes, composite maps, and a few photographs are curated at The Charleston Museum. Herold continued small testing projects and salvage excavations on Charleston sites through the remainder of the decade, using similar methods. Unusual for the time, Herold collected faunal, botanical, and architectural remains, in addition to cultural artifacts, facilitating the NSF-funded study.

Beginning with the excavation of Charleston Place in 1980, and continuing to the present day, controlled excavations in Charleston used a site grid, excavation units of standard size, excavation by natural zone, and screening through ¼-inch mesh. Field records included narrative notes, a variety of forms, unit and site maps, photographs in black and white and color slide film, and a bag (Field Specimen) log. Collections included all faunal remains, selected botanical samples, soil samples from selected proveniences for pollen, soil chemistry, and other studies, and architectural samples. All of these, including soil samples, are curated at The Charleston Museum, along with field and lab records and a final technical site report for each excavation.

Faunal analysis was part of each project, funding permitting. Faunal remains were separated from other materials at the washing stage, and bagged separately by provenience. Based on research questions and size of budget, the most pertinent proveniences were selected for analysis. These, plus provenience information and research issues, were shipped to Georgia Museum of Natural History at the University of Georgia in Athens. Upon completion of faunal analysis, the materials were returned to The Charleston Museum, sorted and tagged by identification and provenience. Reitz submitted a summary report for each project, which subsequently published as a chapter or appendix in the broader site report, available online at charlestonmuseum.org. The tagged and identified faunal remains were boxed separately and curated with other materials from the same site. Additional information on each identified specimen is maintained at the Zooarchaeology Laboratory, University of Georgia, and these data are used to locate individual identified specimens (such as the teeth used in the analysis reported here), facilitating retrieval from the boxed collections. These data records also will be curated at The Charleston Museum.

Destructive analysis, such as the isotope study featured in the present study, requires special permission of the Museum Collections Committee based on a detailed application and description. The remaining portions of sampled specimens are returned to the Museum, where they are curated separately.

Outreach

The mission of the Charleston Museum is "to educate Charleston area residents and visitors about the natural and cultural history of the South Carolina Lowcountry through collections, exhibitions, preservation, conservation, research and related programming." As archaeological research and archaeological collections are part of that mission, results of these projects are regularly incorporated into new interpretation in the Museum's galleries and historic houses. The first projects were at historic house museums, with urban archaeology contributing directly to public interpretation for organizations such as the Museum and Historic Charleston Foundation.

Consistent with the Museum's mission, outreach is an important part of the present project. The results are included in a graphic activity book designed for a K-12 audience, two traveling educational boxes, known as Bragg Boxes, and new interpretative exhibits in the yard, the kitchen, and the dining room of the Heyward-Washington House.

The graphic activity book is one in a series of educational activity books developed by the University of Georgia's Center for Applied Isotope Studies. The activity books are intended to communicate archaeological science concepts and discoveries to young audiences. Written by KC Jones, with contributions by Turner Hunt, Meredith Hardy, and illustrated by James Burns, "Archaeology of the Cattle Economy in Colonial Charleston, South Carolina" is bilingual (English and Spanish) and designed to engage students in the diversity of fields and the breadth of knowledge obtained through the scientific study of their heritage. These materials are free of charge to teachers and students in Georgia and South Carolina**,** to reinforce learning outcomes and enhance their museum experience.

The Bragg Boxes augment programs and exhibits at the Heyward-Washington House. Bragg Boxes were pioneered by Laura Bragg, Director of the Charleston Museum in the 1920s. She was the first female Director of a publicly funded museum in the United States. Bragg revolutionized children's programming with specially crafted boxes containing Museum materials and background information for distribution to rural schools throughout the Charleston area, reaching children who might otherwise be unable to visit in person. Several original boxes remain in the Museum's collections and are featured in exhibits. A century later, the Museum faces the same issue: diminished funding for field trips to the Museum, particularly for schools serving disadvantaged students. The response was to revitalize the Bragg Box program.

Two new Bragg Boxes feature artifacts, replicas, reproduction images, documents, lesson plans, and activities providing valuable arts-infused social studies and natural sciences curricula to students, tied directly to South Carolina's educational standards. Boxes are available to area teachers for a nominal fee as a week-long rental, with advance reservation. Each box contains four or five lesson plans, suggesting how the contents could support problem-based learning experiences. The two new boxes use materials and results from the NSF-funded project.

The STEM Bragg Box on foodways allows students to use animal remains in a problem-based learning experience to understand the environmental implications of cattle ranching. Lesson plans covering the environmental history of land use and settlement patterns enhance the broader understanding of foodways and culture. Additional lesson plans cover the history of cattle ranching in the Southeast, identification of animal bones, and activities on food sourcing. This latter activity contrasts the eighteenth century with today's farm-to-table issues. Social studies focus on the people behind the phenomena, primarily enslaved Africans and local Native Americans, from those who raised and tended livestock to those who made and served the foods.

The Archaeology Bragg Box focuses on archaeology as an analytical science, using the Heyward-Washington yard as the basis for the known observations and measurements. Students can use these known observations to infer behaviors at other urban sites. How do we know about the buildings, the animals, the occupants, and the occupations of townhouse residents? What types of data do archaeologists use to interpret the past? What is the evidence for all residents at these houses, enslaved and slave owners alike?

New interpretative exhibits in the yard of the Heyward-Washington House focus on the site's archaeology, its former occupants, and activities of the eighteenth century. Graphics, artifacts, and maps enable visitors to understand the evolution of the property, particularly how the early Milner occupation (1730-1768) differed from that of the later Heyward occupation (1770-1894). Exhibit panels in the yard, faux food in the kitchen, and artifacts in the main house and outbuildings draw upon the project's results. Students unable to visit the house can get the same lessons from the Archaeology Bragg box.

Figure 1-3: Rear view of the Heyward-Washington House, showing the garden, kitchen, stable, privy, and work yard. Collections of The Charleston Museum.

Terminology

- The focus of this volume is Charleston, in South Carolina. Charleston was founded and occupied within a complex cultural, ecological, and political landscape that changed identity over the centuries. At the risk of oversimplifying complex social dynamics, we place sites and people into the human landscape with reference to the most prominent European claimant for each location using current geopolitical terminology (Britain, France, Spain).
- This broader perspective is necessary because of the diverse sources of goods and people contributing to Charleston's identity. The major players were the Spanish Empire, or entities that were part of that empire (e.g., the Philippines, the Netherlands, Germany, northern Africa, New Spain, the Canary and Caribbean islands, South America), Great Britain (a union of England, Wales, Ireland, and Scotland formalized in 1707), and France.
- Many of the sites discussed here were occupied before the modern United States formed, but each site is referenced by its present geopolitical affiliation. Charleston is described as being in South Carolina, the Cowpens as in Georgia, and St. Augustine as in Florida. None of these states existed during much of our study period, but a detailed recital of changing colonial boundaries and claims would needlessly complicate our discussion. In this context, "North America" refers to the United States (USA), primarily to the southeastern Atlantic seaboard. Unless referring to a specific individual or indigenous entity, indigenous peoples are referred to as "Native American," which does not do justice to their rich and complex heritage.
- Charleston was originally known as Charles Town. In 1680 it was moved downstream to its present location. It was renamed Charleston in 1783 after the American Revolution and

incorporation. To distinguish between the earliest evidence of colonization in the Lowcountry and later developments, we refer to the first settlement as "Charles Town" (presently Charles Town Landing States Historic Site) at Albemarle Point. The name "Charleston" is used consistently for the second, peninsular, location regardless of whether it was known officially as "Charles Town" or "Charleston." Colonial documents (1670-1783) consistently refer to both locations as Charles Town.

- Unless stated otherwise, "cattle" only refers to *Bos taurus*, though sheep (*Ovis aries*) and goats (*Capra hircus*) also are in the family Bovidae, referred to in the vernacular as "bovids". As used here "cattle" and "cow" are generic terms subsuming male, female, and castrated animals. If a specific gender is meant, the terms "male," "female," or "castrate" are used unless the context makes this clarification unnecessary. "Ox" also may refer to castrates, though draft animals were not necessarily always male or always castrated.
- The vertebrate assemblages in this study are from 55 Charleston sites or temporal components of sites. Most of these materials were recovered by Zierden using a 6.4 mm (1/4-inch) meshed-screen. This screen size undoubtedly failed to capture the remains of small-bodied fishes such as anchovies (Engraulidae), though intermittent examinations of soil samples and archaeobotanical samples have found no evidence that small-bodied fish were used regularly. On the other hand, the 6.4-mm mesh does capture pins, beads, other small artifacts, and small bones of larger fish, particularly when clogged with brick-and-mortar rubble, a regular occurrence in Charleston. Details of each site are available in Zierden and Reitz (2009, 2016) and in reports available through The Charleston Museum's web site (http://www.charlestonmuseum.org/research/archaeology-reports).
- The assemblages are subdivided into four time periods: 1710-1750s, 1750s-1820s, 1820s-1850s, and 1850s-1900 based on probate records, deeds, other documents, architecture, material culture, and stratigraphy. These time periods do not conform to specific economic and political events in the city, but they do provide a broad historical material trajectory for the city.
- Scavengers worked throughout much of the city's history, but their principal responsibility was to clean public spaces (Butler 2020:20-22, 35-36). Households were responsible for disposing of their own trash, much of which was discarded on the property. This explains the abundant animal remains, but complicates interpretations of status from those remains. Although family members and their free and enslaved staff likely consumed different foods in different places on each urban lot, the trash generated by everyone living there probably was discarded in much the same place, creating rich middens in back yards, along property lines, and under buildings. The use of trash to fill low-lying areas, however, means that at least some of a site's refuse may be on adjacent properties, or under today's streets and parking lots.

Conclusion

Many of the European-sponsored colonies that emerged in the Americas after 1492 AD did so as nodes in large-scale regional, interregional, and global provisioning systems (e.g., Cusick 1998; Guiry et al. 2017; Orser 2009; Silliman 2005; Wallerstein 1974). Animals and plants were fundamental to these emerging economies as raw materials, food, and finished products were produced and distributed to local urban populations and fueled export economies (e.g., Beck et al. 2016; Crabtree 1990; deFrance et al. 2016; Dietler 2010; Landon 2009; Rothschild and Balkwill 1993; Sluyter 2012, among others). As evidence of these material flows, archaeological animal remains provide a unique perspective on the development of colonies and their environmental impact. By exploring these changes from an interdisciplinary perspective, we fill significant gaps in the historical record concerning the causes, timing, and consequences of landscape changes prior to the twentieth century.

Figure 1-4: Florida Scrub, or Cracker, cattle at the Florida Agricultural Museum, Palm Coast, Florida, 2015. Photo by Olga M. Caballero.

Charleston is a case study for how short- and long-distance trade networks and provisioning strategies integrate and organize people and alter colonial landscapes. Although the hypothesis that specialized animal economies were fundamental to the development of urban centers is germane to all colonies, regardless of time or place, colonial cities in the southern United States seldom are studied as centers of economic networks before plantation systems came to dominate their economies (e.g., Burnard and Hart 2012). Our study relies on legacy collections with rich context and expansive potential for future research. It is but a small step toward demonstrating that the Carolina colony and its multicultural residents engaged with global markets from the earliest years of colonization. The multi-proxy approach adopted in this study enables us define what "local" and "distant" mean geographically and to associate these distinctions with the purposes and pathways along which animals and animal products journeyed. In the following pages, we explore the ways market systems involving animals functioned at local and regional levels, thereby affecting wider areas of trade and economy.

Chapter II
The Lowcountry Environment

Introduction

European colonists arriving on the Carolina coast in the late seventeenth century encountered a bountiful land, one teeming with fish, game, and other resources. The Lowcountry environment offered many economic opportunities because of the wide variety of distinct habitats found within it. Primary among these habitats are pine forests, savannas, hardwood forests, and marshes. The Lowcountry is the lower end of the large Coastal Plain that extends from the Fall Line to the Atlantic seaboard. The Coastal Plain can be further subdivided in terms of elevation, topography, drainage, and climate. Colonists initially settled in the Lowcountry, but over time moved further inland. They quickly learned that the Carolinas were not a new Eden and agricultural practices common in Europe or in the Caribbean were ill-suited to the Carolinas. This was particularly true for the Lowcountry. Instead, they discovered that the Coastal Plain offered other economic opportunities and they soon took advantage of those. The resulting cultural and technological consequences transformed the region.

South Carolina Landforms

South Carolina's landforms are known by many formal and informal names which distinguish among the Blue Ridge Mountains, the Piedmont, the exposed continental shelf (Coastal Plain), and the coastal zone (Kovacik and Winberry 1987, 1989). These landforms can be subdivided broadly into those above the Fall Line or Fall Zone and those below it (Kovacik and Winberry 1989:16-26). The Fall Zone is an ancient geologic boundary between a hard, metamorphosed upland terrain and the sandy, relatively flat alluvial Coastal Plain. The Blue Ridge Mountains (part of the Appalachian Mountains) and the Piedmont lie above the Fall Zone and the Coastal Plain lies below it (Kovacik and Winberry 1989:14-18). The Coastal Plain is actually part of the broad, relatively flat exposed continental shelf forming the eastern Atlantic seaboard between New York and Florida, extending into the northern coast of the Gulf of Mexico and the Mississippi River Valley. The Coastal Plain itself is divisible into several ecologically distinct ecoregions. Using the terminology of Kovacik and Winberry (1989:15) these are Upper or Inner Coastal Plain, Lower or Outer Coastal Plain, and the Coastal Zone (see also Porcher [1955:xvii]).

Rivers originate both above the Fall Zone and below it. The Pee Dee, Santee, and Savannah originate in the Appalachian Mountains. The Ashley and Cooper rivers, which combine to form the Charleston peninsula, originate on the Coastal Plain. Rivers traversing the state, some running from the mountainous interior and others initiating in the flatter Coastal Plain, form natural harbors in the Coastal Zone, many of which became the first areas settled.

<u>Piedmont</u>

The Piedmont region extends from the Blue Ridge Mountains to the Fall Zone. "Piedmont prairies" were pockets of grasslands which included little bluestem (*Schizachyrium scoparium*) and a pineland threeawn (*Aristida stricta*; also known in the vernacular as wiregrass, though distinct from the wiregrass of the Upper Coastal Plain) as well as numerous species of wild pea (Fabaceae), previously managed and maintained by Native American communities with fire (Davis et al. 2002). Cattle reached the Piedmont relatively late in the emergence and evolution of Carolina's colonial cattle economy.

Sandhills

The Sandhills are remnants of an Eocene shoreline. This narrow, sandy area is ca. 10-35 miles wide and usually is classified as part of the Coastal Plain (Griffith et al. 2002), though it is difficult to distinguish from adjacent portions of the Piedmont (Kovacik and Winberry 1989:20). The Sandhills are a xeric, sandy region dominated by pine trees and often referred to as the Piney Woods. The Sandhills are known as a longleaf pine (*Pinus palustris*) and wiregrass (*Aristida stricta*) ecosystem maintained by frequent, low-intensity fires. This region also became involved in Carolina's cattle economy relatively late.

The Upper and Lower Coastal Plains below the Sandhills

The Coastal Plain below the Sandhills was the primary focus of the early cattle industry. Since colonial times the Upper (or inner) Coastal Plain was distinguished from the Lower (or outer) Coastal Plain. The elevation of the Upper Coastal Plain ranges between ca. 220 and 300 ft amsl; contrasting with the Lower Coastal Plain which is relatively flat with many swamps, ponds, and sluggish, meandering streams. The South Carolina portion encompasses ca. 20,000 square miles, covering much of the state between the Sandhills and the Atlantic Ocean, a distance of ca. 120-150 miles (Kovacik and Winberry 1989:18-20).

The Upper and Lower Coastal Plains are separated by the Orangeburg Scarp, an ancient terrace formed by a temporary shoreline some 20-30 million years ago (Kovacik and Winberry 1989:20). The Scarp is a physical line of demarcation between the Upper and Lower Coastal Plains (Colquhoun 1969:2; Soller and Mills 1991:290-291). Small earthquakes (and a large one in 1886) are a regular occurrence along this fault. The 1886 earthquake probably ranked a 10 on the Mercalli 12-point scale; Charleston was its epicenter (Kovacik and Winberry 1989:21-22). Above the Orangeburg Scarp, elevations are between 220-300 ft amsl; below the Scarp, the Coastal Plain is relatively flat (Kovacik and Winberry 1989:18-20). Some coastal rivers, such as the Edisto, initiate at this fault line. The movement of water through these sedimentary deposits shaped the land, forming knolls, ridges, and troughs between four to forty ft in elevation.

The infertile sands of the Upper Coastal Plain receive the least precipitation of these regions, creating a distinctive xeric environment which merges into the Sandhills. Wiregrass (*Aristida beyrichiana*) comprises upward of 90% of the understory in some areas (Christensen 1977), including most of the Sandhills (Porcher and Raymer 2001). Little bluestem (*Schizachyrium scoparium*), a native perennial C_4 bunchgrass, competes with wiregrass in the interspersed savannah grasslands across South Carolina; though wiregrass is more stress-tolerant in the xeric Sandhills. The Lower Coastal Plain transitions from rolling, loamy hills to flat sandy soils (SC DNR 2015). Rainfall increases toward the coast (Kirkman et al. 2007; Miller and Miller 1999).

Lower Coastal Plain topography was a critical feature to plantations and the people who lived on them. Islands of "high pine land" lying just a few meters within and around plantation swamps provided sites for buildings and fields for grazing cattle, and the creeks flowing around these landforms provided the water sources and floodplains needed for additional grazing and, later, cultivating rice (Kovacik and Winberry 1989:20-21). The evergreen foliage of river cane (*Arundinaria* spp.), a C_3 species, was the preferred fodder for cattle in this ecoregion throughout the year (Platt and Brantley 1997). The rise and fall of coastal streams and rivers at the coastal fringe of the Lower Coastal Plain were critical to early rice cultivation.

The Coastal Zone

A Coastal Zone lies between the Lower Coastal Plain and Atlantic Ocean. It consists of a patchwork of marshes, estuaries, barrier and marsh islands, pine forests, and freshwater hardwood swamps subject to tidal influence (Kovacik and Winberry 1989:23-26). Lagoons (known locally as estuaries) behind the barrier islands are subject to daily tides surging through inlets between the islands, mixing Atlantic waters with fresh water from rainfall, coastal rivers and streams, and groundwater. Estuarine waters gradually transition from saltwater, to brackish and fresh as they mix with fresh water. Estuaries support a tremendous range of animal and plant life. The Coastal Zone experiences high annual rainfall and salt spray (Griffith et al. 2002). This ecoregion supports abundant, year-round C_4 forage, including cordgrass (*Spartina* spp.).

Marshes within the Coastal Zone are wetlands that consist of fresh, brackish, or saltwater habitats subject to tidal surges produced by a semidiurnal cycle but vary in salinity depending on their proximity to the ocean and the amount of freshwater in the corresponding watershed. Located within these marsh zones are elevation-related microenvironments. The upland border is the boundary between the high marsh and the upland areas located above the tidal zone. The high marsh zone consists of the upper extent of tidal surge, receiving one or two hours of water each day and consisting of a firm sand content. Lowcountry colonists described this area as a "hard marsh" because of the soil's firmness, meadow-like characteristics, and proximity to tidal creeks and flats. Below this point is a lower marsh zone that consists of soft and fine muddy sediment, commonly called "pluff mud," which is covered with water for approximately half the day. Cattle grazed on Smooth cordgrass (*Spartina alterniflora*), Black needlerush (*Juncus roemerianus*), Glasswort (*Salicornia virginica*), Marsh elder (*Iva frutescens*), Saltgrass (*Distichlis spicata*), and Saltmeadow cordgrass (*Spartina patens*) in these ecosystems (Porcher and Rayner 2001:65-66; Sang er and Parker 2016:9-12).

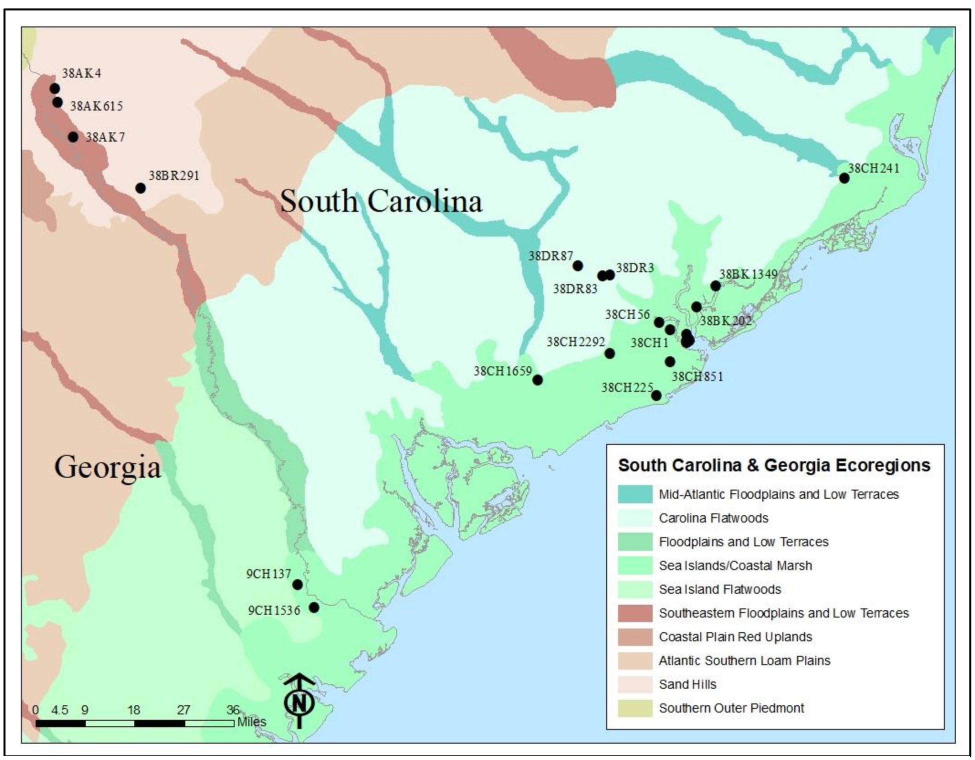

Figure 2-1: South Carolina and Georgia Ecoregions and site locations.

The Coastal Zone also includes grasslands, pine woodlands, and forested wetlands inland from the coast where slow-moving, meandering coastal streams are influenced by daily tides. This tidal influence extends as much as 20-30 miles inland (US Highway 17 is a rough dividing line). The Coastal Zone follows the upper limits of tidal influence inland along coastal streams into the Lower Coastal Plain. This provides a rough definition to the "Lowcountry" (e.g., Porcher 1995:5). The success of many rural tidewater plantations and cowpens relied upon the tidal cycle that defines the Lowcountry; as did many Charlestonians.

<u>Griffith et al. Ecoregions</u>

Reitsema et al. (2015) organized the 2015 pilot study of materials from Charleston using the ecoregion terminology of Griffith et al (2002). Griffith et al. (2002) subdivide the Coastal Plain into three zones: the Southeastern Plains, the Middle Atlantic Coastal Plain, and the Southern Coastal Plain. The Southeastern Plains lies just below the Fall Zone and encompasses both the Sandhills and the Upper Coastal Plain described above. The Middle Atlantic Coastal Plain primarily corresponds with Lower Coastal Plain. Kovacik and Winberry's (1989) Coastal Zone, (the Lowcountry) is referred to by Griffith et al. (2002) as the Southern Coastal Plain.

As used in the present study, "Upper Coastal Plain" broadly corresponds with Griffin et al.'s Southeastern Plains and "Lower Coastal Plain" merges Griffin et al.'s Middle Atlantic Coastal Plain with their Southern Coastal Plain. The Middle Atlantic Coastal Plain, the Southern Coastal Plain, and the Lowcountry are isotopically indistinguishable in terms strontium (Sr) values used to identify cattle origins in the present study. Likewise, the Southeastern Plains and Piedmont have partially overlapping strontium values, resulting in an indeterminate category: Upper Coastal Plain/Piedmont.

Pine Forests, Hardwood Communities, and Canebrakes

Pine forests are mixtures of woodland, savanna, openings, and barren microenvironments throughout the Lowcountry. These areas, interspersed within the upland sandy terraces and scarps, created a patchwork of subtly changing environments. Botanist Richard Porcher explains that bluestem (*Andropogon scopariu*s), switch cane (*Arundinaria tecta*), Spanish moss (*Tillandsia usneoides*), and wiregrass (*Aristida stricta or A. beyrichiana*) provided the predominant food source for cattle in this ecosystem.

Savannas provide a conduit between openings and woodlands. Defined basically as prairies with trees, savannas supported plant species typical of Lowcountry openings, coupled with unique vegetation in the transitional zone towards woodland habitats. Openings, a microenvironment that ecologist Gordon G. Whitney (1994:93) defines as, "breaks in the forest which were relatively destitute of trees," supported grasses, shrubs, scrub oaks, and palmettos (Porcher and Rayner 2001:91; Whitney 1994:93-97). Colonial observers classified these microenvironments as interchangeable, usually as a meadow or prairie, seen in Robert Sandford's 1666 description, "…one Meadowe [sic] of not lesse [sic] than a thousand acres, all firme [sic] good land and as rich a Soyle [sic] as any, clothed with fine grasse [sic] not passing knee deepe [sic], but very thick sett [sic] and fully adorned with yellow flowers…" (Sandford 1666:91).

In colonial times, the longleaf pine community dominated high land of the Coastal Plain. Most of the longleaf forest was harvested, replaced by other types of pine, principally loblolly, several species of oak, and diverse, often dense, understories. Several institutions, including the US Forest Service, are actively engaged in restoration of the longleaf forest (Earley 2004; Franklin 2008; Porcher 1995:48-49; Shelford 1974; Silver 1990:17-18).

A variety of pines, palmettos, and smaller trees dominate the poorly-drained pine-saw palmetto flatwoods. A distinctive lowland feature is the Carolina Bay. These are well-defined oval depressions, oriented southeast, that formed in sandy coastal soil. Carolina Bays act as basins, collecting rainwater from surrounding uplands. As wetland habitats, they serve as an oasis for numerous animals. Bays are characterized by pond pine (*Pinus serotina*), pond cypress (*Taxodium ascendens*), titi (*Cyrilla racemiflora*), and impenetrability (Porcher and Raymer 2001:44-45).

Hardwood communities flourish along freshwater creeks and in swamps and include hickories, oaks, loblolly bays, and sweetgums. The low-lying swampy forests feature dense understories of switch canes or river canes, as well as other grasses. Cane is a native bamboo with straight, hollow stems and bunches of narrow leaves. The giant cane could be as high as 30 ft and "grow so close together, there is no penetrating them." Both the giant cane (*A. gigantea*) and the smaller switch cane were common in damp places (Silver 1990:22; Stewart 1996:73-74, 2007).

Canebrakes were favored foraging grounds for deer and other wild animals. They were also favored by cattle and hogs. Lawson noted that cane "grows in Branches and low Ground…their leaves endure the Winter, in which Season our Cattle eat them greedily." Cattle favored the canebrakes year-round, but particularly in summer when they headed into the dense "cane-swamps" for cover and cool, and winter when they grazed the cane for food (Lefler 1967:107; VanDoran 1955:179-180).

Native peoples hunted, fished, and farmed the Lowcountry for centuries before European colonization. Cultivation of native plants and cultigens such as corn or maize, beans, and squashes were introduced to the Lowcountry long before the arrival of Europeans. The new settlers were attracted to the "old fields" of Indigenous settlements as favorable locations for planting (Porcher and Raymer 2001:42; Silver 1990).

Colonial Settlement Patterns

Colonists responded to the Lord Proprietors' call for agricultural prosperity by cultivating an array of desirable crops, yet the new inhabitants failed at many of these attempts because the Lowcountry climate could not support Mediterranean staples such as olives and grapes or Western Hemisphere desirables such as cocoa. Agricultural experimentation took place on varied terrain, as diverse ecosystems existed within plantation boundaries. The proprietary tracts, no more than 40 miles from the Atlantic coastline, included an assortment of geographical features: from dry upland ridges to wet low-lying troughs. From the outset of colonization, Lord Proprietor Anthony Ashley Cooper optimistically instructed colonists to plant "cotton seed, indigo seed, [and] ginger roots" in a variety of soils, for "our reason for this is that being unacquainted with ye nature of ye soyle [sic], we shall have conveniency of trying which sort of soile [sic] agrees best with ye several [sic] things planted in them" (Cheves 1897, 2000:126; see Agha 2020).

With each wave of immigration, settlers fanned out from Charles Town following navigable waterways into the Carolina frontier. By 1690, colonists claimed land along the Ashley and Cooper rivers plus the navigable tributaries of the Stono River, Goose Creek, and Back River (Kovacik and Winberry 1989:68-69). Under the headright system, the head of the household received 150 acres for every free person and male servant over 16 years old plus an additional 100 acres for every male servant under 16 years old and each woman servant regardless of her age. Although the Proprietors initially recruited colonists who were "seasoned" from living in the West Indies, the new arrivals had a difficult time producing commodities in the new soil. The seventeenth-century Carolina plantation economy, however, faltered because of limited agricultural knowledge conducive farming in the Lowcountry environment and too few workers to transform the landscape (Smith 2020:15). Natural disasters throughout the 1670s, with summer droughts and freezing winters, created a series of crop failures.

Figure 2-2: *A New Map of Carolina*, 1685, by Thornton and Morden. Outer Banks History Center, UNC Library.

From the outset, colonists faced environmental difficulties in growing crops. In the first year of colonization a late October freeze killed all of their crops "before they could come to perfection." The next spring a prolonged drought killed all subsistence crops along with experiments in ginger and indigo. By the second year of colonization, colonists had learned that the Charleston climate was not like that in Barbados, which many had used as a referent. The "sharp and cold" winters, according to one colonist, killed "any thing of a Comodity [sic]," including Barbadian imports of sugar cane, cotton, and ginger. As they came to understand the subtleties of soil and weather, early colonists had to make shifts in their cultivation strategies in response to environmental realities (Cheves 1897, 2000:267, 269, 376).

Despite the environmental realities that colonists faced with poor crop output during the first decade of colonization, they described the Carolina landscape with optimism. After the devastating 1670-71 winter, one colonist wrote of a "winter soe [sic] mild & temperate yet it may rather be termed a continuall [sic] spring." Although the author suffered through debilitating crop failures, he still believed Carolina was the "Land of Canaan, the habitation of the then elect & chosen people of God it is a Land flowing with milk & honey" (Cheves 1897, 2000:309). Seventeenth-century promotional tracts also pictured a healthy environment ready for ample development, a "terrestrial paradise" or a "natural garden." Promoting Carolina, these tracts played off Europeans' biblical understanding of the world. Before facing the reality of the natural environment, newly arriving settlers had created a "paradise myth" of the Lowcountry, as Spaniards had before them (Hoffman 1990). Believing that an "earthly paradise lay somewhere to the west" of Europe, colonists saw the "unaltered" landscape as a mode to fulfill God's will for building a "new Acadia" (Edelson 2006:13-24; Merrens and Terry 1984:434-435).

Although these promotional tracts teem with inaccuracies from absentee authors motivated by the possibility of commerce, the descriptions of the Carolina climate, topography, and agriculture reveal Europeans' landscape desires or, at the very least, appealed to the readers' prejudices. Seventeenth-century colonists promoted Carolina as a mild environment. Maurice Matthews wrote in 1680 that Carolina was "generally verry healthfull [and] it being a rare thing to hear of anybodies death." He optimistically, or deceivingly, claimed, "[s]ome years about July and August wee [sic] have the fevar [sic] and ague among us, but it is not mortal" (Matthews 1680:157). Air was "serene and exceedingly pleasant, and very healthy in its Natural Temperments" (Archdale 1707, 1822:13). One French Huguenot, attempting to persuade future immigrants, claimed Carolina was "a little warmer than Paris," but the colony is "where one feels very fit" (Thibou 1683). In accord with Proprietors' desires to attract immigrants with farming experience, tracts stressed the "fruitfulness" of the land. Soil was "fertile" and the "ground yields greater abundance" for agriculture, wilderness of "groves of Timber Trees" intermix with the "Savana's" to create a landscape "to compare Carolina to those pleasant Parks in England" (Carolina 1684:21). To some English settlers, early Carolina was "a garden [rather] than an untilled place," and they promoted a sublime vision of a "bowling alley, full of dainty brooks and rivers of running waters." To the seventeenth-century reader, these descriptions represented the encouraging prospects of a new life associated with land ownership (Archdale quoted in Smith 2020:17-18).

By the turn of the eighteenth century, Carolina settlers' perceptions of a New Eden gave way to reality. Colonists first began to experience the effects of menacing weather. "To tell you the truth," confided one Huguenot *émigré*, "this country is not at all like it was depicted." The colony is good for those "who are resolved to suffer." Promotional literature presented "only…the good side and hardly ever talks about the difficulties that one endures in establishing oneself" (McClain and Ellefson 2007:390, 394). Trying to make sense out of an unknown country, they assessed healthy places based on sight and smell. The sultry temperatures became an indicator of poor health, as colonists attributed the heat with sickness and death. Colonists died from "exhaustion" when working in the heat and high humidity. Missionary Francis LeJeu described “the greatest danger” near Goose Creek “is to ride in the heat of ye day which is sometimes very great.” He attributed Carolina’s extreme temperatures in 1704 to “killing” a fellow missionary (LeJau 1704:266).

Lowcountry colonists also witnessed disease epidemics from the beginning of June to the end of October. Recounting in 1687 how two former colonists “have never before seen so miserable of a country, nor an atmosphere so unhealthy,” a Bostonian described Carolina with “fevers prevail[ing] all the year, from which those who are attacked seldom recover.” In 1682, 1684, and 1687, there were three notable seasons of disease epidemics, feeding on increasing immigration and wet summers (Silver 1990:155-161; Wood 1975:67). An observer wrote in 1684, “who in this Country have seated themselves near great Marshes, are subject to Agues, as those who are so seated in England” (Carolina 1684:20). The summer of 1687 “was rather severe,” according to a Santee resident, “with almost continuous rains and fevers that were commonplace” (McClain and Ellefson 2007:382, 388). As colonists occupied land bordering the Ashley and Cooper Rivers, disease took its toll on the population. H. Roy Merrens and George D. Terry observed, “in some parts of the colony the mortality rate was so high that a number of parishes did not experience a natural increase in population until the American Revolution” (Merrens and Terry 1984:540-541). Unaware that people, as well as some of the vectors, introduced diseases that thrived in part because of human landscape transformations, Lowcountry colonists made the basic connection that wetland environments were a death sentence to many inhabitants. Governor Archdale pronounced at first that “Planters experimented, seldom having any raging sickness but what has been brought from the Southern Colonies,” yet by 1707 he warned, “the late Sickness may intimidate” prospective colonists (Archdale 1707:13).

Carolinians’ views of wetlands reflected broader English perceptions of such low-lying ecosystems at the turn of the eighteenth century. Settlers in the new environment saw cypress and hardwood bottomland wetlands as “wastes,” land “as unusable while still allowing for the kind of promise of a use not yet found” because they approached landscapes with European ideologies of land use (Edelson 1998:58). Europeans attempting to construct their Eden viewed wooded wetlands as evil or “dismal.” The dense impenetrable landscape, according to Ann Vilesis, “violated [seventeenth-century colonists’] norms of orderliness and presented an incomprehensible, chaotic landscape, in contrast with the familiar English countryside and pastoral landscape that they sought to recreate” (Vilesis 1997:33). Colonists idealized romantic Old World pastoralism and attempted to apply these sensibilities in Carolina, as park-like metaphors used by promoters reflected the ideal of an orderly and tamed landscape (Edelson 2006:6).

To counter the dismal views of low-lying areas, seventeenth-century Europeans and their enslaved laborers settled initially the highest terrain, only five to ten ft above the mean high watermark in modern Charleston County, located in close proximity to navigable waterways. Once colonists claimed desirable tracts, subsequent immigrants traveled further upstream and inland. Free and enslaved initially lived within spatially tight settlements nestled on scarps and terraces that supported upland pine and oak communities. Early trade networks overlapped these ridgelines, as pathways and emerging turnpikes followed Indian paths, on terraces and highland conformities, to Charles Town. The sandy loam environments also supported “English grain,” like barley and wheat, and experimental crops like cotton and tobacco. To European colonists, the elevated ridges became areas where they could recreate the pastoral landscapes of their homelands (South and Harley 1980:4-6, 24-35; Stewart 1931a:16).

During the first decades of colonization, settlers' approach to altering the Lowcountry landscape was based on an uncertain supply of labor. Property owners who arrived in Carolina with little capital were unable to purchase enslaved Africans or Native Americans. Landowners were inspired to initiate economic ventures that required little labor. Once Euro-American planters produced commodities for a world market, the Lowcountry landscape dramatically changed to reveal the human imprint of technology and society. Yet by the turn of the eighteenth century, Carolina's close association with the West Indian plantation complex set the colony apart from other North American colonies. Merchants established trade networks between Carolina, the Caribbean, and Great Britain. West Indian plantations' need for foodstuffs provided stimulus for Lowcountry colonists' agricultural ventures. By 1690, Carolinians were exporting deerskins, naval stores, lumber, and salted meat to England and other colonies (Menard 1996:259-262, quote:261-262).

While planters attempted to define boundaries between plantations and the wilderness, enslaved people served as the "middling" between two environments, as S. Max Edelson explains. Everyday exposure to the environment enabled these people to put the landscape to work for their own benefit. Whether actively herding animals for their owners or temporarily escaping into the wilderness for a brief reprieve, early cattle-hands moved easily between the pineland savannahs and the cypress bottomlands (Edelson 2006:22, 24, 27; Otto 1987:15-20; Sluyter 2012:136-138; quote: Ver Steeg 1975:106).

Conclusion

Although the Lowcountry offered many opportunities to European settlers, they quickly learned this was not a new Eden and the agricultural practices and animal husbandry practices with which they were familiar were ill-suited to the Carolinas. The Lowcountry was not without promise, however, and colonists quickly identified profitable endeavors. As they experimented with other products, they harvested forest products and raised cattle. In this process they cleared land while becoming familiar with the landscape and finding crops that would flourish in the Lowcountry, particularly rice. Reliance on this single crop had significant social consequences, leading to the displacement of Indigenous peoples and the importation of large numbers of enslaved Africans. By relying on the expertise of "cow-hunters" and their knowledge of the Lowcountry, the Lowcountry landscape was transformed to produce rice and other crops.

Chapter III
A History of Carolina

Introduction

European settlers who arrived on the Carolina coast in 1670 encamped on land that had been claimed, occupied, and managed by Native peoples for thousands of years. When European occupation began, numerous small Native American groups lived in the coastal region between the Santee and Savannah rivers. The region very likely also was occupied by feral cattle and hogs escaped or abandoned from the stock brought by Spanish colonizers to Santa Elena in the sixteenth century. After 1670, the steady incursion of European settlers on Native lands was often preceded by the arrival of their free-ranging livestock. Despite the availability of livestock, Native peoples were slow to embrace cattle ranching for a variety of reasons (Pavao-Zuckerman 2007; Pavao-Zuckerman and Reitz 2011; Reitz 1992).

Indigenous Peoples of the Carolina Coast

Historian Gene Waddell (1980) compiled the records of Native residents in the sixteenth and seventeenth centuries in his volume *Indians of the South Carolina Lowcountry*. Working with Spanish records, Waddell names some 19 groups living between the Savannah and Santee rivers, charting their movement and adaptations. He notes little movement of these tribes, during French and Spanish occupation of Carolina between 1562 and 1576. Kusso territory was centered near Charleston Harbor, and the Sewee lived near the mouth of the Santee River. No tribes were recorded living in the lands between Port Royal and Charleston Harbor before 1579. Waddell suggests that many of the earliest recorded Native towns were destroyed during the Escamacu War (1576-1579) during which Spanish colonists attacked the Escamacu and the Kusso. The war probably left the area between the Broad and Savannah River deserted, and the Edisto moved north to present-day Edisto Island. This was the first of a series of moves to the north by coastal residents to avoid contact with Spanish La Florida.

There evidently was little additional alteration in the dynamics of coastal tribes until 1670, when the arrival of the Carolina settlers accelerated demographic changes. At this time, the Wimbee, Combahee, and Ashepoo peoples lived south of the Edistos; the Wando and Sampa lived north of the Kiawah. European claims to Native lands were already widespread by 1675; Lord Proprietor Anthony Ashley Cooper, the Earl of Shaftesbury, lamented as much when he established his own settlement at St. Giles Kussoe at the head of the Ashley River in 1674 because "the people took up for themselves all the best conveniences on that river" (CSPC 1674 in Agha 2012:19) and "left me not a tolerable place to plant."

Movement and Coalescence

Marcoux (2020) describes the various strategies these, and other, Native communities used to be resilient in the face of the European invasion. In the eighteenth century, some groups, such as the Creeks, Choctaws, and Catawbas, absorbed nonlocal groups to form multiethnic confederacies. Others, such as the Westos, Savannahs, and Yamasees migrated, often long distances, to be closer to opportunities to trade with Europeans in both goods and people. Still others, such as the Yuchi and Koasati, relied on mobility to adapt to the intruders, moving through the edges of colonial territories (Marcoux 2020:126; see also Riggs [2012]; Smith et al. [2017]).

Despite his grumbling, Lord Ashley purchased the property from the Kusso. By 1675, a "war" with the European forced the Kusso to "fore ever quitt" their lands on the Ashley River (Snell 1973:8-10) and other tribes were requesting that lands be "reserved" for them. By 1682, the Kiawah had moved from the Ashley River to present-day Kiawah Island. Native groups also moved into the Carolinas to take advantage of trade opportunities and shifting power structures. The Westos, an Erie band displaced from the north in the 1640s, were another source of stress in the region, raiding and enslaving coastal tribes. By the early 1660s, the Westos had reached the Georgia coast. The Westos were supplied with guns by Virginia traders, allowing them to participate in the growing trade in captive Native people. The Westos also killed several European colonists, causing much apprehension in the colony (Bowne 2005, 2013).

Trade with Native groups was a profitable priority for European settlers from the very beginning. Southeastern Native groups had long-established, far-flung trade networks throughout the Southeast long before Europeans arrived, and were already trading with the Spanish colonists along the Gulf of Mexico and the lower regions of La Florida before the Carolina colony was established.

Verner Crane (1981:117) suggests that European-Indian trade passed through distinct stages of organization. During the first decades of colonial occupation, the Lords Proprietors worked to turn a profit from traffic with Native groups. Early trade, both Proprietary and private, focused particularly on deerskins, and was usually carried out at plantation settlements.

Dominating early trade explorations and negotiations was Henry Woodward. He traveled to the southeastern ceremonial and political center of Cofitachequi on the Wateree River (near present-day Camden [SC]) in 1670, and the emperor of that settlement in turn visited Charles Town in 1672 (DePratter 1994). In 1674, Lord Shaftsbury recruited Woodward to meet with his agent, Andrew Percival, at St. Giles Kussoe to initiate this trade. Woodward found the Westo at St. Giles, evidently waiting for such an opportunity. Woodward's travels, and his role in these shifting alliances, led to the lasting alliance between the towns that became the lower Creeks (Bowne 2013).

Marcoux and others (Marcoux 2020; Warren 2014; Warren and Noe 2009) describe the brief role of the Savannahs in the colonial experience, through "a combination of migration, coalescence, and participation in the Indian slave trade" (Marcoux 2020:131). The Savannahs were Shawnees, an immigrant group from the Ohio River Valley, who arrived at the Fall Zone on the Savannah River in the 1670s. The group is first mentioned by Henry Woodward on his 1674 "Westo" voyage. European maps show a "Savanna" or "Savano" town in this location, with nearby villages settled by Yuchi, Apalachees, and Apalachicolas (Cobb 2019; Marcoux 2020). By 1680, Savannahs had usurped the Westo's favored position in the trade in Indian slaves; but their hold on this power was tenuous. Marcoux describes the trade, and slave raiding, gradually moving farther west, with the ascendancy of groups like the Chickasaws, Yamasees and Creeks. Ultimately, European traders armed the Catawbas in order to enlist their aid in removing the Savannahs. The strategy worked, and by 1708, the Savannahs were debilitated with some 450 people killed. The survivors fled from the Savannah River valley to the upper Potomac River (Marcoux 2020; Merrell 1989:53; Warren 2014).

The Lords Proprietors attempted to use the Westos to monopolize the trade in the interior, but colonists were unhappy with this plan. Influential colonists, led by the group known as the "Goose Creek men," sabotaged the Lord Proprietors arrangements. Most Carolinians wished for an end to the Proprietor's monopoly, and the Goose Creek men (James Moore, John Boone, and Maurice Matthews) exploited this sentiment to gain power. They fomented war among native groups, resulting in more enslavement. In 1680, a raid on Spanish Guale missions along coastal Georgia led to the Westo War. This two-year struggle shattered the preeminence of the Westo, though they remained in the region until the early eighteenth century.

Another wave of displacement began with the emigration of Scots into the Port Royal area. By 1686, European settlers had pushed south of Charleston to the Edisto River, but a strip of territory between the Edisto River and the Combahee River, known as “indian land,” was now occupied by the Yamasee alone, except for a few white traders (Milling 1940:186). In 1684, the Proprietors moved to gain title to all coastal areas between the Stono and Savannah rivers as the Wicheaugh, Escamacu (St. Helena), Wimbee, Combahee, Kussah, Ashepoo, Edisto, and Stono peoples surrendered their land claims in a series of accessions.

Waddell notes that maps from the next three decades show Europeans continually claiming the best lands and Indigenous people increasingly confined to smaller and less desirable tracts. The Anglo-Spanish skirmishes that resulted in the 1686 burning of the Port Royal settlement also decimated surrounding Native towns. Every Indigenous group moved north, and the Port Royal area was again deserted. The Europeans took advantage of this opening, and acquired vacant areas. Only the Kusso protested and received a reservation (Waddell 1980).

The Westo incursion was a major impetus for the coalescence of the Yamasee, a diverse confederation of refugees from Altamaha, Ocute, and Icisi. Yamasee, along with the Guale of coastal Georgia, moved into the area, and the original coastal tribes likely moved to avoid these traditional enemies. The Yamasee Nation was composed of several Guale tribes from coastal Georgia, including the Sapelo, Yoa, and others (DePratter 1990; Worth 1995). There were ten Yamasee towns, five lower towns, of which the chief town was Altamaha (in present-day Beaufort County), and five upper towns, centering on the town of Pocotaligo (Bossey 2018; Green 1991; Judge and Smith 1991; Southerlin 1999; Sweeny and Poplin 2006, 2014).

During the years 1687 to 1715, the Yamasee occupied an important position in political and economic relations with the colonial government in Charleston. The previously autonomous coastal groups, now known to Europeans as “settlement Indians” or “neighbor Indians” lived in small groups in or around white settlements. In 1718, the Commission on Indian Trade passed notice that European residents were to engage in government-sanctioned trade with approved agents on their plantations, particularly:

Col. George Logan at Wandoe
Col. John Barnwell at Port Royal
Col. George Chicken at Goose Creek
Capt. Jonathan Drake at James Island and Court Bar
Mr. Sam^{ll} Deane at Ashley Ferry
Col. John Fenwick at Stonoe
Capt. William Scott at New London
Capt. John Whitmarsh at Edistoe
Capt. Thomas Dynes at Dorchester

(McDowell, *Journal of Commissioner of Indian Trade*, 1710-1718:270).

Tribal populations and land holdings again declined during the Yamasee War of 1715-1718. The Wimbee, Combahee, Kusso, and Ashepoo disappear from colonial records, likely absorbed by the Yamasee. After the war, only the St. Helena, Edisto, Kiawah, and Etiwan are mentioned as separate groups; they were “allowed” to live among the settlements and the trading posts listed above facilitated trade. Only the Etiwan are mentioned in 1751 (Waddell 1980:2-6).

Members of several of these communities survived, however, and the descendant groups are now state-recognized (see Hicks and Taukchiray [1999]; Steen [2012]; Taukchiray and Kasakoff [1992]). The Kusso serve as an example, with a well-documented history written by Herb McAmis and Wes Taukchiray (McAmis 1988; Hicks and Taukchiray 1999). The Kusso originally occupied the upper reaches of the Ashley River, selling a large tract of their land to Anthony Ashley Cooper. In 1747, the Kusso combined with a group of Natchez who had emigrated from the Mississippi River, and the conjoined groups occupied the Four Hole Swamp region of South Carolina. The Kusso lived on Spoons Plantation, reserved for them northeast of Willtown. Throughout the nineteenth century, remnants of this group lived on Spoons, a plantation in the vicinity of Round O Savannah and Horseshoe Savannah, across the Edisto in Colleton County, and in the neighborhood of John and Mary Musgrove's settlement in the early eighteenth century (Hahn 2012; McAmis 1988).

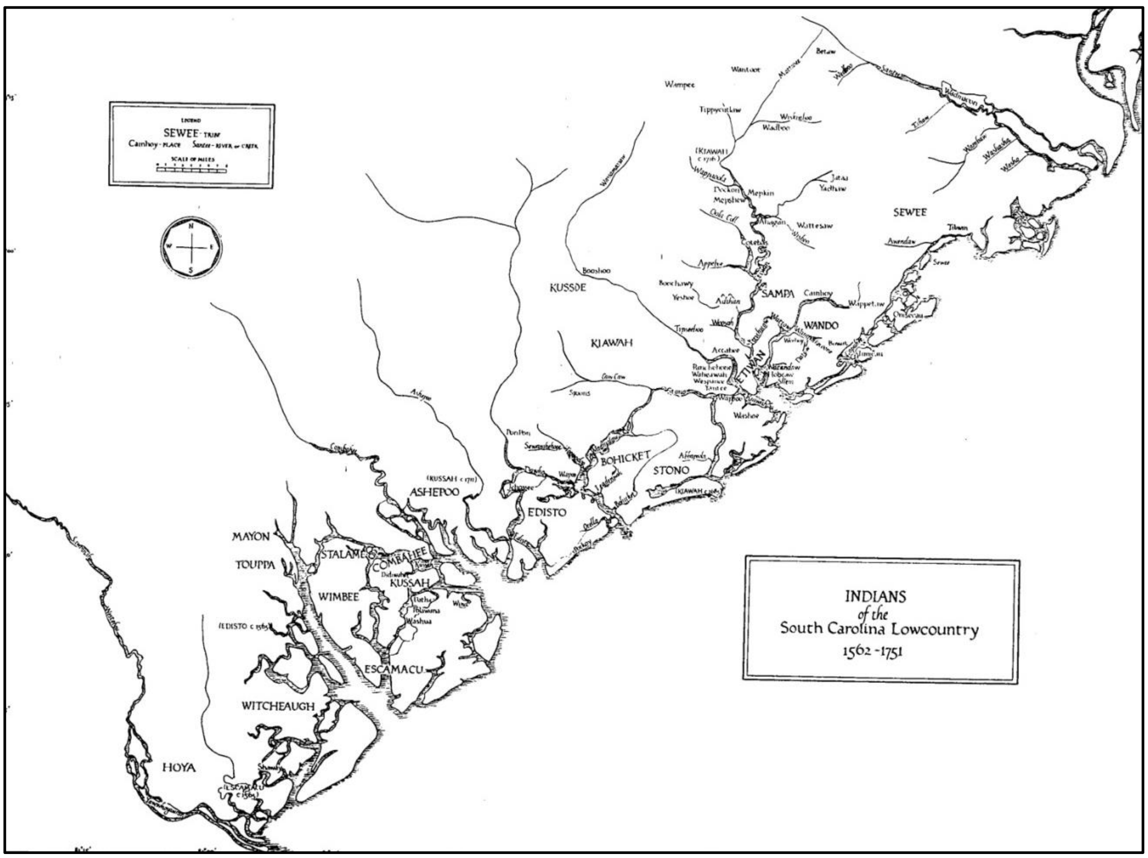

Figure 3-1: "Indians of the South Carolina Lowcountry" by Gene Waddell (Waddell 1980).

The Yamasee War of 1715

The Yamasee War of 1715 stemmed from the frustration of Indians against the long-standing abuses by the colony's traders, including free-range cattle, and lack of diplomatic efforts by Carolina leaders. Despite its name, the conflict involved almost every Indian nation trading with Carolina at that time. Southern groups included the Yamasees, Yuchis, Savannahs, Apalachee, and Lower Creeks. Northern groups were principally the Catawbas, but also the Waterees, Congarees, Waxhaws, Shawnee, Saraw, Waccamaw, Santee, and Cape Fear. The northern coalition ceased hostilities by the summer, but the southern coalition fought far longer. Eventually the conflict spread from Spanish Florida to North Carolina west to the Mississippi to include the Chickasaw and Choctaws.

The War began, seemingly without warning, in the Yamasee town of Pocotaligo on Easter weekend, when Indian Commissioners Thomas Nairne and John Wright interrupted an already tense meeting among Yamasee leaders. The issues facing the Yamasee included escalating enslavement of their kin, theft of their lands, and abuse of their people by colonial traders, largely resulting from their increasing debt. Both British agents claimed they came in peace, but John Wright threatened to kill four of the headmen and "take the rest for slaves." Wright's threat helped ignite a war that nearly destroyed the Carolina colony (Oatis 2004; Ramsey 2008).

The enraged Yamasee killed all but two of the traders' party, then secured the routes into their towns and attacked the colonial settlement at Port Royal. The Yamasees then laid waste to several outlying southern parishes, including St. Paul's Stono and St. Bartholomew's. The Colleton County militia then drove the Yamasees south through Salkehatchee swamp. The Yamasee intended to stay in their homeland, but British counter attacks forced a retreat to St. Augustine, where their presence on the southern frontier encouraged Africans to escape to Spanish La Florida.

The Yamasee War transformed the southern colonies. The Yamasee were forced to abandon their lands, and colonists gradually built rice plantations in the area south of Charleston. Legislation resulting from the conflict altered the relations between enslaved Indians, Africans, and white servants. From 1715 onward, white slave owners sought to divide, rather than unify, Indians and Africans (Hahn 2013; Ramsey 2008). Ramsey (2008:155) notes the war was not a united front, but a series of "aftershocks and realignments in which Indigenous people continued to adjust themselves to a new order." Hahn (2013) calls it "a conflict among intimate acquaintances." Hahn further suggests that the Creek, under Emperor Brims, actually instigated the war, but blamed the Yamasee.

The War involved almost every Indigenous nation that traded with South Carolina: Creek, Choctaw, Catawba, and Yamasee. Groups from the Creek Confederacy included the Coweta, Tallapoosa, Abihka, and Alabamas, as well as those closer to Charleston, such as the Yuchi, Apalachee, Shawnee, Saraw, Waccamaw, Santee, and Cape Fear. The Native slave trade largely ended with the Yamasee War, replaced by trans-Atlantic African enslavement. Thereafter, trade between Indians and the British focused primarily on deerskins. Native groups consolidated their authority, and the Creeks and Cherokees became more powerful confederacies.

Trade Relations in the Eighteenth Century

Soon after European colonists arrived in Charles Town, Muskogean diplomats from the interior (present-day Georgia and Alabama) appeared in Charles Town asking for trade and help against the well-armed Westos. Carolina-Creek relations were cemented in 1685 when Henry Woodward and 250 men arrived in Coweta, the preeminent Muscogean town, on the Chattahoochee River.

After the turn of the eighteenth century, the increasingly powerful Creek confederacy became the principal player in the southeastern Indian trade, with Charleston the center of this enterprise (Crane 1981). Lower Creek headmen journeyed to Charleston in late 1717 and negotiated a new trade treaty for all Creek towns, officially ending the Yamasee War. This longer-distance trade required new commercial arrangements. Professional traders, backed by urban merchants, took control from the planters and casual part-time traders. Savannah Town, located at the Fall Zone on the Carolina side of the Savannah River, became the frontier entrepot. Fort Moore was constructed there after the close of the war to protect the Carolina colony, and the Savannah River became the boundary between European and Indigenous territory (Braund 1992). This was later complicated by the founding of the Georgia colony in 1733.

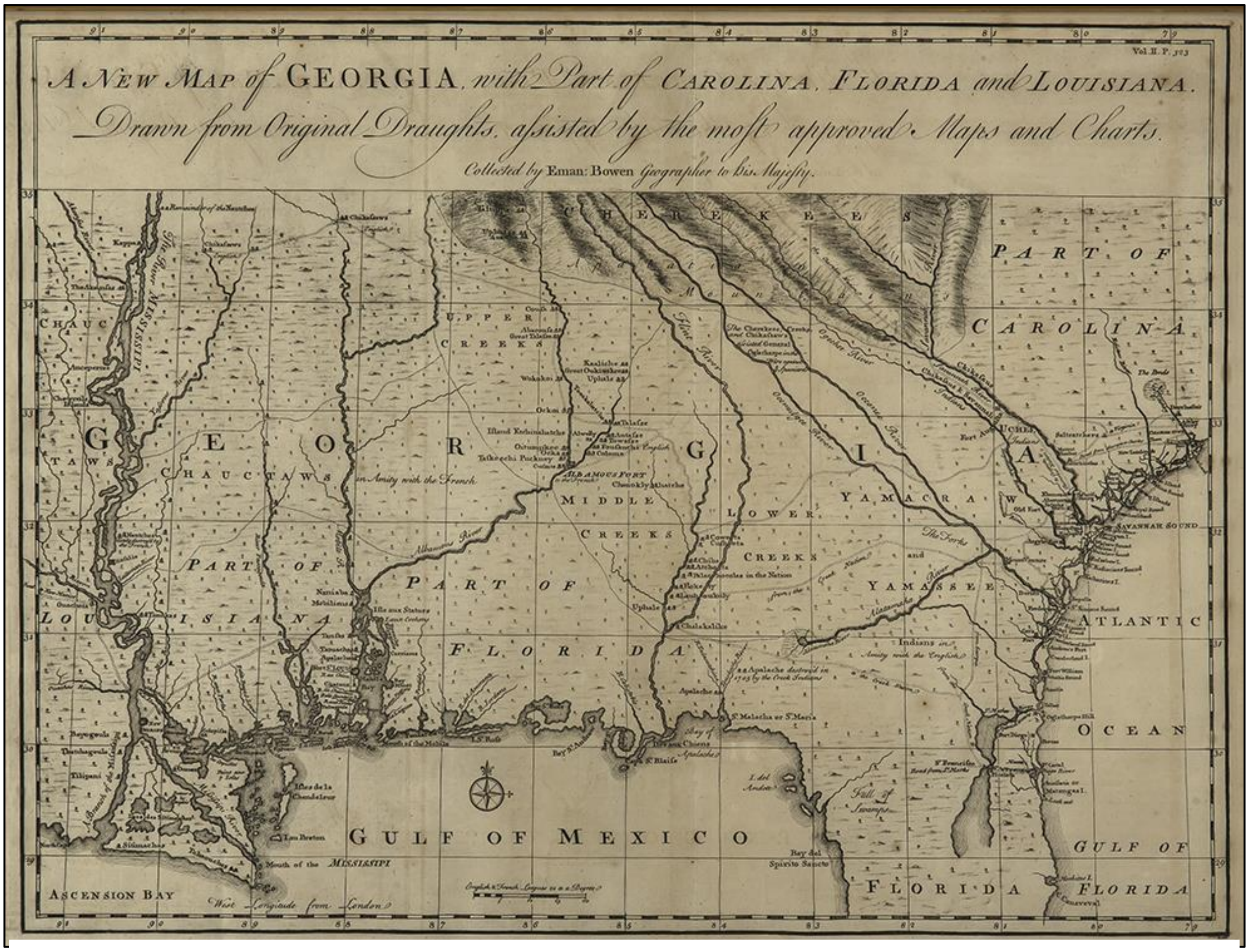

Figure 3-2: *A New Map of Georgia*, 1748. The map shows the Yamasee in southeastern Georgia, the Yamacraw near Savannah, and the Creek to the west. Courtesy Hargrett Rare Books and Manuscript Library, University of Georgia and Poarch Band of Creek Indians.

European traders lived in Creek villages for a large portion of the year, often at the edge of the settlement. James Merrell (1989) suggests that Native people of the interior shaped the contours of the trade for decades, allowing outsiders into their communities only if they behaved in an acceptable manner. European traders worked tirelessly to match European goods with Native preferences. In time, the balance of economic and cultural power shifted to the colonial government, but the trade's effect remained "evolutionary rather than revolutionary" (Merrell 1989:198).

After 1730, the deerskin trade was dominated by Charleston merchants; in the next two decades they drew skins from Georgia as well as South Carolina. In 1748, the province shipped over 700 hogsheads, containing approximately 160,000 deerskins. There was a decline in the early 1750s, but another peak was reached in 1763. Long before that, however, the "infinite herds" of the late seventeenth century were seriously diminished, especially along the coast. This is reflected in many events, including passage of laws regulating hunting seasons of deer for white settlers, as well as the increasing imbalance of power and debt between white traders and Indian hunters (Braund 1992; Silver 1990:94; Waselkov 1989).

Fort Moore served as the strategic entrance to the interior from South Carolina settlements. The route to the Creek interior was along the Savannah Path, which crossed the Edisto River near present-day Gallivant's Ferry State Park in Dorchester County (SC). From here the path ran to Fort Moore, near the Fall Zone, and then hundreds of miles inland to the Creek towns. From Charleston to the upcountry to the north and west the traders followed water routes or well-established roads. Many coastal rivers do not extend above the Fall Zone and the great inland paths really began at this point. Congaree, at the head of the Santee swamp, 145 miles by road from Charleston, was a node for paths to the Catawba and Cherokee (Crane 1981:29).

In the Savannah region, deerskins and trade goods were carried in packs weighing 150 to 180 pounds, either on horseback or often on the backs of Native people. Once the skins reached Augusta, they were unpacked and stored until transported to Charleston. At the storekeeper's warehouse, the skins received little additional processing other than trimming. Workers, usually enslaved, might occasionally "beat the skins" to ward off worm damage, particularly during warm weather. The skins eventually were packed for the journey down the Savannah River and on to Charleston. The boats used in trade, known as *piraguas*, were large, flat-bottomed boats. By the 1740s there were five piraguas operating out of Augusta. The trip to Charleston took 4-5 days (Braund 1992:96).

Personal contacts between Charleston merchants and Augusta traders funneled the skins directly to Charleston (Braund 1992:43). Though other ports such as Augusta and Savannah rose to handle the deerskin trade at its height, none offered the resources of Charleston. Charleston's merchants were well-established and well-connected, and the city had adequate storage and shipping facilities, and other cargo available for ballast. In Charleston, the deerskins were turned over to export merchants who examined the pelts and repacked them for shipment overseas. Leading deerskin merchants included Samuel Eveleigh, Benjamin Stead, James Crockatt, John Gordon, and Henry Laurens.

An unsavory branch of the business was the trade in enslaved Native people. Though wars had led to the enslavement of Native people in other European colonies, only in South Carolina did the traffic reach commercial proportions. The Carolinians particularly pushed their trade among distant tribes in Spanish Florida and Louisiana. The first recorded instance was in 1671, when open hostilities erupted between European colonists and the Coosa, a Cusabo group northwest of the Combahee River. The colonists imprisoned two Coosa who were in Charles Town at the time. They and other captives were evidently sold into slavery by the colony. The next incident involved the Stono in 1674. During a "punitive" European raid on the Stono, captives were taken and sold into slavery in the West Indies. William Snell notes that though Proprietary law forbade such actions, the colonists loosely interpreted the law to fit (Snell 1973:13). A year later, in 1675, the Sewee, who were friendly to the Europeans, brought in some captives who were not. This was the next step in the trade, because the captives were not enemies of Europeans, but of the Sewee. The situation then escalated. In 1680 certain settlers were accused of purchasing Indian captives from the Westo (Ethridge and Shuck-Hall 2009; Gallay 2002:52; Martin 1994; Ramsey 2001).

The first domestic Indian slave on record is in the 1683 inventory of John Smith (Johnson 2018:10, 177-178; Snell 1973:16). In the next few years, as colonists wrested control of the

Indian trade from the Proprietors, trade for skins occurred alongside trade for slaves. The situation escalated after the Yamasee relocated along the Savannah River, following the 1684 settlement of Port Royal by colonists. The Yamasee attacked the Timucua Indians around Spanish St. Augustine and 22 slaves were taken and sold. A pattern of raids against Indians not allied with the Carolina colony was soon established. James Moore's raid on the Apalachee in northern Spanish Florida in 1704 netted a large number of Indian captives, most who remained in the Carolina colony.

While many scholars have suggested the Indian slave trade ended with the Yamasee War, William Snell maintains that quite the opposite was true. Increasing numbers of enslaved Native people are found in legal records from 1716-1724. While many were shipped to colonies in the north or in the West Indies, a number remained as laborers on Carolina plantations. Indians were used for hunting and fishing in the early years, and later as guides and interpreters. Women and children often worked as domestics, and men worked in the fields beside enslaved Africans. William Ramsey suggests a 1715 statute, stating "all and every such slave who is not entirely Indian shall be accounted and deemed as Negro" and removal of the racial category of "mustee" (slaves of mixed African and Indian ancestry) was the beginning of the Black/white racial dichotomy in the Lowcountry. Andrew Johnson has further documented cases where enslaved individuals are identified as Indian in the early eighteenth century, but later identified as "negro" (Johnson 2018; Ramsey 2001; 2008).

Cattle and Colonial Expansion

By 1715 Carolina planters had settled as far south as the Edisto River, near the boundaries of Yamasee lands. The ever-expanding colonists encroached onto Yamasee lands, with stray livestock foraging on vegetation competing with deer and other important Yamasee resources. Frustrated, Yamasee attacked settlers on April 15, 1715. The Yamasee War created two years of economic and agricultural stagnation in the colony and set in motion changes in political and economic structure that took colonists more than 15 years to overcome. The war devastated Carolina's southernmost plantations, destroying "near 400 of the [white] Inhabitants… with many Houses and Slaves, and great numbers of Cattle." Yamasee destruction sent Carolina into an economic depression. Exports of salt meat declined by 2,413 barrels and rice by 4,438 in 1717, compared to 1712. Although meat exports continued at depressed numbers until 1731, annual rice production grew from 22,000 in 1722 to 41,000 barrels in 1730 (Oatis 1999:397-411; Otto 1989:37-38).

Colonial expansion into the Carolina frontier was stalled for 15 years after the Yamasee War. Angered by the Proprietors' inability to handle the Native American attacks, colonists overthrew the Proprietary government in 1719. With the removal of the provincial government, the colonial land office closed and official transfer of land all but ceased. Nonetheless, illegal settlements pushed European and African agricultural practices further into the frontier. The colony's economic recovery and colonial expansion began in 1730 when the British Crown bought out seven of the Lords Proprietors and claimed Carolina as a royal colony. This change in government led to a shift in inland plantation structure and land distribution. With the Crown in charge, the royal government re-opened the land office and distributed lands liberally to prospective planters. The government renewed the Proprietors' headright policy, awarding 50 acres to each settler and 50 acres for each imported enslaved laborer. Royal authorities also permitted colonists to purchase lands at £20 sterling per 1,000 acres and a quitrent of ½ pence per acre. This dramatic increase in grants spreading over uncultivated landscapes led to a new era of cattle ranching, where the reopening of land distribution encouraged ranchers to expand free-range grazing (Armstrong 2013:168; Oatis 1999:397-411; Otto 1989:38).

From 1670 to 1729, colonists and enslaved people herded cattle as one of several experimental commercial ventures fueling the colonial economy. The expanding colonial frontier increased rice output and coincided with a shift in cattle production further inland. In 1729, the Crown's purchase of the Proprietors' rights signaled a new era of expansion and land accumulation. More than a decade had passed since the Proprietors closed the land office. During that time, colonists acquired land through shifty means. Individuals either purchased land through the Proprietors in England or placed tentative claims domestically through "illegal" surveys. However, the reopening of the land office, a brief stability in rice markets during the 1720s, removal of some export tariffs, and new bounties placed on naval stores fueled a land boom in the 1730s. As colonists pushed further out onto the frontier – approximately 40 miles from Charleston, according to S. Max Edelson – newly appointed Governor Robert Johnson issued a "township scheme" and fortification plan in 1730. Townships attracted an influx of immigrants of Scottish, Swiss, and German descent and combined with fortifications along the outlying colonial boundaries to provide a line of defense against Native American, French, and Spanish incursions (Edelson 2006:127, 129-130; Weir 1997:111-117).

Colonists' demand for land during the first decade of the royal period generated a period of speculation and acquisitions. The Middletons, Izards, Cattels, and Balls capitalized on rice cultivation during the first two decades of the eighteenth century; they could afford large tracts of land on the reopened Carolina frontier. Their purchase of land further away from Charleston represented the speculative spirit of the era. These entrepreneurs did not know the topographic details of their undeveloped properties, only that their newly acquired land possessed the possibility for new plantations. Edelson explains that a division in settlement patterns existed between the "core," "secondary," and "frontier" zones. He defined the core zone as an egg-shaped boundary encompassing the watersheds of the Stono, Ashley, Cooper, and Wando rivers, with Charleston as the center. The core zone of settlement followed these four rivers into the interior. The secondary zone formed a crescent between the Edisto and the Santee rivers, while the frontier zone extended 100 miles up and down the coast and 50 miles inland from Charleston (Edelson 2006:129-141, 275; Ryden and Menard 2005:605; Weir 1997:113-114).

Figure 3-3: 1715 Plat of Bob's Savannah (Middleton lands) on the Ashley River.

During the mid-eighteenth-century expansion, the secondary zone offered new opportunities for the cattle economy. Larger landholdings in the secondary zone presented more prospects for the increasing cattle population, as the average size of a plantation within the core zone was 266 acres while the average size in the secondary and frontier zones was 500 acres. Edelson suggests that just under one-half of the land in the secondary zone was suitable for growing rice, compared to approximately one-third of the land in the core zone. He explains that lands close to Charleston did not possess the broad wetlands that characterized larger tracts in the frontier (Edelson 2006:138, 140, 280, 281-282).

Coinciding with the expanding plantation lands during the 1730s was the increasing importation of enslaved Africans. The Black population grew by 19,155 people, or 95%, between 1730 and 1740. Although South Carolina had a "black majority" by 1710, the population of Africans approached 90% of the total Lowcountry population in 1740 (Coclanis 1989:64, 67-68; Earle 2003:283-284). Planters resolved labor shortages on Lowcountry plantations during the 1730s through the expansion of slavery.

Massive slave importation, however, slowed as a result of the 1739 Stono Rebellion. In an effort to prevent future slave rebellions, the South Carolina House of Commons passed laws to control the size of African populations on Lowcountry soil. The Negro Act of 1740 limited the numbers of incoming Africans for most of the decade – specifically banning slave importation between 1741-1743 – and attempted to immobilize enslaved African-Americans' freedoms until the end of the antebellum period. The Act curbed the ability to travel, assemble in groups, raise food, earn money for personal use, and receive an education. Despite subtle agency, enslaved Africans began an increasingly repressive chapter in the history of inland rice cultivation (Coclanis 1989:57-58, 64; Edelson 2006:64; Shuler 2009:99, 101-102, quote:104; Weir 1997:194; Wood 1974:323-325).

The answer to the planters' labor problem came from the gradual domestic extension of credit for Lowcountry plantations. While land became readily available to plantation owners after 1730, the lack of capital to purchase land and labor suppressed potential expansion into the frontier zone. Unlike their counterparts in the British West Indies and Virginia, South Carolina planters did not receive capital advancements directly from British merchants. Instead, people who could not pay up front had to obtain financing for land, enslaved labor, and manufactured goods from domestic merchants.

The fluctuation of rice prices, the Stono Rebellion, and disease placed only temporary roadblocks in front of the ever-expanding rice culture. The ten-year period from 1730 to 1740 saw peaks and troughs in rice prices, importations of enslaved labor, and land improvements. Agricultural historian Lewis Gray (1958:148) associates this rapid increase of acreage with the rise of the cattle population, stating "[b]y 1757 the available ranges in South Carolina were so overstocked that great herds of from 300 to 1,500 head were being driven into the territory between Savannah and the Ogeechee." The eighteenth-century Surveyor General Lewis DeBrahm observed that cattle at this time were "kept in ganges [sic] under the auspice of cowpen keepers, which move from forest to forest, in a measure as the grass wears out, or the planters approach them, whose small stock of cattle are prejudicial to the great stocks" (Coclanis 1989:65-66, 82; DeBrahm quoted in Gray 1933, 1958:148; McCusker 5-763, 5-764; Nash 2001:93-94).

Case Study: Spencer Settlement on the Santee

Known principally as the twentieth-century home of South Carolina's first Poet Laureate and author Archibald Rutledge, Hampton Plantation State Historic Site contains a colonial-era mansion house, a separate kitchen, extensive rice fields, and wooded tracts totaling 274 acres. The tract and adjoining property were acquired by Daniel Horry in the 1730s for rice production, and rice was the principal product for the next 150 years. But like many plantation tracts through the Lowcountry, the Santee River tract was first used for cattle ranching.

The Santee River area was settled by French Huguenots in 1685 in an area known as French Santee. British settlers moved to the area by 1701, and the Hampton properties were among those they acquired. In 1701, a warrant for 500 acres was issued to Daniel McGregor "at Waha on ye south side of Santee River which formerly was ye plantation of King Jeremy" (Bates and Leland 2015:174). McGregor received the grant in 1704. The western portion of McGregor's grant included the eastern portion of Hampton State Park. The location of "King Jeremy's Plantation," evidently to the east, is currently unknown, but of great interest to researchers. Also in 1704, Richard Codner acquired 250 acres adjoining McGregor to the west.

Joseph Spencer acquired portions of these tracts in 1710 and 1714. His will, written in 1729, leaves his wife Elizabeth "all the household goods and the Liberty of the Plantation and one Room during life." This indicates that Spencer built a residence on the tract, one that housed the Spencer family and an enslaved woman named Bess (Hester 2014:12).

Spencer's settlement, adjoining Spencer Pond on the south edge of the lawn area, was discovered during shovel testing in 2014 by Stacey Young. Excavations in 2015 and 2017 by The Charleston Museum and College of Charleston revealed a probable cellar pit, evidence for a wooden structure, and a fence line. The artifacts recovered suggest the site was occupied ca. 1710-1744, consistent with the Spencer family's ownership. In addition to a range of European artifacts, the site contains colonowares with gritty paste, likely made by Native as well as African peoples (Brilliant 2017; Jones 2018). The overall artifact assemblage suggests interaction between Native Americans, Africans, and Europeans.

Spencer used his land for cattle and had one of the largest herds in St. James Santee Parish (Hester 2014:13). His 1730 inventory lists 128 cattle, 77 sheep, 3 hogs, and 5 horses. Hester notes a lack tools associated with rice production; harvested corn was the only agricultural product. The number of cattle is one of the largest herds in the parish. Hester (2014) lists 15 local inventories made between 1724 and 1737, and only one has more cattle (Table 1-1). Most had well under 100. Spencer's inventory also lists 125 pounds of soap, a product made in part from beef tallow, further supporting the economic importance of stock-raising for the Spencer family.

Planters allowed their stock to range freely, unrestrained by fences, through the Lowcountry pine woods, savannas, swamps and marsh lands. It was near here, along the Santee River, that in 1701 John Lawson described Indians "firing the woods" (Lefler 1967). Like Native Americans, European setters used fire, periodically burning grazing areas to encourage growth of grasses and improve pasturage (Hester 2014). Hester (2014) cites John Otto's statistic that one cow in early Carolina required 15 acres of grazing land (Otto 1987; Silver 1990). This suggest that Spencer's large herd would have ranged beyond his own holdings, spilling over into nearby forested lands and "savannahs" such as "Mr. Jerman's Santee Savannah and Mr. Horry's savannah", cited in acts giving Ralph Jerman the rights to operate a ferry across the Santee. Hester (2014) makes an interesting case for Hampton and surrounding properties serving as commons during this period. "Commons" as defined by Kathryn Newfont (2012) is "any significant set of resources that is communally owned, used, or managed." She suggests de facto commons can exist on land that is privately held, especially if the owner is largely absentee. Such would be the case in the newly-settled French Santee region. As the area became more densely occupied and much of it was converted to rice production, this practice was gradually curtailed.

Table 3-1: Cattle Ownership in St. James Santee Inventories, 1724-1737.

Name and Date	**# of Cattle**	**Value in £**	**Total Value Estate £**	**% of Estate**
Peter Couilliando, 1724	2	5	Not determined	Not determined
Daniel McGregor Sr., 1724	50	150	2131	7%
Francis Courage, 1725	85	255	5731	5%
Stephen Dumay, 1727	60	240	1809	13%
James LeGrand, 1727	60	156	8203	2%
Joseph Spencer Sr., 1730	**128**	**512**	**946**	**54%**
Francis Guering, 1730	39	188	2350	8%
James Guery, 1735	110	550	4614	12%
Isaac Chauvin, 1735	65	325	2085	16%
Nicholas LeNud, 1735	144	720	6016	12%
John Mortimer, 1735	24	99	329	30%
Andrew Rembert Sr., 1737	47	235	6663	4%
Elias Horry, 1737	82	417	6927	6%
John Slowman, 1737	40	200	2923	7%
Pierre Guerry, 1737	49	228	4169	6%

Daniel Horry Sr. (ca. 1705-1763) acquired parcels of Hampton beginning in 1730 (555 acres from his father), continuing in 1735 (200 acres), and culminating in 1744 with his purchase of Joseph Spencer’s tract on the mainland and of Hampton Island, the property’s prime rice fields (500 and 100 acres, respectively). By the middle of the eighteenth century, Horry had consolidated holdings appropriate for rice production, particularly Hampton Island. The rice-growing enterprise, managed by a large enslaved population, dominated the property and others on the Santee River for the next century and a half (Hester 2014).

Shift from Ranching to Inland Swamp Rice Culture

Colonists first experimented with rice in upland environments near the Ashley and Cooper rivers. Pine communities meet common European perceptions of the landscape in terms of health and value. Also, Carolinians’ early practice of rice cultivation resembled their understanding of normal European farming practices. A 1666 survey of potential agricultural lands in Carolina listed rice as one of many grains that settlers could grow in the “meadows” of longleaf pine ecosystems. Biologist Richard Porcher (2014:32) notes that the savanna’s limited tree cover made these landscapes easier to convert into agricultural zones without a large labor force. The clay lens approximately one foot underneath the topsoil created moist environment for growing crops. Many European farming practices could be adapted to this landscape, as planters transformed mixed hardwood and pine forests into fields and constructed shallow ditches to drain moist savannas.

With the encouragement of the Lords Proprietors, colonists incorporated rice and other crops into their planting schedule. John Stewart wrote in 1690 that he and his neighbors on the Cooper River were “bettering of all Kinds of European grain and the discovery of pine land to excel far out our oakground either for graine Englysh or Ryce.” The same year, Stewart reported that Governor James Colleton devoted savanna land to cultivating rice, barley, wheat, peas, cotton, indigo, and Indian corn (Clowse 1971:125-126; Porcher and Judd 2014:30-34; Salley 1911:69; Stewart 1931b:86; Stewart 1931a:16-17, 21-22).

Figure 3-4: Aerial view of inland and tidal rice fields at Hampton Plantation on the Santee.

Planters learned, either from their own experiments or from their enslaved labor, which crops worked well in which environments. For example, peas and corn could grow successfully in slightly higher soils in close proximity to rice. Since cultivation zones differed by a few feet (if not inches), variations in soil content dictated each specific crop’s location. Early Carolinians first grew rice on savannas and nearby upland sites. Historians tend to label this general cultivation method as “upland rice,” yet Richard Porcher (Porcher and Judd 2014:28) notes this practice occurred in a variety of microenvironments and “is aptly called providential culture,” for planters sowed seeds with “no provision for water control on the fields.”

Planting initially followed standard European practices: till the soil, broadcast seeds, and then hope for rain to provide irrigation for the crop. In a style similar to sowing barley, planters cast rice seed in a thick cover which “chokt [sic] the weeds.” They found that growing rice was “not like sowing of grain in England.” Planters could not “put the plow in such land,” as stumps and roots hindered initial tilling. As Philip Morgan (1998:150-151) explains, colonists abandoned broadcasting as the enslaved labor favored embedding rice seed into the soil, specifically by indenting the ground with one’s heel and using the foot to slide soil over the seeds, a practice found in present-day Mali and southern Benin (Edelson 2006:103; Dethloff 1982:238; Fields-Black 2008:159; Alpern in Voeks and Rashford 2013:50; Merrens 1977:45-46, 50; Porcher and Judd 2017:32; Stewart 1931:85).

Just as early immigrants faced the reality of the Lowcountry climate in the wake of romantic Mediterranean associations, these colonists also experienced agricultural realities when intensively cultivating sandy soils. Alexander Hewatt (1779:158-159; commented that the sandy highlands “poorly rewarded [the planter] for their toil.” The seemingly endless land left colonists to disregard traditional European husbandry, such as crop rotations, animal grazing/fertilizing harvested fields, and periodic flooding on specific plots. Instead, they favored uncultivated property. Early rice planters cultivated a field three to four years and then abandoned the plot, “lay[ing] it out to grass,” and cleared new land. Because planters allowed cattle to graze unrestrained throughout the Lowcountry, there was no natural fertilization (manure) of the upland soil, and fallow fields took longer to rejuvenate. By the time abandoned providence rice fields could be reintroduced into the rotation, rice cultivation had shifted to more fertile low-lying landscapes that maintained soil fertility for decades (Earl 1988:175-210; Merrens 1977:46).

Colonists continued to practice the providence culture during the last decade of the seventeenth century on small-stream floodplains, also called “dry swamps” or “oak and hickory land,” that formed below the upland pine and savanna communities. Small-stream floodplains were localized alluvial watercourses, or first-order watersheds, providing the headwaters of Lowcountry tidal rivers. The vegetation of small-stream floodplains was “dominated by swamp trees with a herbaceous ground cover or cane-breaks.” Like the upland pine communities, small-stream floodplains had less groundcover compared to bottomland hardwood communities (Hodges 1998:325-328; Merrens 1977:93; Porcher and Judd 2017:30-34; Stewart 1931:16-17, 21-22).

A 1730s account from a German Protestant settling in Georgia provides some insight into the subtle variation between small-stream floodplains and the hardwood bottomland: “We are now learning to understand what the Englishmen mean when they said that swamps contained the best land. They do not mean swamps or bogs as we had in Ebenezer, which lie low, are always full of water and cannot be drained. Instead, they mean dry and low cane-covered regions and valleys in which water does not stand except when it is raining and from which it drains off quickly even then. Or they mean those in which nature has provided a small canal in which the water from the two hilly, cane-covered places can drain off. We have such swamps here, and everybody would like to have them” (Groening 1998:72).

Small-stream floodplain soils were rich in nutrients, providing fertile microenvironments for agriculture with adequate moisture from surrounding streams and periodic freshets. Because small-stream floodplains often had a clay lens under the topsoil that retained surface water, draining practices were necessary for adequately cultivating crops.

Traveling through coastal South Carolina, naturalist Mark Catesby observed how these inland landscapes took shape. “…the further parts of these marshes from the sea, are confined by higher lands, covered with woods, through which by intervals, the marsh extends in narrow tracts higher up the country, and contracts gradually as the ground rises” (Meyers and Prichard 1998). Early colonists conducting agricultural experiments on small-stream floodplains along the Ashley and Cooper Rivers generally grew crops in soil that modern scientists call Lenoir and Wahee loams. Both soil types presented suitable conditions for growing rice, with the higher-elevation Lenoir fine sandy loam slightly more permeable compared to the lower-elevation Wahee clay loam (Hodges 1998:325; James and Collins 2010:23; Porcher and Judd 2017:3; USDA 1980:19-20, 30-31, 95).

As planters experimented with agriculture on small-stream floodplains, variations in soil and water encouraged them to incorporate a variety of agricultural practices. Colonists imposed order on the landscape by straightening out meandering creeks and streams, while channels provided additional drainage when freshets inundated the crops. By the turn of the eighteenth century, rice cultivators also began sowing seeds in furrows, or “trenches.” Field hands would use approximately one to one and one-half pecks of seeds per acre, "covering thin with earth," planting in rows 12 to 18 inches apart between early April to mid-May. The furrow method used ten times less seed per acre compared to broadcasting (Norris 1712 :40; Porcher and Judd 2017:32-33; Oldmixon 1741:519; Stewart 1931:15-17; Van Ruymbeke 2006:32-22).

Draining swamps enabled South Carolina planters to cultivate more land, yet this practice did not single-handedly transform rice cultivation into an agricultural success. Lowcountry savannas, small-stream floodplains, and cypress bottomlands presented planters with drainage problems similar to those of European fens and flowing water meadows. Rice irrigation required a more complex understanding of drawing water on and off the land (Edelson 2006:73-76; Groening 1998:60-65).

For planters to cultivate rice on a commercial level, they had to increase their output and efficiency. Flooding rice fields enabled planters to begin this process. By the time John Norris wrote his 1712 promotional tract, planters had established a cycle of flooding their rice fields three times between April and September to eradicate weeds. Although water-driven milldams began appearing in South Carolina by the turn of the eighteenth century, this technology did not solve the complex method of drawing water onto the fields. To commit to farming in lowland watersheds and practicing routine flooding techniques, prospective rice planters had to look beyond European-style grain cultivation methods to impoundments and channels (Carney 2001:103; Norris 1712:40; Stewart 1931:21-22).

Select enslaved Africans, on the other hand, possessed cultivation skills that observant Carolina planters merged with available European technology. One of the strongest arguments for the "Black Rice" thesis is that West Africans – unlike Europeans – possessed knowledge of "inflow" and "outflow" irrigation practices. In communities from Senegal to Benin, African cultivators had developed a "rice knowledge system" that was "highly localized and specialized" to topographical conditions. West Africans developed diverse cultivation technologies, rice strains, tools, and agricultural language to cultivate specific topographies (See Carney [2001:58]; Fields-Black [2008:107-134]; Hall [2010]; Knight [2010]; Littlefield [1981]; and Wood [1974] in support of the black rice thesis and Bray et al. [2015]; Edelson [2010]; Eltis et al. [2007]; and Hawthorne [2020] for scholarship questioning the thesis).

Just as South Carolina planters developed unique inland irrigation systems relevant to local environments, so had generations of West African cultivators centuries before European contact. Rice cultivation practices developed along the Inland Delta of the Upper Niger River in Mali some ~2,000 to 3,000 years ago. Africans planted a domesticated rice grain, *Oryza glaberrina*, down the Niger River and throughout the inland and mangrove swamps along the West African coastline (Fields-Black 2015:282-284; Fields-Black 2008:1-21; Johnny et al. 1981:596-606; Linares 1981:558-560, 570-577; Linares 2002:16360-16365). By the time Portuguese explorers reached them in the mid-fifteenth century, African communities had developed intensive irrigation techniques for growing subsistence rice. For West Africans transplanted to Carolina, wetlands provided familiar landscapes for growing rice (Carney and Rosomoff 2009:148-154; Littlefield 1981:86; Price 1991:107-127).

Rice was one of several staples transferred through the Middle Passage. Cereals (such as rice, millet, and sorghum), yams, black-eyed peas, sesame (benne), muskmelons, okra, and Guinea squash were all subsistence crops transferred from Africa to Carolina. Slave ship captains relied on these African staples to feed their enslaved cargo. Just as Africans formed a diaspora throughout the Lowcountry, so did the "shadow world of cultivation" of African diets (Carney and Rosomoff 2009:124-125, 148-155; Fields-Black 2015:282).

The appearance of rice in subsistence gardens coincided with colonists' period of experimentation, where perspective planters sought out plants that would take root in the fertile soil for both subsistence and profit. Free and enslaved farmers planted the African *O. glaberrima* and the Asian *O. sativa* strains in early Carolina. Ultimately, European markets and tastes preferred the white-skinned *O. sativa*. By the late seventeenth century, European colonists were exploring ways to incorporate rice into their diets and also to be an export commodity (Carney and Rosomoff, 2009:150-153, Cohen and Yardeni, eds. "Un Suisse en Caroline du Sud," trans. by Leland, 8. Coon 1972:169; Edelson 2006:64-72; Fields-Black 2015:286-287, 150-153; Stewart 1931:16).

South Carolinian colonists incorporated rice into their staple diet, first by substituting ground rice flour for wheat and corn, simulating England's "fine wheaten bread" that was unavailable in the colony. Rice also provided additional "fodder" for poultry and livestock. Rice's versatility as a food for both Africans and Europeans, as historian Max Edelson explains, distinguished it from other plants grown for consumption and profit (Edelson 2006:72).

Enslaved Africans' access to Lowcountry wetlands and small-stream floodplains allowed some to practice subsistence agriculture by constructing rice fields in low-lying wetlands "on the plantation periphery." Early plantation settlement patterns consisted of the planter's residence neighboring enslaved housing on *terra-firma* knolls or ridgelines. Earthen swells, caused by Pleistocene deposits and resulting erosion, created a landscape surrounded by bays, streams, creeks, and rivers. The need to grow crops for survival challenged the enslaved to use land that free colonists considered undesirable. They constructed embankments where they could grow patches of rice as they did in their homeland.

Enslaved laborers' presence in swamps, cutting timber or herding cattle, also made them more acquainted with wetland hydrology. Africans sought the plantation borderlands as a place of refuge. By removing themselves from the watchful eye of their enslavers, Africans used "down-time" to escape the oppression of slavery. As Peter Wood (1974:119-124) notes, these "black pioneers" were a mobile population that negotiated their way through swamps in tending to their duties. The enslaved grew rice as one of many subsistence crops upon land unwanted by their enslavers, one of the many ways that Africans survived in the Lowcountry (Price 1991).

As colonists evaluated swamps for rice cultivation in the early eighteenth century, they became more optimistic about these environments and their productive potential (Edelson 2006:53). Jack P. Greene (1992:103-104) attributes this change in landscape perceptions to the "psychology of colonization." For European colonists, reconstructing the environment symbolized "improved societies" and benefited their families and future generations. Harvesting cypress, for instance, allegedly improved the swampland and "made the earth better adapted to the culture of rice." The wilderness was a disorderly and primitive environment that colonists had to alter. Colonists could provide order to wetlands by clearing land and channelizing water (Edelson, 2006:48-89; Merchant 1995:132-159; Merrens 1977:93; Nash 1982:40-41; Van Ruymbeke 2006:205).

Once European colonists recognized the importance of impounding water to irrigate rice crops while simultaneously eradicating competing grasses, a dramatic shift in landscape perceptions and in agricultural activity occurred. Rice farming moved from the upland and savannah ecosystems down to the cypress-hardwood stream systems. The flow of water through these wetlands fed the dense vegetation that created the apparently "inexhaustible fertility" of the South Carolina Lowcountry ("Reclamation of Southern Swamps," *DeBow's Review and Industrial Resources* 17 (November 1854), 525; Merrens 1977:93). One rice planter described inland swamps as having a “better foundation and soil than any other lands” and “by nature more durable” for cultivation because of the “fine supplies of decayed vegetable, which are deposited while the waters are passing over said lands” (*Southern Agriculturalist* 1828:531).

With a general understanding of reservoir irrigated rice cultivation in a growing market economy, European colonists began shifting settlement patterns by the first decade of the eighteenth century towards low-lying small-stream floodplains and bottomlands. Incorporating technological and agricultural knowledge within new wetland boundaries, planters increased yields by approximately 20 bushels per acre before 1740. Rice cultivation expanded rapidly after South Carolina’s first major export of 300 barrels to England in 1699. In 1714, Carolinians exported 11,000 barrels. Historian Converse Clowse estimated that the Proprietary government granted at least 200,000 acres between 1694 and 1705. About 100,000 acres of the land issued between 1698 and 1705 came from the headrights of enslaved Africans (Clowse 1971:131; Crisp 1711; Haan 1981:250-251; Norris 1712:40; Oldmixon 1741:519; Thornton and Morden 1685).

Figure 3-5: Example of a small-stream floodplain in the Carolina lowcountry. Photo by Hayden Smith.

Willtown: From Frontier Town to Rice Plantation

Willtown is located on the South Edisto River, about 30 miles southwest of Charleston. The dominant feature is a bluff at a curve in the Edisto River, rising almost vertically to a height of 40 feet. The first mention of a contemplated town on the Edisto River is found in instructions from the Lords Proprietors to Surveyor General Maurice Matthews in 1682, “We understand that there is n Edistoh River about 20 miles above the head of the Ashley River a convenient fertill peece of land fit to build a Towne on five hundred akers” (Smith 1988:101).

The town that would be known as Willtown was also known as New London, implying it was a second location. Early maps, such as the 1695 Thornton-Morden map, show both New London and the likely original London on the Edisto. The name Willtown, or Wilton, first appears in a 1697 grant to Landgrave Joseph Morton. Records are scanty, but historian Suzanne Linder suggests that London, also known as Pon Pon, was located in the vicinity of Penny Creek, accessible by boat and by a Native American path in the vicinity of what is now U.S. Highway 17. From the 1690s to the 1730s it was an important landmark at the interface of European settlement and lands controlled by Indigenous people. Several late-seventeenth-century documents refer to only two centers of settlement: Charles Town and "London in Colleton."

A chance meeting led eventually to a new settlement in Dorchester and a missed opportunity for growth of New London. In 1695 a group of dissenters from Dorchester (MA), organized an expedition and sailed for South Carolina. When they arrived and sought a place to settle, Governor Joseph Blake suggested New London. They spent a few days on the Edisto River and were entertained by Landgrave Morton. For reasons that are not clear, the group rejected the New London site and chose instead one on the Ashley River near the property of William Norman (Bell 1995:2). This became the town of Dorchester.

Wilton, or New London, was described as a community of 80 houses in Oldmixon's 1708 *History of the British Empire* (Salley 1967:366). Most scholars agree here is little evidence that the community reached that size. Oldmixon's description may have derived from the ambitious plan for the town. The proprietors instructed that "if any one Will build a house in said town you may by order of the Governour measure out onto him a towne Lott accordin to the proportions appointed at Charles town and 100 akers of Land in the collony as a plantation." Five hundred acres was to be set aside for the town. The 500 acres above and below the town, as well as three 500- acre sections in from the river would be set aside for the precinct. The town plat shows the 500-acre urban tract centered on the bluff (and agreeing remarkably with current landmarks), neatly divided into streets, blocks, and lots. Sets of stairs lead from the top of the bluff to the riverfront. The plat of the town suggests an impressive settlement centered on the high bluff, but deed research suggests the majority of the lots were never granted, and even fewer were improved.

The Willtown community was founded for three principal reasons: defense of the colony, development of a community of religious dissenters, and pursuit of the Indian trade. Each of these driving forces contributed people to the Willtown community. Though the dissenters chose another location, Willtown attracted a number of non-Anglican settlers, and a Presbyterian church was centered in Willtown by 1704. The Rev. Archibald Stobo guided the Presbyterian community until his death in 1741.

Though only 30 miles from Charleston, Willtown was, at its founding, on the edge of the European settlement in South Carolina. A "frontier" settlement in the relational sense, as an area of contested space, Willtown was a multiethnic community, with religions dissenters, Anglicans, traders, merchants, planters, enslaved Africans, local Indigenous people, and likely neighboring and more distant Indigenous groups meeting face to face (Cayton and Teute 1998:1-15; Dowd 1998:17). An emphasis of the Willtown community prior to the Yamasee War was the Indian trade.

The Yamasee war devastated the area in 1715, but a hastily constructed fort at Willtown protected the area for white settlers. The period from 1715 to 1730 was evidently the apex of Willtown's economic success. Willtown flourished through the 1730s, and advertisements give evidence of trade and activity. But the deerskin trade was reorganized after the Yamasee War, and the trade moved inland, engaging confederated groups such as the Cherokee, Catawba, and Creek. The trading path traveled through Dorchester, which remained viable through the American Revolution. Willtown, in contrast, was now off the regular path, and its role as a center of the deerskin trade diminished.

Rice as a profitable staple was introduced by 1695, and the lands around Willtown were well-suited to this crop. The revenues possible from rice and indigo cultivation in the early eighteenth century enabled landowners in the Willtown area to establish successful plantations, to the detriment of the urban community. By 1760, town lots were re-granted as plantation tracts, and rice planters dominate the history of Willtown for the next century. The Willtown church was abandoned in 1750, rebuilt among plantations a few miles away in a location viewed as "more centrical."

New economic opportunities changed the direction of Willtown and the composition of the local community. The steadily increasing profits from rice and the agricultural potential of inland swamps meant that profits could be realized from plantation lands. The principal effect was a rapid growth in the enslaved African population, which created new tension in the white community. By 1730, Africans outnumbered European colonists and, in the event of an uprising, planters felt little security. Likewise, the enslaved were emboldened. In 1739 the Stono Rebellion, the largest slave revolt to occur anywhere on the American mainland during the colonial period, occurred near Willtown and involved the Willtown community. Archibald Stobo, described as a "fierce and violent man," played an important role in the Stono Rebellion of 1739, when his sermon was interrupted by word of the rebels marching south towards Pon Pon. Church official John Bee led the men of the congregation in pursuit of the rebels. In all, 75 black and white Carolinians perished.

Two years later, Archibald Stobo's son, James Stobo purchased a rice plantation tract adjoining Willtown and built a home that reflects the wealth derived from plantation agriculture using an enslaved labor force, and the uncertainty of living among the enslaved who recently revolted. James Stobo's plantation is located inland, about a mile from the Willtown bluff. It is on a knoll of high land, 15 feet above sea level, but adjacent to inland swamps. The knoll drops to freshwater swamp to the north, east and south. The land to the north has been diked and water is impounded to the west.

The first owner of this plantation tract was dissenter John Ash, who received a grant for 450 acres in 1710 (Colonial Grants 39:79; Memorials, 5:165). John Smelie purchased "Drumhall" in 1719. His will of 1727 suggests he built a home on the property. Drumhall went to three minor children, who sold the plantation to James Stobo in 1739. James Stobo accumulated some 4,400 acres of land, and engaged in rice and indigo planting. A contemporary states that James Stobo was noted for producing high quality indigo. At his death, he owned two sets of indigo vats, several luxury items, and 124 enslaved people. Though James Stobo lived until 1780, we know from records of the Presbyterian church that Stobo departed the Willtown area suddenly in 1767 (Simmons 1960).

By the time James Stobo's estate (under the ownership of his son Richard Park Stobo) was subdivided in the 1790s, the property had become extremely valuable, with both inland swamp and tidal rice fields, indigo production sufficient to require two vats, and resources to operate a lumber mill. The lands around Willtown and Stobo's plantation were acquired by several wealthy and prominent planter families. Together, they formed the Willtown community of the nineteenth century.

The Stobo house was exposed in its entirety during three seasons of archaeological excavation. James Stobo's house plan seems to be a direct physical response to the Stono rebellion. Though daily violence was far more perceived than real, it appears that James Stobo was never really secure in his wealth and position. The house features a three-bay plan, with a central courtyard. The northern room features a brick floor, while the eastern bay has two rooms.

A back external chimney split the two rooms and heated both. The third bay, to the west, was less well-preserved and more ephemeral. The central courtyard formed by these three units was paved with sand. Some type of brick wall, or fence with a brick foundation, connected Bay 1 to Bay 3. Some between 1765 and 1770, a dense organic midden accumulated over the floors. The midden contained many intact artifacts, with a concentration in the courtyard. On top of this organic soil is evidence of the building's collapse and the robbing of the brick walls, represented by a continuous trench around the compound. Artifacts in the trench suggest general abandonment of the site around 1810. The midden accumulation likely reflects a calamity, one that damaged the structure. Since there is no evidence of burning, a storm or flood is the likely source. The artifact placement suggests scavenging prior to cleanup.

Figure 3-6: Excavation of James Stobo's 1741 house at Willtown in 1997. Collections of The Charleston Museum.

Beneath the features of the Stobo house was evidence of one, and possibly two, earlier structures. One was represented by small sill trenches and the other is reflected in a pattern of post stains.

Although the economic emphasis at James Stobo's plantation, and other colonial plantations on the Edisto, by the second quarter of the eighteenth century was rice production, raising cattle was likely an important industry before and during the plantation era. While James Stobo was known for his indigo, and produced successful rice crops from a managed inland system, he also maintained cattle. Stobo's estate inventory of 1781 lists a number of luxury goods, ranging from silver tea pots to books and bibles. One hundred twenty-four enslaved persons are enumerated by name. Plantation tools range from boats to axes to cooper and carpenter tools. There were 18 horses. And two groups of cattle, possibly kept in different locations. The first entry is 60 cattle and 4 "yoke oxen." Thirty-nine more are listed separately (Zierden et al. 1999:338). Clearly cattle ranching and the sale of beef contributed to the plantation income.

Chapter IV
Cattle in the Colonial Lowcountry

Introduction

A rider through the swamps in the eighteenth century might spy deer and turkey, but was just as likely to encounter a cow, ears notched with the mark of the owner. Little information is available about the appearance and origins of these animals. It is likely they were mixed-heritage English and Spanish animals adapted to the Lowcountry environment and a free-range management style. As colonists and enslaved herders tended cattle, they became familiar with ecosystems such as Hell Hole Swamp. Many areas such as these, devoted to cattle ranching, later were transformed into rice fields. Early cattle centers, referred to as cowpens, were common in the Lowcountry, but as farming moved inland, herders retreated into the pinewoods further up the coastal plain and eventually into the Piedmont. Beef and other cattle products sold in the city and shipped from Charleston Harbor came from rural production centers such as the trading post and cowpen operated between 1732 and 1751 by Mary Musgrove.

"Breeds" in the Colonial Lowcountry

Animals brought to the Americas were the regionally distinct pre-breeds available to colonists at the time (Fussell 1929, 1937a, 1937b; Jordan 1989; Moore-Colyer 1989:335-346; Periam and Baker 1882:505-507; Rodero et al. 1992; Rouse 1970a:281, 1973:350- 353, 1977:288; Thirsk 1957:176-177; 1967:186-187; Trow-Smith 1959:24-29, 45-58, 70-72, 95; Youatt 1859). Prior to the 1860s the only improved breed imported in large numbers along the British Atlantic seaboard were Shorthorns, sometimes known as Durhams (Leavitt 1933; Periam and Baker 1882:540-548; Rouse 1973:352-353, 361-362; 405-408, 1977:7; Thompson 1942:3; Trow-Smith 1959:90). All of these early cattle were taurines, *Bos taurus taurus* (Decker et al. 2014; Rouse 1973:358; Williamson and Payne 1978:205). Although some records suggest zebu (indicines/zebu; *B. t. indicus* or *B. indicus*) were introduced to North America before 1850, Rouse (1973:440) argues these animals left no trace and that zebu hybrids common today were developed in the late 1800s. Brahmans are a modern breed developed from zebus in the United States after the 1880s (Decker et al. 2014; Williamson and Payne 1978:243).

Breeds as we know them today are relatively new (see Cossette and Horard-Herbin 2003 for a summary of early cattle "breeds" in New France). Descriptions of early British animals are limited and vague. Early Shorthorns, for example, were described as "…generally of large size, thin-skinned, sleek-haired, bad handlers, rather delicate in constitution, coarse in the offal, and strikingly defective in girth in the forequarters" (Youatt 1859:95). Landed European gentry and prosperous farmers began to develop improved, stable breeds in the late 1700s.

Zooarchaeological research using measurements finds a temporal change in the size of cattle in London after the fourteenth century, with a significant tendency for animals to be larger in the sixteenth and seventeenth centuries, though the reasons for this increase in size requires further study (Thomas et al. 2013). The first purebred stock did not reach the United States until 1793 and large numbers were not imported until after the 1860s (Rouse 1973:353). Advances in breeding, nutrition, and veterinary care in the nineteenth and early twentieth centuries brought major improvements in livestock as well as stability to breeds genetically tailored for specific production goals. This resulted in the loss of most local, unimproved pre-breeds and early improved breeds such as populated the Lowcountry prior to the mid-1800s, complicating our efforts to visualize Lowcountry cattle.

Some inferences about the size of Lowcountry cattle can be made from surviving descendants of early breeds. British Park cattle are an ancient breed with roots in the Middle Ages. British Park cows today weigh ca. 842 lb and bulls ca. 992 lb when raised in improved conditions (Rouse 1970a:291). Cows from another surviving ancient breed, the English Dexter, weigh ca. 595-694 lb on good pasture and bulls weigh ca. 992 lb (Rouse 1970a:294-295). Spanish Retinto and Black Andalusian breeds raised under modern husbandry conditions weigh ca. 1,000-1,500 lb (Rouse 1977:217, 224). Brown Atlas, a native breed of northern Africa, weighs ca. 595 lb on average pasture and ca. 760 lb on better pasture (Rouse 1970b:596, 604). Brown Atlas bulls on good pasture may reach 893 lb.

Lowcountry cattle probably were similar in many respects to Criollos. Present-day Criollos are small, hardy animals widespread in the Hispanic Americas, which included much of what was Spanish Florida until 1821. They are mottled shades of brown, white, red, black, and fawn. Criollos are heat-tolerant, long lived, resistant to parasites and diseases, and productive on low-quality forage. Criollo cows on Hispaniola today weigh ca. 500-800 lb and bulls weigh ca. ca. 1,000 lb (Rouse 1973:58-60). Criollo cows in Florida today weigh about 450 lb when grazing in palmetto scrub and 650 lb when grazing on prairie; bulls weigh slightly more (Rouse 1977:186). The Galphin Trading Post, located near Augusta on the South Carolina side of the Savannah River, reported net weights of 280 and 333 lb for "beeves" in 1785 and 1786 (Stewart 1996:284, n. 66). The Galphin animals would be on the small side for most Spanish animals, which were reported to be larger than "English cattle" at the time (*Georgia Gazette*, March 9, 1768).

Measurements of archaeological cattle bones also find that Spanish cattle were larger than cattle in Charleston, neighboring plantations, Savannah, and Fort Frederica (Reitz and Ruff 1994). The earliest cattle measurements are from Puerto Real, a Spanish town founded in 1503 on the northern coast of Hispaniola in what is now Haiti (Deagan 1995). Cattle at Puerto Real were abundant and free-ranging. They also were very large, approaching the size of aurochs, the large wild ancestor of modern cattle which reached over 1,900 lb (Reitz and Ruff 1994). Their large size may be due to the extensive fertile grasslands, mild climate, long growing season, and lack of competitors, predators, and diseases on Hispaniola, conditions also found on other Caribbean islands in the sixteenth century.

If the large size of the Puerto Real cattle can be generalized to other sixteenth-century Caribbean islands, such as Cuba, cattle brought to Spanish Florida probably were large initially. Over time, the body size of their progeny declined, perhaps due to the stress of diseases shared with deer, predators such as wolves, and limited nutritional pasturage. This stress-related body size reduction persists into the present; Florida Criollos are still smaller than Criollos on Hispaniola. Archaeological and anecdotal evidence suggests that cattle in the Lowcountry in later centuries were smaller than either Spanish cattle or cattle in Annapolis, Maryland.

Horn cores suggest the appearance of Lowcountry cattle was not uniform (Appendix VII). What is often called "horn" is actually a keratin sheath that covers a bony core. The sheath is unlikely to survive in Lowcountry archaeological deposits and horn cores are rare. The few cores that have been recovered present a wide variety of shapes and sizes, but are primarily from short- and medium-horned males, females, and oxen (castrated males) slaughtered between two and ten years of age. None are from the long-horned animals often associated with Spanish cattle in North America. One medium-horn female horn core is identical to a core recovered from

Mission San Luis de Apalachee, a Spanish Franciscan mission built in 1656 near present-day Tallahassee (FL). This mission was destroyed in 1704 in advance of a raid led by Colonel James B. Moore out of South Carolina. The range of sizes and shapes in these horn cores is what we would expect of mixed herds and limited control over breeding.

Figure 4-1: Horn core from Charleston VRTC (above) and Mission San Luis (below). Photo University of Georgia.

Sources of Lowcountry Cattle

Determining where Lowcountry cattle originated also is challenging because colonists were from many different parts of Europe, Africa, the Americas, and Asia (Cook 1988; Rouse 1970b:1026-1027; 1973:358-361). The diverse origins of colonists and raids among French, Spanish, and British colonies likely ensured that cattle lineages were equally diverse.

The first cattle in the Americas were from the Iberian Peninsula, though the Spanish Florida animals likely originated in Spanish herds in the Caribbean instead of Iberia or Africa. Cattle may have reached the Lowcountry in 1562, when France established Charlesfort on Parris Island. They were certainly there by 1576 when Spain established its first capital, Santa Elena, on Parris Island (Reitz 2017). Cattle brought to the Lowcountry a century later by Carolina colonists likely joined the wild progeny of these earlier animals (e.g., Stewart 1991:5). Some of the Carolina animals might have originated in Britain, northern Europe, Bermuda, the British Caribbean, or British colonies on the Atlantic seaboard north of Charleston.

It cannot be assumed that all cattle in a colony were transported from territories claimed by the nation sponsoring that colony, however. For example, the first cattle in the Americas were brought to the Caribbean on Spanish ships which sailed from Seville (Spain), close to the Iberian cattle complex in Andalucia (Jordan 1989). These cattle, however, could have at least some African roots because much of the Iberian Peninsula was part an Islamic state from 711 until the end of the Reconquest (January, 1492). Originally founded by Maghrebine Berbers, the Iberian territory was known in Classical Arabic as al-Andalus. At its peak, al-Andalus encompassed most of modern-day Spain and Portugal. Thus, Iberia and northern Africa had close economic, historical, and political ties. It is likely that cattle and herd management practices were shared between the two continents. mtDNA in three archaeological cow teeth from St. Augustine, deposited between 1565 and 1600, as well as studies of cattle world-wide show American Criollos originated in Iberia, but had some African ancestry inherited via these Iberian ancestors (Decker 2012:165; Decker et al. 2009; Decker et al. 2014; Edwards et al. 2011; McTavish et al. 2013; Reitz and Ruff 1994; Rouse 1977). After the Reconquest, Spanish ships sailing for the Caribbean called first at the Canary Islands, where they might take on cattle (Rouse 1977:28). Cattle were not indigenous to the Canaries (Glas 1764:2, 26; Rodero et al. 1992; Rouse 1977:225).

The first cattle in the Americas may have arrived in this hemisphere in 1492 via the ill-fated *La Santa María*, but they certainly were on Hispaniola by 1493 when Columbus established La Isabela on the north coast of Hispaniola (Deagan 2002:145, 301). The Spanish Empire eventually had outposts throughout the Caribbean and stocked each island with cattle (e.g., Rouse 1973:14-16). Although many of these islands subsequently became British, French, or Dutch colonies, the original Spanish animals on these islands likely persisted. Puerto Real (1503), for example, was an active seaport through which large numbers of cattle hides were shipped. Illegal trade was so rampant at Puerto Real and other northern ports that Spain abandoned the north coast in 1579 and the entire western part of Hispaniola by 1605 (Hodges and Lyon 1995). Zooarchaeological data from Puerto Real indicate cattle were abundant and large (Deagan and Reitz 1995; Reitz 1986; Reitz and McEwan 1995; Reitz and Ruff 1994).

Figure 4-2: Florida Scrub, or criollo, cow at the Florida Agricultural Museum, Palm Bay, 2015. Photo by Olga M. Caballero.

In terms of the Lowcountry, Spain and France spent much the 1500s attempting to solidify competing territorial claims on the Atlantic coast of North America. Parris Island, in particular, was the focus of both French (Charlesfort, 1562-1563) and Spanish settlements (Santa Elena, 1576-1587). Spain's claim to the Atlantic seaboard was solidified when St. Augustine (1565, Florida) and Santa Elena (1566, South Carolina) were founded. Over the ensuing centuries, Spain lost territory to Britain, ceding what remained of Spanish Florida to the United States in 1821.

It is not known how many cattle were brought to Spanish Florida over the centuries, but the first governor, Pedro Menéndez de Avilés, agreed to transport 200 calves to the colony (Lyon 1976:215). Given the hazards of trans-Atlantic shipping in the sixteenth century and Menéndez's ties to the Greater Antilles, it is likely these animals were from free-range herds on Hispaniola, Puerto Rico, or Cuba (Lyon 1976:52, 104; Rouse 1977:73-74). Menéndez was governor of Cuba at the time. By the 1600s, ranches with free-range cattle flourished near Gainesville (FL) and in Apalachee Province (near Tallahassee, FL; Arnade 1961; Bushnell 1978). Cattle also were present at other Spanish locations, especially at missions such as Santa Catalina de Guale on the Atlantic coast north of St. Augustine (Reitz et al. 2010). These missions extended up to Parris Island and beyond. Native American trade routes expanded Spanish influence and goods (and possibly livestock) into the interior Southeast. By the early 1700s large numbers of cattle roamed the coastal plain and by the 1730s Georgia settlers in the 1730s found the land full of feral cattle (Stewart 2007:72-77).

Settlers in the Lowcountry likely brought or imported additional cattle from northern Europe, from other colonies on the Atlantic seaboard, and from British holdings in the Caribbean. For example, in 1674, Lord Anthony Ashley Cooper, one of the Lord Proprietors of the Carolina colony, owned a trading post and cattle ranch at St. Giles Kussoe (38DR83A; Agha 2012:23). Ashley ordered his Carolina agent to obtain cattle from Bermuda, where Ashley had interests, or from Maryland (Agha 2012:19-20). Ashley requested 300-400 head, though it is not known how many of these animals reached St. Giles. Ashley and other early Carolina settlers also had interests in Barbados, and some cattle could have originated on that island (Agha 2012:11-12, 15). Most British-affiliated Caribbean holdings, including Barbados, were on islands originally claimed by Spain, raising the possibility that cattle imported from British Caribbean islands had a Spanish heritage (Rouse 1973:14-15). Whatever their origins, by 1682 there were nearly 700 head of cattle at St. Giles alone (Agha 2012:17).

Perhaps more interesting is the possibility that cattle in the British Carolinas were Spanish. When Santa Elena was abandoned in 1587, it is unlikely all the free-range cattle were removed. Their wild progeny could have been there for the taking in 1670 when Charles Town was established ca. 75 miles north of Parris Island. Spain repeatedly claimed that Carolinians stole Spanish cattle during their many raids on Spanish settlements (Hann 1986; Stewart 1991). According to Alonso de Leturiondo's *Memorial to the King of Spain* (written in 1700), "...the English of St. George [aka: Charleston] have sought to carry off cattle from Florida because their own are so scrawny that their bulls and cows are not much different than the one-year-old calves of Florida" (Hann 1986:200). The claim that Spanish cattle were superior to Lowcountry cattle is echoed in English accounts (Stewart 1991:5).

One account described St. Augustine as 60 leagues from the nearest British settlement, "with great store of neat cattle" (Salley 1928). British raids reached deep into Spanish territory, burning St. Augustine and destroying missions and cattle ranches west of the town. After these raids, Colonial James B. Moore returned to Carolina with enslaved Native Americans and "all that could be collected, including cows and horses." Cattle taken to Georgia and the Carolinas after raids on Spanish missions and ranches augmented feral cattle ranging throughout the coast, many of which could trace their roots to animals escaped or abandoned as Spanish missions and ranches were evacuated.

Lowcountry settlers took advantage of cattle taken during raids or left behind as Spain retreated southward. *South Carolina Gazette* advertisements specifically described "black Cattle" and "Spanish Breed" as part of estate or cattle sales, signifying that Carolina colonists sought out specific "breeds" by the early to mid-eighteenth century. An ad from 1740 notes the following stock: "On Tuesday the 21st of February next, will be exposed to Sale at publick Outcry, at my Plantation near the Brick Church in the Parish of St. Thomas, a choice parcel of Plantation Slaves, Trades-men, House Wenches, and sensible Boys and Girls, most of them Natives of this Country. Also, several fine young Horses, breeding Mares and their Colts, together with several Yoke of large working Oxen, and a Stock of *Cows and young Cattle, most of them of the Spanish Breed*, (emphasis added) and also Coopers, Sawyers and Plantation Tools" (*South Carolina Gazette*, January 12, 1740).

A simplistic summary of Lowcountry cattle origins is that some were from European colonies further north along the Atlantic seaboard and some were indirectly from Spain via former Spanish holdings in the Caribbean, but a few were from the British Isles or northern Europe. The semi-feral cattle of Spanish Florida and the Lowcountry likely experienced several generations of natural selection in the novel colonial environments and these must be taken into account when attempting to link nineteenth-century European stock with earlier stock (McTavish et al. 2013), but the reported superiority of Spanish cattle was not simply hyperbole.

Colonial Husbandry Strategies

Shortly after European-sponsored colonization began, it became evident that cattle thrived in the region's pinewoods, savannahs, canebrakes, and marshes (Brooks et al. 2000:29; Gray 1958 [1933]). Former Carolina Governor John Archdale stated in 1707, "[a]nd so advantageously in the Country scituated [sic], that there is little or no need of Providing Fodder for Cattle in the Winter; so that a Cow is grazed near as cheap as a Sheep here in England" (Archdale 1707:32). Lowcountry cattle foraged on cordgrasses, salt grasses, and Spanish moss. Cane in swampy areas was a favorite food and was particularly important as winter forage. Free-range animals were not limited to rural areas. Charleston's citizens complained about roaming animals and the slaughter of livestock within the city for decades, to little effect (e.g., *City Gazette and Daily Advertiser*, September 27, 1783; Eckhard 1844:137; Edwards 1802:39).

Cattle ranching took place on three ecosystems that later became rice fields: upland longleaf pine communities, small stream floodplains, and low-lying hardwood bottomlands. As colonists and enslaved herders tended cattle, they became familiar with these ecosystems, knowledge which became a critical component for successful rice farming. Carolina settlers found the longleaf pine communities particularly conducive to raising cattle. According to one early eighteenth-century traveler, the longleaf pine forests were "exceedingly good for a stock of cattle, and on which [planters] frequently settle their cow-pens" (Merrens 1977, *Gentleman* 1733-1734:119). The complex layering of the longleaf pine canopies mixed with an understory of grasses created savannas that, according to environmental historian Albert Way, had "an aesthetic of parklike openness" (Way 2011:11).

Figure 4-3: 1721 map of the Southeast, showing “pine land full of cain runs fitt for cowpens” along the Edisto River. *Map of Part of North America from Cape Charles to the Mouth of the River Mississippi* by John Barnwell, Yale University.

According to Dunbar (1961:294), a cowpens not only was “a pen or an enclosure but was also used to designate a large grazing area, usually between 100 to 400 acres in size.” Cowpens might encompass 40 to 200 ha with clusters of corrals, outbuildings, living quarters, and gardens. William Bartram, describing holdings on a coastal island in the eighteenth century, wrote “…the greatest part of these are as yet the property of a few wealthy planters…they settle a few poor families on their insular estates, who rear stocks of horned cattle, horses, swine and poultry, and protect the game for their proprietors” (VanDoran 1955:77-78). Some Carolina cowpens were reported to have 6,000 or more animals (e.g., Dunbar 1961:128; Edgar 1998:133; Hart 2016; Stewart 1996:73). Most animals received little or no supplemental feed or shelter and were largely free-ranged (Arnade 1961; Bushnell 1978; Dunbar 1961).

Colonists continued the Native American custom of “carving” savannas out of upland pine forests by burning the understory grasses to hunt game and clear agricultural land. This human practice mimicked the natural phenomenon of lightning storms, igniting the long-leaf pine forests and leading to an evolution of fire dependent ecosystems. By manipulating these burnings, humans turned a natural phenomenon that evolved over the millennia into a tool for their own benefit. Despite the introduction of humans into this equation, the longleaf communities still thrived with growth of fire-adapted vegetation and the animals that fed on these species (Earley 2004; Porcher and Rayner 2001:91-92; Way 2011:7-12).

Packed meat exported to the British West Indies became an early route to wealth and landholdings. Like the Indian trade, ranching required relatively little labor and capital. Colonists let their livestock free-range throughout the emerging plantation landscape; abundant land eliminated the need to construct fences and produce fodder. Hogs and cattle foraged freely “at no cost whatever" in the upland forests and savannas during the summer while feeding in hardwood bottomlands and marshland canebrakes during the winter. By the early eighteenth century, hogs were "in abundance" throughout the Lower Coastal Plain as "they go daily to feed in the Woods, where they rove several Miles feeding on Nuts and Roots" (Pyne 1997:466, 477, see also Wood 2008:87-89).

Cattle ranching was instrumental in establishing the Carolina plantation enterprise as land and labor needed for this regime provided the foundation for later commodities. Salted beef and pork became the first successful venture in the colony and was the fourth most exported commodity behind rice, deerskins, and indigo by the mid-eighteenth century. Satisfying the demands abroad for salted beef and pork, ranching brought profits to Carolinians by 1682. By 1684, W. Muschamp, the Collector of Plantation Duties, noted that in Carolina, "[t]he Chief subsistence of the first settlers being by Hoggs and Cattle they sell to ye New Comers, And with which they purchase Clothes, and Toole [sic] from them…" As trade and herds increased, so did colonists' demand for more enslaved people (Salley 1928:219).

By 1708, at least 1,000 of the 1,800 enslaved Africans in South Carolina worked in the cattle industry. Oldmixon (1741:520) noted in 1708 "…about 40 years ago it was reckoned a great deal to have three to four cows, now some people have 1000 Head, and for one Man to have 200 is very common." Ranchers needed large estates to feed the livestock adequately through this "wild cattle" method. One cow required 15 acres to adequately graze. Some entrepreneurs who amassed more than 300 head of cattle began purchasing larger plantations to accommodate their livestock.

Carolinians continued the English West Indies tradition of naming landscapes after cattle activity. Select plantations that supported the livestock industry also contained desirable ecosystems to grow rice, coincidentally becoming important inland rice zones. "Cow Savannah," "Hog Swamp," and "Horse Savannah" reflect three low-lying landscapes west of the Ashley River where planters successfully cultivated rice in the eighteenth century (Otto 1987:13-16; Smith 1914:155). These same areas remained unimproved when the Stono rebellion shook the community in 1739. Those responsible for the insurrection reportedly had been requisitioned from area planters to construct a "passage," or drain, into the North Branch of the Stono River. When planters protested the loss of their property for this public project, the passage was routed through Horse Savannah, Jack's Savannah, and Long Savannah, undeveloped lands (Hoffer 2012:63).

Grazing lands also catered to the early development of rice cultivation and became the conduit between the two commercial enterprises by the end of the seventeenth century. Otto (1987:22-23) implies this connection, stating "Planters cultivated rice in the 'low moist Lands' along rivers, and they grazed stock in the surrounding woods." Large property holdings, available capital, and enslaved labor, attained through the success of the livestock industry, were three elements that benefited aspiring rice planters. Otto (1987:24) explains that livestock ranches were a "prelude to the rice plantation economy," a precursor to colonial South Carolina rice cultivation. Otto (1986:122) writes that, "drawing upon British and African antecedents, cattle-ranching proved the ideal industry for early Carolina – a colony with an abundance of land and cattle but a shortage of capital and labor."

Joseph Wigfall's early-eighteenth-century shift from cattle ranching to rice is an example of these broader changes in land use. A butcher by trade, Wigfall originally raised cattle on a 1,500-acre tract located on the western branch of Awendaw Creek and sold his butchered meat at Charles Town Beef Market on the northeast corner of Meeting and Broad Streets. A surveyor used Wigfall's cowpens as a marker of delineation in the 1708 Christ Church Parish boundary. The same year, Wigfall and his brother-in-law David Maybank split the property. Wigfall used the northern "Willow Hall" tract to graze cattle, while Maybank cultivated his 500 acre "Owendaw" tract, later re-named "Rice Hope" (Deas n.d.:1; Wheaton et al. 1992:28-29).

By 1712, rice farming surpassed livestock ranching as the leading agricultural activity. That year Carolina exported 12,727 barrels of rice, valued at approximately £40,000 sterling compared to 1,963 barrels of salted beef and 1,241 barrels of salted pork, with a combined approximate value of £10,000 sterling. In 1725, the Wigfalls shifted to growing rice on an Awendaw Creek tributary. Twenty-one enslaved laborers grew 725 bushels of rough rice while tending 220 head of cattle at Willow Hall. Joseph's brother Samuel reflected the transition between economic ventures, as he was simultaneously listed as a "planter" and a "livestock raiser," when owning the plantation in 1725. Representing the transition from cattle to rice enterprises, Wigfall and his descendants continued to grow the grain on this property for the next 150 years (Deas n.d.:4; Otto 1987:23; Wheaton et al. 1992:44).

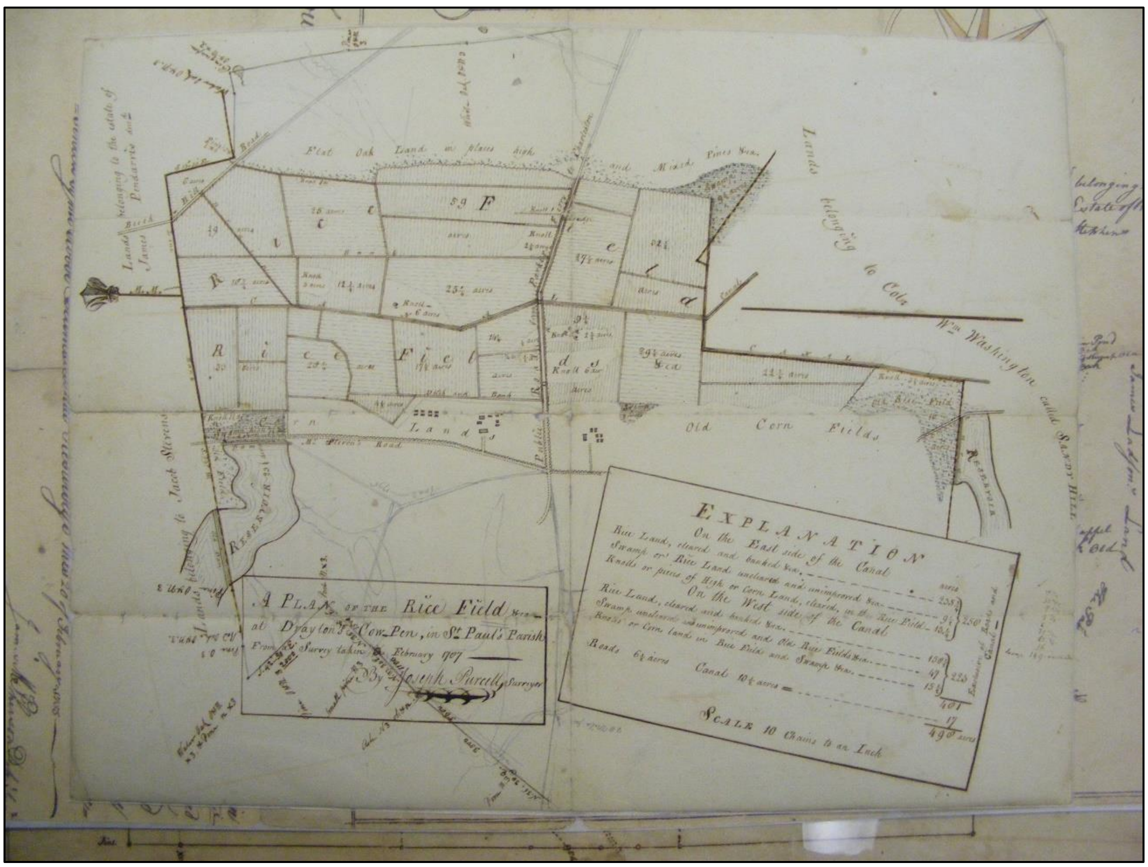

Figure 4-4: Plat of the rice fields at Drayton's Cow Pen, 1787, by Joseph Purcell.

Although Europeans and Native Americans served as cattle hands, the task of managing cowpens and driving cattle to market in Charleston largely fell to Africans (Dunbar 1961; Otto 1986, 1987; Rowland et al. 1996:87). Already familiar with raising cattle in the Senegambian region of Africa, enslaved Africans became the first American "cowboys" (Otto 1986, 1987; Wood 1975; see also Sluyter [2009]). Edgar (1998:133) reports that "…in 1708 there were eighteen hundred adult male slaves in South Carolina; nearly a thousand of them were 'Cattle-hunters.'" The term suggests the wild nature of the animals and the challenges of tending them (Wood 1975:30-31).

Cattle ranching gave enslaved Africans access to the diverse Lowcountry landscape. Part of the cattle hunters' duties were to round up free ranging livestock each evening. Cattle and hogs foraged through the sprawling landscape, roaming through tidal marshes, upland savannahs, and bottomland floodplains. Europeans hesitated to venture into low-lying swamps and the task of tending to foraging livestock was left to enslaved Africans. In doing so, enslaved cattle-hands familiarized themselves with the various Lowcountry ecosystems. One 1708 writer noted the majority of enslaved people in Carolina "knows the Swamps and Woods, most of them Cattle-hunters" (Oldmixon 1741). Although planters attempted to define boundaries between plantations and the wilderness, enslaved herders served as the "middling" between the two environments, as S. Max Edelson (2007:381) explains. Everyday exposure to the environment enabled these people to put the landscape to work for their own benefit.

Whether actively herding animals for their owners or temporarily escaping into the wilderness for a brief reprieve, early cattle-hands moved easily between pineland savannahs and cypress bottomlands (Edelson 2006:22, 24, 27; Otto 1987:15-20; Sluyter 2012:136-38). Sometimes the escape was more than temporary. Peter Hoffer (2012:69) relays an anecdote from the Account of the Negroe Insurrection in South Carolina, where Georgia authorities describe enslaved men making for the freedom offered in Spanish St. Augustine prior to the 1739 Stono Rebellion: "four or five [slaves] who were cattle hunters, and knew the woods" made for St. Augustine (Ver Steeg 1975:106). They stole their master's horses, wounded his son and killed another man "… indians paid to chase them were able to kill one, but the rest were received there with great honors."

Spanish, English, and African Cattle Herding Antecedents

Much has been written about the origin of the unregulated, free-range tradition that prevailed in Spanish Florida as well as in the Lowcountry. The possible antecedents usually are described as being either Spain or Africa (Otto 1986; Stewart 2007:78), though Otto (1986) also makes a case for this being a tradition from the British Isles or British West Indies. Although good cases can be made for an Iberian background for this tradition (Bishko 1952; Butzer 1988), valid arguments also be made for an African tradition (Sluyter 2012). Given the presence of Spanish colonists along the Atlantic seaboard following Spain's rout of French colonial efforts in 1565, it seems likely that the cattle were accustomed to free-range in a landscape conducive to it by 1670. This suggests the tradition of free-range cattle was thoroughly entrenched by the time British colonial efforts began. It is also true that much of the task of "hunting" these cattle fell to Africans. Underlying this debate is the centuries of social, economic, and political ties between northern Africa and al-Andalus. This suggests a shared tradition arising from a common source. It seems unlikely this originated in the British Isles or northern Europe, where dairy traditions required more engagement with animals than did the commodity tradition dominant in Spanish Florida and the Lowcountry.

Beyond Milk and Meat: The Lowcountry Commodity Tradition

Although the cattle industry is often thought of in terms of dairy production versus meat production, many raw materials from cattle were also important, particularly before the twentieth century's development of petroleum-based replacements. Raw materials such as brains, oil, marrow, tallow, horn, and bone were used as lubricants, skin/leather dressings, building materials, pigments, adhesives, bindings, soap, cosmetics, tools, and ornaments (e.g., Stokes 2000; Yeomans 2008). Over 50,000 lbs of tanned hides cleared Savannah's customs house in 1772 (Stewart 1991:15). When left in hides, horn cores, metapodials, and phalanges provide weight and limit shrinkage in unprocessed hides (Serjeantson 1989:139). Cow phalanges still are considered the best sources of high-quality neatsfoot oil, extracted by boiling cattle phalanges and the associated hide (Serjeantson 1989:141). Harriott Pinckney Horry's 1770 receipt book provides receipts that use fresh cow dung to treat injured trees, combine hide and rice flour to produce a cheap paint, and mix beef marrow, hog lard, and other products to make French pomade (Hooker 1984:113, 115, 123).

Bone itself has architectural uses and is invaluable in small objects such as combs, pins, buttons, hooks, toggles, and handles (e.g., Armitage 1989a, 1989b; MacGregor 1989; Pawłowska 2011). Charleston provides some clear examples of these uses. A 1736-1750s privy at Charleston's Dock Street Theatre contained 13 carpals, one carpometacarpus, and 15 digits, all from chickens (Zierden et al. 2009). As a group, these elements suggest musicians at the theatre used chicken primary feathers as inexpensive plectra, small tools used to play stringed instruments such as harpsicords. Excavations at the Sanders House encountered a dense layer of cow bones consisting of seven carpals and tarsals, 44 metapodials from the forefoot and hindfoot, 596 phalanges, and one humerus fragment (Poplin and Salo 2009). These bones are estimated to be from 36 individuals. No discernable pattern was observed. The deposit could not be dated precisely and could be from any time between the 1820s and early twentieth century. Perhaps the deposit was intended to improve drainage in a work yard or driveway, was residue from extracting neatsfoot oil, or originally formed a decorative surface. Decorative bone features were fashionable in the late seventeenth- and early-eighteenth-century Europe as were other architectural uses of bones, particularly those from lower legs (e.g., Armitage 1989a, 1989b).

Horn cores might be residue left after the keratin sheath was removed, or used to fill a low-lying area or improve drainage (e.g., Armitage et al. 1980). Horn cores have been recovered from several sites in Charleston. Two cores were found in a 1790s pre-Russell feature (Feature 26, Zierden 1995, Zierden 1996). These two cores probably are from the same individual, though they do not cross mend. These are not the only horn cores recovered from residential sites in Charleston. Seven cores are from a 1740s barrel well inside what eventually became Heyward's kitchen cellar (Zierden 1993; Zierden and Reitz 2007). Miller Sr. lived on the Heyward-Washington property at the time and operated a gunsmith there. These cores probably were soaking to remove the keratin horn sheath but were abandoned for unknown reasons. An additional seven horn cores are from the Charleston Visitor Reception and Transportation Center (VRTC). The VRTC cores are from deposits dating to the 1790s-1880s, when the site may have been a slaughter yard, horn-working center, or tannery (Grimes and Zierden 1988; Zierden and Reitz 2016:113-114).

Figure 4-5: Example of horn core, from Heyward-Washington House.

Case Study: Hell Hole Swamp as a Commons

Cattle ranchers' use of Hell Hole Swamp as a commons stems from a long-standing practice of members of a community using land collectively for a specific purpose. J. M. Peck defined a commons in 1834 as "a tract of land…in which each owner of a village lot has a common but not individual right. In some cases, this tract embraces several thousand acres…" (Seaman 2006:116).

The colonial Lowcountry practice of "commons" stems from medieval Europe and, specifically, England and Wales. In his history of the traditions and customs of working-class institutions in England, E. P. Thompson (1991) explains that the practice of commons developed from "wasteland" used by surrounding village communities. Although this land was owned by a lord or other property owner, the lack of development or ability to extract natural resources from the property deemed it unusable and left untouched or fallow. As the increasing population in the Middle Ages added pressure to acquiring food sources and natural resources, neighboring communities saw the value of this land differently and used early commons for livestock grazing, subsistence farming, or firewood gathering (Thompson 1991).

European colonists transferred the cultural understanding of commons land use to colonial North American settlement, and specifically to Hell Hole Swamp, by the turn of the eighteenth century. Hell Hole Swamp was a landscape not easily navigated, much less altered. The mixture of expansive wetlands and cypress forests, intertwined with upland scrub "island" communities, made traversing this ecological anomaly quite difficult. Few areas (e.g., the Big Opening) were "carved" out through centuries of fire management. While this land was privately owned, first by the Lords Proprietors and, later, by the English Crown, neighboring landowners (who had little resemblance to Middle Ages peasants) relied on the Hell Hole commons as an overflow of land to accommodate the ever-expanding population of free-ranging cattle and hogs.

Located in the heart of the present-day Francis Marion National Forest, the aptly named Hell Hole Swamp, and in the middle of Hell Hole, the Big Opening, are unique parts of the Lowcountry cattle story. Documents suggest the swamp was unclaimed and unplatted until the nineteenth century, serving principally as cattle grazing lands during the eighteenth century. Moreover, the practice of grazing cattle in the Hell Hole Swamp continued through the mid-twentieth century, even after the Francis Marion National Forest was established in the 1930s. News articles in 1938 and 1955 describe the US Forest Service leasing pastureland in an attempt to promote purebred stock and reduce "scrub cattle." One rancher recalled that thousands of head of cattle and sheep grazed on open range in the National Forest in the 1890s and that "old abandoned rice fields" were ideal forage.

The name is a source of intrigue among our research team, (and we must admit that part of the reason to choose this location is to have the name in our reports). The origin of the name Hell Hole Swamp has a couple of theories. One account says that the swamp got its name during the American Revolutionary War from Colonel Banastre Tarleton because British troops had great difficulty finding the elusive General Francis Marion. Another is the name comes from being a repository for bootleggers during the Prohibition. But the name is clearly older, as Hell Hole Swamp is designated on the 1773 James Cook Map of South Carolina. Beyond that, the name dates back to 1761 or earlier. On March 3 of that year, James Colladon received a grant of 500 acres in Hell Hole Swamp. A colonial land grant to Daniel Huger on May 13, 1735 for 2,925 acres states these lands are those "butting and bounding to the Northward part on lands of the Inhabitants French Santee and part on lands not laid out, to the South Eastward on Hell Hole Swamp" (Francis Marion National Forest Title Abstract, vol. 2, p. 190).

"Hell Hole" evidently refers to land deemed useless, or impassable, and the term appears in reference to other lands. In a discussion of the South Carolina Land Commission selling land to newly emancipated freedmen, one land commissioner said "an alligator can hardly live there-an alligator could, I suppose, but a human being could hardly." According to the report, "about 2,000 acres more [of the 12,800 acres] is capable of cultivation; the balance is an interminable swamp, and utterly worthless" (Bleser 1969). One of George Washington's earliest efforts at land surveying, in the 1740s, was a small, five-acre tract at Mount Vernon, that he noted as "a Piece of Meadow called Hell Hole" (www.mountvernon.org/george-washington/washingtons-youth/surveying).

In Charleston, a similar commons land-use scenario developed as Charles Town relocated to the peninsula in 1680. Marsh land located on the western (Ashley River side) of the peninsula became the first location for Charleston's commons, situated undeveloped across from the walled city facing the Cooper River. As Charlestonians started to live outside the walled city, many of these common pasturelands were transferred to private ownership and developed. Several commons, however, continued to exist, specifically Harleston Green and land that eventually became Colonial Lake (Butler 2020).

Unlike almost every other desirable square foot of the Lowcountry, Hell Hole Swamp was not settled in the eighteenth century and remained commons until the nineteenth century (Smith 2020). This landscape remained a commons for several centuries due to a combination of dense growth, reflected in the name, and the inability of people to harness it for other agricultural activities, like rice or cotton. French Huguenot settlers began receiving land grants along the eastern half of Hell Hole Swamp in the late seventeenth and early eighteenth centuries. Originally situated along the Santee River, this enclave of Huguenot families began purchasing land further inland, including the Huger area, until the prospect of potentially altering the land became impractical.

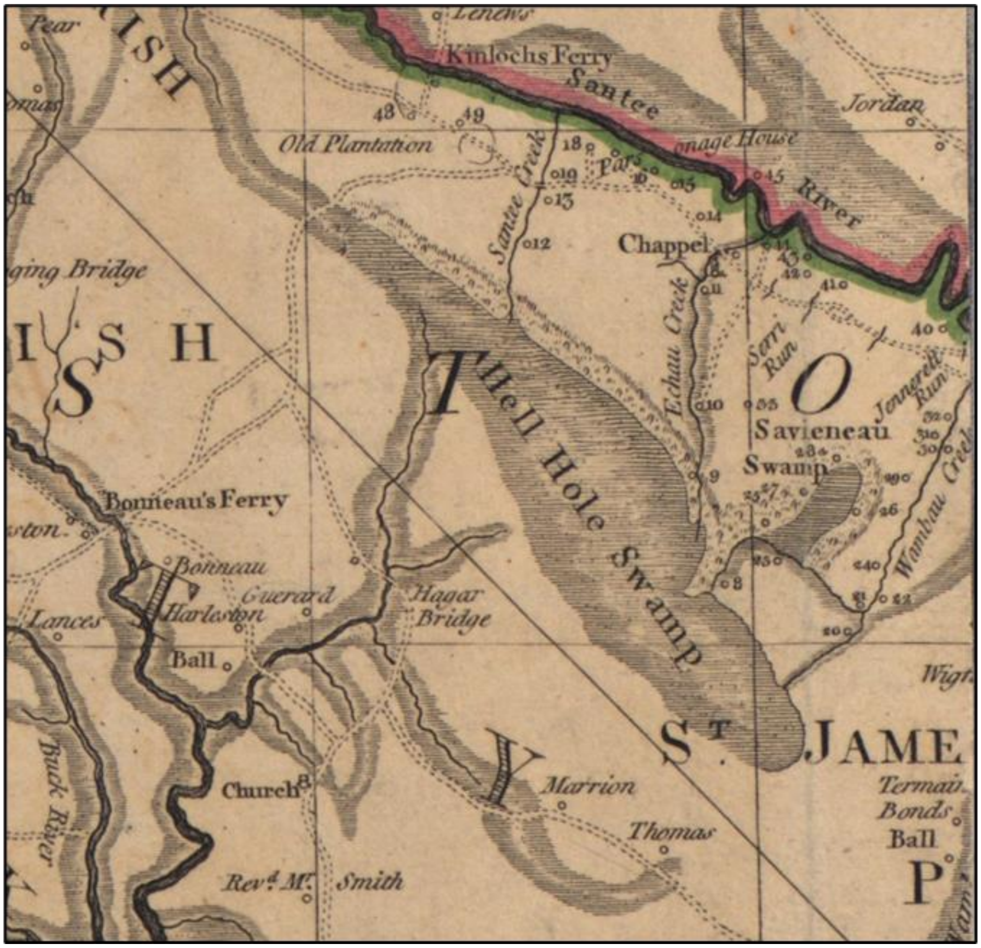

Figure 4-6: Portion of 1757 DeBrahm map showing Hell Hole Swamp and the Santee River.

Following common practice of large landowners at the time, Huguenot settlers invested in cattle ranching. Ranchers with free-range cattle adopted the practice of branding or slitting marks in cattle ears to identify specific animals with their owners (Lesser 1995). Numerous Hell Hole area Huguenots registered their cattle brands with the colonial government (Cattle Brand Records 1697-1699). An example of the extent of free-range cattle in this area is briefly mentioned in a 1708 plantation transaction between Andre Rembert and Rene Ravenel. Part of the sale included "all ye neat Cattle & Swines belonging to ye sd Plantation & yt shall be found with in twenty miles thereof" (Bates and Leland 2015). Cattle ranged across these lands from the early eighteenth century into the 1950s, well after 1936 when it became a national forest (*News & Courier* June 12, 1938). Because of its isolation and inaccessibility, Hell Hole Swamp became a locus for clandestine activities, particularly moonshining, and isolated communities of socially marginal people (Gilbert 1946; McCay 2021; Miles 2015; Taukchiray and Kasakoff 1992). Archaeological survey found few sites other than liquor stills (Stewart et al. 2017).

The unclaimed swamp was a shared common until Charles G. McCay purchased 4,044 acres of "Big Hell Hole Bay" in 1849 and 9,000 acres of Big Hell Hole Swamp in 1857 from the State of South Carolina. The McCays were relative newcomers to St. Stephens Parish (western

Berkeley County, the location of Hell Hole Swamp). Charles McCay, a Scotch-Irish immigrant, arrived around 1800. In 1807, he obtained 500 acres around present-day Alvin (SC) where he constructed a homestead known as Sugarloaf. By the time of his death in 1831 he owned at least 2,100 acres and several enslaved people, possibly as a result of marrying into the Greenland family (Brockington 1992; McCay 2021:8). His son, Charles Greenland ("C.G.") McCay was born in 1809. C.G. McCay married in 1832, and the union produced several children, though many died in childhood. C.G. McCay acquired Sugarloaf in the 1840s and was unique among area planters purposefully acquiring less-desirable, often low-lying, lands. Most of his lands were State Land Grants. McCay received grants for additional lands around Sugarloaf totaling 3,000 acres. He also accumulated lands in Hell Hole Swamp, one grant for 4,044 acres and another in 1857 for 9,000 acres. Today the Hell Hole Bay Wilderness Area is 2,125 acres, but the wetland is much larger. McCay evidently owned the entirety (McCay 2021:15).

In 1860, C.G. McCay owned 19,400 acres, more than any other St. Stephens landowner. He owned more cattle too; 1,000 cattle in 1850, including 460 dairy cattle. By 1860 his livestock included 1,000 milk cows and 2,000 beef cattle. He produced cotton, sweet potatoes, and Indian corn. McCay also produced rice, but less that those planters who owned more desirable rice lands. He harvested 10,000 pounds in 1850 and 22,500 pounds in 1860.

McCay was described as a planter-herdsman, remembered as one who "lived in his saddle" (McCay 2021:19-20; see McDonald and McWhiney 1975). During the Civil War, he sold "subsistence stores" to the Confederacy, delivering 12,125 pounds of fresh beef to Charleston in 1862. A year later, he delivered 5,269 pounds of beef, 263 live beef cattle, and 104 hogs to McClellanville (SC, McCay 2021:22-23). C.G. McCay retained his landholdings after the War, but production was curtailed. McCay was murdered at Palmer's Bridge in 1879 while executing his duties as Roads Commissioner (McCay 2021:27).

Figure 4-7: Aerial photograph of the Big Opening, 1970s, Photo by Richard Porcher.

Centered within the vast, rather impenetrable Hell Hole Swamp is a large savannah known as the Great Opening. The exact land use history of this area is poorly known, but sources suggest this is a dynamic landscape feature, the result of periodic fire activity. The Great Opening is designated on a ca. early twentieth-century soils map for Berkeley County. Historic photographs suggest it was somewhat smaller by the 1930s. A major wildfire in 1954 re-opened the tract. Aerial photos from the 1970s show a more moderate opening. Currently, the opening is fairly closed in. The U.S. Forest Service practices regular controlled burning in and around the Great Opening today, with burns scheduled on a three-year rotation (Chapman 1905; Francis Marion National Forest).

Centers of Cattle Production

Early cattle centers, referred to as cowpens, were common between the Edisto and Savannah rivers and in neighboring areas of North Carolina and Georgia with similar topography. As farmers moved beyond the tidewater and began clearing inland areas for crops, herders retreated further inland, into the pinewoods of the coastal plain and sandhills, where sandier soils favored pastoral strategies over crop agriculture (Owsley 1965 [1945]). Lands previously used for hunting deer by Native Americans were transformed into rice fields and livestock decimated the remaining grasslands (Hann 1982). The Yamassee War of 1715 between Native Americans and British colonists temporarily halted this expansion, but the defeat of Native residents opened the interior to further livestock grazing. By the 1770s, the frontier had advanced into the Piedmont, where the first wave of settlers consisted of cattle ranchers and merchants (Landrum 1897).

Naturalist William Bartram described a cattle pen in the Savannah River valley, about 100 miles inland from Savannah, where he stayed overnight in April, 1776. He describes the compound as “The pen, including two or three acres of ground, more or less, according to the stock, adjoining a rivulet or run of water, is enclosed by a fence; in this enclosure the calves are kept while the cows are out at range; a small part of this pen is partitioned off to receive the cows, when they come up at evening; here are several stakes drove into the ground, and there is a gate in the partition fence for a communication between the two pens. When the milkmaid has taken her share of milk, she looses [sic] the calf, who strips the cow, which is next morning turned out again to range” (VanDoran 1955:255).

Bartram’s overnight accommodations were a short distance north of the Catherine Brown Cowpen, the first cowpen explored by archaeologists. Here, in 1984, Richard Brooks of the Savannah River Archaeological Research Program, uncovered an extant cattle path running through a fenced enclosure (Groover and Brooks 2003:108). Two structures, a dwelling and a smokehouse, were wooden frame, post-in-ground or earthfast construction. Another dwelling, possibly a later one, was located adjacent to the cowpen. Brooks also recorded a butchering area, including a rack or frame, a large offal trench, and bone-filled refuse pit. Based on these features, Mark Groover and Richard Brooks suggest the actual cowpens were relatively small (Groover and Brooks 2003:108). The largest and most important cattle centers remained on the coastal plain (Dunbar 1961). One of these, operated by Mary Musgrove, a woman of Creek and English descent, is central to the development of the Georgia colony and an important link Carolina’s cattle economy.

Case Study: Samuel Eveleigh, the Indian Trade, and the Musgrove Cowpen

Mary Musgrove operated a trading post and cowpen on the Savannah River between 1732 and 1751. Her business affairs were managed by Charleston merchant Samuel Eveleigh. Eveleigh played an important role in the economy of colonial South Carolina through his assets and his contacts. Eveleigh, and his son George, were the second largest exporters of deerskins between the years 1738 and 1752, second only to Benjamin Stead (Moore 1973:147). Samuel Eveleigh briefly served on the five-person commission that controlled the trade.

Spanish traders and their allies faced increasing competition for commodities from British-sponsored trade and raids. Native Americans of many tribal identities were caught up in these international and personal struggles (e.g., Braund 1993:41-42; Hann 1988, 2006; McEwan 2000; TePaske 1964; Usner 1992; Wright 1971). In addition to high mortality from disease and warfare, many were enslaved and others were relocated either voluntarily or involuntarily. Caught between international combatants, some Native Americans endeavored to advance their own interests. Many engaged in trade with Spanish, British, and French interests (e.g., Braund 1993; Hann 1988:188-189, 230). Among these were Mary Musgrove and her husbands. The Musgroves claimed to take in an average of 12,000 pounds of deer skins annually at their Yamacraw Bluff trading store in the early 1730s, about a sixth of the Charleston export total (Braund 1993:41; Fisher 1990:69; Hahn 2012). The Musgroves also were active in the cattle economy, supplying cattle to local and regional markets.

Mary Musgrove Matthews Bosomworth is well-known as a fixture of early Georgia history as a player in the economy and politics of colonial America. The bulk of her story is centered in Georgia, but her professional relationship with merchant Samuel Eveleigh, as well as contact with the colonial governments of South Carolina and Georgia, took her to Charleston from time to time and her economic and political activities place her squarely in the center of Charleston's colonial cattle economy.

Born in 1672, Samuel Eveleigh arrived in Charleston from Bristol in 1698 and immediately entered the Indian trade. As planters were excluded from the Indian trade by the regulatory act of 1707, the emerging merchant community seized the economic opportunity. Unlike other merchants, Eveleigh directly supplied traders with goods on credit. Later, he established a factory at New Windsor township (Fort Moore) and served as commercial agent for the Georgia Trustees. Eveleigh owned nearly 1,200 acres on the Combahee River and 1,000 on Cuckold Creek, but these were undeveloped at his death. He owned 20 enslaved people, but they all worked in his counting house (Edgar and Bailey 1981:235-236). Eveleigh married twice. He died in 1737 and was survived by two children, George and Elizabeth (Wills vol 4:235a). George (1719-1791) evidently continued the Indian trade business, as he is listed as a trader after 1738. In 1742, he built a house on lower Church Street below Vanderhorst Creek (later Water Street).

The best-known Eveleigh property in Charleston is a wharf on the Cooper River, below Tradd Street. It was owned by Samuel Eveleigh's grandson, Thomas (1747-1816). The chain of title is unclear, but this is most likely the same location owned by Samuel Eveleigh that served as the center of his deerskin operation. Thomas inherited 1,100 acres on the Combahee River from his father, George (probably the land owned by Samuel in the 1730s), but also owned numerous tracts elsewhere. He is listed as a planter, merchant, owner of a lot and a half-acre on East Bay Street (probably the wharf property). He was part-owner of four sloops and one schooner. He also participated in the slave trade, importing cargo on his own and in partnership with Edward Lightfoot.

Friendly relations with the Indians were important to merchants such as Eveleigh. In June 1732, a delegation of Creek chiefs visited Charleston. The *South Carolina Gazette* chronicled, "Yesterday the Head Men of the Indians now in Town were plentifully entertained at Dinner, by Mr. Eveleigh, at his House, who carried them, in the Afternoon, on board the *Fox* Man-of-War with the sight of which they seemed mighty well pleased. The civilities showed to these Indians by Mr. Eveleigh are not, we believe (as some would suggest) from any private Views of Interest to himself, but a general design of promoting a good understanding, and consequently our Trade with them" (*South Carolina Gazette*, June 10, 1732). Hahn and others suggest this meeting included Johnny and Mary Musgrove and Creek chief Tomochichi, and resulted in the Musgroves' decision to move their operations to Yamacraw Bluff (Hahn 2012:79).

Eveleigh used his connections to great advantage to stay informed. He kept an eager eye on the efforts of London aristocrats to develop a separate colony between Florida and Carolina in the 1730s. James Oglethorpe and his settlers arrived briefly in Charleston before settling on the bluffs of the Savannah River. Samuel Eveleigh saw opportunity in the settlement of Georgia and kept close contact with the leaders of the new colony. He visited the new settlement and sent a cask of deerskins to the Trustees as a gift in hopes of currying favor. He maintained contact with Oglethorpe and the Trustees, offering a flood of advice and proposals. Particularly, he strongly advocated for legalizing slavery in Georgia.

A year later (1734), Eveleigh proposed constructing a fort and trading post on the Altamaha River, at the junction of the Ocmulgee and Oconee rivers. The Georgia Trustees politely, but firmly, rejected all of his proposals because "Indians owned that land" (Sweet 2011:18). Eveleigh further considered moving his entire operation to the new colony; his interest in moving his Indian trade to Georgia stemmed from new regulations and taxes levied in South Carolina. (A 1716 treaty established the Savannah River as the boundary between Carolina and Creek territory). But the official prohibition on slavery convinced Eveleigh to give up his Georgia plans, and he shifted from investor to advisor to Georgia. Upon his return from Savannah in August, 1735, Eveleigh's health declined. He suffered from dropsy (a heart condition) and gout; chronic illnesses that kept him close to home.

Shortly thereafter, the South Carolina Assembly moderated its fees leveed on the Indian trade while the Georgia Trustees enacted prohibitive rules on the Indian trade. In 1736, Georgians attempted to divert the inland Indian trade from Augusta to Savannah, and to regulate all interactions with the Creek and Cherokee. Thus began a protracted diplomatic struggle between Carolina and Georgia, with the influential Charleston merchants prevailing. Some transferred their trade to Augusta and took out licenses in Savannah, but trading boats usually by-passed Savannah on their way to Charleston, which remained until 1763 "the mart of the whole southern Indian trade" (Crane 1981:124).

Samuel Eveleigh worked constantly to position himself on the correct side of the shifting diplomacy between the two colonies, and between the colonial government and the Indian nations. His relationship with the Musgroves, continued by his son George, were key parts of his strategy.

Mary Musgrove and the Cowpens

Mary, or Coosaponakeesa, was born ca. 1700 in the Creek town of Coweta to an un-named Creek woman, "sister of the old Emperor" Brims, and English trader Edward Griffin. Her father brought Mary from Coweta to St. Bartholomew's parish at Pon Pon (near the site of Willtown) when Mary was seven, presumably because of the death of her mother. Here she was “baptized, educated, and bred up in the principles of Christianity” (Helsley 1997; Fisher 1990; Zierden et al. 1999). After the Yamasee War, Mary returned to the Creek nation, where she married Johnny Musgrove in 1716, son of Indian trader and government agent Col. John Musgrove and an unnamed Creek woman.

The Musgrove family was active in eighteenth-century Carolina colonial affairs. John Musgrove Sr., his son (John Jr., who married Mary Musgrove in 1717), and Mary’s brother participated in some of the battles between the Carolina colony and Spanish Florida, including a 1719 attack on St. Augustine (Braley 2013:11). In 1721, after the British Fort King George was established at the mouth of the Altamaha River (GA), squarely in Spanish territory, John and Mary Musgrove established a trading post nearby (Braley 2013:18). One of Mary Musgrove’s brothers died in the 1740 attack on St. Augustine (Braley 2013:19).

Mary and Johnny Musgrove owned land in St. Bartholomew’s Parish, raising and selling cattle there from 1717 until 1732. This region is described as the “epicenter of the suitable cattle lands.” They also entertained Mary’s Creek and Yamassee relations and acquaintances, and worked for the colonial government. They traveled to Charleston, where they were connected to the deerskin and cattle trade, and to the government, through Mary’s agent, Samuel Eveleigh.

The sparsely settled parish seemed to tolerate, if not welcome, mestizos and Indian people. The presence of mixed-race settlers attracted small bands of Creek and Yamasee Indians, some of whom lived on or near the Musgroves’ lands, eventually 620 acres. Dubbed “the Indians that live about Pon Pon”, this group included Oweeka and John’s uncle, Whitlemico, from Apalachicola. The Pon Pon Indians were occasionally helpful to the colonial government; moreover, both the location and the makeup of this community of Creek Indians were strategically important to the colony after the fallout from the Yamassee War (Hahn 2012:65; 2013:343).

The Musgrove property and associated Indigenous community served as a stopping point for officially sanctioned groups of Creek leaders, many from Coweta, on their trips to Charleston. It remained so for years, though the resident and transient Creek were seen as a source of trouble. Rumors of trouble between the Pon Pon Indians and white settlers reached a breaking point in 1726 with a series of murders. These were blamed on “the stragling Creeks, that live in those lower parts & seldom go up to their nation” (Hahn 2013:357).

The Musgrove property was located on the southwest side of the Pon Pon River, at Round O Savannah. Historian Steven Hahn has traced this land to Carolina secondary road #45 and old Jacksonboro Road, near “Iron Crossroads.” Hahn notes that their landlocked, but high, level land featured some pine stands and the occasional swamp, but was dominated by grasslands or “savannahs” making the land suitable for livestock. While Johnny Musgrove occasionally dabbled in the deerskin trade and provided military service to the colony, his principal activity was ranching, and, eventually, some rice planting. The Musgroves owned two enslaved people, a “negro man named Lewis” and an Indian boy named Justice (Hahn 2012:72). The three men likely worked together with the cattle.

The Musgroves moved from Pon Pon to Yamacraw Bluff in 1732 after a delegation of Upper and Lower Creeks came to Charleston in May of that year to sign a peace treaty (when they were entertained by Samuel Eveleigh, as described above). The Creek delegation included Tomochichi and some of his Yamacraw followers, who had been banished from the Creek towns of Apalachicola and Hitchiti. They likely had passed by the Musgroves’ home on their way to Charleston (Hahn 2012:87). During the Charleston meeting, there were evidently private talks between Tomochichi, Samuel Eveleigh, and the Musgroves, the latter likely acting as interpreters. The three parties worked out a plan to allow Tomochichi's band to settle at Yamacraw Bluff, along with the Musgroves, who were to trade with them. Eveleigh agreed to provide the Musgroves a line of credit that would allow them to buy trade goods. Johnson evidently promised the Musgroves a monopoly of the Yamacraw trade, and an additional grant of land on the south side of the Savannah River (Hahn 2012:79).

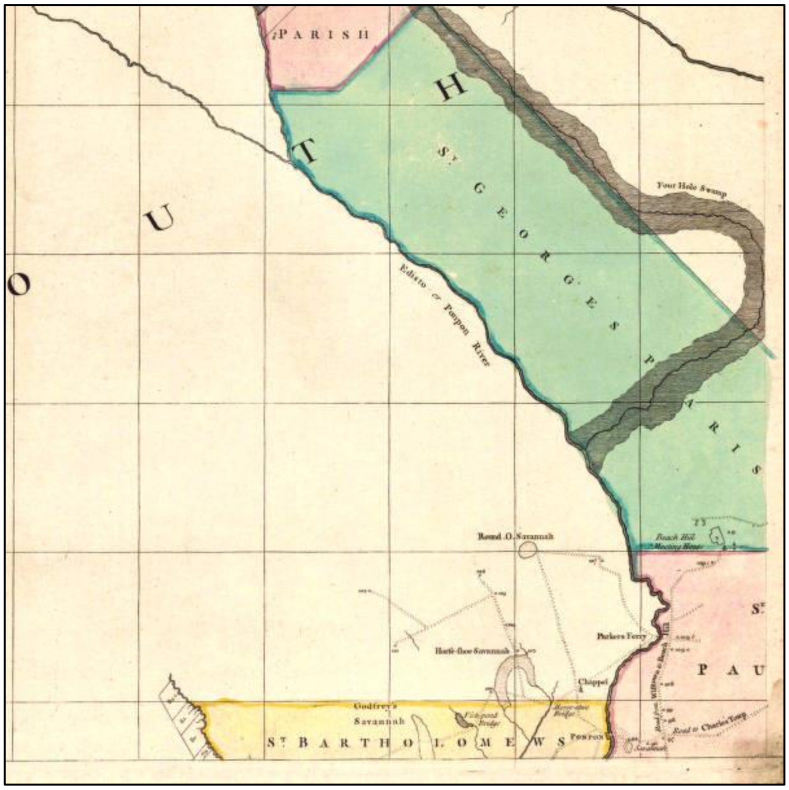

Figure 4-8: 1757 DeBrahm map, showing Round O Savannah and St. Bartholomew's Parish. Courtesy of Steven Hahn.

When Savannah was established in 1733, the new white settlers found this bicultural community a threat. Governor Oglethorpe negotiated a "treaty" whereby the Musgroves and the Yamacraw community moved upstream about five miles. The new location was on the Georgia side of the Savannah River, next to Pipemaker's Creek, with the new Yamacraw located about a mile east (Hahn 2012:84). Archaeological excavations revealed Mary and Johnny Musgrove built a home, first with a small post foundation, and later a more substantial house with a cellar, flagstone paving, and cypress plank walls. There may have been two smaller structures to house servants and slaves. As their cattle were known to stray across the Savannah River to forage, they likely constructed a split rail pen.

At one time or another, Indigenous slaves, Spanish, Salzburger cowkeepers, dairymaids, missionaries, insurgent colonists, and Yamacraw, Creek, and Yuchi chiefs and hunters visited or lived at the site. The Cowpens household included Mary and Johnny Musgrove, their two sons James and Edward, and three Indigenous slaves, Wan, Nanny, and Justice. Justice was murdered and replaced with another "Indian servant," likely known as Nottoway. Hahn (2012:85) suspects the four were Yamasees, purchased earlier from the Pon Pon Indians (Hahn 2013).

In addition to the enslaved Native people, the household included white indentured servants. Job Wiggins, from Fort Moore in South Carolina, was a cattle hand. The second, Jacob

Mathewes, later became Mary's second husband. The multicultural household, and the nearby Yamacraw village, earned a reputation for unrestrained and occasionally dangerous behavior. The Musgroves also were viewed by English settlers as essential diplomats between the various Indigenous groups and the new settlers. Following Johnny's death in 1735, Mary assumed more of this role. Their two sons died the following year.

In 1737, Mary married her servant Jacob Mathewes and left to establish a new trading house at Mount Venture on the Altamaha River, at the request of Oglethorpe. Three years later, Mary adopted the three mixed-race children of her brother, Edward Griffin, who was killed at Gracia Real de Santa Teresa de Mose, the free-black fortified town, during the siege of St. Augustine. The family returned to The Cowpen in 1741, as Mathewes had contracted a long-term illness. Finding the Cowpens in ruins, they constructed a new house. Mathewes did not survive the illness, and passed away in 1742 (Fisher 1990:142). Mary's role as an unofficial "hostess" for the colony continued. In 1744, she married for a third time, to Thomas Bosomworth, an Anglican priest from Fort Frederica (St. Simons Island, GA), several years her junior. Bosomworth soon abandoned his role as minister to become a trader and adventurer.

Braley notes that the Musgroves' Cowpen was renamed Grange Plantation in 1744 when Mary Musgrove married Bosomworth. He suggests the name change ("Grange" means good farmland) indicates that the Bosomworths were turning to farming rather than ranching. By 1745, cattle had become abundant and there were many cowpens in the area around Savannah, Ebenezer, and Augusta (Braley 2013).

In 1746, Bosomworth led the couple in petitioning the Georgia government for compensation for their "services to the colony." A year later, the couple obtained title to three coastal islands in Georgia: Ossabaw, St. Catherines, and Sapelo islands. These islands had been held by the Lower Creeks as hunting territory. Thomas Bosomworth's brother and attorney, Adam Bosomworth, sold the 500-acre Grange tract in 1750.

Mary and Thomas Bosomworth, heavily in debt, returned in 1753 to the South Carolina land held by the estate of Johnny Musgrove. A protracted search for the deed paperwork and written statements from former Colleton County neighbors resulted in Governor Glen awarding Mary two tracts totaling 440 acres, plus a warrant for an addition 210 acres. The Bosomworths remained in South Carolina for another year, seeking compensation for their Creek agency and planning a voyage to London to further their claims.

Hahn (2012:210) suggests the Musgroves had begun to make improvements to their South Carolina lands before an altercation with neighbor Joseph Glover brought them to a halt. He further suggests the Musgroves never intended to sever their ties with South Carolina, only to assume control of the Yamacraw trade as part of a diversified economic strategy. It appears that Johnny Musgrove had acquired a tract on the north side of the Savannah at Purrysburg and planned to farm there, as well. The Musgroves' plans changed with Johnny's death in 1735 and Mary's subsequent marriage to their indentured servant Jacob Mathewes (Hahn 2012:96).

Throughout her life in Georgia, Mary juggled relations between English colonists, the colonial government, visiting Native delegations, and her Creek relatives. Her role as representative for the Creeks and translator for the colony continued, but not without controversy. The Bosomworths continued negotiating with the Georgia colony for compensation. Part of the property exchanged and recorded in memorials were cattle. In 1745, St. Catherines Island was occupied by 8 to 10 Creek or Yamacraw families. Thomas Bosomworth purchased a herd of cattle in South Carolina and shipped them to the island, only later asking the colony's president William Stephens if he had objections. This occupation violated the Indian treaty for the land. Later, a herd of cattle given as a gift to Malatchi, Mary's cousin, fell into the hands of his son, Tugulki, and were part of his testimony for the Bosomworths in 1757.

Following this settlement, Mary and Thomas Bosomworth resumed their service to the Georgia colony as interpreter and negotiator. Mary disappears from the written record in 1760, some of her last documents a trust agreement for her South Carolina properties. They retired to a quiet life on St. Catherines, where Hahn (2012:230) reports a modest house, a few servants, and in excess of 100 head of cattle, "roaming freely on the island's 6,250 acres." Nearly two centuries later, descendants of the Bosomworth's cattle were deemed a nuisance and Georgia state authorities exterminated the semi-wild animals in 1925 (Hahn 2012:230).

Spanish Staggers and Other Diseases

The cattle industry experienced a marked decline in the 1700s, a decline visible in the mid-eighteenth-century Charleston archaeological record. Epidemics in 1742 and 1743 killed many cattle (Dunbar 1961; Otto 1986; Stewart 1991). The decline was sudden and large, characteristic of a new disease in a virgin population (Haygood 1986). Georgia cattle were implicated in the spread of the disease, which was said to have originated in Spanish cattle (Haygood 1986). Babesiosis is believed to be the cause of disease outbreaks in the Carolinas in the 1760s, but there were earlier outbreaks of disease, as well.

News of disease spreading through cattle appears in the *South Carolina Gazette* by summer 1744. As the article notes, "An infectious Distemper spreads itself very much among the Cattle, in divers Parts of this Province. 'Tis said, that some Carcasses having been opened, there was found near the Kidneys some large Boils full of Corruption: Fat Cattle are most affected with this Distemper.… On this Occasion his Excellency the Governor has been pleased to issue a Proclamation, which is annexed to this Gazette" (*South Carolina Gazette*, 1744). To combat the spread of the disease, the South Carolina assembly passed an act to quarantine infected cattle and either burn or bury any free-range cattle dying from the disease: "WHEREAS it is greatly to be feared, that the infectious Distemper which for some Time past has so violently raged amongst the Cattle and that that same (if not timely prevented) will speared and communicate itself through the whole Province" (*South Carolina Gazette*, 1745). Despite these efforts, the disease ravaged the Lowcountry, with newspaper reports indicating which properties contained infected cattle.

In summer 1745, the disease swept through Charleston's Neck stockyards and plantations, adding to the panic in Charleston. One resident sent the newspaper editor a remedy for others to try, "When you perceive they begin to sicken, give to each Beast Two Quarts of Bottle-Milk, with the small Lumps of Butter in it. Repeat the Dose 2 or 3 Times, one about 12-Hours after the other," which – according to the author – "One of my Neighbours has (to my Knowledge) by this Means cur'd 5 Head of his Infected Cattle" (*South Carolina Gazette*, 1745). The epidemic worked its way through the Lowcountry cattle population, eventually slowing by 1750. Advertisements casually promoted cattle sales taking place once stock overcame the "distemper," and the mention of the disease all but disappeared in the news by 1754.

Babesiosis is believed to be the cause of disease outbreaks in the Carolinas in 1760s-1770s. Sometimes called "Spanish staggers," babesiosis (also known as Texas or Southern fever) is caused by a tick-borne parasite (Haygood 1986; Stewart 1991). It was found in the US below the 36th parallel before extensive tick control programs in the late-nineteenth and early-twentieth centuries eradicated the vector. Economically, it is the most important arthropod-transmitted pathogen of cattle (Schnittger et al. 2012). *Babesia* spp. also infect deer (Ramos et al. 2010).

The disease is characterized by massive organ damage. Animals with acquired immunity have a low-grade infection and are carriers of the disease, but must be re-infected to sustain immunity. Restrictions on the movement of cattle from Carolina and Georgia pinewoods in the 1700s may have been designed to control this disease (Bierer 1974 [1939]:6, 8). It caused severe outbreaks during the nineteenth century when infected cattle from Texas were trailed north. The Texas cattle were asymptomatic carriers. Exposure to the parasite when they were calves provided partial immunity, leaving early ranchers uncertain about the cause (e.g., Haygood 1986).

If Spanish staggers was babesiosis, the Lowcountry's free-range animal husbandry practices encouraged disease transmission by permitting infected animals to mix with healthy ones. The spread of the disease and the overall decline in cattle herd size may have been compounded by factors such as overall health, overstocking, shifts in local and international market demands, and climate variability.

A Note About Bison (*Bison bison*)

The arrival of Eurasian cattle on the Atlantic and Gulf of Mexico coastal plains roughly coincided with expansion of the small-bodied American bison (*B. bison*) into the eastern Woodlands. Earlier species of bison (*Bison latifrons*, *B. antiquus*) arrived in North America from Asia ca. 800,000 years ago. Their modern descendent, the American bison, is the largest terrestrial mammal in North America and the only native large grazer. American bison are best known for the large herds that once roamed the Great Plains. These herds were an important resource to many Indigenous people into the 1800s.

Bison herd migrations are influenced by seasonal vegetation changes among other factors. Perhaps as early as 1000 AD a small subspecies expanded into tall-grass prairies and canebrakes east of the Mississippi River (Rostlund 1960). They were attracted particularly to prairies in Ohio, Indiana, and western Kentucky. These eastern animals were smaller than their western relatives and did not form large herds. Although physical evidence for bison in the Southeast is limited, some southeastern locations bear place names such as "Buffalo Creek," a Piedmont location in Union County, South Carolina. There are reliable accounts from the 1600s and 1700s for bison in northern Florida as well as for the Chattahoochee River valley between Alabama and Georgia (e.g., Sherman 1954).

The skeletons of American bison and domestic cattle are extremely similar. Although numerous suggestions have been offered for distinguishing between them, only a few characteristics offer reliable attributions (Balkwell and Cumbaa 1992). Thus, it is possible that some skeletal materials attributed to *Bos taurus* might be bison. Nonetheless, the overwhelming volume of skeletal materials attributed to cattle in the Lowcountry faunal assemblages suggests that most, if not all, of the Lowcountry material is from domestic stock, otherwise the eastern bison herds must have been much larger than supposed.

Conclusion

This discussion indicates the difficulty in determining the breed, origins, or size of cattle in the Lowcountry. The presence of regional breeds, the lack of specific information about them, and uncertainty about the source(s) of cattle in each colony suggest that much remains to be learned about the heritage of colonial cattle. Nonetheless, Spanish cattle, Carolina "black cattle," and colonial commodity economies all were part of the Lowcountry environment. It is hoped that advancements in archaeogenetics eventually will clarify the origins of Lowcountry animals.

Figure 4-9: Cracker cows on Newberry Road outside Gainesville, Florida, 1929-1930. Photo by Raymond Becker, University of Florida.

Chapter V
Colonial Charleston and the Lowcountry

Introduction

Charleston provided the market necessary to make livestock production profitable. The growing city population offered a local market for cattle, while the trans-Atlantic port served as the gateway for shipments of cattle and cattle by-products to the Caribbean and other locations. Cattle raised on nearby plantations and further inland were trailed to the city on the hoof, pastured just beyond the town limits, then brought into the city to sell.

The first English settlement was established in 1670, at Albemarle Point, several miles upstream from the coast on the Ashley River. The settlement was the hub of a broader planned colony that relied on land distribution as a means for economic success. The Lords Proprietors – eight English nobility who served as the ruling landlords of the proprietary colony – gave away or sold acreage to English and Barbadian gentry or colonists. The Proprietors were nobility who supported Charles I's unsuccessful campaign to retain the Crown during the English Civil War. Upon Charles II's rise to power in 1660, the eight Proprietors were awarded the newly established Carolina as a reward for their loyalty. In turn, the Proprietors named the settlement "Charles Town" in honor of their king and the two rivers converging in the harbor in honor of prominent Proprietor, Anthony Ashley Cooper.

Colonists protected their new settlement with a palisade and four pieces of artillery. Native Americans reported to their Spanish allies in 1672 that 30 small houses were located on the west bank of the Ashley River and four were on the east bank of Oyster Point, a coastal peninsula at the confluence of the Ashley and Cooper rivers. By this time, the colony had grown to 268 men, 69 women, and 59 children. Enslaved Africans were already among the residents. Seventeenth-century colonists included settlers from British Caribbean islands, particularly Barbados. These colonists brought a cultural model that included political acumen, a drive for social and economic improvement, and familiarity with a plantation system based on enslaved labor.

European Settlement of Charleston

The original Charles Town settlement was protected, but low, marshy, and too far from the coast. Settlers searched for a more suitable location. Oyster Point proved attractive and increasing numbers of colonists left the inland location for this coastal peninsula. Leaders of the colony sanctioned this trend, noting it was "ideally cituated [sic] for trade." Robert Weir notes, however, that the peninsular location was not ideal, and the town's future was uncertain until the end of the seventeenth century. Mortality rates were high and population growth was slow (Hart 2010; Matthews 1954; Poston 1997; Weir 2002). In the first year of colonization a late October freeze killed the settlers' crops "before they could come to perfection." The "sharp and cold" winters, according to one colonist, killed "any thing of a Comodity [sic]," including sugar cane, cotton, and ginger (Smith 2020).

The area of high bluffs and relatively narrow marsh fronting onto the Cooper River was best suited for shipping, and in the 1680s settlers founded a new town bounded by present-day Water, East Bay, Cumberland, and Meeting streets. The highest land, between Vanderhorst's and Daniel's creeks, was the focus of the earliest settlement. This location coincided with the narrowest reach of marshland and overlooked the harbor's deepest waters. An early plan of

Charleston, called the Grand Modell, divided the peninsula into deep narrow lots and guided development of the city for several decades (Wilson 2016).

The creeks were natural barriers and were enhanced with fortifications. By 1686, an earthen "tranchee" protected a stretch of the Cooper River between two small wooden forts. After years of erosion, the General Assembly authorized construction of a brick "wharf wall" or "curtain line," augmented by brick fortifications. Queen Anne's War in 1703 prompted work that subsequently enclosed the entire town in a system of entrenchments, flankers, parapets, bastions, redans (triangular projections in the defensive wall), and a town gate at Meeting and Broad streets (Butler 2008; Butler et al. 2012; Leland and Resinger 2006; Saunders 2002). French and Spanish threats necessitated fortifying the city, and the settlement was walled completely by 1711.

The Grand Modell encompassed the high land from Oyster Point to present-day Beaufain Street (Earle and Hoffman 1977; Poston 1997). The town was laid out around a central square and divided by wide streets into deep, narrow lots, a plan imposed on Irish towns colonized by Britain (Reps 1965). The relocated Charles Town featured narrow buildings and steep roofs presenting a decidedly medieval appearance in the 1739 Prospect (Coclanis 1984; Poston 1997).

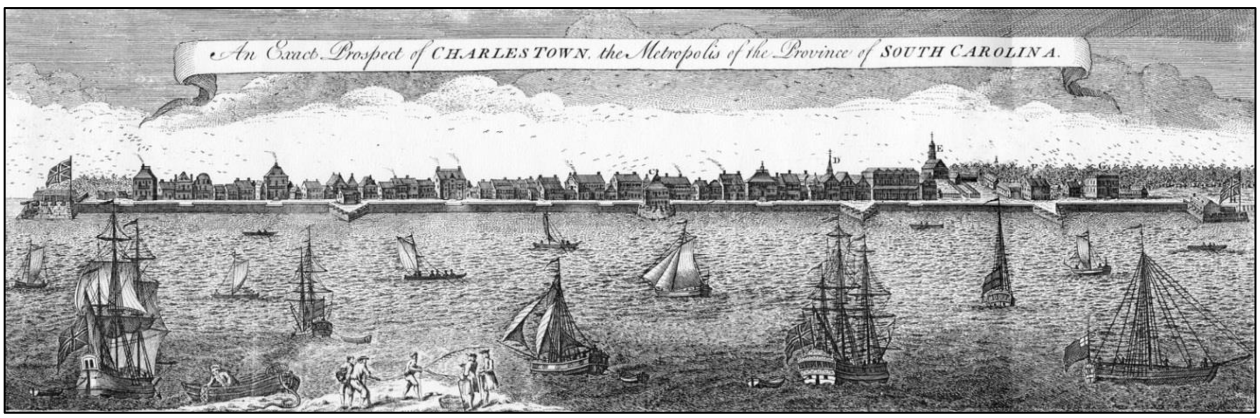

Figure 5-1: *An Exact Prospect of Charles Town*, by Bishop Roberts, 1739. Museum of Early Southern Decorative Arts.

Charleston and the Colonial Economy

Numerous Native American groups resided in the Lowcountry when the first colonists arrived; 18 groups are known by name. Some Native people moved to avoid the colonists; others were attracted to the colonial settlement for trade. This competitive, informal trade was Carolina's first profitable venture. The deerskin trade provided the colony with an export commodity, but also created thousands of consumers of British goods. The deerskin trade became larger and more organized as the eighteenth century progressed. As this project attests, the export of cattle, in barrels and on the hoof, was the second profitable venture.

Rice, introduced to the colony some time before 1695, made some Carolinians wealthy. Rice required many years of experimenting, and many shiploads of enslaved Africans from that continent's rice-growing region, before it proved profitable. Indigo flourished on high land where rice did not. But, like rice, it was a demanding crop, and fetid water was a byproduct. The third agricultural development of the eighteenth century was the development of tidal rice cultivation. Planters continued to use their inland rice fields while developing new tidal ones (Smith 2020). Charleston provided the shipping and business hub of these commodities:

importing manufactured goods and enslaved Africans; exporting plantation staples and naval stores.

The Yamasee War of 1715 took a toll on Native people living near Charleston. Following that war, white settlers moved deeper into Native lands as rice plantations expanded. The development of outlying communities, following the Township Plan of 1730, brought an influx of products to the city from the backcountry. These, along with rice, naval stores, deerskins from the Native American trade, prompted the rise of Charleston merchants as an influential group (Rogers 1980; Stumpf 1982).

<u>Growth of the City</u>

By the 1730s, economic success, largely from rice, transformed Charleston from a small frontier community to a trans-Atlantic mercantile center. This trend received a boost in 1719, when royal rule replaced the inefficient Proprietary government after the Yamasee War and a revolt by the settlers. This transformation was complete by 1729 (Clowse 1971).
As threat of invasion faded and prosperity grew, the city expanded beyond the fortified city wall (Roberts and Toms 1739). The city spread west to the Ashley River and south to the tip of the peninsula, though settlement on the periphery was sparse. The three landward walls, constructed of earth, were dismantled, a task largely complete by the 1740s (Butler 2008; Poston 1997:49). The major fire of 1740 destroyed much of the early city, and the medieval-style architecture was replaced by more modern, Georgian-style structures. The area defined by the wall remained densely settled, with subdivided lots filled with more and more buildings.

Figure 5-2: *Ichnography of Charles-Town, 1739* (Roberts and Toms). Collections of The Charleston Museum.

As the eighteenth century advanced, the economic importance of Charleston and the relative affluence of its citizens increased. Per capita income for Europeans was among the highest in the colonies (Edgar 1998:153; Garrett 1999; McInnis 2005; Savage and Leath 1999:55; Weir 1983). As planters and merchants became more prosperous, they acquired goods suitable to their elevated social station. By the eve of the American Revolution, Charleston was the wealthiest and 4th largest North American colonial city. Personal accoutrements poured into the colony from Europe and elsewhere in the form of furniture, silver, tableware, clothing, and paintings. Imports were matched by a rise in skilled local craftsmen, particularly cabinetmakers and silversmiths. They, and their enslaved workers, produced this finery (Burton 1968, 1970; Hollan 2021; Rauschenberg and Bivens 2003).

Monumental public buildings cemented the visual image of Charleston as an economic force and symbolized the prosperity and prestige of the city. The Exchange Building was built at the foot of Broad Street in 1771 over the foundation of Half Moon Battery, formerly an important part of the city's defensive wall. The new building dominated the skyline when viewed from the Harbor. Charleston continued to be a fortified city, but was no longer a walled city. The State House, built in 1753, and St. Michael's Episcopal Church, built in 1752, were adjacent to the city square at the intersection of Meeting and Broad streets, formerly dominated by the town gate (Joseph et al. 2000; Lounsbury 2001; Saunders 2002; Weir 2002).

While the intersection of Broad and Meeting streets became the administrative center of the city, the waterfront remained its economic center. Factors, commission merchants, and retailers clustered on the wharves and along East Bay Street. As the eighteenth century progressed, more and more wharves were built in front of the original brick curtain line. Government officials who thought that breaches in the curtain line left the city vulnerable to attack were overruled by those who argued that closing these passages would impede trade (Butler et al. 2009; Joseph et al. 2000).

The city's wealth and cosmopolitan nature gave rise to some of the colony's earliest public intellectual institutions. The Charleston Library Society, modeled after those in Britain, was founded in 1748. The Charleston Museum was founded in 1773, becoming the nation's first public natural history museum. These institutions galvanized around investigations into the region's natural history, beginning with John Lawson's "New Voyage to Carolina" in 1700 (Borick et al. 2022; Fraser 1989; Lefler 1967; Rogers 1980; Taylor 1998).

In the first half of the eighteenth century, South Carolina prospered under British rule and the demand for colonial commodities provided a favorable balance of trade. After the Seven Years War in 1763, relations between the colony and Britain deteriorated. Financial difficulties caused Britain to demand a greater share from the colonies. To secure collection of these monies, Parliament sought to tighten the administration of the Navigation Acts. Royal placemen arrived in Carolina to take over lucrative and important positions held by residents of the colonial community (Edgar 1998:219; Rogers 1980:41). The British parliament also sought to impose several direct and indirect taxes upon the American colonists.

Charleston and the American Revolution

On July 4, 1776, 13 British colonies in North America proclaimed their independence from the British Empire. The first British attempt to capture Carolina came in 1776, but was unsuccessful. Warned of another attack in late 1779, General Benjamin Lincoln ordered earthworks to be built. This consisted of a parapet, lined with batteries, redans, and redoubts along its length, at roughly Vanderhorst Street. The Americans created a moat in front, known as the canal, by trenching from a significant tidal creek. Behind this main defense line was the hornwork, a tabby fortification in today's Marion Square. The British soldiers approached these works by digging parallels, or approach trenches. They began this effort on April 1, roughly along Spring Street to Hampstead Hill on the east side of the peninsula. The second parallel, following from a direct approach, was half a block north of Mary Street. Another approach trench was initiated on April 19, and the third parallel was begun on the 22nd. Again, British troops dug to the left and to the right. On April 25, they reached the dam, and began draining the canal. Archaeological explorations behind the Aiken Rhett House in 2017 located a portion of this third parallel (Borick 2003; Borick et al. 2017).

After a lengthy siege, British troops took the city on May 12, 1780, beginning an occupation that lasted two years. Homes such as Rebecca Motte's mansion were used to quarter troops. Some Charlestonians were imprisoned and others were exiled to St. Augustine (FL) during that city's British occupation. Carolinians also were plundered of "enormous wealth." Occupation forces did, however, clean up the city, hauling rubbish to unknown locations. The British occupation brought other changes, including new imported foodstuffs (Borick 2003; Fraser 1989; McCrady and Bragg 2020; Shepherd 2014; Wallace 1961).

The war only briefly interrupted the city's economic growth. The war's physical and economic destruction offered rice planters an opportunity to begin cultivating in tidal swamps. These swamps were cleared, diked, and ditched. Between the 1760s and 1780, the population of enslaved Africans doubled (Kovacik and Winberry 1989; Porcher and Judd 2014). After the Revolution, the bounty on British indigo ended but long-staple Sea Island cotton emerged as a viable replacement. Development of the cotton gin by Eli Whitney in 1793 mitigated the labor required to cultivate cotton and prepare it for market. Experimentation by the Burden family of Johns Island improved the strain (Porcher and Fick 2005). The first post-Revolution cotton crop reached Britain in 1785.

The city was incorporated and renamed, from Charles Town to Charleston, in 1783. At the same time the city limit was moved four blocks north to Boundary (now Calhoun) Street. The ever-growing population was accommodated within this small space by subdividing lots and expanding into the centers of established blocks (Hamby and Joseph 2000; Poston 1977; Powers 1994). The area known as Charleston Neck, north of the city proper and some distance from the wharves, developed more slowly. King Street, the main road from the backcountry and the location of large cattle pens in the eighteenth century, became the city's commercial and retail center. Retail merchants followed their customers up King Street as residential sections expanded. Residences and work places increasingly were separated and neighborhoods of wealthy planters appeared (Fraser 1854).

Charleston in the Nineteenth Century

Planting using the labor of enslaved Africans continued to amass wealth for European Lowcountry residents. By the turn of the nineteenth century, prime rice lands were affordable only to those families already financially secure, and landholdings were consolidated through marriage among planter families. Historian George Rogers suggests that Charleston society became "closed" to outsiders or newcomers by the middle of the antebellum period. Tidal rice and Sea Island cotton stimulated two decades of prosperity for the city (Edgar 1998; Kelly 2013; Rogers 1980). Gene Waddell (1983) suggests that although Charleston appeared prosperous in the 1850s, the city's economic standing had slowly declined after 1800. Most good agricultural land already was under cultivation, and soil fertility was depleted. Concentration of desirable land in the hands of a few families was matched by a concentration of human property (Waddell 1983).

Over-production of cotton throughout the region, however, led to a collapse in prices in 1819 and a national depression that was long-lasting. During the depression, some planters tried to reform agricultural practices and make more efficient use of their land and enslaved labor (Chaplin 1993). Eventually both rice and cotton production in the Lowcountry faced competition from the Mississippi region. Many planters moved their operations and their enslaved people to these areas; by 1850, Charleston had a white majority for the first time since 1708 (Rosengarten 1986). The development of steamboats and railroads changed the region's transportation network. Steamships meant shipping was no longer dependent on the trade winds, while rail lines provided inland planters efficient ways to move crops to markets. Gulf coast cities of Mobile and New Orleans became depots for inland cotton, while Charleston benefitted little from these transportation improvements (Fraser 1989:197-198).

Progressive citizens encouraged industrialization and economic diversification. Many of the new urban enterprises were located on Charleston Neck, north of Calhoun Street. The Neck, too, housed the majority of new Irish and German immigrants after 1820 (Joyce 2002). The Neck also housed many enslaved African workers, "living out" away from their enslavers, as well as a small but influential group of free persons of color (Wade 1964; Wikramanayake 1973). The area between Calhoun and Line streets was annexed into the city in 1849, becoming Wards 5-8, principally to impose police control over the area (Haney 2017; Herman 1999; Powers 1994; Rosengarten et al. 1987).

Through the first half of the nineteenth century, enslaved workers built the city and labored in its markets. Many were classified as laborers, servants, or porters, but others worked as coopers, blacksmiths, millwrights, carpenters and bricklayers. Women worked as seamstresses and fruiters. Enslaved men dominated the maritime labor force as wharf hands and boatmen. Historian Bernard Powers notes that these skilled positions involved little direct supervision and a good deal of mobility; enslaved city dwellers were relatively well-traveled (Clifton and Ellis 2017; Harris Lynn 2014; Powers 1994; Wade 1964).

Enslaved artisans were routinely "hired out" by their owners, both short-term and long-term. This required a license from the City, and in Charleston these took the form of a copper badge, to be worn or kept on the person. Many badges are recovered archaeologically and provide a record of the year of hire and the skill level of the wearer. Badges for "porters" and "servants" are common. There were also badges for vendors, hucksters, and butchers, but those labeled "fisher" and "fruiterer" were the most expensive (Greene et al. 2004; Singleton 1984).

Beyond the 1819 financial depression, another event shaped the economy and the politics of the city in the early nineteenth century: the purported slave uprising of 1822, led by freedman Denmark Vesey. Vesey arrived in Charleston as the property of a sea captain, then purchased his freedom with winnings from a lottery. He worked in the city as a carpenter. He and a small group of co-conspirators, including enslaved skilled workers, reportedly arranged for between 6,000 and 9,000 enslaved plantation workers to join the cause, some from as far away as the Santee River. The plot was betrayed by an enslaved worker who informed his owner. Over 100 suspects were brought to trial; some were executed while others were transported out of state. The overall plan is unclear, and some scholars doubt that an actual plan was in the works (Egerton 1999; Lofton 1983; Robertson 1999). But the perceived threat of rebellion resulted in increasingly harsh restrictions on Black city residents, both enslaved and free (Greene et al. 2004:41-42; January 1977; Rosengarten et al. 1987).

By the second quarter of the nineteenth century, many American cities had developed centralized business districts, separate residential, business and industrial zones, and improved public transportation. Charleston embraced many of these changes, but implementation often lagged. Civic improvements often followed natural disasters. Fear of fire, preventing fire, and rebuilding after fire are recurrent themes. Fires devastated large swaths of the city in 1740, 1778, 1796, 1835, 1838, and 1861. After each fire, legislation required building in brick, rather than wood. One draw of the unincorporated Neck before 1849 was the opportunity to build with less expensive materials. Hurricanes also struck the Carolina coast regularly, with active cycles in the first decades of the nineteenth century, then again in the last years of the century (Fraser 2006). While widespread fire was principally an urban phenomenon, hurricane winds and storm surge devastated urban wharves as well as plantation lands.

The low-lying peninsula, dotted with creeks and marshes, was susceptible to flooding, or simply to standing water. Stagnant water contributed to disease, spread by vectors ranging from mosquitoes to rodents. Filling low-lying areas, often with organic debris, refuse, and offal, was an ongoing effort. Well-constructed drains were another solution (Butler 2020). Filling resulted in new, useable real estate as well as reducing standing water, though filled areas remained low and disease-ridden.

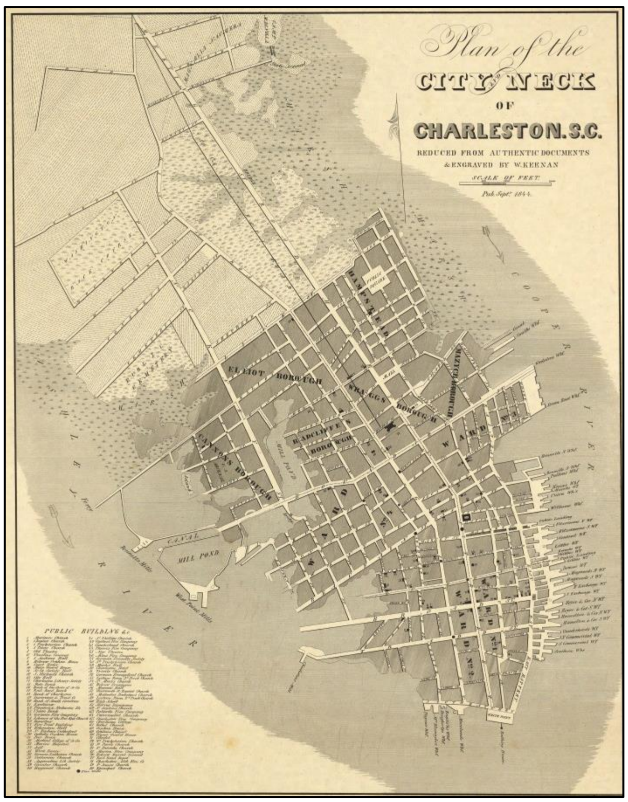

Figure 5-3: *Plan of the City Neck of Charleston in 1844*, by Keenan, showing Wards 5-8 and the Neck beyond Line Street. South Carolina Historical Society.

The City During and After the Civil War

Rice and cotton planter families living on trans-Atlantic credit did not see the changes looming as calls for secession from the United States mounted during the 1850s. South Carolina led the rhetoric that defended slavery and the economy of plantation agriculture. Shots fired from the battery on Fort Sumter in Charleston Harbor in April, 1861, signaled the onset of the Civil War. The city felt little of the war’s impact for several months; instead, much of the heart of the city was devastated by Charleston's largest fire to date a few months later. The fire began on the evening of December 11, with a campfire on the wharves tended by enslaved refugees from the country. Rising winds fanned the flames and by daybreak the fire had cut a swath diagonally across the peninsula, from the Cooper River to the Ashley River. Bare lots and blackened ruins remained for decades (Mazyck 1875).

Following the fall of Port Royal to the Union in November, 1861, refugees crowded into the city. By 1863, the city was blockaded and under siege. Repeated bombardment of the lower peninsula drove residents up the Neck or out of town. By 1865, the city's ability to resist was broken, and Confederate general P.G.T. Beauregard ordered the city evacuated. Retreating Confederate troops set fire to piles of cotton stored in public places, to keep it out of the hands of the enemy. The fire at the Northeastern Railroad ignited a stash of gunpowder, triggering an explosion that killed 150 (Burton 1970:321).

Union troops arriving in Charleston, including the Twenty-First United States Colored Troops and the 54th Massachusetts, were greeted warmly by freed people who remained in the city, as well as recent immigrant laborers. In the weeks that followed, the city's African American population expressed their appreciation for the Union army through parades, meetings, and ceremonies, including raising of United States flag over the ruins of Fort Sumter on April 14. African Americans were elected to municipal and state offices. The occupying Union army remained in the city until 1876 (Williamson 1965:48-49). After 1877, white Democrats controlled state and local government; neither black nor white Republicans were elected to these governing bodies for decades (Fraser 1989:301).

Many of the city's white families remained refugees beyond the war's end in 1865. Those who returned to their townhomes took in boarders or found other means to support their households. Some freedmen remained in the service of their former enslavers, but most did not, and staff operating townhouse properties was greatly reduced. The formerly enslaved were now citizens, and they made their own decisions about where to live and work. Bernard Powers notes that the desertion of domestic servants was particularly common. The city once again had a black majority, resulting from in-migration of rural freedmen (Cote 2000; Harris 2001; Powers 1994; Williamson 1965).

The emancipation of enslaved field workers and disruption to the credit system ended profitable rice production. In 1867, 90% of the plantations on the Cooper River were idle. Planters contracted with freedmen for labor, but many refused to do the most dangerous and miserable tasks, particularly the winter work of digging and maintaining ditches and dikes (Harris 2001; Porcher and Judd 2014; Rosengarten 1986). A series of devastating hurricanes between 1893 and 1911 destroyed rice dikes up and down the coast (Fraser 2006; Grego 2022).

The postbellum economy diversified. Some planters tried new crops. Lumbering and turpentine were important late-nineteenth-century industries, extracting pines and hardwoods from abandoned rice and cotton fields (Porcher and Judd 2014; Smith 2012, 2020). Phosphate rock, abundant and long considered a nuisance, became recognized as a source of fertilizer. The city's economy rebounded, and 1883 was the best year since the Civil War. Truck farming, crabbing, and shrimping were profitable. Charleston remained the largest port south of Baltimore (MD).

African Americans worked in these and other extractive industries. The phosphate industry employed 3,000 black miners and an additional 1,000 workers in 11 processing plants on the Neck (Fraser 1989:308). McKinley (2014) describes the role of freedmen in the phosphate industry, as they resisted efforts by factory workers to impose strict work rules. Instead, freed people brought work patterns from the task system, where they carved out time for their own work. They continued to raise subsistence crops and support urban markets with produce, game, and fish. Some freedmen bought land, often in pine forests adjacent to rice lands (Harris 2001; McKinley 2014).

Charleston's economic prosperity of the 1880s "was illusionary" (Fraser 1989:310). Although briefly a profitable extractive industry, phosphate fell victim to more productive mines in Florida (Harris 2001; McKinley 2014; Shick and Doyle 1985). The economic stagnation that had waned in the 1880s returned, and by 1900 the city's economy was stagnant. The South Carolina Interstate and West Indian Exposition opened in 1901, organized to attract worldwide attention, but the Exposition closed early and failed to attract new economic ventures. Charleston's economy did not recover until World War II, bolstered by growth of the Charleston Naval Base (Fraser 1989; Waddell 1983; Williams 2010).

Never far removed from natural disasters, Charleston and the Lowcountry faced a series of devastating hurricanes in the late nineteenth century. The Sea Island hurricane of 1893 damaged the city and destroyed the Ashley River bridge. But the worst damage was to the sea islands south of Charleston, where a tidal surge drowned over 2,000 Black sea island residents. This, and subsequent storms, destroyed many of the still-functional rice fields and signaled the end of that industry (Fraser 2006; Grego n.d.). The phosphate infrastructure was also a victim of the 1893 hurricane; that storm destroyed rice fields and phosphate dredges with equal energy.

Although hurricanes and fires were familiar to Charleston residents, 1886 brought a new event: the most powerful earthquake to strike the East Coast of North America. Nearly 2,000 buildings were damaged, most of them on the filled creeks, or "made land." Rebuilding the city and distributing aid reflected the racial inequities of the Tillman era (Stockton 1986; Williams and Hoffius 2011). Ben Tillman, a populist reformer, Democratic governor, and later senator, controlled the state from the 1880s until his death in 1918. Tillman was known for his aggressive language, his white supremacist views, and his "redshirt" campaign of terror against Black citizens during the 1876 election. A new state constitution in 1895, championed by Tillmanite politicians, almost completely disenfranchised African American voters (Kantrowitz 2000).

At the turn of the twentieth century, under the direction of Mayor J. Adger Smythe, efforts to make Charleston a healthier city continued. Streets and sidewalks were paved. The Cannon mill pond on the west side of the city around Calhoun Street was filled. The Charleston City Railway company operated the first electric trolley in the city in 1897. The first telephone poles appeared in the late 1890s.

Dr. Henry Horlbeck was appointed the city's health officer and he led a campaign to rid the city of some 10,000 privy vaults. A modern sanitation system was approved, but only a small portion of the city south of Broad Street was connected. When excavation of drain lines continued into the summer, citizens complained, as many believed disturbing the soil in the summer caused miasmas. But Charleston still was plagued by antiquated public health infrastructure. Some 12,000 privy vaults remained the primary means of waste disposal, their remains leaching into the soil and groundwater. Some citizens continued using water from adjacent wells, rather than the new piped water. Over half the streets were dirt.

Dr. Horlbeck also urged laws for food inspection and establishing a modern abattoir. Fraser notes hogs wallowed in low-lying lots and the meat of slaughtered animals was often contaminated before it was sold. Some alleged that Charleston was "a dumping ground for all the condemned meat turned away from other cities" (Fraser 1989:344). Dozens of cows were kept for milk, both for private consumption and for sale.

Dr. John McFall, an African American born in Charleston in 1887, describes his mother keeping a cow in their yard on Calhoun Street during his youth. His job was to churn the milk for butter. Later, when the family moved to the poorer and less-improved western section of the peninsula, on Palmetto Street, his mother "grew" the milk business. McFall now cared for three cows, "cleaning stalls, boiling cow peas, passing out cow pea vine when available, mixing bran." The family also bought spent hops from the brewery, to mix with the cow feed. McFall's father built a small shop, where the family sold wood, vegetables, and other goods. As Palmetto Street was constructed on low, filled land, the McFall home also flooded frequently. The neighborhood suffered extensive flood damage during the hurricane of 1893 (Hollister 2021:49-65).

Demands for civic improvements increased during the late nineteenth century, most notably for a waterborne sewage system. By 1896 the City initiated a program of separate sanitary sewers, and removal of stormwater by a tidal drain system. The 1799 Middleton-Pinckney house was refitted as a pumping station and reservoir, tapping the artesian water system. Lack of funds, rather than lack of interest, kept civic leaders from completing such projects.

Mayor John Grace, elected in 1911, renewed efforts to modernize the city. Grace's Committee on the Streets paved streets in certain districts, and constructed new sidewalks, curbs, and drains. A year later, City Council banned dairies from the city and established a public abattoir, though many citizens ignored these acts and continued to keep cows in the city (Fraser 1989:354). Restaurant inspection began in 1914; the same year the old city pest house was closed. A Health Department laboratory under Drs. Mood and Banov was established (Banov 1970).

The economic stagnation of the postbellum era inadvertently preserved much of the city's architectural heritage. Many buildings slowly decayed. Others were subdivided as multi-family tenements. Appreciation for the city's history and architecture was fostered by the Charleston Renaissance, a cultural and artistic movement of the early twentieth century. The first archaeological investigation (by architects Albert Simons and Samuel Lapham) was conducted during this period. Impetus for the founding of the Society for the Preservation of Old Dwellings and the purchase of the Heyward-Washington House came from the dismantling of historic interiors for sale elsewhere (Bland 1999; Lapham 1925; The Charleston Museum 2022; Weyeneth 2000).

As historic buildings were restored, though, many poor and African American residents left for the affordable areas above Calhoun, then Line, streets. The racially integrated streets and neighborhoods that had characterized the city for decades disappeared from the lower peninsula. This trend continues today (Hutchisson and Greene 2003; Severens 1998; Yuhl 2005).

The Charleston Markets

Charleston supported a number of public markets during the eighteenth century, and two have been explored by archaeologists. The Proprietors of Carolina believed well-organized cities increased security, provided opportunities for trade, and promoted civilization (Weir 2002:67). The 1672 Grand Modell utilized the central square commonly identified with Philadelphia to divide the peninsula into deep narrow lots characteristic of seventeenth-century British colonial towns (Reps 1965:177; Wilson 2016:67, 115). This guided development of city lots until the second quarter of the eighteenth century (Poston 1997:48). Charleston's plan included lots reserved for a church, town house, and other "publick structures" (Thomas Ashe in Bridenbaugh 1938; McCord 1840: 3/458, 3/516). This location for a public square, though, was not central during the early decades of the eighteenth century; rather, it was nestled behind the city gates and drawbridge on the western edge of town.

The Colonial Markets

The earliest market, located at the northeast corner of Meeting and Broad streets and future site of City Hall, consisted of common lands and adjacent lots that gradually came to be recognized as a public square. In 1692, the South Carolina Assembly made permanent an act that, in 1690, had established a temporary market at the corner of Broad and Meeting streets (Bridenbaugh 1938:193). This was reconfirmed in 1710 and 1736 (Childs 1981:24; McCord 1840: 2/73, 2/351). Market Square soon became fixed in the minds of Charlestonians as a central landmark, even if it remained unimproved. Mary Crosse's 1698 will referred to her "three town lots situate near ye Market Place in Charles Town…" (Charleston County Will Book 1:71). Her lots bordered the north side of the market, and were later incorporated into the square (Childs 1981).

The early market probably began as a gathering place for wagons and small temporary stands manned by farmers and enslaved workers bringing produce from the surrounding countryside. As the town stabilized, vendors possibly constructed stalls that were more permanent. There were evidently other market locations in the early town, such as Andrew Allen's building at the foot of Tradd Street (Butler 2008).

In an attempt to be at least partially self-sufficient, many colonial Charlestonians raised a few animals, such as poultry, hogs, goats, and an occasional cow, for their own use. Even in the early town, crowded conditions evidently made the maintenance of these animals a nuisance to neighbors. As early as 1692 an act was passed to prevent swine from running loose in the streets. A 1698 statute indicated that residents must remove slaughterhouses, hog, cattle and sheep pens from the town proper (Waring 1964:15). In outlawing free-range cattle in the city, a 1704 statute (#235) referenced damage to the evidently earthen fortifications on the landward side of town (Shields 2003:3).

Slaughtering animals for the early markets took place in the streets or in the ditches outside the walls of town. This, too, soon was deemed a public nuisance and the legislature banned the practice in 1704 (Weir 2002:72). Under this scenario, the Charleston Judicial Center site, at the northwest corner of Meeting and Broad streets but just outside the city gate, would be a likely location for early slaughterhouses. While no formal facilities were identified, project archaeologist J.W. Joseph reports finding dense dark midden layers filled with bone (Hamby and Joseph 2004:229), a soil similar to Zone 10 in the Beef Market on the other side of the city wall. Possibly cattle were driven to the city along the Broad Path (King Street), the road from the city to the interior, pastured at New Market Plantation beginning in 1732, and slaughtered along the way (see next section).

Regulating the city's markets was a problem in Charleston as it was virtually everywhere. For a while, control over prices, weights and measures, forestalling, and other abuses was not even attempted in Charleston. This lack of control was denounced by the governor in 1706 as "a living sin" (Bridenbaugh 1938:193). In a vain attempt at control, a woefully inadequate law was passed in 1710. Under this act, royal placemen were appointed by the Duke of Newcastle to serve as market clerks. These men, of course, remained in England, authorizing local clerks to perform the actual oversight in Charleston. The deputies of absentee market officials had little motivation to be conscientious in their duties. Their negligence forced consumers to suffer from a lack of regulation that the Grand Jury decried in 1735 as an "intolerable hardship" (Bridenbaugh 1938:351-352).

Charleston's economic expansion in the 1730s was matched by physical expansion. The market was formalized and construction began on a brick market building at this time. In 1739 an act was passed "for the establishing of a market in the parish of St. Phillip, Charlestown; and for preventing engrossing, forestalling, regrating, and unjust exactions in the said town and Market." Legislation dictated: "that a public market shall be held and kept in Charleston, on every day of the week (Sundays excepted) as the place whereon a new Market-house has been lately built, which is commonly reputed to be the place appointed, established and laid out for a market place in the original plot or model of Charlestown" (McCord 1840:403).

The market at Broad and Meeting was apparently a landmark. Members of the business community often advertised their locations in terms of their relation to the market. Peter Laurens directed people to "his shop fronting the new Market Square" (*South Carolina Gazette*, November 7-14, 1741). The market district attracted both craftsmen and merchants throughout the colonial period. Saddlers, in particular, gravitated toward the market square and to Broad Street (Edgar 1972:305). While the gravitation of saddlers to the market neighborhood may be related to use of skins available from the butchered animals, it may just as well reflect the financial status of this trade. Other craftsmen whose work might be associated with the use of animal skins were dispersed through town. Tanners and leather dressers, as well as shoemakers were spread through town, possibly because they could not afford the higher rents of the city center.

The market area also served as a social center. This may have been especially true for less affluent town residents, who made their own market purchases instead of sending a servant or slave. In 1743 a shuffleboard was set up in a house on Market Square, "where Gentlemen may enjoy their Bowl and Bottle with satisfaction and be handsomely served" (*South Carolina Gazette*, May 9, 1743). Evidently, several such establishments were in close proximity to the market (see Shields 2003:7). The Roberts and Toms map of 1739 shows the new market building as a large brick structure on the southwest corner of the square; archaeological monitoring in 2004 revealed the building fronting directly on Broad Street (Zierden and Reitz 2005:221). It was reputed to be "well regulated and plentifully supplied with provisions" (Bridenbaugh 1955:82).

But being well-regulated was evidently a chronic challenge for urban markets. Vendors from the countryside frequently attempted to forestall the market by selling before the opening bell rang; townsmen often tried to monopolize the market by buying up quantities of goods in advance with the intention of profiting from the subsequently inflated prices. Unloading spoiled or otherwise poor-quality perishables was a constant complaint (Bridenbaugh 1955:82). A Charleston law in 1739 attempted to prevent these practices: "Any all and every Butcher or butchers, Poulterer and Poulterers, Country planter, Victualer, Ladder, Kidder, or any Person whatsoever, shall and may there sell, utter, and put up to open Shew or Sale, his or their Beef, Mutton, Veal, Lamb, Port or other Butchery Warees, Poultery, Fish and other Provisions whatsoever, upon every Day of the Week, except Sundays, from the Rising of the Sun all year Long, as long as he or they shall furnish the said Market, with good and wholesome Flesh and other Provisions…" (*South Carolina Gazette,* December 8-15, 1739).

Officials were constantly worried about unscrupulous or merely careless vendors whose weights and measures were inconsistent, or worse. In 1744, the Grand Jury in South Carolina complained of "due regulation of weights and measures throughout province not being observed" (*South Carolina Gazette,* November 5, 1744). Officials also found it difficult to enforce reasonable standards of quality, and the sale of tainted meat was a constant concern for both officials and customers. Another Grand Jury presentment of the same year protested the: “disregard of…proclamation in having drove, and still driving, distempered cattle through other peoples’ plantations, pastures, stocks, and lands, and even down to Quarter House (located on Charleston Neck near present-day Cosgrove Avenue) where several people have died lately; and people who have killed sick cattle and sold them at market, and people who have left their dead cattle unburied on their lands and marshes” (*South Carolina Gazette*, November 5, 1744).

By 1750 Charleston’s plantation-based economy was thriving, built on the enslaved labor of thousands of African people. As the eighteenth century advanced, Charleston’s economic significance expanded and, with it, the relative affluence of its citizens. White per capita income was among the highest in the colonies (Weir 1983). Personal wealth was matched by a rise in imposing public and domestic architecture, coincident with the opportunity for rebuilding provided by the fire of 1740 and the hurricane of 1752. City planners used these opportunities to rebuild the town center set aside at the intersection of Meeting and Broad a half-century earlier.

Re-shaping this area began with the 1739 construction of the brick marketplace, and continued with construction of St. Michael’s Episcopal Church across Broad Street in 1751 and construction of the State House on the opposing corner in 1752 (Lounsbury 2001). The remaining corner was improved a decade later with construction of the two-story treasury and guardhouse on the southwest corner. Architectural historian Carl Lounsbury suggests moving public buildings from the waterfront to a centralized location follows a pattern noted in other early American cities such as New York and Philadelphia. The visibility of the Statehouse and St. Michael’s, in particular, symbolized the prosperity and prestige of the entire community (Lounsbury 2001:16).

In 1760, the old market building was apparently adjudged unequal to its role in the growing town. The Commissioners of the Markets began construction on the same site of a “neat building, supported by brick arches and surmounted by a belfry” (Bridenbaugh 1955:82; Fraser 1854:32-22). According to documents, and to archaeology, the new market was constructed behind and beside the old, so that the 1739 building likely remained functional during construction. The new building thus sat back from Broad Street and was twice as long as the old. It was constructed of brick and again evidently a single story. It became known as the Beef Market. This large building was one of three markets serving the city for the next 40 years.

Archaeological excavations in 1984 and 2004 encountered much of the footprint of the 1760 market, as well as layers of debris deposited between 1760 and 1796, when the market burned. The 45-x-105-ft foundation was well preserved, though construction of City Hall on top of it evidently removed the building’s floor. A hard-packed sand surface (Zone 7) may be an original, unpaved market surface or foundation for paving. Zone 7 was covered by water-washed sand filled with small fragments of hacked bone (Zone 6). Soil stains near the foundation were evidence of wooden posts placed in carefully dug holes. Such posts may have supported hooks and pegs for displaying meats and other products, similar to the market at Old Salem (NC).

The walls likely had a series of arched openings. The description of the structure as “low” and its absence in the Charles Fraser sketch of the intersection suggests a single-story building. The southern façade featured a four-foot projection spanning the central third of the building. A central brick well and a large brick drain were integral parts of the 1760 market and likely were used for daily cleaning.

The market operated until it was destroyed in Charleston’s 1796 fire. A 1794 coin embedded in a deep layer of ash provided archaeological corroboration of that event. After this third market burned, it was not rebuilt. The central location of the Beef Market, once advantageous for bringing cattle to the city, now hampered the ability of butchers to slaughter on-site, or nearby, and to dispose of the waste easily.

As an urban center and an active Atlantic port, Charleston had access to a range of foodstuffs. "An English Traveler" in 1774 described the provisions available in the city: "beef, which on account of the hot weather is now reckoned out of season and but very indifferent can't be had under 4d per pound but in the winter it is much better at 2d per pound. Veal which is sold by the joint comes to about 5d per pound. The town in general is very ill-supplied with fish, which is not owing to a real scarcity for there are plenty to be caught if there were but proper people to seek after them, but as that is not the case they are scarce and dear; however that is pretty well made up for by having plenty of fine turtle one half the year from 4d to 8d per pound. Poultry is in general very good and reasonable, fine capons being at a shilling a piece and very good fowls fit for the spit at 9d and in the winter season here are fine wild ducks at 4d each, plenty of excellent otter-lines, partridges and quails at 2d each, with abundance of very fine wild turkeys weighing from 20 to 40 points from 3 to 5 schillings each, also plenty of venison at a guinea a buck, which tho' it has little or no fat is generally esteem'd good flavored" (Merrens 1977:284).

"English Traveler" likely was able to purchase most of these foods at the Beef Market, for his list matches closely the zooarchaeological specimens recovered at the site. "English Traveler" goes on to describe and price other resources available in Charleston, including butter, eggs, peas and beans, and "vegetables of all kinds at much the same price as they were sold for in and about London." "Most kinds of fruits" were available, and citrus was available from "a place called Providence." The traveler noted that oranges were scarce, but lemons and limes, "as well as pine apples" were available about half the year. The most common drinks were beer, made of "molasses and also of percymon" which he rated as much inferior to English beer. But Charles Town boasted the best Jamaican rum, and plenty of French claret (Merrens 1977:285).

By the third quarter of the eighteenth century, Charleston was evidently large enough to support additional markets. A fish market was constructed on Vendue Range (Queen Street) in 1770. This location was ideally suited to receive the catch by water, and to clean and prepare it for sale with ready access to the waterfront for the disposal of the waste. This, too, seemed to be the case for the Lower Market, constructed at the foot of Tradd Street, on South Adger's Wharf, in 1764.

The Lower Market was evidently a bustling establishment, as indicated by several references to the locale in the newspaper. A 1774 summary in the *South Carolina Gazette* lists the "Creatures killed and sold in the Lower Market for the previous year: "547 beeves, 2907 Calves, 1994 sheep, 1503 lambs, 230 deer, 797 hogs, 4053 shoats" (*South Carolina Gazette,* October 10, 1774; see also *Southern Agriculturalist* 1836, Vol. 9:165).

An early plat of the Lower Market, from 1767, shows a hip-roofed structure on a wharf, in front of "the wall," an angled portion of the brick seawall. By the final quarter of the eighteenth century, the Lower Market was a bustling center of activity for the city. Access to the market for vendors and customers, however, was hampered by the remaining curtain line and redan at the foot of Tradd Street (Butler et al. 2012). Even after the redan was demolished in 1785 (based on the Purcell plat), the curtain line remained an impediment for years. According to a resolution of the Charleston City Council in late 1785, once the old brick redan was finally removed, the Lower Market was enlarged onto the wedge of land abutting Tradd Street to the south, purchased from Jacob Motte in 1768 (Plat # 578, 8-1804). A new shed was built on the south side of the market property. These sheds were reserved for "those persons who come first to market with butter, poultry, wild fowl, or vegetables." They were given "preference of sitting under the shed" and each person shall "have as much room as is necessary" (*Columbian Herald*, May 11, 1786).

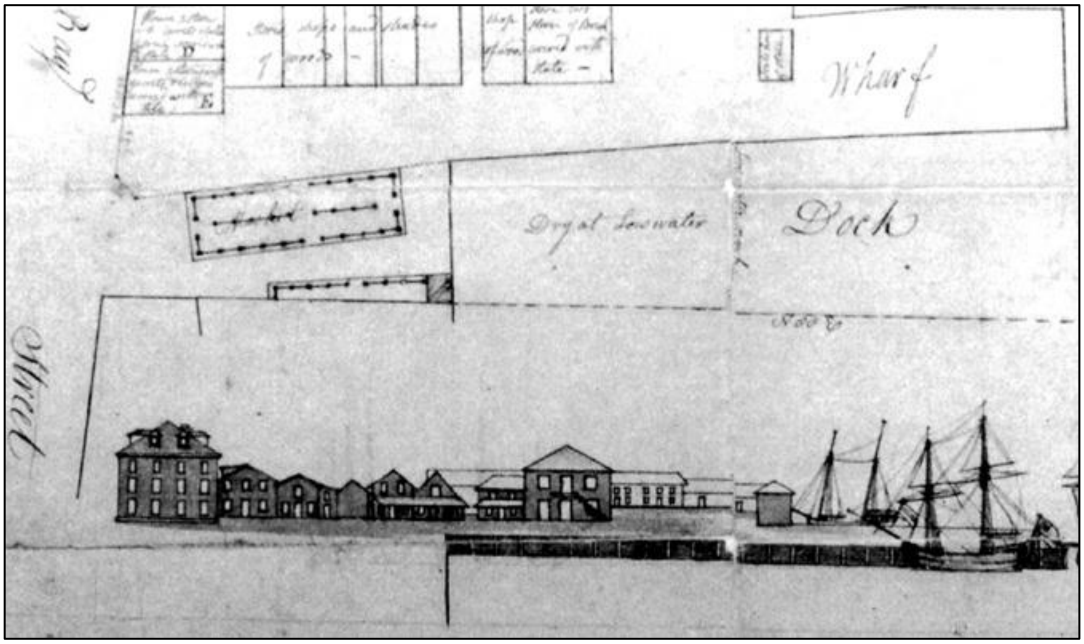

Figure 5-4: 1792 plat showing the expanded Lower Market (CCRMCO F-6, p 241).

At the same meeting of May, 1786, the Commissioners of the Markets addressed other issues plaguing the market. The Grand Jury noted "the very great number of dogs which are suffered to go at large through the streets, particularly those which crowd each market-place" and that the said dogs "worried the cows, horses, etc." and tended to "go mad." (*Columbian Herald*, May 11, 1786). To prevent this, dogs in the market could be killed (*City Gazette*, May 3, 1799).

Evidently dogs were not the only disorderly market attendants. The Commissioners of the Markets resolved that "all persons who bring poultry or vegetables to the Lower Market, be placed in two lines running west from the Market to the street….and the lines to be at least 10 feet apart." Those first would be ushered into the sheds on the south side, described above. First, the Clerk of the Markets would "employ a person to keep each of the markets clean, that they be obliged to sweep the markets twice each day, wash the stalls once each day, and the pavement in and round the markets three times each week," to "keep the markets as clean and sweet as possible" (*The Columbia Herald*, May 18, 1786).

The waterfront market, however, was still too small to accommodate Charleston's growing market needs, and the site was becoming too congested by the post-Revolutionary expansion of the wharves. In an effort to consolidate the city's market activities, the City worked to complete the new Centre Market to the north, closing the Beef Market on Broad Street, the Fish Market on Vendue Range, and the Lower Market on Tradd Street in 1799. The City sold the properties in early 1800.

Centre Market

A new, consolidated market was built on lands given to the City in 1788 by the Pinckney family, with a clause stipulating that the family could reclaim the property if the City ceased to use it as a public market. The complex still functions as the Charleston Market, though the products have changed, drawing thousands of visitors each year (Shields 2015:167).

Centre Market was built gradually, between 1790 and 1806, on a filled creek that once was the northern boundary of the walled city. The new market eventually stretched from Meeting Street to the waterfront. An impressive Market Hall, constructed on the western end in 1837, featured a frieze with ornamental ox skulls (bucrania) and rams' heads, signifying the presence of a meat market. The single-story market stalls were raised a foot above street level at that time (Leland 1980:37; Poston 1997:395-396).

A description of Centre Market in 1883 states that: "meats, vegetables, and fish are sold in separate parts of the market. The stalls are arranged on each side, with a broad walk between. The whole arrangement is quite convenient and well adapted to a Southern climate." Isabella Leland reported that the meats section featured "some 112 stalls, as well as three sections for vegetables, a fish market, and storerooms." Some decades earlier, the *Southern Agriculturalist* gave the following account of animals brought to the Centre Market for sale in the last quarter of 1836: "Beeves, 3081; Calves 583; Hogs 2718; Sheep, 1275, Lambs, 115; goats, 18; Wagons with Poultry, Bacon, &c, 260 and Venison, Game, &c." (Mazyck in Waddell 1983:18; Rogers 1980:87; *Southern Agriculturist* 1836).

Butchering for the Charleston Markets

Archaeological excavations on South Adger's Wharf in 2008-2009 revealed the brick redan of the walled city, preserved about a foot below the present surface. The documented removal of the redan in 1785 was represented by the tumbling of the parapets into the marsh below. The excavations also revealed extensive evidence of the Lower Market, including dense layers of midden and the paving documented in 1789. The waterfront location of the Lower Market likely meant that the remains of these butchered animals were deposited in the harbor.

The central location of the Beef Market on Broad Street, in contrast, likely hampered the ability of butchers there to slaughter on-site or nearby. Evidently in response to a recurring problem, a 1783 issue of the *South Carolina Weekly Gazette* reminded readers that the butchering of cattle "within the city limits" was prohibited (*South Carolina Weekly Gazette*, October 4, 1783).

Slaughter pens and houses were evidently located on the edge of town. Legislation was passed repeatedly to keep these facilities out of the city, but they remained annoying to neighbors, nonetheless. A grievance filed in 1764 complained that two men: "having Slaughter-pens and killing cattle, in and about Ansonborough; to the great annoyance of the neighborhood, by the filth and stench of their pens, and to the endangering of lives of passengers passing and re-passing on the public road" (quoted in Maag 1964:70).

A year later, a more elaborate grievance was filed: "we present as a grievance, the bad custom of butchers shooting cattle in or near Charles-Town, whereby many, who are near their pens, are in danger of their lives; and also, their bringing meat to market in very filthy carts, either uncovered or so exposed to the sun and dust, or covered with very dirty blankets or cloths, to the endangering the healths of the people of this town" (*South Carolina Gazette*, June 8, 1765 quoted in Maag 1964:71).

Butchery of cattle in close proximity to urban residents evidently remained a problem. A 1783 ordinance again banned the killing of cattle within the city limits, now located at Calhoun

Street (*South Carolina Weekly Gazette*, October 4, 1783). Construction of the Charleston Visitor Reception and Transportation Center in 1988 revealed a former creek filled with butchery refuse, particularly horn cores from a variety of cattle. This location was a few blocks outside of the 1783 city limits, on King Street, then known the Broad Path (Reitz and Zierden 2016; Reitz and Ruff 1994). The recovery of horn cores suggests horn (keratin sheath cover the underlying bone) was being removed here for local use or export. Horn was used for a variety of products (Armitage 1990). Maag records the export of some 10,000 in the 1760s (Maag 1964:76).

Table 5-1: Butchers in Charleston, from City Directory, 1790.

Beltzer, Christian	161 Meeting St.
Bieller, Joseph	26 Archdale
Buller, Jacob	13 Beresford (Fulton St.)
Bury, Richard	14 Beresford
Cameron, David	15 Trott St.
Cobla, Nicholas	36 Archdale
Cobla, Francis	161 Meeting St.
Fifher, George	103 MeetingSt.
Harman, Michael	George St.
Jackson, John	12 Liberty St.
McKenzie, Kennedy	29 Society St.
Miller, Benjamin	8 Burns Lane
Moore,Thomas	171 MeetingSt.
Moore, John	19 Hasell St.
Parker, Joseph	114 East Bay St.
Rivers, Thomas	1 Water St.
Strobel, Jacob	3 Magazine St.
Washing, George	146 Meeting St.
Washing, John	146 Meeting St.
Washing, Gasper	136 King St.
Williman, Jacob	Harleston Green
Willman, Christopher	227 King St.
Woolf, Matthias	2 Mazyck St.
Young, George	25 Guignard

Regulating the Charleston Markets

Regulation was made difficult by the number and variety of people who sold – and bought – goods at market. Historian Peter Hoffer describes the mobility and resulting quasi-freedom in describing the enslavers' dilemma: "The assemblymen refused to deny to slaves the practice of going to market for their masters, whatever liberties this allowed the slave to trade on the side for himself" (Hoffer 2012:37).

Enslaved people, from both the city and the countryside, made up a large portion of the vendors. These vendors huckstered a variety of items, both for their own benefit and that of the enslavers. Maurie McInnis notes that the practice of provisioning themselves and the urban market was encouraged by most planters. She notes that enslaved people brought their wares to the market on Saturday nights (McInnis 2005:184).

Local plantations, and particularly the enslaved who lived on them, were the primary producers for the Charleston markets. Historian Philip Morgan suggests that the enslaved of James Island, in particular, were an important, and distinct, link in the Lowcountry marketing system. He cites several references to James Island slaves who worked in the Charleston markets, surmising "an identifiable group of island peddlers had emerged by the late colonial period" (Morgan 1998:251). Many of the planters on James Island grew vegetables and fruits such as watermelons, musk melons, tomatoes, okra, peanuts, Irish potatoes, green peas, beans, squash, cabbages, turnips, and sweet potatoes for the Charleston market. In her path-breaking research on gunsmith John Milner Jr's Church Street occupation, Sarah Platt notes a *South Carolina Gazette* ad for his "mulatto man Joe," who had run away. Joe had been "seen since in market" likely waiting for "passage to Wappoo" (on James Island), "where he has been several times seen to bring hogs and poultry to Charles-Town" (*South Carolina Gazette*, January 29, 1763; Platt 2022).

The connection of Charleston markets to plantations is underscored by an ordinance of 1786: stalls at the Lower Market on Tradd Street were reserved "for the use of the planters that bring or send their own stock to market" (Edwards 1802:39). This meant that some were for favored black women hucksters. Such arrangements were stipulated again in legislation for the new, centrally-located market in 1807, providing "for the use of planters bringing or sending meat of their own stock or raising to market, there shall be reserved six stalls in the Centre Market" (Eckhard 1844:137).

After the Lower Market closed in 1799, the wharf at the foot of Tradd Street continued to serve as the arrival point for James Island hucksters and their wares, well into the twentieth century (Bresee 1986; see Frazier 2006). Historian Emma Hart describes the centrality of the wharves and waterfront to the market affairs of enslaved residents, noting that "Africans were essential to the movement of local provisions through and across the city's wharves" (Hart 2020:9). She notes that private wharves remained central to the provisions trade, even after construction of two waterfront markets. Hart describes the arrival of commodities on wharves as an opportunity for forestalling the markets. A commenter in 1772 noted "Does a boat come to town with corn, hogs, sheep, calves or other provisions, for the Charles-Town market, there are people who watch the wharves before day, to engross the whole…This sort of fraud, is practiced both by white and black people" (*South Carolina Gazette*, November 12, 1772).

Bondsmen and women from the countryside also sold their own eggs, chickens, and garden produce. Black women sold dry goods, cakes, and other baked goods. Black men and women sold all types of produce, small game, and fish in Charleston's markets and streets well into the twentieth century. Under the task system, labor was managed by assigning specific duties to enslaved individuals (Edelson 2006). When those tasks were done, workers could pursue their own interests. Much, if not most, of the city's produce came from the plantation gardens of enslaved workers and wild game and fish came from enslaved hunters and fishers, working on their own time (Hess 1992; Olwell 1996; Sharp 2018). Enslaver Adele Allston described gardens on her husband's plantation: "Each house has a garden, poultry-house, and hog-pen. These are at a distance from their houses & a man is employed to watch these night & day. Each person also has a piece of rice-land. I calculate the crop of each about 4 bushels, some making more, some none at all. I think that each of my Negroes above 16 has, at least 1 hog, many 3 or 4" (Adele P. Allston, miscellaneous papers in McInnis 2005:184).

Historians Robert Olwell and Emma Hart stress that Charleston's public market was the only "official institution in the colony where slaves played not only a central, but a dominant role” (Hart 2016, 2020; Olwell 1996:101). Historians have described the sale of produce and provisions by enslaved hucksters, working within and outside of the formal market system of Charleston. Both legislation and complaints about lack of its enforcement mention Black women selling in the formal markets in Charleston.

The entrepreneurship of enslaved Africans was the most common complaint among white townspeople. Most market regulations provided separate levels of retribution for infringements. A Grand Jury presentment in 1742 complained of “the unlawful practice of Negroes, buying and selling in the public market” (*South Carolina Gazette*, March 27-April 3, 1942). Four years later, “Many well-dispos’d Poor white People” complained of enslaved vendors who, as a result of non-regulation, forestalled the market and frequently sold goods “by very indirect methods.” The Assembly responded with a law that forbade enslaved sellers to vend anything except fish, oyster, and ‘herbage” (Bridenbaugh 1955:82). Despite repeated attempts at legislation, it appears that Black women dominated the market, and the monopoly had a direct effect on supply and price of goods in the city. In 1772, a “Stranger” commented on Black women around the Lower Market: “who are stated there from morn till night, and buy and sell on their accounts…these women have such a connection with and influence on, the country Negroes who come to market, that they generally find means to obtain whatever they choose, in preference to any white person” (quoted in Morgan 1998:250).

The city markets also presented opportunities for those self-emancipating to blend into the city’s crowds, while providing essential services. An advertisement for runaway, posted in 1744, described: “a lusty young Negro fellow, named Baccus, with a broad Face and large Feet, well known in Charles-Town, where he used to go about selling Greens, Fruits, &c” (*South Carolina Gazette*, June 11, 1744).

Enslaved vendors from the countryside who spilled into the city selling provisions were often the object of rancor and legislation. Traffic in the other direction – from town to country – was also cause for concern among the white population. In 1744 the *South Carolina Gazette* printed the following grievance: “We present, as a grievance, Negroes being allowed to go from Town into the Country, under Pretence of picking Myrtle berries &c and who at the same time carry Rum and other Goods to trade with Negroes in the Country, by which they are debauched, and encouraged to steal and robb their Masters of corn, poultry and other Provisions” (*South Carolina Gazette*, November 5, 1744).

Just as enslaved Black women dominated the local market, so too did Black men, at times, dominate the butcher trade. Philip Morgan notes that Charleston’s large urban market created specialized opportunities for men, and he noted several references to enslaved butchers in the eighteenth century. It is unclear in many cases if these men simply butchered on plantations for their owners or earned wages as butchers in the city market, or both (Morgan 1998:55). Historian Emma Hart notes that Africans were integral to every step of the supply chain, a working situation she denotes as “from field to plate.” Enslaved Africans were tenders and cow hunters in the field, but in Charleston they were also butchers, tanners, and tallow chandlers. Hart suggests that free white men in the livestock trades enslaved more workers than any other skilled trade. She describes the enterprise of butcher James Thompson in the late 1740s, who acquired three plantations stocked with cattle. Thompson used his enslaved herders to move cattle to his suburban pasture, where they were slaughtered. From there, the beef was transported to the market stall. John Robinson, who maintained his “A La Mode Beef House” near the market, employed “Five Negro Men Butchers by Trade” as well as a few indentured servants to purchase livestock, drive them to Robinson's suburban pasture, slaughter the animals, and sell at the market (Hart 2016:119).

Hart goes on to describe a free man, Leander, a butcher and meat dealer. He purchased his freedom from proceeds of his labor, becoming essential to the wharf-side marketplace and, thus, to the urban food supply (Hart 2020:10). Enterprising men such as Leander often ran afoul of the oppressive regulations aimed at persons of color. As a result of this free waterfront enterprise, town regulators worked to require Black traders to sell at formal markets, such as the Fish Market and an earlier East Bay Market, to better regulate the trade and the traders. During the 1780s, Leander was eventually charged with selling overpriced veal, resulting in a month's imprisonment (Hart 2020:11). A decade later, John Jackson advertised for the enslaved man Peter, who self-emancipated, presumably with his wife Sarah, enslaved by Mrs. Chambers. Peter was evidently "well-known in Charleston, having for upwards of four years attended a butcher's stall in the lower market" (*City Gazette and Daily Advertiser*, May 22, 1790).

Even as urban residents depended on enslaved women for their food supply, they worked to circumscribe their liberties. Complaints of their "insolent abusive manner" led to especially stringent legislation for establishment of the Fish Market in 1770 (*South Carolina Gazette*, November 1, 1770 in Hart 2020:11, 15n). Fishermen and their wives also huckstered in the streets, sold directly to rural plantations, and worked from wharves located outside the city. The control of boats and waterways by enslaved boatmen added to this fluidity. Enslaved urban marketeers also sold for their plantation counterparts, creating urban-rural "trading partnerships."

Black hucksters also peddled non-food items, described as "sundry sorts of wares." Robert Olwell published this ad from the 1771 *Gazette*: "a large quantity of Earthen ware &c. was seized from Negro Hawkers in Meeting, notwithstanding the many examples lately made by forfeitures for this atrocious offense" (Olwell 1996:105). Colonowares may be one product traded through the urban-rural "trading partnerships" described by Olwell. The lack of colonowares in the archaeological remains of the markets may reflect the extent that informal commerce was the principal means of transfer.

Figure 5-5: Badges for Fisher and Fruiterer. Collections of The Charleston Museum.

Processing Zones: From Woods to Markets

The processing zones for the Lowcountry cattle economy existed in three broadly defined areas in relation to Charleston. The outer-most region pertained to the ever-expanding large-acreage plantations. These large landholdings accommodated most of the cattle population and became synonymous with the free-ranging cattle economy during the colonial period. This rural zone served as a processing zone for both the export economy and surrounding rural population.

Moving closer to Charleston, a niche zone existed on the upper Charleston peninsula, "the Neck." This zone initially served as a rural processing zone consistent with the outer landholdings, but was transformed into a niche zone to accommodate the growing urban market by the mid-eighteenth century. Finally, a compact processing zone existed within the Charleston city limits. This processing zone catered almost exclusively to the urban market and residential population.

The rural plantation zone surrounding Charleston steadily expanded outward in relation to the growing colonial population and related demand for property. Cattle served as the initial Carolina commodity and existed on, if not before, establishment of rural property boundaries. The first decades of settlement coincided with cattle ranching. During the late seventeenth century, ranchers predominately established cattle plantations along the Ashley and Cooper rivers. As more people expanded into this core area, ranchers sought out less populated landscapes that were more conducive to free-range grazing and less vulnerable to nuisance or trespass laws. An example of this transition is highlighted by the Drayton and Izard families, who kept large cattle herds near the headwaters of the Ashley River during the first two decades of settlement. As the Ashley River corridor became more settled, however, later colonists looked south towards the Edisto River near Jacksonboro and Round O. As Lawrence Rowland, Alexander Moore, and George C. Rodgers, Jr. observe, "between 1694 and 1715, the principal cattle-raising area of South Carolina was the broad neck of high woodland between the Edisto and Combahee rivers in Colleton County" (Rowland et al. 1996).

Prominent cattle families - such as the Godfreys, Williamsons, Bellingers, and McPhearsons - developed cowpens that took advantage of ample freshwater access combined with bountiful grazing habitats and essential salt supplies. A 1734 account describes Godfrey's savannah as "…a large spot of clear land, where there never was any timber grew, and nothing but grass, which is exceedingly good for a stock of cattle, and on which they frequently settle their cow-pens. This savannah is about one mile over, and several miles in length" (Loring 1992). In April, the observer encountered James McPherson's cattle drive of 150 head traversing from the McPherson 500-acre cowpen at the headwaters of the Pocotaligo River to the Scottish settlement of Darien (GA), which "…caused joy in all our Settlement to find the Communication for Cattle by Land opened, whereby these Southern Settlements will be supplied with Milk and fresh Provisions, of which they have hitherto stood in great need" (*South Carolina Gazette*, October 9, 1736).

Cypress Barony, located in northeastern Charleston County, represents one of the early land partitions that provided a foundation for the colonial cattle economy. The barony was a 12,000-acre tract that the Lord Proprietors granted to Landgrave Thomas Colleton in August, 1683. The Lord Proprietors rewarded English and Barbadian gentry with these baronies, who in turn managed their landed estates like Old-World feudal estates. Thomas Colleton was the second son of Sir John Colleton, one of original Lord Proprietors of Carolina. The elder Colleton supported Charles I's unsuccessful campaign to keep the Crown during the English Civil War. The overthrow of Charles I in 1648 forced Colleton to flee England for Barbados, where he developed large and profitable sugar estates. Upon Charles II's rise to power in 1660, Colleton was rewarded as one of eight proprietors to the newly established Carolina (Dunn 1972; Weir 1997).

Cypress Barony land-use represents the agro-economic experimentation occurring on these large tracts during the late seventeenth century. Planters experimented with a variety of enterprises that reflected economic demands of the time. Furs, cattle, naval stores, provisional crops, timber, rice, and indigo were all popular commodities during the colonial period. Thomas Colleton was an absentee owner living in Barbados, so he depended upon Elias Horry to manage Cypress Barony. Horry, a French Huguenot, owned Hampton Plantation on the Santee River, but oversaw the enslaved laborers living on the highland settlement later called Limerick Plantation. In comparison, Thomas' brother, Governor James Colleton, grew rice, barley, wheat, peas, cotton, indigo, and Indian corn on his Wadboo Barony approximately eight miles northwest of Cypress Barony. James's overseer, John Stewart, experimented with rice cultivation, along with cotton and silkworm production (Lees 1981). When Peter Colleton sold Cypress Barony in 1707, he advertised 800 head of cattle and a total of 15 enslaved Africans living on the property. Contrary to Colleton's advertisement, cattle hunter Peter Herrington stated in a 1708 deposition that he could find, "noe (sic) more cattle then the Number of four hundred & Sixty head both great & small & that there were never was more to his knowledge and during his time of Imployment (sic) on the sd. Barony then the Number of five hundred and fourty (sic) head of cattle brought in one year" (Lees 1981).

With the connection of the Carolina cattle economy export to Barbados and other trade networks, the rural landscape provided ideal opportunity for free-ranging cattle processing zones. George D. Terry estimates that over 90% of St. Johns-Berkeley plantations were processing cattle between 1720-1729 (Terry 1981). Property owners established cow pens to round up cattle seasonally, typically during colder months to prevent spoiling, which they would slaughter, salt, and pack beef into barrels for market. Enslaved people manufactured keg staves and hoops on site from the abundance of oak and other available hardwoods on the property.

Rural environments provided a diverse landscape for free-ranging cattle. As described in Chapter II, plantations encompassed a variety of Lowcountry micro-environments from sandy upland pine barrens down to low-lying wetland marshes. Cattle hunters utilized these diverse landscapes to their advantage for providing nutrients to the cattle population. Planters observed which environments were well suited for cattle. For example, one Daufuskie Island plantation owner observed "that a large Quantity of hard Marsh, an extraordinary good Place for fatt'ning Cattle" existed on the property (*South Carolina Gazette*, April 26, 1740). Hard marsh was a desirable microenvironment for cattle ranchers along the coastal plain. This firm ground would support grazing animals without getting bogged down in pluff mud or other soft wetlands, while also providing salt tolerant grasses, like salt meadow cordgrass, with moderate amounts of digestible protein.

Despite the tradition of free-range cattle in the early colonial landscape, increasing plantation property holdings and resulting population density gradually placed restrictions on this mode of husbandry, motivating ranchers to move further into the Lowcountry frontier to pursue this practice. Colonial officials created a statute prohibiting the trespass of cattle onto neighboring property as early as 1694. The "Act for Keeping Sufficient Fences, and Keeping the Same in Repair" penalized property owners for allowing their livestock to stray onto neighboring property (South Carolina Statutes 111). This stature became increasingly relevant by the mid-eighteenth century on the Charleston peninsula, as advertisements increasingly promoted the containment of livestock on plantations for sale. For example, one 500-acre plantation located on the Wando River approximately 12 miles from Charleston, strategically has a "Fence of about 200 Panels" that stretches from the Wando River to a tributary, "which makes it easy both to raise and secure Cattle or Hoggs upon it" (*South Carolina Gazette*, June 21, 1742). As cattle ranchers were increasingly held responsible for strayed cattle in an increasingly populated region, and commercial interests shifted to the expanding rice and indigo markets, potential ranchers sought land further away from urban centers.

Plantations located on the Charleston Neck – the narrow peninsula of land stretching from the Charleston city limits to the confluence of Goose Creek and the Cooper River – during the late seventeenth and early eighteenth centuries were part of this rural landscape. However, as the urban population and resulting movement of the city boundary inland, these landholdings began taking on suburban characteristics. Charleston Neck plantations evolved from working agricultural properties to stock yards and large holding pens, while mid-eighteenth-century butchers began leasing land to process large cuts of meat. In 1783, for example, Gideon DuPont advertised that he ‘Has a large Pasture just without the Fortifications on Charlestown Neck, inclosed by a substantial fence, for the reception of such Horses and Cattle as may be sent on Common Point” (*South Carolina Gazette and General Advertiser*, April 29, 1783).

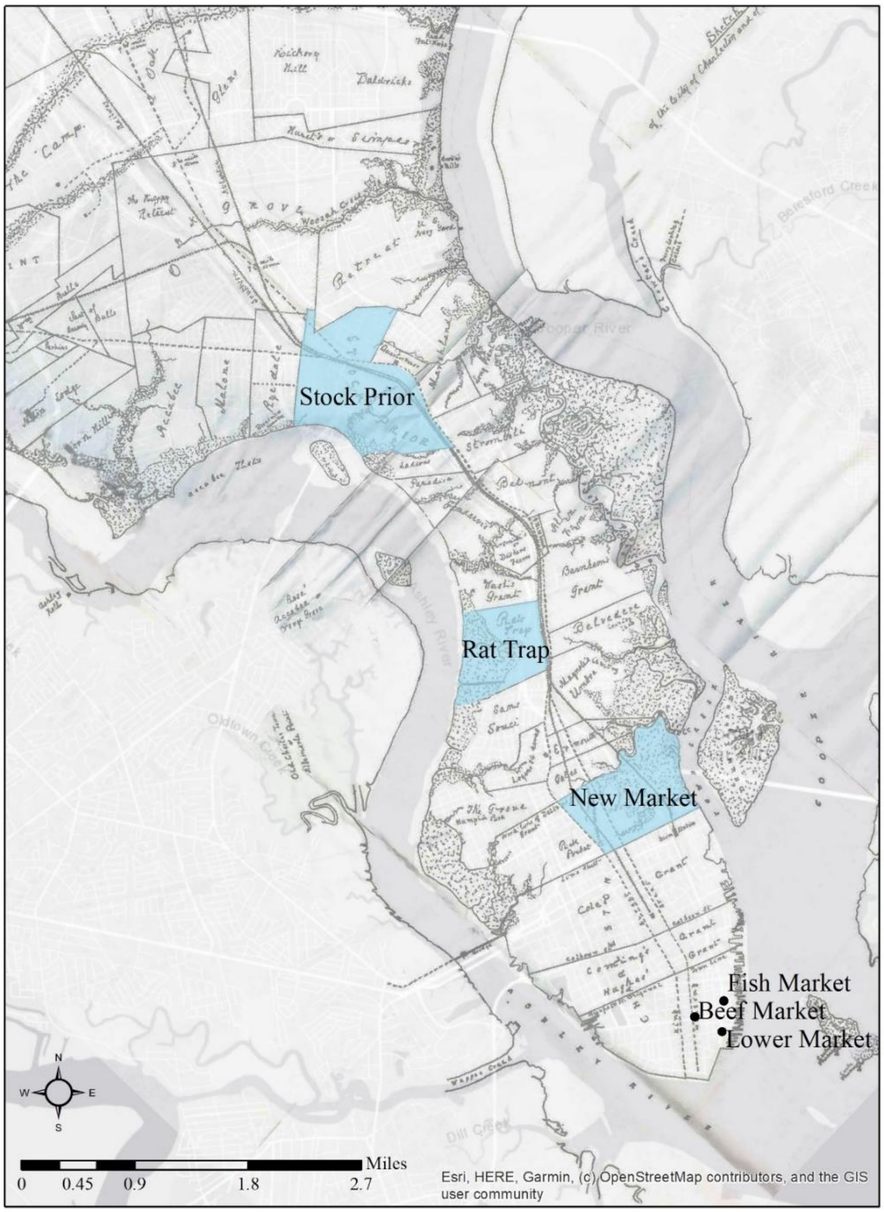

Figure 5-6: Location of plantations on the Neck, relative to Charleston’s markets.

Christopher Smith's landholdings represent this transition from a rural cattle zone to a conduit to the growing urban market. Between 1695 and 1705, Smith received 1,600 acres along the upper Neck. Dividing these parcels between Smith's Cowpen, or the Upper Stock, and Stock Prior, Smith devoted the properties to cattle ranching. His 1706 will lists both properties consisting of cattle, hoggs, and other livestock; along with pens, stables, and other outbuildings. After his death, surviving family members sold the property to Ralph Izard in 1709, whose descendants held the property for 122 years. Stock Prior was part of a conglomeration of properties on the lower Neck that were located within a few miles from the Charleston city limits. These properties served as suburban cattle pens for urban butchers to store their inventory and holding pens for rural cattle drivers to sell their stock. Throughout the eighteenth century, annual cattle sales were advertised in the *South Carolina Gazette* from these properties (Smith 1918, Smith Will 1706).

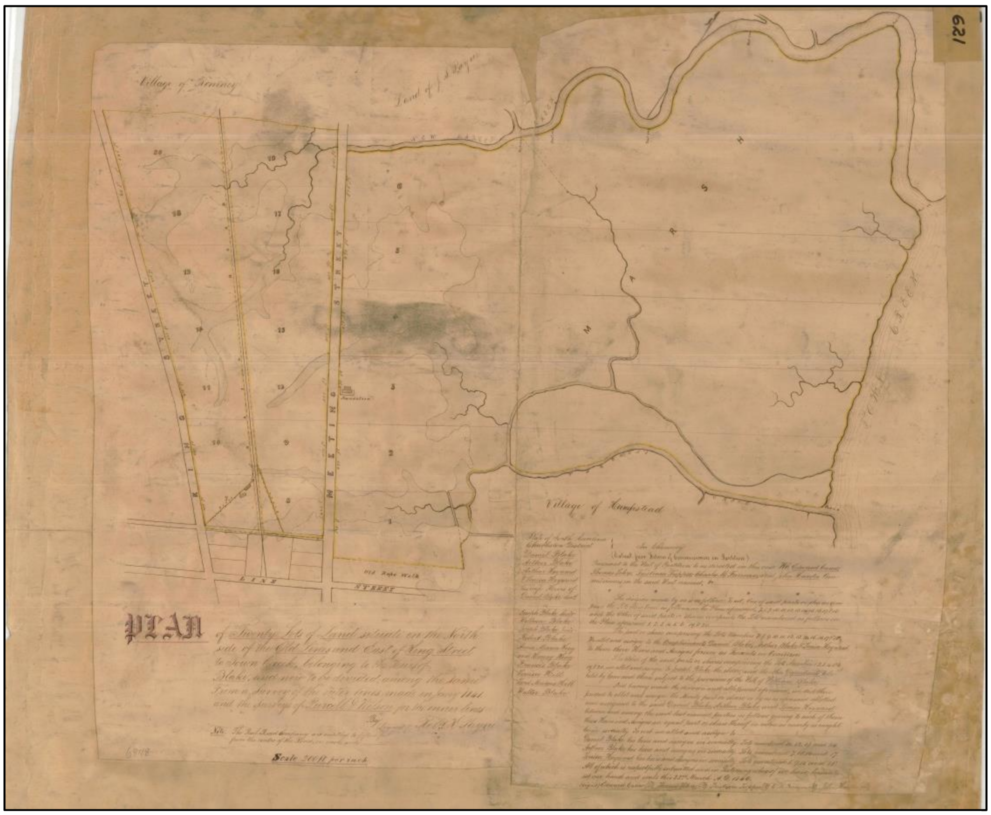

Figure 5-7: 1846 plat of Blake lands, formerly New Market Plantation.

New Market Plantation provided a variety of these services during the first-half of the eighteenth century. Located one mile from the Charleston city limits (and beneath the present-day Ravenel Bridge), the property existed on high uplands with New Market Creek bisecting the northern property boundary. The Cartwright family advertised the property for both cattle sales and holding pens. City commissioners by 1732 also leased the property as a holding pen for stray cattle roaming through Charleston or for city residents who are in "Want of Pasture for the Town Cattle." The commissioners charged "A Half a Crown a Head per Week," citing that the property was convenient for "Any Lad or old Negro fit for nothing else, can easily drive up, and bring back all the Cattle Night and morning" (*South Carolina Gazette,* September 9, 1732).

City commissioners' use of New Market Plantation as a holding pen, or "Common" in the words of nineteenth-century historian John Beaufain Irving, from the early 1730s to 1756 shows how Charleston residents altered land use practices to best suit the shifting demands of the neighboring market economy (Irving 1857). The property changed hands and was subdivided multiple times from the original 1,150-acre grant to Joseph Dalton. By 1712, Richard Cartwright acquired the New Market property and eventually willed it to his sons by 1733 (Smith 1918). The property's western boundary bordered King Street, which straddled the spine – or highland ridge – of the Charleston peninsula. New Market's elevation descended eastward towards New Market Creek and the Cooper River. The property suited the town's increasing need for a commons or cattle pen, as high land was limited but suitable grazing land found in tidal marshes bounded a majority of the plantation property.

The practice of using the Neck properties as grazing lands became increasingly popular during the second-half of the eighteenth century. Some plantations, like Rat Trap – located approximately two miles from Charleston on the Ashley River – were advertised as conducive for cattle grazing of "140 acres with good Pasture" and "very convenient for a Butcher" (*South Carolina Gazette*, September 3, 1737). Directly across the Broad Path (now King Street) from Rat Trap, the Belvedere Plantation owner advertised in the *South Carolina Gazette* with frustration, "WHEREAS many People make a Practice of rurning (sic) their Cattle out on *Charles-Town* Neck, to graze in any Person's Pasture they can get into" to which the plantation owner has "been several Times informed, that sundry Persons have been seen opening my Gates, and even taken down my Fence, to turn their Creatures in, to the great Prejudice and Starving my own." In frustration, Thomas Shubrick announced that he is "…now putting up a Pen; and, after the first Day of *June* next, will drive all Strays into it, to preserve my own Creatures from starving" (*South Carolina Gazette*, May 28, 1772).

The Neck plantations simultaneously served as cow pens for urban residents unable to adequately corral their animals on site and also as a stock yard for large cattle sales. The process of the cattle sales varied, as some auctions composed of a specific estate sale while other sales consisted of multiple estates. During the eighteenth century the Neck provided a strategic location for these cattle auctions; close enough to Charleston to attract a population of potential buyers, yet the large suburban acreage provided enough land and accessibility to drive large stocks to the cow pens for auction. Thomas Butler's plantation served as a cow pen for a liquidation sale of Joseph Hassfort's "Stock of 2000 Head of neat Cattle, and about 200 Horses and Mares" on March 9, 1748 (*South Carolina Gazette*, February 15, 1748).

Emma Hart (2020) also documents how butchers John Robinson and James Thompson used their plantations on the Neck as cow pens to conveniently house cattle awaiting slaughter for the urban Charleston market. Robinson's enslaved and indentured servants would purchase cattle from rural plantations and drive them to the Neck. Thompson had two rural plantations devoted to free-range cattle and his enslaved herders moved them to the Neck cow pen for slaughter. She points out, "the Charleston Neck area was the site of a number of pastures where butchers grazed live stock before killing them and supplying urban inns, markets, and households" (Hart 2016: 120). Butchers expanded their market by packing and selling salted beef to mariners on board ships. Enslaved porters and free entrepreneurs served as the conduit among these processing zones and the market. For example, Ansonborough trader Thomas Nightingale billed butcher Thomas Fullalove for "carting to town your barrel'd beef" along with "7 beer barrels, 2 hogsheads to salt your beef," plus storage for "salting and storing your beef" for a year and a half (Hart 2016: 120).

Hart (2020) suggests an additional processing zone for provisions: one consisting of the privately-owned wharves and waterfront of Charleston. Like other spaces, these were often the de facto domain of the city's enslaved. Those that forestalled or engrossed the market goods were often stationed on the docks, where provisions arrived from the country. Moreover, the boats bringing provisions were usually piloted by enslaved Black men. Construction of two markets on the waterfront was a deliberate effort to impose civic order on this trade (Hart 2020:9).

Livestock arriving in the city on the hoof from the Neck and from boats required pasturage in the city, even if for a brief time. The stray cattle nuisance and increasing stock yards reveal the changing processing zones taking place not only in the Charleston suburbs, but also within the city limits. Butchers within the city traditionally took up residence along the tidal creeks bordering the peninsula. These locations could simultaneously provide ideal grazing for small populations of cattle while utilizing the creek ebb and flow to discharge offal and other slaughter refuse. Early Charleston spatial patterns had wharves, dense settlements, and fortifications facing the Cooper River on the eastern side of the lower peninsula. Undeveloped marshland existed on the western and northern portions. As butchers allowed their cattle to graze in these pastures, they established butchering centers on nearby tidal creeks to dispose of the refuse. Yet, despite this strategic location, city residents who increasingly built houses outside of the walled city, complained about the remains and smell from the slaughter yards. Jacob Bommer and Thomas Sykes were sued in 1764 for "having slaughter-pens and killing cattle" in Ansonborough "to the great annoyance of the neighborhood, by the filth and stench of their pens, and endangering the lives of passengers passing and re-passing on the public road" (*South Carolina Gazette*, November 12, 1764). The following year Charleston residents expressed grievance to "the bad custom of butchers shooting cattle in or neat (near?) Charles-Town…" (*South Carolina Gazette*, June 8, 1765).

Land located along the western boundary of the Charleston city limits was occupied as a common for grazing cattle during the late seventeenth and early eighteenth centuries. This tradition stemmed from a combination of a 1694 statute penalizing cattle for trespassing onto other's property and a 1704 act to prevent people for slaughtering cattle in Charleston city limits. Butchers setting cattle out on unoccupied land and processing the animals without penalty set a precedent for butchering locations and habits during the eighteenth century. As Christina Butler points out, however, the ever-expanding Charleston population, and related city limits, simultaneously placed pressure on the commons and butchering profession. By the 1760s, Charleston commissioners established a defined common area of vacant marsh land along with a proposed canal near Broad and Lynch (now Ashley) streets "that laid the groundwork for the later creation of the Colonial Common." This common, located on the southwest side of the peninsula, continued as public land and was eventually transformed into Colonial Lake and the surrounding park by 1885 (Butler 2020).

Case Study: The Heyward-Washington Site

The Heyward-Washington archaeological collection looms large in the data psyche of the Charleston Museum archaeologists and their colleagues. The large and diverse collections contain a range of materials owned and used by Lowcountry residents through the eighteenth and nineteenth centuries. There are also many rare and unique objects, including faunal specimens. Study of the collections began in the 1970s and is still incomplete. NSF funding provided an opportunity to continue study of this special legacy collection.

The Heyward-Washington House is a historic house museum on Church Street, the oldest section of Charleston. The property is notable as the 1772 townhome of Thomas Heyward, who signed the Declaration of Independence, and as the rented quarters of President George Washington during his 1791 Tour of the Southern States. The Heyward-Washington House is the oldest historic house museum in Charleston, opened to the public in 1929.

It is also the site of the first controlled research excavation in Charleston, conducted by Dr. Elaine Herold of The Charleston Museum. Archaeology reveals that the current 1772 house is at least the third compound on the property. Heyward-Washington is now the largest legacy collection housed at The Charleston Museum. The project received new life through the dissertation research of Sarah Platt (2018, 2022) and the resulting re-cataloging and curation of portions of that collection by Martha Zierden and Sarah Platt.

Besides a three-story double house fronting directly on the street, the 50-x-239-ft property features a 2.5 story kitchen/quarters dependency, a single story stable and carriage house pre-dating the big house, a small brick privy, and connecting pantries/cistern. All are connected by a brick-paved work yard. A colonial revival formal garden occupies the back half of the lot. The property was originally accessed by a drive running along the south side of the house to the carriage house, and a gate to Ropemakers Lane, a narrow passage at the rear northwest corner of the garden (Figure 5-8).

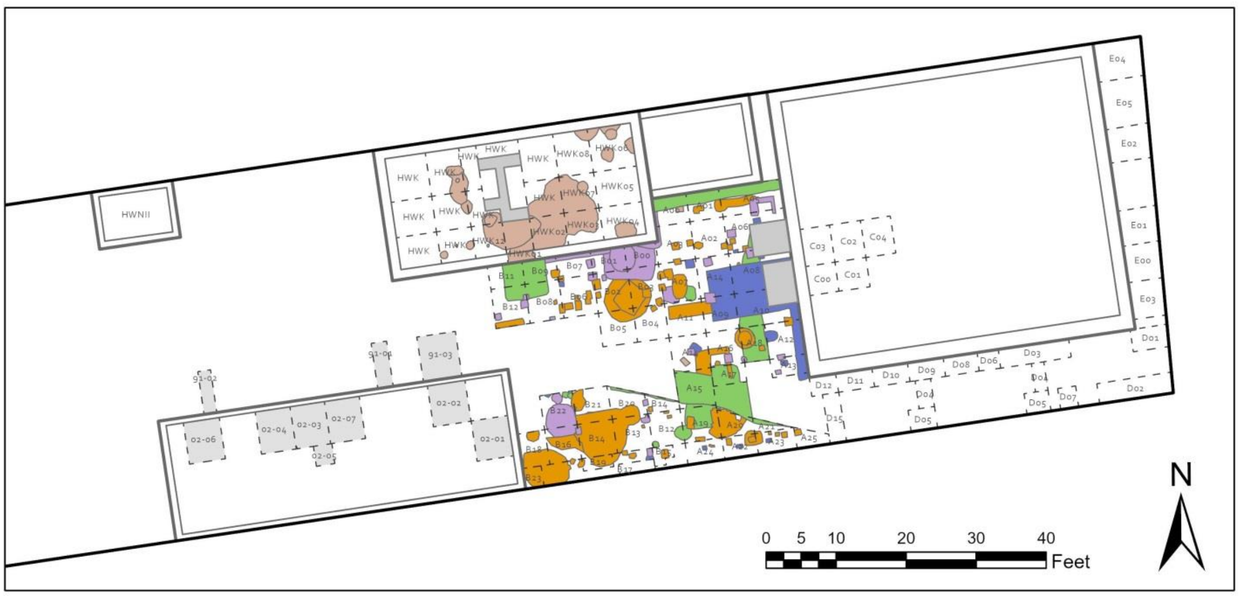

Figure 5-8: Map of the Heyward-Washington lot and archaeological excavation locations. Map by Sarah Platt.

<u>The Milner Occupation</u>

The property was the location of John Milner Sr.'s gunsmithing business in the 1730s. His property burned in Charleston's great fire of 1740, but he and his son, John Milner Jr., continued the business, presumably on the rear portion of the long, narrow property. Upon his father's death in 1749, the younger Milner built a brick single house on the Church Street portion of the property. The features of the elder Milner are separated from those of his son by a distinct zone of ash from the 1740 fire, designated Feature 119 in 2002, and roughly Zone 5 in the 1970s.

The lot at 87 Church Street is within the bounds of the original walled city, constructed by 1710. The property was granted to Joseph Ellicott, listed as a bricklayer, in 1694 (Bates and

Leland 2007:59, 130). His three children inherited the lot later that same year. Prior to Ellicott's ownership, Lot 72 is listed as belonging to Henry Symonds in 1678 and 1680, and to James Stanaryne in 1688 and 1692. Ellicott's children divided the land in 1710 (Bates and Leland 2007:137); this may have been the tenement named "Hog Tavern" in his will. No further information is available on Joseph Ellicott, but his length of ownership suggests the property was improved, and perhaps occupied by the family. Sarah Platt's (2022) statistical analysis reveals that the deepest excavated level (Level 8 in the A and B squares) dates to the Ellicott ownership.

By 1737 John Milner was operating a gunsmithing business on this site, and living in a modest wooden house with his wife and five children. "Mr. Miller's" is described as "the sign of the Pine Tree" (*South Carolina Gazette*, January 26, 1740). The house foundation, exposed by Herold's excavations, measured 24-in wide and 18-in deep.

Beginning in June 1721, the office of public armorer for South Carolina was responsible for storing and maintaining the colony's collection of small arms, including hundreds of muskets, pistols, cutlasses, bayonets, and cartridge boxes, reserved for "public" use. In 1735, the Commons House determined that Capt. Thomas Lloyd's service was lacking, and agreed to divide the contract for maintaining public arms between Philip Massey and John Milner, and to divide the arms between them as well because Charleston did not yet have an armory or arsenal in which to store them. The House also reviewed an account by gunsmith John Milner, representing a charge of L193.2 for "mending the Indian Guns." A Cherokee party had recently been in town. The House agreed to pay the account, but noted that it represented an "unusual" expense. Following Massey's death in 1739, Milner served as the sole "armorer" until his death in 1749.

During the great fire of 1740 that destroyed nearly one-third of urban Charleston, John Milner watched his own house fronting Church Street burn to the ground while he was busy moving the public arms to a more secure location. He rebuilt in 1741, and by 1742 Milner was again storing hundreds of small arms on his property. Near the end of 1743, the government finally completed a brick armory building on the west side of Meeting Street, just south of Broad, and Milner removed the public arms to the new storage facility. Milner's inventory includes 860 muskets in good order with bayonets fixed, 408 guns in good order without bayonets, 81 clean guns out of repair, 15 guns not worth repairing, 1,252 cutlasses with scabbards, 22 cutlasses wanting scabbards, 76 clean bayonets, 32 pistols out of repair, and 448 cartridge boxes (Butler 2019).

Each year between 1736 and 1749 Milner submitted accounts and received compensation for cleaning and repairing the public small arms. Several, but not all, mention cleaning "several guns belonging to the Indians." While these groups are not mentioned by name in his account, on several occasions during those years, Charleston received delegations of Cherokee, Creek, Choctaw, Chickasaw, Catawba, and Notchee/Natchez, to meet with the governor on official business. During such visits, it seems likely that the governor instructed the visiting Indians to take their firearms to John Milner for maintenance. Dr. Nic Butler of the Charleston County Public Library conveniently published a blog post on John Milner's property and about his role in the affairs of the colonies. Butler noted that John Milner evidently repaired the "Indians' guns" regularly, and he often complained of them "hanging around his property." Native American pottery recovered from Milner's workshop and wells is likely evidence of this contact (Butler 2019).

Milner and his son resumed the gunsmithing business after the 1740 fire, but evidently built further back on the long, narrow lot, closer to Meeting Street (Butler 2019). Following his death in 1749, John Milner Jr. built a brick single house on the lot fronting Church Street, along the northern property line. Herold encountered the front of this house in her excavations.

At the time of his death, Milner owned 11 enslaved people, at least three of whom were skilled in the gunsmithing business. In his will, he divided the enslaved among his children, clearly separating families, and instructs the heirs to sell two of the skilled men. Platt (2022) has found evidence of the enslaved self-emancipating soon after their transfer to Milner Jr., one of these was the "mulatto man Joe" mentioned in the context of regulating markets. John Milner Jr. fared poorly with his finances, and was forced to sell the Church Street property in 1768 due to heavy debts.

The Heyward and Grimke Occupations

Faunal remains from the occupations of John Milner Sr. and, possibly, the Ellicott family are the focus of the present project. Materials from a large feature associated with Milner Sr. and the late-nineteenth-century layers of the privy (Levels 8 and 9), associated with the Heyward occupation, were the focus of Manzano's 1980 analysis. Manzano also analyzed upper layers (Layers 6 and 7) that are associated with the nineteenth-century occupation of the house. While not the focus of the current study, the story of the post-Revolutionary years reveals the varied occupants and uses of the Church Street property.

Col. Daniel Heyward purchased the property from the provost marshall in 1770; by 1777, he was known as "the greatest planter in this province," with 16,000 acres of plantation lands, a house and three lots in Beaufort, and a house and lot in Charleston (Doscher 1977). Heyward sold the property at 87 Church Street to his son Thomas, age 25, in 1772, and Thomas constructed the main house, as well as the 2.5-story kitchen and single-story stables. Researchers for many years suggested the kitchen and stable were built by John Milner Jr, and Thomas Heyward simply replaced the main house. The archaeological content of construction trench features for both buildings could support a 1749 construction date (Herold 1978; Zierden and Reitz 2007). But more recent architectural analysis by architectural historians, particularly Ed Chappell, suggests the outbuildings were constructed with the main house (Chappell 2018; Herman 1999). A 1772 coin beneath the window framing of the kitchen supports this idea, as well.

Thomas Heyward completed his house by 1772. Heyward was a lawyer and a plantation owner, eventually first president of the Agricultural Society. White Hall plantation was the family seat; his brother Nathaniel managed his plantations during his absences. He is known nationally as a signer of the Declaration of Independence. He served on several revolutionary committees, and was taken into custody during the British occupation of the city. He and other prisoners, along with their enslaved, were transferred to St. Augustine for the duration of the war, where several were housed in town (McCrady and Bragg 2020; Manucy and Johnson 1942). Heyward's wife Elizabeth Matthews remained at the Church Street house with her son, Daniel and with her sister, Lois Matthews (Mrs. George Abbot) Hall, pregnant with her 9th child. On the first anniversary of the occupation, a mob stormed the house, and the hysteria caused the death of Mrs. Hall, already weak from childbirth. Three months later, the imprisoned Charlestonians were exchanged and sent to Philadelphia. While there, Elizabeth Heyward died in childbirth, as did her second son, Thomas.

Thomas Heyward returned to Charleston in 1782 and resumed an active public life. In 1785, as president of the newly-formed Agricultural Society, he encouraged agricultural experimentation with new methods of cultivation. Historians have suggested this post-war restoration provided the opportunity for the large-scale shift from inland swamp to tidal rice production (Rogers 1990). Heyward's brother, Nathaniel, was one of the first to experiment with tidal rice production, and was one of the largest rice planters of his day (Clifton 1978). Nathaniel Heyward owned 17 plantations, most on the Combahee, including The Bluff. His 5,000 acres of improved land (and 30,000 unimproved) were worked by 1,331 enslaved people (Linder 1995).

In 1786, Heyward married Elizabeth Savage, and they had three children. Heyward resigned his judgeship in 1789, and the family moved to the plantation. Heyward's aunt Rebecca Jameson lived in the Church Street house and operated a boarding school for girls. Twelve girls and 17 enslaved people lived at the house in 1790. It was Mrs. Jameson who negotiated rental of the house to President George Washington during his 1791 Tour of Southern States (Lipscomb 1993).

Heyward offered the house for sale in 1792, advertising "12 rooms with a fireplace in each, a cellar and loft, a kitchen for cooking and washing with a cellar below and five rooms for servants above; a carriage house and stables, all of brick surrounded by brick walls." The property was purchased by John F. Grimke in 1794. Judge Grimke and his family (eventually 12 children) resided there until his death in 1818. Two of his daughters, Sarah and Angelina, became Quakers, educators, writers, and abolitionists.

<u>The Boarding House at 95 Church</u>

Margaret Munro purchased the home in 1825, but she had operated the property as a boarding house since 1819. In 1830, Mrs. Munro hired Mrs. Davis to run the house. Newspaper ads suggest both women were well-known in town and had operated other establishments. Newspaper advertisements suggest that families and single men rented a room or suite of rooms. Merchandise was bought and sold there. The proprietors both owned enslaved people, and hired others to work the property. They advertised for a cook, a stable groom, and waiting men. During the boarding house period, the eastern entrance to the kitchen cellar was enclosed, and a cistern and pantries were added to the space between the house and kitchen (Arendall 2022). Elaine Herold, along with Paul Buchanan of Colonial Williamsburg Foundation, found evidence of a back porch and warming kitchen, as well (Herold 1978).

Mrs. Munro left the property in trust to her grandchildren and, in 1861, a single granddaughter, Elizabeth Jane Trott, was in possession of the property. She closed the boarding house that year, following the passing of Mrs. Davis in 1860, and sold all of the furnishings. She and her husband, Thompson H. Cooke, held the property until 1879; presumably the property served as tenements during this period. Elizabeth Wehrhan purchased the property in 1879, and sold it to Henry Fuseler in 1883. Fuseler operated a bakery on the property until his death in 1925. The Fuseler family radically altered the first floor of the house to create a storefront for the bakery. They built bake ovens inside the stable and behind the kitchen. The Charleston Museum acquired the house in 1929 and gradually restored the property to its late-eighteenth-century appearance, including installation of a colonial garden in the rear half of the property.

The three-century story of the Heyward-Washington House illustrates several general themes of property history in the city. Traditionally interpreted as the home of a wealthy planter family, the property served that role for only 46 of the 300+ years of occupation. The property served as the home and business of craftsmen in the decades before the Heyward family; it served as a multi-family dwelling for people of middling status, many of them transient, in the decades after the Grimke family. One constant, regardless of the status of the property owner: enslaved people were always present on the property, and outnumbered free white residents until emancipation.

Case Study: The Nathaniel Russell House

A later site, and a late-breaking discovery late in the project, was the retrieval of an unusually dense deposit of bone in the cellar space of a kitchen building on Meeting Street. This site is located just outside of the original walled city, on the west side of Meeting Street. Historic maps indicate some development of this area, but not on this lot, in 1739. The area south of the property is an expanse of marsh, drained by a tidal creek. The lot was granted in 1694 and occupied by the 1740s. The 1788 map shows houses on the property, and the creek filled to form Price's Alley. The property contained dwellings when it was purchased by Nathaniel Russell in 1779.

The Nathaniel Russell House, completed in 1808, was built by merchant and slave trader Nathaniel Russell and his wife Sarah when he was 70 and she 56. According to Thomas Savage (1989:5), the house coast $80,000, an enormous figure for the early nineteenth century. Carved wood, plaster, and applied composition ornamentation abound. The drawing room features curved doors, mirrored panels, and an incredibly complex paint scheme. Rather than piazzas, the house boasts delicate wrought iron balconies, the front one embellished with Nathaniel Russell's initials.

Their large brick home and garden were the focus of much admiration and discussion. The garden was evidently tended by famous gardener Philip Noisette, who came to Charleston from Santo Domingo in the early 1800s and resided on Russell's nearby farm. The house features a square, a rectangular, and an elliptical room on each of the three floors. A retinue of service buildings continued behind the house, including a kitchen and quarters, a stable/carriage house, and a privy. An 1870 plat indicates storage space for coal and for firewood.

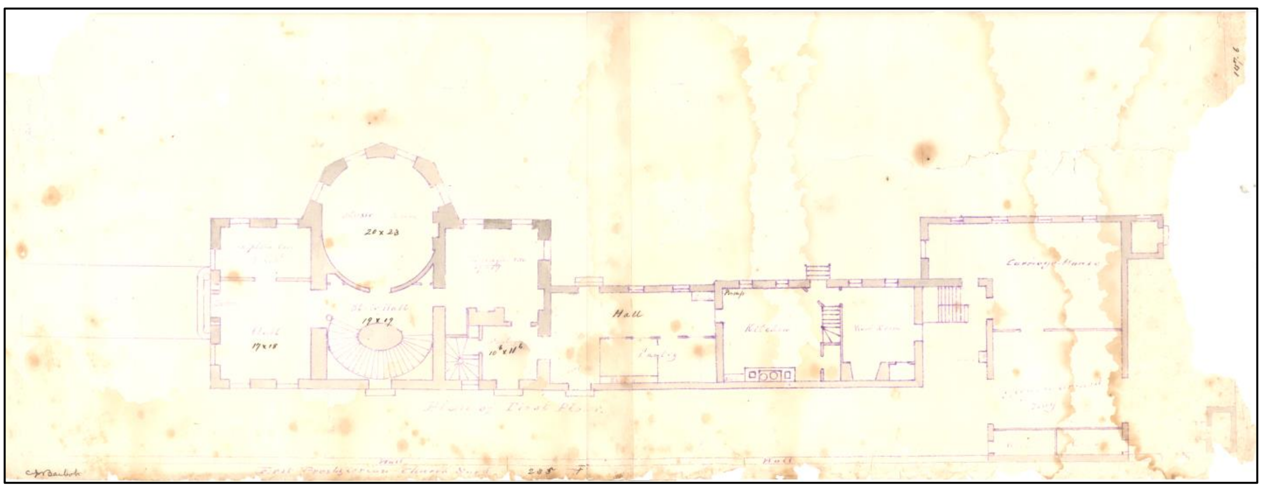

Figure 5-9: 1870 plat of the Nathaniel Russell House. Collections of Historic Charleston Foundation.

Nathaniel Russell died in 1820, but his widow, their children, and grandchildren maintained the mansion until 1857. The Russell family was known for an austere, pious lifestyle, but the inventory of Sarah Russell Dehon at her death suggests otherwise. Listed are 355 ounces of silver, cutlery, teawares and serving pieces of "Blue India China," gold and white dessert ware, bonds, and bank shares.

The property passed to Governor Robert F.W. Allston, who owned the house through the Civil War to 1870. Governor Allston was one of the largest plantation and slave owners of the Georgetown district. He and his family kept nine enslaved people on the Meeting Street property: Daddy Moses, gardener; Nelson, a house servant; William Barron, a cook and later a caterer, Steven Gallant; Joe Washington, a cook; Aleck, the carriage driver; Phoebe, nanny; Nelly (Nelson's wife); and a boy, Harris. The family fled the city during the Civil War; retreating to Society Hill, while Governor Allston remained in Georgetown to manage his plantations. Daddy Moses was left in charge of the townhouse, and he died of a stroke soon thereafter, while tending the garden.

Governor Allston died in 1864, and left the house in Charleston and its furnishings to his widow, along with carriages and horses, house servants and their families. Each of his five children received a plantation and 100 enslaved people. The estate tumbled in value with emancipation and the end of the War. Mrs. Allston returned to Charleston, had the Meeting Street house repaired, and operated a girls' school to make ends meet. She returned to the family plantation, Chicora Wood, near Georgetown, and the house was sold to the Sisters of Charity.

Archaeological testing of the yard area in 1994 and 1995 by The Charleston Museum and College of Charleston field schools followed monitoring of HVAC installation by Fred Andrus in 1990. That year, Andrus noted a concentration of artifacts and refuse beneath the kitchen building, and excavated at 5-ft unit in the cellar space. The unit revealed quantities of bone and kitchen artifacts in a series of superimposed zones, with most of the layers dating to the Russell family occupation. An adjoining unit, excavated in 1995, revealed similar deposits. Six zones were defined, and Zones 3-5 were characterized by quantities of coal and pockets of ash. The unit contained early nineteenth-century Canton-style porcelain, earlier enameled Chinese porcelain, and a variety of creamwares, some with enameled decoration. Faunal remains included plenty of cow bones, many of them from the "discarded" portions following butchering – the lower legs, and portions from the entire carcass, suggesting on-site butchering.

For most of its tenure as a historic house museum, the kitchen building served as offices, gift shop, and space for docents. The interior was renovated in the 1950s. Later careful research by architectural historian Ed Chappell, finishes specialist Susan Buck, and the Museum staff of Historic Charleston Foundation revealed original early-nineteenth-century features and finishes preserved beneath the twentieth-century sheetrock. The entire space was subsequently stripped of modern materials, and the space is now interpreted as the living and working areas of the enslaved people who managed the Russell House. Additional excavations in the cellar space to retrieve additional data and expose the walls and floor of the cellar space was warranted. A third 5-ft unit was excavated in 2021 by archaeologists from Clemson University, Drayton Hall, The Charleston Museum, and the College of Charleston.

The unit produced startling results. Stratigraphy was similar to the previous units, but artifact density was much greater. This was particularly true for Zone 3, a very dark coal-filled sand containing extremely dense deposits of bone. The author has never encountered such a bone deposit in Charleston before, and the density is much greater than encountered in the previous two excavation units. The Zone 3 soil was excavated as a single level. While bone was dense in Zone 3, the quantity of bone increased dramatically in Zone 4. Bone was now bagged separately, in large 3-gallon bags. Zone 4 Level 1 produced six such bags, as well as large ceramic fragments, some nails, some table and bottle glass, and occasional small finds. Zone 4 Level 1 was 0.2-ft deep, while Level 2 was an additional 0.5-ft. Level 2 produced 15 large bags of bone. The large bones were cow, principally from the lower legs. There were no head elements. The assemblage also included pig, wild and domestic birds, and some fish. Ceramics included Canton porcelain, hand-painted pearlware, and undecorated creamware.

Figure 5-10: 2021 excavation at the Nathaniel Russell House with dense deposits of bone. Photo courtesy of Martha Zierden.

While the bone recovered from the first two units was interpreted as the remains of on-site butchering, the quantity of bone in the third unit is perplexing. Artifacts again date the deposit to the Russell's occupation, with a particular concentration of Canton porcelain. The quantity of bone may be the result of deliberate filling, rather than on-site disposal (see Butler 2020). It may also reflect production of non-food products. Because of the unprecedented nature of the deposits, analysis of a sample was included in the present project and will be reported separately. The excavation served as a stark reminder that the urban archaeological record is complex, and not fully understood. Every excavation unit is different.

Chapter VI
Sampling Strategy and Site Selection

Site Selection

The stable isotope study, and selection of teeth for that project, was facilitated by thoughtful and careful selection of specimens. The project presented an opportunity to revisit previously analyzed collections, both the faunal assemblage and the greater archaeological assemblages. Teeth were selected to cover a broad geographic range, and a deep time range, matched to documentary background, while selecting teeth from individual proveniences carefully controlled for temporal and social affiliation.

Beginning with the urban Charleston collections analyzed by Reitz at the University of Georgia, zooarchaeological data cards from each site were consulted for the locations and identifications of cattle teeth. These were then pulled from the bagged collection for inspection and final selection. Teeth from rural sites excavated by The Charleston Museum and curated there were selected in a similar manner. From here, we contacted private firms, historic properties, and curation facilities across the Lowcountry and the state to borrow specimens from specific locations, based on their site histories and excavation results. The sites studied, and rationale for their selection, are described below by river drainage, in roughly temporal order. Some of these same sites, and locations, were selected later for the soil coring/environmental study. Site reports for projects are listed in Appendix II and a descriptive list of the samples is available in Appendix IV. The rural sites are described first, followed by a summary of the urban Charleston sites. Teeth from each site are grouped into time periods, labeled A-E, as listed in Table 6-1: When the occupation date straddles one of these temporal categories the tooth is evaluated under the earlier date

Table 6-1. Time periods used in cattle tooth study.

Time Period (TP)	Date Range
A	Pre-1710
A/B	Pre-1710
B	1710-1730
B/C	1710-1730
C	1730-1780
C/D	1730-1780
D	1780-1820
E	>1820

The Ashley River Drainage and Charleston Harbor

The Charleston peninsula is formed by the confluence of the Ashley and Cooper rivers, part of the Santee River drainage. Some of the earliest sites are spread along the Ashley River, including the original Charles Town settlement. We were able to garner samples from a half-dozen sites, from the earliest European settlement at Charles Towne Landing to the eighteenth-century town of Dorchester in present-day Dorchester County. They are as follows:

Charles Towne Landing/The Miller Site (38Ch1-MS)

This site is the original English settlement, established in 1670. It remained the center of occupation until the town was moved to the coastal peninsula known as Oyster Point in 1680. There was some occupation of the Charles Towne Landing (CTL) site after that time, including small plantations. The Miller site, within the CTL boundaries, was first recorded by John Miller in the 1960s, then explored by CTL archaeologists from 2009 to the present. The site was originally proposed as a tavern occupied by James LeSade from 1694 to 1697. Testing by South Carolina Parks, Recreation, and Tourism (SCPRT) archaeologists, including David Jones, Cicek Beeby, Andrew Agha, Nicole Isenbarger, and others reveal a single component, dating to the 1670s. The site may include a barrel manufactory. Two teeth were loaned by SCPRT and date to the 1670s (TP A).

Ashley Hall Plantation (38Ch56)

This plantation site on the Ashley River was granted to Stephen Bull in 1676 and remained in the Bull family until 1866. A small house built in 1683 remains standing. A larger family house was constructed by his son, William, known as Governor William Bull, in 1704. His son, the Honorable William Bull, owned the plantation in 1755. He organized opposition to the Cherokees during the 1760 war, and signed the treaty with Cherokees in 1761 on the property. Formal gardens were added in the 1770s. The main house was burned by the family to avoid destruction by Union soldiers in 1865. The Bull descendants sold Ashley Hall to the Kennerty family in 1873, and Ashley Hall remained a plantation property until the 1950s.

Brockington and Associates surveyed and excavated the property in association with plans for subdivision and development of the lands around the historic core. Their survey located a dairy and laundry that were salvaged. Laboratory analysis and report preparation is ongoing. The site is notable for the early (1683) standing house as well as evidence of Native American occupation and trade (Ashley pottery). The tooth selected for study is from the dairy/main house area, associated with the William Bull I occupation (1710-1755, TP B) and was loaned by Brockington and Associates. The collection is curated at The Charleston Museum.

Drayton Hall (38Ch255)

Drayton Hall was built between 1738 and 1742 as a country seat for the Drayton family plantation complex. The property was acquired by Francis Yonge in 1718. Yonge likely built the first house on the property, advertised in 1734 as “indifferent dwelling house, outbuildings about 20 head of very good cattle”. The first house likely remained after John Drayton purchased the property in 1738. There is evidence of early cattle production on the property. Some rice was grown at Drayton Hall, and the property was later mined for phosphate. The property was acquired by the National Trust for Historic Preservation in 1974 and is currently operated by the Drayton Hall Preservation Trust, and open for public visitation.

Drayton Hall included two flanker buildings that came down in the late nineteenth century. A large well at the south flanker produced stratified refuse-filled deposits. Several features on the property also pre-date the Drayton occupation, classified as “pre-Drayton”. There have been numerous archaeological projects on the property since the National Trust acquired Drayton Hall from the family in 1974. The south flanker well, excavated by Lynn Lewis in the 1970s, has been the focus of reanalysis by DH staff archeologists over the last five years. Four teeth were studied. Two are associated with Pre-Drayton contexts (TP B) and two date to the mid-eighteenth century (TP C). Teeth were loaned by the Drayton Hall Preservation Trust.

Lord Ashley, St. Giles Kussoe (38Dr83)

The tract set aside for Lord Anthony Ashley Cooper's plantation near the headwaters of the Ashley River is the earliest single-component excavated site in this project. Lord Ashley never lived or traveled here but instead trusted the property to his agent, Andrew Percival. The property was occupied from 1674 until Lord Ashley's death in 1683. The site was used for trade with Native Americans and cattle ranching. Residents included 17 enslaved Africans, likely managing the cattle as well as crops.

The site was discovered by South and Hartley during their 1980 survey of seventeenth-century sites. It was tested by Brockington and a host of volunteers in 2009, as part of a grant-funded expansion of the Ashley River historic district. Additional testing and exploration included magnetic gradiometry by Jon Marcoux, archaeological field schools from College of Charleston in 2011 and 2013, Salve Regina University in 2013 and 2014, and further testing by Andrew Agha in 2015. Materials from 2009, 2011, and 2013 projects are in collections of The Charleston Museum. Bone preservation was poor due to lack of oyster shell. A single tooth is included in the study (TP A) from the collections of The Charleston Museum.

The Ponds (38Dr87)

A tract of 2000 acres on the upper reaches of the Ashley River was granted to Andrew Percival by the Proprietors in 1682. Percival was Lord Ashley's agent in SC, first residing at St. Giles Kussoe while representing Lord Ashley. Percival lived on his own tract by 1691 to 1695, known as The Ponds or Weston Hall. "Weston Hall" may be named for the Westo Indians, who traveled through there during trading periods. Weston Hall was a fortified plantation during the Yamasee War (1715) and the large number of guns on property may include those from St. Giles. The property remained in hands of Percival's children until 1729, when the plantation was purchased by William Donning. Donning died in 1732 and his will indicates he was raising cattle. Donning's descendants retained possession of property until 1788. During the Percival and Donning periods, The Ponds was converted to an inland rice plantation; its location on Great Cypress Swamp at headwaters of Ashley River provided ideal conditions. It was later converted to a modified tidal system, as Ashley was not sufficiently tidal that far upstream.

The Ponds is currently a large development property in Dorchester County and has been surveyed by Brockington and Associates. Sites on the tract have been excavated in phases, as development proceeds. Two teeth from provenience 644 were loaned by Brockington and Associates (TP A/B).

Colonial Dorchester (38Dr3)

Dorchester village was founded by Massachusetts dissenters in the 1690s on the Ashley River in present-day Summerville. It remained a viable town on the Broad Path between Charleston and the interior through the American Revolution. The town was laid out with 116 numbered quarter-acre lots, arrayed between perpendicular and parallel streets. A series of waterfront lots were the focus of riverine trade. By 1717 an Anglican church, St. George's, was built on lot 99. The Congregationalists abandoned the town for a new settlement in Georgia in the 1750s. The town was on the main trading path between Charleston and the Creek towns, and so remained a strategic location. The town eventually housed a few wealthy planters who owned nearby plantations and a brick and tabby fort guarding the river. The settlement was abandoned after the American Revolution. The property is currently owned by SCPRT. Archaeological investigations by the South Carolina Institute of Archaeology and Anthropology (SCIAA), and others were followed by ongoing archaeological investigation since the 1990s by SCPRT.

Three teeth are from Colonial Dorchester State Historic Site. One is from the church yard, excavated by Larry James. The second tooth is from Lot 52, tested by State Parks archaeologists since 2011. The site was an active location by 1742 and owned by Lowcountry planter Joseph Blake Jr. A series of 1-m test units and larger block excavations revealed superimposed brick floors, indicating rebuilding and reuse during the eighteenth century. The teeth were loaned by SCPRT, dating from the mid-eighteenth century (TP B/C). Colonial Dorchester has been cataloged as an urban site for this project, though its size, location, and economic history differ significantly from that of Charleston.

The Wando River Drainage

The shorter Wando River lies east of the Cooper River, and features early colonial sites that communicate directly with Charleston. Two were available for study.

Lesesne Plantation, Daniel Island (38Bk202)

The tract on the east side of Daniel Island was granted to Isaac Lesesne in 1699 or 1709. He was in residence by 1709. Son Isaac inherited the plantation in 1736, and retained it until 1772. Lesesne produced lime, timber, livestock for sale in Charleston, and owned a saw mill. Isaac Lesesne Jr. maintained 154 head cattle, 4 horses, 35 sheep, 28 hogs on Daniel Island, plus 2 lime boats.

The site was excavated by Carolina Archaeological Services and The Charleston Museum in 1984, in advance of construction of the Don Holt Bridge and Interstate-526. Survey and testing of a broad area were followed by block excavations in the footprint of the bridge. Teeth are from Feature 115, a brick foundation filled with successive layers of refuse, dating from 1690s to 1740s. Three samples from the refuse layers of Feature 115 include one dating to the 1690s (TP A), two from the 1710s TP (B), and one from TP C. Collections of The Charleston Museum.

Cain Hoy, John Bartlam’s Pottery (38Bk1349a)

After a 20-year search, Stanley South, Brad Rauschenberg, and George Terry, along with Carl Steen, located the factory of Staffordshire-trained potter John Bartlam on the banks of the Wando River at Cain Hoy. John Bartlam found good clay on the Wando and began his operation in 1765. In 1768 he advertised for young African Americans to work as apprentices. By 1771 he was making Queen’s Ware and China at a manufactory. He evidently abandoned Cain Hoy for a site in Charleston by 1770, and in 1774 had moved to Camden, where he exported his “Queen’s ware” to Charleston.

The area available for excavation in 1991 was limited by new development. South and Steen did not discover a kiln, but excavated a large well pit filled with fragments of Bartlam-made ceramics. The site also includes the usual range of imported British wares. The three teeth from Feature 90 date to 1765-1770 (TP C). Collections of The Charleston Museum.

The Santee River Drainage

The Santee River system is the largest in South Carolina. The coastal portion, the Santee River, forms the northern boundary of Charleston County. The earliest European settlers along the river were French Huguenots. English settlers soon followed, and the river later supported tidal rice plantations. Two sites/locations associated with this drainage were part of the project.

Spencer Settlement/Hampton Plantation (38Ch241-100)

The Joseph Spencer settlement site is on the property of Hampton Plantation State Park. Joseph Spencer acquired portions of the tracts in 1710 and 1714. Spencer used his land for cattle and had one of the largest herds in St. James Santee Parish during the early eighteenth century. Spencer and his sons built a dwelling, cleared small patches for corn crops, and managed cattle in the nearby woods.

The settlement was discovered during shovel testing by Stacey Young in 2014. An open area on the south edge of the front lawn adjoins a small wooded area and the round depression known as Spencer's Pond contains artifacts from the first half of the eighteenth century. Excavations in 2015 and 2017 by the College of Charleston field school, and volunteer digs from 2015-2018 revealed a probable cellar pit, evidence for a wooden structure, presumably a dwelling, and a paling fence. The block excavation of contiguous 5-foot squares explored the overlying plowzone and exposed a range of features, but none were excavated to date. In addition to a range of European artifacts, the site contains colonowares with gritty paste, likely made by Native as well as African people. These wares have been analyzed by Brooke Brilliant (2011). Two teeth from 1710-1730 (TP B) context were loaned by South Carolina Parks. The Spencer settlement and Spencer's Pond were later selected for sediment core sampling. The core site was located in a low-slope depression in organic rich Rutledge soils on the margins of Spencer Pond. A third tooth from the Hampton complex (late eighteenth century) was also part of the study

Hell Hole Swamp/The Big Opening (no associated archaeological site)

Hell Hole Swamp consists of historically unclaimed, unimproved land that was known to range cattle in the eighteenth and nineteenth centuries, and through the first half of the twentieth century. The earliest written record of the swamp is a 1734 plat and accompanying 1735 land grant for acreage adjoining Hell Hole Swamp. Several families purchased lands adjacent to Hell Hole Swamp, but the unclaimed swamp essentially functioned as a shared common until Charles G. McCay purchased 4,044 acres of Big Hell Hole Bay in 1849 and 9,000 acres of Big Hell Hole Swamp in 1857 from the State of South Carolina.

Currently part of the Francis Marion National Forest, portions of Hell Hole Swamp are designated as a Wilderness Area. Centered within the vast, rather impenetrable swamp is a large savannah known as the Great Opening. While the exact land use history of this tract is poorly known, and the opening is currently fairly closed in, the Great Opening is designated on early twentieth-century soil maps. Historic photos suggest the opening was somewhat smaller by the 1930s. A major wildfire in 1954 re-opened the tract. Aerial photos from the 1970s show a more moderate opening. The Forest Service burns the area regularly and is interested in reestablishing the opening. A sediment core was taken to the depth of 1.6 m from low-slope, natural depression within Hell Hole Swamp.

The Stono River

The Stono is the southernmost river draining into Charleston Harbor. It separates James and Johns islands, areas of early settlement and, later, provision cropping.

St. Paul's Parsonage (38Ch2292)

St. Paul's was one of several outlying Anglican parishes created by the 1706 Church act. The Stono River attracted entrepreneurs involved in trade with the Yamasee and other Native groups. Landgrave Edmund Bellinger donated 39 acres to the Anglican Church for construction of the St. Paul's church and parsonage in 1707. The church was expanded in 1732 and razed in 1756. The property remained glebe lands until 1790s, when it was transformed into a working plantation. The property passed through multiple owners through the twentieth century. The St. Paul's property eventually became Dixie Plantation, owned by artist John Henry Dick. Dick bequeathed his property to the College of Charleston as a research property.

The Parsonage, built the same year (1707) as the church, was burned by the Yamasee in 1715. Excavations by the College of Charleston under Kimberly Pyszka and Maureen Hays (2010-2018) revealed the cellar of the parsonage house, filled with burned timbers and household debris, providing a time capsule context. Three teeth, with a 1715 date (TP B), were loaned by the College of Charleston.

<u>Stono Plantation (38Ch851)</u>

The tract known as Stono Plantation exhibits evidence of Indigenous occupation during the seventeenth and early eighteenth centuries. The property was owned and improved by Paul Hamilton in 1732, and owned by him through the American Revolution. A Loyalist, Hamilton lost his property after 1784. Thomas Rivers purchased the plantation and his family owned the property until 1857. At that time, the house site was abandoned in favor of a new house to the south. Stono Plantation is one of three historic plantations that are part of the Dill Sanctuary, a property owned by the Dill sisters and bequeathed to The Charleston Museum in 1985.

Excavations by College of Charleston field schools, directed by Ron Anthony, commenced in 1992 and continued semi-annually until 2000, with three additional sessions through 2011. Extensive block excavations produced heavy plowzone deposits, plus some subsurface features. A single tooth included in this study is associated with the 1780-1850 occupation and comes from a plowzone context (TP D/E). Collections are housed at The Charleston Museum.

The ACE Basin, Ashepoo, Combahee, Edisto Rivers

These three rivers south of Charleston originate in the coastal plain and are called black-water rivers. They transport little sediment and have a high tannic-acid content from decomposition of swamp hardwoods. These were prime rice-growing rivers in the eighteenth and nineteenth centuries, and vast expanses have been preserved through a public-private partnership that currently forms the ACE Basin Wildlife Refuge.

<u>Stobo's Plantation, Willtown (38Ch1659)</u>

The property adjoining the 1690s settlement of Willtown, or New London, was a planation tract by the 1720s. In 1741 James Stobo built a 3-bay plantation house on a peninsula of high land overlooking swamps transformed into inland rice fields. Stobo departed suddenly in 1767, though he retained ownership of the tract until 1781, continuing rice operations.

The site was excavated by The Charleston Museum at the invitation of the Lane family in 1997-1998. Archaeological evidence suggests the plantation house was seriously damaged, probably by a storm, around 1767, resulting in remarkable preservation. Someone continued to occupy the house until ca. 1781. Walls were robbed of brick later. The project included block excavations over the main house, and dispersed test units through yard area. Five teeth from the site are all from later occupational depositions, 1780s, though they may reflect redeposition (TP D, possibly C). Collections of The Charleston Museum.

Our third sediment core sample was taken to a depth of 1.63 m from the swampy margins of the reserve pond located just north of a knoll of high ground where the Stobo settlement was positioned during the early eighteenth century.

The Savannah River Drainage

The Savannah River system forms the western boundary of South Carolina, and was navigable a good distance inland. Savannah, located on the coast, was among Georgia's earliest settlements. Both European and Native people settled on either side of the river at the Fall Zone, near present-day Augusta in the early eighteenth century.

Fort Moore/Savanna (or Savano) Town (38Ak4, 38Ak5)

Fort Moore (38Ak4) was strategically located on the east bank of the Savannah River, across from modern-day Augusta, Georgia. It was built to protect the South Carolina frontier and to facilitate trade with the Native groups that gathered along the Savannah, particularly the Creek, Apalachee, Yuchi, and Chickasaw. Inhabitants of Fort Moore included European soldiers, Native Americans, and enslaved Africans. The fort community later developed into New Windsor township. The Fort was abandoned in 1766, but saw a brief resurgence during the Revolutionary War.

Savanna/Savano Town (38Ak5) was established as a small trading center in 1685. The village was located at the intersection of two important trading paths. After the Yamasee War in 1716 Fort Moore was constructed at Savanna Town by the South Carolina colonial government to help further regulate the Indian trade and eventually protect settlers along the western frontier. The fort operated between ca. 1716 and 1766, until the post was moved upriver. In 1730, Fort Moore was described by a visitor as containing a palisade, four corner bastions with small cannon, but no ditches or moat.

Portions of Fort Moore were excavated in 1966, 1969, and 1971. J. Walt Joseph explored the site in 1969, and Stanley South and Richard Polhemus directed salvage excavations at the river bluff in 1971. The most substantial remains consist of the stockade trade compound. At least four buildings were present in the complex. The trade house was a cellared structure of framed timber and clay construction. Mark Groover, Jonathan Leader, and Stanley South returned to the site in 2001, with South relocating his 1971 work. The projects revealed a 200-x-200 ft palisaded area, numerous earth-fast structures, and a concentration of colonial-period artifacts. The majority of pottery is Native American. A cattle tooth dating to the 1730s (TP B/C) was loaned by the Savannah River Archaeological Research Program, SCIAA.

Meyer Household, New Windsor Township (38Ak615)

The Meyer Plantation was a German-Swiss farm occupied by three brothers and their families beginning in 1737, in New Windsor township. New Windsor grew around Fort Moore after the Yamasee War, attracting German Swiss settlers in 1737. These pastoralists raised cattle and sheep. Augusta, founded in 1738, eventually supplanted New Windsor's role in the deerskin trade; the area fell into disrepair by the 1760s.

Excavations of the Meyer brothers' farm were conducted by David Crass and Tammy Forehand of the Savannah River Archaeological Research Program on property owned by Jackie and Benny Bartley. The excavations revealed a U-shaped settlement with three clusters of buildings and activity areas. At least two enslaved Africans lived on the property. Two cattle teeth from the Meyer farmstead were loaned by the Savannah River Archaeological Research Program, SCIAA, and date to the mid-eighteenth century (TP C).

Catherine Brown Cowpen (38Br291)

The Catherine Brown cowpen site was occupied between the 1750s and 1780s, on the present Savannah River site in Barnwell County. This is the first frontier cowpen site excavated in South Carolina. Archaeology revealed an earthfast cottage and adjacent pen. The cattle pen contained a butchering area and several activity loci denoted by artifact concentrations. The cowpen was deliberately destroyed during the Revolutionary War. The Brown family emigrated from Virginia, and may have been Welsh. The ceramic assemblage is dominated by colono ware.

The site near Steel Creek in Barnwell County was excavated in 1984, in response to the L-Lake construction. The project and site report were completed with assistance from Mark Groover in the late 1990s. Two teeth were loaned by the Savannah River Archaeological Research Program, SCIAA. These date from 1757-1782 (TP C).

Mary Musgrove's Cowpen/The Grange (9Ch137)

Mary Musgrove, or Coosaponakeesa, was the daughter of a Creek woman and British trader. Mary and her first husband, John Musgrove (also of British and Creek descent) received rights to land located on the Savannah River. In 1734 they built a house, trading post, and cowpens. Residents or visitors included enslaved Indians; Spaniards; Salzburger cowkeepers; insurgent colonists; and Yamacraw, Creek, and Yuchi chiefs and hunters. Cattle and deerskins from the Cowpens made their way to the Charleston market, where the Musgroves were represented by Samuel Eveleigh. Mary Musgrove remained at her cowpen until 1751.

The site was discovered during expansion of the Georgia Ports Authority and excavated by Chad O. Braley of Southeastern Archeological Services in 2002-2003. Two large cellar features produced remarkable artifacts, including dairy pans, cattle bones, and deer-stalking headdresses. A portion of the faunal remains were analyzed by University of Georgia in 2008 and additional analysis is reported here.in Chapter XII. Samples were loaned by the University of Georgia Laboratory of Archaeology. Forty-four teeth are part of the present study, associated with the mid-eighteenth century (1734-1752; TP B).

Urban Sites in Charleston, SC, and Savannah, GA

Sites in the city of Charleston excavated by The Charleston Museum and other firms, and analyzed by Reitz at University of Georgia, were perused for samples from a range of contexts. A total of 17 urban sites were sampled, 18 if one includes Colonial Dorchester. They include townhomes of Charleston's wealthy citizens, public spaces ranging from wharves to theaters, markets, middle-class residences, and marginal areas. The samples span the time period considered for this project, with the exception of the late seventeenth century, for which only rural samples are currently available. A very early eighteenth-century component was identified for the Heyward-Washington site (1694-1720s) during the course of the project. A number of teeth from the Heyward-Washington house, one of the largest excavations in the city, were the focus of an earlier pilot study, and additional teeth were sampled during the present study. Both datasets are reported here.

Aiken-Rhett House, 48 Elizabeth Street (38Ch850)

Built in 1818 by John Robinson, the house was acquired by William Aiken in 1827. Robinson's house included four rooms on each of the three floors, with large cellars and store rooms under the dwelling. Aiken's son, William Aiken Jr. and his bride Harriett Lowndes acquired the house in 1831. William Aiken, a progressive, began an ambitious renovation of the house, including enlarging the house, modernizing its layout, and updating the interior finishes.

Improvements included the service buildings and rear yard, where the two-story kitchen was doubled in size and a second story was added to the stable. Gothic revival detailing was added to all of the outbuildings, and privies and garden follies were constructed. The rear pleasure garden was accessed through the work yard. Another round of renovation and expansion in 1857 included gas light fixtures, wallpapers, carpets, and an art gallery.

The house remained in the hands of Rhett family descendants until 1974, when it was donated to The Charleston Museum, then transferred to Historic Charleston Foundation. The Charleston Museum tested the property in 1985, 2001-2002, 2016, and 2017, in cooperation with Historic Charleston Foundation. This study includes two teeth, both from the mid-nineteenth century (TP E). Collections of The Charleston Museum.

<u>Atlantic Wharf, 2 Prioleau Street (38Ch1606)</u>

The harbor, or east side of East Bay Street, gradually filled with refuse, building rubble, and soil accumulating along the early waterfront and around wharves, producing filled, or "made land." Excavations at Atlantic Wharf revealed deep deposits of soil and rubble filled with discarded artifacts from nearby properties and from activities on the wharf. The mud banks under and between wharves likely received a considerable quantity of casual debris from ships, waterfront workers, and adjacent wharves. As the city became more crowded, the waterfront was an attractive place for refuse disposal.

Atlantic Wharf, now a City parking garage, was excavated by Zierden in 1983. Beneath a deep (> 6 ft) deposit of twentieth-century fill was a layer of late-eighteenth-century midden among timbers associated with a crib-style wharf. The late colonial layer contained numerous Spanish ceramics, including types extremely rare elsewhere in the city. The fill also included a parrotfish from the Caribbean. The sample from Atlantic Wharf comes from the late eighteenth century midden, Zone 4 in Test Pit 1, with a TPQ of 1800 (TP D). Collections of The Charleston Museum.

<u>Beef Market, 80 Broad Street (38Ch1604)</u>

Charleston's first market lies beneath the massive foundations of City Hall, constructed in 1800. This location was a civic square on the Grand Modell and was designated as market square by the colonial Assembly in 1692. The market's location, just inside the city gate, provided ready access to products coming into town from outlying farms and ranches. Many different products were sold here until the market burned in 1796. Three phases of market operation were identified. The lot was a poorly-regulated, informal, open area for the first four decades. A large brick market building was constructed in 1739, directly on the corner of Meeting Street, facing Broad Street, accompanied by strict regulations for its management. It was deemed unfit by 1760, and a new, larger building was constructed directly behind it. The name was changed to Upper Market or Beef Market, to distinguish it from the new Fish Market and Lower Market. Fire destroyed the Beef Market in 1796 and it was not rebuilt.

Testing began in 1984 with a single 5-x-10-foot unit in Washington Park. More extensive testing was conducted within the footprint (basement) of City Hall in 2004, in advance of renovations of the building. Here, 16 units were excavated. Monitoring of construction trenches produced additional material. Four teeth representing all three market phases are included in this study. Collections of The Charleston Museum.

Miles Brewton House, 27 King Street (38Ch1597)

This house, built by merchant and slave trader Miles Brewton, is one of the most celebrated architectural achievements in Charleston, one of the finest examples of Georgian architecture in the country. The house remains a private residence, in the same family for successive generations. Each made changes to the property, leaving imprints in the archaeological record.

The large lot was probably unimproved until Brewton, grown wealthy from trade, built a grand townhouse there in 1769. He and his family were lost at sea in 1775, and the property was inherited by his sister, Rebecca Brewton Motte. She maintained the house throughout the Revolutionary War and Charleston's two-year British occupation. Her daughter's family, the William Alstons, expanded the house and added to the inventory of outbuildings during their 1791-1839 tenure. The family's fortunes waned thereafter. William Alston's youngest daughter, Mary Motte Alston, and her husband, William Bull Pringle, sold the back half of the Brewton lot and garden in 1857. This portion of the property was subdivided into lots facing Legare Street. The Civil War exacerbated Pringle's financial situation.

In 1987, the owners embarked on a full restoration that included archaeological research and mitigation. Tommy Graham, Joe Opperman, and Charles Phillips coordinated archaeological investigations with architectural questions. A second phase, in 1989, focused on mitigating the impact of service trenches across the yard. Portions of the service trenches were excavated as archaeological units. Proveniences date from the mid-eighteenth century through the late nineteenth century. Three teeth from this site date from the 1750s to the 1770s (TP C). Collections of The Charleston Museum.

Charleston Center/Charleston Place, 205 Meeting Street (38Ch1605)

The block between Meeting and King streets, fronting Market Street, was vacant and decrepit when Mayor Joe Riley envisioned a hotel and convention space that would anchor revitalization of the Meeting Street corridor. The block was occupied from the late eighteenth century to the late twentieth century, with deposits from all time periods. It was the heart of the city's commercial district in the nineteenth century, and a majority of archaeological deposits are associated with this era. The block-wide site was subdivided continuously, encompassing dozens of individual properties that housed businesses on the ground floor and residences above.

Initial excavations were conducted in 1980 by Nicholas Honerkamp of the University of Tennessee-Chattanooga, the first large-scale federal contract in the city. UTC archaeologists dug 15 large units to varying depths, their location guided by documents and maps and a series of research questions. UTC's controlled excavations were followed by selective sampling, monitoring and salvage excavations by The Charleston Museum. The latter phase, in 1981 and 1985, recovered large features, principally privy vaults. The project produced 250 cubic feet of materials. Teeth from the analyzed UTC assemblage include two from Feature 102, a late colonial well, dated 1765 (TP C). Collections of The Charleston Museum.

First Trident, 170 Meeting Street (38Ch1607)

The First Trident bank building occupies the northeast corner of Meeting and Cumberland streets. A new bank building in 1983 impacted two of the original city lots and provided the opportunity for excavation. When first occupied, the location was a finger of high land adjacent to a marsh outside of the city wall. In the early 1700s the periphery attracted artisans who could not afford real estate in the city core, needed more space, or engaged in activities considered dangerous or offensive by residents of the town. Numerous leather scraps were recovered from moist deposits near the water table, suggesting that residents engaged in tanning or leatherworking. The percentage of cattle elements from the head and lower body is much higher than for any other site of this time period, including the two markets; evidently waste bone accumulated here.

By the late eighteenth century, the creek was filled and the property was used for other commercial and domestic activities. The lots changed hands often during the nineteenth century and apparently were used largely as rental properties. The mill and machine business of Cameron and Barkley burned on this lot in the fire of 1861. John Kennedy kept a billiards saloon on this corner in the 1860s. Nineteenth-century artifacts from two excavation units are largely domestic and suggest a residence of at least modest means. Cattle bones from later deposits are similar to those found at residential sites, including the Motte-Alston occupation at the Miles Brewton House. Three teeth from Unit 2 were analyzed, two from Zone 9, dated to the 1740s, and one from Feature 5, dated to the 1750s (TP C). Collections of The Charleston Museum.

William Gibbes House, 64 South Battery (38Ch1599)

The William Gibbes House is a private residence near the Ashley River. William Gibbes, a merchant and factor, purchased a large lot on South Bay Street, where he constructed a wharf in partnership with Robert McKenzie, Edward Blake, and George Kincaid. His wharf was one of the few on the Ashley River and was "suitable for off-loading lumber and naval stores" transported from Ashley River plantations. Gibbes also offered free wharfage in exchange for off-loaded ballast. He built his townhouse across the street from his wharf in 1772.

Gibbes was an ardent patriot, and suffered loss and damage to his property, which he detailed in a petition to the British government. Gibbes died in 1789, and the property was owned by a series of residents until 1984, when it was protected by covenant by Historic Charleston Foundation. Limited archaeological testing was conducted prior to construction of a swimming pool in 1985. Archaeological proveniences date from the late eighteenth century to the mid-nineteenth century. Two teeth date from the 1780s (TP D) and the 1820s (TP E), respectively. Collections of The Charleston Museum.

Heyward-Washington House, 87 Church Street (38Ch108)

The Heyward-Washington site is the largest excavation and the most complex site among the many urban sites included in this study. Grand Modell lot 72 was granted by 1680, and owned by several different people for decades. The first documented occupant was gunsmith John Milner Sr. in 1730. The household included Milner, his wife, five children, and 11 enslaved workers. His house and gunsmithing operation burned in the 1740 fire after which he and his son worked on the western portion of the lot, beyond the present property boundary. John Milner Jr. built a brick single house in 1749 and continued the gunsmithing business, but eventually lost the property to debts. The gunsmithing work included firearm repair and cleaning for visiting Native American delegations.

The property was acquired by Thomas Heyward, who built a large brick double house, 2.5 story kitchen/laundry/quarters, and single story stable and carriage house, as well as a brick privy and pleasure garden. George Washington rented the property as accommodations during his 1791 tour. Briefly owned by the Grimke family at the turn of the nineteenth century, the property functioned as a boarding house during much of the antebellum period, and finally as a bakery before becoming the city's first house museum in 1929.

Elaine Herold of The Charleston Museum excavated a large portion of the site in the 1970s, in a series of 5-ft squares. Excavations included the work yard and drive, the cellar of the kitchen building, the privy, and the cellar of the main house. Martha Zierden excavated adjacent to the stable building in 1991 and on the building's interior in 2002. The Heyward-Washington collection is the largest and most diverse in the Museum's collections. Fifteen teeth were subject to a pilot study, funded by NSF research funds to Sarah Platt. Thirty-seven samples are selected for the present study. These include two large features from the 1730s-1740s, smaller colonial features associated with cattle processing (Features 131a and 183), zone deposits in the work yard, the late eighteenth-early nineteenth-century privy, and nineteenth-century features. The samples range from TP A/B, B/C, C, C/D, D, and E. Collections of The Charleston Museum.

Lodge Alley/State Street, 185 East Bay Street (38Ch1608)

Lodge Alley is a narrow block-long thoroughfare running from East Bay Street to State Street. The alley featured a Masonic lodge, but women operated boarding houses there, too. Small, dank, and close to the fish market, Lodge Alley was seldom the choice of those who could afford to live elsewhere. Tradesmen, craftsmen, and shopkeepers were often forced by ruinous rents to house both their families and businesses in crowded tenements along such passages. Possible residents and their work included pastry cooks, a laundress, seamstresses, possible brothels, a school, mariners, ship carpenters, coopers, and riggers.

When warehouses on East Bay Street were renovated for a hotel complex in 1983, archaeologists from The Charleston Museum had the opportunity to test in the alley and in the rear yard of an adjoining property, 38 State Street. The alley yielded fragmentary artifacts in layer after layer of sand road paving. Units behind 38 State produced the burned assemblage from an assayer or metalsmith, including clay and graphite crucibles, glassware, slate pencils, and other late eighteenth century artifacts. Five teeth from Lodge Alley date from the late eighteenth century (TP C) and the early nineteenth century (TP E). Collections of The Charleston Museum.

McCrady's Tavern and Longroom, 2 Unity Alley (38Ch559)

The tavern and longroom complex at East Bay and Unity Alley was the first archaeological testing project by Zierden and Reitz. Developers in 1982 renovated a maze of late-colonial buildings to once again house an upscale restaurant. In 1770, Edward McCrady purchased what had been rental property and operated a successful tavern there. Ten years later, McCrady purchased a tract behind his tavern and built a long room over a kitchen. The tavern was connected to the kitchen and long room by a piazza and open arcade. The tavern, long room and kitchen covered the property almost entirely. A storeroom, a well with pump, and a small yard paved in brick completed the complex. Taverns served meals and offered lodging, but long rooms were rented for special occasions and served as banquet halls, conference rooms, ballrooms, and theaters.

McCrady's longroom was the scene of concerts, caucuses, and plays, often attended by Charleston's political and social leaders. President George Washington was entertained there in 1791. Test excavation within the arcade and paved work area produced rich archaeological assemblages, dating from the mid-eighteenth century through the mid-nineteenth century. Two samples date to the 1770s (TP C). Collections of The Charleston Museum.

Powder Magazine, 79 Cumberland Street (38Ch97)

Charleston's powder magazine, constructed in 1712, is the city's oldest standing structure. The fortified town needed a place to store munitions, one that was within the walled city and close, but not too close, to the rest of the town. The powder magazine was constructed on the sparsely occupied northern edge of the walled city. It sits today at an odd angle along Cumberland Street, because Cumberland is part of an urban street grid imposed long after the magazine was built.

The low brick structure was used as a magazine intermittently until 1820. After that time, it reverted to private property and was used as a wine cellar, livery stable, print shop, and blacksmith shop. The South Carolina Chapter of the National Society of Colonial Dames purchased and preserved the building in 1902, and opened it as a museum. Historic Charleston Foundation assumed temporary control of the building in 1993 and directed extensive research and renovation, including archaeology. Excavations inside and outside of the structure revealed a mostly domestic assemblage. A single sample for this study dates to the 1740s (TP C). Collections of The Charleston Museum.

Nathaniel Russell House, 51 Meeting Street (38Ch100)

Nathaniel and Sarah Russell moved into their new grand townhouse on Meeting Street in 1808. Their home and garden were the topic of much discussion. Merchant and slave trader Nathaniel Russell died in 1820, but his widow remained there until 1832. Their widowed daughter, Sarah Russell Dehon, her daughter Sarah, and Reverend Paul Trapier and their 12 children remained in the mansion until 1857. Reverend Trapier established Calvary Church as a place of worship for enslaved African Americans and performed numerous weddings for enslaved people at the Russell House. The elaborate brick single house features a square, rectangular, and oval room on each floor, a free-standing spiral staircase, and a run of brick service buildings along the northern side of the property.

Test excavations adjacent to the main house, outbuildings, and garden in 1994-1995 and in the front lawn in 2003 recovered artifacts reflecting the wealthy household, as well as eighteenth century materials along the filled creek of Price's Alley. A sample from the depths of this deposit dates to the 1730s (TP C). Collections of The Charleston Museum.

John Rutledge House, 116 Broad Street (38Ch1598)

The John Rutledge house on Broad Street is an imposing structure, built in 1763 and radically altered in the 1850s by owner Thomas N. Gadsden. The house narrowly missed destruction in the 1861 fire, as the St. Andrew's Society Hall and St. Finbar's cathedral next door burned in the conflagration. John Rutledge and his second wife, Elizabeth Grimke, built the townhouse and shared the property with 20 of his mother's enslaved staff. Rutledge entered politics in 1761 and remained active through the American Revolution, though much of his personal fortune was lost. He died intestate in 1800 and the house was sold. Wealthy planter John McPherson owned the property until 1838; his 200 enslaved people included Ned, skilled as a horseman, hair dresser, butcher, and eventually self-emancipated.

Archaeological testing in 1987 followed from renovation of the property for an inn. The property at that point had been truncated with the back portion sold, and a single outbuilding survived. Five units were excavated near the kitchen and in the work yard. Units 1 and 3 yielded a sizable assemblage of materials from the 1730s to the early twentieth century. Debris accumulated in deep zones before the area was paved in the 1850s; the zones included evidence for on-site butchering. A single tooth from Zone 5 dates to the 1790s (TP D). Collections of The Charleston Museum.

Simmons-Edwards House, 14 Legare Street (38Ch103)

The neoclassical house on Legare Street was built by planter Francis Simmons in 1801 and embellished by planter George Edwards in 1816. Edwards added wrought iron fencing that bears his initials and the famous towering brick columns surmounted by marble carvings known as "pineapples". A brick single house dominates the double lot, followed by a kitchen/quarters, a large carriage house, and privy. The south portion of the lot was filled with formal gardens. Architect Glenn Keyes and landscape historian C. Allan Brown directed the restoration project, including research and restoration of the pleasure garden.

Archaeology by The Charleston Museum proceeded in five phases, beginning with limited testing and including large block excavations of the front garden. This was the first archaeological study of the contents and evolution of a historic formal garden in Charleston. Testing also included the less formal middle and rear gardens and the work yard. The excavations revealed evidence of the property spanning the nineteenth century. Unexpected deposits of late-eighteenth-century debris include artifacts from the adjoining Miles Brewton house. A single specimen from these deposits dates to the 1780s (TP D). Collections of The Charleston Museum.

South Adger's Wharf/Lower Market, 82 East Bay Street (38Ch2291)

Excavations of a redan associated with the city wall and the lower market followed from discovery of a detailed 1785 plat of Mrs. Motte's wharf by Nic Butler and active petitioning by the Mayor's Walled City Task Force. The plat shows the curtain line along East Bay Street and the 1750s Lower Market in front of a demolished redan. The plan also shows a series of waterfront buildings along the north side of the street and plots purchased by the Commissioners of the Markets. The site, now the cobblestone South Adger's Wharf thoroughfare, was available for excavation in 2007 during construction of a municipal drainage project.

The Task Force and a team of local archaeologists, including The Charleston Museum and Brockington and Associates, excavated an area in the street in 2008 and an adjoining City parking lot in 2009. Together, the excavations exposed the brick redan, a breakwater created from cypress logs five feet in front of the brick face, and layers of pluff mud reflecting the early waterfront. The dig also encountered fill in front of the redan, postdating its abandonment in 1787. The lower market was built in front of the old redan and later expanded over the foundations. The market was well situated for receiving boats with provisions from plantations. The city-owned wharf continued this function long after the lower market was closed in 1799. Deep layers of fill dated to the razing of the redan in 1785, paving of the market site, and its closure in 1799. The market fill contained 35,000 artifacts. One tooth recovered from the marsh mud layer dates to the 1740s (TP C), while three others are from the lower market zones deposited in the mid-1780s (TP D). Collections of The Charleston Museum.

Isaac Mazyck House, 86 Church Street (38Ch2646)

The Isaac Mazyck House at 86 Church Street was constructed by Isaac Mazyck III after the fire of 1788. After his death, the property passed to his daughter, Mrs. Robert Wilson. She and her descendants rented the property as a tenement. Division of an adjoining tract (formerly 88) with 90 Church Street provided a wider lot for both properties. The three-story brick single house has two large brick kitchen buildings, one possibly predating the house, behind the main house, restored in 1950. The property is a private residence, owned by the parents of archaeologist Martha Middleton Wallace. The property was occupied well before the current house, probably by the 1680s.

A 5-ft test unit was excavated between the main house and kitchen by Martha Wallace in 2009. And adjoining 5-ft unit was excavated by Martha Wallace, Martha Zierden, and College of Charleston field school students in 2015. Both units were deep, over 5 ft, with at least seven zones. There was evidence of the fire of 1740 (Zone 4) and the fire of 1778 (Feature 5). The studied teeth are from Zone 2, 1730-1780 (TP C), Zone 5, 1710-1730s (TP B), and Zone 6, 1710s-1730s (TP B) and were loaned by the Middleton family.

<u>Telfair, Savannah (9Ch1536)</u>

The Telfair site consists of 2 trusts and 10 tything lots affected by construction. The property is within the central portion of the historic city, five blocks from the waterfront. The project documented occupation from ca. 1733 to 1900. Trust lots were locations for centralizing functions while tything parcels were domestic. Combined business-residence establishments appear after 1850. Artifact assemblages from the site are primarily domestic and cover the entire occupation period. Extensive disturbance of the site, from removal of standing structures to subsequent artifact collecting compromised some of the site.

Excavations were conducted in 1982 by the University of Tennessee-Chattanooga. The project produced 220,000 artifacts and 225 archaeological features. Zooarchaeological analysis revealed an assemblage typical of the coastal subsistence model. Two teeth date to the early nineteenth century (TP D) and were loaned by the University of Tennessee at Chattanooga.

Figure 6-1: Location of soil core samples.

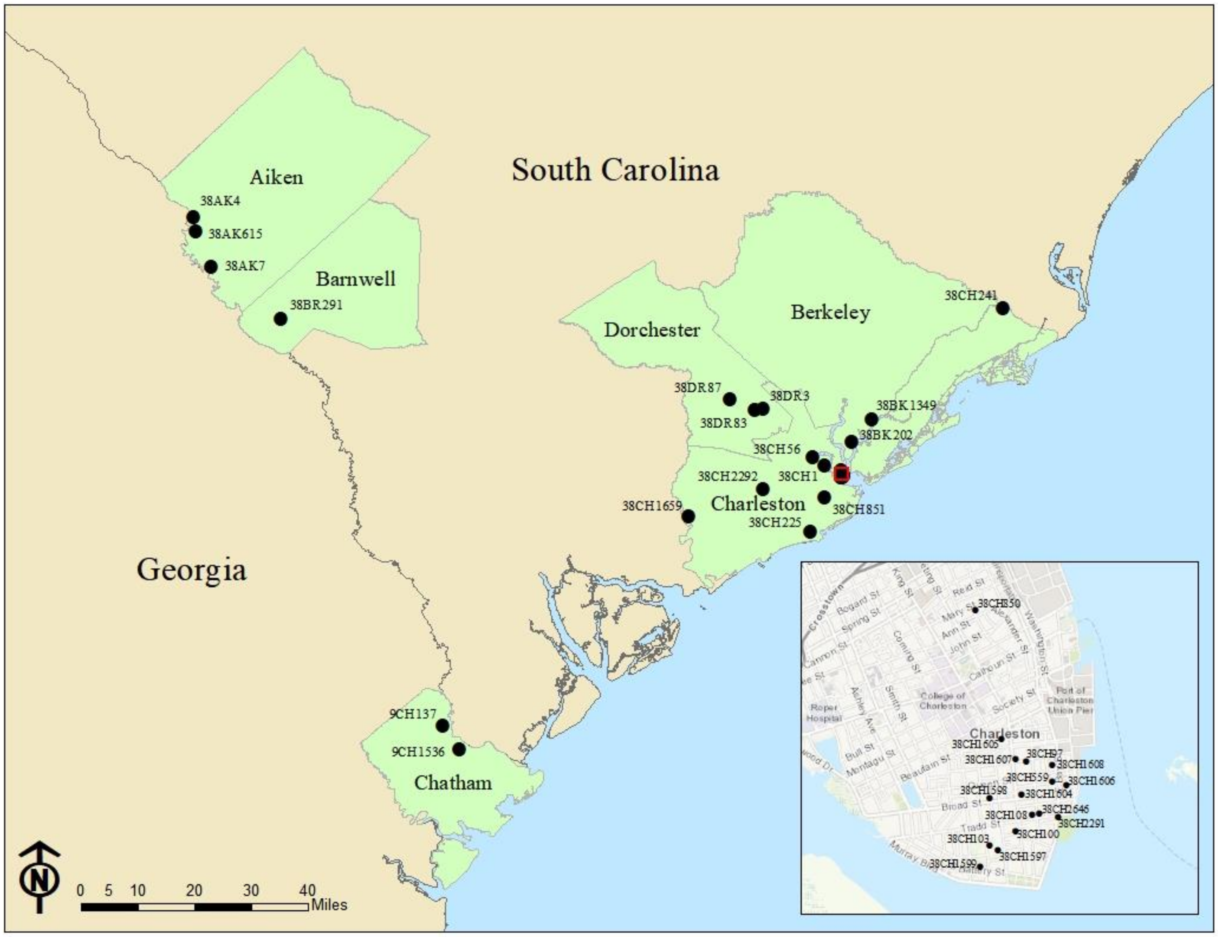

Figure 6-2: Location of tooth sample sites.

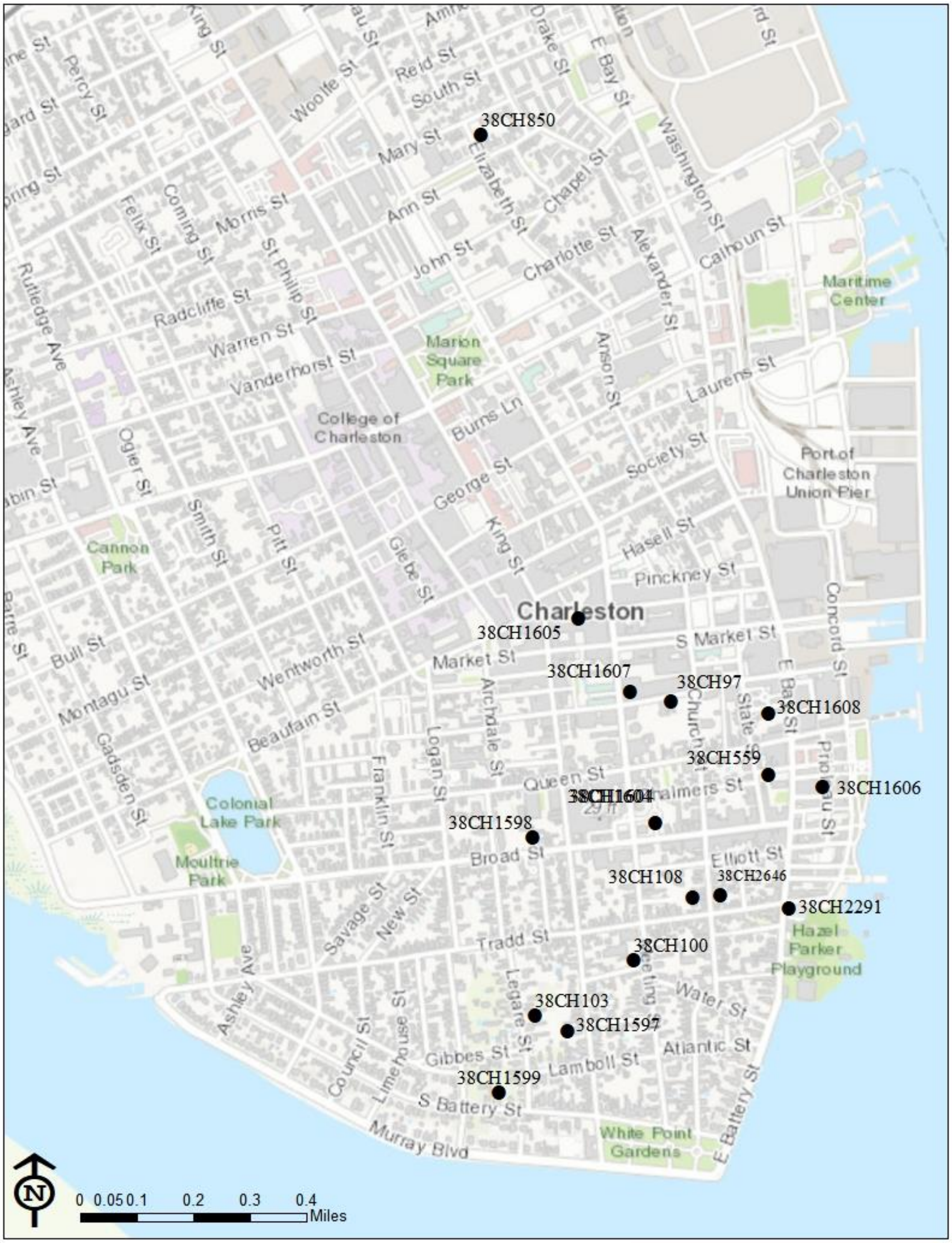

Figure 6-3: Location of tooth samples in Charleston.

Chapter VII
Multi-isotope Perspectives on Cattle Sourcing and Husbandry

Carla S. Hadden and Katherine L. Reinberger

Introduction

This study explores the role of small-scale cattle farming in large-scale urban development from the late seventeenth century to the mid-nineteenth century from the perspective of bone biogeochemistry. Preliminary carbon and nitrogen isotopic data from cattle and pig remains from a mix of domestic and commercial sites within Charleston suggested that urban dwellers did not rely solely on markets for meat (Kornmayer 2018, Kornmayer et al. 2018; Reitsema et al. 2015). In the latter study of 27 cattle bones from 6 sites, isotopic variation among cattle remains was high, indicating cattle came to Charleston from diverse sources. However, differences exist among sites, with data from two low status/dual-function contexts differing from markets and high-status residences (Reitsema et al. 2015). A preliminary interpretation was that the specimens from lower-status/dual-function sites had a different "catchment" for beef than either markets or upper-status residences, with beef procured outside of the formal markets. These results suggested that urban markets perhaps segregated, rather than integrated, access to cattle from different sources. Reitsema and colleagues (2015:250) called for "larger samples from multiple time periods … to disentangle temporal factors from social ones."

The current study expands on this previous isotopic work by adding additional cattle (n=95) from more sites, both rural and urban, local and non-local, and from multiple time periods. Here we present biogeochemical data, including isotopes of carbon ($\delta^{13}C$), nitrogen ($\delta^{15}N$), oxygen ($\delta^{18}O$), strontium ($^{87}Sr/^{86}Sr$), and lead ($^{20n}Pb/^{204}Pb$), from cattle teeth recovered from archaeological sites representing multiple nodes in the Lowcountry animal economy, e.g., markets, dwellings, workyards, cowpens, and plantations. The project tests several hypotheses: (1) animal products in Charleston were drawn from urban, suburban, and rural locations; (2) these sources changed over time; (3) herd management was based on production goals; and (4) landscape modifications associated with European-sponsored colonization reflect the regional animal economy. We focus on cattle teeth, rather than higher utility elements, being more representative of natal origin and husbandry. This approach enables us to explore the distribution of cattle in rural communities as well as link urban deposits to their point of origin.

Uses of Isotopic Analysis in Historical Archaeology

Stable isotope analysis has been a common technique in ecology, geology, and archaeology for decades. Based on the principle that food and water consumed throughout an organism's life leave chemical signatures in tissues, researchers use isotopes to explore ecosystem food webs, dietary changes in human populations, and proveniencing of materials at archaeological sites. Archaeological use of isotopes has been predominantly focused on foodways and mobility of past human populations. The study of these patterns of diet and migration inform us about the structures and relationships in a society (Goodman et al. 2000). Isotope analysis is best used in tandem with other environmental and contextual information from archaeological sites. Developments in isotope analysis, especially in the past decade or so, have seen a proliferation of studies on isotopic research in tandem with zooarchaeological methods (Birch 2013; Guiry et al. 2012a, b; Millard et al. 2013). Research involving isotopic data from pre-Columbian sites is especially valuable in reconstructing past environments and foodways when there is little documentary evidence (Birch 2013). Although early isotopic work focused on pre-Columbian populations (Schoeninger et al. 1983), isotopic research also strengthens post-Columbian archaeology (Guiry et al. 2012a, b; Millard et al. 2013). Isotopic interpretations are informed by historical sources and historical records are expanded using isotope data.

Isotope analysis has several uses in historical zooarchaeology. Differences in local climate, geology, and ecology can impact the isotopic values of local fauna, as well as their human consumers. Archaeologists analyze zooarchaeological remains not only to create isotopic baselines for comparison with human values, but also to reconstruct aspects of former climates and environments for specific sites or regions. Isotopic baseline sampling is important for evaluating whether differences in isotopic values among human populations result from dietary patterns, as opposed to environmental variables affecting the entire food web (Bownes et al. 2018). Beyond their use for establishing isotopic baselines for interpreting human remains, the isotopic analysis of zooarchaeological remains increasingly is used to illuminate human-animal interactions. Isotopes are especially useful in studies of animal husbandry patterns, including foddering (Balasse et al. 2012; Fisher and Thomas 2012; Madgwick et al. 2012) and grazing (Balasse et al. 2006; Britton et al. 2008). Nitrogen isotopes identify historical manuring and fertilizing strategies, which increases the nitrogen values in the soil and consumers (Bogaard et al. 2007; Commisso and Nelson 2010). Additional studies have focused on animal mobility (Millard et al. 2013; Pearson et al. 2007). Carbon and oxygen isotopes of tooth enamel are used to assess seasonality of birth and the slaughter of livestock (Balasse et al. 2002; Frémondeau et al. 2012; Towers et al. 2011). Nitrogen isotopes also are used to identify weaning ages in livestock (Balasse and Tresset 2002).

Guiry et al. (2012a) argue that human-animal interactions and relations in the post-Columbian period should be studied using isotopic techniques because of the many social, economic, and environmental changes that occurred after 1492, altering animal diets and mobility. Their examples include the expansion of livestock production, especially in the context of industrialization, global trade in animals and their products, and significant changes in animal husbandry practices (Guiry et al. 2012a). The study reported here touches on these processes in Charleston (SC) by using isotopic evidence to evaluate historical sources speaking to the expansion of cattle raising in the Carolina Lowcountry, Charleston's role in trade and production in a globalized economy, and specialization in herd management practices.

Cattle Tooth Structure and Growth

In this study, we examine the stable isotope composition of archaeological cattle teeth from sites in and near Charleston, the surrounding hinterlands, and in Georgia (GA), to examine aspects of animal sourcing and husbandry in the colonial cattle economy. Teeth are an exceptional material for isotopic analyses due to their resistance to diagenetic alteration, as well as the diversity of dietary and environmental signals they record in their different tissues. The following description of tooth structure and growth is based on Hillson (2005), unless otherwise noted.

The basic structure of the mammal tooth consists of the crown, which is the portion visible above the gum line, and the root(s), which are below the gumline and hold the tooth into its socket. A distinctive quality of the crown is that it is coated with a hard, shiny covering of enamel. The interior of the crown and the root are composed of dentine, which is similar in composition to bone and is much softer than enamel (Figure 7-1). Enamel and dentine are chemically different, making them suitable for different types of isotopic analyses.

Enamel is almost entirely inorganic, consisting 96% by weight of bioapatite, a mineral found only in teeth and bones. The densely packed mineral structure of enamel is responsible for the tooth's durability and resistance to diagenesis. The chemical formula for bioapatite is similar to hydroxyapatite, $Ca_{10}(PO_4)_6(OH)_2$, but with various substitutions for the phosphate and hydroxyl groups. The substitutions relevant to our isotopic study of tooth enamel include carbonate (carbon and oxygen) and strontium. Additionally, lead accumulates in the mineral bioapatite (Hillson 2005:151).

Dentine is composed of approximately 80% bioapatite and 20% collagen by weight. Collagen is a fibrous protein found in dentine and bone, composed of amino acids forming triple helix macromolecules that are further bundled into collagen fibrils. Amino acids are organic molecules consisting of an amino group (–NH2), a carboxyl group (–COOH), and an organic side chain unique to each amino acid. Relevant to this study are carbon and nitrogen isotopes in dentine collagen.

The sequence of tooth growth and maturation delimits the temporal resolution of our analyses and informs our subsampling strategy. As with humans, tooth formation begins inside the jaw, with teeth erupting into the mouth cavity only after they are fully formed, or nearly so. Teeth take a year or more to fully mature, with growth and maturation occurring in stages. Dentine within the crown is the first dental tissue to form, first as stacks of conical layers, then as a series of overlapping sleeves, forming a foundation for the enamel. Then, enamel formation occurs in two stages. The enamel matrix forms in the first stage an organic framework that is seeded with bioapatite mineral crystallites. The matrix is laid down in increments, which, like dentine, are initially "dome-like" until the tooth reaches its final crown height. The crown then grows in thickness, but not in height, by the addition of overlapping sleeve-like increments (Figure 7-1). In the second stage the enamel matures the bioapatite crystals grow in size and become densely packed, while the organic protein matrix and structural water are removed. Maturation proceeds in waves, first from the enamel surface inwards, then from the deeper layers outwards, and finally the surface layer (Suga 1982, 1989). The root is formed only after the crown is complete.

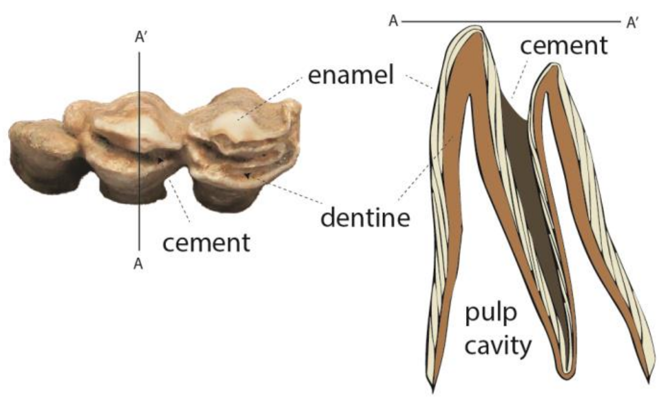

Figure 7-1. Structure and tissues of a cattle molar crown. Left = Gibbes House young adult, right lower M3, GMNH0880066; ARL26349. Wear at the tip of the cusp exposed dentine. Photo by E. Reitz. Right = Cross section of a molar showing internal structure, modified from Hillson 2005: Figure 2.5

Tooth enamel does not remodel after it forms (Zazzo et al. 2005) and dentine has a very slow turnover compared to bone (Balasse et al. 2001; Richards et al. 2002). As a result, the different layers of dentine and enamel in theory represent different periods of growth, and multiple layers could be measured to construct a time-series isotopic record (e.g., Balasse et al. 2001, 2012; Zazzo et al. 2005). However, in practice, the complex timing and geometry of tooth growth and maturation can obscure or attenuate the chronological relationships among the growth lines and geochemical data (Balasse et al. 2001; Montgomery et al. 2010; Zazzo et al. 2005).

To avoid issues with spurious chronologies, we opted to focus on the isotopic compositions of bulk samples of enamel and dentine, rather than incremental samples, and designed a subsampling strategy that averaged out variability among growth increments. The permanent molars M_2 and M_3, the focus of this study, are fully mature by approximately 1 and 3 years of age respectively (Brown et al. 1960). Therefore, our subsampling strategy provides a time-averaged signal of carbon, oxygen, nitrogen, strontium, and lead isotopes throughout the formative period of each tooth, representing the first approximately 13 years of the animal's life.

Isotope Analysis

Isotopes are atoms of the same element that contain the same number of protons but different numbers of neutrons in their nuclei, resulting in differences in atomic mass. These atomic mass differences are measurable through mass spectrometry. Stable isotope values are expressed as a permil (‰) ratio of an element's isotopes in relation to a known abundance standard. Stable carbon, nitrogen, and oxygen stable isotope ratios are reported according to the equation [$\delta = (R_{sample} - R_{standard})/R_{standard} \times 1000$]. The delta notation in analysis provides a convenient way of expressing the small relative differences measured by isotope ratio mass spectrometry between samples and standards (Katzenberg 2008; Schoeninger 2011). Strontium and lead isotope ratios are reported as simple ratios and therefore do not use the delta notation.

Stable carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotopes

Stable carbon and nitrogen isotope values in animal tissues reflect the isotopic signatures in the animal's diet, time-averaged over the period of tissue formation (Schoeninger 2011). The carbon and nitrogen isotopes of proteins, such as collagen, reflect the values of dietary protein ingested by the animal (DeNiro and Epstein 1978, 1981; Schoeninger and DeNiro 1984). Carbon isotopes in tooth and bone bioapatite reflect the animal's total diet, i.e., including carbohydrates (van Klinken et al. 2000).

For omnivores and carnivores, $\delta^{13}C$ values broadly reflect the plants at the base of the food chain. In the case of herbivores, such as cattle, the $\delta^{13}C$ value reflects the types of plants consumed by the animal directly. Plant types are differentiated on the basis of the different photosynthetic pathways used by plants, C_3, C_4, and CAM, which discriminate against the heavy isotope ^{13}C to different degrees (DeNiro and Epstein 1978). Plants utilizing the C_4 photosynthetic pathway (tropical/subtropical grasses) have higher $\delta^{13}C$ values than plants utilizing the C_3 photosynthetic pathway (most woody and herbaceous plants in temperate climates), while CAM plants (succulents) tend to have intermediate carbon isotopic values (Schoeninger and DeNiro 1984). $\delta^{13}C$ values in cattle tissues can be used to estimate the relative proportion of C_3, C_4, and CAM plants consumed by the animal.

$\delta^{15}N$ values typically are used in diet studies to estimate trophic position, with $\delta^{15}N$ increasing ~3-5% each step of the food chain, from producers to primary and secondary consumers. Nitrogen isotopes can also indicate freshwater or marine dietary inputs, as aquatic ecosystems have longer food chains, resulting in higher $\delta^{15}N$ values (Schoeninger et al. 1983). Environmental (and microenvironmental) effects also can increase $\delta^{15}N$ values, such as salinity, aridity, fire, use of fertilizers, and vegetation cover (van Klinken et al. 2000).

Together, these isotopes reflect the grazing opportunities of free-ranging animals, or fodder provided to penned animals. Overgrazing, forest clearing, drainage projects, and changes in vegetation can be seen in variations in carbon and nitrogen isotopes (e.g., Bogaard et al. 2007; Britton et al. 2008; Drucker et al. 2008; Tieszen 1991; van Klinken et al. 2000). Indirectly, carbon and nitrogen isotopes in cattle remains reveal information about where and how an animal was raised. For example, Kennedy and Guiry (2022) used carbon and nitrogen data to discriminate between cattle consuming local C_3 plants, as opposed to non-local maize, a C_4 plant, to study the impacts of the Transcontinental Railroad on the nineteenth-century meat trade. Grimstead and Pavão-Zuckerman (2016) used carbon isotopes as a proxy for the grazing elevation of Mission-period cattle in the American Southwest. Guiry et al. (2021) used carbon and nitrogen isotopes in combination with sulfur to examine the importance marsh plants in cattle husbandry in seventeenth-eighteenth century Acadia, Canada. These interpretations rely on a baseline understanding of the drivers of isotopic fractionation (the mechanisms that cause higher or lower isotopic values) in the system under study.

In the present study, we focus on carbon and nitrogen isotopes to investigate animal husbandry practices in colonial Charleston and its hinterlands. We interpret $\delta^{13}C$ values in cattle teeth as a continuum between purely C_3 and purely C_4 diet, broadly reflecting a grazing strategy focused on backwater canebreaks dominated by river cane (*Arundinaria* spp.) and coastal marshes dominated by cordgrasses (*Spartina* spp.), respectively. Since cattle are herbivores, we focus on the environmental rather than trophic variables that increase $\delta^{15}N$. Salt marshes, where cattle are historically known to have grazed, have raised $\delta^{15}N$ values due to the salinity (Britton et al. 2008; Guiry et al. 2021). Higher nitrogen isotopic values are also associated with manuring of fields (Bogaard et al. 2007) and penning of animals, as well as areas exposed to heat and sun, salinity, and fire-clearing. This is especially relevant in parts of South Carolina where people may have used fire to clear forested land for agricultural or pastoral use. Forested areas, in contrast, have lower carbon and nitrogen isotopic values (Drucker et al. 2008).

Stable oxygen ($\delta^{18}O$) isotopes

Oxygen isotopes in structural carbonate in bioapatite are precipitated in equilibrium with body water, which in turn reflects the isotopic composition of ingested water, and, ultimately, of local precipitation, surface water, and groundwater (Bryant and Froelich 1995; Bryant et al. 1996; Kohn and Cerling 2002). $\delta^{18}O$ values in teeth and bones reflect the values of local water. Regional patterns in temperature, altitude, distance from the ocean, and humidity map onto spatial patterns in water $\delta^{18}O$. In eastern North America, for example, $\delta^{18}O$ values of precipitation and river water exhibit a latitudinal gradient: low latitudes and high temperatures are associated with high $\delta^{18}O$ values, high latitudes and cool temperatures with low $\delta^{18}O$ values (Dutton et al. 2005; Kendall and Coplen 2001).

$\delta^{18}O$ values of bones and teeth are used to reconstruct aspects of paleoclimate (Koch 1998), to investigate migration and mobility of human and animal populations (Lightfoot and O’Connell 2016; Evans et al. 2019; Gan et al. 2018), and to study animal husbandry (Grimstead and Pavão-Zuckerman 2016). Grimstead and Pavão-Zuckerman (2016) argued on the basis of oxygen isotopes that eighteenth-century Spanish missions stored and managed water for livestock, similar to modern practices. Tooth values were much higher than expected local surface water and precipitation, suggesting the water had undergone evaporation.

Following Grimstead and Pavão-Zuckerman (2016), we focus on $\delta^{18}O$ in cattle tooth enamel to test for evidence of water management associated with the Carolina cattle industry. Did cattle obtain water from free-flowing rivers and streams, consistent with free-range management practices, or did some animals rely on stored or impounded water, as might be expected for animals that were penned or enclosed? To test for water storage/management, source water $\delta^{18}O$ values are reconstructed from cattle tooth $\delta^{18}O$ values. Resultant values more enriched in ^{18}O compared to local surface water and precipitation are interpreted as evidence that the source water had undergone significant evaporation, i.e., stored or stagnant water.

Radiogenic strontium ($^{87}S/^{86}Sr$) and lead ($^{20n}Pb/^{204}Pb$)

Strontium and lead isotopes in the food chain are derived from local rocks, soils, and groundwater, made bioavailable to herbivores via plants. Lead is also incorporated into the body through the consumption or inhalation of soils (Kamenov 2008). Strontium and lead isotopes are incorporated into the mineral component of teeth and bone, and reflect the isotopic ratios of the soil and bedrock age and composition (Price et al. 2002). In biological tissues they preserve a chemical signature of the geological region at the time of tissue formation (Turner et al. 2009), thus providing evidence for provenance and mobility.

Strontium is an alkaline earth element with a similar ionic radius and valence to calcium, so often substitutes for calcium in hydroxyapatite during the development of teeth and bones (Beard and Johnson 2000; Bentley 2006). The small mass differences between the isotopes of strontium (^{84}Sr, ^{86}Sr, ^{87}Sr, and ^{88}Sr) results in little to no fractionation, so the values in tissues reflect the same values as an organism's diet (Faure and Powell 1972; Price et al. 2002). ^{87}Sr is the only radiogenic isotope that forms through the radioactive decay of rubidium (Rb). The present-day $^{87}Sr/^{86}Sr$ ratio in a rock is a function of the initial $^{87}Sr/^{86}Sr$ ratio, rubidium and strontium content (Rb/Sr), and the age of the rock (Bentley 2006).

There are four naturally occurring lead isotopes (^{204}Pb, ^{206}Pb, ^{207}Pb, and ^{208}Pb). The lightest, ^{204}Pb, is non-radiogenic. The others, ^{206}Pb, ^{207}Pb, and ^{208}Pb are radiogenic and are the decay products uranium (^{238}U, ^{235}U) and thallium (^{232}Th), respectively (Dickin 2005, Faure and Mensing 2004, Malainey 2011). Lead isotopes ($^{20n}Pb/^{204}Pb$) are also useful indicators of geographic origins because the radiogenic isotopes are affected by the geologic age of the bedrock, increasing in abundance relative to ^{204}Pb as the rocks age.

Geochemical sourcing studies rely on a baseline map of biologically available isotopes in the possible source regions. For example, studies of cattle remains from eighteenth-century Spanish missions in the Mexico, Guatemala, and the US Southwest concluded that missionized Native Americans bred and raised cattle locally, on the basis of strontium isotopes because faunal $^{87}S/^{86}Sr$ were indistinct from local values (Grimstead and Pavão-Zuckerman 2016). A small proportion of animals were imported from geologically distinct sources, although not distant sources such as Spain, Africa, or the West Indies (Freiwald and Pugh 2018).

The geologic regions of South Carolina (Figure 7-2) can be visualized as bands running roughly parallel to the coast, with the youngest deposits along the coast and the oldest deposits farthest inland, in the mountains (Willoughby et al. 2005). The Lower Coastal Plain, which includes the tidewater region known as the Lowcountry, is underlain by relatively young Holocene- and Pleistocene-age deposits. Moving inland, the Upper Coastal Plain is underlain by older (Pliocene, Paleocene, Eocene, and Upper Cretaceous) deposits. Piedmont geology is older still, with Late Proterozoic and Cambrian deposits with pockets of Paleozoic granites. Broadly speaking, the relatively young coastal deposits are expected to be the least radiogenic, with expected $^{87}Sr/^{86}Sr$ values close to modern seawater (= 0.709), with higher $^{87}Sr/^{86}Sr$ values observed in older/more radiogenic deposits as one moves inland. On this basis, cattle that originated within the Lower Coastal Plain can be differentiated from animals that originated farther inland, and vice versa, enabling us to identify spatial and temporal patterns in colonial cattle trade networks.

Unfortunately, we lack a robust baseline map for interpreting lead isotope ratios in cattle teeth. Future work should focus on developing and ground-truthing a spatial model for the distribution of biologically available lead isotopes in the Southeast.

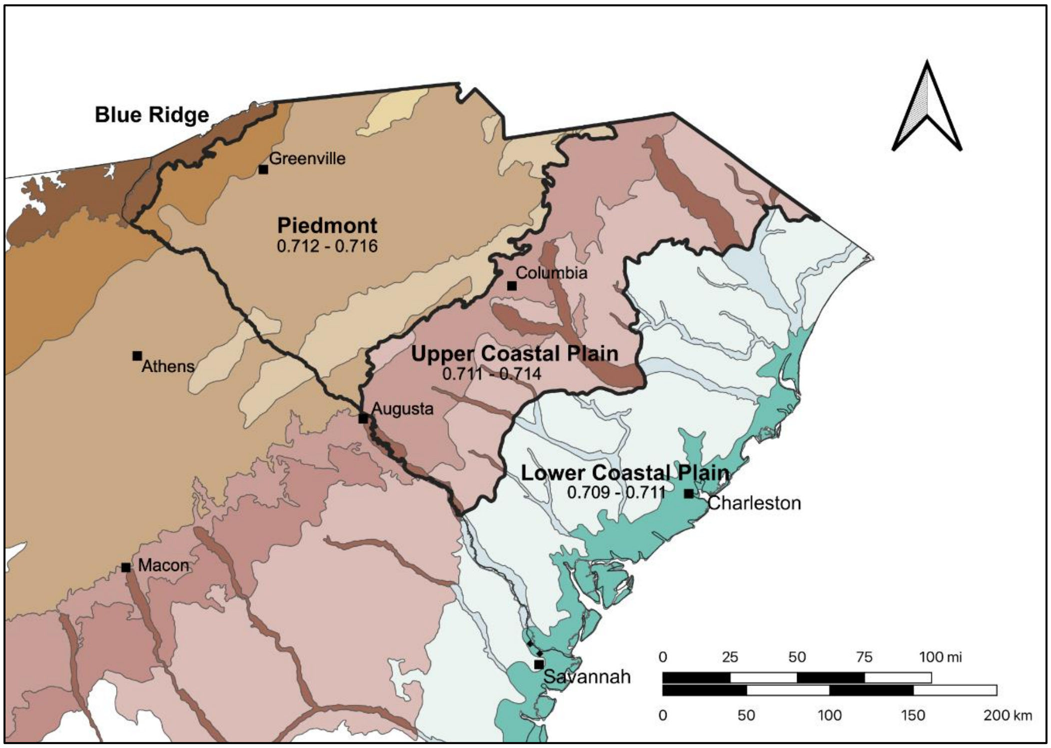

Figure 7-2. Map of study area showing locations of ecoregions in this study with expected $^{87}Sr/^{86}Sr$ values. Note that the Upper Coastal Plain and Piedmont have partially over-lapping values. For the sourcing study, cattle specimens with $^{87}Sr/^{86}Sr$ in the range 0.712–0.714 are interpreted as "Indeterminate Upper Coastal Plain/Piedmont."

Materials and Methods

This study includes data from 95 cattle teeth from 16 urban Charleston sites (N = 54 teeth), Colonial Dorchester (N = 1 tooth), 16 rural cowpens and plantations (N = 38 teeth), and the Telfair site in Savannah (GA; N = 2). Descriptions of the sites and sample selection strategies are described in Chapter VI; complete metadata for analyzed teeth are presented in Appendix IV.

The external surface of each cattle tooth was cleaned and a section was cut along one side, from root to tip, using a hand-held rotary tool with a diamond wheel. Each slice of tooth was then manually separated into enamel and dentine fractions. These large bulk samples were taken to average out isotopic values over the entire formation period of the tooth. Samples for isotopic analysis broadly represent the first 1-3 years of the animal's life.

Carbon ($\delta^{13}C_{coll}$) and nitrogen ($\delta^{15}N$) in dentine collagen

Collagen was recovered from tooth dentine following a modified Longin (1971) procedure as follows. Tooth dentine samples were gently reduced to smaller fragments of approximately 3-5 mm in size and were demineralized in cold (4ºC) 1N HCl for 24 hours. The acid was decanted and the demineralized dentine fragments were rinsed with ultrapure (MilliQ) water until neutral. The dentine fragments were then treated with 0.1M NaOH to dissolve and remove humic acids, and subsequently rinsed in ultrapure water until neutral. The demineralized dentine fragments were then rinsed with 1N HCl to eliminate atmospheric CO_2, rinsed in ultrapure water to pH 4 (slightly acidic), and heated at 80ºC for 8 hours. The resulting solutions were filtered through glass fiber filters to isolate the total acid insoluble fraction ("collagen") and freeze-dried.

Approximately 1 mg of each collagen sample was encapsulated in tin, and the carbon and nitrogen elemental concentrations and stable isotope ratios ($\delta^{13}C_{coll}$ and $\delta^{15}N$) were measured using an elemental analyzer isotope ratio mass spectrometer (EA-IRMS) housed at the University of Georgia Center for Applied Isotope Studies (CAIS). Analytical standards included internally prepared spinach and bovine tendon. Values are expressed as $\delta^{13}C_{coll}$ with respect to VPDB and $\delta^{15}N$ with respect to AIR, with an error of less than 0.1 ‰.

We estimated the relative abundance of C_4 plants in cattle diet from a linear mixing model using an endpoint value of -30 ‰ for C_3 plants and -10 ‰ for C_4 plants, a diet-collagen offset of 5 ‰ (Hedges 2003). The endpoints were estimated from $\delta^{13}C$ of C_4 plants including cordgrass, wiregrass (*Aristida stricta*), and switchgrass (*Panicum* spp.) and which have $\delta^{13}C$ values ranging from -15 to -10 ‰; and common C_3 forage such as cane, sabal palm (*Sabal palmetto*), cattail (*Typha* spp.), and needlerush (*Juncus* spp.) with $\delta^{13}C$ values ranging from -30 to -25 ‰ (Reitsema et al. 2015: Table 3). Spanish moss (*Tillandisa usneoides*), which is a CAM plant, has isotopic values similar to and for our purposes indistinguishable from C_4 plants (-15 ‰).

Carbon ($\delta^{13}C_{ap}$) and oxygen ($\delta^{18}O$) in tooth enamel

Tooth enamel subsamples were pretreated with acetic acid following Dudas et al. (2016) to remove secondary or diagenetic carbonates, modified as follows. The samples were sonicated in ultrapure water for 30 minutes and decanted, then sonicated in 5% ultrapure acetic acid for 30 minutes. The acid was decanted and replaced with fresh 5% ultrapure acetic acid. After 5 minutes the acid was decanted and the samples were rinsed exhaustively in ultrapure water and dried at 80° C. Each sample was split into two sub-samples, one for $\delta^{13}C_{ap}$ and $\delta^{18}O$ analysis, and one for $^{87}Sr/^{86}Sr$ and $^{20n}Pb/^{204}Pb$ analysis.

Approximately 1 mg of each pretreated enamel sample was reacted with 100% phosphoric acid in flushed exetainer vials to produce CO_2, and stable isotope ratios ($\delta^{13}C_{ap}$ and $\delta^{18}O$) were measured using a Thermo GasBench II-IRMS. Values are expressed as $\delta^{13}C_{ap}$ and $\delta^{18}O$ with respect to VPDB, with an error of less than 0.1 ‰.

The abundance of C_4 plants in cattle diet was estimated as with $\delta^{13}C_{coll}$, however a diet-bioapatite offset of 15 ‰ (Passey et al. 2005) was used. This resulted in two separate estimates of $\%C_4$ diet, one from collagen (reflects dietary protein) and one from enamel (reflects total diet).

Source water $\delta^{18}O$ was estimated from bioapatite $\delta^{18}O$ to determine whether cattle predominantly consumed fresh or evaporated water. First, bioapatite $\delta^{18}O$ values were used to reconstruct the animals' body water values using the fractionation factor relating structural carbonate to body water $\alpha = 1.0263$ (Bryant et al. 1996). The body water value was then converted into Standard Mean Ocean Water (SMOW). Then, we estimated the drinking water $\delta^{18}O$ assuming a drinking water-body water offset = 7 ‰ for cattle based on Grimstead and Pavão-Zuckerman (2016). Water across most of South Carolina ranges from -6 to -2 ‰ with respect to SMOW (Kendall and Coplen 2001; Dutton et al. 2005); reconstructed source water values > -2 ‰ are interpreted as evaporated/stagnant water.

Strontium ($^{87}Sr/^{86}Sr$) and lead ($^{20n}Pb/^{204}Pb$) in tooth enamel

Approximately 20 mg of the pretreated enamel sub-samples were transferred to Savillex beakers and treated with ultrapure 5N HNO_3 over low heat for 24 hours. The samples were allowed to cool, then the acid was evaporated to incipient dryness. One ml of ultrapure hydrogen peroxide was added to each beaker and heated to evaporate to incipient dryness. One ml of concentrated HNO_3 was added to the beaker and heated to evaporate to incipient dryness. 450 microliters of 8N HNO_3 was added to each beaker, and the sample was allowed to dissolve in the acid before loading onto the column with SPEX Sr resin to isolate strontium and AG 10-80X resin to isolate lead. Sr and Pb isotopic compositions were determined at the University of Georgia Center for Applied Isotope Studies on a Nu-Plasma II MC-ICP-MS.

$^{87}Sr/^{86}Sr$ ratios were corrected for mass bias using exponential law and $^{86}Sr/^{88}Sr = 0.1194$. ^{87}Sr was corrected for the presence of rubidium (Rb) by monitoring the intensity of ^{85}Rb and subtracting the intensity of ^{87}Rb from the intensity of ^{87}Sr, using $^{87}Rb/^{85}Rb = 0.386$ and a mass-bias correction factor determined from $^{86}Sr/^{88}Sr$. All analyses were done using on-peak measured zeros determined on an ultra-high purity 2% HNO_3 solution to correct for isobaric interferences of Krypton impurities in the argon gas.

Lead isotope ratios (^{204}Pb, ^{206}Pb, ^{207}Pb, and ^{208}Pb) were corrected for mass-dependent bias by spiking samples with thallium, monitoring $^{205}Tl/^{203}Tl$, and using exponential law ($^{205}Tl/^{203}Tl = 2.38750$; see Kamenov et al. [2004] for details). Mercury (Hg) interference (with ^{204}Pb) was corrected by monitoring $^{204}Hg/^{202}Hg$. Background measurements were made by monitoring faraday cups while the ion beam was deflected by the ESA. NIST SRM 981 was used to monitor instrumental drift using the sample-standard bracketing method of White et al. (2000).

The expected $^{87}Sr/^{86}Sr$ ranges for the source regions (Figure 7-2) were calculated from values from a published model that predicts $^{87}Sr/^{86}Sr$ values in global bioavailable strontium (Bataille et al. 2020; Bataille et al. 2021). This model uses a multivariate random forest regression framework, combining biological, geological, and environmental covariates and bioavailable $^{87}Sr/^{86}Sr$ data, to predict the average $^{87}Sr/^{86}Sr$ at each pixel and associated uncertainty in the map. This model was published in a raster file and made publicly available (Bataille et al. 2021). Once the raster was input into QGIS, the Sample Raster Values was used to pick 500 random points in each ecoregion and extract the $^{87}Sr/^{86}Sr$ value of the randomly selected pixels. These data were downloaded as a CSV file and the mean and standard deviation was calculated for each ecoregion. Each $^{87}Sr/^{86}Sr$ range was calculated with plus and minus one standard deviation from the mean and rounded to the nearest thousandth (3rd-decimal). The calculated ranges for the ecoregions are as follows: the Lower Coastal Plain (0.709 to 0.711), Upper Coastal Plain (0.711 to 0.714), Piedmont (0.712 to 0.716). Note the partially overlapping values of the Upper Coastal Plain and Piedmont resulted in a fourth category, Indeterminate Upper Coastal Plain/Piedmont (0.712 to 0.714).

Results

Complete isotopic data for individual teeth are available in Appendix IV. Values below (Table 7-1) are summarized by the location where the tooth was excavated, i.e., the ecoregion in which the cattle likely were slaughtered. This resulted in four groups: Urban Charleston, Lower Coastal Plain (including sites from SC and GA, but excluding those from within Charleston), Upper Coastal Plain, and Urban Georgia.

Viewed from the perspective of slaughter location, we observe very few statistically significant differences in cattle tooth geochemistry. Broadly speaking, cattle recovered from the Upper Coastal Plain have more negative $\delta^{13}C$ values than animals recovered from the Lower Coastal Plain, suggesting the latter had a greater reliance on C_4 plants. Animals from the Upper Coastal Plain and Urban Georgia also exhibit significantly more radiogenic $^{87}Sr/^{86}Sr$ values, suggesting a more inland source. However, the geochemical signals recorded in the teeth are locked-in early in the animal's life, providing insights into cattle husbandry practices, animal diet, and drinking water sources in the region where the animals originated, not necessarily the region where animals were eventually slaughtered and their teeth were recovered by archaeologists.

Table 7-2 presents the same isotopic data summarized by probable source region as determined from the strontium isotope values, rather than slaughter location. For this purpose, individual animals were assigned to a source origin as follows:

- Lower Coastal Plain = $^{87}Sr/^{86}Sr$ values greater than 0.709 and less than 0.711;
- Upper Coastal Plain = greater than or equal to 0.711 and less than 0.712;
- Indeterminate Upper Coastal Plain/Piedmont = greater than or equal to 0.712 and less than 0.714; and
- Piedmont = greater than or equal to 0.714 and less than 0.716.

In total, 66 (69%) of the animals studied likely originated in the Lower Coastal Plain; the remaining animals originated in the Upper Coastal Plain or Piedmont. Overall, animals raised in the Lower Coastal Plain have the highest $\delta^{13}C$ values, suggesting these animals were more reliant on C_4/CAM plants (tropical grasses and succulents) compared to animals raised further inland, which relied to a greater extent on C_3 plants such as cane. However, the large standard deviations suggest considerable variability in cattle diet, particularly on the Lower Coastal Plain.

Table 7-1. Means/standard deviations for isotopic values by probable slaughter region.

Slaughter Region	$\delta^{13}C_{coll}$ (n=95)	$\delta^{15}N$ (n=95)	$\delta^{13}C_{ap}$ (n=95)	$\delta^{18}O$ (n=95)	$^{87}Sr/^{86}Sr$ (n=95)	$^{208}Pb/^{204}Pb$ (n=80)	$^{207}Pb/^{204}Pb$ (n=80)	$^{206}Pb/^{204}Pb$ (n=80)
Urban Charleston (n=55)	-15.0 ± 2.9	5.7 ± 1.2	-6.5 ± 3.1	-0.7 ± 1.4	0.71074 ± 0.00113	38.49 ± 0.41	15.67 ± 0.04	17.98 ± 0.42
Lower Coastal Plain (n=35)	-14.7 ± 4.1	5.8 ± 1.1	-5.9 ± 4.3	-0.2 ± 1.3	0.71035 ± 0.00124	38.44 ± 0.29	15.67 ± 0.03	17.96 ± 0.35
Upper Coastal Plain (n=3)	-19.7 ± 4.0	6.3 ± 0.8	-12.5 ± 1.3	-0.3 ± 1.3	0.71212 ± 0.00119	38.54 ± 0.03	15.68 ± 0.01	18.05 ± 0.02
Urban Georgia (n=2)	-14.6 ± 0.1	6.2 ± 0.01	-6.6 ± 2.0	0.4 ± 0.5	0.71228 ± 0.00089	38.44 ± 0.50	15.68 ± 0.03	17.94 ± 0.48

Table 7-2. Means/standard deviations for isotopic values by probable source region.

Source Region	$\delta^{13}C_{coll}$ (n=95)	$\delta^{15}N$ (n=95)	$\delta^{13}C_{ap}$ (n=95)	$\delta^{18}O$ (n=95)	$^{87}Sr/^{86}Sr$ (n=95)	$^{208}Pb/^{204}Pb$ (n=80)	$^{207}Pb/^{204}Pb$ (n=80)	$^{206}Pb/^{204}Pb$ (n=80)
Lower Coastal Plain (n=66)	-14.2 ± 3.6	5.9 ± 1.2	-5.7 ± 3.8	-0.5 ± 1.4	0.71001 ± 0.00056	38.49 ± 0.40	15.68 ± 0.04	18.00 ± 0.44
Upper Coastal Plain (n=14)	-18.6 ± 2.1	5.4 ± 1.1	-9.2 ± 1.8	-1.1 ± 1.1	0.71143 ± 0.00029	38.36 ± 0.27	15.66 ± 0.02	17.85 ± 0.23
Indet. Upper Coastal Plain/ Piedmont (n=14)	-16.2 ± 1.7	5.1 ± 0.7	-7.4 ± 3.0	0.2 ± 1.1	0.71267 ± 0.00041	38.48 ± 0.21	15.67 ± 0.02	17.95 ± 0.18
Piedmont (n=1)	-17.7	7.2	-9.8	-3.0	0.71555	38.58	15.68	18.02

Discussion

The large variation in stable isotope values indicates there was not a "one-size fits all" approach when it came to raising cattle. The geochemical signals recorded in teeth and bones tell a story, and each animal has its own unique story: where and how it was raised, and where it was slaughtered. Table 7-3 presents our interpretations of the geochemical data for each animal: the source region based on enamel $^{87}Sr/^{86}Sr$ values, the types of plants (proportion of C_4 plants in its diet) based on $\delta^{13}C$ values of collagen and bioapatite; and an estimate of the $\delta^{18}O$ value of its drinking water based on enamel carbonate. Here we discuss some of the broader patterns that emerge from these individual stories.

Strontium isotope data support a one-way transport of cattle stock

Strontium isotope analysis allows us to identify whether individual cattle were slaughtered near their natal origin. Strontium isotope data support a one-way transport of cattle stock, from the Upper Coastal Plain to the Lower Coastal Plain, with almost no evidence of the reverse. In Figure 7-3, the symbol corresponds to the locality where the specimen was recovered; the colored fields correspond to the ranges of expected $^{87}Sr/^{86}Sr$ values of the source ecoregions (see Figure 7-2 for map of source regions). The majority (~70%) of animals recovered from sites in the Lower Coastal Plain were "local" in the sense they originated in the Lower Coastal Plain. This is true for urban Dorchester and Charleston, as well as for rural sites. The remaining 30% of animals likely originated in the Upper Coastal Plain or Piedmont and were imported into the Lower Coastal Plain where they eventually were slaughtered. Cattle were routinely imported to Charleston over a distance of 75 km or more, doubtless a multi-day journey, with cattle drives rarely progressing more than 15 miles [24 km] per day (Durham 1965:38). One animal (RDE-68), an elderly individual recovered from Stono Plantation and dating to 1780-1820, originated in the Piedmont, a distance of 150 km or more. The presence of these animals in the Lowcountry is evidence that cattle were transported from the interior to supply both urban markets and rural tidewater plantations.

In contrast, cattle recovered from the sites in the Upper Coastal Plain have isotopic values consistent with Upper Coastal Plain geology, suggesting that cattle recovered from those sites were slaughtered in the same region in which the animals were raised, possibly for local use. Specimen RC-72, from the Meyer household in New Windsor Township, is the sole exception. This animal was excavated from a site located in the Upper Coastal Plain, but has strontium values consistent with the Lower Coastal Plain. This animal may have been purchased downriver, or brought to the area when the Meyers first moved to Windsor.

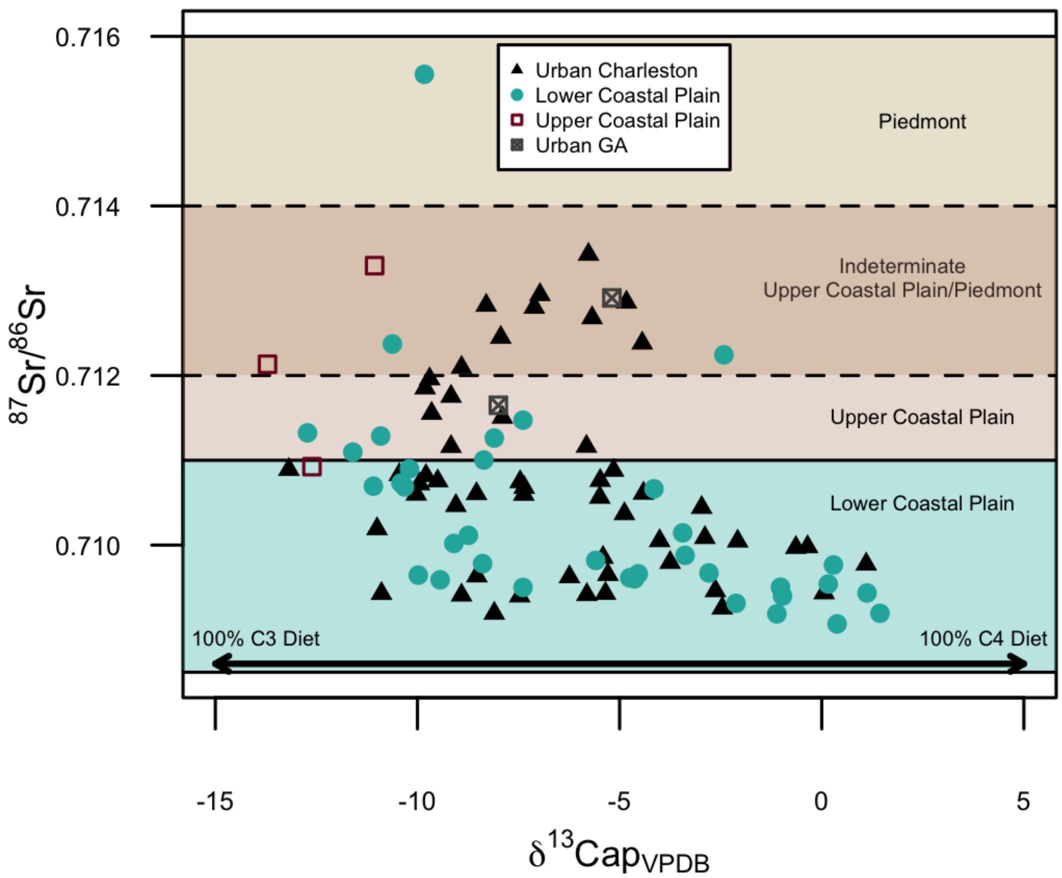

Figure 7-3. $^{87}Sr/^{86}Sr$ and $\delta^{13}C_{(apatite)}$ values from archaeological cattle teeth. Symbols refer to region where specimen was excavated. The expected $^{87}Sr/^{86}Sr$ values for the source ecoregions are indicated with horizontal lines and colored rectangles: (Lower Coastal Plain = 0.709 – 0.711; Upper Coastal Plain = 0.711 – 0.714; Indeterminate Upper Coastal Plain/Piedmont = 0.712 - 0.714; Piedmont = 0.712 – 0.716). The horizontal arrow shows expected values for 100% C_3 and 100% C_4 diets based on modern plant samples.

Cattle diet varied among and within source regions

The diversity in grazing patterns reflects the ecological diversity of South Carolina. Cattle diets within the Lower Coastal Plain were highly variable: the proportion of C_4/CAM plants in cattle diets averaged around 50%, but ranged from approximately 8-90% based on collagen or 9-82% based on bioapatite. In comparison, animals from the Upper Coastal Plain had more restricted diets that relied more heavily on C_3 plants, with diets consisting of 30-40% C_4/CAM plants and 60-70% C_3 plants on average (Figure 7-3). The large range of nitrogen values (Figure 7-4) suggests further variability in soils and plants. Wooded areas, lands recently fertilized or burned for clearing, and salt marshes would lead to plants (and cattle) having higher nitrogen values.

In the Lower Coastal Plain, vegetational communities are shaped by tidal flow, salinity, and topography. Animals grazing near the coast are expected to have elevated $\delta^{15}N$ values due to sea spray effects. Overall, these coastal environments offer abundant but varied C_4 forage opportunities. On some of the larger or more elevated sea islands, cattle grazed among salt-tolerant maritime forests dominated by C_3 plants such as palmetto, live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), southern magnolia (*Magnolia grandiflora*), and eastern redcedar (*Juniperus virginiana*) with shrub thickets of yaupon holly (*Ilex vomitoria*) and wax myrtle (*Morella cerifera*) (SC DNR 2005:14). Coastal dune habitats support abundant C_4 vegetation such as switchgrass and sea oats (*Uniola* spp.). The estuarine zone consists of a complex of marshlands, tidal creeks, sand flats, and mud flats. Grasses, sedges, and herbs including three species of cordgrasses (*Spartina* spp.) provided abundant C_4 pasturage for cattle grazing in salt marshes.

Further inland, the Lower Coastal Plain transitions from flat sandy soils to rolling loamy hills dominated by grasslands, pine woodlands, and river bottoms. The grasslands are open meadows with few trees. Overall, the open grasslands would lead to soils, plants, and cattle having lower $\delta^{15}N$ values than on the coast, unless they had recently been burned. Wooded areas would lead to higher nitrogen values. The pine woodlands are dominated by C_3 vegetation such as loblolly (*Pinus taeda*) and longleaf (*P. palustris)* pines, with stands of hollies and wax myrtle. Spanish moss (*Tillandisa usneoides*), a CAM plant, provides abundant browse for free-range cattle if the epiphyte remains below the browse-line (Otto 1985). Windfall from cyclic weather events such as tornadoes and hurricanes regularly added Spanish moss to the cattle diet.

In the Upper Coastal Plain, cattle thrived in a xeric environment supporting fire-adapted communities of longleaf pine and turkey oak (*Q. cerris*). Frequent fires would lead to high $\delta^{15}N$ values. Common C_4 grasses include little bluestem (*Schizachyrium scoparium*) and wiregrass (*Aristida* spp.*)*. Little bluestem is a native perennial bunchgrass found throughout the longleaf savannas of the coastal plains of South Carolina (Platt 1999). Wiregrass is the keystone species of the fire-dependent longleaf pine ecosystem, which historically covered most of the Sandhills region (Bussell 2005; Cathey et al. 2010; Platt 1999; Sharma et al. 2011). Wiregrass comprised upwards of 90% of the understory in some areas (Christensen 1977). By retaining its leaf mass all year, wiregrass can photosynthesize and produce roots throughout the winter (West et al. 2003). The non-deciduous foliage of this perennial bunchgrass also captures resinous pine needle litter, fueling the spread of early summer lightning fires (Outcalt et al. 1999). Periodic fires favor the spread of *A. stricta* because its reproductive success depends on the post-fire environment (Fill et al. 2012; Mulligan and Kirkman 2002; Wall et al. 2012; Wenk et al. 2011).

Rivers cut across these ecoregions. River cane (*Arundinaria* spp.), a C_3 plant, colonized alluvial floodplains through an underground rhizome, forming monotypic stands of bamboo-like "brakes" across the southeastern region (Griffith et al. 2009). River cane served as a major forage for overwintering cattle in South Carolina (Platt and Brantley 1997). William Bartram (Bartram and Harper 1943), writing about his travels in the southern colonies between 1773 and 1777, described huge canebrakes, some being miles long. The evergreen foliage of river cane was a preferred fodder species for cattle.

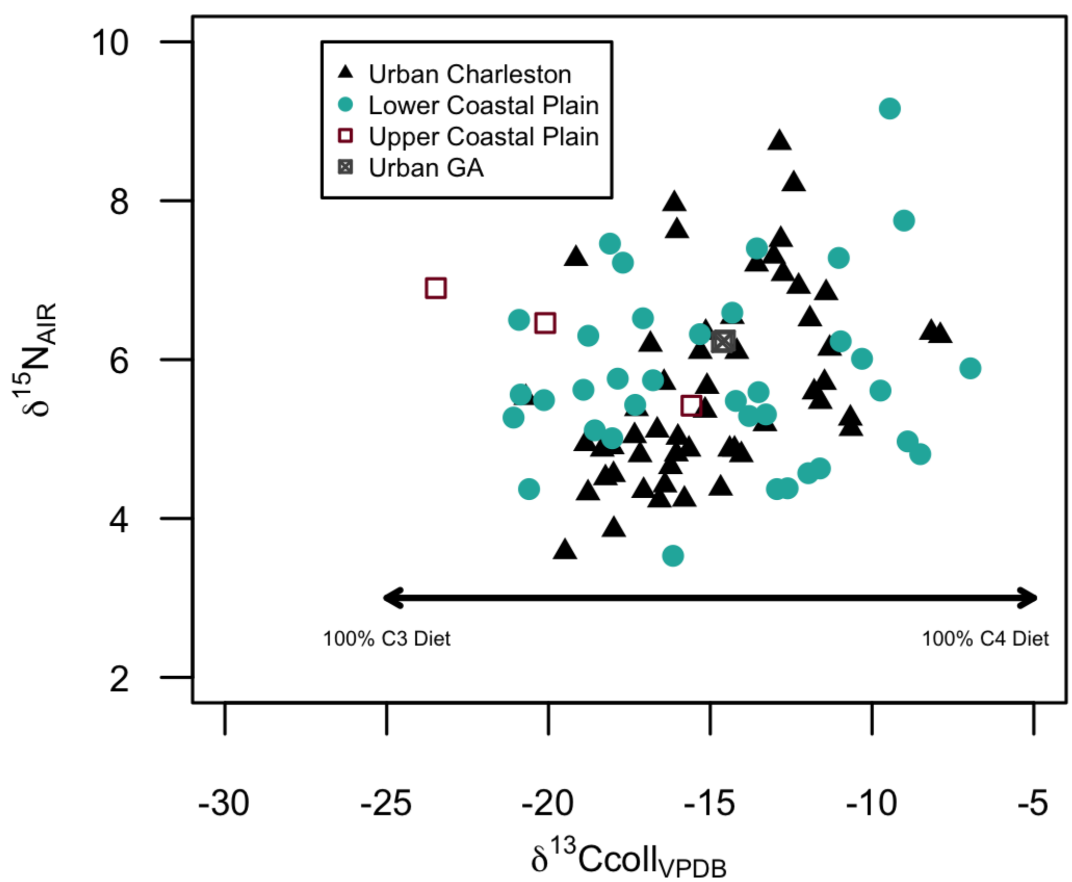

Figure 7-4. $\delta^{13}C_{collagen}$ and $\delta^{15}N$ values from archaeological cattle teeth. Symbols refer to region where the specimen was excavated. The horizontal arrow shows expected values for 100% C_3 and 100% C_4 diets based on modern plant samples.

<u>The movement of cattle from the interior to the Lower Coastal Plain peaked ca. 1730-1780</u>

Cowpens expanded into the Piedmont region by the 1720s, and peaked around the mid-eighteenth century (Brooks et al. 2000, Rouse 1977). Strontium isotope data support the historical record. In our study: the proportion of "non-local" cattle in the Lower Coastal Plain initially increased over time, and then peaked by ca. 1730-1780 (Time Periods C and C/D). During the peak period, over 40% of the animals in our study that were slaughtered in the Lower Coastal Plain had originated further inland, mostly from the Upper Coastal Plain. The proportion of non-local animals subsequently declined.

Specimens from Mary Musgrove's Cowpen (9Ch137) highlight the role of cattle in the relationship between the urban center and the hinterlands of South Carolina during the 1730-

1780 time period. The Savannah River granted access to cowpens below Augusta (Stewart 1996:95-96). The Musgrove Cowpen, located in the Lower Coastal Plain on the Savannah River, functioned as a node in the cattle economy that connected the rural Upper Coastal Plain with urban markets. Two-thirds of the specimens analyzed from the Musgrove Cowpen were non-local, originating from the Upper Coastal Plain/Piedmont. The diversity in carbon, nitrogen, and oxygen isotopic values indicates that the individual cattle spent their early years free-ranging in different habitats, and likely were obtained by the Musgroves from many different small-scale cattle stakeholders. Perhaps free-range cattle from upstream were fattened at the Musgrove Cowpens before sending “finished” meat or animals to Lowcountry plantations and other markets.

Many urban dwellers in Charleston continued to source cattle locally during the peak of the inland cattle economy. Most of the Heyward-Washington cattle were local. The percentage originating from further inland generally increased during the mid-eighteenth century: 8% of individuals from the earliest time period (TP AB) were imported, compared to 25% from period C (1730-1780), and 100% from TP E (after 1820). The dominance of local cattle at Heyward-Washington at the exact same time that cattle were being imported in record numbers, even as the regional economic focus shifted away from livestock production, is a testament to the enduring presence of cattle within the Lowcountry.

<u>Isotopic evidence is consistent with a free-range herd management strategy</u>

Although it is generally accepted that free-range cattle management was cheaper and easier because cattle were able to find their own sources of food and water, it may have been necessary for some cattle to be penned, for example within cattle production centers (“cowpens”) or in urban homesteads. This would be particularly true for nursing cows being milked. Penned animals would need to be provided with food and water, which would lead to relatively homogenous diets and thus, homogenous carbon, nitrogen, and oxygen isotope values among individuals. On the contrary, carbon isotopic values suggest animals had varied diets consisting of both C_3 and C_4 in varied proportions, even animals that likely were raised on the same plantation. The James Stobo Plantation is a good example of this, with cattle diets ranging from approximately 50–90% C_4 plants, though all were local to the Lower Coastal Plain.

Isotopic evidence for penning or fencing could also include high $\delta^{18}O$ values, as stored/stagnant/impounded water would have undergone significant evaporation compared to flowing surface water. The majority (88%) of animals have $\delta^{18}O$ values consistent with local precipitation and river water as the source of drinking water, suggesting they had access to fresh, flowing water. A small proportion (<12%) of animals did not; instead, they consumed highly evaporated water. Some of these animals may have been penned; alternatively, these animals may have consumed water from stagnant ponds or flooded fields.

Elevated $\delta^{15}N$ values may reflect management and husbandry strategies, such as the use of fire to improve pastures, fertilizers to improve fodder, or penning. However, $\delta^{15}N$ values also reflect environmental and climatic variables, including proximity to the coast and drought conditions. $\delta^{15}N$ values are highly variable among the individuals in this study, and some of the most elevated values may reflect intentional care and management.

Conclusions

The project set out to test four hypotheses:

(1) *Animal products were drawn from urban, suburban, and rural locations.*

The data support this hypothesis. Isotopic data suggest most animals recovered from urban Charleston and rural tidewater plantations were "local" in the sense that they originated in the Lower Coastal Plain, although a large proportion (30%) were imported from rural locations further inland. However, we are unable to distinguish between urban, suburbam, and rural origins within the Lowcountry on the basis of isotopic data.

(2) *These sources changed over time.*
The data support this hypothesis. Cattle were imported into the Lowcountry from more distant locales as the frontier advanced. The proportion of "non-local" cattle in the Lower Coastal Plain initially increased and then peaked in the mid-eighteenth century, and subsequently declined. Cowpens emerged as an important node in the cattle economy, linking rural producers in the interior to urban consumers and plantations near the coast.

(3) *Herd management was based on production goals.*
This hypothesis is partially supported by isotopic data. In the Upper Coastal Plain and rural Lower Coastal Plain, local production exceeded local demand for cattle and cattle products, yet the rural cowpens were reported to have large herds with thousands of animals (e.g., Dunbar 1961:128; Edgar 1998:133; Hart 2016). Generating surpluses for exportation was a production goal. Many of the animals produced outside of the city were produced for urban markets (see Chapter X and Chapter XII), and, possibly many more, for exportation outside of the Carolina colony.

(4) *Landscape modifications associated with European-sponsored colonization reflect the regional animal economy.*
This hypothesis is partially supported. Strontium isotopes document the rapid expansion of the free-range cattle industry from the Tidewater region to the interior, and intensive grazing of grasslands, savannas, canebreaks, and marshes. The presence of large herds of cattle likely degraded wetlands and decimated canebreaks, and the increased use of fire to improve forage opportunities further altered vegetational communities (see Chapter VIII and Chapter IX).

This project has four primary future directions with isotopic data:

(1) Sulfur isotope analysis of dentine collagen would complement the current carbon and nitrogen collagen data. Sulfur isotope data is used to distinguish between marine and non-marine consumers (Richards et al. 2001). Specifically, sulfur isotope data in conjunction with carbon isotopes would provide a marker for *Spartina* grasses in cattle diet and a means of evaluating the role of salt marshes in cattle husbandry (Guiry et al. 2021). This will improve the spatial resolution of the sourcing study, enabling us to identify coastal and inland Lower Coastal Plain sources.

(2) We recommend parallel isotopic studies on cattle remains from contemporaneous sites in the Southeast, West Indies, and Europe to explore the connections between the Lowcountry and global markets. In particular, comparing $^{87}Sr/^{86}Sr$ values of cattle teeth from the Caribbean to cattle in this study, as well as the isoscapes calculated here to look for evidence of Carolina cattle that were exported out of the colony, especially British sugar cane plantations in the West Indies.

(3) Lead isotope data are reported here, but are difficult to interpret without a spatial model of biologically available lead. Future work should focus on developing a lead isoscape for the Southeast to facilitate geochemical sourcing studies.

(4) One of the earliest specimens studied from the Lowcountry, RA-62, originated in the Upper Coastal Plain. This is a surprising result because it suggests cattle were free-

ranging in interior Carolina prior to 1710. Genetic studies on this animal would help determine whether this animal was of British or Spanish stock or, possibly, a wild American bison (see note on *Bison bison* in Chapter IV).

Table 7-3. Interpretations of geochemical data from cattle teeth. LCP = Lower Coastal Plain; UCP = Upper Coastal Plain; Pd = Piedmont. Note: source regions in **bold** indicate animals originating in a region **other** than where they were slaughtered.

		Slaughter region	**Source region**	**%C$_4$ in diet**		**Drinking water $\delta^{18}O_{VSMOW}$**
Sample ID	**Site Name**	**from site location**	**from $^{87}Sr/^{86}Sr$**	**from $\delta^{13}C_{col}$**	**from $\delta^{13}C_{ap}$**	**from $\delta^{18}O_{ap}$**
UE-01	Aiken-Rhett House (38CH850)	LCP	LCP	58	48	-2
UE-02	Aiken-Rhett House (38CH850)	LCP	LCP	54	49	-3
UD-03	Atlantic Wharf (38CH1606)	LCP	**UCP/Pd**	50	47	**-1**
UC-04	Beef Market (38CH1604)	LCP	LCP	31	20	-2
UC-05	Beef Market (38CH1604)	LCP	LCP	55	56	-4
UD-06	Beef Market (38CH1604)	LCP	LCP	66	61	-2
UB-07	Beef Market (38CH1604)	LCP	**UCP/Pd**	35	34	-3
UC-08	Miles Brewton House (38CH1597)	LCP	LCP	45	30	-4
UC-09	Miles Brewton House (38CH1597)	LCP	LCP	60	38	-2
UC-10	Charleston Place (38CH1605)	LCP	**UCP/Pd**	43	35	**0**
UC-11	Charleston Place (38CH1605)	LCP	**UCP/Pd**	43	40	-3
UC-12	First Trident (38CH1607)	LCP	**UCP/Pd**	49	51	-2
UC-13	First Trident (38CH1607)	LCP	**UCP/Pd**	46	53	-2
UE-14	William Gibbes House (38CH1599)	LCP	LCP	86	75	-3
UD-15	William Gibbes House (38CH1599)	LCP	LCP	44	30	-5
UAB-16	Heyward-Washington (38CH108)	LCP	LCP	39	28	-4
UAB-17	Heyward-Washington (38CH108)	LCP	LCP	65	46	-3
UCD-18	Heyward-Washington (38CH108)	LCP	LCP	68	62	-4
UBC-19	Heyward-Washington (38CH108)	LCP	LCP	67	81	-3
UBC-20	Heyward-Washington (38CH108)	LCP	LCP	42	32	-2

		Slaughter region	Source region	%C_4 in diet		Drinking water $\delta^{18}O_{VSMOW}$
Sample ID	**Site Name**	**from site location**	**from $^{87}Sr/^{86}Sr$**	**from $\delta^{13}C_{col}$**	**from $\delta^{13}C_{ap}$**	**from $\delta^{18}O_{ap}$**
UC-21	Heyward-Washington (38CH108)	LCP	LCP	41	32	-3
UBC-22	Heyward-Washington (38CH108)	LCP	**UCP**	29	27	-3
UE-23	Heyward-Washington (38CH108)	LCP	**UCP/Pd**	42	30	-3
UBC-24	Heyward-Washington (38CH108)	LCP	LCP	57	48	-2
UBC-25	Heyward-Washington (38CH108)	LCP	**UCP**	47	35	-3
UE-26	Heyward-Washington Kitchen (38CH108)	LCP	**UCP**	40	29	-3
UE-27	Lodge Alley and East Bay Street (38CH1608)	LCP	LCP	61	51	**-1**
UE-28	Lodge Alley and East Bay Street (38CH1608)	LCP	LCP	61	60	**-1**
UCD-29	Lodge Alley and East Bay Street (38CH1608)	LCP	**UCP**	39	26	-3
UC-30	McCrady's Tavern and Long Room (38CH559)	LCP	LCP	68	49	**-1**
UC-31	McCrady's Tavern and Long Room (38CH559)	LCP	**UCP/Pd**	45	46	-3
UC-32	Powder Magazine (38CH97)	LCP	LCP	68	44	-3
UC-33	Nathaniel Russell House (38CH100)	LCP	**UCP/Pd**	45	39	-3
UD-34	John Rutledge House (38CH1598)	LCP	LCP	61	55	-3
UD-35	South Adger's Wharf/Lower Market (38CH2291)	LCP	LCP	64	48	-4
UD-36	South Adger's Wharf/Lower Market (38CH2291)	LCP	LCP	63	34	-4
UC-37	South Adger's Wharf/Lower Market (38CH2291)	LCP	**UCP**	35	26	-4
UD-38	Telfair, Savannah, GA (9CH1536)	LCP	**UCP**	52	35	-3
UD-39	Telfair, Savannah, GA (9CH1536)	LCP	**UCP/Pd**	52	49	-2
UD-40	Simmons-Edwards House (38CH103)	LCP	LCP	84	72	-3

		Slaughter region	Source region	%C_4 in diet		Drinking water $\delta^{18}O_{VSMOW}$
Sample ID	**Site Name**	**from site location**	**from $^{87}Sr/^{86}Sr$**	**from $\delta^{13}C_{col}$**	**from $\delta^{13}C_{ap}$**	**from $\delta^{18}O_{ap}$**
RC-41	John Bartlam's pottery at Cain Hoy (38BK1349a)	LCP	LCP	32	30	-3
RC-42	John Bartlam's pottery at Cain Hoy (38BK1349a)	LCP	LCP	48	51	-2
RC-43	John Bartlam's pottery at Cain Hoy (38BK1349a)	LCP	LCP	57	38	-2
RB-44	Lesesne Plantation, Daniels Island (38BK202)	LCP	LCP	73	70	**-1**
RB-45	Lesesne Plantation, Daniels Island (38BK202)	LCP	LCP	76	64	-4
RA-46	Lesesne Plantation, Daniels Island (38BK202)	LCP	LCP	56	52	-2
RC-47	Drayton Hall (38CH225)	LCP	LCP	35	25	-5
RC-48	Drayton Hall (38CH225)	LCP	LCP	57	58	-4
RB-49	Drayton Hall (38CH225)	LCP	LCP	53	33	-3
RB-50	Drayton Hall (38CH225)	LCP	LCP	80	76	-2
RC-51	Mary Musgrove's Cowpens (9CH137)	LCP	LCP	24	24	-3
RC-52	Mary Musgrove Cowpens (9CH137)	LCP	**UCP/Pd**	60	63	**-1**
RC-53	Mary Musgrove's Cowpens (9CH137)	LCP	**UCP**	22	17	-3
RC-54	Mary Musgrove's Cowpens (9CH137)	LCP	LCP	30	23	-3
RC-55	Mary Musgrove's Cowpens (9CH137)	LCP	**UCP**	44	34	-3
RC-56	Mary Musgrove's Cowpens (9CH137)	LCP	LCP	65	54	-3
RC-57	Mary Musgrove's Cowpens (9CH137)	LCP	**UCP**	38	33	-3
RC-58	Mary Musgrove's Cowpens (9CH137)	LCP	**UCP**	36	20	-4
RC-59	Mary Musgrove's Cowpens (9CH137)	LCP	**UCP**	20	11	-4
RA-60	Lord Ashley Settlement (38DR83a)	LCP	LCP	20	31	-2
RA-61	Miller Site/Charles Town Landing (38CH1-MS)	LCP	LCP	80	70	-3

		Slaughter region	**Source region**	**%C_4 in diet**		**Drinking water $\delta^{18}O_{VSMOW}$**
Sample ID	**Site Name**	**from site location**	**from $^{87}Sr/^{86}Sr$**	**from $\delta^{13}C_{col}$**	**from $\delta^{13}C_{ap}$**	**from $\delta^{18}O_{ap}$**
RA-62	Miller Site/Charles Town Landing (38CH1-MS)	LCP	**UCP**	41	38	-3
RD-63	James Stobo Plantation, Willtown (38CH1659)	LCP	LCP	62	52	**0**
RD-64	James Stobo Plantation, Willtown (38CH1659)	LCP	LCP	54	47	-3
RD-65	James Stobo Plantation, Willtown (38CH1659)	LCP	LCP	70	76	**0**
RD-66	James Stobo Plantation, Willtown (38CH1659)	LCP	LCP	90	82	-2
RD-67	James Stobo Plantation, Willtown (38CH1659)	LCP	LCP	70	69	-4
RDE-68	Stono Plantation, James Island (38CH851)	LCP	**Pd**	37	26	-5
RB-69	Ashley Hall Plantation (38CH56)	LCP	**UCP/Pd**	35	22	-5
RC-70	Catherine Brown Cowpen (38BR291)	UCP	UCP/Pd	47	20	-2
RBC-71	Fort Moore (38AK5)	UCP	UCP/Pd	25	6	-2
RC-72	Meyer household, New Windsor Township (38AK615)	UCP	**LCP**	8	12	-4
RB-73	St. Paul's Parsonage (38CH2292)	LCP	LCP	59	61	-2
RB-74	St. Paul's Parsonage (38CH2292), Tooth 1	LCP	LCP	82	81	**-1**
UBC-75	Colonial Dorchester State Historic Site (38DR3)	LCP	LCP	67	58	-2
UB-76	86 Church Street (38CH2646)	LCP	LCP	52	38	-2
RAB-77	The Ponds (38DR87)	LCP	LCP	31	23	-3
RAB-78	The Ponds (38DR87)	LCP	LCP	21	20	-2
RC-79	Hampton (38CH241-1-WHL)	LCP	LCP	78	77	-3
RB-80	Spencer Settlement/Hampton Plantation (38CH241-100)	LCP	LCP	40	28	-4
33795	Heyward-Washington (38CH108)	LCP	LCP	31	21	-5

		Slaughter region	Source region	%C_4 in diet		Drinking water $\delta^{18}O_{VSMOW}$
Sample ID	**Site Name**	**from site location**	**from $^{87}Sr/^{86}Sr$**	**from $\delta^{13}C_{col}$**	**from $\delta^{13}C_{ap}$**	**from $\delta^{18}O_{ap}$**
33796	Heyward-Washington (38CH108)	LCP	LCP	34	25	-4
33797	Heyward-Washington (38CH108)	LCP	LCP	48	53	**-1**
33798	Heyward-Washington (38CH108)	LCP	LCP	53	38	-3
33799	Heyward-Washington (38CH108)	LCP	LCP	35	25	-4
33800	Heyward-Washington (38CH108)	LCP	LCP	38	38	-5
33801	Heyward-Washington (38CH108)	LCP	LCP	33	9	-6
33802	Heyward-Washington (38CH108)	LCP	LCP	44	23	-5
33803	Heyward-Washington (38CH108)	LCP	**UCP**	22	46	-4
33804	Heyward-Washington (38CH108)	LCP	LCP	53	48	-3
33805	Heyward-Washington (38CH108)	LCP	LCP	49	65	-3
38968	Heyward-Washington (38CH108)	LCP	LCP	72	63	-5
38969	Heyward-Washington (38CH108)	LCP	LCP	72	73	-7
38970	Heyward-Washington (38CH108)	LCP	**UCP**	54	29	-7
38971	Heyward-Washington (38CH108)	LCP	LCP	28	26	-4

Chapter VIII
Sediment Coring and Paleofire Reconstructions for the South Carolina Lowcountry

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Introduction

This chapter describes the motivation, methods, and results of analyses conducted on two sediment cores collected from deposits that span portions of the Coastal Plain surrounding Charleston, SC. As a component of the larger NSF-supported project, this work seeks to understand how intentional burning may have played a role in shaping landscapes to support free-ranging cattle and contributed to the success of the cattle economy during the eighteenth and nineteenth centuries. In Lowcountry ecosystems, fire is a necessary ecosystem disturbance process that is linked to ecosystem health and biodiversity (Van Lear et al. 2005). Perhaps the most well-studied, fire-dependent ecosystem of the South Carolina Lowcountry is the longleaf pine (*Pinus palustris*) savanna, which is characterized by an open, pine-dominated overstory and a grass and forb-dominated understory. Low-severity surface fires play a critical role in the life history of longleaf pines and native grasses, reducing the risk of high-severity, stand-replacing fires, and creating habitat for diverse plant and animal species (Mitchell et al. 2009).

Longleaf pine ecosystems were, and continue to be, important landscapes for humans, providing a multitude of ecosystem services and economic opportunities. While much of the ecological and restoration literature focuses on what are often referred to "natural" or "undisturbed" Lowcountry ecosystems, archaeological and paleoecological research clearly demonstrates that humans have been actively manipulating both fire and fuels throughout the Southeastern Coastal Plain for millennia (Stambaugh et al. 2011, 2018). However, the extent to which long-term anthropogenic fire, and more recent economic exploitation of longleaf pine ecosystems, may have ultimately shaped these landscapes today remains unevaluated.

Project Motivation

This project focused on how intentional, repetitive burning of Lowcountry landscapes may have impacted fire and fuels and subsequently helped facilitate the success of the early colonial cattle economy. While we acknowledge there is ample evidence in the paleoecological record and through ethnohistorical documents of regular burning by Native peoples, the work presented here is focused primarily on interpreting fire activity associated with cattle, timbering, and rice cultivation during the colonial period (Stambaugh et al. 2018). We are particularly interested in how colonial-era cow hunters and land managers used fire to encourage important fodder species, such as little bluestem (*Andropogon scoparius*), switch cane (*Arundinaria tecta*), and wiregrass (*Aristida stricta*).

Outside of Charleston, cattle were a vital component of the rural economy and inexpensive to raise. The first colonists arrived in the Lowcountry in 1670 after the formation of a British proprietorship in 1663. By 1682, cattle were allowed to free-range in the Lowcountry's pinewoods, savannahs, canebreaks, and marshes. The upland pine communities, small-stream flood plains, and hardwood bottomlands offered fodder for free-ranging livestock (Smith 2020). Cattle were particularly fond of the waist-high canebreaks, where they grazed year-round, as well as remnant fields and woods fired by Native peoples. Some early cattle centers, known as cowpens, were reported to have 6,000 or more animals (Jordan 1993).

To understand how the cattle industry may have influenced patterns of fire and fuels throughout the Lowcountry, we employed a sedimentary coring strategy to reconstruct long-term fire histories through charcoal analysis. Traditionally, charcoal analysis is conducted as a supplementary analysis in conjunction with pollen analysis. However, in this project we decided to prioritize the charcoal analysis and utilize measures of charcoal abundance and morphology to identify important changes in fire activity. Charcoal is a product of the incomplete combustion of plant biomass and is considered an excellent proxy for fire activity as it is highly durable in the sedimentological record and directly related to combustion (Conedera et al. 2009). Charcoal can be collected and analyzed from sediments exhibiting extreme pH values and sandy texture classes that would likely not preserve other traditional paleoecological proxies (e.g., pollen or phytoliths).

The approach used in this study is to focus on local signatures of fire through a series sedimentary charcoal cores samples from landscapes with varying environmental and cultural contexts. Mathematical modeling and supporting empirical studies have demonstrated that larger charcoal fragments are transported shorter distances by convective uplift during combustion (Clark 1988). Consequently, we reconstruct fire activity from meso- and macro-charcoal datasets (> 105 μm). This strategy allows us to compare how fire may have been applied to the landscape under varying land-use strategies during the eighteenth and nineteenth centuries in the region.

Research Questions

The placement of sedimentary cores and subsequent charcoal analyses were guided by the following research questions:

- Are the presence of cattle and the land-use practices associated with the free-ranging cattle industry detectable in the paleoecological record?
- If so, how is the emergence of the colonial cattle economy (AD 1670-1860) in rural areas surrounding Charleston, SC, related to changes in fire and vegetation in Lowcountry ecosystems?

This standalone charcoal study and paleofire reconstruction cannot answer these questions to their fullest extent, however we rely on a multi-proxy approach (detailed in other chapters in this report) to provide the necessary historical context, archaeological material evidence, and descriptions of vegetation dynamics to interpret the charcoal work presented here.

Previous Paleoecological Studies in the Lowcountry

Several previous paleoecological studies have been conducted over the last three decades in the region, including several within the Atlantic Coastal Plain of Florida, Georgia, South Carolina, and North Carolina. These studies have been described as "relatively poorly dated, single-proxy (pollen) records of vegetation, limiting our understanding of millennial-scale events and relationships between climate, herbivory, and vegetation changes in the region" (Krause et al. 2019:862). However, recent re-investigations of previously cored lake sediments, and new studies focused specifically on fire-vegetation dynamics recorded in non-lacustrine contexts, have broadened the interpretation of changing environments during the Pleistocene and Holocene in the coastal Southeast.

Broadly, several critical transition periods related to millennial-scale oscillations in global mean annual temperatures are reflected in pollen-reconstructed southeastern vegetation communities over the last 30,000 years. These are particularly evident in the pollen sequences from White Pond, South Carolina (Krause et al. 2019), Jones and Singletary Lakes (Spencer et al. 2017), and Lake Tulane, Florida (Grimm et al. 2006), which demonstrate climatic changes during the last glacial period (65,000-21,000 cal. yr BP), the Bølling Allerød warming period (14,700-12,900 cal. BP), Younger-Dryas cooling period (12,900-11,700 cal. BP), and the Holocene (11,700 cal. BP-present). Primarily, pollen records from these sequences map on to trends in warm, wet conditions and cool, dry conditions in the climate of the Coastal Plain. Cool, dry conditions are demonstrated to favor oak-scrub/prairie taxa while warm, wet conditions favor pine and associated understory taxa. Regionally, these sequences all tend to agree that the pine-dominated Lowcountry landscapes we recognize today were established by the middle Holocene (~6,000-4,000 cal. BP).

Increases in charcoal abundance beginning during the early to mid-Holocene are also recorded in many of paleoecological sequences from the Coastal Plain, including both lacustrine deposits and sandhill marsh environments (Krause et al. 2019; Tanner et al. 2018). Increased charcoal accumulation is likely linked to the establishment of pine ecosystems, which depend on regular fire return intervals for ecosystem health. Simple charcoal morphological analyses, classifying grassy charcoal and non-grass charcoal fragments through visual examination, have been employed to understand changes in fuels and fire behavior though time. Krause and colleagues (2019) identify periods of increased charcoal accumulation and high percentages of grassy charcoal, which they interpreted as frequent, low-intensity fires throughout the middle and late Holocene. They conclude that these signatures may be related to intentional burning practices by Indigenous communities.

Methods

Site Selection

Site selection for sediment cores is based on a strategy for sampling landforms and soil types best suited for charcoal accumulation and preservation, as well as locations associated with the colonial cattle industry. Suitable landform and soil types include organic rich soils in low-slope, erosionally stable areas, such as depressions or seasonal ponds. Additionally, site locations must have an association with the colonial cattle industry in one or more of the following dimensions: 1) historically documented use as an area for free-ranging cattle, 2) located in proximity or associated with documented archaeological sites which engaged in cattle production, and 3) an excavated colonial-era site with faunal assemblages included in the stable isotope study (see Chapters VI, VII). Below, each coring location is described in its relation to these criteria.

Hampton Plantation / Spencer Pond (SC-1-Hampton)

Spencer Pond is a large circular swamp adjoining the Santee River, part of a property operated by South Carolina State Parks, now called Hampton Plantation. Hampton Plantation contains a colonial-era mansion house, a separate kitchen, extensive rice fields, and wooded tracts totaling 274 acres. Joseph Spencer acquired portions of these tracts in 1710 and 1714. Spencer used his land for cattle and had one of the largest herds in St. James Santee Parish (Hester 2014). Spencer and his sons altered the land at Hampton by building a dwelling, clearing small patches for corn crops, running stock, and possibly burning the woods. It was near here, along the Santee River, that in 1701 John Lawson described Indians “firing the woods” (Lefler 1967).

Spencer’s Settlement (38Ch241-100), adjoining Spencer Pond on the south edge of the lawn area, was discovered during shovel testing in 2014 by Stacey Young. Excavations in 2015 and 2017 by The Charleston Museum and College of Charleston revealed a probable cellar pit, evidence for a wooden structure, and fencing. The artifacts recovered suggest the site was occupied ca. 1710-1744, consistent with the Spencer family ownership. In addition to a range of European artifacts, the site contains colonowares with gritty paste, likely made by Native as well as African people (Brilliant 2017; Jones 2018). The overall artifact assemblage suggests interaction between Native Americans, Africans, and Europeans. While test excavations were limited to the open lawn area, Young's shovel test survey indicates that the archaeological deposits continue into the wooded area, adjacent to Spencer's Pond.

A seasonally flooded location adjacent to Spencer Pond was chosen for the SC-1-Hampton core (Figure 8-1). High-resolution digital elevation models of the location indicated that it is part of the larger basin that comprised Spencer Pond, meaning charcoal produced from local fires would likely accumulate in this location. Further testing of the location in the field indicated the presence of highly organic soils in the upper meter of the profile, indicating the likelihood of excellent charcoal preservation.

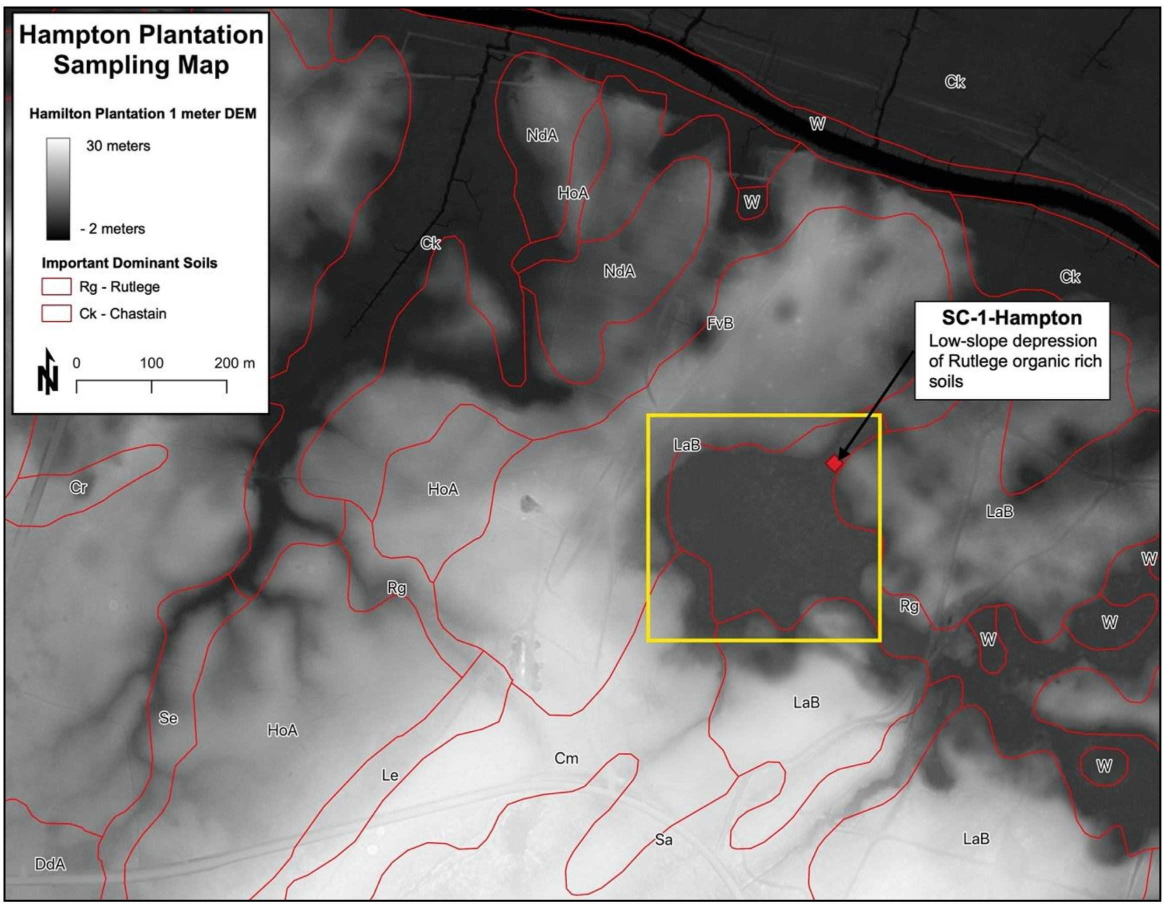

Figure 8-1. Hampton Plantation / Spencer Settlement sampling map showing soils, topography, and coring location.

Hell Hole Swamp (SC-2-Hell Hole)

Hell Hole Swamp consists of historically unclaimed, unimproved land that was known to range cattle in the eighteenth and nineteenth centuries, and through the first half of the twentieth century. Currently part of the Francis Marion National Forest, the area has a robust and well-documented history of fire, both prescribed and wildfires (see Chapter IV for details). Presently, portions of Hell Hole Swamp are designated as a Wilderness Area. The earliest written record of the swamp is a 1734 plat and accompanying 1735 land grant for acreage adjoining Hell Hole Swamp. Several families purchased lands adjacent to Hell Hole Swamp, but the unclaimed swamp essentially functioned as a shared common until Charles G. McCay purchased 4,044 acres of Big Hell Hole Bay in 1849 and 9,000 acres of Big Hell Hole Swamp in 1857 from the State of South Carolina.

Centered within the vast, rather impenetrable swamp is a large savannah known as the Big Opening. While the exact land-use history of this tract is poorly known, and the opening is currently fairly closed in, the Big Opening is designated on early twentieth century soil maps. Historic photos suggest the opening was somewhat smaller by the 1930s. A major wildfire in 1954 re-opened the tract. Aerial photos from the 1970s show a more moderate opening. The Forest Service regularly conducts prescribed burns in this area and is interested in reestablishing the opening.

The location of SC-2-Hell Hole was chosen using digital elevation models and field evaluation, much like the strategy employed to select the SC-1-Hampton coring location. Since no large depressions were evident in or adjacent to the Hell Hole Swamp, soil maps from the USDA Natural Resource Conservation Service were used to identify deep, organic soils in the study area. These included Pamlico, Coxville, and Byers soil maps units, all of which are associated with low-lying areas, small depressions, and organic horizons. Ultimately, a location was chosen that was not inundated with water and therefore accessible by foot, and that was adjacent in or adjacent to the suitable soil map units (Figure 8-2).

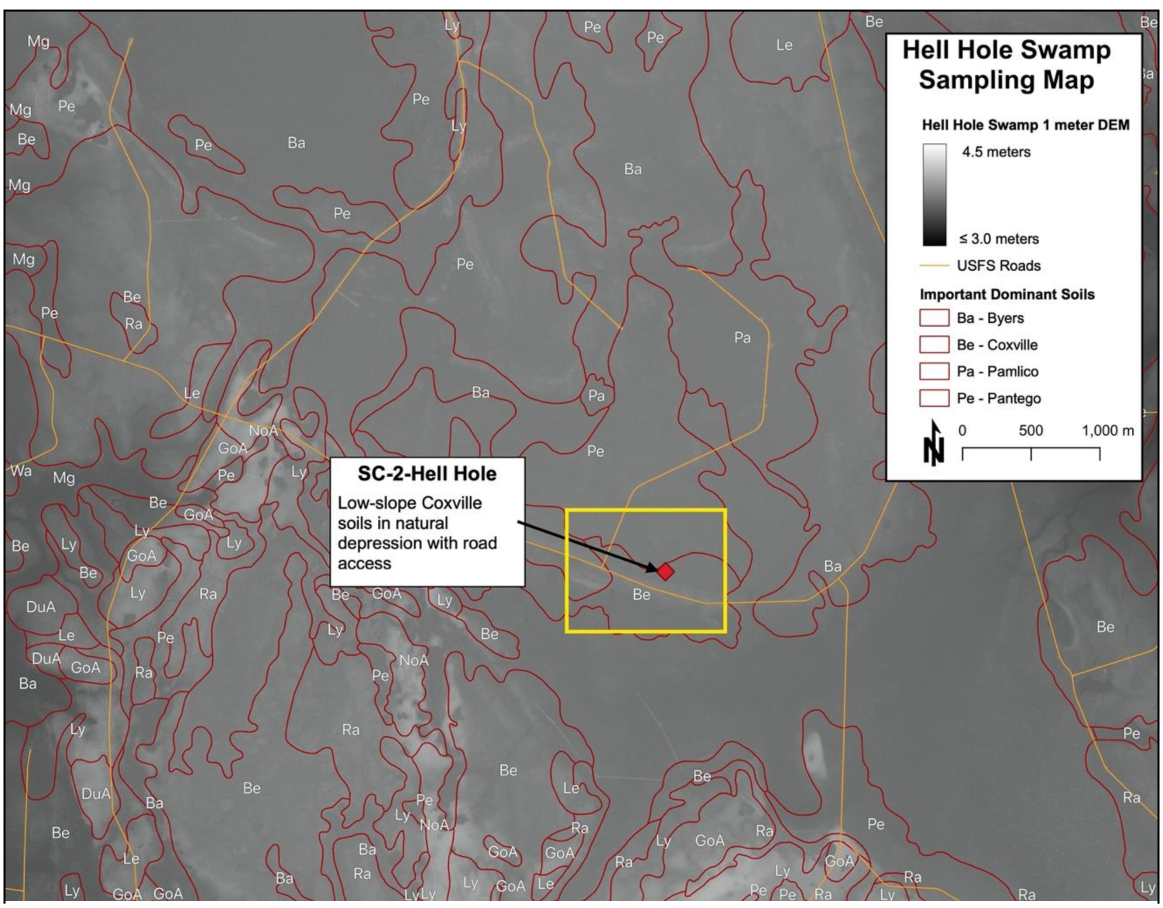

Figure 8-2. Hell Hole Swamp sampling map showing soils, topography, and coring location.

Stobo Plantation at Willtown Bluff (SC-3-Willtown)

The same methods used to identify locations for coring at the other study sites were also used at the Stobo Plantation (38Ch1659) at Willtown Bluff. While a suitable coring was ultimately identified on the seasonally flooded margins of a low-lying pond east of the main settlement (Figure 8-3), the core extracted from that location could ultimately not be used due to a large root intrusion discovered after the core was split in the laboratory.

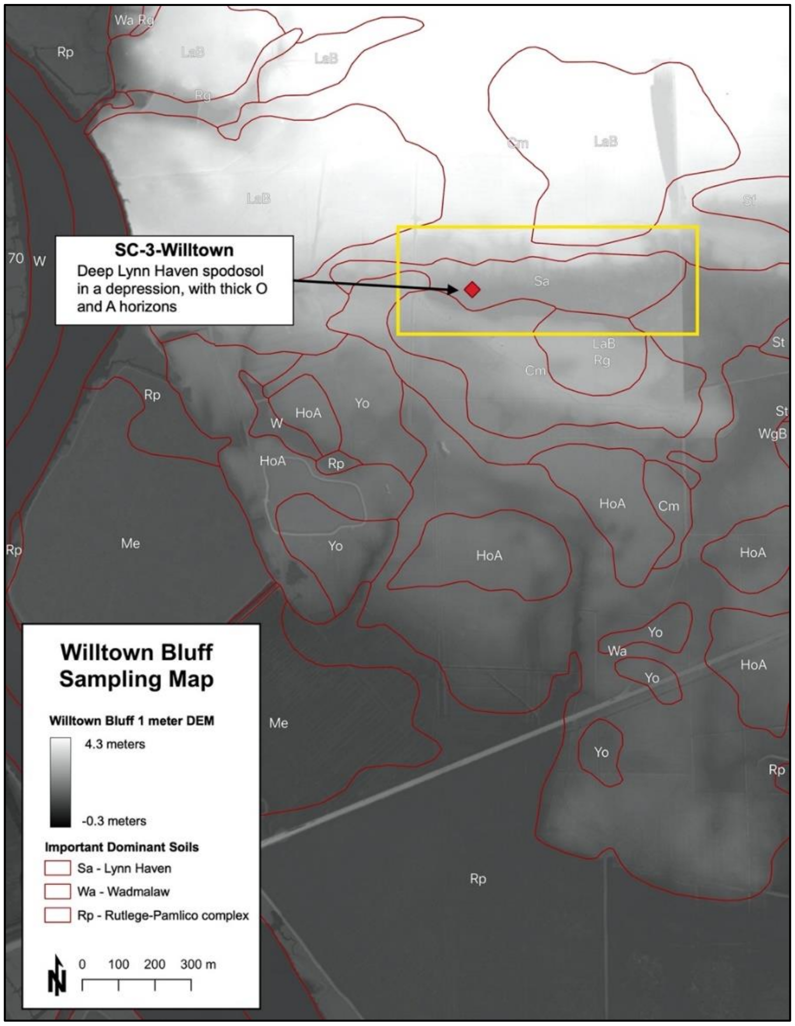

Figure 8-3. Stobo Settlement at Willtown Bluff sampling map showing soils, topography, and coring location.

Coring Methods

Each core was extracted using a 10-cm-diameter PVC pipe driven vertically into the soil, capped, and then extracted using a farm jack. This relatively simple method has been used successfully in other marshy contexts and results in very little soil compaction within the core (Peck et al. 2020). Additionally, it is an extremely inexpensive and quick method of extracting multiple cores. All our fieldwork was completed over two days in January 2020.

Cores were successfully extracted from the Hampton Plantation/Spencer Pond (SC-1-Hampton), Hell Hole Swamp (SC-2-Hell Hole), and the Stobo settlement at Willtown Bluff (SC-3-Willtown). The SC-1-Hampton core was extracted to a depth of 121 cm with minimal compaction over the length of the core (~ 4 cm). The SC-2-Hell Hole core was extracted to a depth of 161 cm and also experienced minimal compaction over the length of the core (~ 4 cm). The SC-3-Willtown was extracted to a depth of 162 cm with a compaction of ~ 8 cm.

Each core was split using a circular saw; one side of the core was used for analysis and the other was retained as an archive. Cores were photographed and described by genetic soil horizon following National Cooperative Soil Survey Standards including soil color, texture, and structure (Schoeneberger et al. 2021). Subsamples collected from each horizon were air-dried and sieved to pass a 2-mm sieve prior to further analysis. A large root intrusion was discovered in the SC-3-Willtown core when it was split in the lab. This intrusion impacted sediments from approximately 40-162 cm within the core, thus rendering the majority of the core unreliable and unusable. Photographs and samples were taken from the upper, unimpacted portions of the core and retained for future analysis.

Sedimentological Analysis

Samples were collected from the soil cores by genetic horizon for grain-size analysis and soil pH measurements. Particle size distribution was determined by laser diffraction with a Beckman Coulter LS 13 320. Duplicate 0.6-g samples were pretreated with 30% hydrogen peroxide to remove organic matter, and dispersed with 5% sodium hexametaphosphate and 16 hours of shaking at 120 oscillations per minute before determining particle size distribution. Two laboratory replicates representing three 60-s analysis runs from the instrument were averaged to represent the sample. Samples that had >5% differences in either sand or clay fractions had a third laboratory replicate analyzed and all values were averaged per sample. Soil pH was measured in 1:1 (w/v) soil to water and 1:2 (w/v) 0.01 M $CaCl_2$ (Schoeneberger et al. 2021). Additional samples were collected from the soil cores at 1-cm intervals for charcoal analysis. Ten additional samples were selected from the upper portion of the core for pollen and non-pollen palynomorph (NPP) studies (see Chapter IX).

Charcoal Analysis

Charcoal analysis was performed on 2 cm^3 volumetric samples extracted in 1-cm intervals throughout the entire length of both the Hell Hole and Hampton cores, except for the 100-160 cm section of the Hell Hole core, which was sampled at a 1 cm interval every 5 cm. Subsamples were processed for charcoal extraction using standard procedures following Whitlock and Anderson (2003) and Snitker (2019). Each volumetric sample was dispersed using a 5% sodium hexametaphosphate solution for 24 hours, after which the sample is oxidized using 3% hydrogen peroxide for 48 hours to lighten unburned, organic materials and visually isolated charcoal fragments. Samples are then wet-screened through a 105 μm sedimentology sieve to separate meso- and macro-charcoal fragments from smaller clasts. Each sample is transferred to a petri dish and allowed to dry at room temperature for 48 hours. Charcoal abundance and morphology were analyzed using CharTool, an ImageJ macro plugin for charcoal analysis, using a digital microscope (Snitker 2020). Large charcoal fragments encountered during subsampling of the core or in subsequent processing were extracted for AMS ^{14}C dating to establish the age-depth model for each core.

AMS ^{14}C Dating

Charcoal samples were manually cleaned to remove superficial contaminants such as root hairs prior to acid/alkali/acid (AAA) pretreatment, as follows. Charcoal subsamples were treated in 10mL of 1N HCl and heated to 80°C, decanted, and rinsed with ultrapure (MilliQ) water to neutral. Samples were then treated with 0.1 M NaOH at room temperature to remove humic substances; decanted, and rinsed to neutral with MilliQ water. Samples were treated with HCl a second time at 80°C, rinsed repeatedly with MilliQ water, and dried at 105°C.

Samples were combusted at 900°C in evacuated and sealed quartz tubes in the presence of CuO to produce CO_2 for accelerator mass spectrometer (AMS) dating. The CO_2 samples were cryogenically purified from the other reaction products and catalytically converted to graphite using the method of Vogel et al. (1984). Graphite $^{14}C/^{13}C$ ratios were measured using the NEC 0.5 MeV AMS housed at the University of Georgia Center for Applied Isotope Studies. Sample ratios were compared to the ratios measured from the Oxalic Acid I standard (NBS SRM 4990). Uncalibrated dates are given in Fraction modern (Fm) and radiocarbon years before 1950 (years BP), calculated using the ^{14}C half-life of 5568 years. The results were corrected for isotope fractionation using the $\delta^{13}C$ value measured by isotope ratio mass spectrometer (IRMS).

Results

Age-Depth Models

Age-depth models are used to estimate the calendar ages of depths in a sediment core based on limited numbers of dated depths and can be used to infer past accumulation rates (Table 8-1). The recently developed suite of Bayesian chronological tools tends to perform better at inferring sediment age from its depth compared to more classical approaches (e.g., interpolation and regression models) in that they explicitly account for multiple sources of uncertainty, and they are well-suited to handling outliers, age reversals, and changes in accumulation rate (Bronk Ramsey and Lee 2013).

Table 8-1. AMS ^{14}C Dates for the SC-1-Hampton and SC-2-Hell Hole Sequences. All dates on charcoal.

Sequence	Depth, cmbs	Laboratory ID	$\delta^{13}C$	^{14}C yr BP	Calibrated Age (95% HPD)
SC-1-Hampton	20.0	UGAMS 47117	-27.1	440 ± 20	1430-1470 cal. AD
	30.5	UGAMS 51137	-25.6	1260 ± 26	670-867 cal. AD
	62.0	UGAMS 47178	-26.0	5440 ± 50	4440-4060 cal. BC
	74.0	UGAMS 47175	-25.1	7460 ± 35	6420 - 6240 cal. BC
SC-2-Hell Hole	7.5	UGAMS 47179	-31.0	Modern	1990 - 2000 cal. AD
	10.5	UGAMS 51017	-31.1	Modern	1990 - 2000 cal. AD
	13.0	UGAMS 47171	-24.4	330 ± 30	1470 - 1650 cal. AD
	26.0	UGAMS 47172	-24.6	3620 ± 30	2120 - 1890 cal. BC
	58.0	UGAMS 47173	-13.1	11190 ± 110	11,330 - 10,840 cal. BC
	139.0	UGAMS 47170	-27.5	25060 ± 70	27,450 - 26,880 cal. BC

The chronology of the SC-1-Hampton sequence is derived from six radiocarbon dates on charcoal fragments collected in situ from the core (Figure 8-4A). Two samples (UGAMS-47174 and UGAMS-47176) were determined to be intrusive roots and were excluded from age-depth modeling. The chronology of the Hampton Plantation sequence is derived from the 4 remaining radiocarbon dates on charcoal fragments collected in situ from the core. All age-depth models were generated using Bchron in R (Haslett and Parnell 2008).

The chronology of the SC-2-Hell Hole sequence is also derived from 6 radiocarbon dates on charcoal fragments collected in situ from the core (Figure 8-4B). The IntCal20 calibration curve (Reimer et al. 2020) was used for samples <100 pMC, whereas the Bomb21 Northern Hemisphere Zone 2 calibration curve (Hua et al. 2021) was used for the two "modern" samples (samples >100 pMC, corresponding to the post-1950 "bomb" period). The dates occurred in stratigraphic sequence, except for the reversal of two modern dates from the top 10 cm of the core. These modern materials are likely substantially impacted by bioturbation; therefore, the general outlier model was applied, with a 5% prior probability that each individual sample is an outlier.

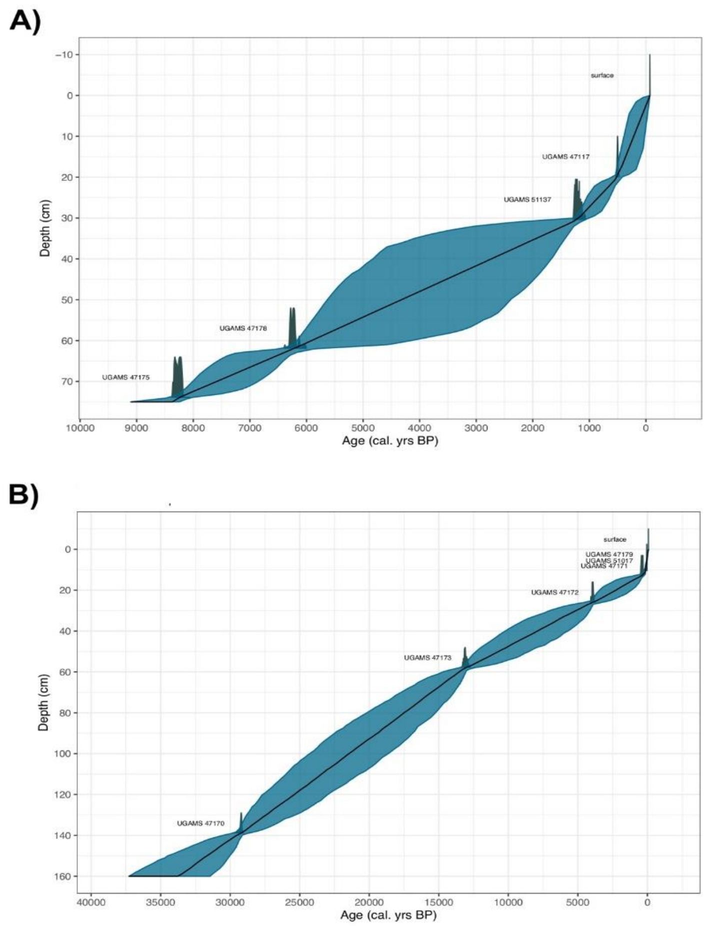

Figure 8-4. Age-depth models created for the a) SC-1-Hampton and b) SC-2-Hell Hole sequences.

Sediment Descriptions

The SC-1-Hampton sequence was sampled from a Rutlege loamy fine sand map unit (Sandy, siliceous, thermic Typic Humaquepts) which has a black A horizon of 38 cm above two C horizons extending to 178 cm indicative of very poorly drained conditions. The core described did not fit this description and rather had a thick sequence of black and very dark grayish brown A horizons to 29 cm followed by E horizons to 75 cm and Bt horizons from 75 to 115+ cm with redder colors and no iron depletions indicating better drained conditions than the Rutlege series. The upper 75 cm of this core were primarily loamy fine sand texture with an average of 80%

sand and 6% clay followed by a clear transition to a clay loam with approximately 38% clay and 40% sand (Table 8-2).

The SC-2-Hell Hole sequence was sampled from a soil map unit with 95% Coxville soils and 2% Rains soils adjacent to a Pantego fine sandy loam map unit (95% Pantego, 2% Rains). Coxville is a Fine, kaolinitic, thermic Typic Paleaquults with a 23 cm Ap, 10 cm of Eg and BEg, Btg from 33-183 cm, and Cg from 183-203 cm+. The core was described as having two A horizons with black color to 22 cm, an EA transitional horizon 22-57 cm, two E horizons extending to 79 cm, a sequence of clay rich Bt and Btg horizons to 128 cm, a combination horizon of dark gray sandy clay and yellowish red fine sandy loam, and finally a Cg horizon with stratified fine sand and clay from 142-160+ cm. The 0-79 cm depth ranged between 61–91% sand dominated by fine sands. Clay percentage increases abruptly at the E2 transition to the Bt horizon from 3% to 34% and further increases to 50% from 95-112 cm (Table 8-3). The results of the sedimentological analyses, including pH and detailed grain size measurements by soil horizon, are presented in Figure 8-5 and Figure 8-6.

Table 8-2. Sediment Descriptions for SC-1-Hampton.

Horizon	Depth (cm)	Transition	Matrix Color	Secondary Color	Texture (hand-texture method)
A1	0-14	Clear, Smooth	10YR 2/1		Fine Sandy Loam
A2	14-28.5	Clear, Smooth	10YR 3/2		Fine Sandy Clay Loam
E1	28.5-45	Clear, Smooth	10YR 5/4		Fine Sandy Loam
E2	45-75	Clear, Smooth	2.5 YR 6/2		Fine Sandy Loam
Bt1	75-92	Clear, Smooth	10YR 6/4	5YR 4/6	Fine Sandy Clay Loam
Bt2	92-108	Clear, Smooth	10YR 5/6	2.5 YR 4/8 (35% Iron concentrations)	Fine Sandy Clay Loam
Bt3	108-115+	--	10YR 6/3	2.5 YR 5/6 (35% Iron concentrations)	Sandy Clay Loam

Table 8-3. Sediment Descriptions for SC-2-Hell Hole.

Horizon	Depth (cm)	Transition	Matrix Color	Secondary Color	Texture (hand-texture method)
A1	0-11	Clear, Smooth	GLEY 2.5 / N	--	Very Fine Sandy Loam
A2	11-22	Clear, Smooth	10YR 2/1	--	Fine Sandy Loam
EA	22-57	Clear, Wavy	7.5 YR 3/2	--	Fine Sandy Loam
E1	57-69	Clear, Wavy	2.5 YR 4/3	7.5YR 2.5/2 (Organic Stains); 10YR 5/2 Depletions	Fine Sandy Loam
E2	69-79	Abrupt, Irregular	2.5 YR 7/1	--	Fine Sand
Bt	79-95	Clear, Irregular	10YR 6/2	5YR 6/8 (30%); 5YR 5/6 (20%);	Sandy Clay Loam
Btg	95-128	Clear, Wavy	10YR 4/1	5YR 5/8 (20%)	Very Fine Sandy Clay
Btg / Cg	128-142	Clear, Smooth	10YR 6/1	10YR 4/1 (20% and Sandy)	Very Fine Sandy Clay / Fine Sandy Loam
Cg	142-160+	--	2.5YR 4/1	2.5YR 6/1 (20% and Sandy)	Clay / Fine Sand

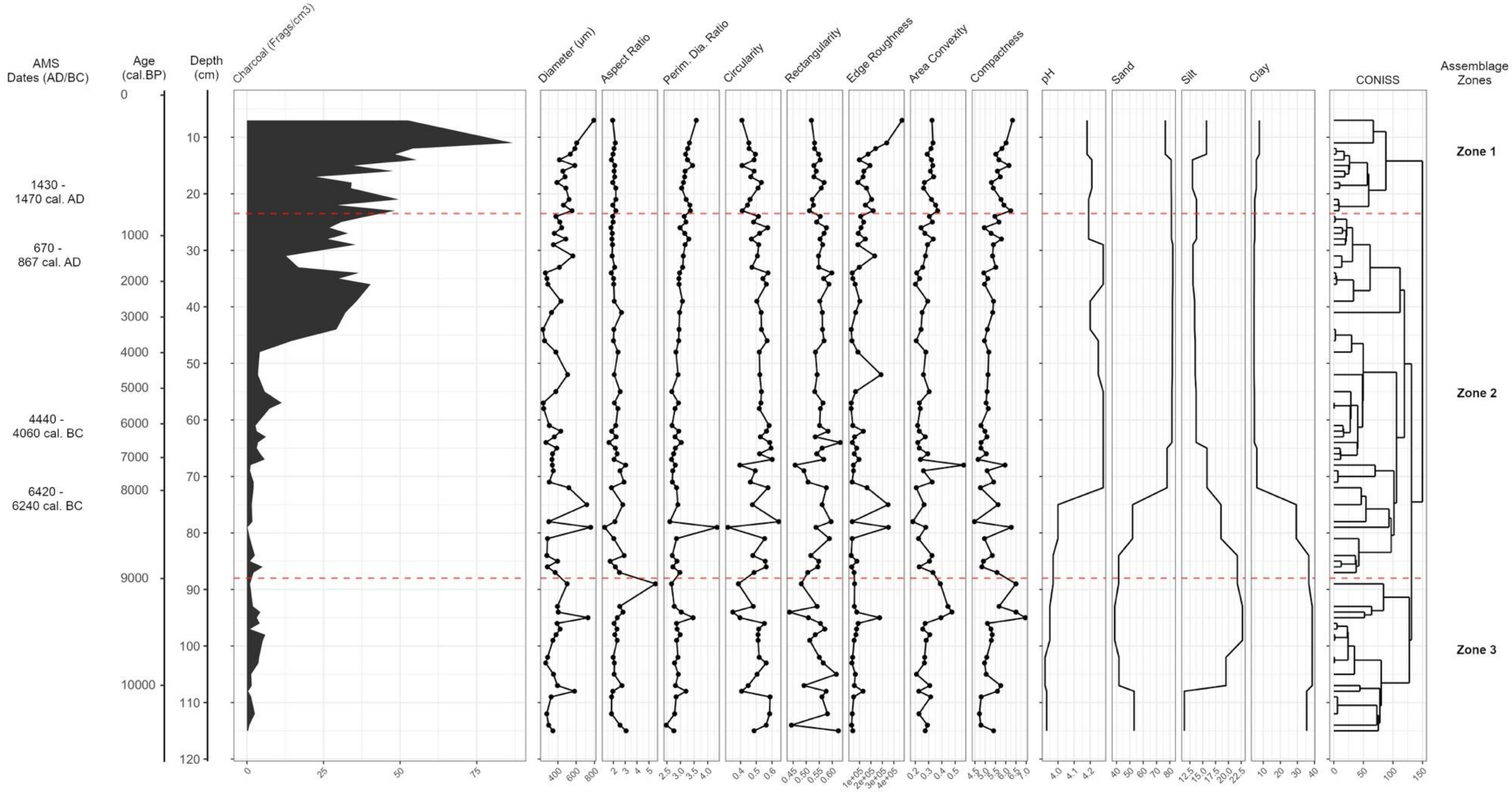

Figure 8-5. Charcoal abundance, charcoal morphology, and sediment properties for the SC-1-Hampton sequence.

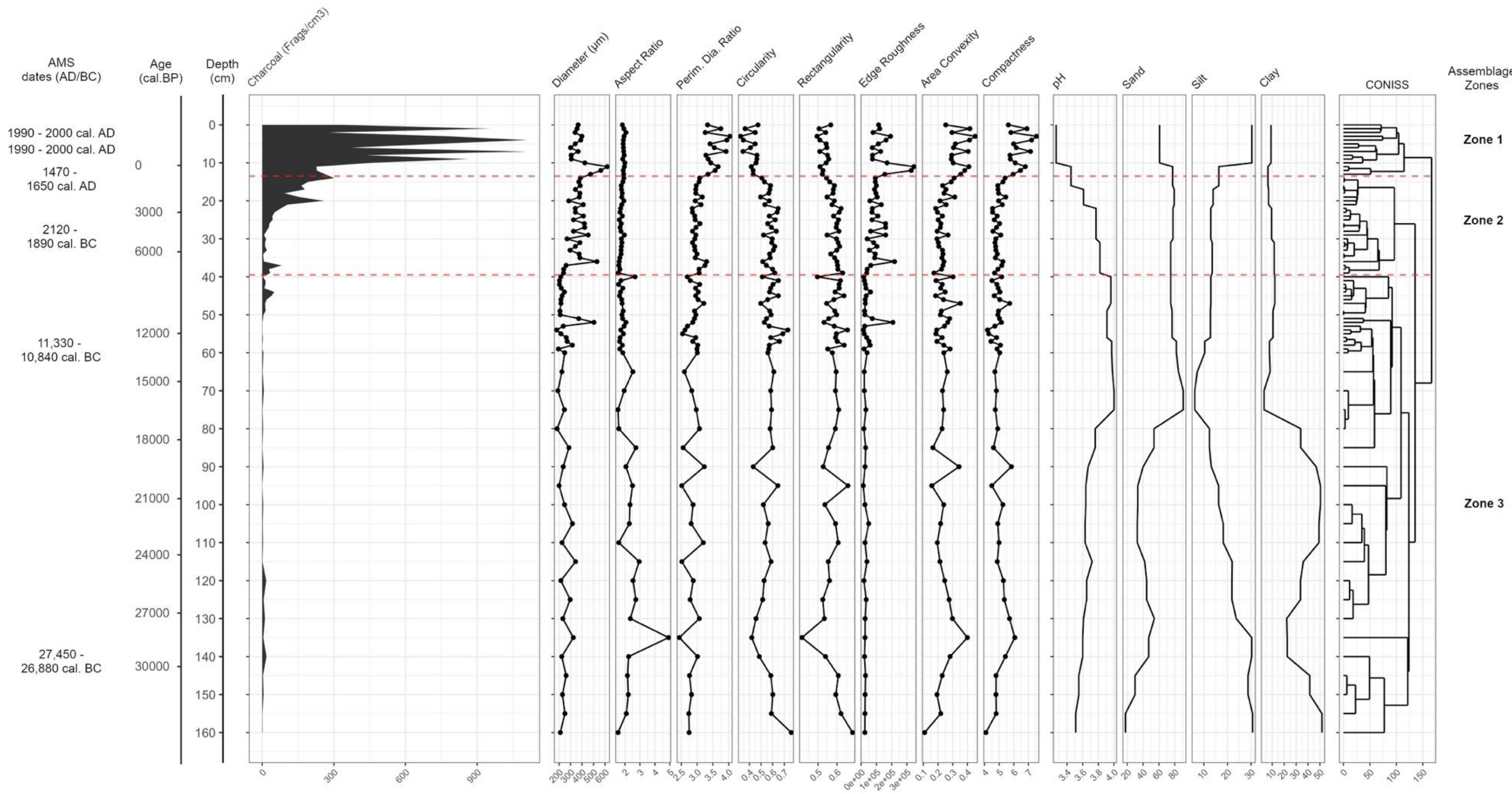

Figure 8-6. Charcoal abundance, charcoal morphology, and sediment properties for the SC-2-Hell Hole sequence.

Table 8-4. Morphological Metrics Used to Describe Charcoal Assemblages in this Study.

Morphological Metric	Description	Interpretation
Diameter	Length of the longest dimension of the fragment.	Length of fragment is related to their overall size. Larger fragments are more often local in origin (see Whitlock and Larsen 2001).
Area Convexity	Normalized difference of the convex hull area and the charcoal fragment's area.	Higher values indicate less rounded, and more irregular shapes. These attributes can be found in the broken/fragmented edges of grassy charcoal, leaf litter charcoal, and pine litter charcoal (see Enache and Cumming 2006, 2007).
Circularity	A circularity value of 1.0 indicates a perfect circle, and thus less irregular or complex. As the value approaches 0.0, it indicates an increasingly elongated and potentially irregular polygon.	Fragment circularity is an indication of shape elongation and complexity. Elongated, complex charcoal shapes are indicative of finer, grassy fuels, while more circular fuels are related to low-complexity, irregular broadleaf litter fuels (see Enache and Cumming 2006, 2007).
Rectangularity	Represents how rectangular a shape is by evaluating completely it fills its minimum bounding rectangle.	Provides an indication of how geometric or blocky the charcoal is. Wood charcoal should be geometric and blocky (see Enache and Cumming 2006, 2007).
Compactness	Ratio of the object's perimeter to area.	Provides information about the general complexity and the form factor, which it is closely related to roundness (Wäldchen and Mäder 2018).
Edge Roughness	Higher values represent increased roughness, or complexity, along the edges of each fragment. Based on the index created by Mandelbrot (1983).	Evaluates the roughness or complexity the charcoal fragment's shape. Broken/fragmented edges of grassy charcoal, leaf litter charcoal, and pine litter charcoal will have higher edge roughness values (Wäldchen and Mäder 2018).
Aspect Ratio	Ratio of the fragment's length and width	Higher values indicate more elongated charcoal, such as grass or pine litter charcoal (e.g., Leys et al. 2017).
Perimeter/Diameter Ratio	Ratio of a fragment's perimeter and longest diameter	Higher values indicate more shape complexity (Wäldchen and Mäder 2018).

Charcoal Results

Charcoal abundance and morphology for both the SC-1-Hampton and SC-2-Hell Hole cores are illustrated in Figure 8-5 and Figure 8-6, respectively. The quantity of charcoal fragments identified and measured in each core was substantial—approximately 6,000 individual fragments in the SC-1-Hampton sequence and approximately 52,000 individual fragments in the SC-2-Hell Hole sequence. Both cores exhibited increases in charcoal accumulation starting at approximately 5000 cal. BP, which is interpreted as a proxy for increasing fire activity. A similar chronology for the increased fire and the transition to pine dominated ecosystems has been reported by other recent paleoecological studies within the Southeast Coastal Plain (Krause et al. 2019; LaMoreaux et al. 2009; Spencer et al. 2017). Charcoal accumulation reaches it maximum rate during the last 300-400 years.

Morphological measurements for each individual charcoal fragment encountered in each core are presented in Table 8-4. These metrics are useful in evaluating the taphonomic processes influencing the creation and form of each charcoal fragment during combustion and deposition. While recent studies have demonstrated the wide diversity of morphological measurements applied to charcoal analysis (Courtney Mustaphi and Pisaric 2014), others have critiqued the utility of highly specific fuel categorization or fire intensities interpretations from such measures (Vachula et al. 2021). For these reasons, the approach applied morphological metrics aimed at understanding the contributions of geometric, elongated, and irregularly shaped charcoal fragments, which constitute standard morphological categories as outlined by Enache and Cummings (2006) and have been applied widely in paleoecological and empirical validation studies.

Stratigraphically constrained cluster analyses (CONISS) of charcoal abundance and morphological metrics were performed to define distinct charcoal assemblage zones (Grimm 1987). Three zones were identified for each sequence, which are illustrated in Figures8-5 and Figure 8-6, as well as outlined in the sections below. All data processing, cluster analysis, and visualization was conducted using R (version 4.1.3 [R Core Team 2022]), the tidyPaleo package (version 0.1.2 [Dunnington et al. 2022]), and RStudio (version 1.4.1103 [RStudio Team 2021]).

Discussion

<u>Interpretation of SC-1-Hampton Charcoal Abundance and Morphology</u>

Zone 3 (115-88 cm; ca. 11,600-9400 cal. BP)

Charcoal abundance is relatively low but variable during the early Holocene in the SC-1-Hampton sequence. Charcoal morphological parameters also exhibit variability in this assemblage zone, which is likely due to the increased influence of outliers due to low sample sizes at these depths. Overall, charcoal morphology is relatively geometric, exhibiting high values of rectangularity, and low markers for shape complexity (e.g., Perimeter/Diameter Ratio, Edge Roughness, Area Convexity, and compactness) with the exception of some outlying, high values among these metrics between 95-92 cm (ca. 10,000-9500 cal. BP). While these trends are not robust, they do point to low levels of fire activity and woody fuels characterized by geometric charcoal fragments.

Zone 2 (88-23 cm; ca. 9400-500 cal. BP)

The same trends continue throughput the lower portions of Zone 2. Again, low charcoal abundance is likely resulting in outliers having an amplified effect on the morphological data, particularly between 80-70 cm (ca. 8700-7400 cal. BP) where charcoal counts are minimal. This pattern changes at approximately 56 cm (ca. 5300 cal. BP) with a slight increase in charcoal accumulation, followed by substantial increases in charcoal between 45-23 cm (3500-500 cal. BP). Charcoal morphology metrics between 56-23 cm (ca. 5300-500 cal. BP) indicate a gradual change in the overall assemblage of charcoal fragments. During this period of the sequence, the assemblage contains larger and more elongated charcoal fragments, with periodic increases in edge roughness, without a complementary increase in shape complexity or irregularity. This points to an increase in elongated charcoal morphotypes, which are related to grassy fuels and lower fire intensify during combustion.

These changes, in combination with an increase in charcoal abundance, suggests that in addition to geometric, woody fuels, lower intensity fires consuming more fine fuels, may have also been present on the landscape. These trends match well with the regional cultural chronology for the area, as signatures of low-intensity fire are often associated with agricultural practices (Van Lear et al. 2005). The Woodland period (3000 BC-1000 AD) is characterized by increasing horticultural practices, sedentism, and cultural complexity, followed by the development of populous, socially stratified agricultural societies during the Mississippian period (1000 to 1520 AD), which had a regional presence throughout the Southeast, including the Coastal Plain. The charcoal assemblage abundance and morphology from SC-1-Hampton suggests the possibility of local and/or regional anthropogenic burning contributing to the formation of this record.

Zone 1 (23-7 cm; ca. 500 cal. BP-present)

Charcoal assemblages from Zone 1 are the most abundant and show the most evidence for frequent, low-intensity fire. Between 23-7 cm (500 cal. BP-present) charcoal abundance reaches the highest concentrations present in the sequence and remains at elevated levels throughout the zone. Charcoal morphology also indicates a clear pattern of large, more elongated fragments, as well as increase shape complexity. This is illustrated by elevated edge roughness, perimeter/diameter ratios, and area convexity values in correlation with decreasing circularity values. The charcoal assemblage during this portion of the sequence is likely composed of a mixture of geometric, elongated, and irregular charcoal morphotypes, which indicate frequent low-intensity fires burning a range of fuels, including woody fuels and fine fuels, such as grass and broadleaf litter. These fuel categories can be interpreted as regular, low-intensity fire activity that is likely related to the agropastoral activities taking place at the Spencer Settlement and later the Hampton Plantation, such as burning the woods to increase fodder for cattle, or clearing agricultural fields, fallow areas, or brush within the plantation property. These activities likely continued until the twentieth century, after which wildfires and controlled burns in the nearby Francis Marion National Forest likely contributed charcoal to this sequence.

<u>Interpretation of SC-2-Hell Hole Charcoal Abundance and Morphology</u>

Zone 3 (160-39 cm; ca. 33,300-300 cal. BP)

Much like the SC-1-Hampton sequence, charcoal abundance in the SC-2-Hell Hole sequence is very low throughout the entirety of Zone 3. A slightly elevated period of charcoal accumulation occurs between 140-120 cm (ca. 29,000-25,000 cal. BP). Charcoal morphology remains consistent throughout this zone, with high rectangularity values and relatively low shape complexity, suggesting that charcoal is geometric and woody. Much like the SC-1-Hampton sequence, low sample sizes for this zone are likely causing any fluctuations in charcoal morphology metrics.

Zone 2 (39-13 cm; ca. 7300-400 cal. BP)

The SC-2-Hell Hole sequence exhibits an early increase in charcoal abundance at the beginning of Zone 2 (39-25 cm), followed by a substantial increase at the end of the zone (25-13 cm). Most of the charcoal morphology metrics remain at similar values to Zone 3, except for fragment diameter, which almost doubles during this portion of the sequence. These patterns show some similar attributes to the SC-1-Hampton sequence, with the emergence of larger, more elongated charcoal fragments during the middle and late Holocene, as well as possible associations with anthropogenic burning associated with agricultural practices. However, the chronological resolution of the SC-2-Hell Hole sequences is low during this period due to a slowed sedimentation rate, which makes these interpretations difficult to evaluate.

Zone 1 (13-0 cm; ca. 400 cal. BP-present)

The upper portion of the SC-2-Hell Hole sequence, representing the last several hundred years, shows charcoal accumulation increasing significantly, reaching a maximum concentration of >900 fragments per cm^3. While charcoal abundance fluctuates during this zone, it remains very high. Charcoal morphology also exhibits substantial changes. These including increased diameter and compactness, indicating more elongated fragments. This is also supported by a slight increase in average aspect ratio. Additionally, edge roughness, area convexity, and perimeter/diameter ratio all increase substantially, while circularity decreases. The change in the relationship between these morphological parameters point to an increase in charcoal shape complexity. These patterns are similar to those exhibited by the SC-1-Hampton sequences, which are interpreted in as an increase in frequent, low-intensity fires consuming wood, grass, and broadleaf litter fuels. However, the charcoal abundance values in the SC-2-Hell Hole sequence suggest that fires were much more abundant and likely more local to the coring location. This pattern corresponds well with what would be expected from burning practices associated with maintaining forage patches for free-ranging cattle within Hell Hole Swamp. Unfortunately, bioturbation and the sedimentation rates near the top of the core precludes us from making any specific interpretations of most recent changes in fire history, such as fire suppression during the first half of the twentieth century.

Future Work

Future refinement of the charcoal morphological analyses is needed to bolster the current interpretations of fuel types and fire intensities for both sequences. Drawing on experimental charcoal assemblages created from known fuels collected from the South Carolina Lowcountry, we can advance our statistical methods for classifying and clustering charcoal morphotypes based on the combustion conditions that produce them. Once this work is complete, we will compare our results across all three cores to create a regional perspective on colonial changes to fire and vegetation. Variation in the types of land-use and activities practiced in the vicinity of each core should provide insights into the heterogeneity of the rural colonial landscapes, particularly the distinction between common areas such as Hell Hole Swamp and more formalized, plantation acreage, such as the Spencer Settlement / Hampton Plantation.

Conclusions

The results of this study imply that fire has been an important part of pine-dominated, Lowcountry landscapes since approximately the middle Holocene. However, the highest observed charcoal accumulation occurred during last ~300-400 years in both sequences, suggesting increased fire activity beginning during the colonial period and has continued to the present day. Charcoal size and fragment morphology suggest that fires since the colonial period were likely low-intensity and characterized by incomplete combustion of fine and woody fuels. This pattern corresponds well with what would be expected from burning practices associated with maintaining forage patches for free-ranging cattle. The approach to charcoal analysis used in this study greatly enhances our abilities to interpret the linkages between the colonial cattle industry and the paleoecological record at our study sites. This analysis, coupled with the conclusions from colleagues working on other portions of this project, are revealing just how transformative the cattle industry was on the economics and environments of the South Carolina Lowcountry during the seventeenth, eighteenth, and nineteenth centuries.

Chapter IX
Hell Hole Swamp Core:
Analysis of Pollen and Non-pollen Palynomorphs

Angelina G. Perrotti

Methodological Background

Pollen analysis of a dated stratigraphic sequence is a valuable paleoecological tool because pollen records reflect local and regional vegetation at a particular site throughout time. Non-pollen palynomorphs (hereafter NPP) are materials that are often found alongside pollen in regular preparations and include algae, fungi, eggs, oocytes, and other zoologic material, diatoms, dinoflagellates and more. They are traditionally under-analyzed or ignored but can provide a wealth of environmental information. Of particular interest to this study are coprophilous (or dung) fungi which are often associated with herbivore dung. The strength of association with different types of dung or other substrates such as decaying plant material varies among genera. *Sporormiella* sp. is strongly obligate to herbivore dung and is frequently used as a proxy for herbivore abundance and disappearance at the end of the Pleistocene (e.g., Davis 1987; Gill 2014; Halligan et al. 2016; Perrotti 2018; Robinson et al. 2005; Robinson and Burney 2008). Dung fungi analyses incorporating a number of taxa are more robust than those that use only one taxon because it can protect against species-specific reactions to microenvironmental fluctuations that result in a change in overall spore reproduction (Perrotti and van Asperen 2019). Dung fungi have been found to reflect nearby dung sources and herbivore abundance and are not known to be transported long distances (Baker et al. 2016; Gill et al. 2013).

Methods

One-centimeter samples were removed from the Hell Hole Swamp core by Grant Snitker at 0, 3, 6, 9, 12, 15, 18, 21, 42 and 54 cms (Figure 9-1). One cubic centimeter subsample was removed from each for pollen and NPP extraction. Initial experiments indicated that pollen and NPP in this core were fragile and poorly preserved, so a minimally destructive chemical extraction protocol was utilized.

After the addition of one *Lycopodium* tablet containing 18,584 tracer spores, the samples were treated with 10% HCl in a boiling water bath for five minutes. After centrifuging and decanting supernatant liquid, samples were swirled and decanted three times, followed by sieving through 180-micron mesh to remove heavy particles such as large silicates. The samples were then subject to heavy density liquid separation in a solution of sodium polytungstate with a specific gravity of 2.1. After palynomorphs were pipetted off the top of the sodium polytungstate, samples were dehydrated using ethanol and curated in glycerol.

Samples were mounted on slides, encased using a 22 mm coverslip and one slide was scanned using light microscopy at 400x. A minimum of 200 terrestrial pollen grains were counted while also using a rarefaction curve to monitor sample richness. In some samples, a 200-grain count could not be achieved within one slide. In those circumstances, up to two slides were counted. All palynological material was noted and unknown morphotypes were described and photographed for subsequent identification. Identifications were primarily made using the Non-Pollen Palynomorph Database (http://nonpollenpalynomorphs.tsu.ru/NPP_Database.html).

Many NPP are not presently identifiable because of their rare occurrence within the Hell

Hole Swamp samples and incomplete reference materials. Other NPP are identifiable using morphotype codes (named after the labs in which they were first described), but do not have modern taxonomic affiliations. Despite the lack of modern ecological understanding, morphotypes can still provide environmental information based upon the other pollen and NPP alongside which they occur in other studies. Pollen is presented in relative abundances and NPP are presented using concentration (/cm^3), calculated with the following formula: (spores/pollen counted x *Lycopodium* added)/*Lycopodium* counted.

During analysis, fungal spore types are grouped based on how strongly each taxon's abundance reflects megaherbivore presence. Strongly coprophilous spore types include *Arnium, Delitschia, Sordaria, Sporormiella,* and *Trichodelitschia*. Other types (such as *Coniochaeta*) are often associated with herbivore dung but also occupy decaying vegetation.

When plotting NPP, unknown NPP were grouped together, unless the total abundance of the unknown NPP reached ~2,500 NPP/cc, in which case it was deemed important enough to include in each figure separately.

Results and Discussion

Results presented here include only pollen and NPP data and should be re-interpreted within the context of other ongoing research including sedimentological, chronological, and microcharcoal analyses.

Table 9-1. Hell Hole Swamp core radiocarbon dates. All dates on wood charcoal.

Depth, cmbs	UGAMS#	$\delta^{13}C$, ‰	^{14}C age years, BP	±	pMC	±	Calibrated date range (95% HPD)
7.5	47179	-31.0	Modern	—	111.04	0.28	1990–2000 cal AD
10.5	51017	-31.1	Modern	—	109.13	0.29	1999–2002 cal AD
13	47171	-24.4	330	30	95.99	0.32	1470–1650 cal AD
26	47172	-24.6	3620	30	63.73	0.21	2120–1890 cal BC
58	47173	-13.1	11190	110	24.82	0.34	11330–10840 cal BC

The Hell Hole Swamp core has been divided into three palyno-stratigraphic zones based upon radiocarbon dates and visual inspection of pollen and NPP assemblages. Zone 1 includes sediments within 22-55 cms and is characterized by very low pollen preservation, with pollen concentration values of below 1,000 pollen grains/cmbs. This zone has been omitted from the summary pollen diagrams shown in this report (Figures 9-2- 9-5) because low pollen concentration values result in non-representative pollen vegetation due to a low number of total pollen counts. Zone 2 includes sediments within 21-12 cms and is characterized by moderate pollen concentration and preservation, with pollen concentration values ranging from ~60,000-215,000 pollen grains/cmbs. Indeterminable (or severely degraded) pollen hovers around 25% in this zone. Although pollen preservation is better in Zone 2, caution should be exercised when interpreting the pollen assemblage because biases can still emerge as very fragile pollen types (e.g., *Populus*) are unlikely to be present in the sample, even if the local vegetation had high levels of *Populus*. In addition, some indeterminable pollen grains such as *Pinus* are more easily identifiable even in a degraded state as opposed to pollen grains with more subtle morphological features. Zone 3 includes sediments within 11-0 cms and is characterized by better pollen preservation and higher average pollen concentration values of nearly 200,000 pollen grains/cmbs. Indeterminable pollen ranges from about 20-5% in this zone. Samples with over 10% indeterminable pollen should still be interpreted cautiously.

Zone 1 (55-22 cm)

Zone 1 is roughly bracketed by radiocarbon dates calibrated to 11330–10840 BC (58 cm) and 2120–1890 BC (26 cm) (Table 9-1). Though poor pollen preservation prohibits any interpretation of the pollen record in Zone 1, some NPP were present. Most NPP present in Zone 1 are currently unknown but are likely fungal in nature. The only identified NPP in this zone, cf. *Savoryella lignicola* (as described in Gelorini et al. [2011]), typically colonizes dead wood and ferns, and often occurs in brackish water (Eaton 1972). This zone covers a broad time period during which sea levels were rising and North America was warming. Overall, the NPP assemblage is too sparse to make any environmental interpretations.

Zone 2 (22-13 cm)

Zone 2 is roughly bracketed by radiocarbon dates calibrated to 2120-1890 BC (26 cm) and 1470-1650 AD (13 cm) (Table 9-1). Overall, the pollen assemblage at this time appears to reflect a *Pinus* dominated forest with interspersed or patchy stands of deciduous tree with particular importance of trees within the Betulaceae family. Due to pollen degradation, genera-level identifications were not possible, although *Alnus* can definitively be ruled out. Although *Pinus* pollen is very high, between 40% and 50% abundance, it may be overrepresented within this zone, leaving deciduous tree and herbaceous pollen underrepresented. As previously mentioned, *Pinus* is more easily identifiable when degraded, leading to potential for overrepresentation within samples with a high percent of indeterminable pollen. In addition, Lycopodiacaeae cf. *Diaphastrum* is a genus of club moss that grows in acidic soils in *Pinus* forests, and is present in amounts up to 10% in Zone 3, but not in Zone 2, indicating that *Pinus* became more important in the subsequent zone.

NPP concentration in this zone increased from Zone 1 but remains low. Most NPP recovered in Zone 2 include fungi, most of which are likely decomposers of wood and rotting vegetation. NPP recovery drastically increases in the sample from 12 cm, but it is not known when the increase occurs between samples at 15 cm and 12 cm, thus is it possible that NPP concentration increases in conjunction with the colonial period date of 1470-1650 AD at 13 cm (Table 9-1).

Zone 3 (12-0 cm)

Zone 3 is roughly bracketed on the bottom by a date calibrating to 1470-1650 AD at 13 cm. This zone is primarily modern as two modern dates are reported from the sediments within 10.5 cm and above (Table 9-1). Given current chronological information and pollen/NPP sampling resolution, 12 cm is our only sample that has a strong likelihood of representing the early colonial period. In this sample, it is possible that *Pinus* is still overrepresented. Herb and grass pollen remain low. During this colonial period, we see the emergence of dung fungi, likely reflecting some presence of grazing animals nearby. Not only are small herbivores such as rabbits and deer unlikely to contribute many dung fungal spores to a sediment record (Baker et al. 2016; Davis 1987; Gill et al. 2013), the lack of dung fungi throughout the record supports a significant change in land use, such as the introduction of domestic herbivores.

The remainder of pollen/NPP samples are modern in age and likely heavily bioturbated. From 9-0 cms, the pollen assemblage reflects an increase in dominance of *Pinus* on the landscape, as reflected by an increase in *Pinus* pollen, as well as Lycopodiaceae cf. *Diaphastrum.* Though sediments are mixed, it is possible that grass pollen increases within the top 6 cms as a result of modern land management strategies such as an increase in cattle grazing and prescribed burns which clear the canopy and produce more open patches for grass expansion. NPP abundance and diversity drastically increases in the modern sediments. A drastic increase in strongly coprophilous fungi indicates an increase in herbivory. Furthermore, NPP remains including cf. UO-105 and 107 (Loughlin et al. 2018) which reach concentrations about 3,000 spores/cc were also found in previous studies within paleoecological samples with high organic matter, but variable forest pollen, which could speculatively invoke herbivores rather than forest cover for the high levels of organic matter. possible increase in fire is indicated by the presence of *Gelasinospora*, which has been touted as a fire indicator (Wicklow and Hirschfield 1979). NPPs including cf. UO-105 and 107, cf. *Rhabdocoela* Oocytes, cf. *Amphitrema flavum*, and *Psuedoschizaea* Thiergart and Frantz (Christopher 1976; Thiergart and Frantz 1962) all indicate at least seasonal submerged conditions at the site.

Conclusion

The palynological analysis of Hell Hole Swamp included 10 samples spanning 54 cm and ~13,000 years. Pollen preservation was so poor throughout most of the core that it inhibits environmental interpretations except for in the top ~21 cms, which cover about 4,000 years. In general, the pollen and NPP assemblage indicates a *Pinus* forest with increasing dominance of *Pinus* through time. The site was seasonally submerged at least beginning in the colonial period. The coprophilous fungi record suggests an increasing reliance on Hell Hole Swamp for domestic herbivores throughout the colonial period and into modern times.

Limitations of these interpretations include poor pollen preservation throughout much of the core, incomplete identifications, and the need for interpretation within the greater context of other sedimentological and chronological information. This report will be updated as more NPPs are positively identified and as the other research within the broader project becomes available.

Acknowledgments

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Figure 9-1. Hell Hole Swamp core. Photo courtesy of Grant Snitker.

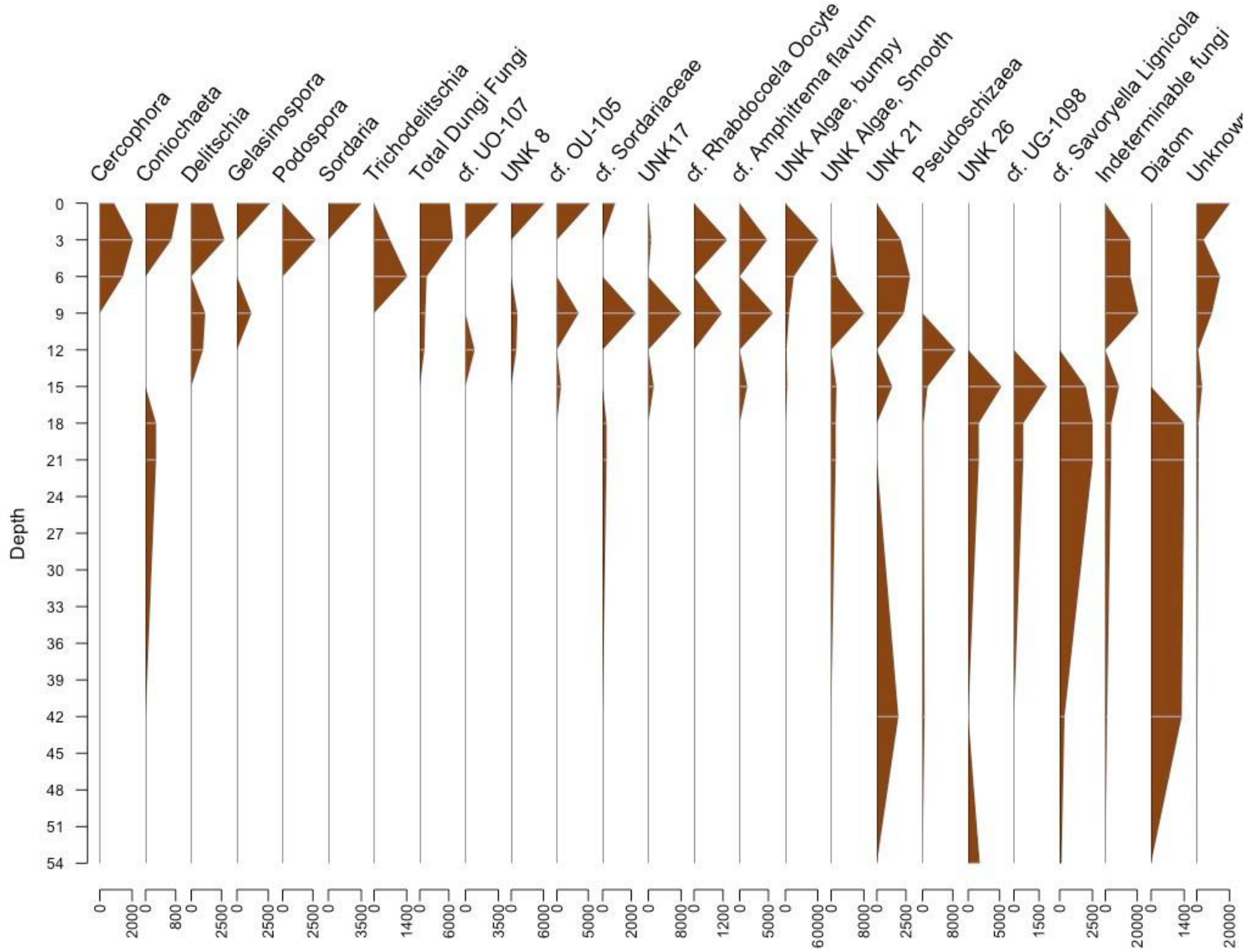


Figure 9-2. Concentration (NPP/cmbs) for all NPP (excluding lower abundance unknowns which are presented as a sum in the last column) with cumulative concentration over 750 (x axis). Individual taxon graphs are not scaled proportionately because unlike pollen, the relative concentration of different NPP types has little comparative value. Bars are perhaps a more accurate representation of the pollen stratigraphy because of differences in sampling resolution. Additionally, sediment accretion increases drastically in the upper 10 cms of the curve. However, silhouettes are presented here for easier comparison between adjacent samples.

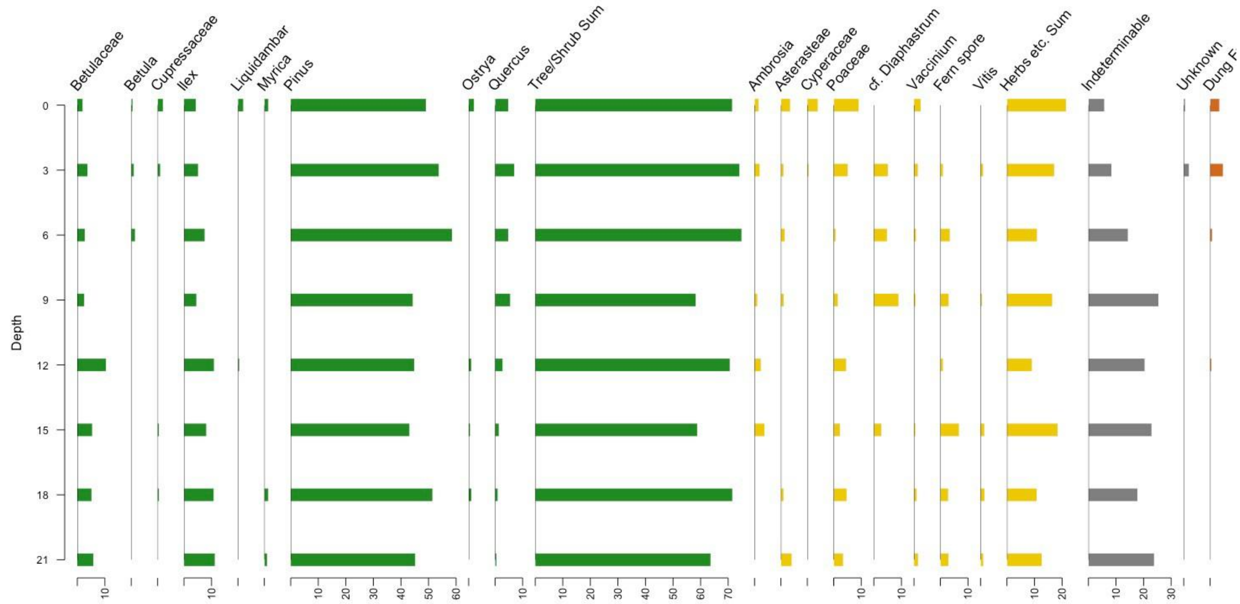


Figure 9-3. Pollen percent (x axis) of all types with cumulative abundance of >5%. Trees and shrubs are in green and herbaceous and non-tree types are in yellow. Dung fungi total is presented here as a ratio to the pollen sum in brown. Only the top 21 cm of the core are featured here because of poor pollen preservation in the down core sediments. Bars are perhaps a more accurate representation of the pollen stratigraphy rather than silhouettes featured in Figure 9-4 because sediment accretion increases drastically in the upper 10 cms of the curve.

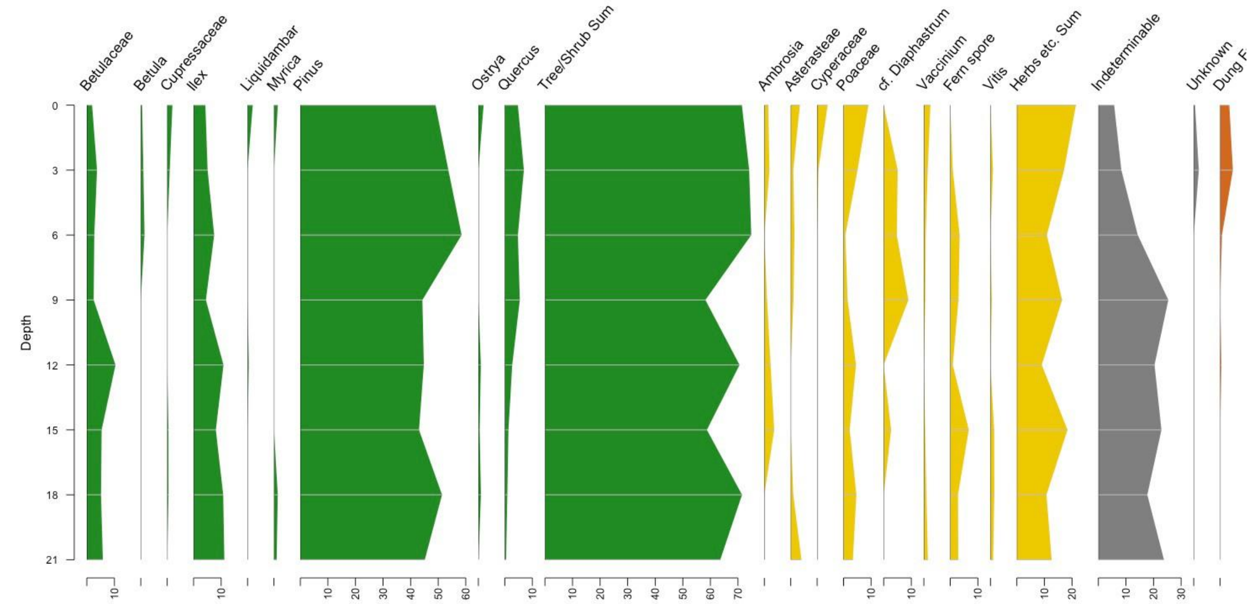


Figure 9-4. Pollen percent (x axis) of all types with cumulative abundance of >5%. Trees and shrubs are in green and herbaceous and non-tree types are in yellow. Dung fungi total is presented here as a ratio to the pollen sum in brown. Only the top 21 cm of the core are featured here because of poor pollen preservation in the down core sediments. Bars are perhaps a more accurate representation of the pollen stratigraphy rather than silhouettes featured in this figure because sediment accretion increases drastically in the upper 10 cms of the curve. However, silhouettes are presented here for easier comparison between adjacent samples.

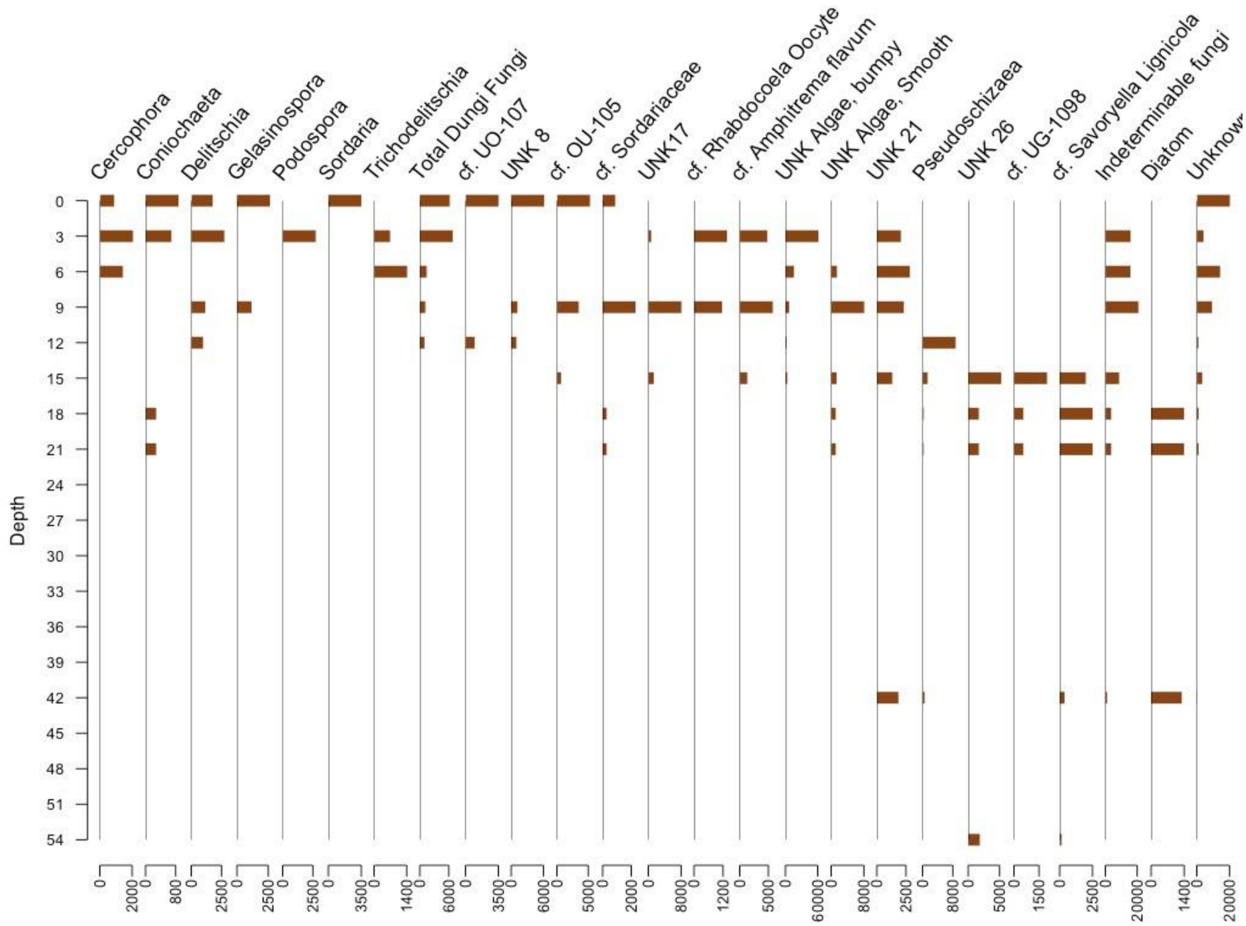
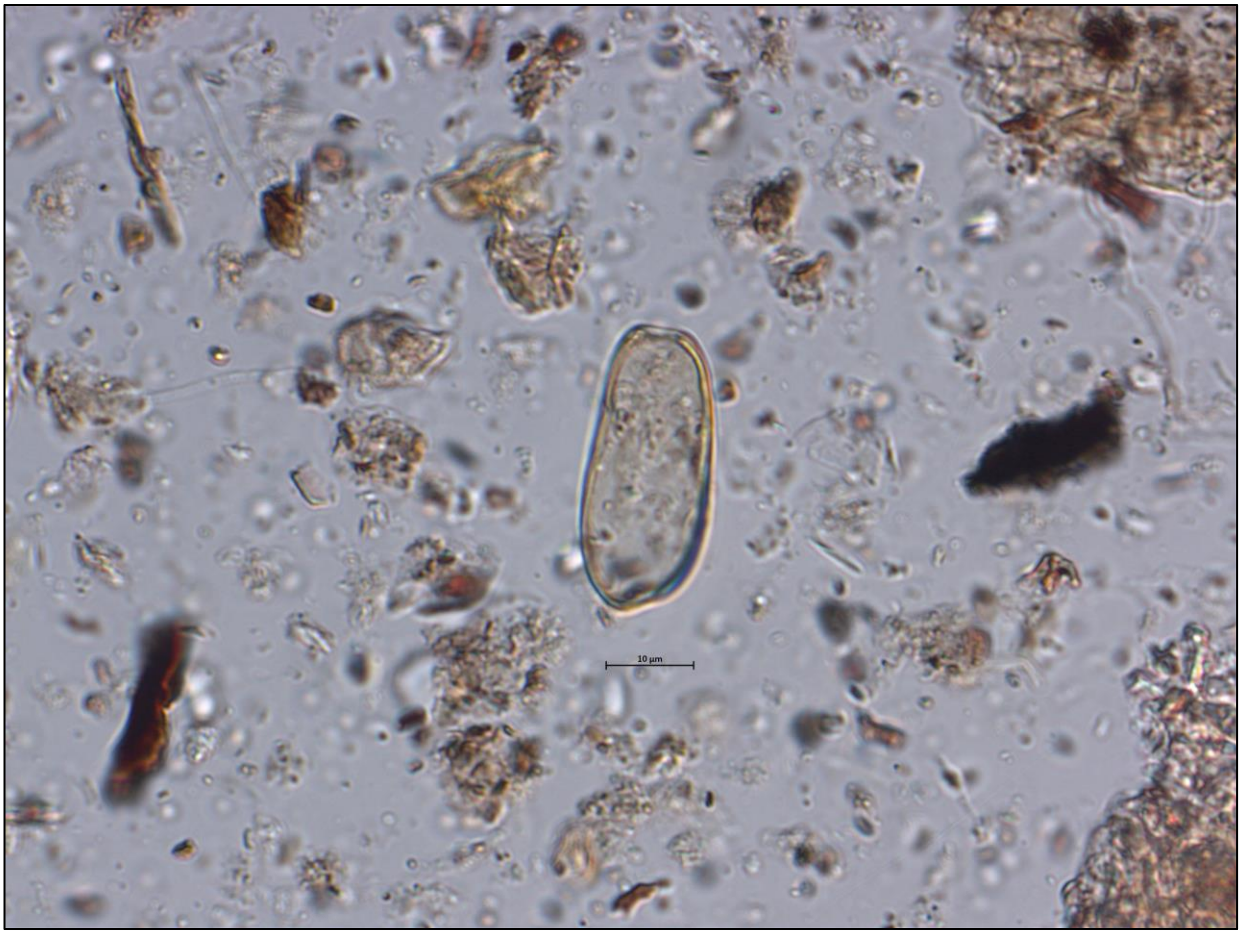


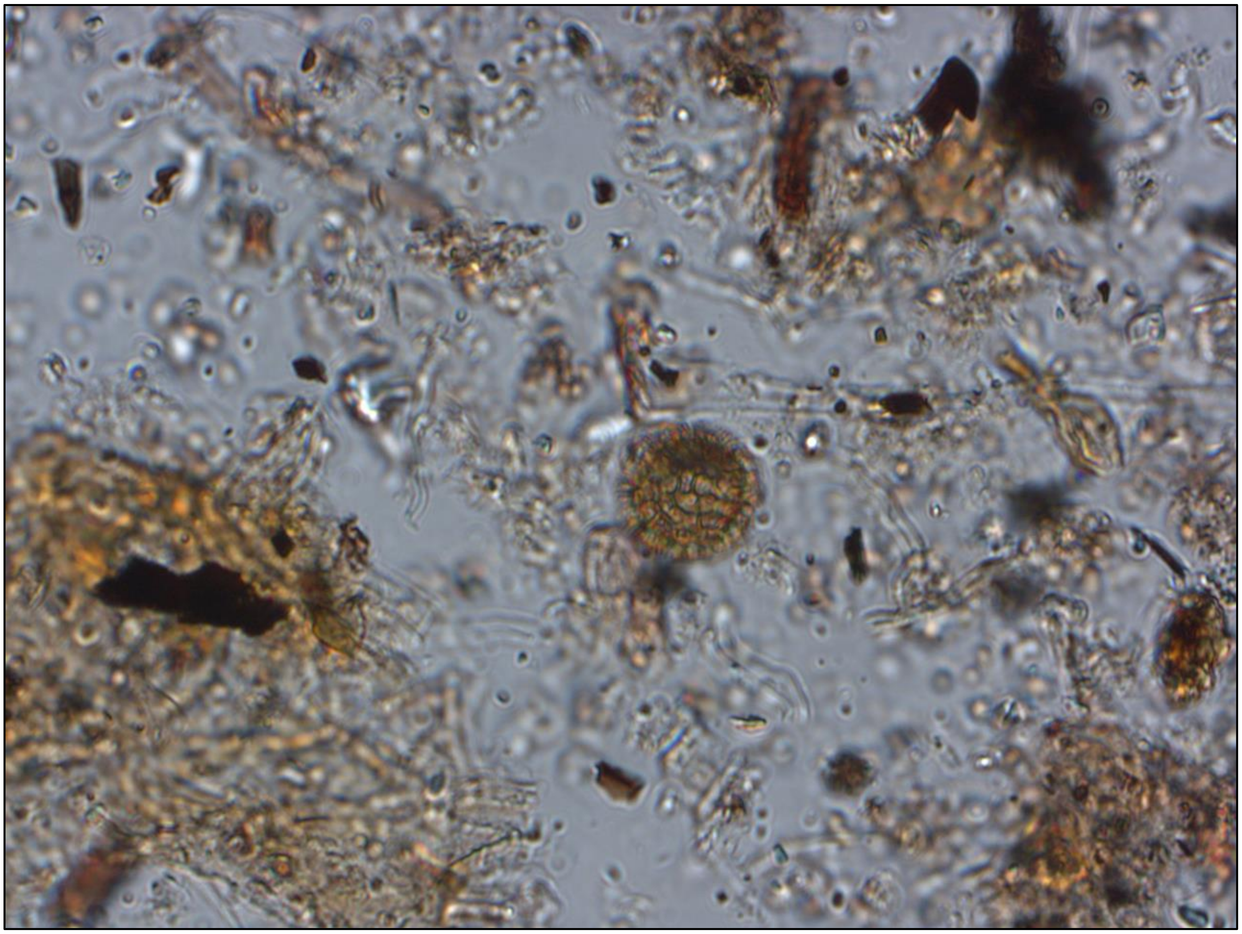
Figure 9-5. Concentration (NPP/cmbs) for all NPP (excluding lower abundance unknowns which are presented as a sum in the last column) with cumulative concentration over 750 (x axis). Individual taxon graphs are not scaled proportionately because unlike pollen, the relative concentration of different NPP types has little comparative value. Bars are perhaps a more accurate representation of the pollen stratigraphy rather than silhouettes featured in Figure 9-4 because of differences in sampling resolution. Additionally, sediment accretion increases drastically in the upper 10 cms of the curve.

Appendix: Pollen and NPP Photographs

Gelasinospora sp.



cf. *Amphitrema flavum*



Lycopodiaceae cf. *Diaphastrum*

Pinus sp.

Chapter X
Zooarchaeological Evidence for Charleston's Cattle Economy

Introduction

Many European-sponsored colonies in the Americas thrived as nodes in regional, interregional, and global provisioning systems (e.g., Orser 2009; Silliman 2005). Much of the wealth and many of the resources present in colonial urban centers was generated in the countryside. Early colonial cities had a broad reach and played a substantial role in organizing environments and livelihoods far from their urban core (Anderson 2004; Hall 2018; Lewis 1999). Animals and plants produced and distributed as raw materials, food, and finished products at rural production centers supplied urban consumers and fueled export economies fundamental to growth in these colonies (e.g., Beck et al. 2016; Crabtree 1990; Dietler 2010; Landon 2009; Rothschild and Balkwill 1993; among others). Boundaries between rural and urban were not static, however. With changing settlement patterns and economic developments, these boundaries shifted as the frontier zone became more distant from the urban center itself (Cressey et al. 1982).[1]

The effect of rural-urban connections on vegetation, landforms, and livelihoods in South Carolina, particularly the social and environmental consequences of cattle (*Bos taurus*), are assessed from the perspectives of historical documentation, stable isotope geochemistry, fire histories, vegetation change, and coprophilous (or dung) fungi elsewhere in this volume. Charleston itself was the end point in a complex distribution network linking rural producers with urban households and overseas markets. Much of this distribution network involved cattle, in the early decades of the colony. Cattle production was among the Carolina colony's first successful enterprises and the source of much of its early wealth.

In this chapter rural-urban connections are considered from the perspective of zooarchaeological evidence for cattle in Charleston. Did urban consumers obtain the products they used directly from their own animals or indirectly from rural production centers? Within the city, were cattle used primarily for beef and other post-mortem products, for dairy products, or for traction? Is there zooarchaeological evidence that the objectives for managing cattle changed over time? What does Charleston's zooarchaeological record suggest about the city's cattle economy? Two lines of evidence from Charleston are used to address these questions: degree of skeletal completeness (i.e., the relative frequency of anatomical parts) and slaughter age (i.e., epiphyseal fusion sequences, tooth eruption sequences, tooth wear stages).

Hypothetical Slaughter Age Profiles

Broadly speaking, cattle are managed to produce secondary products such as butter, traction, and dung or to produce primary or post-mortem products such as meat, tallow, and hides (e.g., Greenfield 2005; Mulville and Outram 2005). Demographic profiles reflect management decisions about how best to produce such products (Landon 1996; O'Connor 2003:157-170, 2010; Thomas 2005:31; Wilson et al. 1982). Management decisions are more complex than this dichotomy suggests, especially when herds are managed to meet several production goals (Bowen 1994; Greenfield 2005; Landon 1996). Urban households managing their own animals for their own use may make different decisions about when to slaughter their animals than rural production centers managing animals for their own use as well as to supply urban and overseas markets.

Broadly speaking, herd management balances the value of post-mortem commodities (e.g., beef, suet, hides, horn, bone, sinew, glue) against dairy products and traction, while maintaining or enlarging the herd. When cattle are managed primarily for post-mortem products, most animals are culled when they reach the point of optimum weight gain, some are kept as breeding stock, and a few are used as draft animals. In herds managed for dairy products, most young male calves are slaughtered for post-mortem commodities shortly before or after weaning (Balasse 2003). Heifers and milking cows are spared as long as they are fertile and produce milk. At the other end of the age spectrum, animals raised primarily for labor are slaughtered after a lifetime of service.

Several hypothetical slaughter age profiles characterize these various objectives (Greenfield 2005:18; Payne 1973). These profiles are intentionally vague about calendrical ages because it is likely the actual ages when animals reached critical life history points in the past was not the same as they are today (e.g., Silver 1969:261-262). It is the overall pattern that is relevant here, not the precise age. To the extent that draft animals were slaughtered, each of these slaughter age profiles might have an additional peak consisting of elderly individuals dying at an advanced age. The general assumption is that draft animals were largely castrated males (oxen), though there is some suggestion in the literature that females were used as draft animals as well and that draft animals were not necessarily elderly when slaughtered (e.g., van Dijk 2016).

The first slaughter age profile presumes both rural and urban households were self-sufficient, raising animals primarily for beef and other post-mortem commodities for on-site use. This self-sufficient "beef" strategy might be signaled by two peaks in the age profile. The first peak would consist of older juveniles, subadults, or young adults slaughtered at the end of their most efficient growth phase. The second peak would consist largely of elderly adults that were no longer productive.

The second age profile presumes both rural and urban households raised animals primarily for dairy products for their own use and/or for sale. This also would produce two peaks referred to by O'Connor (2010:11) "young plus elderly." Dairy production in the past was seasonal and associated with the birthing season because calves are important to freshen cows and keep them in milking condition. Calves often need to be present to induce milk ejection and the absence of a calf might lead to a significant reduction in the quantity and quality of milk as well as a shorter lactation period (Balasse 2003). Usually, visual contact between cow and calf is maintained during milking and the calf is permitted to suckle again after milking. Dairy production also is associated with veal: young juveniles, primarily male calves, slaughtered when only a few months old once no longer needed to stimulate milk production. Veal would not be the only valued commodity obtained from calves; calfskins are thinner and softer than the hides (i.e., leather) from older animals. The slaughter of infertile or non-productive adults would produce the second peak.

The third and fourth age profiles presume rural producers sent market-aged animals on-the-hoof to agents or other distributors in Charleston. The age cohort with the highest market value, likely older juveniles, subadults, or young adults slaughtered at the end of their most efficient growth phase, would be poorly represented at production centers. The age profile at the production center might have two peaks: a relatively small one consisting of juveniles that failed to thrive and a second peak consisting of adults too old to send to market and no longer contributing to herd maintenance. If Charleston relied on rural production for its beef, the largest peak in Charleston would consist of the market-aged animals rare in assemblages from rural production centers: older juveniles, subadults, and young adults.

The fifth and sixth age profiles presume rural production centers only sent meat and other post-mortem products to Charleston instead of trailing livestock to the city. If that were the case, the age profile at the rural end would be similar to that for on-site self-sufficiency, with all age cohorts represented, but dominated by older juveniles, subadults, and young adults slaughtered at the end of their most efficient growth phase, as well as older, unproductive adults. Assuming that most of the preserved meat sent to Charleston contained little or no bone, most of the cattle remains recovered from Charleston would have originated locally. Skeletal remains would primarily be from animals slaughtered by the household or from whatever bone fragments remaining in meat purchased from local vendors. The urban age profile would be consistent either with the self-sufficiency "beef" profile or the dairy profile.

As Greenfield (2005:18) and van Dijk (2016) observe, there is a seventh option. Today's cattle industry is focused on intensive, specialized production goals, which may not have been the case in South Carolina prior to the 1850s. Instead, it is probable that rural production centers and Charleston households followed a mixed strategy designed to provide some post-mortem products, as well as dairy products and labor. The age profile for this multi-purpose, mixed strategy would differ from that of the dairy strategy because young males would be culled for meat at the end of their most efficient growth phase, instead of as nursing calves. Females would be supported as long as they produced offspring and milk but slaughtered when they became unproductive. One might have a profile that contains juveniles of various ages, subadults, adults, and a few elderly animals used for labor; a model referred to by van Dijk (2016) as a subsistence model. In this multi-purpose, mixed subsistence strategy the needs of the household would take priority over the production of a specific product. This strategy could be practiced both at rural centers producing for the urban and overseas markets as well as at urban households managing their own animals. It might be particularly characteristic of the early decades in South Carolina though replaced by more specialized objectives in the later decades as connections among rural production centers, urban consumers, and oversea markets matured.

There are some practical aspects to coastal South Carolina's herd management that likely could be ignored in northern Europe and New England. Before ice became available in Charleston (ca. 1790; Butler 2018a), fresh milk probably was produced as close to the consumer as possible each day while a cow was lactating. Coastal South Carolina is not ideal for curing most cheese, which requires prolonged cool temperatures, though butter, cream, and buttermilk can be made under warmer conditions (Hooker 1984:105-109, 118). To the extent that most animals were free-ranging, it is unclear how herders could be assured of extracting individuals hiding out in canebreaks when they reached the point of optimum weight gain or how many cows were sufficiently tame to be milked. "Cow hunters" may very well have used the animals they could capture, regardless of what the "optimum" age might have been. Dairy animals were probably specifically designated as such, not part of free-range herds. "Tame" animals would be accustomed to handling and pastured nearby in order to be milked daily unlike "wild" ones. To the extent that fresh milk was the objective, milking was probably done as close as possible to customers, likely within the city. Further from the city, butter was probably the primary milk product sent to Charleston.

Cattle Economies in New England and Chesapeake Bay

Zooarchaeological studies of skeletal completeness and slaughter age at other colonies on the Atlantic seaboard document regional differences in the management objectives of cattle (Bowen 1994; see also Landon 1996). Joanne Bowen's comparative analysis of products, production goals, and distribution patterns in colonial New England and the Chesapeake Bay region is particularly useful because her study draws upon zooarchaeological evidence from both rural and urban locations (Bowen 1988, 1992, 1994, 1996). She concludes that regional differences in faunal assemblages reflect local economic priorities.

New England

In New England, the herding system met three broad age-related production goals: meat, dairy, and traction (Bowen 1994). Meat and dairy products were cash crops with a ready market among New England's urban consumers and both rural and urban faunal assemblages reflect this. Many farmers specialized in either commercial production of dairy products or of meat depending on the land available to them. Most cattle in the rural Mott Farm faunal assemblage were slaughtered in their prime, which Bowen estimates to be ca. 36-48 months of age. This slaughter pattern indicates a strategy that emphasized beef production but included some dairy production. The age group included young females that probably had calved once, been milked until they went dry, and then were slaughtered. The few young animals slaughtered before 36 months probably were surplus male calves or juveniles not destined to serve females or provide labor. The limited numbers of animals older than 48 months at death probably were oxen, milk cows, and, perhaps, an aged bull that had survived to that advanced age.

Although New England urban faunal assemblages are from slightly later periods compared to her rural assemblage, Bowen (1994) reports that 80% or more of the cattle individuals in those assemblages were slaughtered between 7 and 18 months of age, reflecting an urban preference for the tender meat of younger animals. The few urban animals slaughtered after 48 months probably were oxen and dry females. Landon (1996:99-101) reports a similar pattern at the rural Winslow site (Marshfield, MA).

Another way to interpret the New England pattern is to think of this as a continuum. As part of an inter-connected production chain, young animals (7-18 months of age) were sent from rural farms to urban centers, where they were slaughtered for beef as were a few older milk cows and oxen. These age groups are rare in the rural Mott Farm assemblage, especially the 7- to 18-month group. Farmers, however, slaughtered animals at 24-48 months, probably selectively culling unproductive animals too old to send to the urban market. These middle-aged animals were slaughtered at rural locations for local consumption, along with a few young and aged animals. The absence of 24-to 48-month animals in urban collections is striking, though the temporal difference between Mott Farm (1730-1750) and urban assemblages (1790s-1830s) cannot be ignored.

Chesapeake Bay

In the Chesapeake Bay system, cattle were managed within an economy specializing in tobacco production (Bowen 1994). The primary rural husbandry strategy in the early seventeenth-century Chesapeake system was to turn cattle loose to fend for themselves in woodlands and abandoned fields. According to documentary sources, these herds were managed primary to produce meat, with little attention to dairy products. Both rural and urban archaeological kill-off patterns, however, are dominated by cattle 36 months of age or older, suggesting dairying was more common than the documentary record indicates. The average slaughter age of cattle in the archaeological record seems to get older over time. Bowen estimates that in the early-seventeenth century most cattle were at least 24 months old when slaughtered. By the late-seventeenth century most were more than 48 months old at death. In the early-eighteenth century, the percentage of 24-36-month-old animals had increased, but most animals were older than 36 months of age when they died. Urban faunal assemblages dating to the 1720s and late eighteenth century are very similar to early-eighteenth-century rural patterns, except urban assemblages contain some animals slaughtered between 7 and 18 months of age, a group notably absent in most rural assemblages.

Bowen (1994, 1996) suggests the Chesapeake pattern reflects a shift in management strategies stimulated by several factors. Farmers may have diversified slightly in response to depressed tobacco prices in the early-eighteenth century, producing more cattle. The importance of oxen for traction and of cattle dung for fertilizer also might be responsible for some aspects of this pattern, particularly for differences between early- and late-seventeenth-century slaughter patterns. More interesting from the perspective of Charleston, herders in western Virginia began sending 36- to 48-month-old animals to urban markets in the late 1700s. This is the age group that dominates the John Draper site in Williamsburg in the late eighteenth century (Bowen 1994) and suggests animals were sent to coastal urban markets from what was at the time the frontier.

Cattle in the Carolina Lowcountry

The foundation and development of South Carolina and its ranching tradition are discussed in Chapters III-V, but relevant points are summarized here as background for evaluating cattle management decisions from the perspective of Charleston's zooarchaeological record. The earliest archaeological evidence for the British occupation dates to 1670, though archaeological evidence prior to 1700 is limited both for Charleston and the rural coastal plain.

The tidal zone of South Carolina and Georgia lies within the relatively flat, low-lying Lower Coastal Plain (see Chapter II for details and Figure 7-2 to associate ecoregions with strontium values). The Lower Coastal Plain consists of the coastal islands and salt marshes lining the Atlantic coastline as well as the grasslands, pine woodlands, and forested wetlands common away from the coast. Tidal influence extends ca. 20-30 miles inland along coastal streams into the Lower Coastal Plain, forming a tidal zone that defines the Lowcountry (e.g., Porcher 1995:5). The Lowcountry extends across the Savannah River, where James E. Oglethorpe founded the colony of Georgia in 1733. Further inland lies the Upper Coastal Plain, which merges into a sandhill region just below the Fall Zone. The Fall Zone separates the coastal plain from the Piedmont.

Although the founding principles of the two colonies were different, Georgia colonists quickly adopted the entrepreneurial objectives motivating many of South Carolina's colonists. This included producing and selling large numbers of cattle (Stewart 1991, 2007). Some Georgia production centers, such as the Musgrove Cowpen (Chapters IV, XII), sent live animals, as well as by-products such as barreled beef and tanned hides, to Charleston. Sugar production monopolized much of the available land in the Caribbean, and the West Indies offered a ready market for livestock, meat, and other animal products (e.g., Burnard and Hart 2012; Stewart 1991). During much of the eighteenth century, meat was one of Charleston's top exports (Edgar 1998:134). In 1712, exports included 1,963 barrels of beef (Clowse 1971:83, 129). By the mid-1700s, a third of the ships leaving Charleston carried animals, meat, and animal byproducts to the Caribbean (Hart 2016, 2020).

Lowcountry cattle herds could be large and most of the animals were free-ranged (see Chapter IV; Dunbar 1961; Groover and Brooks 2003; Stewart 1991, 1996:73). Early cattle production centers were known broadly as cowpens, referring more to an area than to fenced pastures. Some cowpens, such as the Musgrove Cowpen, were owned by independent producers. Others were owned by plantation owners or Charleston merchants, though these might be some distance from either the specific plantation or the city (Dunbar 1961:126; Otto 1986). Many of the herders were Africans skilled as cattle hunters (Dunbar 1961; Otto 1986, 1987). Before the prohibition against slavery in the Georgia colony was lifted in 1751 (Stewart 1996:86), workers at Georgia cowpens were largely Europeans. South Carolinian herding traditions, including enslaved cow hunters, arrived shortly after this prohibition was lifted.

Herd management strategies were diverse and changed over time as production goals changed (Dunbar 1961; Otto 1986, 1987; Stewart 1991). Otto (1986; Dunbar 1961) describes an annual cycle in which fields were burned in the winter to improve grazing; nursing females and their calves were collected into folds during the spring and summer so the cows could be milked; penned animals were released to forage on their own over the fall and winter. Some cattle were encouraged to return each evening throughout the year (Otto 1987:18). Colonists who distinguished between "ranging free" and "tame" or "gentle" animals (Stewart 1991:11) likely milked the tame ones.

Early cowpens were located along the tidal streams of the Lowcountry, primarily near Charleston and Savannah. From there, producers sent preserved meats, tanned hides, and live animals to the city for slaughter and processing (Otto 1987). Over time, though, cowpens spread inland, especially into the non-tidal Lower Coastal Plain as well the Upper Coastal Plain (Brooks et al. 2000; Dunbar 1961; Groover and Brooks 2003). By the late 1700s, a complex supply network linked the cattle industry, plantation-based agricultural production, and the city (Dunbar 1961; Hart 2016; Otto 1986; Stewart 1991).

Charleston's zooarchaeological record reflects much of this history (Figure 10-1). Beef is far more abundant than other meats in Charleston and remained so into the late 1800s. Beef comprised 78% of Charleston's non-commensal biomass in 1710-1750 and 70% in 1850-1900 (Zierden and Reitz 2009, 2016). The modest decline in the biomass percentage after 1850 suggests on-site discard of cattle refuse was less common. This may be due to increased use of commercial sources of meat containing little bone, improved garbage collection, enforced restrictions on raising and slaughtering large animals on residential lots, a decline in beef production due to cattle diseases, or the after-effects of the Civil War.

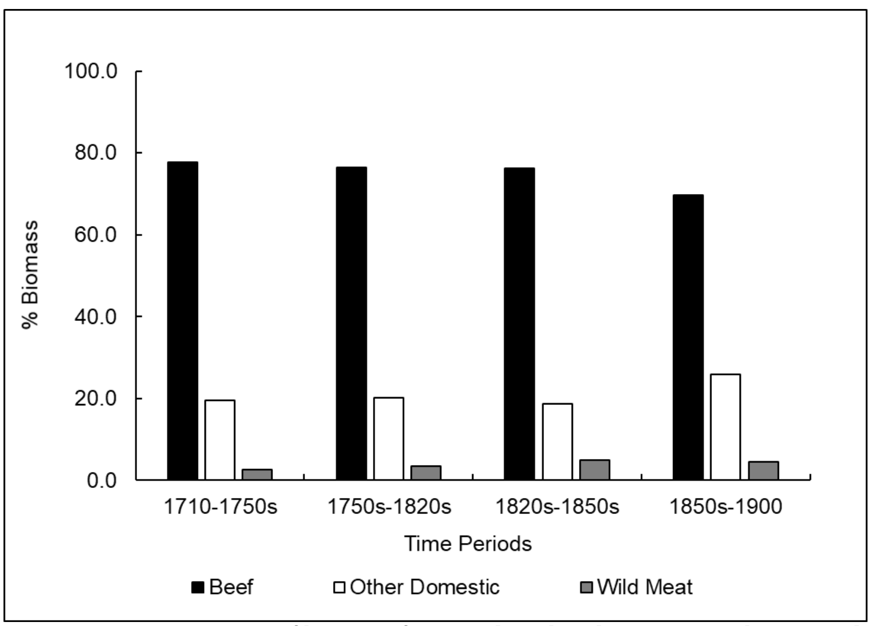


Figure 10-1. Percentages of biomass from cattle, other domestic vertebrates, and wild vertebrates over time in Charleston. See Appendix III for methods.

Skeletal Completeness as Evidence for Distribution Networks

Background

Interpreting Figure 10-1 requires considering where cattle were slaughtered and butchered, specifically, distinguishing between animals slaughtered where their remains were recovered and those slaughtered elsewhere. Was beef (with or without bone) obtained exclusively or primarily from rural production centers (e.g., cowpens) and urban distributors (e.g., knacker yards, butcher shops, markets, street vendors). Or did some of the bones (and associated meat) originate with animals butchered at residential sites within the city?

Skeletal completeness is one of the key lines of zooarchaeological evidence for distribution networks. When households acquire animal products directly, perhaps from their own animals, butchery is likely to be near the point of consumption and the resulting zooarchaeological assemblages should contain skeletal fragments from most, if not all, parts of the carcass (e.g., O'Connor 2003:143-156; Thomas 2005:31). As distribution becomes more selective, specialized, and indirect, one or more steps intervene between the point of production (e.g., the herd) and the point of consumption (e.g., the urban household). Distinctions between producers and consumers become more pronounced as more processing is done further from the household, and eventually further from the city itself. Rural producers, their agents, and other intermediaries likely tailored production to supply the animal products preferred by different customers along this continuum.

If butchery waste usually was deposited at non-residential production centers, such as cowpens, markets, or butchers, then consumption sites should have little evidence for "waste" products. On-site butchery is implied by assemblages with high percentages of low-value "waste" portions compared to high-value portions, whether at a production center or at a primarily residential site. Skeletal specimens from the head and lower part of the carcass generally are interpreted as "waste" portions because they are associated with very little meat and specimens from the upper part of the carcass are interpreted as high-value portions because they are associated with larger quantities of meat.

Skeletal remains recovered from each stage in a distribution network would consist largely of specimens (NISP, number of identified specimens) from carcass portions deemed less desirable by customers further down the line. Products not favored by residential customers might be discarded or diverted to specialists such as meat packers, ship chandlers, tanners, hornworkers, and other specialists. If Charleston households obtained meat from commercial distributors, household skeletal remains should reflect this selectivity and be skewed toward skeletal remains associated with high-value carcass portions. High percentages of skeletal portions considered waste or associated with craft production might be rare at residential sites. This distinction might be less clear where residential and commercial activities using cattle products occurred at the same site, as, for example, they did at the Heyward-Washington site ca. 1730-1768 (Chapter XI).

Results: Skeletal Completeness

Cattle specimens from all parts of the skeleton are recovered from all Charleston sites (Figure 10-2). "Head" and "Lower Leg" specimens comprise 53% of Charleston's cattle specimens, closely approximating the percentage of these specimens (60%) in an intact cow reference skeleton. Specimens from the "Body" comprise 47% of the Charleston archaeological cattle specimens compared to 39% of an intact reference skeleton. The similarity of 1750-1820 percentages with the intact reference cow skeleton is particularly telling. This pattern is characteristic of most Charleston assemblages regardless of time period, status, ethnicity, or site function, suggesting post-mortem transportation was minimal in many cases. It also was subject to change with time. Prior to 1850, urban sites appear to have a high degree of skeletal completeness. The increase in percentage of specimens from the "Body" in the latter half of the nineteenth century suggests households increased their use of indirect, commercial meat.

Faunal remains from the Beef Market are merged with other urban assemblages in Figure 10-2, but in Figure 10-3 the Beef Market and other, contemporaneous non-market sites in the city are subdivide into 1710-1750 and 1750-1820 components. If the Beef Market were a significant source of skeletal material associated with meat in the city, contemporaneous Beef Market and non-market graphs should be mirror-images of one another. Instead, Beef Market and non-market percentages are virtually identical in the 1710-1750 period. The 1750-1820 non-market graph is different; but virtually identical to the complete, undisturbed reference cow skeleton. This suggests two sources of cattle in the city. One source was commercial, such as the Beef Market, with animal products probably originating outside the city, perhaps no further away than the Charleston Neck. The second source was informal, including direct acquisition and residential slaughter from local herds.

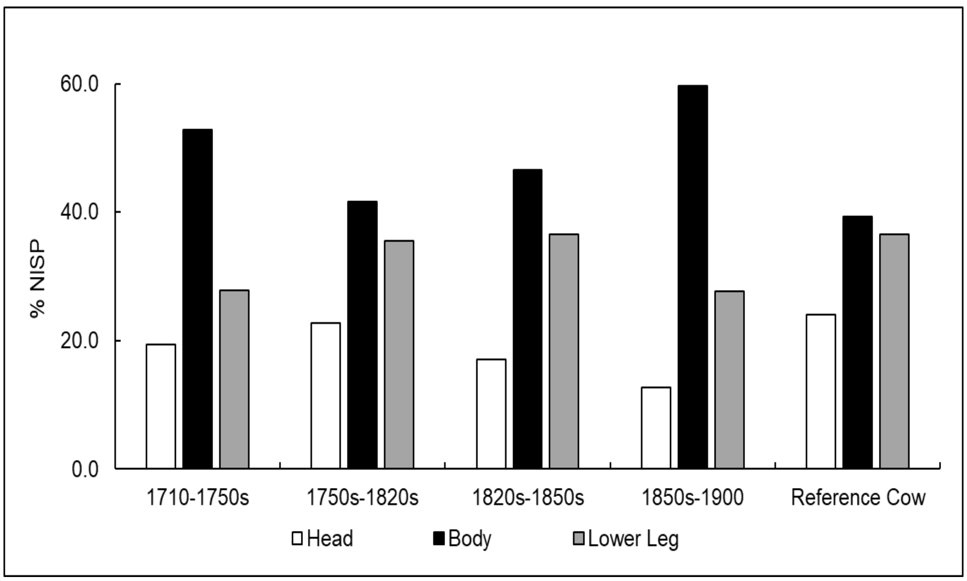


Figure 10-2. Percentages of the number of identified cattle specimens (NISP) for all sites in each time period and a reference cow. Specimens from the 1970 Heyward-Washington assemblage are not included in this or any other calculation in this chapter because of differences in recovery method (Chapter XI). See Appendix III for methods.

Discussion of Skeletal Completeness as Evidence for Distribution Networks

It is the abundance of teeth even in assemblages from properties such as the Heyward-Washington House that makes the stable isotope study in Chapter VII possible, but it also raises questions about how to interpret patterns in skeletal completeness. Very similar skeletal patterns could be evidence of on-site slaughter, a lower-status diet, or a household's use of raw materials for non-dietary products. Head (primarily teeth) and Lower Leg specimens may not have been common at many residential sites in Charleston, but they may dominate the archaeological record because they have a high survival potential or were subject to less processing compared to specimens from the Body. On the other hand, if the Head and Lower Leg portions were of little value to households, one would think those portions were sent to craft specialists (e.g., skulls to horner, lower legs to tanners or bone workers [e.g., Luff 1994]) whether they were the waste products of on-site butchery or refuse produced by specialists slaughtering off-site.

The simplest explanation for the Charleston pattern is that consumers enjoyed dishes such as brain cutlets, forced hog's ears, cock's combs, baked calf's heads, calves foot jelly, smoked neat tongues and udders, veal knuckles, and pickled pigs' feet whether purchased from vendors or derived from their own animals (e.g., Glasse 1983; Hooker 1984; Stewart 1991:16). It seems likely that Head and Lower Leg portions are abundant in the archaeological record because they were of value to the household; consumers did not consider them to be "waste." The eighteenth-century definition of "edible," or at least usable, was broader than some twenty-first-century definitions. Many low-meat-yield portions carcass portions (and "waste" bones) considered to have little household value today had many uses before petroleum products replaced them; one need only think of the critical importance of tallow for candles and soap (e.g., Clutton-Brock 1982). The possibility that residential kitchen refuse is mixed with discards from on-site slaughter, horn removal, neatsfoot oil extraction, and related by-product production should be considered. Many other examples are found in period receipt books of even very wealthy housewives using these portions; suggesting that the elements of cuisine such as cooking techniques, seasonings, and style of presentation, were the relevant status markers (e.g., Bowen 1992). Many of these uses complicate associating specific skeletal elements with transportation decisions, urban consumer choices, status, and ethnicity from meat utility indices, market price, and/or the presence of specimens from the head or foot.

To complicate interpretation further, it is probable that households did purchase animal products from commercial outlets. The city's first formal market was called The Beef Market (Calhoun et al. 1984; Zierden and Reitz 2005). Although other products were sold at the Beef Market, so, too, was beef. The historical record lends support to this combination of home-slaughter and commercial sources of meat. Smith's (2007) analysis of Sarah Reeves Gibbes journal, written in Charleston between 1807 and 1809, shows that daily marketing was common. On the other hand, more than half of the space on many early urban lots was devoted to crops, livestock, and other farming activities. People complained for decades about free-ranging animals and slaughtering animals within the city, to little effect (e.g., *City Gazette and Daily Advertiser*, August 18, 1791; Eckhard 1844:137; Edwards 1802:39; Hart 2016; Hooker 1984:14; *South Carolina Weekly Gazette*, October 4, 1783). Perhaps some urban households kept at least one cow and her calf on their property or nearby, grazing them in suburban commons or nearby rural pastures. These local animals were slaughtered near the residence and their skeletal parts merged with remains from commercially slaughtered animals. These land-use practices diminished as the city grew (Joseph 2002) and fewer animals were raised (and slaughtered) within the urban core over time.

Links between social attributes (e.g., status, wealth, and ethnicity) and zooarchaeological remains are weak if some households raised and slaughtered their own cattle on their urban property. Recipes using portions from heads and feet suggest that interpreting "Head" and "Lower Leg" specimens as evidence of social or economic status is misplaced, an observation made in other contexts (e.g., Bowen 1992, 1996). These associations are further weakened by the knowledge that many Charleston residential properties were occupied simultaneously by people who did not share the same status, specifically slave owners and enslaved staff. On other urban properties, non-familial residents, such as boarders and school children, might differ in economic social, or ethnic status. The number and identity of residents on other properties is undocumented; we only know the identity of the owner of record. All of these different people discarded their trash in much the same way, often in work yards, under buildings, along property lines, in streets, or in nearby creeks. This admixture may explain why most faunal assemblages contain fragments from all parts of the cow skeleton, though the distinction between low- and high-quality carcass portions may be unjustified.

Broad similarities in body parts represented at sites within Charleston are more striking than are differences among them. Charleston faunal assemblages regardless of site function, status of occupants, or time period tend to contain specimens from all parts of the carcass. Landon (1996:57, 121) reports a similar pattern in colonial Boston, observing, as we do, that significant amount of butchery was done on urban lots in that city during the late-eighteenth and early-nineteenth century.

Landon (1996:17) suggests that status differences might be more strongly associated with the quantity of meat consumed instead of the part of the carcass from which that meat derived, adding that the quantity of fresh versus preserved meats likely was a particularly relevant marker of status. Unlike in New England or the Chesapeake region, fresh meat from cattle probably was available throughout the year in the Lowcountry, thus the seasonal aspect of consuming fresh versus preserved meat may be less pertinent in the Lowcountry but distinctions based on the amount of meat consumed likely applied throughout the Lowcountry. Differences in meat consumption among households and within a single household are difficult to assess, though it seems likely this was an important distinction. Regardless of which part of the carcass was consumed: fresh was better and very likely at a premium.

Figures 10-2 and 10-3 suggest that urban consumers acquired cattle products both directly and indirectly; with commercial outlets becoming the main sources of such products only during the second half of the nineteenth century. Skeletal parts from the entire carcass are present in most Charleston archaeological assemblages, suggesting urban households acquired some animal products directly (home-slaughter). Householders with plantations or cowpens may have supplemented slaughter of their own in-town animals with meat and other products from their rural herds while less-affluent households slaughtered their own animals, raised within the city or in the suburbs. Commercial butchers, tanners, and hornworkers, however, likely operated on the outskirts of the city (see Chapter V).

Given the complexity of urban household composition and urban site-formation processes, especially casual trash disposal and use of bone as landfill (e.g., Butler 2020) it seems that the Charleston data are best interpreted as evidence of the city’s animal economy instead of economies for specific households. In that case, city residents used cattle products from both local and distant sources, with products from distant sources increasing over time.

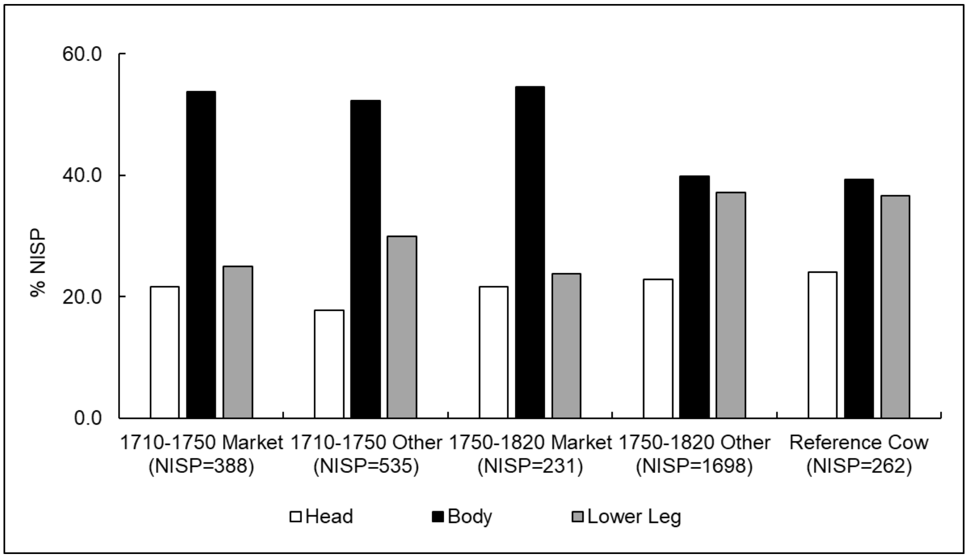


Figure 10-3. Percentages of the number of identified cattle specimens (NISP) for two market periods, contemporaneous non-market Charleston assemblages, and a reference cow. Specimens from the 1970 Heyward-Washington assemblage are not included because of recovery method (Chapter XI). See Appendix III for methods.

Developmental Stages in Physiological Events: Epiphyseal Fusion and Tooth Eruption

Background

Developmental stages in epiphyseal fusion and tooth eruption provide information about slaughter ages for Charleston cattle. Although the *sequence* of fusion and tooth eruption is the same for all artiodactyls, the age when fusion and tooth eruption begin and end is governed by environmental and genetic variables. Negligent care likely delayed maturation for colonial Carolina cattle. Calendrical ages associated with these physiological events are based on modern breeds and likely are not the same as calendrical ages in earlier centuries (e.g., Grigson 1982; Silver 1969:261-263; see Appendix III for additional information). Thus, fusion and tooth eruption are evaluated only in terms of very broad categories roughly approximating age cohorts: juvenile, subadult/young adult, and adult (Appendix III-Table 2).

The deciduous lower fourth premolar (dP_4) is of particular interest in this study because it generally is replaced by the permanent fourth premolar (P_4) as the last lower molar (M_3) emerges above the gum line. Carter (2006) provides radiographs showing this sequence in red deer [*Cervus elaphus*]. This replacement may mark the transition from subadult to young adult (Bond and O'Connor 1999:346).

Results: Epiphyseal Fusion and Tooth Eruption Sequences

Of the Charleston individuals (MNI, minimum number of individuals) for which age could be estimated using epiphyseal fusion and tooth eruption sequences, 73% were juveniles or subadults/young adults when they died (Figure 10-4; MNI = 199). These individuals may have been under 48 months of age when slaughtered. Although this estimated age is based on recent herd demographics, it is likely these animals were considered young by Carolina colonists regardless of their calendrical age. Only 27% of cattle individuals aged using epiphyseal fusion and tooth eruption sequences reached full adulthood before slaughter (MNI = 53). The preference for young animals, particularly young adults, is characteristic of the entire temporal sequence.

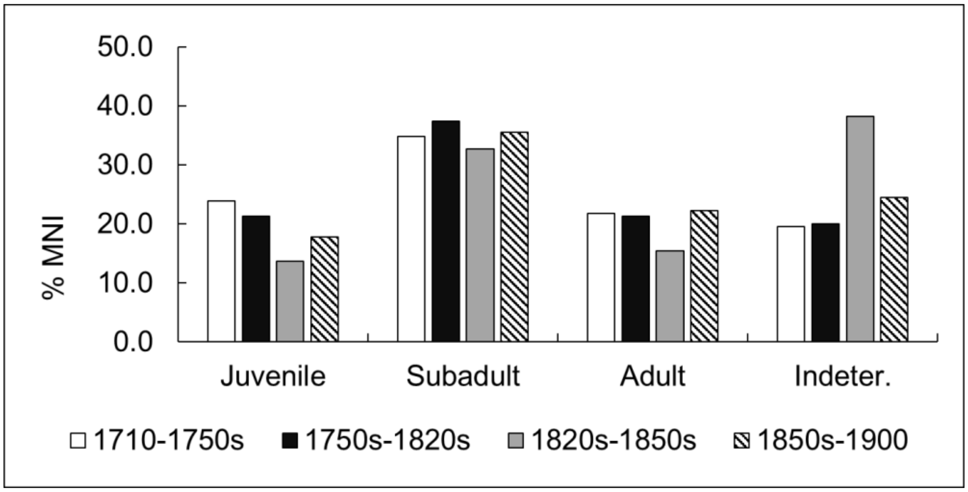


Figure 10-4. Charleston cattle age from epiphyseal fusion and tooth eruption sequences. The age at death for fused specimens in the early-fusing and middle-fusing categories in the archaeological assemblage is indeterminate and is not included in this graph. See Appendix III methods.

Discussion of Epiphyseal Fusion and Tooth Eruption Sequences

Broadly speaking, juveniles and subadults/adults probably were slaughtered to cull herds as well as to harvest higher-quality meat and skins. Adults likely were valued for their ability to produce offspring, dairy products, and traction. Unproductive adults were culled. This pattern might be produced by a mixed production strategy in which post-mortem products were the primary slaughter objective, but that kept some animals past that age if they contributed dairy products, offspring, and/or traction.

Tooth Wear Stage (TWS)

Background

Patterns in occlusal wear extend demographic profiles beyond physiological events (Ervynck 2005; Grant 1982; Hillson 2005:214-219, 223-225; O'Connor 2003, 2010). After teeth erupt, they begin to wear down, doing so for the remainder of the animal's life. The rate and degree of tooth wear is influenced by many of the same variables that affect tooth eruption; however, the actual rate of wear for each animal may be unknown (e.g., Salvagno et al. 2021). Tooth wear is particularly sensitive to graze quality (e.g., silicates, dirt encrusted vegetation) and jaw pathologies (e.g., Mutze et al. 2021). Grant (1982:92) offers a guide to recording the degree of wear in terms of tooth wear stages (TWS) based on the assumption that the teeth of cattle with a similar diet will wear down at a similar rate; the teeth of young animals will show less wear than the teeth of older animals (Figure 10-5).

Tooth wear stages (TWS) were estimated for two slightly different groups of cattle teeth: one group used for the stable isotope study in Chapter VII and a larger group of teeth that were not part of the isotope study. In this chapter, dP_4 and M_3 used in the stable isotope study (Chapter VII) are combined with additional dP_4 and M_3 that were not part of the isotope study. Cattle teeth (dP_4 NISP = 32; M_3 NISP = 76) in this expanded TWS study are from 16 rural cowpens and plantations (NISP = 62 teeth) and 16 urban Charleston locations (NISP = 46 teeth). Grant's system is a "floating" system of relative ages; no specific calendrical age is associated with each tooth wear stage. To simplify the discussion, the five teeth from Colonial Dorchester and the Savannah-Telfair site are excluded. Pseudoreplication was controlled as in the stable isotope study so the 108 teeth in this TWS study likely represent 108 individuals.

Figure 10-5. Examples of TWS classifications in dP4 (top row) and M3 (bottom row). TWS D indicates that modest wear was observed and TWS L and N signify considerable wear.

Teeth are subdivided by time period and ecoregion (Tables 10-1, 10-2). The time frame 1674-1900 is subdivided into five temporal groups: 1674-1710, 1710-1730, 1730-1780, 1780-1820, and 1820-1900. When the archaeological occupation date straddles one of these temporal categories, the tooth is evaluated under the earlier date. Only three non-urban ecoregions are represented: the Lowcountry, non-tidal Lower Coastal Plain, and the Upper Coastal Plain. No TWS estimates for dP$_4$ and M$_3$ are available for rural teeth deposited after 1820 or teeth excavated from archaeological sites in the Piedmont.

Ecoregion assignments are based on the location of the archaeological site where the tooth was recovered. This may not be where the animal was born or where it spent much or most of its life. Drayton Hall is a good example of this distinction. The excavations at Drayton Hall were close to the Ashley River, which places the site and the tooth in the rural Lowcountry. The Drayton Hall property, however, extended into a savannah that lies outside of the tidal zone though only a few yards to the east, on the other side of what is now US Highway 17. In other words, the Drayton teeth were excavated from a site located in the rural Lowcountry, but Drayton ran local cattle in both the tidal zone and in the non-tidal Lower Coastal Plain.

Results: Tooth Wear Stages (TWS)

The results of tooth wear analysis for the three ecoregions are shown in Figure 10-6. Based on the percentage of dP_4s (33% of the teeth) and M_3s in TWS EFGH (43%) it is likely that most cattle slaughtered in Charleston were either juveniles or adults. Two Charleston juvenile dP_4 are in TWS C and may be from nursing calves. Young adults are rare in the Charleston sample (6%) and 17% of the teeth are from elderly animals. At rural Lowcountry sites, 29% of the teeth are from juveniles (dP_4) and 36% are M_3s from adults. None of the rural Lowcountry juvenile teeth are from calves, though three dP_4 are in TWS D. Fewer juveniles and adults, as well as more elderly adults, were slaughtered at rural Lowcountry sites compared to Charleston. Although samples from the other rural ecoregions are very small, juveniles are less common and older animals more common than in either Charleston or rural Lowcountry locations.

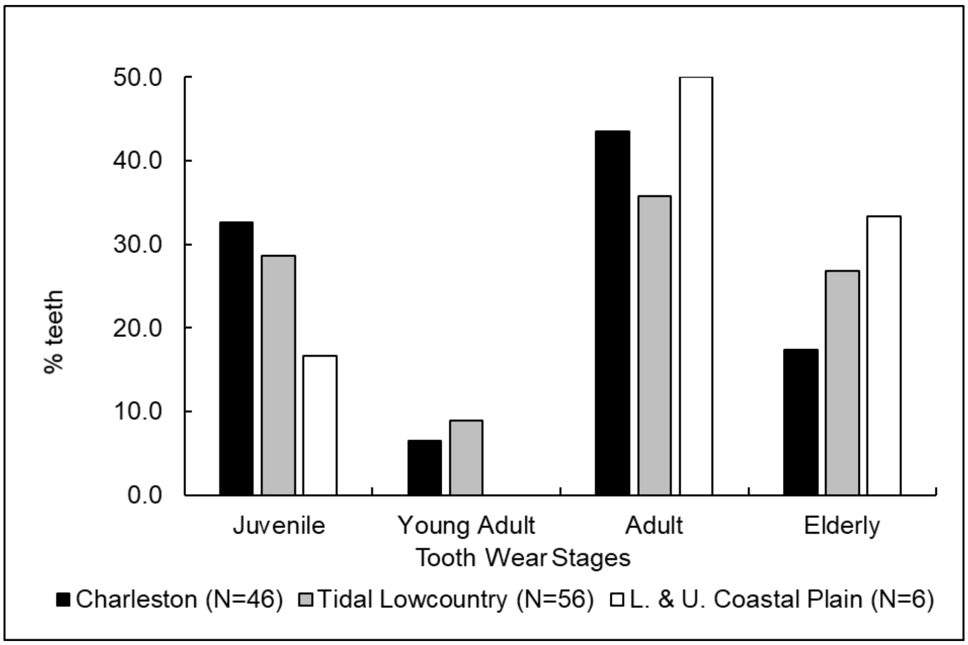


Figure 10-6. Percentages of cattle teeth in four TWS categories from Charleston, the rural Tidal Lowcountry, and beyond the tidal zone in the Lower and Upper Coastal Plain. All dP4s are classified as juveniles/subadults. M3 categories are: Young Adults (TWS ABCD), Adults (TWS EFGH), and Elderly Adults (TWS JKLM). See Tables 10-1 and 10-2 for a summary of these teeth, Appendix III for methods, and Appendix IV for detailed data for all teeth in this study.

Discussion: Tooth Wear Stages (TWS)

Viewed as a production continuum, the slaughter age of animals in Charleston was slightly younger than that at rural production centers, especially those inland from the rural Lowcountry. It seems likely that rural production centers sent their juveniles and some adults to Charleston on the hoof instead of incurring the cost and risk involved in preparing cattle products and transporting them through them to the coast. Very few animals lived long enough to be considered elderly; but they were less likely to reach that age in Charleston than they were at rural sites, particularly those at upper coastal plain locations. This possibility is tempered by the possibility that the remains of elderly dairy and draft animals were discarded at knacker yards, which would leave little evidence of at most Charleston sites.

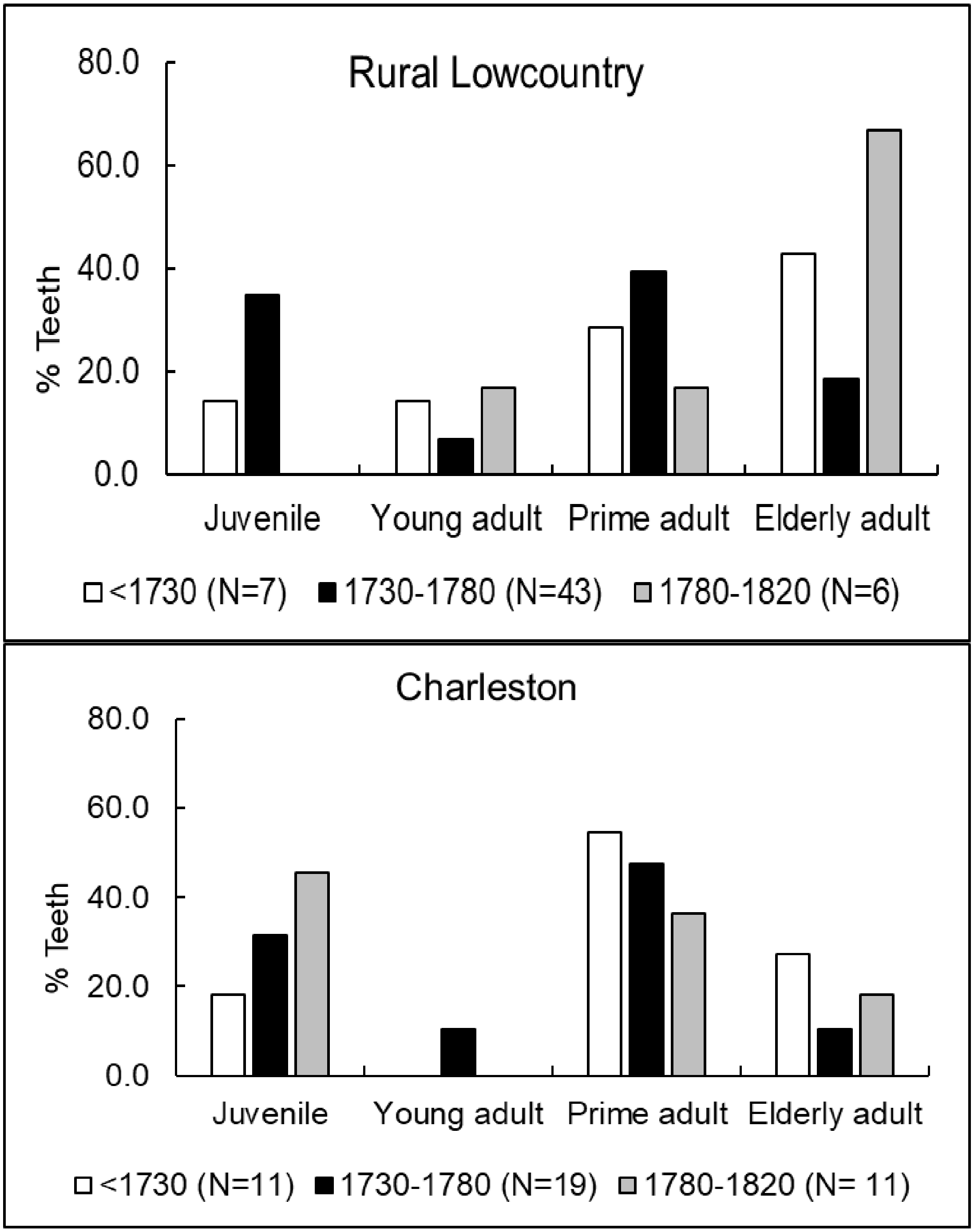


Figure 10-7. Percentages of teeth in five TWS categories from Charleston and rural/tidal Lowcountry sites between 1670 and 1820. Age categories are those used in Figure 10-6. The Lower and Upper Coastal Plain samples are too small (NISP = 6 teeth) to be informative as is the Charleston sample after 1820 (NISP = 5 teeth). See Tables 10-1 and 10-2 for a summary of these teeth, Appendix III for methods, and Appendix IV for detailed data for all teeth in this study. The 1730-1780 rural data are dominated by the Musgrove Cowpen (Chapter XII).

Over time, the slaughter age of animals in Charleston declined (Figure 10-7). In the 1730-1780 period, the percentage of juvenile and young adult teeth (42%) approaches that of adults (47%) in Charleston age profile. The slaughter of juveniles is even more common after 1780. It is likely cattle sent to Charleston from rural production centers were intended for households which preferred to purchase young animals, particularly juveniles, and slaughtered them for meat and other post-mortem products. The slaughter of adults, such as dairy cows, declined and draft animals were slaughtered only occasionally.

Only the rural Lowcountry sample is large enough to subdivide into time periods. Prior to 1730, juvenile and young adults were slaughtered infrequently and most animals were well into adulthood if not elderly when they died. It seems plausible that younger animals were sent to Charleston on the hoof. The 1730-1780 graph is largely from the Musgrove Cowpen (Chapter XII) and mirrors the contemporaneous Charleston graph, suggesting that animals were so abundant in both places that slaughtering juveniles was routine, or that dairying was practiced at both places and calves slaughtered at the end of the milking season. The objective at both locations was to practice a mixed strategy to meet local needs for both pre- and post-mortem goods and services.

As strontium values suggest, it is likely that at least some animals from the Upper Coastal Plain or Piedmont were sent to coastal plantations if not to Charleston itself. An elderly individual (RDE 68; TWS = M) from an 1820s context at Stono Plantation probably originated in the Piedmont. A contemporaneous elderly individual (RD 67; TWS = M) from Stobo Plantation was probably local. Both Stono and Stobo are Lower Coastal Plain sites a few miles distant from Charleston. Young animals sent from up-country locations could be fattened on lands near the city before being slaughtered.

Caveats

Addressing the project's questions is hampered by a number of issues.

- Data from eighteenth-century rural areas are very limited. Almost all of the rural teeth in this study are from the Musgrove Cowpen, which may or may not be typical of contemporaneous rural production centers (Chapter XII) and probably was very different from later production centers located further inland. We particularly need data from the Upper Coastal Plain and the Piedmont. Regrettably, these are locations where bone preservation often is poor.
- Regional studies also are hampered by limited data from urban centers other than Charleston, such as Dorchester, Savannah, and Augusta. Our inability to separate commercial contexts from residential ones within Charleston also is problematic.
- Bowen (1994) observes that slaughter patterns alone can be misunderstood as evidence for herd management systems and are best understood by combining archaeological and documentary information about early cattle biology, herd demographics, field and herd management strategies, and economies at the household and regional levels. Elements and slaughter age provide only a glimpse into complex systems developed in the context of local environmental conditions, individual choices, regional traditions, and market opportunities.
- The study would be considerably improved if we knew more about the maturation sequence of colonial Carolina cattle and could restrict the study to mandibles containing a series of adjacent teeth.

- As others have found, the demographic slaughter profiles developed from epiphyseal fusion may not agree with those developed from epiphyseal fusion or TWS (e.g., Landon 1996:122; O'Connor 2003:168-169; Zeder 2006). This is not an unusual outcome and reconciling different results derived from epiphyseal fusion, tooth eruption sequences, and wear mortality is difficult. Landon (1996:123) argues that "…animal age profiles based on tooth eruption and wear are often more accurate than those derived from epiphyseal fusion, especially for younger animals," noting that more research is needed this area. O'Connor (2003:170) argues in support of relying primarily on eruption stages in a sequence of teeth embedded in mandibles.

Discussion

Despite these caveats, it is clear that management of cattle in Charleston was different from that at rural production centers, serving to define suggestions to guide future research.

<u>Did Charleston consumers obtain the products they used directly from their own animals or indirectly from other sources, either local vendors or rural production centers?</u>

Charlestonians used cattle products from both local and distant sources, with products from distant sources increasing over time. Skeletal completeness (i.e., the relative frequency of anatomical parts) suggests that all portions of the cow carcass were discarded at Charleston sites, regardless of site function or time period. These skeletal remains originated from two broad sources. One source was informal: direct acquisition and residential slaughter of animals from local herds. This likely reflects choices made by specific households. The other source was commercial: animals sent from rural production centers were slaughtered near, or within, the city either by commercial specialists or individual households. Over time, the distribution of animal products became more specialized and indirect. By the mid-1800s, the amount of beef purchased from commercial outlets had increased and showed a strong preference for carcass portions from the upper part of the carcass. Rural production centers most likely sent livestock to Charleston, and later Savannah. Connections between rural production centers and consumers at urban centers undoubtedly played an important role in the region's economic development.

<u>Within Charleston, were cattle used primarily for beef and other post-mortem products, for dairy products, or for traction?</u>

The actual calendrical age at death may be less significant in addressing this question than the overall trend in slaughter age. Cattle slaughtered in Charleston are primarily in two age groups. The first age group consists of juveniles, animals slaughtered primarily to provide meat and other post-mortem commodities to households in the city as well as craft production centers. Some adults were raised in the city for dairy products and their urban-born offspring were slaughtered along with those acquired from rural production centers. Both within Charleston and at rural production centers, these animals often were older juveniles likely slaughtered when they reached optimum weight gain. Calves, animals recently weaned, rarely were slaughtered. Over time, the preference for younger animals in Charleston becomes pronounced and quite different from the slaughter age at rural locations. Although it is likely some animals were kept in or near the city for a few years for household dairy products and labor, elderly animals probably were slaughtered at knacker yards instead of on the residential properties that dominate the Charleston zooarchaeological record.

Is there zooarchaeological evidence that the objectives for managing cattle change over time?

Cattle herds were managed to meet production goals, both rural and urban requirements for consumables as well as sources of market commodities, specifically meat. From the Charleston perspective, beef increasingly became the herd management objective: juvenile animals were more likely to be slaughtered in Charleston than at rural sites and the use of young animals increased in Charleston over time. Some juveniles also were slaughtered at rural production centers for on-site consumption, but many of the animals slaughtered at rural locations were elderly animals. These older animals may not have been profitable to send to Charleston. When they no longer produced offspring needed for the Charleston market or to maintain herd stability, they were slaughtered. It is possible that calves were released and not slaughtered once they were no longer needed to encourage limited milk production in their mothers, but this would mean that this source of young, tender meat and soft, unblemished calfskins favored in Charleston would be ignored in favor of recapturing the animal when it was tougher and the leather likely blemished. The tooth wear pattern provides no evidence for an emphasis on draft animals in Charleston. Considerable household variation within Charleston and likely considerable between rural production centers.

What does Charleston's zooarchaeological record suggest about the city's cattle economy?

It has been argued that herd management can emphasize production of meat, leather, and other post-mortem products only in developed economies (Greenfield 2005). Harvesting primary products requires slaughtering, perhaps compromising the long-term survival of the herd. Renewable products, such as milk, cheese, fertilizer (dung), blood, wool, and labor, were preferred in less developed economies, if only because these products do not require slaughtering productive animals and pose less of a threat to herd's long-term productivity. The distinction between management for primary and secondary products is also relevant for Charleston, bearing in mind the remarkable increase in the number of cattle in the colony.

The Charleston profile contains juveniles of various ages, adults, and a few elderly animals used for labor, similar to van Dijk's (2016) multi-purpose, mixed subsistence strategy. This strategy was practiced both at rural centers producing for the urban and overseas markets as well as at urban households managing their own animals. This strategy was particularly characteristic of Charleston's cattle economy prior to 1850. It slowly was replaced by more specialized objectives as connections among rural production centers, urban consumers, and oversea markets matured. Although Charleston was founded in the context of a developed economy, perhaps the frontier conditions prevailing in the colony encouraged diversified production rather than specialization, subsequently maturing into a more developed economy.

Conclusions

Despite limitations of this study, Charleston offers a case study for how short- and long-distance trade networks and provisioning strategies integrated and organized some aspects of the city. The production and distribution of animal products between and within rural and urban centers in South Carolina involved complex and heterogenous choices. The study explores the function of market system at local and regional level with consequences for other times and places globally. It offers a perspective on global narratives of colonization and environmental history by providing details about the sources of one product, cattle, in an emerging urban center, clarifying the consequences of colonial-period urbanization for the economy and landscape.

Many of the assumptions upon which this study is based may not be verified with additional archaeological and archival research. Only after many similar studies are conducted will it be possible to compare data from Charleston with similar data from rural cowpens, plantations, and small towns, elaborating upon the role of cattle and cattle byproducts in emerging urban economies. This combination will offer new perspectives on urbanization, urban-rural interactions, animal husbandry, trade, and landscapes; critical ingredients in the development of colonial outposts into cities.

The intent of this study is not to assert that this interpretation is correct but to encourage others to record data relevant to livestock management at other early centers of production and consumption, including those that emerged before and after 1492. Only in this way can trends in the development of colonial economies be observed. Certainly, we should not assume that Eurasian livestock protected people in European-sponsored colonies in the Americas from accommodating, or taking advantage of, local conditions. Additional case studies such as this one are needed.

Notes

1. Present-day geopolitical names are used here. "Great Britain" formed from a union of England, Wales, Ireland, and Scotland in 1707, but the entire period is referred to as "British." The Carolinas became a royal colony in 1719 and were not divided into North and South Carolina until 1729; but Charles Towne and Charleston are referred to as being in "South Carolina." The name "Charleston" is used here for the second, peninsular, location of the city regardless of whether it was known officially as "Charles Town" or "Charleston" though the second location of the city was not formally renamed until 1783. People living on the southeastern Atlantic coast prior to the British-sponsored colony was founded are referred to as "Native American," which does not do justice to their complex social relationships. Unless stated otherwise, "cattle" only refers to *Bos taurus*, though sheep (*Ovis aries*) and goats (*Capra hircus*) also are in the family Bovidae, referred to in the vernacular as "bovids." As used here "cattle" and "cow" are generic terms subsuming male, female, and castrated animals. If a specific gender is meant, the terms "male," "female," or "castrate" are used unless the context makes this clarification unnecessary.

Table 10-1. Summary of Charleston Tooth Wear Stages (TWS) Used in this Study.

CAIS sample #	Description	TWS	Time Period	Site Name
UAB-17	rt P1, P2, P3, dec. P4, in mandible	D	1710-1730	Heyward-Washington (38CH108)
na	lt lower dec. P4	N	1710-1730	Heyward-Washington (38CH108)
UC-32	lt P3, dec. P4, in mandible	D	1730-1780	Powder Magazine (38CH97)
UC-08	rt lower dec. P4	F	1730-1780	Miles Brewton House (38CH1597)
UC-09	rt lower dec. P4	F	1730-1780	Miles Brewton House (38CH1597)
na	rt dec. P4, in mandible	G	1730-1780	H-W-N (38CH108)
na	rt lower dec. P4	J	1730-1780	H-W Stable (38CH108)
UC-10	rt lower dec. P4	N	1730-1780	Charleston Convention Ctr (38CH1605)
UD-34	rt dec. P4, in mandible	C	1780-1820	John Rutledge House (38CH1598)
UD-15	rt lower dec. P4	C	1780-1820	William Gibbes House (38CH1599)
UD-40	lt P2, P3, dec. P4, in mandible	D	1780-1820	14 Legare (38CH103)
UD-36	rt lower dec. P4	D	1780-1820	South Adger's Wharf/Lower Market (38CH2291)
UD-35	rt lower dec. P4	G	1780-1820	South Adger's Wharf/Lower Market (38CH2291)
na	rt lower dec. P4	E	>1820	Heyward-Washington (38CH108)
na	lt dec. P4, in mandible	L	>1820	H-W-N (38CH108)
UAB-16	rt lower M3	F	1710-1730	Heyward-Washington (38CH108)
Platt 2, 38968	lt lower M3	G	1710-1730	Heyward-Washington (38CH108)
UBC-22	lt lower M3	G	1710-1730	Heyward-Washington (38CH108)
UBC-25	lt lower M3	G	1710-1730	Heyward-Washington (38CH108)
UBC-24	lt lower M3	G	1710-1730	Heyward-Washington (38CH108)
UBC-20	rt M2, M3, in mandible	G	1710-1730	Heyward-Washington (38CH108)
UBC-19	rt lower M3	J	1710-1730	Heyward-Washington (38CH108)
na	rt lower M3	L	1694-1724	Heyward-Washington (38CH108)
Platt 1, 33796	rt lower M3	L	1710-1730	Heyward-Washington (38CH108)
na	rt lower M3	C	1730-1780	H-W-N (38CH108)
na	lt lower M3	D	1730-1780	Heyward-Washington (38CH108)
na	lt lower M3	E	1730-1780	Lodge Alley/State St (38CH1608)
UC-37	rt lower M3	F	1730-1780	South Adger's Wharf/Lower Market (38CH2291)

CAIS sample #	Description	TWS	Time Period	Site Name
na	rt lower M3	F	1730-1780	Heyward-Washington (38CH108)
UC-04	lt lower M3	G	1730-1780	Beef Market (38CH1604)
UC-05	lt lower M3	G	1730-1780	Beef Market (38CH1604)
UC-11	lt lower M3	G	1730-1780	Charleston Convention Ctr (38CH1605)
UC-21	rt lower M3	G	1730-1780	Heyward-Washington (38CH108)
UCD-18	rt lower M3	G	1730-1780	Heyward-Washington (38CH108)
UCD-29	rt M2, M3, in mandible	G	1730-1780	Lodge Alley/State St (38CH1608)
na	lt lower M3	J	1730-1780	86 Church Street (38CH2646)
na	lt lower M3	M	1730-1780	Miles Brewton House (38CH1597)
na	lt lower M3	E	1780-1820	South Adger's Wharf/Lower Market (38CH2291)
Platt 1, 33804	rt M3, in mandible	G	1780-1820	Heyward-Washington (38CH108)
na	rt lower M3	G	1780-1820	Heyward-Washington (38CH108)
na	rt lower M3	G	1780-1820	Heyward-Washington (38CH108)
UD-06	lt lower M3	J	1780-1820	Beef Market (38CH1604)
UD-03	lt lower M3	J	1780-1820	Atlantic Wharf (38CH1606)
UE-14	rt lower M3	D	>1820	William Gibbes House (38CH1599)
UE-26	rt M3, in mandible	G	>1820	H-W-Kitchen (38CH108)
UE-23	rt lower M3	J	>1820	Heyward-Washington (38CH108)

Note: Full data available in Appendix IV. CAIS numbers were assigned only to teeth in the stable isotope study.

Table 10-2. Summary of Rural Tooth Wear Stages (TWS) Used in this Study.

CAIS sample #	Description	TWS	Time Period	Site Name
Rural/tidal Lowcountry				
RB-45	lt lower dec. P4	D	1710-1730	Daniels Is (38BK202)
RC-59	lt dec P4, in mandible	D	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower dec P4	E	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower dec P4	F	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	H	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	J	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower dec P4	J	1730-1780	Musgrove Cowpens (9CH137)
na	rt dec P4, M2, M3, in mandible	K	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec P4, w/M1, M2	L	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	L	1730-1780	Musgrove Cowpens (9CH137)
RC-58	lt lower dec. P4	M	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	M	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	N	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower dec. P4	N	1730-1780	Musgrove Cowpens (9CH137)
RC-47	lt lower dec. P4, fragment	D	1730-1780	Drayton Hall (38CH225)
RC-48	rt dec. P4, M1, M2, in mandible	K	1730-1780	Drayton Hall (38CH225)
RB-50	rt adult P4, M1, M2, M3, in mandible	A	1710-1730	Drayton Hall (38CH225)
RA-62	lt lower M3	H	1710-1730	Miller Site (38CH1-MS)
RB-69D	rt lower M3	H	1710-1730	Ashley Hall (38CH56)
RA-46	lt M3, in mandible	K	1710-1730	Daniels Is (38BK202)
RB-44	rt lower M3	K	1710-1730	Daniels Is (38BK202)
RB-49	lt M3, in mandible	M	1710-1730	Drayton Hall (38CH225)
na	lt M2, M3, in mandible	A	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	B	1730-1780	Musgrove Cowpens (9CH137)
RC-57	lt M3, in mandible	D	1730-1780	Musgrove Cowpens (9CH137)
RC-43	rt M1, M2, M3, in mandible	E	1730-1780	Cain Hoy (38BK1349a)
na	rt lower M3	E	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	E	1730-1780	Musgrove Cowpens (9CH137)

CAIS sample #	Description	TWS	Time Period	Site Name
na	rt M1, M2, M3, in mandible	E	1730-1780	Musgrove Cowpens (9CH137)
RC-55	lt lower M3	F	1730-1780	Musgrove Cowpens (9CH137)
RC-51; 42432/23733	lt M3, in mandible	F	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	F	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	F	1730-1780	Musgrove Cowpens (9CH137)
RC-53; 42434/23733	lt M3, in mandible	G	1730-1780	Musgrove Cowpens (9CH137)
42433/23733	lt lower M3	G	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower M3	G	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower M3	G	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower M3	G	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	G	1730-1780	Musgrove Cowpens (9CH137)
na	rt adult P4, M1, M2, M3, in mandible	G	1730-1780	Musgrove Cowpens (9CH137)
RC-52; 42429/23733	lt M3, in mandible	H	1730-1780	Musgrove Cowpens (9CH137)
42430/23733	lt M3, in mandible	H	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	J	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower M3	K	1730-1780	Daniels Is 38BK202
na	lt M2, M3, in mandible	K	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	K	1730-1780	Musgrove Cowpens (9CH137)
RC-54	lt M2, M3, in mandible	M	1730-1780	Musgrove Cowpens (9CH137)
RC-56	lt M3, in mandible	M	1730-1780	Musgrove Cowpens (9CH137)
na	lt lower M3	M	1730-1780	Musgrove Cowpens (9CH137)
na	rt lower M3	M	1730-1780	Musgrove Cowpens (9CH137)
RD-65	rt M3 unerupted, in mandible	A	1780-1820	Stobo/Willtown (38CH1659)
RD-66	lt lower M3	G	1780-1820	Stobo/Willtown (38CH1659)
RD-63	rt lower M3 fragment	K	1780-1820	Stobo/Willtown (38CH1659)
RD-64	rt lower M3 fragment	L	1780-1820	Stobo/Willtown (38CH1659)
RD-67	lt lower M3	M	1780-1820	Stobo/Willtown (38CH1659)
RDE-68	lt lower M3	M	1780-1820	Stono Plantation, James Is (38CH851)

CAIS sample #	Description	TWS	Time Period	Site Name
Non-tidal Lower Coastal Plain				
RA-60	lt lower M3	G	1710-1730	Lord Ashley Settlement (38DR83a)
RAB-78D	rt lower M3	H	1710-1730	The Ponds (38DR87)
RAB-77D	rt lower M3	J	1710-1730	The Ponds (38DR87)
Upper Coastal Plain				
RC-70D	lt dec. P4, M1 root, in mandible	J	1730-1780	Catherine Brown Cowpen (38BR291)
RC-72D	lt M3, in mandible	G	1730-1780	Meyer (38AK615)
na	rt adult P4, M1, M2, M3, in mandible	J	1730-1780	Meyer (38AK615)

Note: Full data available in Appendix IV. CAIS numbers were assigned only to teeth in the stable isotope study. Data are subdivided by ecoregion.

Chapter XI
Analysis of Heyward-Washington Faunal Assemblage

This chapter focuses on Charleston's animal economy as viewed from the perspective of faunal remains recovered from a single, and singular, site: the Heyward-Washington House. This sizable, diverse assemblage contains a range of materials owned and used by Lowcountry residents from the late seventeenth century through the nineteenth century. In addition to many rare and unique objects, the Heyward-Washington faunal assemblage extends from 1694 into the late nineteenth century, the largest temporally stratified source of such data available for Charleston. Although excavated in 1970s, much of the assemblage remains unstudied. NSF funding provides the opportunity to study additional faunal materials from this special legacy assemblage.

In addition to elaborating on the animal economy at the Heyward-Washington site, the NSF-funded study is particularly important because it provides data for the early decades in Charleston at a stratified, multi-component site with a mixed residential/commercial function. Much of Charleston's zooarchaeological record is drawn from townhouses of wealthy merchants and planters which were shared with enslaved Africans, homes of middling and poor urban residents, city markets, and public sites (e.g., theatre, tavern, powder magazine, and wharves) augmented by materials from rural farmsteads and plantations (e.g., Zierden and Reitz 2016). Most of these studies focus on animal use at late-eighteenth- through mid-nineteenth-century townhouse sites. Data from well-defined deposits from the earlier period (1670-1750) are rare. The Heyward-Washington faunal assemblage, therefore, provides data for several previously under-represented aspects of life in the city.

Cattle in Charleston's Animal Economy

Defining the role of cattle in Charles Town's economy as it became Charleston is one of the central objectives of the project. The research builds on Zeder's classic 1991 study in which she argues the distribution of meat and other animal products is a fundamental urban process and a barometer for the economic development of early, complex urban centers (Zeder 1991:250-254). As small settlements become larger and more complex, Zeder argues that urban residents increasingly rely on specialized distribution channels instead of their own animals for household consumption. Zeder's model was developed to explore the role of animal economies in the development of early urban societies. In many respects, however, early European-sponsored settlements on the Atlantic seaboard were also "new" in a region where Eurasian-style metropolitan centers were unknown. We might expect to see a similar trajectory in the animal economies at early colonial settlements such as Charleston as they grew from small communities into large commercial nodes in regional, national, and global markets.

Relationships between rural production centers and urban markets on the Atlantic seaboard may have experienced transitions in their animal economies similar to those reported for emerging market systems elsewhere (Armitage 1982b; Crabtree 2012:41-42; Landon 1996; Walsh et al. 1997). Animal products might be obtained from near the point of consumption during the first decades of the Carolina colony. Many of these animals may have been raised on individual lots within the town. As the town became more urbanized, livestock production might first take place within the growing urban center but over time involving more distant and specialized sources of livestock. Animal products obtained indirectly might go through several intervening steps between the point of origin: from where the animal was raised or "finished" (e.g., herds), to intermediaries in the distribution network (e.g., markets, butcher shops), and the final point of consumption (e.g., the household).

As the sources of animals became more distant and specialized, it is likely the types of animal products preferred by consumers also became more specialized. Early urban consumers, especially those with their own livestock, might raise animals for a variety of goods and services, not only meat, dairy products, and labor, but also raw materials such as tallow, hides, and bone essential for household production and maintenance of tools, furnishings, clothing, and ornaments. Parts of the entire skeleton would be present at such sites. Eventually, urban households might rely on commercial networks to meet household needs, especially consumables such as meat and butter. Thus, over time, we might expect a shift from household-level production using many parts of the carcass to a production and distribution network tailored to provide a range of specialized products to both commercial and residential consumers within the city.

This transition should be reflected in the types of skeletal remains recovered from urban sites and in the slaughter age of livestock. The more removed the producer is from the consumer, the more incomplete the resulting faunal assemblage should be at the consumer level compared to a complete skeleton. If animal products were procured directly, at the household/consumer level, butchery likely took place on the property or nearby, leaving behind skeletal remains from much of the carcass and minimal evidence of transportation bias. If slaughter took place elsewhere and the consumer purchased preferred or affordable carcass portions from vendors, many parts of the skeleton would be absent or at least present in low numbers compared to a complete, intact skeleton. In addition, as the economy shifts from direct, household-level production to an indirect, specialized distribution network, animals might be slaughtered at a younger age, when optimum growth is achieved and both meat and hides are considered to be at their best, instead of at an older age when the animal is no longer productive in terms of dairy products, offspring, or labor. Thus, skeletal completeness and slaughter age are key lines of evidence for distinguishing between animal products produced at the household level and those procured from more distant production centers.

Consumer choices such as these are associated with site function as well as the status and ethnicity of the consumers. Linking archaeological evidence of animal use to distinguish among social groups in Charleston is unsuccessful for several reasons (e.g., Reitz et al. 2006; Reitz and Zierden 1991; Zierden and Reitz 2009, 2016). Many Charleston households included people who did not share the same rank, specifically slave owners and the enslaved (Hart 2020). Another reason is that we may not know who lived at the site. Often the social affiliation of a site is inferred from the property owner of record, but the Heyward-Washington site is not unique in being occupied by someone other than the owner for some of its history. Non-familial residents, such as boarders, might share the same economic potential as the owner of record, but differ in social or ethnic background. For some properties, the number and identity of residents is undocumented. In addition, markets were not the exclusive or even primary sources of meat in the city (Hart 2020). Associating the cost of high- or low-yield carcass portions with purchases of cuts of meat from commercial vendors is challenging in a city where some households raised their own animals, sometimes within the city itself, the actual residents at the property may be unknown, people of very different social groups occupied the same property, and many people disposed of their trash in the same places, often in work yards, under buildings, along property lines, in abandoned lots, in streets, or in nearby marshes and creeks (e.g., Butler 2020).

Archaeological Background

The Heyward-Washington House is a historic house museum on Church Street, the oldest section of Charleston. Before becoming a house museum owned by The Charleston Museum, the Heyward-Washington property was a commercial and residential site (Herold 1978; Zierden 1993; see Chapter V). The property is notable as the 1772 townhome of Thomas Heyward, who signed the Declaration of Independence, and as the rented quarters of President George Washington during his 1791 Tour of the Southern States. The Heyward-Washington House, the oldest historic house museum in Charleston, opened to the public in 1929. It is also the site of the first controlled archaeological research excavation in Charleston, conducted by Dr. Elaine Herold of The Charleston Museum. This produced the largest legacy collection currently housed at the Museum. The project received new life through the dissertation research of Sarah Platt (2022) and the resulting re-cataloging and curation of portions of that collection by Martha Zierden and Platt.

Herold, trained in pre-contact archaeology at the University of Chicago, arrived in Charleston with her husband Don, Director of The Charleston Museum, in 1973. She re-tooled her skillset to focus on historical archaeology and embarked on a multi-year volunteer excavation at the Heyward Washington House. Beginning in 1974, Herold and volunteers excavated in the kitchen cellar and eventually included an undisturbed half of a privy, the work yard between the dependency buildings, the driveway, some of the cellar beneath the main house, and small planting beds in front of the house.

She uncovered numerous features associated with Milner Sr. These included a modest frame house on brick piers fronting Church Street, a three-sided, post-and-frame structure enclosing a furnace and forge, a smaller post-in-ground shed, a well with a square, wood-lined shaft (Feature 65), large trash-filled pits (Features 166, 183), and multiple features originally interpreted as barrel-lined wells (Features 88, 89, 131). Over 20 cow and goat horn cores were found in the curated collection in 2017. These were from the barrel features and many still were attached to skull portions (see below). The features were full of vertebrate remains long presumed to be associated with residential use of the property.

The current 1772 house is at least the third built on the property. Besides a three-story double house fronting directly on the street, the 50-x-239-ft property features a 2.5-story kitchen/quarters dependency, a single-story stable and carriage house and a small brick privy. Connecting pantries/cistern were added in the early nineteenth century. These are connected by a brick-paved work yard. A formal colonial revival garden occupies the back half of the lot. The property was accessed originally by a drive running along the south side of the house to the carriage house, and a gate to Ropemakers Lane, a narrow passage at the rear northwest corner of the garden (Figure 11-1).

Herold worked at the site off and on for four years. She divided the site into 5-ft squares, or smaller units designed to fit in existing limitations, and excavated in eight natural levels. Seventy-five units were excavated in accessible areas of the workyard. An additional 23 contiguous units were excavated in the kitchen cellar; here the shallow soils were excavated in three levels. All soils were sifted through ½-in-meshed screen.

A small army of volunteers helped with the excavations, washed all of the artifacts, and wrote provenience information on every fragment. After each fragment was labeled, Herold cross-sorted the artifacts by type, so that all creamware is together, all delft, bottle glass, table glass, brick, etc. etc. Those fragments number over 60,000 ceramics and a proportionate number of other objects. They now occupy 200^3 ft of boxes plus an entire 7-x-5-ft Interior Steel cabinet.

Herold completed a preliminary, summary report in 1978 and continued to work on the analysis while engaged in a series of contract projects for The Charleston Museum. When her husband left Charleston to assume a museum directorship in Buffalo, New York, Herold took the Heyward-Washington materials with her, continuing to analyze and count artifacts and return them to the Museum. Don died suddenly of a heart attack two years later and Herold continued to work in the University of Buffalo Archaeological Survey until her retirement in 2001. She then moved with daughter Jennifer to Tucson, Arizona, and fought a long battle with Alzheimer's that she lost in 2015. Jennifer subsequently returned all of the documents and artifacts that she could find to The Charleston Museum, where they currently reside.

The existing records include daily narrative notes and an overall site map with features sorted by date of deposition and association. There are no field photos or individual unit maps, though Herold writes extensively about "mapping" in her notes. Also lacking are descriptions and measurements of any of the features. Existing records include a sample stratigraphic profile for the work yard. We also know that some of the deep features – the privy and at least one well – were excavated in levels. Her analysis is sufficiently detailed that she could propose dates of deposition and associations for the features and other deposits, though notes for these tabulations are missing. Data analysis by Platt (2022) validates Herold's temporal attributions with only minor adjustments. The Milner Sr. occupation is the principal focus of the present study, though the Platt's discovery of Joseph Ellicott's 1694-1720 tenure on the property is an unexpected bonus.

The work yard units were excavated by Herold in eight or nine arbitrary levels. These were centered in five locations (A-E), and then numbered ordinally (A1, A2, etc.). The yard contained two brick paving episodes beneath the present one, probably from the 1780s (Level 3a or Patio III) and 1840s (Level 3b or Patio II), respectively. Layers beneath the paving were associated principally with John Milner Sr. (1734-1749) and his son, John Milner Jr. (1749-1768), punctuated by evidence of Charleston's great fire of 1740 which destroyed nearly one-third of urban Charleston. In the privy, or Necessary (designated HWN), Levels 5-7 date to the second quarter of the nineteenth century, while the lowest three levels (Levels 8-10) date to the 1780s. Refuse accumulated in the kitchen cellar (designated HWK) during the nineteenth century, particularly in the second half of that century, possibly when the cellar was not in active use.

Additional excavations were conducted at the site by Zierden in 1991. She excavated outside the stable building, exposing an eighteenth-century well and a nineteenth-century drain. In 2002, Zierden explored the interior of the stable building prior to its repurposing. This included excavating 12 5-ft squares, screened through ¼-in-meshed screen. The proveniences excavated by Zierden date from the late seventeenth century through the nineteenth century. Several unusual and restorable artifacts and a significant deposit of faunal remains were preserved in these layers. The site was remarkable for its stratigraphic and temporal integrity, and the project produced artifacts and stratigraphic profiles that aided interpretation of Herold's 1970s data.

The Ellicott and Milner Occupations

<u>Joseph Ellicott</u>

The lot at 87 Church Street is within the bounds of the original walled city, constructed by 1710. Lot 72 is listed as belonging to Henry Symonds in 1678 and 1680 and to James Stanyarne in 1688 and 1692. It was granted to Joseph Ellicott, listed as a bricklayer, in 1694

(Bates and Leland 2007:59, 130). Ellicott's three children inherited the lot later that same year. Ellicott's children divided the land in 1710 (Bates and Leland 2007:137); this may have been the tenement named "Hog Tavern" in his will. No further information is available on Joseph Ellicott, but the length of his ownership suggests the property was improved and perhaps occupied by the family.

The Milners

Of particular importance to our study, the property was the location of Milner Sr.'s gunsmithing business in the 1730s. By 1737, Milner Sr. was operating his business on the site and living in a modest wooden house with his wife and five children. "Miller's" is described as at "the sign of the Pine Tree" (*South Carolina Gazette*, January 26, 1740). The house foundation, exposed by Herold's excavations, was 24-ft wide and 18-ft deep.

The property burned in the great fire of 1740, but Milner Sr. and his son, Milner Jr., resumed their gunsmithing business after the fire, evidently building further back on the long, narrow lot, closer to Meeting Street (Butler 2019). Upon his father's death in 1749, the younger Milner built a brick single house on the northern property line, fronting Church Street. Herold encountered the front of this house in her excavations. Milner Sr.'s features are separated from those of his son by a distinct zone of ash from the 1740 fire, designated Feature 119 in 2002, and, roughly, Zone 5 in the 1970s.

At the time of his death, Milner Sr. owned 11 enslaved people, at least three of whom were skilled in the gunsmithing business. In his will, he divided the enslaved among his children, clearly separating families, and instructing the heirs to sell two of the skilled men (Table 11-1). Platt (2022) has found evidence of the enslaved self-emancipating soon after their transfer to the younger Milner. Milner Jr. fared poorly with his finances and sold the Church Street property in 1768 due to heavy debts.

Colonel Daniel Heyward purchased the property from the provost marshal in 1770. By 1777, Heyward was known as "the greatest planter in this province," with 16,000 acres of plantation lands, a house and three lots in Beaufort, and a house and lot in Charleston (Doscher 1977). Heyward transferred the 87 Church Street property to his son Thomas, age 25, in 1772, and Thomas constructed the present standing structures. Residential use of the property continued with its purchase by the Grimke family in 1794. The property served as a boarding house from 1819 until 1861.

Previous Zooarchaeological Studies in Charleston

This summary focuses on zooarchaeological details pertinent to the goals of the NSF-funded project; data germane to other research goals are available elsewhere (Reitz et al. 2006; Reitz and Zierden 1991, 2014, 2021; Zierden and Reitz 2009, 2016). The NSF project was designed to investigate the emergence and evolution of Carolina's early-eighteenth-century cattle economy. The production of animals and animal products, especially cattle, ranked fourth among Charleston's agricultural enterprises in the 1700s. We argue that the success of the colony, and of the city, was linked, in part, to this animal economy. Due to the prominence of cattle in the Lowcountry economy, cattle are the primary focus of the zooarchaeological study summarized here.

The NSF project tests three hypotheses: (1) animal products were drawn from urban, suburban, and rural locations; (2) these sources changed over time; and (3) reflect regional changes in the evolving rural-urban animal economy. Where did cattle originate? Were they raised primarily within the city or its immediate suburbs or were they primarily from rural production centers? What were the role(s) of cattle in the colonial economy? How old were they when they were slaughtered? Does the slaughter age suggest animals were raised primarily for dairy products, labor, and offspring, generally being slaughtered after years of service? Or, were they primarily raised for post-mortem products such as beef, hides, horn, tallow, and other commodities? If meat production was the primary goal, did households obtain meat primarily from markets and vendors, or from their own animals, perhaps butchered on-site? Did production centers, slaughter locations, and/or slaughter age change as Charleston's economy, and that of the Lowcountry, expanded?

In this chapter, these questions are approached primarily from the perspective of skeletal elements (representing carcass portions) and slaughter age estimated from epiphyseal fusion of post-cranial materials. (See Appendix III for zooarchaeological methods.) Isotopic and tooth wear stages for cattle in the Heyward-Washington assemblage also are summarized in this chapter. Chapters VII and X elaborate on the sources of cattle and slaughter age derived from stable isotopes and tooth wear stages (TWS) for the city and the region as a whole and Chapter XII highlights a rural production center, the Musgrove Cowpens.

Previous work shows that beef was far more abundant than other sources of biomass in colonial Charleston, from the earliest site to the latest (Table 11-2). Beef contributes 76% of the non-commensal biomass (range 70%-78%). The decline in beef after 1850 suggests on-site discard of cattle refuse was less common, perhaps due to more frequent use of commercial sources of meat (perhaps without bones), such as butcher shops, improved garbage collection, limited space for raising large animals within the urban setting, or reduced herd productivity following the Civil War. It may also reflect an increase in cattle diseases such as "Spanish staggers" (e.g., Haygood 1986). Architectural uses for bones and archaeological evidence of a horn industry adds emphasis to the diverse roles of cattle in the regional economy beyond meat (e.g., Poplin and Salo 2009).

Age at slaughter based on tooth wear stages is discussed in Chapter X, though the results are similar to those derived by earlier studies from epiphyseal fusion and tooth eruption sequences. Tables 11-3 and 11-4 compare the percentage of juvenile, subadult, and adult individuals estimated from fused and unfused pig (*Sus scrofa*) and cattle (*Bos taurus*) specimens in each age cohort in Charleston faunal samples. Only 16% of the pig individuals (range 9%-22%) which could be aged reached adulthood before slaughter and only 27% of cattle individuals (range 25%-29%). This pattern suggests post-mortem commodities were the primary objective, particularly meat and hides from young animals. Slaughter of old animals, perhaps unproductive ones, did occur, but infrequently.

The usual zooarchaeological approach to assessing the distribution of animal products in complex societies distinguishes "meat-bearing" from "non-meat-bearing" portions of a carcass, on the assumption that most, if not all, consumables were purchased from markets and that some were of higher quality than others. High-quality skeletal portions are defined as those from the upper body (e.g., vertebra, rib, humerus, femur). These are skeletal elements generally associated with large amounts of meat and fat compared to skeletal portions from the head and the lower legs. If meat originated only from markets or street vendors, household faunal assemblages, especially assemblages from wealthy households, should contain more high-valued, upper body specimens, than would an assemblage from sites with non-residential functions or less-affluent households. None of the urban residential sites should yield skeletal remains from all parts of the carcass (high degree of skeletal completeness) in percentages typical of intact skeletons if butchering waste was deposited at locations such as slaughter yards and markets instead of residential locations.

The Charleston data do not conform to this presumption (Tables 11-5, 11-6; Reitz et al. 2006; Reitz and Zierden 1991; Zierden and Reitz 2009, 2016). When skeletal representation in Charleston is quantified, we find similar proportions of high-quality and low-quality pig and cattle specimens (see Appendix III for the zooarchaeological methods). Pig specimens from the Head and Lower Leg comprise 68% of the pig specimens (range 50%-77%), approximating the percentage (67%) in an unmodified, intact pig skeleton. Cattle specimens from the Head and Lower Leg comprise 53% of the cattle specimens (range 40%-58%), approximating the percentage (60%) in an unmodified, intact cattle skeleton. This is characteristic of all sites regardless of period, status, ethnicity, or function, suggesting that people obtained animal products through direct (home-slaughter) acquisition as well as indirect (market) acquisition. Consistent with the possibility that much of this material represents home-slaughter, hacked specimens comprise 37% of the modified specimens and is much more frequent than sawing (16%; Table 11-7). Over time, hacking declines in frequency from 55% of the modified specimens to 10% and sawing increases from 5% of the modified specimens to 42%.

Previous Zooarchaeological Studies of Heyward-Washington House Materials

Two zooarchaeological studies of faunal remains from the Heyward-Washington house were conducted prior to the 2021-2022 NSF-funded study. The first of these was done in 1980, when Bruce Manzano analyzed a sample from the site under the direction of Paul Parmalee of the University of Tennessee. Manzano analyzed materials from Feature 166, a large refuse pit associated with Milner Sr., and Levels 6-9 of refuse from the Necessary (Manzano 2007). Feature 166 dates to the 1730s. Levels 8-9 of the privy are associated with the end of the Heyward occupation and possibly the beginning of the Grimke period. Levels 6-7 of the privy are associated with the decades when the property served as a boarding house. Manzano's study resulted in the identification of a guinea pig (*Cavia porcellus*) and a blue-fronted Amazon (*Amazona aestiva*) in Level 6 of the Necessary. Both are interpreted as pets and are unique even in the large Charleston assemblage (Zierden et al. 2019).

The second study examined materials retrieved during excavations inside and outside of the stable building by Zierden in 2002 using ¼-in-meshed screen and natural zones (Reitz and Colaninno 2007; Zierden and Reitz 2007). Four temporal/analytical units were defined: (1) 1730-1740, associated with Milner Sr.; (2) 1740-1750s, associated with the fire followed by Milner Jr.'s ownership; (3) 1750-1820, based on the then-interpreted construction date of the carriage house (1750), but more likely associated with a 1770-1820 date range; and (4) late nineteenth/early twentieth centuries. These last two temporal units are associated with the Heyward/Grimke and Boarding House periods. The two Milner components are summarized here though here they are discussed in the closest/most appropriate overall temporal period based on what we now know about the site. (See Appendix III for zooarchaeological methods.)

<u>Summary of the 1730-1750 Milner Sr. Materials Excavated in 2002</u>

The 1730-1740 Milner Sr. (pre-fire) subdivision contains 606 specimens and the remains of at least 16 individuals from 12 taxa (Reitz and Colaninno 2007: Table 6). Cows contribute 19% of these individuals and 80% of the biomass, compared to 19% of the biomass from pork, mutton, or goat. Juvenile and subadult pigs and cows are present, but no specimens are definitively from adults (Tables 11-3, 11-4). Specimen distribution data for pig and cows indicate that portions are not equally represented (Tables 11-5, 11-6). Two-thirds of the pig specimens are from the Head (67%) and these are primarily teeth (NISP = 4). Specimens from the Head and Forequarter are over-represented compared to the Standard Pig and elements from the Hindquarter and Lower Leg absent (Figure 11-2). The absence of elements from these portions of the carcass is unusual, though this may be due to the small sample size. Cow specimens are primarily from the Forequarter (42%); other carcass portions are less abundant. Specimens from the Head and Lower Leg are under-represented compared to the Standard Cow and specimens from the Hindquarter and especially the Forequarter are over-represented (Figure 11-3).

The 1740-1750 Milner Sr. (post-fire) subdivision contains 2,296 specimens and the remains of at least 34 individuals from 26 taxa (Reitz and Colaninno 2007: Table 13). Cows contribute 9% of these individuals and 71% of the biomass, compared to 24% from pork, mutton, or goat. The assemblage primarily contains remains of juvenile and subadult pig and cow individuals, but no specimens are definitively from adults (Tables 11-3, 11-4). Pigs and cows indicate that portions of entire skeletons are present in the assemblage (Tables 11-5, 11-6). Most of the pig specimens are from the Head (82%) and these are primarily teeth (NISP = 33). Specimens from the Head and Forequarter are over-represented compared to the Standard Pig, with specimens from the Hindquarter and Lower Leg under-represented (Figure 11-2). Cow specimen distribution data reveals a high incidence of specimens from the Head (32%) and Lower Leg (40%). Compared to the Standard Cow, no portion of the skeleton is under-represented and the Lower Leg specimens are consistent with what would be expected in a complete skeleton (Figure 11-3).

Methods for 2022 Zooarchaeological Study of Herold's 1970s Materials

Collections from the Heyward-Washington House are stored in one-cubic-foot boxes at The Charleston Museum. The two previous zooarchaeological studies analyzed 26 of these boxes, leaving 58 boxes of faunal materials unanalyzed. One objective of the NSF project was to complete the study of as many of the remaining boxes as possible, beginning with proveniences most pertinent to the project's goals. Twenty boxes were delivered to University of Georgia during the NSF-funded project (five others were rough-sorted by students at UGA in 2015). Since, obviously, not all of the material could be analyzed with the time and funds available, large sample bags from Level 8 were prioritized. This sampling strategy was intended to maximize samples associated with Milner Sr.; but, as we learned late in the study, this sampling strategy also produced a collection associated with Ellicott. Ellicott's 1694-1720 materials are the earliest residential Charleston faunal samples studied to date, overlapping with the early deposits from the Beef Market (1710-1750).

Vertebrate remains recovered by Herold in the 1970s were identified in 2021-2022 using the same zooarchaeological methods used in the study of the 2002 materials (see Appendix III for methods). Identifications were made by Taesoo Jung and Claire Brandes with the assistance of Isabell Skipper using the comparative skeletal collection of the Zooarchaeology Laboratory located in the Georgia Museum of Natural History, University of Georgia. A list of the samples studied is provided in Appendix 11-A. This report also includes two samples from Feature 166 (ARL 49772, ARL 51349). These two samples were not included in Manzano's 1980 study of Feature 166 and are reported here in order to complete the identification of materials from that feature. In estimating MNI for the Heyward-Washington assemblage, faunal remains are grouped by time period and the owner of record: Ellicott, Milner Sr., and Milner Jr. Measurements are presented in Appendix 11-B.

2021-2022 Zooarchaeology Study of Herold's 1970s Materials

The combined 1970s Heyward-Washington materials reported here consists of 1,547 vertebrate specimens weighing 37170.676 g containing the remains of an estimated 79 individuals. The assemblage is subdivided into three components: Ellicott, Milner Sr., and Milner Jr. All three components are dominated by cow, perhaps because of the ½-in-meshed screen used by Harold. This relationship will be considered further in the discussion.

Joseph Ellicott (1694-1720s)

The Ellicott collection contains 438 specimens and the remains of 22 individuals from 13 taxa (Table 11-8). Domestic pigs, cows, and a sheep or goat (Caprinae) contribute 45% of the individuals and 97% of the biomass for taxa for which MNI is estimated (Table 11-9). Wild animals contribute 41% of the individuals, but little biomass. Fish are rare in the collection, but three species of turtles are present: diamondback terrapin (*Malaclemys terrapin*), cooter/slider (*Pseudemys/Trachemys* spp.), and box turtle (*Terrapene carolina*). The collection also includes three wild birds: a diving duck (*Aythya* sp.), a Canada goose (*Branta canadensis*), and a turkey (*Meleagris gallopavo*). These last two birds might have been tame or domestic forms but are considered wild given the early date of the Ellicott occupation. Two deer (*Odocoileus virginianus*) individuals are present. The only commensal taxon is a gull (Laridae).

Artiodactyl elements show varying degrees of dependence on different parts of the carcass (Table 11-10). Half of the pig specimens are from the Head (54%) and these primarily are teeth (NISP = 20). Specimens from the Head, Forequarter, and Hindquarter are over-represented compared to the Standard Pig and the Lower Leg is under-represented (Figure 11-4). Cow specimens are primarily from the Hindquarter (25%), though specimens from other portions also are common. Teeth (NISP = 15) comprise 71% of the cranial specimens. Specimens from the Head and Lower Leg are under-represented compared to the Standard Cow (Figure 11-5). All parts of the caprine skeleton are represented, though 40% of the caprine specimens are from the Head.

Juvenile, subadult, and adult individuals are present (Tables 11-11, 11-12, 11-13, 11-14). Pigs include two subadults and a third individual for which age could not be estimated. The two deer individuals include a subadult and an adult. Cows include three subadults, two adults, and one individual for which age at death could not be estimated. The caprine is represented by a single individual which was at least a subadult at death if not older.

The most common modification is hacking (Table 11-15). Hacking is observed on 76% of the modified specimens. Hacks are present on 47% of the cow specimens compared to 8% of the pig specimens. No sawed specimens were observed. Cow and pig specimens are equally likely to be cut (9% and 8%).

John Milner Sr. (1730-1749)

The Milner Sr. collection contains 944 specimens and 41 individuals from 21 taxa (Table 11-16). Domestic mammals, including pig, cow, and sheep or goat, contribute 41% of the individuals and 98%% of the biomass for taxa for which MNI is estimated (Table 11-17). One of the caprines is a sheep (*Ovis aries*). Wild animals contribute 41% of the individuals, but little biomass. Fish are rare in the collection but include sea catfishes (*Arius felis*, *Bagre marinus*) and several members of the drum family (*Cynoscion* spp., *Pogonias cromis*, *Sciaenops ocellatus*). These estuarine fish are common both in Charleston waters and Charleston faunal assemblages (Reitz and Zierden 2021). The collection also contains a diamondback terrapin and a cooter/slider. These freshwater and estuarine turtles are relatively common in Charleston collections, but the cranial, carapace, plastron, and axial sea turtle (Cheloniidae) specimens are unusual. One of these specimens can be attributed to a loggerhead sea turtle (*Caretta caretta*). The collection also includes six wild bird individuals: a duck (*Anas* spp.), a Canada goose, a bobwhite (*Colinus virginianus*), and two turkeys. Commensal taxa include a crow (*Corvus brachyrhynchos*), a possible dog (*Canis* cf. *familiaris*), and a cat (*Felis domesticus*).

Artiodactyl elements in the Milner Sr. collection show different degrees of dependence on carcass portions (Table 11-18). Pig specimens are primarily from the Head (43%) and these are primarily teeth (NISP = 13). Specimens from the Head, Forequarter, and Hindquarter are over-represented compared to the Standard Pig and the Lower Leg is under-represented (Figure 11-4). Cow specimens are primarily from the Head (24%) and Vertebra/Rib (25%). Forty-eight percent of the Head specimens are fragments from the occipital, parietal, temporal, maxilla, and basioccipital regions. Cow specimens from the Head are present in percentages consistent with what would be expected in a complete skeleton with no transportation bias, though specimens from the Lower Leg are under-represented compared to the Standard Cow (Figure 11-5). No caprine specimens are from the Head; most specimens are from the Forequarter (53%). The sheep is represented by an atlas fragment.

Though not included in the above data, the barrel-lined well beneath the main house cellar (Feature 88) yielded seven horn cores (see Chapter IV). The barrels likely were soaking vats to separate the bony core from the valuable keratinized sheath, perhaps for use in powder horns, handles, combs, buttons, and other useful devices (e.g., Armitage 1982a, 1989a, 1989b, 1990; Armitage and Clutton-Brock 1976; Armitage et al. 1980; Robertson 1989; Salvagno et al. 2017; Serjeantson 1989:141; Yeomans 2007, 2008; Zierden and Reitz 2016). The cores themselves might be sold as cheap alternatives to bricks or to enhance drainage (Yeomans 2008). Horn working was unknown for the city and adds an unexpected dimension to the region's animal economy. Following Armitage (1982a) and Grigson (1982) the cores appear to be from subadult and adult females and males; as well as one from an adult short-horn ox, though Sykes and Symmons (2007) note that the methods used to assess sex may not be reliable.

Juvenile, subadult, and adult individuals are present (Tables 11-19, 11-20, 11-21, 11-22). Pigs include one juvenile, two subadults, one adult, and a fifth individual for which age could not be estimated. The deer died as a subadult. Cows include one juvenile, four subadult, and four adult individuals. Caprines are represented by one juvenile, one subadult, and one adult individual. The age of the sheep could not be estimated. All of the chickens were mature at death and two were roosters.

The most common modification is hacking (Table 11-23). Hacking is observed on 65% of the modified specimens, 10% of the pig specimens, and 33% of the cow specimens. The loggerhead turtle humerus is hacked. Three cow specimens are sawed (1%). Pig specimens are somewhat more likely to be cut (14%) than are cow specimens (10%).

<u>John Milner Jr. (1749-1768)</u>

A total of 165 specimens and 16 individuals from 11 taxa are represented in the Milner Jr. collection (Table 11-24). Domestic mammals, including pig, cow, and sheep or goat, contribute 44% of the individuals and 95% of the biomass for taxa for which MNI is estimated (Table 11-25). The caprine is represented by a single individual, likely a sheep (*Ovis aries*). Wild animals contribute little biomass, but 37% of the individuals. The collection includes a black drum (*Pogonias cromis*), a diamondback terrapin, a cooter/slider, and a deer. The Canada goose in the collection might have been a tame or domestic form, especially considering the later date for the Milner Jr. occupation. Commensal individuals include an Old World rat, possibly a brown rat (*Rattus* cf. *norvegicus*) and a cat.

Artiodactyl elements show varying degrees of dependence on different parts of the carcass (Table 11-26). Pig specimens are primarily from the Head (30%) and Hindquarter (30%). Specimens from the Head, Forequarter, and Hindquarter are over-represented compared to the Standard Pig, and the Lower Leg is under-represented (Figure 11-4). Cow specimens are primarily from the Lower Leg (37%) and otherwise are equally distributed among Vertebra/Rib (18%), Forequarter (19%), and Hindquarter (18%) portions. Specimens from the Head are under-represented compared to the Standard Cow and specimens from the Lower Leg are present in percentages similar to that of a complete skeleton (Figure 11-5). Caprine specimens are primarily from the Forequarter (45%). The sheep is represented by crossing-mending portions of the parietal, frontal, and zygomatic process.

Juvenile, subadult, and adult individuals are present (Tables 11-27, 11-28, 11-29, 11-30). The pigs include one subadult and one adult male. Deer individuals include one subadult and one indeterminate animal. Cows include three subadults and one adult. The sheep was a subadult at death.

The most common modification is hacking, which is observed on 64% of the modified specimens (Table 11-31). No modifications were observed on the pig specimens, though 31% of the cow specimens were hacked and 7% were cut. Two Indeterminate Mammal specimens were sawed (5%).

Evaluating Sample Size, Context, and Screen Size

A comparison of Herold's ½-in-mesh and Zierden's ¼-in-mesh assemblages shows that sample size, context, and screen size do matter (Table 11-32). In terms of sample size, the assemblages excavated by Herold and Zierden are considered small, especially when subdivided into temporal components. The small samples size of each temporal component exaggerates animals represented by comparatively few specimens. The 1750-1769 collection excavated in 1970, for example, contains the remains of two commensal individuals (NISP = 2; MNI = 2) in a collection of 165 specimens and 16 individuals (Table 11-24). These two individuals constitute an estimated 12% of the individuals in the collection (Table 11-25). The larger 1730-1740 collection excavated in 1970 contains a similar number of commensal individuals (NISP = 3; MNI = 3), but in a larger collection (NISP = 944; MNI = 41 individuals); commensal animals comprise an estimated 7% of the individuals (Tables 11-16, 11-17).

Activities on a complex, mixed-use lot such as the Heyward-Washington site influence the types of animals recovered from different parts of the lot. The collection excavated with ¼-in mesh is from a stable and carriage house. The accumulated refuse, stored foods, and shelter offered by this structure likely encouraged commensal animals. Remains of rats (*Rattus* spp.), in particular, are noteworthy for their abundance in the stable after 1750 (Reitz and Colaninno 2007: Table 21). The percentage of commensal individuals in the 1750-1820 stable collection is one of the highest percentages for a Charleston site, similar to those for the harbor-side Atlantic Wharf and Charleston Exchange sites, and the well at 70 Nassau Street (Table 11-33). Herold's ½-in-mesh samples are from generally high-traffic locations, areas that were likely to accumulate butchering and food preparation debris but less conducive to the accumulation of dead rodents, dogs, and cats (Tables 11-8, 11-16, 11-24).

The expectation is that the ½-in-meshed screen would bias comparisons of wild animals, particularly fish and small mammals, while exaggerating the role of livestock. As expected, domestic, non-commensal animals comprised high MNI percentages in Herold's ½-in-screened assemblage (55%-57%) compared to Zierden's ¼-in-screened assemblage (34%-53%). This complicates comparing the roles of wild and domestic animals in the city. The role of non-commensal domestic animals, however, does appear to be reflected reliably in the ½-in screened samples, though somewhat elevated when compared to other resource categories. Both screen sizes, however, document the increase of commensal animals in Charleston over time. These observations are not to say that urban archaeologists should feel free to use ½-in-meshed screens. Some of the most interesting aspects of the Charleston's economy and the Lowcountry landscapes would be overlooked if the contributions of aquatic animals, birds, small wild mammals, and commensal animals were ignored.

Despite the influence of sample size, context, and screen size on these materials, both recovery methods demonstrate the city had a complex, multi-component economy that merged a rich array of local wild resources with domestic ones. Livestock shared the urban landscape with an array of other animals, some of which were pets and others pests. The role of non-domestic resources in the urban landscape would be expanded further if invertebrate resources were included in this study.

Skeletal Completeness

Skeletal completeness is one approach to testing the premise that distribution of animal products became more specialized over time. We might expect a shift from household-level production using many parts of the carcass to a distribution network tailored to provide a range of specialized products to both commercial and residential consumers. At centers of production, where primary butchery might occur, carcass portions with minimal retail value and high transportation costs (e.g., Head and Lower Leg) might be abundant and bones from the more profitable portions (e.g., Forequarter and Hindquarter) rare. Markets might be intermediate locations where some secondary butchering took place but might not be locations with high degrees of skeletal completeness. Over time, as specialization increased, portions with higher consumer values, largely measured as meat, would be under-represented at production centers and over-represented at consumption sites compared to the standard.

By comparing the relative percentages of specimens recovered from a site with the relative percentage of those same specimens in a complete, undisturbed reference skeleton, it should be possible to estimate the extent to which butchery occurred at the household level and consider whether specialized, commercial cuts of meat became more abundant in the Heyward-Washington faunal record over time.

In Figures 11-4 and 11-5, the distribution of pig and cow elements in the Ellicott and Milner materials excavated by Herold (with ½-in-meshed screen) are compared to the (¼-in-meshed screen) Beef Market (1692-1796; Calhoun et al. 1984; Zierden and Reitz 2005) and three 1725-1769 residential properties. This comparison is hampered by uneven and small sample sizes, but it is instructive nonetheless. The overall pattern of pig elements represented compared to the Standard Pig is similar in all five components with all parts of the pig skeleton being present, though specimens from the Lower Leg are under-represented (Figure 11-4). This is consistent with period recipes which use ingredients from the Head, though one wonders where the Lower Leg specimens were discarded. Even less variability is found in cow elements compared to the Standard Cow (Figure 11-5). Although Head specimens are consistently under-represented, they are particularly abundant in the Milner Sr. collection, perhaps reflecting his commercial use of horn cores. Otherwise, Figure 11-5 also is consistent with debris from on-site butchery combined with debris from purchased meats. The marked similarity between Beef Market data and those from residential sites requires further study.

Using a more traditional format, we see that specimens from the meaty part of the carcass (Body) initially comprises 66% of the cow specimens and decline thereafter as elements from the Head (Milner Sr.) or Lower Leg (Milner Jr.) increase (Figure 11-6). In this figure, data from the Beef Market are divided into early (1692-1739) and later deposits (1760-1796). There are few differences in elements represented, though over time the percentages of specimens from the Body decline in the Heyward-Washington assemblage (66% to 55%) instead of increasing. Consistent with Milner Sr.'s commercial use of horn cores, the percentages of Head specimens during his occupation are similar to those in the intact, complete reference cow, as are the two Beef Market components. The Market deposits are more similar to the Ellicott and Milner deposits than to the reference cow suggesting that primary and secondary butchery occurred at both the Market and on the Heyward-Washington property.

Although more research needs to be done on elements represented at archaeological sites in Charleston, it is clear that simplistic associations between element representation, meat utility indices, and social groups will not likely be the best explanation for the patterns observed. Instead, it seems that all portions of cow carcasses were present at these sites, reflecting choices made by specific households. Ellicott, for example, may have purchased much of his meat from the Beef Market, with a preference for portions from the Body, whereas the Milners may have augmented market purchases with on-site butchery or their cattle bones may reflect their commercial enterprises.

Sawed bone is another line of evidence for a specialized distribution network. If sawing is a mark of "butcher" meat, it may be that purchases of such meats were more common for middle-class households in the early and middle part of the nineteenth century than it was at townhouse sites (Table 11-7). The low percentages of sawed specimens in Herold's Hayward-Washington materials are consistent with other Charleston collections. By the end of the nineteenth century, however, sawed bones had increased, presumably for cuts of meat obtained primarily from commercial butchers. On a much smaller scale this can be seen in the Heyward-Washington materials.

Age at Slaughter

Another difference that might be expected between production and consumption centers is the age at which the animals were slaughtered and where they were slaughtered. This topic receives more attention in Chapter X, but is summarized here for the Heyward-Washington assemblage.

Epiphyseal fusion and tooth eruption sequences suggests that cows generally were slaughtered in Charleston before they reached adulthood (Tables 11-3, 11-4). Over time, the percentage of adults used at the Heyward-Washington site declined as the percentages of subadults increased (Figure 11-7). Excluding indeterminate individuals; 60% of the Ellicott cows were subadults, 55% of the individuals slaughtered by Milner Sr. were either juveniles or subadults, and 75% of the individuals slaughtered by Milner Jr. were subadults. The Heyward-Washington subadult cattle percentages are higher than the 1692-1750 city average for individuals which could be aged (43%, Table 11-4).

Tooth wear stages (TWS) are estimated for 26 Heyward-Washington cow teeth following Grant (1982). TWS suggests that many of the cattle were slaughtered as adults (Figure 11-8). This conundrum and the method itself are discussed in more detail in Chapter X (see Appendix III for zooarchaeological methods). Nine of the 17 Ellicott and Milner cow teeth were in TWS G, evidence for the slaughter of adults. TWS suggests that the preferred slaughter age became younger over time. Using the deciduous lower 4th premolar (dP_4) as evidence for the slaughter of juveniles, 17% of the teeth in Ellicott's collection were from juveniles compared to 75% of the teeth in the Boarding House collection (ca. 1820-1850). O'Connor et al. (2010), summarizing mortality profiles for early Medieval Europe, concludes that cattle slaughtered predominantly as adults, though not very old adults (such as those in TWS G), is evidence for the importance of post-mortem products as part of a multi-purpose production objective.

Fourteen teeth from the Heyward-Washington site are included in the geochemical study enabling a tentative association of slaughter age with the origins of these animals at death (Figure 11-9). In the case of the Ellicott teeth, all four of these animals originated on the Lower Coastal Plain. Given the 1694-1720 date for Ellicott, these animals probably originated from locations within the tidewater zone itself, perhaps from within Charleston itself. The Milner Sr. teeth are from a wider area. Although three of the Milner Sr. animals originated from the Lower Coastal Plain, two Milner Sr. animals originated within the Upper Coastal Plain. The youngest Milner Sr. animal, however, was a juvenile which originated within the tidewater zone, probably a very local calf. Both of the Milner Jr. animals were adults and originated on the Lower Coastal Plain. One of the Heyward/Grimke animals was from the Lower Coastal Plain, but one was from the Intermediate Upper Coastal Plain/Piedmont region, documenting the city's expanded catchment area. The Boarding House animal likely originated in the Upper Coastal Plain. Although the sample is small and difficult to precisely associate with a production center, it seems probable that over time, production centers did move up the coastal plain, becoming more distant from Charleston itself, though local animals continued to be used.

Conclusion

The Heyward-Washington materials provide valuable information about the early animal economy in Charleston and changes in that economy as the city grew, space became limited, and sanitation/drainage control became urgent. At mixed residential/commercial sites such as Heyward-Washington faunal remains may be more strongly associated with raw materials needed to manufacture products than with the traditional triad of meat, milk, and labor. A variety of animal products were used at the Heyward-Washington site, many of which were produced there. In fact, the horn cores suggest that the site may have been as much a center of production as it was a center of consumption during the Milner era.

Specimens from the meaty part of the cow carcass were consistently the dominant part of each collection, cattle were slaughtered at increasingly younger ages, and, over time, animals were more likely to be acquired from production centers located some distance from the city. It seems unlikely that household production of dairy products was a primary objective. Draft animals usually were slaughtered elsewhere. Over time, though, meat became the primary objective at Heyward-Washington. Some of this meat was obtained on-site, though over time more of it was acquired through specialized distribution channels. In the early years, cattle were local, originating within the tidewater region if not within the city itself. As the city expanded and its economy flourished, cattle were drawn from a broad catchment area that extended into the Upper Coastal Plain and perhaps into the Piedmont. The household did not abandon household-level production altogether, however, which may be characteristic of household economies where residents were socially and racially diverse.

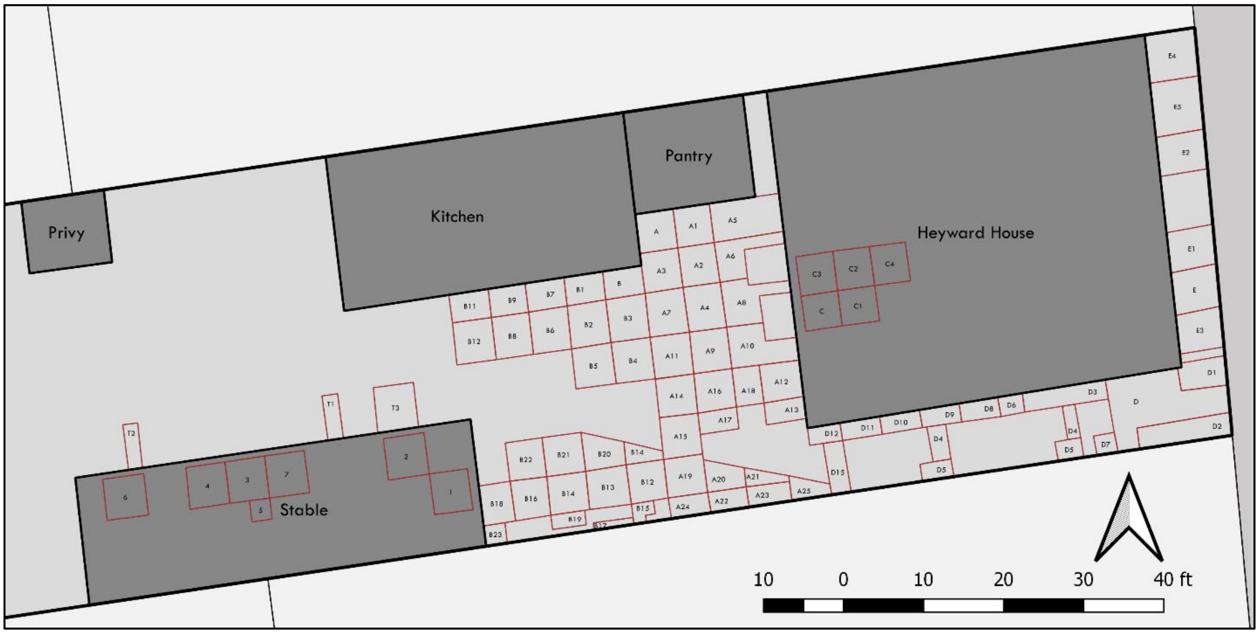


Figure 11-1. Plan of Elaine Herold's 1974-1978 excavations at the Heyward-Washington House and present-day structures.

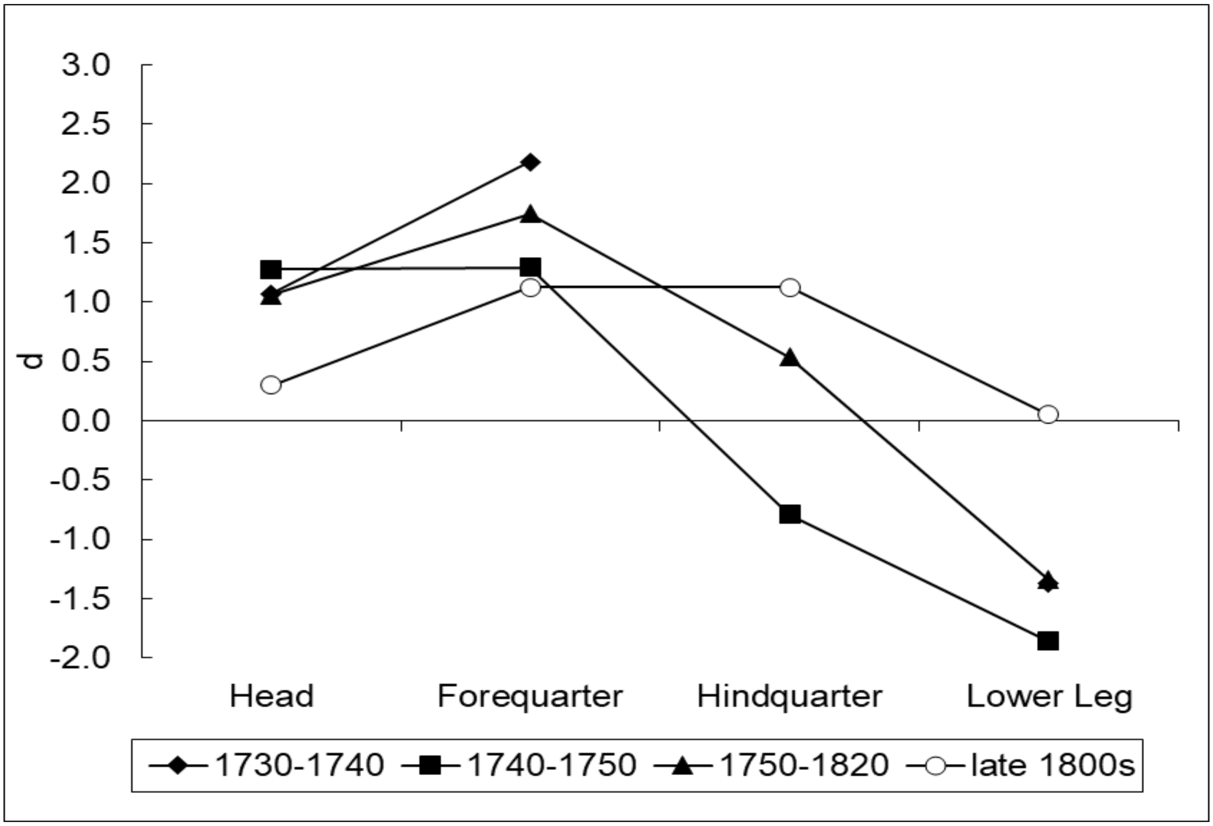


Figure 11-2. Logged ratio diagram for pig elements, Heyward-Washington Stable (Zierden and Reitz 2007:149). Specimens in the Vertebra/Rib category likely are under-represented due to the difficulty of distinguishing among fragmentary artiodactyl vertebrae and ribs. Data for that carcass portion are not included in this figure. Log difference values are calculated using the formula d = Loge X-Loge Y. See Appendix III for details.

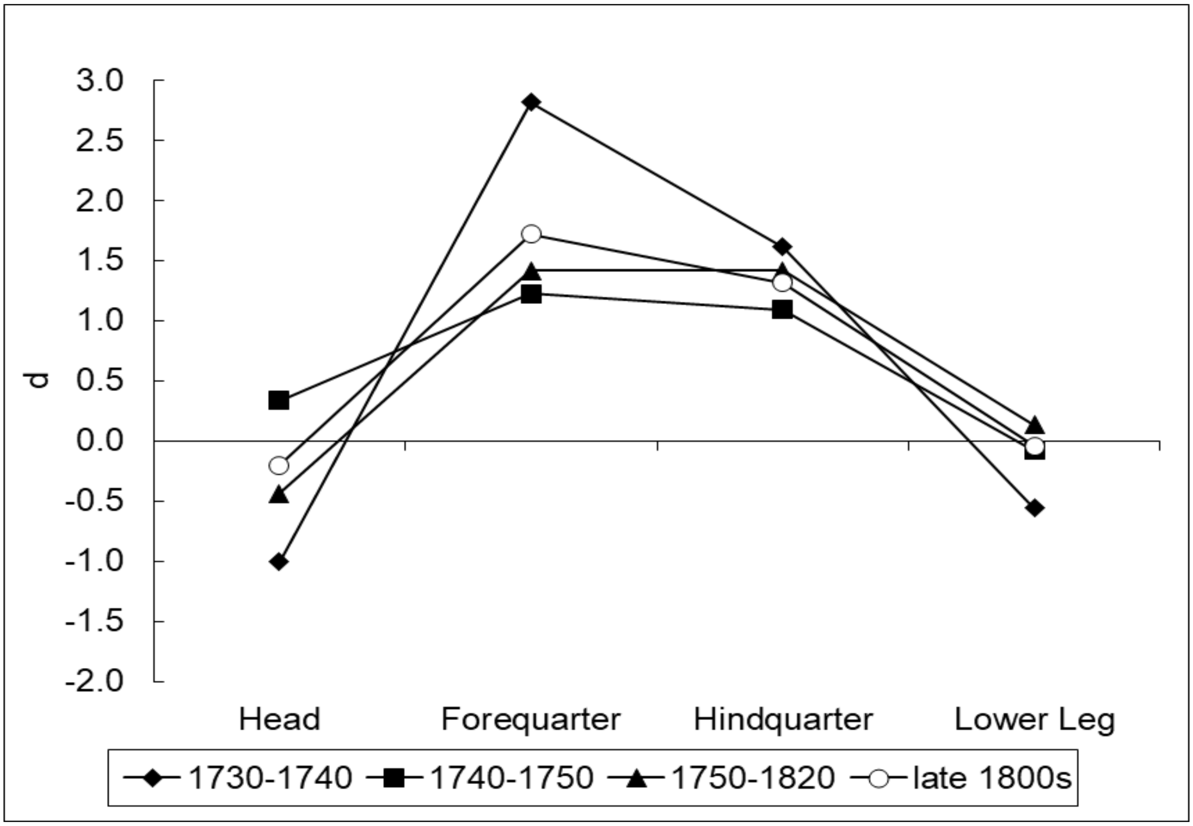


Figure 11-3. Logged ratio diagram for cow elements, Heyward-Washington Stable (Zierden and Reitz 2007:149). Specimens in the Vertebra/Rib category likely are under-represented due to the difficulty of distinguishing among fragmentary artiodactyl vertebrae and ribs. Data for that carcass portion are not included in this figure.

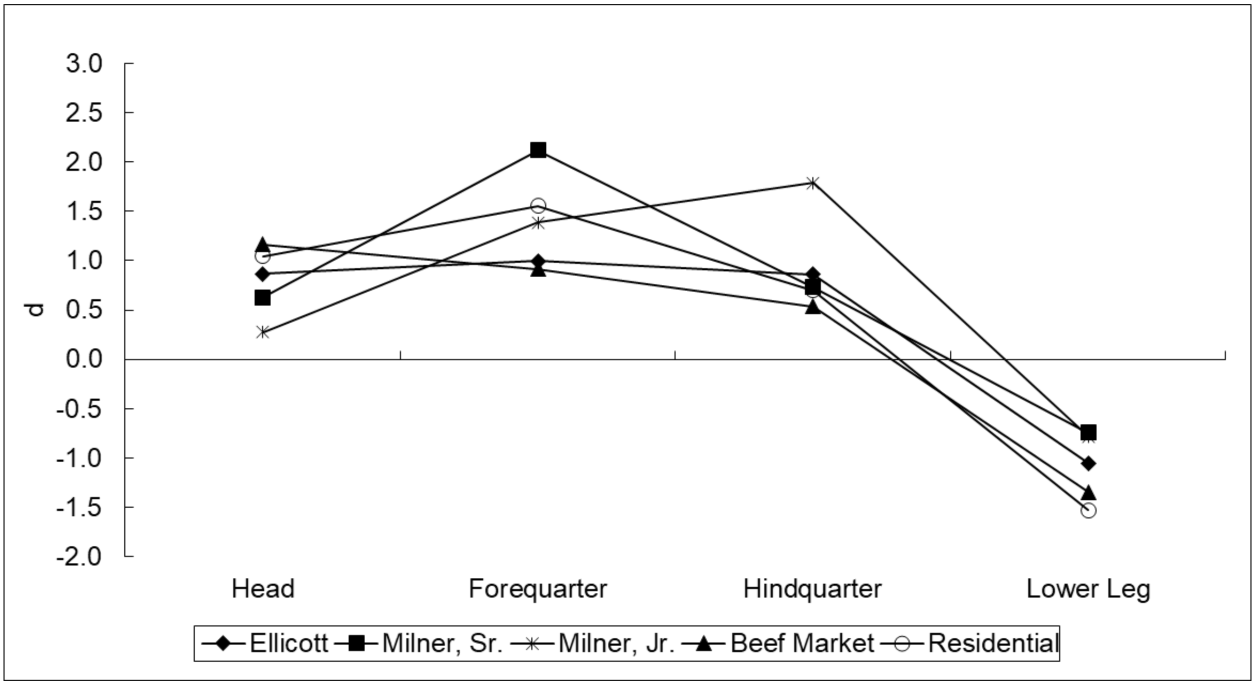


Figure 11-4. Logged ratio diagram for pig elements. Herold's Heyward-Washington data are compared to the Beef Market and three Charleston 1725-760 residential collections (Heyward-Washington [Zierden and Reitz 2007], Charleston Post Office [McKenzie House, Reitz and Ruff 1987], and Rutledge House [Zierden and Grimes 1989]). Beef Market data are from Zierden and Reitz (2005). Specimens in the Vertebra/Rib category likely are under-represented due to the difficulty of distinguishing among fragmentary artiodactyl vertebrae and ribs. Data for that carcass portion are not included in this figure.

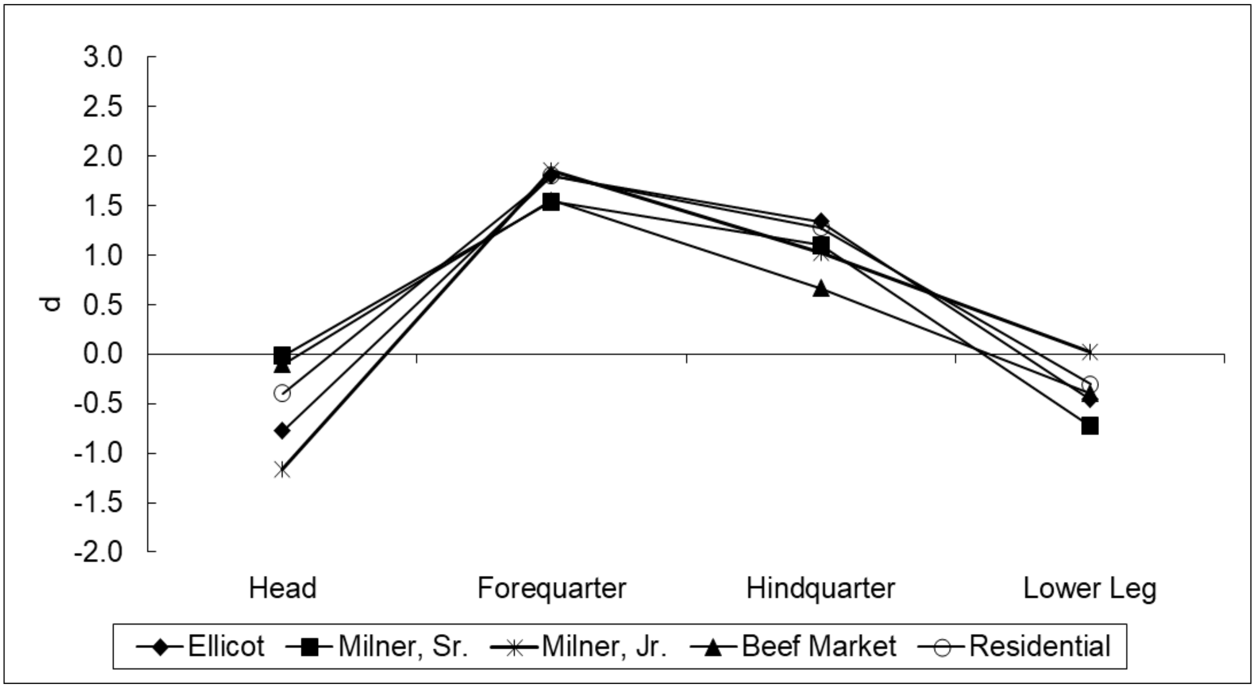


Figure 11-5. Logged ratio diagram for cow elements. Herold's Heyward-Washington data are compared to the Beef Market and three Charleston 1725-760 residential collections (Heyward-Washington [Zierden and Reitz 2007], Charleston Post Office [McKenzie House, Reitz and Ruff 1987], and Rutledge House [Zierden and Grimes 1989]). Beef Market data are from Zierden and Reitz (2005). Specimens in the Vertebra/Rib category likely are under-represented due to the difficulty of distinguishing among fragmentary artiodactyl vertebrae and ribs. Data for that carcass portion are not included in this figure.

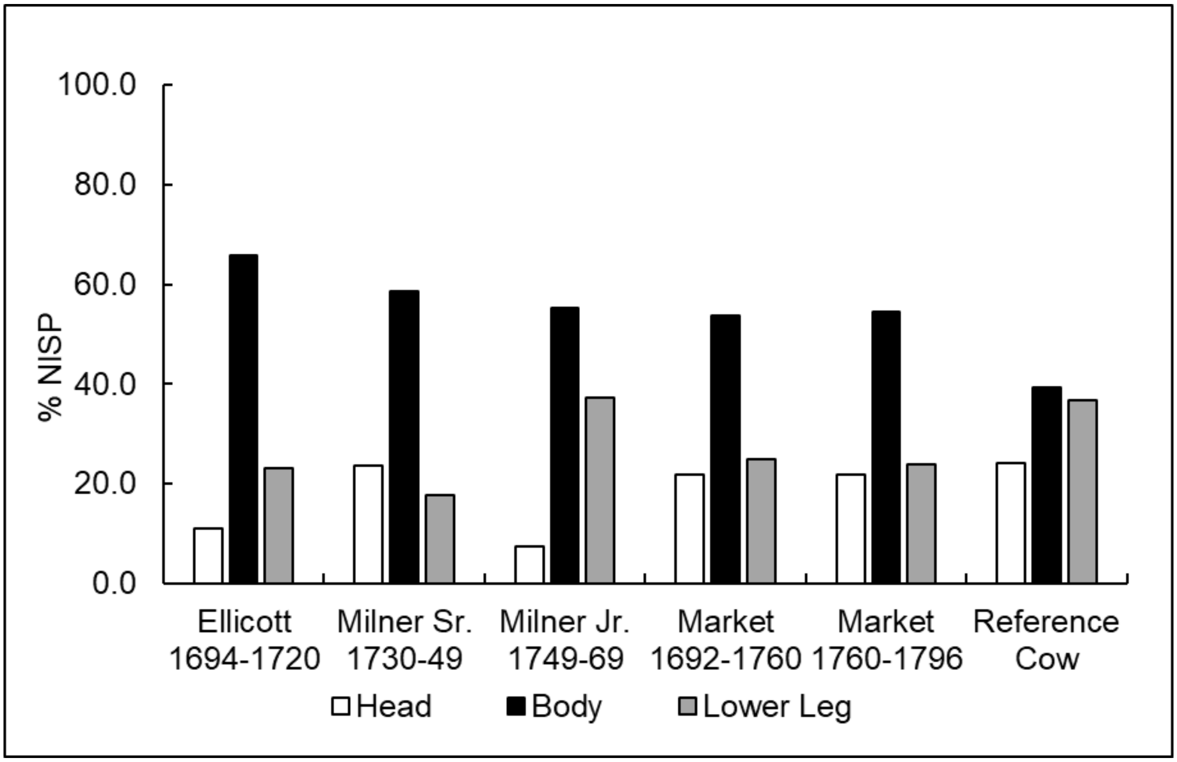


Figure 11-6. Cow carcass portions at Heyward-Washington compared to Beef Market and a Reference Cow. Heyward-Washington data are from Tables 11-10, 11-18, and 11-26. Beef Market data are from Table 11-6. "Body" includes Vertebrae/rib, Forequarter, and Hindquarter specimens from those tables.

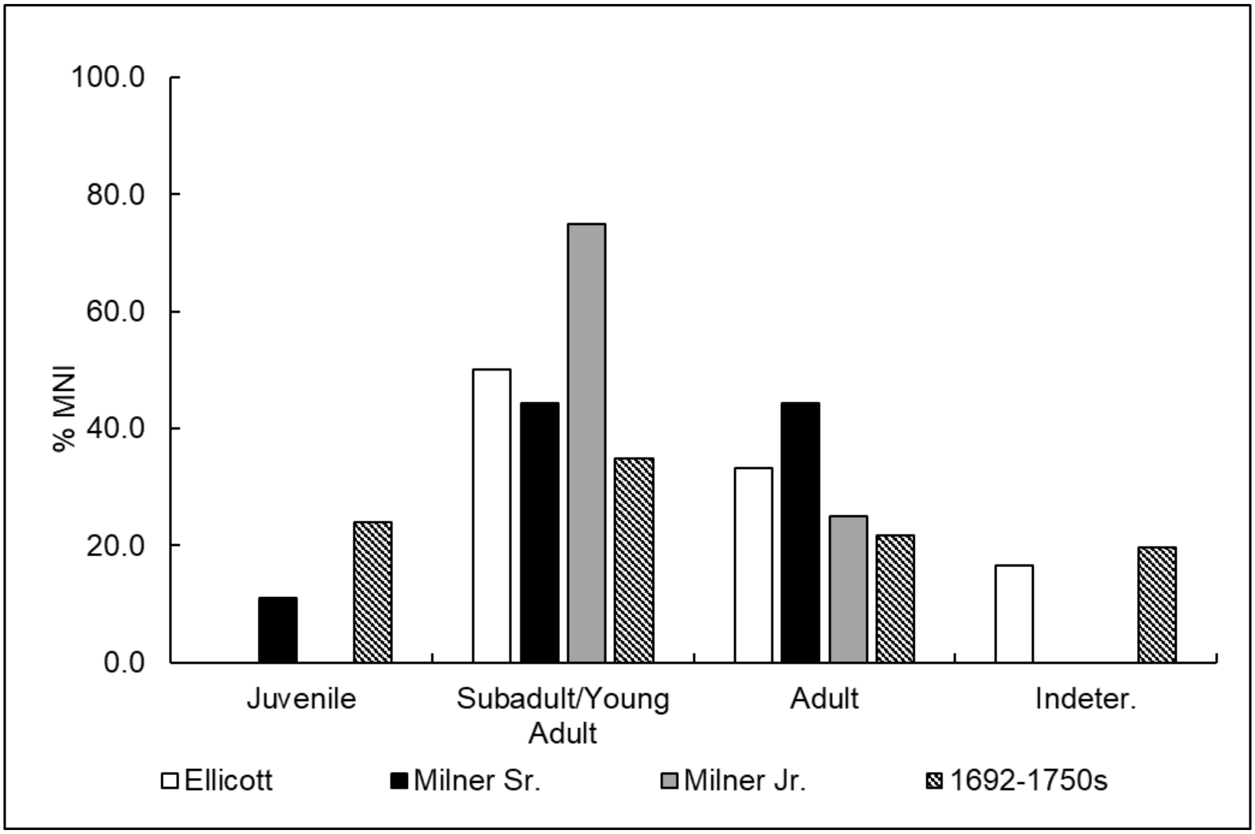


Figure 11-7. Slaughter age for cattle estimated from epiphyseal fusion and tooth eruption sequences. Heyward-Washington data are from this report and the 1692-1750s data are from Table 11-4.

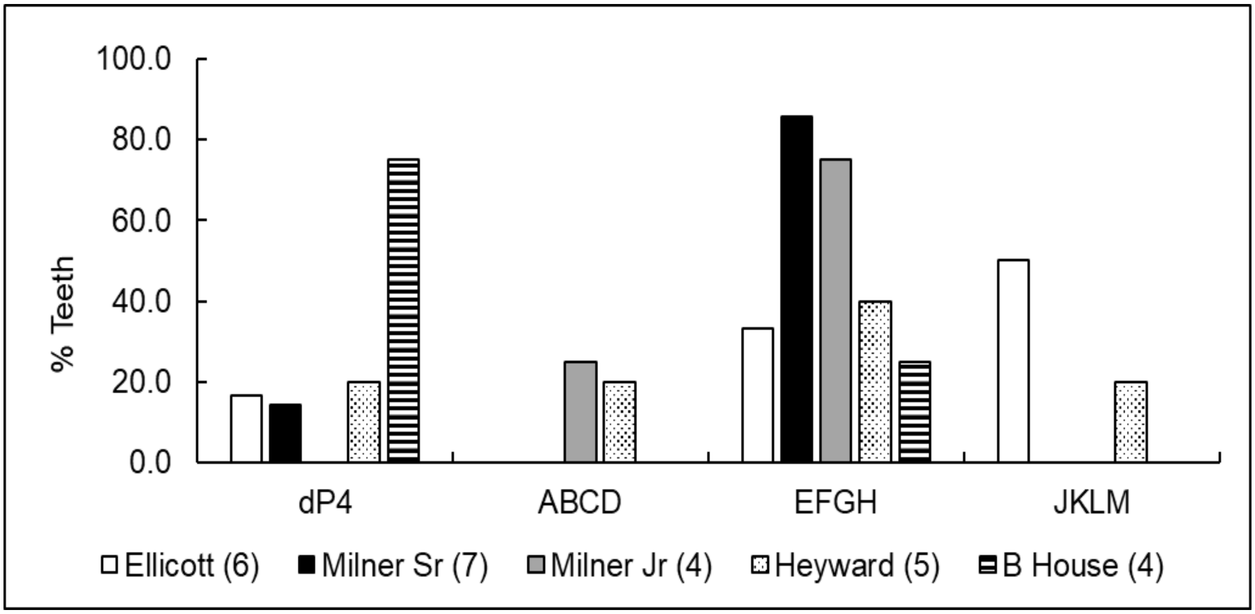


Figure 11-8. Tooth wear stages (TWS) in Heyward-Washington cow teeth. dP_4 teeth are interpreted as juveniles, teeth in TWS ABCD are as young adults, TWS EFGH as adults, and TWS JKLM as elderly. Heyward/Grimke (1770-1819 and Boarding House (1819-1861) data are from Zierden and Reitz (2007). The Ellicott, Milner Sr, and Milner Jr. data are from the present study.

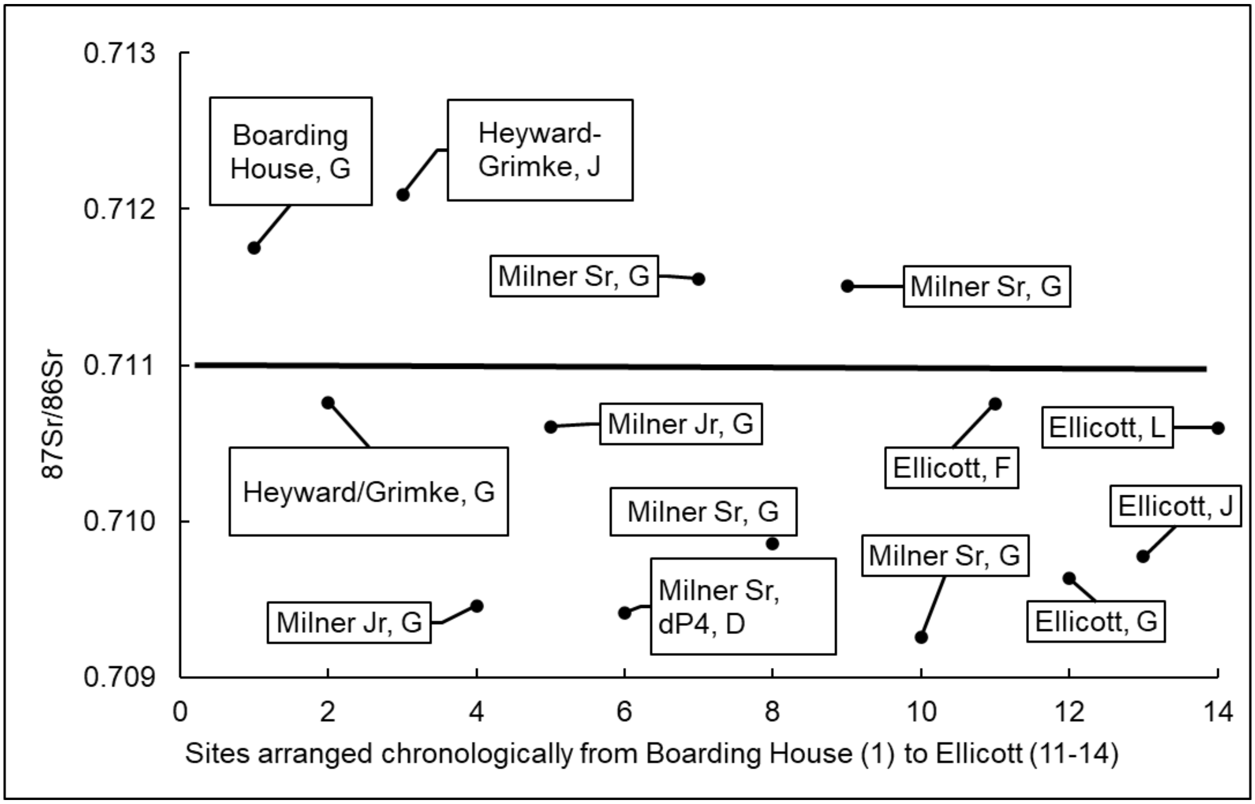


Figure 11-9. Tooth wear stages (TWS) and strontium (Sr) values for Heyward-Washington cow teeth. Tooth wear stages follow Grant (1982) and dP_4 refers to the deciduous lower 4th premolar. All other teeth are lower M3. Heyward/Grimke and Boarding House data are from Zierden and Reitz (2007). Heyward/Grimke (1770-1819) and Boarding House (1819-1861) data are from Zierden and Reitz (2007). The horizontal line approximates the dividing line between the Lower and Upper Coastal Plain. Sites are arranged chronologically. See Chapter VII and Appendix IV for more information about these teeth.

Table 11-1: Will of John Milner, of Charles Town, Gunsmith, 27 September 1749.

To loving sons John Jr. and Solomon all wearing apparel.
To son John, my negro Fellow Prince a gunsmith and my mulatto Boy Slave Joe.
Also my smiths pair of Bellows, an anvil and a vice.
To Solomon, Negro slave Ladd Dandy and Negro boy Jack.
To daughter Sarah, my Negro slave wench hester and my Negro slave Boy Isaac, the son of Celia;
Also out of real estate the sum of 850 pounds, current money to be paid in 3 years , in meantime she be allowed out of rents and profits the sum of 70 pounds current money yearly.
To daughter Mary, Negro slave wench Mariam and Negro slave Girl, the daughter of Celia, also 850 pounds within 3 years.
To daughter Martha, Negro slave wench Celia, also out of real estate 1000 pounds current money within 3 years, and in meantime she be allowed a sufficient maintenance.
To wife Agathy, out of real estate, 500 pounds current money in 3 years.
All real estate, subject to payments to 2 sons. Residue to be divided between 5 children.
2 Negro men slaves, Prince a blacksmith and Jack a carpenter to be sold and money divided between 5 children.

(Will proved 13 October 1749) (WPA Project, Wills, vol. 6, p. 200)

Table 11-2. Charleston Summary, Including Markets, By Time Period.

	1710-50		1750-1820s		1820s-50s		1850s-1900s	
General Categories	MNI	MNI%	MNI	MNI%	MNI	MNI%	MNI	MNI%
Domestic Mammals	99	33.4	162	26.7	222	29.2	111	21.8
Domestic Birds	39	13.2	74	12.2	113	14.9	94	18.5
Wild Terrestrial Mammals	15	5.1	33	5.4	46	6.1	19	3.7
Wild Birds	28	9.5	64	10.6	81	10.7	46	9.0
Reptiles	17	5.7	33	5.4	46	6.1	28	5.5
Sharks, Rays, Fishes	65	22.0	156	25.7	147	19.3	95	18.7
Commensal Taxa	33	11.1	84	13.9	105	13.8	116	22.8
Total MNI	296	100.0	606	100	760	102.8	509	100
Pigs	26	8.8	55	9.1	74	9.7	42	8.3
Cows	46	15.5	75	12.4	110	14.5	45	8.8
Sheep and/or goats	27	9.1	32	5.3	38	5.0	24	4.7
Chickens	36	12.2	67	11.1	104	13.7	89	17.5
White-tailed deer	7	2.4	18	3.0	28	3.7	8	1.6
Canada geese/turkeys	15	5.1	32	5.3	51	6.7	22	4.3
Old World rats	20	6.8	63	10.4	56	7.4	78	15.3
Dogs and cats	4	1.4	10	1.7	14	1.8	24	4.7

	1710-50		1750-1820s		1820s-50s		1850s-1900s	
General Categories	Biomass	Biomass%	Biomass	Biomass%	Biomass	Biomass%	Biomass	Biomass%
Domestic Mammals	436.6985	96.4	924.923	95.3	756.732	91.8	291.239	86.9
Domestic Birds	3.0306	0.7	8.655	0.9	12.573	1.5	9.23	2.8
Wild Terrestrial Mammals	4.2269	0.9	17.932	1.8	14.813	1.8	3.023	0.9
Wild Birds	2.3403	0.5	6.294	0.6	9.367	1.1	4.49	1.3
Reptiles	3.1421	0.7	3.226	0.3	10.778	1.3	2.419	0.7
Sharks, Rays, Fishes	2.4805	0.5	5.49	0.6	4.7	0.6	4.093	1.2
Commensal Taxa	1.2913	0.3	4.377	0.5	15.597	1.9	20.775	6.2
Total Biomass	453.2102	100.0	970.897	100	824.560	100.0	335.269	100
Pigs	39.162	8.6	127.099	13.1	101.8712	12.4	49.789	14.9
Cows	351.2646	77.5	738.736	76.1	617.1261	74.8	219.038	65.3
Sheep and/or goats	46.2719	10.2	59.088	6.1	37.7349	4.6	22.413	6.7
Chickens	2.9736	0.7	8.493	0.9	12.1214	1.5	9.113	2.7
White-tailed deer	3.9149	0.9	17.296	1.8	13.4672	1.6	2.11	0.6
Canada geese/turkeys	1.3383	0.3	5.471	0.6	8.3464	1.0	3.573	1.1
Old World rats	0.5595	0.1	2.478	0.3	2.4468	0.3	5.83	1.7
Dogs and cats	0.309	0.07	1.339	0.14	2.1152	0.3	13.89	4.1

Note : This table does not include the new Heyward-Washington data.

Table 11- 3. Summary of Age at Death for Pigs.

Site	Date	Juvenile	Subadult	Adult	Indeterminate	Pig MNI	Site Total	Time Period
Beef Market	1692-1739	1			1	2	11	1710-50s
Beef Market	1739-1760		1	1	1	3	36	1710-50s
Dock Street Theatre	1736-1750s	2			1	3	51	1710-50s
1st Trident	1740s				1	1	15	1710-50s
Heyward-Washington House	1730-1740	1			1	2	16	1710-50s
Heyward-Washington House	1740-1750	1	1			2	34	1710-50s
McCrady's Tavern	1720-1750				1	1	5	1710-50s
Post Office (McKenzie House)	1725-1769	2	2	1		5	59	1710-50s
Powder Magazine	1712-1750	1		1	1	3	30	1710-50s
Rutledge House	1730s-1760s		1			1	9	1710-50s
South Adgers Wharf	1710-1760	1	2			3	30	1710-50s
1710-50s Total Individuals		9	7	3	7	26	296	
1710-50s Percentages		34.6	26.9	11.5	26.9	100.0		
Atlantic Wharf	1790s-1820s	1	2	1		4	65	1750s-1820s
Beef Market	1760-1796	1			4	5	42	1750s-1820s
Brewton (Brewton House)	1750-1770	1	1	1		3	39	1750s-1820s
Exchange	1750-1790				1	1	5	1750s-1820s
1st Trident	Colonial, 1740s-1790s	1			1	2	27	1750s-1820s
Heyward-Washington House	1750-1820		1	1	1	3	46	1750s-1820s
Lodge Alley	18th cent, 2nd half	1	1	1		3	30	1750s-1820s
McCrady's Tavern & Longroom	1770s-1780s	2	2			4	30	1750s-1820s
Powder Magazine	1751-1820	1	1		2	4	41	1750s-1820s
pre-Russell (Russell House)	1730-1808	2		1		3	31	1750s-1820s
Rutledge House	1760s-1820s	1			1	2	33	1750s-1820s
South Adgers Wharf	1760-1804	4	5			9	77	1750s-1820s
14 Legare Street	late 1700s	5	5	2		12	140	1750s-1820s
1750s-1820s Total Individuals		20	18	7	10	55	606	
1750s-1820s Percentages		36.4	32.7	12.7	18.2	100.0		
Aiken Rhett House	1818-1830				1	1	4	1820s-50s
Aiken Rhett House	1830-1850		1		1	2	29	1820s-50s
Beef Market	early 19th century		1			1	21	1820s-50s
Charleston Place	1730s-late 1800s	6	8	3	16	33	289	1820s-50s
Exchange	mid 19th century	1				1	16	1820s-50s

Table 11- 3. Summary of Age at Death for Pigs.

Site	Date	Juvenile	Subadult	Adult	Indeterminate	Pig MNI	Site Total	Time Period
1st Trident	Federal, 1790s-1840s	2	1		5	8	76	1820s-50s
Gibbes House	1772-1830s		2			2	27	1820s-50s
Lodge Alley	19th cent, 1st half		1	2		3	14	1820s-50s
McCrady's	early 19th century	1			1	2	8	1820s-50s
Motte-Allston (Brewton House)	1775-1830	1	1	1		3	62	1820s-50s
Powder Magazine	1820-1850	1	1		1	3	27	1820s-50s
President Street	mid-19th century				1	1	6	1820s-50s
Russell House	1808-1857	1	1	1	1	4	65	1820s-50s
Rutledge House	post 1820s				1	1	11	1820s-50s
14 Legare Street	1800-1880s	3	2	3		8	99	1820s-50s
72 Anson Street	early-mid 1800s		1			1	6	1820s-50s
1820s-50s MNI Totals		16	20	10	28	74	760	
1820s-50s Percentages		21.6	27.0	13.5	37.8	100.0		
Aiken Rhett House	1850-1870		1			1	6	1850s-1900s
Aiken Rhett House	1870-1900s	1	1	2	1	5	48	1850s-1900s
Allston (Russell House)	1857-1870	1	1			2	17	1850s-1900s
Exchange	late 19th century		1			1	6	1850s-1900s
Heyward-Washington House	late 19th century		1	1		2	35	1850s-1900s
Powder Magazine	1851-1900	1	1			2	22	1850s-1900s
President Street	late 19th century	1				1	11	1850s-1900s
Pringle Frost (Brewton House)	1840s-1880	1	2			3	80	1850s-1900s
Sisters of Charity (Russell House)	1870-1908	1				1	11	1850s-1900s
Visitors Reception & Transportation	1790s-1880s	2	1		2	5	46	1850s-1900s
14 Legare Street	late 1800s	1	2			3	32	1850s-1900s
40 Society Street	mid-late 1800s		1		1	2	14	1850s-1900s
66 Society Street	1800-1870	1	1			2	19	1850s-1900s
70 Nassau Street	mid-late 1800s	4	2		4	10	153	1850s-1900s
72 Anson Street	mid-late 1800s		1		1	2	9	1850s-1900s
1850s-1900s Total Individuals		14	16	3	9	42	509	
1850s-1900s Percentages		33.3	38.1	7.1	21.4	100.0		

Note: This table does not include the new Heyward-Washington data.

Table 11-4. Summary of Age at Death for Cows.

Site	Date	Juvenile	Subadult	Adult	Indeterminate	Cow MNI	Total MNI	Time Period
Beef Market	1692-1739	1	1		1	3	11	1710-50s
Beef Market	1739-1760	1	3	2		6	36	1710-50s
Dock Street Theatre	1736-1750s	1		1	1	3	51	1710-50s
1st Trident	1740s		1		1	2	15	1710-50s
Heyward-Washington House	1730-1740	1	1		1	3	16	1710-50s
Heyward-Washington House	1740-1750	1	1		1	3	34	1710-50s
McCrady's Tavern	1720-1750				1	1	5	1710-50s
Post Office (McKenzie House)	1725-1769	4	5	5	3	17	59	1710-50s
Powder Magazine	1712-1750	1	2	1		4	30	1710-50s
Rutledge House	1730s-1760s		1			1	9	1710-50s
South Adgers Wharf	1710-1760	1	1	1		3	30	1710-50s
1710-50s Totals		11	16	10	9	46	296	
1710-50s Percentages		23.91	34.78	21.74	19.57	100		
Atlantic Wharf	1790s-1820s	1	5	1		7	65	1750s-1820s
Beef Market	1760-1796	1	1	2		4	42	1750s-1820s
Brewton (Brewton House)	1750-1770	1	1		1	3	39	1750s-1820s
Exchange	1750-1790				1	1	5	1750s-1820s
1st Trident	Colonial, 1740s-1790s	1	2		1	4	27	1750s-1820s
Heyward-Washington House	1750-1820	1	2	1	1	5	46	1750s-1820s
Lodge Alley	18th cent, 2nd half	1	1	1	2	5	30	1750s-1820s
McCrady's Tavern & Longroom	1770s-1780s	2	1		1	4	30	1750s-1820s
Powder Magazine	1751-1820	1		1		2	41	1750s-1820s
pre-Russell (Russell House)	1730-1808	1	3		1	5	31	1750s-1820s
Rutledge House	1760s-1820s	1	2	1	2	6	33	1750s-1820s
South Adgers Wharf	1760-1804	2	3	2	5	12	77	1750s-1820s
14 Legare Street	late 1700s	3	7	7		17	140	1750s-1820s
1750s-1820s MNI Totals		16	28	16	15	75	606	
1750s-1820s Percentages		21.3	37.3	21.3	20.0	100.0		
Aiken Rhett House	1818-1830				1	1	4	1820s-50s
Aiken Rhett House	1830-1850		1			1	29	1820s-50s
Beef Market	early 19th century		2			2	21	1820s-50s
Charleston Place	1730s-late 1800s	5	11	6	20	42	289	1820s-50s
Exchange	mid 19th century		1			1	16	1820s-50s

Table 11-4. Summary of Age at Death for Cows.

Site	Date	Juvenile	Subadult	Adult	Indeterminate	Cow MNI	Total MNI	Time Period
1st Trident	Federal, 1790s-1840s	1	1		4	6	76	1820s-50s
Gibbes House	1772-1830s	1	1	1		3	27	1820s-50s
Lodge Alley	19th cent, 1st half	1			1	2	14	1820s-50s
McCrady's	early 19th century	1			1	2	8	1820s-50s
Motte-Allston (Brewton House)	1775-1830	1	1	1	3	6	62	1820s-50s
Powder Magazine	1820-1850	1	1		1	3	27	1820s-50s
President Street	mid-19th century		1			1	6	1820s-50s
Russell House	1808-1857	1	14	7	6	28	65	1820s-50s
Rutledge House	post 1820s		1			1	11	1820s-50s
14 Legare Street	1800-1880s	3		2	5	10	99	1820s-50s
72 Anson Street	early-mid 1800s		1			1	6	1820s-50s
1820s-50s MNI Totals		15	36	17	42	110	760	
1820s-50s Percentages		13.6	32.7	15.5	38.2	100.0		
Aiken Rhett House	1850-1870				1	1	6	1850s-1900s
Aiken Rhett House	1870-1900s	1	2	1	1	5	48	1850s-1900s
Allston (Russell House)	1857-1870	1	1	1		3	17	1850s-1900s
Exchange	late 19th century				1	1	6	1850s-1900s
Heyward-Washington House	late 19th century	1	1		1	3	35	1850s-1900s
Powder Magazine	1851-1900	1	1			2	22	1850s-1900s
President Street	late 19th century		1			1	11	1850s-1900s
Pringle Frost (Brewton House)	1840s-1880	1	2	1		4	80	1850s-1900s
Sisters of Charity (Russell House)	1870-1908	1		1		2	11	1850s-1900s
Visitors Reception & Transportation	1790s-1880s		2	1	1	4	46	1850s-1900s
14 Legare Street	late 1800s	1		1	1	3	32	1850s-1900s
40 Society Street	mid-late 1800s			1	1	2	14	1850s-1900s
66 Society Street	1800-1870	1	1	1	2	5	19	1850s-1900s
70 Nassau Street	mid-late 1800s		4	2	1	7	153	1850s-1900s
72 Anson Street	mid-late 1800s		1		1	2	9	1850s-1900s
1850s-1900s MNI Totals		8	16	10	11	45	509	
1850s-1900s Percentages		17.8	35.6	22.2	24.4	100.0		

Note: This table does not include the new Heyward-Washington data.

Table 11-5. Number of Identified Specimens (NISP) for Pigs.								
Site	Head		Body		Lower Leg		Total NISP	Status
	NISP	NISP%	NISP	NISP%	NISP	NISP%		
1710-50								
Beef Market	7	63.6	4	36.4	-	-	11	Public
Beef Market	63	72.4	11	12.6	13	14.9	87	Public
Dock Street Theatre	-	-	-	-	10	100.0	10	Public
1st Trident	3	60.0	-	-	2	40.0	5	Lower
Heyward-Washington House	6	66.7	2	22.2	1	11.1	9	Upper
Heyward-Washington House	36	81.8	5	11.4	3	6.8	44	Upper
McCrady's Tavern	1	100.0	-	-	-	-	1	Public
Post Office (McKenzie House)	65	59.1	36	32.7	9	8.2	110	Upper
Powder Magazine	21	65.6	8	25.0	3	9.4	32	Public
Rutledge House	3	50.0	-	-	3	50.0	6	Upper
South Adgers Wharf	17	51.5	14	42.4	2	6.1	33	Public
1710-50 Total NISP	222	63.8	80	23.0	46	13.2	348	
1750-1820								
Atlantic Wharf	32	51.6	14	22.6	16	25.8	62	Public
Beef Market	59	75.6	12	15.4	7	9.0	78	Public
Brewton (Brewton House)	23	67.6	4	11.8	7	20.6	34	Upper
Exchange	-	-	1	50.0	1	50.0	2	Public
1st Trident	7	58.3	2	16.7	3	25.0	12	Modest
Heyward-Washington House	23	65.7	8	22.9	4	11.4	35	Upper
Lodge Alley	55	65.5	9	10.7	20	23.8	84	Public
McCrady's Tavern & Longroom	2	10.0	1	5.0	17	85.0	20	Public
Powder Magazine	14	35.9	15	38.5	10	25.6	39	Public
pre-Russell (Russell House)	37	56.9	20	30.8	8	12.3	65	Modest
Rutledge House	50	68.5	17	23.3	6	8.2	73	Upper
South Adgers Wharf	45	35.7	53	42.1	28	22.2	126	Public
14 Legare Street	180	47.0	127	33.2	76	19.8	383	Upper
1750-1820 Total NISP	527	52.0	283	27.9	203	20.0	1013	
1820-50								
Aiken-Rhett House	-	-	1	100.0	-	-	1	Upper
Aiken-Rhett House	1	10.0	8	80.0	1	10.0	10	Upper
Beef Market	14	63.6	2	9.1	6	27.3	22	Public
Charleston Place	91	41.6	70	32.0	58	26.5	219	Modest
Exchange	2	50.0	1	25.0	1	25.0	4	Public
1st Trident	86	74.1	13	11.2	17	14.7	116	Modest
Gibbes House	10	31.3	11	34.4	11	34.4	32	Upper
Lodge Alley	12	60.0	3	15.0	5	25.0	20	Public
McCrady's Tavern	1	50.0	-	-	1	50.0	2	Public
Motte-Allston (Brewton House)	36	54.5	20	30.3	10	15.2	66	Upper
Powder Magazine	7	15.2	34	73.9	5	10.9	46	Public
President Street	1	20.0	4	80.0	-	-	5	Modest
Russell House	25	36.2	27	39.1	17	24.6	69	Upper
Rutledge House	1	100.0	-	-	-	-	1	Upper
14 Legare Street	61	45.5	38	28.4	35	26.1	134	Upper
72 Anson Street	2	66.7	1	33.3	-	-	3	Modest
1820-50 Total NISP	350	70.9	233	47.2	167	33.8	750	

Table 11-5. Number of Identified Specimens (NISP) for Pigs.								
Site	Head		Body		Lower Leg		Total NISP	Status
	NISP	NISP%	NISP	NISP%	NISP	NISP%		
1850s-1900								
Aiken-Rhett House	-	-	-	-	2	100.0	2	Upper
Aiken-Rhett House	14	29.8	25	53.2	8	17.0	47	Upper
Allston (Russell House)	8	28.6	15	53.6	5	17.9	28	Upper
Exchange	-	-	2	66.7	1	33.3	3	Public
Heyward-Washington House	4	30.8	3	23.1	6	46.2	13	Upper
Powder Magazine	23	56.1	11	26.8	7	17.1	41	Public
President St	-	-	8	100.0	-	-	8	Modest
Pringle Frost (Brewton)	30	53.6	13	23.2	13	23.2	56	Upper
Sisters of Charity (Russell House)	1	25.0	3	75.0	-	-	4	Public
Visitors Reception & Transportation	21	80.8	4	15.4	1	3.8	26	Modest
14 Legare Street	14	46.7	10	33.3	6	20.0	30	Upper
40 Society Street	11	68.8	5	31.3	-	-	16	Modest
66 Society Street	10	41.7	9	37.5	5	20.8	24	Modest
70 Nassau Street	8	5.3	117	78.0	25	16.7	150	Modest
72 Anson Street	1	25.0	3	75.0	-	-	4	Modest
1850-1900 Total NISP	145	32.1	228	50.4	79	17.5	452	

Note : This table does not include the new Heyward-Washington data in this report.

Table 11-6. Number of Identified Specimens (NISP) for Cows.								
Site	Head		Body		Lower Leg		Total NISP	Status
	NISP	NISP%	NISP	NISP%	NISP	NISP%		
1710-50								
Beef Market	14	13.6	73	70.9	16	15.5	103	Public
Beef Market	70	24.6	134	47.0	81	28.4	285	Public
Dock Street Theatre	2	12.5	12	75.0	2	12.5	16	Public
1st Trident	11	35.5	6	19.4	14	45.2	31	Lower
Heyward-Washington House	1	8.3	8	66.7	3	25.0	12	Upper
Heyward-Washington House	15	31.9	13	27.7	19	40.4	47	Upper
McCrady's Tavern	-	-	1	100.0	1	100.0	2	Public
Post Office (McKenzie House)	34	13.9	154	62.9	57	23.3	245	Upper
Powder Magazine	15	14.2	52	49.1	39	36.8	106	Public
Rutledge House	1	9.1	4	36.4	6	54.5	11	Upper
South Adgers Wharf	16	24.6	30	46.2	19	29.2	65	Public
1710-50 Total NISP	179	19.4	487	52.8	257	27.8	923	
1750-1820								
Atlantic Wharf	38	33.6	23	20.4	52	46.0	113	Public
Beef Market	50	21.6	126	54.5	55	23.8	231	Public
Brewton (Brewton House)	12	25.0	20	41.7	16	33.3	48	Upper
Exchange	-	-	2	66.7	1	33.3	3	Public
1st Trident	14	38.9	11	30.6	11	30.6	36	Modest
Heyward-Washington House	10	14.7	24	35.3	34	50.0	68	Upper
Lodge Alley	56	52.3	19	17.8	32	29.9	107	Public
McCrady's Tavern & Longroom	14	38.9	2	5.6	20	55.6	36	Public
Powder Magazine	4	10.3	20	51.3	15	38.5	39	Public
pre-Russell (Russell House)	47	20.5	123	53.7	59	25.8	229	Modest
Rutledge House	14	11.7	38	31.7	68	56.7	120	Upper
South Adgers Wharf	34	13.2	97	37.6	127	49.2	258	Public
14 Legare Street	146	22.8	299	46.6	196	30.6	641	Upper
1750-1820 Total NISP	439	22.8	804	41.7	686	35.6	1929	
1820-50								
Aiken-Rhett House	1	33.3	2	66.7	-	-	3	Upper
Aiken-Rhett House	1	7.7	9	69.2	3	23.1	13	Upper
Beef Market	17	47.2	15	41.7	4	11.1	36	Public
Charleston Place	142	36.8	162	42.0	82	21.2	386	Modest
Exchange	2	22.2	5	55.6	2	22.2	9	Public
1st Trident	8	17.4	21	45.7	17	37.0	46	Modest
Gibbes House	29	22.7	71	55.5	28	21.9	128	Upper
Lodge Alley	13	44.8	6	20.7	10	34.5	29	Public
McCrady's Tavern	1	25.0	1	25.0	2	50.0	4	Public
Motte-Allston (Brewton House)	37	17.8	98	47.1	73	35.1	208	Upper
Powder Magazine	6	7.4	61	75.3	14	17.3	81	Public
President Street	3	42.9	2	28.6	2	28.6	7	Modest
Russell House	11	1.6	311	45.1	367	53.3	689	Upper
Rutledge House	-	-	2	50.0	2	50.0	4	Upper
14 Legare Street	46	21.3	97	44.9	73	33.8	216	Upper
72 Anson Street	1	12.5	5	62.5	2	25.0	8	Modest
1820-50 Total NISP	318	17.0	868	46.5	681	36.5	1867	

Table 11-6. Number of Identified Specimens (NISP) for Cows.								
Site	Head		Body		Lower Leg		Total NISP	Status
	NISP	NISP%	NISP	NISP%	NISP	NISP%		
1850s-1900								
Aiken-Rhett House	1	25.0	2	50.0	1	25.0	4	Upper
Aiken-Rhett House	21	17.8	85	72.0	12	10.2	118	Upper
Allston (Russell House)	6	6.5	47	50.5	40	43.0	93	Upper
Exchange	1	100.0	-	-	-	-	1	Public
Heyward-Washington House	8	18.6	17	39.5	18	41.9	43	Upper
Powder Magazine	12	26.1	26	56.5	8	17.4	46	Public
President St	-	-	2	13.3	13	86.7	15	Modest
Pringle Frost (Brewton)	12	13.3	44	48.9	34	37.8	90	Upper
Sisters of Charity (Russell House)	3	15.8	8	42.1	8	42.1	19	Public
Visitors Reception & Transportation	4	30.8	6	46.2	3	23.1	13	Modest
14 Legare Street	10	22.7	16	36.4	18	40.9	44	Upper
40 Society Street	-	-	9	90.0	1	10.0	10	Modest
66 Society Street	1	3.4	21	72.4	7	24.1	29	Modest
70 Nassau Street	-	-	81	94.2	5	5.8	86	Modest
72 Anson Street	-	-	7	63.6	4	0.6	11	Modest
1850-1900 Total NISP	79	12.7	371	59.6	172	27.7	622	
Note : This table does not include the new Heyward-Washington data in this report.								

Table 11-7. Summary of Modified Specimens.									
Site	Hacked	Sawed	Cut	Burned	Gnawed	Worked	Total Modifications	Total NISP	Status
1710-50									
Beef Market	47	5	5	3		2	62	1377	Public
Beef Market	878	16	23	116	2	6	1041	13007	Public
Dock Street Theatre	20	17	5	57	4		103	1748	Public
1st Trident	67	1	20	59			147	572	Lower
Heyward-Washington House	41	8	22	30	10		111	606	Upper
Heyward-Washington House	117	29	107	42	56	1	352	2296	Upper
McCrady's Tavern			1		2		3	23	Public
Post Office (McKenzie House)	22	18	99	53	45		237	2595	Upper
Powder Magazine	31	1	33	38	13	1	117	1483	Public
Rutledge House	2				2		4	213	Upper
South Adgers Wharf	95	32	53	3	17		200	1023	Public
1710-50 Totals	1320	127	368	401	151	10	2377	24943	
1750-1820									
Atlantic Wharf	174		48	273	22	2	519	2826	Public
Beef Market	787	29	42	69	1	5	933	15949	Public
Brewton (Brewton House)	9	5	37	45	5	-	101	2782	Upper
Exchange	-	-	2	-	-	-	2	57	Public
1st Trident	41	-	52	5	4	-	102	596	Modest
Heyward-Washington House	76	71	66	12	129	3	357	2429	Upper
Lodge Alley	155	2	100	2	3	1	263	2570	Public
McCrady's Tavern & Longroom	5	12	42	3	22	-	84	575	Public
Powder Magazine	22	14	36	37	28	1	138	1549	Public
pre-Russell (Russell House)	44	27	41	15	4	2	133	2023	Modest
Rutledge House	14	3	101	16	14	-	148	2867	Upper
South Adgers Wharf	529	70	242	7	40	7	895	3685	Public
14 Legare Street	125	94	214	31	65	2	531	13083	Upper
1750-1820 Totals	1981	327	1023	515	337	23	4206	50991	
1820-50									
Aiken-Rhett House		1	3		1		5	17	Upper
Aiken-Rhett House	3	26	20	12	30		91	531	Upper
Beef Market	572	2	16	11	2		603	2900	Public
Charleston Place	28	188	240	302	91	4	853	11017	Modest
Exchange		13	14		35		62	208	Public
1st Trident	55	42	77	70	74		318	4155	Modest
Gibbes House	12	19	16	13	5		65	1108	Upper
Lodge Alley	19	3	17	1	2		42	500	Public
McCrady's Tavern	1	2	2		3		8	84	Public
Motte-Allston (Brewton House)	31	20	79	123	15	2	270	6076	Upper
Powder Magazine	19	76	30	5	43	1	174	1078	Public
President Street		22	3	3			28	148	Modest
Russell House	59	109	37	29	23	3	260	3440	Upper
Rutledge House	1	7	3	1	5		17	303	Upper
14 Legare Street	59	135	102	56	46	10	408	5346	Upper
72 Anson Street		3	2	2			7	142	Modest
1820-50 Totals	859	668	661	628	375	20	3211	37053	

Table 11-7. Summary of Modified Specimens.									
Site	Hacked	Sawed	Cut	Burned	Gnawed	Worked	Total Modifications	Total NISP	Status
1850s-1900									
Aiken-Rhett House	14	62	32	23	10		141	1123	Upper
Aiken-Rhett House	5	43	17	2	21		88	462	Upper
Aiken-Rhett House	2	2	1	3			8	56	Upper
Allston (Russell House)	7	78	11	20	2	2	120	946	Upper
Exchange	2	5	2	1	7		17	37	Public
Heyward-Washington House	77	68	66	11	118	2	342	1502	Upper
Powder Magazine	22	83	25	6	37	3	176	1082	Public
President St	8	40	10	13	3		74	250	Modest
Pringle Frost (Brewton)	10	113	36	124	22		305	7383	Upper
Sisters of Charity (Russell House)	4	14	8	5	3	1	35	331	Public
Visitors Reception & Transportation		45	18	24	18		105	1630	Modest
14 Legare Street	30	49	23	21	5	16	144	1428	Upper
40 Society Street		24	7	28	4		63	274	Modest
66 Society Street		42	28		2		72	429	Modest
70 Nassau Street	5	135	38	15	40		233	4206	Modest
72 Anson Street	1	11		1			13	183	Modest
1850-1900 Totals	187	814	322	297	292	24	1936	21322	

Note : This table does not include the new Heyward-Washington data in this report. NISP refers to the number of identified specimens with modifications in each category. It does not refer to the actual number of modifications on each specimen.

Table 11-8. Heyward-Washington, Joseph Ellicott: Species List.

Taxa	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii	16			69.690	0.918
Indeterminate bony fish					
Sciaenidae	1	1	4.5	0.617	0.027
Drum family					
Testudines	3			5.230	0.096
Indeterminate turtle					
Emydidae	1			1.149	0.035
Pond turtles					
Malaclemys terrapin	1	1	4.5	1.763	0.046
Diamondback terrapin					
Pseudemys/Trachemys spp.	1	1	4.5	15.843	0.201
Pond turtles					
Terrapene carolina	1	1	4.5	5.534	0.100
Box turtle					
Aves	3			1.649	0.032
Indeterminate bird					
Anatidae	2			2.655	0.050
Ducks					
Aythya sp.	1	1	4.5	1.748	0.034
Diving duck					
Branta canadensis	1	1	4.5	7.032	0.120
Canada goose					
Gallus gallus	8	2	9.1	13.084	0.212
Chicken					
Meleagris gallopavo	1	1	4.5	8.300	0.140
Turkey					
Laridae	1	1	4.5	1.269	0.025
Gulls and terns					
Mammalia	123			1060.279	13.896
Indeterminate mammal					

		MNI			
Taxa	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Artiodactyla	2			9.600	0.201
Even-toed ungulate					
Sus scrofa	59	3	13.6	446.083	6.375
Pig					
Odocoileus virginianus	8	2	9.1	113.871	1.865
White-tailed deer					
Bos taurus	190	6	27.3	7565.761	81.467
Cow					
Caprinae	15	1	4.5	197.516	3.062
Sheep and goat					
Vertebrata				15.878	
Indeterminate vertebrate					
Total	438	22		9544.551	108.902

Table 11-9. Heyward-Washington, Joseph Ellicott: Summary Table.

	MNI		Biomass	
	#	%	kg	%
Fishes	1	4.5	0.027	0.03
Turtles	3	13.6	0.347	0.4
Wild birds	3	13.6	0.294	0.3
Domestic birds	2	9.1	0.212	0.2
Wild mammals	2	9.1	1.865	2.0
Domestic mammals	10	45.5	90.904	97.0
Commensal taxa	1	4.5	0.025	0.03
Total	22		93.674	

Table 11-10. Heyward-Washington, Joseph Ellicott: Element Distribution.

	Pig	Deer	Cow	Sheep/Goat
Head	32	1	21	6
Vertebra/Rib	7		43	1
Forequarter	4	1	35	2
Hindquarter	7	2	47	2
Forefoot		1	7	1
Hindfoot	4	1	26	2
Foot	5	2	11	1
Total	59	8	190	15

Table 11-11. Heyward-Washington, Joseph Ellicott: Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal	1		1
Radius, proximal	2		2
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal	3	1	4
Middle Fusing:			
Tibia, distal	4		4
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal	2		2
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal	2		2
Tibia, proximal			
Total	14	1	15

Table 11-12. Heyward-Washington, Joseph Ellicott: Epiphyseal Fusion for Deer (*Odocoileus virginianus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal			
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal		2	2
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal	1		1
Femur, distal			
Tibia, proximal		1	1
Total	1	3	4

Table 11-13. Heyward-Washington, Joseph Ellicott: Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		4	4
Scapula, distal		1	1
Radius, proximal		7	7
Acetabulum		1	1
Metapodials, proximal		5	5
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal	2	2	4
Calcaneus, proximal	6	1	7
Metapodials, distal			
Late Fusing:			
Humerus, proximal	6	2	8
Radius, distal	1		1
Ulna, proximal	3		3
Ulna, distal			
Femur, proximal	4	3	7
Femur, distal	8		8
Tibia, proximal	5	1	6
Total	35	27	62

Table 11-14. Heyward-Washington, Joseph Ellicott: Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal		1	1
Acetabulum		1	1
Metapodials, proximal		2	2
1st/2nd phalanx, proximal		1	1
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal		1	1
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	0	6	6

Table 11-15. Heyward-Washington, Joseph Ellicott: Modifications.

Taxon	Hacked	Sawed	Clean Cut	Cut	Burned	Calcined	Rodent gnawed	Carnivore gnawed
Diving duck				1				
Canada goose				1				
Chicken					1			
Indeterminate mammal	21			5	1			
Pig	5			5				
Deer	1			2				
Cow	90			18				2
Caprine	1			2				
Indeterminate vertebrate	1							
Total	119			34	2			2

Table 11-16. Heyward-Washington, John Milner Sr.: Species List.

Taxa	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii	25			44.186	0.635
Indeterminate bony fish					
Ariidae	1			0.418	0.009
Sea catifish family					
Arius felis	1	1	2.4	0.250	0.005
Hardhead catfish					
Bagre marinus	1	1	2.4	0.227	0.005
Gafftopsail catfish					
Cynoscion spp.	4	2	4.9	2.379	0.074
Seatrout					
Pogonias cromis	1	1	2.4	17.620	0.325
Black drum					
Sciaenops ocellatus	2	1	2.4	5.054	0.129
Red drum					
Testudines	1			1.242	0.037
Indeterminate turtle					
Malaclemys terrapin	3	1	2.4	12.093	0.168
Diamondback terrapin					
Pseudemys/Trachemys spp.	2	1	2.4	17.494	0.215
Cooters and sliders					
Cheloniidae	5			27.141	0.289
Sea turtles					
Caretta caretta	1	1	2.4	6.412	0.110
Loggerhead sea turtle					
Aves	6			4.949	0.088
Indeterminate bird					
Anatidae	1			0.532	0.011
Ducks and geese					
Anas spp.	6	2	4.9	13.905	0.224
Ducks					

Taxa	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Branta canadensis	1	1	2.4	0.525	0.011
Canada goose					
Phasianidae	1			0.270	0.006
Pheasant family					
Colinus virginianus	1	1	2.4	0.181	0.004
Bobwhite					
Gallus gallus	17	4	9.8	31.670	0.474
Chicken					
Meleagris gallopavo	4	2	4.9	22.537	0.348
Turkey					
Corvus brachyrhynchos	1	1	2.4	0.595	0.013
American crow					
Mammalia	330			1796.055	22.331
Indeterminate mammal					
Canis cf. *familiaris*	1	1	2.4	2.724	0.065
possible Domestic dog					
Procyon lotor	1	1	2.4	4.451	0.101
Raccoon					
Felis domesticus	2	1	2.4	3.720	0.086
Domestic cat					
Artiodactyla	30			293.128	4.369
Even-toed ungulate					
Sus scrofa	77	5	12.2	1066.057	13.964
Pig					
Odocoileus virginianus	3	1	2.4	46.153	0.828
White-tailed deer					
cf. *Bos taurus*	1			8.520	0.181
possible Cow					
Bos taurus	395	9	22.0	19909.848	194.615
Cow					
Caprinae	18	3	7.3	286.856	4.285

		MNI			
Taxa	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Sheep and goat					
Ovis aries	1	(1)		11.428	0.236
Sheep					
Vertebrata				80.906	
Indeterminate vertebrate					
Total	944	41		23719.526	244.241

Table 11-17. Heyward-Washington, John Milner Sr.: Summary Table.

	MNI		Biomass	
	#	%	kg	%
Fishes	6	14.6	0.538	0.2
Turtles	3	7.3	0.493	0.2
Wild birds	6	14.6	0.587	0.3
Domestic birds	4	9.8	0.500	0.2
Wild mammals	2	4.9	0.900	0.4
Domestic mammals	17	41.5	212.864	98.5
Commensal taxa	3	7.3	0.164	0.1
Total	41		216.046	

Table 11-18. Heyward-Washington, John Milner Sr.: Element Distribution.

	Pig	Deer	Cow	Caprinae/Sheep
Head	33		93	
Vertebra/Rib	4		99	4
Forequarter	16	1	56	10
Hindquarter	8	1	77	1
Forefoot			16	
Hindfoot	7	1	27	3
Foot	9		27	1
Total	77	3	395	19

Table 11-19. Heyward-Washington, John Milner Sr.: Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal	2	2	4
Scapula, distal		2	2
Radius, proximal		2	2
Acetabulum	1	2	3
Metapodials, proximal			
1st/2nd phalanx, proximal	3	1	4
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal	1		1
Metapodials, distal	4		4
Late Fusing:			
Humerus, proximal	1	1	2
Radius, distal	2		2
Ulna, proximal			
Ulna, distal	1		1
Femur, proximal			
Femur, distal	2		2
Tibia, proximal	1		1
Total	18	10	28

Table 11-20. Heyward-Washington, John Milner Sr.: Epiphyseal Fusion for Deer (*Odocoileus virgininus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal			
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal	2		2
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	2	0	2

Table 11-21. Heyward-Washington, John Milner Sr.: Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		14	14
Scapula, distal		9	9
Radius, proximal		3	3
Acetabulum	1	3	4
Metapodials, proximal		2	2
1st/2nd phalanx, proximal	1	14	15
Middle Fusing:			
Tibia, distal	2	6	8
Calcaneus, proximal	5	3	8
Metapodials, distal	3	3	6
Late Fusing:			
Humerus, proximal	5	1	6
Radius, distal	4	1	5
Ulna, proximal		1	1
Ulna, distal			
Femur, proximal	4	2	6
Femur, distal	8	5	13
Tibia, proximal	11	3	14
Total	44	70	114

Table 11-22. Heyward-Washington, John Milner Sr.: Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		3	3
Scapula, distal		3	3
Radius, proximal		2	2
Acetabulum			
Metapodials, proximal		2	2
1st/2nd phalanx, proximal	1		1
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal			
Metapodials, distal		1	1
Late Fusing:			
Humerus, proximal			
Radius, distal	2		2
Ulna, proximal		1	1
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	3	12	15

Table 11-23. Heyward-Washington, John Milner Sr.: Modifications

Taxon	Hacked	Sawed	Clean Cut	Cut	Burned	Calcined	Carnivore gnawed
Indeterminate bony fish				1			
Loggerhead sea turtle	1						
Ducks				1			
Chicken				1			1
Indeterminate mammal	8			2		1	
Even-toed ungulate	3			2			
Pig	8			11	1		
Cow	129	3	4	38			2
Caprinae/sheep	2			2			
Indeterminate vertebrate						13	
Total	151	3	4	58	1	14	3

Table 11-24. Heyward-Washington, John Milner Jr.: Species List.

Taxa	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii Indeterminate bony fish	8			23.622	0.382
Pogonias cromis Black drum	1	1	6.3	8.003	0.181
Emydidae Pond turtles	1			2.045	0.051
Malaclemys terrapin Diamondback terrapin	1	1	6.3	8.728	0.135
Pseudemys/Trachemys spp. Pond turtles	1	1	6.3	17.721	0.217
Branta canadensis Canada goose	1	1	6.3	1.628	0.032
Gallus gallus Chicken	2	1	6.3	4.727	0.084
Mammalia Indeterminate mammal	51			549.981	7.697
Rattus cf. *norvegicus* Possible brown rat	1	1	6.3	0.519	0.015
Felis domesticus Domestic cat	1	1	6.3	4.114	0.094
Artiodactyla Even-toed ungulate	6			52.404	0.928
Sus scrofa Pig	10	2	12.5	95.550	1.593
Odocoileus virginianus White-tailed deer	3	2	12.5	79.455	1.349
Bos taurus Cow	67	4	25.0	2878.284	34.138
Caprinae Sheep and goat	10	1	6.3	157.317	2.495

		MNI			
Taxa	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Ovis aries	1	(1)		22.501	0.434
Sheep					
Vertebrata					
Indeterminate vertebrate					
Total	165	16		3906.599	49.825

Table 11-25. Heyward-Washington, John Milner Jr.: Summary Table.

	MNI		Biomass	
	#	**%**	**kg**	**%**
Fishes	1	6.3	0.181	0.4
Turtles	2	12.5	0.352	0.9
Wild birds	1	6.3	0.032	0.1
Domestic birds	1	6.3	0.084	0.2
Wild mammals	2	12.5	1.349	3.3
Domestic mammals	7	43.8	38.226	94.8
Commensal taxa	2	12.5	0.109	0.3
Total	16		40.333	

Table 11-26. Heyward-Washington, John Milner Jr.: Element Distribution.

	Pig	Deer	Cow	Caprinae/Sheep
Head	3		5	2
Vertebra/Rib	1		12	
Forequarter	1	2	13	5
Hindquarter	3	1	12	2
Forefoot			8	
Hindfoot	2		8	1
Foot			9	1
Total	10	3	67	11

Table 11-27. Heyward-Washington, John Milner Jr.: Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal	1		1
Radius, proximal			
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal	1		1
Metapodials, distal	1		1
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	3	0	3

Table 11-28. Heyward-Washington, John Milner Jr.: Epiphyseal Fusion for Deer (*Odocoileus virginianus*).

	Unfused	**Fused**	**Total**
Early Fusing:			
Humerus, distal	1	1	2
Scapula, distal			
Radius, proximal			
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal	1		1
Total	2	1	3

Table 11-29. Heyward-Washington, John Milner Jr.: Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal		2	2
Acetabulum			
Metapodials, proximal		2	2
1st/2nd phalanx, proximal	1	3	4
Middle Fusing:			
Tibia, distal		1	1
Calcaneus, proximal		1	1
Metapodials, distal		4	4
Late Fusing:			
Humerus, proximal	1		1
Radius, distal	6		6
Ulna, proximal	1		1
Ulna, distal			
Femur, proximal		1	1
Femur, distal			
Tibia, proximal	3	2	5
Total	12	16	28

Table 11-30. Heyward-Washington, John Milner Jr.: Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		1	1
Scapula, distal			
Radius, proximal		2	2
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal		1	1
Middle Fusing:			
Tibia, distal		1	1
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal	1		1
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	1	5	6

Table 11-31. Heyward-Washington, John Milner Jr.: Modifications.

Taxon	Hacked	Sawed	Clean Cut	Cut	Burned	Calcined	Carnivore gnawed
Diamondback terrapin				1			1
Indeterminate mammal	4	2		1			
Deer	2			2			
Cow	21			5			1
Caprinae/sheep	1			3			
Total	28	2	0	12	0	0	2

Table 11-32. Influence of Screen-Size on MNI Percentages.								
1/4-in mesh (2006)	1730-1740	1730-1740	1740-1750	1740-1750	1750-1820	1750-1820	late 1800s	late 1800s
Fishes	2	12.5	9	26.5	8	17.4	9	25.7
Turtles	2	12.5	3	8.8	3	6.5	2	5.7
Wild birds	2	12.5	3	8.8	5	10.9	4	11.4
Domestic birds	1	6.3	3	8.8	5	10.9	7	20.0
Wild mammals	1	6.3	4	11.8	2	4.3	1	2.9
Domestic mammals	7	43.8	7	20.6	9	19.6	7	20.0
Commensal Taxa	1	6.3	5	14.7	14	30.4	5	14.3
Total MNI	16		34		46		35	
1/2-in mesh (2022)	Ellicott	Ellicott	Milner Sr.	Milner Sr.	Milner Jr.	Milner Jr.		
Fishes	1	4.5	6	14.6	1	6.3		
Turtles	3	13.6	3	7.3	2	12.5		
Wild birds	3	13.6	6	14.6	1	6.3		
Domestic birds	2	9.1	4	9.8	1	6.3		
Wild mammals	2	9.1	2	4.9	2	12.5		
Domestic mammals	10	45.5	17	41.5	7	43.8		
Commensal Taxa	1	4.5	3	7.3	2	12.5		
Total MNI	22		41		16			
1/4-in mesh (2006)	1730-1740	1730-1740	1740-1750	1740-1750	1750-1820	1750-1820	late 1800s	late 1800s
Wild, non-commensal	7	46.7	19	65.5	18	56.3	16	53.3
Domestic non-commensal	8	53.3	10	34.5	14	43.8	14	46.7
Total MNI	15		29		32		30	
1/2-in mesh (2022)	Ellicott	Ellicott	Milner Sr.	Milner Sr.	Milner Jr.	Milner Jr.		
Wild, non-commensal	9	42.9	17	44.7	6	42.9		
Domestic non-commensal	12	57.1	21	55.3	8	57.1		
Total MNI	21		38		14			

Table 11-33. Summary of Commensal Animals in the City.											
Site	Rodents	Dogs	Cats	Equids	Birds	Snakes	Frogs/toads	Total Commensal MNI	Total MNI/per Site	MNI%	Status
1710-50s											
Beef Market	1	-	-	-	-	-	-	1	11	9.1	Public
Beef Market		-	1	-	1	-	-	2	36	5.6	Public
Dock Street Theatre	1	-	2	-	1	-	1	5	51	9.8	Public
1st Trident	1	-	-	-	1	-	-	2	15	13.3	Lower
Heyward-Washington House	1	-	-	-	-	-	-	1	16	6.3	Upper
Heyward-Washington House	3	1	1	-		-	-	5	34	14.7	Upper
McCrady's Tavern	-	-	-	-	-	-	-	0	5	0.0	Public
Post Office (McKenzie House)	4	2		-		-	-	6	59	10.2	Upper
Powder Magazine	2	-	-	-	-	-	-	2	30	6.7	Public
Rutledge House	1	-	-	-	1	-	-	2	9	22.2	Upper
South Adgers Wharf	7	-	-	-	-	-	-	7	30	23.3	Public
1710-50s MNI Total	21	3	4	-	4	-	1	33	296		
1710-50s Percentages	7.1	1.0	1.4	-	1.4	-	0.3	11.1	100.0		
1750-1820											
Atlantic Wharf	22	-	1		1	-	-	24	65	36.9	Public
Beef Market	3	1			1	-	-	5	42	11.9	Public
Brewton (Brewton House)	1	-	-	-	-	-	1	2	39	5.1	Upper
Exchange	-	-	-	-	-	-	-	-	5	-	Public
1st Trident	1	-	-	-	-	-	-	1	27	3.7	Modest
Heyward-Washington House	10	2	1	1	-	-	-	14	46	30.4	Upper
Lodge Alley	2	-	-	-	-	-	-	2	30	6.7	Public
McCrady's Tavern & Longroom	2	-	-	-	-	-	-	2	30	6.7	Public
Powder Magazine	5	-	-	-	-	-	-	5	41	12.2	Public
pre-Russell (Russell House)	2	-	1	-	-	-	-	3	31	9.7	Modest
Rutledge House	1	-		-	-	-	-	1	33	3.0	Upper
South Adgers Wharf	5	1	3	-	-	-	-	9	77	11.7	Public
14 Legare Street	11	1		-	1	-	3	16	140	11.4	Upper
1750-1820 MNI Total	65	5	6	1	3	-	4	84	606		
1750-1820 Percentages	10.7	0.8	1.0	0.2	0.5	-	0.7	13.9			

Site	Rodents	Dogs	Cats	Equids	Birds	Snakes	Frogs/toads	Total Commensal MNI	Total MNI/per Site	MNI%	Status
1820-50											
Aiken-Rhett House								0	4	0.0	Upper
Aiken-Rhett House	4	-	-	-	-	-	2	6	29	20.7	Upper
Beef Market	1	1	-	-	-	-	-	2	21	9.5	Public
Charleston Place	23	1	6	6	-	1	4	41	289	14.2	Modest
Exchange	4	-	1	-	-	-	-	5	16	31.3	Public
1st Trident	9	-	-	-	2	-	1	12	76	15.8	Modest
Gibbes House	2	-	-	-	-	-	-	2	27	7.4	Upper
Lodge Alley	1	-	-	-	1	-	-	2	14	14.3	Public
McCrady's Tavern	-	-	-	-	-	-	-	0	8	0.0	Public
Motte-Allston (Brewton House)	6	1	1	-	1	-	4	13	62	21.0	Upper
Powder Magazine	3	-	-	1	-	-	-	4	27	14.8	Public
President Street	-	1	-	-	-	-	-	1	6	16.7	Modest
Russell House	2	-	-	-	-	-	1	3	65	4.6	Upper
Rutledge House	1	-	1	-	-	-	-	2	11	18.2	Upper
14 Legare Street	7	-	2	1	-	-	1	11	99	11.1	Upper
72 Anson Street	1	-	-	-	-	-	-	1	6	16.7	Modest
1820-50 MNI Total	64	4	11	8	4	1	13	105	760		
1820-50 Percentages	8.4	0.5	1.4	1.1	0.5	0.1	1.7	13.8	100.0		
1850-1900											
Aiken-Rhett House	2	-	1	-	1	-	1	5	48	10.4	Upper
Aiken-Rhett House	-	-	-	-	-	-	-	-	6	-	Upper
Allston (Russell House)	2	-	1	-	-	-	-	3	17	17.6	Upper
Exchange	1	-	-	-	-	-	-	1	6	16.7	Public
Heyward-Washington House	4	-	1	-	-	-	-	5	35	14.3	Upper
Powder Magazine	2	-	-	1	-	-	-	3	22	13.6	Public
President Street	-	-	-	-	-	-	-	-	11	-	Modest
Pringle-Frost (Brewton House)	13	1	3	1	1	-	1	20	80	25.0	Upper
Sisters of Charity (Russell House)	1	-	-	-	-	-	-	1	11	9.1	Public
Visitors Reception & Transportation	7	1	1	-	1	-	-	10	46	21.7	Modest
14 Legare Street	3	1	1	1	1		1	8	32	25.0	Upper
40 Society Street	1	-	-	-	-	-	-	1	14	7.1	Modest
66 Society Street	-	1	-	-	-	-	-	1	19	5.3	Modest
70 Nassau Street	44	5	7	-	-	-	-	56	153	36.6	Modest
72 Anson Street	2	-	-	-	-	-	-	2	9	22.2	Modest
1850-1900 MNI Total	82	9	15	3	4	-	3	116	509		
1850-1900 Percentages	16.1	1.8	2.9	0.6	0.8	-	0.6	22.8	100.0		

Note : This table does not include the new Heyward-Washington data.

Appendix 11-A. Heyward-Washington: List of Samples Studied.				
Bag #	**Context**	**Occupant**	**Notes**	**CAIS Isotope #**
49700	Feature 65	Milner, Sr., 1730-1749	Square, wood-lined well	
49704	Feature 65D	Milner, Sr., 1730-1749	Square, wood-lined well	
49705	Feature 65E	Milner, Sr., 1730-1749	Square, wood-lined well	UAB-16, 33801, 33802, 33803
49722	Feature 89	Milner, Sr., 1730-1749	Barrel well, horn cores	
49723	Feature 131a	Milner, Sr., 1730-1749	Barrel well, horn cores	
49725	Feature 183	Milner, Sr., 1730-1749		UAB-17
49757	B6/5	Milner, Jr., 1749-1768		UC-18
49763	E5/9	Ellicott, 1694-1720s		
49766	B5/8	Ellicott, 1694-1720s		UBC-19, UBC-20
49772	B16/Feature 166a	Milner, Sr., 1730-1749	Manzano study 1671-1728	
49775	A22/Feature 136	Milner, Sr., 1730-1749		
49787	E4/8	Ellicott, 1694-1720s		
50916	B13/4	Milner, Jr., 1749-1768		UC-21
50926	A20/Feature 136	Milner, Jr., 1749-1768		
50930	Feature 150	Milner, Sr., 1730-1749		
50943	E2/8	Ellicott, 1694-1720s		
50945	A6/8	Ellicott, 1694-1720s		
50946	A12/7	Milner, Jr., 1749-1768		UBC-22
50965	A12/3b	Milner, Jr., 1749-1768		UE-23
50970	E3/9	Ellicott, 1694-1720s		
50996	B2/7	Milner, Jr., 1749-1768		UBC-24
51008	A13/8	Ellicott, 1694-1720s		
51009	A10/8	Ellicott, 1694-1720s		
51032	B2/6	Milner, Jr., 1749-1768		UBC-25
51040	A16/8	Ellicott, 1680s		
51041	A18/Feature 131b	Milner, Sr., 1730-1749	Barrel well, horn cores	
51043	Feature 136	Milner, Sr., 1730-1749		

Bag #	Context	Occupant	Notes	CAIS Isotope #
51052	E5/7a	Ellicott, 1694-1720s		
51053	E5/9	Ellicott, 1694-1720s		
51074	E4/Floor	Ellicott, 1694-1720s		
51076	Feature 136T	Milner, Sr., 1730-1749		
51082	Feature 136A	Milner, Sr., 1730-1749		
51126	A/8	Ellicott, 1680s		
51157	Feature 131	Milner, Sr., 1730-1749	Barrel well, horn cores	
51169	A19/7,8	Ellicott, 1694-1720s		
51170	A18/8	Ellicott, 1694-1720s		
51196	A23/8	Ellicott, 1694-1720s		
51199	A17/8	Ellicott, 1694-1720s		
51203	A15/8	Ellicott, 1694-1720s		
51245	B 15/8	Ellicott, 1694-1720s		
51261	A21/8	Ellicott, 1694-1720s		
51262	A7/8	Ellicott, 1694-1720s		
51280	A12/8	Ellicott, 1694-1720s		
51316	A5/8	Ellicott, 1694-1720s		
51318	A8/8	Ellicott, 1694-1720s		
51321	A2/9	Ellicott, 1694-1720s		
51324	A6/9	Ellicott, 1694-1720s		
51332	A1/8	Ellicott, 1694-1720s		
51348	A3/8	Ellicott, 1694-1720s		
51349	B20/F166	Milner, Sr., 1730-1749	Manzano study 1671-1728	
51373	Feature 199	Milner, Sr., 1730-1749		
51403	A14/8	Ellicott, 1694-1720s		
6/2/2022				

Appendix 11-B. Heyward-Washington: Measurements.																
Species	**Element**	**Side**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Context**	**Bag #**
Ellicott (1694-1720s)																
Anatidae	Ulna	Left	Did	10.44											A1/8	51332
Aythya sp.	Humerus	Left	Bp	19.39											A10/8	51009
Branta canadensis	Humerus	Left	Bd	21.96											A6/9	51324
Gallus gallus	Femur	Left	Dp	10.92	Bp	17.49									B5/8	49766
Gallus gallus	Scapula	Left	Dic	13.91											A5/8	51316
Gallus gallus	Tarsometatarsus	Left	Bp	12.5											A7/8	51262
Gallus gallus	Ulna	Right	SC	4.30	Did	10.86									A8/8	51318
Sus scrofa	1st Phalanx	Ind.	GLpe	39.06	Bp	18.39	SD	14.06	Bd	16.29					A10/8	51009
Sus scrofa	1st Phalanx	Ind.	SD	13.05	Bd	15.95									A19/7,8	51169
Sus scrofa	1st Phalanx	Ind.	Bd	13.91											A14/8	51403
Sus scrofa	3rd Metatarsus	Left	Bp	13.99											A6/8	50945
Sus scrofa	4th Metatarsus	Left	Bp	15.64											E3/9	50970
Sus scrofa	Astragalus	Right	Dm	26.01	Bd	25.84	GL1	41.97	GLm	38.08					A14/8	51403
Sus scrofa	Radius	Right	SD	14.29											A6/8	50945
Sus scrofa	Radius	Left	SD	13.68	CD	39.06									A14/8	51403
Sus scrofa	Scapula	Right	SLC	21.58											A16/8	51040
Sus scrofa	Tibia	Right	SD	11.17	CD	31.52									B5/8	49766
Sus scrofa	Tibia	Left	SD	17.13	CD	48.72									A10/8	51009
Odocoileus virginianus	1st Phalanx	Ind.	GL	35.43	Bp	11.40	SD	9.20	Bd	10.57					B5/8	49766
Odocoileus virginianus	Astragalus	Right	GL1	38.32	GLm	35.02	D1	21.30	Dm	20.63	Bd	23.17			A12/8	51280
Bos taurus	1st Phalanx	Ind.	SD	18.19											A6/8	50945
Bos taurus	1st Phalanx	Ind.	GLpe	66.76	Bp	35.57	SD	30.16	Bd	31.16					A19/7,8	51169
Bos taurus	1st Phalanx	Ind.	GLpe	63.66	SD	29.54	Bd	31.23							A6/9	51324
Bos taurus	1st Phalanx	Ind.	GLpe	58.96	Bp	29.05	SD	25.96	Bd	26.81					A3/8	51348
Bos taurus	1st Phalanx	Ind.	Bd	28.48											A5/8	51316
Bos taurus	2nd Phalanx	Ind.	SD	20.35											B5/8	49766
Bos taurus	2nd Phalanx	Ind.	SD	21.51	Bd	24.48									A2/9	51321
Bos taurus	2nd Phalanx	Ind.	GL	42.24	Bp	29.63	SD	22.78	Bd	24.47					A3/8	51348
Bos taurus	3rd Phalanx	Ind.	DLS	61.74	Ld	50.84	MBS	20.91							A21/8	51261
Bos taurus	3rd Phalanx	Ind.	DLS	69.74	Ld	49.05	MBS	22.98							A3/8	51348
Bos taurus	3rd Phalanx	Ind.	MBS	23.68											A7/8	51262
Bos taurus	Astragalus	Left	GLm	66.07											A16/8	51040
Bos taurus	Astragalus	Right	GLm	62.57											A5/8	51316
Bos taurus	Astragalus	Right	GL1	72.18	GLm	65.51	D1	39.50	Bd	49.72					E5/9	51053
Bos taurus	Cubonavicular	Right	GB	65.34											E5/7a	51052
Bos taurus	Femur	Left	DC	43.70											A19/7,8	51169
Bos taurus	Femur	Left	DC	46.23											A3/8	51348

Species	Element	Side	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Context	Bag #
Bos taurus	Humerus	Right	SD	26.39											B5/8	49766
Bos taurus	Humerus	Left	Dp	97.07											A6/8	50945
Bos taurus	Innominate	Right	LA	69.41											A3/8	51348
Bos taurus	Magnum	Right	GB	39.38											A6/8	50945
Bos taurus	Malleolaire	Left	GD	34.79											A8/8	51318
Bos taurus	Metatarsus	Left	Bp	55.14	Dp	51.93									E5/9	51053
Bos taurus	Metatarsus	Left	Bp	50.33	Dp	49.36									E5/9	51053
Bos taurus	Metatarsus	Right	Bp	51.11	Dp	50.07									A1/8	51332
Bos taurus	Patella	Left	GB	57.77											A/8	51126
Bos taurus	Scapula	Left	GLP	73.18	LG	56.16	BG	52.35							A23/8	51196
Bos taurus	Tibia	Left	Bp	92.86	unf										E4/Floor	51074
Bos taurus	Ulna	Right	BPC	47.59	SDO	51.11	DPA	68.50							A3/8	51348
Caprinae	1st Phalanx	Ind.	GLpe	34.52	Bp	12.48	SD	9.04	Bd	11.42					A8/8	51318
Caprinae	Calcaneus	Left	GL	59.92											A23/8	51196
Caprinae	Innominate	Right	LA	30.66											A7/8	51262
Caprinae	Metacarpus	Ind.	Bp	25.84	SD	13.79	CD	39.40	Dp	18.77	DD	10.03			A18/8	51170
Caprinae	Radius	Right	SD	18.29											A6/8	50945
Caprinae	Tibia	Left	Bp	55.36											A23/8	51196
Milner Sr. (1730-1749)																
Cynoscion spp.	Atlas		Width	17.58											F183	49725
Anas sp.	Coracoid	Left	GL	59.44	Lm	54.58	BF	22.11							F136A	51082
Anas sp.	Humerus	Right	SC	6.09	Bd	13.24									F131a	49723
Anas sp.	Ulna	Right	GL	92.40	Dip	14.24	Bp	11.81	SC	5.84	Did	12.33			F136T	51076
Colinus virginianus	Humerus	Left	Bp	9.24											F136T	51076
Gallus gallus	Femur	Left	GL	78.57	Lm	74.28	Bp	20.41	SC	8.41	Bd	20.08	Dd	16.32	F136T	51076
Gallus gallus	Femur	Left	Bd	14.20											F199	51373
Gallus gallus	Humerus	Right	Bd	16.8											A22/F136	49775
Gallus gallus	Humerus	Left	Bp	18.59											F65E	49705
Gallus gallus	Humerus	Right	SC	7.00	Bd	16.99									A22/F136	49775
Gallus gallus	Scapula	Right	Dic	12.75											F65	49700
Gallus gallus	Tarsometatarsus	Left	SC	5.41											F131a	49723
Gallus gallus	Tarsometatarsus	Left	SC	6.85											A18/F131b	51041
Gallus gallus	Tarsometatarsus	Left	Bd	15.71											F183	49725
Gallus gallus	Tarsometatarsus	Left	Bd	13.59											F183	49725
Gallus gallus	Tarsometatarsus	Right	Bd	14.47											F65E	49705
Gallus gallus	Tibiotarsus	Left	Bd	12.4											F199	51373
Gallus gallus	Tibiotarsus	Right	Bd	10.2	Dd	9.4									F65	49700
Gallus gallus	Ulna	Left	Did	10.41	SC	4.53									A22/F136	49775
Gallus gallus	Ulna	Left	GL	71.80	Bp	9.7	Did	9.0							A22/F136	49775
Meleagris gallopavo	Humerus	Right	Bp	32.55											F183	49725

Species	Element	Side	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Context	Bag #
Meleagris gallopavo	Tibiotarsus	Left	SC	10.79	Bd	18.06	Dd	19.26							F131a	49723
Corvus brachrhynchos	Humerus	Left	SC	5.34											F131a	49723
Procyon lotor	Tibia	Left	Bp	22.05											A18/F131b	51041
Felis domesticus	Radius	Right	SD	4.78											F65	49700
Sus scrofa	1st Phalanx	Ind.	SD	11.92	Bd	13.56									F65	49700
Sus scrofa	1st Phalanx	Ind.	SD	12.86	Bd	13.64									F65	49700
Sus scrofa	3rd Phalanx	Ind.	DLS	32.10	Ld	29.72	MBS	13.21							F65E	49705
Sus scrofa	4th Metatarsus	Right	B	13.57											F65E	49705
Sus scrofa	Humerus	Right	Bd	45.85											F131a	49723
Sus scrofa	Humerus	Left	SD	13.12											F150	50930
Sus scrofa	Innominate	Right	LA	30.79	LAR	25.97									F65	49700
Sus scrofa	Mandible	Left	9a	34.37											F65	49700
Sus scrofa	Radius	Right	SD	21.45											F131a	49723
Sus scrofa	Ulna	Right	BPC	25.39											F131a	49723
Odocoileus virginianus	1st Phalanx	Ind.	Bd	12.10	SD	10.32									F131a	49723
Bos taurus	1st Phalanx	Ind.	Bd	30.85											F89	49722
Bos taurus	1st Phalanx	Ind.	GLpe	57.46	Bp	28.61	SD	24.56	Bd	27.73					F65	49700
Bos taurus	1st Phalanx	Ind.	GLpe	64.70	Bp	34.26	SD	30.39	Bd	33.52					F131a	49723
Bos taurus	1st Phalanx	Ind.	GLpe	61.06	Bp	30.90	SD	24.10	Bd	27.70					F131a	49723
Bos taurus	1st Phalanx	Ind.	GLpe	60.57	Bp	31.71	SD	26.50	Bd	30.24					F150	50930
Bos taurus	1st Phalanx	Ind.	GLpe	64.81	SD	29.45	Bd	31.55							F136T	51076
Bos taurus	2nd Phalanx	Ind.	SD	18.43											F65E	49705
Bos taurus	2nd Phalanx	Ind.	SD	27.05	Bd	29.69									F136A	51082
Bos taurus	2nd Phalanx	Ind.	GL	43.94	Bp	32.15	SD	25.59	Bd	28.29					F65	49700
Bos taurus	2nd Phalanx	Ind.	GL	40.40	Bp	32.24	SD	25.83	Bd	28.88					F65	49700
Bos taurus	2nd Phalanx	Ind.	GL	41.92	Bp	32.41	SD	24.65	Bd	26.09					F65	49700
Bos taurus	2nd Phalanx	Ind.	Bp	29.89											F136T	51076
Bos taurus	3rd Phalanx	Ind.	DLS	63.80	Ld	49.58	MBS	24.04							F65	49700
Bos taurus	3rd Phalanx	Ind.	DLS	64.84	Ld	51.60	MBS	23.41							F89	49722
Bos taurus	3rd Phalanx	Ind.	MBS	24.49											A18/F131b	51041
Bos taurus	3rd Phalanx	Ind.	MBS	29.44											F136A	51082
Bos taurus	3rd Phalanx	Ind.	Ld	52.19	MBS	23.83									F65	49700
Bos taurus	Calcaneus	Left	GL	135.78	GB	52.33	unf								B16/F166a	49772
Bos taurus	Calcaneus	Left	GL	148.70	GB	51.51	unf								F65	49700
Bos taurus	Calcaneus	Right	GL	149.01	GB	58.03	unf								F89	49722
Bos taurus	Calcaneus	Right	GL	152.26	fused										F131a	49723
Bos taurus	Calcaneus	Right	GL	152.43	GB	56.23	fused								F136T	51076
Bos taurus	Calcaneus	Right	GB	53.98	fused										A18/F131b	51041
Bos taurus	Cubonavicular	Right	GB	60.04											F65D	49704
Bos taurus	Cubonavicular	Left	GB	62.22											F131a	49723

Species	Element	Side	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Dim.	mm	Context	Bag #
Bos taurus	Cubonavicular	Right	GB	57.50											F150	50930
Bos taurus	Femur	Left	DC	49.99											F65E	49705
Bos taurus	Femur	Left	Bd	102.6											F131a	42923
Bos taurus	Humerus	Left	Bd	86.58											F131a	49723
Bos taurus	Humerus	Right	Bd	86.8											B20/F166	51349
Bos taurus	Humerus	Left	BT	78.63											F65E	49705
Bos taurus	Humerus	Left	BT	82.39	Bd	90.82									F131a	49723
Bos taurus	Humerus	Right	BT	80.97	Bd	94.01									F131a	49723
Bos taurus	Innominate	Right	LA	79.18											F131a	49723
Bos taurus	Innominate	Right	LA	84.57											F131a	49723
Bos taurus	Magnum	Left	GB	37.47											F65	49700
Bos taurus	Magnum	Left	GB	37.13											F136T	51076
Bos taurus	Malleolaire	Right	GD	37.16											F65D	49704
Bos taurus	Metacarpus	Right	SD	36.63	CD	105.76									F65E	49705
Bos taurus	Metacarpus	Right	Bp	60.7											F65E	49705
Bos taurus	Patella	Right	GB	62.91											F65D	49704
Bos taurus	Radius	Left	BFd	60.16											F65	49700
Bos taurus	Radius	Right	BFp	70.50	Bp	75.99									F65	49700
Bos taurus	Radius	Right	BFp	68.51	Bp	74.98									F65	49700
Bos taurus	Scapula	Right	GLP	74.13	LG	65.56	BG	53.63							F65	49700
Bos taurus	Scapula	Right	GLP	71.79	BG	54.35									F131a	49723
Bos taurus	Scapula	Right	SLC	64.38											F65D	49704
Bos taurus	Tibia	Right	SD	43.55	CD	122.54									F65D	49704
Bos taurus	Tibia	Left	Bp	108.44											F131a	49723
Bos taurus	Tibia	Right	Bp	106.08											F131a	49723
Bos taurus	Tibia	Right	Bd	68.4											B20/F166	51349
Bos taurus	Ulna	Right	BPC	44.84	DPA	56.98									F65	49700
Caprinae	Humerus	Left	Bd	34.41	SD	16.48	BT	32.28							F150	50930
Caprinae	Metatarsus	Left	Bp	20.12											F150	50930
Caprinae	Metatarsus	Ind.	SD	14.59	CD	41.17									F136T	51076
Caprinae	Scapula	Right	GLP	31.12	SLC	18.62	BG	18.19	LG	23.54					F65E	49705
Caprinae	Scapula	Left	SLC	17.11											F136T	51076
Milner Jr. (1749-1769)																
Gallus gallus	Femur	Right	Dp	12.90	Bp	21.60	Bd	19.9	Dd	15.6					A12/7	50946
Felis domesticus	Humerus	Right	SD	6.53	Bd	16.63									B2/6	51032
Rattus cf. *norvegicus*	Femur	Left	Bp	9.01	DC	4.21									B6/5	49757
Sus scrofa	2nd Metatarsus	Left	B	4.79	Bd	4.36									B2/6	51032
Sus scrofa	Scapula	Right	SLC	19.28											A12/7	50946
Sus scrofa	Tibia	Right	SD	19.66	CD	57.05									A12/7	50946
Odocoileus virginianus	Humerus	Left	SD	16.20											B13/4	50916

Species	**Element**	**Side**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Dim.**	**mm**	**Context**	**Bag #**
Bos taurus	1st Phalanx	Ind.	GLpe	57.68	Bp	29.11	SD	26.17	Bd	27.12					B13/4	50916
Bos taurus	1st Phalanx	Ind.	GLpe	65.35	Bp	31.87	SD	27.29	Bd	30.28					A12/3b	50965
Bos taurus	1st Phalanx	Ind.	GLpe	59.90	Bp	28.14	SD	23.17							B2/6	51032
Bos taurus	1st Phalanx	Ind.	SD	18.80	Bd	20.96									B2/6	51032
Bos taurus	2nd Phalanx	Ind.	Bp	33.87	SD	26.27	Bd	29.34	GL	48.12					B6/5	49757
Bos taurus	2nd Phalanx	Ind.	SD	25.27	Bd	27.77									B6/5	49757
Bos taurus	2nd Phalanx	Ind.	GL	40.95	Bp	31.05	Bd	24.10							A12/3b	50965
Bos taurus	2nd Phalanx	Ind.	Bp	28.98	GL	40.81	SD	23.06	Bd	24.30					B2/7	50996
Bos taurus	Astragalus	Left	GL1	70.50	GLm	65.71	D1	40.66	Dm	41.14	Bd	47.61			B13/4	50916
Bos taurus	Astragalus	Left	GL1	72.85	GLm	65.31	D1	39.45	Bd	50.21					B13/4	50916
Bos taurus	Calcaneus	Right	GL	135.06	GB	45.88	unf								B6/5	49757
Bos taurus	Cubonavicular	Right	GB	58.63											A12/7	50946
Bos taurus	Cubonavicular	Right	GB	54.50											A12/7	50946
Bos taurus	Malleolaire	Left	GD	40.65											B2/7	50996
Bos taurus	Metacarpus	Ind.	Bd	59.95											A12/3b	50965
Bos taurus	Metacarpus	Left	Bp	62.2											B6/5	49757
Bos taurus	Metatarsus	Left	Bp	51.17	Dp	50.89									B6/5	49757
Bos taurus	Metatarsus	Ind.	Bd	61.82											B13/4	50916
Bos taurus	Radius	Left	BFd	77.34	unf										B6/5	49757
Bos taurus	Radius	Left	BFp	79.84	Bp	86.25									B13/4	50916
Bos taurus	Radius	Left	BFd	83.76											B13/4	50916
Bos taurus	Radius	Right	BFd	73.79	unf										A12/7	50946
Bos taurus	Radius	Right	BFd	75.48	unf										B2/7	50996
Bos taurus	Radius	Right	BFd	67.65	unf										B2/7	50996
Bos taurus	Tibia	Left	Bp	105.13											B13/4	50916
Bos taurus	Tibia	Left	Bp	95.16	unf										B13/4	50916
Caprinae	2nd Phalanx	Ind.	GL	23.88	Bp	12.09	SD	8.72	Bd	9.27					A12/3b	50965
Caprinae	Humerus	Left	Bd	27.49	BT	26.64									B13/4	50916
Caprinae	Radius	Right	BFp	28.28	Bp	31.41									B6/5	49757
Caprinae	Radius	Left	Bp	25.86	BFp	28.20	SD	15.26							A12/3b	50965
Caprinae	Scapula	Left	SLC	26.54											B6/5	49757
Caprinae	Scapula	Right	SLC	29.24											A12/7	50946
Caprinae	Tibia	Right	SD	15.15	CD	42.95	Bd	29.32	Dd	22.58					B13/4	50916

Note : Measurements follow Driesch (1976). f=fused; unf=unfused

Chapter XII
Zooarchaeological Analysis of the Musgrove Cowpen

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Introduction

The Mary Musgrove Cowpens (9Ch137) is located outside Savannah, Georgia, on a section of land alongside the Savannah River referred to as Yamacraw Bluff. Mary Musgrove was a central figure in the early years of the Georgia colony, playing an essential role in supplying Charleston with deerskin and cattle. This project seeks to understand the changing subsistence and economic strategies undertaken at this rural outpost in the Carolina Lowcountry. This research completes analysis of faunal remains from the Musgrove Cowpens with the goal of further elucidating the role of Carolina Lowcountry cowpens and trading posts in the eighteenth-century colonial economy. Cowpens and trading posts are not well understood from the archaeological record, and the robust faunal assemblages from Musgrove offers an unparalleled perspective into early eighteenth-century subsistence and economic activities. The faunal collections discussed below include the 2008 analysis of Features 7 and 231 (Orr et al. 2008) and the 2020-2022 study of Feature 231 funded through the National Science Foundation (NSF Award #1920863). The 2020-2022 study completes analysis of Feature 231 from the Musgrove Cowpens (9Ch137). All three assemblages are presented together here to provide a more complete summary of the vertebrate faunal record from this colonial outpost.

Site Background

The Musgrove Cowpens was established on the Georgian ‘frontier’ by Mary Musgrove (born Coosaponakeesa) and her first husband, John Musgrove, in 1732 (Figure 12-1). Established on the Yamacraw Bluff along the Savannah River, the trading post and cowpen likely operated as a trading house and Mary’s residence between 1732-1738 and 1742-1746 (Orr and Lucas 2008:4). The property was renamed Grange Plantation in 1744 following Mary’s marriage to Thomas Bosomworth and was later sold to William Francis in 1750 (Braley 2013; Hahn 2012). Additional historical background for the site is provided in Chapter IV.

The site was excavated in 2002-2003 by Chad O. Braley, Southeastern Archeological Services, Inc, under contract with the Georgia Ports Authority. Vertebrate remains were recovered from two contemporaneous contexts, Features 7 and 231, using ¼-in-mesh screens (Figure 12-2; Braley 2013). The two contexts were determined to be roughly contemporaneous based upon cross-mending ceramic sherds found in both features. Feature 7 was a rectangular pit (6.2-x-3.8 m) interpreted as a cellar with a mean ceramic date of 1741 (Braley 2013:108). Feature 231 was a 5-m^2 cellar with a mean ceramic date of 1740 (Braley 2013:116-121, 240). Feature 231 was probably the cellar of a house built in 1734 and filled by 1763. Feature 231 is interpreted as the trading house built by John and Mary in 1734, abandoned following Jacob Mathew’s construction of a new house there in 1742 (Braley 2013:119). A mean ceramic date of 1740.5 places the fill of Feature 231 primarily in the 1740s and 1750s. This result indicates that a large portion of the faunal material was deposited during the later period of Mary’s occupation and part of William Francis’s occupation of Grange Plantation (Braley 2013:121). It is possible that the earliest levels of Feature 231 predate 1742. The contents of Feature 231 are clearly different from those of Feature 7, however. Feature 7 contained cream pans and storage jars.

Feature 231 was filled with bottle glass, tobacco pipe fragments, firearm equipment and a large number of modified antler fragments believed to be used as part of decoy headdresses (Braley 2013:105, 122; Orr et al. 2008; Pavão-Zuckerman et al. 2019). The recovery of both dairy pans and deer antler decoys (stalking heads) testifies to the complex cultural environment at the Cowpens.

Materials and Methods

Vertebrate remains from Feature 7 and a portion of Feature 231 (2008) were studied following standard zooarchaeological methods using the comparative skeletal collection at the Zooarchaeology Laboratory, Georgia Museum of Natural History, University of Georgia (Orr and Lucas 2007; Orr et al. 2008). The remaining unstudied materials from Feature 231 (2022) were identified and analyzed between 2020 and 2022 by C. Cameron Walker using the comparative skeletal collections at the University of Maryland's Zooarchaeological Laboratory and the Zooarchaeology Laboratory, Georgia Museum of Natural History, University of Georgia. All materials studied at the University of Georgia and the University of Maryland were analyzed using the same standard zooarchaeological methods described in Appendix III, with minor differences described below.

Deer-Cattle Ratios and Spatial Analysis

In addition to the standard quantitative indices (NISP, MNI, Biomass) described in Appendix III, analysis of the Feature 231 (2022) faunal material includes a "Deer-Cattle Index" to estimate the proportion of deer (*Odocoileus virginianus*) versus cattle (*Bos taurus*) among depositional levels and to highlight changes in the relative representation of deer versus cattle over time.

$$Deer - Cattle\ Index = \frac{N(Deer)}{N(Cattle) + \ N(Deer)}$$

A Deer-Cattle Index value of 0.0 indicates a lack of deer, 0.5 demonstrates an equal representation of deer and cattle, and 1.0 shows a lack of cattle. Along with other spatial data, this index may reveal shifts in economic strategy from engagement with the deerskin trade to engagement with the cattle industry. The Deer-Cattle Index eventually will be estimated for the Musgrove materials from Feature 7 and Feature 231 (2008) reported by Orr et al. (2008).

Spatial data provided with Lot Numbers (LN) assigned during the original excavation were used to produce sub-samples for deriving the Deer-Cattle indices. These spatial data need further refinement given irregularities in the contextual information available at this time. Zooarchaeologists should understand all excavation methodologies and provenience controls before aggregating their sample into further subsamples (Reitz and Wing 2008:208-209). Levels based on natural stratigraphy linked to cultural activity should be used rather than arbitrary levels based on excavation logistics. Feature 231 was excavated in two separate phases. Phase one involved a one-meter-wide trench on the east-west axis that removed fill in 10-cm arbitrary levels, followed by a one-meter-wide trench on the north-south axis excavated in 10-cm arbitrary levels (Braley 2013:116). Phase two involved the excavation of 2-x-2-m units, with vertical control maintained by natural stratigraphy (Braley 2013:116).

The faunal material in the Feature 231 (2022) collection came with corresponding context information, including the context's LN, the unit coordinates, and the corresponding excavation level to the LN. Each LN analyzed in the Feature 231 (2022) collection has unit coordinates that follow 2-x-2-m coordinate information. Unless more information can be gleaned from reading further, the assumption is that contexts in the Feature 231 (2022) collection are from levels defined by natural stratigraphy.

No horizon letters are included with the context information. Instead, there is a number from 1 to 6. There are six such vertical levels, with one being the highest and latest context and six being the lowest and earliest context. The levels had the following number of LNs: Level 1 had four, Level 2 had seven, Level 3 had twelve, Level 4 had six, Level 5 had six, and Level 6 had five. The Deer-Cattle indices exclude data from six Feature 231 (2022) analyzed LNs because either they are grab samples (two LNs) or their associated level is unknown (four LNs). Most of the faunal material accumulated when Feature 231 (a cellar feature) was filled following the construction of a new main residence. It is possible that earlier contexts are included in the Feature 231 material, and the final (uppermost) level contains material from William Francis' occupation.

Interpreting the Deer-Cattle Index should be done with caution. Future work is needed to clarify the contextual information for the assigned levels and to incorporate data previously studied from Feature 231 (2008). It should also be kept in mind that hides likely were processed away from these structures and many cattle were driven to market in Charleston or Savannah. Both of these activities would alter the representation of these animals in the Musgrove archaeological record.

Results

Feature 7 (2008)

A total of 30,465 specimens weighing 74,169.62 g were identified in the 2008 study of Feature 7, with a minimum of 86 individuals from 29 taxa (Table 12-1). Cattle and deer dominate the collection when measured by NISP and biomass. Cattle contribute 48% of the NISP and deer 24%, with these NISP percentages calculated only from the taxa informing the summary table (Table 12-2). Domestic mammals contribute 78% of the biomass and deer 18% (Table 12-2). Cattle contribute the largest percentage of domestic mammal biomass (97%). When considering NISP and biomass, all other observed categories of animals are less prevalent than deer and cattle. However, wild animals other than deer (including wild mammals, wild birds, fish, and reptiles) comprise 53% of the individuals. When also factoring in deer, wild animals comprise 72% of the individuals. Domestic mammals other than cattle only represent 5% of the individuals. Chickens (*Gallus gallus*) are the only domestic birds in this collection, representing 5% of the individuals and less than 1% of the biomass.

A total of 93 pig (*Sus scrofa*) specimens were identified in the Feature 7 collection (Figure 12-3; Table 12-3). The pig skeletal distribution indicates an unequal representation of the carcass. The highest number of pig specimens are from the head (NISP = 72), most of which are teeth or tooth fragments. A limited number of pig specimens are from the meaty portions of the carcass, including ten forequarter and six hindquarter specimens.

A total of 442 deer specimens were identified in the Feature 7 collection (Figure 12-4; Table 12-3). The deer skeletal distribution indicates that meaty and non-meaty portions of the carcass are present in this collection. The highest number of specimens are from the head (NISP = 107), most of which are teeth or tooth fragments. Specimens from the forequarter (NISP = 87) and hindquarter (NISP = 107) also show an abundance of meaty portions of the carcass. Log difference scaling indicates that forequarter, hindquarter, and hindfoot specimens are overrepresented compared to a standard deer skeleton (Figure 12-5).

A total of 872 cattle specimens were identified in the Feature 7 collection (Figure 12-6; Table 12-3). The cattle skeletal distribution indicates that meaty and non-meaty portions of the carcass are present, although non-meaty portions are far more prevalent. The highest number of specimens are from the head (NISP = 387). Most are teeth or tooth fragments. Foot specimens (NISP = 308) are the second most prevalent portion of the cattle carcass. Numerous specimens are identified from the valued portions of the carcass, which include the hindquarter (NISP = 65) and forequarter (NISP = 47). However, log difference scaling indicates this collection's element distribution pattern does not drastically diverge from that of a standard cattle skeleton (Figure 12-7).

The small NISP (9) for sheep/goat (Caprinae) specimens precludes an analysis of skeletal portion recovery (Figure 12-8; Table 12-3).

Epiphyseal fusion data are available for eight pig specimens in the Feature 7 collection (Table 12-4). In combination with tooth eruption sequences, these data provide evidence for at least one adult and one sub-adult individual; the remaining individual is of indeterminate age. Several early-fusing specimens are identified; however, all these specimens are fused, thus providing limited evidence for the age of these individuals. One middle-fusing specimen, an unfused proximal calcaneus, provides evidence for at least one sub-adult individual. In pigs, the proximal calcaneus fuses between 24-30 months of age (Reitz and Wing 2008:72). Two late-fusing elements are present in the Feature 7 collection, including an unfused distal radius and a fused proximal ulna. In pigs, fusion of the distal radius occurs by 42 months of age and the proximal ulna fuses between 36-42 months (Reitz and Wing 2008:72). The unfused distal radius is difficult to interpret because it could have come from an individual at any age younger than 42 months. The fused proximal ulna indicates the presence of at least one adult individual in the Feature 7 collection. Tooth eruption data, specifically the presence of erupted upper and lower third molars, also provide evidence of at least one adult individual.

Epiphyseal fusion data are available for 171 deer specimens in the Feature 7 collection (Table 5). Together with tooth eruption sequences, these data provide evidence for at least one juvenile, six adults, and seven sub-adult individuals; the remaining two deer individuals are of indeterminate age. Several early-fusing specimens are identified; however, most of these specimens are fused, thus providing limited evidence for the age of these individuals. A singular unfused distal humerus provides evidence for at least one juvenile individual. In deer, the distal humerus fuses between 12-20 months of age (Reitz and Wing 2008:72). One lower deciduous fourth premolar also provides evidence for a juvenile individual. Several unfused middle-fusing specimens provide evidence for sub-adult or juvenile individuals in the Feature 7 collection. In deer, the distal tibia fuses between 20-23 months of age and the proximal calcaneus fuses between 26-29 months (Reitz and Wing 2008:72). Thus, these specimens come from sub-adult or juvenile individuals younger than the specified age ranges. Most late-fusing elements fuse between 26-42 months of age in deer, though the specific age at which fusion occurs varies for each element (Reitz and Wing 2008:72). Tooth eruption data, specifically the presence of several erupted third molars, also provide evidence for adult individuals.

Epiphyseal fusion data are available for 209 cattle specimens in the Feature 7 collection (Table 12-6). Together with tooth eruption sequences, these data provide evidence for at least one juvenile, four adults, and seven sub-adult individuals. Several early-fusing specimens are identified; however, most of these specimens are fused, thus providing limited evidence for the age of these individuals. Unfused early-fusing specimens include two distal humerii, two acetabula, and three phalanges. In cattle, the distal humerus fuses between 12-18 months, the acetabulum fuses between 6-10 months, and phalanges fuse between 18-24 months of age (Reitz and Wing 2008:72). One upper deciduous fourth premolar also provides evidence for a juvenile individual. Several unfused specimens in the middle-fusing category provide evidence of sub-adult or juvenile individuals. In cattle, the distal tibia fuses between 24-30 months of age, the proximal calcaneus fuses between 26-29 months, and distal metapodials fuse between 24-36 months (Reitz and Wing 2008:72). Thus, these individuals are sub-adults or juveniles younger than the specified age ranges. Several fused specimens from the late-fusing category provide evidence for adult cattle in the Feature 7 collection. In cattle, most late-fusing specimens fuse between 42-48 months of age (Reitz and Wing 2008:72). Tooth eruption data, specifically the presence of several erupted third molars, also provide evidence for adult individuals.

Epiphyseal fusion data are available for two sheep/goat specimens in the Feature 7 collection (Table 12-7). Although both specimens provide indeterminate evidence for the age of the sheep/goat individual in this collection, one of the individuals was at least a sub-adult when it died.

The most common modifications in the Feature 7 collection are the result of burning (NISP = 8,926) and calcination (NISP = 1,256) (Table 12-8). Most of the burned and calcined specimens are indeterminate mammal (Mammalia) remains. Hacking (NISP = 594) and cutting (NISP = 188) are also common modifications in the Feature 7 collection. Although most of these specimens are identified as indeterminate mammal, numerous deer and cattle specimens are modified by either hacking or cutting.

Diversity and equitability estimates based on MNI and biomass reflect the wide range of animals discarded in the feature, but the dominance of large-bodied deer and cattle. MNI diversity (H’ = 2.755) and equitability (V’ = 0.817) indices indicate that Feature 7 is relatively diverse with an even distribution of taxa. Biomass-derived indices, on the other hand, reflects the focus on just a few sources of meat (H’ = 0.771) and equitability (V’ = 0.229).

Feature 231 (2008)

A total of 15,320 specimens weighing 54,921.24 g were identified in the 2008 study of Feature 231 (2008), with a minimum of 138 individuals from 41 taxa (Table 12-9). Cattle and deer dominate the collection when measured by NISP and biomass. Cattle are the most abundant species according to NISP (30%) compared to deer (25%), with these NISP percentages calculated only from the taxa informing the summary table (Table 12-10). Cattle dominate biomass estimated for the collection (58%) compared to deer biomass (36%; Table 12-10). Cattle contribute 94% of the domestic mammal biomass. When considering NISP and biomass, all other observed categories of animals are less prevalent than deer and cattle. However, wild animals other than deer (including wild mammals, wild birds, fish, and reptiles) comprise 53% of the individuals. When also factoring in deer, wild animals comprise 74% of the individuals. Domestic mammals other than cattle only represent 7% of the individuals. Chickens are the only domestic birds in this collection, representing 6% of the individuals and less than 1% of the biomass.

A total of 106 pig specimens were identified in the Feature 231 (2008) collection (Figure 12-9; Table 12-11). The pig skeletal distribution indicates an unequal representation of the carcass. The highest number of specimens are from the head (NISP = 81), most of which are teeth or tooth fragments. A limited number of specimens come from the valued portions of the carcass, including nine forequarter and seven hindquarter specimens.

A total of 725 deer specimens were identified in the Feature 231 (2008) collection (Figure 12-10; Table 12-11). The deer skeletal distribution indicates that meaty and non-meaty portions of the carcass are heavily present in this collection. The highest number of specimens are from the head (NISP = 261), most of which are teeth or tooth fragments. Specimens from the forequarter (NISP = 103) and hindquarter (NISP = 158) also show an abundance of meaty portions of the carcass. Log difference scaling indicates that the forequarter, hindquarter, and hindfoot specimens are overrepresented compared to a standard deer skeleton (Figure 12-5).

A total of 857 cattle specimens were identified in the Feature 231 (2008) collection (Figure 12-11; Table 12-11). The cattle skeletal distribution indicates that meaty and non-meaty portions of the carcass are present in this collection, although non-meaty portions are more prevalent. The highest number of specimens are from the head (NISP = 470) and most these are teeth or tooth fragments. Foot specimens (NISP = 286) are the second most prevalent portion of the cattle carcass. Numerous specimens are identified from the valued portions of the carcass, which include the hindquarter (NISP = 43) and forequarter (NISP = 31). Log difference scaling indicates that specimens from every portion of the carcass except the head are underrepresented compared to the standard cow skeleton (Figure 12-7). Although most portions of the carcass are underrepresented, the patterns reported here do not diverge drastically from that of the standard cow skeleton.

The small NISP (23) for sheep/goat specimens precludes an analysis of skeletal portion recovery (Figure 12-12; Table 12-11).

Epiphyseal fusion data are available for seven pig specimens in the Feature 231 (2008) collection (Table 12-12). In combination with tooth eruption sequences, these data provide evidence for at least one juvenile, two adults, and one sub-adult individual; the remaining pig individual is of indeterminate age. Two unfused acetabulum specimens indicate the presence of at least one juvenile pig in this collection. In pigs, the acetabulum fuses by 12 months of age (Reitz and Wing 2008:72). One lower deciduous fourth premolar also provides evidence for a juvenile individual. One late-fusing specimen, an unfused proximal ulna, is present in this collection. The proximal ulna fuses between 36-42 months of age in pigs (Reitz and Wing 2008:72). This specimen provides limited evidence for age because it could have come from a juvenile or sub-adult individual at any age younger than 36-42 months. Two adult individuals are evidenced by the presence of erupted third molars in this collection.

Epiphyseal fusion data are available for 277 deer specimens in the Feature 231 (2008) collection (Table 12-13). In combination with tooth eruption sequences, these data provide evidence for at least five juveniles, five adults, and thirteen sub-adult individuals; the remaining six deer individuals are of indeterminate age. Several unfused early-fusing specimens provide evidence for juveniles in this collection. In deer, fusion of the early-fusing specimens ranges from before birth through 20 months of age depending on the specific element (Reitz and Wing 2008:72). Five juvenile individuals are also evidenced by the presence of deciduous fourth premolars. Several fused late-fusing specimens provide evidence for at least five adult individuals in Feature 231 (2008).

Epiphyseal fusion data are available for 184 cow specimens in the Feature 231 (2008) collection (Table 12-14). In combination with tooth eruption sequences, these data indicate the presence of at least four juveniles, two adults, and two sub-adult individuals; the remaining seven cow individuals are of indeterminate age. Three unfused early-fusing specimens, including a distal scapula and two phalanges, provide evidence for a single juvenile individual. In cattle, the distal scapula fuses between 7 to 10 months of age and proximal phalanges fuse between 18-24 months (Reitz and Wing 2008:72). Additionally, the presence of four lower right deciduous fourth premolars provide evidence for four juveniles in the Feature 231 (2008) collection.

Numerous unfused specimens in the middle- and late-fusing categories provide evidence for at least two juvenile or sub-adult individuals. Several fused late-fusing specimens provide evidence for two adult individuals.

Tooth eruption sequences and epiphyseal fusion data for caprines indicates that the Feature 231 (2008) collection contains the remains of one juvenile, one adult, and two individuals of indeterminate age (Table 12-15). There was one unfused late-fusing specimen, a single fused proximal ulna, providing evidence for at least one adult individual in the Feature 231 (2008) collection. The proximal ulna fuses between 24-84 months of age in goats and between 36-42 months of age in sheep (Reitz and Wing 2008:72). The other specimen, a fused proximal radius, provides limited evidence for aging the individual. The proximal radius fuses between 4-9 months of age in goats and between 3-10 months of age in sheep (Reitz and Wing 2008:72). Therefore, this specimen could have come from any animal at least 3 months of age or older.

The most common modification in the Feature 231 (2008) collection is hacking (NISP = 1,210) (Table 12-16). Most of the hacked specimens are indeterminate mammal (Mammalia) remains (NISP = 932), but numerous deer (NISP = 158) and cow (NISP = 88) specimens are also hacked. Burning (NISP = 178), cutting (NISP = 123), and calcination (NISP = 112) are also common modifications in the Feature 231 (2008) collection.

Diversity and equitability estimates based on MNI and biomass reflect the wide range of animals discarded in the feature, but also the dominance of large-bodied deer and cattle. MNI diversity (H' = 3.047) and equitability (V' = 0.8217) indices indicate that Feature 231 (2008) is more diverse than Feature 7 (2008) in terms of individuals, but biomass-derived indices, on the other hand, reflects the focus on just a few sources of meat (H' = 1.151) and equitability (V' = 0.312), though more sources than in Feature 7 (2008).

<u>Feature 231 (2022)</u>

A total of 26,205 specimens weighing 109,829.19 g were identified in the 2022 study of Feature 231 (2022), with a minimum of 189 individuals from 57 taxa (Table 12-17). Deer and cattle dominate the collection when measured by NISP and biomass. Deer and cattle are near evenly represented by NISP, with deer accounting for 32% and cattle accounting for 32% of identified specimens**.** These NISP percentages were calculated only from the taxa informing the summary table (Table 12-18). Cattle are the most abundant species according to biomass, accounting for 62% of the biomass, while deer contribute 28% (Table 12-18). Deer account for 15% of the individuals and cattle account for 11% of the total MNI (Table 12-18). Although all other species contribute far less of the biomass than do deer and cattle, the MNI from other species suggests a high presence of wild animals in Feature 231 (2022). When considering NISP and biomass, all other observed categories of animals are less prevalent than deer and cattle. However, wild animals other than deer (including wild mammals, wild birds, fish, and reptiles) comprise 63% of the individuals. When also factoring in deer, wild animals comprise 78% of the individuals. Domestic mammals other than cattle only represent 5% of the individuals. Chickens are the only domestic bird in this collection, representing 3% of the individuals and less than 1% of the biomass.

A total of 188 pig specimens were identified in the Feature 231 (2022) collection (Figure 12-9; Table 12-19). The pig skeletal distribution indicates an unequal representation of the carcass. The highest number of specimens are from the head (NISP = 150). Cranial portions represent 80% of the represented pig specimens, most are teeth or tooth fragments. Only four forequarter and seven hindquarter specimens are present in this collection, demonstrating a potential bias behind the deposition or preservation of pig specimens that limits the recovery or identification of valued portions of the carcass.

A total of 1,453 deer specimens were identified in the Feature 231 (2022) collection (Figure 12-10; Table 12-19). The deer skeletal distribution indicates that meaty and non-meaty portions of the carcass are heavily present in this collection. The highest number of specimens are from the head (NISP = 456), again, most are teeth or tooth fragments. Many mandibles, maxilla, cranial fragments, and antlers were also identified. Specimens from the forequarter (NISP = 225) and hindquarter (NISP = 255) also show an abundance of meaty portions of the carcass. Log difference scaling indicates that the head, forequarter, hindquarter, and hindfoot specimens are overrepresented compared to a standard deer skeleton (Figure 12-5). There is less fragmentation of deer specimens compared to specimens from other species. Whole and near whole deer mandibles are present in high numbers, alongside near-complete postcranial elements.

A total of 1,454 cattle specimens were identified in the Feature 231 (2022) collection (Figure 12-11; Table 12-19). The cattle skeletal distribution indicates that meaty and non-meaty portions of the carcass are present in this collection, although non-meaty portions are more prevalent. The highest number of specimens are from the head (NISP = 666). Various head portions are present, but teeth and tooth fragments are predominant. Foot specimens (NISP = 498) are the second most prevalent portion of the cattle carcass. Cattle specimens are generally well-distributed across the skeleton, with log difference scaling indicating that only foot and hindquarter specimens are underrepresented. Head, forequarter, forefoot, and hindfoot are over-represented compared to the standard cow (Figure 12-7). Twenty-eight percent of the unidentifiable mammal specimens from the Feature 231 (2022) collection are large mammal fragments. It is likely that many of these are cattle, given their prevalence in the identified assemblage. Many of these large mammal fragments are long bone, vertebra, rib, and cranial fragments that lack diagnostic features.

As with other Musgrove assemblages, sheep/goat (caprine) specimens are not common in the Feature 231 (2022) collection (Figure 12-12). The identification of just 36 sheep/goat specimens precludes an analysis of skeletal portion recovery (Table 12-19).

Epiphyseal fusion data are available for nine pig specimens in the Feature 231 (2022) collection (Table 12-20). Together with tooth eruption sequences, these data provide evidence for at least two juveniles, two adults, and two sub-adult individuals. There are two right lower and two left lower deciduous fourth premolars, suggesting the presence of at least two juveniles. This collection also contains two late-fusing specimens (unfused proximal ulnas), providing potential evidence of two sub-adult individuals. Two erupted third molars indicate that at least two adult individuals are represented in the Feature 231 (2022) collection.

Epiphyseal fusion data are available for 415 deer specimens in the Feature 231 (2022) collection (Table 12-21). Together with tooth eruption sequences, these data provide evidence for at least six juveniles, eight adults, and eight sub-adults; the remaining six deer individuals are of indeterminate age. Several unfused early-fusing specimens and deciduous fourth premolars indicate the presence of juveniles in this collection. Six unfused right humeri suggest at least six juvenile deer individuals. In deer, the proximal calcaneus fuses between 26-29 months of age. From this collection, the presence of eight unfused left calcanei suggests at least eight deer individuals younger than this age range. Several fused late-fusing elements provide evidence for at least five adult individuals in the Feature 231 (2022) collection. A future study on the tooth age wear of deer from Feature 231 (2022) may change our understanding of age amongst the identified deer individuals.

Epiphyseal fusion data are available for 341 cattle specimens in the Feature 231 (2022) collection (Table 12-22). Together with tooth eruption sequences, these data include the presence of at least nine juveniles, two adults, and five sub-adults; the remaining five cattle individuals are of indeterminate age. Several unfused early-fusing specimens were from proximal metapodials, proximal phalanges, and proximal radius. In cattle, the proximal radius fuses between 12 and 18 months of age (Reitz and Wing 2008:72). On top of the unfused early-fusing specimens, there are nine lower right deciduous fourth premolars, suggesting the presence of at least nine juvenile cattle individuals in the Feature 231 (2022) collection. Forty-one specimens were in the middle-fusing category, including five right unfused distal metatarsals. A limited number of specimens in the late-fusing category only provides evidence for two adult individuals.

Epiphyseal fusion data are available for four sheep/goat specimens in the Feature 231 (2022) collection (Table 12-23). Together with tooth eruption sequences, these data include the presence of at least one sub-adult; the remaining two individuals are of indeterminate age. There was one unfused late-fusing specimen, a single unfused distal femur. The distal femur fuses between 23 and 60 months of age in goats and 36 and 42 months of age in sheep (Reitz and Wing 2008:72).

The most common modification in the Feature 231 (2022) collection is hacking (NISP = 1,733) (Table 12-24). Most hacked specimens are indeterminate mammal remains (NISP = 1,472). The second most common modification is cutting (NISP = 719), with indeterminate mammal (NISP = 333) most frequently exhibiting cut marks. Deer and cattle specimens have the most hacks and cuts from identifiable specimens beyond taxonomic Class. One-hundred and thirty-five deer specimens were hacked, and 143 deer specimens were cut. One-hundred and ten cattle specimens were hacked, and 209 cattle specimens were cut. This collection had two worked specimens: one turtle carapace and one indeterminate mammal fragment. Burning (NISP = 433) and calcination (NISP = 326) are also common modifications in the Feature 231 (2022) collection.

The species diversity and equitability estimated for the Feature 231 (2022) collection, based on both MNI and biomass, reflect the previous findings on the Musgrove Cowpens. When the number of individuals (MNI) is considered, the collection is somewhat diverse (H’ = 1.388) and shows an even distribution of taxa (V’ = 0.791). Biomass-derived indices, on the other hand, indicate that this assemblage is not very diverse (H’ = 0.480). Equitability (V’ = 0.273) based on biomass is also low, mirroring the results of earlier analyses (Orr et al. 2008:23). The low biomass indices are likely due to the dominance of large-bodied cattle and deer from these two cellar features. All three collections indicate a pattern of a moderately diverse and relatively even distribution of individuals, with the Feature 231 (2008) collection being somewhat more diverse and more equitable than Features 7 and 231 (2022). In terms of biomass, all three collections return low diversity and equitability values.

Deer-Cattle Index

Deer-Cattle indices were derived for all six Feature 231 (2022) levels (Tables 12-25, 12-26, 12-27). A trend is observable among all three quantitative measures. Larger animals have an advantage in both NISP and biomass, and MNI is a valuable measure in limiting that bias (Lyman 2008:29). This might explain the higher cattle NISP and biomass percentages and the lower cattle percentages in MNI. Despite this bias, using the three separate quantitative measures shows a similar pattern in Feature 231 (2022). Although the indices do not change in lockstep from Level 6 to Level 1, a pattern is observable in the proportional representation of deer and cattle over time. Levels 4 through 6 have the highest deer and cattle ratios in NISP, MNI, and biomass, save for the Level 2 MNI index, indicating higher numbers of deer in the earlier levels first deposited in the feature.

The NISP Deer-Cattle index tables show the large number of deer and cattle NISP that some excavated levels contain (Figure 12-13; Table 12-25). Although this observation may change after the Feature (2008) data are incorporated into these indices, a marked shift seems to occur from Level 4 to Level 2. The two oldest levels (Level 6 and 5) are much smaller samples but have the same index, at 0.53. Level 4 has the highest number of deer specimens, possibly indicating a period of intensive deer use or trade through the trading post. Levels 3 and 2 show a decline in deer specimens, with cattle specimens marginally increasing. There is then a significant decline in the presence of deer in Level 1, with the highest presence of one species (cattle) over the lowest (deer) in all six NISP indices. Deer specimens are their most prevalent in the three lowest, and earliest, levels, followed by a precipitous decline after a peak in deer specimens in Level 4.

The Deer-Cattle indices derived from MNI yield the least discernable pattern among the three quantitative measures (Figure 12-14; Table 12-26). As measured by MNI, there was never a predominance of cattle individuals over deer individuals. There appears to be a trend of deer individuals moving in and out of predominance in Feature 231 (2022). Level 4 is the obvious outlier in the MNI Deer-Cattle Index. These indices depict rough parity between deer and cattle individuals at three points: Levels 5, 3, and 1. Levels 6 and 2 are also nearly identical and depict two points where there is a slight increase in deer only to return to an equal presence of deer and cattle individuals.

The Biomass Deer-Cattle Index shows the clearest pattern of a decreasing presence of deer and an increasing presence of cattle in Feature 231 (2022) (Figure 12-15; Table 12-27). Unsurprisingly, cattle dominate the biomass totals throughout the six levels. However, there is a noticeable decline in overall meat yield from deer compared to cattle: Levels 6, 5, and 4 show near-identical indices. Levels 3 and 2 have the highest biomass values for deer among the six levels. However, so too does cattle biomass values increase. Level 1 shows a significant decline in the biomass of deer compared to the biomass of cattle.

Subsistence Strategies at the Musgrove Cowpens

We surmise that the geographic location and the political, economic, and social activities of Mary and John Musgrove meant that many different individuals moved through their property (Fisher 1990; Hahn 2012; Orr et al. 2008). Enslaved Native Americans, Spanish prisoners-of-war, indentured servants, cattle ranchers, and a milkmaid are known to have lived at the site throughout Mary Musgrove's ownership (Braley 2013:16; Orr et al. 2008:24). When Mary and John Musgrove settled on the Yamacraw Bluff in 1732, the Yamacraw also lived alongside them (Hahn 2012:87). Native and European traders interacted with the cowpens and trading post, and the Musgrove's' political relationships brought colonists and members from various Indigenous communities to the Yamacraw Bluff location (Braley 2013; Hahn 2012; Orr et al. 2008). The cultural and physical proximity of both European and Native communities created a landscape firmly embedded within multiple cultural communities of the colonial South (Hahn 2012:88).

The multi-ethnic landscape around the Musgrove Cowpens meant that animal use at Yamacraw Bluff was as varied as ethnohistorical depictions of the cowpen and trading post suggest. Various individuals from numerous economic, racial, and gender backgrounds likely contributed to the faunal material used, processed, and transported to and from this location. Orr and colleagues (2008:25) previously discussed how the Musgrove faunal material follows typical subsistence characteristics of eighteenth-century rural colonial sites on the coastal plains. These characteristics, established in Reitz and Honerkamp (1983), include: "(1) dominance of cattle and a lesser reliance on pigs, (2) heavy reliance on wild terrestrial or estuarine taxa, (3) occasional use of wild birds and reptiles, and (4) a lack of sheep/goats" (Orr et al. 2008:25). The Feature 231 (2022) collection supports Orr et al.'s (2008:26) observation that faunal materials from the Musgrove Cowpens are similar to those from other British colonial sites, with the faunal material from each feature showing all four characteristics.

The faunal material discussed in this chapter are from contemporaneous features, Features 7 and 231. Although both features are cellars dated to the second quarter of the eighteenth century and were filled during the middle of the eighteenth century, the features likely represent different functions at the Musgrove Cowpens. Feature 231 is a cellar with paved flooring and planked walls and was probably the main house (Braley 2013:108, 119). Feature 7 is from a smaller structure, and the cellar lacked paved flooring and planked walls (Braley 2013:108). The faunal collections from these features show similarities and differences, the most pertinent to this discussion being the high representation of both cattle and deer. However, Feature 231 has a far more even distribution of cattle and deer than Feature 7. Feature 231 also represents a more diverse assemblage and contains a higher percentage of wild animals. Perhaps the most striking difference between the two features is the much higher representation of burned specimens in Feature 7 compared to Feature 231. It is possible that Feature 7 represents household consumption and foodways, while Feature 231 is representative of the various butchery practices at Musgrove. Future analysis will consider further differences between these two features.

The subsistence strategies at the Musgrove Cowpens certainly reflect contemporary trends, but the high percentages of wild animal species stand out. Geographical proximity is the most likely explanation for the diversity and abundance of species observed in these collections (Orr et al. 2008:26). The significant presence of freshwater fish and some coastal fish highlights the site's proximity to the Savannah River. The Savannah River forms most of the border between South Carolina and Georgia, and the Musgrove Cowpens is located at the upper end of the estuary created as the river flows into the Atlantic Ocean. This estuary also serves as a perfect habitat for numerous turtle, bird, and mammal species, with a good representation of this ecosystem in the Musgrove faunal collections.

This proximity to the Savannah River was advantageous for trade, as well as for fishing. During Musgrove's time, the site was easily accessible via boat from the Upper Coastal Plain, as well as Atlantic shoreline (e.g., Stewart 1996:95). The Yamacraw Bluff remains an invaluable trading port due to its position on the waterway; the Musgrove site now lies under the Garden City Terminal of the Georgia Port Authority, the largest single shipping container terminal in North America.

Native subsistence strategies at many Lowcountry sites prior to 1500 often included deer, though venison rarely contributed more than 50% of the biomass (Reitz et al. 2010:56, 71). Given the presence of various species of animal typically reserved for consumption (such as catfish and turtle), deer specimens in these collections likely represent local use in addition to the involvement in the deerskin trade. Deer were no doubt exploited at the Musgrove Cowpens for hide/fur, and other secondary products, but they were likely also essential components of the foodways and cultural activities of the occupants and visitors to the Yamacraw Bluff. Wild individuals dominate the collections, indicating a potential higher reliance on wild resources supplemented by occasional consumption of livestock not sold to urban markets.

Subsistence is intimately tied to local ecosystems, and previous zooarchaeological research on Native subsistence links changes in faunal assemblages to economic and colonial pressures on the environment (Lapham 2005; Pavão-Zuckerman 2007, 2020). The location of the Musgrove Cowpens on the Yamacraw Bluff provided not only ideal access to wild resources, but also proximity to Charleston and Savannah as well as perfect conditions for cattle ranching. This enabled the Musgroves to engage in multiple economic activities. Free-ranging livestock took advantage of the 'open land' of the coastal plain, foraging on the same prime coastal woodlands and wetlands as wild game (Pavão-Zuckerman 2020:232). Deer populations were on the decline near coastal settlements during the early eighteenth century due to the increased use of deerskins for the global deerskin market, compounded by habitat destruction, competition with livestock, and, perhaps, babesiosis (Braund 1993; Haygood 1986; Lapham 2005; Pavão-Zuckerman 2000, 2007). A combination of increased deerskin trade and cattle encroachment on the local ecosystem likely impacted the presence of deer and other game animals near colonial settlements (Lapham 2020; Pavão-Zuckerman 2020). Following a decline in wild animal populations, there may have been little choice but to prioritize the use of livestock for meat and secondary products (e.g., butter, tallow, horn) as economic resources for trade (Pavão-Zuckerman 2007, 2020).

The Musgrove Cowpens Role in the Colonial Market Economy

In the seventeenth and eighteenth centuries, the colonial economy relied on Native communities to produce animal products for local and global markets (Pavão-Zuckerman 2000, 2007). Using their social position as biracial Creek and English people, Mary and John Musgrove established themselves as profitable deerskin traders and political allies to James Oglethorpe and the developing colony of Georgia (Hahn 2012, 2015). Mary Musgrove's identity allowed her to be an active participant in the colonial economy and positioned her as a producer within the Native-centric and reliant economic system. Factors including individual identity (such as gender and ethnic identity) as well as proximity to trade and settlers likely impacted the timing and extent of Musgrove's shift to cattle raising.

This discussion on the economic positionality of Native individuals ties into Pavão-Zuckerman's (2007:28-29) discussion of 'pushes and pulls' amongst Creek communities. Adopting animal husbandry and participating in the deerskin trade were two strategies implemented by Native communities to varying degrees across time and space. Pavão-Zuckerman (2007:28) establishes a cultural landscape where multiple intersecting factors meant that Creek communities viewed the 'pull' of cattle raising as insufficient to disengage from deerskin trading. Active participation in the global market for deerskins, the association of cattle and other livestock with the loss of Native land to settlers and plantations, and Native understanding that livestock negatively impacted traditional hunting and farming practices initially soured any pull toward intensive husbandry (Pavão-Zuckerman 2007; Saunt 1999).

While the Musgrove occupation on the Yamacraw Bluff was in the first half of the eighteenth century (1732-1750) several inferences can be gleaned from ethnohistoric research on Native communities in the decades following the mid-1700s. Around the end of the eighteenth century and the beginning of the nineteenth century, the zooarchaeological and historic records suggest that Creek communities began to shift toward animal husbandry. The shift was precipitated by several factors, including the collapse of the deerskin trade, government pressure toward American assimilation, and the increasing expansion of settlers westward (Pavão-Zuckerman 2007; Saunt 1999). Saunt (1999:1) argues that individuals of both Native and

European descent were influential in implanting subsistence and social change within Native communities. Mestizo individuals were the 'most dedicated' ranchers in Creek country at the start of the nineteenth century. Social and geographical proximity played a significant role in the socio-political change in the Southeast. As bilingual and bicultural individuals of mixed descent, the Musgroves were uniquely positioned to participate in the settler-colonial economy (Saunt 1999:159).

The Feature 7 and 231 faunal collections indicate that the use of deer and cattle changed during the two decades represented by these collections (ca. 1732-1750). The skeletal distribution of deer does not definitively establish that deerskins were processed on location. Orr et al. (2008:29) considered if head, and especially, foot specimens might be explained by historical accounts indicating that hooves and portions of the deer head were left in dressed deerskins. However, as Orr et al. suggest, the limited number of head and foot specimens, especially in Feature 7, may be evidence of differential deposition among contexts (Orr et al. 2008:29). Head specimens are overrepresented in both the Feature 231 (2008) and Feature 231 (2022) collections, suggesting that some contexts contain more head specimens than others. Future analysis of the merged Feature 231 collection will provide a more complete understanding of element distribution patterns.

Results from the NSF-funded project suggest that cattle were both locally used and sold through regional market systems. The skeletal distribution of cattle indicates that all portions of the cattle carcass were discarded into both Musgrove features, evidence that some cattle were slaughtered locally. When the Musgrove skeletal representation is compared to 1710-1820 contexts from the Charleston Beef Market and contemporaneous non-Market Charleston sites (Chapters X, XI), Musgrove cattle specimens from the meat-bearing 'Body' constitute much lower percentages (Figure 12-16). The Charleston collections are more closely aligned with the reference cow than are the contents of the Musgrove features. Perhaps primary butchery of cattle carcasses took place at the Cowpens and the processed meat and by-products were sold to plantations or urban markets. Some carcass portions were retained for secondary butchery and local use. Traditional zooarchaeological methods are limited in their ability to verify that live animals were driven to distant markets, but the small number of teeth with tooth wear stages (TWS) consistent with young adults in the Musgrove material (Figure 12-17) suggests that live cattle in this age group may have been sent elsewhere for slaughter.

Yamacraw Bluff is situated in the tidal portion of the Lower Coastal Plain, but two-thirds of the Musgrove cattle in the stable isotope study originated in the Upper Coastal Plain (Figure 12-18; Chapter VII). One individual originated as far upcountry as the Upper Coastal Plain/Piedmont, perhaps from one of the cowpens near Augusta. These non-local cattle highlight the significance of the Cowpens' location. The trading post was strategically placed at the coastal end of a river that extends above the Fall Zone but also close to plantations, Charleston, Savannah, and smaller markets in towns such as Dorchester. Economic activities on the Yamacraw Bluff depended on interaction with non-local rural and urban trade partners. Isotopic analysis of deer, the other major trade product, may provide an even more precise image of the economic and environmental interactions not only between rural producers and urban markets, but among interior and coastal producers.

Despite the limitations outlined above, the Deer-Cattle Index reveals a trend in the relative representation of cattle and deer in the Feature 231 (2022) assemblage: by the time the last level of Feature 231 (2022) was filled, cattle were more abundant in the Musgrove Cowpens assemblage than deer. One interpretation of the change in deer and cattle over time in Feature

231 (2022) is that this reflects a shift in the procurement strategies at the Musgrove Cowpens. Both NISP and biomass indices indicate that the lowest three levels (Levels 6, 5, and 4) contained the highest presence of deer. Considering that the highest MNI index for deer is in Level 4, use of deer at the site may have declined over time. Biomass indices potentially indicate a local use of both deer and cattle at the Musgrove Cowpen. The decline in deer biomass, however, may indicate that the availability of deer declined, and the need to supply cattle for local use as well as to supply urban markets increased. However, other explanations are possible. These include seasonal changes in the availability of deer, fluctuations in cattle herd size, and environmental changes impacting the availability of both species. The Deer-Cattle indices presented here, however, suggest an overall trend of decreasing engagement with the deerskin trade and increasing involvement with cattle raising.

Although both Mary and John Musgrove were children of white Indian Traders, there is limited evidence of their involvement in the deerskin trade prior to opening their trading post (Hahn 2012:69-70). Hahn (2012:78-79) suggests that a potential catalyst for their move from Pon Pon to the Musgrove Cowpens was a political agreement with South Carolina Governor Robert Johnson favoring the Musgrove's control over deerskin trade from Yamacraw Bluff. A shift in economic strategies at the Cowpens may have occurred after 1735, upon the death of John Musgrove and after Johnson left office. These losses may have spelled a decline in Musgrove's political influence and reduced trade in the area (Hahn 2012:102). Mary's subsequent marriages and the increasing influence of religious and colonial activity may have affected activities at the Cowpens (Hahn 2012:108). The faunal material from the two features also may reflect both the Musgrove Cowpen and Grange Plantation eras. The later contexts may reflect the subsistence and economic activity of the subsequent owner William Francis' occupation of the site (1750-1763).

The faunal material from the Musgrove site suggests that the outpost experienced pushes and pulls similar to those experienced by Upper Creek communities, but a half-century earlier. These early shifts likely occurred not only due to their identity as Creek and English but also their flexible positions as translators, traders, and proximate suppliers to the most significant colonial urban metropole in the Southeast (Hahn 2012, 2015; Saunt 1999). It is also likely that deer herds were impacted by intensive hunting earlier on the coast than in the interior, explaining the earlier shift to animal husbandry. The cultural identity, physical and economic proximity of the Musgroves to Charleston, and potentially early environmental effects of the deerskin trade in the rural areas around Charleston all likely explain the Musgrove's early and prominent involvement in Charleston's beef economy.

Perhaps nothing illustrates this dynamic more than nine specimens recovered from Feature 231 (2008); likely decoys made of deer antler (Figure 12-19). Swanton (1977:314) describes deer antler decoys as, "…made of the head of a buck, the back part of the horns being scraped and hollow for the lightness of carriage." At least three deer antler specimens recovered from Feature 231 (2008) are remarkably similar to those described by Swanton (Orr et al. 2008). An additional six specimens may be fragments of other decoys. A metal saw was used in the manufacture of some of these decoys.

Conclusion and Future Directions

Deer and cattle were likely consumed for subsistence and produced for economic reasons throughout the Musgrove occupation. The subsistence change at the Musgrove Cowpens likely represents environmental and economic pressures on the coastal deer populations and the increasing importance of cattle ranching. These pressures included: the expansion of colonial settlement into ever more distant rural areas, a growing market for livestock and cattle byproducts, and the economic transition away from indigenous labor and ecological knowledge toward the large-scale enslavement of Africans (Pavão-Zuckerman 2007; Saunt 1999; Smith 2020).

Further study of the involvement of the Musgrove outpost in the deerskin trade is reliant on the incorporation of additional lines of evidence. All of the Feature 231 data should be merged, and the spatial data for both Features 7 and Features 231 re-evaluated to verify the results of the Deer-Cattle indices. Measurements for cattle, deer, pig, and chicken specimens from Feature 231 (2022) may provide information about age and sex to clarify demographic aspects of the deerskin trade (Lapham 2005; Pavão-Zuckerman 2007). Analysis of the frequency and position of butchery marks on deer specimens should also be undertaken. Future work might also include geochemical analysis of deer teeth following the methods applied during the present project to cattle, expanded to include deer teeth from coastal sites occupied before 1500. This would facilitate assessing the catchment area for deer prior to 1500 and subsequently, as well as documenting environmental change resulting from deforestation driven by colonial industries, as well as the Little Ice Age.

The Musgrove Cowpens faunal assemblage is robust and diverse, yet heavily dominated by deer and cattle. Current zooarchaeological analysis of the Musgrove Cowpens points to a local landscape that reflected the multi-ethnic nature of the owners and the enslaved and free people who worked at this trading post and cowpen (Orr and Lucas 2008:13). The economic significance of the site lies in its ability to demonstrate local-level agency in a shifting colonial economic landscape. There was a decrease in deer over time and an increase in cattle. This change indicates a potential shift in economic production at the outpost away from a dual focus on deerskin trading and cattle raising to a more targeted approach focused on cattle ranching. Taken together, the robust documentary and zooarchaeological material highlight the important role of rural localities to the urban and global markets in colonial landscapes.

Acknowledgments

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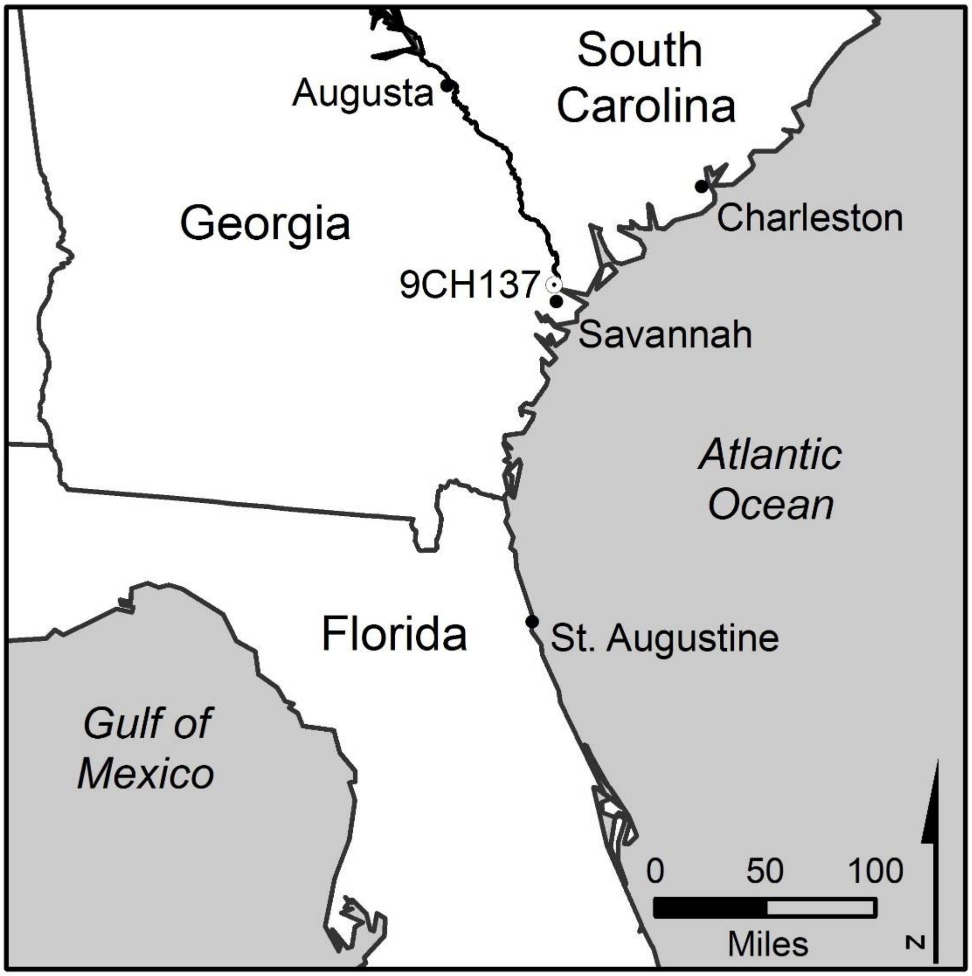

Figure 12-1. Location of the Musgrove Cowpens and trading post (9Ch137) in the southeastern United States.

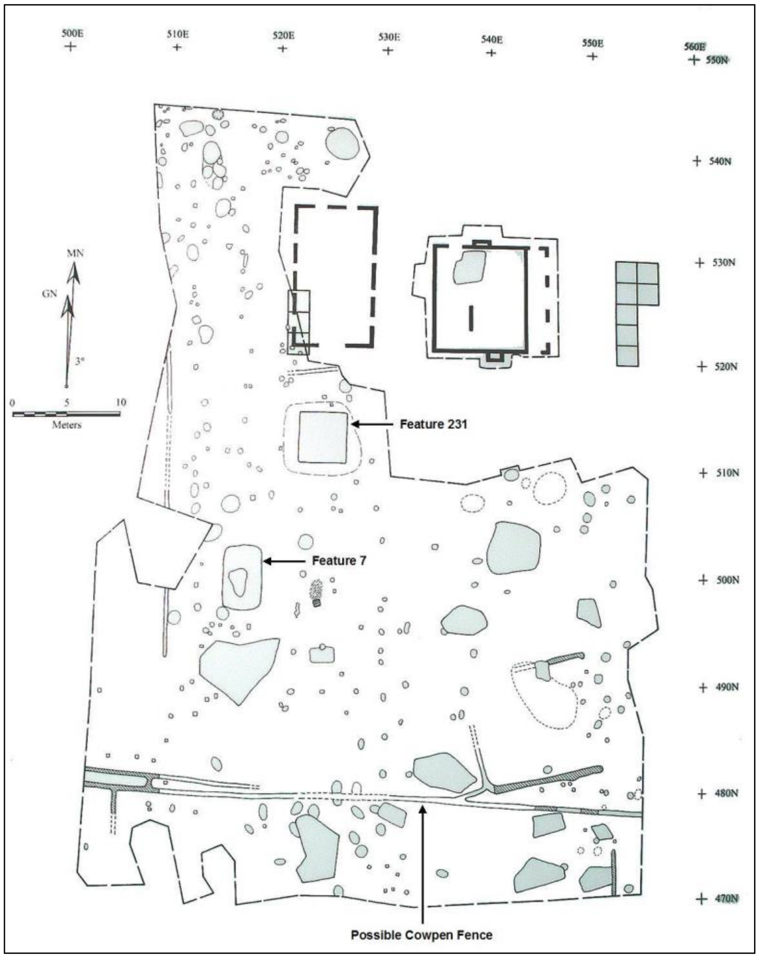

Figure 12-2. Excavations at the Musgrove Cowpens (from Braley 2013:109).

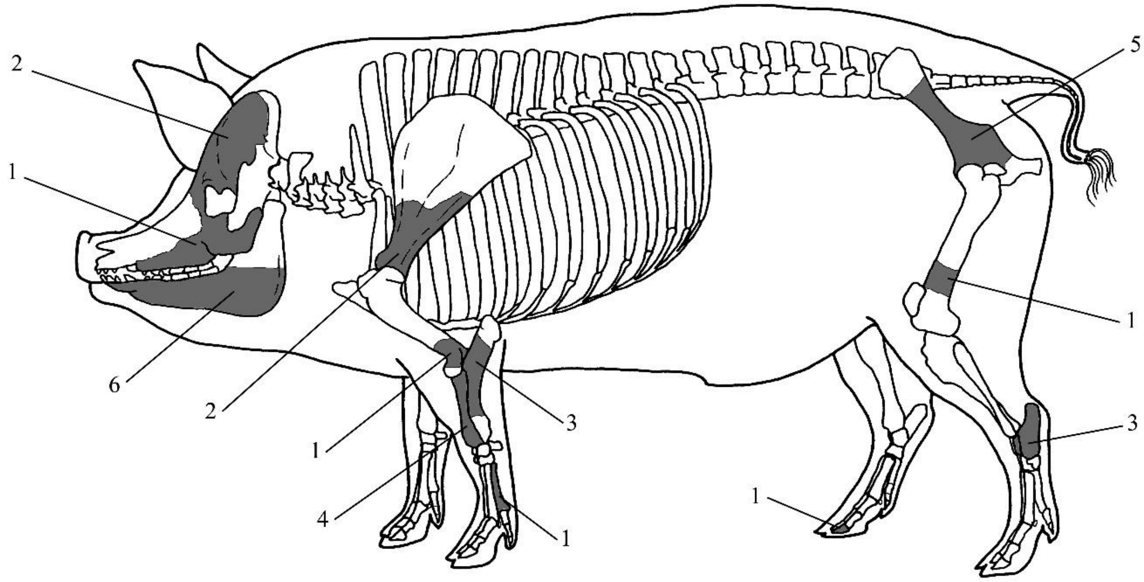

Figure 12-3. Musgrove Cowpens, Feature 7, pig (*Sus scrofa*) elements identified (NISP = 93). Not illustrated are 63 teeth.

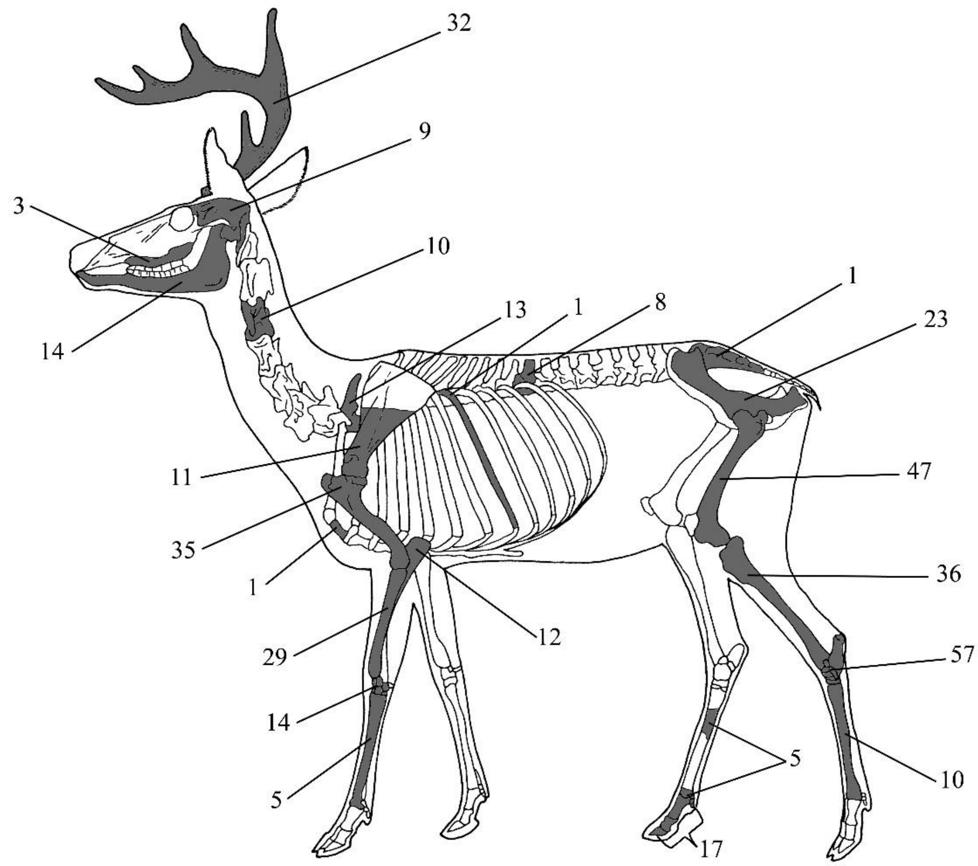

Figure 12-4. Figure Musgrove Cowpens, Feature 7, deer (*Odocoileus virginianus*) elements identified (NISP = 442). Not illustrated are 49 teeth.

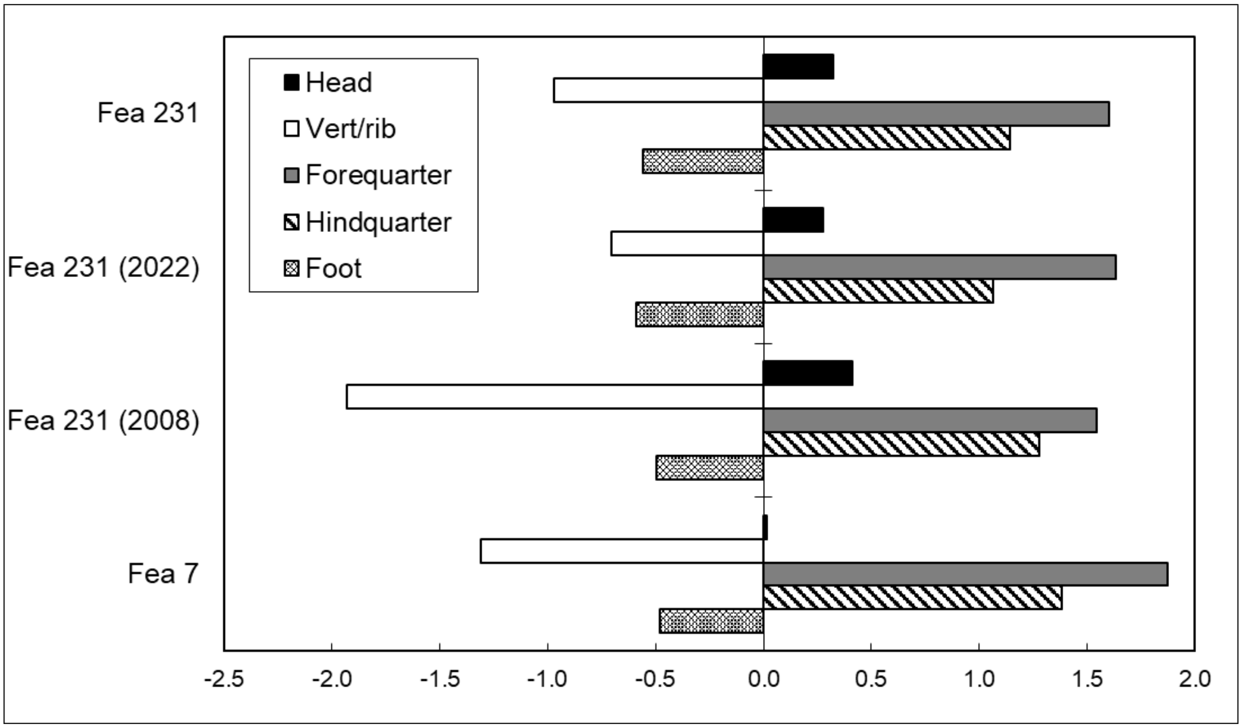

Figure 12-5. Musgrove Cowpens deer (*Odocoileus virginianus*) element distribution presented as a logged ratio for Features 7, 231 (2008), 231 (2022), and combined Feature 231. The vertebrae/rib category could be under-represented due to difficulties attributing these elements to deer rather than equids, pigs, and bovids. See Appendix III for methods.

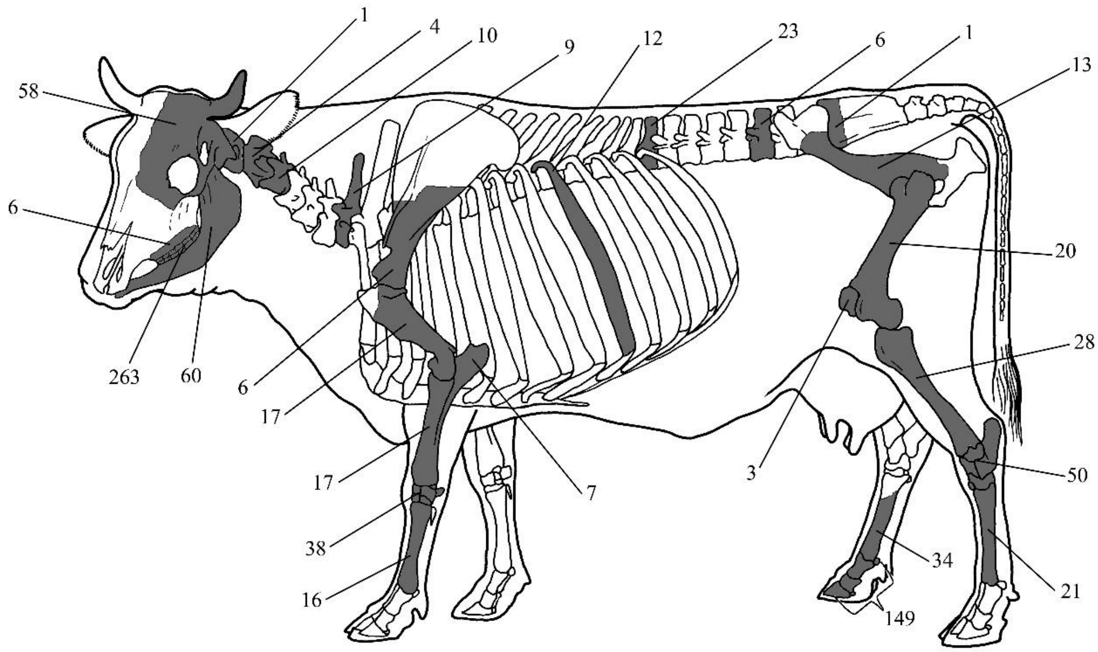

Figure 12-6. Musgrove Cowpens, Feature 7, (*Bos taurus*) elements identified (NISP = 872).

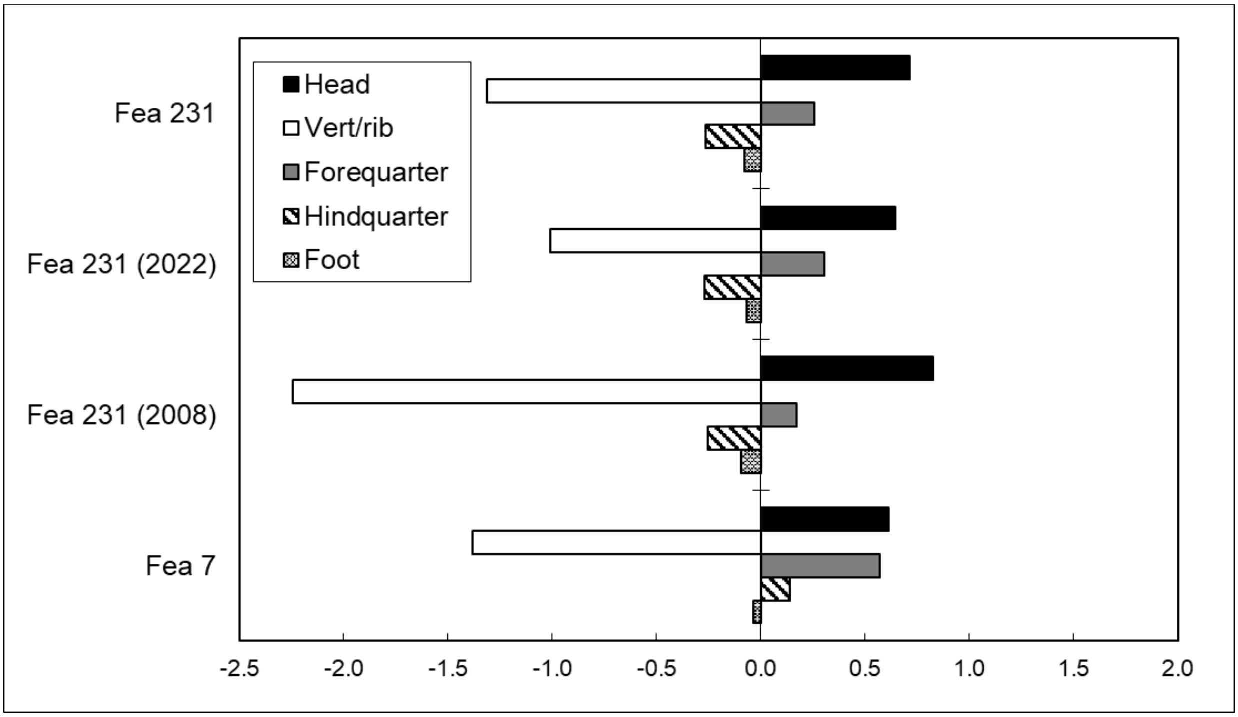

Figure 12-7. Musgrove Cowpens cow (*Bos taurus*) element distribution presented as a logged ratio for Features 7, 231 (2008), 231 (2022), and combined Feature 231. The vertebrae/rib category could be under-represented due to difficulties attributing these elements to cow rather than equids, pigs, and other bovids. See Appendix III for methods.

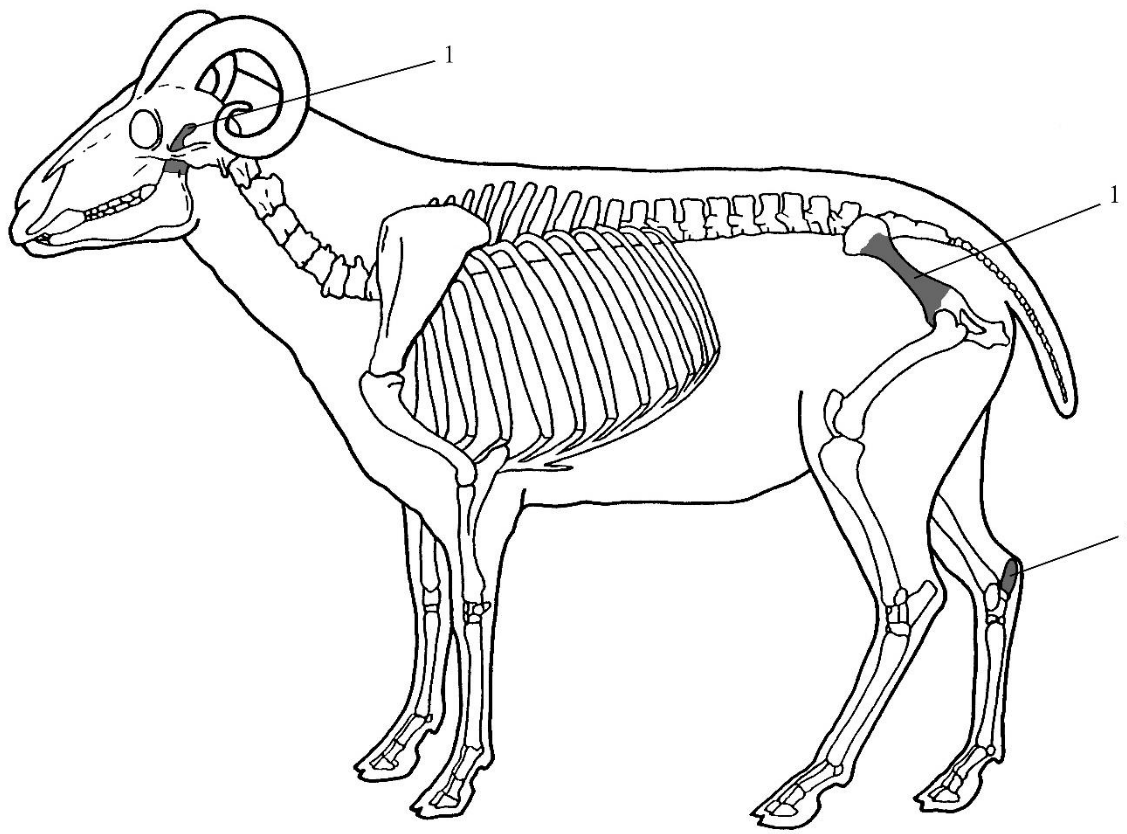

Figure 12-8. Musgrove Cowpens, Feature 7, sheep/goat (Caprinae and *Ovis aries*) elements identified (NISP = 9). Not illustrated are 6 teeth.

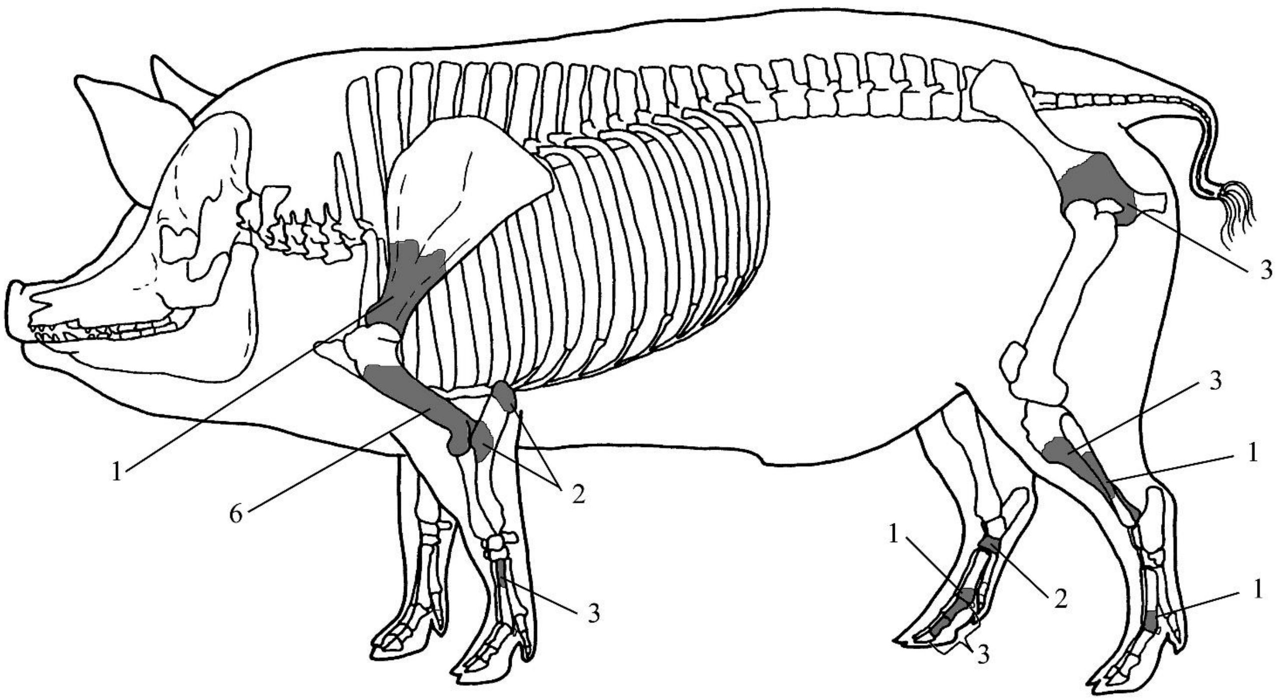

Figure 12-9. Musgrove Cowpens, Feature 231 (2008), pig (*Sus scrofa*) elements identified (NISP = 106). Not illustrated are 76 teeth and 4 skull fragments.

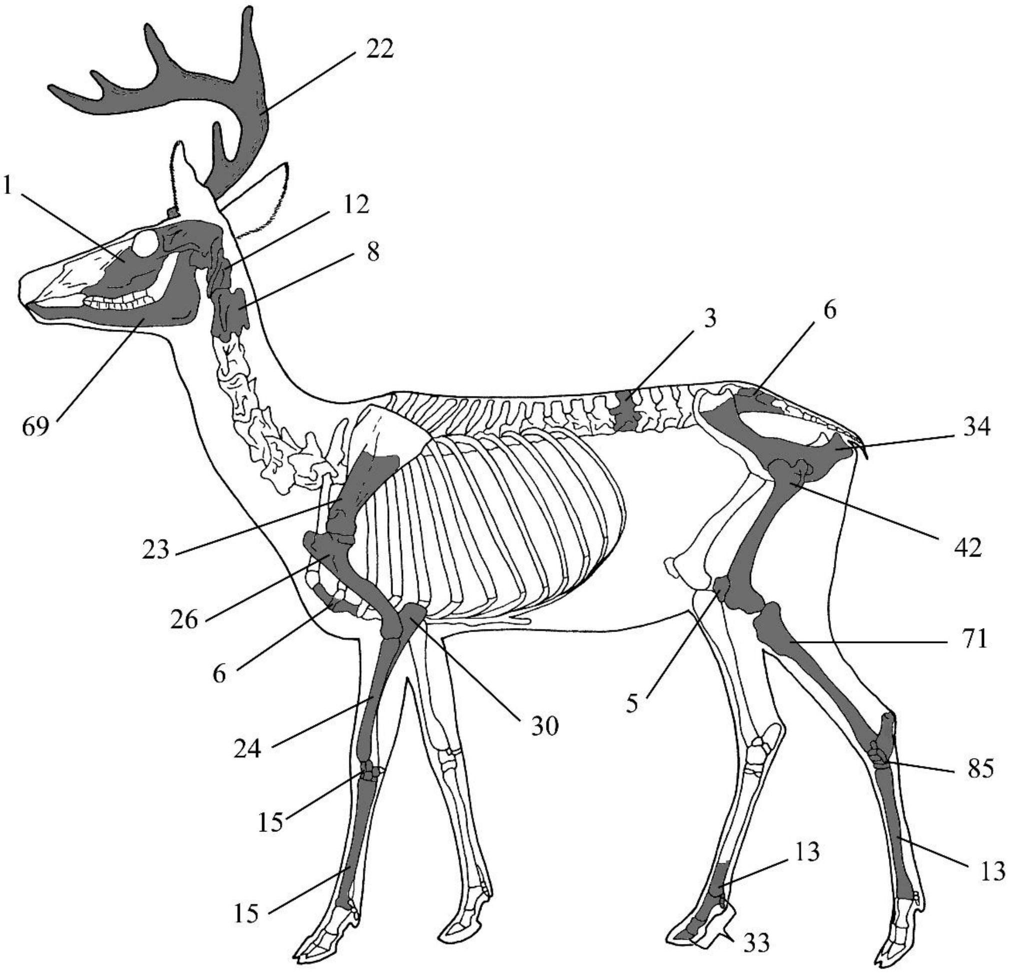

Figure 12-10. Musgrove Cowpens, Feature 231 (2008), deer (*Odocoileus virginianus*) elements identified (NISP = 725). Not illustrated are 99 teeth.

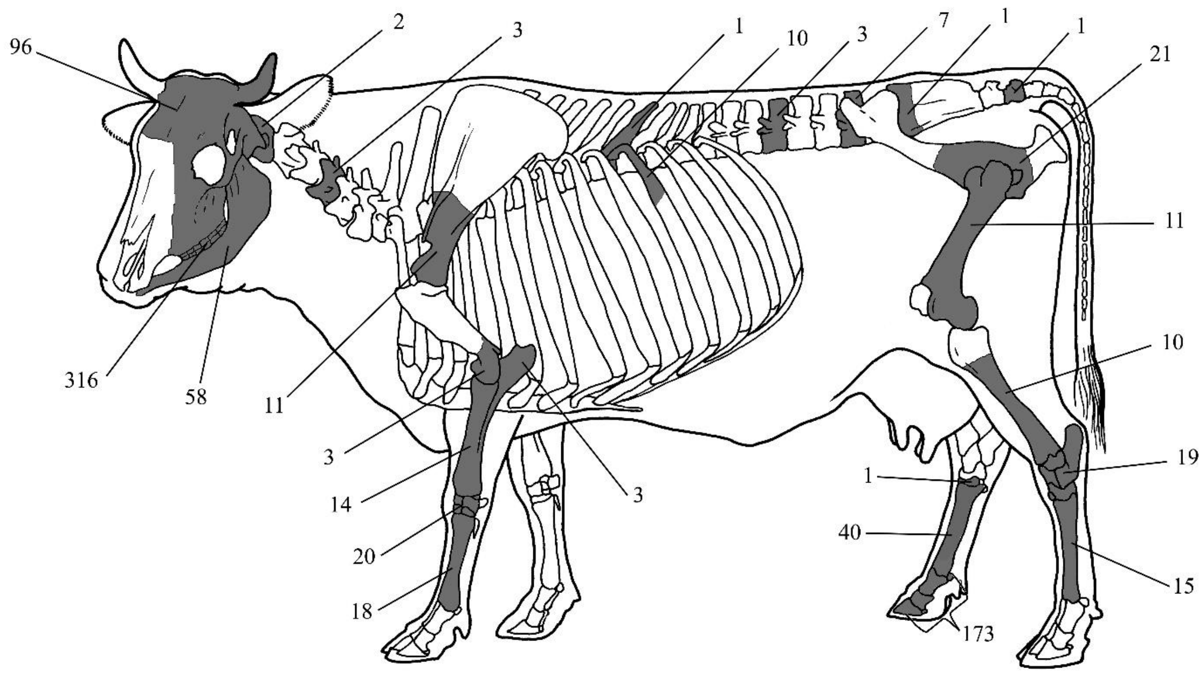

Figure 12-11. Musgrove Cowpens, Feature 231 (2008), cow (*Bos taurus*) elements identified (NISP = 857).

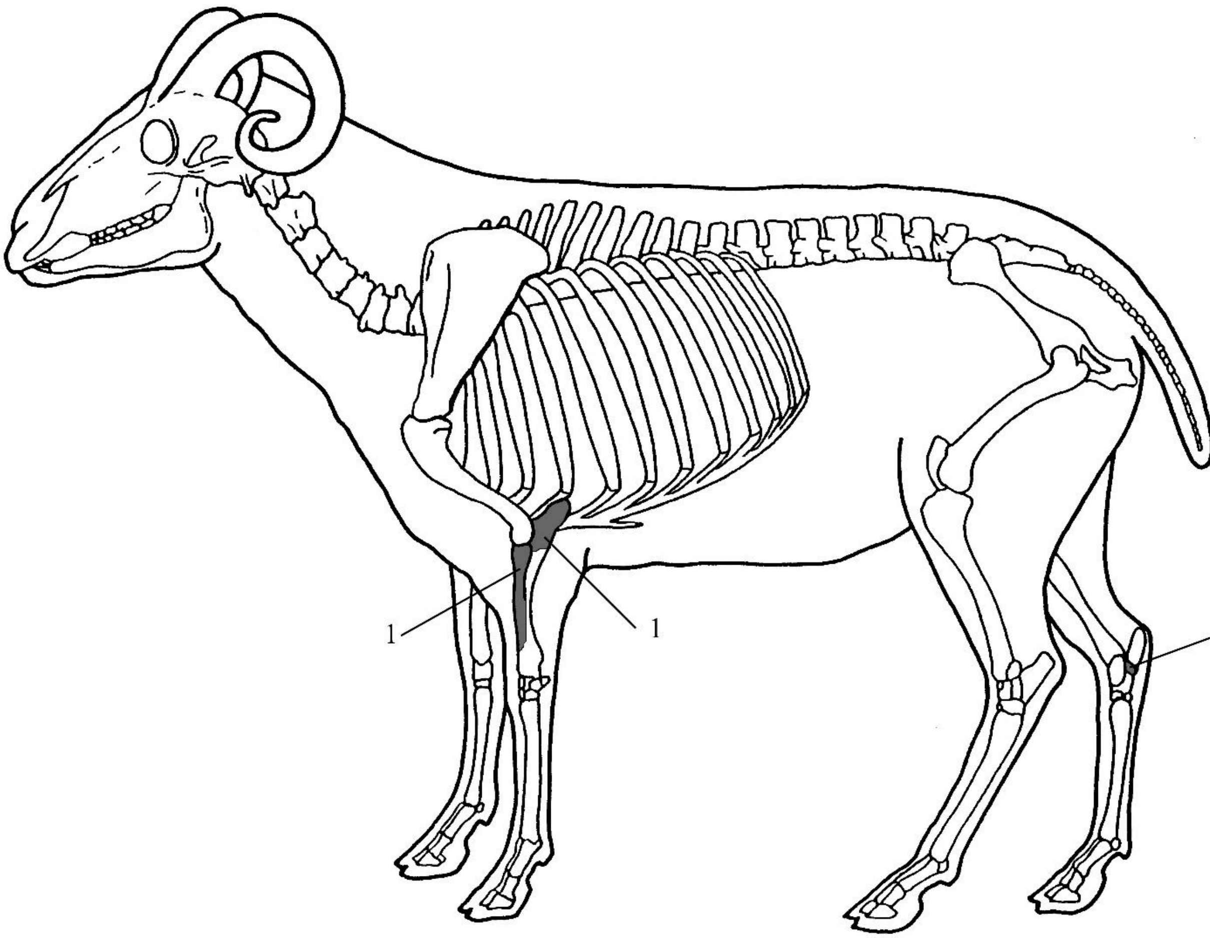

Figure 12-12. Musgrove Cowpens, Feature 231 (2008), sheep/goat (Caprinae) elements identified (NISP = 23). Not illustrated are 20 teeth.

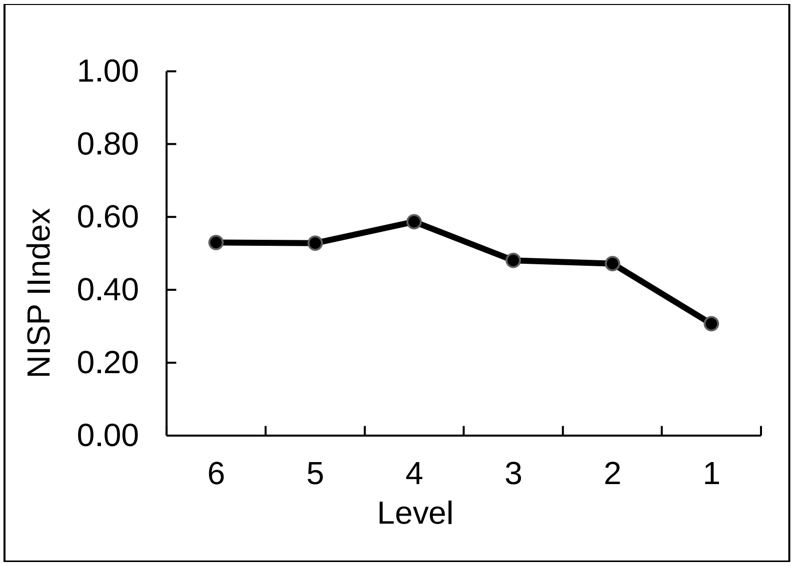

Figure 12-13. Musgrove Cowpens, Feature 231 (2022), Deer-Cattle NISP Index values.

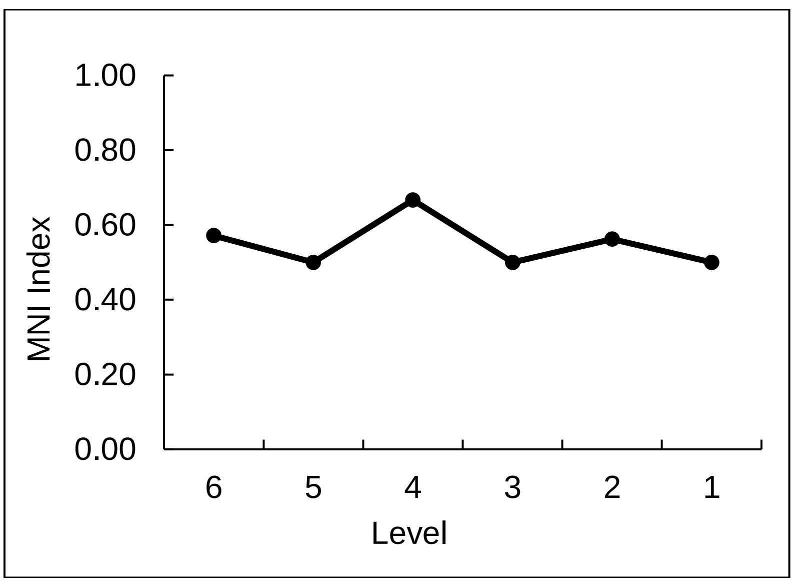

Figure 12-14. Musgrove Cowpens, Feature 231 (2022), Deer-Cattle MNI Index values.

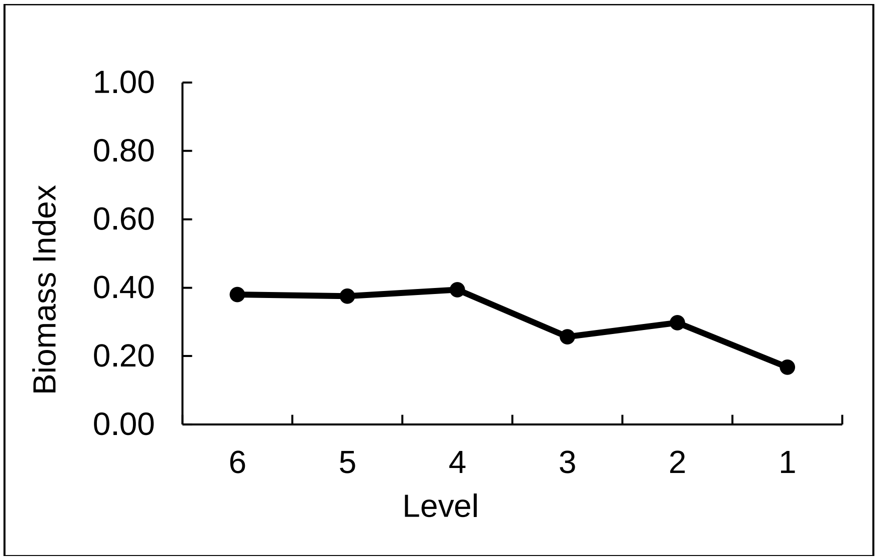

Figure 12-15. Musgrove Cowpens, Feature 231 (2022), Deer-Cattle Biomass Index values.

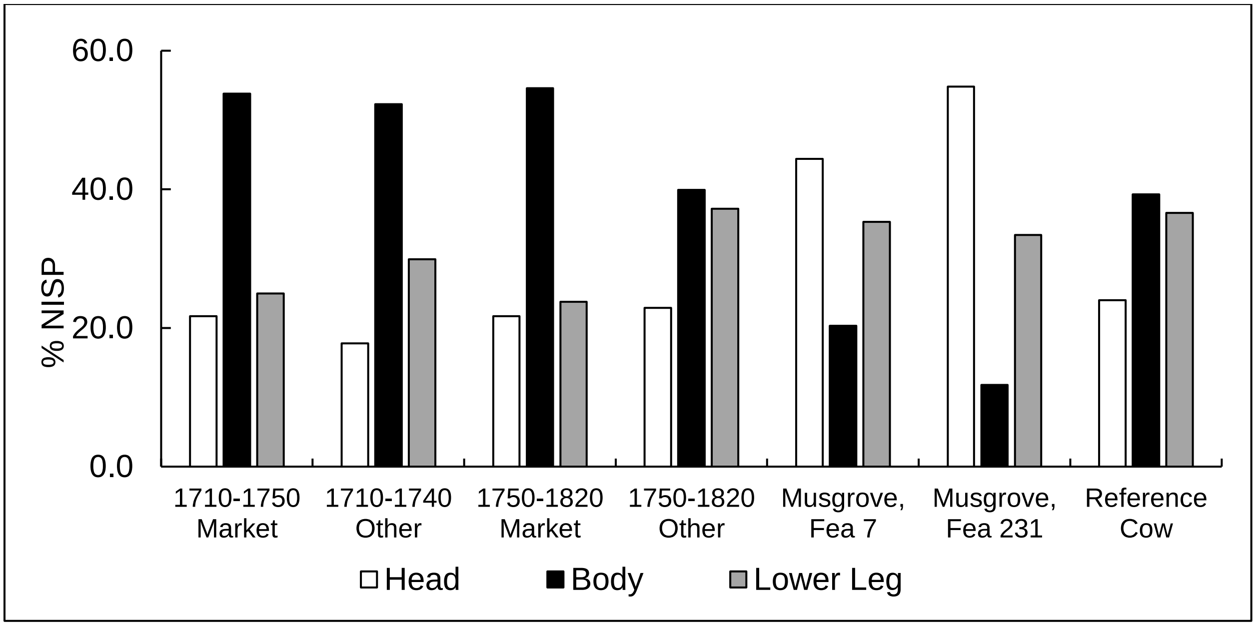

Figure 12-16. Comparison of cattle elements represented in Charleston's Beef Market and other Charleston contexts compared to Musgrove Feature 7, Feature 231 (2008), and a standard reference cow. See Appendix III for methods. Total NISP = 4,581.

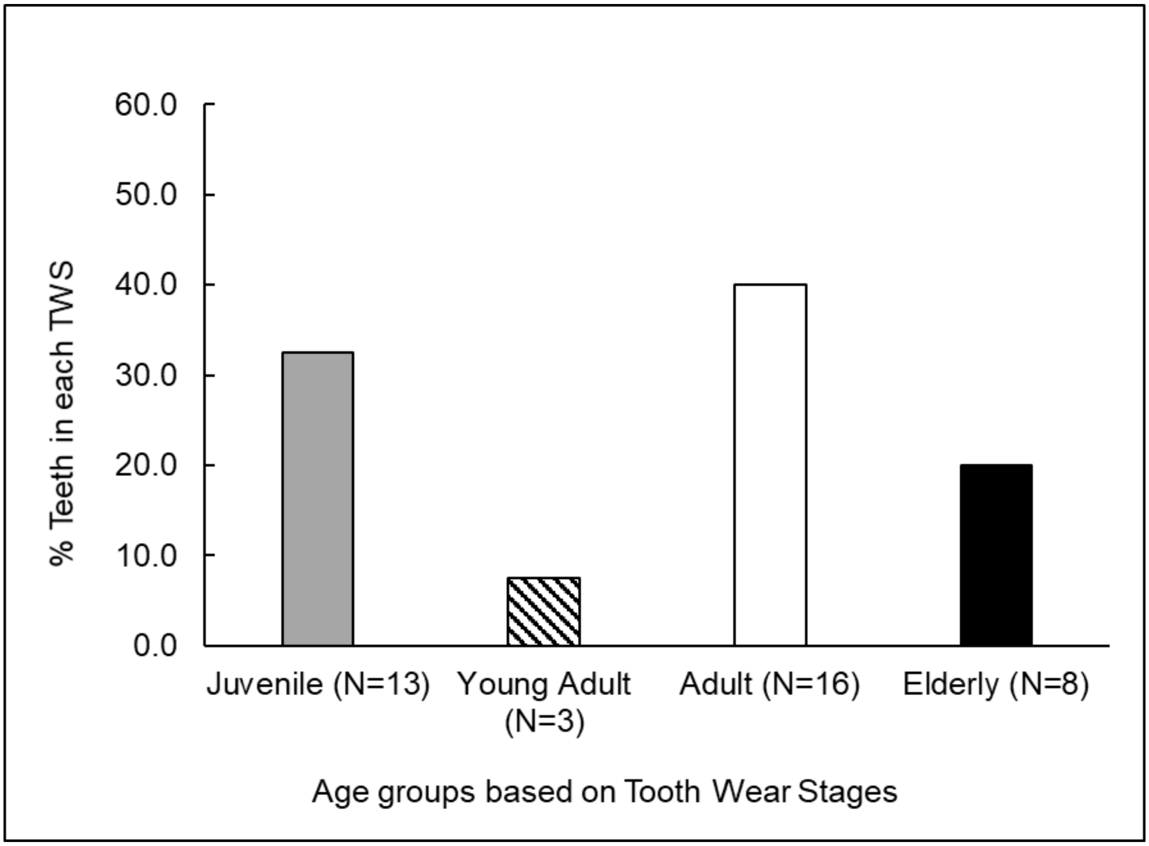

Figure 12-17. Age groups for Musgrove cattle based on tooth wear stages (TWS). Graph includes dP_4 and M_3 from Feature 7, Feature 231 (2008), and Feature (2022), some of which were also used in the stable isotope study. See Chapter X for a discussion of TWS, Appendix III for methods, and Appendix IV for the data (N = 40).

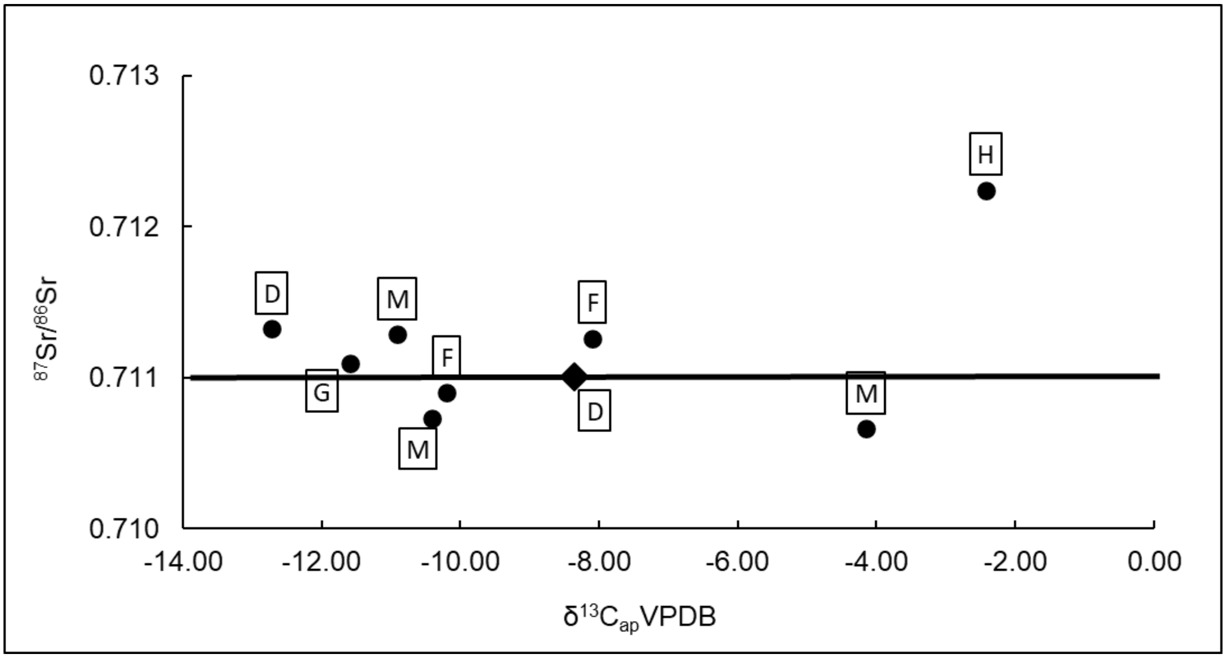

Figure 12-18. Tooth wear stages for Musgrove dP_4 (diamond) and M_3 (circles) used in the stable isotope study plotted against strontium (Sr) and carbon apatite ($\delta^{13}C_{ap}$VPDB) values. The dP_4 animal (diamond) is intepreted as a juvenile and the animal with TWS D (circle) is interpreted as a young adult. Animals with TWS E-H are interpreted as adults and animals with TWS M are interpreted as very elderly animals. The horizonatal line approximates the dividing line between the Lower and Upper Coastal Plain. See Chapter VII and Appendix IV for more information about these teeth.

Figure 12-19. Deer antler decoys from Musgrove Feature 231 (2008). Photograph by Chad Braley.

Table 12-1. Musgrove Cowpens, Feature 7: Species List.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii Indeterminate bony fishes	63			9.50	0.183
Acipenser spp. Sturgeon	1	1	1.2	0.18	0.008
Lepisosteus spp. Gar	5	1	1.2	0.97	0.032
Amia calva Bowfin	1	1	1.2	0.95	0.006
Siluriformes Catfishes	2			0.46	0.010
Ictaluridae Freshwater catfishes	31	11	12.8	10.93	0.193
Ameiurus spp. Bullheads	7	(1)		4.20	0.078
Ictalurus punctatus Channel catfish	4	(2)		1.62	0.032
Sciaenops ocellatus Red drum	1	1	1.2	3.19	0.092
Testudines Indeterminate turtles	89			51.63	0.444
Emydidae Pond turtles	48			77.58	0.584
Terrapene carolina Eastern box turtle	20	2	2.3	27.31	0.290
Trachemys scripta Slider	1	1	1.2	0.34	0.015
Colubridae Non-venomous snakes	2	1	1.2	0.23	0.003
Crotalinae Venomous snakes	1	1	1.2	0.70	0.010

Table 12-1. Musgrove Cowpens, Feature 7: Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Aves	245			95.77	1.297
Indeterminate birds					
cf. *Podilymbus podiceps*	1	1	1.2	0.29	0.007
Probable grebe					
Anatidae	49			27.51	0.417
Swans, geese, and ducks					
Anas spp.	81	12	14.0	56.97	0.808
Dabbling ducks					
Anas platyrhynchos	1	(1)		0.47	0.010
Mallard					
Branta canadensis	1	1	1.2	12.24	0.199
Canada goose					
Gallus gallus	52	4	4.7	41.77	0.610
Chicken					
Meleagris gallopavo	14	2	2.3	47.16	0.681
Turkey					
Colinus virginianus	1	1	1.2	0.24	0.006
Bobwhite					
Columbidae	3			0.72	0.015
Doves					
Ectopistes migratorius	1	1	1.2	0.32	0.007
Passenger pigeon					
Mammalia	28037			33646.32	312.074
Indeterminate mammals					
Didelphis virginiana	8	2	2.3	14.20	0.286
Opossum					
Rodentia	1			0.39	0.011
Rodents					
Sciurus spp.	2			1.31	0.034
Squirrel					

Table 12-1. Musgrove Cowpens, Feature 7: Species List, cont.

		MNI			
Taxon	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Sciurus carolinensis	1	1	1.2	0.29	0.009
Eastern gray squirrel					
Muridae	2			0.07	0.002
Mice, rats, and voles					
Rattus spp.	3	2	2.3	0.42	0.012
Old World rats					
Carnivora	1			1.17	0.030
Carnivores					
Urocyon cinereoargenteus	1	1	1.2	2.49	0.060
Gray fox					
Ursus americanus	35	2	2.3	703.58	9.607
American black bear					
Procyon lotor	6	1	1.2	8.99	0.190
Raccoon					
Mustelidae	1			0.75	0.020
Otters, weasels, and skunks					
Lontra canadensis	3	1	1.2	10.39	0.216
River otter					
Mephitis mephitis	2	1	1.2	1.63	0.041
Striped skunk					
Lynx rufus	5	1	1.2	11.29	0.233
Bobcat					
Artiodactyla	216			409.78	5.906
Even-toed ungulates					
Sus scrofa	93	3	3.5	632.90	8.734
Pig					
Odocoileus virginianus	442	16	18.6	6477.23	70.838
White-tailed deer					
Bos taurus	872	12	14.0	31449.69	293.676
Cow					

Table 12-1. Musgrove Cowpens, Feature 7: Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Caprinae	8			31.27	0.583
Goats and sheep					
Ovis aries	1	1	1.2	1.83	0.045
Sheep					
Vertebrata				290.38	
Indeterminate vertebrates					
Total	30465	86		74169.62	708.644

Table 12-2. Musgrove Cowpens, Feature 7: Summary Table.

	MNI		Biomass	
	#	**%**	**kg**	**%**
Fishes	15	17.4	0.331	0.1
Turtles and alligators	3	3.5	0.305	0.1
Wild birds	18	20.9	1.708	0.4
Domestic birds	4	4.7	0.610	0.2
Deer	16	18.6	70.838	18.3
Other wild mammals	10	11.6	10.642	2.8
Domestic mammals	16	18.6	302.455	78.2
Commensals	4	4.7	0.025	<0.1
Total	86		386.914	

Table 12-3. Musgrove Cowpens, Feature 7: Element Distribution.

	Pig	Deer	Cow	Sheep/Goat
Head	72	107	387	7
Vertebra/Rib		33	65	
Forequarter	10	87	47	
Hindquarter	6	107	65	1
Forefoot	1	19	54	
Hindfoot	3	67	71	1
Foot	1	22	183	
Total	93	442	872	9

Table 12-4. Musgrove Cowpens, Feature 7: Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		1	1
Scapula, distal		1	1
Radius, proximal		2	2
Acetabulum			
Metapodials, proximal		1	1
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal	1		1
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal	1		1
Ulna, proximal		1	1
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	2	6	8

Table 12-5. Musgrove Cowpens, Feature 7: Epiphyseal Fusion for Deer (*Odocoileus virginianus*).

	Unfused	**Fused**	**Total**
Early Fusing:			
Humerus, distal	1	14	15
Scapula, distal		9	9
Radius, proximal		16	16
Acetabulum			
Metapodials, proximal		10	10
1st/2nd phalanx, proximal		6	6
Middle Fusing:			
Tibia, distal	7	18	25
Calcaneus, proximal	8	12	20
Metapodials, distal		2	2
Late Fusing:			
Humerus, proximal	6	4	10
Radius, distal	1	8	9
Ulna, proximal	1	6	7
Ulna, distal		1	1
Femur, proximal	5	6	11
Femur, distal	11	11	22
Tibia, proximal	1	7	8
Total	41	130	171

Table 12-6. Musgrove Cowpens, Feature 7: Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	**Fused**	**Total**
Early Fusing:			
Humerus, distal	2	4	6
Scapula, distal		6	6
Radius, proximal		5	5
Acetabulum	2	3	5
Metapodials, proximal		23	23
1st/2nd phalanx, proximal	3	86	89
Middle Fusing:			
Tibia, distal	13	4	17
Calcaneus, proximal	2	6	8
Metapodials, distal	13	6	19
Late Fusing:			
Humerus, proximal	2		2
Radius, distal	4	6	10
Ulna, proximal	1	3	4
Ulna, distal			
Femur, proximal	5	2	7
Femur, distal	2	1	3
Tibia, proximal	1	4	5
Total	50	159	209

Table 12-7. Musgrove Cowpens, Feature 7: Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal			
Acetabulum		1	1
Metapodials, proximal			
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal		1	1
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal			
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total		2	2

Table 12-8. Musgrove Cowpens, Feature 7: Modifications.

Taxon	**Hacked**	**Sawed**	**Clean Cut**	**Cut**	**Burned**	**Calcined**	**Worked**	**Rodent gnawed**	**Carnivore gnawed**	**Pathological**
Testudines					6	1				
Emydidae					5					
Terrapene carolina					1					
Aves					1					
Anatidae				3					1	
Gallus gallus				1		1				
Meleagris gallopavo				1						
Mammalia	411	3	18	118	8269	1207		1	7	
Ursus americanus	3			2	1					1
Lontra canadensis				1						
Mephitis mephitis			1	1						
Lynx rufus					1					
Artiodactyla	1		2		25	2				
Sus scrofa	2			2	5					1
Odocoileus virginianus	68	1	11	22	33	8	2		3	
Bos taurus	109	6	32	37	38	1			5	
Caprinae									1	
Vertebrata					541	36				
Total	594	10	64	188	8926	1256	2	1	17	2

Table 12-9. Musgrove Cowpens, Feature 231 (2008): Species List.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii Indeterminate bony fishes	414			124.37	1.468
Acipenser spp. Sturgeon	69	1	0.7	103.57	1.180
Lepisosteus spp. Gar	17	1	0.7	4.42	0.098
Minytrema melanops Spotted sucker	1	1	0.7	0.39	0.014
Siluriformes Catfishes	3			0.96	0.019
Ictaluridae Freshwater catfishes	117			42.78	0.707
Ameiurus spp. Bullheads	72	9	6.5	31.64	0.531
Ictalurus spp. Freshwater catfish	65	10	7.2	45.97	0.757
Ictalurus punctatus Channel catfish	23	(4)		17.64	0.305
Ariidae Sea catfishes	3			1.67	0.032
Ariopsis felis Hardhead catfish	2	1	0.7	0.53	0.011
Centrarchidae Sunfishes	2			1.27	0.021
Micropterus spp. Bass	2	1	0.7	0.80	0.014
Pogonias cromis Black drum	3	1	0.7	3.10	0.090

Table 12-9. Musgrove Cowpens, Feature 231 (2008): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Mugil sp.	1	1	0.7	0.11	0.004
Mullet					
Anura	1	1	0.7	0.05	
Frogs and toads					
Alligator mississippiensis	14	2	1.4	24.38	0.352
Alligator					
Testudines	76			70.50	0.547
Indeterminate turtles					
Kinosternidae	1			0.34	0.015
Mud/musk turtles					
Sternotherus oderatus	2	1	0.7	1.66	0.044
Musk turtle					
Emydidae	36			51.41	0.443
Pond turtles					
Terrapene carolina	60	6	4.3	109.92	0.737
Eastern box turtle					
Trachemys spp.	9	1	0.7	42.49	0.390
Slider					
Aves	492			206.88	2.614
Indeterminate birds					
Ardea herodias	1	1	0.7	2.32	0.044
Great blue heron					
Anatidae	35			19.80	0.309
Swans, geese, and ducks					
Anas spp.	22	3	2.2	14.19	0.228
Dabbling ducks					
Aythya sp.	1	1	0.7	0.99	0.020
Diving duck					

Table 12-9. Musgrove Cowpens, Feature 231 (2008): Species List, cont.

		MNI			
Taxon	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Branta canadensis	1	1	0.7	8.10	0.137
Canada goose					
Buteo spp.	2	1	0.7	2.18	0.041
Hawk					
Galliformes	12			2.76	0.051
Gallinaceous birds					
Phasianidae	5			5.74	0.100
Turkeys and chickens					
Gallus gallus	125	8	5.8	86.61	1.184
Chicken					
Meleagris gallopavo	45	3	2.2	200.16	2.537
Turkey					
cf. *Zenaida macroura*	1	1	0.7	0.11	0.003
Probable mourning dove					
Passeriformes	3			0.29	0.007
Passerine birds					
Agelaius phoeniceus	1	1	0.7	0.05	0.001
Blackbird					
Mammalia	11480			25425.41	242.517
Indeterminate mammals					
Didelphis virginiana	100	9	6.5	146.010	2.333
Opossum					
Sylvilagus spp.	34	2	1.4	16.940	0.336
Rabbit					
Rodentia	14			8.860	0.187
Rodents					

Table 12-9. Musgrove Cowpens, Feature 231 (2008): Species List, cont.

		MNI			
Taxon	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Sciurus spp.	12			4.870	0.109
Squirrel					
Sciurus carolinensis	3	2	1.4	1.470	0.037
Eastern gray squirrel					
Sciurus niger	3	1	0.7	0.890	0.024
Fox squirrel					
Rattus spp.	3	1	0.7	2.500	0.060
Old World rats					
Sigmodon hispidus	1	1	0.7	0.140	0.004
Hispid cotton rat					
Carnivora	2			0.240	0.007
Carnivores					
Canis sp.	2	1	0.7	0.980	0.026
Dogs and wolves					
Urocyon cinereoargenteus	1	1	0.7	1.840	0.046
Gray fox					
Ursus americanus	23	2	1.4	385.050	5.584
American black bear					
Procyon lotor	21	4	2.9	54.50	0.961
Raccoon					
Lontra canadensis	2	1	0.7	3.78	0.087
River otter					
Mephitis mephitis	2	1	0.7	1.61	0.040
Striped skunk					
Puma concolor	1	1	0.7	21.38	0.414
Mountain lion					
Lynx rufus	2	1	0.7	3.22	0.075
Bobcat					

Table 12-9. Musgrove Cowpens, Feature 231 (2008): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Artiodactyla	164			728.02	9.907
Even-toed ungulates					
Sus scrofa	106	5	3.6	582.48	8.105
Pig					
Odocoileus virginianus	725	29	20.9	9800.33	102.829
White-tailed deer					
Bos taurus	857	15	10.8	15832.41	158.341
Cow					
Caprinae	23	4	2.9	71.30	1.224
Goats and sheep					
Vertebrata				596.860	
Total	15320	138		54921.24	548.308

Table 12-10. Musgrove Cowpens, Feature 231 (2008): Summary Table.

	MNI		Biomass	
	#	**%**	**kg**	**%**
Fishes	26	18.8	2.699	0.9
Turtles and alligators	10	7.2	1.523	0.5
Wild birds	12	8.7	3.011	1.0
Domestic birds	8	5.8	1.184	0.4
Deer	29	21.0	102.829	35.6
Other wild mammals	25	18.1	9.937	3.4
Domestic mammals	24	17.4	167.670	58.0
Commensals	4	2.9	0.090	<0.1
Total	138		288.943	

Note: Anurans are included in the MNI calculation, but are not included in the biomass calculation because allometric values are not currently available for this taxon.

Table 12-11. Musgrove Cowpens, Feature 231 (2008): Element Distribution.

	Pig	Deer	Cow	Sheep/Goat
Head	81	261	470	20
Vertebra/Rib		29	27	
Forequarter	9	103	31	2
Hindquarter	7	158	43	
Forefoot	3	30	38	
Hindfoot		98	34	1
Foot	6	46	214	
Total	106	725	857	23

Table 12-12. Musgrove Cowpens, Feature 231 (2008): Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	**Fused**	**Total**
Early Fusing:			
Humerus, distal		1	1
Scapula, distal			
Radius, proximal			
Acetabulum	2		2
Metapodials, proximal			
1st/2nd phalanx, proximal		1	1
Middle Fusing:			
Tibia, distal		1	1
Calcaneus, proximal			
Metapodials, distal		1	1
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal	1		1
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total	3	4	7

Table 12-13. Musgrove Cowpens, Feature 231 (2008): Epiphyseal Fusion for Deer (*Odocoileus virginianus*).

	Unfused	**Fused**	**Total**
Early Fusing:			
Humerus, distal	2	12	14
Scapula, distal	1	17	18
Radius, proximal		12	12
Acetabulum	4	6	10
Metapodials, proximal		18	18
1st/2nd phalanx, proximal	13	11	24
Middle Fusing:			
Tibia, distal	9	31	40
Calcaneus, proximal	12	24	36
Metapodials, distal	13	5	18
Late Fusing:			
Humerus, proximal	3	3	6
Radius, distal	3	8	11
Ulna, proximal	11	5	16
Ulna, distal			
Femur, proximal	11	11	22
Femur, distal	7	7	14
Tibia, proximal	7	11	18
Total	96	181	277

Table 12-14. Musgrove Cowpens, Feature 231 (2008): Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal		1	1
Scapula, distal	1	1	2
Radius, proximal		2	2
Acetabulum		3	3
Metapodials, proximal		16	16
1st/2nd phalanx, proximal	2	109	111
Middle Fusing:			
Tibia, distal	1	4	5
Calcaneus, proximal		1	1
Metapodials, distal	21	8	29
Late Fusing:			
Humerus, proximal			
Radius, distal	3	3	6
Ulna, proximal	1	1	2
Ulna, distal			
Femur, proximal	4		4
Femur, distal		2	2
Tibia, proximal			
Total	33	151	184

Table 12-15. Musgrove Cowpens, Feature 231 (2008): Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Fused	Total
Early Fusing:			
Humerus, distal			
Scapula, distal			
Radius, proximal		1	1
Acetabulum			
Metapodials, proximal			
1st/2nd phalanx, proximal			
Middle Fusing:			
Tibia, distal			
Calcaneus, proximal			
Metapodials, distal			
Late Fusing:			
Humerus, proximal			
Radius, distal			
Ulna, proximal		1	1
Ulna, distal			
Femur, proximal			
Femur, distal			
Tibia, proximal			
Total		2	2

Table 12-16. Musgrove Cowpens, Feature 231 (2008): Modifications.

Taxon	Hacked	Sawed	Clean cut	Cut	Burned	Calcined	Worked	Carnivore gnawed	Weathered	Pathological
Osteichthyes					1					
Ictalurus spp.				1						
Testudines					4	1				
Emydidae					1					
Terrapene carolina	1				3					
Aves				3	1				2	
Anatidae									1	
Anas spp.									1	
Phasianidae										
Gallus gallus					1				4	
Meleagris gallopavo									3	
Mammalia	932	4	23	64	140	108	1	50		
Didelphis virginianus					1				4	
Scurius spp.									1	
Ursus americanus	2							1		
Procyon lotor				1						
Lontra canadensis									1	
Artiodactyl	14		2	2		1			2	
Sus scrofa	7			2					2	
Odocoileus virginianus	158		18	22	5	1	10	10	12	2
Bos taurus	88		18	26	3			1	21	3

Table 12-16. Musgrove Cowpens, Feature 231 (2008): Modifications, cont.

Taxon	Hacked	Sawed	Clean cut	Cut	Burned	Calcined	Worked	Carnivore gnawed	Weathered	Pathological
Caprinae	1									
Vertebrata	7		1	2	18	1	1	2		
Total	1210	4	62	123	178	112	12	64	54	5

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Actinopterygii Indeterminate bony fishes	1138			405.54	3.824
Acipenser spp. Sturgeon	78	1	0.5	106.40	1.921
Lepisosteus spp. Gar	3	1	0.5	12.07	0.289
Amia calva Bowfin	5	1	0.5	5.98	0.124
Minytrema melanops Spotted sucker	1	1	0.5	0.10	0.004
Siluriformes Catfishes	19			8.24	0.148
Ictaluridae Freshwater catfishes	194	35	18.5	116.72	1.836
Ameiurus spp. Bullheads	34	5	2.6	14.91	0.260
Ictalurus spp. Freshwater catfish	120			94.91	1.508
Ariopsis felis Hardhead catfish	19	3	1.6	7.18	0.130
Morone spp. Striped bass	6	1	0.5	4.93	0.104
Micropterus salmoides Largemouth bass	5	1	0.5	1.45	0.028
Archosargus probatocephalus Sheepshead	1	1	0.5	0.34	0.011
Cynoscion nebulosus Spotted seatrout	3	1	0.5	1.66	0.032

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List, cont.

		MNI			
Taxon	**NISP**	**#**	**%**	**Weight, g**	**Biomass, kg**
Sciaenops ocellatus	1	1	0.5	6.77	0.160
Red drum					
Scomberomorus sp.	1			0.35	0.006
Mackerel					
Scomberomorus maculatus	2	1	0.5	1.43	0.027
Spanish mackerel					
Paralichthys lethostigma	6	1	0.5	1.58	0.040
Southern flounder					
Anura	8	1	0.5	1.26	0.017
Frog					
Alligator mississipensis	7	1	0.5	4.35	0.063
American alligator					
Testudines	221			187.83	1.055
Indeterminate turtles					
Chelydra sp.	3	1	0.5	12.16	0.169
Snapping turtle					
Kinosternon subrubrum	4	1	0.5	15.14	0.195
Eastern mud turtle					
Emydidae	4			4.94	0.092
Pond turtles					
Chrysemys picta	8	1	0.5	11.16	0.159
Painted turtle					
Deirochelys reticularia	8	2	1.1	21.93	0.250
Chicken turtle					
Malaclemys terrapin	32	2	1.1	34.95	0.342
Diamondback terrapin					
Pseudemys sp.	4			4.33	0.084
Cooter					

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Pseudemys concinna River cooter	63	4	2.1	427.30	1.831
Terrapene carolina Eastern box turtle	83	3	1.6	135.90	0.850
Trachemys sp. Slider	10	1	0.5	9.49	0.143
Apalone ferox Florida softshell turtle	6	1	0.5	4.26	0.084
Aves Indeterminate birds	1751			882.80	9.789
Anatidae Swans, geese, and ducks	17			8.56	0.144
Anas spp. Dabbling ducks	101	11	5.8	72.47	1.006
cf. *Anas platyrhynchos* Probable mallard	7	3	1.6	5.12	0.090
Anser sp. Geese	1			5.13	0.090
cf. *Branta canadensis* Probable Canada goose	8	2	1.1	41.64	0.608
Gallus gallus Chicken	94	6	3.2	107.27	1.438
Meleagris gallopavo Turkey	43	3	1.6	225.75	2.830
Treskiornithidae Ibis	1	1	0.5	0.87	0.018
Buteo spp. Hawk	5	1	0.5	4.73	0.084

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Charadriidae Plover	1	1	0.5	0.09	0.002
Laridae Gull	1	1	0.5	1.25	0.025
Columbidae Pigeon	1	1	0.5	0.14	0.003
Zenaida macroura Mourning dove	1	1	0.5	0.10	0.003
Passeriformes Song birds	1			0.16	0.004
Corvidae Crow	2	1	0.5	1.11	0.022
Turdus migratorious American robin	1	1	0.5	0.06	0.002
cf. *Cardinalis cardinalis* Cardinal	1	1	0.5	0.12	0.003
Mammalia Indeterminate mammals	18130			41811.02	379.456
Didelphis virginiana Virginia opossum	127	7	3.7	220.60	3.383
Leporidae Rabbit	3			1.48	0.037
Sylvilagus floridanus Cottontail rabbit	5	1	0.5	8.51	0.181
Rodentia Rodents	5			1.15	0.030
Sciuridae Squirrel	5			1.88	0.046

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
Sciurus carolinensis	5	1	0.5	2.28	0.055
Eastern gray squirrel					
Sciurus niger	5	1	0.5	2.16	0.053
Fox squirrel					
Neotoma floridana	9	2	1.1	5.14	0.115
Eastern woodrat					
Canidae	7			9.20	0.194
Dog, coyote, or wolf					
cf. *Canis familiaris*	2	1	0.5	5.53	0.123
Probable domesticated dog					
cf. *Urocyon cinereoargenteus*	5	1	0.5	14.37	0.290
Gray fox					
Vulpes vulpes	1	1	0.5	0.32	0.009
Red fox					
Ursus americanus	115	3	1.6	1827.62	22.683
American black bear					
Procyon lotor	23	2	1.1	38.64	0.705
Raccoon					
Mustelidae	2	1	0.5	1.79	0.044
Weasel, otter, or mink					
Mephitis mephitis	1	1	0.5	0.44	0.013
Stripped skunk					
cf. *Felis concolor*	2	1	0.5	12.24	0.251
Probable mountain lion					
cf. *Equus* spp.	2	1	0.5	84.70	1.429
Probable horse					
Artiodactyla	500			1689.40	21.133
Even-toed ungulates					

Table 12-17. Musgrove Cowpens, Feature 231 (2022): Species List, cont.

Taxon	NISP	MNI #	MNI %	Weight, g	Biomass, kg
cf. *Sus scofra* Probable pig	2			146.97	2.347
Sus scofra Pig	186	6	3.2	801.78	10.806
cf. *Cervus canadensis* Probable elk	1	1	0.5	41.70	0.755
cf. *Odocoileus virginianus* Probable white-tailed deer	4			10.46	0.218
Odocoileus virginianus White-tailed deer	1449	28	14.8	17081.99	169.545
cf. *Bos taurus* Probable cattle	1			31.70	0.590
Bos taurus Cattle	1453	21	11.1	41412.32	376.198
cf. Caprinae Probable sheep or goat	1			3.47	0.081
Caprinae Sheep or goats	35	3	1.6	214.26	3.295
Vertebrata				1545.44	
Total	26220	189		110051.49	1026.011

Table 12-18. Musgrove Cowpens, Feature 231 (2022): Summary Table.

	MNI		Biomass	
	#	**%**	**kg**	**%**
Fishes	54	28.6	6.000	1.0
Turtles and alligators	17	9.0	4.210	0.7
Wild birds	26	14.8	4.880	0.8
Domestic birds	6	3.2	1.440	0.2
Deer	28	14.8	169.760	27.8
Other wild mammals	21	11.1	28.730	4.7
Cattle	21	11.1	376.790	61.8
Other domestic mammals	10	5.3	17.960	2.9
Commensals	6	2.1	0.100	0.0
Total	189		609.87	

Table 12-19. Musgrove Cowpens, Feature 231 (2022): Element Distribution.

	Pig	Deer	Cow	Sheep/Goat
Head	150	456	666	25
Vertebra/Rib	12	199	158	1
Forequarter	4	225	60	2
Hindquarter	7	255	72	4
Forefoot	4	72	97	2
Hindfoot	5	168	109	2
Foot	6	78	292	0
Total	188	1453	1454	36

Table 12-20. Musgrove Cowpens, Feature 231 (2022): Epiphyseal Fusion for Pig (*Sus scrofa*).

	Unfused	Nearly Fused	Partially Fused	Fused	Total
Early Fusing:					
Humerus, distal					
Scapula, distal					
Radius, proximal					
Acetabulum					
Metapodials, proximal				2	2
1st/2nd phalanx, proximal					
Middle Fusing:					
Tibia, distal					
Calcaneus, proximal	1				1
Metapodials, distal					
Late Fusing:					
Humerus, proximal					
Radius, distal				1	1
Ulna, proximal	2			1	3
Ulna, distal					
Femur, proximal	1			1	2
Femur, distal					
Tibia, proximal					
Total	4			5	9

Table 12-21. Musgrove Cowpens, Feature 231 (2022): Epiphyseal Fusion for Deer (*Odocoileus virginianus*).

	Unfused	Partially Fused	Nearly Fused	Fused	Total
Early Fusing:					
Humerus, distal	10	1	1	34	46
Scapula, distal				27	27
Radius, proximal	3		1	26	30
Acetabulum	6			11	17
Metapodials, proximal	1		2	31	34
1st/2nd phalanx, proximal	9	1	5	27	42
Middle Fusing:					
Tibia, distal	11	3	1	38	53
Calcaneus, proximal	16	1	3	17	37
Metapodials, distal	10			7	17
Late Fusing:					
Humerus, proximal	4	1	1	1	7
Radius, distal	7	2	1	14	24
Ulna, proximal	8			11	19
Ulna, distal					
Femur, proximal	14			9	23
Femur, distal	9		1	10	20
Tibia, proximal	9	1	2	7	19
Total	117	10	18	270	415

Table 12-22. Musgrove Cowpens, Feature 231 (2022): Epiphyseal Fusion for Cow (*Bos taurus*).

	Unfused	Partially Fused	Nearly Fused	Fused	Total
Early Fusing:					
Humerus, distal				3	3
Scapula, distal			1	9	10
Radius, proximal	2	1		4	7
Acetabulum				4	4
Metapodials, proximal	7	4	3	30	44
1st/2nd phalanx, proximal	9	10	3	166	188
Middle Fusing:					
Tibia, distal	7		2	5	14
Calcaneus, proximal		1	2	4	7
Metapodials, distal	27	1		13	41
Late Fusing:					
Humerus, proximal	2				2
Radius, distal	4			1	5
Ulna, proximal	1		1	2	4
Ulna, distal					
Femur, proximal	1			2	3
Femur, distal	4			1	5
Tibia, proximal	4				4
Total	68	17	12	244	341

Table 12-23. Musgrove Cowpens, Feature 231 (2022): Epiphyseal Fusion for Sheep/Goat (Caprinae).

	Unfused	Partially Fused	Nearly Fused	Fused	Total
Early Fusing:					
Humerus, distal	1				1
Scapula, distal					
Radius, proximal					
Acetabulum					
Metapodials, proximal	1				1
1st/2nd phalanx, proximal					
Middle Fusing:					
Tibia, distal					
Calcaneus, proximal					
Metapodials, distal	1				1
Late Fusing:					
Humerus, proximal					
Radius, distal					
Ulna, proximal					
Ulna, distal					
Femur, proximal					
Femur, distal				1	1
Tibia, proximal					
Total	3			1	4

Table 12-24. Musgrove Cowpens, Feature 231 (2022): Modifications.

Taxon	Hacked	Sawed	Cut	Burned	Calcined	Rodent gnawed	Carnivore gnawed	Worked	Weathered	Pathological
Acipenseridae	1									
Ictalurus spp.			2		1					
Testudines				3						
Terrapene carolina				7						
Chrysemys picta				1						
Pseudemys concinna			2					1		
Malaclemys terrapin				1						
Aves	1		1	9	1					
Anas spp.				1						
Meleagris gallopavo			3							
Mammalia	1472	2	333			2	3			
Sylvalgius floridianus			1	348	121			1		
Canidae sp.			1							
Urocyon cinerargenteus cf.			1							
Ursus americanus	8		10							
Procyon lotor				1						
Artiodactlya	3		5	7						
Sus scrofa	3		7							
Odocoileus virginianus	135	1	143	8	2	1	10			1
Bos taurus	110	1	209	18	1	1	9		6	1

Table 12-24. Musgrove Cowpens, Feature 231 (2022): Modifications, cont.

Taxon	Hacked	Sawed	Cut	Burned	Calcined	Rodent gnawed	Carnivore gnawed	Worked	Weathered	Pathological
Caprinae		1	1							
Vertebrata				29	200					
Total	1733	5	719	433	326	4	22	2	6	2

Table 12-25. Musgrove Cowpens, Feature 231 (2022): Deer-Cattle Index, NISP.

Level	Deer NISP	Cattle NISP	Deer/Cattle Index
1	73	165	0.31
2	330	369	0.47
3	305	329	0.48
4	465	327	0.59
5	37	33	0.53
6	132	117	0.53
Total	1342	1340	0.50

Table 12-26. Musgrove Cowpens, Feature 231 (2022): Deer-Cattle Index, MNI.

Level	Deer MNI	Cattle MNI	Deer/Cattle Index
1	4	4	0.50
2	9	7	0.56
3	10	10	0.50
4	12	6	0.67
5	2	2	0.50
6	4	3	0.57
Total	41	32	0.56

Table 12-27. Musgrove Cowpens, Feature 231 (2022): Deer-Cattle Index, Biomass.

Level	Deer Biomass	Cattle Biomass	Deer/Cattle Index
1	8.78	43.6	0.17
2	35	82.42	0.30
3	42.6	123.56	0.26
4	26.57	40.85	0.39
5	7.53	12.53	0.38
6	25.31	41.39	0.38
Total	145.79	344.35	0.30

Chapter XIII
Outreach Products

KC Jones, Elise Reagan, and Stephanie Thomas

Results of the NSF-funded project are presented to a broader audience, both children and adults, through three products developed from the research. The products, all parts of ongoing efforts at University of Georgia and The Charleston Museum, were designed to be broadly inclusive and accessible, incorporating the voices of the communities that would be impacted the most by our work.

Carbon Comics

The first outreach product is the third installment of the *Carbon Comics* series, an educational comic sponsored by the University of Georgia Center for Applied Isotope Studies (CAIS). These bilingual comic books focus on the intersection of historical narratives and archaeological science, describing projects conducted by CAIS scientists and collaborators. These include lesson plans that are aligned with Georgia science and social studies standards as well as Next Generation Science Standards.

The *Carbon Comics* series was developed as a way to integrate real archaeological questions and scientific processes into a format accessible to children, young adults, and the interested public. The field of comic studies is still relatively new, beginning in the early 2000s (Kirtley et al. 2020; Steirer 2011), but several sources tout the value of this approach. One benefit of teaching with comics is the inherent interdisciplinarity of the medium, which lends itself to being a broadly collaborative form of outreach. Educational comics represent the combined efforts of artists, writers, and discipline-specific specialists (in our case, the scientists involved with this project), and engage learners through both literary reading and visual literacy.

The first in the series described "Radiocarbon Dating" while the second covered "The Science of Archaeometallurgy." The third, "The Archaeology of the Cattle Economy" is a longer, more diverse script. In this volume of the *Carbon Comic* series, we tie 30+ years of research on colonial Charleston to the present NSF study through a meta-narrative conversation between the two researchers with the most experience at "digging into" Charleston's past – Martha Zierden and Betsy Reitz. Through conversational dialogue between each other and the readers, Martha and Betsy walk the reader through decades of research into colonial Charleston, and introduce the current NSF program and the science behind it.

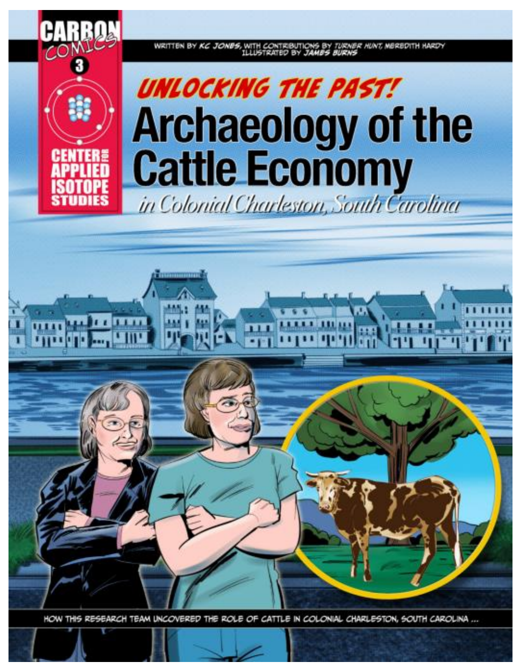

Figure 13-1: Carbon Comics #3 (draft).

Similar to previous volumes of the *Carbon Comic* series, this issue includes flexible lesson plans structured for middle school and high school-aged students (Appendix V). Additionally, this volume continues the trend of previous *Carbon Comic* issues, and will be made available in both English and Spanish. Discussions with

Muscogee (Creek) Nation for a Muskogean translation are ongoing. A long-form, accessible-text version of the script and storyboard is also in development for individuals who require the use of screen readers to engage with visual media.

One major change with this volume is the deliberate integration of descendent community consultation during different stages of the comic's production. Because this research program invokes the histories of both enslaved and indigenous communities, cultural consultants from the Gullah Geechee Cultural Heritage Corridor Commission and the Muscogee (Creek) Nation were brought into the production process (and compensated as far as federal and tribal employment restrictions allowed). Cultural consultants had direct input into the narrative scope, artistic rendering, and messaging of the comic, with authorship credit. The final product will be made freely available to both the Commission and the Muscogee (Creek) Nation to supplement their own outreach initiatives in both print and digital formats.

Bragg Boxes

The Charleston Museum communicates with our audiences through lectures, newsletters, booklets, radio and television interviews. Increasingly in the era of Covid-19, the Museum uses electronic media such as Facebook, Twitter, and the Museum's web site. Students participate in Museum programs through streamable learning and other remote learning outlets, as well as in-person visits to the Museum and its historic houses. The Charleston Museum routinely interprets Lowcountry history to the public through archaeological materials and interpretations. This outreach brings the excitement of scientific discovery, intrinsic to STEM research, directly to visitors, especially children. The Charleston Museum's interactive educational programs, designed in consultation with representatives from area school districts to fulfill the needs of students in K-12.

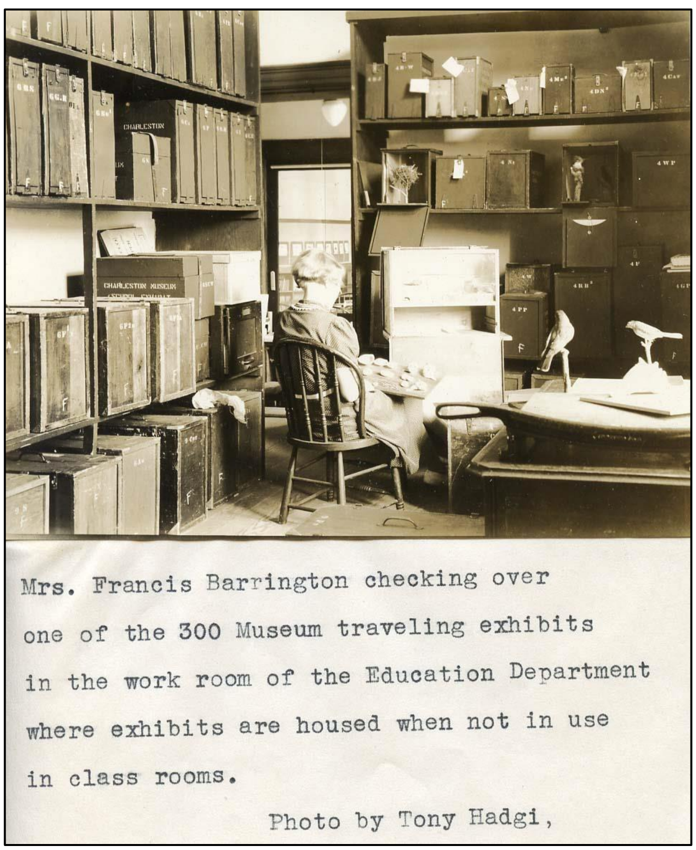

Figure 13-2: Museum Director Laura Bragg and the Bragg Boxes, 1920s. Collections of The Charleston Museum.

The Charleston Museum incorporated the project into modernized Bragg Boxes and programs and exhibits at the Heyward-Washington House. Bragg Boxes were pioneered by Laura Bragg, Director of the Charleston Museum in the 1920s (and the first female Director at a publicly-funded museum in the United States). Bragg revolutionized children's programming for those unable to visit in person with specially crafted boxes containing Museum materials, which she distributed to rural schools throughout the Charleston area. A century later the Museum is faced with the same issue: diminished funding for field trips to the Museum, particularly for those schools serving disadvantaged students. The response was to revitalize the Bragg Box program.

Bragg Boxes feature artifacts, replicas, reproduction images, documents, lesson plans, and activities to provide valuable arts-infused social studies and natural sciences curricula to students, tied directly to South Carolina state educational standards. Each box contains 4-5 lesson plans, so that the box contents can be used in a variety of problem-based learning experiences (Appendix VI). The boxes are easily transportable; the materials are kept in a rolling footlocker trunk. Trunks have been dropped off at local schools, shipped to schools out of state, and been made available for pick up, and funding has been available for free usage to Title One or schools in at-risk communities. The materials inside the trunk encourage accessibility and inclusivity through different instructional modalities and physical access to the artifacts and lessons that would otherwise only be available through direct access to the sites themselves.

Figure 13-3: Props for the Bragg Boxes include a 3-D scan of the VRTC horn core at ¾ scale, created by the University of Georgia Laboratory of Archaeology and models of the soil core, created by Matt Gibson of The Charleston Museum.

Two new boxes were developed using the materials and results from the Colonial Cattle Economy project: *Cattle and Cultures of Colonial Charleston* (the "What we Find") and *The -Ologies of Environmental and Archaeological Science* (the "How we Find"). Each box features four lesson plans. The Bragg Boxes and Comic Book are designed for middle school students – grades 6th, 7th, and 8th, but an additional advantage of the Bragg Box design is that it can be adaptable to other grade levels and other audiences. Teachers have the freedom to use the items, images, documents in the trunk to blend in with their existing lesson plans. For example, the

Cattles and Cultures Box can be easily adapted for 3rd and 4th grade South Carolina standards in social studies and science.

New Interpretation at the Heyward-Washington House

Archaeological discoveries and results of the project have been incorporated into on-site interpretation at the Heyward-Washington House. The largest controlled archaeological collection at The Charleston Museum, faunal materials from Heyward-Washington proveniences formed the core of the project’s stable isotope analysis. A third round of zooarchaeological analysis focused on materials from the early to mid-eighteenth-century occupations of the property, those pre-dating construction of the Heyward house in 1772.

Concurrently, Sarah Platt engaged in detailed archaeological and historical analysis of the colonial period and the Milner occupations, resulting in a PhD dissertation. Graduate student Judith Arendall enrolled in a Museum internship, where she researched the period when the house functioned as a boarding house (1819-1861). The results of all these projects were incorporated into new wayside/interpretive panels at the house. Those previously staged in the kitchen and laundry space were updated with current interpretations of the spaces. This includes expanded discussion of the methods and results of zooarchaeological analysis, and the importance of animal remains to interpretation of dining and food preparation.

Zooarchaeological research served as the foundation to add faux food interpretation to the kitchen and dining room. Curator of History Chad Stewart worked with Paul McClintock of From Common Hands Studio in Clinton, Washington, to design and execute foods represented in the archaeological species list, as well as menu items used in the 1770s.

Figure 13-4: The Heyward-Washington House kitchen, prior to installation of faux foods. Faux foods: pond turtle, scalded calf’s head (in progress). Collections of The Charleston Museum.

An unexpected, but welcome, addition to the collections of The Charleston Museum was a feed trough that came to the attention of Zierden through a local market. The trough was constructed of chestnut in the nineteenth century. The wood, and the provenance information, suggests the mountains of North Carolina as a source. The basic style matches those in use throughout the colonial period, and so the item was purchased for interpretation of the Heyward-Washington workyard. The trough was placed in the laundry, the only climate-secured space available. An associated wayside interprets the zooarchaeological evidence for maintenance of livestock on townhouse properties.

Figure 13-5: Nineteenth-century livestock trough and label.

Two waysides installed in the workyard interpreted the features encountered through archaeology: those pre-dating the house, and those installed in the nineteenth century. Both interpretive panels underscore the necessity of archaeological research to fully understand historic spaces. The newest wayside explores the Milner occupation, including interpretations derived from the present faunal analysis.

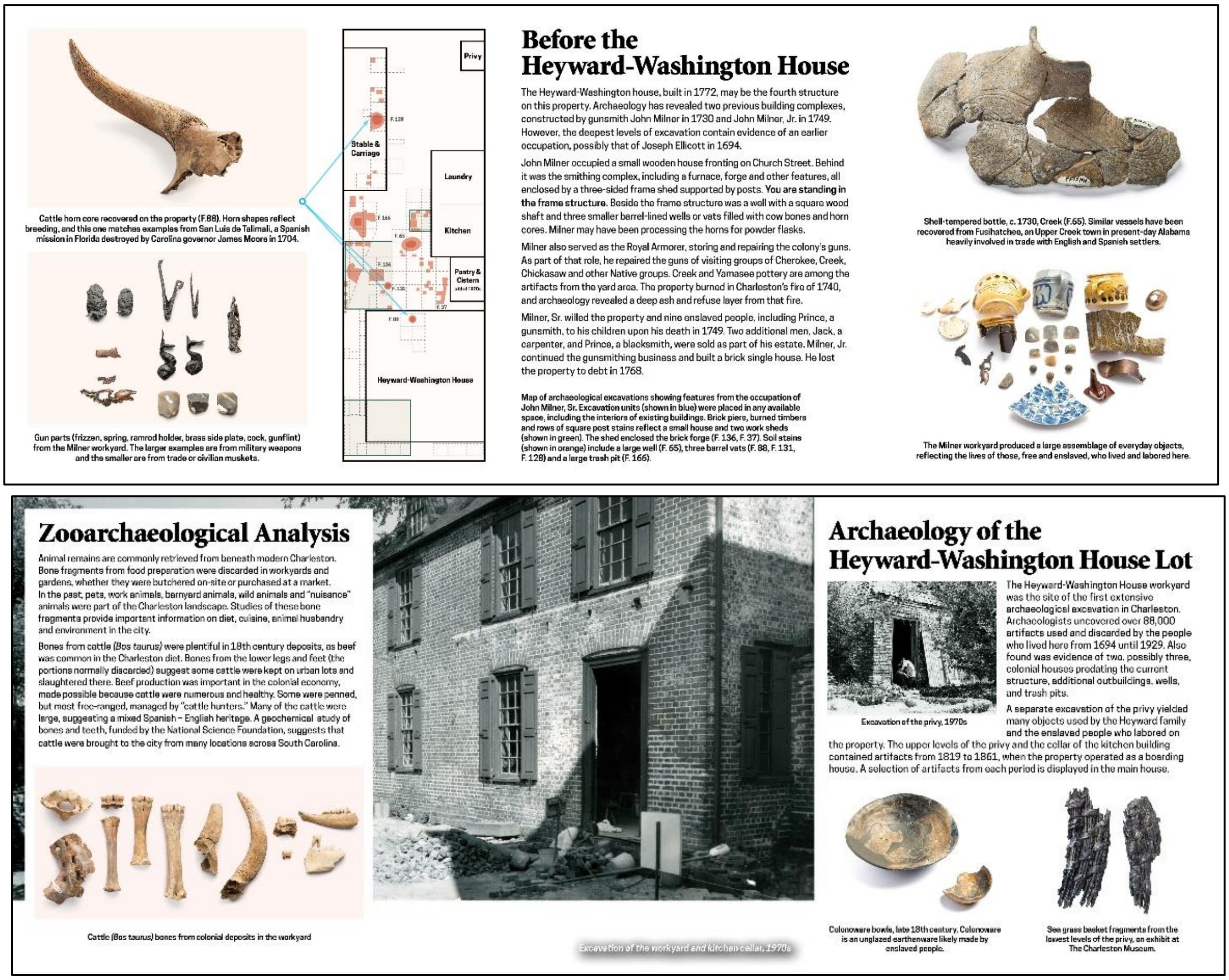

Figure 13-6: Waysides at the Heyward-Washington House.

Future Endeavors

Additional changes to interpretation of the Heyward-Washington House are underway. The Museum is shifting from docent-led tours to an audio tour. This entails expansion of the archaeological exhibits in the main house space, as well as expanded discussion of archaeological materials in the audio presentation. The discovery of two rat's nests in the kitchen/quarters building promises another avenue of exploration: an above-ground archaeological research project. Discussions with scholars working on similar resources at the Nathaniel Russell House kitchens are ongoing.

Both the below-ground and above-ground spaces at the Heyward-Washington house warrant continued research, with promises for evolving interpretation of the lives of those who lived and worked on the property for over three centuries. The NSF cattle project has been a catalyst for renewed interest in research and reinterpretation.

Chapter XIV
The Lowcountry Cattle Economy

Introduction

Much of the story told in these pages seems remote, even implausible, to many people today; a representation of an economy in the distant past. Very, very few people own cows in the United States currently for either sustenance or financial investment. Two generations ago, however, a cow could be a common and valuable household commodity. Yet, as told at a recent neighborhood dinner, a resident of the small Lowcountry town of McClellanville (SC) recalled her childhood, where yards were still fenced to keep livestock out and the neighbors' cattle wandered freely. A few decades before that, wild, or feral, cattle still roamed the woods and swamplands of the Lowcountry, a lifestyle reflected in oral interviews, historical vignettes, and literature.

Figure 14-1. "A Herd of Cattle, Georgetown County, 1890s." Courtesy of Georgetown County Library.

Although eclipsed by rice in the mid-eighteenth century, cattle and other livestock were critical elements in the Carolina economy throughout the colonial period and continued to be an important part of the plantation economy into the nineteenth century. By the last decades of the nineteenth century, the rice economy was in decline; resulting from the end of enslaved labor, storm damage to banks and dikes, and mechanization of agricultural production. Much of the Lowcountry farmland was underutilized and, as a result, many landholders turned again to free-range cattle ranching as an economic enterprise, one that required little labor. This free-range management system persisted through the early twentieth century (Scardaville in Brockington et al. 1985). Likewise, though on a smaller scale, cattle persisted within Charleston until they finally were successfully outlawed in the city the early twentieth century.

The value of even a single cow to a household is captured in two documents that bookend our study period. The first is from 1724. Historian Suzannah Miles shared the inventory taken of the "estate" of one George Mitchell. Mitchell lived at a place called Mitchell's Point on the Wando, probably a small point of land on the upper Wando River (in the current Park West area) going up to Wappetaw. His existence was meager. One knife. One fork. One pot. One bed. Three hogs. Two cows. His most valuable possession was a note where someone owed him five pounds. Miles notes that at "…this time in history the total white population of Christ Church Parish was 107 people. It was a lonely life" (Wills 1724-1725, Vol. 60, p. 89; Miles comment on Charleston History before 1945, Facebook group).

Cattle remained a valuable commodity into the twentieth century, sometimes in unexpected ways, as captured in this 1992 interview with Tibwin resident Elizabeth Colleton. Mrs. Colleton's son, Buckshot, and his siblings own Buckshot's Restaurant in McClellanville. Mrs. Colleton noted "We kept cows, but our cows was for paying tax. That cow would have a calf, and they would raise that calf, and that calf was the money to pay that tax. That's what my mama and my grandmamma and all of them did. They all had cows, and that calf gonna be paying that tax. We'd eat beef from the market, but I never saw my family kill a cow" (Williams 1992:37).

An Example from Daniel Island

As part of an archaeological mitigation project in 1985, Garrow and Associates excavated a late-nineteenth-century settlement on Daniel Island, adjacent to peninsular Charleston. Historian Michael Scardaville examined the history of the island from the seventeenth century through the present, noting that livestock was a significant part of the island's economy throughout this period. A 1772 appraisal of the Lesesne Plantation on Daniel Island revealed that the estate included a significant number of animals, particularly cattle, sheep, and hogs. Scardaville notes this land-use pattern persisted into the twentieth century. As the property was inherited and subdivided, livestock supplemented cotton production as a source of income. After 1850, people on Daniel Island, and in the greater St. Thomas and St. Denis Parish more generally, moved toward livestock production. Other major crops of the 1850s were corn and sweet potatoes, used for stock feed.

Scardaville lists depressed land prices, high taxes on underproductive farms, and increasing forfeiture rates as factors that offered an opportunity for George I. Cunningham to acquire most of Daniel Island after the Civil War. Originally from Tennessee, Cunningham arrived in Charleston in 1852 at the age of 17 and became involved in the cattle and butchering business. Cunningham used his consolidated parcels on Daniel Island for an extensive ranching enterprise to complement his abattoir. This was possible because of the nearby urban market. Cunningham's emphasis was on meats, including beef, mutton, veal, and pork, for the Charleston market. Ranching did not require a large, or even a year-round, labor force.

After Cunningham's death, the property was transferred to New Yorker A. F. Young, who turned to the relatively new enterprise of truck farming. The large-scale enterprise cultivated produce for export. Most of the produce was packed and shipped from wharves along the Wando River. Most of the employees were African American. The property sold in 1946 to Harry F. Guggenheim, one of the country's leading philanthropists. Guggenheim abandoned truck farming and converted the tract into pasture for 1,200 head of Hereford cattle raised for commercial beef. After Mr. Guggenheim's passing in 1971, the Guggenheim Foundation leased the tracts to truck farmers, until real estate development on Daniel Island made the land itself the most valuable commodity (Scardaville in Brockington et al. 1985:166-174).

Cattle in the City

As on nearby Daniel Island and other farmlands, Charleston's cattle population expanded after the Civil War. While the postbellum city became more crowded, keeping livestock on city lots became recognized as a health hazard, albeit a familiar economic enterprise. Hogs, goats, and cattle, as well as horses, were common urban dwellers in the eighteenth and nineteenth centuries, and even into the twentieth century. Although an ordinance limited the number of bovines that could be kept within the city, the law was routinely evaded. City officials acknowledged this as a serious problem in 1871, but were loath to act: "…this is a delicate subject to legislate upon, as a large number of our people now support their families entirely by the sale of milk" (Lebby 1870:36).

Cattle and other livestock were always an issue, alive or dead. In the antebellum period, butchers built their pens on the Neck, along tidal creeks. Offal and slaughter debris were deposited into the creeks, to be carried away by the tides. Christina Butler (2020:71) notes that, more often than not, the tides also carried the "putrifying matter" back towards the city, clogging drains and rotting in marshes. Much of this activity was centered in Cannonborough near the millponds on Radcliff Street. When the Neck (Wards 5-8) was annexed by the City in 1849, these issues came before City Council. Aldermen from Ward 6 reported that the rotting offal was so severe that several butchers had already vacated their pens and moved elsewhere. Since Cannonborough and Radcliffeborough were now in the city limits, ordinances prohibiting animal slaughter applied and butchers were required to move further up the peninsula. Abattoirs were once again moved away from residential areas by Mayor Grace in 1915 (Butler 2020:138).

Most of the cattle kept in the city in the late nineteenth century were used for dairy products. The maintenance of live animals posed its own set of problems. Cow lots were smelly and attracted flies, a City official noted in 1905. Confined to an urban setting, moreover, cows were bound to give unwholesome milk:

> As to offensiveness, cow lots are to be put in the same category as Butcher Pens. The two are 'much of a muchness.' They both are offensive to one's neighbors; they both breed flies, and flies, like mosquitoes, breed and transmit disease. By the last count made, there are 434 cows in the city; shut up, in most cases, in filthy pens, and cramped in small sheds and narrow stalls, they can hardly produce wholesome milk. The voidings of a cow are so profuse and pervasive that it is practically impossible to keep a cow yard 'sweet and clean' as the requirements under Ordinance demand; and the breathing and re-breathing of such airs and of their own expirations and emanations must impart similar properties to the milk, and make it to that degree unfit, especially for infants (City Yearbook 1905).

In 1912, the Board of Health required that all dairies be moved beyond the city limits (City Yearbook 1912:182).

The *Autobiography of Dr. John A. McFall* provides a first-hand description of household maintenance of livestock in the city during his life (1878-1954). Dr. McFall fought the Jim Crow laws of the early twentieth century and much of his memoir concerns those struggles. But his descriptions from his childhood of the markets, the keeping of livestock and gardens, the growth of neighborhoods, and the damage and reconstruction from storms provide a great window into everyday life. Dr. McFall first lived on Woolfe Street, a diverse neighborhood. The family soon moved up the Neck to F Street, where small lots owned by people of color mixed with small farms. Dr. McFall recalls the nearby cattle lot, where cows and other animals were loaded and unloaded from railroad cars. The herds were managed by drovers on horseback, and McFall describes a cacophony of sounds and smells associated with the cattle yard.

McFall's mother kept cows when the family lived on Calhoun Street. But when the family moved to Palmetto Street, the extreme western portion of the city, McFall found the location less convenient. The house was on filled land and fresh water was harder to obtain. The family brought two cows with them from Calhoun Street, and added another, all for milk. McFall's father sold the milk, and other supplies, from a small store. This created a long list of chores – cleaning stalls, boiling cow peas, mixing food, and hauling spent hops from the brewery to add to the feed – for the young McFall, and he was relieved when his mother "disposed of her cows" (Hollister 2021:63).

Although most of the urban cattle were contained behind garden fences or in sheds, there were occasions of errant cattle, and the occasional stampede. A 1911 article from The State newspaper in Columbia is worth quoting in its entirety:

> CATTLE STAMPEDE STIRS CHARLESTON
>
> Quiet on King Street Disturbed by Wild West Scene
>
> COWS ENTER STORE DOORS
>
> Frightened Teams Ran Away and no Such Excitement
> Has Been Seen Since Earthquake of '86.
>
> Charleston, March 6 (1911) — Considerable excitement was caused on upper King Street this afternoon by the stampede of a herd of cows which soon included several horses hitched to wagons in the street, and for a time the whole thoroughfare was on the move. Not only did the street itself seem to be moving, but with the wild animals invading several of the stores, things were lively within as well as without, and it is understood that no small damage was done before the wild animals were all gotten out of the stores and again started for the slaughter pen to which it is understood that the cows were destined before they took fright.
>
> NOT USED TO NOISE
>
> The cows had been driven into King from Spring Street, having entered the city over the Ashley River bridge. The animals seemed to have proceeded along quietly enough until the noise and bustle of upper King Street frightened them. One or two of the cows got separated from the rest of the herd, which numbered about 20 in all. The butcher who had been following in a buggy attempted to drive the separated cows back into the fold and in cracking his whip and with the rattling of the buggy over the granite block pavement, other cows took fright, and as they began to run and cavort about the street, people took to their heels and soon several teams which had been left unattended got scared and joined in the wild rampage.
>
> AN UNUSUAL SIGHT
>
> It was a sight which has not been witnessed on King Street in a long time if ever before. It was not just one wild steer afraid of city life and refusing to proceed across a section of the city to the pen or pasture field, which has been seen at times, but it was a full herd, and as they bellowed, kicked up their hoofs and darted about the street at random, it was time for pedestrians to seek safety, and the people did not have to be told to get out of the way.
>
> Into more than one store the cows made their way. In one establishment especially, near Morris Street, the cow owned the store. Counters with clothing, hats and other men's apparel were turned over, while the show cases slid on the floor and the whole place was turned inside out in a few minutes. The proprietors did not care to take any chances with putting her ladyship out, and the cow was left to find an exit for herself.
> (*The State*, Columbia, March 7, 1911: 1)
> (shared by Josephine Humphreys in *Charleston History before 1945*, a Facebook group).

Free-range Cattle in the Twentieth Century

The wild, semi-feral aspect of free-range cattle is embodied in descriptions from the early eighteenth century, when those tending the herds were called "cow hunters." Still other aspects of free-ranging cattle are captured in this early twentieth century tale related by author and master storyteller William P. Baldwin of McClellanville. His aunt, Ann Bridges (herself a local historian), recalls as a young girl walking the woods of the South Santee River, possibly at Peachtree Plantation, with her parents when they were set upon by a wild bull. They quickly took refuge in a dilapidated slave cabin, but the bull nearly pulled the rotten building apart before he lost interest and wandered on. Baldwin wove this tale into his first novel, *The Hard to Catch Mercy* (1993; also Baldwin, personal communication, McClellanville, July 19, 2020).

A somewhat more contained option was to free-range cattle on an island. Tim Penninger, owner of Sewee Restaurant, describes the enterprise of his grandfather, Herbert Thames. Mr. Thames purchased Commander Island in the Santee River from "an older black man" in 1918, for $1.00 per acre. The owner, unable to read or write, requested payment in $1 bills. The Thames family owned the island until 1975. Roughly 200 head roamed the island. Thames would come over weekly with some feed, to prompt the cattle to gather in the corral. They had a chute into the corral, and then another chute on the edge of the river, leading to a barge that would carry the cattle to the mainland for transportation to market. These were old wooden barges, and Mr. Peninger estimates about 20 animals fit on each. During freshets, when the island would flood, the cattle would be rounded up the same way, and taken temporarily to high ground on the mainland. Mr. Peninger notes, "That was a pain" (Peninger, personal conversation, Fairfield Plantation, August 20, 2021).

In a 1992 Interview, "Fifteen Head at the Table," McClellanville resident John Ackerman describes the commonality of livestock ownership and their free-ranging habits. "People used to have hogs and cows…had a brand and a mark, and had them recorded in the courthouse in Moncks Corner. And every summer in May and June we penned the cows up, keep 'em up a month or two, kind of tame them cows…if you didn't you couldn't handle 'em. Brand the calves, turn 'em back in the woods, or sell 'em. A lady in McClellanville, Beulah Sullivan, she used to butcher, and had a meat market across the street. She used to come butcher the cows herself" (Williams 1992:21).

Closing the Range

Before the Civil War, "unfenced land" was open to the public, and state law did not consider it trespassing to enter unfenced land (Sawers 2015:360). The free-range tradition required farmers to fence their crops to keep cattle out instead of requiring ranchers to construct and maintain fences to prevent animals roaming. On October 27, 1873, a De Kalb, Illinois, farmer named Joseph Glidden submitted an application to the U.S. Patent Office for a fencing wire with sharp barbs. Before his invention, fence material was largely confined to stones and wood. Stone being in short supply on the coastal plain and wood prone to rot, the free-range tradition may have been a virtue made of necessity.

The open range tradition was not unique to the Lowcountry. States throughout the nation gradually closed most, if not all, of their open range as the tradition came into conflict with large agricultural enterprises, improved stock, disease control measures, railroads, automobiles, and urban expansion. Sawers (2015; see also Hahn 1982) argues that labor control also motivated fencing, trespass, and game laws at the end of Reconstruction, laws designed to prevent freedmen from achieving economic independence and prosperity. In building his argument, Sawers describes aspects of freedmen's lives derived from colonial practices, discussed in earlier sections of this study. Planters trying to maximize profits by reducing the cost of feeding the enslaved encouraged self-sufficiency in the form of the task system, garden plots, hunting and fishing to augment rations. Moreover, Sawers states, "wild food gave workers bargaining power." A surplus could be sold or traded, as noted by customers of the Charleston markets. These included "hogs and other stock"; wild hogs and cattle were common and frequently hunted (Sawer 2015:363). Where wild foods provided some autonomy, workers could withdraw from the labor market. Sawers concluded that restricting access to hunting and fishing sites by closing the range and criminalizing trespass on private lands was designed to force freedmen back into the labor market (Sawers 2015:356-360).

Arguments in favor of ending open range in parts of South Carolina began in 1785 and a South Carolina planter argued in 1845 that the reason for open range "had ceased to exist" (in King 1982:55). In 1881, South Carolina became the first southern state to close its range statewide; Georgia did not close its range until 1955. Laws closing open range did not become widespread in the United States until the 1970s (King 1982). A series of statutes followed in the late-nineteenth and early-twentieth century, empowering landowners to sue for damages caused by trespassing stock. Landowners had the right to claim trespassing stock as compensation for damages, as lawmakers placed power in the hands of people who owned property and shifted economic control away from cattle owners who relied on traditional free-range practices and common lands.

Remnants of semi-wild cattle herds eventually disappeared from the Lowcountry. Perhaps in response to incidents such as the wild bull at Peachtree Plantation, Billy Baldwin noted that cattle were deliberately hunted out of the McClellanville area. Local hunters shot them, and brought them to local butchers for processing, eventually removing them from nearby woods. The Hell Hole area remained a cattle range through the first half of the twentieth century, even after it was acquired by the U.S. Forest Service for the new Francis Marion National Forest in the 1930s. A goal of the grazing agreement was to promote "purebred stock." In a 1938 *News and Courier* (June 12, 1938) article, Forest Ranger Russell Rea notes that "…at present, most of the stock are scrub cattle, but there has been shown increased interest in improving the quality of the stock." Today, scrub cattle remain in central and southern Florida, and the Florida Scrub is managed as a heritage breed (Ward 2009; see also Mealor and

Figure 14-2. Flora, a pet Highland/white calf in McClellanville.

Prunty 1976, Tinsley 1990). There are now discussions in several camps about returning free-ranging cattle in the Lowcountry (e.g., Martin 2015).

Results of Study

The closure of the open range and enactment of urban ordinances regarding livestock have all but ended centuries-old practices of cattle management in the Carolina Lowcountry. Oral histories document the importance of the cattle economy even into the twentieth century, but a full understanding of the historic cattle economy requires deeper study of archaeological and historical records. In this contribution, archival, stable isotope, and zooarchaeological studies of Charleston and its hinterlands provide new insights into the seventeenth- to nineteenth-century cattle economy. Specific findings include the following:

- Most animals recovered from the Lowcountry were "local" in the sense that they originated in the Lower Coastal Plain.
- Strontium isotope data support a one-way transport of cattle stock from the interior to the Lower Coastal Plain, but not the reverse. This movement peaked ca. 1730–1780, when nearly half of all animals recovered from sites in the Lower Coastal Plain originated further inland.
- Isotopic evidence is consistent with a free-range herd management strategy.
- Most of the Heyward-Washington cattle were local, but the percentage originating from further inland increased overtime. The numerous cattle may have been a facet of John Milner's commercial enterprise.
- The majority of the Musgrove Cowpen animals were "non-local." These likely were free-range animals originating on the Upper Coastal Plain.
- Cattle at rural locations were largely local and slaughtered at older ages compared to cattle in Charleston, which were from a broader catchment area and slaughtered at younger ages.
- Cattle were managed for beef and dairy products at rural production centers and for beef in Charleston. Some animals were used for labor in both locations.
- Over time, rural production centers moved further upcountry, perhaps pushed there by expanding agricultural interests, and cattle were sent to Charleston from further away.
- This represents a transition from a generalist cattle husbandry strategy to a more specialized concentration on meat and other secondary products.
- These changes likely are associated with supplying cattle products to the growing urban population (e.g., Trow-Smith 1957).
- Large cattle herds played a role in altering the Lowcountry landscape and its economy, facilitating rice and cotton production.
- This project elucidates the subtleties and complexities of the coastal plain environment, the profound significance of waterways, and differences between life in upland and lowland areas, a conclusion highlighted by merging archival and archaeological data.
- Cattle in the Carolina Lowcountry may have had a mixed Spanish and British heritage.
- Disease, degraded habit, and poor nutrition may have played a role in the decline of the cattle industry.

These results are consistent with other studies associating animal husbandry with urban-rural provisioning networks and urban growth. Zeder's classic 1991 study, *Feeding Cities: Specialized Animal Economy in the Ancient Near East*, was the stimulus for the present study. She argues that the distribution of meat and other animal products is a fundamental urban process and a barometer for the economic development of early, complex urban centers (Zeder 1991:250-254). As small settlements became larger and more complex, Zeder argues that urban residents increasingly relied on specialized distribution channels instead of their own household animals, with consequences for both rural and urban areas.

This is much the same process Trow-Smith (1957) argues occurred in Britain and Armitage (1982) documents in London's zooarchaeological record (see also Davis et al. [2012]; Thomas et al. [2013]). They, among others, argue that growing cities attracted livestock from throughout the country in the seventeenth and early-eighteenth centuries. Cattle born in distant parts of the England, for example, were sent to graziers close to London for fattening and thence to the city for slaughter. This was associated with changes in rural husbandry favoring specialized commercial production over generalized local needs (Davis et al. 2012; Thomas et al. 2013). A focus on producing dairy products and veal for growing urban markets is closely associated with slaughter age; resulting in faunal assemblages consisting largely of young cattle slaughtered shortly after weaning (i.e., veal) and unproductive cows. Maltby (1979:82, 93), for example, reports slaughter ages changed markedly in Exeter (UK), with an increase in veal-aged animals produced specifically for the expanding Exeter market. Davis et al. (2012) also found an increase in newly weaned cattle at post-Medieval Launceston Castle (UK).

Increased commercialization of cattle production for urban markets may be one of several explanations for size changes observed in the British archaeological record (e.g., Davis et al. 2012). Thomas et al. (2013) reports multiple episodes of increased (and decreased) size in Britain between AD 1220 and 1900. Much of the emphasis was on crude size (Thomas et al. 2013). Cattle size, however, did not continue to increase into the eighteenth century, perhaps because the emphasis changed from bulk size to other production and aesthetic attributes (Thomas et al. 2013). Clutton-Brock (1982) notes tallow was a critical need in expanding urban centers because of the large quantity needed for candles, placing a premium on fat as much as on dairy products and meat. Calf skin likely also was in high demand being more suitable than leather for many applications.

A similar pattern is found in New England, with rural production centers supplying urban markets. Landon (1996:124, 126 see also Bowen [1994]) argues that the trajectory toward specialized production of post-mortem products such as meat to New England urban markets began in the late-eighteenth and early-nineteenth century. Prior to that, cattle were slaughtered either during their first summer or fall or at an advanced age, a pattern associated with dairy production and draft animals (Landon 1996:100-101, 114). Cattle sent to Boston likely were surplus to the needs of rural farmers and not animals raised specifically for the urban market (Landon 1996:114). By the mid-eighteenth century, however, farmers near urban markets were purchasing cattle from upland farms and fattening them prior to sending them to market (Landon 1996:124). Although Landon (1996:123) did not observe an increase in the proportion of young cattle in the seventeenth- and eighteenth-century New England assemblages he studied, Bowen (1994) reports an increase in the proportions of young cattle in other New England assemblages. By the late-eighteenth and early-nineteenth centuries, patterns of butchery and portions represented were more standardized and raising/slaughtering cattle in Boston proper was curtailed (Bowen 1992; Landon 1996:121).

These trends also are present in the Charleston archaeological record. As rural production centers increasingly targeted the expanding Charleston market, the production objective changed from a generalist husbandry strategy to specialized production of young animals for meat and prime age cows for dairy products and veal. Within the city, the slaughter of calves was delayed only as long as necessary to keep cows fresh. Outside the city, surplus young animals were sent from distant herds to pastures near the city to be fattened before being slaughtered for meat and other by-products.

Future Directions

As has been demonstrated by others before us (e.g., Emery et al. 2015; Grimstead and Pavao-Zuckerman 2016; Guiry et al. 2014, 2015, 2017, 2018; Klippel 2001; Raynor and Kennett 2008) multi-proxy studies significantly improve our understanding of human-environmental interactions in the post-Columbian world. Only after many similar studies are conducted, however, will it be possible for historical archaeologists to place studies such as these in broader environmental, historical, and social environmental contexts. An expanded archaeological comparative base will enable historical archaeologists to elaborate upon urbanization, urban-rural interactions, animal husbandry, trade, and landscapes as critical ingredients in the transition of North American colonial outposts into cities. Future case studies should examine the causes, timing, and consequences of colonial-era economic and landscape changes through combinations of archival, botanical, geochemical, sedimentary, and zooarchaeological studies of materials from these and other colonial contexts. The multi-proxy approach of our study provides guidance for future research using similar methods.

As we conclude this stage of our own study, several phenomena in particular stand out as particularly relevant to similar studies and should be assessed in more detail. These include anthropogenic and non-anthropogenic sources of landscape changes; archaeogenetics and morphometrics; disease ecology; and additional archival research.

Anthropogenetic and Non-Anthropogenic Sources of Landscape Changes

It is clear from the available data that landscape changes occurred during the colonial era; but when did they start and what were the drivers? Establishing a pre-colonial landscape baseline would facilitate distinguishing between colonial-era changes of anthropogenic and non-anthropogenic origins.

It is likely that some aspects of the data collected during the present study reflect climate variability during the last centuries of the Little Ice Age (ca. 1300-1870; Mann et al. 2008; Marcott et al. 2013; deMenocal 2000). Multiple proxies associate a North American "megadrought" with the failure of the Spanish Jesuit mission in the 1500s, the collapse of the Lost Colony (Roanoke, VA) in 1587-1580, and the early challenges in Jamestown (VA; Blanton 2000; Blanton and Thomas 2008; Harding et al. 2010; Stahle and Cleaveland 1994; Stahle et al. 1998; Willard et al. 2003). Growth increments in bald cypress (*Taxodium distichum*) on the lower Altamaha River (GA) show oscillating periods of wetter-drier/warmer-colder conditions in both the 1600s and 1700s (Anderson et al. 1995; Blanton 2004). The Carolina colony undoubtedly experienced these same oscillations in temperature and rainfall.

Environmental data bracketing the 1500s should be collected to assess periods of wetter-drier/warmer-colder variations and their associations with animal husbandry, farm productivity, and fire. In order to document this, materials from sites representing the late Mississippian period (ca. 1300-1560s) into the 1800s on the Atlantic coastal plain should be examined to develop a multiproxy temporal sequence associating economic and social phenomena with landscape changes. This should specifically explore post-1565 changes that might be attributed to climatic instability and commodity production, two drivers that undoubtedly are related.

Such a study would be enhanced by merging additional sediment studies with stable isotope analysis of deer teeth from sites before and after the 1500s. Deer teeth are proxies for pre-colonial conditions and subsequent changes in temperature/rainfall and vegetation that might be due either to climate or to colonial enterprises. Identification and analysis of phytoliths and pollen embedded in dental calculus of cattle and deer are additional proxies for changes in vegetation that might be attributed to climate change, deforestation, fires, or overgrazing. Stable oxygen isotopes offer a complementary line of evidence into climate change and the mobility or trade of cattle and deer.

Additional analysis of deer teeth from pre-1500 contexts as well as post-1500 contexts would clarify the catchment area for deer prior to the colonial era, the role of deer in Indigenous communities after 1500, and the contributions of Indigenous communities to European and African economies. The faunal collections archived by The Charleston Museum and other institutions include deer appropriate for such studies, many of which are from the same sites, and often the same contexts, examined here.

Clearly, results from the single soil core sample from Hell Hole Swamp support additional sampling, and study of the effects of fire and grazing on the landscape. While careful archival research and consultation with foresters and biologists led us to the general location, and an extensive site selection procedure was used to determine the coring location, the Hell Hole Swamp core represents only one of a multitude of potential coring areas within the vast swamp, and the wider region. The remarkable preservation of charcoal and fungal data in that single sample suggests much can be learned about the environmental history the Lowcountry, and the role of cattle in that history, with additional sampling, a project we hope to undertake in the future.

Archaeogenetics and Morphometrics

A central quest of our long-term research (Reitz and Ruff 1994; Zierden and Reitz 2016), one not addressed in this study, are data regarding the presence of Spanish stock in colonial Carolina, and the mixing of Spanish and English cattle in Lowcountry herds. Comparative study should incorporate archaeogenetics and gross measurements of the samples studied here. Beyond the rural Lowcountry, comparative sampling should include Florida cattle ranches of the seventeenth-century Spanish missions in Florida and Georgia and the urban centers of St. Augustine and Santa Elena.

Future studies should take advantage of advances in archaeogenetic analysis to explore the introduction of new blood lines in colonial livestock and the roles of selective breeding, natural selection, slaughter age, body size, infectious diseases of both humans and livestock, international movement of livestock, and socioeconomic contexts (e.g., Decker et al. 2014; McTavish et al. 2013; Thomas et al. 2013). The large range of cattle sizes found in archaeological collections may reflect genetic heritage, nutritional status, selective breeding, and disease burdens; but likely also reflects sexual dimorphism associated with production objectives, particularly castration (e.g., Cossette and Horard-Herbin 2003; Reitz and Ruff 1994; Thomas et al. 2013). Molecular analysis may enable us to distinguish among males, females, and castrates (e.g., Davis et al. 2012). Archaeogenetic studies assessing the genetic heritage and sex of cattle might clarify the origins and lineages of these animals as well as herd management strategies. Alternative explanations could be tested by combining archaeogenetic and geochemical analyses with morphometrics, paleopathological characterizations, and environmental histories. This might clarify whether the small cattle body size observed in some Lowcountry cattle and the decline cattle production can be attributed to their genetic history, herd management choices, environmental stresses (of either anthropogenic or non-anthropogenic origins), or disease.

The present study was constrained by the availability of legacy collections which contained cattle teeth and had been studied by a zooarchaeologist. Thus, the rural part of the study is dominated by the Musgrove Cowpen. The study would be improved by larger samples from rural deposits from the late 1600s and early 1700s, particularly from rural plantations such as Drayton Hall. Archaeologist Mark Groover suggested specific sites just as the present project had exhausted funds for adding samples to the present study, but this is clearly a next step. Cattle remains from early rural sites such as Drayton Hall should be measured.

Disease Ecology

It would be helpful to involve a paleopathologist to characterize growth arrest lines, lesions, and the aDNA of pathogens in cattle and deer bones. Babesiosis infects deer as well as cattle and a comparison of deer from pre-colonial sites with deer and cattle from post-colonial sites might clarify if deer were infected with babesiosis before colonization. This part of the study otherwise would assess cattle disease history to determine what "Spanish Staggers" was, when it emerged, and how widespread it was. Such a study might show the decline in cattle and deer was due to another cause altogether, such as weather that either enabled cattle and deer to flourish during some parts of the colonial era but adversely affected them at other times.

Additional Archival Research

Although not mentioned specifically among future directions, archival research toward elaborating upon what is known about the ecological history of the region should accompany each of these initiatives. This, in turn, could guide additional fieldwork through soil coring and broader excavation (e.g., Agha and Philips 2009; Agha et al. 2011; Doty 2005; Smith 2012). Questions arise regarding the impact that free-ranging cattle and hogs had on the Lowcountry landscape. Anecdotal evidence shows that introduction of these animals produced a virgin soil epidemic leading to a dramatic population explosion of domesticated animals, but at the expense of native plants and altered ecosystems (Crosby 1972). Colonial naturalist Mark Catesby observed that cattle and hogs foraging in Carolina were probably responsible for the extinction of many flowering plants and bushes (Meyers 1998:241). Archival research paired with archaeobotanical studies of the Lowcountry may reveal the impact of these animals within the broader Columbian Exchange narrative.

Another topic needing further archival research is the expansion and contraction of the Charleston beef trade in relation to international markets. How did the increase in sugar production in the West Indies impact the export of cattle from Charleston? How did Charleston's exports vary in relation to expanding exports in competing colonies and states? Was there a correlation between demands in packed beef and the output of sugar? What was the role of the declining Charleston beef trade in the larger history of the city's shifting economic role in the South? Does this shift coincide with the outmigration of a broader state population to Georgia, Alabama, and Mississippi?

Conclusion

This study is based on a number of assumptions that may not be verified with additional archaeological and archival research, but yields a number of important conclusions regarding the role of the rural hinterlands in the development of Charleston as an urban colonial metropole. The Lowcountry was a tightly knit economic system, with the vast majority of cattle moving locally, from the inland rural hinterlands to the Lower Coastal Plain. Cattle were most likely semi-feral and free-ranged, as evidenced by the diversity of diets reflected in carbon isotope assays—most especially on the ecologically diverse coastal plain. Oxygen isotope assays also reflect free-range practices. The vast majority of cattle drank fresh, flowing water, rather than ponded water as would be expected for penned animals.

Cattle were managed differently in rural and urban locations. In Charleston, cattle were managed primarily for beef, and were slaughtered at younger ages, as is typical for beef-managed herds. In the rural hinterlands, cattle were managed primarily for both beef and dairy, with infertile cows slaughtered at comparatively older ages. The movement of cattle from the rural hinterlands to the urban center at Charleston seems to have peaked in the mid-eighteenth century, followed by a protracted but steady decline in the Lowcountry cattle industry. This decline may have been driven by disease, habitat degradation, and/or poor nutrition, topics that deserve further exploration. Rural production centers also appear to have moved further upcountry, perhaps pushed away by an expanding demand for agricultural land outside Charleston. Ironically, it appears that the growth of herds into the eighteenth century altered Lowcountry landscapes, facilitating the intensification of rice and cotton production that eventually replaced the free-range tradition. These changes indicate a shift from a generalized cattle husbandry strategy to a strategy more focused on meat and other secondary products, such as tallow, in the service of supplying the growing urban population in Charleston and the international market. This research, merging archival and archaeological data, also elucidates the subtle and not-so-subtle differences between upcountry and Lowcountry landscapes and lifeways.

As this project demonstrates, the tool-kit available to support multi-proxy studies of colonial enterprises has expanded far beyond archives, archaeological context, and material culture to include an ever-growing array of methods. When merged, the results of these applications demonstrate the complexity of the multiple relationships among people and their landscapes. Over time, international collaborations will build integrative studies focused on the ways colonists and indigenous peoples in the United States and elsewhere interacted with animals and one another throughout the post-Columbian world.

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1992 *The McClellanville Coast Cookbook: Recipes, Oral Histories, Poetry, Prose, Prints, Photographs, and Paintings from McClellanville, Awendaw, South Santee, Germanville, Tibwin, Sewee, Buck Hall, Moss Swamp, and Honey Hill, South Carolina*. McClellanville Arts Council, McClellanville, SC.

Williams, Susan Millar, and Stephen G. Hoffius
2011 *Upheaval in Charleston: Earthquake and Murder on the Eve of Jim Crow*. University of Georgia Press, Athens.

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2010 *A History of Charleston's Water, 1823-2010: The Development of a Public Water and Wastewater System*. Charleston Water System Archives and Records Management, Charleston, SC.

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1965 *After Slavery: The Negro in South Carolina During Reconstruction, 1861-1877.* University of North Carolina Press, Chapel Hill.

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1982 *Ageing and Sexing Animal Bones from Archaeological Sites*. British Archaeological Reports, British Series 109, Oxford, UK.

Wilson, Thomas D.
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2008 They Understand Their Business Well: West Africans in Early South Carolina. In *Grass Roots: African Origins of an American Art*, edited by D. Rosengarten, T. Rosengarten, and E. Schildkrout, pp. 78-93. University of Washington Press, Seattle.

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1995 *The Struggle for the Georgia Coast: An Eighteenth-Century Spanish Retrospective on Guale and Mocama*. Anthropological Papers 75, American Museum of Natural History, University of Georgia Press, Athens.

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1995 *The Nathaniel Russell House: Initial Archaeological Testing*. The Charleston Museum Archaeological Contributions 24, Charleston, SC.

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1996 *Big House/Back Lot: An Archaeological Study of the Nathaniel Russell House*. The Charleston Museum Archaeological Contributions 25, Charleston, SC.

Zierden, Martha A.
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1986 Urban Adaptation in Charleston, South Carolina, 1730–1820. *Historical Archaeology* 20(1):29-43.

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1990 An Archaeological Interpretation of Elite Townhouse Sites in Charleston, South Carolina, 1770-1850. *Southeastern Archaeology* 9(2):79-92.

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1989 *Investigating Elite Lifeways Through Archaeology: The John Rutledge House*. The Charleston Museum Archaeological Contributions 21, Charleston, SC.

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1999 *Willtown: An Archaeological and Historical Perspective*. The Charleston Museum Archaeological Contributions 27, Charleston, SC.

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2002 Eighteenth-century Charleston: Aftermath of the Siege. *El Escribano* 39:113-131.

Zierden, Martha A., and Elizabeth J. Reitz
2005 *Archaeology at City Hall: Charleston's Colonial Beef Market*. The Charleston Museum Archaeological Contributions 35, Charleston, SC.

Zierden, Martha A., and Elizabeth J. Reitz
2007 *Archaeology at the Heyward-Washington Stable: Charleston through the Eighteenth Century*. The Charleston Museum Archaeological Contributions 39, Charleston, SC.

Zierden, Martha A., and Elizabeth J. Reitz
2009 Animal Use and the Urban Landscape in Colonial Charleston, South Carolina, USA. *International Journal of Historical Archaeology* 13:327-365.

Zierden, Martha A., and Elizabeth J. Reitz
2016 *Charleston: An Archaeology of Life in a Coastal Community*. University Press of Florida, Gainesville, FL.

Zierden, Martha A., Elizabeth J. Reitz, Barnet Pavao-Zuckerman, Laurie J. Reitsema, and Bruce L. Manzano
2019 What is this Bird? The Quest to Identify Parrot Remains from the Heyward-Washington House, Charleston, South Carolina. *Southeastern Archaeology* 38:240-250. DOI 10.1080/0734578X.2018.1555407.

Zierden, Martha, Ronald Anthony, Sarah Stroud Clarke, Lisa Hudgins, James Legg, Eric Poplin, Carl Steen, and Michael Stoner
2017 Charleston South Carolina. In Ceramics in America 2017, edited by Robert Hunter and Angelika R. Kuettner, pp. 22-39, Chipstone Foundation, University Press of New England, Hanover.

Appendix I
Native American Groups in South Carolina

Federally Recognized Tribes
(From South Carolina Department of Archives and History)

Catawba Indian Nation
<u>Tribal Historic Preservation Office</u>
<u>Wenonah G. Haire</u>, Tribal Historic Preservation Officer
1536 Tom Steven Road
Rock Hill, SC 29730
803-328-2427 ext. 224

Absentee-Shawnee Tribe of Indians of Oklahoma
Alabama-Quassarte Tribal Town
Cherokee Nation
Chickasaw Nation
Eastern Band of Cherokee Indians of North Carolina
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Miccosukee Tribe of Indians of Florida
Muscogee (Creek) Nation
Seminole Nation of Oklahoma
Seminole Tribe of Florida
Shawnee Tribe
Thlopthlocco Tribal Town
Tuscarora Nation of New York
United Keetoowah Band of Cherokee Indians in Oklahoma

South Carolina's Recognized Native American Indian Entities:

https://cma.sc.gov/minority-population-initiatives/native-american-affairs/south-carolinas-recognized-native-american-indian-entities

State Recognized Tribes:

Beaver Creek Indians
Chief Louis Chavis
Beaver Creek Indians
125 May Mornind Dr.
Lexington,SC 29073

Edisto Natchez-Kusso Tribe of South Carolina

Chief John Creel
Edisto Natchez Kusso Tribe of South Carolina
1125 Ridge Road
Ridgeville, SC 29472

Pee Dee Indian Nation of Upper South Carolina

Chief Carolyn Chavis Bolton
Pee Dee Indian Nation of Upper South Carolina
3814 Highwy 57 North
Little Rock, SC 29567

Pee Dee Indian Tribe

Chief Pete Parr
Pee Dee Indian Tribe
P.O. Box 568
Latta, SC 29565

Piedmont American Indian Association

Chief Mary Louise Worthy
Piedmont American Indian Association
Lower Eastern Cherokee Nation of South Carolina
3688 Warrior Creek Church Road
Gray Court, SC 29465

The Santee Indian Organization

Chief Gregory Crummie
The Santee Indian Organization
432 Bayview Street
Holly Hill, SC 29059

Sumter Tribe of Cheraw Indians

Chief Ralph Oxendine
Sumter Tribe of Cheraw Indians
5700 Oak Hill Road
Sumter, SC 29154

The Waccamaw Indian People

Chief Harold Hatcher
The Waccamaw Indian People
P.O. Box 628
Conway, SC 29528

State Recognized Groups:

Chaloklowa Chickasaw Indian People

Mingo Vernon Tanner
Chaloklowa Chickasaw Indian People
501 Tanner Lane
Hemingway, SC 29554

Eastern Cherokee, Southern Iroquois and United Tribes of South Carolina

Chief Lamar Nelson
Eastern Cherokee, Southern Iroquois, and United Tribes of South Carolina
649 Berry Shoals Road
Duncan, SC 29334

Natchez Tribe of South Carolina

Chief Steve Davis
Natchez Tribe of South Carolina
79 Bluff Road
Columbia, SC 29201

Pee Dee Indian Nation of Beaver Creek

Chief Elizabeth Skyye Vereen
Pee Dee Indian Nation of Beaver Creek
P.O. Box 396
Neeses, SC 29107

Pine Hill Indian Community Development Initiative

Chief Michelle Mitchum
Pine Hill Indian Community Development Initiative
North, SC

The Wassamasaw Tribe of Varnertown Indians

Lisa M. Collins, Tribal Administrator
The Wassamasaw Tribe of Varnertown Indians
P.O. Box 428
Summerville, SC 29484

Appendix II
Site #s and Reports for Selected Sites

Rural Sites:

Miller Site/Charles Towne Landing, 38Ch1-MS
Jones, David, and Cicek Beeby
2010 Miller Site Excavations Fall Field Season 2009, 38Ch1-MS, Charles Towne Landing State Historic Site. Ms. on file, SCPRT, Columbia, SC.

Agha, Andrew. "Historical Archaeology at Old Towne Plantation, Miller Site Excavations Fall 2012-Summer 2013." Report on file, Charles Town Landing State Historic Site, Charleston, SC.

Ashley Hall Plantation, 38Ch56
Bailey, Ralph, Colin Brooker, Larry James, Sheldon Owens, and Charles Philips
2016 Cultural Resources Survey of Ashley Hall Plantation, Charleston County, South Carolina. Report on file Brockington and Associates, Charleston, SC.

Drayton Hall, 38Ch225
Lewis, Lynn G.
1978 Drayton Hall: Preliminary Archaeological Investigation at a Low Country Plantation. National Trust for Historic Preservation, University Press of Virginia, Charlottesville, VA.

Carlson, Jenna
2014 Analysis of Faunal Remains from the South Flanker Well, Drayton Hall, Charleston, South Carolina. Report on file, Drayton Hall, Charleston, SC.

Lord Ashley Settlement, 38Dr83a
Agha, Andrew
2012 St. Giles Kussoe and "The Character of a Loyal States-man": Historical Archaeology at Lord Anthony Ashley Cooper's Carolina Plantation. Report on file, Historic Charleston Foundation, Charleston, SC.

Agha, Andrew, and Charles F. Philips, Jr.
2010 Archaeological Investigations at 38Dr83a, St. Giles Kussoe House/Lord Ashley Settlement. Report prepared by Brockington and Associates, submitted to Historic Charleston Foundation, Charleston, SC.

The Ponds (Percival), 38Dr87
Bailey, Ralph, Larry James, and Charles Philips
2014 Archaeological Testing of 38Dr87 and a Portion of 38Dr177: Cresswind at The Ponds Phase II. Draft Report on file, Brockington and Associates, Charleston, SC.

Colonial Dorchester State Historic Site, 38Dr3
Bell, Daniel
1995 Old Dorchester State Park Visitor's Guide. On file, SCPRT, Columbia, SC.

Beck, Monica
2002 Anglicans and Dissenters in the Colonial Village of Dorchester. In Another's Country, edited by J.W. Joseph and Martha Zierden, University of Alabama Press, Tuscaloosa, AL.

Lesesne Plantation, Daniels Island, 38Bk202

Zierden, Martha, Lesley Drucker, and Jeanne Calhoun
1986 Home Upriver: Rural Life on Daniel's Island, Berkeley County, South Carolina. Report on file, South Carolina Department of Highways and Public Transportation, Columbia, SC.

John Bartlam's pottery at Cain Hoy, 38Bk1349

South, Stanley
2004 John Bartlam: Staffordshire in Carolina. South Carolina Institute of Archaeology and Anthropology Research Manuscript Series 231, University of South Carolina, Columbia, SC.

Spencer Settlement, Hampton Plantation, 38Ch241-100

Jones, David
2018 Excavations at the Spencer Site, Hampton Plantation Site 38Ch241-100, May 2015-March 2018. Report on file, SCPRT, Columbia, SC.

Hester, Al
2014 Cultural Landscape Report for Hampton Plantation State Historic Site, McClellanville, South Carolina: Part 1, Site History, Analysis and Evaluation. Report on file, South Carolina State Park Service, SCPRT, Columbia, SC.

St. Paul's Parsonage, 38Ch2292

Pyszka, Kimberly
2013 "Built for the Publick Worship of God, according to the Church of England": Anglican Landscapes and Colonialism in South Carolina. Historical Archaeology 47(4):1-22.

Pyszka, Kimberly, Nathan Fulmer, Maureen Hays, and Kalen Mc Nabb
2011 "…a small but convenient House of Brick": A Tale of the St. Paul's Parsonage House, Hollywood, South Carolina, USA. Church Archaeology 13:47-54.

James Stobo Plantation, Willtown, 38Ch1659

Zierden, Martha, Suzanne Linder, and Ronald Anthony
1999 Willtown: An Archaeological and Historical Perspective. The Charleston Museum Archaeological Contributions 27, Charleston, SC, and South Carolina Department of Archives and History, Columbia, SC.

Stono Plantation, James Island, 38Ch851

Anthony, Ronald W.
2012 Dill Sanctuary Archaeology: A Descriptive Summary. Archaeological Contributions 46, The Charleston Museum, Charleston, SC.

Mary Musgrove's Cowpens/Grange Plantation, 9Ch137

Braley, Chad O.
2013. Archaeological Data Recovery at the Cowpens/Grange Plantation Site (9CH137), Chatham County, Georgia.” Ms. on file, Southeastern Archaeological Services, Inc., Prepared for the Georgia Ports Authority, Savannah, Georgia, through CH2M Hill/Lockwood Greene, Pooler, GA.

Meyer Household, New Windsor Township, 38Ak615

David Colin Crass, Bruce R. Penner, Tammy R. Forehand, John Huffman, Lois J. Potter, and Larry Pottery
1997 Excavations at New Windsor Township, South Carolina. Savannah River Archaeological Research Heritage Series 3, SRARP, SCIAA, University of South Carolina, Columbia, SC.

Crass, David Colin, Bruce R. Penner, and Tammy R. Forehand
1999 Gentility and Material Culture on the Carolina Frontier. Historical Archaeology 33(3):14-31.

Fort Moore, 38Ak4

Groover, Mark, and Jonathan Leader
2003 Exploring Fort Moore. Legacy 7(2) and 8(1):17-19.

Groover, Mark, Geoff Hughes, and Chris Thornock
2003 Exploring Fort Moore: Results of Site Survey and Testing, 2001-2002. Paper presented at the Society for Georgia Archaeology, Jekyll Island, GA.

George Galphin’s Silver Bluff, 38Ak7

David Colin Crass, Bruce R. Penner, Tammy R. Forehand, Lois J. Potter, and Larry Potter
1995 A Man of Great Liberality: Recent Research at George Galphin’s Silver Bluff. South Carolina Antiquities 27(1&2):26-41.

Catherine Brown Cowpen, 38Br291

Brooks, Richard D., Mark D. Groover, and Samuel C. Smith
2000 Living on the Edge: The Archaeology of Cattle Raisers in the South Carolina Backcountry. Savannah River Archaeological Research Ppaer 10, SRARP, SCIAA, University of South Carolina, Columbia, SC.

Urban sites:

Heyward-Washington House, 87 Church Street, 38Ch108
Herold, Elaine
1978 Preliminary Report on the Research at the Heyward-Washington House. Report on file, The Charleston Museum, Charleston, SC.

Zierden, Martha, and Elizabeth Reitz.
2007 Archaeology at the Heyward-Washington Stable: Charleston through the Eighteenth Century. The Charleston Museum Archaeological Contributions 39, Charleston, SC.

Aiken-Rhett House, 48 Elizabeth Street, 38Ch850
Zierden, Martha
2003 Aiken-Rhett House: Archaeological Research. The Charleston Museum Archaeological Contributions 31, Charleston, SC.

Zierden, Martha, Jeanne Calhoun, and Debi Hacker
1986 Outside of Town: Preliminary Investigations of the Aiken-Rhett House. The Charleston Museum Archaeological Contributions 11, Charleston, SC.

Atlantic Wharf, 25 Prioleau Street, 38Ch1606
Zierden, Martha, and Elizabeth Reitz
2002 Excavations on Charleston's Waterfront: the Atlantic Wharf Garage Site. The Charleston Museum Archaeological Contributions 30, Charleston, SC.

Beef Market, 80 Broad Street, 38Ch1604
Calhoun, Jeanne, Elizabeth Reitz, Michael Trinkley, and Martha Zierden
1984 "Meat in Due Season: Preliminary Investigations of Marketing Practices in Colonial Charleston. The Charleston Museum Archaeological Contributions 9, The Charleston Museum, Charleston, SC.

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Appendix III
Zooarchaeological Methods

Introduction

New faunal data featured in this volume are from the Heyward-Washington House Chapter XI) and the Musgrove Cowpens (Chapter XII; also known as Grange Plantation [9Ch137]). With few exceptions, faunal materials from both sites were studied with similar methods in order to maintain comparability. Those methods and the exceptions are described here. Methods used to study tooth wear stages (TWS) also are described here.

Vertebrate remains from the Heyward-Washington House and the Musgrove Cowpens were studied over a number of years. The Heyward-Washington materials were reported in 2007 by Carol Colaninno and Elizabeth Reitz (Reitz and Colaninno 2007; Zierden and Reitz 2007) Additional materials were studied in 2021-2022 by Taesoo E. Jung with the assistance of Claire E. Brandes, Isabell R. Skipper, and McKenna Waite (see Chapter XI). The Musgrove Cowpen materials from Features 7 and 231 were studied by Kelly L. Orr and Gregory S. Lucas in 2008 with the assistance of J. Matthew Compton, Rhonda Cranfill, and Glenn Thomas (Orr and Lucas 2007; Orr et al. 2008). Additional materials from Feature 231 were studied by Charles Cameron Walker in 2021-2022 (see Chapter XII). The original studies of both collections were done using the comparative skeletal collection at the Zooarchaeology Laboratory, Georgia Museum of Natural History, University of Georgia, as was the 2022 study of additional materials from the Heyward-Washington House. Walker completed the study of Musgrove Feature 231 using the University of Maryland's Zooarchaeological Laboratory and University of Georgia's Zooarchaeology Laboratory. All of these materials were studied using the same methods, with some minor and ultimately inconsequential differences as described below.

Primary Data

Specimens are attributed to the lowest possible taxonomic level through comparison with skeletal reference material of known taxonomic classification and are described in terms of elements represented, the portions recovered, and symmetry, fusion, sex, and modifications. The Number of Identified Specimens (NISP) is determined. Cross-mending specimens are counted as single specimens, as are teeth still seated in mandibles or maxillae. Indeterminate vertebrate (Vertebrata) specimens are not counted because they tend to be highly fragmented and NISP is unlikely to be accurate or replicable. All specimens are weighed to provide additional information about the relative abundance of the taxa identified. Measurements for pigs (*Sus scrofa*), white-tailed deer (*Odocoileus virginianus*), cattle (*Bos taurus*), sheep/goats (caprines, Caprinae), and chickens (*Gallus gallus*) follow Driesch (1976).

The 2007 study of Musgrove Features 7 and 231 and the 2021-2022 study of Musgrove Feature 231 used different approaches to record "unidentifiable" vertebrate remains. Much of the Musgrove Cowpens faunal assemblage is highly fragmented, limiting most taxonomic identification to Class. For example, a bone that can only be identified as a mammal was attributed to "Mammalia" in the 2007 study. In the 2021-2022 study, Walker sorted Mammalia specimens into size categories, including large mammal (e.g., cattle, horse [*Equus caballus*], mule [*E. mulus*]), medium-large mammal (e.g., pig, deer), medium mammal (e.g., dog [*Canis familiaris*], caprine), small-medium mammal (e.g., opossum [*Didelphis virginiana*], raccoon [*Procyon lotor*]), and small mammal (e.g., rabbit [*Sylvilagus* spp.], squirrel [*Sciurus* spp.]).

When appropriate, unattributable mammal specimens were recorded as likely cranial, vertebra/rib, or long bone fragments.

Unless stated otherwise, “cattle” only refers to *Bos taurus*, though goats (*Capra hircus*) and sheep (*Ovis aries*) also are in the family Bovidae, referred to in the vernacular as “bovids”. As used here “cattle” and “cow” are generic terms subsuming male, female, and castrated animals. If a specific gender is meant, the terms “male,” “female,” or “castrate” are used unless the context makes this clarification unnecessary. The term “caprine” refers to both goats and sheep, members of the bovid subfamily Caprinae. Distinguishing between goats and sheep specimens is difficult and most are attributed to Caprinae. In some cases, a specimen can be attributed to sheep or and an MNI estimate noted parenthetically for the taxon, but the parenthetical data are not included in subsequent calculations.

Secondary Data

<u>MNI</u>

MNI refers to the minimum number of individuals necessary to account for all of the specimens of a given taxon based on the elements represented, symmetry, age at death, sex, and size (Grayson 1979:203-225; Reitz and Wing 2008:205-210; White 1953). Normally, MNI is estimated at the lowest possible taxonomic level. Occasionally, an MNI estimate for a lower taxonomic level (e.g., genus or species) is smaller than the MNI for a corresponding higher taxonomic level (e.g., family or subfamily). For example, the estimated MNI for freshwater catfish (*Ictalurus* spp.) may be higher than for channel catfish (*I. punctatus*). In such cases, MNI for the lower taxonomic category is recorded parenthetically in the species list to indicate how many individuals there might be, but evaluated as part of the higher taxonomic level (i.e., MNI of the lower taxonomic category is not added to the higher taxon, but the specimens are considered as though no lower attribution was made). The parenthetical value is not used in subsequent calculations.

Although MNI is a standard zooarchaeological quantification method, the measure has several well-known biases. For example, MNI emphasizes small species over larger ones. This can be demonstrated in a hypothetical collection consisting of ten squirrels and one cow. Although ten squirrels indicate considerable interest in squirrels, one cow has the potential to supply more meat. MNI also is subject to identifiability biases; animals with elements that are more readily identifiable may appear to be more significant than animals with less distinctive elements. Pig teeth, readily identified from very small fragments, exemplify this situation. Conversely, some taxa represented by large numbers of specimens may present few paired elements and their MNI may be underestimated. Gars (*Lepisosteus* spp.) and turtles (Testudines) are subject to this bias. MNI for these animals may be low relative to the number of identified specimens. Basic to MNI is the assumption that entire individuals were used at the site, though ethnographic studies indicate this is not always true. This is particularly the case for larger individuals, animals used for special purposes, and for sites involved in commodity exchange.

In addition to these primary biases, MNI is subject to secondary biases introduced by the way samples are aggregated during analysis (Grayson 1973). The “minimum distinction” method aggregates archaeological samples into larger analytical units and is a conservative approach to estimating MNI. This contrasts with the “maximum distinction” method used when analysis discerns discrete sample units. The Hayward-Washington samples reported in Chapter X are subdivided Joseph Ellicott (1694-1720s), Joseph Milner Sr. (1730-1749), and Joseph Milner Jr. (1749-1768). Musgrove Features 7 and 231 reported by Orr et al. treated Features 7 and 231 as two separate analytical units for purposes of estimating MNI, but did not subdivide either feature by level. Walker did not distinguish among levels in the Feature 231 materials he studied outside of the discussion on the deer-cattle ratio.

<u>Biomass</u>

Biomass estimates the quantity of tissue that a specific taxon supplies, compensating for some of the problems encountered with MNI. Biomass is based on the principle of allometry, which states that body mass, skeletal mass, and skeletal dimensions change proportionally with increasing body size. This scale effect compensates for weakness in the basic structural material, in this case bones and teeth. The relationship between body weight and skeletal weight is described by the equation:

$$Y = aX^b$$

(Simpson et al. 1960:397). In this equation, *X* is specimen weight, *Y* is biomass, *b* is the constant of allometry (the slope of the line), and *a* is the Y-intercept for a log-log plot using the method of least squares regression and the best-fit line (Reitz et al. 1987; Reitz and Wing 2008:233-237). Thus, a given quantity of skeletal material represents a predictable amount of tissue due to allometric growth. Values for *a* and *b* are derived using data from the Florida Museum of Natural History, University of Florida, and the Georgia Museum of Natural History (Appendix III-Table 1). Biomass is not estimated for amphibians and lizards because formulae are not available.

Appendix III-Table 1. Regression Formulae Used.

Taxa	N	Slope (b)	Y-intercept (a)	r^2
Chondrichthyes	17	0.86	1.68	0.85
Actinopterygii	393	0.81	0.90	0.80
Non-perciformes	119	0.79	0.85	0.88
Lepisosteidae	26	0.87	1.13	0.96
Amiidae	13	1.10	1.10	0.87
Siluriformes	36	0.95	1.15	0.87
Perciformes	274	0.83	0.93	0.76
Serranidae	18	1.08	1.51	0.85
Centrarchidae	38	0.84	0.76	0.8
Carangidae	17	0.88	1.23	0.86
Sparidae	22	0.92	0.96	0.98
Sciaenidae	99	0.74	0.81	0.73
Pleuronectiformes	21	0.89	1.09	0.95
Alligator	18	1.00	1.16	0.99
Testudines	26	0.67	0.51	0.55
Aves	307	0.91	1.04	0.97
Mammalia	97	0.90	1.12	0.94

Note: $Y = aX^b$ where *Y* is biomass or meat weight; *X* is specimen weight; *a* is the Y-intercept; and *b* is the slope. N is the number of observations (Pavao-Zuckerman 2001:183; Reitz and Wing 2008:234-242).

Taxonomic Summaries

Taxa are summarized by taxonomic groups to distinguish among wild, domestic, and commensal forms. These categories are Fishes, Turtles and alligators, Wild birds, Domestic birds, Deer, Other wild mammals, Domestic mammals, and Commensal taxa. To ensure comparability of MNI and biomass values, these summaries only include biomass estimates for those taxa for which MNI is available. For example, biomass is estimated for the sea catfish family (Ariidae) in Milner Sr.'s materials (Chapter XI: Table 11-16) but this estimate is not included in the summary table (Chapter XI: Table 11-17).

Canada geese (*Branta canadensis*) and turkeys (*Meleagris gallopavo*) are interpreted as wild birds, though individuals of both species may be domestic. The American Poultry Association (1874) established standards of excellence for Canada geese and turkeys by the mid-eighteenth century. Measurements are the primary means of distinguishing between wild and domestic birds, however, but measurements have thus far not clearly distinguished domestic individuals from tame or wild ones in our study area. Because wild Canada geese and turkeys are present in South Carolina and Georgia, the more conservative interpretation is to attribute archaeological specimens to the wild form.

Taxa tentatively classified as commensal are: frogs and toads (Anura), non-venomous snakes (Colubridae), venomous snakes (Crotalinae), gull (Laridae), crow (*Corvus brachyrhynchos*), Hispid cotton rats (*Sigmodon hispidus*), Old World rats (*Rattus* spp., *Rattus norvegicus*), dogs and wolves (*Canis* spp.; *Canis* cf. *familiaris*), and cats (*Felis domesticus*). Animals tentatively classified as commensal might be of economic value, but they also are commonly found in close association with humans and their built environment as pets, work animals, vermin, or urban wildlife (Reitz and Zierden 2014; Reitz and Wing 2008:137-138). Some commensal animals are ones that people either do not encourage or may actively discourage. Just as some of the animals in the commensal category might be eaten either by choice or necessity, likewise some of the animals in the non-commensal categories might be commensal in specific contexts.

For the secondary analysis of the Feature 231 faunal material, Walker derived a "Deer-Cattle Index" in order to track changes in the relative representation of deer versus cattle over time using NISP, MNI, and biomass. A Deer-Cattle Index value of 0 indicates a lack of deer, 0.5 demonstrates an equal representation of deer and cattle, and 1.0 shows a lack of cattle. Alongside other spatial data, this index may reveal any shifts in economic strategy from engagement with the deerskin trade to engagement with the Lowcountry cattle industry. The Deer-Cattle Index was not calculated for other assemblages reported here because it was derived to answer a specific research question germane to the current project's research goals. Otherwise, the results are comparable, and the Deer-Cattle Index may be used to understand all Musgrove Cowpens faunal material in the future.

Element Distribution

Artiodactyl element distribution patterns provide evidence for butchering practices, transportation decisions, and social distinctions (Reitz and Zierden 1991). The Head category includes skull fragments, antlers, and teeth. The Vertebra/rib category includes the atlas and axis, along with other vertebrae and ribs. It is likely the Head and Vertebra/rib categories are under-represented due to differential recovery and identification biases. Vertebrae and ribs of pig, deer, and caprine are similar in similar size and rarely can be attributed to any of these animals unless distinctive morphological features support such identifications. Ribs of some non-artiodactyls (e.g., bear [*Ursus americanus*], equids) may fall within the same size range as cattle. Such features often are not present and these specimens are referred to one of the indeterminate mammal categories because The Forequarter category includes the scapula, humerus, radius, and ulna, and the Hindquarter category includes the innominate, sacrum, femur, patella, and tibia. Carpal and metacarpal specimens are placed in the Forefoot category, and the Hindfoot category includes tarsal and metatarsal specimens. Indeterminate metapodial and podial specimens, sesamoids, and phalanges are assigned to the Foot category.

These elements are presented visually to illustrate their number and location in a carcass. Loose teeth, tooth fragments, and some skull fragments are shown in approximate locations. Although the atlas and axis fragments are depicted accurately, other vertebrae and ribs are placed approximately on the illustration. The last lumbar location illustrates vertebrae that could only be identified as vertebrae. Specimens identified only as sesamoids, metapodiae, podials, or phalanges are illustrated on the right hindfoot.

Logged ratio diagrams are used to visualize the degree to which differential transportation of deer and cow carcass portions influenced recovered remains (Reitz et al. 2006; Reitz and Wing 2008:223-224; Simpson 1941). The archaeological data are compared to the distribution of carcass portions in a complete standard deer or cow skeleton. The standard distribution is estimated from the number of elements found in a complete skeleton organized into the same anatomical categories described above. This step permits NISP for each element type represented in the archaeological assemblage to be compared to the number of that same element group in a complete, unmodified skeleton. Log difference values are calculated using the formula:

$$d = Log_e X - Log_e Y$$

where d is the logged ratio, X is percentage of that element category in the archaeological sample, and Y is percentage of that category in the standard skeleton, (Simpson 1941; Simpson et al. 1960:357-358). The resulting value (d) is plotted against the standard represented by a horizontal line, which represents what would be expected in a complete standard skeleton. The closer each archaeological observation is to the horizontal line, the more likely it is that the element category is about what one would expect in an intact skeleton. Elements on the positive side of the horizontal line are over-represented compared to the standard skeleton, suggesting transportation decisions and differential access to valued parts of the carcass. Those on the negative side of the scale are under-represented.

Epiphyseal Fusion and Tooth Eruption

Epiphyseal fusion and tooth eruption sequences provide estimates for age at death (e.g., Gilbert 1980:102; Reitz and Wing 2008:172-176; Severinghaus 1949). These physiological events follow well-documented, developmental sequences shared by most mammals (Getty 1975:872; Grigson 1982; Hillson 2005:207-210, 213, 223-225, 232; O’Connor 2003:160; Schmid 1972; Silver 1969; Watson 1978). Many of the age categories used by zooarchaeologists for pigs and bovids are based on modern breeds, though it is likely the age when epiphyses fused and teeth erupted were different in the past than today. Both epiphyseal fusion and tooth eruption occur over many years and many archaeological specimens are not completely fused or erupted. Tooth eruption generally is complete by 48-50 months of age, but complete fusion of all skeletal elements takes longer to achieve. Even today, the vertebral centra of cattle may not fuse until 60 or 108 months of age (Grigson 1982:22; Schmid 1972:75; Silver 1969:252).

Generally negligent care likely delayed maturation for Carolina animals. The age when fusion and tooth eruption begin and end is governed by environmental and genetic variables. These include environmental stresses (e.g., temperature, humidity, labor), breed, nutrition, diet, trauma, and overall health. These physiological events also occur at different rates in females, bulls, and castrates. This difference is particularly relevant for livestock management because many decisions are based on the sex of the animal. Determining the sex of livestock is challenging, however (Ruscillo 2006), and estimates of the sex of cattle in this study using morphometric approaches need further work (Reitz and Ruff 1994).

In this study, archaeological specimens are assigned to ranges within general age categories instead of to calendrical groups in recognition of the many variables that affect maturation. Slightly different categories are used for age classifications derived from epiphyseal fusion, tooth eruption, and wear sequences (Appendix III-Table 2). Although the categories used are ambiguous, the exercise itself is useful for broadly suggesting colonial mortality profiles that can be used for intersite comparisons (e.g., van Dijk 2016).

Appendix III-Table 2. Broad Age Categories for Cattle (*Bos taurus*) Associated with Terms Used in this Volume.

Epiphyseal fusion	Tooth eruption	Tooth wear stage
Juvenile <18 months	Juvenile <18 months	Calf dP4 TWS A-C
Subadult 18-30 months	Subadult 18-24 months	Juvenile dP4 TWS D-G
Young adult 30-48 months	Young adult 24-32 months	Subadult dP4 TWS H-N
Adult > 48 months	Adult >32 months	Young adult M3 TWS A-D
		Adult M3 TWS E-H
		Elderly M3 TWS J-M

Note: Epiphyseal fusion and tooth eruption do not occur in tandem. Epiphyseal fusion age ranges refer to ages when unfused dimensions generally fuse. For example, the distal humerus generally fuses before 18-20 months of age. If the archaeological specimen is unfused, it likely is from a juvenile. Chronological ages are broad estimated ranges compiled from Getty (1975:872), Grant (1982), Grigson (1982:22-23), Hillson (2005:233), O'Connor (2003:160, 2010), Schmid (1972:74-75, 77), and Silver (1969:252-253; 261-263). These may not reflect the timing of physiological events in the Carolinas between 1670 and 1900. Grant does not used the letter "I" in her TWS system.

Epiphyseal fusion refers to the ossification of cartilaginous plates. When mammals are immature, a cartilaginous plate separates the diaphysis (shaft) from the epiphyses (the ends of the specimens). Growth is complete when all of these cartilaginous plates are fully ossified (Reitz and Wing 2008:70-73). Tuberosities as well as distal and proximal aspects may fuse at different times. Although many factors influence the actual age at which fusion is complete, centers of ossification fuse in a regular temporal sequence (Gilbert 1980; Grigson 1982:22; Purdue 1983; Schmid 1972:74-75; Silver 1969:252-253; Watson 1978). The calendrical ages provided in Appendix III-Table 2 are estimates based on modern cattle and likely are not accurate for cattle in earlier centuries. Other artiodactyls follow a similar sequence (Reitz and Wing 2008:70-73).

During analysis, specimens are recorded as either fused or unfused and placed into one of three categories (early-fusing, middle-fusing, and late-fusing) based on the age in which fusion generally occurs. Early-fusing specimens are the distal humerus, distal scapula, proximal radius, acetabulum, proximal metapodials, proximal 1st and 2nd phalanges. Middle-fusing specimens are the distal tibia, proximal calcaneus, and distal metapodials. Late-fusing specimens are the proximal humerus, distal radius, proximal and distal ulna, proximal and distal femur, and proximal tibia. Semi-fused epiphyses and diaphyses are counted in the younger age category for that particular ossification center.

Unfused elements in the early-fusing category are interpreted as evidence for juveniles, unfused elements in the middle-fusing and late-fusing categories are interpreted as evidence for subadults and young adults, and fused specimens in the late-fusing group is evidence for adults. Fused specimens in the early- and middle-fusing groups are indeterminate. Fusion is more informative for unfused early-fusing specimens and fused late-fusing specimens. An early-fusing element that is fused could be from an animal that died immediately after fusion was complete or many years later. In some cases, an individual is interpreted as young because the specimen is too small to be from an adult or may be placed in the adult category because the specimen is too large to be from a young individual. The ambiguity inherent in age estimates is somewhat reduced by recording fused dimension in the oldest possible category.

Tooth eruption status also are recorded during the identification stage (e.g., see Severinghaus 1949). Teeth are classified as either unerupted or erupted and ambiguous teeth are assigned to the older category. As with epiphyseal fusion, the exact age when a specific teeth erupts is uncertain, but tooth eruption follows a regular sequence. The calendrical ages provided in Appendix III-Table 2 are estimates based on modern cattle. Age ranges and terminology for tooth eruption follow Getty (1975:872), Grigson (1982:23), Hillson (2005:233), O'Connor (2003:160, 2010), Schmid (1972:77), and Silver (1969:261-263).

Sex

The sex of animals is an important indication of hunting strategies and livestock management; however, there are few clear indicators of sex. Males are indicated by the presence of spurs on the tarsometatarsus of turkeys and chickens, antlers on deer, a baculum in those species that have one, pelvic characteristics, and characteristics of cattle horn cores. The size and shape of pig canines also provides evidence for male individuals. Male turtles are indicated by a depression on the plastron to accommodate the female during mating. Females are recognized either by the absence of these features or by different shapes in these features. Female birds also may be identified by the presence of medullary bone (Rick 1975; Serjeantson 2009:47-53). Another approach is to compare measurements of identified specimens for evidence of elements that fall into a male or female range, though there are rarely enough measurements to indicate sex reliably.

Modifications

Modifications may indicate butchering methods as well as site formation processes. Modifications include pathologies, hacked, sawed, clean cut, cut, burned, calcined, worked, rodent-gnawed, carnivore-gnawed, and weathered. Some specimens were metal-stained, but these are not included in the modification tables because such stains are to be expected on European-affiliated sites in the Carolinas. Although the NISP for indeterminate vertebrate (Vertebrata) specimens is not included in the species lists, modified indeterminate vertebrate specimens are enumerated in the modification tables. Pathologies are rare in faunal collections, but a few were noted in these assemblages. Pathologies occur when bone is exposed to biological (e.g., disease, nutritional deficiencies, infection) or physical trauma (e.g., fractures). When damaged bone heals, a swollen area of additional bone may form on the specimen (Baker and Brothwell 1980; Greig 1931). It is likely this list is incomplete because modified bones often are not sent for zooarchaeological study.

Some modifications occur as the carcass was skinned, dismembered, or as meat was removed from the bone before or after cooking. Hack marks are evidence that a larger implement, such as a cleaver, hatchet, or axe, was used to dismember the carcass. The presence of parallel striations on the outer layer of compact bone indicates that a specimen was sawed, probably before the meat was cooked. Clean-cut specimens are characterized by a flat, even surface across the compact bone layer with no visible evidence of striations, though these probably also are left by saws. Cuts are small incisions across the surface of specimens. These marks were probably made by smaller implements as tissue was removed before or after it was cooked or when the carcass was disarticulated at the joints. Some marks that appear to be made by human tools may actually be abrasions inflicted after the specimens were discarded, but distinguishing this source of small cuts requires access to higher powered magnification than was available during the original study (Shipman and Rose 1983).

Burned specimens result from the carbonization of collagen and are identified by their charred condition and black coloration (Lyman 1994:384-385). Burned specimens may result from exposure to fire when meat is roasted, though it is more likely that burning occurred as specimens were intentionally or unintentionally burned after discard. Heating bone at extreme temperatures (≥ 600° C) can cause the specimen to become completely incinerated or calcined; calcined specimens usually are recognized by a white or blue-gray discoloration (Lyman 1994: 385-386). Experimental studies indicate that the color of bone may be a poor indicator of the type of modification because it is difficult to describe color variations precisely and other diagenetic factors may alter bone color (Lyman 1994:385).

Gnawing by rodents and carnivores indicates some specimens were not buried immediately after disposal. Although burial would not ensure an absence of gnawing, exposure of specimens for any length of time might result in gnawing. Rodents might be animals such as mice, rats, and squirrels and carnivores include animals such as dogs and raccoons. Gnawing by rodents and carnivores would result in loss of an unknown quantity of discarded material. Some gnawed specimens may have been moved out of their original context. Empirical studies indicate that carnivore gnawing may not leave any visible sign of gnawing in faunal collections, but specimens may be removed from their original context through such activity (Kent 1981).

Specimens considered “worked” show evidence of human modification for reasons probably not associated with primary or secondary butchering. Worked specimens may be grooved and snapped, flaked, polished, or drilled for use as tools, jewelry, and in other objects.

Richness, Ubiquity, Diversity and Equitability

Richness and ubiquity quantify the role of individual species within and among the assemblages. Richness is the number of taxa for which MNI was estimated for each context. MNI is used because it is the value available for the largest number of zooarchaeological assemblages, providing a standardized decision criterion upon which to select taxa to use in this and subsequent studies. Ubiquity refers to the number of contexts in which a specific taxon is present and for which MNI is estimated. A taxon present in every context has a high ubiquity and one present in only a few assemblages has a low ubiquity.

Diversity and equitability enable comparisons of the variety and degree of specialization represented in an assemblage by describing aspects of the economy in terms of effort invested in one or more parts of the resource base. These estimates permit discussion of economic strategies in terms of the variety of animals used at the site (diversity) and the degree of dependence on specific resources and the effective variety of species used based on the evenness (equitability) with which individual species are used. Diversity and equitability indices provide data on the variety of animals used at the site (diversity) and the evenness (equitability) with which those species were utilized (Peet 1974; Reitz and Wing 2008:245-247). Diversity and equitability are estimated for both MNI and biomass. In the case of MNI, estimates of individuals are taken directly from the species lists. Biomass represents a different problem because biomass is estimated for more taxonomic levels than MNI. In order to compare MNI and biomass diversity and equitability estimates for the same taxonomic units, only biomass estimates for taxa for which MNI is estimated are included in the biomass diversity and equitability calculations. This ensures that when comparing biomass and MNI diversity results, exactly the same sample is considered. Biases associated with these indices are discussed elsewhere (Grayson 1981; Reitz and Wing 2008:235-246).

Diversity is estimated using the Shannon-Weaver Index:

$$H' = -\Sigma(p_i)(Log_e\, p_i)$$

where p_i is the number of the *ith* species, divided by the sample size (Pielou 1966; Shannon and Weaver 1949:14). P_i is the evenness component since the Shannon-Weaver Index measures both how many species were used and how much each was utilized. With the Shannon-Weaver index, diversity increases with the addition of more taxonomic categories and with a higher degree of equitability (Reitz and Wing 2008:110-113).

Equitability is estimated using the formula:

$$V' = H'/Log\, S$$

where H' is the Diversity Index and $Log\, S$ is the natural log of the number of observed species (Pielou 1966; Sheldon 1969). An even distribution of taxa is indicated by equitability values approaching 1.0 whereas lower values suggest only a few taxa dominated the collection (Reitz and Wing 2008:112).

Interpreting these indices can be difficult. Diversity increases as both the number of species and the equitable use of species increases. A diversity index of 4.99 is the highest possible value. A sample containing many species with the number of individuals slowly declining from very abundant to very rare will be highly diverse. Diversity can be increased by adding a new taxon to the list, but if another individual of a taxon already present in the list is added, diversity declines. Low diversity is obtained either by having a few species or low equitability, with one species considerably more abundant than others. A low equitability value indicates that one species was more heavily used than other species in the sample. A high equitability index, approaching 1.0, indicates an even distribution of species in the sample following a normal pattern where there are a few abundant species, a moderate number of common ones, and many rare ones.

Stable Isotope Study and Tooth Wear Stages (TWS)

Patterns in the occlusal wear of teeth extend demographic profiles beyond physiological events (Ervynck 2005; Grant 1982; O'Connor 2010; Salvagno et al. 2021). Once teeth erupt, they begin to wear down, doing so for the remainder of the animal's life (Hillson 2005:214-219, 223-225). The rate and degree of tooth wear is influenced by many of the same variables that affect tooth eruption, but may be sensitive particularly to graze quality (e.g., silicates, dirt encrusted vegetation) and jaw pathologies (e.g., Mutze et al. 2021). Tooth wear estimates are more reliable when teeth are from animals that had similar diets because they were from the same herd or grazed in the same environment. This is difficult to achieve for archaeological specimens, another argument supporting a conservative interpretation of age at death for Lowcountry cattle.

Tooth wear stages (TWS) in this study were estimated for two slightly different groups of cattle teeth. The first group consists of teeth used in the stable isotope study (Chapter VII; Reitz et al. 2022). Teeth in the "isotope" group were weighed, measured following Driesch (1976), and assigned to a TWS following Grant (1982:92) before being transferred to the Center for Applied Isotope Studies. Landon (1996:100) applied Grant's 1982 terminology to deciduous and permanent mandibular and maxillary P2 through M3 and this protocol was followed for the "isotope" group. Deciduous lower fourth premolars (dP_4) and lower third molars (M_3) in the "isotope" group are reported by Reitz et al. (2022). The second group consists of dP_4 and M_3 that were not used in the stable isotope study. These also were measured, weighed, and assessed for TWS. Chapter X uses TWS estimates for dP_4 and M_3 in both groups. Data for the teeth in both groups are available in Appendix IV. As a matter of record, teeth in both groups were returned in 2022 to the institutions which so generously made them available for this study.

Pseudoreplication in both groups was controlled by considering archaeological context, quadrant (maxillary or mandibular), number (first molar, second molar, etc.), and symmetry (left or right). For the isotope group, the tooth of choice was the dP_4 or M_3 because these teeth are readily distinguished from other teeth and strongly associated with the maturation sequence. The same individual is unlikely to retain dP_4 long after M_3s erupt. Incisors, premolars, and molars from any quadrant were used in the isotope study only if a dP_4 or M_3 was unavailable for that specific site or time period. When several suitable teeth were available from a specific site and time period, preference was given to those from the left side. If this was not possible, TWS was used to distinguish among individuals. A right M_3 in an early TWS (e.g., TWS = D) and a left M_3 in an advanced TWS (e.g., TWS = L) are unlikely to be from the same individual and both teeth might be included in either "isotope" or "not isotope" group if archaeological context, quadrant, number, and symmetry did not suggest otherwise (see Chapter X, Figure 10-5; Grant 1982; Reitz and Wing 2008:175).

Getty (1975:827) places the dP_4/M_3 transition in oxen at ca. 24-36 months of age and Silver (1969:262) at ca. 28-30 months. Grigson (1982) suggests an even older age range (ca. 30-40 months). Payne (1984) argues that some historical sources report cases in which M_3 erupts before P_4. This may reflect different criteria for "erupted" as well as differences between what can be observed in a living animal and an archaeological specimen (e.g., O'Connor 2000:83). Broadly speaking, though, the dP_4 is replaced by the permanent P_4 as M_3 emerges above the gum line and tooth wear begins, bearing in mind this is a biological process and not a point (e.g., Carter 2006).

Because of differences between the "isotope" group and the "not isotope" group, some teeth were used in the stable isotope study but not in the TWS study and vice versa. Cattle teeth in the "isotope" group were drawn from 16 rural cowpens and plantations (NISP = 38 teeth), Colonial Dorchester (NISP = 1 tooth), the Telfair site in Savannah (GA; NISP = 2), and 16 urban Charleston locations (NISP = 54 teeth). Given the sampling protocol, it is likely the 95 teeth in the stable isotope study represent 95 individuals. (Note: Only TWS for dP_4 [NISP = 16] and M_3 [NISP = 45] in both the "isotope" and the "not isotope" groups are used in Reitz et al. [2022].)

In Chapter X, dP_4 and M_3 in the "isotope group" are combined with dP_4 and M_3 in the "not isotope" group. This increased the TWS sample size (dP_4 NISP = 32; M_3 NISP = 76). Cattle teeth in this expanded TWS study are from the same 16 rural cowpens and plantations (NISP = 62 teeth) and 16 urban Charleston locations (NISP = 46 teeth) used by Reitz et al. (2022). To simplify the present discussion, the five teeth from Colonial Dorchester and the Savannah-Telfair site are excluded. Given the sampling protocol, it is likely the 108 teeth in the TWS study are from 108 individuals.

In the TWS studies (e.g., Chapters X-XII), all dP_4s are referred to as juveniles (Grant refers to dP_4 as m_4) and all lower third molars (M_3) are referred to as adults. Ambiguous teeth are assigned to the older age. The overall juvenile category ranges from TWS A to N, which includes calves (dP_4 TWS A-C), juveniles (dP_4 TWS D-G), and subadults (dP_4 TWS H-N). Adult M_3s are from young adults (M_3 TWS A-D), prime adults (M_3 TWS E-H), and elderly adults (M_3 TWS J-M).

Assessing which herd management strategy was practiced at a site or within a region is usually approached via mortality profiles or survivorship curves (e.g., Greenfield 2005; Payne 1973; Rizzetto and Albarella 2022), but this approach is not taken here. Although the number of cattle specimens appears quite large from the perspective of Carolina archaeology, in fact, it is quite small compared to samples used in mortality profiles elsewhere. In addition, mortality profiles using tooth eruption and wear usually are based on tooth wear stages observed from mandibles with a series of teeth in situ. Although some teeth in this study are associated with mandibles, most are not.

Summary

Derived measures such as these are subject to several common biases (Grayson 1979, 1981; Reitz and Wing 2008). In general, samples of at least 200 individuals or 1,400 specimens are needed for reliable interpretations. Smaller samples frequently will generate a short species list with undue emphasis on one species in relation to others. It is not possible to determine the nature or the extent of the bias, or correct for it, until the sample is made larger through additional work. These data also reflect the fact that elements of some animals are identified more readily than others and the taxa represented by these elements may appear more significant in terms of specimen count than they were in the diet. If these animals are identified largely by unpaired elements, such as scales and cranial fragments, the estimated MNI for these taxa will be low. At the same time, animals with many highly diagnostic but unpaired elements will yield high specimen weights and biomass estimates. Hence high specimen count, low MNI, and high biomass for some animals are artifacts of analysis. This source of bias is particularly critical to interpretations of the role of turtles in the island economy. Unfortunately, no specific sample size ensures that all parameters of a sample population are adequately represented and may skew the importance of one taxon relative to others (Lyman and Ames 2004).

Appendix IV
Data for Teeth Used in the Stable Isotope and Tooth Wear Studies
8/20/2022

	Ashley Hall Plantation (38CH56)		John Bartlam's pottery at Cain Hoy (38BK1349a)				
CAIS Isotope Sample #	RB-69		RC-41	RC-42	RC-43		
Classification	Rural		Rural	Rural	Rural		
Location	Tidal Coastal Plain		Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain		
Time Period	1710-1730		1730-1780	1730-1780	1730-1780		
FS#	-		90a	90b	90c		
Context	674.1:5		Feature 90, well pit	Feature 90, well pit	Feature 90, well pit		
Description	rt lower M3		rt upper M3	rt upper M1, M2, in maxilla	rt lower M1, M2, M3, in mandible		
GMNH#	na		na	na	na		
TWS	H		E	G	E		
Measurements, in mm	B=12.6, L=38.22		B=11.14, L=33.64	B=17.34, L=26.16	B=9.80, L=30.94		
Wt, g	37.127		28.76	73.39	136.39		
Notes	-		-	M2 description	M3 description		
Modifications	-		-	-	-		
$\delta^{13}C_{ap}$	-10.62		-9.10	-4.75	-7.39		
$\delta^{18}O_{VPDB}$	-2.52		-0.37	0.91	0.28		
$\delta^{13}C_{col}$	-18.03		-18.57	-15.32	-13.51		
$\delta^{15}N_{AIR}$	5.01		5.11	6.32	5.59		
Total %C	40.41		41.19	44.78	44.51		
Total %N	14.64		14.71	16.45	16.24		
C/N	3.22		3.27	3.18	3.20		
Collagen yield %	3.9		7.7	10.8	9.7		
$^{87}Sr/^{86}Sr$	0.7123714		0.7100195	0.7096140	0.7095003		
$^{208}Pb/^{204}Pb$	38.4361		38.5577	38.4563	38.5583		
$^{207}Pb/^{204}Pb$	15.6688		15.6829	15.6800	15.6864		
$^{206}Pb/^{204}Pb$	17.9712		17.9934	17.9614	17.9997		
$^{208}Pb/^{206}Pb$	2.08675		2.09065	2.08881	2.09010		
$^{207}Pb/^{206}Pb$	0.85073		0.85033	0.85168	0.85024		
12/27/2021							

	Catherine Brown Cowpen (38BR291)	
CAIS Isotope Sample #	RC-70	-
Classification	Rural	Rural
Location	Upper Coastal Plain	Upper Coastal Plain
Time Period	1730-1780	1730-1780
FS#	83	83
Context	Prov. 88 Level D	103 Feature 34 Level X
Description	lt lower dec. P4, M1 root, in mandible	rt lower adult M2
GMNH#	na	na
TWS	J	H
Measurements, in mm	B=11.5, L=28.8	B=19.4, L=28.5
Wt, g	47.9	26.2
Notes	P4 description	-
Modifications	-	-
$\delta^{13}C_{ap}$	-11.06	-
$\delta^{18}O_{VPDB}$	0.83	-
$\delta^{13}C_{col}$	-15.58	-
$\delta^{15}N_{AIR}$	5.42	-
Total %C	41.64	-
Total %N	15.11	-
C/N	3.22	-
Collagen yield %	13.4	-
$^{87}Sr/^{86}Sr$	0.7132953	-
$^{208}Pb/^{204}Pb$	38.5705	-
$^{207}Pb/^{204}Pb$	15.6781	-
$^{206}Pb/^{204}Pb$	18.0522	-
$^{208}Pb/^{206}Pb$	2.08489	-
$^{207}Pb/^{206}Pb$	0.84754	-
12/29/2021		

	Aiken-Rhett House (38CH850)			Atlantic Wharf (38CH1606)	
CAIS Isotope Sample #	UE-01	UE-02		U-03	
Classification	Urban	Urban		Urban	
Location	Tidal Coastal Plain	Tidal Coastal Plain		Tidal Coastal Plain	
Time Period	>1820	>1820		1780-1820	
FS#	8	43		23	
Context	T.P 1 , Zone 2, level 3	-		-	
Description	lt upper M3	rt upper M3		rt lower M3	
GMNH#	850042	850233		na	
TWS	E	G		J	
Measurements, in mm	B=13.44, L=25.87	B=0, L=25.69		B=12.64, L=37.82	
Wt, g	9.57	30.26		28.63	
ARL	-	-		-	
Notes	-	-		-	
Other Notes	48 Elizabeth Street	48 Elizabeth Street		25 Prioleau Street	
Modifications	-	-		-	
$\delta^{13}C_{ap}$	-5.49	-5.15		-5.68	
$\delta^{18}O_{VPDB}$	0.49	-0.06		1.07	
$\delta^{13}C_{col}$	-13.31	-14.25		-15.10	
$\delta^{15}N_{AIR}$	5.19	4.87		5.66	
Total %C	42.17	42.58		40.43	
Total %N	15.25	15.39		14.64	
C/N	3.23	3.23		3.22	
Collagen yield %	3.8	8.9		7.3	
$^{87}Sr/^{86}Sr$	0.7105623	0.7108804		0.7126799	
$^{208}Pb/^{204}Pb$	40.6013	38.7764		38.7142	
$^{207}Pb/^{204}Pb$	15.9046	15.7134		15.7002	
$^{206}Pb/^{204}Pb$	20.2517	18.1785		18.1334	
$^{208}Pb/^{206}Pb$	1.96198	2.08202		2.08343	
$^{207}Pb/^{206}Pb$	0.76866	0.84378		0.84499	
12/29/2021					

	Beef Market (38CH1604)				
CAIS Isotope Sample #	UC-04	UC-05	U-06	UB-07	
Classification	Urban	Urban	Urban	Urban	
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	
Time Period	1730-1780	1730-1780	1780-1820	1710-1730	
FS#	111	145	153*	242	
Context	Unit 5 Zone 10	Unit 7 fea 5/zone 7	Unit 9 zone A	Unit 11 zone 10	
Description	lt lower M3	lt lower M3	lt lower M3	upper lt P4	
GMNH#	2280509	2280614	2280279	na	
TWS	G	G	J	-	
Measurements, in mm	B=12.4, L=0	B=12.25, L=0	B=11.4, L=32.9	B=17.02, L=20.25	
Wt, g	27.58	21.86	14.07	11.1	
ARL	ARL 28258	ARL 28292	ARL 28300	-	
Notes	-	-	Reitsema bone study	-	
Other Notes	80 Broad Street	80 Broad Street	80 Broad Street	80 Broad Street	
Modifications	-	-	-	-	
$\delta^{13}C_{ap}$	-11.00	-3.75	-2.89	-8.30	
$\delta^{18}O_{VPDB}$	0.18	-1.58	0.68	-0.54	
$\delta^{13}C_{col}$	-18.85	-14.04	-11.79	-18.03	
$\delta^{15}N_{AIR}$	4.94	4.80	5.59	4.90	
Total %C	41.38	43.78	42.73	39.86	
Total %N	15.11	15.99	15.61	14.56	
C/N	3.19	3.19	3.19	3.19	
Collagen yield %	8.8	5.6	6.5	2.9	
$^{87}Sr/^{86}Sr$	0.7101912	0.7097938	0.7100875	0.7128270	
$^{208}Pb/^{204}Pb$	38.5089	38.6106	38.5671	38.5678	
$^{207}Pb/^{204}Pb$	15.6620	15.6896	15.6826	15.6837	
$^{206}Pb/^{204}Pb$	17.9912	18.0433	18.0002	18.0051	
$^{208}Pb/^{206}Pb$	2.08845	2.08807	2.09069	2.09000	
$^{207}Pb/^{206}Pb$	0.84944	0.84850	0.85010	0.84996	
12/29/2021					

	Miles Brewton House (38CH1597)				Charleston Place (38CH1605)	
CAIS Isotope Sample #	UC-08	UC-09	-		UC-10	UC-11
Classification	Urban	Urban	Urban		Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain		Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780		1730-1780	1730-1780
FS#	10	88	10		I-F-102	I-F-102
Context	Feature 3	N225W185 zone 5	Feature 3		-	-
Description	rt lower dec. P4	rt lower dec. P4	lt lower M3		rt lower dec. P4	lt lower M3
GMNH#	1100055b	1100704	1100055a		390282a	390282b
TWS	F	F	M		N	G
Measurements, in mm	B=8.27, L=32.75	B=9.39, L=32.05	B=13.99, L=36.43		B=12.03, L=27.40	B=11.04, L=36.99
Wt, g	8.72	7.47	12.11		5.442	32.011
ARL	ARL 15420b	ARL 15498	ARL 15420a		ARL 34749a	ARL 34749b
Notes	Brewton-Motte-Alston	pre-Brewton	Brewton-Motte-Alston		-	-
Other Notes	27 King Street	27 King Street	27 King Street		205 Meeting St. Chas Conv Ctr	205 Meeting St. Chas Conv Ctr
Modifications	-	-	-		-	-
$\delta^{13}C_{ap}$	-9.05	-7.47			-7.94	-6.97
$\delta^{18}O_{VPDB}$	-1.46	0.63			2.35	-0.43
$\delta^{13}C_{col}$	-16.03	-13.04			-16.43	-16.40
$\delta^{15}N_{AIR}$	7.62	7.30			5.71	4.42
Total %C	43.25	41.57			38.27	40.52
Total %N	15.90	15.06			13.69	14.84
C/N	3.17	3.22			3.26	3.19
Collagen yield %	4.4	6.7			5.3	6.2
$^{87}Sr/^{86}Sr$	0.7104650	0.7093988			0.7124494	0.7129528
$^{208}Pb/^{204}Pb$	38.4681	38.4855			38.5907	38.5062
$^{207}Pb/^{204}Pb$	15.6570	15.6564			15.6927	15.6704
$^{206}Pb/^{204}Pb$	17.9592	17.9623			18.0376	17.9893
$^{208}Pb/^{206}Pb$	2.08993	2.09051			2.08797	2.08839
$^{207}Pb/^{206}Pb$	0.85071	0.85050			0.84902	0.84992
12/29/2021						

	First Trident (38CH1607)				William Gibbes House (38CH1599)		
CAIS Isotope Sample #	UC-12	UC-13	-		UE-14	U-15	
Classification	Urban	Urban	Urban		Urban	Urban	
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain		Tidal Coastal Plain	Tidal Coastal Plain	
Time Period	1730-1780	1730-1780	1730-1780		>1820	1780-1820	
FS#	21*	25*	23		16	23	
Context	Unit 2, feature 5	TP2, Zone 9, level 1	TP2, Zone 9, Level 2		unit 2, Zone 4, Level 2	Unit 2, Feature 3	
Description	tooth fragment	rt upper M2, in maxilla	upper lt M1		rt lower M3	rt lower dec. P4	
GMNH#	600182	600156	na		880066	880095	
TWS	-	J	L		D	C	
Measurements, in mm	-	B=18.26, L=28.75	B=20.62, L=19.46		B=10.33, L=29.73	B=7.62, L=31.8	
Wt, g	4.43	51.91	11.3		35.14	6.1	
ARL	ARL 35010	ARL 35014	-		ARL 26349	ARL 26356	
Notes	Reitsema bone study, Colonial	Reitsema bone study, Colonial	Colonial		-	-	
Other Notes	170 Meeting St	170 Meeting St	170 Meeting St		64 South Battery	64 South Battery	
Modifications	-	-	-		-	-	
$\delta^{13}C_{ap}$	-4.83	-4.44			0.06	-8.91	
$\delta^{18}O_{VPDB}$	0.32	0.40			-0.29	-2.55	
$\delta^{13}C_{col}$	-15.16	-15.80			-7.89	-16.11	
$\delta^{15}N_{AIR}$	5.36	4.24			6.30	7.96	
Total %C	35.10	40.70			40.92	42.49	
Total %N	12.85	14.96			14.87	15.47	
C/N	3.19	3.17			3.21	3.20	
Collagen yield %	2.1	7.4			6.9	7.3	
$^{87}Sr/^{86}Sr$	0.7128641	0.7123811			0.7094353	0.7094091	
$^{208}Pb/^{204}Pb$	38.5460	38.6276			38.8266	38.5421	
$^{207}Pb/^{204}Pb$	15.6753	15.6935			15.7042	15.6719	
$^{206}Pb/^{204}Pb$	17.9913	18.0646			18.3409	17.9951	
$^{208}Pb/^{206}Pb$	2.09042	2.08696			2.06649	2.08974	
$^{207}Pb/^{206}Pb$	0.85010	0.84770			0.83581	0.84967	
12/29/2021							

	Lodge Alley and East Bay Street (38CH1608)					
CAIS Isotope Sample #	UE-27	UE-28	UC-29	-	-	
Classification	Urban	Urban	Urban	Urban	Urban	
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	
Time Period	>1820	>1820	1730-1780	1730-1780	1730-1780	
FS#	6	6	7	7	13	
Context	TP1, Feature 4, Level 1	TP1, Feature 4, Level 1	TP1, zone 4-5 interface	TP1, zone 4-5 interface	-	
Description	lt upper M3	lt upper M3, not in maxilla	rt lower M2, M3, in mandible	lt lower M3	rt upper M3, in maxilla	
GMNH#	500022a	500022b	500030a	500030b	na	
TWS	K	F	G	E	K	
Measurements, in mm	B=18.88, L=28.01	B=16.77, L=27.75	B=12.81, L=37.25	B=8.94, L=34.83	B=23.67, L=25.73	
Wt, g	30.01	34.23	190.95	30.23	73.22	
ARL	ARL 34505	ARL 34505	-	-	-	
Notes	-	-	M3 described	-	-	
Other Notes	185 East Bay St	185 East Bay St	185 East Bay St	185 East Bay St	185 East Bay St	
Modifications	-	-	cut marks	-	-	
$\delta^{13}C_{ap}$	-4.88	-2.97	-9.70			
$\delta^{18}O_{VPDB}$	1.02	1.48	-0.63			
$\delta^{13}C_{col}$	-12.82	-12.75	-17.28			
$\delta^{15}N_{AIR}$	7.51	7.08	5.38			
Total %C	43.40	40.72	40.03			
Total %N	15.89	14.87	14.53			
C/N	3.19	3.19	3.21			
Collagen yield %	15.2	14.3	9.3			
$^{87}Sr/^{86}Sr$	0.7103692	0.7104426	0.7119595			
$^{208}Pb/^{204}Pb$	38.4454	38.4153	38.4936			
$^{207}Pb/^{204}Pb$	15.6692	15.6654	15.6726			
$^{206}Pb/^{204}Pb$	17.9120	17.8795	17.9424			
$^{208}Pb/^{206}Pb$	2.09382	2.09581	2.09313			
$^{207}Pb/^{206}Pb$	0.85342	0.85468	0.85217			
12/29/2021						

	McCrady's Tavern and Long Room (38CH559			Powder Magazine (38CH97)		Nathaniel Russell House (38CH100)
CAIS Isotope Sample #	UC-30	UC-31		UC-32		UC-33
Classification	Urban	Urban		Urban		Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain		Tidal Coastal Plain		Tidal Coastal Plain
Time Period	1730-1780	1730-1780		1730-1780		1730-1780
FS#	24	29		80		288
Context	TP3, Feature 14	TP3, Area B, Zone 7		N145 E120, Feature 24, Level 2		N130 E328 Zone 7
Description	rt lower M2	rt lower M2		lt lower P3, dec. P4, in mandible		lt lower adult P4, in mandible
GMNH#	480072	480107		1760114		1800446
TWS	B	J		D		D
Measurements, in mm	B=8.93, L=28.55	B=14.02, L=25.96		B=7.97, L=32.94		B=9.56, L=20.07
Wt, g	8.27	23.75		33.61		65.88
ARL	ARL 34523	ARL 34528		ARL 26410		ARL 26689
Notes	-	-		P4 described		pre-Russell
Other Notes	2 Unity Alley	2 Unity Alley		79 Cumberland St		51 Meeting Street
Modifications	-	-		-		cut marks
$\delta^{13}C_{ap}$	-5.29	-5.77		-6.24		-7.11
$\delta^{18}O_{VPDB}$	1.59	-0.37		-0.74		-0.47
$\delta^{13}C_{col}$	-11.42	-16.05		-11.47		-16.00
$\delta^{15}N_{AIR}$	6.84	4.81		5.71		5.02
Total %C	42.36	44.02		42.38		39.18
Total %N	15.46	16.05		15.25		14.10
C/N	3.20	3.20		3.24		3.24
Collagen yield %	6.4	10.6		4.5		8.1
$^{87}Sr/^{86}Sr$	0.7096512	0.7134278		0.7096253		0.7128033
$^{208}Pb/^{204}Pb$	38.5436	38.5368		38.4310		38.6855
$^{207}Pb/^{204}Pb$	15.6770	15.6718		15.6777		15.6993
$^{206}Pb/^{204}Pb$	17.9854	17.9901		17.8631		18.1633
$^{208}Pb/^{206}Pb$	2.09089	2.08995		2.09855		2.07853
$^{207}Pb/^{206}Pb$	0.85040	0.84991		0.85606		0.84344
12/29/2021						

	John Rutledge House (38CH1598)		Simmons-Edwards House (38CH103)
CAIS Isotope Sample #	U-34		U-40
Classification	Urban		Urban
Location	Tidal Coastal Plain		Tidal Coastal Plain
Time Period	1780-1820		1780-1820
FS#	10		774
Context	Unit 1, Zone 5, Level 3, FS 10		Zone 6
Description	rt lower dec. P4, in mandible		lt lower P2, P3, dec. P4, in mandible
GMNH#	1090137		2032250
TWS	C		D
Measurements, in mm	B=8.58, L=33.68		B=8.10, L=32.56
Wt, g	24.5		121.23
ARL	-		ARL 27570
Notes	-		P4 described
Other Notes	116 Broad St		14 Legare
Modifications	-		-
$\delta^{13}C_{ap}$	-4.01		-0.64
$\delta^{18}O_{VPDB}$	-0.29		-0.48
$\delta^{13}C_{col}$	-12.86		-8.17
$\delta^{15}N_{AIR}$	8.73		6.34
Total %C	40.29		44.18
Total %N	14.49		16.14
C/N	3.24		3.19
Collagen yield %	3.1		11.2
$^{87}Sr/^{86}Sr$	0.7100508		0.7099707
$^{208}Pb/^{204}Pb$	38.5338		38.4300
$^{207}Pb/^{204}Pb$	15.6742		15.6715
$^{206}Pb/^{204}Pb$	17.9781		17.8686
$^{208}Pb/^{206}Pb$	2.09125		2.09818
$^{207}Pb/^{206}Pb$	0.85063		0.85552
12/29/2021			

	South Adger's Wharf/Lower Market (38CH2291)			
CAIS Isotope Sample #	U-35	U-36	UC-37	-
Classification	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1780-1820	1780-1820	1730-1780	1730-1780
FS#	183	233	283a	166/167
Context	N345 E320, Zone 3B-C	N345 E315, Zone 3	N345 E325 Zone 10, Level 3-4	N345 E320, Zone 3B
Description	rt lower dec. P4	rt lower dec. P4	rt lower M3	lt lower M3
GMNH#	2510313	2510353	2510475	2510229
TWS	G	D	F	E
Measurements, in mm	B=10.38, L=31.67	B=8.02, L=31.18	B=11.97, L=35.69	B=9.7, L=36.57
Wt, g	7.39	5.21	47.02	29.95
ARL	ARL 48085	ARL 48135	ARL 48180	ARL 48068
Notes	-	-	-	-
Other Notes	82 East Bay Street	82 East Bay Street	82 East Bay Street	82 East Bay Street
Modifications	-	-	-	-
$\delta^{13}C_{ap}$	-5.35	-8.10	-9.81	
$\delta^{18}O_{VPDB}$	-1.96	-1.60	-1.25	
$\delta^{13}C_{col}$	-12.27	-12.42	-17.98	
$\delta^{15}N_{AIR}$	6.92	8.21	3.86	
Total %C	41.54	39.84	44.25	
Total %N	15.23	14.47	16.14	
C/N	3.18	3.21	3.20	
Collagen yield %	5.6	2.1	12.6	
$^{87}Sr/^{86}Sr$	0.7094293	0.7091945	0.7118518	
$^{208}Pb/^{204}Pb$	38.5142	38.5614	37.9070	
$^{207}Pb/^{204}Pb$	15.6690	15.6764	15.6312	
$^{206}Pb/^{204}Pb$	17.9618	18.0176	17.4095	
$^{208}Pb/^{206}Pb$	2.09187	2.08817	2.12260	
$^{207}Pb/^{206}Pb$	0.85111	0.84891	0.87521	
12/29/2021				

	86 Church Street (38CH2646)		
CAIS Isotope Sample #	UB-76	-	-
Classification	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1710-1730	1730-1780	1710-1730
FS#	185	124	133
Context	Unit 3, Zone 6	Unit 1, Zone 2 Level 2	Unit 1, Zone 5 Level 1
Description	lt lower adult P1 and P3, in mandible	lt lower M3	rt upper adult P3
GMNH#	na	na	na
TWS	G	J	-
Measurements, in mm	B=12.7, L=34.8	B=14.26, L=42.7	B=19.33, L=15.5
Wt, g	121.632	40.16	7.996
ARL	-	-	-
Notes	P3 description	-	-
Other Notes	86 Church Street (38CH2646)	86 Church Street (38CH2646)	86 Church Street (38CH2646)
Modifications	cut marks	-	-
$\delta^{13}C_{ap}$	-7.37		
$\delta^{18}O_{VPDB}$	0.81		
$\delta^{13}C_{col}$	-14.68		
$\delta^{15}N_{AIR}$	4.38		
Total %C	39.79		
Total %N	14.53		
C/N	3.20		
Collagen yield %	3.0		
$^{87}Sr/^{86}Sr$	0.7105975		
$^{208}Pb/^{204}Pb$	38.5038		
$^{207}Pb/^{204}Pb$	15.6713		
$^{206}Pb/^{204}Pb$	17.9891		
$^{208}Pb/^{206}Pb$	2.08833		
$^{207}Pb/^{206}Pb$	0.85003		
12/29/2021			

Heyward-Washington (38CH108)					
CAIS Isotope Sample #	UAB-16	UAB-17	UC-18	UBC-19	UBC-20
Classification	Urban	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1694-1724	1730-1749	1740s/TPQ 1820	1694-1724	1694-1724
FS#	-	-	-	-	-
Context	Feature 65e	Feature 183	B 6/5	B 5/8	B 5/8
Description	rt lower M3	rt lower P2, P3, dec. P4, in mandible	rt lower M3	rt lower M3	rt lower M2, M3, in mandible
GMNH#	2980066	na	2980005	2980012	2980012
TWS	F	D	G	J	G
Measurements, in mm	B 10.3; L=0	B=7.6; L= 32.1	B=12.0; L=35.6	B=12.7; L=33.4	B=12.1; L=33.3
Wt, g	26.9	31.8	22.8	38.7	98.99
ARL	ARL 49705.2	ARL 49725	ARL 49757	ARL 49766a	ARL 49766b
Notes	-	P4 description	-	-	M3 description
Other Notes	Ellicott 1694-1724	Milner, Sr 1730-1749	Milner, Jr 1749-1768	Ellicott 1694-1724	Ellicott 1694-1724
Modifications	-	-	-	-	cut marks
$\delta^{13}C_{ap}$	-9.50	-5.81	-2.63	1.10	-8.53
$\delta^{18}O_{VPDB}$	-1.17	-0.57	-1.25	-0.06	0.06
$\delta^{13}C_{col}$	-17.17	-11.92	-11.31	-11.60	-16.64
$\delta^{15}N_{AIR}$	4.80	6.51	6.14	5.47	5.11
Total %C	37.88	38.65	38.37	43.28	40.77
Total %N	13.87	14.10	13.95	15.76	14.85
C/N	3.19	3.20	3.21	3.20	3.20
Collagen yield %	8.9	11.1	5.1	10.2	5.0
$^{87}Sr/^{86}Sr$	0.7107564	0.7094149	0.7094605	0.7097745	0.7096348
$^{208}Pb/^{204}Pb$	38.5592	37.9977	38.0916	38.0782	38.0140
$^{207}Pb/^{204}Pb$	15.7015	15.6216	15.6347	15.6282	15.6283
$^{206}Pb/^{204}Pb$	18.2067	17.5704	17.6356	17.6346	17.5755
$^{208}Pb/^{206}Pb$	2.06704	2.10859	2.10641	2.10580	2.10891
$^{207}Pb/^{206}Pb$	0.84160	0.86690	0.86453	0.86424	0.86706
6/18/2022					

Heyward-Washington (38CH108)						
CAIS Isotope Sample #	UC-21	UBC-22	UE-23	UBC-24	UBC-25	UE-26
Classification	Urban	Urban	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1740s-50s	1730-1749	1772-1780s	1730-1749	1730-1749	1850s
FS#	-	-	-	-	-	-
Context	B 13/4	A 12/7	A 12/3b	B 2/7	B 2/6	Feature 7, kitchen
Description	rt lower M3	lt lower M3	rt lower M3	lt lower M3	lt lower M3	rt lower M3, in mandible
GMNH#	2980021	2980041	2980015	2980033	2980028	na
TWS	G	G	J	G	G	G
Measurements, in mm	B=13.5; L=36.1	B=12.8, L=36.9	B=13.6, L=39.3	B=11.8, L=35.8	B=12.4; L=39.2	B=11.5, L=0
Wt, g	35.2	25.7	54.4	38.6	41.2	128.7
ARL	ARL 50916	ARL 50946	ARL 50965	ARL 50996	ARL 51032	ARL 51058
Notes						
Other Notes	Milner, Jr 1749-1768	Milner, Sr 1730-1749	Heyward 1772-1780s	Milner, Sr 1730-1749	Milner, Sr 1730-1749	Boarding House 1820-50
Modifications	-	-	-	-	-	-
$\delta^{13}C_{ap}$	-8.54	-9.65	-8.91	-5.41	-7.90	-9.17
$\delta^{18}O_{VPDB}$	-0.90	-0.95	-0.54	0.50	-0.89	-0.94
$\delta^{13}C_{col}$	-16.85	-19.15	-16.57	-13.57	-15.66	-17.06
$\delta^{15}N_{AIR}$	6.19	7.27	4.23	7.20	4.87	4.35
Total %C	39.96	43.04	38.99	42.54	40.36	39.85
Total %N	14.35	15.77	14.11	15.60	14.71	14.47
C/N	3.25	3.18	3.22	3.18	3.20	3.21
Collagen yield %	6.9	11.4	7.5	7.4	3.5	4.4
$^{87}Sr/^{86}Sr$	0.7106055	0.7115525	0.7120947	0.7098538	0.7115061	0.7117534
$^{208}Pb/^{204}Pb$	38.1665	38.0910	38.1564	38.2496	38.4790	38.4309
$^{207}Pb/^{204}Pb$	15.6403	15.6327	15.6375	15.6517	15.6603	15.6680
$^{206}Pb/^{204}Pb$	17.6868	17.6356	17.6732	17.7678	17.9479	17.8895
$^{208}Pb/^{206}Pb$	2.10445	2.10632	2.10537	2.09963	2.09153	2.09563
$^{207}Pb/^{206}Pb$	0.86240	0.86447	0.86291	0.85918	0.85128	0.85437
6/18/2022						

Heyward-Washington (38CH108)				
CAIS Isotope Sample #	33795	33796	33797	33798
Classification	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1694-1724	1694-1724	1694-1724	1694-1724
FS#	-	-	-	-
Context	Feature 65a	Feature 65b	Feature 65b	Feature 65b
Description	rt upper M3, in maxilla	rt lower M3	rt upper M2	rt upper M2
GMNH#	02850001a	02850002a	02850002b	02850002c
TWS	K	L	K	J
Measurements, in mm	-	B=13.8, L=37.8	-	-
Wt, g	60.02	29.95	39.17	31.59
ARL	ARL 49701a	ARL 49702a	ARL 49702b	ARL 49702c
Notes	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones
Other Notes	Ellicott 1694-1724	Ellicott 1694-1724	Ellicott 1694-1724	Ellicott 1694-1724
Modifications	-	-	-	-
$\delta^{13}C_{ap}$	-10.89	-10.03	-4.41	-7.46
$\delta^{18}O_{VPDB}$	-2.25	-1.27	1.18	-0.96
$\delta^{13}C_{col}$	-18.78	-18.24	-15.31	-14.40
$\delta^{15}N_{AIR}$	4.32	4.51	6.10	4.87
Total %C	40.23	42.43	42.40	42.33
Total %N	15.39	15.51	15.84	15.56
C/N	3.05	3.19	3.12	3.17
Collagen yield %	8.3	6.7	5.9	5.7
$^{87}Sr/^{86}Sr$	0.709428	0.710599	0.710610	0.710746
$^{208}Pb/^{204}Pb$	38.582	38.573	38.679	38.694
$^{207}Pb/^{204}Pb$	15.689	15.671	15.689	15.709
$^{206}Pb/^{204}Pb$	18.425	18.578	18.685	18.831
$^{208}Pb/^{206}Pb$	2.09432	2.07660	2.07051	2.05534
$^{207}Pb/^{206}Pb$	0.85169	0.84374	0.83996	0.83459
6/18/2022				

Heyward-Washington (38CH108)				
CAIS Isotope Sample #	33799	33800	33801	33802
Classification	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1694-1724	1694-1724	1694-1724	1694-1724
FS#	-	-	-	-
Context	Feature 65b	Feature 65b	Feature 65e "10/20"	Feature 65e "10/20"
Description	lt lower P2	rt lower P2	rt upper M2, in maxilla	rt upper M3
GMNH#	02850002d	02850002e	02850003a	02850003b
TWS	worn/ adult	worn/ adult	H	F
Measurements, in mm	-	-	-	-
Wt, g	6.69	7.13	58.11	42.27
ARL	ARL 49702d	ARL 49702e	ARL 49705a	ARL 49705b
Notes	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones
Other Notes	Ellicott 1694-1724	Ellicott 1694-1724	Ellicott 1694-1724	Ellicott 1694-1724
Modifications	-	-	-	-
$\delta^{13}C_{ap}$	-9.95	-7.36	-13.18	-10.45
$\delta^{18}O_{VPDB}$	-1.78	-2.30	-3.46	-2.97
$\delta^{13}C_{col}$	-17.99	-17.34	-18.34	-16.23
$\delta^{15}N_{AIR}$	4.55	5.04	4.87	4.65
Total %C	43.15	37.67	41.74	35.35
Total %N	15.86	13.90	15.52	13.09
C/N	3.17	3.16	3.14	3.15
Collagen yield %	3.5	3.7	14.6	4.9
$^{87}Sr/^{86}Sr$	0.710721	0.710679	0.710891	0.710830
$^{208}Pb/^{204}Pb$	38.602	38.537	38.679	38.505
$^{207}Pb/^{204}Pb$	15.681	15.666	15.702	15.654
$^{206}Pb/^{204}Pb$	18.670	18.522	18.835	18.493
$^{208}Pb/^{206}Pb$	2.06779	2.08066	2.05337	2.08260
$^{207}Pb/^{206}Pb$	0.84014	0.84586	0.83363	0.84686
6/18/2022				

Heyward-Washington (38CH108)					
CAIS Isotope Sample #	33803	33804	33805	38968	38969
Classification	Urban	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1694-1724	1772-1780s	1772-1750s	1730-1749	1730-1749
FS#	-	-	-	-	-
Context	Feature 65e "10/20"	HWN II/8	HWN II/9	Feature 166b	Feature 166b
Description	rt upper M2	rt lower M3, in mandible	rt incisor #1	lt lower M3	rt lower M2
GMNH#	02850003c	02850004a	02850005a	02850006c	02850006e
TWS	K	G	worn/ adult	G	K
Measurements, in mm	-	B=13.1, L=35.7	-	B=12.4, L=35.8	B=16.7, L=26.0
Wt, g	23.92	250.03	3.8	21.26	24.3
ARL	ARL 49705c	ARL 49714a	ARL 49715a	ARL 49720c	ARL 49720e
Notes	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 1; 2/24/18, w/ John Jones	Platt 2; 11/12/18	Platt 2; 11/12/18
Other Notes	Ellicott 1694-1724	Heyward 1772-1780	Heyward 1772-1780	Milner, Sr 1730-1749	Milner, Sr 1730-1749
Modifications	-	-	-	-	-
$\delta^{13}C_{ap}$	-5.82	-5.48	-2.08	-2.46	-0.35
$\delta^{18}O_{VPDB}$	-1.38	-0.74	-0.26	-2.64	-4.62
$\delta^{13}C_{col}$	-20.70	-14.32	-15.14	-10.67	-10.65
$\delta^{15}N_{AIR}$	5.52	6.54	6.34	5.26	5.13
Total %C	43.34	39.76	39.68	41.49	41.12
Total %N	16.10	14.95	14.63	15.15	14.43
C/N	3.14	3.10	3.16	3.20	3.32
Collagen yield %	14.0	15.8	17.5	7.4	6.0
$^{87}Sr/^{86}Sr$	0.711164	0.710761	0.710046	0.709256	0.709979
$^{208}Pb/^{204}Pb$	38.659	38.638	38.668	38.278	38.264
$^{207}Pb/^{204}Pb$	15.685	15.684	15.685	15.599	15.585
$^{206}Pb/^{204}Pb$	18.758	18.714	18.797	18.328	18.341
$^{208}Pb/^{206}Pb$	2.06147	2.06531	2.05764	2.08918	2.08691
$^{207}Pb/^{206}Pb$	0.83661	0.83865	0.83484	0.85148	0.85010
6/18/2022					

Heyward-Washington (38CH108)						
CAIS Isotope Sample #	38970	38971	-	-	-	-
Classification	Urban	Urban	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1749	1749-1768	1694-1724	1820-1850	1772-1780s	1772-1780s
FS#	-	-	-	-	-	-
Context	Feature 131a	Feature 26 Level 4	Feature 65e	HWN II/6	HWN II/8	HWN II/8
Description	rt upper M2	lt lower M1	lt lower dec. P4	lt lower dec. P4, in mandible	rt lower dec. P4, in mandible	rt lower M3, ERUPTING
GMNH#	2850007	2850008	2980066	na	na	na
TWS	K	L	N	L	G	C
Measurements, in mm	B=24.6, L=25.9	B=12.6, L=24.0	B=12.4; L=27.3	B=13.3, L=26.4	B 8.8; L 31.3	-
Wt, g	19.68	17.081	6.8	163.7	65.2	87.2
ARL	ARL 49723	ARL 49729	ARL 49705.1	ARL 49712	ARL 49714.1	ARL 49714.2
Notes	Platt 2; 11/12/18	Platt 2; 11/12/18	-	-	-	-
Other Notes	Milner, Sr 1730-1749	Milner, Jr 1749-1768	Ellicott 1694-1724	Boarding House 1820-1850	Heyward 1772-1780	Heyward 1772-1780
Modifications	-	-	-	-	-	-
$\delta^{13}C_{ap}$	-9.17	-9.79				
$\delta^{18}O_{VPDB}$	-4.20	-1.66				
$\delta^{13}C_{col}$	-14.18	-19.49				
$\delta^{15}N_{AIR}$	6.10	3.58				
Total %C	43.06	44.42				
Total %N	15.57	16.17				
C/N	3.23	3.21				
Collagen yield %	8.1	10.8				
$^{87}Sr/^{86}Sr$	0.711162	0.710819				
$^{208}Pb/^{204}Pb$	38.292	38.277				
$^{207}Pb/^{204}Pb$	15.595	15.584				
$^{206}Pb/^{204}Pb$	18.373	18.346				
$^{208}Pb/^{206}Pb$	2.08477	2.08707				
$^{207}Pb/^{206}Pb$	0.84915	0.84984				
6/18/2022						

Heyward-Washington (38CH108)						
CAIS Isotope Sample #	-	-	-	-	-	-
Classification	Urban	Urban	Urban	Urban	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1749	1850s	1749-1768	1749-1768	1780s	1800s
FS#	-	-	-	-	-	148
Context	E5/7a	Feature 45W	A2/3a	B12/7	E1/3	unit 7, Zone 5a; Stable
Description	lt lower M3	rt lower dec. P4	rt lower M3	lt lower M3	rt lower M3	rt lower dec. P4
GMNH#	na	na	na	na	na	2340311
TWS	G	E	G	D	G	J
Measurements, in mm	B=11.49, L=0	B=9.3, L=35.0	B=11.59, L=36.41	B=10.93, L=36.13	B=12.87, L=38.93	-
Wt, g	28.99	8.2	32.66	37.6	28.56	4.62
ARL	ARL 51052	ARL 51059	ARL 51063	ARL 51128	ARL 50971	ARL 28145
Notes	-	-	-	-	burned	-
Other Notes	Milner, Sr 1730-1749	Boarding House 1820-50	Milner, Jr 1749-1768	Milner, Jr 1749-1768	Heyward 1772-1780	Grimke 1800
Modifications	-	-	-	-	-	-
$\delta^{13}C_{ap}$						
$\delta^{18}O_{VPDB}$						
$\delta^{13}C_{col}$						
$\delta^{15}N_{AIR}$						
Total %C						
Total %N						
C/N						
Collagen yield %						
$^{87}Sr/^{86}Sr$						
$^{208}Pb/^{204}Pb$						
$^{207}Pb/^{204}Pb$						
$^{206}Pb/^{204}Pb$						
$^{208}Pb/^{206}Pb$						
$^{207}Pb/^{206}Pb$						
6/18/2022						

Heyward-Washington (38CH108)		
CAIS Isotope Sample #		
Classification	Urban	Urban
Location	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1694-1724	1730-1749
FS#	-	-
Context	A19/7,8	Feature 65
Description	rt lower M3	rt lower M3
GMNH#	2980237	2980064
TWS	L	F
Measurements, in mm	-	-
Wt, g	9.2	24.4
ARL	ARL 51169	ARL 49700
Notes		
Other Notes	Ellicott 1694-1724	Milner, Sr 1730-1749
Modifications	-	-
$\delta^{13}C_{ap}$		
$\delta^{18}O_{VPDB}$		
$\delta^{13}C_{col}$		
$\delta^{15}N_{AIR}$		
Total %C		
Total %N		
C/N		
Collagen yield %		
$^{87}Sr/^{86}Sr$		
$^{208}Pb/^{204}Pb$		
$^{207}Pb/^{204}Pb$		
$^{206}Pb/^{204}Pb$		
$^{208}Pb/^{206}Pb$		
$^{207}Pb/^{206}Pb$		
6/18/2022		

	Colonial Dorchester State Historic Site (38DR3)		
CAIS Isotope Sample #	UBC-75	-	-
Classification	Urban	Urban	Urban
Location	Lower Coastal Plain	Lower Coastal Plain	Lower Coastal Plain
Time Period	1710-1730	1710-1730	1710-1730
FS#	3146	3132	1569
Context	Lot 52; 3645862N 577513E, Level 3	Lot 52; 3645872N 577515E, Level 2, 10-20 cmbs	3645949N 577522E, 20-40 cmbd, Church
Description	lt lower M3, in mandible	rt lower M3	lt lower adult M1
GMNH#	na	na	na
TWS	H	G	K
Measurements, in mm	B=12.9, L=34.98	B=11.83, L=34.97	B=12.74, L=24.75
Wt, g	111.185	30.106	14.0
ARL	3146-37, CDSHS	3132-43, CDSHS	1569-16; 2569, CDSHS
Notes	Cat # 37	Cat # 43	Cat # 16
Modifications	cut marks	angled cut	-
$\delta^{13}C_{ap}$	-3.44	-	-
$\delta^{18}O_{VPDB}$	0.46	-	-
$\delta^{13}C_{col}$	-11.61	-	-
$\delta^{15}N_{AIR}$	4.63	-	-
Total %C	29.35	-	-
Total %N	10.60	-	-
C/N	3.23	-	-
Collagen yield %	3.4	-	-
$^{87}Sr/^{86}Sr$	0.7101438	-	-
$^{208}Pb/^{204}Pb$	38.5266	-	-
$^{207}Pb/^{204}Pb$	15.6737	-	-
$^{206}Pb/^{204}Pb$	17.9700	-	-
$^{208}Pb/^{206}Pb$	2.09175	-	-
$^{207}Pb/^{206}Pb$	0.85104	-	-
12/29/2021			

	Drayton Hall (38CH225)			
CAIS Isotope Sample #	RC-47	RC-48	RB-49	RB-50
Classification	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1710-1730	1710-1730
FS#	2114	5237	7886	8611
Context	S. Flanker Wall	S. Flanker Wall	pre-Drayton	pre-Drayton
Description	lt lower dec. P4, fragment	rt lower dec. P4, m1, M2, in mandible	lt lower M3, in mandible	rt lower P4, M1, M2, M3, in mandible
GMNH#	na	na	na	na
TWS	D	K	M	A
Measurements, in mm	-	B=12.57, L=27.94	B=11.23, L=34.37	-
Wt, g	4.5	144.9	160.5	157.7
Other context	2114-1303-DH28Q	5237-1303-DH28PPP	7886-1303-DH71E	8611-1303-DH70CC
Notes	-	P4 description	-	M3 description
Modifications	-	cut at base of P4	multiple cuts and hacks	-
$\delta^{13}C_{ap}$	-9.98	-3.38	-8.39	0.29
$\delta^{18}O_{VPDB}$	-2.75	-1.13	-0.63	0.00
$\delta^{13}C_{col}$	-18.10	-13.56	-14.32	-9.01
$\delta^{15}N_{AIR}$	7.46	7.40	6.59	7.75
Total %C	44.32	43.25	43.31	45.13
Total %N	16.18	15.77	15.81	16.47
C/N	3.20	3.20	3.20	3.20
Collagen yield %	9.5	15.4	13.3	7.1
$^{87}Sr/^{86}Sr$	0.7096453	0.7098793	0.7097813	0.7097658
$^{208}Pb/^{204}Pb$	38.6592	38.4694	38.1975	38.4953
$^{207}Pb/^{204}Pb$	15.6956	15.6632	15.6736	15.6751
$^{206}Pb/^{204}Pb$	18.1197	17.9326	17.6710	17.9517
$^{208}Pb/^{206}Pb$	2.08218	2.09306	2.10760	2.09225
$^{207}Pb/^{206}Pb$	0.84540	0.85234	0.86482	0.85199
12/28/2021				

	Fort Moore (38AK5)		Hampton (38CH241-1-WHL)
CAIS Isotope Sample #	RBC-71		RC-79
Classification	Rural		Rural
Location	Upper Coastal Plain		Tidal Coastal Plain
Time Period	1710-1730		1730-1780
FS#	-		13
Context	16197 Cat #83		Unit B, Wall and floor
Description	rt lower adult P4, M1, M2, in mandible		lt lower P4
GMNH#	na		na
TWS	G		-
Measurements, in mm	B=12.56, L=26.9		-
Wt, g	146.1		9.52
Notes	M2 description		-
Modifications	cut marks		-
$\delta^{13}C_{ap}$	-13.71		0.38
$\delta^{18}O_{VPDB}$	0.01		-0.60
$\delta^{13}C_{col}$	-20.10		-9.45
$\delta^{15}N_{AIR}$	6.46		9.16
Total %C	40.55		42.72
Total %N	14.70		15.3
C/N	3.22		3.26
Collagen yield %	5.6		4.5
$^{87}Sr/^{86}Sr$	0.7121329		0.7090700
$^{208}Pb/^{204}Pb$	38.5397		38.4830
$^{207}Pb/^{204}Pb$	15.6799		15.6680
$^{206}Pb/^{204}Pb$	18.0347		17.9486
$^{208}Pb/^{206}Pb$	2.08515		2.09192
$^{207}Pb/^{206}Pb$	0.84842		0.85177
12/27/2021			

	Lesesne Plantation, Daniels Island (38BK202)					Lord Ashley Settlement (38DR83a)
CAIS Isotope Sample #	RB-44	RB-45	RA-46	-		RA-60
Classification	Rural	Rural	Rural	Rural		Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain		Lower Coastal Plain
Time Period	1710-1730	1710-1730	1690-1700	1730-1780		pre-1710
FS#	667	1026	1093	663		149
Context	at house, N29E190-PZ F. 115	Fea. 115 Zone 1-A	N29E188, F. 115/Z2-B, slave quarters	N46E140 PZ		1674-1683
Description	rt lower M3	lt lower dec. P4	lt lower M3, in mandible	lt lower M3		lt lower M3
GMNH#	780245	na	780471	780243		na
TWS	K	D	K	K		G
Measurements, in mm	B=13.75, L=34.57	B=8.67, L=29.38	-	B=15.09		B=12.26, L=33.67
Wt, g	33.85	6.05	187.96	26.56		20.08
ARL	ARL 37154	ARL 37506	ARL 37573	ARL 37150		ARL 48971
Notes	-	-	-	-		-
Modifications	-	-	-	-		-
$\delta^{13}C_{ap}$	-0.97	-2.12	-4.63			-8.74
$\delta^{18}O_{VPDB}$	1.34	-1.05	0.72			0.26
$\delta^{13}C_{col}$	-10.31	-9.74	-13.80			-21.08
$\delta^{15}N_{AIR}$	6.01	5.61	5.29			5.27
Total %C	45.35	43.78	43.66			41.82
Total %N	16.55	16.00	15.96			14.98
C/N	3.20	3.19	3.19			3.26
Collagen yield %	11.4	7.8	11.8			5.8
$^{87}Sr/^{86}Sr$	0.7093986	0.7093135	0.7096021			0.7101149
$^{208}Pb/^{204}Pb$	38.4954	38.3890	38.2812			38.0706
$^{207}Pb/^{204}Pb$	15.6807	15.6679	15.6670			15.6403
$^{206}Pb/^{204}Pb$	18.0047	17.8959	17.8161			17.6223
$^{208}Pb/^{206}Pb$	2.08625	2.09272	2.09593			2.10680
$^{207}Pb/^{206}Pb$	0.84972	0.85405	0.85772			0.86563
12/29/2021						

Mary Musgrove's Cowpens (9CH137)				
CAIS Isotope Sample #	RC-51	RC-52	RC-53	RC-54
Classification	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1036	1041	1102	1010
Context	Fea 7, N498-500 E517-519 L 1	Fea 7, N500-502 E517-519 L 2	Fea 7, N500-500.5 E517-519	Fea 231, N513-516 E523.5-524.5, Z 2, grab sample
Description	lt lower M3, in mandible	lt lower M3, in mandible	lt lower M3, in mandible	lt lower M2, M3, in mandible
GMNH#	2250111	2250017	2250606	na
TWS	F	H	G	M
Measurements, in mm	B=9.9, L=32.6	B=15.6; L=0	-	B=16.92, L=38.84
Wt, g	57.2	100.73	185.74	103.66
Notes	¯ 42432/23733	¯ 42429/23733	¯ 42434/23733	M3 description, from Maryland
Modifications	-	-	-	-
$\delta^{13}C_{ap}$	-10.20	-2.42	-11.60	-10.41
$\delta^{18}O_{VPDB}$	-0.42	1.37	-0.79	-0.16
$\delta^{13}C_{col}$	-20.14	-12.94	-20.60	-18.92
$\delta^{15}N_{AIR}$	5.49	4.37	4.37	5.62
Total %C	43.62	42.69	42.04	42.92
Total %N	15.94	15.60	15.31	15.67
C/N	3.19	3.19	3.20	3.19
Collagen yield %	6.3	15.5	7.2	14.4
$^{87}Sr/^{86}Sr$	0.7108986	0.7122434	0.7110962	0.7107332
$^{208}Pb/^{204}Pb$	38.0906	38.0897	38.3292	38.1051
$^{207}Pb/^{204}Pb$	15.6407	15.6309	15.6591	15.6366
$^{206}Pb/^{204}Pb$	17.6269	17.6579	17.8128	17.6868
$^{208}Pb/^{206}Pb$	2.10730	2.10390	2.09907	2.10129
$^{207}Pb/^{206}Pb$	0.86539	0.86346	0.85764	0.86238
3/24/2022				

Mary Musgrove's Cowpens (9CH137)			
CAIS Isotope Sample #	RC-55	RC-56	RC-57
Classification	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780
FS#	1051	1056a	1056b
Context	Fea 231 N510-512 E520-523.5, L 2	Fea 231 N510-512 E523.5-524.5, L3 inside cellar	Fea 231 N510-512 E523.5-524.5, L3 inside cellar
Description	lt lower M3	lt lower M3, in mandible	lt lower M3, in mandible
GMNH#	na	na	na
TWS	F	M	D
Measurements, in mm	B=11.24, L=33.81	B=12.77, L=36.45	B=9.30, L=32.96
Wt, g	13.01	169.27	167.58
Notes	¯ from Maryland	¯ from Maryland	¯ from Maryland
Modifications	-	-	-
$\delta^{13}C_{ap}$	-8.10	-4.15	-8.36
$\delta^{18}O_{VPDB}$	-0.01	-0.25	-0.79
$\delta^{13}C_{col}$	-16.15	-11.97	-17.32
$\delta^{15}N_{AIR}$	3.53	4.57	5.43
Total %C	42.47	42.42	41.19
Total %N	15.59	15.49	15.10
C/N	3.18	3.20	3.18
Collagen yield %	4.7	5.3	3.5
$^{87}Sr/^{86}Sr$	0.7112621	0.7106631	0.7110034
$^{208}Pb/^{204}Pb$	38.2726	38.3374	38.0379
$^{207}Pb/^{204}Pb$	15.6487	15.6538	15.6315
$^{206}Pb/^{204}Pb$	17.7828	17.8434	17.5802
$^{208}Pb/^{206}Pb$	2.09940	2.09596	2.10994
$^{207}Pb/^{206}Pb$	0.85850	0.85593	0.86716
3/24/2022			

Mary Musgrove's Cowpens (9CH137)				
CAIS Isotope Sample #	RC-58	RC-59	42430/23733	42431/23733
Classification	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1057a	1057b	1038	1038
Context	Fea 231 N510-512 E523.5-524.5, L 4	Fea 231 N510-512 E523.5-524.5, L 4	Fea 7, N500-502 E515-517 L 1	Fea 7, N500-502 E515-517 L1
Description	lt lower dec P4	lt lower dec P4, in mandible	lt M3, in mandible	lt M2 root, in mandible
GMNH#	na	na	2250038a	2250038b
TWS	M	D	G	E
Measurements, in mm	B=12.47, L=27.25	B=8.71, L=35.69	B=12.7, L=36.6	-
Wt, g	5.649	20.719	94.41	47.56
Notes	¯ from Maryland	¯ from Maryland	pulled¯ for isotopes, didn't use	pulled for isotopes, didn't use
Modifications	-	-	-	burned
$\delta^{13}C_{ap}$	-10.91	-12.72		
$\delta^{18}O_{VPDB}$	-1.67	-1.98		
$\delta^{13}C_{col}$	-17.86	-20.91		
$\delta^{15}N_{AIR}$	5.76	6.50		
Total %C	41.18	40.53		
Total %N	14.90	14.81		
C/N	3.22	3.19		
Collagen yield %	7.4	4.6		
$^{87}Sr/^{86}Sr$	0.7112863	0.7113235		
$^{208}Pb/^{204}Pb$	38.4136	38.4648		
$^{207}Pb/^{204}Pb$	15.6677	15.6526		
$^{206}Pb/^{204}Pb$	17.8681	17.9619		
$^{208}Pb/^{206}Pb$	2.09731	2.08947		
$^{207}Pb/^{206}Pb$	0.85553	0.85039		
3/24/2022				

Mary Musgrove's Cowpens (9CH137)						
CAIS Isotope Sample #	42433/23733	1	2	3	4	5
Classification	Rural	Rural	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1040	323	323	323	324	324
Context	Fea 7, N500-502 E517-519 L1	Fea 7, L 4 (40-50 bd)	Fea 7, L4 (40-50 bd)	Fea 7, L4 (40-50 bd)	Fea 7, L5 (50-60 bd) S 1/2	Fea 7, L 5 (50-60 bd) S 1/2
Description	lt lower M3	lt lower dec P4, w/M1, M2	rt lower M3	rt lower M3	lt lower M3	lt lower M3
GMNH#	2250461	2250173	2250173	2250173	2250163	2250163
TWS	G	L	F	M	M	G
Measurements, in mm	B=12.8, L=34.7	B=13.35, L=29.32	B=12.45, L=37.08	B=14.73, L=39.70	B=14.29, L=34.0	B=11.97, L=36.97
Wt, g	41.82	180.09	36.62	28.37	26.87	38.8
Notes	pulled for isotopes, didn't use	C Walker	C Walker	C Walker	C Walker	C Walker
Modifications	-	-	-	-	-	-
$\delta^{13}C_{ap}$						
$\delta^{18}O_{VPDB}$						
$\delta^{13}C_{col}$						
$\delta^{15}N_{AIR}$						
Total %C						
Total %N						
C/N						
Collagen yield %						
$^{87}Sr/^{86}Sr$						
$^{208}Pb/^{204}Pb$						
$^{207}Pb/^{204}Pb$						
$^{206}Pb/^{204}Pb$						
$^{208}Pb/^{206}Pb$						
$^{207}Pb/^{206}Pb$						
3/24/2022						

Mary Musgrove's Cowpens (9CH137)					
CAIS Isotope Sample #	6	7	8	9	10
Classification	Rural	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780
FS#	324	395	397	1036	1038
Context	Fea 7, L 5 (50-60 bd) S 1/2	Fea 7, L 7 Ext. 5N 1/2	Fea 7, L 7 Ext. 6N 1/2	Fea 7, N498-500 E517-519, L1	Fea 7, N500-502 E515-517, L1
Description	lt lower M3, in mandible w/M2	rt lower M3	lt lower dec P4	rt lower M3	rt lower M3
GMNH#	2250163	2250476	2250471	2250111	2250038
TWS	K	-	N	F	E
Measurements, in mm	B=16.78, L=42.46	B=12.81	B=11.69, L=26.93	B=11.49, L=35.69	B=11.40, L=36.38
Wt, g	84.68	9.55	5.75	34.08	34.61
Notes	– C Walker	– C Walker	– C Walker	– C Walker	– C Walker
Modifications	-	-	-	-	-
$\delta^{13}C_{ap}$					
$\delta^{18}O_{VPDB}$					
$\delta^{13}C_{col}$					
$\delta^{15}N_{AIR}$					
Total %C					
Total %N					
C/N					
Collagen yield %					
$^{87}Sr/^{86}Sr$					
$^{208}Pb/^{204}Pb$					
$^{207}Pb/^{204}Pb$					
$^{206}Pb/^{204}Pb$					
$^{208}Pb/^{206}Pb$					
$^{207}Pb/^{206}Pb$					
3/24/2022					

Mary Musgrove's Cowpens (9CH137)				
CAIS Isotope Sample #	11	12	13	14
Classification	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1038	1039	1040	1041
Context	Fea 7, N500-502 E515-517, L1	Fea 7, N500-502 E515-517, L2	Fea 7, N500-502 E517-519, L1	Fea 7, N500-502 E517-519, L2
Description	rt lower M3, in mandible w P4, M1, M2	rt lower M3	rt lower M3	rt lower dec P4, in mandible w/M2, M3
GMNH#	2250038	2250001	2500461	2250017
TWS	G	B	G	K
Measurements, in mm	B=13.29,L=40.92	-	B=12.72, L=32.51	B=11.53, L=28.15
Wt, g	270.7		34.01	264.85
Notes	C Walker	CAM couldn't find	C Walker	C Walker
Modifications	-	-	-	-
$\delta^{13}C_{ap}$				
$\delta^{18}O_{VPDB}$				
$\delta^{13}C_{col}$				
$\delta^{15}N_{AIR}$				
Total %C				
Total %N				
C/N				
Collagen yield %				
$^{87}Sr/^{86}Sr$				
$^{208}Pb/^{204}Pb$				
$^{207}Pb/^{204}Pb$				
$^{206}Pb/^{204}Pb$				
$^{208}Pb/^{206}Pb$				
$^{207}Pb/^{206}Pb$				
3/24/2022				

Mary Musgrove's Cowpens (9CH137)					
CAIS Isotope Sample #	15	16	17	18	19
Classification	Rural	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1100	1102	1135	738	745
Context	Fea 7, N500.5-502 E517-519, L3	Fea 7, N500-500.5 E517-519	Fea 7, N498-500 E515-517, L2	Fea 231	Fea 231
Description	rt lower M3, in mandible w M1, M2	rt lower M3, in mandible w P4, M1, M2	rt lower M3	lt lower M3	rt lower M3
GMNH#	2250610	2250606	2250445	2250221	2250262
TWS	E	G	J	G	-
Measurements, in mm	B=11.69,L=32.79	B=15.54, L=54.77	B=14.13, L=37.35	B=13.37, L=36.34	-
Wt, g	326.9	326.6	29.88	43.69	-
Notes	C Walker	C Walker	C Walker	-	-
Modifications	-	.	-	-	-
$\delta^{13}C_{ap}$					
$\delta^{18}O_{VPDB}$					
$\delta^{13}C_{col}$					
$\delta^{15}N_{AIR}$					
Total %C					
Total %N					
C/N					
Collagen yield %					
$^{87}Sr/^{86}Sr$					
$^{208}Pb/^{204}Pb$					
$^{207}Pb/^{204}Pb$					
$^{206}Pb/^{204}Pb$					
$^{208}Pb/^{206}Pb$					
$^{207}Pb/^{206}Pb$					
3/24/2022					

Mary Musgrove's Cowpens (9CH137)						
CAIS Isotope Sample #	20	21	22	23	24	25
Classification	Rural	Rural	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780
FS#	759	866	867	867	996	996
Context	Fea 231	Fea 231	Fea 231	Fea 231	Fea 231	Fea 231
Description	rt lower M3	lt lower M3	rt lower dec P4	rt lower dec P4	lt lower dec P4	lt lower dec P4
GMNH#	2250365	2250406	2250804	2250804	2250696	2250696
TWS	K	-	E	F	M	N
Measurements, in mm	B=13.91, L=37.94	-	B=9.03, L=30.89	B=8.04, L=29.55	B=11.55, L=22.80	B=12.69, L=27.48
Wt, g	24.58	-	-	-	-	-
Notes	-	-	in mandible w/M1	-	-	-
Modifications	-	-	-	-	-	-
$\delta^{13}C_{ap}$						
$\delta^{18}O_{VPDB}$						
$\delta^{13}C_{col}$						
$\delta^{15}N_{AIR}$						
Total %C						
Total %N						
C/N						
Collagen yield %						
$^{87}Sr/^{86}Sr$						
$^{208}Pb/^{204}Pb$						
$^{207}Pb/^{204}Pb$						
$^{206}Pb/^{204}Pb$						
$^{208}Pb/^{206}Pb$						
$^{207}Pb/^{206}Pb$						
3/24/2022						

Mary Musgrove's Cowpens (9CH137)						
CAIS Isotope Sample #	26	27	28	29	30	31
Classification	Rural	Rural	Rural	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780	1730-1780
FS#	1002	1005	1005	1005	1005	1005
Context	Fea 231	Fea 231	Fea 231	Fea 231	Fea 231	Fea 231
Description	lt lower dP4	lt lower M3	lt lower M3, in mandible w/M2	rt lower dP4	rt lower M3	lt lower dP4
GMNH#	2250774	2250732	2250732	2250732	2250732	2250732
TWS	L	G	A	J	E	J
Measurements, in mm	B=12.6, L=27.61	B=13.69, L=39.51	-	B=10.64, L=34.99	B=11.96, L=37.3	B=10.6, L=34.5
Wt, g	7.28	211.4	181.9	51.39	64.9	71.3
Notes	-	in mandible w/M2	not fully erupted	in mandible w/P2, P3	-	in mandible w/P2, P3, M1
Modifications	-	hacked, cut	hacked	-	hacked, cut	-
$\delta^{13}C_{ap}$						
$\delta^{18}O_{VPDB}$						
$\delta^{13}C_{col}$						
$\delta^{15}N_{AIR}$						
Total %C						
Total %N						
C/N						
Collagen yield %						
$^{87}Sr/^{86}Sr$						
$^{208}Pb/^{204}Pb$						
$^{207}Pb/^{204}Pb$						
$^{206}Pb/^{204}Pb$						
$^{208}Pb/^{206}Pb$						
$^{207}Pb/^{206}Pb$						
3/24/2022						

Mary Musgrove's Cowpens (9CH137)		
CAIS Isotope Sample #	32	
Classification	Rural	
Location	Tidal Coastal Plain	
Time Period	1730-1780	
FS#	1011	
Context	Fea 231	
Description	lt lower dP4	
GMNH#	2250640	
TWS	H	
Measurements, in mm	B=18.56, L=31.42	
Wt, g	-	
Notes	-	
Modifications	-	
$\delta^{13}C_{ap}$		
$\delta^{18}O_{VPDB}$		
$\delta^{13}C_{col}$		
$\delta^{15}N_{AIR}$		
Total %C		
Total %N		
C/N		
Collagen yield %		
$^{87}Sr/^{86}Sr$		
$^{208}Pb/^{204}Pb$		
$^{207}Pb/^{204}Pb$		
$^{206}Pb/^{204}Pb$		
$^{208}Pb/^{206}Pb$		
$^{207}Pb/^{206}Pb$		
3/24/2022		

	Meyer Household, New Windsor Township (38AK615)			Miller Site/Charles Town Landing (38CH1-MS)	
CAIS Isotope Sample #	RC-72	-		RA-61	RA-62
Classification	Rural	Rural		Rural	Rural
Location	Upper Coastal Plain	Upper Coastal Plain		Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1730-1780	1730-1780		pre-1710	pre-1710
FS#	158	200		267	295
Context	72 BP-1191 Feature 158 N	72 BP-980 Feature 200 SE		N485 E545, Zone 3, Lvl 3	N450 E610, Zone 2, Lvl 1
Description	lt lower M3, in mandible	rt lower adult P4, M1, M2, M3, in mandible		rt upper M3	lt lower M3
GMNH#	na	na		2640247	2640235
TWS	G	J		H	H
Measurements, in mm	B=11.4, L=36.3	B=13.7, L=38.46		B=0; L=27.84	B=19.23, L=0
Wt, g	55.9	249.2		25.75	22.7
Notes	-	M3 description		-	-
Modifications	-	cut marks		-	-
$\delta^{13}C_{ap}$	-12.61	-		-1.02	-7.39
$\delta^{18}O_{VPDB}$	-1.78	-		-0.84	0.00
$\delta^{13}C_{col}$	-23.48	-		-8.90	-16.77
$\delta^{15}N_{AIR}$	6.90	-		4.97	5.74
Total %C	39.73	-		41.07	42.36
Total %N	14.57	-		14.96	14.97
C/N	3.18	-		3.20	3.30
Collagen yield %	13.8	-		4.8	5.1
$^{87}Sr/^{86}Sr$	0.7109254	-		0.7095034	0.7114730
$^{208}Pb/^{204}Pb$	38.5134	-		38.5400	38.5654
$^{207}Pb/^{204}Pb$	15.6686	-		15.6830	15.6843
$^{206}Pb/^{204}Pb$	18.0659	-		17.9961	18.0326
$^{208}Pb/^{206}Pb$	2.08034	-		2.08957	2.08693
$^{207}Pb/^{206}Pb$	0.84638	-		0.85029	0.84875
12/29/2021					

	St. Paul's Parsonage (38CH2292)		
CAIS Isotope Sample #	RB-73	RB-74	-
Classification	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1710-1730	1710-1730	1710-1730
FS#	-	-	-
Context	Area F Unit 142, Level 3	540N 475E; Area F Unit 53, L. 3	540N 475E; Area F Unit 53, L. 3
Description	rt lower adult M2	rt lower adult P3 thru M2, in mandible	lt lower adult M2
GMNH#	na	na	na
TWS	F	L	F
Measurements, in mm	B=15.9, L=30.14	B=12.8, L=24.8	B=18.8, L=25.2
Wt, g	37.597	147.57	26.56
Notes	5/16/2018	Tooth #1;M2 description; Cat #90	Tooth #2; Cat #90
Modifications	-	cut marks	-
$\delta^{13}C_{ap}$	-2.79	1.12	-
$\delta^{18}O_{VPDB}$	0.54	1.84	-
$\delta^{13}C_{col}$	-13.28	-8.51	-
$\delta^{15}N_{AIR}$	5.31	4.81	-
Total %C	39.69	42.87	-
Total %N	14.31	15.68	-
C/N	3.24	3.19	-
Collagen yield %	5.7	5.1	-
$^{87}Sr/^{86}Sr$	0.7096710	0.7094348	-
$^{208}Pb/^{204}Pb$	38.4812	38.3977	-
$^{207}Pb/^{204}Pb$	15.6708	15.6584	-
$^{206}Pb/^{204}Pb$	17.9493	17.9412	-
$^{208}Pb/^{206}Pb$	2.09175	2.08809	-
$^{207}Pb/^{206}Pb$	0.85186	0.85158	-
12/29/2021			

	Spencer Settlement, Hampton Plantation (38CH241-100)		
CAIS Isotope Sample #	RB-80	-	-
Classification	Rural	Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain
Time Period	1710-1730	1710-1730	1710-1730
FS#	145	291	291
Context	Test Unit 42, PZ 2	Test Unit 78, PZ 2	Test Unit 78, PZ 2
Description	rt upper M2	lt upper P4	lt upper M1
GMNH#	na	na	na
TWS	K	K	L
Measurements, in mm	B=21.4, L=0	B=14.8, L=18.5	B=19.7, L=22.7
Wt, g	17.811	11.53	15.42
Notes	-	-	-
Modifications	-	-	-
$\delta^{13}C_{ap}$	-9.44	-	-
$\delta^{18}O_{VPDB}$	-1.01	-	-
$\delta^{13}C_{col}$	-17.08	-	-
$\delta^{15}N_{AIR}$	6.52	-	-
Total %C	42.69	-	-
Total %N	14.98	-	-
C/N	3.32	-	-
Collagen yield %	4.7	-	-
$^{87}Sr/^{86}Sr$	0.7095902	-	-
$^{208}Pb/^{204}Pb$	38.5673	-	-
$^{207}Pb/^{204}Pb$	15.6763	-	-
$^{206}Pb/^{204}Pb$	18.0388	-	-
$^{208}Pb/^{206}Pb$	2.08627	-	-
$^{207}Pb/^{206}Pb$	0.84808	-	-
12/29/2021			

	James Stobo Plantation, Willtown (38CH1659)						Stono Plantation (38CH851)
CAIS Isotope Sample #	R-63	R-64	R-65	R-66	R-67		RE-68
Classification	Rural	Rural	Rural	Rural	Rural		Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain	Tidal Coastal Plain		Tidal Coastal Plain
Time Period	1780-1820	1780-1820	1780-1820	1780-1820	1780-1820		1780-1820
FS#	81	118	278	329	580		26
Context	N210E200 wall clean	N215E200 Zone 2	N200E180 Fea 2, Lev 1	N195E180 Fea 72	N205E200 Fea 1		N340 E315, pz
Description	rt lower M3 fragment	rt lower M3 fragment	rt lower M3 unerupted, in mandible	lt lower M3	lt lower M3		lt lower M3
GMNH#	1980036	1980134	1980565	1980756	1981551		1620132
TWS	K	L	A	G	M		M
Measurements, in mm	B=2.9, L=0	B=1.4, L=0	B=10.4, L=13.69	B=11.63, L=33.59	B=12.49, L=34.16		B=13.34, L=37.25
Wt, g	14.81	18.16	26.14	30.87	26.47		22.16
Notes	ARL 40178, 1998	ARL 40217, 1998	ARL 40386, 1998	ARL 40438, 1998	ARL 40692, 1998		ARL 25075-56
Modifications	-	-	-	-	-		-
$\delta^{13}C_{ap}$	-	-	-	-	-		-
$\delta^{18}O_{VPDB}$	-4.54	-5.59	0.16	1.44	-1.11		-9.83
$\delta^{13}C_{col}$	2.45	-0.60	2.94	0.26	-1.20		-2.96
$\delta^{15}N_{AIR}$	-12.61	-14.21	-11.03	-6.96	-10.97		-17.70
Total %C	4.38	5.48	7.28	5.89	6.23		7.22
Total %N	43.63	41.23	42.08	42.26	41.81		43.43
C/N	15.92	15.06	15.35	15.43	15.18		15.87
Collagen yield %	3.20	3.20	3.20	3.20	3.21		3.19
$^{87}Sr/^{86}Sr$	12.0	5.0	2.9	9.5	10.4		6.3
$^{208}Pb/^{204}Pb$	0.7096608	0.7098188	0.7095404	0.7091950	0.7091889		0.7155526
$^{207}Pb/^{204}Pb$	38.5555	38.4435	38.7390	38.5265	39.8149		38.5802
$^{206}Pb/^{204}Pb$	15.6729	15.6618	15.6920	15.6832	15.8299		15.6812
$^{208}Pb/^{206}Pb$	18.0136	17.9186	18.2393	18.1767	19.7847		18.0219
$^{207}Pb/^{206}Pb$	2.08847	2.09320	2.07301	2.06863	1.96812		2.08880
12/29/2021	0.84903	0.85279	0.83977	0.84215	0.78259		0.84908

	Telfair, Savannah, GA (9CH1536)			The Ponds (38DR87)	
CAIS Isotope Sample #	U-38	U-39		RAB-77	RAB-78
Classification	Urban	Urban		Rural	Rural
Location	Tidal Coastal Plain	Tidal Coastal Plain		Lower Coastal Plain	Lower Coastal Plain
Time Period	1780-1820	1780-1820		pre-1720	pre-1720
FS#	33	227		644.2	644.2
Context	Operation 3-A, lower well fill	Operation I-E		Cat #83	Cat #83
Description	rt lower dec. P4	rt lower M2		rt lower M3	rt lower M3
GMNH#	460042	na		na	na
TWS	M	K		J	H
Measurements, in mm	B=13.9, L=26.0	B=0, L=24.9		B=13.5,L=0	B=13.2, L=0
Wt, g	5.44	17.09		16.2	23.1
Notes	-	-		in poor condition	in poor condition
Modifications	-	-		-	-
$\delta^{13}C_{ap}$	-8.00	-5.19		-10.32	-11.09
$\delta^{18}O_{VPDB}$	-0.03	0.73		-0.50	0.48
$\delta^{13}C_{col}$	-14.64	-14.55		-18.77	-20.86
$\delta^{15}N_{AIR}$	6.22	6.24		6.30	5.56
Total %C	45.23	44.70		40.90	13.03
Total %N	16.01	16.25		14.80	4.48
C/N	3.30	3.21		3.23	3.39
Collagen yield %	14.5	14.1		6.6	3.2
$^{87}Sr/^{86}Sr$	0.7116489	0.7129146		0.7106862	0.7106950
$^{208}Pb/^{204}Pb$	38.7934	38.0932		38.2225	38.2446
$^{207}Pb/^{204}Pb$	15.6997	15.6526		15.6469	15.6512
$^{206}Pb/^{204}Pb$	18.2770	17.6040		17.7988	17.8072
$^{208}Pb/^{206}Pb$	2.07178	2.11018		2.09471	2.09502
$^{207}Pb/^{206}Pb$	0.83835	0.86700		0.85759	0.85743
12/27/2021					

-    -

Appendix V
Lesson Plans to accompany Carbon Comic 3
"Archaeology of the Cattle Economy in Colonial Charleston"

KC Jones

Downloadable content:
https://cais.uga.edu/outreach-education/carbon-comics/

Lesson Plan

<table>
<tr><td>Author:</td><td>KC Jones</td></tr>
<tr><td>Author Affiliation and Location:</td><td>PaleoResearch Institute, Golden, CO</td></tr>
<tr><td>Lesson Plan Credit:</td><td>Adapted from isotopic lesson plans developed by Dr. Sammantha Holder, sammholder@gmail.com</td></tr>
<tr><td>Introduction (Lesson Plan Abstract):</td><td>Archaeologists rely on different kinds of evidence to interpret the past. One method for reconstructing past environments and foodways is through the study of isotopic or biogeochemical data. Students will engage with and explore the field of archaeological isotopic research using original data sets from the Charleston Cattle Economy Project. Carbon ($\delta^{13}C$) and Nitrogen ($\delta^{15}N$) isotopes extracted from cattle teeth have been used to explore the role of small-scale cattle farming in large-scale urban development, particularly the rise of Charleston, South Carolina, from the late 17th century to the mid-19th century.

Students will be provided with stable isotopic data (values expressed as parts per million $^{0}/_{00}$ ratios) that they will plot on an X-Y axis of carbon and nitrogen values after a brief lesson about what isotopes are and how they help archaeologists investigate past environments and the foods animals and people ate. Students will then debrief with the instructor using provided discussion questions to interpret the diets of colonial cattle, and how these diets might inform archaeologists on how and where cattle were raised.

Note: Students should be familiar with Cartesian coordinate systems and mapping on an X-Y axis prior to attempting this lesson.</td></tr>
<tr><td>List of Standards Addressed:</td><td><u>State Science Standards</u>:
• SB5 – Science Georgia Standards of Excellence, Biology
• SBO5 – Science Georgia Standards of Excellence, Botany
• SEC3 – Science Georgia Standards of Excellence, Ecology
• SEV4 – Science Georgia Standards of Excellence, Environmental Science
• H.B.6B.1 – South Carolina Biology Standards
• H.E.3A.8 – South Carolina Academic Standards and Performance Indicators for Science, Earth Science

<u>Next Generation Science Standards</u>:
• MS-LS1-6 – Next Generation Science Standards, Middle School Life Sciences
• MS-LS2-3 – Next Generation Science Standards, Middle School Life Sciences
• HS-LS1-5 – Next Generation Science Standards, High School Life Sciences

<u>Social Studies Standards</u>:</td></tr>
</table>

Standards (Cont.)	• SS8H1.b. – Social Studies Georgia Standards of Excellence, 8th Grade, Historical Understandings • SSUSH1.b. – Social Studies Georgia Standards of Excellence, High School, United States History • SSWH10.d. – Social Studies Georgia Standards of Excellence, High School, World History • 8.1.CE – South Carolina Social Studies Standards, 8th Grade, Settlement and Development • 8.1.P - South Carolina Social Studies Standards, 8th Grade, Settlement and Development • HG.5.5.PR - South Carolina Social Studies Standards, 9th Grade, Urban Land Use *For a complete list of primary and secondary science and social studies standards addressed through this lesson plan and its variants, please see appended list. Links to state and national standards are provided therein.*
Learning Objectives:	By the end of the lesson, students will be able to: • *Describe* what an isotope is; • *Analyze* the ways stable isotopes enter the bodies of people and animals; • *Identify* differences in isotopic values between archaeological samples; • *Organize* the provided archaeological data on a Cartesian plane; • *Interpret* how these differences in isotopic values might indicate differences in diets and environments; • *Compare* their results with their classmates and the answer key provided by the instructor
Appropriate Grade Levels:	Middle School (8th Grade), High School, Undergraduate introductory archaeology courses (with scaling in difficulty/additional readings and lectures)
Group Size, # of students activities are designed for:	This exercise is most effective in class sizes of less than 25-30 students, with small group break-outs optional so students can compare results before debriefing with instructor.
Setting:	Indoor classroom with desks/tables available for students
Approximate time of lesson:	45-60 minutes, depending on length of introductory lesson. Instructor should introduce isotopes, diet and environmental reconstruction, and Charleston project (~25-30 minutes). Activity should take ~10 minutes (graphing only), with instructor leading debrief and working through discussion questions with students for ~15 minutes.
Resources needed for students:	• Printed lesson plan activity sheet (two sheets, printed single-sided if possible so students can see their graphed results while working through discussion questions) • Desks/tables for students to work independently or in small groups
Resources needed for educators:	• PowerPoint (to display introductory lecture material and graphical results of the activity for students to compare their answers to)
Lesson Activity:	**Engage**:

Lesson Activity (Cont.):	• Students will participate in a brief lecture on the nature of isotopes, how they enter the bodies of people and animals, and their utility in helping archaeologists answer questions of diet and environmental variability using the Charleston Cattle Economy Project as an example. • The instructor will link conceptual isotopic information to real-world applications through questions directed at students. Ex: "What would the isotopes in your body tell future archaeologists about what you ate?" **Explore**: • Students are either broken into small groups or may work individually and are provided with the printed isotopic data and a Cartesian plane with the $\delta^{13}C$ (X-axis) and $\delta^{15}N$ (Y-axis) values provided for several specimens analyzed during the Charleston Cattle Economy Project from different locations in the study area. • Students are asked to plot the isotopic data on the provided Cartesian plane (instructor may want to demonstrate by plotting the first set of isotopic values with the class on a PowerPoint slide). Students will then work individually or in small groups to try and answer provided discussion questions. **Explain**: • The instructor will walk around the room and clarify graphing schema with students. • Students may want to share their Cartesian graphs with the class or swap with a partner prior to debriefing or having the answers provided by the instructor via overhead projection of the completed graph. • Instructor will work through the discussion questions with students, linking isotopic data from the activity with prior knowledge from the introductory lecture to explain similarities/differences in dietary resources among cattle in the study group. **Elaborate**: • At the end of the activity, students will hear about the results of the Charleston Cattle Economy Project, and how their activity reflects the real-world results of the work conducted in colonial Charleston.
Assessment/Evaluation:	Students will be qualitatively evaluated during the lesson for evidence of learning using the following criteria: • Evidence of linking concepts together, specifically tying isotopic raw data to interpretations of diet and environment • Ability to execute class activity on their own or in a group setting

Name ______________________________________

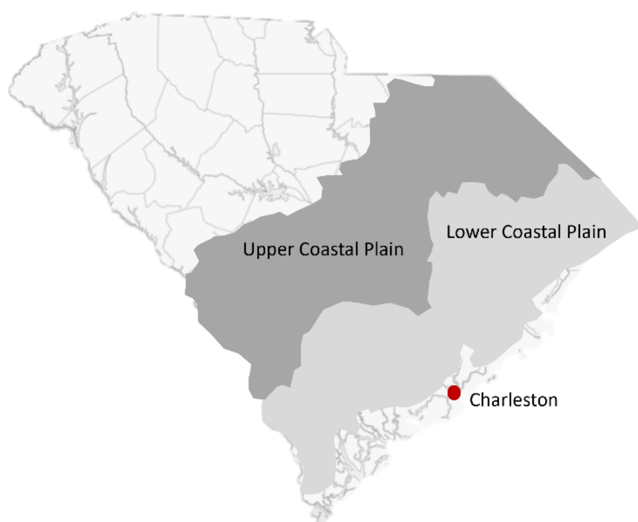
Charleston Cattle Economy Project
Stable Carbon and Nitrogen Isotope Exercise

The purpose of this activity is to familiarize you with traditional graphic methods used to depict stable isotope data, use stable isotopes to reconstruct the diets of cattle in and around colonial Charleston, and link diet to broader social and ecological processes from that time period.

Data[1]:

Site Location	Sample Number	$\delta^{13}C$	$\delta^{15}N$
Lower Coastal Plain	UE-14	-8	6.3
	RB-50	-9	7.8
	RB-44	-10.3	6
	UC-30	-11.4	6.8
	RD-63	-12.6	4.4
	RB-80	-17.1	6.5
Upper Coastal Plain	RC-72	-23.5	6.9
	RBC-71	-20.1	6.5
	RC-70	-15.6	5.4

Map of site locations:



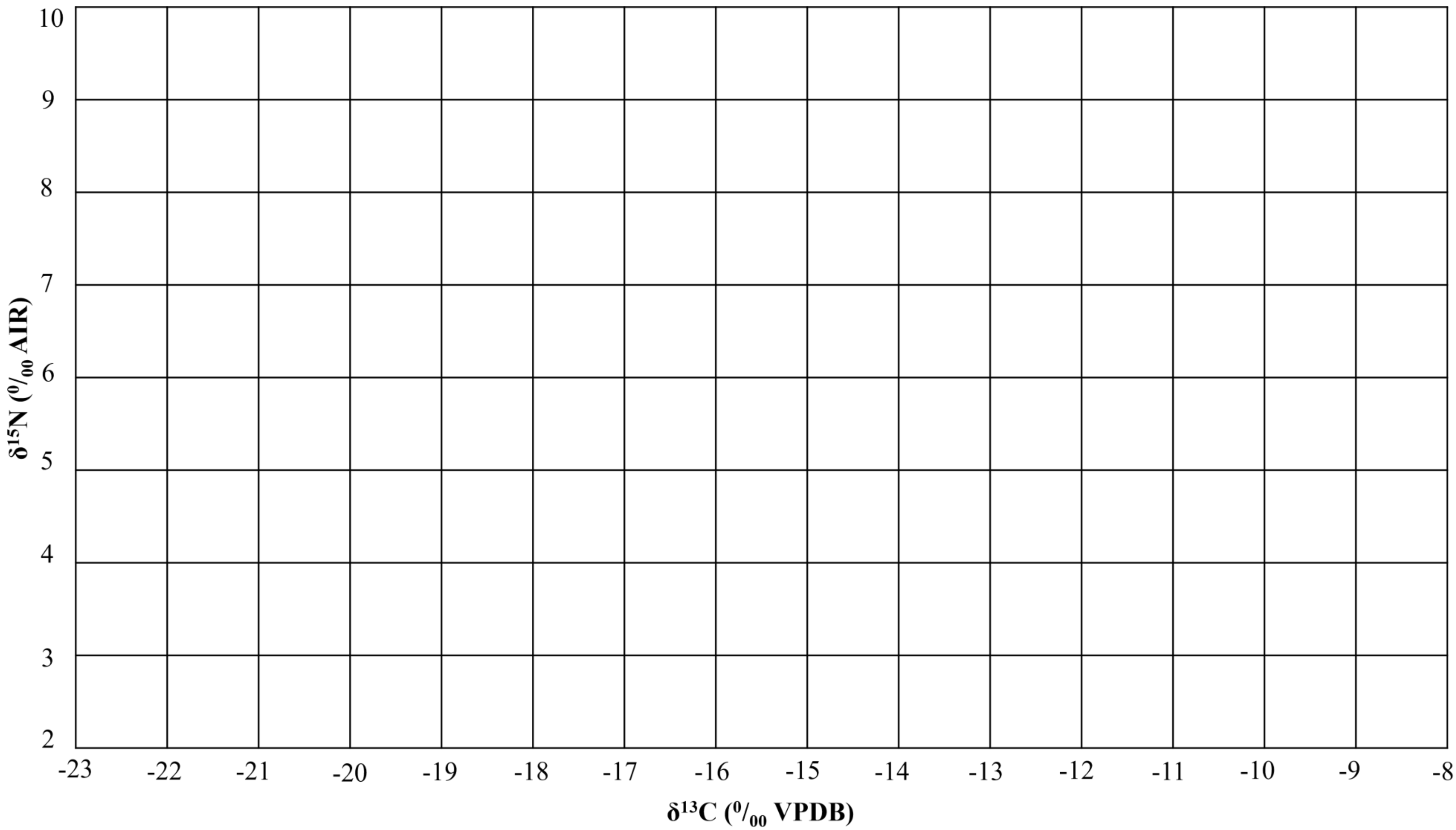
Directions:

This research explores how small-scale, rural cattle farming played a role in the growth and development of urban areas like colonial Charleston, South Carolina, from the late 17th century (late 1600s) to the mid-19th century (mid-1800s). You will plot real data from the Charleston Cattle Economy Project from areas where cattle remains were excavated. You will then use this isotopic data to investigate what types of plants these cattle were eating and make some interpretations about the environments where these cattle lived.

Plot the data from the table above on the blank graph provided on the next page. Once you have plotted the data, answer the questions on the following page using your graph and the contextual information provided.

---

[1]This activity was created using data from the Charleston Cattle Economy Project (NSF Award #1920835).


10
9
8
7
6
5
4
3
2
δ15N (0/00 AIR)
-23
-22
-21
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
δ13C (0/00 VPDB)

1. Cattle eating a lot of C_3 plants like river cane have different $\delta^{13}C$ ranges (-30 to -20 $^0/_{00}$) than cattle eating a lot of C_4 plants like grasses and sedges (-15 to -8 $^0/_{00}$). Based on your scatterplot, what kind of diet do you think the cattle from the Upper Coastal Plain had?

2. How do the diets of the cattle from the Upper Coastal Plain compare to cattle from the Lower Coastal Plain? What is one possible explanation for the differences in diet between the two locations? (Hint: Think about the environments of these two places!)

3. Based on your plot and comparisons, describe the broader patterns of diet at Upper Coastal Plain and Lower Coastal Plain sites. Did diets vary in these different geographic locations? If so, how? What do you think could explain the differences in diet?

Powerpoint Slides

Downloadable Content:
https://cais.uga.edu/wp-content/uploads/2022/08/Teacher_Resources_Powerpoint_C3.pptx

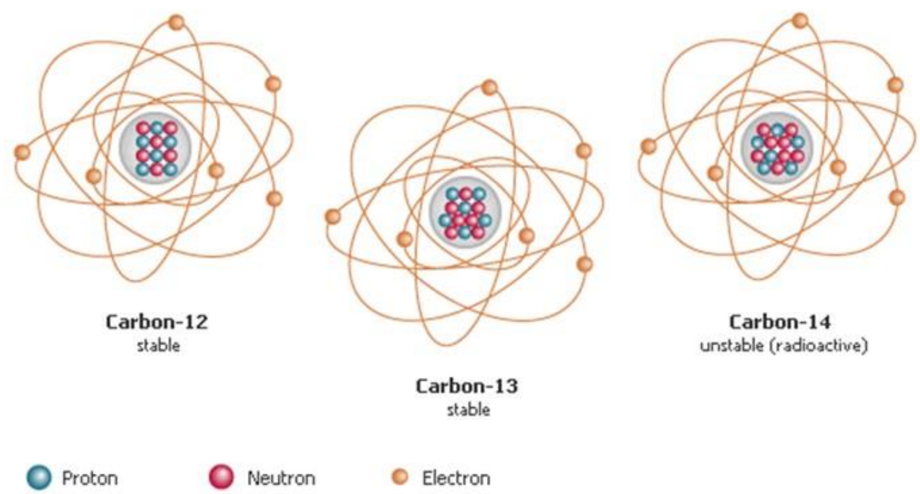
What are (stable) isotopes?

Two or more forms of an element that have the same number of protons but different numbers of neutrons, leading to different atomic mass.

Two types: **radioactive** and **stable**

Stable isotopes do NOT break down (decay) over time.

Stable isotope ratios are reported as delta (***δ***) values
in parts per mil (‰).



Where do stable isotopes come from?

Food and water that an animal consumes during its life leaves a chemical signature in its tissues (like bones and teeth)

Isotopes of elements like **carbon (C), nitrogen (N),** and **strontium (Sr)** found in animal remains at archaeological sites can tell us about:

- Where animals were raised
- What types of plants or animals they were eating

Carbon and nitrogen exist in the atmosphere as gases, which are absorbed by plants during photosynthesis and bacteria in the soil. Animals eat these plants, and absorb their carbon and nitrogen into their own bones and teeth.

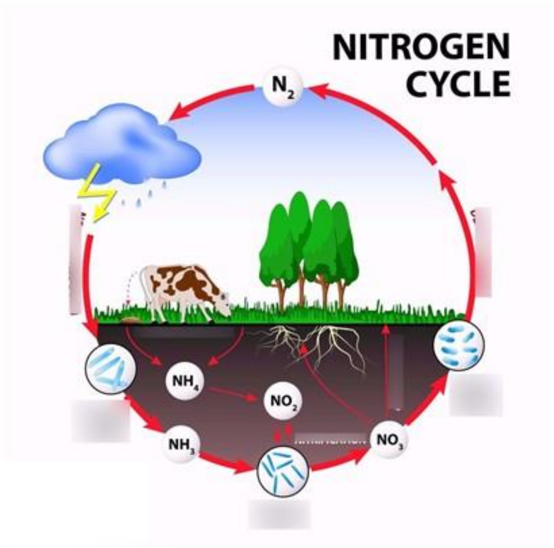
Where do stable isotopes come from?

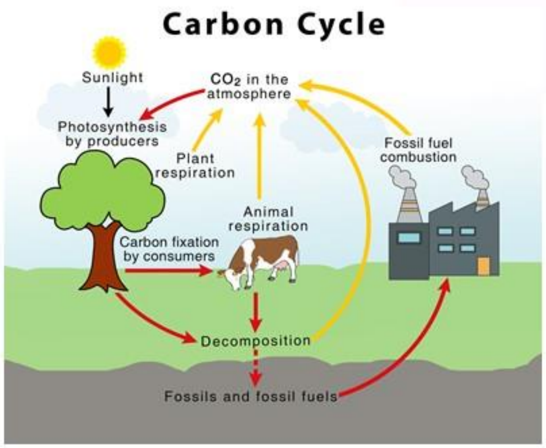
Carbon and nitrogen exist in the atmosphere as gases, which are absorbed by plants during photosynthesis and bacteria in the soil. Animals eat these plants and absorb their carbon and nitrogen into their own bones and teeth.

Strontium isotopes are found in rocks. When rocks break down into soils, plants absorb some of this strontium into their tissues. Strontium isotope ratios vary from place to place, depending on the bedrock makeup of the local region.

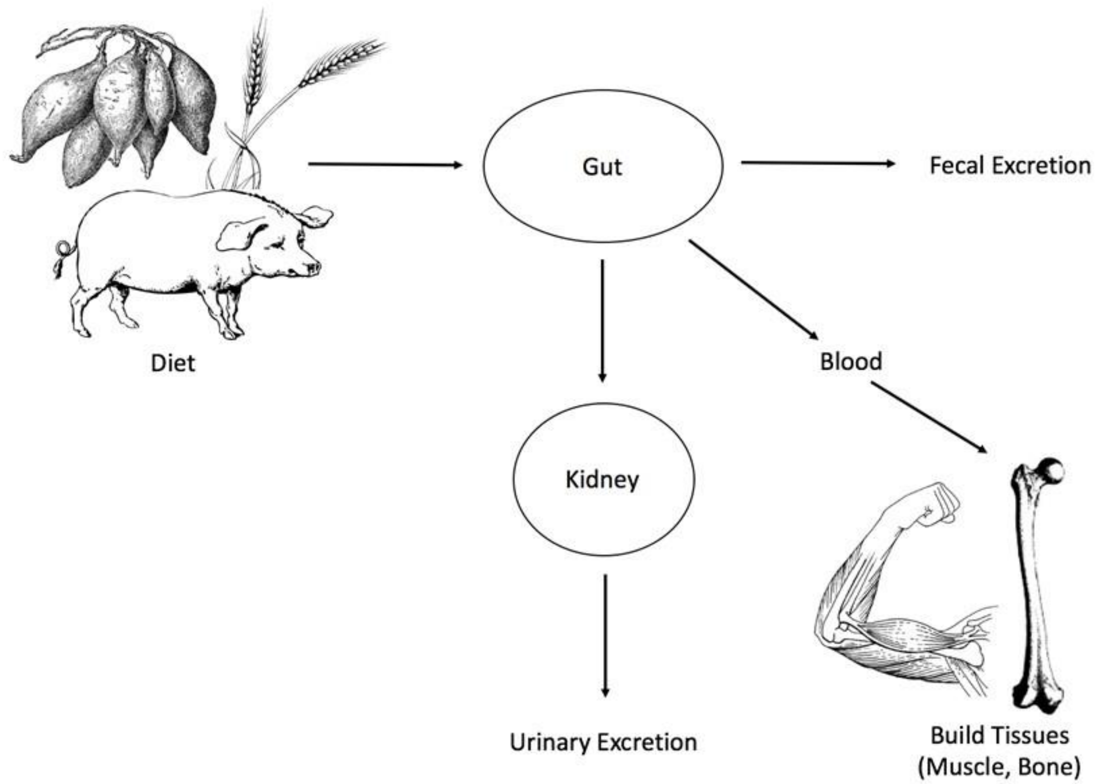
Review carbon and nitrogen cycles with students, as well as photosynthetic pathways.

Review C3, C4, and CAM photosynthetic pathways; or remind students that different kinds of plants take in carbon in different ways.





How do stable isotopes enter our bodies and the bodies of animals?



How do stable isotopes reflect diet?

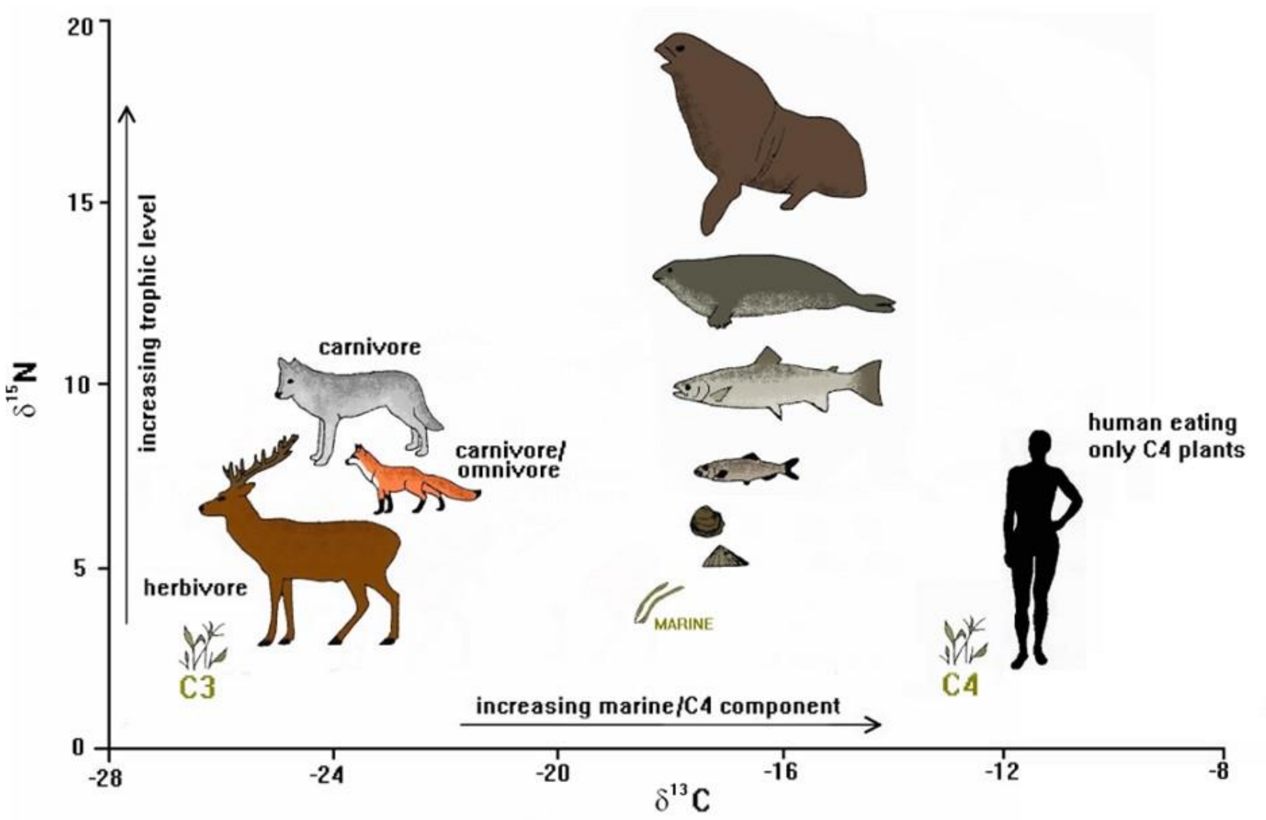
Food and water that an animal consumes during its life leaves a chemical signature in its tissues (like bones and teeth)

Isotopes of elements like **carbon (C), nitrogen (N),** and **strontium (Sr)** found in animal remains at archaeological sites can tell us about:

- Where animals were raised
- What types of plants or animals they were eating

Carbon and nitrogen exist in the atmosphere as gases, which are absorbed by plants during photosynthesis and from bacteria in the soil. Animals eat these plants, and absorb their carbon and nitrogen into their own bones and teeth.

How do stable isotopes reflect diet?

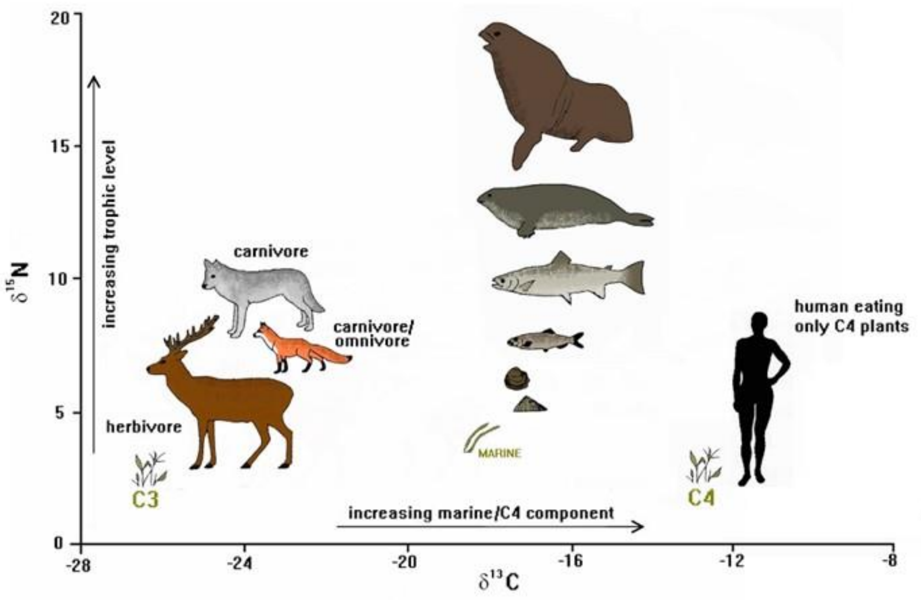


How do stable isotopes reflect diet?

Stable carbon (C) and nitrogen (N) isotopes reflect different aspects of an animal's diet.

Carbon tells us about the types of plants consumed by animals. Plants use one of three photosynthetic pathways: C_3, C_4, and CAM to create food for themselves. Each of these pathways creates a different carbon signature in the plant's tissues.

Plants that use C_4 pathways (tropical plants and grasses) have higher (less negative) $\delta^{13}C$ values. Plants that use C_3 pathways (woody plants) have lower (more negative) $\delta^{13}C$ values.

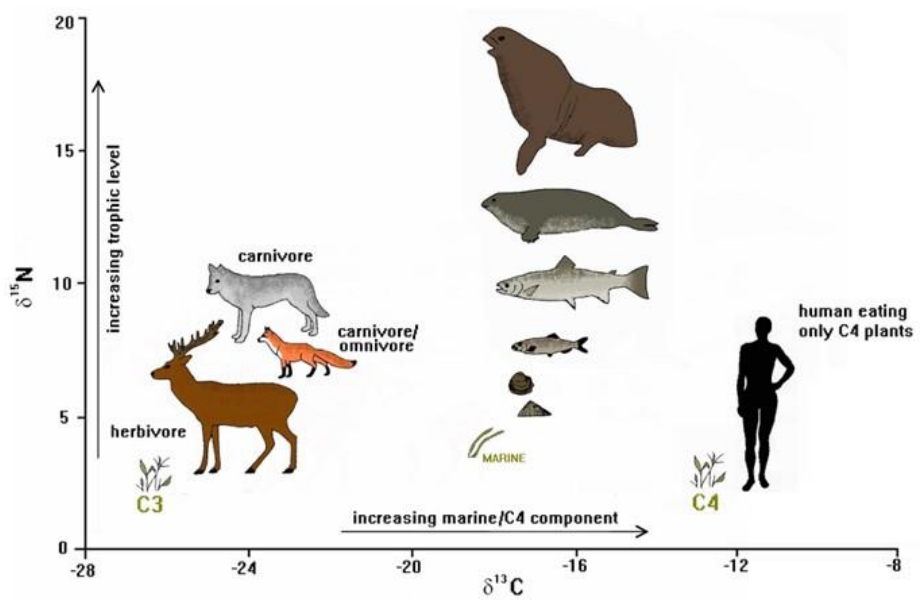


How do stable isotopes reflect diet?

Nitrogen isotopes are used in diet studies to estimate the trophic level the animal was eating at – where in the food chain was the animal eating? Producers? Primary and secondary consumers?

Nitrogen isotopes also help us determine if the animal was eating from marine (salt water) sources and aquatic ecosystems, or freshwater sources.

Environmental factors like **salinity**, **aridity**, and **vegetation cover** also increase nitrogen values in animal bones and teeth.

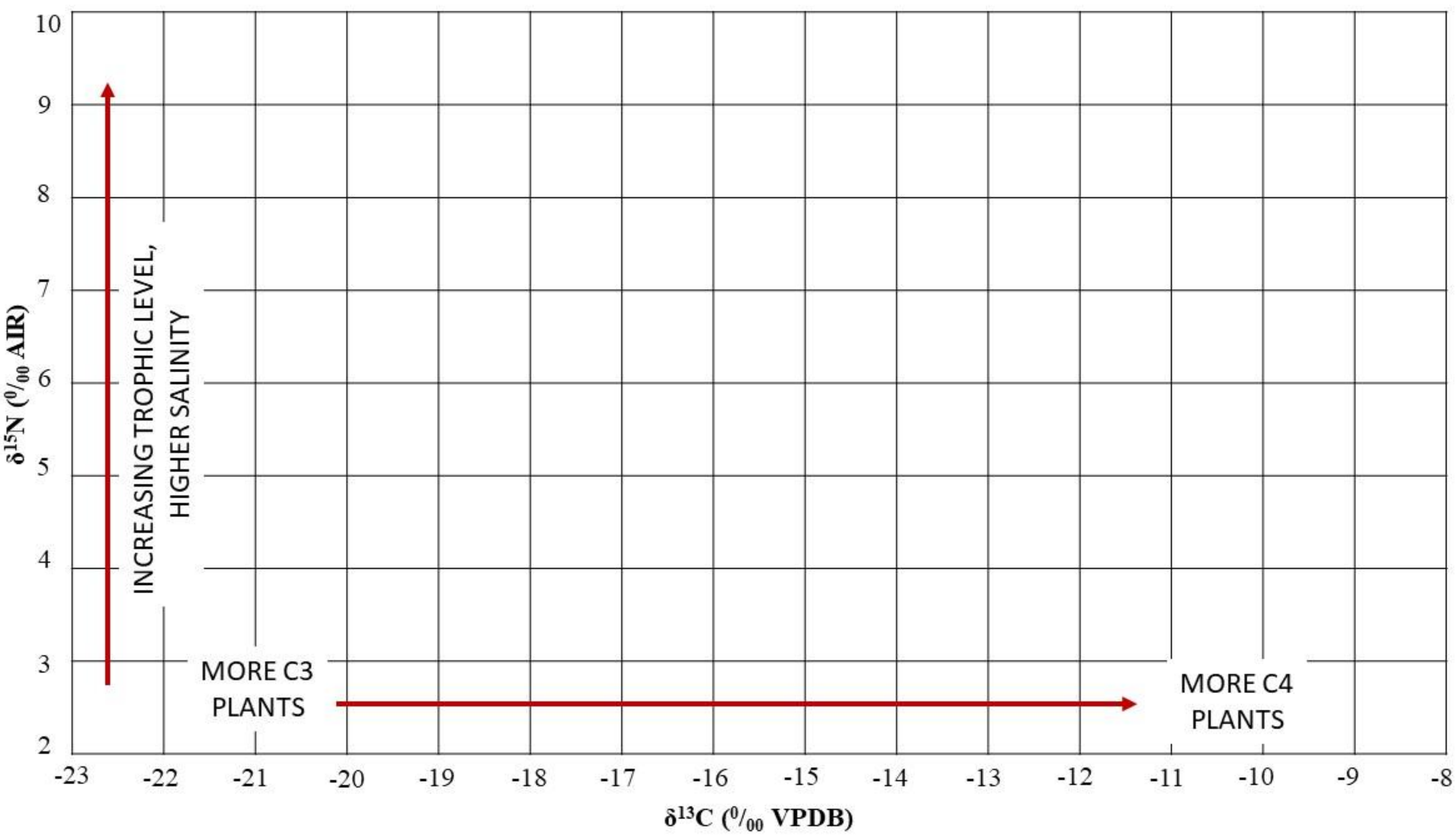


What were cattle in and around colonial Charleston eating?

In the **Upper Coastal Plain**, cattle were living farther from the coastal areas in a dry environment of pine and oak forests. While some grasses (**C_4 plants**) were available for grazing, this area was surrounded by rivers and streams that supported abundant river cane (*Arundinaria gigantea*), a **C_3 plant**. Cattle often over-wintered in the Upper Coastal Plain of South Carolina and would eat river cane throughout the season.

In the **Lower Coastal Plain**, cattle were much closer to the coastal zone, and were foraging in estuarine regions, mud flats, and tidal creeks, areas that were full of plants that could tolerate **high salinity (salt)**. These marshy areas were full of grasses, sedges, and herbs, all **C_4 plants** that would have been available to cattle for grazing. Most habitats in the Lower Coastal Plain would have been impacted by **wind-blown salt spray** coming from the coast.


Upper Coastal Plain
Lower Coastal Plain
Charleston



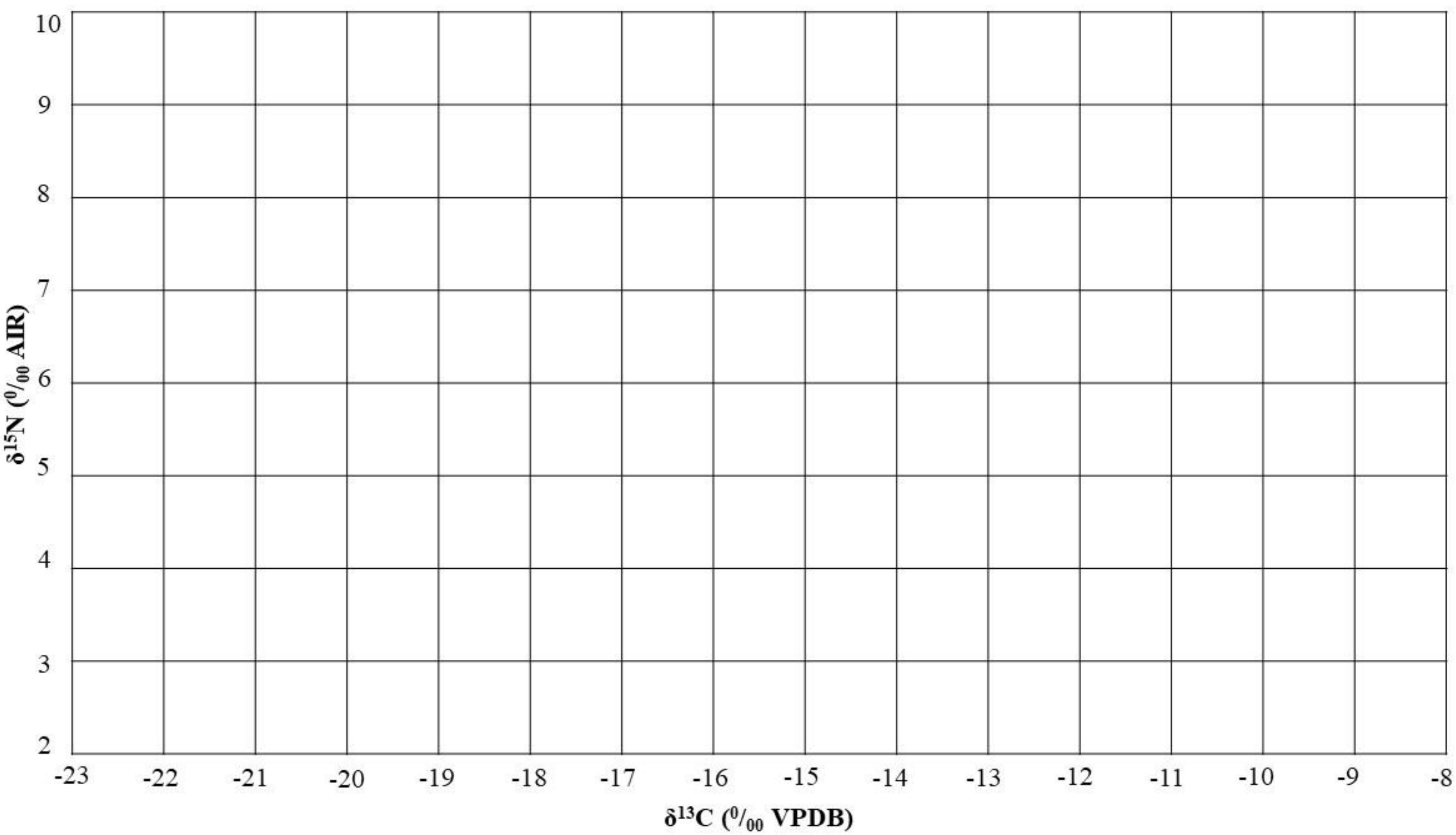
δ15N (0/00 AIR)
10
9
8
7
6
5
4
3
2
INCREASING TROPHIC LEVEL,
HIGHER SALINITY
MORE C3
PLANTS
MORE C4
PLANTS
-23
-22
-21
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
δ13C (0/00 VPDB)

Instructor's Note:

Review the diets of cattle between the Upper and Lower Coastal Plains (you may want to leave the notes on the board for students to reference while they're answering discussion questions).

A blank graph is included in this resource guide if you would like to plot the first few samples with the class via projector.

You may want to encourage students to use different colors/symbols while plotting points. For example, students may want to plot the Upper Coastal Plain points in blue or with a circle, while they may want to plot the Lower Coastal Plain points in red or a square.


10
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δ15N (0/00 AIR)
-23
-22
-21
-20
-19
-18
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-16
-15
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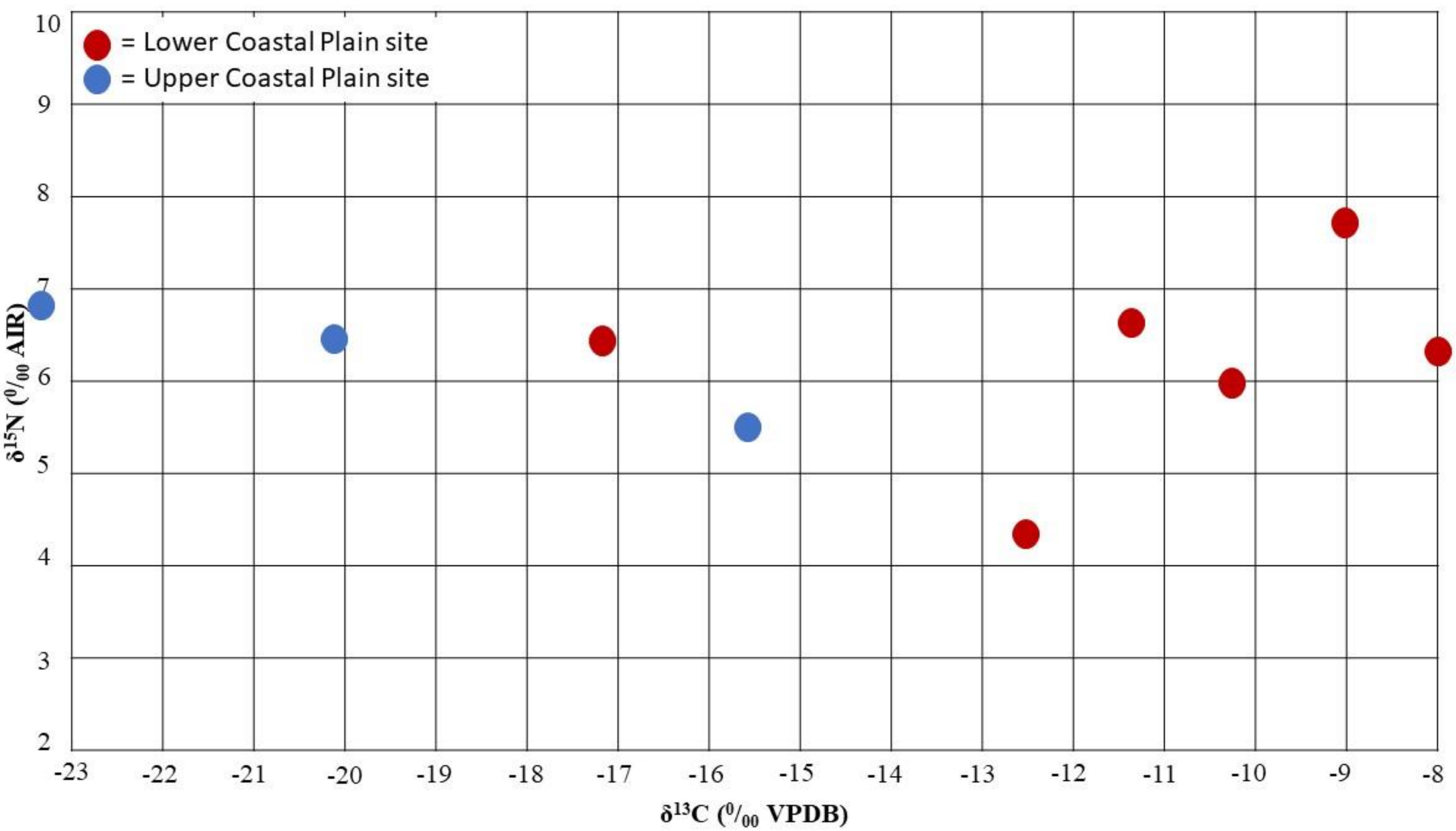
-13
-12
-11
-10
-9
-8
δ13C (0/00 VPDB)


= Lower Coastal Plain site
= Upper Coastal Plain site
10
9
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6
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4
3
2
δ15N (0/00 AIR)
-23
-22
-21
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-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
δ13C (0/00 VPDB)

Results

Cattle from Upper Coastal Plain have more negative $\delta^{13}C$ values than those from the Lower Coastal Plain, indicating that LCP animals were eating more C4 plants.

Lower Coastal Plain sites have higher (less negative) $\delta^{13}C$ values – suggesting cattle in these regions were more reliant on C_4 plants compared to animals raised further inland, who were eating C_3 plants like cane.

Large range of nitrogen values. The higher values might come from cattle that were grazing in salt marshes or areas recently burned for clearing areas for pastures. Reflects ecological diversity of SC.

In the Lower Coastal Plain, the estuarine zone consists of marshlands, tidal creeks, and mud flats (high salinity areas). Marshes have abundant grasses, sedges, and herbs that are all C_4 plants available to cattle for grazing. Coastal dune habitats were influenced by windblown salt spray and sand.

In the Upper Coastal Plain, cattle thrived in xeric (dry) environments with some C_4 plants, but the rivers cutting across this region supported large stands of river cane, a C_3 plant. Cattle foraged on river cane while overwintering in the interior of SC.

Appendix VI
Bragg Boxes, Contents and Lesson Plans
www.charlestonmuseum.org

Bragg Box: Cattle and Culture of Colonial Charleston

Table of Contents

What's in the Box

Objects:

Lesson One:

Horn Buttons
Powder Horn
Horn Plates
Horn Comb
Glue
Bone-Handled Tableware
Horn Spoon
Soap
Cow Metatarsal – Hacked
Cow and Pig from Legare Street
Deer Jaw
Rat Bones
Turtle Shell
Examples of Sawed Bones
Chicken Wing
Pig Tusk
Bony Fish
Blue Crab
Chicken Skull
Rat Snake Skeleton
Butchered Jaw Bone Cow
Eastern Oyster
Knobbed Whelk
Chicken Leg

Lesson Two:

Block of Tea
Corn/Maize
Rice
Fanner Basket

Lesson Three:

Trowel

Ruler

Toothbrush

Plastic Strainer

Stratigraphy of Beef Market Site

Stratigraphy of Heyward Site

Examples of ceramics

Chamber pot

Pipe

Lesson One: Bones

Objective:

To learn what faunal remains recovered from archaeological sites can tell us about human and animal interaction including diet, pets, and pests.

Vocabulary:

Archaeological Record: All the physical (not written) items and evidence found by archaeologists

DNA: Deoxyribonucleic acid is a molecule in cells that controls the genetic material of living things

Domesticated: An animal that has been tamed and kept as a pet or on a farm; the animal is not wild

Faunal: Animal life, animal remains

Industry: Producing an item or service to make money

Interpret: To explain or tell the meaning of; archaeologists use the archaeological record to interpret life in the past

Lard: Fat from a pig often used in cooking as a shortening or spread similar to butter

Marrow: A soft, fatty substance found in the center openings of bones, sometimes eaten; white blood cells are produced here

Mullet: A boney fish commonly found in the Lowcountry

Raw Material: Material collected to make another product or item

River Cooter: A species of freshwater turtle native to the Lowcountry

Specimen: An example used in scientific study or for display

Tallow: Solid, rendered (melted to make pure) fat from sheep or cattle used to make soap, candles, and oils

Background Information:

Zooarchaeology or archeo-zoology is the study of animal remains from archaeological sites. These remains include bones, shell, hair, chitin (what exoskeletons of insects and crabs are made of), scales, hides, proteins, and DNA. Zooarchaeology is a combination of zoology, the study of animals and animal behavior, and archaeology—the study of human history through material remains. In other words, zooarchaeology is the study of the interactions between animals and people. Zooarchaeology helps us to answer many questions about the past.

1. What was diet like, and in what ways were animals used for food?
2. Which animals were eaten and in what quantity?
3. How can faunal remains identify social differences such as class or ethnicity?
4. Besides food, what other purposes did animals have?
5. What was the environment like?
6. How have humans domesticated animals over time?
7. How do modern animals compare to animals of the past and what

does that tell us about human and animal interactions?

Procedure:

Zooarcheologist, Betsy Reitz, worked with Charleston Museum Archaeologist Martha Zierden to study animal remains found in archaeological digs at the Heyward Washington House. When digging, archaeologists would place all the animal remains in bags to be sorted by the zooarcheologists. (See image of "Bone Analysis" 1D). The bag of remains would be sorted by the type of animal. Two charts have been included showing the animal remains recovered for the dig at the Heyward Washington House stable. Table 6 shows animal remains that date to 1730 – 1740 and Table 13 shows animal remains dating to 1740 – 1750. The years were determined by the layers of soil in which they were found as well as artifacts that were found in those same layers.

1. Study the two charts (Table 6 and Table 13) to see the wide range of remains found at this one site. Also explore the document "List of Animals found in Charleston Archaeology".
2. Study the bone remains in the box from archaeological digs in Charleston.
3. Once you have reviewed these sources, complete the Pet, Pest, or Food worksheet.

How did these animals get to these sites?

Food: The majority of the remains have to do with food. The diet of Charlestonians was unique in the widespread consumption of wild game.

Wild game are wild animals that people ate. What local animals do you think early Charlestonians ate?

The white-tailed deer was the most consistently eaten, but many residents also consumed a range of small mammals—opossums, rabbits, squirrels, beavers, muskrats, raccoons, and minks. Many of these animals frequented sites of human habitation and could be caught in traps.

A wide range of reptiles, particularly turtles was also consumed. These included alligators, snapping turtles, chicken turtles, river cooters, box turtles, and loggerhead sea turtles. The diamondback terrapin was the most common. Green and loggerhead sea turtles were considered delicacies and were often sent alive as gifts to friends in England.

Pests: Some remains belong to animals that are pests.

These are animals that gather at areas of human habitation to benefit from the food left behind. Rats are an example of pests.

Pets: Some remains are pets, maybe?

Think of animals you would have as a pet on the list, could they also be food? The guinea pig and parrot are examples of pets.

Industry/Jobs: The remains of these animals can also be evidence of industry or jobs.

Although products provided by live animals were important (such as labor, wool, offspring, dairy products, and eggs), many animals were used in even more ways after they died. Raw materials gathered from dead animals such as brains, oil, marrow, tallow, horn, and bone were used to make oils, clothing, building materials, paints, glues, bindings, soap, makeup, tools, decorations, and jewelry. One Charlestonian recommended mixing hide—animal skin—and rice flour to produce a cheap paint and combining beef marrow, hog lard, and other products to make French pomade (hair oil similar to hair gel).

Bone is very strong and sturdy, so it was used in small objects such as combs, pins, buttons, hooks, toggles (similar to a button but usually longer and is attached through a loop of rope or thread), and handles. However, bone can be used in many other ways. If bone is boiled to create gelatin (edible glue, like Jello), the bone may survive, but if bones are boiled further to make glue, so much collagen (a protein that gives skin and connective tissues their shape) is removed that they breakdown and disappear from the archaeological record. This means that sometimes it is very difficult to find bone remains or fragments at places where glue was produced.

In Charleston, there are quite a few places where archaeologists found animal remains showing the non-food uses of animals in the city. A 1736–1750s privy (bathroom similar to an outhouse) at Charleston's Dock Street Theatre contained 13 carpals, one carpometacarpus, and 15 digits, all from chickens. These small bones were used by musicians to play music on instruments with strings such as a harpsichord. Think of these tiny bones as a tiny guitar pick!

Other non-food animal remains found in the Charleston area are horn cores. A horn core is the inner part of an animal's horn. Like the Earth has a core in the middle of the planet, an animal horn has a core that supports the outer layer of a horn made from keratin. Keratin is the same stuff that makes our finger nails and hair! Horn cores have been recovered from several sites in Charleston. Two cores were found at the Nathaniel Russell House in a 1790s feature—that means the horn cores were there long before the present house was built. Seven cores were found at the Heyward-Washington House in a well that became part of the kitchen cellar. John Milner, Senior, lived on the property at the time and owned a gunsmith there. These cores probably were soaking to remove the outer layer of keratin called a horn sheath, but were abandoned for unknown reasons. The keratin horn sheath would have been used to make a powder horn where gunpowder was stored. An additional seven horn cores are from the Charleston Visitor Reception and Transportation Center (VRTC). The VRTC cores are from deposits dating to the 1790s–1880s, when the site may have been a slaughter yard, horn-working center, or tannery (a place where leather is made).

Sometimes it is difficult for archaeologists to find animal remains because they are destroyed through use and to make other products, like glue, and sometimes archaeologists may find more animal remains than they thought they would at a dig site. That is because trash from many different areas may be dumped in one spot, mixing all sorts of information together. At home, do you put your kitchen trash into one trash can and your bathroom trash into another? You might when you first throw it away, but eventually it all gets mixed together and taken to the dump! This happened in the past too. Sometimes kitchen trash was mixed with the garbage from one of the industries using animal remains. When this happens, it changes how archaeologists interpret a site.

Explore items in the box that are all made from cow parts and by-products. A by-product is something that is created, used, or sold in addition to the meat from an animal.

What surprises you most that is made from cow?

Conclusion:

What would an archaeologist 100 years from now find in your backyard? What would that tell them about you? Would there be animal remains in your yard? Why of why not?

Lesson Two: A Mixing of Cultures

Objective:

To learn about the origins of Lowcountry Foodways and how we study them.

Vocabulary:

Cash Crop: A plant grown to be sold to make money for the grower

Climate: The weather conditions in an area over a long period of time

Culture: The customs, social institutions, and arts of a social group or people

Food Crop: A plant grown to be used as food, either to be eaten by the grower or to be sold by the grower

Background Information:

Foodways

Foodways are culturally defined patterns of diet, nutrition, cooking, eating, feasting, and fishing. Foodways and eating habits of the Lowcountry were shaped by local environmental conditions, by the migration and mixing of different ethnic groups, and by new methods, techniques, and technology being introduced. The result is a distinctive regional cuisine which we have here in the Lowcountry because different people made this area their home.

Who were some of these people? They were Native Americans, Africans, Europeans, and people from the West Indies and the Caribbean. The Native Americans used the plants and animals living in their area to create food and traditions native to this land. The other groups of people brought recipes, flavors, and even plants and animals from their home lands to the Lowcountry. What each group brought mixed with what was here, creating a unique cuisine and culture.

Look at the map, created by National Public Radio, showing where some foods originally grew. What are some of the foods you see on the map? Do you see any of your favorite foods? If so, where did those foods come from? Are you surprised by where some of the foods we eat every day originally came from?

How Do We Learn about Foodways?

Written Sources

Historical researchers use different types of sources to learn about the past. The most valuable resources used in the study of history are written or recorded sources. Examples of primary resources that are used to study foodways include written documents such as diaries, traveler's accounts, journals, newspaper advertisements, and particularly cookbooks. This also includes environmental data gathered from hunting and fishing records. This data can tell us about the populations and types of animals that were fished or hunted throughout history and how those populations have changed. Another example of a resource used to study foodways is artwork or images. These include paintings, photographs, and sketches of food, meals, and people working to produce food. While we can learn a lot by reading and viewing images, there are other sources that can tell us even more about food and foodways around the world.

Archaeology

Through archaeology, researchers can learn a lot about the foods and diets of a region. Archaeologists recover many items or parts of items used by cultures related to food. These include items to grow, gather, or hunt food; items that are used to prepare and store foods; and items used while eating foods. Items and objects used by people in the past are called material culture. Plates, bowls, teapots, cups, forks, knives, pots, pans, jugs, other utensils, and even buildings and structures are all examples of material culture. Archaeological excavations in Charleston and on rural (country) sites have provided artifacts and animal remains for the study of the Lowcountry diet.

Zooarchaeology

A specialized branch of archaeology is zooarchaeology. This is the study of biological—once living, animal—remains of food and foodways preserved in the ground. The analyzed faunal (animal) collections from Charleston are the largest in the country, numbering 100,000 specimens and a minimum of 2,000 individual animals. From these collections we can learn what animals were eaten or used in producing food, what those animals ate, and about their life, death, and how they were used in both.

Procedure:

Native Americans

Who were the first people living in South Carolina? Native American tribes, such as the Cherokee, Catawba, Cusabo, Yemassee, Wando, Edisto, and others, were the first people here in South Carolina. They managed the land for centuries. They burned the forest to create better soil, to remove unwanted plants, to move the animals they hunted, and to make fields to farm.

How did Native Americans get their food? Did they have stores like Walmart, Target, and Publix? No! They had to get their food from the land. Native Americans hunted large animals such as deer and bison using tools made from natural resources. These tools included bows and arrows, projectile points (arrows or spearheads made from stone), and spears. Tribes that lived along the coast and near the rivers also fished for their food, making canoes, fish hooks, fish traps, and spears. Native Americans did not only hunt animals, they also grew their own food such as corn, beans, squash, peaches, and many other plants. Farming food is a difficult job needing special tools. One of these tools was a shell hoe made from a whelk shell with a wooden handle. Native Americans had special ways to prepare the food they had grown. Corn—or maize—was one of the most important foods grown by the Native Americans because it was able to be eaten in so many different ways. Native American women would take two stones, a mortar and pestle, and smash the dried corn kernels to create a corn meal or flour. This ground corn could be used to make pancakes or flatbread, corn flakes, or a corn porridge similar to modern grits. Corn was also eaten fresh off the cob or dried on the cob and the whole dried kernels were then heated over fire. What kind of food do you think this created? Popcorn, a delicious snack that we still eat today! Corn produced two-thirds of Native American calories.

With all these sources of food, Native Americans needed a way to keep their food safe and dry until they needed to eat, so they used pottery. Pottery allowed people to store their food to make sure they had enough in winter when it was more difficult to find and grow food. Pottery was important for food storage, but it also became a beautiful form of artwork. The Catawba people in South Carolina are known for their pottery, and members of the Catawba tribe are still making pottery with the clay from the Broad River just as their ancestors have done for over 600 years.

The Native Americans, who called South Carolina home, knew how to live with the land and use their resources to survive. Native Americans had managed the land for centuries before the first settlers arrived in the New World. It was their knowledge that helped the newly arriving Africans and Europeans to survive.

European Colonists and the Enslaved African People

When settlers were arriving was South Carolina a state? No, it was a colony. What country controlled the Carolina colony? England! Where do you think most of the first settlers came from? England! When European settlers arrived in Carolina in the late 17th century, they encountered a bountiful land, teeming with fish, game, and a variety of natural resources. The subtropical climate was well suited to the growth of wild foods and the cultivation of crops, both familiar and exotic. The forests and fields supported a variety of wild game, particularly white-tailed deer.

Agriculture and Food Crops

Is the climate here similar to England? No, it is much colder and rainier in England. Do you think you can grow the same crops here? No, different crops need different conditions. Some plants grow in warm, tropical, humid climates while other prefer cold, freezing winters, and drier conditions. Imagine moving somewhere and not being able to have your favorite meal. The new settlers came with their own favorite foods and flavors but had to change them to what they could get in their new environment. Colonists tried growing crops they were familiar with, some worked, and some did not.

Two crops popular in Europe and easy to grow in those colder climates were wheat and barley. These two crops were what most Northern Europeans ate, but both wheat and barley were tried and failed in the colonists' new home in Carolina. Lowcountry settlers were immediately introduced to corn by local Native Americans, and it largely replaced wheat and barley in the southern colonies. Corn was ground into flour for bread, muffins, grits, and cornmeal mush. Corn was soaked in lye to produce grits. Corn kept the European colonists from starving.

Rice was introduced by the end of the 17th century and soon became the Lowcountry's cash crop. Carolina Gold, the strain of rice grown in the Lowcountry was a type of rice native to Africa, so the European colonists did not know how to grow this crop. Rice cultivation was supported by the importation of countless Africans. Africans were enslaved in part for their knowledge of rice planting, growing, harvesting, and processing rice. They developed the tools used in rice processing including the fanner basket and the wooden mortar. Rice still remains a staple in the Lowcountry diet.

The colonists acquired food in most of the same ways as the Native Americans, by hunting, farming, and gathering. Some foods were found by trade. New arrivals to the Lowcountry brought with them their own food preferences, but they ate what was available once they settled into their new lives.

Read through the letter written by Elizabeth Hyrne to her brother and answer the questions after the letter.

Livestock

Cattle ranching was an early business in Carolina. By 1682 surplus (extra) beef and pork was exported to New England and the West Indies. The majority of the labor was enslaved Africans. In 1708, two-thirds of the 1,800 enslaved men were "Cattle hunters."

People living in Charleston also kept cattle and pigs on their property. One Charlestonian noted, "By the last count made, there are 434 cows in the city; shut up in most cases, in filthy pens, and cramped din small sheds and narrow stalls, they can hardly produce wholesome milk." As early as 1692, a law was passed to prevent pigs from running loose in the streets. It was not until the early 1900s that livestock was permanently removed from Charleston.

Of all of these groups, which one do you think was the main shaper of Lowcountry cuisine? Who did most of the cooking in 18th and 19th century Lowcountry? The enslaved African people.

Lowcountry Diet

A lot of information we have on the Lowcountry diet, comes from studying bones of animals. What do you think we can learn by just examining these bones? Faunal—animal—remains from dozens of archaeological sites in Charleston have contributed to our knowledge of the Lowcountry diet. Measurements of bones from domestic animals provide information on animal size. A list of elements (parts of body) recovered can determine where and how the animal was butchered. Estimation of age can determine whether older animals were slaughtered after use of draft or dairy animals, or if younger animals were raised specifically for meat. Marks on bone give evidence to type of butchering.

To see examples of two types of butchering techniques found in Charleston, look at "Image of Bones with Coarse-Toothed Saw Cuts" and "Image of Bones with Hack Marks." Can we use these marks to tell what kind of tools were used? Yes, we can tell that saws and cleavers were used in the different examples.

Regional cuisine is the foods used and prepared that are particular to an area or region. Here in the Lowcountry, the regional cuisine is Creole. Creole is a cultural mixing of European, African, and Native American foods and foodways, in a manner unique to the resources of the Carolina Lowcountry. What are some of the foods unique to the Lowcountry? Do these foods come from the land, the sea, or both? What are some of your favorite foods? Are those special to our area?

Fishing

What is another large part of the diet of people living here that would only be available to people living near the ocean or rivers? Seafood! Fish, shrimp, crabs, oysters, clams, even whelks were eaten by the various people living in the Lowcountry. Guess who did most of the fishing for the local markets and for their own use as well? The enslaved African people. The time afforded by the task system enabled enslaved people time to go fishing, hunting, trapping, as well as take care of their own gardens and livestock.

"Mosquito Fleet"

At its height in 1880s, the Mosquito fleet numbered several hundred Black fisherman and as many as 50 boats. Showing great courage, these men would take their small fishing vessels as far as 40 miles offshore. Though much smaller than in the past, the Mosquito fleet remains active today.

Imports

Charleston was a great port city. Trade with countries across the ocean was often easier than trade over land. Living in Charleston had the benefit of access to familiar and newly discovered luxuries from European cities, the Caribbean islands, and other ports across the Atlantic Ocean.

By the time of settlement in Carolina, a global exchange of plants, animals, and food crops was taking place. Food plants found in the Americas and sent back to Europe and Africa included potatoes, corn, tomatoes, peppers, and peanuts. Ships from Europe and Africa brought pigs, chickens, cattle, wheat, and barley along with seeds for sugar cane, rice, yams, beans, sesame, and watermelon. Cheese, butter, wheat flour, and beer were of poor quality or unavailable in the Lowcountry due to its hot and humid climate. A booming trade with the West Indies brought great quantities of sugar, molasses, rum, and tropical fruits from ports in Barbados, Jamaica, and Antigua. The new hot beverages—coffee, chocolate, and particularly tea—as well as a variety of spices from Asia arrived on British ships.

Charleston's Markets

Starting in 1692 a market was built on the corner of Meeting and Broad streets.

Today, City Hall is located in this spot. The market was open from rising sun every day except Sunday and was an open area similar to a field.

Two new markets were built at around 1760: a Fish Market at the bottom of Queen Street and the Lower Market at the end of Tradd Street. When the Lower Market was built, the Market on Broad became known as Upper Market or Beef Market.

The Beef Market was described as a low, dirty looking brick market house for beef. The Beef Market was destroyed by a fire in 1796, and a new market was constructed in 1804 at the present location of Market Street. Meats and produce of every type were sold in the stalls that ranged the three blocks from Meeting to the Charleston Harbor. The fire of 1838, destroyed portions of the market and prompted the construction of a more permanent complex, anchored by Market Hall. The two-story structure modeled after a stone temple features ox heads and ram heads signifying the presence of a beef market.

1) Within this trunk you have a collection of items many Charlestonians may have found at the markets in Charleston. Can you figure out what these items are and how people would have used or eaten them?

2) Look at the recipe cards included in this trunk and answer these questions:

   What are some of the dishes that Charlestonians used to eat?
   What are ingredients used to make these dishes?
   Where do you think those ingredients came from—were they grown in the Lowcountry or traded from lands faraway?
   Do we still use any of these ingredients today?
   Would you like to eat any of these dishes?

Lesson 3: Trash

Objective:

To learn how we can study the past by looking at the items people have left behind and what studying garbage from the past can teach us.

Vocabulary:

Historic: A time that has happened and left recorded history—written or oral

Prehistoric: A time before recorded history

Site: Any place where there are physical remains of the human past; this is where archaeologists dig

Society: A group of people living together in an organized way

Strata: A geological or man-made deposit composed of layers of rock, soil, ash, or sediment within which artifacts are embedded

Background Information:

Archaeology

Does anyone know what archaeology is? Archaeology is the scientific study of artifacts and other physical remains of past human life, prehistoric or historic. Very simply, it is the study of humans in the past. Archaeology is a branch of anthropology which is the study of humanity and what makes us human. Beliefs, religion, food, games, stories, and many other things are studied by anthropologists to better understand how we have become the people we are today.

This lesson is called Trash, why do you think we call it that? Archaeology is about collecting the "garbage" or remains from the past. Most of the objects archaeologists find are trash that have been left behind—broken dishes, bottles, animal bones, and so much more.

Why is Studying Old Trash Important?

Where do we usually get our information from? Books! What is wrong with just using books? Books give a one-sided view of things. Women didn't get to write, and only rich men did the research, so books do not give us a complete picture of the past. Archaeology helps to paint a full portrait of history by telling the most open-ended story and filling in the spaces left by written records. Everyone leaves trash whether you can read or write or not, so these physical objects left behind can tell us about all the people in a society.

The Archaeological Process

Archaeologists look for a site that has evidence of past human activity. A lot of work goes into the preparation of a site before the digging ever starts. Archaeologists map out the site and then divide the site into 5' by 5' squares. These squares are called units. Look at images 3G and 3H to see archaeologists working in units at the Beef Market Dig.

Take a look at images 3A and 3B. These show two units at the same site. Notice the sides of the unit, see how even and smooth they are?

Archaeologists were very careful not to break or damage anything as they were digging. There are several tools that archaeologists use, some are expensive and some are not. What is a screen and why do you need one? It helps filter out the bigger objects from the smaller. A screen also helps archaeologists from losing any artifacts when moving them from the unit to the lab. To see archaeologists using a screen look at Images 3C, 3D, 3E, and 3F.

Look at some of the tools archaeologists use while they are digging at a site. Do any of these tools look familiar? Have you ever used any of these before? If so, what did you use them for? You may have even seen some of these items at your own home or a hardware store! How do you think archaeologists use these tools while at a site? There are many different types of archaeology, this lesson will focus on Historic Archaeology.

Historic Artifacts

These are artifacts that do have written or recorded history. So why do we need the artifacts if we have the history written down? It fills in the blanks. There are many types of historic artifacts: glass, iron or metal, leather, ceramics, and more. The most common type of artifact to find are ceramics because they do not break down or disintegrate.

Ceramics

Explore the ceramic pieces in the Bragg Box, but be careful not to break any of the pieces. What do you think each piece is or what was it part of? Do you see any colors or patterns on the pieces? Can the pieces go together to form a larger, intact artifact?

Glass

Glass is also good to find on archaeological digs, but it breaks down into sand and liquid.

Look at the bottles. Work together to decide which bottle is the oldest and which is the newest. Bottles have several features that archaeologists use to determine what time they were made.

- An old bottle no matter how hard you clean it, it still looks dirty, this is called devitrification.
- The way that you can tell which bottle is older is to look to see if it has any seams or air bubbles. The bottles that have no seams and have air bubbles were handmade.
- Bottles that have an uneven lip and form are handmade and therefore older. This is compared to the bottles that are made in factories. Bottles made in factories have the same shape and are evenly formed.
- Archaeologists can date glass by looking at the advancement of technology because different colors and shapes of bottles can only be made when technology improves.
- Another way to tell how old a bottle is, is to look underneath the bottle. The bump underneath is called a kick.

The higher the kick on the bottle the older the bottle is.

Some bottles have labels or stamps on them. It has a stamp on the front. What can bottles tell us about a site? Medicine bottles at a site might tell archaeologists there might have been a pharmacy there, but barbers also sold medicine. The stamp or label on the bottle said what was in the bottle, where it came from, or even who made or owned it. If you were wealthy you could have a stamp put on the bottle with your name.

Metal

Metal is a little harder to find because it breaks down very quickly.

Show Nail. What is this? Railroad tie, made of wrought iron, pounded and older than cast iron.

Show hoe. What is this and how old do you think it is? Garden hoe, only about 80 years old but in very bad shape.

Show skate. Can you guess what this is? What information can we gain from this? Do people ice skate in Charleston. Most children will say "The Ice Palace!" Did we have the ice palace in the 1700s and 1800s? No. People were moving down this way from the north. A long time ago when people moved, they were unsure of the place they were going so they brought everything that they owned. It might also mean that someone from here was visiting in the north.

Bone

Show cow bone. What does it tell us? People were eating beef, this may be where a butcher shop was located, or farms were here. This bone has a cut through it, Native Americans did not have this technology. Also cows only came over with the Spanish.

Show Bone comb. What is this made out of?

Chamber Pot

What is this? It is a toilet! Very old, but only missing the handles, someone must have been very attached. There were no bathrooms in houses, so the chamber pot was kept under the bed to be used at night instead of going out to the outhouse. The children had to empty the pots out as part of their chores. They used to throw the waste out into the streets! Yuck!

<u>Procedure:</u>

Students will analyze strata from the Heyward Washington Dig and one from the Beef Market Dig and compare a public site with a private site.

These strata represent a cross section of a dig. Archaeologists dig until they hit the light-colored soil, which is called the sterile sub soil. Usually there is no activity under this layer. The trowel is used on the side of the unit. Archaeologists do not just start digging like you would if you were building a sand castle at the beach. They "cut" the sides down and push the dirt in the middle by layers. A scoop is then used to transfer the dirt to a screen. Some archaeologists even take the dirt straight form the shovel and put it into the screen.

Look at image 3I and the strata from the Heyward Washington Dig. Notice the different colors in the soil. It doesn't always mean how old something is, but how organic (living) materials decompose there.

Look at the strata and images 3J, 3K, and 3L. See how the dark brown dips down, why do you think it does this? What do you think it might represent? This discoloration in the dirt was from a hole dug by someone, maybe to bury trash or to build a fence, some kind of post. In all the layers there are bits of ceramics. Archaeologists use these layers to date the artifacts.

What do you think the layers that we leave behind will say about our culture?

Lesson Four: Cowboys

Objective:

To learn about the first cowboys and the role enslaved workers had in raising cattle.

Article:

Cow Hunters of Colonial South Carolina

Procedure:

1. Ask your students – When you think of cowboys what comes to mind?
2. List their answers.
3. Have the students read the article about Cow Hunters.
4. Answer the following questions:
   - Who were actually the first cowboys?
   - Does this change your perception of cowboys?
   - Does this change your perception of slavery?
   - Many people associated plantations with crops, but plantations also raised cattle, raised horses, and many other tasks. Can you name some other jobs that were done by enslaved people?

Appendix VII
San Luis de Talimali and Charleston Horn Core Descriptions

Site	Basal circumference (44), mm	Greatest basal diameter (45), mm	Minimum basal diameter (46), mm	Length (47), mm	Weight, g	Surface texture	Description	Context	GMNH# or ARL#
San Luis de Talimali, Leon Co., Florida	180	-	57.9	335.0	-	4-5	right, medium horn, 7-10 years old, female	190N519E, Fea. 61, Area 71, FS# 4322	1240001
Miles Brewton	14.0	46.3	38.1	125.0	138.5	4	right, short-horned, 3-7 years old, female or ox, young adult	no provinence	ARL 15411.51
Heyward-Washington	176.0	57.6	54.2		151.6	2	left, similar to 02770002 and 02770005, in two pieces, tip missing, 2-3 years old, subadult female	Feature 88, John Milner, Sr. 1730-1749	02770001
Heyward-Washington	184.0	56.9	53.9	-	132.3	2	right, similar to 02770001, tip missing, 2-3 years old, subadult female	Feature 88, John Milner, Sr. 1730-1749	02700002
Heyward-Washington	213.0	70.1	61.3	-	374.6	3	right, tip missing, full of dirt, 3-7 years old, young adult male	Feature 88, John Milner, Sr. 1730-1749	02770003
Heyward-Washington	181.0	61.5	51.8	-	239.1	4	left, tip missing, 7-10 years old, adult male	Feature 88, John Milner, Sr. 1730-1749	02770004
Heyward-Washington	208.3	70.9	56.1	357.0	315.3	4	left, similar to 02770003, complete, medium-horned, 7-10 years old, adult male	Feature 88, John Milner, Sr. 1730-1749	02770005
Heyward-Washington	142.0	46.3	42.7	205.0	118.5	5	right, complete; short-horned, over 10 years old, adult ox	Feature 88, John Milner, Sr. 1730-1749	02770006
Heyward-Washington	144.0	48.2	41.0	ca. 210.0	92.9	4	left, in five pieces, tip present; short-horned, 7-10 years old, adult male	Feature 88, John Milner, Sr. 1730-1749	02770007
Heyward-Washington	202.0	65.1	61.2	-	126.8	3	left, 3-7 years old, young adult female	Feature 128, early 19th century, ca. 1820	02770008
Nathaniel Russell, pre-Russell	72.8	63.6	-	389.6	3-4	4	left medium horn, 7-10 years old, full cranium, only left can be measured, adult ox	FS 278	1800626 ARL 26679.1

Site	Basal circumference (44), mm	Greatest basal diameter (45), mm	Minimum basal diameter (46), mm	Length (47), mm	Weight, g	Surface texture	Description	Context	GMNH# or ARL#
Visitor Reception & Transportation Ctr	195.7	63.5	57.9	330.0	327.5	4-5	right medium horn, 7-10 years old, female		00900142; ARL 18930
Visitor Reception & Transportation Ctr	235.0	84.2	64.4	-	1061.0	2	right and left, medium horn, 2-3 years old, measurement from the left side ox		00900143; ARL 18931
Visitor Reception & Transportation Ctr	130.0	43.0	30.7	125.0	69.4	2-3	right, shorthorn; nutritional trauma or damage, 3-7 years old, little male or ox		00900145; ARL 18932
Visitor Reception & Transportation Ctr	140.0	48.6	41.1	190.0	179.7	4	left, shorthorn, 7-10 years old, female		00900146; ARL 18933
Visitor Reception & Transportation Ctr	162.5	55.1	43.7	-	188.2	4	left, medium horn, ox-like female or shorthorn ox, sawed, 7-10 year old, adult, female		00900147; ARL 18934
Visitor Reception & Transportation Ctr	-	-	56.1	-	219.1	3-4	right, crossmends w/0090149; medium horn female (or ox), 3-10 years old, adult, female		00900148; ARL 18935
Visitor Reception & Transportation Ctr	189.0	65.8	53.9	-	289.6	3-4	right, crossmends w/0090148; medium horn female (or ox), 3-10 years old, adult, female		00900149 ; ARL 18936

Note: Measurements follow Driesch (1976:29), numbers 44-47 refer to dimensions in Driesch. Surface texture follows Armitage (1982:38). Horn core descriptions follow Armitage (1982; 1990:83). See also Armitage and Clutton-Brock (1976). GMNH# refers to the number assigned to the specimen at the Zooarchaeology Laboratory, Georgia Museum of Natural History. ARL refers to the number assigned to the specimen by The Charleston Museum. The San Luis horn core is curated at the Mission San Luis archaeological site (Tallahassee, FL). All other horn cores are curated at The Charleston Museum.

Cover illustration
A Herd of Cattle, Georgetown County, 1890s
Courtesy of the Georgetown County Library

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