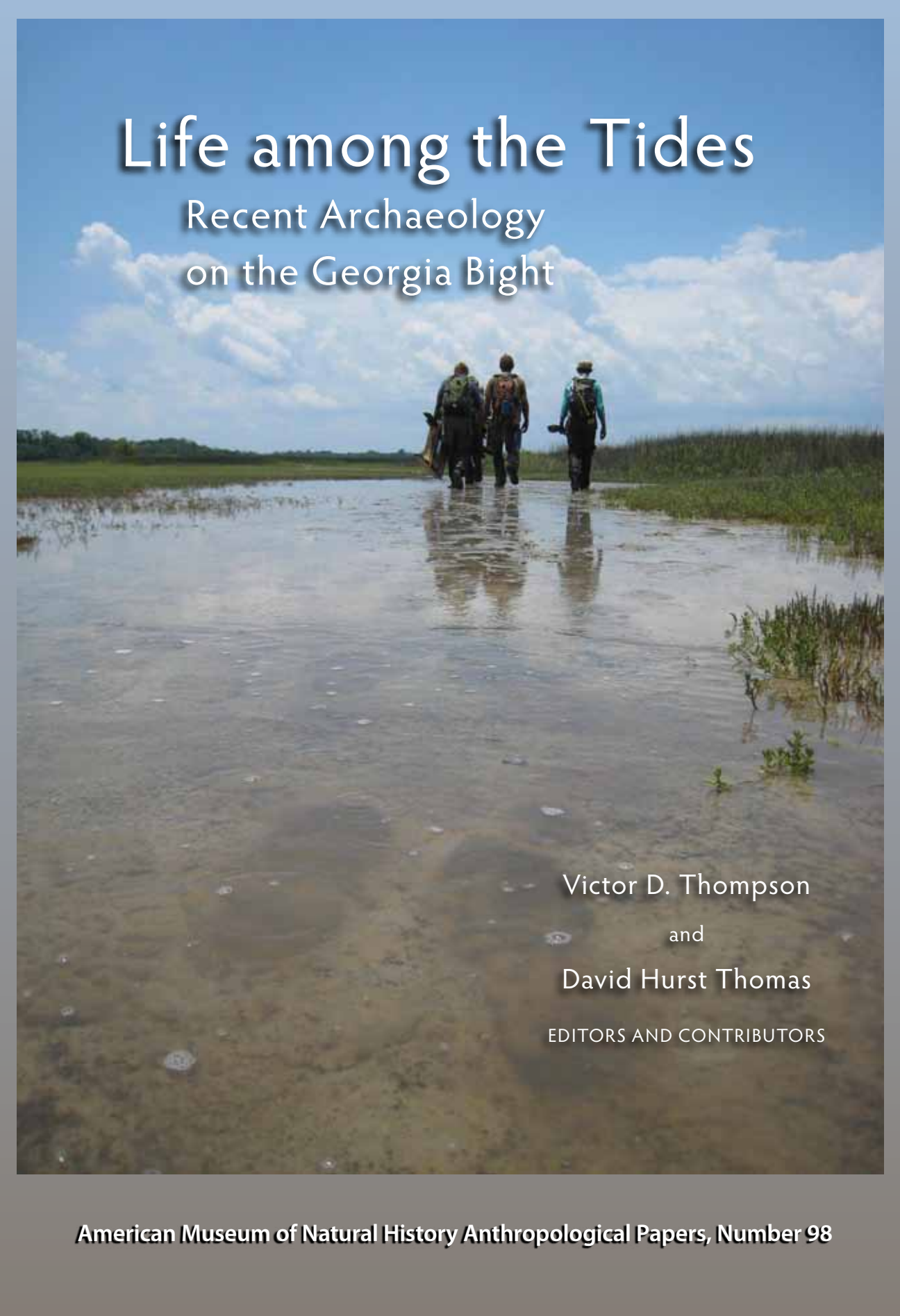


# Life among the Tides

Recent Archaeology  
on the Georgia Bight



Victor D. Thompson

and

David Hurst Thomas

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# **LIFE AMONG THE TIDES RECENT ARCHAEOLOGY ON THE GEORGIA BIGHT**

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AND

DAVID HURST THOMAS

EDITORS AND CONTRIBUTORS

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## ABSTRACT

Although this volume covers a broad range of temporal and methodological topics, the chapters are unified by a geographic focus on the archaeology of the Georgia Bight. The various research projects span multiple time periods (including Archaic, Woodland, Mississippian, and contact periods) and many incorporate specialized analyses (such as petrographic point counting, shallow geophysics, and so forth). The 26 contributors conducting this cutting-edge work represent the full spectrum of the archaeological community, including museum, academic, student, and contract archaeologists. Despite the diversity in professional and theoretical backgrounds, temporal periods examined, and methodological approaches pursued, the volume is unified by four distinct, yet interrelated, themes.

Contributions in Part I discuss a range of analytical approaches for understanding time, exchange, and site layout. Chapters in Part II model coastal landscapes from both environmental and social perspectives. The third section addresses site-specific studies of late prehistoric architecture and village layout throughout the Georgia Bight. Part IV presents new and ongoing research into the Spanish mission period of this area.

These papers were initially presented and discussed at the Sixth Caldwell Conference, cosponsored by the American Museum of Natural History and the St. Catherines Island Foundation, held on St. Catherines Island, Georgia, May 20–22, 2011.

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## PREFACE

VICTOR D. THOMPSON AND DAVID HURST THOMAS

### LIFE AMONG THE TIDES

This book—and the conference it describes—had a somewhat different genesis from the other titles in the Caldwell Conference series.

We originally envisioned *Life Among the Tides: Recent Archaeology on the Georgia Bight* as a book highlighting current archaeological research along the Georgia Bight. But as we read drafts of the papers being submitted, we realized that all of us would benefit from the Caldwell format, allowing the participants to come together in a congenial setting to discuss already well-developed papers. This is how the Sixth Caldwell Conference was born. Most of the papers in this volume were presented at that conference, held

May 20–22, 2011 on St. Catherines Island, co-sponsored by the American Museum of Natural History and the St. Catherines Island Foundation. Due to unforeseen circumstances, a few participants could not attend the meeting, but their contributions are included here anyway.

Previous Caldwell Conference publications have focused on methodological issues (e.g., Bishop, Rollins, and Thomas, 2011) or temporal themes (e.g., Deagan and Thomas, 2009; Thomas and Sanger, 2010). The papers in the present volume, however, are tied together by a geographic focus on the Georgia Bight, covering a broad range of temporal and methodological topics. We came to realize that this approach was worthwhile because both of us had recently worked on pub-



Participants in the Sixth Caldwell Conference, standing near an exposed sea turtle nest at South Beach, May 20–22, 2011: (left to right) Elliot Blair, Dave Thomas, Victor Thompson, Dick Jefferies, Alex Parsons, Matt Sanger, Lori Pendleton (in front), Ryan Sipe, Clark Alexander (in back), Diana Rosenthal (in front), Tom Whitley, Christa Hayes, Royce Hayes, Matt Napolitano, Anna Semon, Keith Ashley, Ann Cordell, Neill Wallis, Scott Fitzpatrick, Christina Friberg (seated in front, left), and Guinness Mahar (seated in front).

lications that required synthesizing and digesting the voluminous scholarly publications available on the Georgia Bight (including literature from both academic and contract archaeology). For Thomas, the three-volume *Native American Landscapes of St. Catherines Island, Georgia* (Thomas, 2008) pulled together a multiyear, interdisciplinary archaeological project conducted by the American Museum of Natural History and situated these results into the larger context of the Sea Islands coast to consider the implications of larger anthropological issues (emphasizing the changing interrelationships among human landscapes, subsistence practices, and the emergence of social inequality). For Thompson, the inspiration was his coauthored article with John Worth (published in the *Journal of Archaeological Research*) in which they presented a synthesis of Native American coastal adaptations in the American Southeast (Thompson and Worth, 2011). This article draws heavily on research results along the Georgia Bight, situated within broader theoretical and methodological contexts.

In these independent efforts, we both came to appreciate the growing corpus of new archaeological research on the Georgia Bight—considerably more material than could be incorporated into our respective publications. These research projects spanned multiple time periods (including Archaic, Woodland, Mississippian, and contact periods) and many incorporated specialized analyses (such as petrographic point counting, shallow geophysics, and so forth). Since we knew most of the major players involved in these ongoing projects and had visited and/or worked on many of these sites, we came to realize that a critical mass of new and innovative research warranted a volume specifically organized around the archaeology of the Georgia Bight.

We also recognized that most of the new research efforts built upon long-term scholarly legacies and inquiries in the region. Those readers already familiar with the archaeology of the Georgia Bight will recognize a number of familiar research themes, addressed in fresh and inventive perspectives. We hope that those new to this region will find parallels and draw inspiration from these studies, many of which have theoretical, methodological, cultural, and historical implications for broader anthropological understanding.

With these thoughts in mind, we pulled together our list of potential participants for this volume. We quickly realized that those conduct-

ing cutting-edge work in the Georgia Bight represented the full spectrum of the archaeological community, including museum, academic, student, and contract archaeologists. Despite the diversity in professional and theoretical backgrounds, temporal periods examined, and methodological approaches pursued, we readily identified several interrelated themes, which generated the organizational headings of this volume.

Contributions in Part I address analytical approaches to time, exchange, and site layout. David Hurst Thomas, Matthew C. Sanger, and Royce H. Hayes begin the section by examining the marine  $^{14}\text{C}$  reservoir correction ( $\Delta R$ ) for St. Catherines Island and extending this research to other areas of the Georgia coast. This work builds on the earlier derivation of the reservoir correction based on late 19th- and early 20th-century oyster shell samples recovered from oyster factories on St. Catherines Island (Thomas, 2008: chap. 13). Chapter 1 addresses the question of geographic variability in the  $\Delta R$  from St. Catherines Island and whether the value changed through time. Thomas, Sanger, and Hayes present newly dated samples of pre-bomb marine invertebrates in order to refine the existing  $\Delta R$  estimate. They conclude that  $\Delta R$  remained relatively constant during the Late Holocene in the waters surrounding St. Catherines Island. They also found that the marine reservoir was stable throughout the seasons in this part of the Georgia Bight and did not vary appreciably in the areas sampled.

In chapter 2, Alexandra L. Parsons and Rochelle A. Marrinan examine and review the available faunal data from coastal Georgia and northeast coastal Florida. They consider a long temporal span, which begins at 3000 cal B.C. and ends at A.D. 1680. Their discussion includes samples from famous sites in the region, including McQueen Shell Ring, Sapelo Shell Ring complex, Kings Bay sites, Grand Shell Ring, and the Fountain of Youth site. Overall, they observe that the faunal records reflect similar subsistence strategies that persisted for millennia in this area, albeit with some temporal and geographic variation (see Colaninno, 2010). They also make recommendations for the future of faunal studies in the Georgia Bight.

In chapter 3, Ginessa J. Mahar argues that we should consider archaeological geophysics as a primary data source for interpreting the past. Building on the work of Kvamme (2003a) and Thompson et al. (2011), she presents a nuanced approach to the use of shallow geophys-

ics in archaeology. Specifically, Mahar uses her own work at two Late Archaic shell rings on St. Catherines Island (both dating circa 3000 cal B.C. to 1000 cal B.C.) to argue that geophysics can supplement excavation data to provide a more holistic perspective.

Chapter 4, by Ann S. Cordell and Kathleen A. Deagan, examines paste variability and clay resource use among the 16th-century aboriginal populations at the Fountain of Youth (FOY) site in St. Augustine (Florida), established in 1565 by Pedro Menéndez de Avilés, which was the location of the first permanent European town in what was to become the United States. Deagan has excavated at FOY for a number of years, recovering a diverse ceramic assemblage, which includes St. Johns, San Marcos, and San Pedro wares. The early years of Spanish occupation in La Florida substantially altered aboriginal lifeways, with major shifts in demography and population density. Cordell and Deagan argue that technological ceramic analysis provides another way of monitoring such change through time. The paste of clay and sherd samples from FOY shows considerable variability and provides insight into the multiethnic population at the site, which included groups from other areas of the coast.

In chapter 5, Neill J. Wallis and Ann S. Cordell expand on the methodological insights of chapter 4 by comparing the results of petrographic analysis of thin sections from pottery and clays from southeast Georgia and northeast Florida with results of Instrumental Neutron Activation Analysis (INAA). They examine the famous Swift Creek pottery by distinguishing Early Swift Creek (circa cal A.D. 200–500) from Late Swift Creek (circa cal A.D. 500–800) ceramics. Swift Creek pottery has long fascinated archaeologists in the Deep South, mainly due to the intricately carved paddle-stamped designs on these vessels (e.g., Williams and Elliott, 1998; Pluckhahn, 2007; Wallis, 2008, 2011). It is notable that examples of paddle-stamped Swift Creek pottery, made with the same paddle, have been identified hundreds of kilometers apart. Investigating what kind of social interaction could lead to these widespread “paddle matches,” Wallis and Cordell use multiple techniques to examine the regional variation in clay and temper sources used to make Swift Creek pottery. These results suggest that whereas the vast majority of vessels studied were produced locally, some were transported from the Altamaha River to the St. Johns

River area and deposited in burial mounds. Wallis and Cordell believe that this patterning reflects gift giving associated with marriage alliances between widespread descent groups.

Part II of this volume contains papers that model coastal landscapes from both environmental and social perspectives. Chester B. DePratter and Victor D. Thompson (chap. 6) reconstruct paleoshorelines using data collected by DePratter during his 1970s shoreline survey of islands along the Georgia Bight, augmented by modern site file data. The resulting maps demonstrate the nature of shoreline change over the past 4500 years, based largely on the northern Georgia ceramic sequence. These maps document the nature of environmental change on the Georgia coast, providing a point of departure for understanding the social implications of these changes.

In chapter 7, John A. Turck and Clark R. Alexander provide a complementary study with a more detailed examination of the local geomorphology and geology of the Georgia Bight. They present the results of recent vibracoring, sediment analysis, radiocarbon, and optically stimulated luminescence dating, arguing that these coastal landscapes have evolved in complex ways, rendering the holistic modeling and human utilization of these landforms problematic. That said, Turck and Alexander demonstrate how geoarchaeological techniques can generate a more nuanced understanding of human environmental interactions. For the most part, chapter 7 corroborates the previous archaeological dating of coastal landforms (e.g., DePratter and Thompson, chap. 6, this volume) and also the observation that humans utilized new landforms shortly after they formed (see Thompson, Turck, and DePratter, 2013).

In chapter 8, Matthew F. Napolitano considers the role of small islands along the central Georgia coast, building upon the recent surveys of marsh islands near Sapelo Island (Thompson and Turck, 2010). Napolitano surveyed Bull Island with a full coverage 20 m interval shovel test program, small scale testing, and specialized analysis of excavated materials (e.g., stable isotope analysis on shellfish). Napolitano’s research documented a 4000 year history of human articulate that compares favorably with the extensive surveys conducted by the American Museum of Natural History on nearby St. Catherines Island (Thomas, 2008). The Bull Island survey demonstrates the intensive and extensive use of the broader landscape of the Georgia Bight, demand-

ing that archaeologists consider the relative importance that small islands and landforms play in coastal economies (see also Keegan et al., 2008, for a similar example from another region).

In chapter 9, Matthew C. Sanger presents the results of the Springfield Legacy archaeology survey of 425 acres on the central Georgia coastal mainland. Sanger combines traditional shovel testing with Light Detection and Ranging (LiDAR) mapping to investigate specific landforms and the associated human settlement pattern. In his chapter, Sanger provides detailed information on several different dimensions of environmental change, subsistence, and demographic shifts, concluding that this landscape is composed of multiple connections rather than impenetrable boundaries. The surveys by Sanger and Napolitano help generate broader perspectives on the nature of coastal settlement over vast temporal periods.

Chapter 10, by Thomas G. Whitley, is a GIS modeling of seasonality and potential caloric return rates for habitats and species across the Georgia Bight. Drawing on a theoretical framework grounded in human behavioral ecology, Whitley simultaneously develops a predictive model and reveals the variability in the coastal Georgia landscape. This heterogeneity, Whitley argues, allows for modeling of spatial value as predicted by caloric returns, generating insights into the exploitation of coastal landforms with significant implications for social control and exchange of these resources. The Whitley model provides archaeologists working on the Georgia Bight with a powerful tool for exploring past subsistence practices, settlement patterning, and concomitant social relations.

The chapters in Part III address site-specific studies of late prehistoric architecture and village layout on the Georgia Bight. A variety of archaeological surveys have demonstrated that the Irene phase (circa cal A.D. 1350 to A.D. 1565) saw the greatest increase in site density (and by extension, human population) than any prior period (see Crook, 1984; Thomas, 2008; Thompson and Turck, 2010; Napolitano, chap. 8, and Sanger, chap. 9, this volume). But relatively little is known about the domestic architecture and village structure of these populations. Current knowledge is based largely on the reanalysis of landmark WPA excavation at the Irene-type site 9Ch1 (Caldwell and McCann, 1941; Thompson, 2009), but important new evidence

is emerging.

In chapter 11, Deborah A. Keene and Ervan G. Garrison present a detailed analysis of the remains of Irene phase domestic architecture from the Grove's Creek site (9Ch71) located on Skidaway Island, Georgia. Long-term excavation at this site has nearly doubled the number of Irene phase houses investigated on the Georgia coast. Keene and Garrison compile the information for all of these known structures, which are compared and contrasted with ethnohistoric descriptions of similar architecture. While there are gross similarities among these structures, these investigators emphasize the considerable diversity in the shape, size, and construction of domestic architecture, likely due to functional variability.

In chapter 12, Ryan O. Sipe reports on his large-scale excavation at Redbird Creek village site (9Bn9), an Irene phase village with an associated mortuary context. This chapter illustrates the potential for preserved features and village layout in the sandy soils of the Georgia Bight. These new data provide an important contribution to the variation in community patterning on the coastal mainland, particularly when compared to research on the barrier islands on Irene and mission period village settlements (e.g., Crook, 1984, Saunders, 2000a, 2000b; Thomas, 2008).

Part IV addresses mission period archaeology of the Georgia Bight. While considerable archaeological research has addressed this time frame, particularly on St. Catherines Island (e.g., Thomas, 1987, 1993a, 2008; Larsen, 1990, 2001a, 2001b, 2002; Blair, Pendleton, and Francis, 2009), there is still much to learn. Many of the missions and their associated Native American villages remain undiscovered or are only vaguely referred to in the historic documents. To understand the nature of initial European contact along the Georgia Bight, we need a large sample of sites, complemented by more detailed, focused studies of mission period sites previously investigated.

In chapter 13, Richard W. Jefferies and Christopher R. Moore present evidence that the village site of Sapala and its associated mission of San Joseph de Sapala are located on the northwest side of Sapelo Island, Georgia. This important site was occupied by at least four formerly independent communities by A.D. 1684, reflecting the intensified conflict during this time period.

Although definitive Spanish architecture has yet to be identified, the volume of European goods (e.g., military items, ceramics, etc.) dating to the mission period is unmatched elsewhere on Sapelo Island. Jefferies and Moore use their archaeological findings to discuss the nature of Native American–Spanish interaction.

In chapter 14, Elliot H. Blair discusses community organization at Mission Santa Catalina de Guale based on geophysical, geochemical, topographic, and subsurface survey data. He investigates the nature of household distribution in the pueblo portion of the mission site, contextualizing his results into a sophisticated theoretical framework that allows for a more nuanced evaluation than such data normally receive.

In chapter 15, Keith H. Ashley, Vicki L. Roland, and Robert L. Thunen present new data on the Spanish Mission of San Buenaventura de Guadalquini. Drawing upon both ethnohistoric and archaeological evidence, they document its move from the northern Mocama frontier (contemporaries of the Guale of the central and northern Georgia coast) to northeast Florida. They also attempt to pinpoint the exact location of the original St. Simons Island mission (in Georgia). While the original location remains unknown, the relocated mission, forced to move due to threats from English-sponsored slave raids and French corsairs, is the subject of their ongoing archaeological investigations. The relocated mission, renamed Santa Cruz y San Buenaventura de Guadalquini, is known archaeologically as the Cedar Point site (8Du81) on Black Hammock Island (Florida). They compare their work at Guadalquini with other coastal missions in an attempt to understand the variations in material culture and social life at such sites.

Chapter 16, by Victor D. Thompson, John A. Turck, Amanda D. Roberts Thompson, and Chester B. DePratter, examines the Guale landscape and the nature of interaction with Spanish arrival. These authors specifically address the degree to which traditional land use practices of the Guale changed during the early contact period. They employ shoreline survey information over a large region of the Georgia coast, having also conducted both shovel test survey of specific islands and excavation data from one small back barrier island site. They conclude that, whereas the Guale continued extensive utilization of the coastal landscape during the mission period, this utilization was not as intense as that during the

late prehistoric era. They suggest that despite the relatively intense debate regarding Guale settlement patterns, few have taken a perspective using regional scale site locational data. Such studies have implications for, and can lend insight into, the way the Guale experienced and mediated colonial entanglements.

Given the regional focus of the Caldwell VI conference, we invited two discussants to participate, and all contributors benefited from their perspectives on the presentations. Mark Williams, who is intimately familiar with coastal and uplands archaeology in Georgia, shared his comments on the past and future of the archaeology of the Georgia Bight during the conference. Scott M. Fitzpatrick, an archaeologist who has worked in island and coastal settings in both the Caribbean and the Pacific, offers his thoughts on the broader place of the Georgia Bight in terms of worldwide island and coastal archaeology in chapter 17.

#### A WORD ABOUT RADIOCARBON DATING

All radiocarbon evidence presented in this volume has been calibrated according to the protocols set out by Bishop et al. (2011). Specifically, we uphold the standards established by the journal *Radiocarbon* in their “Instructions for Authors” (promulgated 22 August, 2005, and updated 28 August, 2006). The standard reference on the calculations and terminology follows Stuiver and Polach (1977). Whenever possible, calibrated dates are reported using the latest available international calibration curve (currently INTCAL09 and MARINE9).

- *Uncalibrated Ages:* In this volume, “B.P.” is understood to signify “conventional radiocarbon years before A.D. 1950.”

- *Calibrated Ages:* The symbol “cal” is used to express calibrated radiocarbon ages (with “cal” understood as “calibrated,” not “calendar”). In this volume, authors are free to use either “cal B.P.” or “cal B.C./A.D.” (or both). Similarly, the use of  $1\sigma$  and/or  $2\sigma$  confidence intervals is left to the author’s discretion.

- *Reservoir Correction:* see discussion in Thomas, Sanger, and Hayes (chapter 1, this volume).

- *Rounding Conventions:* We employ the rounding conventions advocated by Stuiver and Polach (1977: 362).

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**PART I**  
**ANALYTICAL APPROACHES**  
**TO TIME AND EXCHANGE**







CHAPTER 1  
REVISING THE  $^{14}\text{C}$  RESERVOIR CORRECTION  
FOR ST. CATHERINES ISLAND, GEORGIA  
DAVID HURST THOMAS, MATTHEW C. SANGER, AND  
ROYCE H. HAYES<sup>1</sup>

Radiocarbon dating has long been important to archaeologists working on St. Catherines Island and, to date, more than 300 “cultural”  $^{14}\text{C}$  determinations have been processed on island samples (Thomas, 2008: table 13.4). The recently published *Geoarchaeology of St. Catherines Island* presents an additional 60 noncultural radiocarbon dates (Bishop, Rollins, and Thomas, 2011: appendix I; see also Thomas, 2008: chap. 29, table 29.1).

The vast majority of these radiocarbon determinations were processed on marine shell, and for good reason. Speaking specifically of St. Catherines Island, we have argued that shell samples tend to provide more reliable results than charcoal samples from the same context. Not only are shell samples vastly more abundant, but, unlike charcoal, Holocene-age marine shells are not subject to contamination by organic carbon from modern vegetation decay (thereby reducing the importance of chemical cleaning). Large shell fragments do not move as readily through the stratigraphic column and do not have the problem of rootlet contamination (a difficulty with charcoal samples). Excreted by short-lived organisms, these shells are more abundant than reliable charcoal samples found in most shell middens. With the advent of high-precision radiocarbon techniques emphasizing short-lived terrestrial organisms, our thinking has changed somewhat, but we still believe that  $^{14}\text{C}$  dating of marine shells will always be important for archaeological chronologies along the Georgia coast and elsewhere.

More than four decades ago, Joseph Caldwell recognized the importance of combining radio-

carbon dating with ceramic analysis to establish the cultural chronology of the Georgia coast. In a paper presented at the Southeastern Archaeological Conference in October 1970, he reported 13 new radiocarbon dates from his excavations on St. Catherines Island (Caldwell, 1971). Aware of some potential problems relating to the radiocarbon dating of marine shells, Caldwell deliberately paired some charcoal and shell determinations. Assessing the results from his first two field seasons of research on the island, he concluded that “radiocarbon determinations made from oyster shell do not appear to differ significantly from determinations made from charred wood. In this connection, some of you will recall that a few years ago modern oyster shells from adjacent Sapelo Island collected in 1955 were run at the University of Michigan (M-614) and did not differ significantly from Michigan’s wood standard” (Caldwell, 1971: 1). But later in the same paper, Caldwell admitted his suspicion that “our shell determinations, while compatible with charred wood determinations, may be running slightly later.” He wisely reassured that “of course we shall continue to look for an oyster shell correction factor and other factors based on the available amount of radiocarbon in the biosphere at a particular time.”

A decade later, while reporting the results of new excavations at several Refuge/Deptford period burial mounds on St. Catherines Island, Thomas and Larsen (1979: 138) presented 29 additional radiocarbon dates, nearly one-quarter of them processed on marine shell. Although referencing potential “reservoir effects,” these investigators basically relied on Caldwell’s previous

intuition and ignored the problem.

We now realize that assumption was wrong. A significant reservoir effect is clearly operating here because, relative to the atmosphere, ocean water is depleted in  $^{14}\text{C}$ , transmitting this deficiency to marine organisms. This means that the apparent radiocarbon ages of marine samples can be several hundred years older than contemporaneous atmospheric  $^{14}\text{C}$  samples. Dissolved inorganic carbon in the upper ocean is influenced by the exchange with both the atmosphere and the radiocarbon-depleted deep ocean, with a  $^{14}\text{C}$  content intermediate between the two (Broecker, Ewing, and Heezen, 1960; Broecker and Olson, 1961; Berger, Taylor, and Libby, 1966; Taylor, 1987: 34). Reservoir effects—the incorporation of ancient carbonates in living organisms—are today attributed primarily to upwelling, in which water from deeper ocean contexts is periodically brought upward and mixed with surface ocean water. Marine shell species can also be heavily influenced by the effects of estuaries, bayous, inland waterways, and bay environments. In such environments, living shell can also be seriously affected by the discharge of carbonate-rich freshwater, which causes variability in apparent ages of up to a millennium.

Clearly then,  $^{14}\text{C}$  dating of zooarchaeological marine shells continues to play a prominent role in understanding the cultural chronologies of St. Catherines Island (and elsewhere), and we must correct for the reservoir effects involved in these analyses. When dating marine materials, it is essential to separate the  $^{14}\text{C}$  of the ocean surface from that of atmospheric  $\text{CO}_2$ . Regional patterning is controlled by diverse factors, including localized circulation patterns, the relative inflow off freshwater sources (presumably carrying older carbonates), spatial variations in upwelling, water mass mixing, and variable air-sea gas exchange.  $\Delta R$  values can likewise vary in marine mollusc samples due to species, habitat, and/or substrate (Dye, 1994; Forman and Polyak, 1997; Hogg, Higham, and Dahm, 1998; Reimer and Reimer, 2001; Masteller, Thieler, and Horton, 2011). In areas where waters are continuously exchanged with open ocean water and vertically well mixed (with concentrated upwelling offshore), reservoir effects tend to increase. Estuarine processes and dilution by freshwater most likely reduce reservoir effects within tidal waters.

#### REDEFINING RESERVOIR EFFECTS ON ST. CATHERINES ISLAND

We began developing a local reservoir correction by dating a series of known-age prebomb (< A.D. 1950) molluscs curated in various museum collections (Thomas, 2008: chap. 13, 348–353). The initial sample consisted of nine molluscs, spanning several species and approximately 800 km of coastline, from Beaufort (North Carolina) to Cocoa Beach (Florida). Although relevant comparable values are still scarce (see Masteller, Thieler, and Horton, 2011, and Rick et al., 2011 for recent advances), the mean  $\Delta R$  value for the Carolina–Florida subsample ( $106 \pm 26$   $^{14}\text{C}$  years) compared favorably with the other available regional average  $\Delta R$  values (available at the time in the online Marine Reservoir Correction Database (<http://calib.qub.ac.uk/marine/>) for the Bahamas and Florida ( $36 \pm 14$  years), Long Island Sound, New York ( $165 \pm 78$ ), and the Gulf of Maine ( $38 \pm 40$  years). But because none of the available prebomb, known-age molluscs came from the Georgia coast, we needed a better way to create the modern control sample.

Knowing (1) that a commercial oyster industry had once flourished in the waters surrounding St. Catherines Island during the late 19th century and (2) this industry ceased operation during the 1920s, we reasoned that their massive spoil heaps on St. Catherines Island could provide a new, more specifically localized source of modern control samples. Specifically, because virtually all of the shells within these factory middens derived from *Crassostrea virginica* that were harvested between about 1900 and 1920, we anticipated that such known-age molluscs might be a useful addition to the reservoir-effect study (fig. 1.1). We estimated the age of harvest for each sample to be A.D.  $1910 \pm 10$  years.

We processed numerous  $^{14}\text{C}$  determinations on *Crassostrea virginica* collected from the oyster boiling factories of St. Catherines Island and found that these “modern” oyster shells produced an extraordinarily negative mean  $\Delta R$  value of  $-134 \pm 26$ —one of the most extreme values yet recorded (Thomas, 2008: chap. 13, 357–259). It is clear that the intertidal species *Crassostrea* found on St. Catherines Island were sampling a different  $^{14}\text{C}$  reservoir than the surface mixed layer commonly assumed for such marine samples (perhaps due to intense wave action or exposure during low tide that caused atmospheric

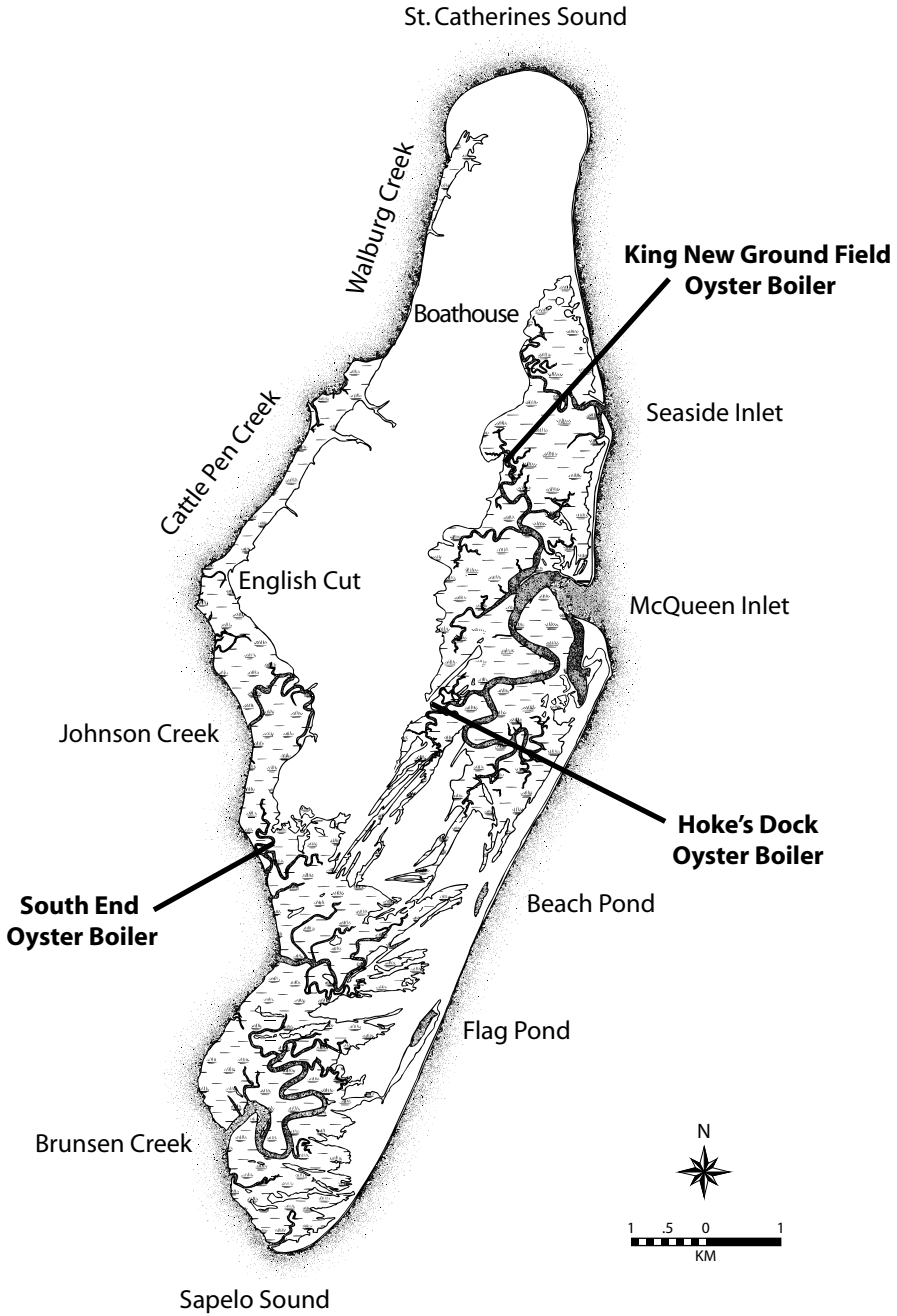


Figure 1.1. Location of 19th-century oyster factories on St. Catherines Island (after Thomas, 2008: fig. 13.4).

mixing in shallow and estuarine waters). When we applied this reservoir correction to 11 charcoal-marine shell pairs, we found that in each case the charcoal and marine shell dates overlap significantly, reinforcing the conclusion that the local reservoir factor satisfactorily resolves the discrepancy between atmospheric and marine samples on St. Catherines Island (Thomas, 2008: table 13.3, fig. 13.9).

Although the St. Catherines Island reservoir correction does indeed seem to “correct” marine dates to comparable ages derived from terrestrial samples, Thomas (2011a: 50–52) raised several potential problems with these procedures, and this paper attempts to address the most important of these.

#### EXPANDING THE SAMPLE

The extreme reservoir correction previously derived for St. Catherines Island might result from the positioning of the island relative to carbonate sources draining from the Piedmont. Of all the Georgia barrier islands, St. Catherines is currently farthest from a major river; neither Sapelo Sound to the south nor St. Catherines Sound to the north communicates directly with a major freshwater source. Rather, the Medway, South Newport, and Sapelo rivers are salt marsh estuaries situated north of St. Catherines, Sapelo, and Wolf islands, respectively, and are dominated by ebb tides, with very little freshwater inflow (Howard and Frey, 1975). Griffin and Henry (1984: 43) suggest that this isolation from major deltaic systems may account for the extreme rates of erosion observed on St. Catherines Island during the historic period. Even a cursory look at coastal geomorphology shows that St. Catherines Island lies near the southern extent of the destructive delta bulge built by the Savannah and Ogeechee rivers to the north. Perhaps this diminished freshwater sourcing reduces the number of carbonates entering the marine catchment. Further, the headwaters of the Ogeechee and Altamaha rivers extend far into the coastal plain and distributary systems that aggrade north of Ossabaw and Little St. Simons islands, respectively. Perhaps also, barrier island sources closer to these major rivers would contain a greater load of imported carbonates, thereby making their apparent age more extreme (and, of course, requiring a different reservoir correction).

Thomas (2011a: 51) hypothesized that distance to major deltaic systems might influence

the reservoir effect: the closer to the major freshwater source, the greater the carbonate load reflected in the  $\Delta R$ . Recent research in the mid-Atlantic has further reinforced this hypothesis as  $\Delta R$  values were positively affected by proximity to freshwater sources (Masteller, Thieler, and Horton, 2011, and Rick et al., 2011). To test the hypothesis of lateral, facieslike variability, we expanded our small-scale sampling programs on late 19th- and early 20th-century oyster factories along the Georgia Bight. The attempt has been to locate known-age oyster samples and derive independent  $\Delta R$  values to compare with the St. Catherines Island results (see table 1.1).

Here, we report the results from reservoir correction experiments at five additional oyster factories located along the central Georgia Bight (fig. 1.2).

**SOUTH END BOILER, ST. CATHERINES ISLAND:** Previous research on the St. Catherines Island reservoir correction sampled three separate oyster factories (fig. 1.1, see also Thomas, 2008: chap. 13). The results from King New Ground Field and Hoke’s Dock boilers proved to be satisfactory. But earlier work at the South End yielded mixed results because three of the four samples produced  $^{14}\text{C}$  determinations that were a millennium too old (clearly reflecting the use of ancient archaeological middens in constructing the causeway at South End).

In the winter of 2009, Hayes collected three additional samples from the South End boiler. Careful to collect only shells from the spoil pile directly associated with the boiler, Hayes’s new samples produced results entirely consistent with early 20th-century oyster collection, and these new dates appear in table 1.1.

**COFFIN OYSTER BOILER, SAPELO ISLAND:** Working with Buddy Sullivan (former manager, Sapelo Island National Estuarine Research Reserve), we attempted to sample oysters from the cannery operated by island owner Howard Coffin about 1920–1930, located on Barn Creek, along the southwest side of Sapelo Island (fig. 1.2). Mr. Sullivan noted that whereas only minimal shell residue remained near the boiler itself (fig. 1.3), there was sufficient shell along the eroding bank and three samples were submitted for radiocarbon dating. As indicated on table 1.1, these three  $^{14}\text{C}$  dates are clearly a millennium too old and we conclude (per our earlier experience at the South End boiler on St. Catherines Island) that we had inadvertently sampled an ancient archaeological

TABLE 1.1  
 $^{14}\text{C}$  Ages,  $\delta^{13}\text{C}$ , and  $\Delta\text{R}$  Values of Known-Age Shells from the Central Georgia Bight  
 Expanded and modified from Thomas, 2008: table 13.2.  
 Previous estimates of Reservoir Age and  $\Delta\text{R}$  appear in brackets.

Lab ID	Location	Species	Collection Year	Raw $^{14}\text{C}$ Age B.P.	$\delta^{13}\text{C}$ ‰	$^{14}\text{C}$ Age B.P.	Reservoir Age (years)	$\Delta\text{R}$
<b>Previously Reported Radiocarbon Determinations (Thomas, 2008: table 13.2)</b>								
Beta-21410	South End Boiler, Catherines Island	<i>Crassostrea virginica</i>	1910	102.7 ± 0.7	-1.9	170 ± 60	71 ± 60 [76 ± 60]	-278 ± 64 [-280 ± 60]
Beta-21411	King New Ground Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	50 ± 90	-0.5	460 ± 90	361 ± 90 [366 ± 90]	-12 ± 93 [10 ± 90]
Beta-21412	Back Creek Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	101.6 ± 0.9	-1.0	270 ± 70	171 ± 70 [270 ± 70]	-171 ± 70 [-180 ± 70]
Beta-177688	Back Creek Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	100.67 ± 0.5	-0.7	350 ± 40	251 ± 40 [256 ± 40]	-98 ± 46 [-100 ± 70]
Beta-177689	Back Creek Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	101.54 ± 0.7	-0.8	290 ± 60	191 ± 60 [196 ± 60]	-160 ± 60 [-160 ± 60]
Beta-177690	Back Creek Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	101.37 ± 0.7	-0.7	350 ± 60	251 ± 60 [256 ± 60]	-98 ± 64 [-100 ± 60]
Beta-177691	King New Ground Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	100.6 ± 0.6	-1.5	340 ± 50	241 ± 50 [246 ± 50]	-108 ± 55 [-110 ± 50]
Beta-177692	King New Ground Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	100.33 ± 0.7	-0.7	370 ± 60	271 ± 60 [276 ± 60]	-78 ± 64 [-80 ± 60]
Beta-177693	King New Ground Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	101.07 ± 0.7	-1.0	310 ± 60	211 ± 60 [216 ± 60]	-138 ± 64 [-140 ± 60]
<b>Additional Radiocarbon Determinations (reported here for the first time)</b>								
Beta-256510	South End Boiler, Catherines Island	<i>Crassostrea virginica</i>	1910	100.6 ± 0.5	-2.0	330 ± 40	230 ± 40	-118 ± 46
Beta-256511	South End Boiler, Catherines Island	<i>Crassostrea virginica</i>	1910	101.1 ± 0.5	-1.9	290 ± 40	190 ± 40	-158 ± 46
Beta-256512	South End Boiler, Catherines Island	<i>Crassostrea virginica</i>	1910	101 ± 0.6	-2.6	280 ± 40	181 ± 40	-168 ± 46

TABLE 1.1 — (Continued)

Lab ID	Location	Species	Collection Year	Raw $^{14}\text{C}$ Age B.P.	$\delta^{13}\text{C}$ ‰	$^{14}\text{C}$ Age B.P.	Reservoir Age (years)	$\Delta R$
Beta-262303	Bluff Creek, Colonels Island	<i>Crassostrea virginica</i>	1910	100.3 ± 0.5	-1.2	360 ± 40	261 ± 40	-88 ± 46
Beta-262304	Sunbury	<i>Crassostrea virginica</i>	1910	20 ± 40	-2.8	380 ± 40	281 ± 40	-68 ± 46
Beta-262305	Yellow Bluff, Colonels Island GA	<i>Crassostrea virginica</i>	1930	0 ± 40	-1.7	380 ± 40	228 ± 40	-74 ± 50
Beta-260789	Valona, McIntosh County	<i>Crassostrea virginica</i>	1900	100.1 ± 0.5	-1.7	370 ± 40	310 ± 40	-74 ± 46
<b>Rejected "modern" ages</b>								
Beta-177694	South End Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	860 ± 60	-0.8	1260 ± 60	—	—
Beta-177695	South End Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	970 ± 60	-1.3	1360 ± 70	—	—
Beta-177696	South End Boiler, St. Catherines Island	<i>Crassostrea virginica</i>	1910	1450 ± 60	-1.8	1830 ± 70	—	—
Beta-254941	Coffin Boiler, Sapelo Island	<i>Crassostrea virginica</i>	1910	1080 ± 40	-2.2	1450 ± 40	—	—
Beta-254942	Coffin Boiler, Sapelo Island	<i>Crassostrea virginica</i>	1910	1090 ± 40	-1.8	1470 ± 40	—	—
Beta-254943	Coffin Boiler, Sapelo Island	<i>Crassostrea virginica</i>	1910	1000 ± 40	-2.0	1380 ± 40	—	—

midden, and these too-old dates are not helpful in computing the reservoir correction operating in the waters surrounding Sapelo Island. We now suspect that Mr. Coffin was using the oyster shell debris created by his oyster cannery to improve the roads of Sapelo Island, meaning that an oyster factory-related midden did not occur near the boiler.

**SHELL BLUFF CANNING COMPANY, VALONA:** Sullivan also recommended that we sample the shell deposits at the commercial fishing village of Valona, located on a bend in Shellbluff Creek, about 10 mi north of Darien, Georgia (fig. 1.2). Serious commercial harvesting of oysters in McIntosh County began in the 1890s with the opening of the Valona factory (fig. 1.4), which continued operations into the very first part of the 20th century (Sullivan, 2000a: 99; see also

Sullivan, 2008: 15); this site later became the Durant shrimp docks (and subsequently the King Seafood docks). This purely saltwater locality was important for the reservoir correction study because it contained the oldest commercial oyster shell deposits in McIntosh County. When Hayes and Thomas visited Valona in May 2009, they found ample shell deposits on the banks of the creek. The single, highly satisfactory AMS date was processed from the Valona shell deposits (table 1.1).

**YELLOW BLUFF FISHING CAMP, COLONEL'S ISLAND:** In his history of Liberty County, Robert Long Groover (1987) notes that the Yellow Bluff fishing camp was established in 1924, along with an associated oyster factory (fig. 1.2; see also Devendorf, 2009: 39). Assisted by Jeff Woods, Hayes and Thomas collected an oyster sample





Figure 1.2. Map of St. Catherines Island showing modern oyster sample locations.

from the spoil pile associated with the former oyster boiler.

**BLUFF CREEK, COLONEL'S ISLAND:** Assisted by Jeff Woods, Hayes, and Thomas collected a shell sample from the oyster factory that once operated here, adjacent to the property of Jack Waters (fig. 1.2); we assume that this oyster factory is contemporary with those operated by Augustus Oemler on St. Catherines Island (see table 1.1).

**SUNBURY:** Assisted by Jeff Woods, Hayes, and Thomas collected a shell sample from the oyster factory spoils in downtown Sunbury (fig. 1.2). We have no specific information about the dates of the Sunbury factory, but we assume that it is contemporaneous with those operated by Augustus Oemler on St. Catherines Island (see table 1.1).

#### RECOMPUTING THE RESERVOIR AGE AND $\Delta R$

We have now generated an expanded control sample of prebomb molluscs that have been

dated by 16 independent  $^{14}\text{C}$  determinations on *Crassostrea virginica* samples from St. Catherines Island and surrounding waters (table 1.1). Following Reimer and Reimer (2001: 461), we will compute a correction for the regional variation from marine reservoir age ( $\Delta R$ ), then calibrate using the standard marine calibration curve (originally proposed by Stuiver, Pearson, and Braziunas, 1986 [and revised in Stuiver et al., 1998], per procedures outlined in Stuiver and Braziunas, 1993). Table 1.1 employs the following definitions, adopted from the Marine Reservoir Correction Database website (<http://www.calib.org/marine>; see also Reimer and Reimer, 2001):

**$^{14}\text{C}$  age B.P.** = conventional radiocarbon age (half-life = 5568 years; corrected for isotopic fractionation) as defined by Stuiver and Polach (1977)

**Reservoir age** = measured marine  $^{14}\text{C}$ -atmo-



Figure 1.3. The steam-operated oyster boiler installed by Howard Coffin on Sapelo Island and used roughly 1920–1930.

spheric  $^{14}\text{C}$  at time  $t$  (as defined by Stuiver, Pearson, and Braziunas, 1986)

$\Delta R$  = difference between the regional and global marine  $^{14}\text{C}$  = measured marine  $^{14}\text{C}$  – marine model  $^{14}\text{C}$  age at time  $t$ .

These terms and conventions, employed in table 1.1 are discussed in considerable detail elsewhere (Thomas, 2008: chap. 13); the previous estimates have been updated (below) using the newest available atmospheric and marine datasets.

**THE MEASURED  $^{14}\text{C}$  AGE:** We must first derive a measured  $^{14}\text{C}$  estimate for each modern, prebomb marine sample. Such conventional age estimates take the apparent  $^{14}\text{C}$  age normalized to a  $\Delta^{13}\text{C}$  value of  $-25\%$  of the PDB standard (Stuiver and Polach, 1977).

**THE ATMOSPHERIC  $^{14}\text{C}$  AGE:** The atmospheric age is derived from the IntCal04 calibration dataset (Reimer et al., 2004).

**THE GLOBAL MARINE  $^{14}\text{C}$  AGE:** The global marine  $^{14}\text{C}$  age is available from the decadal marine calibration dataset, Marine04 (Hughen et al., 2004).

**THE RESERVOIR AGE:** The reservoir age,  $R$ , is the difference between the measured marine  $^{14}\text{C}$  age and the atmospheric  $^{14}\text{C}$  for the year of collection for each modern sample. The error term in this case is based on counting statistics and the uncertainty in the marine calibration dataset (Reimer and McCormac, 2002: 163).

As before, the error term is given by the square root of the summed variances. Following current  $^{14}\text{C}$  protocols, we compute the central tendency of  $\Delta R$  values as the weighted mean of the individual  $\Delta R$  values (e.g., Reimer and Reimer, 2001; Reimer and McCormac, 2002).<sup>2</sup> Additionally, following Reimer and Reimer (2001: 461) and Reimer and Reimer (2001: 131), we define the uncertainty around the regional mean  $\Delta R$  as the maximum of (1) the standard deviation (the sigma mean based on the reported error in the conventional sample  $^{14}\text{C}$  shell ages) and (2) the scatter sigma (the square root of the variance divided by the number of samples).

For the  $N = 16$  samples listed in table 1.1, we calculate the regional  $\Delta R$  mean to be  $-119$   $^{14}\text{C}$  years B.P. The sigma mean for this sample is 15.5  $^{14}\text{C}$  years B.P. and the sigma scatter is 16.0  $^{14}\text{C}$  years B.P.; we will employ the larger value to estimate the error of the regional  $\Delta R$  mean.

To summarize: the new sample of 16 prebomb, known-age samples of *Crassostrea virgi-*

*nica* is now computed to be  $-119 \pm 16$   $^{14}\text{C}$  years B.P. The revised mean and error term are slightly less than the previously estimated St. Catherines Island reservoir correction of  $-134 \pm 26$   $^{14}\text{C}$  years B.P. (as derived in Thomas, 2008: chap. 13).

As a practical matter, these revised results make virtually no difference in the actual computation using the St. Catherines Island reservoir correction ( $\Delta R$ ), as is graphically evident in figure 1.5. Beta-242427, for instance, is a *Mercenaria mercenaria* sample from Back Creek Village (26Li207), a late prehistoric site on St. Catherines Island. The uncorrected  $^{14}\text{C}$  age is  $740 \pm 40$ , which can be readily converted into two-sigma ranges using the old and revised  $\Delta R$  from St. Catherines Island:

Previous St. C. Island $\Delta R$ ( $-134 \pm 26$ ) cal A.D. 1350–1540	Revised St. C. Island $\Delta R$ ( $-119 \pm 16$ ) cal A.D. 1400–1540
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Figure 1.5 also plots the differences in  $\Delta R$  for UGA-64, a date on *Crassostrea americana* from Stage II construction at Johns Mound, a St. Catherines period burial mound (Thomas and Larsen, 1982). The uncorrected  $^{14}\text{C}$  age is  $1090 \pm 60$ , which is readily converted into two-sigma ranges using the old and revised  $\Delta R$  from St. Catherines Island:

Previous St. C. Island $\Delta R$ ( $-134 \pm 26$ ) cal A.D. 1050–1290	Revised St. C. Island $\Delta R$ ( $-119 \pm 16$ ) cal A.D. 1060–1300
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Finally, figure 1.5 plots the differences in  $\Delta R$  for Beta-251769, a *Mercenaria* sample from the McQueen Shell Ring (Sanger and Thomas, 2010: table 3.1). The adjusted  $^{14}\text{C}$  age is  $3830 \pm 40$ :

Previous St. C. Island $\Delta R$ ( $-134 \pm 26$ ) 2150–1870 cal B.C.	Revised St. C. Island $\Delta R$ ( $-119 \pm 16$ ) 2130–1870 cal B.C.
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In all cases, the changes in calibration between previous and revised  $\Delta R$  values for St. Catherines Island are minimal.

It is important to note that the revised St. Catherines Island reservoir correction both refines and expands the usefulness of this  $\Delta R$  value. The negative mean  $\Delta R$  values found on St. Catherines Island and vicinity remain some of the most extreme values to be recorded anywhere in the world, differing considerably from those  $\Delta R$  estimates from

elsewhere along the Eastern Seaboard (Paula Reimer, personal commun.; Masteller, Thieler, and Horton, 2011, and Rick et al., 2011). Given the critical importance in melding marine and terrestrial  $^{14}\text{C}$  along this 1000-mile-long expanse, it is clear that much work remains to be done. The only comparable research was recently conducted along the Chesapeake Bay and Middle Atlantic coast (Masteller, Thieler, and Horton 2011; Rick et al., 2011). This recent increase in research into the local variability of marine reservoir corrections is heartening as it suggests that we are getting closer to building a database that will facilitate cross-regional comparability. This research also highlights the need for further microregional studies as  $\Delta R$  values varied by more than 250 years between samples drawn from less than 100 mi of one another (Masteller, Thieler, and Horton, 2011).

#### POTENTIAL ISSUES OF OCEANIC UPWELLING

Reservoir effects—the incorporation of ancient carbonates in living organisms—are today attributed primarily to upwelling, meaning that water from deeper ocean contexts is periodically brought upward and mixed with surface ocean water. When such upwelling is uncommonly high, the apparent  $^{14}\text{C}$  age of water can be in excess of 1000 years, in part because the slow mixing of deep ocean waters leaves the global marine radiocarbon reservoir depleted of  $^{14}\text{C}$  relative to the atmosphere. Even within somewhat restricted areas, localized upwelling can induce variations up to the equivalent of 200–300 years in the reservoir effects. Marine shell species can also be heavily influenced by the effects of estuaries, bayous, inland waterways, and bay environments

(Broecker and Olson, 1961). In such environments, living shell can also be seriously affected by the discharge of carbonate-rich freshwater, which causes variability in apparent ages of up to a millennium (Berger, Taylor, and Libby, 1966).

To date marine materials, it is essential to separate the  $^{14}\text{C}$  of the ocean surface from that of atmospheric  $\text{CO}_2$ . Regional patterns of  $\Delta R$  are controlled by diverse factors, including localized circulation patterns, the relative inflow of freshwater sources (presumably carrying older carbonates), spatial variations in upwelling, water mass mixing, and variable air–sea gas exchange.  $\Delta R$  values can likewise vary in marine mollusc samples due to species, habitat, and/or substrate (Dye, 1994; Forman and Polyak, 1997; Hogg, Higham, and Dahm, 1998; Reimer and Reimer, 2001). In areas where waters are continuously exchanged with open ocean water and vertically well mixed (with concentrated upwelling offshore), reservoir effects tend to increase. Estuarine processes and dilution by fresh water most likely reduce reservoir effects within tidal waters.

Kennett and Culleton (2012) demonstrate how annual growth increment studies of hard clams (*Mercenaria mercenaria*) can today be integrated into a program of high-precision AMS  $^{14}\text{C}$  dating (e.g., O'Brien and Thomas, 2008; Quitmyer and Jones, 2012). These studies are ongoing, and the specifics of wiggle-matching and Bayesian modeling are beyond the present scope; but recent radiocarbon results from this approach are relevant to our consideration of reservoir effects on St. Catherines Island and elsewhere.

In the previous consideration of the reservoir offset on St. Catherines Island, Thomas (2008: chap. 13) assumed marine upwelling to be minimal, reflecting a greater than average mixing



Figure 1.4. This 1906 photograph shows the Shell Bluff Canning Company, located at Valona, on Shell Bluff Creek (Sullivan, 2000a).

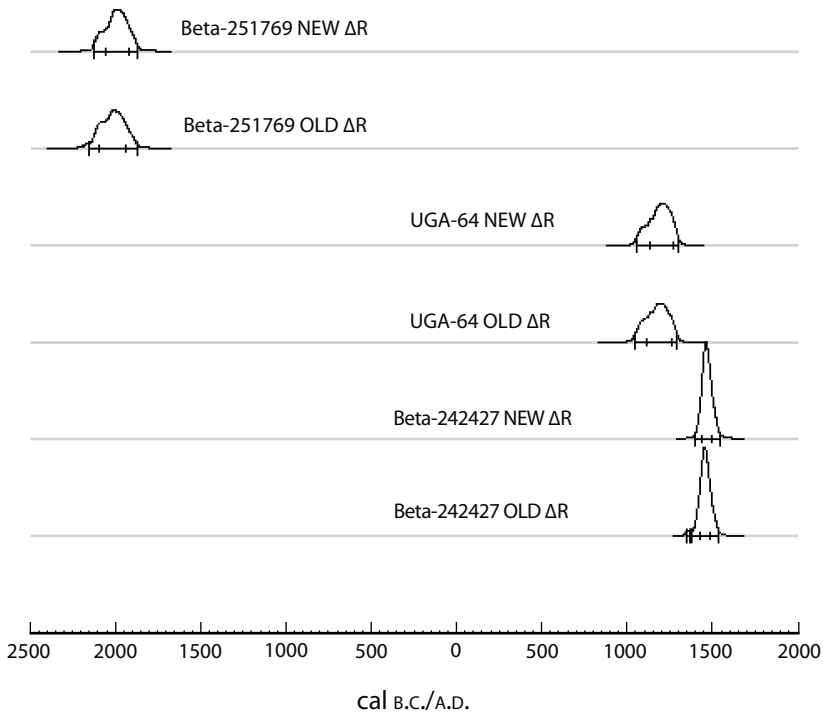


Figure 1.5. Graph showing the minimal effects involved in recomputing the revised St. Catherines Island reservoir correction.

of atmospheric carbon compared to the global marine model age. But as Kennett and Culleton (2012) have emphasized, this assumption requires testing and we can now do this.

#### SEASONAL VARIABILITY IN $\Delta R$

Based on an exhaustive study of hard clams recovered from the McQueen Shell Ring (Sanger and Thomas, 2010), Quitmyer and Jones (2012) determined that the *Mercenaria* valves recovered from the “clam floor” feature were intensively harvested during a very narrow period of time during winter and spring seasons. They further determined through age-based analysis that the zooarchaeological population represented at the McQueen Shell Ring was dominated by individuals between two and six years of age. In contrast to modern baseline studies, this zooarchaeological collection was nearly devoid of hard clams living longer than six years.

In a recent experiment with important implications for our understanding of the reservoir correction on St. Catherines Island, Quitmyer selected the single oldest individual analyzed in the “clam floor” zooarchaeological assemblage from the McQueen Shell Ring. This eight-year-old individual valve, previously sectioned for annual incremental analysis, was submitted to the Archaeometry Laboratory at the University of Oregon, where Douglas Kennett and Brendan Culleton removed microdrilled samples for AMS dating at the Keck Carbon Cycle AMS Facility, Earth System Science Department, University of California, Irvine. Five AMS dates were processed on this single *Mercenaria* valve—three from the opaque (winter) incremental bands and two from the translucent (spring, summer, fall) growth ring—as indicated in figure 1.6 and table 1.2.

Specifically with respect to the issues sur-

rounding the variability of  $\Delta R$ —within a single year, through deeper time, and across space—several points emerged from this pilot study. For one thing, the sequential, high-precision dating of this single *Mercenaria* valve makes it crystal clear that the marine reservoir surrounding St. Catherines Island is extraordinarily stable on a season-to-season basis. This portion of the Georgia Bight is totally lacking in the radical fluctuations within the annual cycle caused by varying supplies of old carbon resulting from upwelling, as noted elsewhere in the world (e.g., Kennett et al., 1997; Culleton et al., 2006). We have previously assumed this to be true, but this is the first empirical evidence that effectively tests this important assumption.

#### DOES $\Delta R$ REMAIN CONSTANT THROUGH TIME IN THE GEORGIA BIGHT?

We initially assumed that the global reservoir  $^{14}\text{C}$  age of the ocean's surface water has remained stable through time on St. Catherines Island (and there is some support for this assumption; e.g., Reimer and Reimer, 2001). But other studies have found that local marine  $\Delta R$

values have fluctuated through time, due primarily to changing patterns of ocean circulation or regional upwelling in which deeper, older water may cause  $\Delta R$  to vary temporally (e.g., Ingram and Southon, 1996; Kennett et al., 1997; Deo, Stone, and Stein, 2004).

Recent research by Timothy Chowns and his colleagues suggests another mechanism through which differential carbon uptake and  $\Delta R$  shifts might have occurred in the waters surrounding St. Catherines Island. Chowns (2002) and Chowns et al. (2008) argue that rising sea levels over the last few thousand years have caused a number of inlets along the Georgia coast to become straighter. This change in drainage pattern has caused some inlets (such as St. Simons Sound, Sapelo Sound, and Ossabaw Sound) to become broader, while others have narrowed (viz. St. Andrews and St. Catherines sounds; see also Chowns, 2011). Chowns et al. (2008) have demonstrated this “jumping inlet” pattern of stream capture for the Brunswick River, which, prior to about 1480 B.P., entered the Atlantic Ocean south of Jekyll Island. But rising sea level “encouraged the river” to follow a more direct route and empty instead to the north of Jekyll.

TABLE 1.2  
Calibrated Results for  $^{14}\text{C}$  Transect Across Single *Mercenaria* Valve  
from McQueen Shell Ring, St. Catherines Island

Lab ID	Seasonality	$^{14}\text{C}$ Age B.P.	Radiocarbon age calibrated ( $\pm 2\sigma$ )
UCIAMS-80932	O1, Year 2, Winter	3870 $\pm$ 20	2460–2290 cal B.C.
UCIAMS-80933	T1-3, Year 3, Spring, Summer, or Fall	3900 $\pm$ 20	2470–2310 cal B.C.
UCIAMS-80934	O1, Year 4, Winter	3910 $\pm$ 20	2320–2310 cal B.C.
UCIAMS-80935	T1-3, Year 6, Spring, Summer, or Fall	3915 $\pm$ 20	2470–2340 cal B.C.
UCIAMS-80936	O1, Year 8, Winter	3950 $\pm$ 20	2460–2210 cal B.C.

If similar patterns of relocation hold further to the north, then redirection of the Altamaha and Ogeechee rivers could significantly change the distribution of ancient carbonates from the various catchments on the Piedmont. With these possibilities in mind, we have been seeking ways of monitoring  $\Delta R$  shifts in the archaeological sites of St. Catherines Island.

One productive avenue comes from the McQueen Shell Ring study discussed in the previous section. As indicated in table 1.2, the five AMS dates processed on the same *Mercenaria* valve are statistically the same ( $t = 7.8$ ;  $\chi^2_{0.05} = 9.49$ ), with a pooled mean age of  $3889 \pm 6.3$   $^{14}\text{C}$  years. Applying the revised St. Catherines Island reservoir correction ( $-119 \pm 16$   $^{14}\text{C}$  years), the pooled mean *Mercenaria* age converts to 2150–1980 cal B.C. Several contemporary terrestrial samples are available from the correlative stratum at the McQueen Shell Ring, but the most precise comparison comes from two recent AMS dates on hickory nut fragments (cited in Sanger and Thomas, 2010: table 3.1; see also table 1.4, this chapter). Figure 1.6 demonstrates how the revised St. Catherines Island reservoir correction shows the near-complete overlap and agreement in the probability distributions of the composite marine mean and the two terrestrial samples.

A second, related point also emerges from figure 1.6. Despite the close agreement between the marine and terrestrial dates, they are statistically different from one another ( $t = 34.63038$ ;  $\chi^2_{0.05} = 5.99$ ). This counterintuitive result underscores a major point made recently by Kennett and Culleton (2012):

Radiocarbon dates with large analytical error reflect poor precision, but also undermine accuracy by increasing the range of accurate calendar ages that could produce the measure age. This compromises our ability to determine if two sites with seasonality data are contemporary or not ... *put simply, low precision dates are more likely to appear contemporaneous, even with a generally robust statistical test, than high-precision dates* [emphasis added].

This is precisely what happened in figure 1.6: despite the overlapping and virtually identical probability distributions, the precise error terms involved in both the composite marine and two

terrestrial samples make it extremely difficult to establish statistical contemporaneity. Such high-precision comparisons will become increasingly important as we pursue multiscale approaches to site contemporaneity and seasonality.

We can also approach the issue of potentially fluctuating  $\Delta R$  values by examining paired terrestrial and marine samples from secure archaeological contexts. One problem with the previous “test” was that most of the 11 paired samples (Thomas, 2008: chap. 13) derived almost entirely from late prehistoric (Irene) contexts, with only two of the pairs coming from pre-Irene contexts; none of the  $^{14}\text{C}$  ages were older than 2000  $^{14}\text{C}$  yr B.P. (Thomas, 2008: table 13.1).<sup>3</sup> To test the proposition that  $\Delta R$  values might shift through time, we have been systematically collecting paired charcoal-marine shell dates during our more recent excavations, including the two contemporary Late Archaic shell rings on St. Catherines Island—the McQueen Shell Ring (9Li1648) and St. Catherines Shell Ring (9Li231)—two sites that were occupied approximately 2500–2000 cal B.C. (Sanger and Thomas, 2010). In the case studies below, we will employ a simple simulation method to seek the effects of changing  $\Delta R$  values by examining 15 different marine-terrestrial pairs from our St. Catherines Island research (table 1.3).

The selection criteria were fairly straightforward. Based on archaeological provenience information, we decided whether it was reasonable that two marine-terrestrial samples *could be assumed* to have shared behavior contemporaneity; this is entirely a subjective determination. Then, once the radiocarbon dates were processed, we returned to these paired dates; if the two samples returned “approximately contemporary”  $^{14}\text{C}$  results, we retained the pair for additional analysis. As a practical matter, we usually required that the mean difference in  $^{14}\text{C}$  ages be less than two or three centuries (although we did include a couple of more extreme cases on table 1.4, for comparison purposes).

Clearly, this selection process is problematic, arbitrary, and prone to error. But as a practical matter, we thought it better to include a broader range of dated pairs than to hyperselect only a handful of potential pairs (a process that could seriously bias the outcome). And selectivity aside, we must emphasize again the intuitive nature of any assumption that two samples are in fact behaviorally contemporaneous.

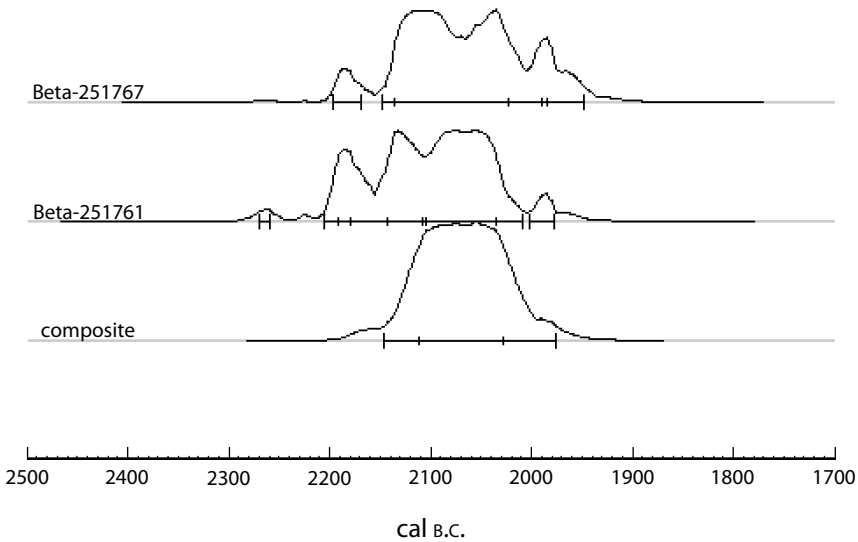


Figure 1.6. Probability profiles comparing the composite age for the *Mercenaria* sample from the McQueen Shell Ring (fig. 1.8 and table 1.4) with two closely correlated terrestrial  $^{14}\text{C}$  samples.

#### THE PAIRED SAMPLES FROM ST. CATHERINES ISLAND LATE ARCHAIC CONTEXTS

PAIR A1: MCQUEEN SHELL RING (9Li648): Table 1.3 compares a charred organic sample (Beta-251761, processed by AMS) from N243 E233 (4.3–4.2 m) with a *Mercenaria mercenaria* sample (Beta-251769) from the same excavation unit within 20 cm of each other, processed by conventional radiometric analysis. The mean age of the clam sample is 110  $^{14}\text{C}$  years older than the terrestrial sample (fig. 1.7).

The calibration issue can be approached in two rather different ways. Employing the IntCal09 dataset, we find that the terrestrial sample (Beta-251761) converts to an age estimate of 2280–1980 cal B.C. Using the revised St. Catherines Island  $\Delta R$  value derived above ( $-119 \pm 16$ ) and the Marine09 dataset, the hard clam radiocarbon date calibrates to 2130–1870 cal B.C. By using the revised St. Catherines Island  $\Delta R$ , the two dates largely overlap one another.

These results certainly confirm the application of the revised St. Catherines Island reservoir correction on paired samples nearly 4000 years old. But in this section, we are questioning whether this reservoir correction has remained unchanged over this time span, and another approach seems

warranted as well.

Figure 1.8 shows a simple simulation designed to determine goodness-of-fit across a range of reservoir correction values. The bottom curve arrays the probability profile for the terrestrial sample discussed above (Beta-251761). The upper seven probability profiles array the *Mercenaria* sample (Beta-251769), calibrated with a series of reservoir corrections at five-decade increments ranging from  $50 \pm 25$   $^{14}\text{C}$  years to  $-250 \pm 25$   $^{14}\text{C}$  years.

Whereas the revised St. Catherines reservoir correction ( $-119 \pm 16$   $^{14}\text{C}$  years) effectively calibrates the marine sample relative to its terrestrial match, figure 1.6 clearly demonstrates that the best calibration fit for pair A1 derives from a simulated reservoir correction of  $-225 \pm 25$   $^{14}\text{C}$  years.

PAIR A2: MCQUEEN SHELL RING (9Li648): Table 1.3 compares the same charred organic sample in pair A1 (Beta-251761) with a different *Mercenaria mercenaria* sample (Beta-251762) from the same provenience, both processed by AMS dating. The mean age of the clam sample is 100  $^{14}\text{C}$  years older than the terrestrial sample.

The terrestrial sample (Beta-251761) converts to an age estimate of 2280–1980 cal B.C. Applying the revised St. Catherines Island reservoir



TABLE 1.3  
**Calibrated Results for Paired Charcoal-Marine <sup>14</sup>C Age Determinations  
 from St. Catherines Island**

Lab ID	Species	<sup>14</sup> C Age B.P.	Radiocarbon age calibrated ( $\pm 2\sigma$ )
<b>Pair A1: McQueen Shell Ring (9Li648), N243 E233, 4.3–4.2 m</b>			
Beta-251769	<i>Mercenaria mercenaria</i>	3830 $\pm$ 40	2130–1870 cal B.C.
Beta-251761	Charred material	3720 $\pm$ 40	2280–1980 cal B.C.
<b>Pair A2: McQueen Shell Ring (9Li648), N243 E233, 4.5–4.4 m</b>			
Beta-251762	<i>Mercenaria mercenaria</i>	3820 $\pm$ 50	2140–1820 cal B.C.
Beta-251761	Charred material	3720 $\pm$ 40	2280–1980 cal B.C.
<b>Pair B: McQueen Shell Ring (9Li648), Feature 38NE</b>			
Beta-258562	<i>Mercenaria mercenaria</i>	3810 $\pm$ 50	2120–1850 cal B.C.
Beta-258561	Charred material	3710 $\pm$ 50	2210–1950 cal B.C.
<b>Pair C: McQueen Shell Ring (9Li648), N243 E233, 4.4–4.3 m</b>			
Beta-251768	<i>Mercenaria mercenaria</i>	3910 $\pm$ 40	2240–1960 cal B.C.
Beta-251767	Charred material	3680 $\pm$ 40	2200–1950 cal B.C.
<b>Pair D1: McQueen Shell Ring (9Li648), N272 E200, 5.1–5.0 m</b>			
Beta-251765	<i>Mercenaria mercenaria</i>	3990 $\pm$ 50	2390–2040 cal B.C.
Beta-251766	Charred material	3800 $\pm$ 40	2440–2060 cal B.C.
<b>Pair D2: McQueen Shell Ring (9Li648), N272 E200, 5.1–5.0 m/5.3–5.2 m</b>			
Beta-251765	<i>Mercenaria mercenaria</i>	3990 $\pm$ 50	2390–2040 cal B.C.
Beta-251764	Charred material	3710 $\pm$ 40	2210–1980 cal B.C.
<b>Pair E1: St. Catherines Shell Ring (9Li231), N771 E819, 2.39–2.3 m</b>			
Beta-238336	<i>Mercenaria mercenaria</i>	4390 $\pm$ 60	2890–2570 cal B.C.
Beta-238337	Charred material	3860 $\pm$ 60	2460–2210 cal B.C.
<b>Pair E2: St. Catherines Shell Ring (9Li231), N771 E819, 2.39–2.3 m</b>			
Beta-238336	<i>Mercenaria mercenaria</i>	4390 $\pm$ 60	2890–2570 cal B.C.
Beta-273291	Direct sherd date	3980 $\pm$ 40	2580–2350 cal B.C.
<b>Pair F: Back Creek Village (9Li207), N488 E495, 49.79-.49 cm</b>			
Beta-242426	<i>Mercenaria mercenaria</i>	600 $\pm$ 40	cal A.D. 1500–1670
Beta-249873	Charred maize	450 $\pm$ 40	cal A.D. 1410–1620
<b>Pair G: Back Creek Village (9Li207), Test Pit IV, 48.88-48.68 cm</b>			
Beta-242421	<i>Mercenaria mercenaria</i>	760 $\pm$ 40	cal A.D. 1380–1530
Beta-249874	Charred maize	410 $\pm$ 40	cal A.D. 1430–1630
<b>Pair H1: Marys Mound (9Li20), Burial 2 (Thomas and Larsen, 1982)</b>			
UGA-1685	<i>Crassostrea americana</i>	1090 $\pm$ 60	cal A.D. 1060–1300
Beta-225470	Human bone	1030 $\pm$ 40	cal A.D. 900–1150
<b>Pair H2: Marys Mound (9Li20), Burial 6 (Thomas and Larsen, 1982)</b>			
UGA-1685	<i>Crassostrea americana</i>	1090 $\pm$ 60	cal A.D. 1060–1300
Beta-225473	Human bone	910 $\pm$ 40	cal A.D. 1030–1210
<b>Pair I1: Johns Mound (9Li18), Burial 10/Stage II (Thomas and Larsen, 1982)</b>			
UGA-64	<i>Crassostrea americana</i>	1190 $\pm$ 60	cal A.D. 980–1240
Beta-225475	Human bone	1070 $\pm$ 40	cal A.D. 890–1020
<b>Pair I2: Johns Mound (9Li18), Central Pit/Stage II (Thomas and Larsen, 1982)</b>			
UGA-64	<i>Crassostrea americana</i>	1190 $\pm$ 60	cal A.D. 980–1240
UGA-61	Unidentified charcoal	900 $\pm$ 60	cal A.D. 1020–1250
<b>Pair J: Seaside Mound I (9Li26), Central Tomb/Feature 15 (Thomas and Larsen, 1979: table 4)</b>			
UGA-1826	<i>Crassostrea americana</i>	1630 $\pm$ 60	cal A.D. 515–780
UGA-112	Unidentified charcoal	1430 $\pm$ 115	cal A.D. 390–870

TABLE 1.4  
**Comparison of 15 Pairs of Marine and Terrestrial  $^{14}\text{C}$  Ages from  
 St. Catherines Island**  
 (mean terrestrial/marine age disparity  $\leq 200$   $^{14}\text{C}$  years highlighted in gray)

Approximate age cal A.D./B.C.	Simulated reservoir correction Range $^{14}\text{C}$ years	Mean terrestrial/marine disparity $^{14}\text{C}$ years	Pair designation
cal A.D. 1500	(-50 – -100)	350	Pair G (Back Creek Village)
cal A.D. 1425	(-150 – -200)	290	Pair F (Back Creek Village)
cal A.D. 1150	(-75 – -125)	100	Pair I2 (Johns Mound)
cal A.D. 1100	(-175 – -225)	120	Pair H2 (Marys Mound)
cal A.D. 1000	(~ 300)	60	Pair H1 (Marys Mound)
cal A.D. 950	(-225 – -275)	120	Pair I1 (Johns Mound)
cal A.D. 600	(-125 – -175)	200	Pair J (Seaside Mound I)
2050 cal B.C.	(-50 – -100)	230	Pair C (McQueen Shell Ring)
2100 cal B.C.	(-200 – -250)	100	Pair B (McQueen Shell Ring)
2100 cal B.C.	(-200 – -250)	100	Pair A2 (McQueen Shell Ring)
2100 cal B.C.	(-25 – -75)	280	Pair D2 (McQueen Shell Ring)
2100 cal B.C.	(-200 – -250)	110	Pair A1 (McQueen Shell Ring)
2250 cal B.C.	(-125 – -175)	190	Pair D1 (McQueen Shell Ring)
2300 cal B.C.	(~+100)	530	Pair E1 (St. Catherines Shell Ring)
2450 cal B.C.	(~+50)	410	Pair E2 (St. Catherines Shell Ring)

correction to the Marine09 dataset, Beta-251762 converts to 2140–1820 cal B.C. As with the first pair of radiocarbon results, the application of the revised St. Catherines Island  $\Delta R$  generally brings these two dates into agreement.

Whereas the revised St. Catherines reservoir correction ( $-119 \pm 16$   $^{14}\text{C}$  years) effectively calibrates the marine sample relative to its terrestrial match, the simulated goodness-of-fit across a range of reservoir correction values demonstrates that the best fit for pair A2 is a reservoir correction of  $-225 \pm 25$   $^{14}\text{C}$  years.

PAIR B: MCQUEEN SHELL RING (9Li648): Table 1.3 compares a charred organic sample from Feature 38 NE (Beta-258561) with a correlative *Mercenaria mercenaria* sample (Beta-258562) from the same provenience, both processed by AMS dating. The mean age of the clam sample is 100  $^{14}\text{C}$  years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2210–1950 cal B.C.

Applying the revised St. Catherines Island

reservoir correction to the Marine09 dataset, Beta-251762 converts to 2120–1850 cal B.C.

These results echo the findings for pairs A1 and A2: Although the revised St. Catherines reservoir correction ( $-119 \pm 16$   $^{14}\text{C}$  years) effectively calibrates the marine sample relative to its terrestrial match, the simulated goodness-of-fit across a range of reservoir correction values demonstrates that the best fit for pair A2 is a reservoir correction of  $-225 \pm 25$   $^{14}\text{C}$  years.

PAIR C: MCQUEEN SHELL RING (9Li648): Table 1.3 compares a charred organic sample from N243 E233, 4.4–4.3 m (Beta-251767) with a correlative *Mercenaria mercenaria* sample (Beta-251768) from the same provenience, both processed by AMS dating. The mean age of the clam sample is 230  $^{14}\text{C}$  years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2200–1950 cal B.C. Applying the revised St. Catherines Island reservoir correction to the Marine09 dataset, Beta-251768 converts

to 2240–1960 cal B.C. The application of the St. Catherines Island  $\Delta R$  brings these two dates into near perfect concordance. The simulated goodness-of-fit suggests that the best calibration fit for pair C is a reservoir correction of  $-75 \pm 25$  <sup>14</sup>C years.

PAIR D1: McQUEEN SHELL RING (9Li648): Table 1.3 compares a charred organic sample from N272 E200, 5.1–5.0 m (Beta-251766), processed by AMS dating with a correlative *Mercenaria mercenaria* sample (Beta-251765) from the same provenience, processed by conventional radio-

metric dating. The mean age of the clam sample is 190 <sup>14</sup>C years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2440–2060 cal B.C. Applying the revised St. Catherines Island reservoir correction to the Marine09 dataset, Beta-251765 converts to 2390–2040 cal B.C. Again, the application of the revised St. Catherines reservoir correction ( $-119 \pm 16$  <sup>14</sup>C years) calibrates the dates to near perfect concordance. The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit

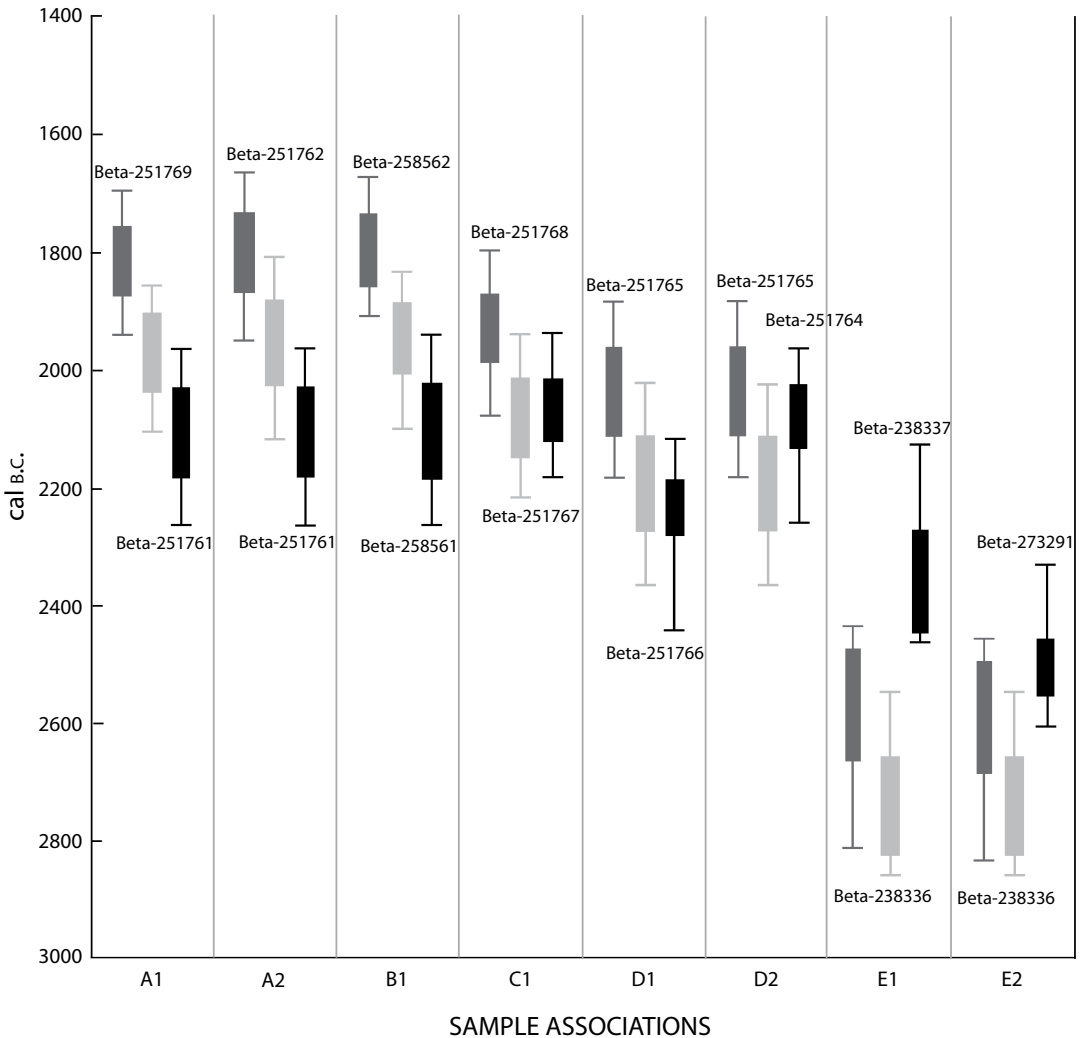


Figure 1.7. Paired samples from Late Archaic contexts on St. Catherines Island. The lightest gray symbols demonstrate the application of  $\Delta R$ .

for pair D1 derives from a reservoir correction of  $-150 \pm 25$   $^{14}\text{C}$  years. In this case, the St. Catherines reservoir correction *undercorrected* the marine result.

PAIR D2: McQUEEN SHELL RING (9Li648): Table 1.3 compares a terrestrial sample from N272 E200 5.3–5.2 m (Beta-251764), with the same correlative *Mercenaria mercenaria* sample employed in D1 (Beta-251765), processed by AMS dating. The mean age of the clam sample is 280  $^{14}\text{C}$  years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2210–1980 cal B.C. As before, Beta-251765 converts to 2390–2040 cal B.C., bringing the two dates significantly closer together than they would be without the revised St. Catherines Island reservoir correction.

The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair D2 derives

from a reservoir correction of  $-50 \pm 25$   $^{14}\text{C}$  years. In this case, the St. Catherines reservoir correction *overcorrected* the marine result.

PAIR E1: ST. CATHERINES SHELL RING (9Li231): We have derived three possible pairs of samples from a single provenience at the St. Catherines Shell Ring. Table 1.3 compares a charred organic sample from N771 E819, 2.39–2.3 m (Beta-238337), processed by AMS dating with a correlative *Mercenaria mercenaria* sample (Beta-238336) from the same provenience, processed by conventional radiometric dating. The mean age of the clam sample is 530  $^{14}\text{C}$  years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2460–2210 cal B.C. Applying the revised St. Catherines Island reservoir correction to the Marine04 dataset, Beta-238336 converts to 2890–2570 cal B.C.

The revised St. Catherines reservoir correc-

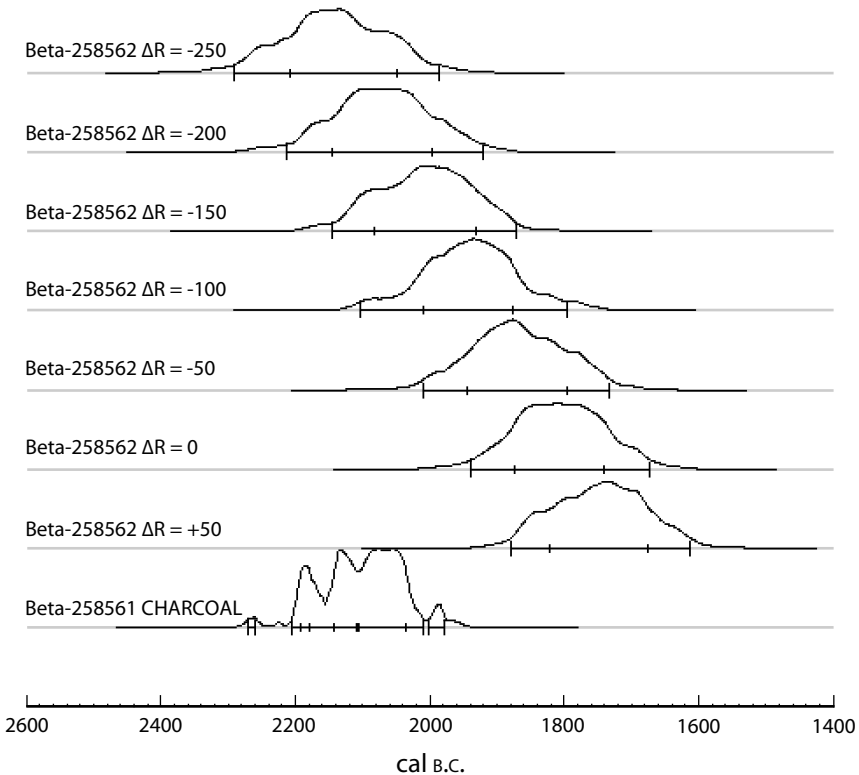


Figure 1.8. Simulated reservoir correction values for the pair A1 samples from the McQueen Shell Ring.

tion ( $-119 \pm 16$  <sup>14</sup>C years) does not calibrate the marine sample relative to the terrestrial match. The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair E1 would require a reservoir correction of roughly  $100 \pm 25$  <sup>14</sup>C years. Given the disparity in mean <sup>14</sup>C age between these two samples, it's a stretch to believe that pair E1 is behaviorally contemporary.

PAIR E2: ST. CATHERINES SHELL RING (9Li231): This is the final possible pair of samples from this provenience. Table 1.3 compares a direct date on organics contained within a fiber-tempered sherd from N771 E819, 2.39–2.30 m (Beta-273291), processed by AMS dating with a correlative *Mercenaria mercenaria* sample (Beta-238336) from the same provenience, processed by conventional radiometric dating. The mean age of the clam sample is 410 <sup>14</sup>C years older than the terrestrial sample.

The terrestrial sample converts to an age estimate of 2580–2350 cal B.C. Applying the revised St. Catherines Island reservoir correction to the Marine09 dataset, Beta-238336 converts to 2890–2570 cal B.C.; these calibrated estimates barely overlap with one another. Although there is a wide disparity in mean age of these two samples, the simulated goodness-of-fit shows the best calibration fit for pair E3 would require a reservoir correction of roughly  $50 \pm 25$  <sup>14</sup>C years. It seems likely that our attempt to directly date the fiber-tempered sherd failed and we instead dated more recent materials that do not accurately reflect the actual usage and deposition of the sherd.

#### THE PAIRED SAMPLES FROM ST. CATHERINES ISLAND LATE PREHISTORIC CONTEXTS

PAIR F: BACK CREEK VILLAGE (9Li207): Table 1.3 compares a charred maize sample from N493 E495, 49.75–49.65 cm (Beta-249873) with a correlative *Mercenaria mercenaria* sample (Beta-242426; both processed by AMS dating). The mean age of the clam sample is 290 <sup>14</sup>C years older than the maize sample (fig. 1.9).

The maize sample converts to an age estimate of cal A.D. 1410–1620 and the hard clam sample converts to cal A.D. 1380–1540, using the revised St. Catherines Island reservoir correction. As with many of the other samples, the application of the revised St. Catherines Island reservoir correction brings the two dates into near concordance.

The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair F requires a reservoir correction of  $-175 \pm 25$  <sup>14</sup>C years.

PAIR G: BACK CREEK VILLAGE (9Li207): Table 1.3 compares a charred maize sample from test pit IV, 48.78–48.69 cm (Beta-249874) with a correlative *Mercenaria mercenaria* sample (Beta-242421; both processed by AMS dating). The mean age of the clam sample is 350 <sup>14</sup>C years older than the maize sample. The maize sample converts to an age estimate of cal A.D. 1430–1630 and the hard clam sample converts to cal A.D. 1380–1530, using the revised St. Catherines Island reservoir correction. These calibrated estimates are nearly identical to one another.

The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair G requires a reservoir correction of  $-75 \pm 25$  <sup>14</sup>C years to close the gap.

PAIR H1: MARYS MOUND (9Li20): Table 1.3 compares a charred maize sample from burial 2 (Beta-225470), processed by AMS dating with a correlative *Mercenaria mercenaria* sample from Stage II construction (UGA-1685, processed by conventional radiometric dating). The mean age of the oyster shell sample is 60 <sup>14</sup>C years older than the maize sample.

The human bone sample converts to an age estimate of cal A.D. 900–1150 and the oyster sample converts to cal A.D. 1060–1300, using the revised St. Catherines Island reservoir correction.

Given the broad age spread between the mean dates, it seems unlikely that these two samples date contemporaneous events. But if they do, then the revised St. Catherines reservoir correction far *undercalibrates* the marine sample relative to its terrestrial match (at a level of 0.05 statistical significance). The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair H1 requires a reservoir correction of  $-300 \pm 25$  <sup>14</sup>C years to close the gap.

PAIR H2: MARYS MOUND (9Li20): Table 1.3 compares a charred maize sample from burial 6 (Beta-225473), processed by AMS dating with the same correlative *Mercenaria mercenaria* sample used in pair H1 (UGA-1685). The mean age of the oyster shell sample is 120 <sup>14</sup>C years older than the maize sample.

The human bone sample converts to an age

estimate of cal A.D. 1030–1210 and, as before, the oyster sample converts to cal A.D. 1060–1300, using the revised St. Catherines Island reservoir correction. These calibrated estimates are relatively similar to one another, although they are not in perfect concordance.

The simulated goodness-of-fit across a range of possible reservoir correction values indicates

that the best calibration fit for pair H2 requires a reservoir correction of  $-200 \pm 25$   $^{14}\text{C}$  years to close the gap.

PAIR II: JOHNS MOUND (9Li18): Table 1.3 compares a human bone sample from burial 10 (Beta-225475), processed by AMS dating with a correlative *Crassostrea* sample from Stage II mound construction (UGA-64). The mean age

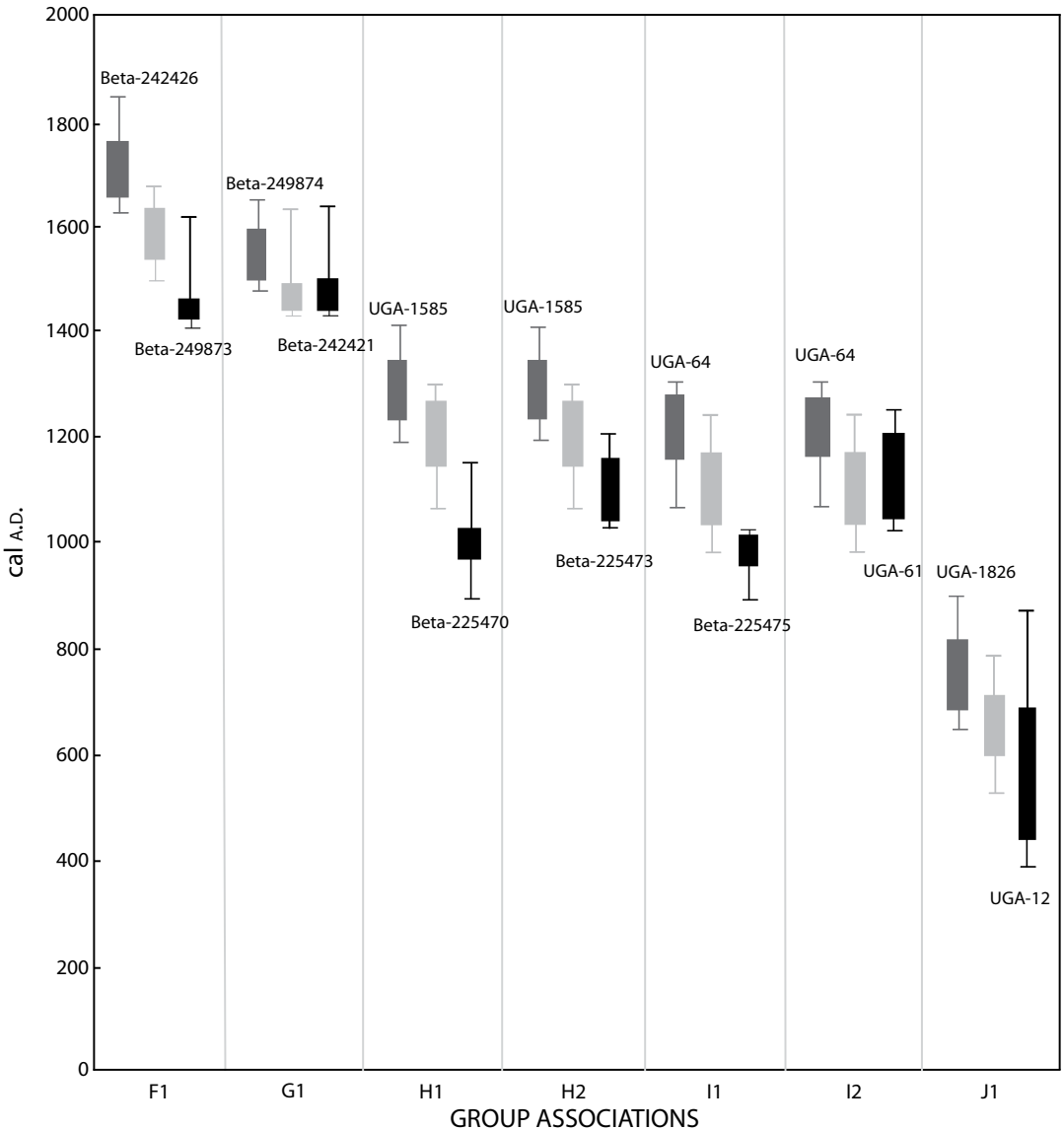


Figure 1.9. Paired samples from Late Prehistoric contexts on St. Catherines Island. The lightest gray symbols demonstrate the application of  $\Delta R$ .

of the oyster shell sample is 120  $^{14}\text{C}$  years older than the human bone sample.

The bone sample converts to an age estimate of cal A.D. 890–1020 and the oyster sample converts to cal A.D. 980–1240, using the revised St. Catherines Island reservoir correction. These calibrated estimates largely overlap one another, although the best calibration fit for pair I1 requires a reservoir correction of  $-250 \pm 25$   $^{14}\text{C}$  years.

PAIR I2: JOHNS MOUND (9Li18): Table 1.3 compares a human bone sample from charcoal found in the Central Pit (UGA-61) and the correlative *Crassostrea* sample (employed in pair I1) from Stage II mound construction (UGA-64), both processed by conventional radiometric methods. The mean age of the oyster shell sample is 100  $^{14}\text{C}$  years older than the Central Pit charcoal.

The charcoal sample converts to an age estimate of cal A.D. 1020–1250 and the oyster sample converts to cal A.D. 980–1240, using the revised St. Catherines Island reservoir correction. These calibrated estimates are nearly identical. The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair I2 requires a reservoir correction of  $-100 \pm 25$   $^{14}\text{C}$  years to close the gap.

PAIR J: SEASIDE MOUND I (9Li26): Table 1.3 compares a charcoal sample from the Central Tomb (UGA-112) with a correlative *Crassostrea* sample from Feature 15 (UGA-1826). The mean age of the oyster shell sample is 200  $^{14}\text{C}$  years older than the charcoal sample.

UGA-112 converts to an age estimate of cal A.D. 390–870 and the oyster sample converts to cal A.D. 515–780, using the revised St. Catherines Island reservoir correction. These calibrated estimates are almost identical. The simulated goodness-of-fit across a range of possible reservoir correction values indicates that the best calibration fit for pair J is  $-150 \pm 25$   $^{14}\text{C}$  years, a value quite close to the revised St. Catherines  $\Delta R$ .

## DISCUSSION

This section addressed the question of whether  $\Delta R$  remained relatively constant in the waters surrounding St. Catherines Island during the late Holocene. The most satisfying results came from the transect of five  $^{14}\text{C}$  dates across

the seasonal increments accumulated on an eight-year-old *Mercenaria* from the McQueen Shell Ring. The fact that all five radiocarbon samples, with a pooled mean of 2150–1980 cal B.C., generated an extremely close fit with two closely associated hickory nut fragments is strong evidence for continuity in  $\Delta R$  values across the last 4000 years. But, importantly, the marine and terrestrial dates were not indistinguishable, underscoring the point that increased precision in the radiocarbon dating process carries with it the need to reconsider the issue of contemporaneity in fine-grained archaeological assemblages.

Less satisfying are the results from the 15 paired archaeological samples in table 1.3. These samples were selected to enhance the variability contained within the available radiocarbon record, and that variability carried through to the results of the data. These results have been tallied on table 1.4, and some impressions are in order. Of the 15 pairs, only three (H1, E1, and E2) have very large (more than 150 years) differences between their calibrated returns and their best-fit corrections. All of these pairs appeared to be flawed comparisons in that the materials being dated were not behaviorally contemporaneous. Of the remaining 12 pairs, half are within 55 years of their best-fit corrections when calibrated using the updated St. Catherines Island reservoir correction.

Unfortunately, there does not appear to be any consistent variation between the date of the samples and their relation to their best-fit corrections. The most ancient dates have an equivalently variable relation between their best-fit and corrected dates as the more recent dates.

Generally, the paired dates suggest that the remarkably high negative value of the St. Catherines Island reservoir correction is accurate, and if anything, the value is not negative enough. Ignoring the two pairs from the St. Catherines Island Shell Ring (E1 and E2), which appear to be flawed, only one of the returns (D2) suggests that the St. Catherines Island reservoir correction is overcorrecting our results.

## CONCLUSIONS

This paper emphasized the necessity of explicitly exploring the nature of reservoir corrections along the Georgia Bight. Refining previous research by Thomas (2008: chap. 13), we took a number of new samples from known-age, pre-

bomb shells of *Crassostrea virginica* and derived a new reservoir correction of  $-119 \pm 16$   $^{14}\text{C}$  years B.P., a value slightly less extreme than the previous estimate of  $-134 \pm 26$   $^{14}\text{C}$  years B.P. (as derived in Thomas, 2008: chap. 13). This revision both refines and expands the usefulness of this  $\Delta R$  value. By employing sequential, high-precision dating across a single *Mercenaria* valve, we determined that the marine reservoir surrounding St. Catherines Island has been extraordinarily stable on a season-to-season basis. This portion of the Georgia Bight is totally lacking in the radical fluctuations within the annual cycle caused by varying supplies of old carbon resulting from upwelling, as noted elsewhere in the world. Finally, we ran numerous experiments attempting to determine whether the St. Catherines Island reservoir correction changes through time and we found no evidence of such change.

With respect to future research, we suspect that increasingly high-precision radiocarbon sampling and technology will allow more fine-grained approximations of  $\Delta R$  values relevant to archaeological applications.

## NOTES

1. We gratefully acknowledge the St. Catherines Island and Edward John Noble foundations for their long-term support of archaeological research on the island. We are particularly grateful to Buddy Sullivan, Jack Waters, and Jeff Woods for their assistance in obtaining new known-age, prebomb oyster shell samples in Liberty and McIntosh counties, Georgia. We also acknowledge the assistance of Douglas Kennett and Brendan Culleton in processing the new high-precision samples from St. Catherines Island. We also greatly appreciate the assistance of Lorann Pendleton Thomas and Diana Rosenthal in preparing this manuscript.

2. Whereas the simple mean treats each variate as equally significant, the *weighted mean* assigns an importance, or "weight," to the various observations. In the case of  $\Delta R$ , the individual  $\Delta R$  values are inversely weighted according to their associated error terms (expressed as  $\text{weight} = 1/\text{error}^2$ ). In effect, the smaller the error, the higher the weight assigned to a given value of  $\Delta R$ . The various error estimates associated with the mean of  $\Delta R$  likewise affect the weighting of the initial, sample-specific error estimate.

3. Another problem is that miscommunication with the radiocarbon laboratory resulted in the  $^{13}\text{C}/^{12}\text{C}$  ratio being omitted from several of the Meeting House Field  $^{14}\text{C}$  determinations (Thomas, 2008: chap. 13, table 13.4). Rather than attempt to estimate the results with dummy values, we have excluded these dates from consideration here.





## CHAPTER 2

### AN ASSESSMENT OF COASTAL FAUNAL DATA FROM GEORGIA AND NORTHEAST FLORIDA

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#### INTRODUCTION

Since the 1970s, significant progress has been made in the development of what broadly may be called “subsistence studies.” This generally has come to mean the analysis of plant and animal remains and the various kinds of studies derived from them. Although often underemphasized in textbooks or dismissively represented as “eco-facts,” these kinds of studies have broadened our understanding of prehistoric life in ways beyond the capabilities of what had previously been regarded as the mainstays of archaeological analysis: ceramics, lithics, skeletal remains, and settlement patterns. The oft-repeated rubric—that our goal is to understand (explain or explicate) prehistoric human behavior—is more truly realized by the addition of data produced by subsistence and environmental archaeological studies. The additions of archaeobotany, zooarchaeology, soils science, and climate data clearly have broadened our horizons and provided insights about human behavior regardless of our individual theoretical grounding or preferences.

In this chapter, we review available vertebrate faunal data from coastal Georgia and northeast coastal Florida to evaluate what we have learned about a variety of issues relevant to our inquiries as anthropological archaeologists. We consider historical motivations for faunal studies, their development, and their application to our study area. We also discuss disciplinary advances and how data generated since the 1970s inform us about sedentism, prehistoric environments, technology, and social behavior. Our review begins around 3000 B.C. and concludes around A.D. 1680.

Our discussion includes samples from St. Catherines Island (St. Catherines Shell Ring, McQueen Shell Ring, and South End Mound I), Sapelo Island (Shell Ring III and Bourbon Field), Cathead Creek, St. Simons Island (Cannon’s Point Shell Ring and West Shell Ring), Kings Bay (Kings Bay and Devil’s Walkingstick), Fort George Island (Grand Shell Ring), Mill Cove Complex near Jacksonville (Kinzeys Knoll and the Bluff Midden and Grant Mound), Jacksonville Electric Authority sites (two sites), and Fountain of Youth site in St. Augustine (see appendix 2.1 for summaries of available faunal data). The majority of these samples were recovered from indigenous shell rings and middens. Our most numerous sources of data fall at the Late Archaic and Mississippian period extremes of the coastal chronology, although we have several intervening Woodland period sites as well. Our overview considers 16 sites from a 200 km stretch of the Atlantic coast.

All of the data we evaluate here were generated since the mid-1970s. We have selected a group of sites for which detailed faunal data have been published or are areas subject to our current research. Sites evaluated in this chapter meet the following criteria:

- (1) indigenous sites from coastal Georgia and northeast Florida with access to a similar suite of estuarine resources,
- (2) samples for which data on the number of identified specimens (NISP), weight, estimated biomass, and minimum number of individuals (MNI) calculations were available, and
- (3) sites that create a representative chronological spread.

Several sites were excluded because they did not meet our criteria or because the resultant publications had missing or incomplete data. The samples reviewed here were published in peer-reviewed journals, books, dissertations, or are assemblages that we have analyzed.

### METHODOLOGICAL ADVANCES

Spurred by the Danish *kokkenmøddinger* investigations, the study of riverine shell middens began in North America in the mid-19th century (Trigger, 1986: xi–xxiv). Attention first was paid to shell middens on the middle Atlantic coast (Vanuxem, 1843) and slightly later to those on the northeast coast of North America (Chadbourne, 1859). The shell heaps of the St. Johns River, Florida, were first explored in 1860 (Wyman, 1875). Shell middens and rings on the southeast Atlantic coast have been of interest since the late 19th century (e.g., McKinley, 1873). The shell heaps of the California coast, particularly in the vicinity of San Francisco Bay (Nelson, 1909), have received attention since Uhle's (1907) work on the Emeryville Shellmound in 1902 and Nelson's (1910) investigations at the Ellis Landing Shellmound in 1907. The latter investigations are well reported and illustrate recovered faunal remains. Excavations in California shell middens prompted concern for methodology, quantification, diet, and population estimates (Gifford, 1916; Cook, 1946).

The multidisciplinary projects of the 1950s and 1960s, specifically the Jarmo Archaeological Project (Braidwood, 1960), and the Tehuacán Valley Archaeological and Botanical Project (Flannery, 1967; MacNeish, 1967) brought specialists together, often in the field, and provided archaeologists with credible examples of what could be learned using zooarchaeological and archaeobotanical analysis. Although termed "multidisciplinary" or "interdisciplinary" instead of "conjunctive," they nevertheless provided in spirit the new kinds of approaches that Taylor (1948) had envisioned and urged. These developments were not uniquely Americanist, however, as evidenced by early methodological compilations such as Heizer and Cook (1960) and Brothwell and Higgs (1969).

The most difficult aspect of this type of research was developing practitioners. The Koster Project, led by Stuart Struever in the early 1970s, provided an example of how an archaeological

project could investigate a locality and provide training in a variety of subdisciplinary skills. Early scholars in this pursuit developed identification guides (Olsen, 1964, 1968, 1972; Casteel, 1976) and syntheses (Wing and Brown, 1979). In museums and academic institutions, individuals such as Paul Parmalee, Elizabeth S. Wing, and Kent V. Flannery assisted students in learning the rudiments of zooarchaeological analysis. There were fewer exemplars for archaeobotany, but Hugh Cutler, Richard I. Ford, Paul Manglesdorf, Margaret A. Towle, and Richard A. Yarnell were instrumental in introducing students to the study of plant remains and the publication of early archaeobotanical research.

These projects and individuals were stimuli for the broader field of archaeology and made the analyses of nontraditional materials both interesting and desirable. Prior to the 1960s, there were few guides to the identification and interpretation of animal remains (Cornwall, 1956). During the 1960s, Stanley J. Olsen (1964, 1968) published guidebooks to mammalian, avian, and reptilian remains. The greatest advance is evident beginning in the 1970s, however. This advance is marked by the founding of the International Council for Archaeozoology (ICAZ) in 1971, the appearance of overview publications on zooarchaeology (Chaplin, 1971; Grayson, 1984; Klein and Cruz-Urbe, 1984; Lyman, 1994, 2008; Reitz and Wing, 1999, 2008), the increasing availability of identification manuals (Schmid, 1972; von den Driesch, 1976; Gilbert, 1980, 1990; Gilbert, Martin, and Savage, 1981; Sobolik and Steele, 1996), and special publications on shell middens (Meehan, 1982; Stein, 1992). During this period there also were increasing numbers and sophistication of papers in professional journals such as *American Antiquity*, *Journal of Archaeological Science*, and *Historical Archaeology* (particularly the special publication by Reitz and Scarry, 1985).

Since the 1970s, the analysis of vertebrate and invertebrate fauna is more frequently a part of archaeological investigations. It is unfortunate that we have no grasp of the true number of field projects conducted in our coastal strand study area from the 1970s to the present with which to make comparisons. It is clear, however, that long-term research-based projects are the source of most of the samples used in this overview ( $N = 15$ ). CRM projects have generated fewer of our samples ( $N = 3$ : Cathead Creek, two time periods; Jack-

sonville Electric Authority site).

As a result of the call in the late 1960s for more rigorous field methods, screening became a more standard practice in fieldwork. The most common gauge is  $\frac{1}{4}$  in., but finer screens are sometimes employed (particularly for features), and are almost always used for column samples. The choice of  $\frac{1}{4}$  in. hardware cloth is often related more to concerns about available field time and analysis expense than to whether a representative sample is being obtained. In the coastal zone, the presence of invertebrate fauna increases screen time in the field or in the laboratory, depending on where the screened samples are processed. The use of  $\frac{1}{8}$  in. screen should be encouraged to recover a greater diversity of small-bodied species and to more accurately represent the faunal record. Faunal samples recovered using screens finer than  $\frac{1}{8}$  in. may require specialists with substantial experience in microscopic identification. Given the widespread use of  $\frac{1}{4}$  in. screen, many comparable samples have been generated, but concern remains regarding what is lost (Newsom and Wing, 2004: 41; Quitmyer, 2004).

Comparative collections are critical to the process of identification, and are now available in research institutions, agencies, and cultural resource management firms. The Florida Museum of Natural History's Environmental Archaeology Laboratory has been a leader in this effort, as have the Zooarchaeology Laboratory of the Georgia Museum of Natural History and the Zooarchaeological Research Facilities at the University of Tennessee. Several academic institutions offer both courses and research opportunities that help to prepare new practitioners.

Many analysis measures are now standard practice in zooarchaeological reporting and discussion. Measures such as the number of identified specimens (NISP), specimen weight, estimated biomass, number of thermally altered, worked, or butchered bones, and the minimum number of individuals calculation (MNI) are regularly provided (Lyman, 2008; Reitz and Wing, 1999, 2008). Issues such as preservation bias, taphonomic processes, ethnoarchaeology, natural versus cultural faunal assemblages, feasting, and ritual use of animals have been the subjects of professional papers since the late 1960s. The availability of faunal data has contributed to theoretical arguments such as the role of humans in plant and animal extinction, optimal foraging strategies, feasting and ritual

behavior, and resource overexploitation and decline in coastal ecosystems.

How to relate recovered vertebrate faunal remains to dietary contribution has been a continuing discussion. Early methods, such as that proposed by White (1953), used an averaged standard weight and the MNI to estimate the meat-weight contribution of mammalian fauna. The introduction of estimated biomass using allometric scaling, by Reitz and colleagues (Reitz et al., 1987), has provided a means of representing the dietary contributions of mammals, fish, reptiles, and birds. Although this method has its critics (see Jackson, 1989), it is a valuable means of comparison within and among samples and is easy to use because it is based on the weight of vertebrate bone recovered from archaeological contexts.

Since the mid 1970s, zooarchaeologists have produced datasets that anchor comparisons of findings from a number of coastal Georgia and Florida sites. Not all reports of faunal datasets are adequate, however. Missing data on standard measurements such as weights, missing data on screen size, and lack of contextual information negatively impact the usefulness of faunal reports. A standardized approach to analysis and reporting that includes standard measurements such as weights, counts, MNI, and biomass permits faunal assemblages to be compared and overall patterns to be identified across sites.

## THE SITES

ST. CATHERINES ISLAND SHELL RING (9Li231) is one of two Late Archaic shell rings on St. Catherines Island. The site is located near a salt marsh on the leeward side of the island and was first recorded in 1979 during systematic sampling of the island (Thomas, 2008: chap. 20, 555–557). During this transect survey, three test pits were excavated in the ring matrix, a volume totaling approximately 2.6 m<sup>3</sup>. Remains were screened over  $\frac{1}{4}$  in. hardware cloth. Reitz (2008) analyzed vertebrate faunal remains from this excavation. Beginning in 2006, more extensive excavations were undertaken at the site. In the ring interior, excavation revealed a number of pit features with steep sides and flat bottoms, approximately 1 m in diameter (Sanger and Thomas, 2010). These features were relatively devoid of material culture or food remains and slightly predate construction of the shell ring. Based on remote

sensing, Sanger and Thomas (2010: 59) estimate that 500 of these features are present within the ring interior. Colaninno (2010) analyzed samples from six 1 × 1 m excavation units located in the north, east, and west arcs of the ring, as well as two interior features (totaling approximately 11.8 m<sup>3</sup>). The materials analyzed by Colaninno (2010) were water-screened over 1/8 in. mesh.

MCQUEEN SHELL RING (9Li1648) is the second Late Archaic shell ring on St. Catherines Island. The McQueen Shell Ring was discovered in 2007, and has been the subject of extensive excavations by the American Museum of Natural History. The McQueen ring is located on the seaward side of the island adjacent to a salt marsh protected by a dune ridge. The ring is approximately 70 m in diameter and is 30–70 cm in height (Colaninno, 2010). Colaninno (2010) examined vertebrate faunal remains from two 1 × 1 m excavations in areas of high elevation in the southern and northwestern arc of the ring that amounted to approximately 1.2 m<sup>3</sup>. These materials were water-screened over 1/8 in. mesh.

SOUTH END MOUND I (9Li3) is a mortuary site that was first excavated by Moore (1998 [1897]) in 1896. He exposed 50 burials: one cremation, four secondary urn burials, and 45 primary burials (Larsen, 2002). Based on the ceramics, the site dates to the Irene (Mississippi) Period. Moore excavated all but a small portion of the mound. During his excavation, he encountered a large concentration of oyster and clam shells within the burial mound, which is likely responsible for the excellent preservation of skeletal remains. Upon completion of the excavation, Moore backfilled the mound, leaving most of the skeletal remains roughly in their original location.

Larsen and Thomas undertook excavations at the South End Mound in 1979, 1981, and 1991–1993. The latter excavations included 13 2 × 2 m units and a single 1 × 2 m unit approximately 1 m deep, the remains of which were screened through 1/8 in. hardware cloth (Larsen, 2002). Reitz et al. (2002) reported on the faunal remains obtained from these excavations. During removal of Moore's backfill, abundant oyster was encountered, verifying the shell deposit described by Moore (Larsen, 2002).

SAPVELO SHELL RING COMPLEX (9Mc23) is a shell ring complex on Sapelo Island that contains three shell rings: rings I, II, and III, and a number of amorphous shell middens. William McKinley (1873) first described the shell ring complex in

1872. Moore (1998 [1897]: 73) visited the site and referred to Ring I as "an aboriginal fortification or ceremonial enclosure." Moore's excavations revealed no burials but he recovered a temporal bone from a human skull (Moore, 1998 [1897]: 73). Ring III is the smallest of these rings, with a diameter of approximately 50 m (Thompson et al., 2004). Thompson (2006) conducted the most recent excavations at the Sapelo Ring Complex. Colaninno (2010) analyzed vertebrate faunal remains from two contexts of Ring III: a 25 × 25 cm column sample in unit 9 (in the southwest portion of the ring) and unit 4 (in the northwest arc of the ring) where dense shell deposits remained. The column sample was screened over 1/8 in. mesh and the unit 4 material was screened over 1/4 in. mesh.

BOURBON FIELD is an approximately 14 hectare (ha) area adjacent to a marsh at the north end of the eastern side of Sapelo Island (Crook, 1984: 187). It is a multicomponent site consisting of 119 shell middens and a small earthen mound. Moore (1998 [1897]: 55–67) excavated two burial mounds at Bourbon Field: a large truncated mound (9Mc20) that Moore assigned to the Irene-San Marcos period based on the ceramic assemblage, and a second "low" mound (9Mc21) that Moore hypothesized dated to the Woodland period.

Crook (1984) sampled 10 shell middens and several off-midden areas for a total of 54 2 × 2 m units. The middens include occupations from a number of periods: St. Simons (Late Archaic), Deptford, Wilmington (Woodland period), Savannah, and Irene-San Marcos (Mississippi period), with the latter two periods being the best represented. The majority of the excavated matrix was screened through 1/4 in. hardware cloth. Twenty-liter samples of matrix were screened through nested sieves with a minimum size of 1/16 in., but the 1/4 in. fauna was removed and added to the 1/4 in. general level (block excavation) samples (Crook, 1984; Reitz, 1982). Reitz (1982) stated that approximately 94% of the sample was screened through 1/4 in. mesh, while the remaining 6% was screened through fine mesh.

Several column samples were analyzed, but fine-screened materials from the plowzone (~30 cm) were not included in the faunal analysis (Crook, 1984). The Savannah- and Irene-period faunal assemblages are reported together, so we are unable to differentiate subsistence between the two periods. Crook (1984) designated the Sa-

vannah time period as A.D. 1000–1540, and the Irene-San Marcos period as 1540–1680 based on Milanich's (1977) chronology. In his interpretation, Crook (1984) described the Irene-San Marcos period occupations in terms of both sacred and domestic spaces. Based on midden distribution, Crook (1984: 263) argued that the first signs of formally organized space are evident in the Savannah period, with a reorganization of domestic space in the Irene-San Marcos period and further, that these new spatial arrangements may have been related to the increasing importance of maize agriculture. Drawing from Larsen's (1982) work on St. Catherines Island, Crook (1984: 263) stated that osteological evidence indicates that maize was becoming an important dietary item in the Savannah period, although maize remains were rarely encountered during excavations.

CATHEAD CREEK (9Mc360) is a shell midden site located on a 7 m tall bluff at the convergence of Cathead Creek and Darien River (Reitz and Quitmyer, 1988). The Darien River is somewhat brackish and is responsive to tidal changes (Reitz and Quitmyer, 1988). The midden is approximately 1.6 m deep, with Mississippian remains in the upper 90 cm of the midden. Swift Creek refuse was recovered from the lower 70 cm. Materials were excavated by Lucy B. Wayne (Air and Water Research, Inc.) and Reitz and Quitmyer (1988) analyzed 10 liter samples from five levels within a single 1 × 1 m unit. Samples were screened through geological sieves with a minimum size of 1/8 in. (0.5 mm). Faunal remains are reported as two assemblages based on chronology, one Swift Creek assemblage and one Savannah assemblage (Woodland and Mississippian periods, respectively).

CANNON'S POINT SHELL RING (9Gn57) is a Late Archaic shell ring lying in the marsh on the east side of the north end of Cannon's Point on St. Simon's Island, Georgia. It was identified in the fall of 1972, and Marrinan (1975, 2010) conducted excavations there in subsequent years. The ring is isolated from the mainland, but when it was deposited, it was probably on the mainland edge. It is possible that eustatic sea level rise or changing tidal creek/marsh/mainland relations accounts for its current isolation. The ring is approximately 68 m (east-west) by 44 m (north-south) and has been breached on its northeast side. Marsh grasses grow in its center, water enters at high tide, and approximately 1 m of sediment has been deposited in the area.

The faunal sample is drawn from excavation unit 18N, 0E, a 3 × 3 m test placed near the highest elevation of the ring on its northwest arc. Excavation fill was dominated by oysters, most of which appeared to be single, not clumped specimens. Also present were quahog clams and a variety of less numerous invertebrate species, both estuarine and terrestrial. The depth of deposit was 1.65 m. The vertebrate faunal sample was recovered from an approximate volume of 13 m<sup>3</sup> (taking baulks into account) and was water-screened through 1/8 in. hardware cloth.

WEST RING (9Gn76) is the second of two shell rings on St. Simons Island. It is located on high ground approximately 100 m southwest of the Cannon's Point Shell Ring (Marrinan, 1975). The ring is 42 m in diameter and its southeast side is currently eroding into the adjacent salt marsh. Faunal remains were recovered from a volume of approximately 2.8 m<sup>3</sup> and were water-screened through 1/8 in. hardware cloth. The data reported here represent a single 2 × 2 m unit (5S, 30E) placed in the east arc of the ring.

KINGS BAY (9Cm171) is located on the mainland in Kings Bay Naval Station, and is a 91.5 ha site composed of several small, discrete shell middens near the marshes of the Cumberland Sound (Reitz and Quitmyer, 1988). Material culture spans the Late Archaic through historic periods. Analyzed faunal materials were associated primarily with the Woodland Period. The majority of the samples were located in three arbitrarily defined sections of the site: Artesian Well, Poisonberry, and Bluff areas. These areas date from the Swift Creek Period and contained the least disturbed cultural remains (Saunders, 1986: 22). The excavation was conducted by the University of Florida under the direction of William H. Adams. Reitz and Quitmyer (1988) analyzed samples from three Swift Creek features that were interpreted as trash pits. These samples were water-screened over a minimum of 1/16 in. mesh.

DEVIL'S WALKINGSTICK (9Cm177) is a series of small discrete middens located in the Kings Bay Naval Station, approximately 2 km away from the Kings Bay site. Quitmyer and Reitz (2006) analyzed the Savannah period remains from three areas: 11 50 × 50 × 10 cm column samples and two features from the North Bunker Area, a single feature from the South Bunker Area, and a single feature from the Marsh Area. These materials were sieved over a minimum of

1/16 in. screen.

GRAND SHELL RING (8Du1) is an early Mississippian shell ring and earthen mound site that has been known since the late 19th century. Since Moore could not obtain permission to excavate there, professional excavation has only been undertaken recently. As would be expected, looting has occurred through the years, mostly in the sand burial mound that overlies the shell ring midden on its west arc. In 2006, Ashley, Rolland, and Marrinan (2007) excavated a trench of seven 1 × 2 m units through the southern arc of the ring. The sample used here was recovered from a volume of approximately 13 m<sup>3</sup> and was screened over 1/4 in. hardware cloth. Faunal analysis of this material was reported in Ashley, Rolland, and Marrinan's 2007 report, but we have recently completed analysis on unanalyzed samples. A composite spreadsheet including the newly analyzed material is presented in appendix 2.2.

THE MILL COVE COMPLEX is an Early Mississippian period group of two mounds, earthworks, and midden deposits located on the east bank of the St. Johns River near present-day Jacksonville, Florida (Ashley, 2003, 2005). Grant Mound (8Du14) and Shields Mound (8Du12) lie approximately 750 m apart: Grant to the west and Shields to the east. South of the Shields Mound, there are earthen ridges, which have not been investigated. The Grant Mound has been threatened by erosion for several centuries and it is likely that more than half of it has washed into the river (Moore, 1999 [1894]; Thunen, 2005). Between and around the mounds, there are small shell midden deposits. C.B. Moore (1999 [1894]) first reported these sites and later investigated both Grant and Shields mounds. Ashley (2003, 2005) and Thunen (2005) have conducted excavations in both mounds and in a number of the midden deposits in the area. Specific sites and areas in the Mill Cove Complex are discussed below.

SHIELDS MOUND (8Du12) is a large, oblong platform mound lying on a relict sand dune overlooking the St. Johns River (Moore, 1895). It is primarily composed of sand, but there are lenses of shell midden. C.B. Moore excavated this site in 1894 and 1895 and characterized it as unusual for the St. Johns area. He recovered both extended and bundled burials and noted that they were usually associated with ground hematite pigment. Grave goods included items of copper, galena, exotic stone (celts and axes), earthenware and soapstone pipes, bone pins, and

chert projectile points. The mound is surrounded by a number of midden deposits and our samples derive from two of these: Kinzeys Knoll and the Bluff Midden.

KINZEYS KNOLL (8Du5606) is a dense dome-shaped shell midden approximately 30 m (north-south) by 25 m (east-west). It is located approximately 30 m northwest of Shields Mound, and although the midden is adjacent, it does not appear to be contiguous with the mound. Our samples come from four contiguous 1 × 1 m units placed in the southeast sector of the midden. The deposit reached a depth of 80 cm, and excavated material totaling 3.2 m<sup>3</sup> was screened over 1/4 in. mesh. Rolland (2005: 231) analyzed the ceramics recovered from this area, and concluded that they were unlike all other areas sampled in the vicinity of Shields Mound. She considered them to represent a ceremonial assemblage (Rolland, 2005: 226). These collections contained more large vessels and open serving vessels, the highest frequency of decorated sherds, an estimated vessel count of 350 (from a total of 2535 sherds), and an unusual percentage of hematite-slipped or hematite-impregnated ceramics (84 sherds, or 3%) in contrast to other excavation areas (Rolland, 2005). The vertebrate and invertebrate fauna and ceramics were recovered with a number of broken items: bone pins, copper, greenstone, shark and dolphin teeth that were worn and battered, and chunks of hematite. It appears that each of these materials was discarded at the end of its functional use-life.

THE BLUFF MIDDEN (8Du5605) is approximately 80 m in length and 20 m at its widest. Its center lies along the bluff edge approximately 130 m from the northwest edge of Shields Mound. Our samples come from two contiguous 1 × 2 m units (units 7 and 8) located near the center of the midden. At this location, the midden is approximately 60–65 cm deep. The vertebrate sample was recovered from a midden volume of 2.5 m<sup>3</sup>, which was screened over 1/4 in. hardware cloth. Rolland's (2005: 221–224) ceramic analysis indicated that the use-life of Bluff Midden vessels had been longer in duration and suggested that their use may have been more domestic than ceremonial.

GRANT MOUND (8Du14) was described by Moore (1999 [1894]) as a truncated conical mound rising over 26 ft above the bluff on which it stood. Moore (1894: 200) also noted that one-third of its mass had been washed into the river

exposing “a rich harvest of aboriginal relics.” Thunen (2005: 259) recovered our samples during excavations in 1989. The analysis of faunal remains from two 2 × 2 m units (screened over ¼ in. mesh) is currently unpublished, so we have included the composite spreadsheet in appendix 2.2. Test Unit 2 was located along the flank of the mound on its west margin. Its upper eight levels were mound fill and the faunal collection was very sparse. Fauna from its lower 11 levels were recovered from dense shell midden. Unit 4, located off the mound proper, was placed in shell midden. For the purposes of this overview, we have combined the lower midden levels of Test Unit 2 with Test Unit 4. In estimating the midden fill from which these faunal samples were recovered, Test Unit 2 represents approximately 4.4 m<sup>3</sup> and in Test Unit 4, the midden depth is reported as 52 cm (2.1 m<sup>3</sup>) for a total of 6.5 m<sup>3</sup>.

JACKSONVILLE ELECTRIC AUTHORITY SITES (8Du634 and 8Du669) are mainland sites with a number of small shell middens near a salt marsh in the St. Johns River drainage (Reitz, Quitmyer, and Marrinan, 2009). The University of West Florida Office of Cultural and Archaeological Research conducted excavations in order to mitigate proposed construction on the property (Lee et al., 1984). Twelve shell middens were encountered during excavation, revealing occupation primarily during the late prehistoric period (A.D. 1200–1500) (Lee et al., 1984). Lee and colleagues interpreted the site as a seasonal, low-density occupation and hypothesized that the sites were occupied by mobile inland groups who returned to the area intermittently, perhaps to supplement their maize diet (Lee et al., 1984: 4).

Elizabeth Wing and Irvy Quitmyer analyzed zooarchaeological materials from the Jacksonville Electric Authority sites. Samples were taken from flotation material from features, as they were better preserved in the shell middens than in the general level acidic soil (Lee et al., 1984). The screen sizes include a minimum of ⅓ in. Seven column samples were analyzed from 8Du634, and eight column samples were analyzed for 8Du669. The allometric scaling formulas outlined by Reitz and colleagues (Reitz et al., 1987) were unavailable for use in the Lee et al. (1984) report. As such, different formulas were used to estimate biomass. In order to make the estimated biomass more comparable to other sites in our review, we have used the quantifications of a subsample reported in Reitz et al., 2010 (they

utilized the more recent allometric scaling formulas). Reitz et al. (2010) report that this sample was screened over ⅙ in. mesh.

FOUNTAIN OF YOUTH (8SJ31) is a multicomponent site adjacent to a salt marsh, tidal creeks, and Hospital Creek. Hospital Creek flows into the Matanzas River, which forms a large embayment with an outlet to the sea a short distance away. Excavations recovered fauna from the Late Archaic Period, St. Johns II (Mississippi Period), a brief Spanish occupation in 1565, and the later mission period (Reitz, 1991). Survey of the site identified two St. Johns II shell middens, along with a St. Johns II village located between the middens. Ed Chaney conducted fieldwork under the direction of Kathleen Deagan in 1985 and 1987 (Chaney, 1987). Chaney (1987: 11) based his interpretation of the village on the presence of numerous circular postmolds, associated with hearths and trash pits. Materials included in our discussion are from the Late Archaic and St. Johns II periods and were screened over ⅙ in. hardware cloth; these remains were analyzed and reported by Reitz (1991).

## DISCUSSION OF THE SAMPLES

A variety of decisions are made that affect zooarchaeological analysis. The first decisions include protocols for sampling (how much will be removed) and screen size (what screen size will be used for which kinds of samples). These kinds of decisions also continue when the samples reach the laboratory. Given the sheer size of some field collections and the cost of analysis, subsamples may be required. The samples discussed above were recovered using a variety of screen sizes, primarily ¼ in. and ⅓ in. mesh. The sizes of excavations and analyzed samples also varied greatly, ranging from column samples to large block excavations. Although excavation strategies differed, analysts quantified the above samples using standard zooarchaeological methods and measurements. In the discussion below, we attempt to mitigate different recovery strategies to compare the faunal assemblages and to make generalizations about subsistence in the Georgia Bight.

Evident in these samples is the overwhelming dependence on salt marsh and estuarine resources. A pattern of broad-spectrum harvesting—through collection of shellfish and fishing—is clearly present from the Late Archaic through the

Mississippi Period. The data we have reviewed are insufficient to address specific changes in subsistence through time. The Kings Bay and Devil's Walkingstick assemblages (Woodland and Mississippi periods) suggest considerable continuity. However, the two multicomponent sites show differences in animal use that are difficult to interpret. The Cathead Creek assemblages (Woodland and Mississippi) are similar, but demonstrate slightly different proportions of mammals and fish. The Fountain of Youth assemblages (Late Archaic and Mississippi) are quite different, but the Late Archaic sample is rather small and perhaps not a complete representation of the diet. More faunal assemblages must be analyzed in order to tease apart local variability from large-scale changes in subsistence through time.

Overall, the data indicate that a similar subsistence strategy persisted for several thousand years in the Georgia Bight. In terms of how many species were exploited, the diet was broad at both shell ring deposits (e.g., Grand Shell Ring) and midden deposits (e.g., Grant Mound Midden). Nevertheless, reliance on a lesser number of species is evident. From the marsh-estuary environments, marine catfishes, mullets, and drums tend to be the primary resources in terms of estimated biomass. Species such as herrings, jacks, flounders, and porgies (sheepshead) provide a second tier of dependence.

Less common are assemblages with high concentrations of terrestrial fauna. Although deer and a variety of other mammals are present, in general they are lower contributors to estimated biomass. In our samples, there are several exceptions—primarily from St. Catherines Island. At the sites we review, mammal biomass comprises anywhere from 1.8% (Fountain of Youth–Mississippi Period) to 95% (South End Mound I) of the vertebrate biomass (fig. 2.1). The amount of mammalian biomass does not seem to correspond to any particular time period, nor does it increase or decrease through time in any predictable way. Sites located on St. Catherines Island (particularly the South End Mound I and St. Catherines Shell Ring) generally contain higher percentages of mammal remains when compared to other sites in the Georgia Bight. Although the St. Catherines Shell Ring materials analyzed by Reitz were recovered using  $\frac{1}{4}$  in. screen, the materials analyzed by Colaninno (2010) were recovered using  $\frac{1}{8}$  in. screen. The material analyzed by

Colaninno (2010) showed a slight decrease in the percentage of mammalian biomass but overall mammalian biomass remained remarkably high. The South End Mound material was also recovered using  $\frac{1}{8}$  in. screen. This indicates that the use of  $\frac{1}{4}$  in. screen does not explain the unusually high percentage of mammalian remains on St. Catherines Island. As at other sites, deer contributes most of the estimated mammalian biomass percentage. On St. Catherines Island, it appears that deer were an exceptionally important part of the vertebrate diet. It is currently unclear why deer remains are so ubiquitous on St. Catherines Island. Reitz et al. (2010: 59, 75) discussed two possibilities for the high number of deer remains at Sea Island sites: circumscription of deer lowered the energy costs of acquiring such animals or the ecological diversity of the larger Sea Islands may have supported more deer than mainland locations.

The South End Mound I assemblage was recovered from a disturbed mortuary context containing secondary midden fill. Several explanations are possible for the large amount of mammal remains: (1) they are a result of the ritual nature of the burial mound (Reitz, Larsen, and Schoeninger, 2002), (2) they are food offerings associated with mortuary rites (Reitz et al., 2010: 69–70), or (3) the transport of midden material may have resulted in the loss or exclusion of smaller fish remains, and favored the inclusion of larger mammalian remains in the deposit. Moore (1998 [1897]: 161) stated, “Local layers of oyster shells were present, and the central portion of the mound was made up of a deposit of oyster shells about 2 feet thick—not midden refuse but loose as though brought there at one time and deposited.” It is clear that the faunal materials recovered from South End Mound I do not fully represent the diet of those interred in the mound because isotopic analysis of their remains indicated a heavy reliance on maize (Larsen, 2002), as well as a strong marine orientation (Reitz et al., 2010).

Bourbon Field also had an exceptionally high percentage of mammalian biomass. The faunal assemblage reflects both Savannah and Irene–San Marcos Period deposits; as such, we are currently unable to distinguish chronological differences in subsistence. It is possible that if these groups were growing maize (see Crook, 1984: 263), they may have engaged in garden hunting, resulting in a higher proportion of mammal (especially deer) remains (see Reitz et al., 2010: 53).



Elsewhere, Marrinan and Parsons (2008) proposed that high percentages of mammal remains in coastal sites might be indicative of ritual or ceremonial contexts. We argued that in a coastal setting, people might have sought out mammals for feasts or rituals as a departure from daily subsistence focused on fish and shellfish. Following Dietler and Hayden's (2001: 3) definition of "feast," we characterize feasts as events focused on the communal consumption of food and/or drink that is different or separate from everyday meals. Our proposed link between mammal remains and ritual contexts was based on the faunal assemblages from four early Mississippi Period sites in northeast Florida: Kinzeys Knoll and Bluff Midden (adjacent to Shields Mound), Grant Mound, and the Grand Shell Ring. Shields Mound, as a monumental construction and place of burial, is a locale in which we would expect ritual and ceremonial activities. Further evidence for a ritual or ceremonial nature of the deposit can be seen in the presence of primarily large ceramic vessels, a large quantity of ceramics and bone pins, presence of exotic goods (e.g., greenstone, copper, and ochre), and unusual faunal remains (e.g., bear, gar dentaries, utilized porpoise teeth) (Marrinan and Parsons, 2008). When compared to other sites in the Georgia Bight, the Shields assem-

blages do not appear to be particularly high in mammalian biomass (especially compared to the St. Catherines Island sites). However, when they are compared to other Mississippi Period sites in northeast Florida, the mammalian biomass is clearly unusual. It is possible that in northeast Florida during the Mississippi Period, feasts and ritual events involving food differed from other settings because of the lack of maize agriculture. Currently, there is no evidence for maize agriculture in northeast Florida during the St. Johns II Period (A.D. 900–1250) (Ashley, 2005). The earliest evidence of maize consumption in northeast Florida does not appear until the 16th century in contexts associated with Spanish missions (Ashley, 2005: 279).

Avian fauna are present but not numerous in the assemblages (fig. 2.2). Their remains are more fragile and may have been broken in the heavy shell matrix beyond our means of identifying them. Relatively few avian remains were recovered from the examined sites; estimated avian biomass ranged from 0% (Fountain of Youth—Late Archaic, Sapelo Ring III, Cathead Creek—Woodland, and Jacksonville Electric) to 5.3% of the total biomass (Kinzeys Knoll), with most samples ( $N = 10$ ) containing less than 1%. Avian biomass was highest in Kinzeys Knoll, followed

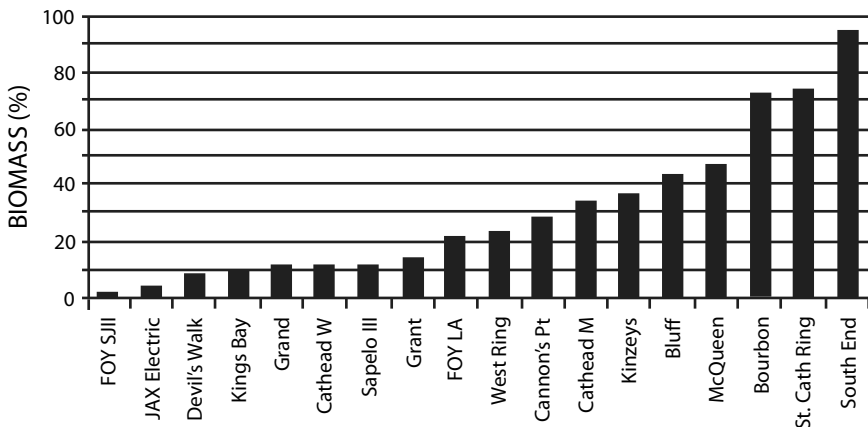


Figure 2.1. Estimated biomass contribution for mammals (in ascending order). Abbreviations: **FOY SJII**, Fountain of Youth, St. Johns II Period; **JAX Electric**, Jacksonville Electric Authority; **Devil's Walk**, Devil's Walkingstick; **Cathead W**, Cathead Creek, Woodland Period; **Sapelo III**, Sapelo Shell Ring III; **FOY LA**, Fountain of Youth, Late Archaic Period; **Cathead M**, Cathead Creek, Mississippi Period; **Kinzeys**, Kinzeys Knoll; **Bluff**, Bluff Midden; **McQueen**, McQueen Shell Ring; **Bourbon**, Bourbon Field; **St. Cath Ring**, St. Catherines Shell Ring (Reitz, 2008, and Colaninno, 2010, data); **South End**, South End Mound I.

by Grand, Grant, and Bluff. This may represent a local focus on birds, or it may be the result of taphonomic processes.

The biomass estimates for reptiles are rather diverse, ranging from 1% (McQueen Shell Ring) to 10.7% (Jacksonville Electric) of the vertebrate biomass (fig. 2.3). Reptiles, predominantly turtles, are generally well represented in estimates of contributed biomass. Although reptiles are usually third in importance (after fish and mammals), in some cases their contributions are second only to fish (ray-finned fishes and cartilaginous fishes). Turtles from all habitats were taken. Turtles with highly sculptured carapaces (e.g., chicken turtle, diamondback terrapin, and sliders) are often the prime targets, suggesting that an aesthetic sense may motivate their capture (Marrinan, 1975).

Based on the sites we have reviewed, fishes (ray-finned, sharks, and rays) usually contribute the highest estimated vertebrate biomass (fig. 2.4). Fish biomass contributed 50% or more to the overall sample in all but four collections: South End Mound I, St. Catherines Ring, Bourbon Field, and the Bluff Midden. Fish and mammalian biomass are essentially inversely related: when fish biomass declines, mammalian biomass increases. Fish and mammals (especially deer) were undoubtedly the most important vertebrate contributors to diet in the coastal strand.

It is likely that the biomass estimates discussed above would be small in comparison to the invertebrate biomass. Shellfish, always the most numerous in every measure, have not been treated with the same level of quantification as the vertebrate constituents of shell rings and middens. It is a massively time-consuming prospect to quantify invertebrate midden constituents. In the few studies in which this has been attempted, the estimated biomass of shellfish dwarfs all other midden constituents (e.g., Kinzeys Knoll—Marrinan, 2005: table 4). Crabs are recovered in both shell ring and midden sites. When found in large numbers in features, they and the other materials recovered with them may represent a single meal.

#### FAUNAL DENSITY

One problem faced when comparing faunal assemblages from different sites is that different gauge screens may have been utilized to recover remains. Quitmyer (2004) demonstrated that NISP and often MNI dramatically increase with use of small-gauge screens, driven primarily by

the increase of small fish remains. The samples we have examined were sieved through screens ranging from  $\frac{1}{32}$  in. to  $\frac{1}{4}$  in. Another problem with comparing faunal assemblages is that the amount of excavated fill and analyzed fauna ranges from very small to very large samples. The amount of matrix that is excavated and screened highly influences the NISP, weights, and biomass estimates. Several of the samples we review were removed solely from column samples and features, but others were obtained from large block excavations. To overcome these difficulties in making comparisons, we have calculated the vertebrate faunal density for nine sites. Following Sidrys's (1977) use of lithic density to measure relative quantities of obsidian in Maya sites, we calculated faunal density by dividing the relevant variable by the number of cubic meters excavated and analyzed. Table 2.1 provides faunal density data for six sites. The NISP and MNI rankings appear to be similar, but biomass is not always similarly correlated. Because NISP and MNI are highly dependent on screen size, we chose to evaluate faunal density using estimated biomass values. Using estimated biomass allowed us to mitigate some of the effects of screen size and calculate the approximate amount of food that was generated by the remains in each cubic meter of midden matrix.

For our comparisons, we included samples that were obtained from excavations larger than one cubic meter. Because shell midden density is often variable, we selected samples of at least 1 m<sup>3</sup> to avoid extrapolating density for unexcavated or unanalyzed portions of the midden deposit. Volumetric data regarding the provenience of the analyzed faunal sample were lacking from most publications. We have calculated the faunal density for nine sites for which data were available, including five shell rings—St. Catherines (combined data from Reitz, 2008, and Colaninno, 2010), McQueen, Cannon's Point, West, and Grand; three middens—Grant, Kinzeys, and Bluff; and the mound fill of South End Mound I (table 2.2).

Faunal density based on biomass estimates varied considerably in the samples (fig. 2.5). We define four categories of faunal density: very low (0–999 g), low (1000–4999 g), high (5000–14,999 g), and very high (15,000 g and above). We did not identify any patterns regarding faunal density and biomass contributions of particular classes of fauna. Faunal density was lowest

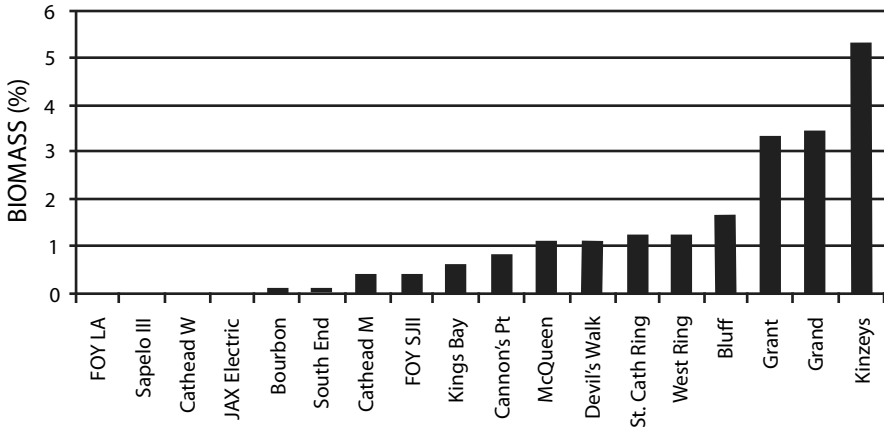


Figure 2.2. Estimated biomass contribution for birds (in ascending order).

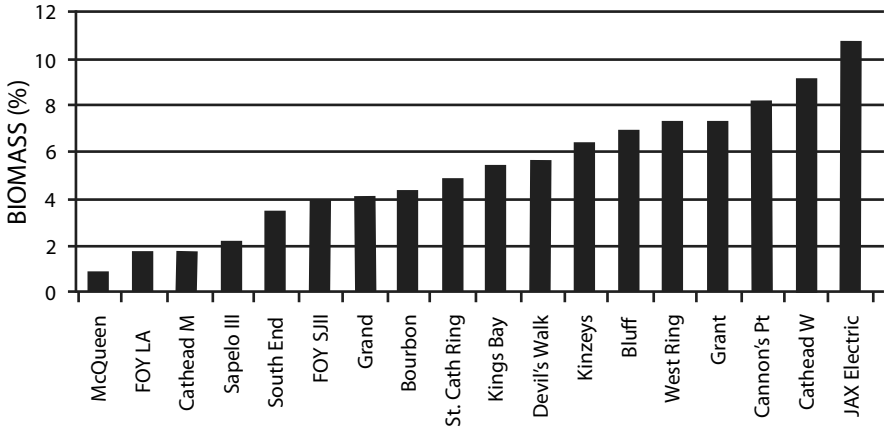


Figure 2.3. Estimated biomass contribution for reptiles (in ascending order).

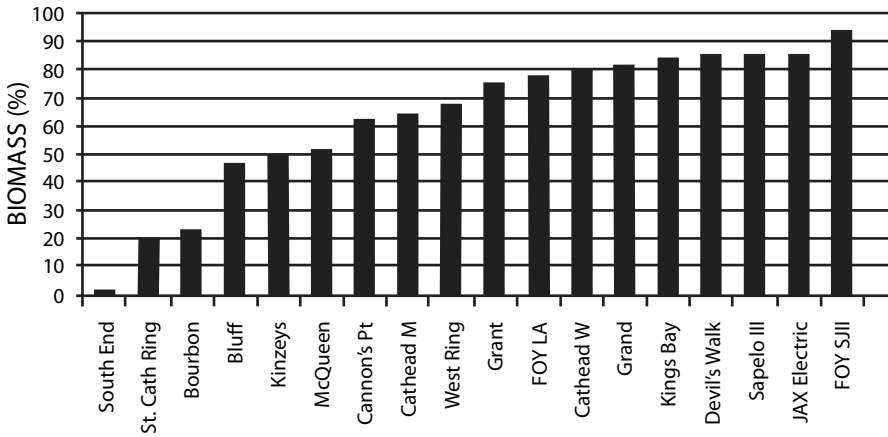


Figure 2.4. Estimated biomass contribution for fish (in ascending order).

TABLE 2.1  
**Faunal Density Using NISP, MNI, and Estimated Biomass**

Faunal density calculations using NISP, MNI, and estimated biomass are ranked in ascending order; rank 1 has the highest density and 6 has the lowest. Note that the ranks for each site are not always identical.

Site	Screen (in.)	NISP/m <sup>3</sup>	Rank	MNI/m <sup>3</sup>	Rank	Biomass (g/m <sup>3</sup> )	Rank
Cannon's Point	⅛	1574.2	6	26.5	6	1392.0	6
West Ring	⅛	3399.3	4	89.3	3	2212.9	5
Grand Shell Ring	¼	7201.3	2	133.0	2	9482.8	4
Grant Mound	¼	3857.2	3	69.7	4	9897.2	3
Bluff Midden	¼	2719.2	5	54.8	5	11,881.2	2
Kinzeys Knoll	¼	8157.8	1	134.7	1	25,566.1	1

TABLE 2.2  
**Faunal Density Calculations**

Faunal density is calculated using estimated biomass (in ascending order of biomass per cubic meter) for each of the sites with at least one cubic meter of excavated and analyzed material.

Site	Period	Screen (in.)	Biomass (g)	Excavated Volume (m <sup>3</sup> )	Biomass (g/m <sup>3</sup> )
South End	Mississippi	⅛	16,082	54	297.8
Cannon's Point	Late Archaic	⅛	18,096	13	1392.0
West	Late Archaic	⅛	6196	2.8	2212.9
St. Catherines Ring	Late Archaic	¼, ⅛	59,541	14.4	4134.8
Grand	Mississippi	¼	123,276	13	9482.8
Grant	Mississippi	¼	64,322	6.5	9897.2
Bluff	Mississippi	¼	29,703	2.5	11,881.2
McQueen	Late Archaic	⅛	15,704	1.2	13,086.7
Kinzeys	Mississippi	¼	85,011	3.2	25,566.1

at South End Mound I (our very low category, with only 297.8 g of biomass per m<sup>3</sup>). The very low faunal density is unsurprising since the midden was only a small portion of the burial mound fill. Faunal densities at the shell rings varied, although most were in the low category: Cannon's Point, West, and St. Catherines fell into the low category, but McQueen and Grand were in the high category. Grant and Bluff middens were also

in the high category. Kinzeys Knoll was quite literally off the charts, with an estimated 25,566.1 g of biomass/m<sup>3</sup>. The Kinzeys Knoll deposit has been proposed as an assemblage that represents feasting (Marrinan, 2005). The extremely dense faunal deposit may be the result of ritual feasts, but comparisons with other feasting assemblages are needed to evaluate whether faunal density can be linked to ritual behavior and feasting.

Calculations of faunal density may provide some insight into the nature of the deposit. Russo (2004) has commented on the use of the term “clean shell” to indicate that large quantities of loose oyster shells comprise shell ring fill. He suggests that this observation may indicate intentional mounding of shell. In this case, sites with low density include all of the Late Archaic shell rings with the exception of McQueen. We are unsure of the reasons why the McQueen sample differs, but its excavated and analyzed volume is considerably lower than the other samples. If most Late Archaic shell rings evidence a lower density of vertebrate fauna than later period sites, there may be a different depositional pattern.

ARCHAEOLOGY OF COASTAL GEORGIA AND NORTHEAST FLORIDA

SEASONALITY STUDIES AND SEDENTISM

Faunal analysis has made strides in the study of food consumption, which also has provided an indication of season of site occupation. Seasonality studies offer the opportunity to understand patterns of mobility or settled life in the coastal zone. These studies provide direct evidence of human presence at a site during specific seasons of the year. Archaeologists are interested in knowing when a society becomes sedentary for a multitude of reasons. A sedentary lifestyle requires more than a simple cessation of movement on the

landscape; social behaviors must change to cope with sustaining continued occupation in a single area. Solutions must be found for complex problems, such as procuring food from a limited area throughout the year, developing seasonal schedules of procurement to prevent food shortages, and tolerating extended periods of communal living. To ensure that resources are not depleted and food shortages do not ensue, both individual and group foraging must be reorganized (Kelly, 1998) and this may mean broadening the resource base (Reitz, and Wing, 1999: 253).

Until the 1970s, intensive faunal analyses for coastal sites in the Georgia Bight were lacking. Previously, elaborate models of migration between coastal and inland areas were used to explain the presumed lack of appeal for living on the coast during particular seasons of the year. Traditional markers of sedentism, such as storage pits, ceramics, deep midden deposits, large site size, formal cemeteries, large populations, cultivated or domesticated plants, and a dependable subsistence economy, have been described by Binford (1980), Price and Brown (1985), Rafferty (1985), Kelly (1998), Rocek (1998), and Russo (1998). In the southeast U.S., these characteristics were often considered inadequate evidence for sedentism at early coastal sites. Although many archaeologists considered coastal sites to be short-term seasonal occupations, some thought that these sites were occupied by

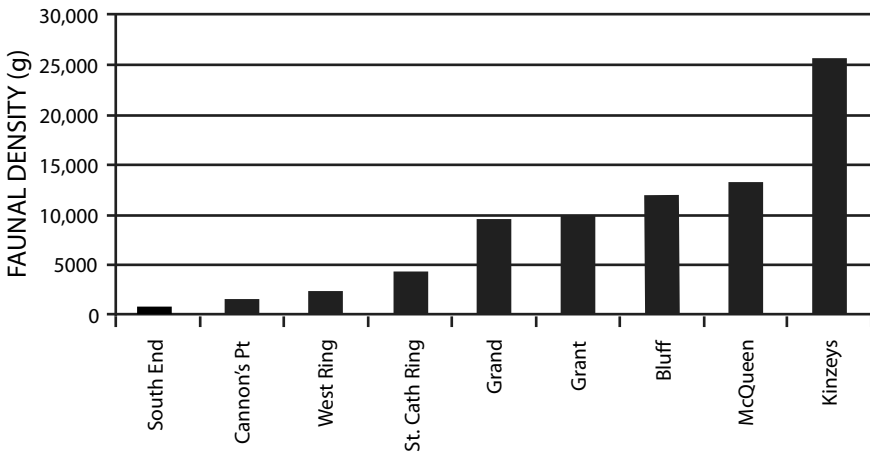


Figure 2.5. Graph of the faunal density using biomass estimates (in ascending order) for samples that were obtained from at least one cubic meter.

relatively sedentary societies that had successfully adapted to the coastal strand in general and estuarine and marsh ecosystems in particular.

Analysis of the faunal samples from the shell rings on St. Simons Island (Marrinan, 1975) in the mid-1970s suggested year-round use of the sites. These data, a combination of faunal and floral indicators, were contrary to then-current conceptions of Archaic people as mobile hunters and gatherers. Since that study, the evidence supporting permanent residence has increased. The addition of quahog clam seasonality data (Quitmyer, Hale, and Jones, 1985a, 1985b) to coastal faunal studies represented a breakthrough that generated yet more evidence of extended residential occupation from the Late Archaic to Mississippian times. The publication of the modern comparative collection from Kings Bay, Georgia (Quitmyer, Hale, and Jones, 1985a, 1985b; Quitmyer, Jones, and Arnold, 1997) facilitated numerous quahog clam studies in the surrounding area. The ability to assess the season of death for quahogs was an important advance, given their frequency in coastal middens. While oysters are typically more numerous than clams in shell middens, determining their season of death has proven to be less straightforward. Research to refine oyster seasonality studies is ongoing; however, archaeologists have used isotopic analysis (e.g., Thompson and Andrus, 2011) as well as size-class studies of *Boonea impressa* (e.g., Russo, 1991) to evaluate oyster seasonality. Recently, Colaninno (2010) has undertaken isotopic assessment of fish otoliths to evaluate seasons of capture at three shell rings on the Georgia Sea Islands.

Over the last 40 years, seasonality data have been amassed from numerous sites in the Georgia Bight. These datasets suggest that from the Late Archaic through the Mississippi Period, coastal groups were relatively sedentary (Marrinan, 1975; Quitmyer, Hale, and Jones, 1985b, Quitmyer, Jones, and Arnold, 1997; Russo, Cordell, and Ruhl, 1993; Ashley, Rolland, and Marrinan, 2007; Parsons, 2008, 2012; Quitmyer and Jones, 2012). In many sites, it appears that some part of the population remained in a single location throughout much of the year. This provides a significantly different picture than that of a highly mobile population migrating between inland and coastal locations. These datasets also reveal that indigenous coastal groups practiced a seasonal schedule for exploitation of particular foods, pos-

sibly as a strategy to maximize returns (Parsons, 2012) or as a result of the reorganization necessary for sedentary groups described by Kelly (1998).

#### PREHISTORIC ENVIRONMENT

Consonant with the characterization of migratory Late Archaic peoples has been an underlying assumption that the coast was inhospitable at certain times of the year. As a consequence, prehistoric groups were thought to engage in a seasonal round that brought them to the coast for shellfish exploitation and returned them inland during other seasons. Data from faunal analyses and the material culture present in coastal sites strongly suggest that coastal people annually exploited the resources of estuarine environments—salt marsh, tidal creeks, and tidal rivers—and were not seasonally migratory. The low frequency of lithic artifacts and debitage in most coastal middens, particularly in Late Archaic shell rings, suggests that inland resources such as chert were not abundant among coastal populations. If groups were practicing an inland-to-coast annual round, more lithic materials would be expected. The masses of invertebrate fauna and the taxa identified in these coastal sites indicate a primary emphasis on the shellfish, fish, turtles, and crabs of the estuary and a secondary emphasis on terrestrial vertebrate fauna.

Our understanding of the role that climate change has played in prehistoric times has grown in the past 40 years. Sea level rise, changing patterns of moisture and drought, temperature fluctuations, and the impact that these factors have had on coastal environments are issues of current concern and research (e.g., Bishop, Rollins, and Thomas, 2011). The addition of dendrochronological data from bald cypress may provide insights that will assist in modeling the kinds of challenges faced by coastal peoples (Blanton and Thomas, 2008). At the present time, however, the available dendrochronological record does not extend to the Late Archaic.

Several recent assessments of human impacts on coastal resources warn that we should expect significant and extensive human impacts on the prehistoric coastal environment and fisheries (e.g., Jackson et al., 2001; Erlandson and Rick, 2008). Reitz (2004) has shown how human fishing in the coastal strand has diminished the fisheries over time. Today we look at the maritime forests of the barrier islands and coastal margins

and imagine Late Archaic people in these environments. Given the plantation history of the barrier islands and coastal zone, however, most of these areas have been cleared extensively and are now reforested. In prehistoric times, it is more likely that substantially cleared expanses were created by coastal people because of the need for wood in building, cooking, heating, transportation, lighting, and many lesser technological uses such as snares, traps, arrows, spears, paddles, and mortars. Grasses and palm fronds would be needed for thatching, cordage, thread, matting, and bedding. Areas for canoe fabrication as well as launching ways, repair, and storage should be expected. A system of weirs in the tidal creeks, of increasing size and complexity relative to the size of the tributary, could sustain coastal populations.

#### TECHNOLOGY

Given the evidence for sedentism and the adaptation to coastal hunting, gathering, and fishing, the material inventory of these groups must be anticipated to focus technology to these needs. In an early study of freshwater river-corridor adapted people in Guiana (Roth, 1924), a majority of the technology, including basketry traps, cordage, arrows, harpoons, and many other items were fabricated from perishable materials. The absence of quantities of lithic material suggests that coastal people in the Georgia Bight made a similar adaptation. Sedentary occupants of the coastal zone probably obtained food from many, if not all, of the biotopes available to them. Procurement strategies likely included constructing weirs in the tidal creeks and rivers; fishing from canoes with spears, harpoons, arrows, leisters, or lines; hunting on the marsh islands and mainland; and gathering plants and invertebrates. Although direct evidence of fishing technology is meager—perhaps we recover only the small bipointed bone segments used as fish gorges—indirect evidence of netting capture or spearing can be gained from study of the sizes of fish in the collections (Colaninno, 2011). Estimates of fish size (length) suggest that a variety of sizes were being taken with concentration on smaller fishes. Although canoes were available (Wheeler et al., 2003), there is no evidence of offshore fishing.

#### SOCIAL BEHAVIOR

In this overview, we have two basic types of sites: shell rings and shell middens. Shell rings

are primarily a Late Archaic phenomenon but ring-shaped middens (with black earth and shellfish) are known from Florida during the Woodland Period (e.g., Bernath—8Sr986 and Bird Hammock—8Wa30) (Bense, 1969, 1998; Penton, 1970). Shell rings are annular accumulations of food debris, broken pottery, occasional lithic materials, and occasional nonarticulated human remains. They are associated with the earliest ceramics in North America, the fiber-tempered series. The kind of social organization among these people is unknown, but the probability of sedentary life has suggested to many that the egalitarian social structure of truly migratory bands cannot be imputed to these people. The term *transegalitarian* has been suggested by Clark and Blake (1994) and Hayden (1995a) to describe societies that are somewhere between egalitarian and politically stratified. This term may be a good descriptor for sedentary Late Archaic people who occupied the Georgia Bight.

The function of shell rings has been a subject of contention for archaeologists for several decades. Recently, arguments regarding ring function have taken three primary stances: (1) shell rings represent monumental architecture and are the product of feasting and other ceremonial events; (2) shell rings represent the accumulation of daily refuse; (3) shell rings are the result of a combination of both quotidian and ceremonial accumulations. Our current lack of housing structures associated with shell rings confounds the issue of ring function. Although archaeologists have identified pit features and postmolds inside several shell rings using remote sensing (e.g., Sanger and Thomas, 2010), housing structures remain elusive. If, as some believe, the habitation was internal, we may be seeing all of the living debris—whether ceremonial or daily—deposited around an interior structure or structures. Thompson and Andrus (2011: 336) include a depiction of dwelling structures inside a ring, but the relationship of shell-bearing deposits and residential areas is currently unknown. If refuse were not deposited around a circular arrangement of structures, then we must agree that the refuse was intentionally disposed in a circular manner. It was not a rectangular deposit, nor square, but intentionally circular. This deposition pattern repeats along the Atlantic coastal zone in the Late Archaic Period more than three dozen times.

Shell middens are deposits of refuse that are the result of both quotidian and ceremonial activ-

ities. Rather than viewing these middens as monumental, most archaeologists view midden deposits as food refuse, with residential structures located in the immediate vicinity. The effective distance that people take their refuse for disposal is unknown, but Milanich's (1973) description of a Deptford Period site on Cumberland Island indicated that the midden was immediately adjacent to the residence.

## DISCUSSION

Since the 1970s, a sizeable database of samples from sites in the Georgia Bight has been generated, primarily by long-term research projects directed by museums and academic institutions. It is clear that this research has added to our understanding of prehistoric lifeways from Late Archaic times through the Mississippi Period. Zooarchaeological data and archaeobotanical data (of which we have far less) have provided insights regarding diet, subsistence strategies, seasons of site occupation, technological requirements, and environmental focus. As a result of our site assessments, we can also see areas where more work is needed.

One of the greatest needs is evidence of house types and housing arrangement in the coastal strand. At the present time, our data are meager. Over the years, there has been argument about whether habitations were located atop, inside, or outside shell rings and on or adjacent to middens. Early archaeologists focused on midden deposits and gave far less attention to the inside of the midden or its surrounding area. There has been a perception that the midden *is* the site rather than that the midden is one element of a site. Field experiments at Hatchery West showed that evidence of Mississippian house patterns lay apart from household midden deposits (Binford et al., 1970). However, expanded excavations and shovel-test surveys surrounding the Late Archaic shell rings on St. Catherines Island have not identified residential structures thus far.

Another long-standing issue is the absence of skeletal remains in Late Archaic shell ring sites. C.B. Moore (1998 [1897]: 159) recovered human remains in Sapelo Ring I and commented that it was not from an articulated burial. Since that time similar observations have been made elsewhere (Marrinan, 1975). Precisely what these human skeletal remains represent is unknown, but they may be evidence of ancestor

vation, discard of human remains that were considered unimportant, or even cannibalism. To date, articulated burials are lacking from Late Archaic shell ring sites but they are not uncommon in some midden sites throughout the Southeast (e.g., Indian Knoll, Tick Island).

The possibility of migration from another area remains the elephant in the room for some of us. While we marvel that Oceanic colonizers sailed across vast stretches of open ocean to settle the islands of the Pacific, we must not overlook the settling of the Caribbean. As Rouse (1992) has reminded us, it was not wholesale colonization, but rather waves of settlement occurring at varying distances over many years. We do not know whether Florida and the southeastern Atlantic coast figure into the spread of people from South and Central America as Ford (1969) contended. As the techniques of DNA sequencing become less expensive and more effective, we approach the time when genetic profiles for contemporaneous coastal and inland populations may be obtained. It may become possible to respond to Ford's hypothesis.

Also clear to us is the need for CRM firms to generate floral and faunal data from the projects they undertake, and to publish these data widely. Today, CRM firms undertake more archaeological investigations than all other segments of the archaeological community. The publication of detailed faunal analyses from CRM projects has the potential to greatly increase our understanding of subsistence in the Georgia Bight. Standardization of screen size to  $\frac{1}{8}$  in. or smaller, as well as the quantification of at least some portion of the invertebrate remains, would provide datasets that are more comparable in their representation of the assemblage.

Worked bones are a common midden inclusion, but many archaeologists regard worked bones as "artifacts" and remove these specimens from the faunal sample. Thus the faunal analyst does not see these specimens and cannot include them in the analysis of the assemblage. There is controversy regarding how worked bones should be treated in faunal analyses because elements such as antlers and teeth are commonly modified. In Florida, it is not uncommon to find shark teeth that have been drilled, notched, or show evidence of use-wear. Most analysts separate these specimens and exclude them from biomass estimates. Bones such as the metapodials of white-tailed deer, which were commonly modified for the



production of tools, represent primary food resources and secondary use as tools. Elements that were commonly used to make bone tools may be underrepresented in faunal assemblages as a consequence of removing worked bone. As such, the biomass estimates for particular species may be underestimated.

Faunal analysts remain concerned about obtaining *representative* samples. Column sampling should not replace the recovery of larger samples such as block excavation assemblages. Certainly it is cheaper to take column samples and ignore the remains in general levels, but this practice results in a biased view of the taxa present and their relative significance in the collection. It is true that we typically excavate only a small percentage of a site; this further constricts that percentage to a 50 × 50 cm column or less and cannot assure the recovery of a representative sample. This is particularly true for large coastal sites that were occupied over centuries or include multiple phases of occupation. In some instances, the practice of subsampling column samples (e.g., selecting certain levels or areas) results in even less representative data.

Forty years later, we can measure our progress in the quality of samples recovered from field projects and the data generated by analysis.

We also can see that insights regarding the behavior of people in the coastal zone have suggested more complexity than traditionally attributed to Late Archaic groups. Older attitudes about the feasibility of life in the coastal zone have been challenged by this work and healthy debate has flourished. After 40 years of development in the field of zooarchaeology, “archaeologists have a well-stocked arsenal of methods and techniques available for reconstructing the past subsistence activities” (Thomas, 2008: chap. 12, 306).

## NOTES

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Appendix 2.1  
**Vertebrate Fauna by Class for Sites Evaluated in This Chapter**

<b>St. Catherines Shell Ring (Reitz, 2008)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	11,592	N/R	13	N/R
Birds	330	N/R	3	N/R
Reptiles	542	N/R	10	N/R
Fish and sharks	2967	N/R	92	N/R
<b>Totals</b>	15,431	N/R	118	N/R
<b>St. Catherines Shell Ring (Colaninno, 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	32,327	N/R	39	N/R
Birds	409	N/R	22	N/R
Reptiles	2343	N/R	35	N/R
Fish and sharks	9031	N/R	1121	N/R
<b>Totals</b>	44,110	N/R	1217	N/R
<b>McQueen Shell Ring (Colaninno, 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	7310	N/R	11	N/R
Birds	177	N/R	8	N/R
Reptiles	168	N/R	9	N/R
Fish and sharks	8049	N/R	1112	N/R
<b>Totals</b>	15,704	N/R	1140	N/R
<b>South End Mound I (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	15,293	N/R	13	N/R
Birds	12	N/R	1	N/R
Reptiles	541	N/R	7	N/R
Fish and sharks	236	N/R	6	N/R
<b>Totals</b>	16,082	N/R	27	N/R
<b>Sapelo Ring III (Colaninno, 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	2259	N/R	4	N/R
Birds	60	N/R	4	N/R
Reptiles	426	N/R	6	N/R
Fish and sharks	15,443	N/R	497	N/R
<b>Totals</b>	18,188	N/R	511	N/R

## Appendix 2.1 — (Continued)

<b>Bourbon Field (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	21,420	N/R	106	N/R
Birds	11	N/R	2	N/R
Reptiles	1250	N/R	38	N/R
Fish and sharks	6662	N/R	398	N/R
<b>Totals</b>	29,343	N/R	544	N/R
<b>Cathead Creek (Woodland) (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	145.4	N/R	3	N/R
Birds	0	N/R	0	N/R
Reptiles	116.05	N/R	6	N/R
Fish and sharks	1017.4	N/R	64	N/R
<b>Totals</b>	1278.9	N/R	73	N/R
<b>Cathead Creek (Mississippi) (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	448.00	N/R	6	N/R
Birds	4.70	N/R	1	N/R
Reptiles	24.01	N/R	8	N/R
Fish and sharks	849.20	N/R	61	N/R
<b>Totals</b>	1325.91	N/R	76	N/R
<b>Cannon's Point Shell Ring, Excavation Unit 18N, 0E (Marrinan, 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	5214.4	314.1	11	387
Birds	147.2	8.1	5	81
Reptiles	1476.4	144.1	10	712
Fish and sharks	11,257.6	741.1	319	18,783
<b>Totals</b>	18,095.6	1207.4	345	19,963
<b>West Ring, Excavation Unit 5S, 30E (Marrinan, 1975)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	1472.7	78.1	7	225
Birds	73.3	3.9	2	51
Reptiles	446.7	33.2	6	253
Fish and sharks	4203.2	250	235	8910
<b>Totals</b>	6195.9	365.2	250	9439

## Appendix 2.1 — (Continued)

<b>Kings Bay (Woodland) (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	444.1	N/R	9	N/R
Birds	25.4	N/R	2	N/R
Reptiles	245.8	N/R	10	N/R
Fish and sharks	3861.9	N/R	1672	N/R
<b>Totals</b>	<b>4577.2</b>	<b>N/R</b>	<b>1693</b>	<b>N/R</b>
<b>Devil's Walkingstick (Mississippi) (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	334.26	N/R	14	N/R
Birds	40.80	N/R	4	N/R
Reptiles	212.84	N/R	17	N/R
Fish and sharks	3184.57	N/R	853	N/R
<b>Totals</b>	<b>3772.47</b>	<b>N/R</b>	<b>888</b>	<b>N/R</b>
<b>Grand Shell Ring, Units 1-7 (Appendix 2.2)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	13,800.0	878.5	35	714
Birds	4125.4	308.6	18	757
Reptiles	5174.4	816.9	16	1633
Fish and sharks	100,175.7	10,601.30	1660	89,560
<b>Totals</b>	<b>123,275.5</b>	<b>12,605.30</b>	<b>1729</b>	<b>92,664</b>
<b>Kinzeys Knoll, Shields Mound vicinity, Units 1-4 (Marrinan, 2005)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	31,332.7	2178.7	37	1092
Birds	4538.8	317.9	28	429
Reptiles	5443.2	1118.7	21	1113
Fish and sharks	43,696.7	4819.1	345	22,551
<b>Totals</b>	<b>85,011.4</b>	<b>8434.4</b>	<b>431</b>	<b>25,185</b>
<b>Bluff Midden, Shields Mound vicinity, Units 7 and 8 (Marrinan, 2005)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	12,918.2	859.3	17	315
Birds	473.5	29.1	5	47
Reptiles	2057.9	223.8	13	195
Fish and sharks	14,253.2	1131.1	102	5956
<b>Totals</b>	<b>29,702.8</b>	<b>2243.3</b>	<b>137</b>	<b>6513</b>

## Appendix 2.1 — (Continued)

<b>Grant Mound, Units 2 and 4 (Appendix 2.2)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	8754.9	525.2	23	405
Birds	2151.1	148.3	7	251
Reptiles	4719.5	662	15	776
Fish and sharks	48,696.4	4091.2	408	22,999
<b>Totals</b>	64,321.9	5426.7	453	24,431
<b>Jacksonville Electric Authority (Reitz et al., 2010)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	29	N/R	5	N/R
Birds	0	N/R	0	N/R
Reptiles	76	N/R	7	N/R
Fish and sharks	604	N/R	157	N/R
<b>Totals</b>	709	N/R	169	N/R
<b>Fountain of Youth (Late Archaic) (Reitz, 1991)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	161	N/R	4	N/R
Birds	0	N/R	0	N/R
Reptiles	13	N/R	1	N/R
Fish and sharks	606	N/R	23	N/R
<b>Totals</b>	780	N/R	28	N/R
<b>Fountain of Youth (Mississippi) (Reitz, 1991)</b>				
<b>Class</b>	<b>Biomass (g)</b>	<b>Weight (g)</b>	<b>MNI</b>	<b>NISP</b>
Mammals	31	N/R	6	N/R
Birds	7	N/R	1	N/R
Reptiles	63	N/R	5	N/R
Fish and sharks	1460	N/R	204	N/R
<b>Totals</b>	1561	N/R	216	N/R

Appendix 2.2  
**Faunal Analysis Composite Datasheets for the Grand Shell Ring (8Du1)  
 and Grant Mound (8Du14)**

Faunal Composite for the Grand Shell Ring (8Du1)												
Scientific Name	Common Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI
Mammalia, Large	Probably deer or bear	108	0.12	192.6	1.50	2993.58	2.43	5	1.74	3	11.11	0.00
Mammalia, Medium	Probably opossum or raccoon	31	0.03	12.9	0.10	262.74	0.21		0.00		0.00	0.00
Mammalia, Small	Probably rabbit or squirrel	85	0.09	17.1	0.13	338.61	0.27	3	1.05		0.00	0.00
Mammalia	Unidentified mammal	100	0.11	33.3	0.26	616.88	0.50	1	0.35	1	3.70	0.00
<i>Didelphis virginiana</i>	Eastern opossum	58	0.06	66.4	0.52	1148.02	0.93		0.00		0.00	2
<i>Scalopus aquaticus</i>	Eastern mole	8	0.01	1.4	0.01	35.61	0.03		0.00		0.00	3
<i>Sylvilagus sp.</i>	Rabbits	97	0.10	0.1	0.00	3.31	0.00		0.00		0.00	6
Rodentia	All Rodents	25	0.03	2.7	0.02	64.30	0.05	1	0.35		0.00	0.00
Rodentia cf., <i>Neofiber</i>	Possibly round-tailed muskrat	1	0.00	0.2	0.00	6.18	0.01		0.00		0.00	1
Scuridae	Squirrels	1	0.00	0.5	0.00	14.10	0.01		0.00		0.00	0.00
<i>Sciurus carolinensis</i>	Gray squirrel	36	0.04	10.8	0.08	223.91	0.18		0.00		0.00	7
<i>Sciurus niger</i>	Fox squirrel	3	0.00	0.7	0.01	19.08	0.02		0.00		0.00	1
<i>Sigmodon hispidus</i>	Hispid cotton rat	5	0.01	0.9	0.01	23.92	0.02		0.00		0.00	3
<i>Ursus sp.</i>	Bears	2	0.00	3.4	0.03	79.13	0.06		0.00		0.00	1
<i>Lutra canadensis</i>	River otter	3	0.00	1.8	0.01	44.64	0.04		0.00		0.00	1
<i>Mephitis mephitis</i>	Skunk	9	0.01	4.6	0.04	103.87	0.08		0.00		0.00	1
<i>Mustela vison</i>	Mink	1	0.00	0.9	0.01	23.92	0.02		0.00		0.00	1
<i>Procyon lotor</i>	Raccoon	23	0.02	38.1	0.30	696.36	0.56		0.00		0.00	2
<i>Canis familiaris</i>	Domestic dog	1	0.00	0.2	0.00	6.18	0.01		0.00		0.00	1
Artiodactyla	Probably deer	4	0.00	2.2	0.02	53.48	0.04		0.00		0.00	0.00
<i>Bos taurus</i>	Domestic cattle	3	0.00	20.0	0.16	389.88	0.32		0.00		0.00	1
<i>Odocoileus virginianus</i>	White tail deer	110	0.12	467.7	3.65	6652.28	5.40	1	0.35	5	18.52	4
All mammals		714	0.76	878.5	6.85	13,799.98	11.19	11	3.83	9	33.33	35
<i>Homo sapiens sapiens</i>	Humans	1		0.4								1
Aves	Unidentified birds	673	0.72	245.1	1.91	3050.02	2.47	4	1.39	3	11.11	0.00
<i>Gavia immer</i>	Common loon	7	0.01	11.8	0.09	192.94	0.16		0.00		0.00	1
<i>Podiceps auritus</i>	Horned grebe	8	0.01	3.4	0.03	62.18	0.05		0.00		0.00	1

## Appendix 2.2 — (Continued)

Faunal Composite for the Grand Shell Ring (8Du1)													
Scientific Name	Common Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
<i>Phalacrocorax auritus</i>	Double-crested cormorant	20	0.02	21.2	0.17	328.83	0.27		0.00		0.00	1	0.06
<i>Phalacrocorax carbo</i>	Great cormorant	1	0.00	0.3	0.00	6.83	0.01		0.00		0.00	1	0.06
<i>Eretta alba</i>	Great egret	1	0.00	0.3	0.00	6.83	0.01		0.00		0.00	1	0.06
Anatidae	Ducks	2	0.00	0.6	0.00	12.83	0.01		0.00		0.00		0.00
Aythinae	Diving ducks	2	0.00	0.5	0.00	10.87	0.01		0.00		0.00		0.00
<i>Aythya americana</i>	Redhead duck	1	0.00	1.1	0.01	22.27	0.02		0.00		0.00	1	0.06
<i>Mergus</i> sp.	Mergansers	2	0.00	1.2	0.01	24.10	0.02		0.00		0.00		0.00
<i>Mergus merganser</i>	Common merganser	11	0.01	11.8	0.09	192.94	0.16		0.00		0.00	1	0.06
<i>Mergus serrator</i>	Red-breasted merganser	10	0.01	5.9	0.05	102.68	0.08		0.00		0.00	1	0.06
<i>Haliaeetus leucocephalus</i>	Bald eagle	1	0.00	1.4	0.01	27.73	0.02		0.00		0.00	1	0.06
<i>Cathartes aura</i>	Turkey vulture	1	0.00	0.4	0.00	8.87	0.01		0.00		0.00	1	0.06
<i>Grus canadensis</i>	Sandhill crane	1	0.00	1.0	0.01	20.42	0.02		0.00		0.00	1	0.06
<i>Rallus longirostris</i>	Clapper rail	7	0.01	1.6	0.01	31.31	0.03		0.00		0.00	1	0.06
<i>Larus argentatus</i>	Herring gull	1	0.00	0.1	0.00	2.51	0.00		0.00		0.00	1	0.06
<i>Larus atricilla</i>	Laughing gull	2	0.00	0.2	0.00	4.72	0.00		0.00		0.00	1	0.06
<i>Larus delawarensis</i>	Ring-billed gull	1	0.00	0.2	0.00	4.72	0.00		0.00		0.00	1	0.06
Passeriformes	Songbirds	2	0.00	0.1	0.00	2.51	0.00		0.00		0.00	1	0.06
Emberizidae	Buntings and sparrows	1	0.00	0.1	0.00	2.51	0.00		0.00		0.00	1	0.06
Icteridae	Probably red-winged blackbird	2	0.00	0.3	0.00	6.83	0.01		0.00		0.00	1	0.06
All birds		757	0.81	308.6	2.41	4125.42	3.35	4	1.39	3	11.11	18	1.04
Reptilia	Unidentified reptile	2	0.00	1.6	0.01	26.40	0.02		0.00		0.00	1	0.06
Testudines	Unidentified turtle	1148	1.23	370.3	2.89	1663.15	1.35	84	29.27		0.00		0.00
<i>Chelydra serpentina</i>	Snapping turtle	6	0.01	5.9	0.05	103.87	0.08		0.00		0.00	1	0.06
Kinosternidae	Mud or musk turtle	121	0.13	39.1	0.31	368.77	0.30	5	1.74		0.00	4	0.23
<i>Terrapene carolina</i>	Eastern box turtle	62	0.07	90.0	0.70	644.68	0.52		0.00		0.00	2	0.12
<i>Trachemys</i> sp.	Pond sliders	10	0.01	5.3	0.04	96.66	0.08		0.00		0.00	1	0.06
<i>Deirochelys reticularia</i>	Chicken turtle	34	0.04	19.2	0.15	228.99	0.19		0.00		0.00	1	0.06
<i>Malaclemys terrapin</i>	Diamondback terrapin	151	0.16	141.1	1.10	871.33	0.71	2	0.70		0.00	3	0.17
<i>Gopherus polyphemus</i>	Gopher tortoise	39	0.04	60.4	0.47	493.51	0.40		0.00		0.00	1	0.06

## Appendix 2.2 — (Continued)

Faunal Composite for the Grand Shell Ring (8Du1)													
Scientific Name	Common Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
<i>Apalone ferox</i>	Softshell turtle	2	0.00	1.9	0.01	48.61	0.04		0.00		0.00	1	0.06
Cheloniidae	Sea turtles	37	0.04	79.6	0.62	593.76	0.48		0.00		0.00	1	0.06
All turtles		1610	1.72	812.8	6.34	5113.33	4.15	91	31.71	0	0.00	15	0.87
Serpentes	Snakes	19	0.02	2.2	0.02	30.61	0.02		0.00		0.00		0.00
Colubridae	Non-poisonous snakes	2	0.00	0.3	0.00	4.09	0.00		0.00		0.00	1	0.06
All snakes		21	0.02	2.5	0.02	34.70	0.03	0	0.00	0	0.00	1	0.06
<i>Siren lacertina</i>	Greater siren	3	0.00	0.3	0.00	4.09	0.00		0.00		0.00	1	0.06
Anura cf. <i>Rana</i>	Frogs	5	0.01	0.6	0.00	8.24	0.01		0.00		0.00		0.00
Ranidae	Frog family	1	0.00	0.1	0.00	1.35	0.00		0.00		0.00	1	0.06
All frogs		9	0.01	1.0	0.01	13.68	0.01	0	0.00	0	0.00	2	0.12
Actinopterygii	Unidentified ray-finned fishes	53,445	57.09	5022.6	39.19	29,359.74	23.81	63	21.95	5	18.52		0.00
<i>Accipenser</i> sp.	Sturgeon	12	0.01	6.1	0.05	127.68	0.10		0.00		0.00	1	0.06
<i>Lepisosteus</i> sp.	Gar	8	0.01	6.1	0.05	127.68	0.10		0.00		0.00	1	0.06
<i>Amia calva</i>	Bowfin	72	0.08	9.0	0.07	174.96	0.14		0.00		0.00	2	0.12
<i>Elops saurus</i>	Ladyfish	222	0.24	12.6	0.10	229.77	0.19		0.00		0.00	6	0.35
Clupeidae	Herrings and menhaden	1706	1.82	48.9	0.38	689.19	0.56	2	0.70		0.00	176	10.16
<i>Anguilla rostrata</i>	American eel	200	0.21	9.2	0.07	178.10	0.14		0.00		0.00	3	0.17
Siluriformes	All catfish	4169	4.45	396.0	3.09	5858.82	4.75	14	4.88		0.00		0.00
Ictaluridae	Freshwater catfish	341	0.36	60.9	0.48	989.43	0.80		0.00		0.00	58	3.35
Ariidae	Marine catfish	4635	4.95	988.0	7.71	13,964.30	11.33	32	11.15	1	3.70	348	20.08
<i>Ariopsis felis</i>	Hardhead catfish	2249	2.40	369.6	2.88	5487.13	4.45	6	2.09		0.00		0.00
<i>Bagre marinus</i>	Gafftopsail catfish	1151	1.23	221.4	1.73	3372.24	2.74	17	5.92		0.00		0.00
<i>Opsanus</i> sp.	Toadfish	158	0.17	24.0	0.19	387.23	0.31		0.00		0.00	18	1.04
<i>Mugil</i> sp.	Mullet	7460	7.97	440.5	3.44	4088.80	3.32	10	3.48		0.00	493	28.45
<i>Strongylura</i> sp.	Needlefish	9	0.01	1.0	0.01	29.51	0.02		0.00		0.00	1	0.06
<i>Fundulus</i> sp.	Topminnow	1	0.00	0.2	0.00	8.01	0.01		0.00		0.00	1	0.06
<i>Pomatomus saltatrix</i>	Bluefish	216	0.23	18.1	0.14	308.12	0.25		0.00		0.00	1	0.06
Carangidae	Jacks	262	0.28	46.3	0.36	1136.87	0.92		0.00		0.00		0.00



## Appendix 2.2 — (Continued)

Faunal Composite for the Grand Shell Ring (8Du1)													
Scientific Name	Common Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
<i>Caranx</i> sp.	Jack	1637	1.75	353.6	2.76	6802.85	5.52	6	2.09		0.00	33	1.90
<i>Trachinotus</i> sp.	Pompano	47	0.05	8.8	0.07	171.80	0.14		0.00		0.00	7	0.40
<i>Lutjanus</i> sp.	Snapper	1	0.00	0.2	0.00	8.01	0.01		0.00		0.00	1	0.06
<i>Lobotes surinamensis</i>	Tripletail	5	0.01	1.9	0.01	49.64	0.04		0.00		0.00	1	0.06
Sparidae	Porgies	218	0.23	18.4	0.14	231.01	0.19	3	1.05		0.00		0.00
<i>Archosargus probatocephalus</i>	Sheepshead	1695	1.81	454.3	3.54	4413.22	3.58		0.00		0.00	86	4.96
Sciaenidae	Drums	150	0.16	23.9	0.19	407.39	0.33	2	0.70		0.00		0.00
<i>Bairdiella</i> sp.	Silver perch	10	0.01	1.1	0.01	41.75	0.03		0.00		0.00	4	0.23
<i>Cynoscion</i> sp.	Seatrout	2840	3.03	403.3	3.15	3297.35	2.67	13	4.53		0.00	203	11.71
<i>Micropogonias undulatus</i>	Atlantic croaker	83	0.09	17.9	0.14	328.94	0.27		0.00		0.00	28	1.62
<i>Pogonias cromis</i>	Black drum	1031	1.10	842.9	6.58	5689.50	4.61		0.00		0.00	27	1.56
<i>Sciaenops ocellatus</i>	Redfish	579	0.62	179.4	1.40	1810.63	1.47		0.00		0.00	74	4.27
<i>Gobionellus</i> sp.	Gobies	48	0.05	2.9	0.02	69.91	0.06		0.00		0.00	2	0.12
<i>Trichiurus</i> sp.	Cutlassfish	637	0.68	104.6	0.82	1275.91	1.03	1	0.35	1	3.70	17	0.98
Pleuronectiformes	Flounders	4123	4.40	474.2	3.70	6332.95	5.14	5	1.74		0.00	66	3.81
All ray-finned fishes		89,420	95.52	10,567.9	82.46	97,448.45	79.04	174	60.63	7	25.93	1658	95.67
Squaliformes	Sharks	5	0.01	1.0	0.01	125.89	0.10		0.00	1	3.70	0	0.00
Carcharhinidae	Requiem sharks	19	0.02	2.0	0.02	228.50	0.19		0.00	3	11.11	1	0.06
Rajiformes	Rays	116	0.12	30.4	0.24	2372.86	1.92	2	0.70	2	7.41	1	0.06
All sharks and rays		140	0.15	33.4	0.26	2727.25	2.21	2	0.70	6	22.22	2	0.12
Unidentified Vertebrate	Unidentified fragments	944	1.01	209.0	1.63		0.00	5	1.74	2	7.41		0.00
Totals		93,618	100.00	12,815.7	100.00	123,289.21	100.00	287	100.00	27	100.00	1733	99.94
Decapoda	Crabs	29	1.16	4.5	0.62	39.51	0.66		0.00		0.00		0.00
<i>Callinectes</i> sp.	Blue crabs	2454	98.51	698.0	96.82	5826.62	96.70	513	100.00		0.00	250	98.81
<i>Menippe mercenaria</i>	Stone crab	8	0.32	18.4	2.55	159.28	2.64	0	0.00		0.00	3	1.19
Total		2491	100.00	720.9	100.00	6025.41	100.00	513	100.00	0	100.00	253	100.00

## Appendix 2.2 — (Continued)

Faunal Composite for the Grant Mound (8Du14)		Taxonomic Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
Mammalia, Large	Probably deer, bear, panther		59	0.35	67.1	1.23	1158.91	2.37	3	3.23		0.00		0.00
Mammalia, Medium	Probably raccoon, fox, dog		4	0.02	4.6	0.08	103.87	0.21		0.00		0.00		0.00
Mammalia, Small	Probably rabbit, squirrel		16	0.10	2.7	0.05	64.30	0.13		0.00		0.00		0.00
Mammalia	Unidentified mammal		75	0.45	31.4	0.58	585.11	1.20	1	1.08		0.00		0.00
<i>Didelphis virginiana</i>	Eastern opossum		5	0.03	7.7	0.14	165.14	0.34		0.00		0.00	1	0.27
<i>Sylvilagus</i> sp.	Rabbits		2	0.01	0.6	0.01	16.61	0.03		0.00		0.00	1	0.27
Rodentia	Rodents		10	0.06	1.0	0.02	26.30	0.05		0.00		0.00		0.00
<i>Neofiber alleni</i>	Round-tailed muskrat		1	0.01	0.3	0.01	8.90	0.02		0.00		0.00	1	0.27
<i>Sciurus carolinensis</i>	Gray squirrel		12	0.07	2.9	0.05	68.57	0.14		0.00		0.00	2	0.54
<i>Sciurus niger</i>	Fox squirrel		5	0.03	3.6	0.07	83.31	0.17	1	1.08		0.00	1	0.27
<i>Sigmodon hispidus</i>	Hispid cotton rat		16	0.10	2.2	0.04	53.48	0.11		0.00		0.00	4	1.07
<i>Mustela vison</i>	Mink		5	0.03	4.2	0.08	95.70	0.20	2	2.15		0.00	1	0.27
<i>Procyon lotor</i>	Raccoon		20	0.12	16.6	0.30	329.68	0.67		0.00		0.00	1	0.27
<i>Ursus</i> sp.	Bear		1	0.01	33.8	0.62	625.21	1.28		0.00		0.00	1	0.27
<i>Odocoileus virginianus</i>	White tail deer		50	0.30	134.2	2.46	2162.61	4.42	1	1.08		0.00	2	0.54
All mammals			281	1.68	312.9	5.75	5547.70	11.35	8	8.60	0	0.00	15	4.02
<i>Homo sapiens sapiens</i>	Humans		2		6.9								1	
Aves	Unidentified birds		141	0.84	54.7	1.00	779.06	1.59	1	1.08		0.00	1	0.27
<i>Meleagris gallopavo</i>	Wild turkey		4	0.02	22.9	0.42	352.74	0.72		0.00		0.00	1	0.27
All birds			145	0.87	77.6	1.42	1131.79	2.32	1	1.08	0	0.00	2	0.54
Reptilia	Unidentified reptile		1	0.01	1.8	0.03	29.32	0.06	1	1.08		0.00	1	0.27
<i>Alligator mississippiensis</i>	American alligator		12	0.07	184.0	3.38	1801.72	3.69		0.00		0.00	1	0.27
All reptiles			13	0.08	185.8	3.41	1831.04	3.75	1	1.08	0	0.00	2	0.54
Testudines	Unidentified turtles		244	1.46	333.8	6.13	1551.44	3.17	20	21.51		0.00		0.00
<i>Chelydra serpentina</i>	Snapping turtle		1	0.01	1.0	0.02	31.62	0.06		0.00		0.00	1	0.27
Kinosternidae	Mud or musk turtles		29	0.17	10.0	0.18	147.91	0.30		0.00		0.00	2	0.54
<i>Terrapene carolina</i>	Eastern box turtle		3	0.02	2.6	0.05	59.98	0.12	1	1.08		0.00	1	0.27

## Appendix 2.2 — (Continued)

Faunal Composite for the Grant Mound (8Du14)													
Scientific Name	Taxonomic Name	NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
<i>Trachemys</i> sp.	Pond sliders	10	0.06	4.3	0.08	84.03	0.17		0.00		0.00	1	0.27
<i>Gopherus polyphemus</i>	Gopher tortoise	216	1.29	234.8	4.31	1225.65	2.51		0.00		0.00	3	0.80
All turtles		503	3.01	586.5	10.77	3100.64	6.34	21	22.58	0	0.00	8	2.14
Colubridae	Non-poisonous snakes	6	0.04	1.1	0.02	15.20	0.03		0.00		0.00	1	0.27
Anura	Frogs, toads	1	0.01	0.1	0.00	1.35	0.00		0.00		0.00		0.00
<i>Rana</i> sp.	Frog	1	0.01	0.1	0.00	1.35	0.00		0.00		0.00	1	0.27
All frogs and toads		2	0.01	0.2	0.00	2.70	0.01	0	0.00	0	0.00	1	0.27
Actinopterygii	Unidentified ray-finned fish	9626	57.68	3183.8	58.46	20,294.86	41.52	9	9.68		0.00		0.00
<i>Lepisosteus</i> sp.	Gar	39	0.23	12.4	0.23	226.81	0.46	1	1.08		0.00	2	0.54
<i>Amia calva</i>	Bowfin	10	0.06	1.9	0.03	49.64	0.10		0.00		0.00	1	0.27
<i>Elops saurus</i>	Ladyfish	3	0.02	0.2	0.00	8.01	0.02		0.00		0.00	1	0.27
Clupeidae	Herrings	98	0.59	1.8	0.03	47.51	0.10		0.00		0.00	11	2.95
<i>Anguilla rostrata</i>	American eel	39	0.23	2.1	0.04	53.83	0.11		0.00		0.00	1	0.27
Siluriformes	All catfishes	540	3.24	72.0	1.32	1160.02	2.37	1	1.08		0.00		0.00
Ictaluridae	Freshwater catfishes	229	1.37	44.7	0.82	737.55	1.51	1	1.08		0.00	29	7.77
Ariidae	Marine catfishes	879	5.27	226.5	4.16	3446.00	7.05	26	27.96		0.00	82	21.98
<i>Ariopsis felis</i>	Hardhead catfish	261	1.56	64.3	1.18	1041.84	2.13	1	1.08		0.00		0.00
<i>Bagre marinus</i>	Gafftopsail catfish	198	1.19	65.1	1.20	1054.15	2.16	5	5.38		0.00		0.00
<i>Strongylura</i> sp.	Needlefish	24	0.14	3.0	0.06	71.86	0.15		0.00		0.00	2	0.54
<i>Mugil</i> sp.	Mullet	1052	6.30	99.4	1.83	1224.29	2.50	2	2.15		0.00	68	18.23
<i>Lepomis</i> sp.	Sunfish	1	0.01	0.1	0.00	2.51	0.01		0.00		0.00		0.00
<i>Lepomis microlophus</i>	Red-ear sunfish	4	0.02	1.4	0.03	23.05	0.05		0.00		0.00	2	0.54
<i>Micropterus</i> sp.	Bass	23	0.14	4.3	0.08	59.17	0.12		0.00		0.00	5	1.34
<i>Caranx</i> sp.	Probably jack crevelle	138	0.83	56.7	1.04	1358.79	2.78	1	1.08		0.00	7	1.88
<i>Trachinotus</i> sp.	Pompano	1	0.01	0.1	0.00	5.13	0.01		0.00		0.00	1	0.27
<i>Lobotes surinamensis</i>	Tripletail	3	0.02	1.3	0.02	36.50	0.07		0.00		0.00	2	0.54
Sparidae	Porgies	13	0.08	0.7	0.01	11.42	0.02		0.00		0.00		0.00

## Appendix 2.2 — (Continued)

Faunal Composite for the Grant Mound (8Du14)		NISP	%	Weight	%	Biomass	%	Burnt	%	Worked	%	MNI	%
Scientific Name	Taxonomic Name												
<i>Archosargus probatocephalus</i>	Sheepshead	160	0.96	39.8	0.73	469.78	0.96		0.00		0.00	8	2.14
Sciaenidae	Drums	76	0.46	8.9	0.16	196.13	0.40	3	3.23		0.00		0.00
<i>Cynoscion</i> sp.	Seatrout	317	1.90	48.0	0.88	682.52	1.40	1	1.08		0.00	31	8.31
<i>Micropogonias undulatus</i>	Atlantic croaker	74	0.44	17.8	0.33	327.58	0.67		0.00		0.00	23	6.17
<i>Pogonias cromis</i>	Black drum	151	0.90	60.5	1.11	810.03	1.66		0.00		0.00	14	3.75
<i>Sciaenops ocellatus</i>	Redfish	100	0.60	48.8	0.90	690.92	1.41		0.00		0.00	15	4.02
<i>Gobionellus</i> sp.	Gobies	683	4.09	39.3	0.72	577.37	1.18		0.00		0.00	22	5.90
<i>Trichurus</i> sp.	Cutlassfish	5	0.03	0.4	0.01	14.05	0.03		0.00		0.00	1	0.27
Paralichthyidae	Flounder family	684	4.10	104.1	1.91	1642.60	3.36	4	4.30		0.00	12	3.22
All bony fishes		15,431	92.46	4209.4	77.30	36,323.92	74.32	55	59.14	0	0.00	340	91.15
Lamniformes	Sharks	2	0.01	0.3	0.01	44.70	0.09		0.00		0.00	1	0.27
Carcharhinidae	Requiem sharks	1	0.01	0.7	0.01	92.64	0.19		0.00		0.00	1	0.27
Rajiformes	Rays	24	0.14	8.4	0.15	785.02	1.61		0.00		0.00	2	0.54
All sharks and rays		27	0.16	9.4	0.17	922.36	1.89	0	0.00	0	0.00	4	1.07
Unidentified Vertebrate	Unidentified fragments	281	1.68	62.8	1.15		0.00	7	7.53	5	100.00		0.00
Totals		16,689	100.00	5445.7	100.00	48,875.34	100.00	93	100.00	5	100.00	373	100.00
Decapoda	Crabs	14	25.00	1.8	14.88	54.87	19.30	9	21.95		0.00		0.00
<i>Callinectes</i> sp.	Blue crab	42	75.00	10.3	85.12	229.36	80.70	32	78.05		0.00	5	100.00
All crabs		56	100.00	12.1	100.00	284.23	100.00	41	100.00	0	0.00	5	100.00



## CHAPTER 3

# ARCHAEOLOGICAL GEOPHYSICS ON ST. CATHERINES ISLAND: BEYOND PROSPECTION

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### INTRODUCTION

Geophysical instrumentation was first used on St. Catherines Island in May of 1981 (Garrison, Baker, and Thomas, 1985: 299) during the search for the once-lost Mission Santa Catalina de Guale. At the time, this method of archaeological investigation was still in its infancy. Very few archaeological projects had the proper access, funding, personnel, or foresight to include still-underdeveloped methods of prospection. The unrealized potential of geophysical prospection would not last for long, however. In the more than 30 years since Mission Santa Catalina de Guale was discovered, great advances have graced the field of archaeogeophysics, specifically in regard to the collection, processing, display, and analysis of geophysical data (Wynn, 1986; Clark, 1990; Brizzolari et al., 1992; Juppenlatz and Tian, 1996; Cammarano et al., 1998; Piro, Mauriello, and Cammarano, 2000; Vafidis, Economou, and Sarris, 2002; Kvamme, 2003b; Neubauer, 2004; Johnson, 2006; Kvamme, 2006a; Wiseman and El-Baz, 2007; Aspinall, Gaffney, and Schmidt, 2008; Campana and Piro, 2009). Instrumentation has become more sensitive and easier to use with software that is approachable, even for the novice. The computer graphic interpretation of geophysical data has become commonplace in archaeology, and most archaeologists today are accustomed to viewing the results of a geophysical survey in color scale or contour maps, as opposed to crude printouts with no sense of spatial reference. More importantly, these graphics are able to be georeferenced so that they are linked in real space in a GIS platform, allowing

the results to be overlaid with many other lines of investigation, such as topographic mapping and excavation. Even more remarkable is that survey, processing, and display can take place all in the same day.

The tremendous success of the geophysical surveys at Mission Santa Catalina encouraged David Hurst Thomas to continue with geophysical surveys on St. Catherines. In the years to follow, the mission Pueblo (9Li8, 9Li13, 9Li274), Back Creek Village (9Li207), Meeting House Field (9Li21), the St. Catherines Shell Ring (9Li231), and the McQueen Shell Ring (9Li1648) were all surveyed geophysically, which was no small feat considering the sheer size of these sites. Over the course of investigating these sites, the motivation and benefits of geophysical survey have changed little: gain as much information as possible from the sites and do it in the most responsible way. Taking to heart the island creed of “Research, Education, Conservation,” Thomas has developed a program of geophysics in conjunction with excavation on St. Catherines that has benefitted more than just the archaeology of the island (the research). This course of investigation has also helped to minimize the impact of destructive excavation (the conservation) and has provided wonderful opportunities for a plethora of promising young scientists (the education).

In his 1987 work, *The Archaeology of Mission Santa Catalina de Guale: 1. Search and Discovery*, Thomas proposed using midrange theory to better utilize geophysical data. He argued that a bridge needed to be built between empirically collected geophysical data and theoretical concepts in archaeology. Thomas and colleagues

proposed establishing a library of geophysical signatures that align with archaeological features at Mission Santa Catalina de Guale. Although the data were never taken to that precise level in that study, the idea that geophysical signatures can be used to extrapolate and project archaeological information is an intriguing and, as this chapter will show, completely feasible concept.

### GEOPHYSICS TODAY: BEYOND PROSPECTION

In his 2003 *American Antiquity* article, Kenneth Kvamme pointed out how archaeogeophysical surveys can contribute to lines of archaeological inquiry beyond prospecting for archaeological features to excavate. Advances in data collection and computer processing, strong research objectives, and proper data collection practices have led archaeogeophysics to take a turn from its traditional role in archaeology as a mere prospection tool (Kvamme, 2003a; Lockhart and Green, 2006; Lydick, 2007; Thompson, 2007; Gaffney, 2008; Mahar, 2008; Campana and Piro, 2009; Keay et al., 2009; Mušič et al., 2009; Thompson, Arnold, and VanDerwarker, 2009; Conyers, 2010; Conyers and Leckebusch, 2010; Leopold et al., 2010; Mol and Preston, 2010; Thompson et al., 2010; Hurley, 2011; Mahar, 2011a; 2011b; Masini and Soldovieri, 2011; Walker, 2012).

The current study agrees with Kvamme's claim that archaeogeophysical data, when collected and applied properly, can be used as a primary source of data in the archaeological evaluation of a site. First, this study will examine the practices and criteria necessary to use geophysical data as primary archaeological data. Second, a bit of necessary background will be presented regarding the geophysical surveys conducted, after which the methods of data integration and display will be discussed. Next, specific examples regarding the geophysics of the shell rings will be detailed as evidence of the benefits of geophysical investigation, showing how the data can be used as a primary means of investigation. Lastly, conclusions and proposals for further research will be made.

### GEOPHYSICAL DATA AS EMPIRICAL ARCHAEOLOGICAL DATA

Geophysical data can provide much more than a map of where to dig (Conyers and Leckebusch, 2010). The data generated, since they are based

on measurements of observable physical properties, are strongly tied to the basis of empirical research, especially when collected under a well-organized research design (Clark, 1990; Aspinall, Gaffney, and Schmidt, 2008; Conyers and Leckebusch, 2010). Geophysical techniques provide the ability to measure the physical properties of the ground below the surface in a scientific manner. Depending on the technique or techniques being used, geophysical investigation provides firsthand, observable data that speak of the characteristics of the archaeology underfoot, much like various other data acquisition techniques in use today. As such, the data gathered can be taken into consideration much like geomorphology, soil chemistry, radiocarbon testing, soil and sediment analysis, and stable isotope analysis are, to name a few. Though using geophysical survey solely as a prospection technique is tremendously useful, it hinders the potential application of the data. This chapter will attempt to use middle range theory to approach geophysical evidence, using signatures as direct archaeological evidence, instead of as an intermediary on the way to excavation. There are two major criteria for using geophysical data as archaeological empirical data as far as this study is concerned. The first is a multiple means approach that is executed with strict collection standards using appropriate instrumentation for the area under investigation. The second is that data must be tested with appropriate excavation strategies under a well-planned research design, and the results may then be extrapolated and projected across the site.

To do this, this chapter will look at both the novel and complementary characteristics of geophysical datasets. A novel, or unique, dataset is one that provides information that cannot be gleaned in any other way. For example, the only way to determine the magnetic properties of a site is to conduct a magnetic survey. Magnetic data provide information that can be used to identify locations of thermal activity and biogenetic processes, as well as applying the amplitude to speculate on temporal association (Kvamme, 2006b). A complementary dataset is one that serves to enhance other datasets, providing additional information that will lead to a more thorough assessment of the data as a whole. For instance, a soil resistance survey can provide information on the conductive characteristics of the soils, but without mapping the vegetation or knowing the geology of the survey area, false conclusions may be

made regarding the results.

Geophysical datasets not only allow us to determine where features of interest are beneath the surface of the soil, but also provide information that may help us to determine what those things are. A dataset with such potential would be tragically undermined if it were used merely for the purpose of locating sites or as a locator for destructive excavations. Recent work in the field has shown the various ways that geophysical information and assessment can stand alone as archaeological interpretative elements (Martin, Bruseth, and Huggins, 1991; Linford and Canti, 2001; Weston, 2001; Ambos and Larson, 2002; Dalan and Bevan, 2002; Thacker, Ellwood, and Pereira, 2002; Olson, Jones, and Lang, 2004; Persson and Olofsson, 2004; Sarris et al., 2004; Jones and Maki, 2005; Jones and Munson, 2005; Maki, 2005; Persson, 2005; Bevan, 2006; Conyers, 2010; Leopold et al., 2010; Moffat et al., 2010). By using geophysical data properly, we can enrich the overall assessment and interpretation of archaeological sites.

**MULTIPLE MEANS APPROACH:** A multiple means approach dictates utilizing multiple geophysical methods in conjunction with other remote sensing techniques to enhance a geophysical dataset (Brizzolari et al., 1992; Piro, Mauriello, and Cammarano, 2000; Clay, 2001; Thompson et al., 2004; Kvamme, 2006a; Kvamme, Johnson, and Haley, 2006; Kvamme, 2007; Lydick, 2007; Keay et al., 2009; Watters, 2009; Leopold et al., 2010). By employing different techniques that are based on varying geophysical principles, a multiple means approach will pick up previously undetected subsurface features while simultaneously creating stand-alone measurements. This may also provide a double-check system of complementary techniques by informing the surveyor as to the various characteristics of the detected geophysical features (otherwise termed geophysical anomalies). A case in point is the earlier example provided regarding the effects of vegetation and soil resistance readings.

Individual datasets can then work together to create a network of datasets, lending further confidence to any one technique. The combination of multiple lines of geophysical data and other remote sensing information is referred to as data fusion and has been the topic of several recent articles and theses (Kamei et al., 2000; Kvamme, 2003a, 2006a; Watters, 2006; Kvamme, 2007; Lydick, 2007; Gaffney, 2008; Keay et al., 2009).

In this study, the two types of geophysical techniques utilized were soil resistance and gradiometry. These methods were used in conjunction with topography, probing, vegetation mapping, coring, and excavation.

**EXCAVATION AND EXTRAPOLATION:** With a background in the archaeology and geology of a region, specific geophysical signatures can be tested, and the findings can be projected across the site with relative confidence. Through minimally invasive subsampling of detected geophysical features, a solid archaeological interpretation can be elucidated and large, destructive investigations can be minimized (Kvamme, 2003a). This method of excavation and extrapolation has become a major influence in landscape archaeology because it can ensure that the maximum amount of information is gained from geophysical and archaeological investigations (Martin, Bruseth, and Huggins, 1991; Kvamme, 2003a; Abdallatif, Mousa, and Elbassiony, 2003; Conyers, 2010; Gaffney, 2008; Mušič et al., 2009; Powlesland, 2009; Leopold et al., 2010; Masini and Soldovieri, 2011; Walker, 2012).

The examples in this chapter show how a program utilizing geophysical survey in tandem with standard archaeological testing, such as excavation, greatly improves both the quantity and quality of data obtained in the field while aiding tremendously in the postfield interpretation of information.

## BACKGROUND

The two case studies discussed here are drawn from work on St. Catherines Island (see fig. 3.1). St. Catherines Island is a barrier island on the Georgia coast composed of well-drained sands. Holocene beaches surround a Pleistocene core that has given rise to a very fruitful environment, including many intertidal channels, estuaries, shellfish beds, and maritime forests that have continually provided for human subsistence for more than 4000 years (Linsley, Bishop, and Rollins, 2008; Thomas, 2011a).

During the Late Archaic Period (3000–1000 B.C.), the stabilization of sea levels formed the barrier islands we know today as the Golden Sea Islands, which stretch from New Jersey to Florida (Linsley, Bishop, and Rollins, 2008). It was also during this period that shellfish beds took hold and began to form the estuary environment with which we are familiar. The first people to

take advantage of these new developments were the Late Archaic people (Reitz et al., 2010: 49). Shortly thereafter, shell middens began to appear along the marsh edges of the island and, soon after that, the Late Archaic shell rings were formed (Sanger and Thomas, 2010: 47).

Shell ring sites have been identified and researched for more than 100 years, but it wasn't until the 1970s that they began to receive the inquiry and consideration they deserve (Waring, 1968; Waring and Larson, Jr., 1968; Hemmings, 1970; Marrinan, 1973, 1975; Trinkley, 1975; Crusoe and DePratter, 1976; Trinkley and Ward, 1978; Trinkley, 1985). Shell rings are composed of mounds of shell often arranged in a circular

or semicircular configuration with little or no shell on the interior or exterior (see fig. 3.2). Their height can vary from 1 m to 6 m and they can be up to 250 m in diameter (Russo, 2006: E, 8). Russo (2006) discusses a thorough range of conventional dates for shell rings and argues for their historic preservation. Dates ranging from 4600 B.C. to 1635 B.C. have been gleaned from both shell and charcoal assays (Russo, 2006: E, 11–17). Although the shell dates in many cases are not corrected for reservoir effects, the point is to show the wide temporal period in which shell rings are present on the landscape. Shell rings have been located along the coastlines of Florida, Georgia, and South Carolina, and regional varia-



Figure 3.1. Locational map of the Golden Sea Islands along the Georgia Bight with St. Catherines Island highlighted in red (Thomas, 2011: 26).



tions can be seen in figure 3.2. Florida’s shell rings tend to be of the C-shaped variety and consequently can be much larger than the circular, closed contexts of those found in Georgia and South Carolina. It has been postulated that this difference in form may be related to a difference in function. A C-shaped construction may facilitate community growth, unlike that of a closed circle that would not as easily expand out to support larger populations (Russo, 2002: 90).

CURRENT THEORIES REGARDING SHELL RING FORMATION

There are four major theories that explain shell ring formation and they will be briefly outlined here. The gradual accumulation model postulates that shell rings are the result of several individual house middens arranged in a circle, which have coalesced into a solid “ring” of continuous shell deposit (Trinkley, 1985; Russo, 2002; Russo and Heide, 2003; Thompson, 2007). The circularity of the residential pattern may or may not reflect an egalitarian system of social organization; this idea will be elaborated upon further in this section. A second hypothesis is that periodic feasting events could explain the shell accumulation in such a conspicuous formation (Saunders, 2004a; Thompson, 2007). Intentional or ceremonial mounding by singular groups or coalitions is

offered as a reason for shell ring construction, either to mark a special place on the landscape or to form a bond among often dispersed members of a larger society (Russo and Heide, 2003; Saunders, 2004b; Saunders and Hays, 2004; Thompson, 2007). A third theory of ring formation combines the two former theories where shell rings are considered social spaces, where inequalities begin to emerge, and where consumption changes from mere function toward a role involving ceremony and display via higher status locations (Russo, 2004; Thompson, 2007). A fourth developmental model is based on Binford’s theory that the function of sites may change over time (Thompson, 2007). Thompson posits that the rings started out as purely functional residences, albeit in a circular pattern, and then at some later point in time they became more ceremonial in function when the ring grew to a point where it was considered “monumental,” perhaps following the earlier theory of conspicuous consumption (Thompson, 2007). Many questions remain regarding the purpose of circular and arcuate ring construction, and it seems that many sites contain unique occupation histories that should be considered independently of one another. The following analysis will provide background on the geophysical surveys conducted and offer an examination of the geophysical and excavation data of the two shell rings on St. Catherines Island.

GEOPHYSICAL SURVEYS

The geophysical surveys of the two Late Archaic rings on St. Catherines were conducted over various field seasons from 2006 through 2009. Site preparation consisted of clearing vegetation that would interfere with the normal, comfortable operation of the instrumentation, such as thick palmetto patches or tangled vines. Trees were only cut down if they exhibited signs of decay or fungus and were deemed a hazard to the surveyors due to their instability. Grid corners were shot in using a laser total station and marked with plastic orange stakes. One-meter intervals along the east-west transects were marked with plastic pin flags for ease of survey. North-south transects were marked using ropes that were held by survey personnel called jockeys. Each rope had 0.5 m or 1 m marks for the surveyor to follow. All topographic data were collected with a laser total station in a systematic fashion. Additionally, probe surveys were conducted at each ring whereby a metal probe was inserted in the

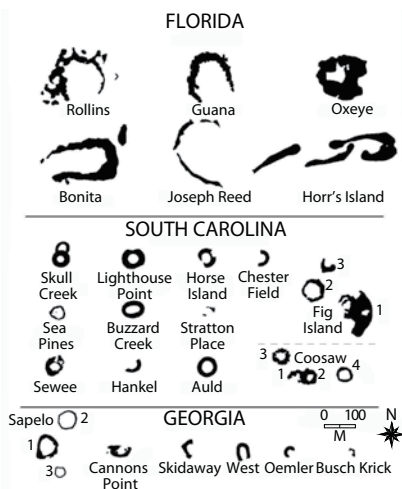


Figure 3.2. A selection of shell rings that have been investigated in the southeastern United States as of 2006 (Russo, 2006).

ground to test for shell density. A scale of 1 to 5 was used (5 indicating impenetrable shell and 1 indicating a shell-free area) and surveyors were kept consistent as a control.

**ST. CATHERINES SHELL RING:** The St. Catherines ring magnetic data were collected in bidirectional fashion with a G858 cesium vapor gradiometer at 1 m wide traverses using a 10 m marker along each north-south transect. Thirty-six 20 m<sup>2</sup> blocks were surveyed for this project, collecting 7600 m<sup>2</sup> of data. The soil resistance for the site was collected using a Geoscan RM15-D for efficient data collection. The use of the multiplexer allowed us to survey in 1 m wide traverses while collecting 0.5 m traverse data. Sample intervals were 0.5 m, amounting for 40 readings per line. The same 36 blocks were surveyed as with the gradiometer.

**MCQUEEN SHELL RING:** The McQueen ring magnetic survey was conducted using a Geoscan FM256 fluxgate gradiometer in a bidirectional fashion, only this time using 0.5 m traverses and 1 m spatial markers within the 20 m grid system. The difference between the magnetic instrumentation used at each site has been studied and is elaborated upon by Mahar (2010). Briefly, we examined the differences between the two gradiometers by resurveying the St. Catherines Shell Ring with the FM256. By having results from the same instrument from each site, we were able to compare the results of the two rings directly. By doing this, we were able to alleviate concerns that we may have achieved dissimilar results due to the change in equipment. The soil resistance data were collected in the same fashion as the soil resistance at the St. Catherines ring.

#### DATA INTEGRATION AND DISPLAY

The goal of data integration and display is to cross correlate numerous remote sensing datasets such as soil resistance, magnetics, topography, shell density, and the like. All the above techniques gather very different types of data and by overlaying them, we can learn more about the specific information each method is relaying. The technique of overlaying geophysical and topographic data has been used in various publications (Brizzolari et al., 1992; Juppenlatz and Tian, 1996; Cammarano et al., 1998; Vafidis, Economou, and Sarris, 2002; Neubauer, 2004; Johnson, 2006; Kvamme, 2006a; Venter et al., 2006; Lydick, 2007; Wiseman and El-Baz, 2007;

Aspinall, Gaffney, and Schmidt, 2008). By integrating the St. Catherines datasets by site, we hoped to reach better-informed conclusions regarding the identification and distribution of archaeological features.

#### DATA INTEGRATION CONCEPTS AND METHODS

Over the last few years, as computers have become better incorporated with archaeological investigative techniques, methods allowing for better integration of data drawn from both prospection and excavation have been developed. Among these, computer-based mapping programs are perhaps the most widely used and more approachable technologies. Programs such as Surfer and ArcGIS have aided tremendously in the overall synthesization of archaeological data. Computer graphic programs such as those mentioned can help to reconstruct three-dimensional images of stratigraphic layers, display the distribution of cultural materials and anthropogenic features, calculate densities, averages, means, ratios, and standard deviations of artifact occurrence, and apply topographic data to the comparison of all the above.

The integration methods presented here are based on interpretive and computer graphic data integration and analysis consisting of visual interpretation, vectorization, two-dimensional overlays, and translucent overlays. By overlaying two or more of these graphic representations of geophysical data, the archaeologist can simultaneously evaluate multiple investigative methods. Traditionally, geophysical data are processed and analyzed separately and are often written up in completely separate reports. Here, however, multiple georeferenced overlays are possible, allowing the data to be visualized at once, which provides a more holistic display of information.

Georeferencing is defined as the process of fitting geophysical data or data images into their correct physical place within a display plane (Aspinall, Gaffney, and Schmidt, 2008: 141). The display plane used for the body of analysis within this work is ArcMap, a component of ESRI's ArcGIS suite of geospatial processing programs. The benefit of georeferencing geophysical datasets is the ability to accurately overlay multiple sets of information. If all data are collected systematically using the same coordinate system, they can be matched up using their geospatial coordinates. This then allows the point-specific analysis of multiple datasets (Juppenlatz and Tian, 1996;

Vafidis, Economou, and Sarris, 2002; Neubauer, 2004; Kvamme, 2006a, 2006c, 2007).

All grid mapping, shell density distribution, elevation, metal prospection, topography, and vegetation mapping were completed with a laser total station based on a site datum connected to UTM coordinates. Knowing the locations of potential unwanted influences, such as historic metal, certain types of vegetation, or sharp increases in elevation, will add to the accurate interpretation of geophysical datasets. Likewise, the overlay of satellite imagery and mapping of topographic elements, such as tree lines and marsh edges, helps to put the data in the perspective of the landscape in which it resides.

Figure 3.3 is a plate of some of the datasets used in the interpretive analysis of the geo-

physical data from the St. Catherines Shell Ring (9Li231). These data were overlaid as layers using ArcGIS and evaluated for archaeologically significant geophysical features. Areas of interest that pertained to the temporal period under investigation were then graphically drawn in or vectorized using ArcGIS, see figure 3.4 (Kvamme, 2007).

### ARCHAEOLOGICAL INTERPRETATIONS OF SHELL RING GEOPHYSICS

This section will directly compare the four major areas of the two Late Archaic shell rings on St. Catherines Island (the ring exterior, the shell midden, the interior edge, and the interior of the ring) by using the analyzed geophysical data in

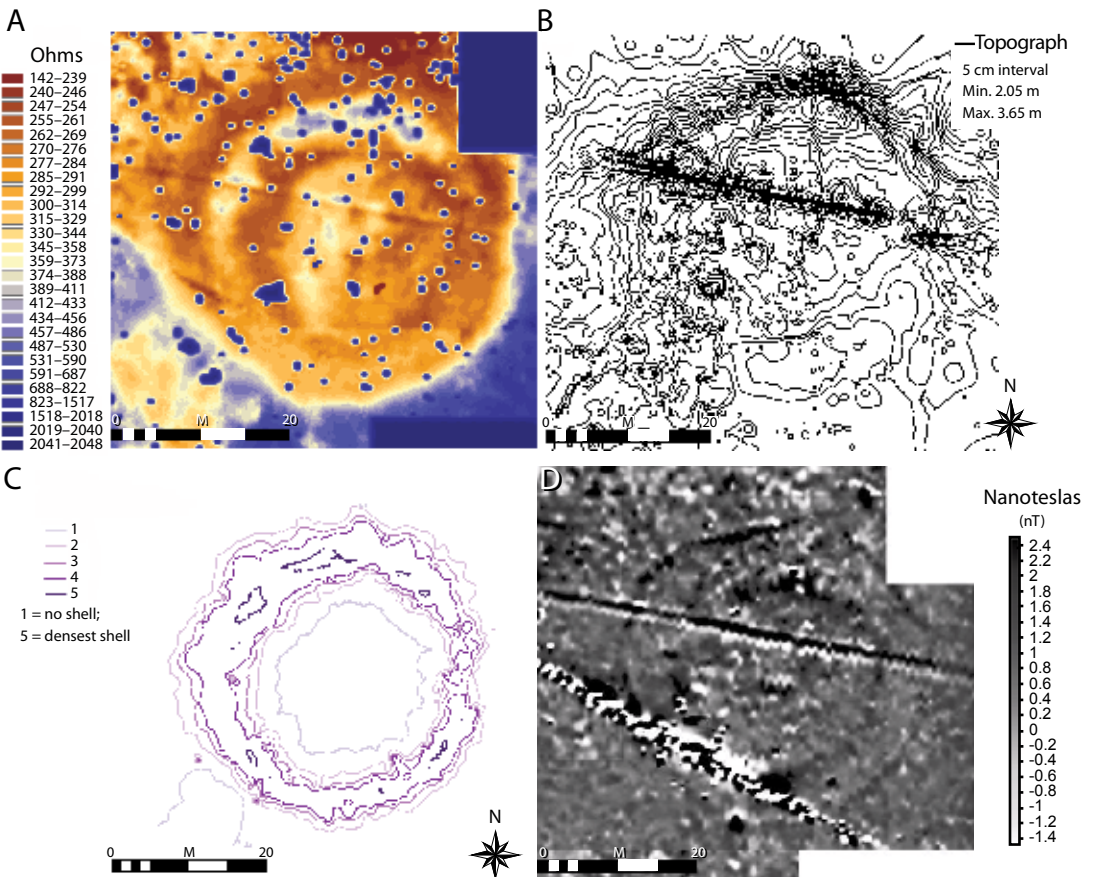


Figure 3.3. Plate showing St. Catherines Shell Ring data collection results used in the vectorization process; A, resistivity; B, topography; C, shell density contour; and D, gradiometry.

conjunction with evidence from recent excavations. The discussion will focus on those areas that pertain to the topic of this chapter, geophysical survey as a substantive line of direct archaeological investigation, as there is not enough room in this volume to expound all aspects of these complex, intriguing sites.

#### THE RING EXTERIOR

The geophysical surveys of each ring incorporated portions of the area outside the shell rings. Along the marsh-facing edges of the rings, survey was executed all the way to the marsh edge and along the interior-facing edges, survey was carried out anywhere from 20–70 m away from the rings' edge. The intention here was twofold. First, it was important that we obtain information regarding what a "normal" or nonring background signature would look like to appreciate the differences caused by the presence of the shell ring (Gaffney, 2009). Second, the area around the shell rings, or exterior ring area, has not been thoroughly explored in previous archaeological investigations, until recently (Thompson, 2007).

Both the resistance and magnetics produced lucrative results along the exterior perimeter of the shell rings on St. Catherines Island. Overall, both surveys showed there were fewer geophysical anomalies outside the ring than within the midden or in the interior shell-free plaza. However, the geophysical signatures that are present have begun to challenge what little we do know about the exterior zone of shell rings. Michael Trinkley (1980) briefly discusses what he believes the exterior of shell rings should contain based on his excavations at Lighthouse Point and Stratton Place in South Carolina. According to Trinkley, there should be an area of debris scatter consisting of potsherds and animal bones 10–15 ft from the exterior edge of the ring. Outside this zone, evidence of human occupation drops significantly, artifact density decreases, and soil chemicals indicating occupation become negligible (Trinkley, 1980). Trinkley concludes that the primary occupation and activity at the rings must have occurred either on top of or inside the rings.

Figure 3.4 shows the vectorized results of the geophysical analysis of both the soil resistance (blue) and the magnetic data (green) in conjunction with data from our systematic shovel test pit surveys that were conducted outside each of the shell rings. In each case, the geophysical sig-

natures occupying the exterior of the rings are fairly large and, in many cases, characterized by geometric forms. The resistance signatures at both rings consist of both circles and polygons of yet unknown associations. Square habitations are common in southeastern aboriginal archaeology, though most of these appear during later temporal periods (Steponaitis, 1986; Scarry and McEwan, 1995). However, Sassaman and Ledbetter relate that evidence for both circular and rectangular structures has been identified in the Middle and Late Archaic periods (Sassaman and Ledbetter, 1996: 87). What is currently lacking is a substantive work on such architecture, as both ephemeral and more permanent structures have been identified but little speculation has been raised as to what the shape, size, and durability of these structures could offer to theories of community patterning and organization.

Although no large excavations have been placed in the exterior zone of either ring on St. Catherines Island, the results of the shovel test pit survey point to a Late Archaic association for at least a few of these geophysical features. Shovel test pits alone could not have provided enough information to surmise that there is the potential for Late Archaic structures within the area immediately outside the shell rings. Trinkley and Ward, in their investigations at the Lighthouse Point Shell Ring, involved chemical testing across and along the exterior of the site; pH, phosphorus, potassium, and calcium were all tested (Trinkley and Ward, 1978). They found that considerable activity occurred outside the ring, although there was a lack of shell and pottery indicating to them that these were not occupation areas (Trinkley and Ward, 1978: 71). Conversely, Thompson's investigations at the Sapelo Island shell ring complex have shown through geophysical investigation and excavation that there were indeed occupations outside the rings that either predate or just postdate the major occupation of the rings themselves, if they are not contemporaneous (Thompson, 2007).

To date, minimally invasive geochemical and geophysical techniques have led to the majority of information we have regarding the activity patterns along the exterior of shell rings. Results such as those produced by geophysical survey or geochemical testing, although not as tangible as structural or artifactual material, cannot be discounted in the research regarding the use of the exterior areas of the shell rings. Ignoring such

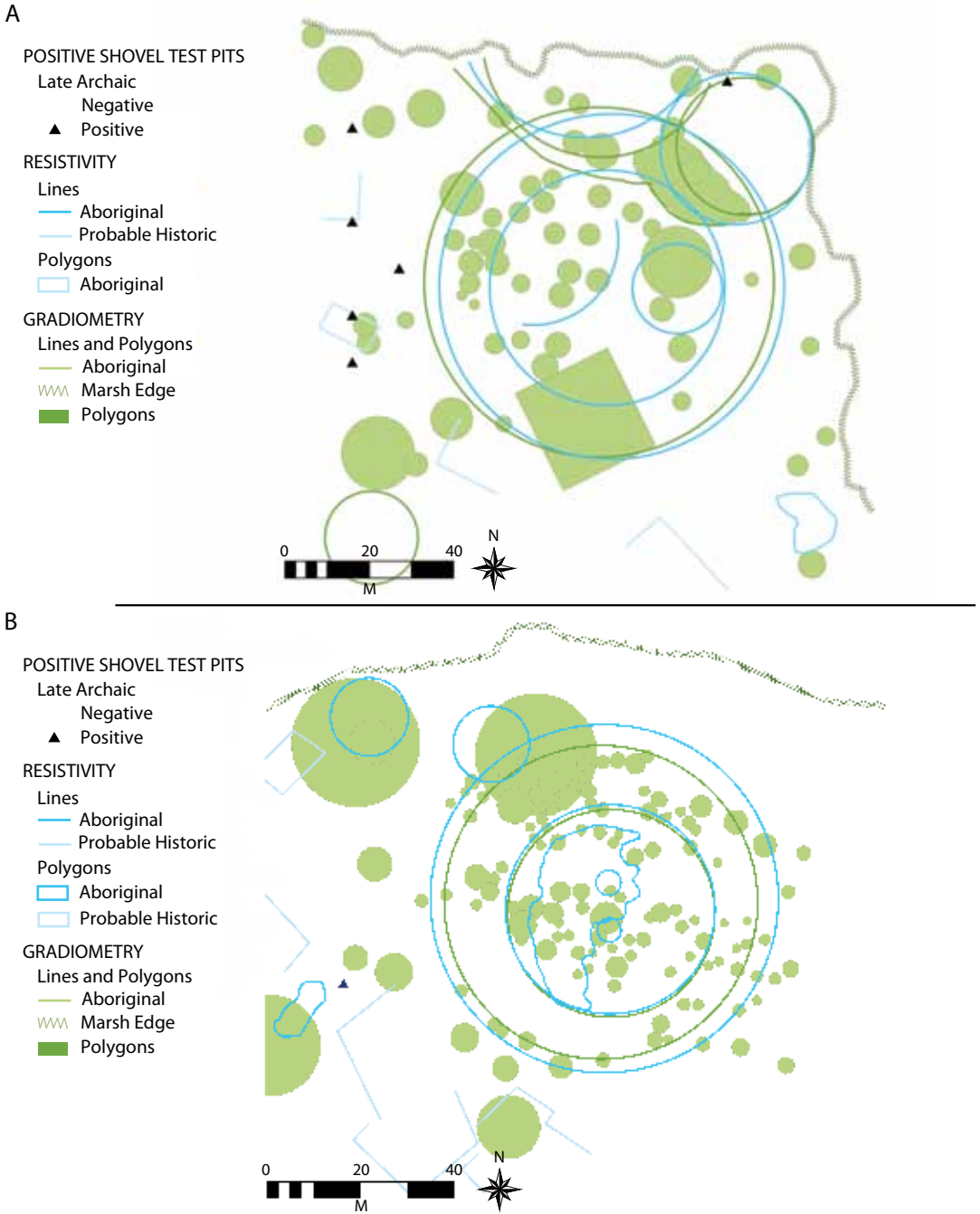


Figure 3.4. Vectorized images of the geophysical results of soil resistance and gradiometer surveys at: **A**, McQueen Shell Ring; **B**, St. Catherines Shell Ring. Green lines and polygons represent magnetic features of interest; blue lines and polygons represent soil resistance features of interest. Triangles represent shovel test pits positive for Late Archaic ceramics; testing was carried out along the exterior of the ring at a 10 m interval within 150 m from the center of each ring.

evidence could unfairly bias the archaeological interpretation of this intriguing and understudied activity area. Additionally, such evidence (for example, the mapping of geophysical features) can be used in hypothesis development, broadening the base by which we approach anthropological questions.

#### THE MIDDEN

The St. Catherines and McQueen shell rings exhibit very different archaeological and geophysical characteristics regarding the primary shell deposit. At the most fundamental level, although similar in diameter and shape, the characteristics of the shell-heavy deposits diverge to almost opposite ends. While the St. Catherines Shell Ring is composed of predominantly whole oyster, intermixed with various other whole molluscs, crushed shells, and very little soil matrix (see fig. 3.5A), the McQueen Shell Ring is composed of whole and crushed shell (still predominantly oyster) interspersed with a matrix of highly organic soil (fig. 3.5B). The following discussion will detail the observed archaeological characteristics of the shell deposits as they apply to the geophysical surveys conducted.

The geophysical signatures present within the midden portion of the shell rings offer insights into formation processes and postdepositional occurrences in addition to helping to identify and interpret activity areas (Thompson, 2007). In the case of the magnetics, there are instances where the collected data are affected by historic influences; the Late Archaic signatures can be obscured by the introduction of ferromagnetic objects or the disturbance of the soil such as by plowing or boundary ditch construction. On the other hand, there are cases where these strong dipolar anomalies cannot be explained by historic interference. To complement our geomagnetic data, we surveyed systematically with a metal detector and laser total station, mapping in any modern or historic metal instances and any changes in elevation. These data can then be used to evaluate the detected magnetic signatures, helping to determine their association with the prehistoric component of the site.

Excavation evidence has been paired up with one of these instances in a test unit along the northern edge of the St. Catherines Shell Ring. Area N789 E801 (fig. 3.6), although excavated prior to any geophysical survey, corresponds to a series of magnetic gradient features (see fig.

3.6A for location). This particular area, in terms of the magnetic gradient results, comprises a series of dipolar signatures that may suggest discrete burning episodes. Features similar to these are common along the shell-heavy portion of the ring as can be seen in figure 3.6.

Not every instance of magnetic variation needs to be excavated, however. What we can project from this particular instance is that there are multiple burnings across the shell midden portion of these sites. These features appear to be small patches of burned shells that are commonly encountered in excavations along the ring. Multiple features of this nature can occur in a single 1 × 1 m excavated unit, and from what we can gather, the higher the density of burned patches, the stronger the magnetic signature. These burned patches do not appear to be heavily used fire pits but discrete burned areas. Although the exact function of these features is not known, from artifactual content, postholes and cooking pits may be unlikely explanations. Rebecca Saunders has suggested that similar features at the Rollins Shell Ring in Florida could have been steaming or smudge pits (Saunders, 2004a: 258). Additionally, burned shell and charcoal have been noted in the screens at the St. Catherines Ring; their presence is not always linked to the discrete burned patches, perhaps indicating extensive and repeated midden surface burning to aid in the decomposition process and vermin control (Meehan, 1982). This particular activity could explain the increase in low-amplitude magnetic activity on the shell midden that is not apparent in the nonmidden portions of the site.

As far as what this evidence means for theoretical interpretations of the rings, we return to Russo's discussion of the second theory regarding shell ring formation, the ceremonial model. Russo postulates that ceremonial feasting episodes may result in fewer surface fires since the deposit is formed so quickly (Russo, 2004: 43). Along this line of interpretation, the frequency of geomagnetic signatures atop the shell rings may help to determine the potential for ceremonial activity at the shell rings. For further speculation regarding burning at shell ring and midden sites, please refer to Trinkley, 1980; Meehan, 1982; Stein, 1992; and Saunders, 2002a, 2004a.

Just as the magnetic data have helped to provide information regarding the potential activities and postdepositional processes occurring on the shell midden, the soil resistance data

have helped to inform us regarding the formation process of the midden. In his 2006 dissertation, Victor Thompson discusses the patterning of resistance signatures as they pertain to the midden deposit of the shell rings on Sapelo Is-

land. His findings at Ring III indicate that the ring is composed of discontinuous piles of shell (Thompson, 2006; 2007). According to Thompson, this arrangement of shell piles interspersed with occupational midden conveys that Ring

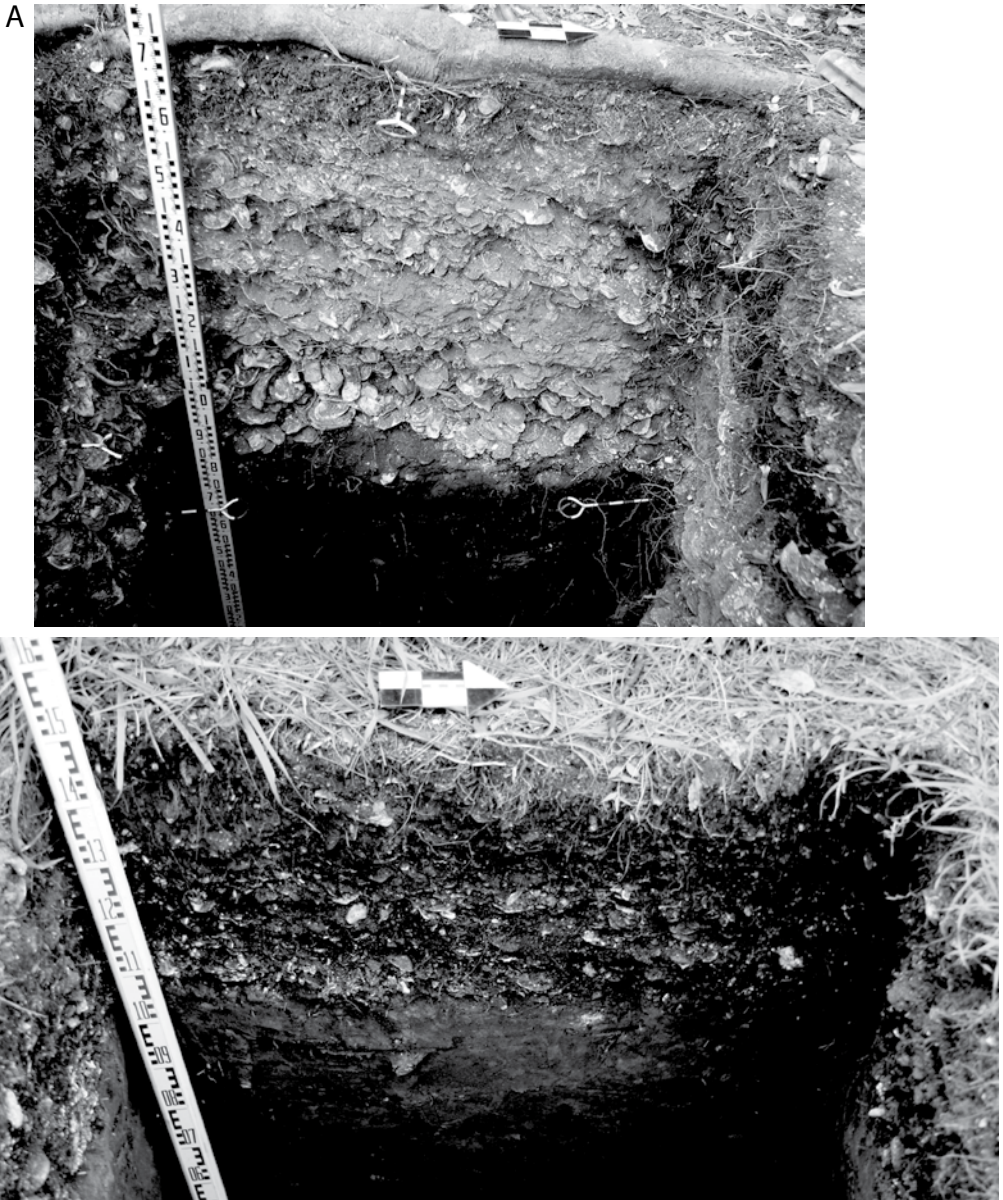


Figure 3.5. Shell midden deposit profiles from (A) the St. Catherines (N789 E801) and (B) the McQueen shell rings (N272 E200) (photographs by Anna M. Semon).

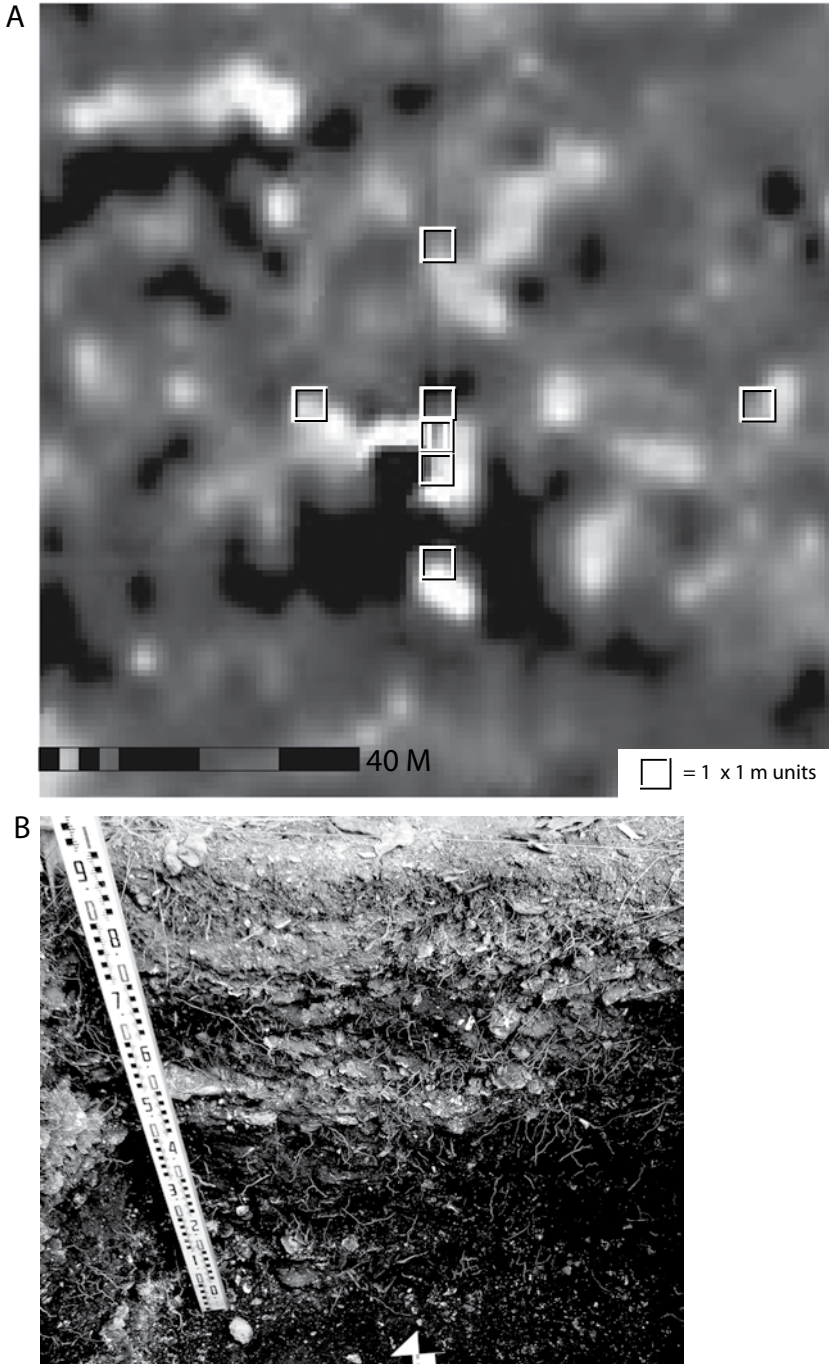


Figure 3.6. **A.** Magnetic gradient data from the northern section of the St. Catherines Shell Ring showing excavated units. Unit N789 E801 is shown as the northernmost white square. **B.** North wall profile of unit N789 E801, burnt patches of shell were identified throughout the excavation (photograph by Anna M. Semon).



III follows the gradual accumulation model of shell ring development (Thompson, 2007). The signatures from the rings on St. Catherines Island seem to follow a different pattern, however. There, at both sites, the resistance data reports that the densest portion of the shell midden holds a higher resistance than the edges and in some cases higher than the shell-free, well-drained interior. The densest portion in this case is also the highest portion of the ring; both factors add to the high resistance readings.

The resistance signatures combined with excavation evidence at the St. Catherines Ring show that there are pits and piles of shell all along the midden deposit, although none appears to be of an occupational deposit like Thompson defines at Ring III. However, the McQueen Shell Ring tells a different story. The resistance and excavation evidence indicates that the McQueen Shell Ring, unlike the St. Catherines Shell Ring, comprises crushed shell and organic soils much like the occupational midden that Thompson describes (Thompson, 2007). The presence of crushed shell has been mentioned in some literature associated with shell rings (Saunders, 2002a; Russo and Heide, 2002, 2003; Saunders, 2004a; Russo, 2004, 2006). The majority of researchers speculate that this comes as a result of trampling and compaction over the course of the use-life of the ring and most likely continues after abandonment. Opinions begin to diverge, however, once the duration of trampling and compaction is discussed. Antonio Waring and Lewis Larson, perhaps the first archaeologists to hypothesize on shell ring use speculate that,

[i]t would seem very likely that the shell ring was the site of many small habitations. The occupants apparently piled the rapidly accumulating shell beside their small dwellings; later they moved, and new shell was then piled on the former habitation site... (Waring and Larson, Jr., 1968: 273).

Here Waring and Larson are discussing Ring I on Sapelo Island. Trinkley has also offered that when shell rings were occupied, people were living on top of them, creating living spaces and surfaces atop the ring. He also suggests, from observations at Lighthouse Point, that when the ring got too tall, the occupants would level it off (Trinkley, 1980).

The amount of dark, organic sands within the matrix at the McQueen Shell Ring and the thinness of the deposit explain its low resistance values. Besides occupational midden as an explanation of leveling off, it may also be that there was a practice of capping the shell deposit with dirt periodically, either to facilitate habitation atop it or in a ceremonial fashion to mark the beginning or end of a session of deposition upon it (see Saunders, 2004a for further discussion on stratigraphic episodes at shell rings). Either way, the tremendous amount of soil present in the McQueen Shell Ring deposit is in stark contrast to the St. Catherines Shell Ring where the matrix involves a larger amount of whole shell and less dark organic sand in a much thicker deposit. Of all the remote sensing techniques conducted at the two rings, it was the soil resistance that best conveyed the difference between the midden portions of each ring, both on an inter- and intrasite basis. Excavation evidence reinforces this observation, and the combination of the two, in addition to the shell density data, has allowed us to pinpoint changes in shell matrix composition that have warranted further investigation.

Along both rings, there are areas of higher resistance and lower resistance that could have been caused by some of the activities proposed earlier, such as leveling, compaction, capping, or a combination of all of the above. Additionally, the evidence also suggests that very different use-lives and formation processes were present at each shell ring. Thompson speculated that shell rings may follow their own trajectories and their own formation histories (Thompson, 2007). The fact that the two shell rings on St. Catherines Island can be contemporaneous (Sanger and Thomas, 2010) and still so different when comparing the midden component is a testament to this statement.

In summation, the geophysical data helped detect unique areas along the deposit that we would not have known to investigate otherwise, such as differences between high and low resistance, that may lead to answers to questions regarding the unique depositional histories of the rings. These instances clearly demonstrate the advantages of integrating geophysical datasets with excavation and approaches like middle-range theory building. Here the data are valued beyond an X marking a spot; rather, they are used to project and assign viable interpretations to detected signatures.

### THE INTERIOR EDGE

Perhaps the most intriguing component of the two St. Catherines Island shell rings, both geophysically and archaeologically as far as this discussion goes, is the area along the interior edge of the midden deposit. Unquestionably, without the input from the geophysical surveys, we would be under very different presumptions as to the understood characteristics of this activity zone. Up to this point in the discussion, while the geophysics has enlightened us regarding various characteristics of the shell rings, the data have remained quite similar between the two rings. Here, however, the datasets begin to diverge. The magnetic gradient data at the rings have shown perhaps the greatest evidence of this. At the St. Catherines Shell Ring, there is evidence of a continuous magnetic “ring” feature along the terminal edge of the interior of the ring deposit, but a similar geophysical signature is not evident at the McQueen Shell Ring (see fig. 3.7).

The fact that the two shell rings do not share similar interior edge magnetic signatures suggests that the activities carried out in these areas were different. The excavations at the St. Catherines Shell Ring have uncovered several shell pit features that coincide with a dramatic change in the resistance signatures and the magnetic “ring” anomaly. This observation is significant when considering the previous discussion on ring formation. Similar pits have been identified at some, but not all, southeastern Late Archaic shell rings. In discussing the geophysics of the Sapelo Island shell rings, Thompson has determined that preexisting pits and individual piles serve as the basis for the formation of Ring III (Thompson, 2007; Thompson et al., 2010). These determinations have not been tested via excavation, however. The presence of prering pits has many connotations. At the outset of this chapter, multiple theoretical models for the creation of shell rings were introduced. Briefly, these were the gradual accumulation model, the ceremonial model, the dual function model (both gradual accumulation and ceremonial), and lastly the developmental model that states that the function and use of a place change over time. Thompson has determined that Ring III at the Sapelo complex was formed as a result of the gradual accumulation model for two reasons. First, the preexisting pits and piles show evidence that the ring was formed as a result of occupational middens interspersed with secondary refuse piles, and second, the archaeological

material collected attests to the relatively domestic activities at the ring (Thompson, 2007). However, he does admit that all shell rings and similar sites will follow their own trajectories.

For instance, no archaeological evidence from the McQueen Shell Ring suggests that there are prering pits along the interior edge or under the main midden deposit. This is significant because it might explain why there was no interior “ring” anomaly detected in the magnetic data. Although excavations at McQueen found no evidence of prering pits, they did expose other characteristics that may help to determine McQueen’s placement within the above theoretical models. Trench N243 was excavated through the shell-heavy portion of the eastern midden deposit and continued west well into the shell-free interior of the ring. This trench, and subsequent block excavation, exposed a stratigraphic layer underneath the primary shell deposit, which has been described as a “clam floor.” This layer consists of a thin level of clam shells, lying with the interior face down. When fully exposed in the block excavation, this “floor” appeared to be about 4 m in diameter, and did not continue throughout the entire exposed block. Later it was discovered that a similar, but less distinct, layer also appeared within the western midden portion of the ring; however, this has not been further investigated beyond a 1 × 1 m unit, and therefore its status as a “floor” is currently undetermined. Beyond this, no other area at either the McQueen or St. Catherines ring has produced similar findings. The presence of this floor, and lack of prering pits, may suggest that McQueen falls under a different theoretical model of formation than the St. Catherines Shell Ring. A prepared floor as such could fall into the category of ceremonial construction (Saunders, 2002a; Russo and Heide, 2003; Russo, 2004; Thompson, 2007).

Certainly, if the interior ring signature we see at the St. Catherines Shell Ring is an effect of a series of early pits, then we are left to conclude that the lack of a similar signature or any physical evidence of pits at McQueen suggests that the gradual accumulation model does not fit at least as far as a linear evolution from pits to ring. The magnetic ring signature and the fundamental difference in construction, and perhaps usage histories, that led to the formation of each ring indicate very different trajectories for these shell rings. This is extremely significant regarding the theories of social organization and ring usage

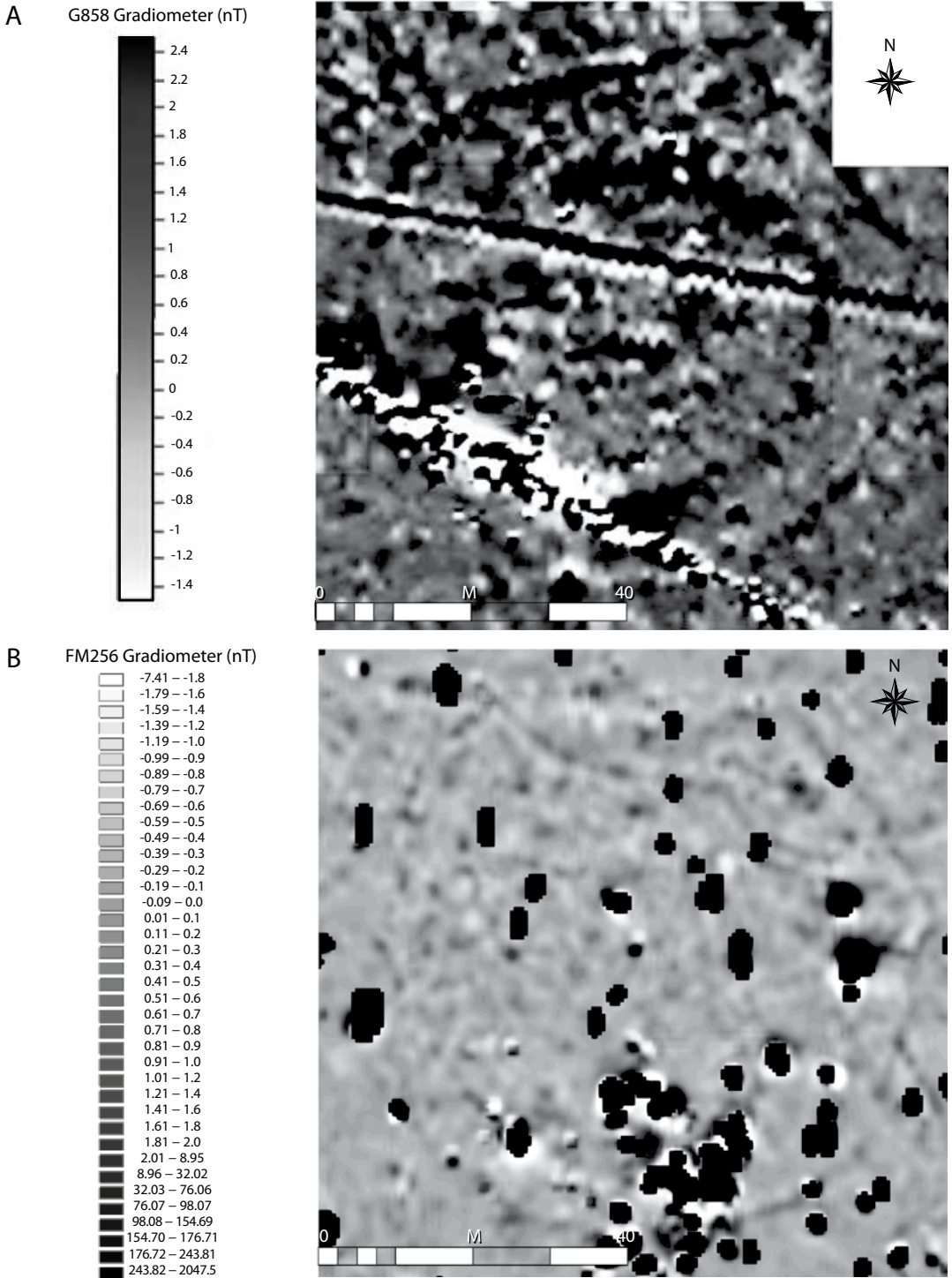


Figure 3.7. Magnetic gradient map results (in nanoteslas) of (A) the St. Catherines and (B) the McQueen shell rings; note the absence of the interior magnetic “ring” feature at the McQueen Shell Ring.



Figure 3.8. The circular features that exist in the interior shell-free portion of the shell rings are still puzzling and unfortunately do not show up in the geophysical surveys. Interior features of: **A**, St. Catherines Shell Ring. **B**, McQueen Shell Ring (photographs by Anna M. Semon).

during the Late Archaic because of the fact that the rings appear to be contemporaneous (Sanger and Thomas, 2010). Sanger and Thomas (2010) discuss the dating of the ring in their chapter “The Two Rings of St. Catherines Island,” the first publication to document the recent work at both of the rings. They have correlated the radiocarbon dates from the excavations at both rings and have surmised that the major construction of both the rings occurred roughly 2250–2000 B.C., although the deposition at the McQueen Shell Ring may have continued for another 50 years after the work at the St. Catherines ring was complete (Sanger and Thomas, 2010: 66). Therefore, if these two rings are overlapping in their formative stages, then surely the differences we have witnessed in construction and development reiterate the argument that these sites follow their own trajectories.

Undoubtedly, the above conjecture regarding the formation of the rings on St. Catherines is just the beginning. Further testing of these theories is warranted, as the questions regarding the rings are still forthcoming. Analysis of the excavations and materials obtained from the rings is still in process. Hopefully, new information, in conjunction with what we have ascertained from the geophysical investigations, will bring us closer to understanding the formation process of these intriguing sites and the intentions of the people who built them.

#### THE INTERIOR

The shell rings on St. Catherines Island, like many other shell rings (Waring and Larson, Jr., 1968; Saunders, 2002a; Russo, 2004, 2006; Thompson, 2007), consist of a shell-free interior. This shell-free zone is not without activity, however; on the contrary, it is home to a series of intriguing circular features surrounding a central activity zone (see fig. 3.8). Similar features have been encountered at other shell rings (Russo and Heide, 2002; Saunders, 2002a; Russo, 2006; Sassaman, Blessing, and Randall, 2006; Thompson, 2007) and for the most part have been determined to either be storage or processing pits, or post-holes for suspected—though not confirmed—structures (Sanger and Thomas, 2010). The exact function of the interior features at both the St. Catherines Island rings has yet to be confirmed at the time of this writing.

The depth, width, and contents of the features suggest that they could potentially be detected

geophysically. Unfortunately, beginning within the first 50 cm below surface, well within the detectable zone, they have evaded our best efforts at detection with the two techniques utilized in this study. The magnetic dataset does reveal several point-specific dipolar anomalies that seem to match up with some of the circular features, but so far, these correlations have not been satisfactorily verified archaeologically. Whatever these features are, they are too similar to the surrounding matrix to be detected at this level of geophysical analysis.

Beyond the evasive circular features, the two rings share the characteristic of having strong geomagnetic signatures at the center of the interior plaza. The central feature at the St. Catherines Shell Ring is located in the precise center of the shell-free interior of the ring (see fig. 3.9, left). It is a rather large magnetic anomaly, measuring 7 × 4 m in area, and looks to be made up of several large dipolar anomalies. The one at the McQueen ring, however, consists of one crisp, dipolar anomaly that measures 3 m in diameter (see fig. 3.9B). This suggests very different behaviors in the properties of the center features, which could relate to depth of the feature, width, and certainly composition.

Excavations at the St. Catherines Shell Ring have shown that the magnetic gradient survey detected a very large feature consisting of dark, organic soil with few artifacts. Artifacts found were common for the site—Late Archaic ceramics, charred faunal remains, baked clay objects, and lithics (Semon, Mahar, and Sanger, 2008). The excavators were able to separate the major central feature into several features as excavation progressed deeper, and it seemed that the area as a whole was erratic in that features appeared to separate and converge unpredictably, making precise feature delineation difficult. Overall, it appears that the central feature at the St. Catherines ring is composed of many features; reuse of the area over time is likely the cause for the layering and intermixing of episodes. It is not a surprise that this heavily utilized area was easily detected in the magnetic survey. Unfortunately, the resistance data is of no further help regarding delineation, as the area does not seem to have detectable changes in resistance.

The McQueen ring center anomaly contrasts drastically with the features described for the St. Catherines ring. This crisp, dipolar anomaly and its surrounding area were tested in May of 2010

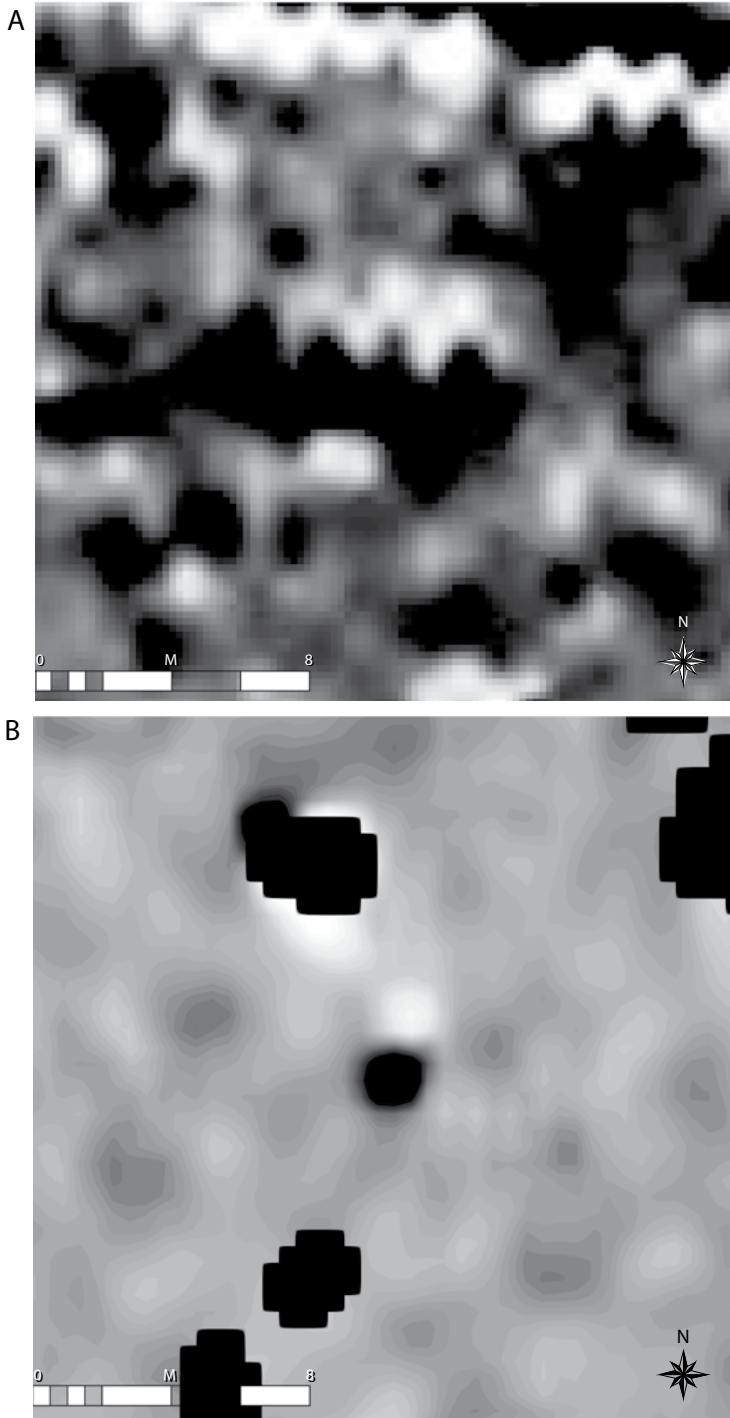


Figure 3.9. Side-by-side comparison of the central magnetic anomalies detected at (A) the St. Catherines and (B) the McQueen shell rings. The same scale has been used for each image to highlight the difference in size and characteristics between the two.

and excavations continued in March of 2011. As of this writing, final analysis of the materials and stratigraphy are pending. However, a few cursory observations can enlighten the current analysis without being too presumptuous. The 2010 and 2011 excavations at the center of the McQueen Shell Ring revealed quite different findings than what was uncovered at the center of the St. Catherines ring. In contrast to dark, organically rich soils, the soils at McQueen were light, mottled, nonorganic soils that faded easily into the surrounding matrix, unlike the stark contrasts seen between feature and nonfeature soil at the St. Catherines ring. The artifact content of the center anomaly feature at McQueen was also very different from St. Catherines's. While St. Catherines's center anomaly featured ceramics, baked clay, and lithics, the center anomaly at McQueen featured large amounts of calcined bone and little other material. It currently appears that the presence of copious amounts of calcined bone caused the strong geomagnetic signature. Some of the bone was scattered in the plow zone while the majority was concentrated in the Late Archaic horizon in the 2011 block excavation, where a pit feature was uncovered. The pit, calcined bone, and the associated mound are the leading cause of the resulting signature.

Overall, the geophysics, while not aiding in the detection of the commonly occurring circular pits, was extremely helpful in detecting other areas of interest that lie within the interior of the rings. Clearly, the interiors of the shell rings are very complex areas consisting of much more activity than periodic sweeping to keep them orderly and clean.

## CONCLUSIONS

From the evidence presented in this chapter, it can be seen that a multicomponent approach involving geophysical survey and analysis, intense mapping, and excavation serves to help properly examine these intriguing and complex sites. Data provided by the multiple means included in this study not only work in tandem, but each means provides novel observations that can be used to investigate the archaeological characteristics of the aforementioned sites.

Reaching the end of this analysis, there are several areas that I believe should be expanded upon regarding the geophysics of the sites. Concerning the evasive circular pit features in the in-

terior of the rings, we might attempt a statistical interpretation of the magnetic gradient data. Perhaps our failure to detect these features lies in our inability to properly visualize subtle differences in the gradient shade plots. Statistical methods are being used more and more in the proper identification and analysis of geophysical features (Cammarano et al., 1998; Piro, Mauriello, and Cammarano, 2000; Gaffney, Gater, and Oven-den, 2002; Kvamme, 2006a; Kvamme, 2007).

Additionally, regarding prehistoric datasets and their sometimes-vague geophysical signatures, a quantitative integration of the datasets may help to identify features of interest in a weaker dataset. A weaker dataset is defined here as one that has a low signal-to-noise ratio, which means that there is a low contrast between the archaeological feature and the surrounding matrix. This can obscure the exact position and size or shape of the feature and, in some cases, result in nondetection (Piro, Mauriello, and Cammarano, 2000: 203). This approach often results in a presence/absence or a confidence map. Once these subtle features are recognized they can then be tested and defined, thus once again providing more information with which to analyze a given archaeological site.

Further testing of detected geophysical features is also warranted. For instance, the angular resistance anomalies and circular magnetic anomalies detected at both rings possibly correlate with Late Archaic architecture. These areas should be investigated via excavation and perhaps soil chemistry testing to determine their candidacy as Late Archaic structures or living surfaces. As was pointed out earlier in this chapter, the exterior of shell rings has been largely ignored. Further investigation of these features can surely help to provide insight into the intentions and activities of the ring builders.

Outside the field, it can also be argued that further laboratory analysis should be carried out on specific soils that have been sampled from excavations at the rings. Trinkley and Ward's work on the soil chemistry of Lighthouse Point Shell Ring in South Carolina helped to shed light on activity areas outside of the rings (Trinkley and Ward, 1978). A similar study would surely help here, especially concerning the areas where little artifactual material has been recovered, and geophysical signatures and soil color changes are all that exist to suggest prehistoric activity.

Lastly, I contend that the data and analysis

presented here argue for the use of geophysical information as a principal means of archaeological investigation. The former use of geophysical data solely as a prospection method should be replaced by the method of proper data processing and graphic representation, geophysical analysis, archaeological interpretation, extrapolation, and projection offered in this chapter. The advances made in recent years involving data processing and graphic representation allow for ease of use and affordability, making the analysis of geophysical data more accessible to the general archaeological community. Processed and analyzed properly, geophysical data may stand on their own as a principal source of archaeological information. However, a thorough knowledge of the ecology, geology, history, and of course archaeology of a region is essential to proper interpretation. Overall, what has been shown here is that using more lines of evidence in site analysis can greatly improve the interpretations we are able to make as researchers.

## NOTES

1. I would first like to thank David Hurst Thomas and Victor Thompson for inviting me to be a part of this volume. This chapter is based on my 2010 master's thesis completed through Hunter College, New York, NY. This work was made possible by funding from the Edward John Noble Foundation and the St. Catherines Island Foundation and support from the American Museum of Natural History. I am forever indebted to Dr. David Hurst Thomas for the opportunity to work on this material and for the guidance he has provided over the years. I would like to thank my friends and colleagues at the American Museum for their encouragement and support throughout the various stages of this project: Lorann Pendleton Thomas, Matt Sanger, Elliot Blair, Matt "Nappy" Napolitano, Rachel Cajigas, and Christina "Cheeks" Friberg. A heartfelt thank you goes to the dedicated participants of the St. Catherines Island Archaeological Project field crew that helped to collect the data used in this study and to Royce Hayes and the St. Catherines Island staff for all their help on and off site. I am indebted to Dr. Lewis Somers for everything from survey troubleshooting to physics lessons. I would also like to thank Dr. Victor Thompson for his helpful suggestions as the final product was being formed, my advisor Dr. William Perry, and Diana Rosenthal for her masterful editing skills.





## CHAPTER 4

### PASTE VARIABILITY AND CLAY RESOURCE UTILIZATION AT THE FOUNTAIN OF YOUTH SITE, ST. AUGUSTINE, 8SJ31

ANN S. CORDELL AND KATHLEEN A. DEAGAN<sup>1</sup>

#### INTRODUCTION

The initial years of Spanish exploration, proselytizing, and occupation in La Florida provoked major changes in the demography and geographical distribution of native people throughout the southeastern U.S. coastal plain. Populations were subject to losses through introduced diseases, and movements of people and towns internally throughout the coastal region created a fluid milieu for settlement and exchange (Stojanowski, 2005a). It is widely assumed that concomitant disruption of native social order and worldview also occurred (see essays in Deagan and Thomas, 2009; McEwan, 2001).

To help understand the ways in which these social disruptions and changes in interaction patterns played out in northeast Florida, technological analysis of ceramics from the Fountain of Youth Park site (8SJ31) in St. Augustine, Florida, was carried out in 2008 by Ann Cordell of the Florida Museum of Natural History. Pottery is perhaps the most widely used archaeological index for characterizing movements of people, changes in population composition, and alteration of both conscious and unconscious daily practice (see, for examples, papers in Skibo and Feinman, 1999).

The Fountain of Youth Park site (fig. 4.1) (referred to hereafter as FOY) was the locus of sustained occupation by Timucua Indians and their predecessors for more than 2000 years. In 1565 (the initial settlement of St. Augustine), the first permanent European town in the United States was established at this site by Pedro Menéndez de Avilés of Spain. That encampment lasted just

one year before Timucuan hostilities forced its relocation to a more secure position (see Deagan, 2009a). The site also contains the remains of the first Franciscan mission to the American Indians, Nombre De Dios, established in 1587, and that mission occupation continued until about 1650. Today the site is a tourist attraction dedicated to the story of Ponce de Leon's voyages to Florida.

Excavations have been carried out at FOY intermittently since 1934, however data for this chapter were recovered between 1985 and 2008 by University of Florida field schools directed by Kathleen Deagan. Excavations have been oriented toward delineating the 1565–1566 Spanish settlement, as well as understanding changes in Timucua life after the arrival of Europeans in northeast Florida (for a summary of these field projects and their results, see Deagan, 2009a).

The geographic and tribal associations of pottery in the region at the time of European arrival are well known (Deagan and Thomas, 2009; Worth, 2009a). Three groups dominated the coastal region of the Georgia Bight between South Carolina and St. Augustine, Florida at the time of Spanish contact, each with a distinctive ceramic tradition that persisted into the colonial period (fig. 4.2). The Guale people of coastal South Carolina and northern Georgia produced sand/grit-tempered stamped wares known as "Irene" and, slightly later, "Altamaha" or "San Marcos" during the 16th century (see DePratter, 2009; Saunders, 2009; Thomas, 2009a) (fig. 4.3A; also see Deagan, 2009b; fig. 6.6). To the south of the Guale region, the Timucua-speaking Mocama Timucua produced a grog-tempered ware known as "San Pedro" (Ashley, 2009) (fig.

4.3B; also see Deagan, 2009b: fig. 6.5). The southernmost group, the “Saltwater” Timucua (as they were known to the Spanish), produced chalky, spiculate St. Johns pottery (fig. 4.3C; also see Deagan, 2009b: fig. 6.4).

Before Spanish arrival, the Saltwater Timucua who lived at FOY used St. Johns chalky ware ceramics almost exclusively (Deagan, 2009b). This changed quickly in the second half of the 16th century when pottery associated with nonlocal Mocama and Guale groups appears in significant quantities at the site (Deagan, 2009b: 156–158; Waters, 2009). This situation raises interesting questions about resilience of traditional pottery production practices in the face of social and demographic disruption. For example, to what de-

gree did historic-period, nonlocal pottery types at FOY represent movement of people and pots into the area from elsewhere? Did Guale or Mocama potters relocate to St. Augustine, and continue producing their traditional pottery using new local resources? Did local Saltwater Timucua at FOY continue to exclusively produce their traditional St. Johns pottery, or is there evidence that they also adopted elements of Guale and Mocama Timucua pottery (as suggested by Waters, 2005 and Worth, 2009a).

Answers to these questions, although focused on the assemblage from a single early site in St. Augustine, could provide insight into the nature of intergroup Native American movements and interactions during the turbulent 16th century.



Figure 4.1. Fountain of Youth location (adapted from Deagan, 2009b: fig. 6.1).

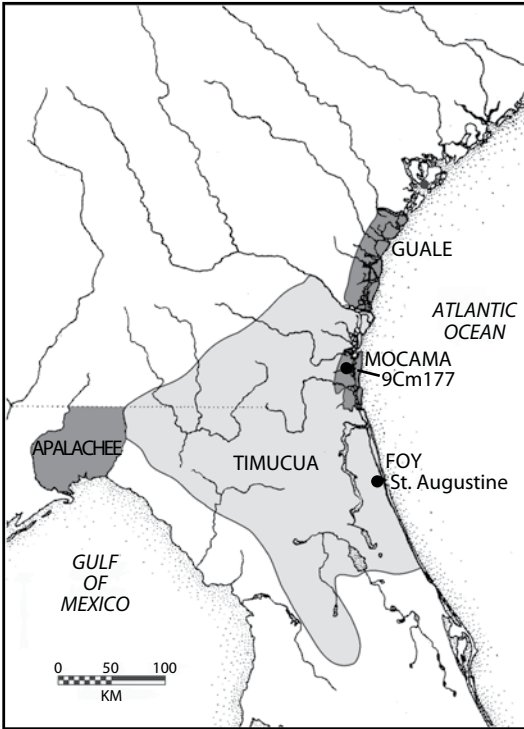


Figure 4.2. Sixteenth-century distribution of ethnic groups (adapted from Saunders, 2009; fig. 3.1), showing location of Fountain of Youth and 9Cm177.

The degree to which production regimens for these ceramic traditions persisted or changed is an important potential index of change or persistence in cultural practice and continuity.

The analysis of ceramics from 16th-century contexts at FOY reported in this chapter was carried out to begin evaluating these possibilities, with emphasis on detecting local versus nonlocal production. It was expected that paste characterization could yield data to indicate whether or not stylistically defined ceramic varieties (San Pedro and Altamaha/San Marcos) found at FOY were locally produced or imported. These varieties have been documented as being traditionally produced by tribal groups outside the Saltwater Timucua region (Ashley, 2009; Saunders, 2009). This question is approached through characterization of paste variability in terms of the relative number and kinds of clay resources used in manufacture of the pottery, and exploring manufacturing origin of the resource groupings.

Several clay samples from the coastal region adjacent to and north of the site were analyzed for comparison.

#### DESCRIPTION OF THE SAMPLES

Three ceramic traditions make up most of the aboriginal pottery at FOY: local Timucuan St. Johns chalky wares (73%), Mocama Timucua San Pedro grog-tempered pottery (3%), Guale-associated Irene/Altamaha/San Marcos sand/grit-tempered tradition (5%), and remaining unassigned wares (19%) (Deagan, 2009b: 147–148). Summary descriptions of these pottery traditions are provided in table 4.1. Deagan selected a sample of 89 sherds from undisturbed 16th-century deposits at the site for analysis by Cordell. All sampled contexts are thought to have been deposited during, or shortly after, the Menéndez encampment occupation at the site (1565–1566).

The grog-tempered wares ( $N = 27$ ) consist of San Pedro series sherds (Ashley and Rolland, 1997; Rolland and Ashley, 2000; Ashley, 2001, 2009), including some with Colorinda-like temper (Sears, 1957; Ashley, 2006a, 2006b). The San Pedro sample includes plain, cob-marked, and stamped surface treatments (table 4.2; fig. 4.3B). Four thin sections of San Pedro Plain from the Devil's Walkingstick site, (9Cm177) a coastal Mocama Timucua site in South Georgia (Smith et al., 1981; Borremans, 1985; Cordell, 1993; also see Wallis and Cordell, chap. 5) were included in this study for comparison.

Sand/grit-tempered wares ( $N = 14$ ) are represented by Irene/Altamaha/San Marcos series stamped sherds (fig. 4.3A) (Smith, 1948; Otto and Lewis, 1974; Saunders, 1992; DePratter, 2009). St. Johns wares ( $N = 48$ ) include check stamped, plain, and several other surface treatments (fig. 4.3C). A typological listing of the sample is provided in table 4.2.

Nine clay samples were analyzed for comparison to the pottery. Six clays are from northeast Florida (fig. 4.4): one from the vicinity of FOY in St. Johns County (edge of the saltwater marsh at Fountain of Youth Park), three from Duval County, and two from Nassau County. Three clay samples are from southeast Georgia: one from Camden County, and two from Glynn County. The clay samples were collected by Neill Wallis, Vicki Rolland, and Kathleen Deagan. The FOY clay sample was thin-sectioned for this study; thin sections of the other eight

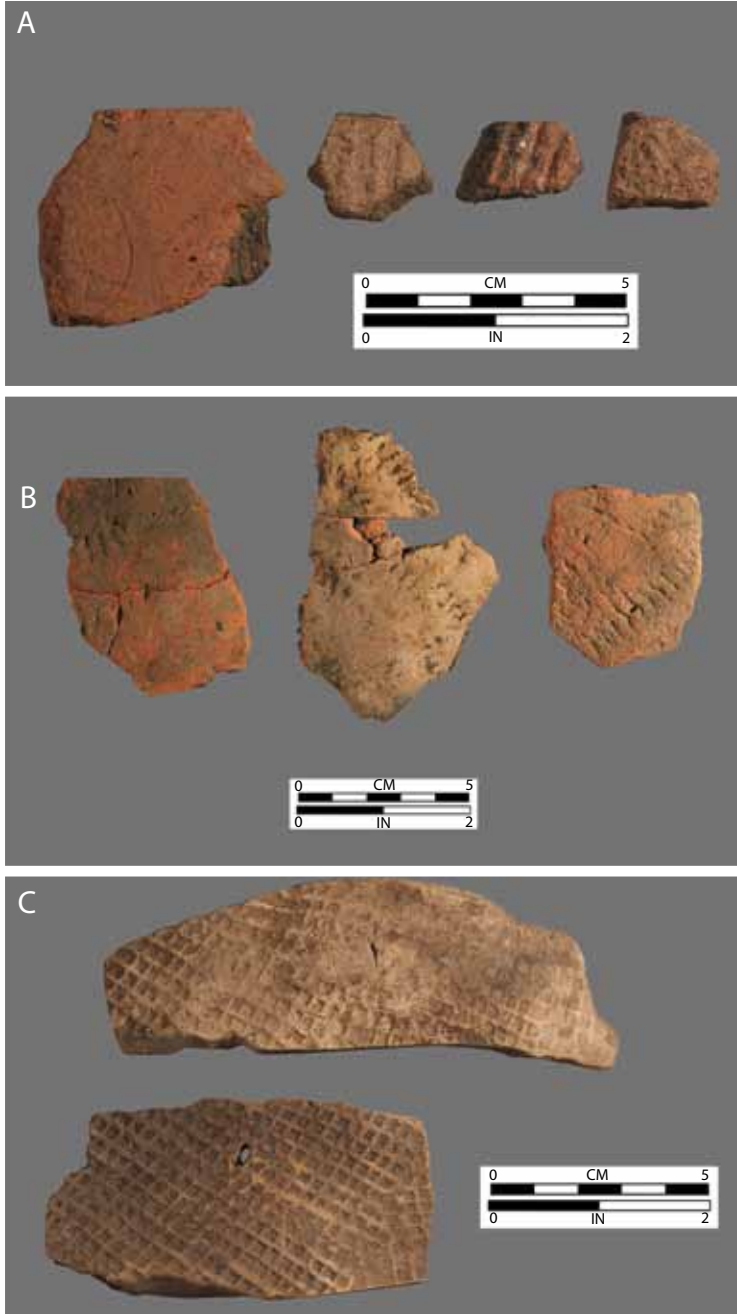


Figure 4.3. Pottery types in the FOY sample: **A**, San Marcos Stamped (*left to right*: FOY samples 31, 38, 39, 41); **B**, San Pedro Cob Marked (*left to right*: FOY samples 12, 1, 8); **C**, St. Johns Check Stamped (FOY samples 88 and 75).

clays were made available for study courtesy of Neill Wallis (Wallis, 2009, 2011).

### METHODS OF ANALYSIS

Three methods of analysis were carried out on the pottery sample in order to characterize paste: gross paste sorting with a binocular stereomicroscope; refring in an electric furnace; and petrographic analysis of thin sections. These methods are the same as those used to characterize paste in the Wallis and Cordell study (this volume, chap. 5). The binocular stereomicroscope was used to identify predominant constituents and to distinguish paste differences within gross temper groupings. The microscope was equipped with an

eyepiece micrometer and fiber optic illuminator. A magnification of  $\times 30$  was used because it was powerful enough to distinguish very fine particle sizes (0.0625 mm to  $\leq 0.125$  mm), but low enough for estimation of size and relative abundance of larger coarse and very coarse constituents (grit sizes  $\geq 0.5$  mm). Occasionally, higher magnifications (up to  $\times 70$ ) were used when necessary. All initial observations were made on sherd edges that had been freshly broken with pliers. For grog-tempered and sand/grit-tempered sherds, additional observations were made on sherd edges that had been freshly cut with a lapidary saw. The textural integrity of the pastes was remarkably well preserved in the cut edges, which also provided larger and more uniform

TABLE 4.1  
Summary Description of Pottery Traditions

Pottery series/tradition	Temper composition	Matrix	Reference	Surface treatment	Time period
San Pedro Series	crushed grog (pre-fired clay)	fine to coarse sand paste	Ashley and Rolland, 1997	plain, check-stamped, cob-marked, textile-impressed, cord-marked, complicated-stamped, various others	late 16th and 17th centuries, Mocama Timucuan
Colorinda	crushed St. Johns sherds	gritty	Sears, 1957	plain	late St. Johns Ib
	crushed St. Johns and nonspiculate sherds	frequent fine to medium sand	Ashley, 2006a	plain, rarely other surface treatments	late Woodland, A.D. 700–900
unnamed sherd-tempered series	small to large chunky crushed potsherds	sandy	Goggin, 1952: 57, 112; also see Ashley and Rolland, 1997: 51–52	plain, cob marked, fabric impressed, simple, complicated, and check stamped	St. Johns II and later
sherd tempered	numerous, sizeable ground sherds (some Colorinda?)	not described	Bullen and Griffin, 1952	plain, cob marked, net/textile impressed, cord marked, check stamped, misc. stamped	some prehistoric, some historic period
clay tempered series	crushed pottery or clay temper (some Colorinda Plain)	not described	Hemmings and Deagan, 1973	plain, cob marked, cord marked, net/textile impressed	A.D. 700–1700
sherd or clay tempered	sherd or clay tempered	not described	Milanich, 1971	plain, cobmarked, San Marcos Stamped	mission-period Timucuan
San Marcos Series	grit, sand, sometimes limestone, shell, rarely grog	not described	Smith, 1948; Otto and Lewis, 1974; Saunders, 2000	stamped, plain, red filmed	Guale, 17th-century St. Augustine
St. Johns	abundant sponge spicules; variable quartz sand	abundant sponge spicules; variable quartz sand	Goggin, 1952; Borremans and Shaak, 1986; Rolland and Bond, 2003; Cordell and Koski, 2003	plain, check stamped predominant, many others	St. Johns period, 500 B.C.–A.D. 1700

surface areas for examination. Size of aplastics was estimated with reference to the Wentworth Scale (Rice, 1987: 38). Particle abundance was estimated with reference to a relative abundance scale.<sup>2</sup> Data from gross paste sorting are summarized in table 4.3.

Sherds were refired to standardize color comparisons between samples, to assess their relative iron oxide content, and for comparison to the clay samples. This method, recently referred to as *oxidation analysis* (Beck, 2006), follows recommendations from Shepard (1939, 1953, 1976: 105) and Rice (1987: 344) to infer gross clay composition from color class of oxidized clays. The lapidary saw was used to control the desired size of fragments for refiring (not all sherds were large enough to spare removal of pieces for refiring). Sherds were refired in an electric furnace at a temperature of 800°C for 30 minutes<sup>3</sup>—conditions that most likely exceeded those of the original firings. A fresh break was made after

refiring to note color changes and Munsell colors were recorded for core colors of a subsample of refired sherds. Four gross refired color ranges were specified for refired sherds, corresponding to relative iron oxide contents ranging from very low to high.<sup>4</sup> A subsample of 30 FOY sherds was thin-sectioned for petrographic compositional and point count analyses. Sampling for thin-sectioning was proportional to gross paste variation within San Pedro and St. Johns categories, and based on sherd size for Altamaha/San Marcos and Colorinda-like categories. The petrographic analysis was conducted to evaluate compositional homogeneity and differences within and between gross paste categories. Point counts were made for quantifying relative abundance of constituents. The point-counting procedure involved using a petrographic microscope with a mechanical stage and generally followed recommendations by Stoltman (1989, 1991, 2000).<sup>5</sup> Four thin sections of San Pedro sherds from Dev-

TABLE 4.2  
FOY Pottery Sample<sup>a</sup>

Temper tradition	Pottery series	Pottery type	Sample size	Thin section sample
grog-temper N = 27	San Pedro N = 22	SP Cob Marked	9	6
		SP Plain	10	8 <sup>b</sup>
		SP uid stamped	3	-
	Colorinda N = 5	Colorinda Plain	5	2
sand/grit N = 14	San Marcos N = 14	SM uid stamped	6	4
		SM Plain	3	-
		SM Simple Stamped	2	-
		SM net impressed	1	-
		SM uid/eroded	2	2
spiculate ware N = 48	St. Johns N = 48	SJ Check Stamped	26	7
		SJ Bold Check Stamped	5	1
		SJ Plain	12	3
		SJ other (various)	5	1
Total			89	34 <sup>b</sup>

<sup>a</sup> Provenience listing on file, FLMNH.

<sup>b</sup> Four thin sections of San Pedro Plain from 9Cm177, Devil's Walkingstick site included with the FOY thin section sample.

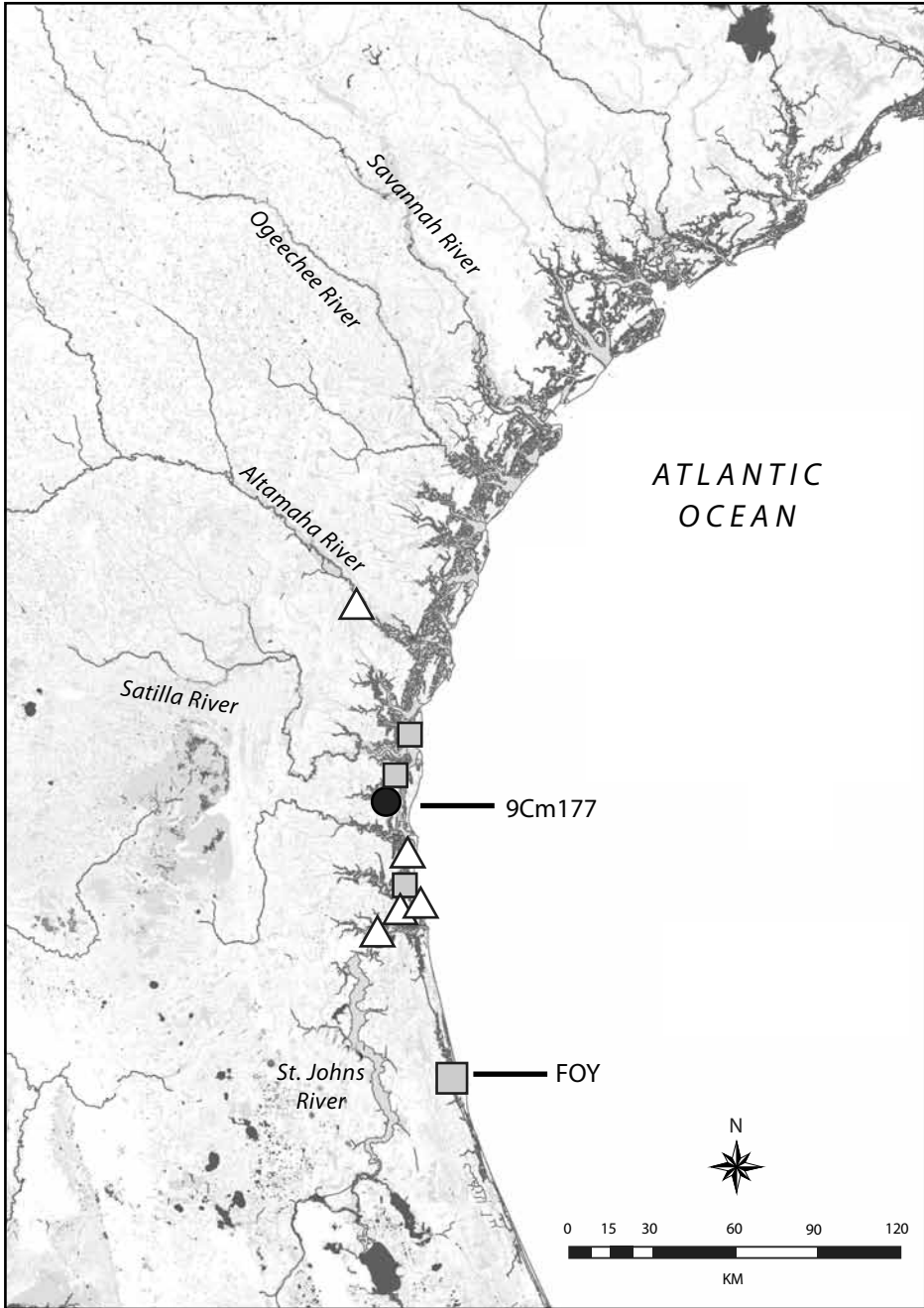


Figure 4.4. Location of clay samples (white triangles and gray squares; gray squares denote clays with diatoms).

TABLE 4.3  
Summary Descriptions of Gross Paste Groupings within Pottery Series

Clay resource groups	Sample size/thin section sample	Paste/matrix texture	Principal constituents	Modal sand size	Relative iron oxide content	Mean sand size index	Bulk composition			Matrix composition (excludes temper)		
							% matrix+silt	% sand <sup>d</sup>	% temper <sup>e</sup>	% matrix	% silt + vf sand	% f-c sand
San Pedro	11/6 <sup>a</sup>	fine/ compact	frequent grog; frequent sand	very fine, fine	moderate to high	1.08	82%	10% (1%)	8%	85%	7%	8%
	15/8 <sup>b</sup>	sandy	frequent grog; common to abundant sand	fine	moderate to high	1.08	60.5%	33% (1%)	6.5%	62%	8%	30%
Colorinda	5/2	sand	occas. to frequent grog; common to abundant sand	fine, very fine	moderate to high	0.96	69%	24% (<1%)	7%	64%	11%	24%
San Marcos	9/4	fine/ compact, gritty	frequent sand/ grit, occas. platy voids, shell temper	very fine to coarse	low to moderate	1.98 <sup>c</sup>	74%	15%	11% (10%) <sup>d</sup>	80%	9%	11%
	5/2	sandy/gritty	common to abundant sand/ grit, occas. platy voids, shell temper	very fine to coarse	moderate to high	1.75	54%	31%	15% (12%) <sup>d</sup>	62%	9%	29%
St. Johns	23/5	very fine (SPC1)	abundant sponge spicules; occas. sand	very fine	very low to high (most very low to low)	0.66	69%	1%	30%	97%	3%	<1%
	18/4	fine (SPC2)	abundant sponge spicules; frequent. sand	very fine, fine	variable; very low to high	0.93	66%	10% (<1%)	24%	84%	9%	8%
	7/3	sandy (SPC3)	common sponge spicules; common sand	very fine to medium	variable; very low to high	1.11	61%	19%	20%	72%	8%	20%

<sup>a</sup> Includes one thin sections from 9Cm177.

<sup>b</sup> Includes three thin sections from 9Cm177.

<sup>c</sup> One extremely low value of 1.08 excluded.

<sup>d</sup> Lower value in parentheses is percentage of coarse and larger grit sizes.

<sup>e</sup> Temper for San Pedro samples = grog; temper for San Marcos samples = coarse and larger grit and shell; temper for St. Johns = sponge spicules.



il's Walkingstick and nine thin sections of clay samples were included in this phase of analysis. Point-count data were used to calculate a "sand size" index for each sample, following Stoltman (2000: 314).<sup>6</sup> Grain size analysis was also conducted on the FOY clay sample and test bars were formed and fired for comparison with sherd physical properties.<sup>7</sup> All analyses were carried out in the Florida Museum of Natural History Ceramic Technology Laboratory (FLMNH-CTL). SAS for Windows (SAS Institute Inc., 2008) was used for computer analysis and statistical comparisons of petrographic data. Ternary diagrams of point count data were constructed (after Graham and Midgley, 2000) for evaluation of trends.

## RESULTS

### PASTE CONSTITUENTS

**PRINCIPAL CONSTITUENTS:** The principal tempers include: quartz sand (0.0625 to < 0.5 mm), quartz and quartzite grit ( $\geq 0.5$  mm), grog-temper, and sponge spicules. Quartz occurs in all sherds in the sample, in varying sizes and abundances. Its status as an added temper or a naturally occurring constituent, or some combination of both, is uncertain. Quartz aplastics falling into silt and very fine Wentworth particle sizes are usually considered to be naturally occurring constituents of the clay source (Rice, 1987: 411; also see Stoltman, 1989: 149–150, 1991: 109–111). Coarser particle sizes may be indicative of tempers (Rice, 1987: 411; Stoltman, 1989: 149, 1991: 109–111). Quartz was generally frequent to abundant in most sherds in the sample, but was the principal constituent in Altamaha/San Marcos samples (fig. 4.5). Polycrystalline quartz or quartzite was noted only in thin section.

Grog temper, or crushed, recycled potsherds, is an occasional to common constituent of the San Pedro sample. In the initial gross paste analysis, grog temper composition was categorized as fine/compact, sandy, or chalky/spiculate (see fig. 4.6).

Sponge spicules are the principal constituents of the St. Johns sample (fig. 4.7). Sponge spicules are variously considered to be naturally occurring constituents of the clays (e.g., Borremans and Shaak, 1986; Cordell and Koski, 2003) or as temper added to clay during paste preparation (e.g., Rolland and Bond, 2003). Sponge spicules are also rare to occasional in some San Pedro and Altamaha/San Marcos pottery, as observed petrographically. In these cases, the

sponge spicules are generally more fragmented than sponge spicules in St. Johns pottery. Sponge spicules that are only occasional constituents of an otherwise sandy paste probably do not represent added temper on the basis of low frequency. Occasional sponge spicules may be natural incidental constituents of the clay source or they could have been introduced incidentally through temper sources (e.g., spiculate grog temper or from a mucky sand source) or through contamination during the manufacturing process.

**OTHER CONSTITUENTS:** Mica, shell fragments and platy shell voids, ferric concretions, feldspars, mafic minerals, and other siliceous microfossils were also observed in some cases. Mica was not observed during the preliminary analysis, rather, only in thin section. Mica is considered a naturally occurring constituent of clays rather than temper. Ferric nodules or concretions are occasional constituents of most sherds, but probably also represent naturally occurring constituents of the clays. Shell temper and/or shell voids from dissolution of shell temper, are present in several Altamaha/San Marcos sherds. Feldspars (mostly microcline and plagioclase) and mafic (ferromagnesian) minerals (mostly epidote and amphibole) are occasional constituents of some sherds and were only discerned in thin section. These constituents may be natural constituents of the clay(s) or incidental to sand tempers.

In addition to sponge spicules, fragments of other siliceous microfossils, specifically diatoms and opal phytoliths, were identified in the matrix of some San Pedro and Altamaha/San Marcos pottery (and in some grog temper characterizing the former) as well as in three clay samples. Diatoms are unicellular algae with ornate cell walls made of silica. Diatoms are useful as environmental indicators and in paleoenvironmental studies (e.g., Stoermer and Smol, 1999; Round, Crawford, and Mann, 2007: 116–117) and have proven useful in applications to archaeological questions and in provenance studies of pottery and clays (e.g., Battarbee, 1988; Juggins and Cameron, 1999; Mannion, 2007). With a few exceptions, the valves and other wall components in FOY thin sections were fragmentary and problematic in terms of species identification. Fresh to brackish water, and marine diatom species were, however, identified (fig. 4.8).<sup>8</sup> The combination of brackish water and marine species indicates deposition under conditions at least occasionally inundated by ocean waters, reflecting coastal locales. These

siliceous microfossils were particularly useful for establishing matches between pottery samples and particular clay resources in the present study.

Opal phytoliths are botanical microfossils composed of silica (Rapp and Mulholland, 1992). No attempts at phytolith species identification have been made. Diatoms, phytoliths, and fragmented sponge spicules (when only rare to occasional in occurrence) were observed only in

thin section with magnifications ranging from  $\times 250$  to  $\times 400$ . These microfossils are considered to be natural constituents of the clay sources, rather than incidental tempers or contaminants.

#### DESCRIPTION OF PASTE/CLAY RESOURCE GROUPINGS

On the basis of petrographic data and refired paste color, a minimum of four gross potential clay resources is represented by the 16th-centu-

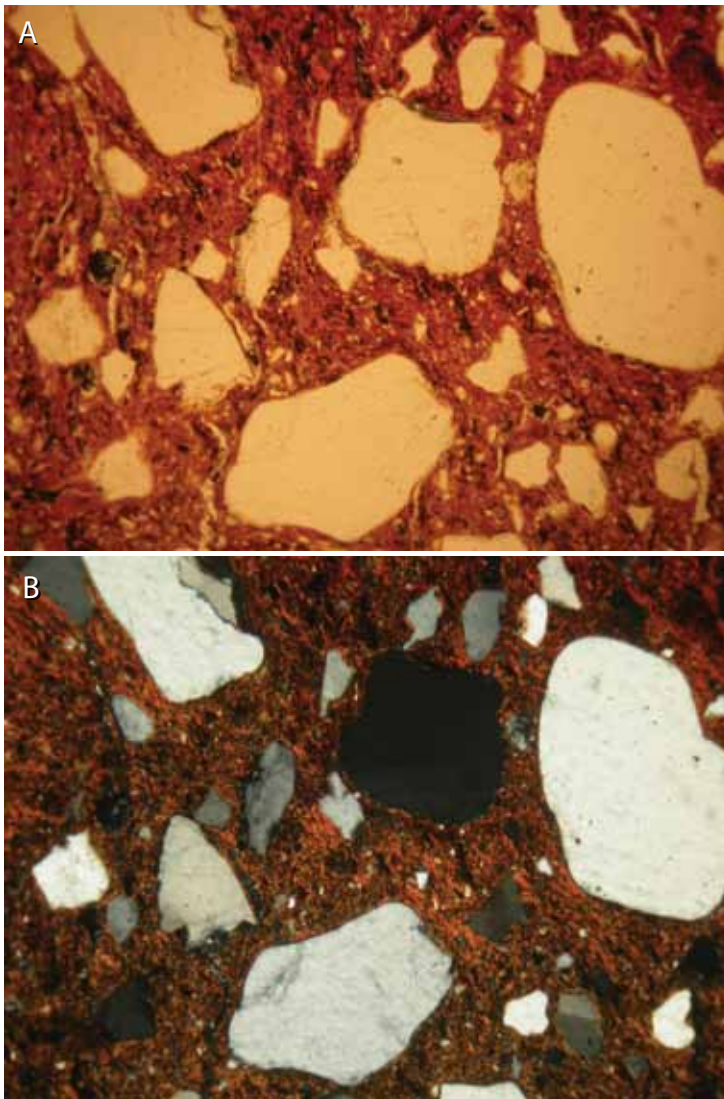


Figure 4.5. Photomicrographs of a San Marcos thin section (FOY 41) showing coarse quartz temper. **A**, plain polarized light (ppl); **B**, cross polars (xp) ( $\times 40$ ; width of images  $\sim 2.25$  mm).

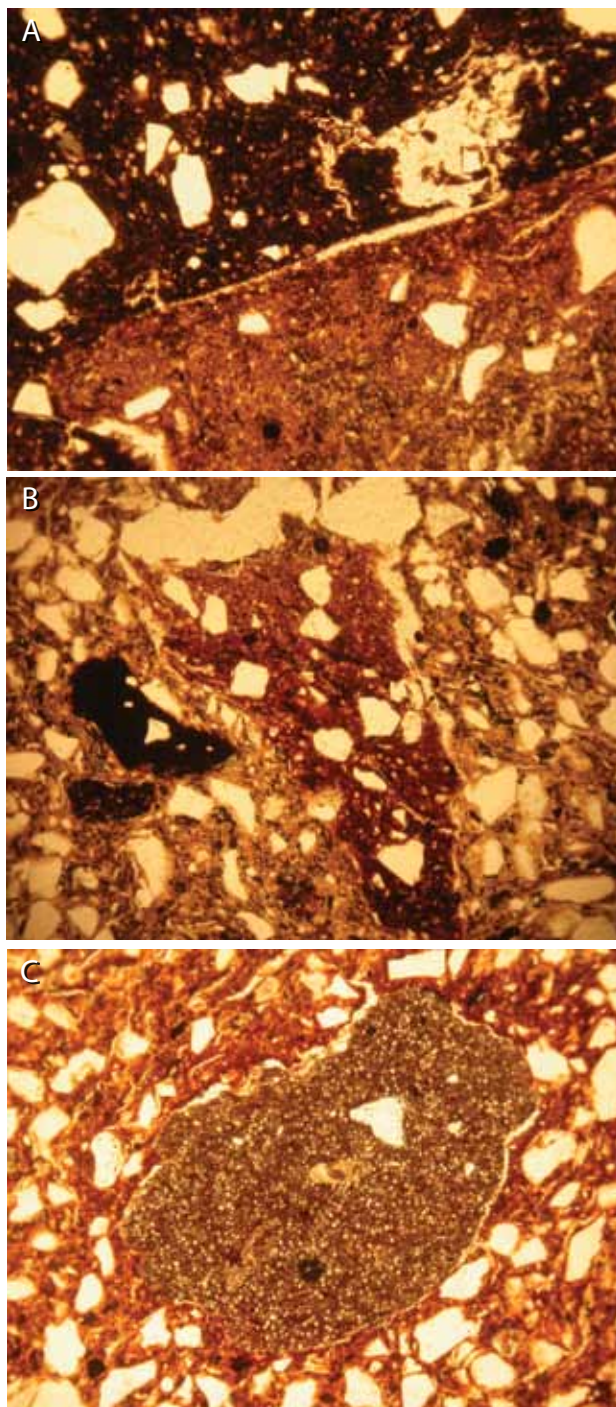


Figure 4.6. Photomicrographs of San Pedro thin sections (ppl,  $\times 40$ ; width of images  $\sim 2.25$  mm): **A**, relatively fine/compact matrix and grog temper (FOY2); **B**, relatively sandy matrix and grog temper (FOY 14); **C**, Colorinda-like paste (sandy matrix and St. Johns temper showing sponge spicules in circular cross section, perpendicular to their elongation [FOY 15]).

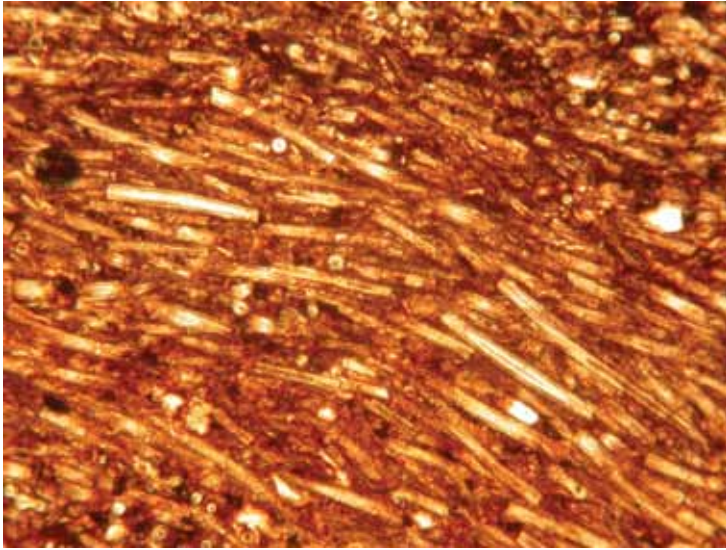


Figure 4.7. Photomicrograph of a St. Johns paste thin section (FOY 70, very fine St. Johns), showing preferred orientation of sponge spicules in longitudinal section (ppl,  $\times 100$ ; width of image  $\sim 1$  mm).

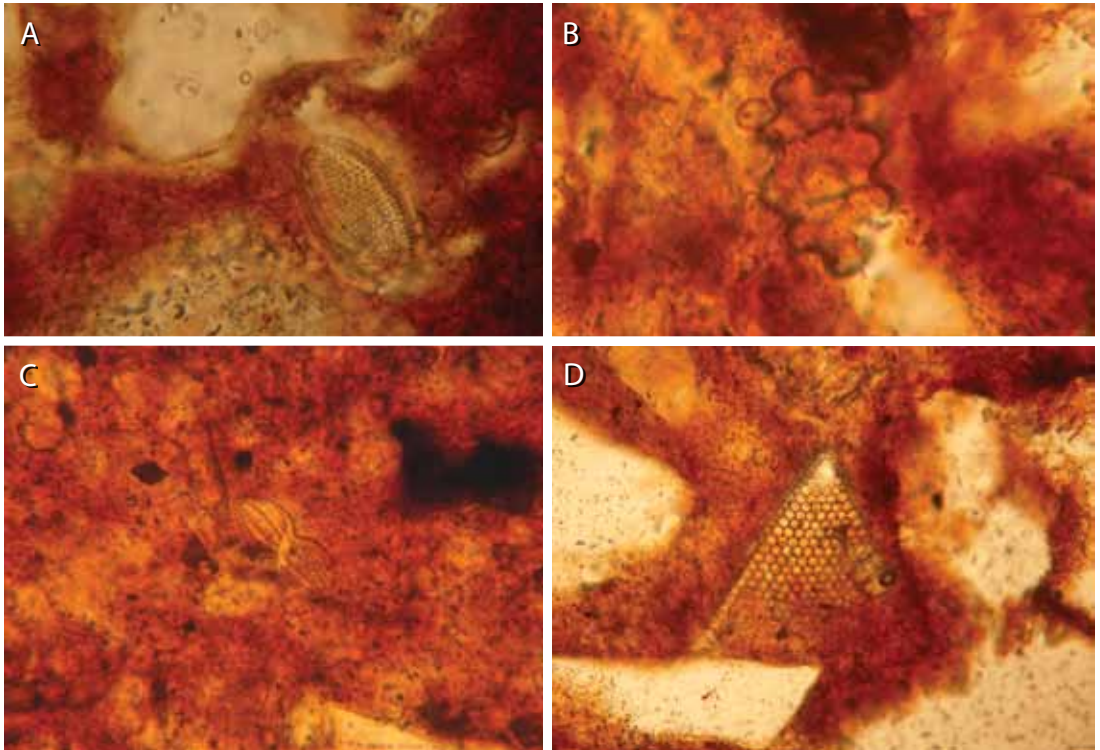


Figure 4.8. Photomicrographs of fossil diatoms in San Pedro pottery and clay samples: brackish water species: **A**, *Tryblionella granulata* (clay sample 10; ppl,  $\times 400$ ; width of image  $\sim 0.15$  mm). **B**, *Terpsinoe americana* (clay sample 7; ppl,  $\times 250$ ; width of image  $\sim 0.16$  mm); marine/coastal genera: **C**, *Diploneis* (pottery sample FOY2; ppl,  $\times 400$ ; width of image  $\sim 0.15$  mm) and **D**, *Triceratium favus* (clay sample 7; ppl,  $\times 250$ ; width of image  $\sim 0.20$  mm).

TABLE 4.4  
**Summary Descriptions of Paste/Resource Groupings (Petrographic Data)**

Clay resource groups <sup>a</sup>	Sample size	Paste/matrix texture	Bulk composition			Matrix composition (excludes temper)			Sand size index <sup>d</sup>	Matrix constituents				Relative iron oxide content
			% matrix+silt	% sand	% temper	% matrix	%silt+vf sand	%f-c sand <sup>c</sup>		sponge spicules	diatoms	phyto-liths	mica	
A	6	fine/compact	80	12	8	83	8	9 (1/3)	1.11 1.22					
	1 <sup>b</sup>	sandy	58	31	11	63	7	30	1.09					rare to occas.
	7	total A	77	15	9	80	7	12 (1/2)	1.10 1.20	2-3%	1-3%	1%		moderate to high
B	2 <sup>b</sup>	fine/compact	86	6	8	88	8	3 (0/12)	0.86 0.98					
	9	sandy	60	33	7	62	10	28 (0.3/0.4)	1.05 1.20					rare to occas.
	11	total B	65	28	7	67	10	23 (0.3/3)	1.02 1.16	none to rare	none	none		moderate to high
C	2	fine/compact	69	17	15	76	10	14 (0/14)	1.14 2.08					
	2 <sup>b</sup>	sandy	59	30	11	64	6	30 (0.15)	1.12					rare to occas.
	4	total C	64	24	13	70	8	22 (0.1/7)	1.13 1.60	1-3%	none	none		low-moderate to high
D	5	very fine (SPC1)	69	1	30	97	3	<1	0.66	30%				very low-high (most very low to low)
	4	fine (SPC2)	66	10	24	84	9	8 (0.5)	0.93					none to rare
	3	sandy (SPC3)	61	19	20	72	8	20	1.11					none to rare
	12	total D	66	9	26	86	6	8 (<0.1)	0.88	26%				none to rare

<sup>a</sup> Resource groups A, B, C, and D correspond to group F/G, A, C, and H in Wallis and Cordell, this volume.

<sup>b</sup> Includes one thin section from 9Cm177 in A and B and two thin sections from 9Cm177 in C.

<sup>c</sup> Lower values in parentheses, when present, are percentages of coarse and larger grit sizes; the first lower value excludes coarse and larger grit for any San Marcos cases; second lower value includes coarse and very coarse grit in San Marcos cases.

<sup>d</sup> Upper sand size index was calculated excluding coarse and larger grit sizes for any San Marcos cases.

ry aboriginal pottery at FOY (table 4.4). Each clay resource group may represent a group of similar clays, rather than a discrete clay source. For convenience they are labeled A–D (note that there is overlap in paste categories A–D in the present study and mineralogical groups A–I in Wallis and Cordell [chap. 5], but the category designations are not equivalent in most cases; Wallis and Cordell designations are included in table 4.4). Bulk composition for the resource groups is compared graphically in figure 4.9, showing that three of the four sort out into fairly distinct groupings.

Resource group A is characterized by fine or compact texture, containing about 15% sand (primarily quartz).<sup>9</sup> Occasional fragmented sponge spicules, phytoliths, and frequent microfossils of diatoms also occur (fig. 4.8). One case with sandy matrix texture was observed (it clusters with group B sherds in figure 4.9). Resource group A samples included sherds typologically identified as San Pedro, primarily, with one occurrence of Altamaha/San Marcos (fig. 4.10).

Resource group B is characterized by sandy texture consisting of about 30% sand and none to rare sponge spicules and absence of other siliceous microfossils. Two cases with fine/compact texture were observed (clustering with group A sherds in figure 4.9). Resource group B samples included sherds typologically identified as San Pedro (including Colorinda-like cases) and Altamaha/San Marcos (fig. 4.10).

Resource group C has fine to sandy matrix with occasional sponge spicules but no diatoms, and includes sherds typologically identified as San Pedro and Altamaha/San Marcos (fig. 4.10). A fine-textured example resembles resource group A (see fig. 4.9), but with no diatoms. Two sandy cases cluster with group B sherds in figure 4.9, while one intermediate case is an outlier (in the group D circle). In clay groups A–C, mica is a rare to occasional constituent, and relative iron oxide content is moderate to high.

Resource group D is assigned to spiculate pastes or clays, characterized by variable sand and iron oxide content. It is assumed for the present that sponge spicules were naturally abundant in the clays. Three textural subgroups, “very fine,” “fine,” and “sandy,” were sorted during the initial gross microscopic analysis on the basis of modal quartz particle size and frequency. These groupings are characterized by increasing quantities of quartz sand and decreasing quantities of

sponge spicules, as shown in table 4.4 and figure 4.11 (table 4.3) (also see Cordell, 1989: 63–65; Cordell and Koski, 2003: 119–121). Examples of pennate, probably freshwater, diatoms were observed in thin section in a few cases, but only extremely rarely (table 4.4). No examples of brackish or marine species, as were observed in resource group A, were observed. Refired colors indicate that group D resources exhibit very low to low and moderate to high iron oxide content, but very fine St. Johns (SPC1) is characterized by the most cases with very low to low iron oxides. Resource group D corresponds exclusively to typologically identified St. Johns sherds, and all St. Johns samples are therefore in this resource group.

Petrographic data indicate that there is a clay source difference between group D clays and the other resource groupings, over and above differences in presence and/or quantity of sponge spicules. Resource group D differs from A–C in terms of its generally lower iron oxide content, lower occurrence of accessory minerals (mica, plagioclase, hornblende), and in both paucity and species differences of diatoms. These data support a contention that different clays were used for making St. Johns pottery from those used for San Pedro and Altamaha/San Marcos pottery.

#### RESULTS BY POTTERY TRADITIONS

**SAN PEDRO:** Recycled sherds were added as temper to San Pedro and Colorinda-like pastes. The San Pedro sherds were sorted into fine/compact versus sandy textures during the initial gross microscopic analysis (see table 4.3). Very fine and fine are modal particle sizes for sand in San Pedro sherds with fine/compact matrix textures (table 4.3), whereas fine sand is modal for sherds with sandy matrix textures. Grog temper ranges from medium to very coarse in size, with most coarse to very coarse. Grog frequency based on point counts ranges from 3% to 11%. Most fine-textured sherds contained fine-textured grog temper (table 4.5). Sandy textured sherds contained both fine- and sandy-textured grog temper.

Petrographically, San Pedro paste exhibits clay resource groups A, B, and C (fig. 4.10). Most of the San Pedro sherds with fine/compact matrix texture correspond to resource group A, whereas most San Pedro sherds with sandy matrix texture, including those with Colorinda-like temper, correspond to resource clay B. There are, however,

a few exceptions. One San Pedro sample made of resource group A has a sandy matrix, and one other made of resource group B paste has a fine-compact matrix. Two cases with sandy matrix texture correspond to resource clay C, fine to sandy matrix with occasional sponge spicules but no diatoms. Each matrix grouping, except sherds

with Colorinda-like paste, contains grog temper recycled from sherds of mainly A and B compositions (table 4.5). The Colorinda-like sherds have grog temper recycled from group D St. Johns sherds (fig. 4.6C).

From consideration of matrix and grog composition in the thin-sectioned San Pedro samples

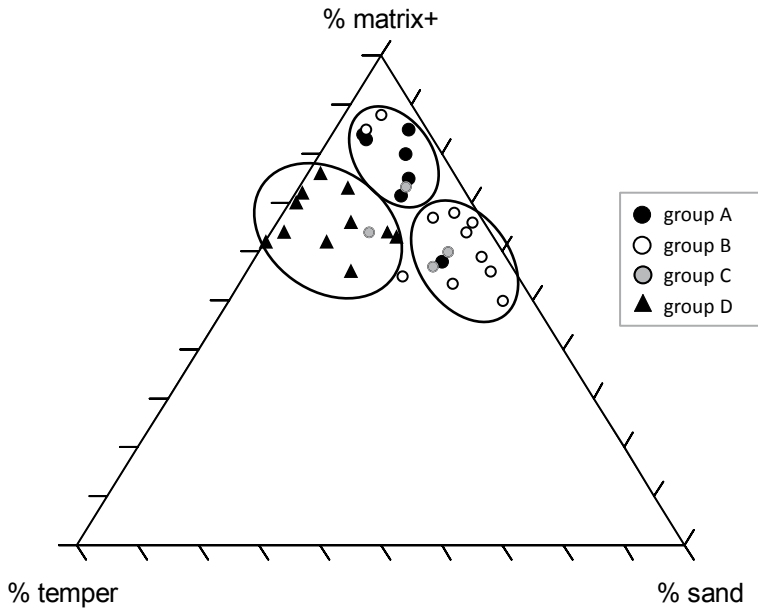


Figure 4.9. Ternary diagram of bulk composition of FOY pottery resource groups.

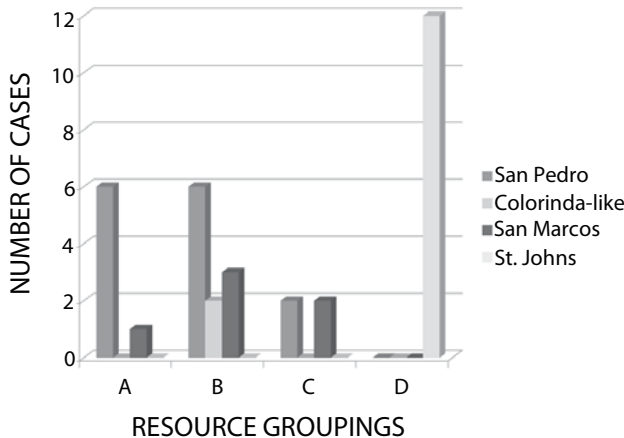


Figure 4.10. Bar chart of resource grouping variability by pottery series (see table 4.4).

from FOY (table 4.5), it is concluded that at least two clay sources were used to make the pottery and potters had access to grog temper composed of multiple categories. Generalizing back to the larger sample of San Pedro sherds from FOY is problematic, given that the criteria for defining clay resource groupings were determined petrographically. Thus it might not be safe to assume that all examples of fine/compact-textured and sandy San Pedro sherds in the FOY sample have clay group A and clay group B matrix compositions, respectively.

Consideration of matrix and grog composition in the four San Pedro samples from 9Cm177 (table 4.5) shows that at least three clay sources were used in making the pottery.

Multiple resource use is also reflected in multigenerational grog-temper particles that are present (generally rare or occasional) in most San Pedro thin sections (from both sites) (table 4.5). Most examples consist of a grog-temper particle with group A composition encompassing a

smaller grog particle with group B composition. Thus the temper source consisted of sherds from a pot with group A matrix that had been tempered with crushed sherds of clay group B composition. Other combinations were also observed: group B with group A temper, group B with group B temper, group A with group A temper, and group B with group C temper (table 4.5). The latter multigenerational grog composition was observed only in the 9Cm177 sample.

**COLORINDA-LIKE SAMPLES:** Five sherds in the FOY sample appear to be consistent with the type Colorinda Plain, two of which were thin-sectioned. This is grog-tempered pottery characterized by a sandy matrix and spiculate or St. Johns sherd temper (fig. 4.6C) (Sears, 1957; Ashley, 2006a). Colorinda Plain dates to the late Woodland Period, A.D. 700–900, according to Ashley (2006a). Ashley and Rolland mention that St. Johns grog is not unknown in San Pedro grog-tempered pottery (1997: 56). These samples are apparently Colorinda-like variants of 16th-

TABLE 4.5  
Grog Composition of San Pedro Sample

Site	Series	Paste texture	Sample size	Matrix composition (clay resource group)	Texture of most grog	Multi-generational grog	Grog composition <sup>a</sup>
8SJ31 (FOY)	San Pedro	fine/compact	5	A	mostly fine/compact	3 cases; most Aw/B; also Aw/A, Bw/B,	3(A,B); 2(B)
		sandy	5	B	fine/compact and sandy	3 cases; variable Aw/A, Aw/B, Bw/A, Bw/B,	3(A,B); 1(A,B,C); 1(B)
	Colorinda	sandy	2	B	most grog spiculate	-	D <sup>b</sup>
9Cm177	San Pedro	fine/compact	1	B	fine/compact and sandy	Bw/B	B
		sandy	1	A	fine/compact and sandy	Bw/B, Bw/C	A,B,C
			2	C	fine/compact and sandy	variable Aw/B, Bw/C	A,B

<sup>a</sup>Letters listed below refer to clay resource group compositions of grog particles.

<sup>b</sup>One case with one occurrence of group B composition.



century San Pedro ware, as no examples of Colorinda Plain were reported in prehistoric contexts at FOY (Deagan, 2009a).

Petrographically, Colorinda-like paste in the present sample has resource group B matrix (fig. 4.10), and temper composed of recycled group D St. Johns sherds (table 4.5). One case also had one grog-temper particle with group B composition.

IRENE/ALTAMAHA/SAN MARCOS: Two matrix textures were observed for Altamaha/San Marcos samples during initial gross microscopic analysis: fine/compact and sandy (table 4.3). Coarse to very coarse and larger quartz or grit are prominent constituents in both textural groupings, but fine sand is modal in the sandy-textured group. Grit-size constituents were most likely added as temper to Altamaha/San Marcos pastes and have been categorized as temper in data presentation (tables 4.3 and 4.4; fig. 4.9). This conclusion is based on particle size data for the sample clays, to be presented later. Crushed shell was occasionally added in very small quantities as temper to Altamaha/San Marcos pastes. Petrographically, Altamaha/San Marcos paste includes examples of resource groups A, B, and C, but mostly B and C (fig. 4.10). Of

the samples with fine/compact paste, resource groups A, B, and C are represented, whereas only group B is represented in the sandier examples. As with San Pedro, generalizing back to the other Altamaha/San Marcos sherds from FOY is problematic in the absence of a larger thin-section sample.

ST. JOHNS WARE: St. Johns chalky, spiculate paste shows very fine, fine, and sandy variants, characterized by increasing quantities of quartz sand and decreasing quantities of sponge spicules (table 4.4; fig. 4.11). Petrographically, there is some overlap between San Pedro and Altamaha/San Marcos pastes at FOY, whereas St. Johns paste represents a distinct resource group. The St. Johns samples were assigned resource group D matrix composition. As noted earlier, St. Johns or clay group D differs from groups A–C in its abundance of sponge spicules, generally lower iron content, lower occurrence of accessory minerals, and paucity of diatoms. The differences imply a very different potting tradition from those represented by San Pedro and Altamaha/San Marcos pottery. Whether sponge spicules were naturally present in the clays or added as temper is still subject to debate.

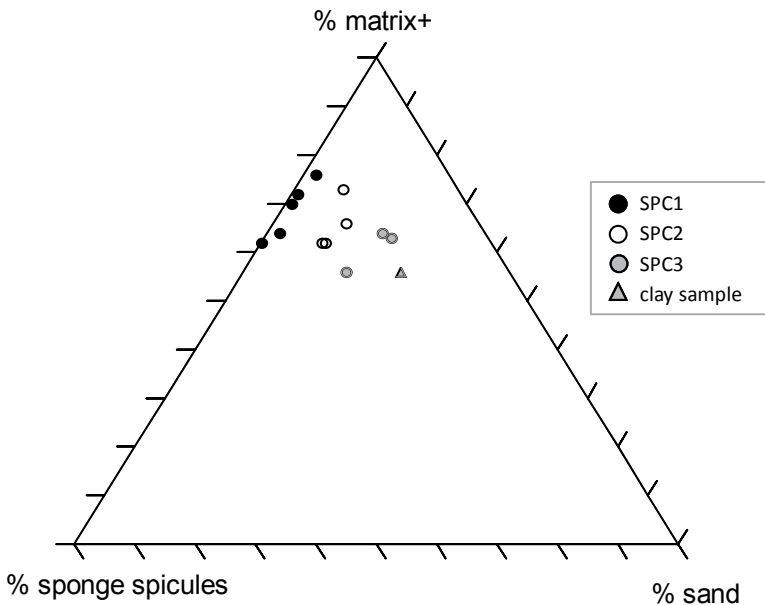


Figure 4.11. Ternary diagram showing St. Johns textural groupings (clay sample 3 is included).

### CLAY SAMPLE VARIABILITY

Physical properties of the clay samples were compared to those of the excavated pottery samples. Comparisons were made in terms of the same properties used to characterize the clay resource groupings; i.e., composition, particle size and abundance, and refired, oxidized color. Comparisons of constituent abundance are based on point count data. Summary descriptions of clay samples are presented in table 4.6.

Most of the clay samples share physical properties (color, constituents, particle size, and frequency) with resource groupings designated for the pottery samples. Four samples (numbers 1, 7, 10, and 15) are characterized by frequent to abundant very fine to medium quartz sand, occasional diatoms, and rare sponge spicules; these are potential matches to resource group A. Four clays (numbers 4, 5, 6, and 17), are characterized by frequent to abundant very fine to medium quartz sand, none to rare sponge spicules and phytoliths, and no diatoms; these are potential matches to resource groups B. None of the samples is considered a match to group C. One clay sample (number 3) is characterized by common sponge spicules and frequent to common quartz sand, and is a potential match to sandier examples (SPC3—sandy St. Johns) of resource group D. However, this clay sample, from the Grant Mound (8Du14), is most likely a stockpiled mass of potting clay, rather than a natural clay deposit (Rolland and Bond, 2003; Wallis, 2009, 2011). Highly spiculate clays are otherwise thus far unknown in the study region (see Rolland and Bond, 2003).

Point-count data and variation in relative abundance of sand constituents within many of the sample clay thin sections indicate that there may be extreme variation within clay deposits, ranging from sandy to very fine and compact. Thus physical properties of the clays can account for much of the matrix variability (excluding tempers) observed in San Pedro and Altamaha/San Marcos pottery, graphically illustrated in figure 4.12. Finer/compact and sandy pastes could have been achieved without addition of sand tempering and perhaps without removal of excess aplastics. Figure 4.12 shows that two clay samples, one of group A (clay 1) and one of group B (clay 5), are unlikely matches in terms of excessive sand (also see table 4.6). The presence of coarse and very coarse quartz grit in the Altamaha/San Marcos samples is most likely at-

tributable to tempering, as point-count data for the sample clays show only occasional presence of grit sizes in some samples (table 4.6).

With the exception of the FOY sample clay, clays with diatoms matching resource group A seem to be coincident with the St. Marys Meander Plain physiographic region (White, 1970; also see Wallis and Cordell, this vol., chap. 5). The recognizable diatom genera in the clay samples overlap, although there may be geographic variation in predominant species. The clay sample from the immediate vicinity of FOY was sandier (table 4.6; figs. 4.4, 4.12) than samples from Nassau and more northern counties (60–120 km north of FOY). Experiments show that it would not have yielded serviceable pots.<sup>7</sup> This sample is in fact one of the samples excluded above as a likely source of group A pottery. But this does not preclude local occurrence of more suitable clays of group A composition or processing of sandy clays to remove excessive aplastics. Many more clay samples from the coastal strand and FOY vicinity will need to be investigated to map the geographic distribution of clays with diatoms and to corroborate any significance in distribution of particular genera.

Clays matching resource group B have a broad geographic distribution in the sample region based on extrapolating from the geographic distribution of the given clay samples. Group B clays occur both north and south of most of the former samples. The sampled clays are located at least 50 km from the FOY site.

In another study of pottery provenance involving Woodland pottery from northeast Florida and southeast Georgia (Wallis et al., 2010, Wallis, 2011, Wallis and Cordell, this volume, chap. 5), pastes comparable to those observed in the present study were distinguished. Mineralogical Group A, which corresponds to resource group B in the present study, was interpreted as local to the lower St. Johns region. Mineralogical Group C, which corresponds to resource group C in the present study, was interpreted as local to the coastal southeast Georgia/lower Altamaha River area. Interpretations of manufacturing origins were based on trace elemental and petrographic data. This may explain the apparent absence of clays resembling resource group C in the sample. These data may support the possibility of relatively local (to FOY) clay sources comparable to resource group B, whereas group C may be nonlocal. None of the

TABLE 4.6  
Summary Descriptions of Clay Samples

Clay sample	County/site	Paste/ matrix texture	Modal sand size	Sand size index	% matrix	%silt+ vf sand	%f-c sand <sup>d</sup>	Sponge spicules	Diatoms	Phyto- liths	Mica	Relative iron oxide content	Clay resource group
1	St. Johns Co. FL (FOY)	very sandy	fine	1.19	46	24	30 (2)	occas.	3%	rare	rare	high	A
3	Duval Co. FL Grant Mound	SPC3 (sandy St. Johns)	very fine, fine	0.86	53 64 <sup>a</sup>	13 16 <sup>a</sup>	16 20 <sup>a</sup>	18%	none	none	rare	moderate	D
4	Duval Co. FL Oxeye Island	fine/ compact to sandy	very fine, fine	1.08	83	6	11 (1)	none	none	none	rare	high	B
5	Duval Co. FL Grand Shell Ring	very sandy	very fine to medium	1.11	34	18	49 (1)	rare	none	rare	none	moderate	B
6	Nassau Co. FL Amelia Island	fine/ compact to sandy	very fine, fine	0.87	81	8	11	none	none	rare	rare to occas.	high	B
7	Nassau Co. FL Little Talbot Island	fine/ compact to sandy	fine	0.97	79	5	16 ( $<1$ )	rare	1-3%	none	rare to occas.	high	A
10	Camden Co. GA Cabin Bluff Shell Ring	very sandy	very fine- medium	1.18	55	11	34 (2)	occas.	1-3%	rare	rare	moderate	A
15	Glynn Co. GA Jekyll Island	fine/ compact	very fine- medium	1.16	83	7	10	rare	1%	2%	rare to occas.	high	A
17	Glynn Co. GA Clay-hole Island	fine/ compact to sandy	very fine, fine	1.13	71	13	16 (2)	rare	none	rare	rare	moderate	B
	means for A clays <sup>b</sup>			1.10	72	8	20 (1)						
	means for B clays <sup>c</sup>			1.03	78	9	13 (1)						

<sup>a</sup> Lower percentage was calculated with counts of sponge spicules excluded from the total for clay #3.

<sup>b</sup> Values for clay #1 were excluded as being excessively sandy.

<sup>c</sup> Values for clay #5 were excluded as being excessively sandy.

<sup>d</sup> Lower value in parentheses, if present, is percentage of coarse and larger grit sizes; no coarse sand in clay 3.

Woodland pottery samples were made of clays matching resource group A.

#### MANUFACTURING ORIGINS OF FOY POTTERY

The overlap in compositions of San Pedro and Altamaha/San Marcos from FOY, and between samples from FOY and 9Cm177, indicate that some of the pottery must have common manufacturing origins, which differs from the presumed local St. Johns wares. We hoped to determine if manufacturing origins for San Pedro and Altamaha/San Marcos types were local or nonlocal to FOY by considering data from the clay analyses.

Comparisons between pottery and clays shows that variability in clays occurring in the northeast Florida–southeast Georgia area can account for clay resource/matrix variability observed in San Pedro and Altamaha/San Marcos pottery. Although clays with diatoms, similar to resource group A, occur both locally and nonlocally to FOY, the FOY sample can be eliminated as a likely source of group A pottery on the basis of other criteria (excessive sand). It is thus likely that San Pedro (primarily) and Altamaha/San Marcos pottery (one case) with group A paste were made in northeast Florida/southeast Georgia and brought to FOY as pots

by Mocama and Guale visitors or their intermediaries, respectively (table 4.7). One San Pedro sherd with group A paste is in fact from 9Cm177 in Georgia, which is located within the Mocama Province to the north.

Clays similar to resource group B have broader geographic distributions in the sample region. Thus, multiple manufacturing origins may have been possible for San Pedro and Altamaha/San Marcos pottery made of this paste. Clay group B includes most thin-sectioned Altamaha/San Marcos and most sandy-matrix San Pedro sherds, including the Colorinda-like samples (table 4.7). One San Pedro sherd with group B paste is from the Mocama site 9Cm177. Hypothetical clay C occurs in two Altamaha/San Marcos samples from FOY and two of four San Pedro Plain sherds from 9Cm177.

If the 9Cm177 samples represent wares local to the Mocama region, then they may serve as proxies for nonlocal manufacture of at least some of the FOY samples, especially those of groups B and C compositions. Some group B sherds, especially the Colorinda-like examples, might represent local wares on the basis of St. Johns/group D grog temper. It is reasonable to propose that this pottery was made where St. Johns pottery was actively being made and used. This was the case

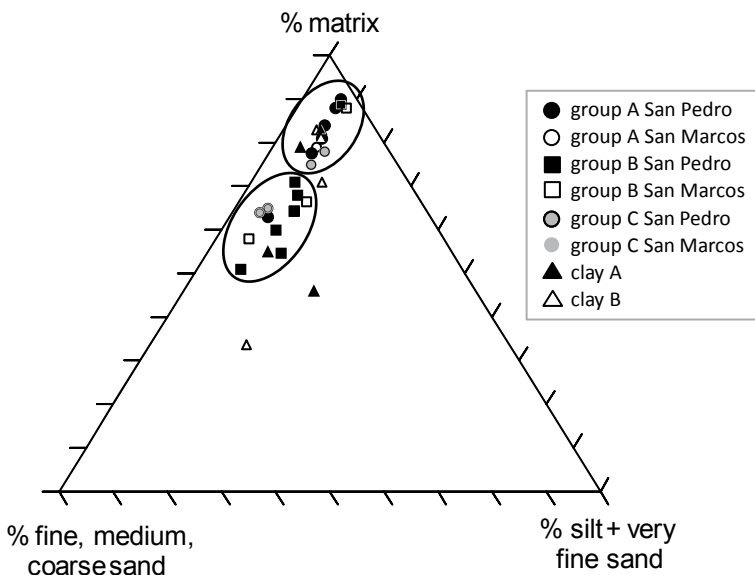


Figure 4.12. Ternary diagram of matrix composition of resource groups A–C, pottery and clays.

TABLE 4.7  
**Manufacturing Origins of Resource Groups**

Resource groups	Matching clays	Local to FOY	Nonlocal to FOY	Comments
A	1, 7, 10, 15	most likely no	yes	accounts for most fine-textured San Pedro
B	4, 5, 6, 17	maybe for some	most likely for some	accounts for most San Marcos and sandy-textured San Pedro (including Colorinda-like sherds)
C	–	no	yes	accounts for some San Marcos and San Pedro
D	3	local	–	local based on criterion of relative abundance; matching clay sources not yet discovered

in the vicinity of FOY, the region of the Saltwater Timucua (Deagan, 2009a; Worth, 2009a), whereas the Mocama and Guale regions to the north were characterized by San Pedro and Altamaha/San Marcos pottery traditions, respectively (Ashley, 2009;Worth, 2009a).

Petrographic data show that sponge spicules are rare or occasional constituents of some clay samples, but the quantities are clearly insufficient to account for variability in St. Johns pottery with clay group D composition. That St. Johns pottery at FOY was locally made is supported by its sheer abundance and prominence at the site. Highly spiculate clays are thus far unknown in the St. Johns County area, however, as alluded to previously, variability in local clay resources is still poorly documented.

#### SUMMARY AND FUTURE DIRECTIONS

One of the acknowledged strengths of historical archaeology is the capacity to articulate textual evidence with other forms of physical evidence. In this study we have articulated documentary sources (identification of cultural/ethnic groups and information about Spanish contact and settlement) with archaeologically excavated context information, and paste characterization of clay and sherd samples. Our analysis was carried out in an effort to question the nature of resilience in traditional pottery production practices in the face of social and demographic changes

provoked by European contact, using samples from the Fountain of Youth Park site in St. Augustine (the site of both the initial Spanish settlement of 1565, and of the first Florida Franciscan mission, Nombre de Dios, in 1587).

Of principal interest was the question of whether the historic-period, nonlocal pottery types present at FOY represented movement of pots into the area from elsewhere, or reflected relocation of Guale or Mocama potters to St. Augustine, continuing their traditional pottery production practices using new local resources.

Pottery production traditions are widely used by archaeologists as indices of social identity and cultural practice in both pre-Columbian and post-Columbian eras. During the European-American contact period, the tracking of local pottery traditions can provide insights into movements of people, social disruption, and changes in expressions of identity. As such, it offers a useful approach to understanding contact-induced changes from an indigenous Native American perspective.

Although this study is focused on the assemblage from a single early site in St. Augustine, with only tentative conclusions, it has provided important information about the probable manufacturing origins of aboriginal pottery in use at St. Augustine shortly after Spanish arrival. This information will help clarify the nature of multicultural indigenous interaction in the southeastern Atlantic coastal region at that time.

Four clay resource groupings were defined

for the 16th-century Native American pottery at FOY. In terms of these clay resources, there is some overlap between San Pedro and Altamaha/San Marcos pottery at FOY, while St. Johns chalky paste represents a distinct resource group. Variability in clays from the northeast Florida/southeast Georgia area can account for the matrix variability observed in much of the San Pedro and Altamaha/San Marcos pottery pastes. With respect to our goal of exploring manufacturing origins of FOY pottery, our effort has yielded mixed results. St. Johns wares are assumed to be local on the basis of sheer abundance at the site. Clay resource group A, occurring primarily in San Pedro pottery, is tentatively considered nonlocal to FOY on the basis of the present analysis. San Pedro and Altamaha/San Marcos pottery made of group C paste also appear to represent nonlocal wares. Whether the pottery with group B paste represents nonlocal wares brought to FOY, or local wares made by Mocama and Guale potters living at FOY, or some combination of nonlocal and local wares cannot be determined with certainty at this time, owing to our limited understanding of clay resource variability in the Saltwater Timucua region. We suspect the answer may be a combination of local and nonlocal production. It should be possible to make these determinations with a more thorough investigation of local clays.

Either Mocama and Guale people, or their pottery, were present at the Saltwater Timucua FOY site early in the second half of the 16th century. Some of the pottery was most likely made elsewhere and brought to FOY. At this early contact period, it is still uncertain whether Guale or Mocama potters relocated to St. Augustine, and continued producing their traditional pottery using new local resources. The abundance of St. Johns pottery during this time indicates continued manufacture of traditional St. Johns pottery by the local Saltwater Timucua at FOY.

Although data presented here are compelling, samples sizes for San Pedro and Altamaha/San Marcos are extremely small. Many more samples will need to be investigated in order to ascertain how this variability extends over the broader northeast Florida/southeast Georgia landscape—and to find out if there are perceptible differences through time during the historic period. This petrographic analysis has provided baseline comparative data for addressing such questions. Fragmented diatoms and sponge spic-

ules were unexpected constituents of San Pedro and Altamaha/San Marcos pottery at FOY. Although these microfossils were not visible in the pottery with standard microscopy, they constituted important elements for assessing the probable origins and movements of pottery at FOY. Clearly, petrographic methods were necessary to resolve questions of clay resource utilization and manufacturing origins in the present study and petrographic methods will be essential in further research on these questions.<sup>10</sup>

## NOTES

1. The authors are grateful for the opportunity to contribute to this volume. Impetus and direction for this study were provided by Kathleen Deagan, Distinguished Research Curator Emerita, Florida Museum of Natural History (FLMNH). Florida Bureau of Historical Resources Special Category Grant # SC 161 provided funding for FOY thin-sectioning. The clay samples were made available for study by Vicki Rolland, Neill Wallis, and Kathleen Deagan and the clay thin sections were provided courtesy of Neill Wallis. We are grateful to Michael Sullivan for conducting diatom species identifications. We also thank the reviewers, Christopher Rodning, Thomas Pluckhahn, and Torben Rick whose comments significantly improved this work. Special thanks go to Diana Rosenthal and the AMNH editorial staff for guidance throughout the editorial process. The FOY pottery samples are curated in Historical Archaeology at FLMNH. FOY and 9Cm177 pottery and clay thin sections are curated at FLMNH-CTL.

2. The relative abundance scale is as follows: abundant, common, frequent, occasional, rare, and none.

3. The kiln temperature was initially set at 275°C and held for 10 minutes (with kiln door slightly open to allow for escape of water vapor). Then the kiln door was shut completely and the temperature was raised to 800°C. After 15 minutes, the 800°C temperature was achieved and was maintained for 30 minutes. The total firing time was approximately 77 minutes.

4. Very low iron oxide content is represented by white to very pale brown refired colors. Low to moderate iron oxide is represented by light yellowish brown refired colors. Reddish yellow to light reddish brown refired colors represent moderate iron oxide and yellowish red to red refired colors represent high relative iron oxide contents.

5. The counting interval ranged from 1 mm × 1 mm to 1 mm × 0.5 mm, depending on the size or area of the thin section. Each point or stop of the stage was assigned to one of the following categories: clay matrix, void (including channel voids, closed pores, and micropores [Rice 1987: 350]), silt particles, sponge spicules, grog temper, and very fine through very coarse quartz and other aplastics of varying compositions. Most of the counts were made using the ×10 objective, but the ×25 objective (with plane-polarized light) was used to confirm the occurrence of sponge spicules and other siliceous microfossils. Size of aplastics was estimated with reference to the Wentworth Scale (Rice 1987: 38). A

comparison chart of estimated percent particle abundance (Rice 1987: 349 [fig. 12.2]) was also used for estimating relative abundance of silt and sponge spicules when occurring in low frequency. For cases in which fewer than 200 points were counted ( $N = 3$ ), the thin sections were rotated 180° on the mechanical stage and counted a second time (after Stoltman, 2000: 306).

6. Counts of quartz and other nonopaque minerals (e.g., quartzite, feldspars, mafic minerals) were included in calculation of sand size indices. Sponge spicules, silt, and other matrix constituents were excluded from this calculation. A second sand size index is also listed, which takes into account the size difference between very fine and fine sand inclusions. In the second index, very fine grains are given a

value of 0.5 while fine grains have a value of 1.

7. Details and results of the sample clay analysis are on file in the FLMNH-CTL.

8. The diatom identifications were provided by diatomist Michael Sullivan.

9. The terms “quartz sand” or just “sand” here and elsewhere in this chapter refer primarily to quartz grains, but includes grains of polycrystalline quartz, and other crystalline accessory constituents.

10. Petrographic analysis of a small sample of San Pedro and San Marcos pottery from 8Du53, San Juan del Puerto, a 17th-century Mocama mission (see Gorman, 2008a), was conducted recently by Ann Cordell. Resource groups A, B, and C are present, primarily B (Gorman, n.d.).







CHAPTER 5  
PETROGRAPHIC ANALYSIS OF POTTERY  
AND CLAY SAMPLES FROM THE GEORGIA  
BIGHT: EVIDENCE OF REGIONAL  
SOCIAL INTERACTIONS  
NEILL J. WALLIS AND ANN S. CORDELL<sup>1</sup>

INTRODUCTION

For several decades, archaeologists have identified evidence of social interaction in Swift Creek Complicated Stamped pottery that is distributed widely across Georgia, northern Florida, and eastern Alabama and dates to approximately A.D. 200–800. The pioneering work of Frankie Snow (1975, 1977, 1988; Snow and Stephenson, 1998) and Betty Broyles (1968) has demonstrated the occurrence of complicated stamped vessels, sometimes hundreds of kilometers apart, that were impressed with the same carved wooden paddle. These connections, called paddle matches, indicate that either vessels, or the wooden paddles used to register the designs, were carried between sites. While these data clearly show some sort of social connection across a variety of distances, paddle matches are merely a glimpse of the past social interactions that might be more fully understood through provenance studies of archaeological pottery and its constituent materials.

Using Swift Creek paddle matches as a point of departure, we explore the mineralogy of pottery and clays across the coastal sector of southeast Georgia and northeast Florida to establish patterns in the manufacture and distribution of vessels and infer corresponding modes of social interaction. We present data from petrographic analysis of 69 pottery samples from Swift Creek sites (Wallis, 2011), 24 samples from a previous study of Deptford and St. Marys pottery (Cordell, 1993), and 10 clay samples from across the region. These data are used to construct mineralogical profiles for clay resource groupings

that correspond with provenance. Clay resource groups defined by mineralogy are then compared to the results of Instrumental Neutron Activation Analysis (INAA) of the Swift Creek pottery and clay samples (Wallis et al., 2010). Finally, through the identification of nonlocal vessels, we offer a model of Swift Creek interaction and discuss future research directions.

SWIFT CREEK ON THE ATLANTIC COAST

Swift Creek Complicated Stamped pottery on the Atlantic coast is distributed primarily at sites just north of the mouth of the Altamaha River to just south of the mouth of the St. Johns River (Ashley and Wallis, 2006; Ashley, Stephenson, and Snow, 2007) (fig. 5.1). This area occupies a central portion of the Georgia Bight, consisting of a landscape of barrier islands, estuaries, tidal creeks, salt marshes, and tidally influenced rivers. The distribution of Swift Creek Complicated Stamped pottery is roughly correlated with the southern extent of the Sea Islands, distinctive composite islands of Pleistocene and Holocene age, and their associated estuarine environments that are often 6 km wide and much wider along the courses of rivers (Reitz et al., 2008; Turck and Alexander, this volume, chap. 7). Just south of the St. Johns River, barrier islands become longer, inlets are unstable, and tidal influence is much more limited, leading to lagoons that in many cases were essentially fresh water before modern dredging (Davis, 1997: 159). Clearly preferred by Swift Creek populations were the extensive estuarine environments associated

with the Sea Islands that support large populations of fish, shellfish, and a diverse array of terrestrial and marine vertebrates (Parsons and Marrinan, this volume, chap. 2). These animals were targeted by Woodland Period populations year-round (Reitz, 1988; Reitz and Quitmyer, 1988; Fradkin, 1998).

Swift Creek sites can be divided into three types: small artifact scatters, large shell middens, and low sand burial mounds. Using the terminology employed by Thomas (2008), the first category likely represents field camps and special-purpose stations while the second category consists of the remains of residential bases. Indeed, many of the large shell middens have a circular or semicircular configuration that presumably corresponds with the circular shape of villages (e.g., “residential bases;” Stephenson, Bense, and Snow, 2002; Ashley and Wallis, 2006; Ashley, Stephenson, and Snow, 2007). Although evidence of structures at these arcuate middens has been elusive, these sites may result from the refuse disposal patterns of multiple households arranged around a central plaza (e.g.,

Russo, Schwadron, and Yates, 2006). These arcuate middens are typical of Swift Creek sites across the lower southeastern United States (Stephenson, Bense, and Snow, 2002).

Burial mounds, the third site category, were often constructed over a period of several centuries in an accretional fashion with human remains, grave goods, and sand periodically added. At least 15 burial mounds of the local Swift Creek culture have been identified on the lower St. Johns River, but few have been recorded in Georgia (Ashley and Wallis, 2006; Ashley, Stephenson, and Snow, 2007). Swift Creek burial mounds in coastal Georgia are found at Evelyn (9Gn6), and possibly Cathead Creek (9Mc360), Lewis Creek (9Mc16), and Sadler’s Landing (9Cm233). While the paucity of burial mounds in coastal Georgia may be due to site destruction, sampling bias, or differing burial practices (Ashley, Stephenson, and Snow, 2007: 22; Wallis, 2011), there are other important differences in the distribution of mounds along the coast. Along the lower St. Johns River, burial mounds are spatially segregated from contemporaneous

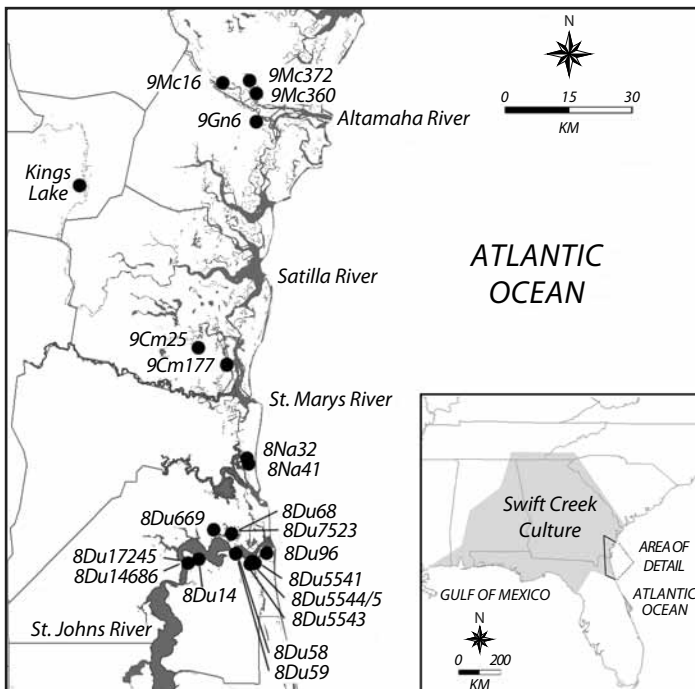


Figure 5.1. Sites mentioned in the text.

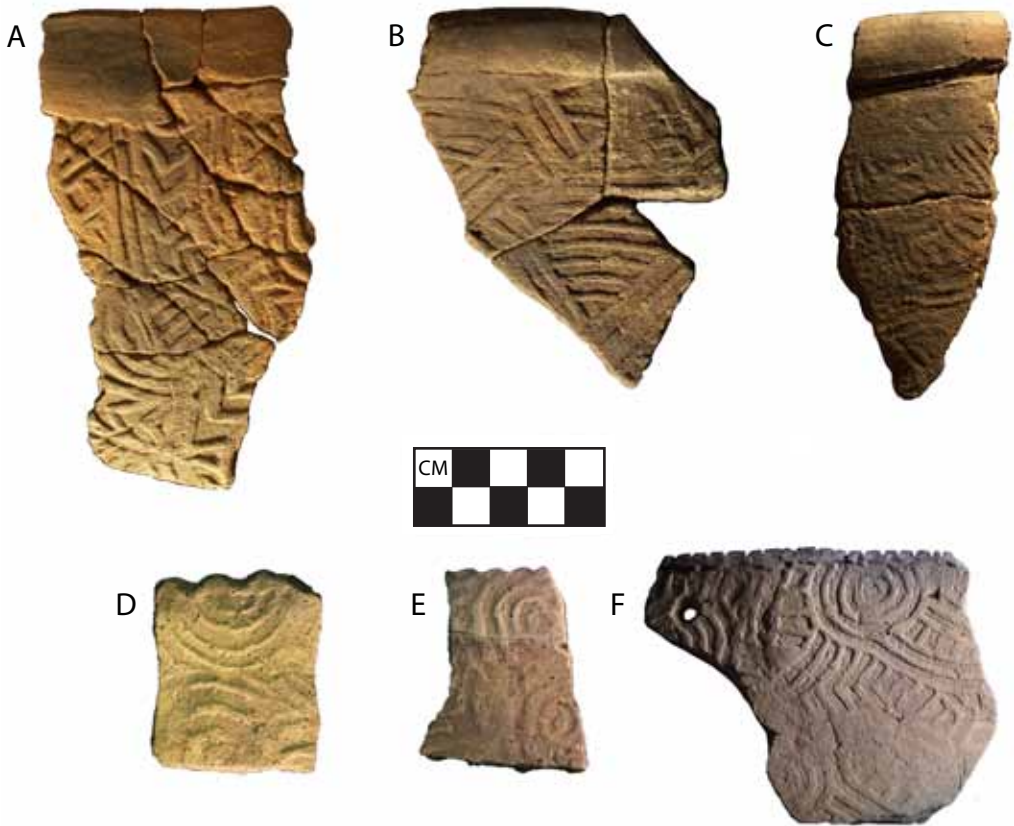


Figure 5.2. Late Swift Creek pottery from 9Mc372 (A, B, C) and Early Swift Creek pottery from 8Du5543 (charcoal tempered; D, E) and 8Du43 (sand tempered; F).

residential bases, typically at a distance of least several hundred meters (Wallis, 2008). In contrast, the burial mound at Evelyn and probable mounds at other sites in Georgia are adjacent to extensive midden deposits. Thus, settlement patterns and mortuary traditions were apparently different along the lower St. Johns and the Georgia coast.

Pottery assemblages also vary along the coast (fig. 5.2). Early Swift Creek Complicated Stamped pottery (ca. cal A.D. 200–500), characterized by notched or crenulated rims, is found primarily along the lower St. Johns River. Early Swift Creek assemblages include mostly sand-tempered plain and charcoal-tempered plain pottery, along with lesser frequencies of complicated stamped sherds that are tempered with sand and/or charcoal. Late Swift Creek Complicated Stamped pottery (ca. cal A.D. 500–800),

identified by folded or simple rounded or flattened rims, is common at sites from the lower St. Johns River to just north of the mouth of the Altamaha River (Ashley and Wallis, 2006; Ashley, Stephenson, and Snow, 2007). Late Swift Creek assemblages consist overwhelmingly of sand-tempered or grit-tempered pastes, with vessels from lower St. Johns River sites typically exhibiting smaller quartz sand temper than vessels from sites north of Amelia Island, which have larger (i.e., “grit”) quartz grains (Ashley and Wallis, 2006: 9).

Late Swift Creek assemblages also vary typologically between the lower St. Johns River and areas to the north. While Swift Creek sites on the Georgia coast typically consist of sand or grit-tempered plain and complicated-stamped vessels, lower St. Johns assemblages often include Weeden Island series and St. Johns series vessels.

The sum total of these differences—variation in the built landscape and pottery assemblages—is likely indicative of social or cultural distinctions between the lower St. Johns River and coastal areas of Georgia to the north.

Even in the context of these apparent differences, there are paddle matches between sites along the coast, linking mortuary mounds on the St. Johns River with villages on the Altamaha River, as well as along the coast between the two rivers (Wallis, 2011). Specifically, there are six paddle designs that link 21 sites along the coast. There are also several paddle matches between sites in south-central Georgia and the Georgia coast (Ashley, Stephenson, and Snow, 2007). Pottery was obviously implicated in social interactions of some kind—the question is: what kind of social practices do paddle matches represent? Are paddle matches evidence of patterns of migration, seasonal mobility, postmarital residence, exchange, and/or pilgrimage? These alternatives remain indecipherable without an understanding of regional variation in clay and temper resources used in the manufacture of pottery and patterns in the distribution of nonlocal vessels, including vessels that are not Swift Creek Complicated Stamped. Toward this goal, in this chapter we present data from petrographic analysis of thin sections from a broad sample of pottery and clays and subsequently compare these data to the results of INAA. We employ these data to identify nonlocal vessels and, according to their patterns of distribution, offer an interpretation of evident social interactions.

### SAMPLING

Petrographic analysis was carried out on thin sections from 69 vessels from 14 Swift Creek sites and 10 unique clay samples. These pottery samples include a majority of Swift Creek Complicated Stamped vessels (both early and late types), including 12 samples that are paddle matches between sites, along with contemporaneous sand-tempered plain and Weeden Island series samples from discrete contexts, such as single-component middens and pit features (table 5.1). All samples were selected with the goals of representing the range of variation in aplastic constituents and approximating the relative frequency of each paste recipe within the total assemblage. Clay samples were taken from Pleistocene deposits of fluvial and marine origins that are exposed along rivers

and tidal streams (fig. 5.3). These clay samples were not necessarily used by prehistoric potters but were considered to approximate the range of mineralogical variation on a regional level.

An additional sample of 24 petrographic thin sections from a previous study of Deptford and St. Marys (formerly Savannah) pottery from the St. Marys region was included for comparison (Cordell, 1993; also see Ashley and Rolland, 2002). The thin section sample includes nine Deptford samples from four sites in Duval County, Florida (table 5.2). Eleven thin sections of cord-marked and plain sherds had been categorized as Savannah or Savannah-related, but subsequent research by Ashley and Rolland (2002) provided data to recategorize the cord-marked samples as St. Marys (Ashley and Rolland, 2002: 29–34) and Ocmulgee III (2002: 29). The plain samples were recategorized as historic period San Pedro (Ashley and Rolland, 2002: 29; also see Ashley, 2001). These samples are from five sites in Duval and Nassau counties, Florida, and Camden County, Georgia (table 5.2). Three thin sections of Savannah Cord Marked from Chatham County, Georgia, and one of Prairie Cord Marked from Alachua County, Florida had also been included in Cordell's (1993: 34–36) study. With a time frame of approximately cal 800 B.C. to as late as A.D. 500, the Deptford samples likely predate and perhaps temporally overlap with the Swift Creek pottery samples (Stephenson, Bense, and Snow, 2002). The remaining 15 samples postdate the Swift Creek samples.

### METHODS

Petrographic analysis was conducted to evaluate compositional and textural variability in the samples and to document potential matches between pottery samples and clays. Point counts were made for quantifying relative abundance of inclusions. This procedure involved using a petrographic microscope with a mechanical stage and generally followed recommendations by Stoltman (1989, 1991, 2000). A counting interval of 1 mm × 0.5 mm to 1 × 1 mm was used, depending on the size/area of the thin section. Each point or stop of the stage was assigned to one of the following categories: clay matrix, void, silt particles, charcoal temper, grog temper, bone temper, biogenic silica (sponge spicules, phytoliths, diatoms), and very fine through very coarse quartz and other aplastics of varying compositions. For cases in which fewer than 200 points

**TABLE 5.1**  
**Thin Section Sample from Clays and Swift Creek Phase Pottery**

Sample number	Site no.	Site name	Pottery type	Gross paste	Petrographic paste	Chemical group	Paddle design
2004-01	8Du96	Mayport Mound	Late Swift Creek Comp Stamp	grit	A	2	38
2005-02	8Du96	Mayport Mound	Early Swift Creek Comp Stamp	charcoal	D	1	
2005-01	8Du96	Mayport Mound	Charcoal Tempered Plain	charcoal	A	1	
2005-03	8Du96	Mayport Mound	Charcoal Tempered Plain	charcoal	A	U1	
2005-26	8Du96	Mayport Mound	Charcoal Tempered Plain	charcoal	A	1	
2004-03	8Du96	Mayport Mound	Plain	grog (Colorinda)	F	1	
2008-06	8Du68	Dent Mound	Late Swift Creek Comp Stamp	sand	A	1	291
2008-32	8Du68	Dent Mound	Late Swift Creek Comp Stamp	grit	B	2	34
2008-04	8Du68	Dent Mound	Late Swift Creek Comp Stamp	grit & sand	A	U2	36
2008-05	8Du68	Dent Mound	Late Swift Creek Comp Stamp	grit	C	2	
2005-24	8Du68	Dent Mound	Late Swift Creek Comp Stamp	grit	A	UO	
2005-25	8Du68	Dent Mound	Early Swift Creek Comp Stamp	charcoal	A	1	
2008-01	8Du68	Dent Mound	Sand Tempered Plain	sand	D	1	
2008-02	8Du68	Dent Mound	Charcoal Tempered Plain	charcoal	A	1	
2008-03	8Du68	Dent Mound	Charcoal Tempered Plain	charcoal	A	1	
2008-08	8Du17245	Tillie Fowler	Swift Creek Comp Stamp	sand	A	1	
2008-10	8Du17245	Tillie Fowler	Sand Tempered Plain	sand	A	1	
2008-11	8Du17245	Tillie Fowler	Early Swift Creek Comp Stamp	charcoal	B	1	
2008-09	8Du17245	Tillie Fowler	Charcoal Tempered Plain	charcoal	D	1	
2008-07	8Du17245	Tillie Fowler	Weeden Island Red	sand	D	UO	
2008-15	8Du14686	JU Temp	Swift Creek Comp Stamp	sand	A	1	
2008-12	8Du14686	JU Temp	Early Swift Creek Comp Stamp	charcoal	D	1	
2008-13	8Du14686	JU Temp	Sand Tempered Plain	sand	D	1	
2008-14	8Du14686	JU Temp	Sand Tempered Plain	sand	A	1	
2008-16	8Du5543	Greenfield 7	Swift Creek Comp Stamp	grit	C	UO	

TABLE 5.1 — (Continued)

Sample number	Site no.	Site name	Pottery type	Gross paste	Petrographic paste	Chemical group	Paddle design
2008-17	8Du5543	Greenfield 7	Swift Creek Comp Stamp	grog	D	1	
2008-19	8Du5543	Greenfield 7	Early Swift Creek Comp Stamp	charcoal	A	1	
2005-23	8Du5543	Greenfield 7	Early Swift Creek Comp Stamp	charcoal	A	UO	
2008-18	8Du5543	Greenfield 7	Early Swift Creek Comp Stamp	charcoal	B	1	
2008-20	8Du5543	Greenfield 7	Sand Tempered Plain	sand	D	1	
2008-21	8Du5544/5	Greenfield 8/9	Swift Creek Comp Stamp	sand	D	1	291
2008-25	8Du5544/5	Greenfield 8/9	Swift Creek Comp Stamp	sand	A	1	291
2008-22	8Du5544/5	Greenfield 8/9	Sand Tempered Plain	sand	D	1	
2008-24	8Du5544/5	Greenfield 8/9	Sand Tempered Plain	sand	A	1	
2008-23	8Du5544/5	Greenfield 8/9	Sand Tempered Plain	grit	B	2	
2008-33	8Na32	McArthur	Swift Creek Comp Stamp	grit	A	2	
2008-36	8Na32	McArthur	Swift Creek Comp Stamp	grit	A	2	
2008-37	8Na32	McArthur	Swift Creek Comp Stamp	grit	B	2	
2008-38	8Na32	McArthur	Swift Creek Comp Stamp	grit & sand	A	2	
2008-34	8Na32	McArthur	New River Comp Stamp	grit & sand	A	U1	
2005-08	8Na32	McArthur	Charcoal Tempered Plain	charcoal	A	UO	
2005-09	8Na32	McArthur	Charcoal Tempered Plain	charcoal	A	1	
2008-35	8Na32	McArthur	Weeden Island Incised	sand	B	UO	
2008-57	9Cm25	Hallows Field	Swift Creek Comp Stamp	grit	B	2	
2008-56	9Cm25	Hallows Field	Swift Creek Comp Stamp	grog	A	1	
2008-45	9Gn6	Evelyn	Swift Creek Comp Stamp	grit	B	2	
2008-47	9Gn6	Evelyn	Swift Creek Comp Stamp	grit	A	2	
2008-46	9Gn6	Evelyn	Swift Creek Comp Stamp	grog	E	1	
2008-44	9Gn6	Evelyn	Sand Tempered Plain	sand	D	1	
2008-48	9Gn6	Evelyn	Sand Tempered Plain	grog	B	U2	
2008-26	9Mc372	Sidon	Swift Creek Comp Stamp	grit	A	2	34

TABLE 5.1 — (Continued)

Sample number	Site no.	Site name	Pottery type	Gross paste	Petrographic paste	Chemical group	Paddle design
2008-31	9Mc372	Sidon	Swift Creek Comp Stamp	grit	B	2	
2008-27	9Mc372	Sidon	Swift Creek Comp Stamp	grit & sand	B	U1	36
2008-28	9Mc372	Sidon	Swift Creek Comp Stamp	grit & sand	A	2	
2008-30	9Mc372	Sidon	Swift Creek Comp Stamp	sand	D	UO	
2008-29	9Mc372	Sidon	Sand Tempered Plain	grit	B	U2	
2008-40	9Mc360	Cathead Creek	Swift Creek Comp Stamp	grit	B	2	38
2008-41	9Mc360	Cathead Creek	Swift Creek Comp Stamp	grit	B	2	
2008-42	9Mc360	Cathead Creek	Swift Creek Comp Stamp	grit	E	2	
2008-39	9Mc360	Cathead Creek	Swift Creek Comp Stamp	grit & sand	B	U2	36
2008-43	9Mc360	Cathead Creek	Swift Creek Comp Stamp	sand	D	UO	
2004-18	9Mc16	Lewis Creek	Swift Creek Comp Stamp	grit	A	2	38
2008-49	9Mc16	Lewis Creek	Swift Creek Comp Stamp	grit & sand	B	2	36
2008-50	9Mc16	Lewis Creek	Swift Creek Comp Stamp	grit & sand	A	2	
2008-51	9Mc16	Lewis Creek	Swift Creek Comp Stamp	grit & sand	E	U1	
2008-52	Brantley, GA	Kings Lake	Swift Creek Comp Stamp	grit	A	UO	
2008-54	Brantley, GA	Kings Lake	Swift Creek Comp Stamp	grit	C	2	
2008-53	Brantley, GA	Kings Lake	Swift Creek Comp Stamp	grit & sand	E	UO	
2008-55	9Wy8	Paradise Park	Swift Creek Comp Stamp	grit	C	2	
C03-58c	8Du14	Grant	clay		H	3	
C04-59c	8Du7479	Oxeye Is.	clay		A	3	
C05-60c	8Du1	Grand	clay		A	3	
C06-61c	Nassau, FL	Amelia Is.	clay		A	UO	
C07-62c	Nassau, FL	Little Talbot Is.	clay		G	3	
C10-63c	9Cm157	Cabin Bluff	clay		G	UO	
C13-64c	9Tf115	Coffee Bluff	clay		I	5	
C15-65c	Glynn, GA	Jekyll Is.	clay		G	UO	
C17-66c	Glynn, GA	Clay-hole Is.	clay		A	4	
C18-67c	Wayne, GA	Lower Sansavilla	clay		I	4	

Abbreviations: UO = unassigned outlier; U1 = unassigned but likely member of Group 1; U2 = unassigned but likely member of Group 2. County is given for locations without site numbers.

were counted ( $N = 8$  for Swift Creek;  $N = 10$  for Deptford/St. Marys), the thin sections were rotated  $180^\circ$  on the mechanical stage and counted a second time (after Stoltman, 2000: 306). Most of the point counts were made using the  $\times 10$  objective, but the  $\times 25$  objective (with plane-polarized light) was used to search for occurrence of siliceous microfossils such as sponge spicules, phytoliths, and diatoms. Size of aplastics was estimated with an eyepiece micrometer with reference to the Wentworth Scale (Rice, 1987: 38). A comparison chart of percent particle abundance (Rice, 1987: 349 [fig. 12.2]) was also used for estimating relative abundance of constituents occurring in low frequency.

## RESULTS

### SWIFT CREEK

Among the Swift Creek assemblages, five predominant temper categories were observed: charcoal temper, quartz sand, quartz grit (particle size  $> 0.5$  mm; includes some quartzite), quartz sand and grit, and grog temper (table 5.3). Bone temper was observed in some samples, but was never the predominant constituent. Other constituents included mica, feldspars, granitic rock fragments (rarely), iron concretions or nodules, birefringent grains, and siliceous microfossils (sponge spicules, phytoliths, and diatoms). Most of these other constituents, especially mica, fer-

ric concentrations, and siliceous microfossils, are probably naturally occurring in the potting clays. Sponge spicules are potential tempering materials but are fragmentary in the samples and are only detectable in thin section with magnifications ranging from  $\times 250$  to  $\times 400$ . They are therefore presumed to be natural constituents of the clay resources used for vessel manufacture. Feldspars and other birefringent minerals may be naturally present or introduced along with sand temper. Differences in fine through very coarse quartz particle sizes and other constituents are attributed to tempering practices, although some fine sand may be naturally present in some cases based on variability in some of the clay samples.

Six petrographic paste groups among pottery samples were defined according to the relative abundance of aplastic constituents considered natural inclusions in the exploited clays (table 5.4). Mica, sponge spicules, phytoliths, diatoms, silt grains, and very fine sand were deemed most significant for defining the clay resource groups. Each defined group represents a resource group made up of one or more clay resources that are similar in terms of these six constituents and may crosscut temper groupings. Using these same criteria, some of the clays were assigned to one or more of the six pottery paste categories, while others formed their own categories. For convenience, the mineralogical resource groups are designated A–I (note that, although there is over-

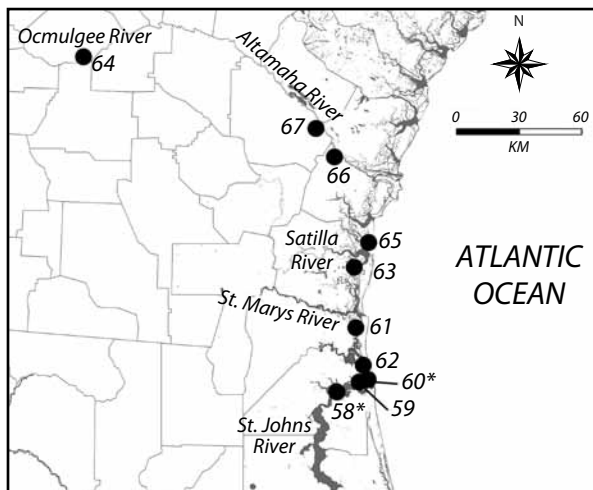


Figure 5.3. Locations of clay samples. Asterisks denote samples from archaeological contexts.



lap in mineralogical groups A–I in the present study and resource groups A–D in Cordell and Deagan [this volume, chap. 4], the category designations are not equivalent in most cases).

The clay resource groupings among pottery and clay samples can be summarized as follows. Group A comprises the most samples ( $N = 31$ )

and is characterized by rare to occasional mica, absent or rare sponge spicules, and absent or rare phytoliths. On the basis of the absence or rarity of phytoliths and sponge spicules, four clays are also assigned to group A. However, the potential in each clay for variability in some constituents makes other group designations possible, as well.

TABLE 5.2  
Thin Section Sample from Cordell 1993 Study<sup>a</sup>

Period/series	Sample no.	Site no.	Site name	Pottery type	Gross paste	Petrographic paste
Deptford	T2	8Du58	Brown Site I	Deptford Bold Check Stamped	grit	B
	T18	8Du59	Brown Site II	Deptford Bold Check Stamped	grit	B
	T19	8Du59	Brown Site II	Deptford Bold Check Stamped	sand & grog (Colorinda)	A
	T80	8Du5541	Greenfield Site 5	Deptford Bold Check Stamped	sandy St. J	H
	T81	8Du5541	Greenfield Site 5	Deptford Linear Check Stamped	sand	A
	T84	8Du5541	Greenfield Site 5	Deptford Check Stamped	sand	C
	T87	8Du5541	Greenfield Site 5	Deptford Plain	sand & grog (Colorinda)	B
	T92	8Du5541	Greenfield Site 5	Deptford Plain	sand	B
	T106	8Du7523	Pelotes Island	Deptford Plain	grit	A
St. Marys	T120	8Du669	JEA site	St. Marys Cord Marked <sup>b</sup>	sand	A
	T103	8Du7523	Pelotes Island	St. Marys Cord Marked <sup>b</sup>	sand	D
	T49	8Na41	Amelia Island	St. Marys Cord Marked <sup>b</sup>	sand	D
	T51	8Na41	Amelia Island	St. Marys Cord Marked <sup>b</sup>	sandy St. J	H
	T48	9Cm177	Devil's Walking Stick	St. Marys Cord Marked <sup>b</sup>	sand	D
	T58	9Cm177	Devil's Walking Stick	St. Marys Cord Marked <sup>b</sup>	sand	E
Ocmulgee III	T36	8Du58	Brown Site I	Ocmulgee III Cordmarked <sup>b</sup>	grit	C
Alachua Tradition	T93	8A127	Rocky Point site	Prairie Cord Marked	grit	C
Savannah	T124	9Ch15	Indian King's Tomb	Savannah Fine Cord Marked	grit	C
	T126	9Ch15	Indian King's Tomb	Savannah Fine Cord Marked	grit	C
	T127	9Ch15	Indian King's Tomb	Savannah Fine Cord Marked	grit	C
San Pedro	T63	9Cm177	Devil's Walking Stick	San Pedro Plain <sup>c</sup>	grog	C
	T64	9Cm177	Devil's Walking Stick	San Pedro Plain <sup>c</sup>	grog	F/G
	T67	9Cm177	Devil's Walking Stick	San Pedro Plain <sup>c</sup>	grog	A
	T69	9Cm177	Devil's Walking Stick	San Pedro Plain <sup>c</sup>	grog	C

<sup>a</sup> See Cordell (1993: 37, fig. 2) for site locations.

<sup>b</sup> Formerly Savannah Fine Cord Marked in Cordell (1993).

<sup>c</sup> Formerly Savannah Plain in Cordell (1993).

TABLE 5.3  
Gross Paste Categories among Swift Creek Phase Samples

Gross paste	Sample size	Tempers	Matrix (%)	Aplastics (%)	Sand (%)	SSI <sub>1.5</sub> /I	Silt (%)	Very fine sand <sup>a</sup> (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Very coarse sand (%)	Petrographic paste	Other constituents <sup>b</sup>
charcoal-temper	15	9% charcoal temper (grog present in 7 cases; bone temper in 3 cases)	60	40	26	0.96/1.10	3-5	7	17	2	<1	-	A = 67% B = 13% D = 20%	2% polyxQ 1% feldspars <1% heavies
grog-temper	5	2-4% crushed sherds (bone temper in one case)	55	45	36	1.05/1.21	3-5	11	18	6	1	<1	A, B, D, E, F	2% polyxQ 2% feldspars 2% heavies
sand-temper	17	quartz sand (grog temper rare in 3 cases; charcoal temper rare in one case)	58	42	36	0.94/1.10	3-5	12	21	2	<1	<1	A = 41% B = 6% D = 53%	2% polyxQ 2% feldspars 1%-2% heavies
grit and sand	10	quartz sand and grit (grog temper rare in two cases)	56	44	39	1.52/1.62	3-5	7	15	11	5	1	A = 50% B = 30% E = 20%	2% polyxQ 1% feldspars 1%-2% heavies
grit-temper	22	grit-sized quartz and quartzite (charcoal present in one case)	60	40	38	1.97/2.02	3-5	4	10	12	10	2	A = 36% B = 41% C = 18% E = 5%	4% polyxQ 1% feldspars 1% heavies

<sup>a</sup> Sand in very fine through very coarse size ranges consists primarily of quartz.

<sup>b</sup> These constituents are included in sand percentages.

TABLE 5.4  
**Summary Descriptions of Variability in Clay Resource Groups among Clays and Swift Creek Phase Samples**

Petrographic paste group	Sample size	Estimated silt (%)	Very fine sand (%)	Mica	Sponge spicules	Phytoliths	Diatoms	Refired color	Temper group	NAA group	Comments	Relationship to clay samples
A	31	3-5%	7	rare to occasional	absent or rare	absent or rare	-	moderate-high iron	charcoal = 10 sand = 7 grog = 1 grit & sand = 5 grit = 8	1 (most charcoal, grog, sand) and 2 (most grit & sand)	silt ranges from 3% to 3-5%, a difference of debatable significance (grit samples with slightly higher silt); differs from B in absence/rarity of phytoliths	possible affinity to clays 4, 5, 6 and 17
A-clay	4	1-5	6-11	rare to none, but might vary	none to rare	none to rare	-	moderate to high iron	clay 4, 5, 6, 17	3, 4, UO	potential for variability in silt, sand content and perhaps other constituents	most similar to paste A; possible affinity to pastes B and C if deposits vary in frequency of phytoliths and sponge spicules
B	16	3-5	5	rare to occasional in most	rare to occasional	occasional to frequent	-	low to moderate-high iron	charcoal = 2 sand = 1 grog = 1 grit & sand = 3 grit = 9	mostly 2	silt ranges from 3% to 5%, a difference of debatable significance; differs from A in terms of presence of noticeable phytoliths	possible affinity to clays 5 and 6 if deposits vary in frequency of phytoliths

TABLE 5.4 — (Continued)

Petrographic paste group	Sample size	Estimated silt (%)	Very fine sand (%)	Mica	Sponge spicules	Phytoliths	Diatoms	Refired color	Temper group	NAA group	Comments	Relationship to clay samples
C	4	3-5	2	rare to occasional in most	occasional to frequent	variable	-	low to moderate iron	grit = 4	2	heterogeneous group in terms of phytoliths; differs from A and B in presence of noticeable sponge spicules and lower frequency of very fine sand	possible affinity to clays 5 and 6 if deposits vary in frequency of sponge spicules
D	13	3-10, variable	13	occasional to frequent	absent to rare	rare to absent	-	low to moderate-high iron	charcoal = 3 sand = 9 grog = 1	1	relatively micaceous compared to groups A-C; variable silt content	possible affinity to A clays 4, 6, 17 if deposits vary in mica frequency
E	4	3-10, variable	7	occasional to frequent	occasional to frequent	variable	-	low to moderate to high iron	grog = 1 grit & sand = 2 grit = 1	variable	similar to group D, but with higher sponge spicule content	possible affinity with I clays 13, 18 or A clays if deposits vary in mica, spicules and phytoliths
F	1	3	21	occasional to frequent	occasional to frequent	rare to occasional	occasional	-	grog = 1	1	similar to D, but with more very fine sand and occasional diatoms	possible affinity to clay 18 in mica, spicule, and phytolith frequency, but diatom species difference precludes a match; might be more similar to F/G clays

TABLE 5.4 — (Continued)

Petrographic paste group	Sample size	Estimated silt (%)	Very fine sand (%)	Mica	Sponge spicules	Phytoliths	Diatoms	Refired color	Temper group	NAA group	Comments	Relationship to clay samples
F/G clay	3	1–3	variable	rare to occasional	rare	absent to rare	occasional to frequent	moderate to high iron	clay 7, 10, 15	3, UO	potential for variation in silt, very fine sand, mica and perhaps other constituents	possible affinity to paste F in diatom species
H clay	1	3–5	10	rare	18%	not observed	–	moderate iron	clay 3	3	spiculate clay, stockpiled	no matches with any of the pottery samples
I clay	2	variable	variable	frequent	occasional to frequent	variable	extremely rare	low to moderate	clay 13, 18	4,5	mica frequency is higher than sherd with F paste	similar to paste F, but diatom species difference precludes a match

Group A in the present study corresponds to resource group B in Cordell and Deagan (this volume, chap. 4). Group B ( $N = 16$ ) has similar constituents as group A, but is differentiated by the occasional to frequent occurrence of phytoliths. Group C ( $N = 4$ ) contains variable frequencies of phytoliths and differs mainly from groups A and B in the occasional to frequent occurrence of sponge spicules. Group C in the present study corresponds to resource group C in Cordell and Deagan (this volume, chap. 4). Group D ( $N = 13$ ) is defined primarily by occasional to frequent mica. Group E ( $N = 4$ ) is characterized by high frequencies of mica like group D, but with occasional to frequent sponge spicules. Group F contains a single sample and is similar to group D but with occasional diatoms. Group F/G clays ( $N = 3$ ) are a potential match for the group F sherd because of matching species of diatoms. However, these clays differ from group F in having only rare sponge spicules and rare to occasional mica. Group F in the present study corresponds to resource group A in Cordell and Deagan (this volume, chap. 4). The single clay that constitutes group H is a stockpiled prepared clay from an archaeological context at the Grant site (8Du14). It contains sponge spicules as the predominant aplastic inclusion and does not match any of the pottery samples in this study. Group H corresponds to sandier examples of group D in Cordell and Deagan (this volume, chap. 4). Finally, group I clays ( $N = 2$ ) are defined by very high mica content, occasional to frequent sponge spicules, and rare diatoms. Groups B, D, E, and I have no counterparts in Cordell and Deagan (this volume, chap. 4).

The five gross temper groups defined in the analysis are not isomorphic with the six clay resource groups among pottery samples (table 5.3; fig. 5.4). For example, group A and B specimens are found in each of the five temper categories. In contrast, the smaller groups (C, D, and E) demonstrate some important correlations. Group C samples ( $N = 4$ ) are composed entirely of grit-tempered sherds. Group D ( $N = 13$ ) consists primarily of sand-tempered sherds but also some charcoal-tempered samples. Group E ( $N = 4$ ) samples are made up of grit-tempered or grit-and-sand-tempered sherds. These correlations reveal an intersection between mineralogically distinct clays and geographically circumscribed tempering traditions. To review, grit temper predominates in Swift Creek assemblages along the

Altamaha River and as far south as Amelia Island while fine sand temper (often with charcoal before A.D. 500) dominates lower St. Johns River assemblages (Ashley and Wallis, 2006).

The defined resource groups correspond with geographical areas that can be usefully summarized by county (table 5.5). Sample sizes are small except from Duval County, but still group A comprises higher percentages of samples from southern counties than northern ones. Likewise, group D samples are mostly from lower St. Johns sites in Duval County. The small group E is made up exclusively of samples from Brantley, Glynn, and McIntosh counties, all in Georgia. Group B and C samples are more evenly divided by county but suffer from small sample sizes in the Georgia counties. What is more, many of the Duval county specimens may be foreign imports based on INAA data (Wallis et al., 2010). In sum, using the geographic distributions of mineralogical groups, the petrographic analysis identified two resource groups presumed to be local to the lower St. Johns River area and three resource groups probably local to the Altamaha River area. The two lower St. Johns groups are group A and group D, which differ from each other mostly in terms of mica content. The three likely Altamaha groups are B, C, and E, the latter two groups sharing occasional to frequent sponge spicules. The single sherd containing diatoms and sponge spicules (group F) is tentatively assigned a geographic origin north of the lower St. Johns region.

#### DEPTFORD AND ST. MARYS

Among the Deptford and St. Marys samples, there are four gross temper categories: quartz sand, quartz grit, grog (including St. Johns grog), and sandy St. Johns (sand and sponge spicules) (table 5.6). There is an apparent relationship between gross temper and pottery series in most cases. In this sample, Ocmulgee III, Alachua Tradition, and Savannah sherds are all grit-tempered. St. Marys samples are all sand-tempered and San Pedro samples are grog-tempered. The Deptford samples show greater variation in gross temper, with grit, sand, grog, and sandy St. Johns pastes. The two grog-tempered examples are Colorinda-like, with grog composed of crushed St. Johns spiculate sherds (Sears, 1957: 25–26; also see Ashley, 2006: 91).

On the basis of petrographic data (presence and relative frequency of siliceous microfossils,

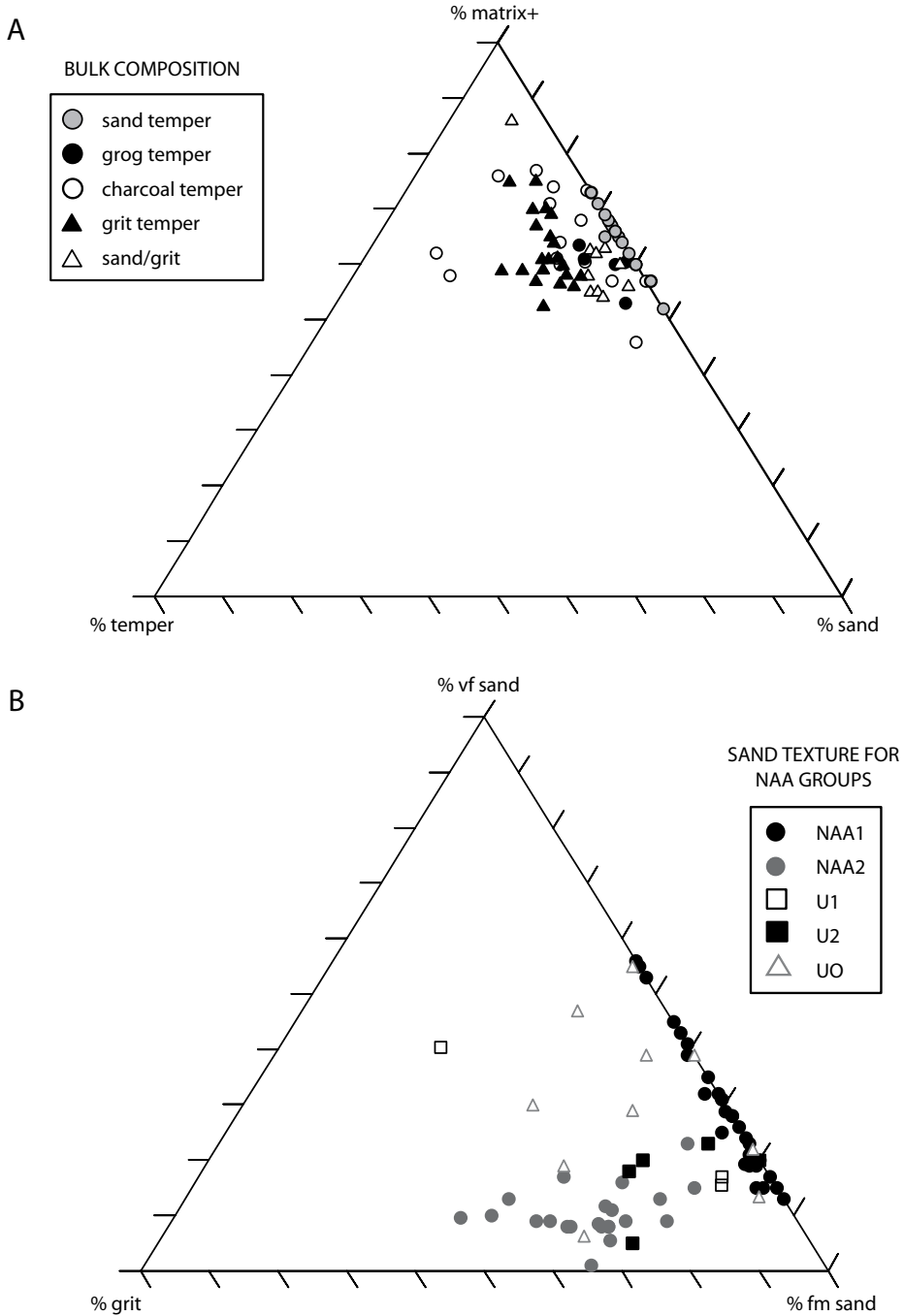


Figure 5.4. Ternary plots of (A) bulk composition; and (B) sand texture/particle sizes among chemical groups defined by NAA (adapted from Graham and Midgley, 2000).

TABLE 5.5  
Clay Resource Groupings by County and INAA Group

Clay resource group	County	INAA G1	INAA G2	INAA unas	Total
A	Duval	13	3	3	18
	Nassau	3	1	2	6
	Camden	1			1
	Brantley			1	1
	Glynn		1		1
	McIntosh		3		3
Total		17	8	6	31
B	Duval	2	2		4
	Nassau		1	1	2
	Camden		1		1
	Glynn		2		2
	McIntosh		5	2	7
Total		2	11	3	16
C	Duval		1	1	2
	Brantley		1		1
	Wayne		1		1
Total		0	3	1	4
D	Duval	9		1	10
	Glynn	1			1
	McIntosh			2	2
Total		10		3	13
E	Brantley			1	1
	Glynn	1			1
	McIntosh		1	1	2
Total		1	1	2	4
F	Duval	1			1

mica, and silt), these additional thin sections could be assigned to petrographic paste groups defined for the Swift Creek study (table 5.6). As with the Swift Creek samples, the gross temper or paste groupings are not isomorphic with petrographic clay resource groupings in many cases (table 5.7). Petrographic paste group A includes

five sherds—three Deptford, one St. Marys, and one San Pedro—encompassing sand, grit, and grog tempers. Petrographic paste B contains only Deptford samples, encompassing grit, sand, and grog (Colorinda-like only) tempers. Petrographic paste C contains Savannah, Ocmulgee III, Deptford, and Alachua Tradition samples,



TABLE 5.6  
**Temporal, Gross Temper, and Petrographic Paste Categories  
 for the Deptford/St. Marys Sample**

Period/ series	Time frame	Gross paste	Sample size	Petrographic paste
Deptford	500 B.C. up to A.D. 800 (Russo, 1992: 114)	grit	3	A = 1 B = 2
		sand	3	A, B, C
		sandy St. Johns	1	H
		sand & grog (Colorinda)	2	A, B
St. Marys	A.D. 1250–1500+ (Ashley and Rolland, 2002: 25) <sup>a</sup>	sand	5	A = 1 D = 3 E = 1
		sandy St. Johns <sup>b</sup>	1	H
Ocmulgee III	A.D. 900–1250 (Ashley and Rolland 2002: 25)	grit	1	C
Alachua Tradition	A.D. 1250–1600 (Milanich and Fairbanks, 1980: 170)	grit	1	C
Savannah	A.D. 1150–1300 (DePratter, 1979)	grit	3	C = 3
San Pedro	16th and 17th centuries A.D. (Ashley and Rolland, 1997)	grog <sup>c</sup>	4	A = 1 C = 2 F/G = 1

<sup>a</sup>At the time of the 1993 study, Russo suggested the time frame for Savannah-like fine cord marked pottery in the St. Marys region ranged from as early as A.D. 800–1500 (1992: 116).

<sup>b</sup>Percentage of sponge spicules in St. Marys sample is a little lower than typical sandy St. Johns. St. Marys sherd also contains phytoliths, which may not be typical of sandy St. Johns.

<sup>c</sup>Grog in most San Pedro samples also composed of F/G paste.

mostly encompassing grit pastes, and San Pedro samples, encompassing grog pastes. Pastes D and E are both represented exclusively by St. Marys samples and sand tempers. Pastes F/G are represented by one San Pedro sherd and some of the grog temper in the San Pedro sherds (Cordell and Deagan, this volume, chap. 4). Paste H/clay 58 or sandy St. Johns paste is represented by one Deptford and one St. Marys sample.

Our previous interpretations regarding lower St. Johns manufacturing origins of petrographic paste groupings A and D are corroborated by most of the St. Marys Cordmarked samples

and some of the Deptford samples. Four of five group A members and two of the three group D members are from lower St. Johns sites. Group B members are from lower St. Johns sites, but may have nonlocal origins on the basis of our findings for the Swift Creek samples. Manufacturing origins outside the lower St. Johns area for group C are also supported, with most members from coastal Georgia sites. This group is broadly distributed, identified in samples as far north as Chatham County, Georgia, and as far west as Alachua County, Florida. Although nonlocal to the lower St. Johns, this wide distribution may

TABLE 5.7  
**Summary Descriptions of Variability in Clay Resource Groups in Deptford/St. Marys Sample**

Petrographic paste group	Sample size	Estimated silt (%)	Mica	Sponge spicules	Phytoliths	Diatoms	Temper group	Pottery type	Relationship to clay samples
A	5	1-3	none to rare	absent or rare	absent or rare	-	sand = 2 grit = 1 grog = 1 Colorinda = 1	Deptford = 3 St. Marys = 1 San Pedro = 1	possible affinity to clays 59, 60, 61, 66
B	4	3-5	none to rare	rare to occasional	occasional to frequent	-	sand = 1 grit = 2 Colorinda = 1	Deptford	possible affinity to clays 60 and 61 if deposits vary in frequency of phytoliths
C	8	1-7, variable	none to rare	occasional to frequent	occasional to frequent <sup>c</sup>	-	sand = 1 grit = 5 grog = 2	Alachua = 1 Deptford = 1 Ocmulgee III = 1 San Pedro = 2 <sup>a</sup> Savannah = 3	possible affinity to clays 60, 61, 66 if deposits vary in frequency of sponge spicules and phytoliths
D	3	1-5, variable	occasional to frequent	absent to rare	rare to absent	-	sand = 3	St. Marys	possible affinity to A clays 59, 61, 66 if deposits vary in mica frequency
E	1	3	occasional to frequent	occasional to frequent	variable (occasional to frequent)	-	sand = 1	St. Marys	possible affinity with I clays 64, 67, or A clays if deposits vary in mica, spicules and phytoliths
H	2	1-3	none to rare	5%-15% (estimated)	none to occasional	-	SSJ = 2	Deptford = 1 St. Marys = 1 <sup>b</sup>	clay 58?
F/G	1	5	rare to occasional	occasional to frequent	rare to occasional	occasional to frequent	grog = 1	San Pedro = 1 <sup>a</sup>	possible affinity to clays 62, 63, 65 diatom species

<sup>a</sup> Some grog temper composed of F/G clays.

<sup>b</sup> Percentage of sponge spicules in St. Marys sample is a little lower than typical sandy St. Johns.

<sup>c</sup> All cases contain noticeable phytoliths. This is in contrast to the Swift Creek phase samples defined as Group C in which phytoliths were variable. In two of four Swift Creek samples phytoliths were not present or rare.

represent similar clay resources that are widespread across the region.

On the basis of these additional data, the use of clay resource A has longevity throughout the study region ranging from Early Woodland Deptford through the historic period. The present sample indicates that clay resources C, D, and E were utilized from Middle Woodland times (ca. A.D. 200) through the time of European contact. In contrast, clay resource B does not seem to have this longevity, as it is only identified in Deptford and Swift Creek samples.

#### INAA COMPARISONS

Measuring the concentrations of 30 elements, the data derived from INAA were used to partition 313 pottery samples from 17 Swift Creek sites into two groups: group 1 ( $N = 129$ ), identified as local to the St. Johns River and group 2 ( $N = 98$ ), local to the lower Altamaha River (Wallis et al., 2010). The remaining 86 pottery samples were left unassigned to any chemical group defined in the analysis. Twenty-two unique clay samples were also analyzed. Of these, three tentative chemical groups were recognized but were too small to be statistically significant. These tentative groups included group 3 ( $N = 5$ ), lower St. Johns River clays, group 4 ( $N = 2$ ), lower Altamaha River clays, and group 5 ( $N = 4$ ), upper Altamaha/lower Ocmulgee River clays.

In general, the mineralogical groups defined by petrographic analysis of 69 samples are corroborated by the INAA chemical groups (fig. 5.5). In mineralogical group A, more than twice as many samples are chemical group 1 members (local to the lower St. Johns River) compared to chemical group 2 members (local to the Altamaha River). Group B contains more than three times as many chemical group 2 members as chemical group 1 members. Group C includes only chemical group 2 or unassigned samples while group D contains only group 1 or unassigned specimens. Group E is the most variable in terms of chemical composition but also suffers from small sample size, with only four members.

Comparison of the group allocations from INAA and petrographic analysis indicates that some samples that appear to be aberrations to these trends in provenance are probably from nonlocal vessels. For example, the INAA results indicate that two of the group B specimens from Duval County are foreign imports from the Altamaha River (e.g., chemical group 2) while

one from Nassau County is unassigned to either chemical group. This leaves only two (13%) of the group B specimens as likely local productions in northeastern Florida (chemical group 1), with the remainder from southeastern Georgia. Similarly, both Duval County specimens in petrographic group C are likely imports based on chemical data, one a chemical group 2 member (Altamaha-made) and the other unassigned to any chemical group. This leaves only specimens from southeastern Georgia sites as local productions in group C.

The data from petrographic analysis of limited clay samples help clarify some of the other discrepancies between mineralogical group members, chemical group members, and their geographic distribution. Group A clays come from sites throughout the study region, from Glynn, Nassau, and Duval counties. Therefore, group A clay resources, and by extension group A pottery, are unlikely to be restricted exclusively to the lower St. Johns River. In other words, the wide distribution of group A clays sets up an expectation for heterogeneous provenance among group A pottery members. There are no natural mineralogical differences between group A clay resources distributed throughout the project area, but INAA was able to identify geographically significant chemical differences between them (Wallis et al., 2010).

Group F/G clays are also widely distributed, derived from Glynn, Camden, and Nassau counties, but seem to be coincident with the St. Marys Meander Plain (White, 1970; see Cordell and Deagan, this volume, chap. 4). For the purposes of this study, the spatial distribution of these group F/G clays has little bearing on the sourcing of sherds because only one sherd potentially matches this group. Group I seems to be the only clay group with a circumscribed spatial distribution, as the two clays comprising this group both come from the Ocmulgee/Altamaha river drainage. Group I clay is the only mineralogical group that contains moderate amounts of both sponge spicules and mica, firmly tying pottery group E to this drainage area. As the only natural clay group with moderate to frequent sponge spicules, group I clay may be related to group C pottery, which also contains sponge spicules as well as rare to occasional mica. Indeed, occasional to frequent naturally occurring sponge spicules occur only in these two Georgia clay samples and pottery samples in these two Georgia pottery groups. The

lone member of group F also contains occasional to frequent sponge spicules but this vessel is tempered with spiculate paste grog (i.e., “Colorinda-like”) that may have introduced the spicules to the prepared paste.

To summarize, the similarity of mineral constituents in group A clays across the region causes this mineralogical group to crosscut the two chemical groups determined by INAA. The other mineralogical groups mostly conform to the two chemical groups but also parse them further into subdivisions on the basis of mineralogical differences. This relationship is evident in comparisons of the mineralogical and chemical categories assigned to vessels with matching paddle designs (table 5.8). With the exception of one unassigned sample, all vessels with paddle-matching designs 34, 36, and 38 share the same chemical group 2 but are split among two different mineralogical groups, A and B. These vessels were therefore all probably made near the Altamaha River, based

on the chemical evidence, but with two or more mineralogically different clay sources. However, paddle-matching vessels belonging to the same chemical *and* mineralogical groups are more likely to have been made from very similar and presumably proximate clay resources. This is the case among three of the paddle matches. Vessels with design 36 from the nearby sites of Cathead Creek (9Mc360) and Lewis Creek (9Mc16) are assigned to chemical group 2 and mineralogical group B. Vessels with design 38 from Lewis Creek and Mayport Mound (8Du96), separated by more than 100 km, are members of chemical group 2 and mineralogical group A. Finally, vessels sharing design 291 from the Dent Mound (8Du68) and Greenfield #8/9 (8Du5544/5) belong to chemical group 1 and mineralogical group A. In contrast, two vessels sharing this design from the same site (8Du5544/5) have different mineralogical designations, group A and group D, distinct groups, but both local to the lower St. Johns

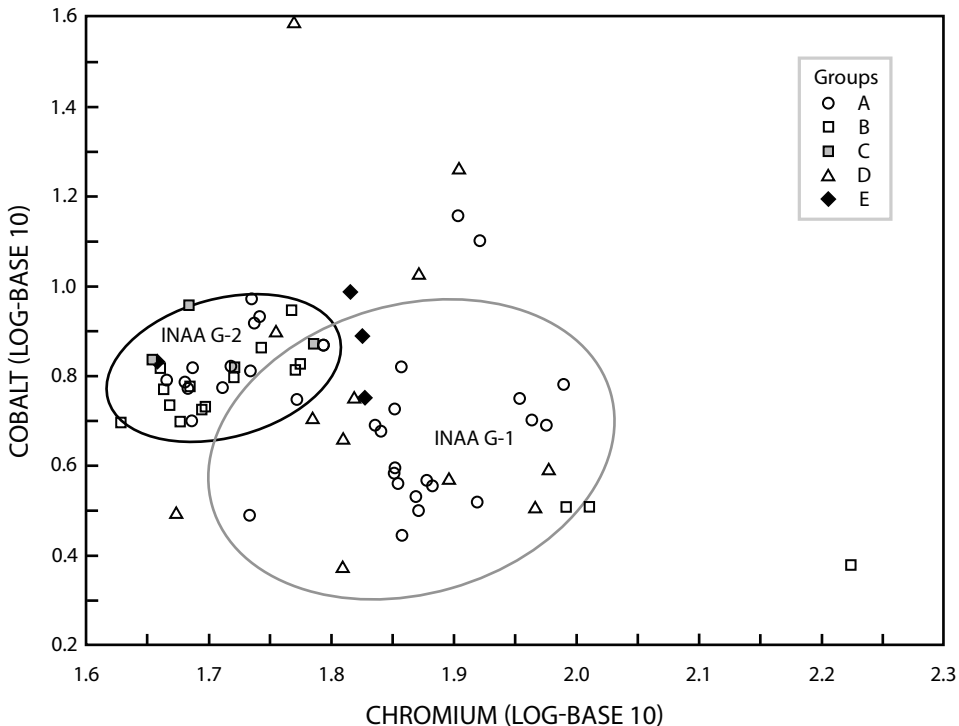


Figure 5.5. Bivariate plot of cobalt and chromium concentrations among clay resource group members. Ellipses represent 90% probability of membership in chemical groups 1 and 2 that were defined for 313 pottery samples (Wallis et al., 2010).

River area. Thus, the data from INAA and petrographic analysis complement one another, each providing data for further distinctions where the other indicates homogeneity.

#### NONLOCAL VESSELS AND MODELS OF INTERACTION

Among the clay resource groups defined by petrographic analysis of the Swift Creek phase samples, nine specimens are identified as made from nonlocal materials (table 5.9). These include seven of 41 (17.1%) Swift Creek Complicated Stamped and two of 10 (20%) sand-tempered plain vessels. This proportion of nonlocal vessels among each type is higher than that of the much larger and presumably more representative INAA sample, in which 11 of 180 (6.1%) Swift Creek Complicated Stamped and 3 of 72 (4.1%) sand tempered plain vessels were identified as nonlocal (Wallis et al., 2010). Although the INAA results reveal a higher percentage of nonlocal samples for Swift Creek Complicated Stamped pottery, the difference is not statistically significant. Generally speaking, both types of vessels were transported between the Altamaha and St. Johns rivers.

Among petrographic samples, nonlocal vessels from sites on the lower St. Johns River ( $N = 6$ ) have clay resource characteristics of the Altamaha River area. These vessels are members of clay resource groups B and C, both local to coastal Georgia, and group A, which was determined to be common in multiple areas along the coast. Two group A members were identified as nonlocal because of their chemical affinity to group 2, defined as local to the lower Altamaha River, and paddle matches linking these samples to sites on the Altamaha River.

Nonlocal vessels from sites on the lower Altamaha River ( $N = 3$ ) have clay resource characteristics of the lower St. Johns River area. These vessels are members of clay resource group D, determined to be local to the lower St. Johns River. All of these specimens have chemical similarities to group 1, also local to the St. Johns River.

Notably, the temper categories represented in all nonlocal vessels are characteristic of their presumed origin of manufacturing. To review, grit temper predominates along the Altamaha River and coastal Georgia while sand temper is more common along the St. Johns River. Nonlocal vessels on lower St. Johns River sites that are

presumed to have been made on the Altamaha River are all tempered with grit or grit and sand. Nonlocal vessels on Altamaha River sites that were presumably made near the lower St. Johns River are all sand-tempered. In sum, mineralogical inclusions, chemistry, and size of quartz temper among these samples clearly indicate the nonlocal area of their manufacture.

The proportion of nonlocal vessels at burial mounds is significantly higher than at residential bases. Among the petrographic samples, 5 of 15 (33.3%) vessels from mounds are identified as nonlocal compared to 4 of 54 (7.4%) vessels from residential bases. A two-proportion Z-test of these distributions is significant at the 95% confidence level ( $Z = 2.2$ ;  $p < 0.05$ ). In comparison, among vessels from sites on the lower St. Johns River from the larger INAA sample, 9 of 49 (18.3%) vessels were identified as nonlocal while only 2 of 98 (2.0%) vessels from residential bases were nonlocal, a difference that is also statistically significant ( $Z = 3.14$ ;  $p < 0.01$ ) (Wallis et al., 2010). What is more, although Swift Creek Complicated Stamped vessels made up only 28% of the total INAA samples from mounds, they comprise nearly 90% of the nonlocal vessels from mounds. The nonlocal origins of four of these vessels are corroborated by petrographic analysis. Clearly, on the lower St. Johns River, burial mounds were preferred locations for the deposition of nonlocal vessels, and the majority of those vessels were Swift Creek Complicated Stamped.

In light of their prevalence at burial mounds as opposed to residential bases, nonlocal vessels do not seem to be the de facto refuse of moving people, either from migrations or seasonal rounds. Either of these behaviors would presumably yield more nonlocal vessels at habitation sites. The few nonlocal vessels at residential bases may represent the exchange of vessels, the contents of vessels, or changes in residence of individuals in marriage. Yet the comparatively high proportion of nonlocal vessels at burial mounds on the lower St. Johns River cannot be linked directly to any of these behaviors or practices.

These vessels were intentionally placed on or within burial mounds, probably in the context of mortuary ceremony and were not often used or broken in local domestic contexts. Vessels were either brought directly to lower St. Johns River burial mounds from residential bases on the Altamaha River or carefully protected from breakage in local villages (or other locales) until their final

TABLE 5.8

**Clay Resource Groupings and INAA Chemical Groups for Paddle Matching Vessels**

Abbreviations: petid = petrographic analysis identification; Petpaste = petrographic (mineralogical) paste category; INAA = instrumental neutron activation analysis chemical group; unas=unassigned to any chemical group defined in the analysis.





Petid	Site	Temper	Petpaste	INAA	Paddle no.	Design
2008-26	9Mc372	GRIT	A	2	34	
2008-32	8Du68	GRIT	B	2		
2008-04	8Du68	GSAND	A	2	36	
2008-27	9Mc372	GSAND	B	unas		
2008-39	9Mc360	GSAND	B	2		
2008-49	9Mc16	GSAND	B	2		
2004-01	9Mc16	GRIT	A	2	38	
2004-18	8Du96	GRIT	A	2		
2008-40	9Mc360	GRIT	B	2		
2008-06	8Du68	SAND	A	1	291	
2008-21	8Du5544/5	SAND	D	1		
2008-25	8Du5544/5	SAND	A	1		

TABLE 5.9

**Samples Identified as Nonlocal by Clay Resource Grouping**

Sample number	Site no.	Site name	Pottery type	Gross paste	Petro. Paste	Chemical group	Paddle design
2004-01	8Du96	Mayport Mound	Late Swift Creek Comp Stamp	grit	A	2	38
2008-04	8Du68	Dent Mound	Swift Creek Comp Stamp	grit & sand	A	U2	36
2008-05	8Du68	Dent Mound	Swift Creek Comp Stamp	grit	C	2	
2008-32	8Du68	Dent Mound	Swift Creek Comp Stamp	grit	B	2	34
2008-16	8Du5543	Greenfield 7	Swift Creek Comp Stamp	grit	C	UO	
2008-23	8Du5544/5	Greenfield 8/9	sand tempered plain	grit	B	2	
2008-44	9Gn6	Evelyn	sand tempered plain	sand	D	1	
2008-43	9Mc360	Cathead Creek	Swift Creek Comp Stamp	sand	D	UO	
2008-30	9Mc372	Sidon	Swift Creek Comp Stamp	sand	D	UO	

deposition at mounds. Either way, these nonlocal vessels served as gifts in the sense that they were symbolic material linking together people in distant locations (Wallis, 2011). Artifacts that are mobilized in the context of death are quite often concerned with the (re)constitution of social relationships. Indeed, death often triggers remittances, in the form of exchange, for debts and obligations accrued between allied or competing descent groups (e.g., Battaglia, 1983, 1990; Kan, 1989; Munn, 1990; Weiner, 1992). In this context, nonlocal vessels and paddle matches are likely to have been the result of marriage alliances (e.g., Stoltman and Snow, 1998; Stephenson et al., 2002), but not because women carried their possessions during changes in residence. Instead, vessels were brought from the Altamaha River as offerings or may have been exchanged in the event of a marriage or death. Rather than mere detritus of people moving from place to place, many nonlocal vessels were used as tools of commemoration or assertion of alliances among descent groups geographically separated by more than 100 km.

Analysis of the mineralogical and chemical constituents of pottery and clays thus reveals that Swift Creek paddle matches and nonlocal pottery on the lower St. Johns River are the result of fairly formalized exchanges that were linked to mortuary practices and, presumably, marriage alliances with Altamaha River groups. With no samples from burial mounds along the Georgia coast, this interpretation is yet to be supported for areas outside the lower St. Johns River. Moreover, the sample size and distribution of pottery and clays currently prevent adequate characterization of clay resources in some areas of the coast, particularly areas between the Altamaha and St. Johns rivers.

Even with these limitations, the compelling results outlined here can be viewed as the beginning of a more comprehensive ceramic ecology of the Georgia and Florida coasts. Many more samples, especially clay samples, are needed to delineate the diversity of clay and temper resources that were available to potters in the past. As demonstrated in the circumscribed successes of the foregoing study, these data have the potential to make significant contributions to our understandings of many aspects of the aboriginal past: patterns of migration, seasonal mobility, settlement, resource exploitation, and exchange, to name a few. For Late Archaic and later popula-

tions, ceramic vessels were ubiquitous tools for cooking, storage, and transport that, in effect, bore witness to numerous aspects of life. With robust and dispersed sampling, in combination with studies of technology and function, ceramic vessels can serve as effective proxies for understanding specific patterns of population movement, interaction, and settlement.

## SUMMARY AND CONCLUSIONS

This study used petrographic analysis to define clay resource groups among clay and pottery samples from the Atlantic coast of southeastern Georgia and northeastern Florida. Among the total 93 pottery samples and 10 clay samples, 12 groups were defined by the analysis, one of which was exclusively local to the lower St. Johns River, four of which were only local to the Altamaha River area, one that seemed to be ubiquitous along the coast, and the rest with inconclusive provenance. The allocation of provenance for these groups was supported by the results of INAA of the same, and additional, Swift Creek phase specimens. Nonlocal vessels were identified by mineralogical and chemical composition that was conspicuously similar to geographically distant pottery and clay samples. Among the Swift Creek phase samples, both Swift Creek Complicated Stamped and sand or grit-tempered plain vessels appear to have been transported between the lower St. Johns and Altamaha rivers. The distribution of nonlocal vessels at sites on the lower St. Johns River, however, is conspicuous. Here, nonlocal vessels were most often complicated stamped and were deposited primarily at burial mounds. These vessels are interpreted as gifts linked to marriage alliances among descent groups centered on the Altamaha and St. Johns rivers.

Understanding the nuances of mineralogical variation in clay resources within and between these two major drainages will require much more data. With a more robust sampling strategy, mineralogical variations in clay resources may aid in future examinations of other temporal periods and more proximate movements and exchanges, such as within river valleys. In the meantime, we have discovered that paddle matches between sites along the coast were most often the result of transported vessels, rather than wooden paddles, and that nonlocal vessels were mostly deposited at burial mounds. This pattern and the accompa-

nying interpretation deserve comparison to other areas of the southeastern United States where Swift Creek Complicated Stamped pottery is distributed. The practices evident on the lower St. Johns River were not necessarily shared by other populations that made and used Swift Creek pottery. In light of the huge temporal and geographic expanse of this pottery type and concomitant archaeological variation, heterogeneity should be expected in the ways that pottery was implicated in social practice. This remains an exciting avenue for future ceramic studies on the Georgia and Florida coasts, and beyond.

#### NOTE

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**PART II**  
**MODELING COASTAL LANDSCAPES**







## CHAPTER 6 PAST SHORELINES OF THE GEORGIA COAST<sup>1</sup>

CHESTER B. DEPRATTER  
AND VICTOR D. THOMPSON

### INTRODUCTION

At 160 km long, the Georgia coast is a diverse and geologically dynamic environment (fig. 6.1). Part of the larger Georgia Bight, which extends from the Outer Banks of North Carolina to Cape Canaveral in northeastern Florida, this low wave action coastline consists of a number of barrier islands, back-barrier islands (colloquially known as hammocks), an expansive marsh system (ca. 10 km wide) of sounds, tidal creeks, and rivers, and a portion of the mainland that borders the marsh system (see Hubbard, Oertel, and Nummedal, 1979; Thomas, 2008: chaps. 7, 32, and 35; Thompson and Turck, 2010). The barrier islands vary considerably in size, ranging from 5 to 15 km long and 1 to 5 km across (Hubbard, Oertel, and Nummedal, 1979), and formed during the Pleistocene ( $N = 8$ ) as well as the Holocene ( $N = 7$ ) (fig. 6.2). The back-barrier islands also have a similar varied geologic history (Hoyt and Hails, 1967; Hubbard, Oertel, and Nummedal, 1979). While some islands in the back-barrier area are quite large, the vast majority are smaller than 0.5 km<sup>2</sup> (Thompson and Turck, 2010: 284). We do not offer an extensive overview of Georgia coastal geology here, as a nice summary of this can be found in Turck and Alexander (chap. 7; see also Turck, 2011). More detailed information can also be found in Thomas (2008: chap. 32), as well as in Bishop, Rollins, and Thomas's (2011) recently edited volume on the geoarchaeology of St. Catherines Island. Our main concern in this chapter is to provide a preliminary assessment of paleoshorelines of the Georgia coast. To understand changes in paleoshorelines over time,

two specific processes are important. The first is that sea level fluctuation has impacted the overall form and distribution of landforms along the Georgia coast for an extended time frame. For the purposes of this chapter, we are only concerned with the last 5000 years of this history, as this is when we can observe an intensive human presence on the coast (DePratter, 1977a; DePratter and Howard, 1981: 1289; Elliott and Sassaman, 1995: 18; Thompson and Turck, 2009, 2010; Williams et al., 2010; Thomas, 2011a; Thompson and Worth, 2011; Turck et al., 2011). The second process that we are concerned with is progradation/retrogradation. Advancing and receding coasts "may advance because of coastal emergence and/or progradation by deposition, or retreat because of coastal submergence and/or retrogradation by erosion" (Bird, 2000: 292). The Georgia coast experiences both progradation and erosion in various areas at present and has over the last 5000 years.

While a detailed discussion of sea level fluctuation and progradational/retrogradational processes is beyond the scope of this chapter, we can offer a brief sketch of how these processes operate along the Georgia coast and outline how they are directly relevant to the study presented here. There are several sea level curves for the Georgia Bight. However, we note that there is a great need for refinement of these curves. Currently, the data suggest that at about 4200 B.P., sea levels rose to about 1.2 m below present (mbp) (DePratter and Howard, 1981; Gayes et al., 1992; Turck, 2011: 11). It was during this time that much of the back-barrier areas became filled in with Holocene marsh sediment and the



Figure 6.1. Map of the Georgia Coast showing the major islands and wetland areas.

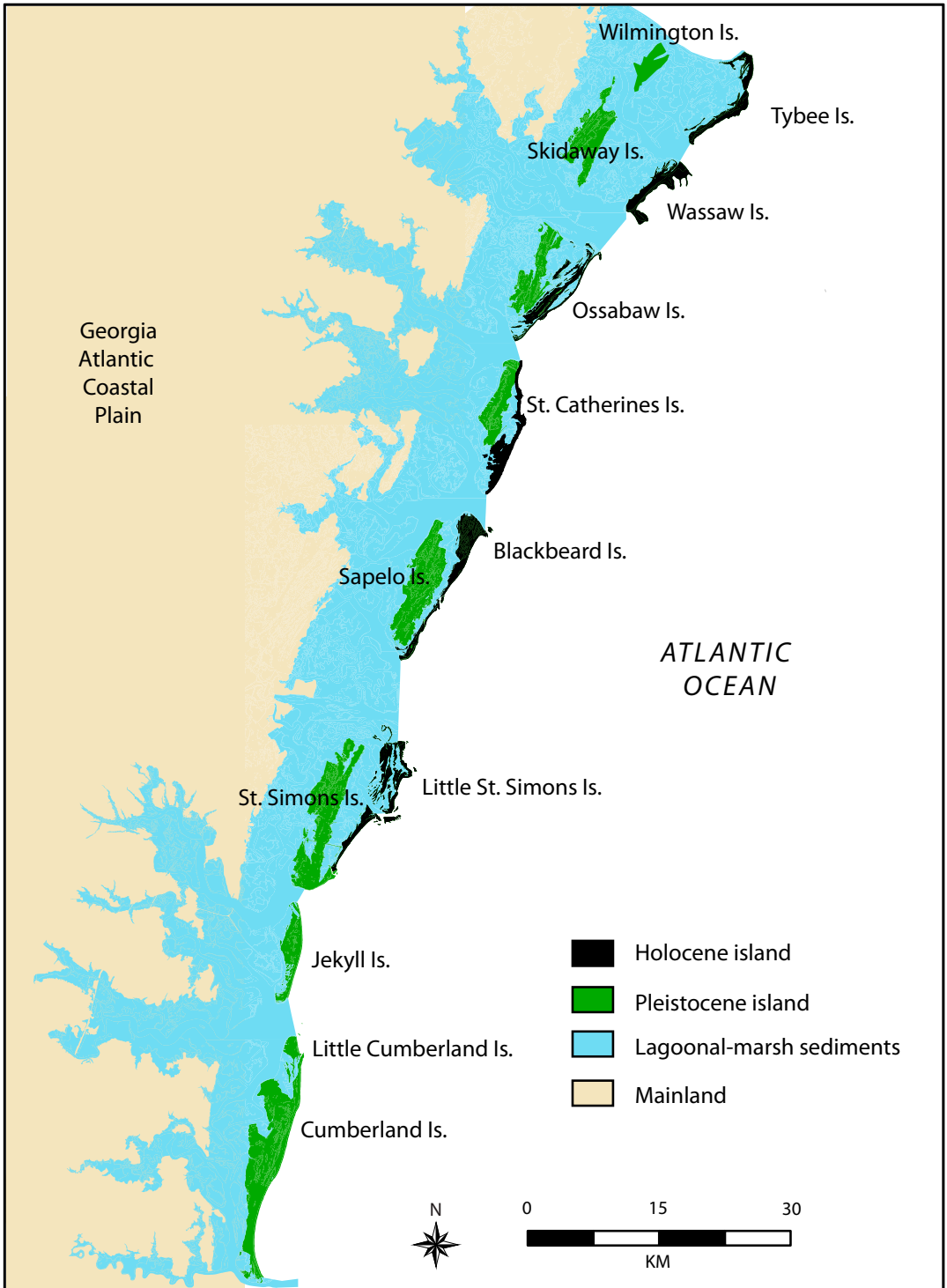


Figure 6.2. Map of the Georgia Coast showing both Holocene and Pleistocene islands.

Holocene portions of the barrier islands formed (DePratter and Howard, 1981: 1289; Hayes et al., 1980: 286; see also chapters in Bishop, Rollins, and Thomas, 2011, and a good summary of this by Turck, 2011). By around 3100 B.P., or perhaps earlier depending on which sea level curve is used, there appeared to be a drop in sea level, thought to be as much as 3–4 mbp (DePratter and Howard, 1981; Colquhoun and Brooks, 1986). Regardless of exactly when this drop occurred, it also roughly coincided with a reduction in use of marsh resources by coastal inhabitants (DePratter, 1977a; Thompson and Turck, 2009, 2010). By around 2400 B.P. there was a return of the productivity of the marsh system, as indicated by people occupying the margins of back-barrier islands (DePratter and Howard, 1981: 12–14; see also Turck, 2011: 14–15 for a summary). Sea levels at this time are thought to have rebounded to around 1 mbp and continued to rise slowly until today with “negligible change in the marsh estuarine system” (Turck, 2011: 15; see also DePratter and Howard, 1980; Gayes et al., 1992).

Despite these changes in sea level, deltaic areas continued to prograde eastward due to sediment loading from the river systems that flow into the estuaries and ultimately into the Atlantic (DePratter and Howard, 1980, 1981; Turck, 2011: 191). Thus, in certain areas of the coast, many new landforms emerged as a result of these dynamic processes. We acknowledge that processes are more complex than we have outlined here, particularly for local islands and river systems (see Chowns, 2011; Potter, 2011; Rich et al., 2011; Rollins and Thomas, 2011; Turck and Alexander, this volume, chap. 7); however, this general outline does provide a brief understanding of the basic principles underlying the study presented here.

The purpose of this chapter is to provide some basic information on paleoshorelines of the Georgia coast. To do this, we use two datasets. The first are site locations and chronological information from shoreline and island surveys conducted by DePratter with James D. Howard in the late 1970s and early 1980s with support from the National Science Foundation. These data were used to create the initial shoreline maps presented here. Preliminary maps of these shorelines can be found in DePratter and Howard (1977a), Howard and DePratter (1980), and DePratter (1977a), as well as in unpublished sources. The shoreline maps published previously only relate to

the northern portion of the coast. In this chapter, we expand this coverage to include areas farther to the south. In order to evaluate these original maps, we generated site distribution maps by time period, using the Georgia Archaeological Site File (GASF) database from May 2007. This allowed us to evaluate the original shoreline locations established by DePratter using updated information. These updated sites include all of the sites originally recorded by DePratter.

In general, we found a high correlation between the current data available for the Georgia coast and DePratter’s original maps. We suggest that the few discrepancies that we note are attributable to small recording errors in the GASF, mistyped ceramics from other researchers over the years (leading to erroneous chronologies for some sites), and possible local variations in shoreline progradation and erosion that require finer-grained data than that available in our current datasets (see Turck and Alexander, this volume, chap. 7). Finally, we note that the location and dating of the shoreline positions for some of the northern areas of the coast have been investigated and dated by both radiocarbon and optically stimulated luminescence (OSL) dating, which corroborate the archaeological findings (see Turck and Alexander, this volume, chap. 7).

## BASIC PRINCIPLES

The basic principle used by DePratter to construct the original shoreline maps is a relatively straightforward concept. In areas that are progradational, landforms “move” seaward over time. That is to say, deposition in these areas causes new hammocks and sand ridges to form in succession, away from the coast. Many of these new landforms would have been located adjacent to, or surrounded by, newly developing marsh-estuarine systems. These new landforms would have provided access to marsh-estuarine habitats that would not have been as widespread in the local area prior to the development of such landforms. Since the beginning of the Late Archaic Period (ca. 4200 B.P.), the vast majority of faunal resources exploited by coastal populations are from marsh-estuarine habitats (Reitz, 1988; Colaninno, 2010; Reitz et al., 2010). Therefore, our assumption is that since these resources were highly valued, people would have taken advantage of them as soon as they were exploitable. In addition, since we observe a general population

increase through time on the Georgia coast (Williams et al., 2010; Turck et al., 2011), new exploitable resources would have been particularly important. Therefore, our basic premise in creating the shoreline maps is that as soon as islands or landforms became stable, they were colonized and occupied by people.

#### COASTAL SURVEY: 1976 TO 1984

Surveys of the Georgia coast by DePratter during the 1970s and 1980s consisted of visiting islands, walking and inspecting exposed island shorelines at low tide, and probing for buried shell deposits. Samples of artifacts (predominantly ceramics) were collected and the site locations recorded. Additional sites were located by walkover surveys on the islands and examining exposed surfaces for shell middens, and shell and/or artifact scatters. DePratter used this archaeological information to create the original shoreline locations on paper maps. These maps were scanned and the data contained on them were digitized, put into a database, and used to create the updated shoreline maps presented in this chapter. Finally, in addition, subsurface testing by the American Museum of Natural History on St. Catherines Island (see Thomas, 2008, for a discussion) has helped to refine the shoreline maps for this area of the coast.

The chronological arrangement for the paleoshoreline maps is based on DePratter's (1979, 1991; see also Williams and Thompson, 1999) ceramic sequence developed for the northern Georgia coast. The Georgia coastal ceramic sequence is perhaps one of the most complex in the region. At least 28 regularly located Native American ceramic types comprise what is normally recovered during archaeological investigations in the area, not to mention a host of other wares that occur in smaller quantities. These are recovered in addition to a number of historic ceramics found in the region. Some of the earliest ceramics in North America occur along the Georgia coast, and Sassaman (2004) suggests that the central Georgia coast may be the birthplace of ceramic vessel production. These earliest ceramics are known as St. Simons, and date as early as around 4400 radiocarbon years B.P. (DePratter, 1979, 1991; Sassaman, 1993; Thompson, 2007; Thomas, 2008). While earlier diagnostic materials are sometimes located along the Georgia coast, we take the 4400 radiocarbon years B.P. date as the starting point for our analysis, as it is

at this time that an archaeologically visible settlement along the coast becomes ubiquitous on the landscape. We note that there are possibly earlier sites on inundated coastal landforms, but so far none have been discovered (see Turck, Williams, and Chamblee, 2011, for a discussion).

Table 6.1 summarizes the general period, phase, ceramic type, and age range for pottery of the Georgia coast. Here, we provide both uncalibrated ranges B.P. (i.e., 1950) as well as calibrated age ranges in B.C./A.D. format. This is to allow the dates provided on the shoreline maps to be correlated with calendar dates. The calibrated ages are derived from Thomas (2008); however, we note that while instructive and most helpful, the calibrated ranges should be used with caution as Thomas's study was specific to St. Catherines Island and his dates for the ceramic sequence may not be applicable to the coast as a whole.

Despite our concerns regarding potential calibration issues, the relative dating of the ceramic sequence is well documented. In general, pottery traditions and attributes along the Georgia coast vary in paste, form, decoration, surface finish, and method of manufacture. A mixture of these stylistic and technological attributes varies over time and can be used as markers (much like index fossils) for geological events (e.g., past shorelines). Due to space limitations, we will not review all the attributes of the basic types listed in table 6.1; however, we do refer the reader to DePratter (1979, 1991), Williams and Thompson (1999), and Guerrero and Thomas (2008) for this information. Finally, we note that the original shoreline positions were drawn using a chronological ceramic sequence that is expressed in uncorrected radiocarbon years (see DePratter, 1991).

While this ceramic sequence is well established for this region, it is less applicable to the southernmost portion of the coast. Therefore, while DePratter conducted surveys on and below Jekyll Island, we did not attempt to posit paleoshorelines on this portion of the southern coast. We do note, however, that this should now be possible given the development of a refined ceramic chronology in association with new radiocarbon dating (Ashley, 2010; see also Ashley, Rolland, and Thunen, this volume, chap. 15) for this area.

Although a large number of islands and surface exposures were examined through the course of DePratter's initial early surveys, there

**TABLE 6.1**  
**Summary of the General Period, Phase, Ceramic Type,**  
**and Age Range for Pottery of the Georgia Coast**

Period	Phases	Ceramic Types	RCY B.P.	Cal B.C./A.D.
Irene	Altamaha	Altamaha Line Block	250	*A.D. 1700
		Altamaha Check Stamp		
		Altamaha Red Filmed		
		Irene Incised		
		Irene Burnished Plain		
		Irene Plain	370	*A.D. 1580
	Irene Complicated Stamped			
	Pine Harbor	Irene Incised		
		Irene Complicated Stamped		
		Irene Burnished Plain		
		Irene Plain	525	A.D. 1410
	Irene Complicated Stamped			
Irene	Irene Burnished Plain			
	Irene Plain	625	A.D. 1310-1390	
	Irene Plain			
Savannah	Savannah II	Savannah Cord Marked	700	A.D. 1300-1380
		Savannah Plain		
		Savannah Burnished Plain		
		Savannah Complicated Stamp		
		Savannah Check Stamped		
	Savannah I	Savannah Cord Marked	800	A.D. 1280
		Savannah Burnished Plain		
		Savannah Plain		
St. Catherines Period	St. Catherines	St. Catherines Net Marked	1000	A.D. 1050-1150
		St. Catherines Cord Marked		
		St. Catherines Burnished Plain		
		St. Catherines Plain		
Wilmington Period	Wilmington	Wilmington Cord Marked	1400	A.D. 660
		Wilmington Brushed		
		Wilmington Fabric Marked		
		Wilmington Plain		
	Walthour	Wilmington Cord Marked		
		Wilmington Plain		
		Walthour Complicated Stamped		
		Walthour Check Stamped		



TABLE 6.1 — (Continued)

Period	Phases	Ceramic Types	RCY B.P.	Cal B.C./A.D.
Deptford Period	Deptford II	Deptford Complicated Stamped	1500	A.D. 630
		Deptford Cord Marked		
		Deptford Check Stamped		
		Refuge Simple Stamped		
		Refuge Plain	1700	A.D. 410
	Deptford I	Deptford Linear Check Stamped		
		Deptford Cord Marked		
		Deptford Check Stamped		
		Refuge Simple Stamped		
Refuge Period	Refuge III	Refuge Plain	2400	400 B.C.
		Deptford Linear Check Stamped		
		Deptford Check Stamped		
		Refuge Simple Stamped		
	Refuge II	Refuge Dentate Stamped	2900	1000 B.C.
		Refuge Simple Stamped		
		Refuge Plain		
	Refuge I	Refuge Simple Stamped	3000	1130–1210 B.C.
		Refuge Incised		
		Refuge Plain		
St. Simons Period	St. Simons II	Refuge Plain	3100	1360 B.C.
		St. Simons Incised & Punctated		
		St. Simons Incised		
		St. Simons Punctated		
	St. Simons I	St. Simons Plain	3700	1980–2030 B.C.
		St. Simons Plain		
		St. Simons Plain	4400	2750–2860 B.C.

\* Historic dates are uncalibrated.

are many more refinements that could be made to the data in this chapter. Specifically, one of the difficulties in conducting archaeological surveys along the Georgia coast is the thick, dense, vegetation that often covers islands and obscures archaeological sites. Therefore, surface visibility is often low to nonexistent over large portions of the coast, except in specific areas (i.e., island beaches at low tide and other erosional surfaces). However, the other way that sites are often identified, as is the case with our survey data, is by highly visible shell middens and shell scatters that dot the islands and coastal mainland. Although this

aids in the overall identification of sites, the results are biased toward those sites containing shell deposits. We know from intensive subsurface surveys that artifact distributions often extend beyond, and are found without, shellfish remains (DePratter, 1979; Thompson and Turck, 2010). Therefore, additional refinement of some of these paleoshoreline maps could be accomplished through intensive shovel-testing programs on islands as Thompson and Turck (2010) conducted on the small back-barrier islands just west of Sapelo Island (see also Turck and Alexander, this volume, chap. 7, for refinement using

geological methods). These new techniques and methods will offer an additional systematic and complementary line of evidence to further evaluate the maps presented in this chapter.

#### THE GASF COASTAL ARCHAEOLOGICAL DATABASE

As we stated at the outset of this chapter, the most recent site location data from the GASF were used to evaluate the original data and shorelines created by DePratter. We used two datasets to create the two sets of maps presented in the results section. The first is a hydrological dataset that we used as the base map of the Georgia coast. Using scanned images of DePratter's original shoreline location maps, we transferred the position of the paleoshorelines to our current base map. Site location data for the site distribution maps are based on the GASF database,<sup>2</sup> University of Georgia Laboratory of Archaeology. These two datasets were then imported and meshed together into a Geographic Information Systems (GIS) computer program in the NAD 27 projection. As noted by Thompson and Turck (2009), such data cannot be used uncritically. In order to identify problems within the dataset, we created a companion database based on DePratter and Howard's original survey information from field books, notes, and information collected during their survey project. This database served as a check on the GASF database.

Despite these database checks, there are a number of limitations with the site location datasets. Foremost among these are the fact that site data are currently only available in point form and, therefore, site size information is absent in the GASF data (Thompson and Turck, 2009). While we do have site size information for the DePratter and Howard database, this is not critical to the current analysis as we are primarily concerned with the location of sites vis à vis the prograding coastline. The other two main sources of bias within the GIS data are survey coverage and time period designations based on ceramics. As for the survey coverage, we discuss the potential limitations in our examination of the various areas surveyed in the following sections. It is important to note that there can also be problems with the locational information in site file data, and steps can be taken to correct for such discrepancies (Turck, 2011: 42–44).

Time period designations based on ceramics can present certain problems in site file data stemming from inconsistencies in pottery identi-

fication and chronological association. It is here that our companion database provides the necessary cross reference to the key sites (those located east from the mainland) that form the basis of our shoreline maps. Greg Palk analyzed ceramics from the DePratter and Howard (1980, 1981; Howard and DePratter, 1980) survey in a manner consistent with DePratter's (1991) sequence for the northern Georgia coast.

#### PALEOSHORELINES

For data presentation, the Georgia coast is divided into three different sections from north to south. The first section is the Ossabaw, Wassaw, and Tybee islands portion of the coast, followed by the St. Catherines and Sapelo islands area, and finally the St. Simons and Little St. Simons islands section. The lines on the following maps only represent general trends and should not be taken as the exact location of the shoreline for the date provided. However, these lines represent a starting point for more detailed studies (Turck and Alexander, this volume, chap. 7) that could further refine our understanding of these processes given a better understanding of the geology, as well as larger and more intensive archaeological survey.

#### OSSABAW, WASSAW, AND TYBEE ISLANDS

The Ossabaw, Wassaw, and Tybee islands area indicates progradation over an extended time frame (fig. 6.3). Perhaps the most interesting portion of this map is the 4500 B.P. shoreline that extends into the marsh northward from Ossabaw Island. Along this portion of the coast, there is considerable divergence between the Pleistocene and Holocene landforms. In this case, the western portion of Ossabaw Island and all of Skidaway and Wilmington islands are part of the Silver Bluff Pleistocene barrier island shoreline that formed when sea levels were much higher than present, around 36,000 to 25,000 B.P. (Hoyt and Hails, 1967: 1541; but see Dockal, 1995; Garrison et al., 2008; and Turck and Alexander, this volume, chap. 7). In contrast, the eastern half of Ossabaw, as well as Wassaw and Tybee islands, is all Holocene formations. These Holocene deposits are part of the Savannah River delta with deposition deflected to the south via longshore drift.

We place the 4500 B.P. paleoshoreline in the area of the Holocene marsh sediments based on the fact that a number of sites are located in



Figure 6.3. Paleoshorelines of the Ossabaw, Wassaw, and Tybee islands section of the Georgia coast.

this area. Specifically, there are shell ring sites as well as shell middens found in the marsh (DePratter, 1975, 1977a). Shell rings are semi-circular, circular, or arc-shaped shell-bearing sites (DePratter, 1976; Russo and Heide, 2001; Thompson, 2007) and the most recent scholarship for the Georgia coast suggests that these sites are occupied throughout the year (Thompson, 2006; Colaninno, 2010; Thompson and Andrus, 2011). Often these sites are situated on the high points of islands, such as the Sapelo Shell Ring complex (see Thompson, 2006).

The sites along the eastern edge of Skidaway and Wilmington islands are shell middens, indicating utilization of marsh resources. These resources would not have been available until sea level rose and stabilized west of a newly developed barrier island that would block off the ocean and allow marsh development to the east of Wilmington and Skidaway islands. There is no remnant of this barrier in existence today. While these data certainly provide insight, we note that the complete geological record is not present at surface due to changing sea level and resulting erosion. Sea levels would have been somewhat lower at the time of occupation, as indicated by middens located on landforms that are now submerged (DePratter, 1975; Marrinan, 1975).

During the subsequent Refuge period, we note a low stand, as previously discussed. This 2900 B.P. shoreline is also based on additional subsurface data, whereas all others are based on surface collections (DePratter and Howard, 1981). Little Tybee Island lacks shell midden sites in general. This is most likely due, in part, to the lowering of sea levels. This environmental change was accompanied by a concomitant shift in technology as well as settlement patterns (Marrinan, 1975; DePratter, 1977a; Thompson and Turck, 2009).

When we compare the paleoshoreline maps created with data from DePratter's surveys with the contemporary site distributions based on the GASF database, we see a striking correlation (figs. 6.4, 6.5, and 6.6). For the Late Archaic, Refuge, and Deptford periods, only two sites from the modern data fall outside of the original shoreline placement. These two sites date to the Late Archaic and are located just east of the line (compare with figs. 6.3 and 6.4). Late Archaic ceramics (St. Simons wares) are distinctive, so we do not think these ceramics are misidentified. It could be that this area was a small spit

of a newly forming barrier island that would later become the western portion of Ossabaw. We suggest that more work be conducted in this area to refine the placement of the shoreline. As for the other time periods, which include Savannah, St. Catherines, and Wilmington, all of the current sites in the GASF database fall in line with the original shoreline placements.

#### ST. CATHERINES AND SAPELO ISLANDS

St. Catherines Island and Sapelo Island are two of the more archaeologically well-known islands of the Georgia coast, largely because of the sustained long-term investigations by individuals and institutions. Sapelo research had tended to focus on specific sites (e.g., Crook, 1986; Thompson, 2007; Thompson and Andrus, 2011; Jefferies and Moore, this volume, chap. 13) and little systematic survey has been undertaken. In contrast, St. Catherines Island has been the focus of research by archaeologists from the American Museum of Natural History for more than 30 years and includes large-scale systematic survey of the entire island, as well as intensive testing and excavation projects (e.g., Thomas, 2008: chaps. 7, 32, and 35; Thomas and Sanger, 2010). Therefore, St. Catherines represents the largest dataset by which paleoshorelines can be inferred (fig. 6.7).

The 4500 B.P. shoreline is based on known site locations as well as recent dating of both the St. Catherines Island Shell Ring and the McQueen Shell Ring (Thomas and Sanger, 2010; Sanger and Thomas, 2010; Bishop, Rollins, and Thomas, 2011). The paleoshorelines map meshes well with new geological data from St. Catherines Island Shell Ring. Recently, Bishop, Rollins, and Thomas (2011) conducted vibracore transects in the vicinity of this site. Their results indicate that there was marsh development around this time frame (ca. 4500 B.P.) both to the north and western sides of St. Catherines Island (Bishop, Rollins, and Thomas, 2011: 201–202). This correlates well with the paleoshorelines map, which also suggests marsh in this area based on the distribution of archaeological sites. In addition, archaeologists recently working on St. Catherines Island identified an additional ring (McQueen) on the eastern side of the island near the northern end of the Back Creek Scarp. The position of this early site again corresponds well with the location of the 4500 B.P. paleoshorelines. Furthermore, its



Figure 6.4. Paleoshorelines of the St. Catherines and Sapelo islands section of the Georgia coast.



Figure 6.5. Paleoshorelines of the St. Simons and Little St. Simons islands section of the Georgia coast.

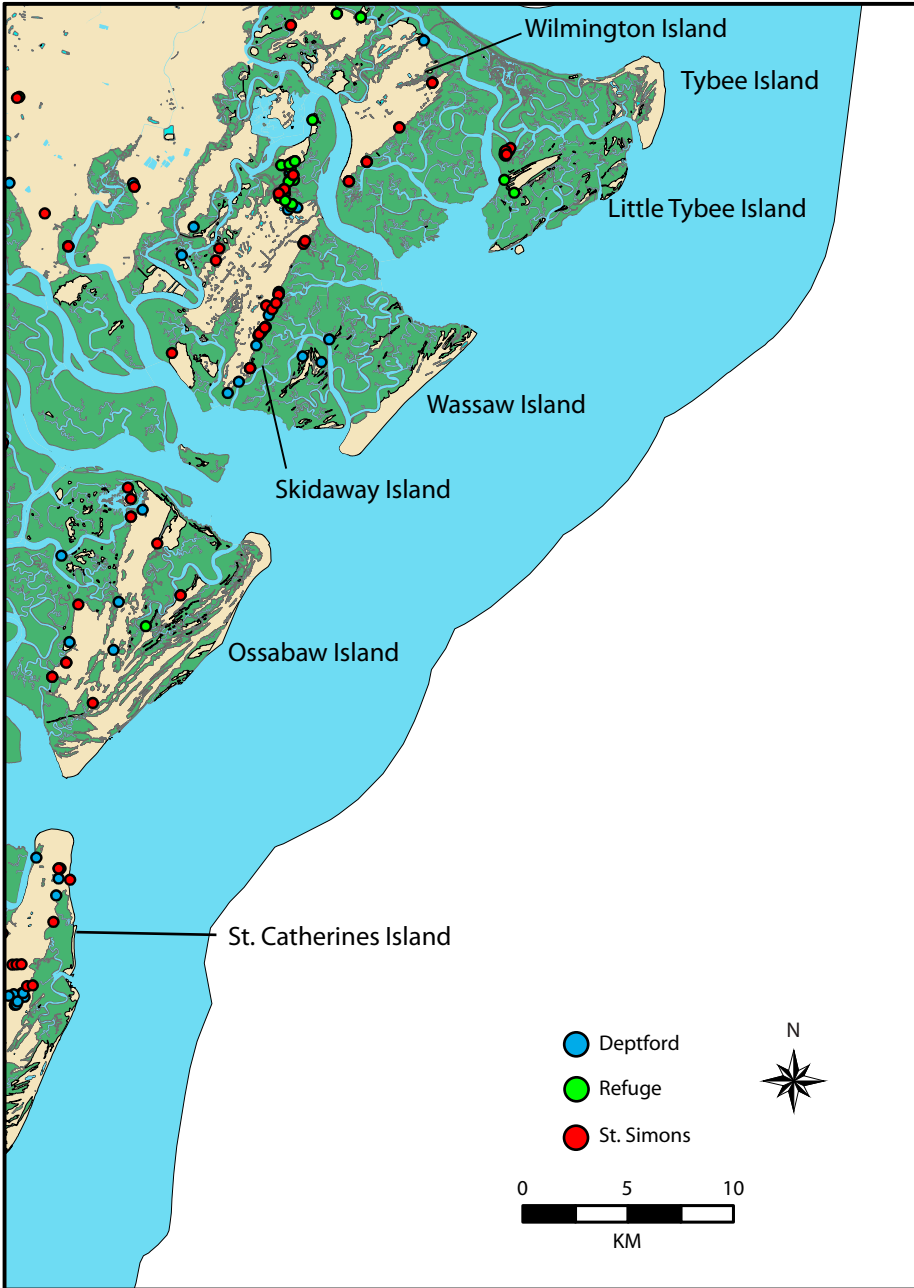


Figure 6.6. Site locations with St. Simons, Refuge, and Deptford period components of the Ossabaw, Wassaw, and Tybee islands section of the Georgia coast.

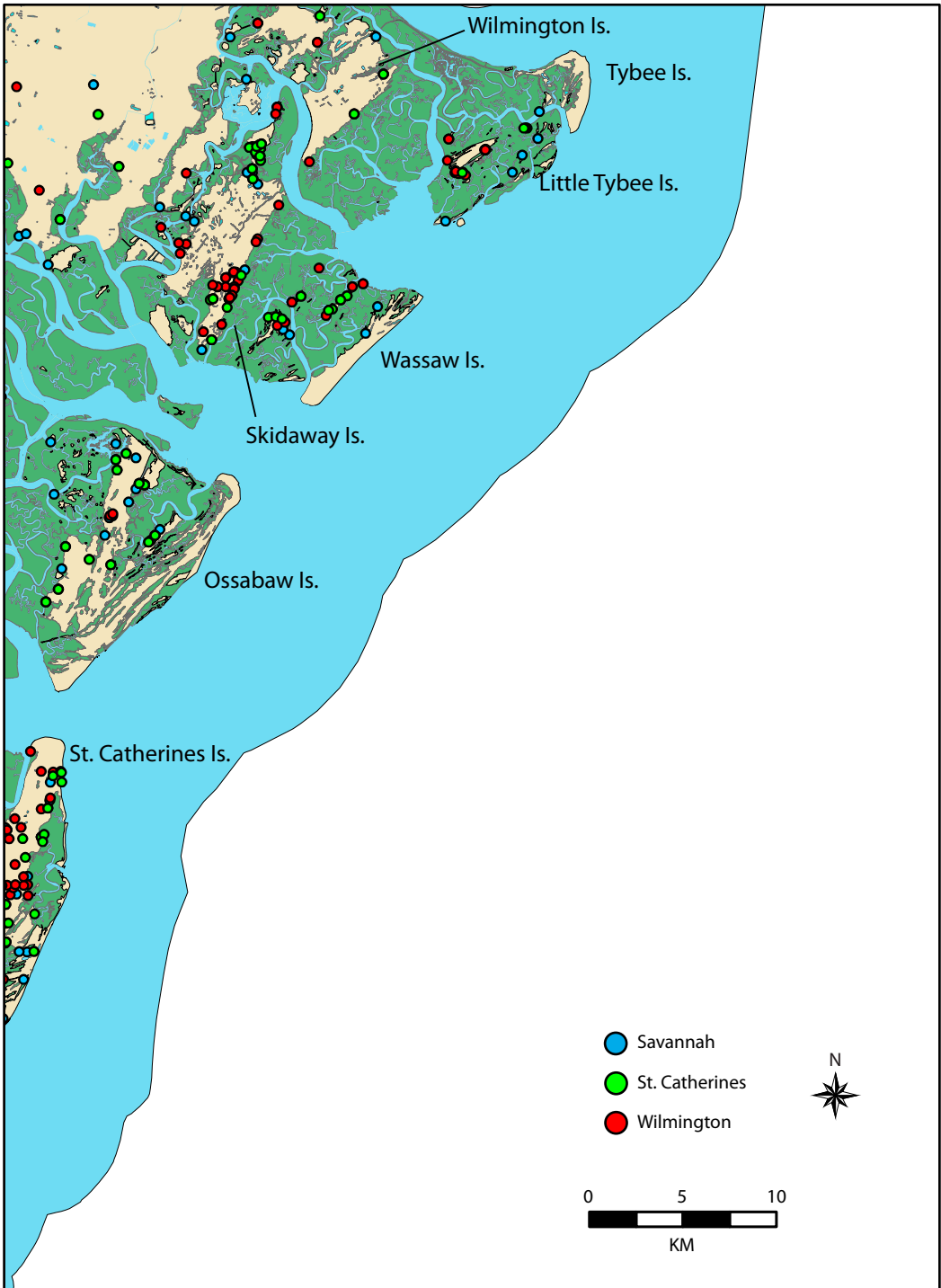


Figure 6.7. Site locations with Wilmington, St. Catherines, and Savannah period components of the Ossabaw, Wassaw, and Tybee islands section of the Georgia coast.



placement on the eastern side of St. Catherines suggests that there must have been a barrier island in place farther to the east to allow marsh development.

Unfortunately, while there is speculation of Holocene island development for eastern portions of St. Catherines Island, as stated earlier, we are missing both geological and archaeological data of such evidence due to erosion. For example, many of the recurved spits on the southern portion of the island may have extended even farther south at one time (see Chowns, 2011). This is also why St. Catherines does not have the “butterfly” configuration noted for islands to the north (Bishop et al., 2007; Thomas, 2008: chap. 32, 843). Thomas, Bishop, and colleagues (Bishop et al., 2007; Thomas, 2008: chap. 32: 843, chap. 35) propose a hypothesized secondary Holocene island, dubbed Guale Island, which would have sheltered areas on the eastern side of St. Catherines allowing for marsh development before it was lost to erosion.

Unlike St. Catherines, Sapelo Island has had less extensive survey, although DePratter visited and surveyed many areas of the island, as well as some of the smaller Sapelo hammocks for his shoreline survey project in the 1980s (see Turck, 2011, for the most recent research on this topic). Despite this, the 4500 B.P. shoreline seems to be parallel to the eastern edge of the island. Although three shell rings are located on Sapelo, they are grouped in a cluster on the western side of the island, adjacent to expansive marsh estuaries. However, it is possible that more shell matrix Late Archaic sites are located on the northeastern portion of the island, as marsh formation may have begun here by the end of the Late Archaic period (see Turck and Alexander, this volume, chap. 7). Unfortunately, we have limited survey data from Blackbeard Island; however, enough sites were located during DePratter’s initial survey to infer the paleoshorelines. We suggest that with additional survey, particularly in light of the ridge and swale topography of Blackbeard Island, shorelines in this area could be refined considerably.

When we compare the paleoshorelines maps created with data from DePratter’s surveys with the contemporary site distributions based on the GASF, we again see a striking correlation (figs. 6.8, 6.9, and 6.10). For all the time periods, the current sites in the GASF database fall in line with the original shoreline placements.

#### ST. SIMONS, LITTLE ST. SIMONS, AND JEKYL ISLANDS

Although there is some information on St. Simons and Little St. Simons islands, we need more data from this region. Despite this, survey data known thus far combined with historic maps (particularly for Little St. Simons Island, where there is limited survey) allow us to propose shorelines for this area (fig. 6.11). Like the other shell ring sites mentioned in the study, the 4500 B.P. shoreline to the east is based on data from Oatland and Cannon’s Point shell rings (see DePratter, 1979; Marrinan, 1975, 2010). From the 4500 B.P. line, the island prograded eastward, as this area is a deltaic environment. Further to the south is Jekyll Island, which has had relatively little survey and the Holocene deposits are limited to small beach ridge clusters on the north and south ends. Therefore, we do not posit paleoshorelines for this island. In contrast, DePratter surveyed a large portion of Little Cumberland Island. However, much of the pottery recovered from this island does not fit with the northern Georgia coastal pottery chronology that we rely on here. So we make no attempt to draw shorelines for Little Cumberland either.

When we compare the paleoshorelines maps created with data from DePratter’s surveys with the contemporary site distributions based on the GASF, we again see a correlation (figs. 6.12–6.14). For all periods, the current sites in the GASF database fall in line with the original shoreline placements.

#### IMPLICATIONS FOR ARCHAEOLOGY, ECOLOGY, AND GEOLOGY

Archaeologists have concentrated most of their research endeavors on the large barrier islands of the Georgia coast (e.g., DePratter, 1976; Pearson, 1979a, 1979b; Thomas, 1988, 2008; Thompson, 2006, 2007; Thompson and Andrus, 2011). These studies document important trends during the past 5000 years; however, we are still missing a large part of the picture—specifically the nature of human occupation along the smaller islands that dot the Georgia coast. Such landforms are important components of Native American economies (Thompson and Turck, 2010; Thompson and Worth, 2011; Turck, 2011; see also Keegan et al., 2008, for the Caribbean area). While small marsh islands may seem like a harsh environment, it is clear from the data

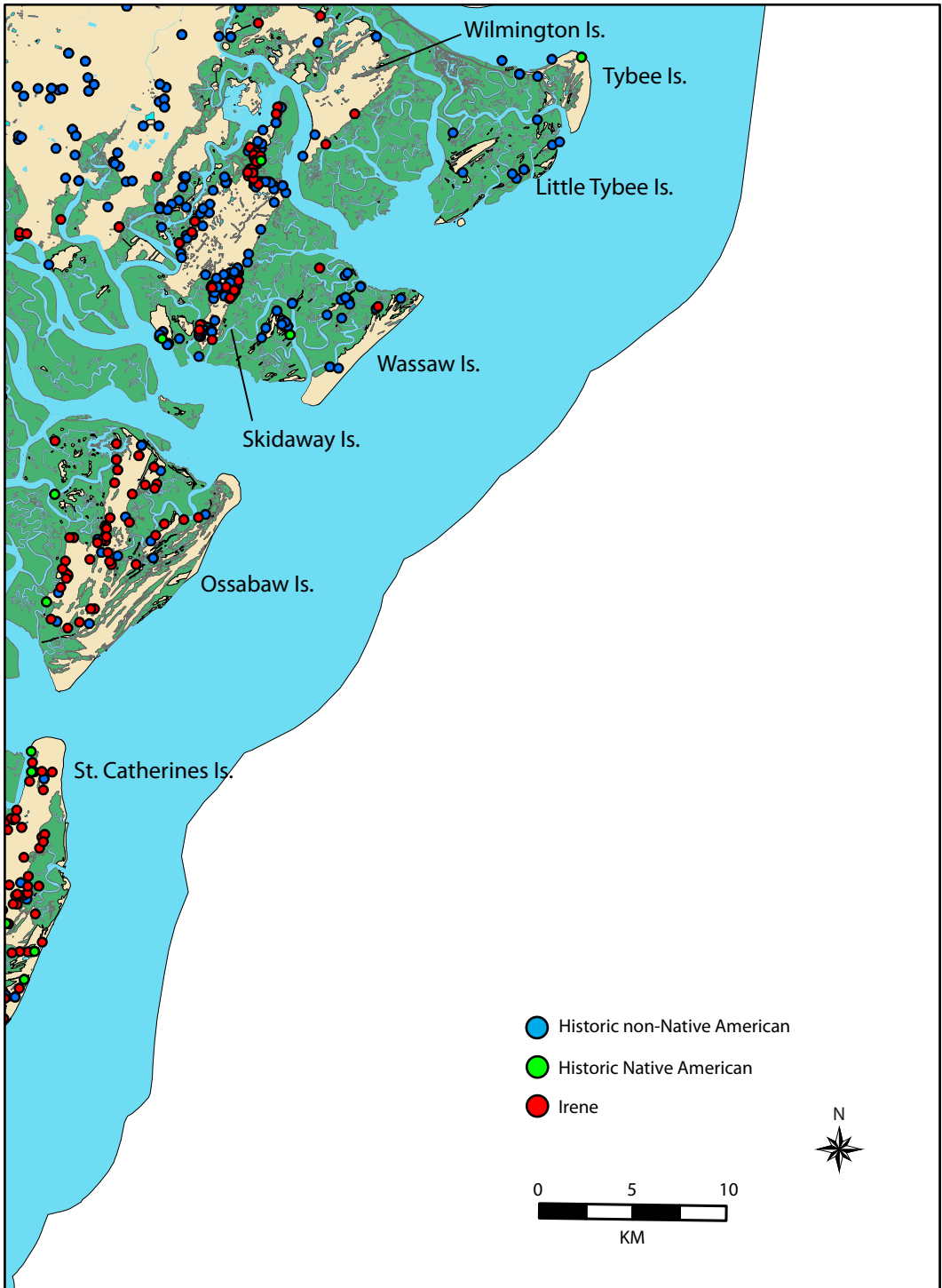


Figure 6.8. Site locations with Irene, Historic Native American, and Historic Non-Native American components of the Ossabaw, Wassaw, and Tybee islands section of the Georgia coast.

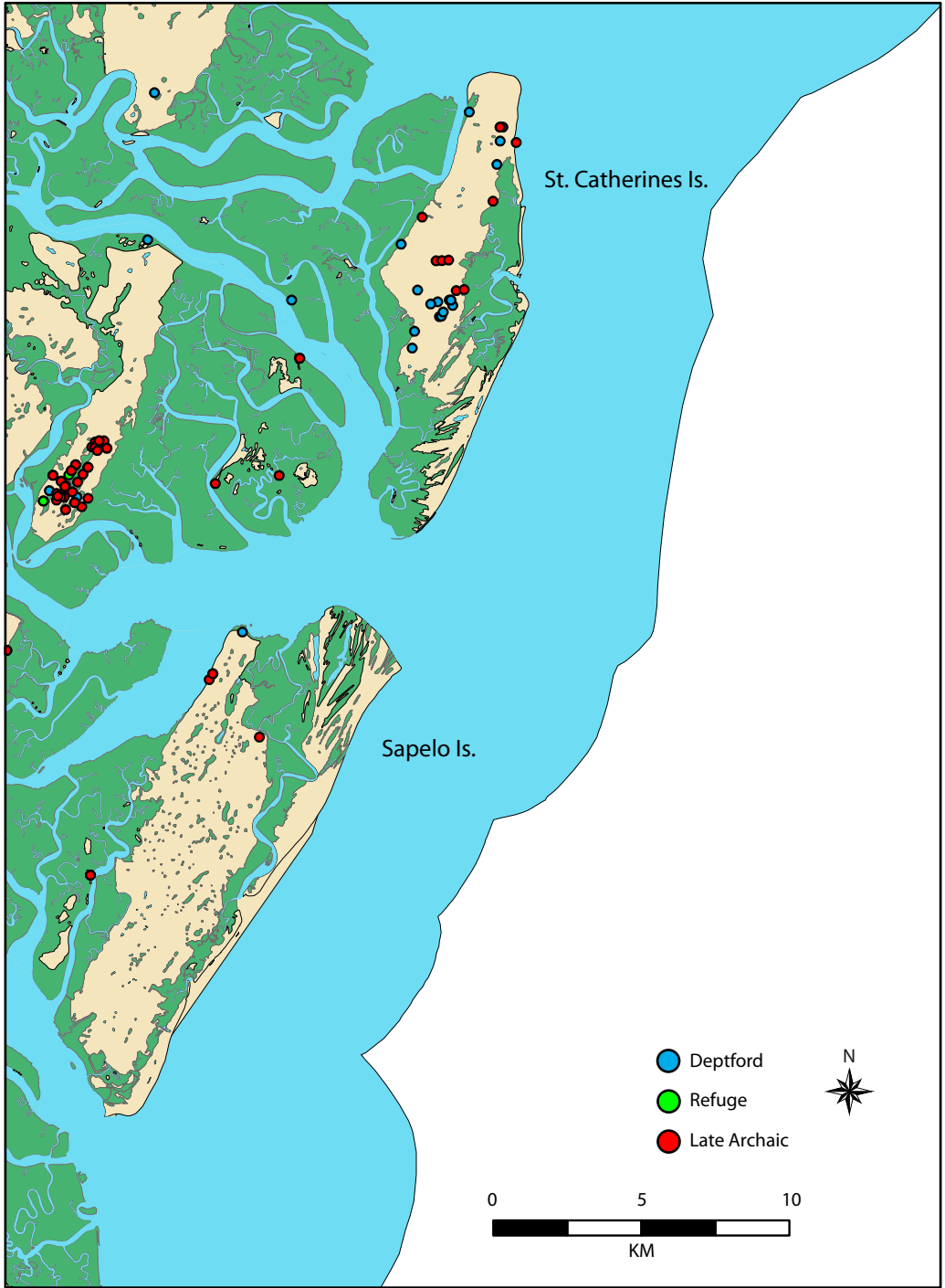


Figure 6.9. Site locations with St. Simons, Refuge, and Deptford period components of the St. Catherines and Sapelo islands section of the Georgia coast.

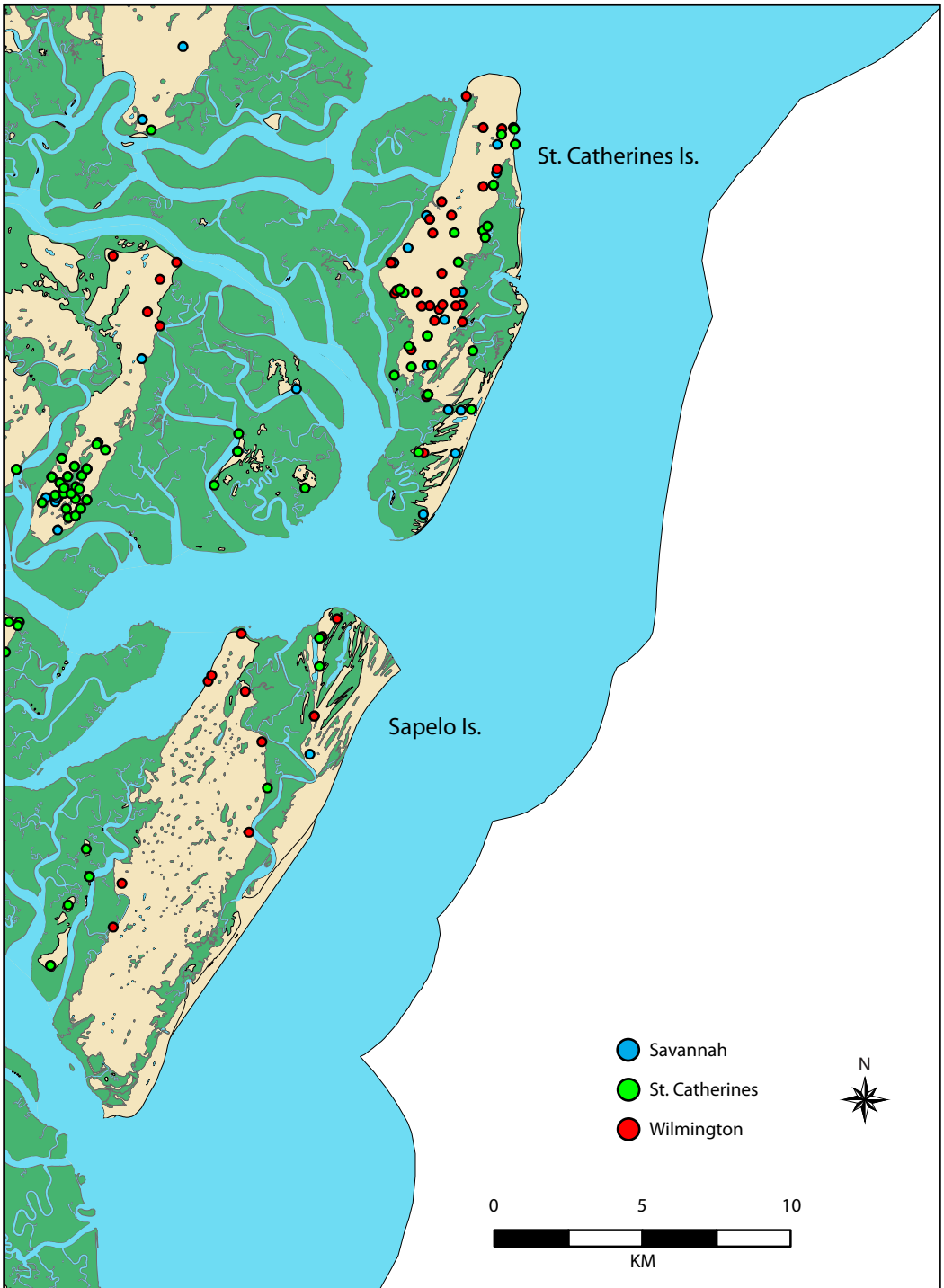


Figure 6.10. Site locations with Wilmington, St. Catherines, and Savannah period components of the St. Catherines and Sapelo islands section of the Georgia coast.

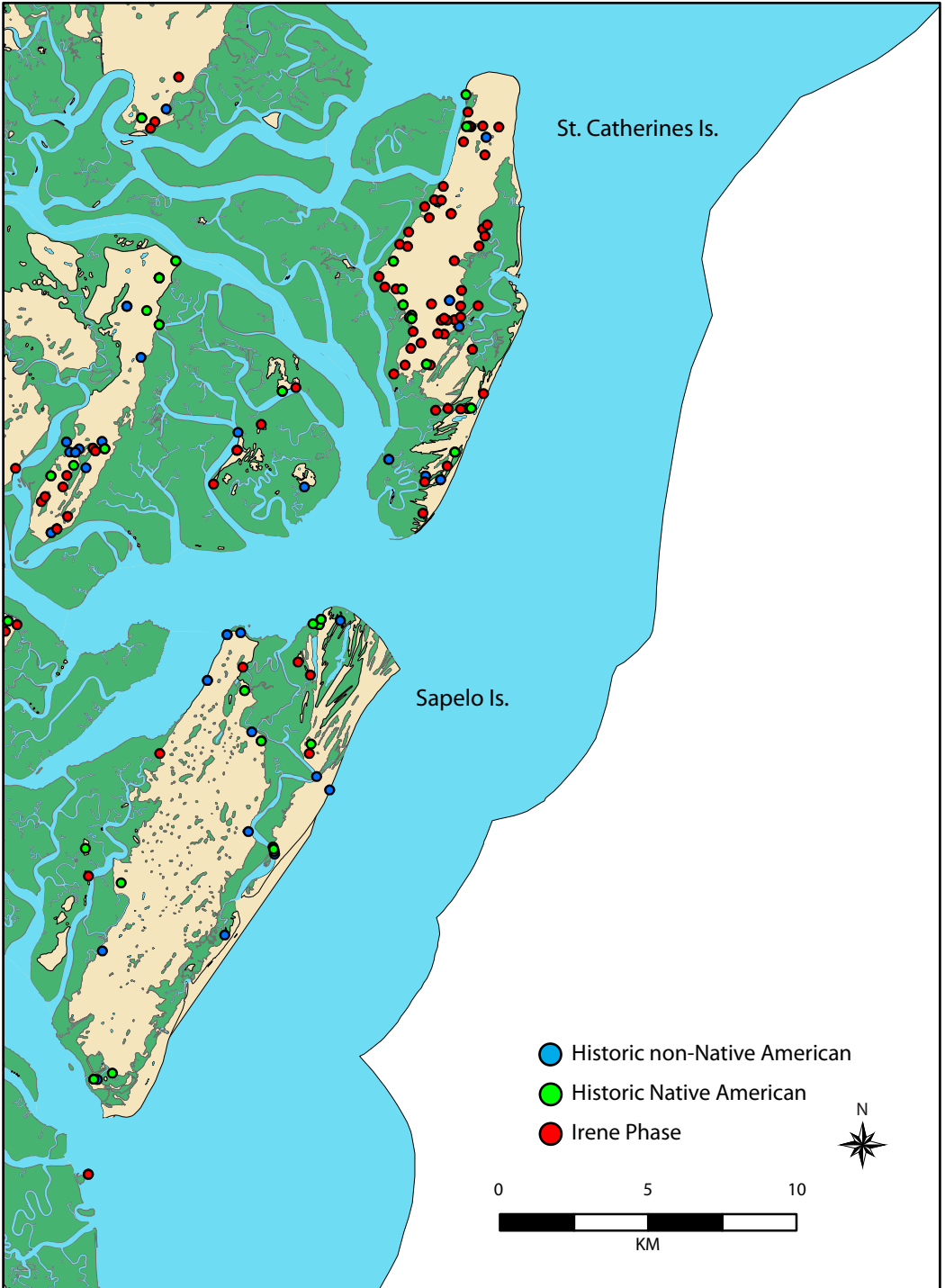


Figure 6.11. Site locations with Irene, Historic Native American, and Historic non-Native American components of the St. Catherines and Sapelo islands section of the Georgia coast.

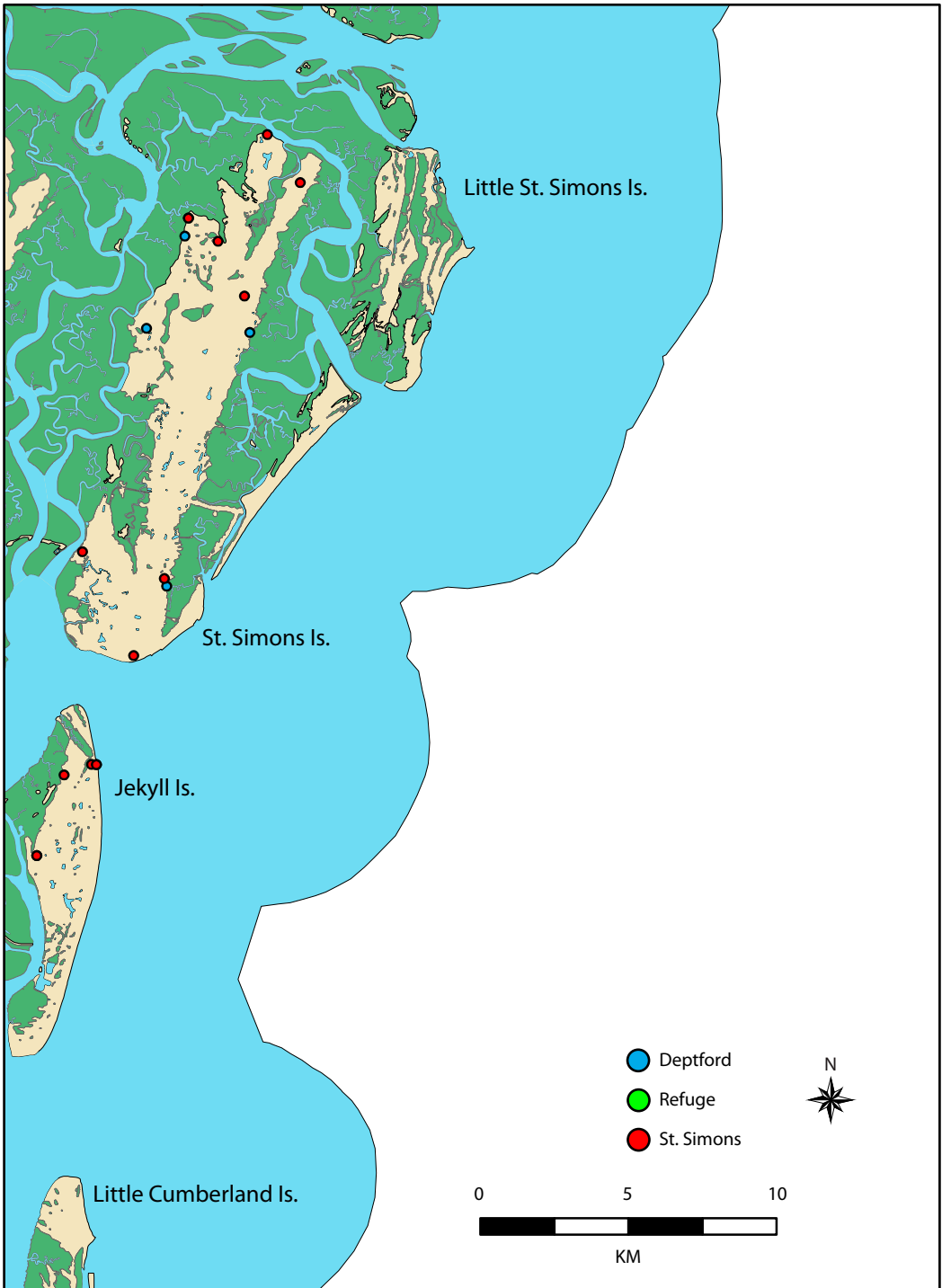


Figure 6.12. Site locations with St. Simons, Refuge, and Deptford period components of the St. Simons and Little St. Simons islands section of the Georgia coast.

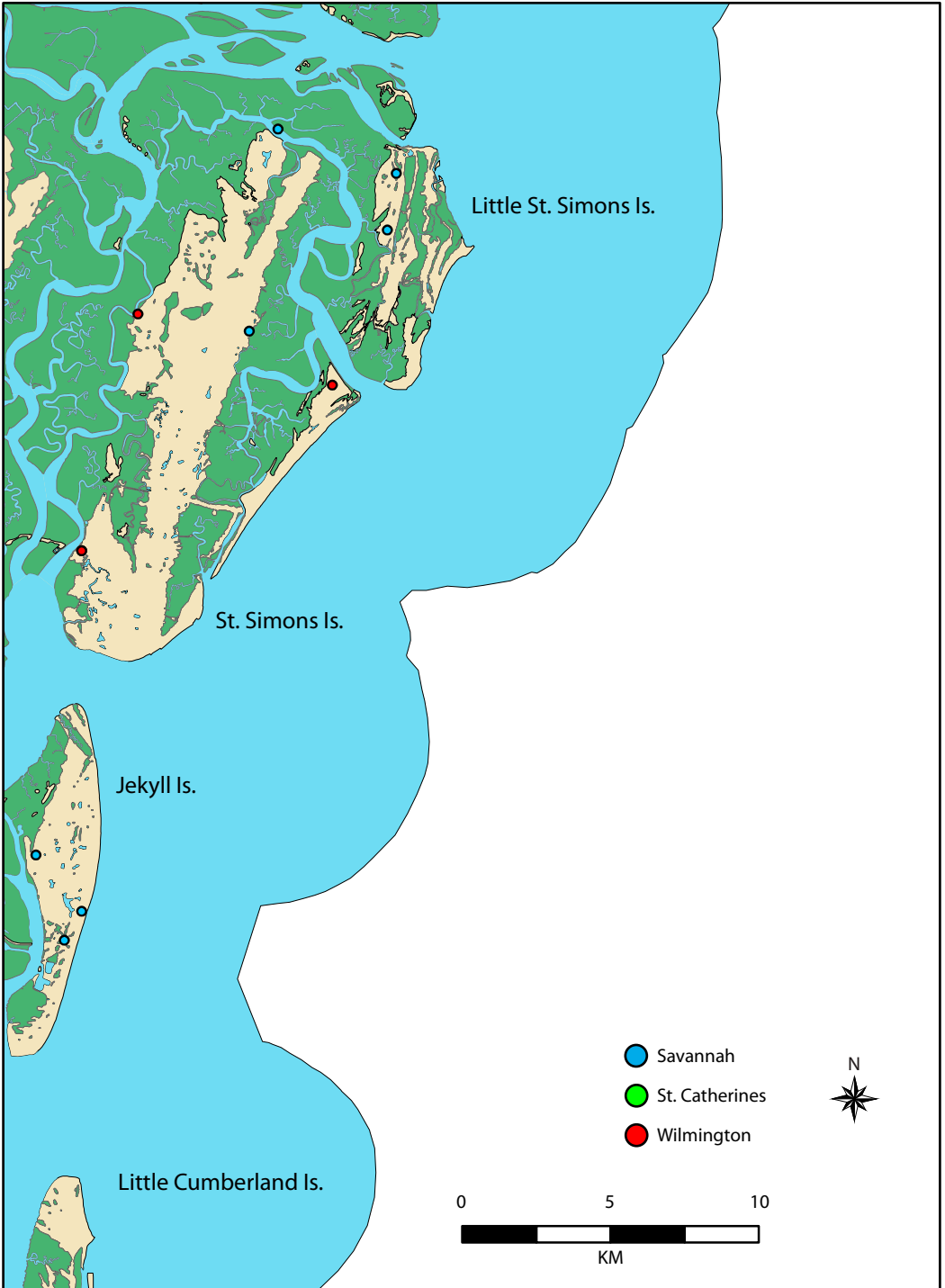


Figure 6.13. Site locations with Wilmington, St. Catherines, and Savannah period components of the St. Simons and Little St. Simons islands section of the Georgia coast.

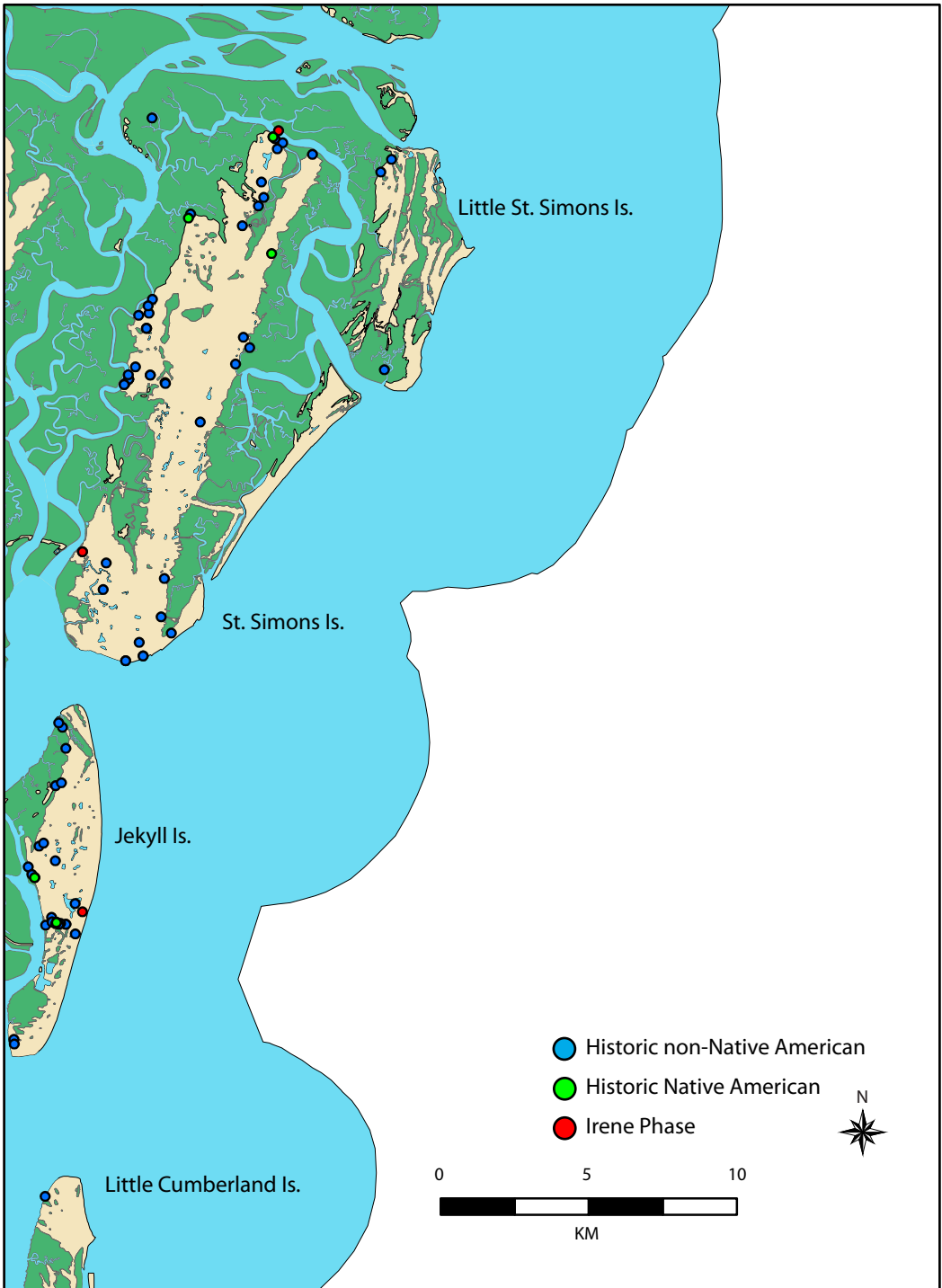


Figure 6.14. Site locations with Irene, Historic Native American, and Historic non-Native American components of the St. Simons and Little St. Simons islands section of the Georgia coast.



presented in this study that coastal peoples used these landforms extensively and intensively. Our study of the past shorelines shows the value of archaeological research in the marsh and back-barrier environment. Furthermore, it informs us regarding human use of this area, which, in part, helps to fill in the knowledge gap in terms of both the geology and human ecology of the coast.

There are several key points that we note as a result of the present shoreline data. First, some areas of the Georgia coast have undergone progradation for more than 4500 years. During this time, new islands, hammocks, and marshes developed because of the changing coastline. At least one time during this period, there was a sea level lowstand (DePratter and Howard, 1980, 1981; Gayes et al., 1992). This lowstand most likely had a significant impact on the distribution of resources and estuaries along the coast (DePratter, 1977a). Furthermore, while this lowstand certainly influences the archaeological visibility of sites, it also affected where and how humans used the landscape (Thompson and Turck, 2009).

Another key point illustrated by the data is that shortly, at least in archaeological terms, after new islands or hammocks formed, humans utilized these landforms (Thompson and Turck, 2010; Thompson, Turck, and DePratter, in press; Turck and Alexander, this volume, chap. 7). Thus, it seems that geological processes, at least in part, were one of the primary drivers of human use on the landscape. Based on this observation, we offer the hypothesis that populations during some time frames were, in part, limited by the lack of formation of new islands and habitats, while during other time periods, other social and economic factors were driving use of these areas. We suggest that at least part of this variability in use may be due to various subsistence practices, including the increasing role of agriculture among coastal populations. We currently do not have the data to evaluate this statement. However, with the new surveys on the mainland (see Sanger, this volume, chap. 9) and along the marsh islands (see Napolitano, this volume, chap. 8), it should be possible in the near future to evaluate these hypotheses. Again, we underscore the value of more intensive archaeological inquiry on small islands (see Thompson and Turck, 2010; Turck, 2011) to provide a broader perspective into the coastal economy and society of Native American peoples.

The survey and documentation of small islands and archaeological sites provide not only impor-

tant clues to the Georgia coast's geological history, but also to its social history. While this study offers a departure point for archaeologists and geologists to consider some of the larger research questions in this area, much more work is needed if a more holistic picture is to be provided. Research on back-barrier marsh islands is a logistically difficult endeavor. Understanding these landforms is further complicated by the fact that they are situated within a dynamic environment where there has been great loss to erosion and some occupied landforms have been submerged due to rising sea level. In the near future (A.D. 2100), predictions of global sea level rise are on the order of between 20 and 200 cm (Erlandson and Rick, 2008: 167). In addition, development along coastlines is on the rise and even the small islands of the Georgia coast are not immune from residential and commercial building. Therefore, time is at a premium for this research and it is imperative that more work of this sort be carried out soon before the record is lost (see Robinson et al., 2010).

## NOTES

1. The National Science Foundation supported DePratter's original fieldwork for the shoreline project (NSF Oceanography Section Grant # OCE76-02320). This original work was conducted with Jim Howard, formerly of Skidaway Institute of Oceanography, Savannah, Georgia. The GIS and new mapping research portion of this chapter was supported, in part, by a grant in association with the Georgia Coastal Ecosystems Long Term Ecological Research project and the National Science Foundation Grant (NSF grant OCE-0620959). The Georgia Department of Natural Resources (GDNR), the Sapelo Island National Estuarine Research Reserve, Department of Anthropology at the Ohio State University, the South Carolina Institute of Archaeology and Anthropology at the University of South Carolina, and the Department of Anthropology at the University of Georgia. We would also like to thank Kimberly Swisher for her diligence in examining the maps for outliers and misplaced sites. The authors would like to thank John Turck, Amanda Roberts Thompson, Steven Pennings, Mark Williams, Merryll Alber, and Clark Alexander of Georgia Coastal Ecosystems Long Term Ecological Research project for their support of our past and ongoing research. The collections from this study are housed at the Laboratory of Archaeology at the University of Georgia. Finally, we thank the reviewers, Torben Rick, Thomas Pluckhahn, and Chris Rodning for their thoughtful comments.

2. Thompson conducted the GIS analysis of the data in 2007; therefore records from the GASF for this year were used in this analysis. Upon completion of the paper in 2011, the authors again consulted the GASF to see if any additional sites would impact the current results. Few sites have been added to the site file in the study region since the original analysis and none that would alter the current interpretations in this chapter.





## CHAPTER 7

# COASTAL LANDSCAPES AND THEIR RELATIONSHIP TO HUMAN SETTLEMENT ON THE GEORGIA COAST

JOHN A. TURCK AND CLARK R. ALEXANDER<sup>1</sup>

### INTRODUCTION

Local geomorphology and geology are important to understanding human settlement patterns (Rossignol, 1992; Stafford, 1995, 2004; Dodonov, A.W. Kandel, A.N. Simakova, et al., 2007). The geomorphology of a landscape reveals when elements of the landscape initially formed, the processes involved in their formation, and the processes involved in subsequent landscape changes over time. Understanding these factors allows for a better interpretation of the archaeological record. Ideally, the analysis of the archaeological record should be separate from the geomorphology, but they are sometimes so intertwined that it is necessary to analyze them simultaneously. This is especially true in dynamic coastal settings, where environmental changes can occur yearly, seasonally, and even daily (Wells, 2001; also see Jordan and Maschner, 2000; Peros, Graham, and Davis, 2006; Dickinson and Burley, 2007; Bicho and Haws, 2008; Pollard, 2009; Erlandson and Braje, 2011).

To refine our understanding of Georgia coastal evolution, a campaign of vibracoring, dating (radiocarbon and optically stimulated luminescence), and sediment analyses were performed in four diverse intertidal settings: back-barrier, nondeltaic interbarrier, deltaic interbarrier, and southern end barrier/recurved spit. The results were then compared to the archaeological records of these areas, noting the implication of landscape history for settlement patterns, as well as how archaeology can speak to geomorphological studies.

### BACKGROUND

The present-day Georgia coast includes barrier islands, marsh islands (also called hammocks), tidal marshes, estuaries, river channels, tidal creeks, as well as tidally influenced areas of the mainland (fig. 7.1). The initial formation of some of these features occurred during the Late Pleistocene epoch, after the height of the previous interglacial period around 125,000 B.P. As temperatures decreased and sea levels fell over the next 100,000 years, barrier island shorelines and associated back-barrier areas were created and abandoned. Beginning around 18,000 B.P., temperatures and sea levels started rising, reflooding these former shorelines and creating a complex mix of Holocene-aged features adjacent to, and on top of, Pleistocene and earlier Holocene features.

At present, the coastal mainland is made up of two of these former barrier island/back-barrier shorelines: the Pamlico shoreline complex (formed when sea level was around 7.3 m higher than at present); and the Princess Anne (formed when sea level was around 4 m higher than at present) (Hoyt and Hails, 1967: 1541) (see fig. 7.2). A former Pleistocene shoreline, known as the Silver Bluff formation, makes up part of the present-day barrier island complexes. This shoreline formed initially when sea level was 1.4 m higher than at present (Hails and Hoyt, 1969; Howard and Frey, 1985: 78). In a recent study by Booth and Rich (1999), freshwater peat from a core extracted from the Silver Bluff section of St. Catherines Island was radiocarbon dated to earlier than 40,000



Figure 7.1. Aerial photograph of the northern part of the Georgia coast, indicating the main islands discussed in chapter 7.

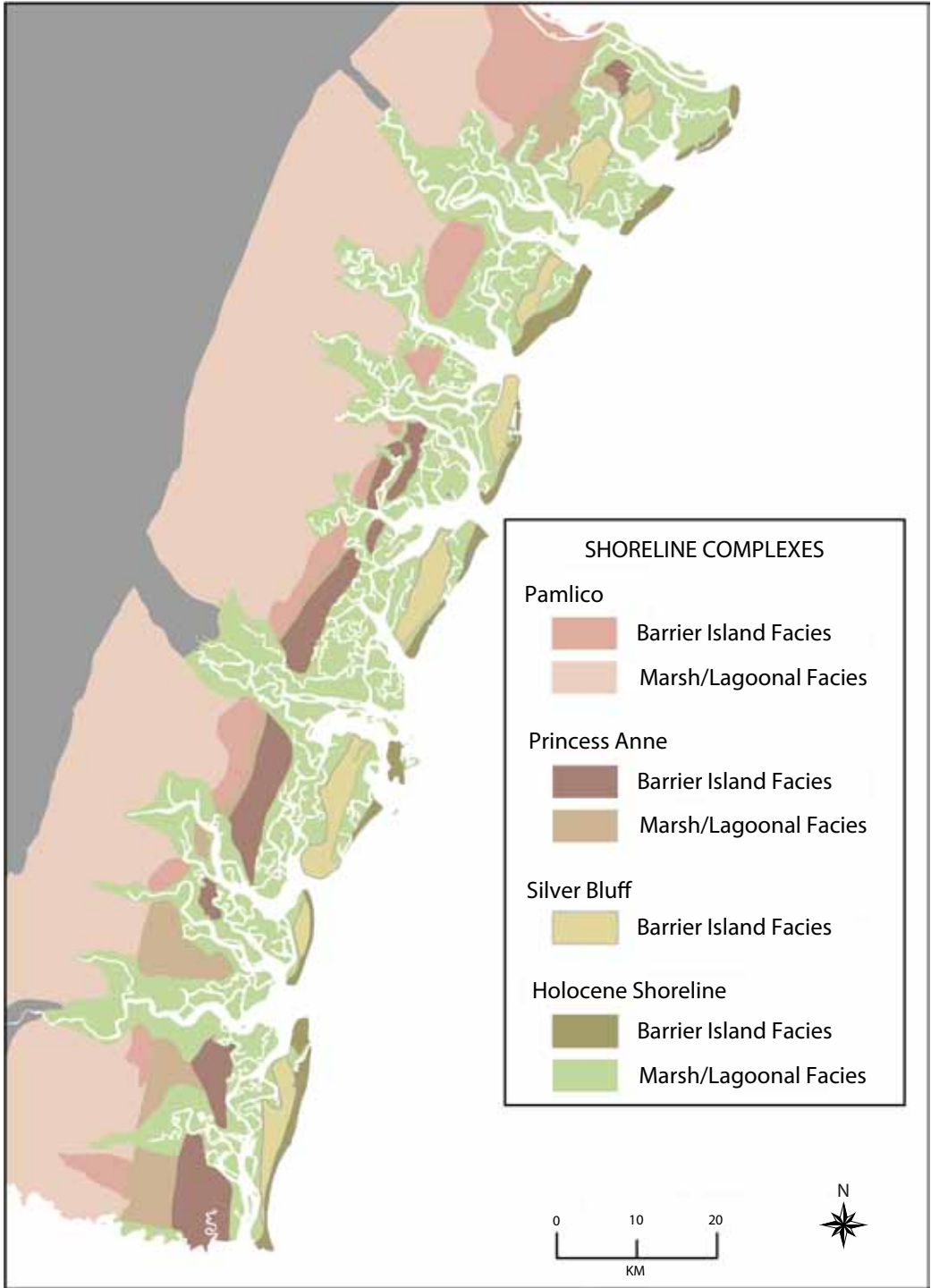


Figure 7.2. Three former shoreline complexes in relation to the present-day (Holocene) shoreline complex.

B.P. The peat was most likely deposited during a time of lowered sea level, indicating that Silver Bluff sections of the present-day barrier islands formed earlier than 40,000 B.P. (Linsley, Bishop, and Rollins, 2008). Wehmiller et al. (2004) report that the Silver Bluff islands are approximately 80,000 B.P. based on U/Th dating.

The present-day back-barrier area, then, will have a fairly complex sedimentary history. Complicating the matter further is that in any given area, some parts of the stratigraphic sequence are preserved and other parts may be missing. Howard and Frey (1985: 78) suggest that stratigraphic deposits here will follow an estuarine sequence (either riverine or salt marsh), not a lagoon-fill sequence. Basal layers will be coarser-grained, and may contain thin sequences of the offshore facies of the Pamlico and Princess Anne shorelines, or deposits of tidal inlet/tidal channel fill, etc. (Hayes et al., 1980: 289). Above this should be the Pleistocene marsh facies that formed contemporaneously with, and behind, the Silver Bluff shoreline. Lying unconformably on top of these marsh deposits should be an erosional unconformity, the evidence of subaerial exposure and terrestrial influences, as sea level remained at least 40 m lower than present levels since 80,000 B.P. (see Martinson et al., 1987). Overlying this should be Holocene marsh sedimentation from the last 4500 years. Marsh islands within the back-barrier area are assumed to be remnants of former shorelines formed sometime after the Princess Anne shoreline, but before the Silver Bluff shoreline. It is also possible that they were parts of the Princess Anne and/or Silver Bluff shorelines that have since been erosionally separated from these larger features. This, of course, excludes those marsh islands of recent historical formation created by the deposition of dredge spoil or ship ballast.

In addition to the Pleistocene-age sections of the present-day barrier islands, there are also Holocene-age beach ridge/dune complexes that formed within the last 4500 years (Hayes et al., 1980: 285). Most of these Holocene deposits are found seaward of, and in close proximity to, the Pleistocene islands. However, Tybee, Wassaw, Little St. Simons, and Sea islands are separated from their Pleistocene counterparts due to the relatively abundant sediment supply from the Savannah and Altamaha rivers (Hayes et al., 1980: 282), allowing seaward progradation of these deltaic coastlines (Hayes et al., 1980: 285).

Intertidal areas between these Pleistocene and Holocene islands have a different sedimentological history than the back-barrier areas between the Pleistocene barrier islands and the mainland, and thus will be termed Pleistocene–Holocene interbarrier areas. These interbarrier areas do not have an underlying Pleistocene marsh facies. Basal deposits typically consist of relatively coarse, Pleistocene sands, especially where marshes closely flank barrier islands (Edwards and Frey, 1977: 236; Frey and Basan, 1981: 118). Holocene marsh deposits (4500 B.P.–present) are found on top of these sands (Frey and Basan, 1981: 118). Marsh islands in interbarrier areas represent relict beach ridges and dunes and must have formed within the last 4500 years given the sea level history in the area. A recent hypothesis suggests that many of these interbarrier areas were originally inlets, but have since been abandoned after rising sea levels caused rivers to follow a more direct route (Chowns et al., 2008; Chowns, 2011).

DePratter and colleagues (DePratter, 1977a; DePratter and Howard, 1977; DePratter and Thompson, this volume, chap. 6) have used Native American ceramics to date archaeological sites, and thus date when upland landforms were present and utilized by humans. Using this technique in the deltaic Pleistocene–Holocene interbarrier area between Skidaway and Wassaw islands, DePratter (1977a) documented seaward-advancing shoreline positions dating to 1500, 1000, 675, and 100 B.P. These data revealed that this part of the coastline prograded eastward over time, with the inhabitants moving with it to access resources. Using cultural remains proved to be a valuable technique in documenting changes in coastline positions, at least for prograding coastlines. DePratter and Thompson (chap. 6) use more recent archaeological data to refine these shoreline positions, and infer the position of Holocene shorelines for the rest of the progradational portions of the Georgia coast.

## METHODS

### VIBRACORING

Numerous sediment cores from various environments along the Georgia coast were extracted and analyzed to better understand coastal evolution. In the back-barrier area behind Sapelo Island, cores were extracted from Jack Hammock, Mary Hammock, Fishing Hammock, and the ad-

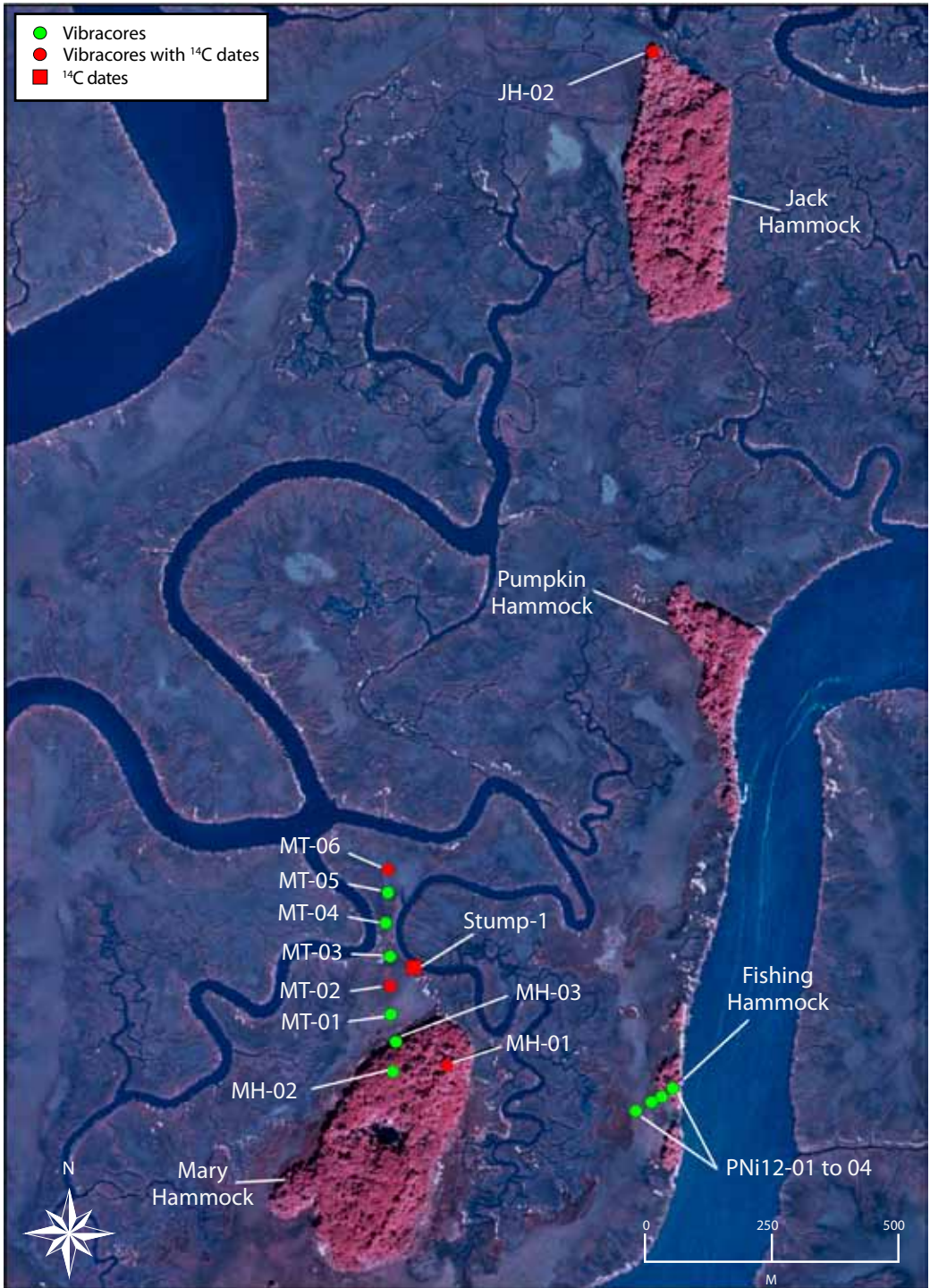


Figure 7.3. Back-barrier area between the mainland and Sapelo Island, indicating the locations of marsh islands discussed in the text as well as the locations of vibracores and <sup>14</sup>C dates.

jacent marsh (fig. 7.3). In the nondeltaic Pleistocene-Holocene interbarrier area between Sapelo and Blackbeard islands, cores were extracted along a transect that runs from the western side of the Holocene-age Bay Hammock (a landform made up of at least seven beach ridges just to the west of Blackbeard Island), into the marsh, over a small marsh island, and then into the marsh on the other side of the hammock (fig. 7.4). Cores were also collected in between Skidaway and Wassaw islands to examine coastal development in a deltaic Pleistocene-Holocene interbarrier setting (fig. 7.5). The last area of core extraction was between a Pleistocene barrier island and a Holocene accretionary recurved spit, found typically at the southern ends of barrier islands. These cores were extracted in a transect running from the southern edge of Sapelo Island, into the marsh, across a small marsh island, and into the marsh on the other side (fig. 7.6).

A vibracorer was used to collect 7.6 cm diameter core samples in aluminum barrels at all sites. The top sediment unit containing root mat (between 15 and 36 cm) was removed with a shovel or bucket auger at some locations prior to coring, to avoid increased friction and clogging in the core barrel. Before and after removal of the barrel from the ground, numerous measurements were taken (e.g., the amount of root removal, the length of core pipe sticking out of the ground, the ground surface on the inside of the core, etc.) to calculate the amount of compaction that occurred during coring. All cores were between 1.5 and 6.0 m lengths, and were cut into 1.5 m lengths and capped on site, prior to transportation to the laboratory facility.

#### CORE ANALYSIS

Cores were transported to the Applied Coastal Research Laboratory of Georgia Southern University on the campus of the Skidaway Institute of Oceanography in Savannah for analysis. Cores were split lengthwise to produce two halves: one for sampling (the working half) and one for archiving (the archive half). First, both halves of each core section were photographed to record the original core color and character. Second, X-radiographs were taken of each working half with a VR 1020 portable X-ray machine to identify discrete layers and sedimentary structures not visible to the naked eye (Edwards and Frey, 1977; Butler, 1992). This aided in sampling, and helped locate unique

items in the core (e.g., organic/carbonate material for dating, cultural remains, etc.). Cores were then described visually and subsampled for later analyses (see below). Color, texture, grain size, bioturbation, layering, and inclusions downcore were part of the visual descriptions. The archive halves of the cores were put into D-tubes and immediately refrigerated at 4°C, as were the working halves after core sampling took place.

Samples for particle size analysis were extracted from the working halves at either 10 or 20 cm intervals. The coarse fraction (i.e., grains larger than or equal to 63  $\mu\text{m}$ ) was separated from the fine fraction and dry sieved. The pipette method was performed on the fine fraction (i.e., grains smaller than 63  $\mu\text{m}$ ) to quantify the distribution of silt and clay (following Galehouse, 1971; also see Folk, 1980).

#### RADIOCARBON AND OSL DATING

As an integral part of understanding the timing of the various geomorphological changes on the coast, several dating procedures were employed. Samples for radiocarbon ( $^{14}\text{C}$ ) dating (dominantly carbonate) were collected from cores where suitable material was present. Radiocarbon samples were cleaned, dried, and analyzed by accelerator mass spectrometry (AMS) at the Woods Hole, MA NOSAMS facility, as well as the UGA Center for Applied Isotope Studies in Athens, GA. Where appropriate,  $^{14}\text{C}$  ages were calibrated using the online version of Calib 6.0. For marine samples, the  $\Delta R$  value from Thomas (2008: chap. 13, 359) of  $-134 \pm 26.0$  was applied, and calibrated using the marine calibration curve (Marine09).

No organic material was present in many of the cores, necessitating the use of another technique to provide temporal context to our core observations. Strategically located soil samples for optically stimulated luminescence (OSL) dating were collected with a hand auger from a number of locales mentioned previously, including Pleistocene and Holocene barrier islands, Holocene beach ridges, and marsh islands. OSL samples were analyzed in the lab of Dr. George Brook at the University of Georgia. To correlate these dates to the calibrated  $^{14}\text{C}$  dates (which are in years before A.D. 1950), a value of 60 years was subtracted from each of the reported OSL dates. Thus, all OSL dates reported in this paper are in relation to years before 1950.



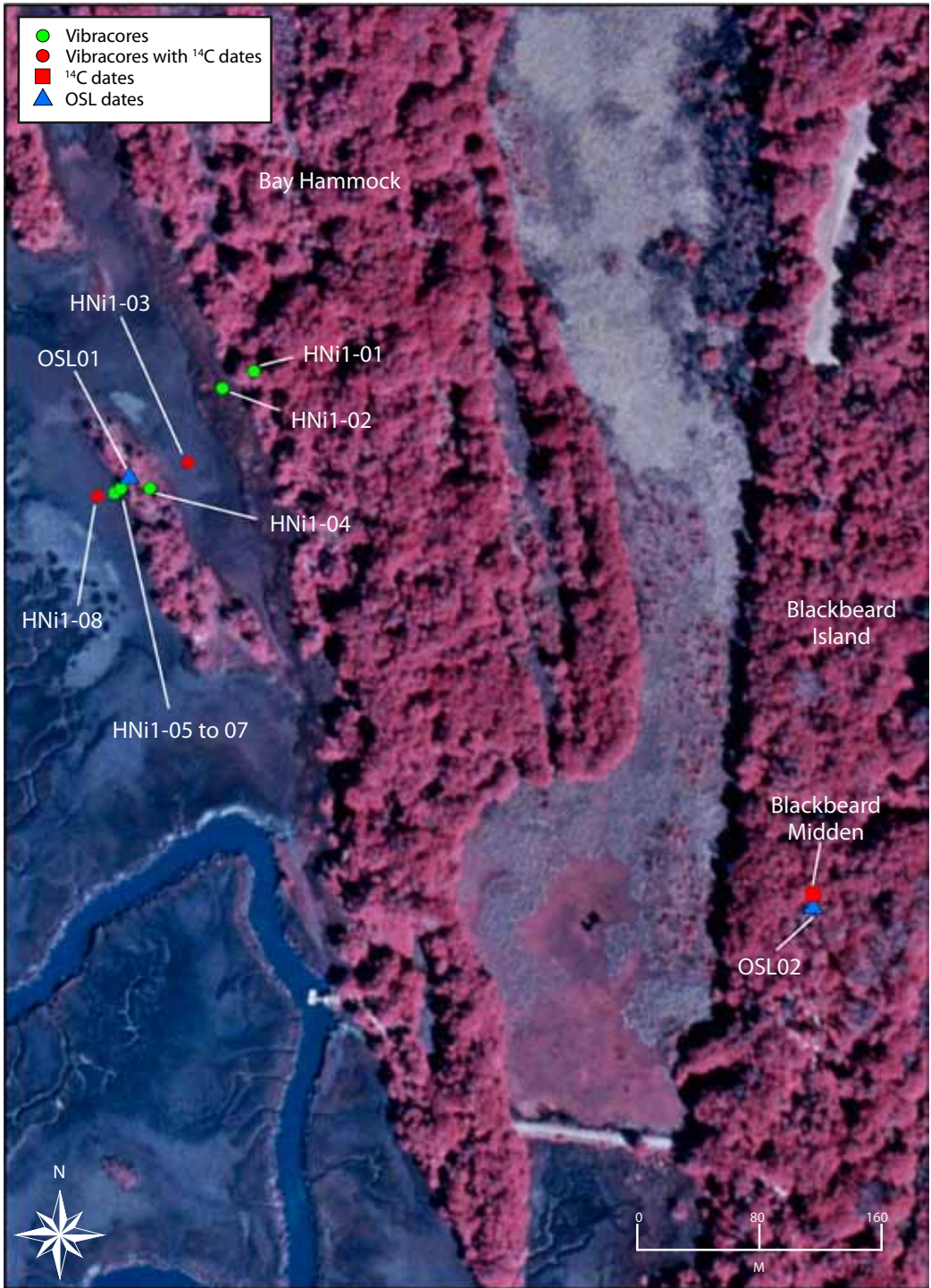


Figure 7.4. Interbarrier area between Sapelo and Blackbeard islands, indicating the locations of islands discussed in the text as well as the locations of vibracores, <sup>14</sup>C dates, and OSL dates.



Figure 7.5. Interbarrier area between Skidaway and Wassaw islands, indicating the locations of <sup>14</sup>C and OSL dates.

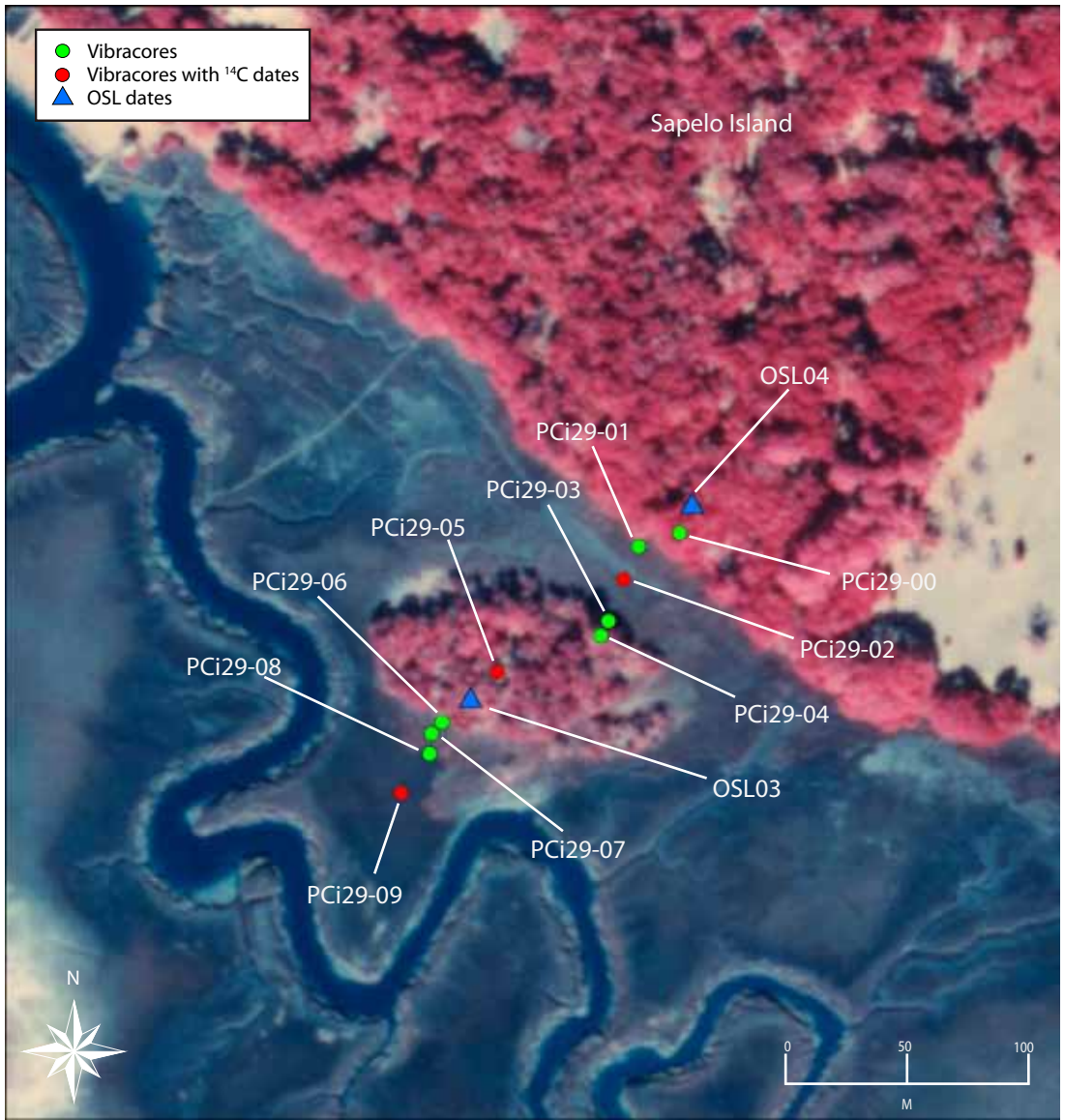


Figure 7.6. Barrier/recurved spit area off of the south end of Sapelo Island, indicating the locations of vibracores, <sup>14</sup>C dates, and OSL dates.

RESULTS

BACK-BARRIER AREA: BEHIND SAPELO ISLAND

MARSH: Visual inspection of cores from the marsh near Mary Hammock (MT-01 to 06, MH-03) and Fishing Hammock (PNi12-02 to 04) revealed three main facies (fig. 7.7). The uppermost

facies is modern marsh, which extends from the marsh surface to between 31 and 108 cm below surface (cmbs). The characteristics of this layer include a live root system (mostly of *Spartina alterniflora*, but also of *Salicornia* sp., etc.), within a soft, very dark gray or greenish gray mud (i.e., silt and clay), which becomes sandier with depth.

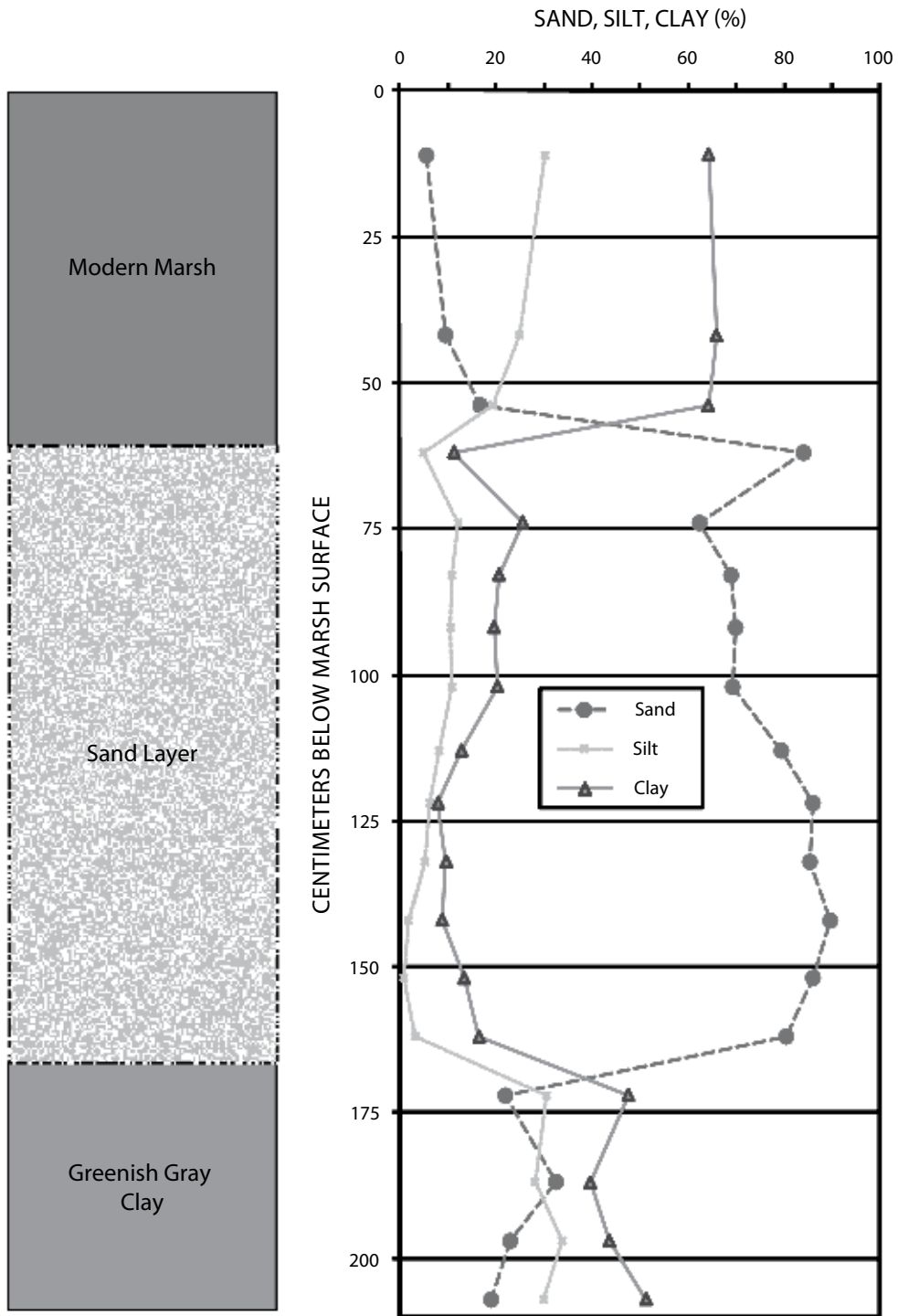


Figure 7.7. Vibracore MT-03, an example of a back-barrier marsh core.

The middle facies is made up of a very dark grayish brown to gray sandy matrix, mottled with black streaks, diffuse dark stains, and clay inclusions. In some of the cores, this sandy layer also contains very dark brown to grayish brown concretions of muddy sand. The bottom facies is a dense, overconsolidated greenish gray clay layer, which is encountered between 163 and 304 cmbs. It contains iron-rich dark yellowish brown and/or brownish yellow stains surrounding preserved root casts. In many of the cores there is a thin transitional layer, where the sandy layer overlies the greenish gray clay layer. This interface, which typically exhibits an erosional character, manifests itself as either a dark yellowish-brown iron-stained layer, or dark yellowish-brown iron-stained clasts in a gray sandy matrix.

X-radiography and particle size analyses, for the most part, confirm the findings of the visual inspection. They also revealed significant bioturbation, with varying amounts of marsh mud mixed in with the sandy layer, as well as the destruction of any physical sedimentary structures. In general, the middle sandy layers contain 70% sand or more. In the upper marsh facies and the bottom clay layer, sand percentages are less than 20%, clay content is around 60%, and silt content is typically less than 30%. More detailed analysis of the sand fraction revealed that fine sands (250–125  $\mu\text{m}$ ) make up the majority of the sand component, except within the greenish gray clay layer, which is made up of mostly very fine sands (125–64  $\mu\text{m}$ ).

The only organic materials obtained from these cores that could be used for  $^{14}\text{C}$  dating were roots and root casts (see table 7.1), which have poor, indeterminate vertical positioning. One root sample (core MT-06) obtained from within the greenish gray clay layer, about 223 cmbs, was dated to between 4972 and 4629 cal B.P. Another sample (core MT-02) obtained from the sand layer, about 162 cmbs, was dated to 2952–2792 cal B.P. As another way of dating marsh formation in the area, Turck (2011) extracted a tree stump from ~130 cm below the marsh surface, and had a sample of it (stump-1) radiocarbon-dated. The date range reported for it was between 4427 and 4247 cal B.P.

**MARSH ISLANDS (MARY, FISHING, AND JACK HAMMOCKS):** Cores from the marsh islands (MH-01 and 02, JH-02, PNi12-01) in back-barrier settings display a stratigraphy similar to the back-barrier marsh cores, but without the upper marsh

unit. Visual observations identify an upper sandy unit extending from the surface to 150–360 cmbs, underlain by the same overconsolidated clay unit observed in marsh cores. While this stratigraphy is typical, it is not always present. One core collected in this study from the eastern side of Mary Hammock (MH-01) displays a thick sequence of sandy deposits throughout its 5.25 m length, with no overconsolidated clay layer.

X-radiography and sediment texture observations show characteristics similar to the back-barrier marsh cores, with bioturbation present in the sandy unit and little preserved stratification, with the exception of heavy mineral laminae and coarser interbeds near the sand/overconsolidated clay boundary. As in the marsh, sandy sediments can be characterized as fine sands (~150  $\mu\text{m}$ , or 2.75 phi units). These are found in the upper 1.5–3.6 m, and are made up of 80% sand or more, with 10% or less of silt and clay. The overconsolidated silty clays contain <10% sand, ~65% clay, and ~25% silt with a mean size of 1–2  $\mu\text{m}$ . Textural data from samples collected with a hand auger during surveys of 20 Pleistocene Georgia back-barrier marsh islands displayed similar characteristics with an average size of 160  $\mu\text{m}$ , and average contents of 82%, 10%, and 8% of sand, clay, and silt, respectively (Alexander, 2008). Core MH-01, from the east side of Mary Hammock, displays similar sand sizes (~150  $\mu\text{m}$ ) in the upper 264 cm of the core, but below that boundary, the stratigraphy is different than that observed on other marsh islands, displaying a broad range of mean sizes (~64  $\mu\text{m}$  to ~4  $\mu\text{m}$ ) over short depth scales, common presence of mica, and concentrations of heavy minerals at the boundary between the upper and lower sand units. Radiocarbon analysis of possible marine shells (they look like *Turritella* sp.) found in this lower, distinctive sand unit at the base of core MH-01 provided ages of 49,274–46,484 cal B.P. (475 cmbs) and 43,221–41,975 cal B.P. (516 cmbs). A bulk carbon  $^{14}\text{C}$  date of the overconsolidated greenish gray clay from Jack Hammock (JH0609-02) provided an age of 9887–9520 cal B.P.

#### NONDELTAIC PLEISTOCENE-HOLOCENE INTERBARRIER AREA:

##### SAPELO-BLACKBEARD BARRIER ISLAND COMPLEX

**MARSH:** Cores within the nondeltaic Pleistocene–Holocene interbarrier marsh area (cores HNi1-02, 03, 04, 06, 07, and 08) show a consistent stratigraphy that differs from that of the

TABLE 7.1  
**Radiocarbon Dates from Various Locations on the Georgia Coast**  
 Abbreviation: cmbs = centimeters below the surface.

Lab/sample no.	Name/core no.	Provenience	cmbs	Material	$\delta^{13}\text{C}$ (‰)	Adjusted $^{14}\text{C}$ age B.P.	$^{14}\text{C}$ age B.P., calibrated ( $\pm 2\sigma$ )	Median age B.P.
UGAMS-5003	Stump-1	Marsh, by Mary Hammock	130.0	wood	-26.60	3920 $\pm$ 30	4427–4247	4357
UGAMS-5004	MT-02	Marsh, by Mary Hammock	161.5	plant frag.	-27.60	2780 $\pm$ 30	2952–2792	2878
UGAMS-5005	MT-06	Marsh, by Mary Hammock	223.0	plant frag.	-25.90	4270 $\pm$ 50	4972–4629	4843
NOSAMS-71166	OSL-07VB	Marsh island, by Skidaway	384.5	shell	-0.54	2720 $\pm$ 15	2745–2374	2595
NOSAMS-71167	OSL-08VB II	Marsh island, by Skidaway	219.5	shell	-0.9	1600 $\pm$ 15	1437–1126	1282
NOSAMS-71168	OSL-08VB III	Marsh island, by Skidaway	377.5	shell	-0.93	1580 $\pm$ 20	1404–1094	1262
NOSAMS-71163	PCi29-02	Marsh, by Sapelo	517.5	shell	0.85	38,400 $\pm$ 1100	44,369–41,070	42,647
NOSAMS-71161	PCi29-05 II	Marsh island, by Sapelo	268.0	shell	-2.36	2450 $\pm$ 20	2442–2056	2246
NOSAMS-71162	PCi29-05 III	Marsh island, by Sapelo	409.5	shell	-0.13	2360 $\pm$ 15	2318–1971	2152
NOSAMS-71164	PCi29-09	Marsh, by Sapelo	431.5	shell	-0.9	2420 $\pm$ 25	2375–2001	2215
NOSAMS-68513	Blackbeard midden	Blackbeard Island	50.0	shell	0.01	2090 $\pm$ 30	2000–1616	1820
NOSAMS-68462	HNi1-03	Marsh, by Blackbeard	437.5	shell	0.84	3690 $\pm$ 35	3976–3560	3770
NOSAMS-71165	HNi1-08 I	Marsh, by Blackbeard	99.5	shell	-4.99	3140 $\pm$ 20	3311–2904	3104
NOSAMS-68500	HNi1-08 III	Marsh, by Blackbeard	422.5	shell	0.25	3700 $\pm$ 40	3997–3561	3782
NOSAMS-74565	JH0609-02	Jack Hammock	212.0	bulk sed.	-24.95	8650 $\pm$ 70	9887–9520	9626
NOSAMS-74484	MH-01 III	Mary Hammock	474.5	shell	-1.23	45,000 $\pm$ 440	49,274–46,484	47,870
NOSAMS-74485	MH-01 IV	Mary Hammock	515.5	shell	0.2	38,400 $\pm$ 410	43,221–41,975	42,592
UGAMS-R50537	Bethesda Shoreline A	Mainland, by Skidaway	150.0	shell	0.19	39,317 $\pm$ 185	43,728–42,757	43,211
UGAMS-R50537B	Bethesda Shoreline B	Mainland, by Skidaway	150.0	shell	0.06	41,572 $\pm$ 412	45,602–44,289	44,922

back-barrier marsh. In all these cores, the upper unit (~100–175 cm thick) is a mixture of sand and varying amounts of mud, and exhibits coarsening with depth (see fig. 7.8). Cores on the fringes of the marsh have less mud content, and those in the middle of the marsh have more. Black staining and streaks, along with mud inclusions is also common. Below the sandy layer, all marsh cores exhibit a rapid transition to normally consolidated, Holocene muds. This grades downward into interbedded sands and muds. This is significantly different from cores from the back-barrier areas, where overlying sands transition rapidly into overconsolidated, Pleistocene muds (i.e., the greenish gray clay layer), below which we have not been able to penetrate.

Textural and X-radiographic data illustrate that the grain sizes and sedimentary structures observed in the nondeltaic Pleistocene–Holocene interbarrier marsh cores are actually fairly similar to that observed in the back-barrier marsh cores. Bioturbation is common in the upper unit, destroying sedimentary structures, whereas the fine-grained deposits below contain relict roots and inclusions of black organics. Grain sizes in the upper and lower units are similar to those in the back-barrier setting as well. The upper unit contains fine sands (~150  $\mu\text{m}$  or 2.75 phi units), with slightly less mud observed (approximately 95–90% sand). The normally consolidated muds in the lower unit are silty clays with a mean size of 1–2  $\mu\text{m}$ , and typically contain <5% sand, ~75% clay, and ~15% silt. The interbedded sands and muds exhibit variable mean grain sizes between 64 and 300  $\mu\text{m}$ , and with 99–25% sand, 40–2% clay, and 7–1% silt. X-radiographs illustrate that the interface between the overlying sands and the underlying muddy deposits is erosional and that the interbedded sands and muds are cross-stratified and preserve graded bedding.

Radiocarbon dates from shell material in two cores in this region provide three ages that constrain the formation of the marsh. In core HNi1-03, a  $^{14}\text{C}$  age of 3976–3560 cal B.P. was determined in the lower part of the interbedded sands and muds near the base of the core at 438 cmbs. In core HNi1-08, a  $^{14}\text{C}$  age of 3997–3561 cal B.P. (sample HNi1-08 III) was determined in similar interbedded sands and muds at 423 cmbs. Higher up in this same core (at 99.5 cmbs), a  $^{14}\text{C}$  age of 3311–2904 cal B.P. (sample HNi1-08 I) was determined at the transition from the sandy mud layer to the consolidated Holocene mud layer.

These ages constrain the initial development of Holocene marsh in the nondeltaic interbarrier area to after 3560 B.P., but prior to 2900 B.P.

**MARSH ISLAND (HNi1):** The single marsh island core (HNi1-05) within the nondeltaic Pleistocene–Holocene interbarrier area exhibits a sandy upper unit about 265 cm thick. This unit overlies the same Holocene mud and interbedded sand and mud units described for the above marsh cores. The only significant stratigraphic difference is the additional thickness (~100 cm) of the overlying sandy unit, and the bedded, coarser sediments at the boundary between the upper (sandy) and middle (muddy) units.

Textural analysis shows that the upper sandy unit contains 97–100% sand, 0–2% clay, and 0–1% silt. It also indicates similar characteristics in the surrounding marsh cores (HNi1-01 to 04, and 06 to 08), exhibiting fine sands in most of the unit (~150  $\mu\text{m}$ , or 2.75 phi units). The lowermost 50 cm of the unit coarsens significantly, from fine to coarse sand (~1000  $\mu\text{m}$ ) and exhibits obvious, well-preserved graded bedding. Textural data from samples collected with a hand auger during surveys of five Holocene marsh islands in a Pleistocene–Holocene interbarrier setting displayed similar characteristics with an average size of 190  $\mu\text{m}$  and average sand, clay, and silt contents of 98%, 1%, and 1%, respectively (Alexander, 2008). X-radiographs highlight the obviously energetic zone between the overlying sand and the underlying mud by exhibiting the cross-bedded internal structure of the coarser layers, as well as the rough, erosive nature of the sand/mud interface.

One OSL date from this island (sample OSL01), collected from the sandy layer (~116 cmbs), provides a date range between 6240 and 4440 B.P. (see table 7.2). As mentioned above, the  $^{14}\text{C}$  method revealed that the underlying Holocene mud unit began forming between 3560 and 3311 cal B.P. The resulting age ranges from these two methods are not only out of sequence, they do not even overlap. This issue will be discussed later and requires further examination.

**Holocene Barrier Island (Blackbeard):** Two samples from a sandy beach ridge on the westernmost side of Blackbeard Island provide independent estimates of the island's initial formation. One sample (OSL02) from 135 cmbs was determined to have an age range of 1340–1140 B.P. using the OSL method. The other sample (Blackbeard midden) was an oyster shell

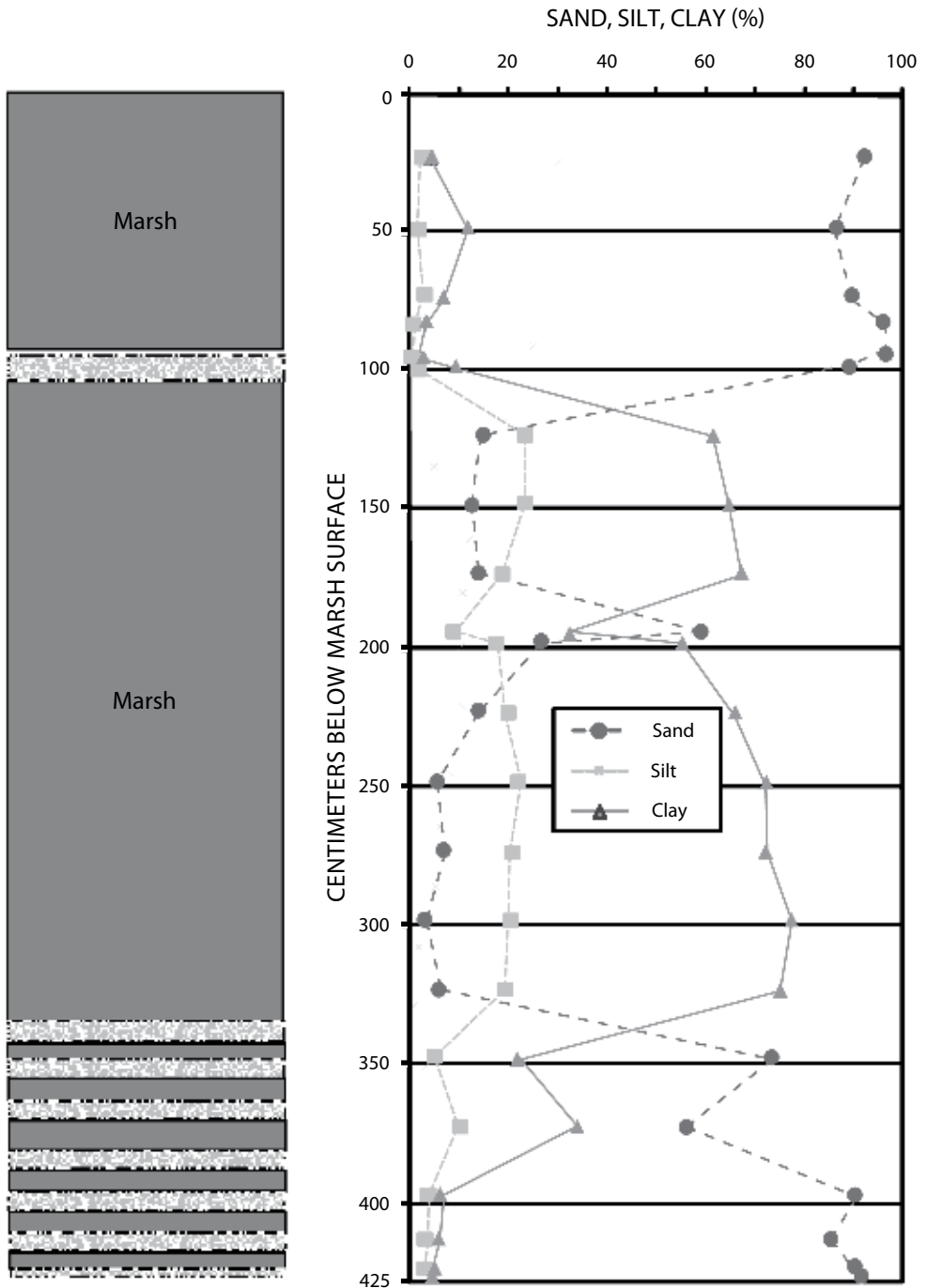


Figure 7.8. Vibracore HNi1-08, an example of an interbarrier marsh core.



from a shell midden approximately 50 cmbs. The  $^{14}\text{C}$  method returned an age of 2000–1616 cal B.P. Similar to the abovementioned Holocene marsh island, there is a slight discrepancy between the OSL and  $^{14}\text{C}$  dates. However, in this case, the  $^{14}\text{C}$  date is older than the OSL date. There is also the added variable that this shell is from a cultural deposit. Again, this issue will be discussed later.

#### DELTAIC PLEISTOCENE-HOLOCENE

##### INTERBARRIER AREA:

##### SKIDAWAY-WASSAW BARRIER ISLAND COMPLEX

MARSH ISLANDS AND BARRIER ISLANDS: Four vibracores (OSL 7VA, 7VB, 8VA, and 8VB) and five auger cores (OSL07 through 011) were col-

lected from marsh islands between Skidaway and Wassaw islands, and from the west side of Wassaw Island to examine the accuracy of the dating methodology of DePratter (1977a). In general, these marsh islands consist of a sandy unit up to 5 m thick, with one or two finer, isolated units contained within this sandy unit. Textural analyses for cores show that sediments are clean, fine sands ( $\sim 150\ \mu\text{m}$ ), with 99–92% sand and 4–1% clay and silt. A few muddy interbeds were also noted in the cores. These layers are texturally varied, and consist of 64–7% sand, 61–21% clay, and 32–15% silt. Textural data from 15 other marsh islands in the deltaic interbarrier area that were collected with a hand auger displayed

TABLE 7.2  
**Optically Stimulated Luminescence Dates  
from Various Locations on the Georgia Coast**  
Abbreviation: cmbs = centimeters below the surface.

Lab/sample no.	Name	Provenience	cmbs	Material	Years ago	Age B.P. (years before 1950) <sup>a</sup>	Age range B.P.
UGA08OSL-593	OSL01	Marsh island, by Blackbeard	115.5	quartz	5400 $\pm$ 900	5340	6240–4440
UGA08OSL-592	OSL02	Blackbeard Island	134.5	quartz	1300 $\pm$ 100	1240	1340–1140
UGA08OSL-594	OSL03	Marsh island, by Sapelo Island	82.0	quartz	2200 $\pm$ 300	2140	2440–1840
UGA08OSL-595	OSL04	Sapelo Island, south end	149.5	quartz	56,400 $\pm$ 9000	56,340	65,340– 47,340
UGA02OSL	SK-03	Mainland	500.0	quartz	62,600 $\pm$ 13,000	62,540	75,540– 49,540
UGA02OSL	SK-05B	Skidaway Island, south end	117.5	quartz	46,500 $\pm$ 9800	46,440	56,240– 36,640
UGA02OSL	SK-06B	Skidaway Island, south end	117.5	quartz	45,800 $\pm$ 10,200	45,740	55,940– 35,540
UGA03OSL	OSL07	Marsh island, near Skidaway	115.0	quartz	1556 $\pm$ 220	1496	1716–1276
UGA03OSL	OSL08	Marsh island, near Skidaway	115.0	quartz	925 $\pm$ 100	865	965–765
UGA03OSL	OSL09	Marsh island, near Skidaway	85.0	quartz	528 $\pm$ 50	468	518–418
UGA03OSL	OSL010	Wassaw Island, western side	115.0	quartz	389 $\pm$ 60	329	389–269
UGA03OSL	OSL011	Wassaw Island, south end	115.0	quartz	135 $\pm$ 20	75	95–55

<sup>a</sup> To correlate the OSL dates to the calibrated radiocarbon dates, 60 years were subtracted from the reported OSL date.

similar characteristics. The average grain size is 19  $\mu\text{m}$ , with average sand, clay, and silt contents of 98%, 1%, and 1%, respectively (Alexander, 2008). The stratigraphy observed in all of these cores is very similar to what was documented in the cores from the marsh islands in the nondeltaic interbarrier area (discussed in the previous section). In terms of depositional units, then, the data provided by these cores are consistent and comparable.

Two OSL samples from the Silver Bluff-age Skidaway Island, SK-05B and SK-06B, returned ages of 46,440 and 45,740 B.P., respectively. These constrain the age of the last active period for geomorphologic change on Skidaway Island. Moving eastward from Skidaway, five OSL ages were produced from auger cores OSL07 through 011 on two marsh islands and Wassaw Island (fig. 7.9). Core OSL07, on DePratter's (1977a) 1500 B.P. line, returned an OSL age of  $1496 \pm 220$  B.P. Core OSL08, just east of the 1000 B.P. line, provided an OSL age of  $865 \pm 100$  B.P. Core OSL09, on the 675 B.P. line, returned an age of  $468 \pm 50$  B.P. Core OSL010, on the western edge of Wassaw Island just east of the 675 B.P. line, returned an age of  $329 \pm 60$  B.P. Finally, Core OSL011, east of the 675 B.P. line, and west of the 100 B.P. line, returned an age of  $75 \pm 20$  B.P. A second set of dates was produced using the  $^{14}\text{C}$  method from two of these OSL sampling sites, to independently check the dating of this area. A date of 2745–2374 cal B.P. (sample OSL-07VB) was produced from shell about 385 cmbs, from the same site as OSL07. Two  $^{14}\text{C}$  dates were produced from the same site as OSL08. A date of 1437–1126 cal B.P. (sample OSL-08VB II) was produced from shell about 220 cmbs, while a date of 1404–1094 cal B.P. (sample OSL-08VB III) was produced from shell at 378 cmbs.

PLEISTOCENE BARRIER/HOLOCENE RECURVED  
SPIT SETTING:

SOUTHERN END OF SAPELO ISLAND

PLEISTOCENE BARRIER ISLAND (SAPELO): The core from Sapelo Island (PCi29-00) exhibited only sandy sediments throughout its 250 cm length. Textural data show that the upper few meters of this core are similar to that observed in other cores throughout this study: fine sand with a mean size of  $\sim 150 \mu\text{m}$ . The lower meter of this core coarsens to a medium sand ( $\sim 300 \mu\text{m}$ ). An OSL date from 150 cmbs returned an age of  $56,340 \pm 9000$  B.P. (sample OSL04).

MARSH: Cores from the marsh (PCi29-01 to 04, and 06 to 09) have highly variable stratigraphy. Along the island fringe, cores (PCi29-04, 06, 07, and 08) have stratigraphy similar to back-barrier and interbarrier areas. Upper sand units are 125–260 cm thick, made up of fine sands with a mean size of  $\sim 150 \mu\text{m}$ . Sands become finer with depth. Sand composes more than 93% of the sediments in these cores.

Cores farther out into the marsh (PCi29-01 to 03, and 09), farther from the island fringe, do not exhibit similar characteristics to the other cores examined in this study. Changes in texture occur relatively quickly, on length scales of 10–25 cm. The grain size changes are large as well. Mean grain sizes range from 1–700  $\mu\text{m}$  over length scales of tens of centimeters. In addition, homogeneous beds intercalated with interbedded sands and muds were found in these cores. This sedimentological character is not similar to the other marsh cores examined in this study, and highlights the dynamic nature of the sound margin environment. Two  $^{14}\text{C}$  ages were determined from two of these marsh cores. A date of 44,369–41,070 cal B.P. (PCi29-02) was produced from shell at about 518 cmbs. A date of 2375–2001 cal B.P. (PCi29-09) was produced from shell at about 432 cmbs. Once again, this discrepancy in dates will be addressed below.

MARSH ISLAND (PCi29): One core was extracted from the marsh island (PCi29-05). This core exhibits a distinct stratigraphy that again accentuates the dynamics of the sound margin environment. In addition, the sediments in this core are the coarsest observed in this study. Textural analyses show that the upper unit is about 100 cm thick and made up of fine sands of  $\sim 150 \mu\text{m}$ . Sediments coarsen to  $\sim 1000 \mu\text{m}$ , exhibiting interbedded medium and coarse sands between 125 and 250 cmbs. Below 250 cm, sediments span a range of sizes (2–64  $\mu\text{m}$ ) and occur as interbedded sands and muds, as well as thick beds of mixed sand and mud. X-radiographs show well-preserved sedimentary structures, including cross-bedding, graded bedding, erosional truncations of strata, and concentrations of shells.

Three dates were determined from this island core. One  $^{14}\text{C}$  age of 2318–1971 cal B.P. (PCi29-05 III) was determined at 410 cmbs. Another  $^{14}\text{C}$  age of 2442–2056 cal B.P. (PCi29-05 II) was determined higher up in the core, at 268 cmbs. An OSL date range of 2440–1840 B.P. (OSL03) was determined at this same site, at about 82 cmbs.

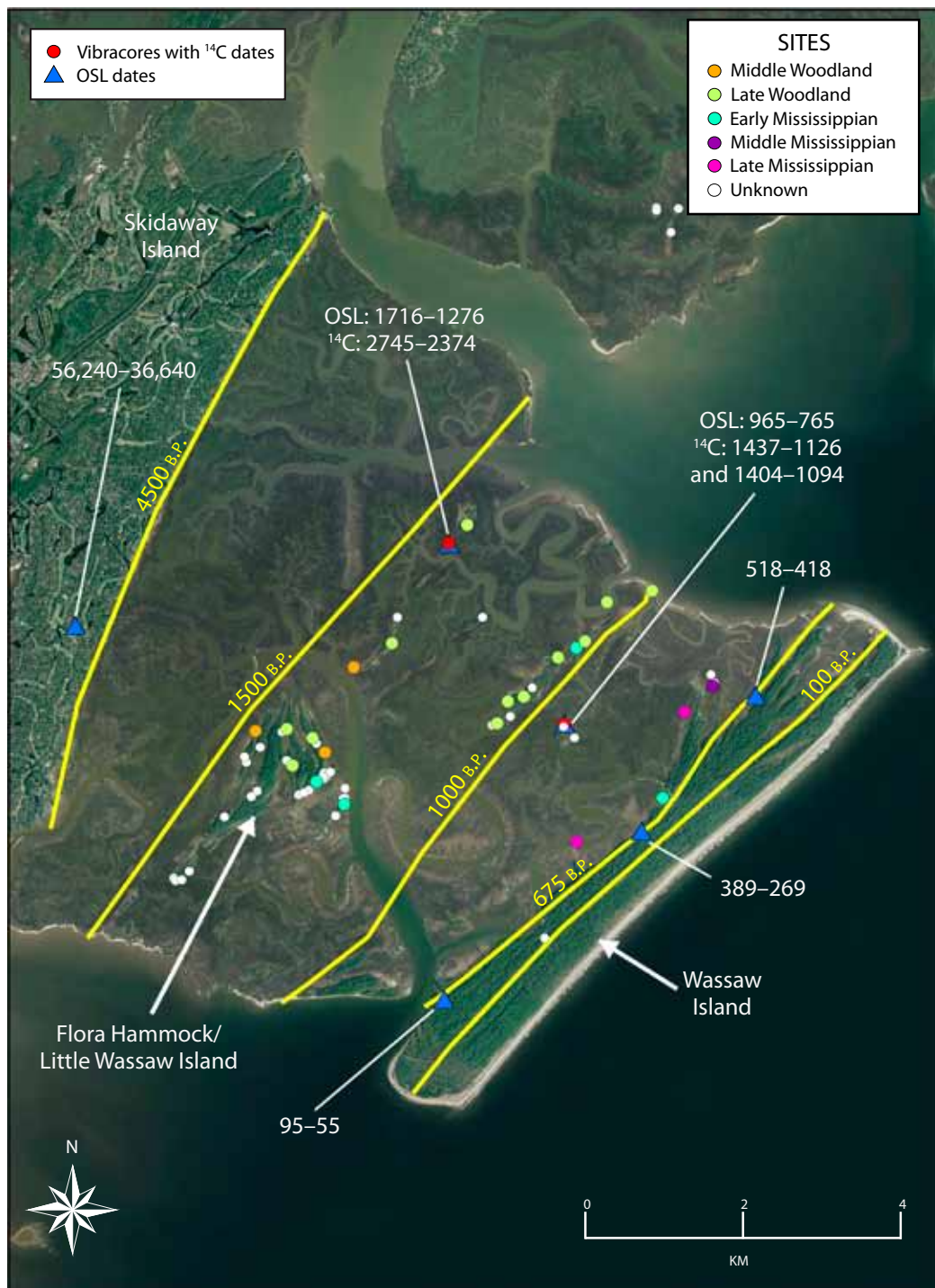


Figure 7.9. Details of the Skidaway-Wassaw interbarrier area showing the locations of the OSL and <sup>14</sup>C dates in relation to DePratter's (1977) shorelines and known (as of 2010) archaeological sites.

## DISCUSSION

### BACK-BARRIER AREA

Positing that the back-barrier area behind Sapelo Island had a fairly complex sedimentary history proved to be an understatement. The overconsolidated greenish gray clay layer found at the bottom of all but one of the cores from the back-barrier region may represent a relict Pleistocene marsh or other estuarine setting, deposited behind the Silver Bluff shoreline after it formed. The Holocene age of 4972–4629 cal B.P. (sample MT-06) can be discounted, due to the nature of the preserved root casts within this clay layer. These root casts represent plants that were living on a surface higher in the core than the level where the sample was obtained, representing young carbon contamination. The living surface of the plants was most likely in the sandy layer, above the greenish gray clay layer. Direct dating of the root (sample MT-06) only revealed that the greenish gray clay layer is older than 4629 cal B.P. This carbon contamination problem also affected the bulk carbon measured in the sample from Jack Hammock (sample JH0609-02). The age of 9887–9520 cal B.P. was also obtained with some organic material from root casts. A similarly compacted blue-green clay layer was found in the back-barrier area of Virginia (Finkelstein and Ferland, 1987: 149). Sandy peat underneath that clay layer has  $^{14}\text{C}$  dates of 23,550 and 30,870 B.P. (Finkelstein and Ferland, 1987: 147 and 151), suggesting that this type of layer is much older.

The sandy layer in between the Holocene marsh layer and the overconsolidated greenish gray clay layer most likely represents the former upland surface that was exposed prior to Holocene marsh deposition (Turck, 2011). The  $^{14}\text{C}$  date for the stump reveals a terminal date of 4427–4247 cal B.P. for this sandy layer, suggesting that saline conditions increased, and possible marsh formation occurred, in the vicinity of Mary Hammock at this time. The elevation of the tree (~130 cmbs) correlates well to the height of sea level at 4200 B.P. (see Turck, 2011: 132–133) as proposed by DePratter and Howard (1981) and Gayes et al. (1992).

The  $^{14}\text{C}$  determinations reported in this chapter for Mary Hammock are Pleistocene in age (MH-01 III and IV) and are found within probable intertidal channel deposits. That these dates were obtained from what look like marine shells is confusing. If they are indeed marine in origin,

they may have eroded from earlier deposits into these deposits by tidal channel migration during the Holocene and may not be related to the formation of the marsh island. The only other date for back-barrier marsh islands in this area comes from shell collected from a “core hole” on Pumpkin Hammock (Hoyt, Henry, and Weimer, 1968: 385–386). Results from this shell support the older ages for the shells from Mary Hammock, as this shell had a finite age of >38,500 B.P. derived using an older, less sensitive  $^{14}\text{C}$  dating technique (Hoyt, Henry, and Weimer, 1968: 385–386).

From our current set of observations near Sapelo Island, it appears that most of the back-barrier marsh islands may be perched atop relict Pleistocene muds, indicating that the marsh islands formed after the Silver Bluff shoreline and after the formation of the marsh behind the Silver Bluff shoreline. If true, this indicates that the surface expression of these marsh islands does not represent erosional remnants of former Pleistocene shorelines. One possible explanation is that marsh islands represent features that were created by sea levels that were higher than present-day levels, sometime after the Silver Bluff highstand, but before 4500 B.P.

Another explanation is that these marsh islands did form before the Silver Bluff shoreline, but had a smaller area and were higher in elevation at the time. After the formation of the Silver Bluff shoreline and subsequent marsh deposition around these existing uplands, erosion deflated the marsh islands, and spread their sand on top of the Silver Bluff marsh. Thus, the original interface between the marsh and the island edge may be much closer to the center of the islands than the position of the present-day island edge. This premise could be tested with a series of closely spaced cores from the edge to the center of one of the back-barrier marsh islands, and/or with the use of geophysical techniques. It is also possible that the bottom clay layer does not represent relict Pleistocene marsh, another premise that needs to be tested.

As far as human settlement patterns are concerned, shovel test surveys of back-barrier marsh islands (Little Sapelo Island, Pumpkin Hammock, Mary Hammock, and Patterson Island; see Thompson and Turck, 2010; Turck, 2011; Thompson, Turck, and DePratter, 2013), as well as a shoreline survey of Jack Hammock by DePratter (Georgia Archaeological Site File database), reveal that Native American occupations

basically span from 4200 to 250 B.P. (i.e., the Late Archaic through historic contact periods). That the earliest human occupation of these marsh islands began around 4200 B.P. seems to confirm the idea that these islands formed more recently. However, this pattern is typical of most of the Georgia coast. There are very few sites that date prior to 4500 B.P. (i.e., during the Paleo-Indian, Early Archaic, and Middle Archaic time periods) on landforms of any age (see Turck, Williams, and Chamblee, 2011). This is related, in part, to assumed lower population levels, to the lack of site visibility (e.g., no pottery or shell deposition occurred during these earlier periods), and to formation processes (e.g., possibly deeply buried sites). The 4427–4247 cal B.P. date range from the tree stump (Stump-1), indicating the time of initial flooding of the back-barrier upland by marine waters and initiation of marsh formation, lends support to the idea that coastal Late Archaic populations were tied closely to the establishment of the marsh-estuarine system. (Although, see Turck, 2012, for a discussion on the potential for Middle Archaic period marsh formation and its implication for Late Archaic period settlement.)

#### NONDELTAIC INTERBARRIER AREA

Holocene marsh formation first occurred in the area between Sapelo and Blackbeard islands sometime after 3560 cal B.P. up until about 2900 cal B.P. These underlying salt marsh deposits exhibit the expected transition from interbedded sand and mud representing tidal channel deposits to more homogeneous, bioturbated, overlying salt marsh silts and clays. This suggests that a Holocene barrier formed by 3560 B.P., protecting the area from wave action. This same marsh deposit can be traced stratigraphically in cores underneath the marsh island and the widespread upper sandy unit, suggesting that the island formed after the marsh. It is probable that energetic forces (e.g., storms or hurricanes) created an erosional unconformity on the marsh surface as they transported sand back onto the marsh, forming the island. It is also important to note that the timing of this unconformity (somewhere around 3311–2904 B.P.) is close in time to the drop/rise in sea level noted by DePratter and Howard (1981) and Gayes et al. (1992) (also see Turck, 2011: 13–14 for discussion). Since that time, the sandy layer has been capped by encroaching marsh and tidal waters, transporting in muddy sediment that has since bioturbated down

into the sandy unit. The marsh island probably formed around 2904 cal B.P. (sample HNi1-08 I), which is the age at the base of the widespread sandy unit that truncates and caps the underlying salt marsh deposits. The older date (6240–4440 B.P.) for the island itself (sample OSL01), probably results from the observed presence of storm-derived, heavy mineral concentrates in the core, which have been shown to affect age calculations using the OSL technique.

While there is no evidence of human occupation on this particular marsh island, there are multiple archaeological sites on marsh islands directly to the north, as well as on Bay Hammock and Blackbeard Island to the east. Surveys by DePratter (1977a) and Marrinan (1980) on these nearby landforms revealed 39 sites with 51 components, none of which date to before 1500 B.P. (i.e., before the Late Woodland period). An OSL date of 1340–1140 B.P. (sample OSL02), and a  $^{14}\text{C}$  determination of 2000–1616 cal B.P. (Blackbeard midden) from the same sampling site on the western edge of Blackbeard Island are consistent with the archaeological data. The  $^{14}\text{C}$  date was obtained from an oyster shell from a human-deposited shell midden, so it is not surprising that this date corresponds with the archaeology. The OSL date, from 135 cmbs, reveals the age of the dune ridge formation itself.

#### DELTAIC INTERBARRIER AREA

The OSL and  $^{14}\text{C}$  dates between Skidaway and Wassaw islands, for the most part, support the technique of using Native American and historic ceramics to date shoreline positions (DePratter, 1977a; DePratter and Howard, 1977). There is general agreement between the archaeology-based timelines and the OSL samples on the marsh islands between Wassaw and Skidaway islands. However, the youngest archaeology-based shorelines proposed for Wassaw Island do not agree with the OSL constrained ages, which are consistent with historical records of shoreline position from old maps and charts.

Part of this discrepancy may be due to the fact that the shoreline dates are uncalibrated, making the comparison tenuous. However, this discrepancy also reveals the problem with only using archaeological data to interpret sea level history. The geomorphology of the beach ridges of Wassaw Island, in conjunction with the OSL dates reported here, indicate the island has been eroding on its north end and accreting toward the

south for the past 300–500 years, thus showing that the island gets younger from north to south. The lack of dated archaeological sites on Wasaw Island makes it difficult, if not impossible, to locate former shorelines without taking into account such geologic information. This also underscores the need for thorough archaeological surveys. Without such surveys, the proper data needed for this technique to work will not be available. For example, a lack of sites noted in an area might be due to a lack of archaeological survey, not necessarily to the formation processes of the landforms.

DePratter and Thompson (this volume, chap. 6) offer more refined shoreline positions based on recent archaeological data, removing the 1500 B.P. shoreline and adding a 1400 B.P. shoreline to the east of Flora Hammock. This shoreline incorporates the Middle Woodland sites found on Flora Hammock, and fits better with the OSL (1716–1276 B.P.) and  $^{14}\text{C}$  (2745–2374 cal B.P.) age ranges (fig. 7.9). Although there were discrepancies between the  $^{14}\text{C}$  date and the OSL dates, the samples for  $^{14}\text{C}$  dating were found between 1.0 and 2.7 m deeper than the OSL samples. Deeper stratigraphic locations represent older surfaces, and thus older dates are expected. The transition from subtidal to intertidal to supratidal should be recorded by the sediment record, with the superposition of multiple features reflecting different sea levels.

The  $^{14}\text{C}$  dates (1437–1126 and 1404–1094 cal B.P.) just to the east of the 1000 B.P. shoreline are more difficult to interpret. It is possible that the 1000 B.P. shoreline should be moved eastward of the marsh island with these older dates. However, the  $^{14}\text{C}$  samples are from fairly deep below the feature (220 and 378 cmbs, respectively), and represent surfaces that would have been intertidal or below sea level at that time. Archaeological sites have been found on this marsh island, but were not dated (DePratter, 1977a: 16), indicating that more detailed archaeological and geomorphological studies need to be performed on this island.

#### BARRIER/RECURVED SPIT SETTING

The cores extracted from this area illustrate the dynamic nature of the inlet/sound environment, and contrast sharply with the cores from the back-barrier, nondeltaic, and deltaic areas. The upper deposits on Sapelo Island formed between 65,340 and 47,340 B.P. (OSL04). Well-pre-

served sedimentary structures found in the marsh and marsh island cores, including cross-bedding, graded bedding, erosional truncations of strata, and concentrations of shells, all suggest that sediments accumulated relatively rapidly, and that an energetic environment prevailed at the site during the initial formation of the marsh island (PCi29). Although at present Doboy Sound is about 925 m away, this location was an active sound margin in the past. While the dates for the marsh island (samples OSL03, PCi29-05 II, and PCi29-05 III) and the marsh (sample PCi29-09) are slightly out of sequence, their ranges overlap considerably, showing strong coherence. All four dates overlap within the range of 2318–2056 B.P., indicating that the area went from an active inlet to a protected marsh setting fairly rapidly (in a little more than 250 years). The 42,647 cal B.P.  $^{14}\text{C}$  age from deep in the marsh (core PCi29-02) is anomalous and represents an old shell, remobilized from Pleistocene deposits. The textural data indicate that Doboy Sound was directly adjacent to the southern edge of Sapelo Island at this time—such coarse sediments are not found along the beaches or other back-barrier islands.

The marsh island at this location was initially thought to be Pleistocene in age and to have potentially been a section of Sapelo Island, based on its proximity and its roughly circular nature. Holocene hammocks are typically elongate in character. Under this scenario, rising sea levels would have isolated the landform, and eventually filled the intervening areas with marsh sediment. The dating, as well as the archaeology, refuted this idea. While no formal archaeological survey has been performed on this marsh island (site 9Mc495), Turck and Thompson have performed two informal pedestrian surveys in conjunction with the coring activities reported in this chapter. The earliest occupation seems to be around 1500–1000 B.P. (i.e., Wilmington cord-marked pottery was noted), although shovel testing and/or excavation could reveal an earlier occupation. These documented ages coincide with the OSL and  $^{14}\text{C}$  dates for the island, and show the utilization of the upland surface soon after it was created.

#### CONCLUDING REMARKS

This chapter reveals that processes are not always consistent in a dynamic landscape. This inconsistency highlights the many difficulties

encountered in generalizing changes in coastal landforms. Back-barrier marsh islands might not be remnants of former Pleistocene shorelines. Reworking of sediment and transport onto previously formed surfaces might describe more landform formation than once thought. Despite a close proximity to Pleistocene barrier islands, marsh islands can date to much more recent times. In short, the timing of landform creation cannot be estimated based solely on the position of that landform on the landscape. One implication for archaeology, then, is that different geological and geomorphological processes occurred within close proximity of each other on the landscape, allowing for a range of environments from which humans could choose when settling the coast. In addition, this study reveals that the timing of the human occupation of a landform should not be assumed without some form of archaeological ground-truthing (i.e., survey or excavation). As Turck (2011: 210–211) notes, each specific environment/habitat of the Georgia coast needs to be treated separately, and characterized both environmentally and archaeologically. Deltaic, nondeltaic, barrier, back-barrier, inter-barrier, mainland, island, marsh, Pleistocene, Holocene, etc., are all characteristics that inform us of the environmental processes that formed the landscape. They are also variables related to how the landscape was affected by environmental changes over time (especially changes in sea level). Only after each landform is characterized, including their geomorphological changes over time, can we appreciate any subtle changes in human settlement and subsistence patterns that may be manifest on those landforms and begin to better understand the timing of (and reasons for) those patterns (Turck, 2011: 211).

This chapter also corroborated what others have noted previously, namely that the archaeological record can be used to effectively date landforms (DePratter, 1977a; DePratter and Howard, 1977; DePratter and Thompson, this volume, chap. 6). Our observations also corroborate an important aspect of human settlement patterns that has been noted before: coastal landforms were rapidly utilized by humans soon after the landforms developed (DePratter, 1977a; DePratter and Howard, 1977; also see Thompson, Turck,

and DePratter, 2013). This continuity between landform development and utilization illustrates that archaeological studies of an area can be as good as radiometric dating at revealing the ages of landscapes, as long as pertinent geological and site formation processes are also considered. In addition, while surface surveys worked particularly well in areas of rapidly moving coastlines (DePratter and Howard, 1977), we suggest that subsurface surveys should be employed in areas where landform creation is slower and where there is currently no obvious erosion. This will allow deeper, unexposed, and possibly older, archaeological deposits to be found that might not be manifest on the surface.

One final point to be made is of the complementary nature of archaeological, geological, and geomorphological techniques. Although this chapter reveals how each can inform the others, it must be stressed that they are directly complementary and must be used together to best enhance interpretations. Comparison of the OSL dates from the Skidaway-Wassaw area with the shoreline ages proposed by DePratter (1977a) for the same area shows that geological, as well as archaeological, knowledge must be employed to get the most accurate estimates of former shoreline position and age. Together, these techniques can be used to understand processes that are not straightforward in either field individually, avoid circular arguments, and add a human dimension to physical landscape change.

## NOTES

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CHAPTER 8  
THE ROLE OF SMALL ISLANDS  
IN FORAGING ECONOMIES  
OF ST. CATHERINES ISLAND  
MATTHEW F. NAPOLITANO<sup>1</sup>

INTRODUCTION

Although coastal environments were once marginalized in the anthropological literature as unproductive or inhospitable areas for subsistence and settlement (e.g., Osborn, 1977), they are now widely recognized as productive environments that have supported human populations for millennia, if not longer (see Erlandson, 2001; Erlandson and Fitzpatrick, 2006). Ecological diversity is important in understanding why populations thrive in coastal areas. For example, in coastal sections of southeastern North America, there are varieties of subsistence resources ranging from easily collected flora and fauna, such as nut mast and molluscs, to high-calorie, protein-rich wildlife, such as alligator, fishes, and white-tailed deer (e.g., Claassen, 1986; Reitz, 1988, 2008; Reitz, Larsen, and Schoeninger, 2002; Thomas, 2008; Reitz et al., 2010). Coastal waterways also offer efficient means of travel (e.g., Ames, 2002; Wheeler et al., 2003), allowing the use of canoes and other watercraft to increase the quantity of resources an individual can transport at one time and increase the distance covered (Thomas, 2008: chap. 10, 227).

Beyond simply documenting how aboriginal populations relied on coastal habitats, recent archaeological research also emphasizes the role such environments played in migration, population growth, social inequality, and connectivity between groups (see Erlandson, 2001; Rick, Erlandson, and Vellanoweth, 2001; Bailey and Milner, 2002; Mannino and Thomas, 2002; Fitzpatrick, 2004a; Moss, 2004; Erlandson and Fitzpatrick, 2006; Thomas, 2008; Thompson

and Turck, 2009, 2010; Thompson and Worth, 2011). Indeed, within anthropological archaeology, coastal and island archaeology has emerged as a distinct subdiscipline. However, the majority of island archaeological research deals with large islands, thus creating a bias against smaller islands (Keegan et al., 2008; Thompson and Turck, 2010). This is problematic because, in many cases, smaller islands support many of the same resources as large islands, making them desirable to humans for occupation or exploitation (Keegan et al., 2008). Further, ethnographic data support the idea that travel between large and small islands was common (e.g., Moss, 2004). To understand the economies of coastal groups better, it is critical to understand the role of small islands within a larger regional context. One area where it is possible to study the role of small islands within a coastal forager economy is the Georgia coast where large barrier islands protect a productive back-barrier island complex of estuaries, tidal channels, and small marsh islands. The back-barrier islands are located close to large barrier islands for which there are subsistence and settlement models. Detailed subsistence and settlement models for barrier islands and coastal areas make the back-barrier island region an excellent study area (Thomas, 2008; Whitley, this vol., chap. 10).

This chapter examines the role of Bull Island Hammock, a small back-barrier island, in the economies of coastal foraging groups. To do this, systematic shovel test pit and shell probe surveys were conducted to evaluate aboriginal activity on the island. The distribution of shell deposits and material culture provides the baseline for assess-

ing aboriginal activity. Data from these surveys are supplemented by four accelerated mass spectrometry (AMS) dates and stable isotope analysis of five archaeological shells. AMS dates were run when temporally diagnostic artifacts were not recovered archaeologically. Stable isotope data provide the season of capture for a shell, which offers a glimpse into the seasonal mobility patterns of aboriginal groups in the absence of other seasonal indicators (e.g., Andrus and Crowe, 2000, 2008; Keene, 2004; Thompson and Andrus, 2011; Andrus, 2012; Cannarozzi, 2012). While the stable isotope sample size is small, the season of capture data create a baseline dataset toward future work assessing how utilization of the hammock might have varied in different seasons.

Data from the Bull Island Hammock surveys are compared to results from similar surveys on the hammocks of Sapelo Island (Thompson and Turck, 2010) to increase our understanding of how small islands collectively play a role in forager economies. Finally, results of the survey are compared to settlement models for St. Catherines Island to show how small islands affect existing models (Thomas, 2008).

The temporal focus of this study is the aboriginal occupation of the coast beginning with the earliest known occupation (approximately 2500 B.C.) and continuing until the Spanish mission period, which began approximately in the 1580s. Dates for a given cultural period fluctuate depending on its location on the coast (i.e., northern Georgia versus southern Georgia; see Thomas, 2008: table 15.3). In order to compare the results of this study to others in the back-barrier island region, the cultural dates used by Victor Thompson and John Turck (2010) are used here; however the reader is referred to DePratter (1979: table 30, 1991: table 1) and Thomas (2008: table 15.3) for broader discussions with more regionally specific chronologies based on ceramic assemblages and radiocarbon inventories. Cultural periods are as follows: Late Archaic (locally known as St. Simons; 2500–1100 cal B.C.), Early Woodland (locally known as Refuge; 1100–400 cal B.C.), Middle Woodland (locally known as Deptford; 400 cal B.C.–A.D. 500), Late Woodland (locally known as Wilmington; cal A.D. 500–1000), Early Mississippian (locally known as Savannah or St. Catherines; cal A.D. 1000–1325), Late Mississippian (locally known as Irene; cal A.D. 1325–1580 radiocarbon years B.P.), and change to Spanish mission period (locally known as Altamaha; 1580–1700 radiocarbon years B.P.).

## ARCHAEOLOGY OF BACK-BARRIER ISLANDS AND ST. CATHERINES ISLAND

Chester DePratter and James Howard conducted the first archaeological investigation of the back-barrier island region in the late 1970s and early 1980s. They identified hundreds of sites on large and small barrier and back-barrier islands with nonsystematic shoreline surveys. The sizes of sites vary and ages of the sites range from the Late Archaic to Spanish mission and colonial periods. While many of these sites were never systematically tested or excavated, DePratter and Howard's work is important in establishing a baseline for evaluating aboriginal use of the Georgia coast (DePratter and Howard, 1977, 1980, 1981; see also DePratter, Paulk, and Thomas, 2008).

The back-barrier island region is receiving attention from archaeologists for the first time since DePratter and Howard's surveys. Thompson and Turck (2010) conducted systematic shovel test pit surveys on four small islands between Sapelo Island and the mainland coast. They reason that small islands played a role in aboriginal economies and are important for understanding issues relating to subsistence, settlement/mobility, the development of social inequality, and other socioeconomic factors that up to this point have been largely overlooked (Thompson and Turck, 2010: 283–284). To test this, they conducted a shovel test pit survey across each hammock. From this, they analyzed aboriginal activity on the back-barrier island region and discussed the implications for coastal archaeology.

Their surveys revealed a range of aboriginal activity on each hammock (Thompson and Turck, 2010: 289–294). The degree of intensity to which aboriginal groups utilized hammocks varies. The authors found evidence of intensification on the hammocks over time, peaking in the Late Mississippian period. However, the specific distribution of material culture for each period was far from uniform. For example, there was minimal, if any, activity during the Late Archaic on Mary Hammock, but a significant Late Archaic presence on Little Sapelo Island and Patterson Island. It should be noted that hammock erosion plays a role in trying to understand aboriginal utilization of the back-barrier island region. The abundance of Late Archaic sherds ( $N = 42$ ) collected during a shoreline survey of Pumpkin Hammock suggests that a section of the hammock that had a considerable Late Archaic component has eroded

away (Thompson and Turck, 2010: 293). These results show that the history of occupation and utilization on the hammocks is extensive and the back-barrier region as a whole warrants more intensive survey.

The work of David Hurst Thomas (2008) on St. Catherines Island is certainly the most extensive survey to date and a number of his conclusions are significant for the current study. Thomas (2008: preface, 7) asks four “deceptively simple” questions to guide the long-term research on St. Catherines Island: (1) how and why did the human landscape (settlement patterns and land use) change through time? (2) to what extent were subsistence and settlement patterns shaped by human population increase, intensification, and competition for resources? (3) what factors can account for the emergence of social inequality in Georgia’s Sea Islands? and (4) can systematically collected archaeological evidence resolve the conflicting ethnohistorical interpretations of the aboriginal Georgia coast (the so-called Guale problem)?

To investigate these questions, Thomas employs human behavioral ecology to theoretically frame his research. Specifically, he uses central place theory, diet breadth, and patch choice modeling to predict how and where sites should be distributed around St. Catherines Island for each cultural period and then tested the models with a systematic transect survey of 20% of the island.

Thomas concludes that the majority of the aboriginal sites conform to the projections of central place theory, which is that foragers set up their residential bases to have the most access, quantity, and widest variety of resources within an effective foraging radius (Thomas, 2008: 211–233, 871, 929–931). With an effective foraging radius of approximately 10 km (Thomas, 2008: 1064; see Kelly, 1995), most optimal central places are on the east and west sides of the island where the edges of the maritime forest are adjacent to the saltwater marsh and tidal streams (Thomas, 2008: 859). From the various central places on St. Catherines Island, a forager could reach any collection spot on the island—the salt marsh, the St. Catherines and Sapelo sounds, or the Atlantic Ocean—and return home the same day (Thomas, 2008: 1064). A key factor to understanding what this means in terms of aboriginal subsistence strategies is that the location of central places changed over time as the geomorphology of St. Catherines Is-

land changed (Thomas, 2008: chap. 29).

Not all sites identified in the transect survey conform to the central place theory projections. Sites were found along the Pleistocene core on the center of the island, away from marsh-side settlements areas. But recent work on the hydrology of St. Catherines Island shows that heavy well drilling for pulp production in Savannah significantly lowered the water table in the Georgia Bight in the 19th and early 20th centuries by approximately 3 m. Considering this, the center of St. Catherines Island was a lacustrine habitat, filled with freshwater ponds and meadows (Hayes and Thomas, 2008: 56–58). In terms of productivity, lacustrine habitats are on par with estuarine habitats. As confirmed by updated hydrological models, the sites found along the center of the island actually prove not to be outliers, but conform to the central place theory. Thomas presents lacustrine sites along the center of the island as outliers because they were not originally predicted in the initial central place theory modeling (Thomas, 2008: 893, 904, 915, 922, 929).

#### IMPLICATIONS FOR BACK-BARRIER ISLAND RESEARCH

Thomas’s work constitutes a significant contribution to the literature and provides a theoretical and empirical framework to test his research in other coastal areas in Georgia. By returning to two of the four “deceptively simple questions” that frame Thomas’s research, it is possible to demonstrate why an understanding of the aboriginal activity on nearby hammocks is so important.

The first question addresses how and why human land use changed over time. This question can only be adequately addressed by first looking at long-term environmental factors (e.g., seasonal wetness, sea level rise, etc.) and how that impacts island geomorphology and ecology. Using a suite of hydrological, geological, and archaeological data, Thomas reconstructed the changing shape of the island (see DePratter, Paulk, and Thomas, 2008; Thomas, 2008: chaps. 3–5, 16; Thomas, Rollins, and DePratter, 2008; Bishop, Rollins, and Thomas, 2011). These data were then used to interpret the distribution of sites across the island (Thomas, 2008).

While no geomorphologic reconstruction has taken place in the study area (but see Turck and Alexander, this volume, chap. 7, for hammock

geological formation processes), the distribution of temporally diagnostic material culture speaks to how Bull Island Hammock might have changed over time. The change in land use evidenced by the distribution of material culture can be tested against the data from St. Catherines Island.

The second question, which addresses population increase, intensification, and competition for resources on St. Catherines Island, is a key question in contextualizing aboriginal use of the back-barrier island region. If populations increase on St. Catherines Island, resulting in increased competition for resources, then there should be a quantifiable increase in aboriginal activity on back-barrier islands.

### THE BACK-BARRIER ISLANDS OF ST. CATHERINES ISLAND

There are three types of back-barrier islands in the Georgia Bight. The first type is Pleistocene in age and is a remnant of the former Pleistocene shoreline when sea levels were lower and composed of a mix of Pleistocene and Holocene components. DePratter and Howard (1981) argue that back-barrier islands are former barrier islands of a continuous beach ridge that are partially submerged or eroded. In this scenario, Holocene sediments are deposited on top of Pleistocene remnants. Oertel (1979: 279) argues that hammocks are discrete landforms that accrete individually. According to this model, hammocks form from coarse-grained sediments accreting together to form “marsh-encircled islands” and can be much younger in age than nearby barrier islands with Pleistocene components (Oertel, 1979: 276). A third is from modern dredge spoils and from shipping ballast (Emery et al., 1968; Thompson and Turck, 2010: 284).

#### BULL ISLAND HAMMOCK

There are two back-barrier islands to the west of St. Catherines Island: Moss Island and Bull Island. Moss Island has two hammocks on it and Bull Island has three. Bull Island Hammock is approximately 8 ha, making it the largest of the St. Catherines Island hammocks (fig. 8.1). Bull Island Hammock is small when compared to other hammocks in the surrounding area (see Thompson and Turck, 2010). Bull Island Hammock is located approximately 1.5 km to the west of Persimmon Point (formerly English Cut, the

westernmost point on the island) near the site of Mission Santa Catalina de Guale (9Li274).

Following the “patch types” defined by Thomas (2008: 250–256), Bull Island Hammock is a maritime forest (mixed deciduous-pine forest) surrounded by salt marsh. The hammock was utilized for cotton farming during the 19th century and remnants of cotton rows, a drainage ditch, and a dyke are still present. The combination of a lightning fire within the past decade and no permanent deer population make the understory incredibly dense.

The soil type on Bull Island Hammock is an Echaw-Centenary blend (Looper, 1982). This blend contains some Mandarin-Rutledge soils in small amounts. Echaw-Centenary soils drain better when there is less Mandarin-Rutledge soil present. This soil blend is similar to the periphery of the Pleistocene core of St. Catherines Island (Reitz et al., 2008: 53–55). The soil in the tidal marsh area around the hammock is Bohicket-Capers (Looper, 1982). On St. Catherines Island, Bohicket-Capers is found in between the Holocene beach ridges.

At present, it is unknown whether the hammock had a source of water on it. Whether or not the hammock supported water in the past is a critical factor for predicting and understanding aboriginal activity. There is a topographically low area just to the west of the center of the hammock (fig. 8.2). A historic-period drainage ditch runs north to the marsh from this area. Given that the water table in the Georgia Bight was significantly higher, it is possible that the hammock supported fresh water seasonally or year-round. Like the lacustrine habitat in the central depression of St. Catherines Island, a freshwater resource would have provided a collection site for flora, fauna, and provided a source of potable water. If fresh water was not available, activity would be limited by the amount of time one could spend on the hammock.

#### FIELDWORK AND LABORATORY PROTOCOLS

Shovel test pits were set at 20 m intervals with each shovel test pit labeled according to its coordinate location (fig. 8.3). Shovel test pits in topographically low areas (i.e., wetter areas along the marsh edges or in areas with standing water) were omitted. Each shovel test pit was 50 cm in diameter. Soil was excavated in 20 cm arbitrary levels. Soil was dry screened through 1/8 in. mesh. This screen size was chosen in an attempt to re-

cover a variety of fauna, including small fishes. When shell was encountered, it was weighed from each level, mixed with the backdirt, and then put back in the test pit.

To map the distribution of shell, a probe survey was conducted at 5 m intervals. A crew of four, spaced 5 m apart from each other, walked in north-south transects with steel probes, probing

the ground every fifth meter.

Four judgmental test pits were excavated off the 20 m grid in areas of interest. The location of each was chosen based on the results of the shovel test pit survey to further investigate possible aboriginal activity areas. Each test pit was 50 × 50 cm and excavated in 10 cm arbitrary levels.

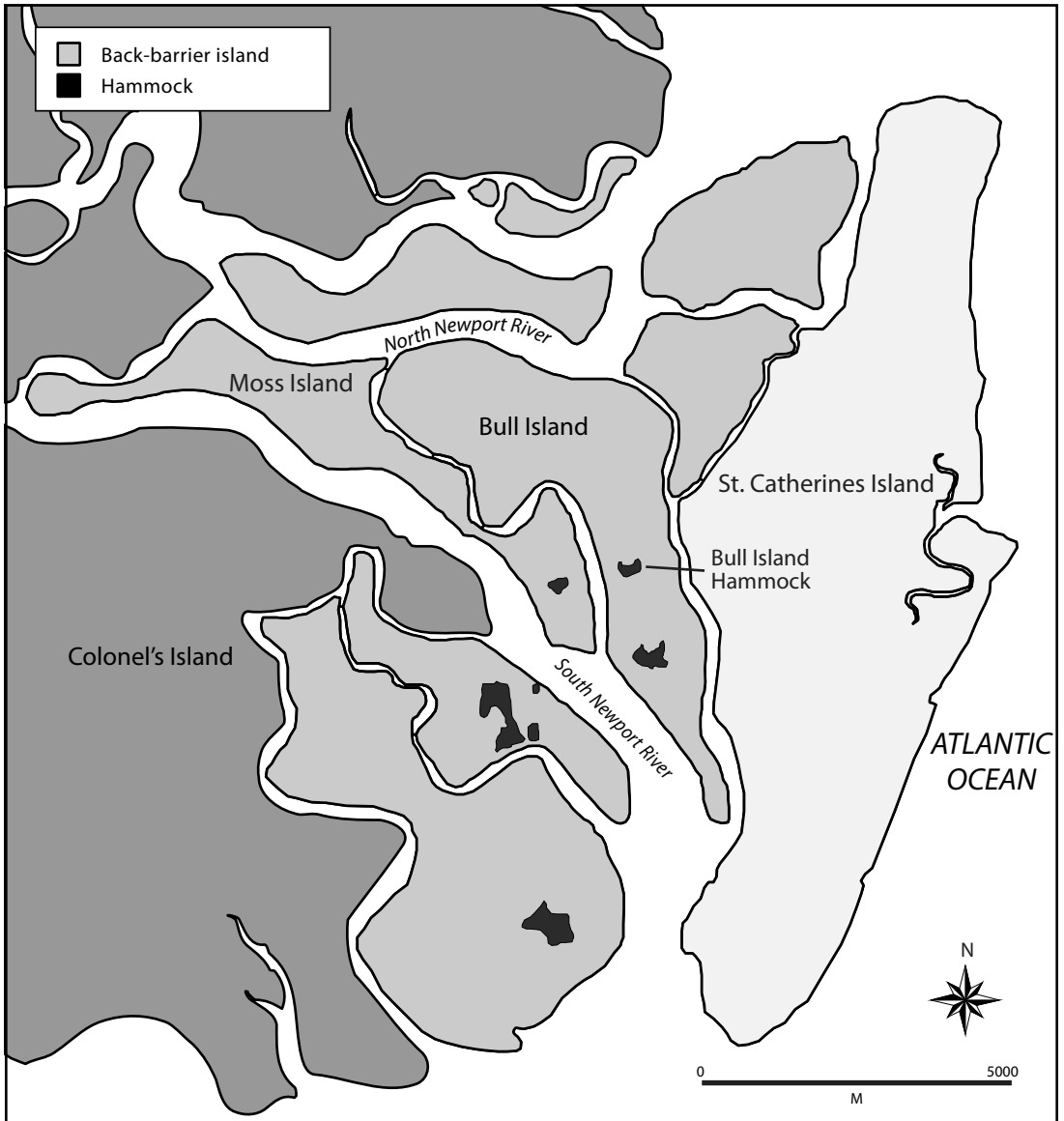


Figure 8.1. St. Catherines Island and its associated islands, showing back-barrier islands and hammocks.

During fieldwork, two aberrant areas north of Bull Island Hammock were investigated because they had higher elevations compared to the surrounding flat, tidal marsh. Each area looks like a small mound. The first area (Area 1) is located approximately 100 m north of the northeastern tip of Bull Island Hammock. The second area (Area 2) is approximately 250 m north of the

hammock. Informal probing around both areas revealed a buried tree stump and/or root system at the edge of each area.

Ceramics were analyzed with the assistance of Chester DePratter of the South Carolina Institute of Archaeology and Anthropology, according to the standard typologies for the Georgia coast (see DePratter, 1979, 1991; Williams and Thompson,

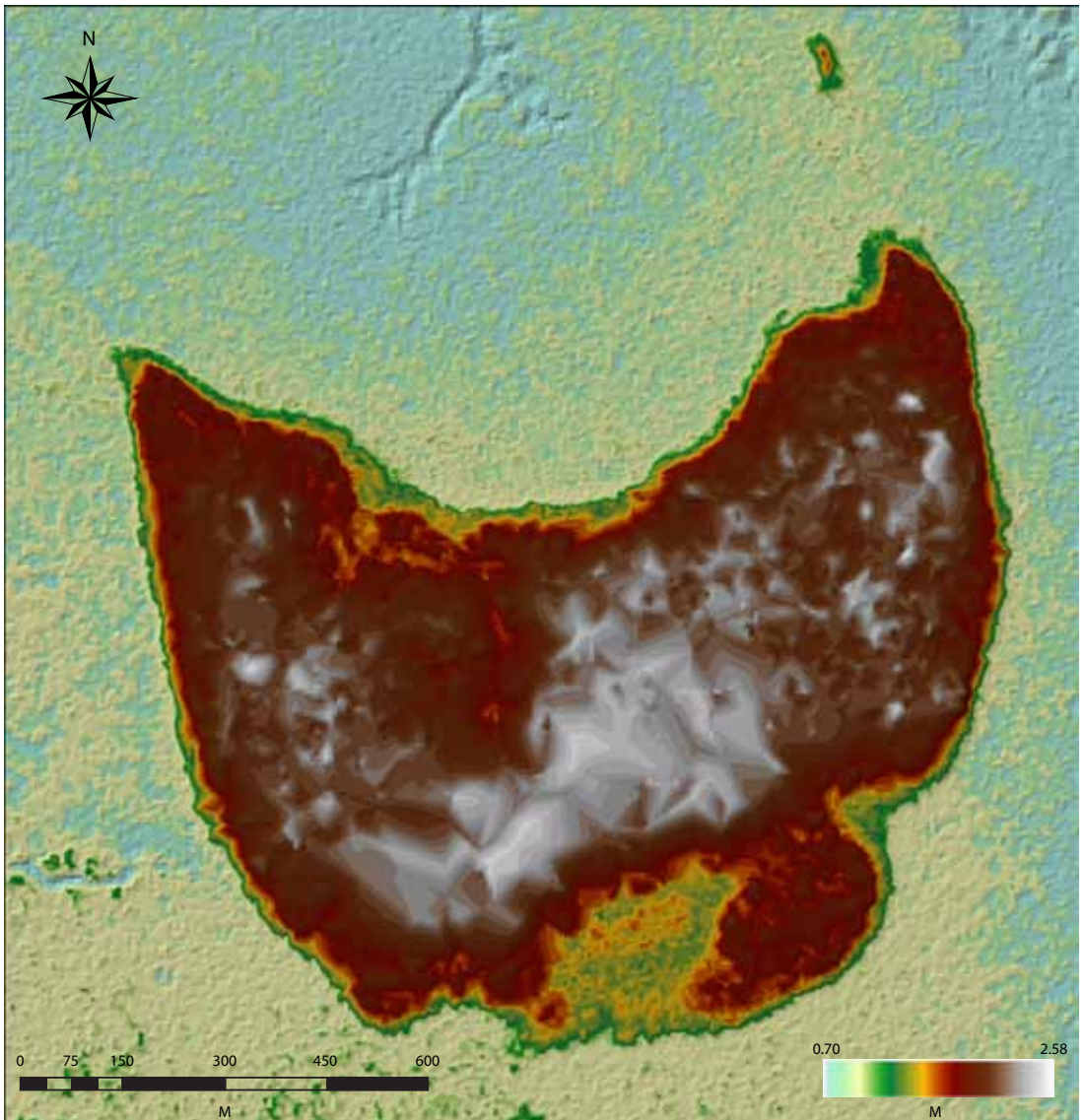


Figure 8.2. LiDAR image of Bull Island Hammock with white representing higher elevation.

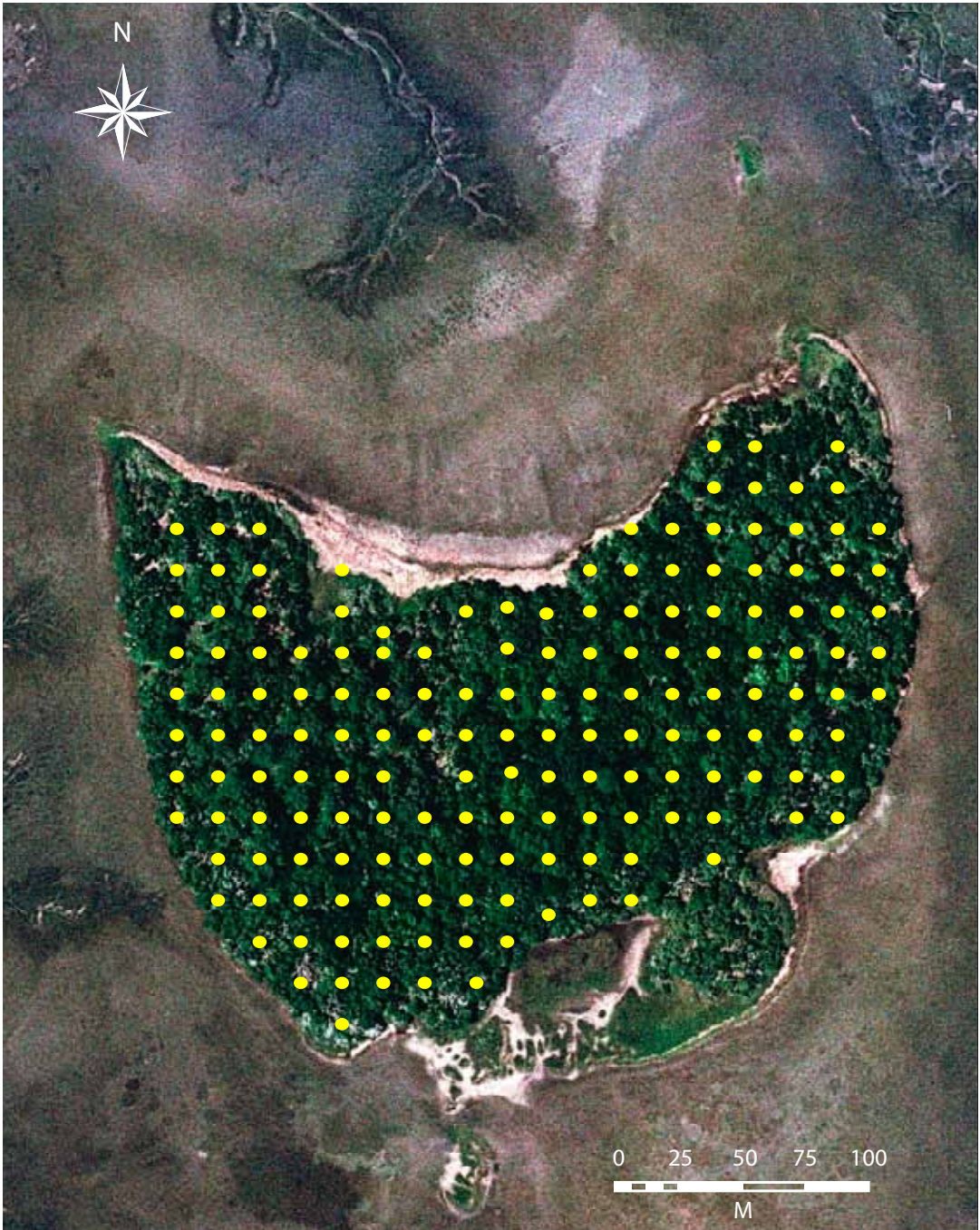


Figure 8.3. The shovel test pit grid.

1999; Guerrero and Thomas, 2008).

In order to understand the temporal range of aboriginal activity on the hammock, four samples were collected for AMS dating. Three samples were clam shells taken from large midden deposits with no temporally diagnostic artifacts (i.e., ceramics). The fourth sample sent for AMS dating was from the buried tree stump north of the hammock. A stump preserved in the marsh is significant because an AMS date from the tree stump will shed light on sea level rise around the hammock. The date indicates a point in time when there was enough fresh water for the tree to survive before the area was inundated by salt-water.

Dates from the clam shells were corrected using the reservoir correction developed for St. Catherines Island (Thomas, 2008; Thomas, Sanger, and Hayes, this volume, chap. 1). Reservoir corrections ( $\Delta R$ ) are commonly used to calibrate the age of marine shell dates. Marine shell dates need to be corrected because they will always date "older" than terrestrial samples (e.g., charcoal) of the same age (Thomas, 2008: 346). The St. Catherines Island reservoir correction was calculated using modern oysters of a known age and archaeological samples. When calculated,  $\Delta R = -134 \pm 26$  (Thomas, 2008: 357–358). In this volume (chap. 1), Thomas, Sanger, and Hayes modified the reservoir correction with more samples from known-age oysters from mainland coastal Georgia. The updated reservoir correction is  $\Delta R = -119 \pm 16$ . The difference between these two corrections is statistically negligible so the first correction is used in this study.

In an attempt to understand how subsistence strategies vary according to season, oyster and clam shell samples were processed for stable isotope analysis. Shells were collected from Late Mississippian Period middens. Late Mississippian Period middens were sampled because the season of capture results from these shells could be contextualized with the existing models for Guale subsistence (Jones, 1978; Crook, 1986; Keene, 2004; Thomas, 2008).

Five shells were processed at the Department of Geological Sciences at the University of Alabama, Tuscaloosa by C. Fred T. Andrus. Twelve samples were collected from each shell using a microdrill, beginning with the terminal growth band of the clam or oyster and then moving further back to the older part of the shell. The goal

was to collect samples that represented one year of growth for the shell. From this, the ratio of  $^{16}\text{O}$  to  $^{18}\text{O}$  (expressed as  $\beta^{18}\text{O}$ ) is determined. This is then correlated to salinity and water temperature during the life of the shell. Water temperature during the mollusc's season of capture indicates which season the shell was collected in (Andrus and Crowe, 2000, 2008; Thompson and Andrus, 2011; Andrus, 2012). While the sample size is too small to evaluate seasonal mobility patterns, it serves as a first step to understand how the hammock was utilized in different seasons.

## RESULTS AND ANALYSIS

The shovel test pit and shell probe surveys revealed the presence of aboriginal activity on Bull Island Hammock in each of the cultural periods found on the larger Georgia barrier islands. Positive shovel test pits had cultural material, shell, or both cultural material and shell. In total, more than 100 ceramics and a small amount of historic brick were recovered. The shell probe survey revealed 29 discrete shell deposits, ranging from isolated shell scatters to large, dense midden deposits indicating that processing of shellfish and faunal took place in varying degrees over time. Activity on the hammock appears to be minimal during the Late Archaic (only two sherds recovered) and Early Woodland (only one sherd recovered) periods. Utilization of the hammock increased during the Late Woodland and Mississippian periods before rapidly declining just after Spanish contact. The distribution of shell and cultural material across the hammock shows that shellfish processing was limited to specific areas on the hammock, suggesting a possible freshwater resource or different activity areas on the hammock.

**SHOVEL TEST PIT SURVEY:** A total of 167 shovel test pits were excavated on Bull Island Hammock (table 8.1). The majority of the shovel test pits ( $N = 107$ ) were negative for evidence of aboriginal activity. Sixteen percent ( $N = 26$ ) of the shovel test pits were positive for shell, but lacked cultural material, 10% ( $N = 16$ ) of the shovel test pits were positive for cultural material, but lacked shell, and 11% ( $N = 18$ ) were positive for both shell and cultural material. In positive shovel test pits lacking shell, cultural material was recovered between the surface and 40 cm. No cultural material was recovered from subsoil. Additionally, with the exception of one judgmental shovel test



TABLE 8.1  
**Results of the Shovel Test Pit (STP)  
 Survey on Bull Island Hammock**

STP Content	STP (no.)	STP (%)
Pottery and shell	18	11
Pottery only	16	10
Shell only	26	15
Sterile	107	64
Total	167	100

pit (see below), no artifacts were recovered from below the water table.

Cultural material and shell were concentrated in similar areas (fig. 8.4). Therefore, while some shovel test pits with shell contained no cultural material, ceramics were often recovered from adjacent shovel test pits. This does not suggest that cultural material is related to nearby shell deposits, however. When ceramics were recovered from shell middens, they often dated to a different cultural period than ceramics from adjacent test pits. It does suggest that the same areas of the hammock were repeatedly utilized by aboriginal groups.

Most shell deposits in shovel test pits were visible on the surface or began just below the surface. Shell middens that began on or near the surface generally terminated at approximately 40 cm below surface. The deepest middens encountered during the shovel test pit survey did not appear until approximately 20 cm below the surface and terminated at a depth of 50–80 cm below surface. Thickness of shell deposits (excluding shell scatters) ranged from 9 to 65 cm with an average of 34 cm. Like the distribution of cultural material, shell deposits are mostly found in the central and southern parts of the hammock (fig. 8.4).

JUDGMENTAL TEST PITS: Three of the four judgmental test pits yielded little additional information. Test pit D was placed in the topographically low area near the center of the hammock. When fieldwork began, this area had standing water in it and the gridded shovel test pit was omitted from the survey. By the end of fieldwork, there was no longer standing water on the hammock. Probing

in the topographically low area revealed a submerged shell deposit approximately 30–40 cm below surface.

Excavation hit the water table at approximately 20 cm below surface, which complicated digging. At 30–40 cm below surface, excavation revealed a midden composed of dense, crushed shell including oyster, clam, and ribbed mussel. Late Mississippian ceramics and fauna were mixed in with the shell. A wood fragment was recovered from the 40–50 cm level. The shell ended at approximately 70 cm below surface. It is thickest in the northeastern part of the test pit and thinnest in the southwestern part. In the east and south profiles, the shell deposit slumps with its lowest part in the southeastern corner.

CERAMIC ANALYSIS: A total of 104 aboriginal sherds were recovered in the survey, which spanned the entire known occupation along the Georgia coast (table 8.2). Over time, there is a general increase in the number of sherds per cultural period, peaking during the Late Mississippian and then decreasing precipitously during the Spanish mission (Altamaha) period. Late Mississippian ceramics account for 57% of the total ceramic count and 61% of the total weight (fig. 8.5A–B).

Ceramic density across the hammock varied little because, with the exception of one shovel test pit, no more than 10 sherds were recovered within a single test pit. Using ceramics as a proxy for aboriginal activity, more of the hammock was found to be utilized in later periods (fig. 8.6A–D). Many of the shovel test pits containing cultural material had more than one temporal period represented. Activity areas appear to be reused in multiple periods as well. Similar to the distribution of shell (see below), ceramics cluster around the topographically low part of the hammock, which may indicate a singular activity area utilized over multiple cultural periods.

FAUNAL ANALYSIS: Faunal remains were recovered from three areas. Fauna came from middens dating to the Late Woodland or Late Mississippian periods (table 8.3). The majority of the faunal remains were freshwater or brackish turtles (table 8.4). Four different species of turtle were identified, although most were only identifiable at the taxon level. Most of the turtle fragments were plastron or carapace, which are the primary cuts when butchering turtles. Catfish and indeterminate mammal were recovered in small amounts.

SHELL PROBE SURVEY: The shell probe survey

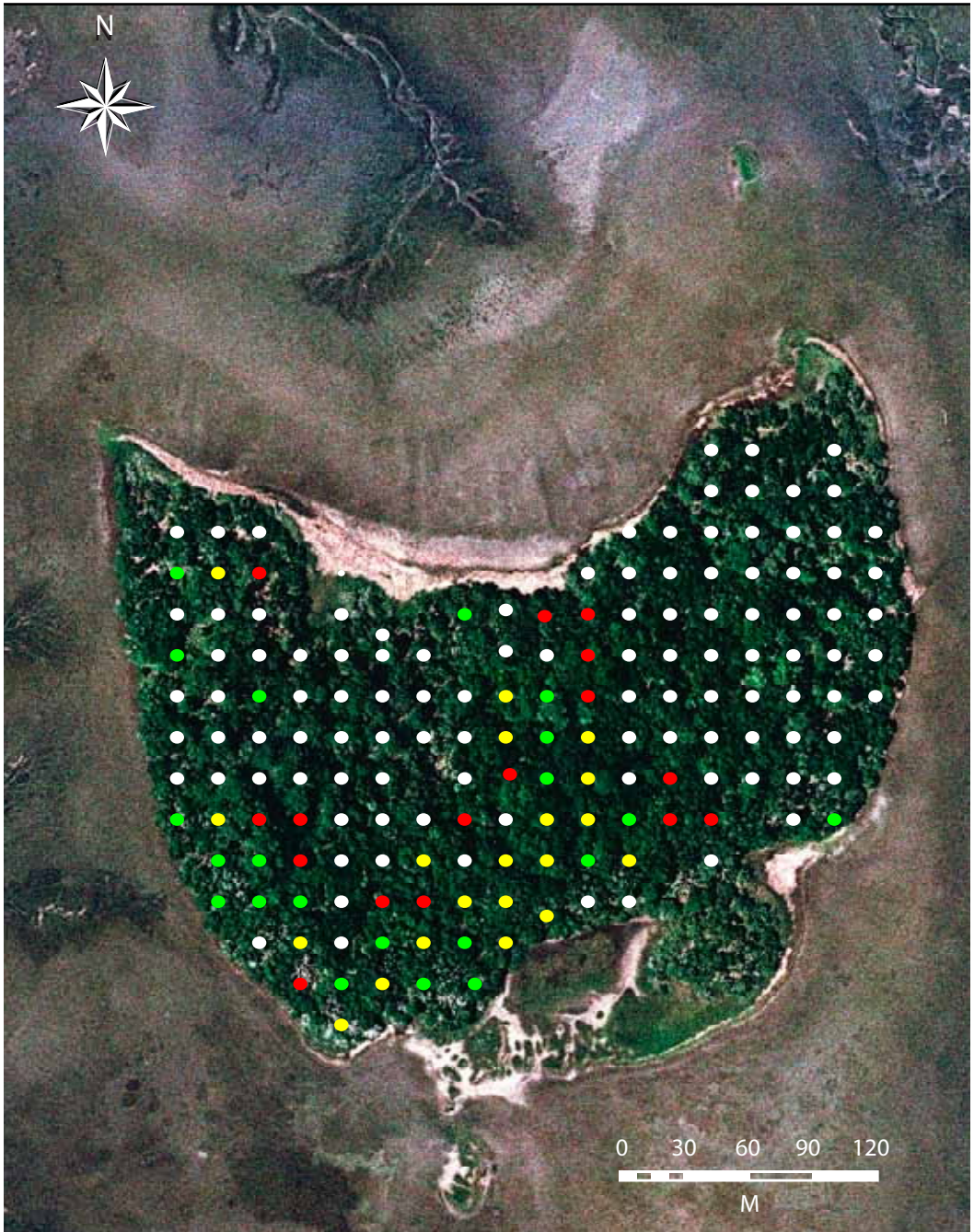


Figure 8.4. Results of the shovel test pit survey on Bull Island Hammock. Red indicates shovel test pits positive for cultural material; yellow, shell and cultural material; green, shell; and white, no shell or cultural material.

TABLE 8.2  
**Aboriginal Ceramic Sherd Counts and Weights**

Cultural period abbreviations: LA (Late Archaic), EW (Early Woodland), MW (Middle Woodland), LW (Late Woodland), EM (Early Mississippian), LM (Late Mississippian), SM (Spanish Mission), UKN (Unknown).

Period	Sherds (no.)	Total (%)	Weight (g)	Total weight (%)
LA	2	1.92	10.0	1.52
EW	1	0.96	4.5	0.68
EW/MW	7	6.73	21.5	3.27
MW	1	0.96	2.3	0.35
LW	4	3.85	101.4	15.43
LW/EM	5	4.81	49.9	7.59
EM	5	4.81	16.9	2.57
EM/LM	9	8.65	6.3	0.95
LM	60	57.69	395.3	60.17
LM/HC	6	5.77	21	3.19
SM	3	2.88	27.7	4.21
UKN	1	0.96	0.5	0.07
Total	104	100.00	657.3	100.00

revealed 29 discrete shell deposits of varying sizes and densities (fig. 8.7). They range from light subsurface shell scatters to large sheet middens. The shell probe survey identified deposits not found in the shovel test pit survey.

The largest shell middens are in the south central part of the hammock. The densest middens are in the south central and southeastern part of the hammock. Shell deposits are also found on the far western and southeastern areas of the island, but are considerably less dense than other middens.

Two large areas of the hammock did not have any shell (or cultural material) at all. The first area is the topographically low area of the hammock. It is possible that this part of the island supported fresh or brackish water. The distribution of shell suggests that aboriginal activity (i.e., processing of shellfish) took place around this possible freshwater resource. The second area with no shell is the east side of the island. When shell deposits are present, they are restricted to

the southern part of the island. Probing and shovel testing indicate that these middens are from 31 to 40 cm thick, which is average for Bull Island Hammock. It is possible that aboriginal activity took place in this area of the hammock but did not leave an archaeological signature. It is unlikely that farming during the 19th century obliterated all evidence of aboriginal activity in those areas because the entire island was utilized for farming and the cotton rows are present across the entire hammock. Unlike the topographically low area of the island, it is not plausible that the east part (a topographically higher part) of the island supported fresh water.

**AMS DATES:** Four samples were sent to Beta Analytic Laboratories for accelerated mass spectrometer (AMS) dating. Three of the samples were clam shells from aceramic middens and one was a wood sample from the buried tree stump in the marsh north of the hammock (see table 8.5). One of the sampled middens is on the far southeastern side of the hammock (N9260 E1140).

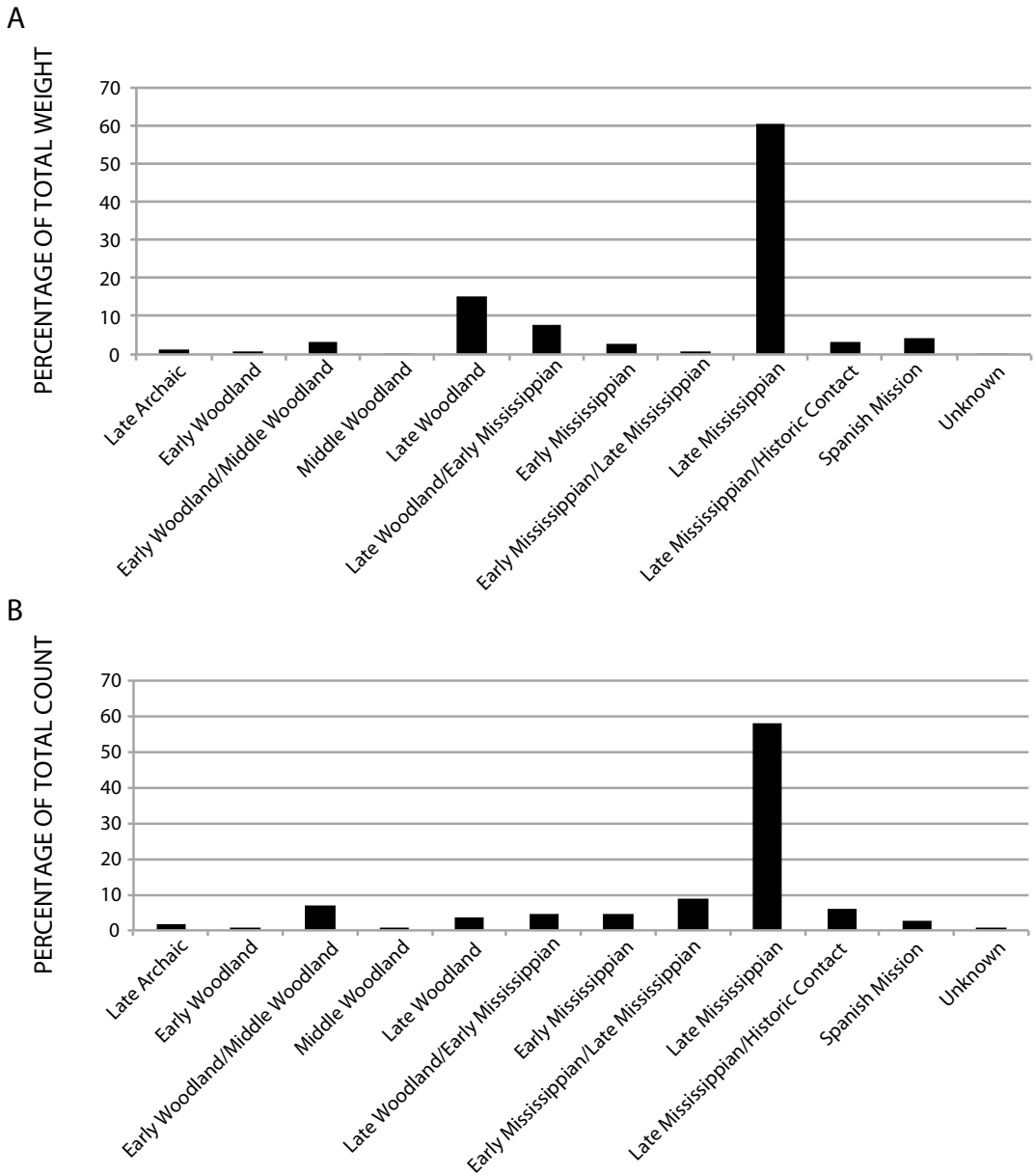


Figure 8.5. (A) Percentage of total sherd weight. (B) Percentage of total sherd count.

The shell was sampled from the base of the midden, which was toward the bottom of the 40–60 cm level. The shell dates to cal A.D. 1050–1270, which puts it in the Early Mississippian (or St. Catherines) period. One clam shell from N9180

E1240 and another from N9220 E1180 returned nearly identical dates, at cal A.D. 680–890 and cal A.D. 660–870, respectively. These date to the Late Woodland (or Wilmington) Period.

The tree stump sample dated to 300 cal B.C.–

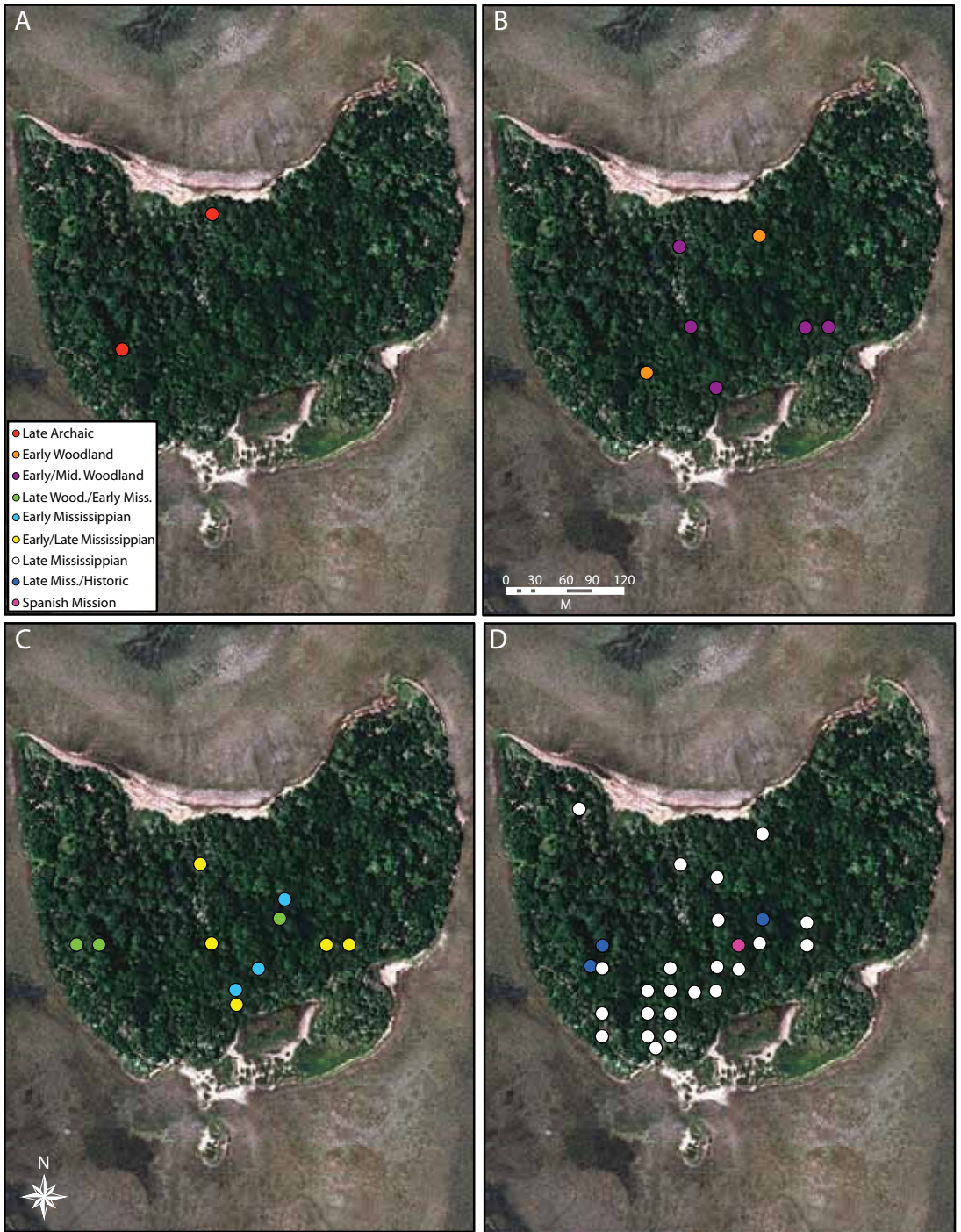


Figure 8.6. Distribution of sherds across various time periods. (A) Late Archaic; (B) Early Woodland and Early/Middle Woodland; (C) Late Woodland/Early Mississippian, Early Mississippian, and Early/Late Mississippian; (D) Late Mississippian, Late Mississippian/Historic, and Spanish mission period.

TABLE 8.3  
**Faunal Remains from Bull Island Hammock**  
 Abbreviations: MNI = minimum number of individuals; NISP = number  
 of individual specimens present.

Taxon	Common name	NISP	MNI	Weight (g)
Ariidae	Sea catfishes	1		0.292
<i>Ariopsis felis</i>	Hardhead catfish	2	1	0.88
Testudines	Indeterminate turtles	44		51.979
Emydidae	Pond turtles	6		8.348
<i>Deirochelys reticularia</i>	Chicken turtles	2	1	6.341
<i>Malaclemys terrapin</i>	Diamondback terrapin	7	2	14.905
<i>Terrapene Carolina</i>	Box turtle	1	1	0.762
Mammalia	Indeterminate mammals	4	1	5.339
Total		67	6	88.846

TABLE 8.4  
**Faunal Remains by Test Pit and Number of Individual Specimens Present (NISP)**

Unit	Level (cm below surface)	Taxon	Common name	NSIP
N9180 E1240	20-40	Ariidae	Sea catfish	1
		<i>Ariopsis felis</i>	Hardhead catfish	1
		<i>Deirochelys reticularia</i>	Chicken turtle	2
		<i>Malaclemys terrapin</i>	Diamondback terrapin	4
		Mammalia	Indeterminate mammal	2
		Testudines	Indeterminate turtle	37
	40-60	Mammalia	Indeterminate mammal	1
N9302 E1280	20-40	Testudines	Indeterminate turtle	2
ST D	30-40	<i>Ariopsis felis</i>	Hardhead catfish	1
		Emydidae	Pond turtle	4
		<i>Terrapene carolina</i>	Box turtle	1
		Testudines	Indeterminate turtle	5
	50-60	Emydidae	Pond turtle	2
		<i>Malaclemys terrapin</i>	Diamondback terrapin	3

cal A.D. 10, which is the Early Woodland (or Deptford) Period. While this sample is “noncultural” and does not directly indicate aboriginal activity on the hammock, it does provide a departure point for considering sea level rise around Bull Island and can be incorporated with the noncultural radiocarbon database for St. Catherines Island (see Bishop, Rollins, and Thomas, 2011: 379–381). The noncultural radiocarbon database facilitates the interpretation of archaeological site patterning and geomorphology on St. Catherines Island (Thomas, 2008: chaps. 32–35) and the date from Bull Island Hammock could eventually be used to test the geomorphological models for St. Catherines Island.

**STABLE ISOTOPE ANALYSIS:** Three clam and two oyster shells were analyzed for stable isotope ratio in order to determine their season of capture (table 8.6). Shells were selected from two middens containing only Late Mississippian pottery. The five samples revealed a four-season presence on the hammock, with four seasons represented in one midden. More analysis and greater sample size are necessary before contextualizing these results into a broad activity model. It is worth noting, at the very least, that collections in summer and fall months have been reported in other stable isotope studies on St. Catherines Island and nearby islands (e.g., Andrus and Crowe, 2008; Thompson and Andrus, 2011; Cannarozzi, 2012.)

## DISCUSSION

### THE SAPELO ISLAND SURVEYS

Since the methods used in this survey are comparable with those used on the Sapelo Island hammocks, it is possible to compare the results of the Bull Island Hammock surveys to the others. Positive shovel test pits in the Sapelo Island hammock surveys yielded shell, pottery, or a combination of shell and pottery. The quality of aboriginal activity on Bull Island Hammock appears most similar to Pumpkin Hammock, the smallest of the four Sapelo hammocks that were surveyed. Bull Island Hammock is approximately 8 ha and Pumpkin Hammock is 3 ha. In terms of material culture, a total of 63 sherds were recovered on Pumpkin Hammock compared to the 104 on Bull Island Hammock and both assemblages indicate the same long-term utilization. Pumpkin Hammock is the only one of the four hammocks where the majority of the shovel test

pits were negative. A total of 53% of the test pits on Pumpkin Hammock were negative while 64% of the shovel test pits on Bull Island Hammock were negative. Recent stable isotope analysis on shell samples from Pumpkin Hammock indicate that groups were active (i.e., processing shellfish) in all seasons, suggesting that groups lived on the hammock (Victor Thompson, personal commun., 2011). However, a caveat to season of capture studies is that presence during four seasons does not necessarily mean continued year-round use or that groups were settled on the hammocks.

The next hammock closest in size is Mary Hammock at 10 ha. The aboriginal activity on Mary Hammock is very different from that on Bull Island Hammock. Nearly three times as many ceramics were recovered ( $N = 269$ ). The shell deposits are much larger and denser (Thompson and Turck, 2010: table 1, figs. 5–7). Mary Hammock also contained the most positive number of shovel test pits (68%), almost double the percentage on Bull Island Hammock (36%).

As the islands get larger, aboriginal activity becomes less similar to the activity on Bull Island Hammock. Patterson Island is 18 ha and the material cultural assemblage and shell distribution are remarkably different. Four times as many ceramics were recovered ( $N = 469$ ) and 40% of shovel test pits were negative. In other words, it not only appears that the island was being utilized more intensively, but that more of the island was utilized. Finally, at 47 ha, Little Sapelo Island is by far the largest small island surveyed. A total of 841 ceramics were recovered, which dwarfs the Bull Island Hammock assemblage. Only 35% of the Little Sapelo Island shovel test pits were negative, indicating that larger sections of the island were being utilized.

The most significant similarity shared by Bull Island Hammock and the Sapelo Island hammocks is the dramatic increase in activity during the Early and Late Mississippian periods (see Thompson and Turck, 2010: fig. 7, table 2). The work on St. Catherines Island tells us that there was a large-scale population increase during this time (Thomas, 2008: chap. 35). With the exception of Pumpkin Hammock, activity on each of the hammocks appears to decrease precipitously during the Spanish mission period. The majority of sherds recovered from Pumpkin Hammock were Altamaha ( $N = 16$ ) and accounted for one-third of the percentage by weight (33%) of sherds recovered (Thompson and Turck, 2010: table 2).



Figure 8.7. Results of the shell probe survey on Bull Island Hammock.



TABLE 8.5  
Accelerator Mass Spectrometry (AMS) Dates from Bull Island Hammock

Lab ID	Location	Sample type	Raw $^{14}\text{C}$ year (B.P.)	$^{13}\text{C}/^{12}\text{C}$ ratio	Conventional radiocarbon age (B.P.)	Radiocarbon age calibrated ( $\pm 2\sigma$ )
Beta-281062	North of Bull Island	Wood	2250 $\pm$ 40	-22.2	2300 $\pm$ 40	300 B.C.–A.D. 10
Beta-281063	N9180 E1240	<i>Mercenaria</i>	1080 $\pm$ 40	-0.9	1480 $\pm$ 40	A.D. 680–890
Beta-281064	N9220 E1180	<i>Mercenaria</i>	1120 $\pm$ 40	-1.5	1510 $\pm$ 40	A.D. 660–870
Beta-281066	N9260 E1140	<i>Mercenaria</i>	720 $\pm$ 40	-1.2	1110 $\pm$ 40	A.D. 1050–1270

TABLE 8.6  
Results of Season of Capture Analysis

Sample Number	Unit	Level (cm below surface)	Sample type	Season of capture
110551_1	Shovel Test D	40–50	<i>Mercenaria</i>	Spring
110551_2	Shovel Test D	40–50	<i>Mercenaria</i>	Winter
110548	Shovel Test D	40–50	<i>Crassostrea</i>	Summer
110557	Shovel Test D	60–70	<i>Crassostrea</i>	Fall
110420	N9200 E1240	0–20	<i>Mercenaria</i>	Summer

Each island surveyed had shovel test pits containing shell without pottery and pottery without shell. This underscores the importance of systematic survey on small islands because simply using shell to identify or delineate sites would miss a substantial segment of aboriginal activity (Thompson and Turck, 2010: 289).

#### THE ST. CATHERINES ISLAND DATASET

There were multiple changes in aboriginal land use over time on St. Catherines Island that were partly caused by the shifting geomorphology of the island and estuarine habitat on the east side of the island. For example, during the Wilmington Period, sites shifted further south on the island as rising sea levels eroded Guale Island and changed the location of Guale Marsh. However, on the west side of the island, geomorphology changed little after the sea level

regressed in the Early Woodland and then rose (Thomas, Rollins, and DePratter, 2008: 844; Thomas, 2011a). During this period, sites are found along the western margin of St. Catherines Island. This pattern continues for Woodland and Mississippian sites, the only difference being that site size and the quantity of sites increased (Thomas, 2008: chap. 32). Therefore, the west side of the island can be considered a central place for every cultural period except the Early Woodland (Refuge) Period. It appears that as long as sites were occupied along the western margin of St. Catherines Island, foragers were utilizing Bull Island Hammock. The effective foraging radius models that Thomas built for populations on St. Catherines Island posit that a forager can travel 10 km a day or 30 km by canoe and still return to the residential base (Thomas, 2008: 228, 1064; see also Ames,

2002: 47; Kelly, 1995: 135). The hammock also fits within the range of the effective foraging radius given the large distances one can travel using canoes and taking advantage of the twice daily tides. However, a freshwater source would create the possibility of the hammock serving as a temporary processing camp or residential site where foragers could stay longer.

To summarize, despite the changing distribution of sites across St. Catherines Island, sites were consistently found on the marsh edge of the western side of the island since the Early Woodland. As the number and size of sites increased throughout the Middle-Late Woodland and Mississippian on St. Catherines Island, so did intensification of activity on the hammock. Except for the scale of utilization, activity changed little over the course of millennia on Bull Island Hammock as the dominant activity area was centered around the topographically low part of the hammock. While there is no evidence for any kind of habitation on the hammock, it did serve as a collection and processing site for thousands of years.

The fact that utilization of Bull Island Hammock appears to have intensified throughout the Woodland and Mississippian periods underscores its importance in forager economies, specifically during the Late Mississippian. The importance of the hammock in forager economies is seen during the Late Mississippian period, when the population on St. Catherines Island increased exponentially (Thomas, 2008: 1050–1052). This is when Bull Island Hammock was utilized most extensively. This pattern is corroborated by the research off Sapelo Island (Thompson and Turck, 2010).

A consequence of population growth is increased taxation on subsistence resources. As Thomas (2008: 1060) argues, an increased population likely resulted in an increased consumption of shellfish, which may have depleted some shellfish beds on the island. While it is possible that shellfish beds were “managed” (i.e., older oysters were collected to prevent overharvesting, see Thomas, 2008: 1059–1060), groups could have relied on the shellfish beds in the marsh area around Bull Island Hammock to supplement the growing need for food without depleting the resources on St. Catherines Island. Shellfish beds might also have been “managed” for nonanthropological reasons. For example, times of unseasonal dryness, major storm activity, season of the year, and water temperature all

impact shellfish availability (e.g., Rollins, Prezant, and Toll, 2008; Prezant, Rollins, and Toll, 2011; Rollins and Thomas, 2011: 322–337).

#### THE IMPORTANCE OF SMALL ISLANDS

Bull Island Hammock was utilized for more than four millennia. The presence of Late Archaic pottery indicates that at least a portion of Bull Island formed around the same time that Holocene beach ridges prograded to the north and south of the Pleistocene core of St. Catherines Island. Culturally, this is approximately when the shell rings on the east and west side of the island were in use.

When local sea level dropped around the Late Archaic–Early Woodland transition, it is believed that depleted estuarine resources led in part to a large-scale shift in settlement on St. Catherines Island. At present, it is unclear whether groups switched to more terrestrial-based foraging or depopulated the island and moved west to follow migrating estuarine resources (Thomas, 2008; see also Thompson and Turck, 2009). On Bull Island Hammock, there is a slight increase in Early and Middle Woodland ceramics, so it is unclear what role Bull Island Hammock played in this socio-economic shift. However, the Early and Middle Woodland ceramics from Bull Island were not associated with any substantial middens. The lack of middens and artifacts dating to the Early and Middle Woodland periods mirrors what is seen during the Refuge/Deptford period on St. Catherines Island, albeit on a much smaller scale.

Aboriginal activity on Bull Island Hammock shifted during the Late Woodland Period. The presence of ceramics in the midden and two AMS dates from aceramic middens indicate that there is an increase in the amount of shellfish being processed. On St. Catherines Island, both marsh habitats on the east and west sides of the island were productive, yet groups consumed more fishes during the Late Woodland (Reitz, 2008). There is also a decrease in turtle remains from this period (Thomas, 2008: 1020). Interestingly, on Bull Island Hammock, one of the Late Woodland Period middens yielded the vast majority of fauna recovered from the hammock, almost all of which was turtle. There is also an increase in the number of ceramics recovered from the hammock during the Late Woodland.

The quantity of ceramics decreased on Bull Island Hammock during the Early Mississippian Period (which includes sherds from both Savan-

nah and St. Catherines periods). One AMS date from an aceramic midden on the extreme southeastern edge of Bull Island Hammock is from the Early Mississippian period. On St. Catherines Island, data on seasonal rainfall indicate that there was a severe drought from approximately cal A.D. 1200–1300. The drought is believed to have caused, in part, a shift in subsistence strategies for St. Catherines Island populations, which resulted in fewer shell midden deposits (Blanton and Thomas, 2008: 801–802). It is not possible at this point to say if there was any correlating activity on Bull Island, however, the decrease in number of ceramics does indicate a change in utilization of the hammock. Thompson and Turck (2010: fig. 7) do not report a similar change on the Sapelo Island hammocks; therefore this pattern may be unique to the vicinity around St. Catherines Island.

The dramatic increase in Late Mississippian sherds on the hammock mirrors demographic changes occurring on St. Catherines Island. An exponential population increase led to heightened competition for resources, which in turn led to increased utilization of the hammock. A sharp rise in activity during the Late Mississippian periods has also been observed on the hammocks off Sapelo Island (Thompson and Turck, 2010).

During the period of Spanish occupation on St. Catherines Island, it appears that the hammock was used very little, if at all. This is not surprising given that populations at this point were engaged in large-scale intensive maize agriculture and lived within the immediate vicinity of Mission Santa Catalina de Guale (Thomas, 2008: 205–207; see also Bushnell, 1994; Milnich, 1999).

Importantly, one cannot assume that the groups that utilized Bull Island Hammock were residents of St. Catherines Island. It is likely that the hammocks were utilized by many different groups that may have lived on the mainland coast or other barrier islands. If freshwater outlets did exist on the hammock then people possibly stayed temporarily on the hammock. If one assumes an effective foraging radius on an individual or small group traveling by canoe to be 30 km (Ames, 2002; Thomas, 2008: 227), then Bull Island Hammock is within the effective foraging radius for a significant portion of the coastal area. However, since Bull Island Hammock is less than 2 km away from St. Catherines Island, it is appropriate to contextualize the Bull Island Hammock

dataset to the St. Catherines Island dataset.

The aboriginal activity on Bull Island Hammock makes it clear that small islands played a role in the subsistence and settlement patterns of groups that occupied St. Catherines Island and other nearby coastal areas. Although it appears that this island did not play a significant role in aboriginal economy prior to the Late Woodland, this hammock was utilized more in the Mississippian period. In other words, while the pottery recovered is evidence for more than 4000 years of utilization, the hammock was probably used intermittently in each cultural period.

The results of this study corroborate other similar studies (Keegan et al., 2008; Thompson and Turck, 2010): small islands often played a role in the economies of groups that inhabited larger islands and in coastal zones. At present, small islands are not studied as commonly as large islands; however this study demonstrates that until archaeologists examine small islands with the same focus given to large islands, subsistence and settlement models remain incomplete.

This study creates a number of avenues for further research. In order to fully understand the nature of aboriginal activity on Bull Island Hammock and how it changed over time, in-depth geological and hydrological investigation is necessary. Expanding the work of Turck and Alexander (chap. 7) by vibracoring and dating the basal deposits from Bull Island will help elucidate the formation and age of the hammock. This will contribute to a better understanding of why the east half of Bull Island Hammock was not utilized the way the rest of the hammock was (i.e., for shellfish and vertebrate processing). Second, building hydrological models for the hammock will answer the question of whether there was the possibility of a freshwater outlet and a detailed soil analysis will also contribute to determining whether there was such an outlet on the hammock at any point. Also, analyzing the exact soil type ratio might determine whether different parts of the island drained better than other parts.

Shellfish samples collected from the middens can be used for multiple studies. Both oysters and clams can be studied for stable isotope analysis, which can be used to interpret the season of the year when groups were using the hammock. Sclerochronological analysis of clam samples can also be used for season of capture studies. Following Crook (1992), oysters from the ham-

mock can be analyzed to determine their habitat. This is potentially important for determining the type of estuarine habitat around the hammock. If oyster bed growth (i.e., clusters, banks, or reefs) is significantly different in later periods, this may shed light on why utilization of the hammock was less intensive prior to the Late Woodland. This could also be affected by how the distribution of estuarine habitats changed over time following the movement of streambeds and river channels (Chowns, 2011). Hydrological, geological, and shellfish studies on and around Bull Island Hammock can be used to test such theories.

As the hammock appears to only be utilized periodically, exactly when groups were foraging and hunting on the hammock may prove interesting and may be a future research direction. More AMS dating and season of capture studies may provide a link between times of stress on the island and increased mobility (e.g., during the mid-16th century when Jesuit priests observed Irene populations engaged in a high degree of mobility caused by prolonged drought; Zubillaga, 1946).

Finally, island size appears to correlate in some way to aboriginal activity. The results of

this study, when combined with the results from Thompson and Turck (2010), appear to show that aboriginal activity intensifies as island size increases. Further, the recent work on two hammocks smaller than Bull Island revealed almost no evidence for aboriginal activity (Sanger, chap. 9). It is possible to test in the future by comparing island size with the rate of positive and negative shovel test pits with shell and ceramic density.

#### NOTE

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## CHAPTER 9 EVER-SHIFTING LANDSCAPES: TRACKING CHANGING SPATIAL USAGE ALONG COASTAL GEORGIA

MATTHEW C. SANGER<sup>1</sup>

### SETTLEMENT STUDIES AND SURVEY DATASETS

Studying the spatial patterning of cultural materials across broad landscapes has been an important aspect of archaeological studies for more than 60 years. Beginning with Julian Steward's (1937) research in the western United States and Gordon Willey's (1953) work in Peru, archaeologists began to formally investigate the spatial organization of past peoples as a proxy for underlying social structures, behavioral patterns, and cultural adaptation to the surrounding environment (Anschutz, Wilshusen, and Scheick, 2001). The distribution of archaeological materials across the landscape continues to be an important avenue of archaeological research as demonstrated by the wealth of publications focused on settlement studies in the last 40 years (for overviews see Trigger, 1967; Parsons, 1972; Evans and Gould, 1982; Billman and Feinman, 1999; Kowalewski, 2008).

Tracking the shifting nature of archaeological material distribution through time and across space continues to be used by archaeologists to investigate a wide variety of past ideological, economic, and social phenomena including: relationships between people and natural resources (Daniel, 1996; Jones et al., 2003), logistical organization and residential strategies (Savelle, 2001), the creation and maintenance of social territories (Dortch, 2002; Kowalewski, 2003; Peterson and Drennan, 2005), changing power relations (Hally, 1996, 1999, 2006; Williams and Shapiro, 1996), and demographic shifts (Feinman et al., 1985; Milner and Oliver, 1999; Scarre, 2001; Cobb and Butler, 2002; Kowalewski, 2003; Kintigh,

Glowacki, and Huntley, 2004; Osborne, 2004).

Of primary importance to most settlement studies is a regional dataset drawn from a systematic survey project (Kowalewski, 2008). This chapter reports on the findings of a project undertaken in coastal Georgia during the summer of 2009. This project, deemed the Springfield Legacy Archaeological Project (SLAP), was a mixture of traditional field techniques, including field survey and intensive subsurface sampling, as well as newer techniques, such as using Light Detection and Ranging (LiDAR) to analyze topographic features and Geographic Information Systems (GIS) to create spatial models. Together, these techniques built a rich dataset through which we are beginning to understand how the past peoples of coastal Georgia interacted with their landscapes and how that interaction varied through time and space. As this project is the first systematic archaeological investigation conducted at the study area, it offers only the most preliminary insights into the shifting relationships between people and their landscape. Rather than offering decisive conclusions, this chapter will instead highlight different techniques that were beneficially applied, preliminary hypotheses to be tested, as well as potential research questions that can be pursued by future studies. Like most initial research programs, the work conducted by SLAP provides baseline empirical data on which further projects can build.

### SPRINGFIELD LEGACY STUDY AREA

More than 9000 contiguous acres of privately held land between the town of Midway and Colonel's Island in Liberty County, Georgia (located

roughly 40 km south of Savannah) were presented for potential archaeological analysis by a local not-for-profit institution, the Springfield Legacy (fig. 9.1). This land includes coastal marshland, upland pine forests, and marsh islands—much of which has been heavily impacted by farming, road construction, and tree farming. While the property has been visited by both professional and amateur archaeologists in the past, no formal reports or publications have been produced and all work has been minimal by any respects.

The Springfield Legacy properties were divided into 10 analytical sections based on ecosystem, elevation, distance to waterways, and accessibility. This division allowed precision in terms of discussing the property as well as dividing it into portions that could feasibly be surveyed in

single four-week seasons. Section 6 was chosen as the initial study area as it contained a variety of biozones, including marshes, freshwater streams, uplands, and marsh islands (fig. 9.2). Section 6 is located on the western edge of Colonel's Island and contains 425 acres. To our knowledge, this project is the first archaeological investigation of any kind within this study area.

#### LiDAR DATA AND METHODS

The Springfield Legacy Archaeological Project (SLAP) was heavily dependent on airborne LiDAR data for project planning, wayfinding, model building, and postexcavation data analysis. Airborne LiDAR systems are based on the use of a laser scanner placed on a helicopter or



Figure 9.1. SLAP study area.



Figure 9.2. Section 6 survey area.

airplane flying at relatively low altitudes. The laser scanner broadcasts pulses of energy toward the ground and records the time it takes to rebound and return to the scanner in order to assess the range between the aircraft and the surface below (Watkins, 2005; Weitkamp, 2005). In combination with Global Positioning System (GPS) technology, and an Inertial Measurement Unit (IMU), the distance between aircraft and reflective surface is transformed into topographical data of a well-defined location (Habib et al., 2005; Hollaus, Wagner, and Kraus, 2005; Reutebuch, Andersen, and McGaughey, 2005; Pfeifer and Briese, 2007).

The use of LiDAR for archaeological research purposes is becoming relatively common in Europe (especially Britain and the Netherlands) and is slowly growing in importance in the United States. Archaeologists have used LiDAR to both better understand large, topographically complex archaeological sites such as the Stonehenge environs (Bewley, Crutchley, and Shell, 2005) and historic plantation sites in Maryland (Harmon et al., 2006), and as a tool to survey broad areas in an attempt to recognize previously undiscovered sites (Gallagher and Josephs, 2008). LiDAR technology and analysis has progressed to a level where it is now possible to “remove” data associated with vegetation and to produce relatively reliable maps of the underlying ground topography (Lillesand, Kiefer, and Chipman, 2004; Raber et al., 2002; Sithole and Vosselman, 2004). While LiDAR has quickly become a major source of digital terrain information (Raber et al., 2007), numerous researchers have pointed out many inaccuracies that can affect the quality of data based on topography (Bowen and Waltermire, 2002), postprocessing methods (Lloyd and Atkinson, 2002), and quantity of vegetational interference (Dowman and Fischer, 2001).

Even with these potential sources of error, LiDAR remains a relatively accurate source of topographic data and was the backbone of the SLAP survey project. Previous to fieldwork, a visual analysis of the LiDAR data in conjunction with aerial photos allowed an accurate assessment of the size and shape of the project area, as well as a baseline from which transects could be superimposed; also, the quantity of test pits could be estimated. As we became more familiar with the terrain and vegetation, it was also possible to imagine field conditions throughout the study area based solely on the topographic data

presented by LiDAR. Higher elevation areas with little slope were dominated by pine stands while poorly draining low-elevation areas were more likely to be filled with palmettos. Field conditions could have dramatic impacts on fieldwork, such as the difficulty in surveying a young pine stand intermixed with Devil’s Walkingstick (*Aralia spinosa*). The LiDAR data gave us the opportunity to assess those conditions prior to engaging in direct fieldwork and to plan our survey strategy accordingly.

Beyond providing a baseline topographic map of the area, LiDAR data were also utilized to discover less common natural features on the landscape that were of archaeological interest. Small waterways and dried up ponds were relatively easy to recognize using the LiDAR images even when they were difficult to see in the field because of surface vegetation. Such features suggest the presence and distribution of fresh water within the study area, an important natural resource that could have affected how past peoples interacted with their landscape. Along with natural features, the LiDAR data proved important in delineating portions of the landscape that were culturally modified. Drag lines used to drain marshland, old roadways and firebreaks, as well as mounds of sawdust from milling were visible in the LiDAR images (fig. 9.3). The LiDAR images also highlighted several topographic features that required more detailed field investigation, including three potential burial mounds as well as a large, rectangular depression that appears to have been used as a water retention feature (see the sites section of this chapter for more details).

#### PEDESTRIAN SUBSURFACE SAMPLING STRATEGY, METHODS, AND RESULTS

As mentioned earlier, a 425 acre section of the total 9000 acre project area was selected as the focus of our first research season. This portion of the project area was on the northwestern edge of Colonel’s Island—a 4000 acre plot of land that lies between mainland Georgia and the Intercoastal Waterway. We also selected three marsh islands as research locales. Each of these marsh islands was small (less than 15 acres), relatively easy to get to (we could walk to two of them, the third took a very short kayak ride to reach), and would provide an important comparison with our larger sample from Colonel’s Island. During the summer of 2009, a small crew of students



from Columbia University and Barnard College, alongside more experienced staff members employed by SLAP, conducted a shovel test pit (STP) survey across both the 425 acre study area (Section 6) on Colonel’s Island and the three small marsh islands (A, B, and C) (fig. 9.4).

STP surveys have become a mainstay within archaeological research, especially in the Eastern Woodlands, since they were first formally

described by William Lovis in 1976. While not without controversy (see Nance, 1979; Wobst, 1983; Lightfoot, 1986, 1989; Nance and Ball, 1986, 1989; Shott, 1989), STP surveys have proven to be a relatively economical and accurate method of tracking the distribution of cultural materials across the landscape. Because of various factors affecting discard practices, as well as taphonomic processes, care needs to be taken in

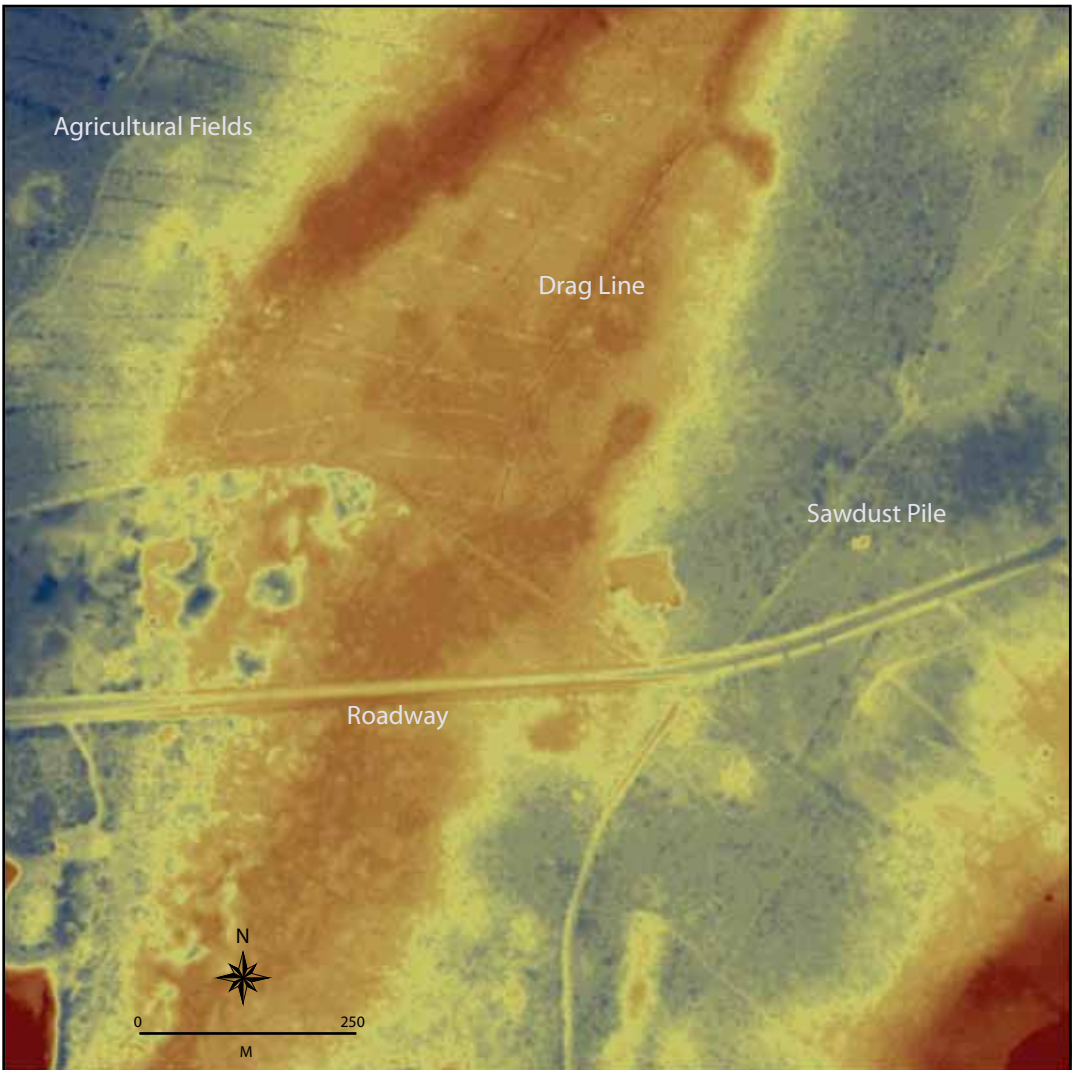


Figure 9.3. LiDAR data showing topographically visible historic period features (red = high elevation, blue = low).

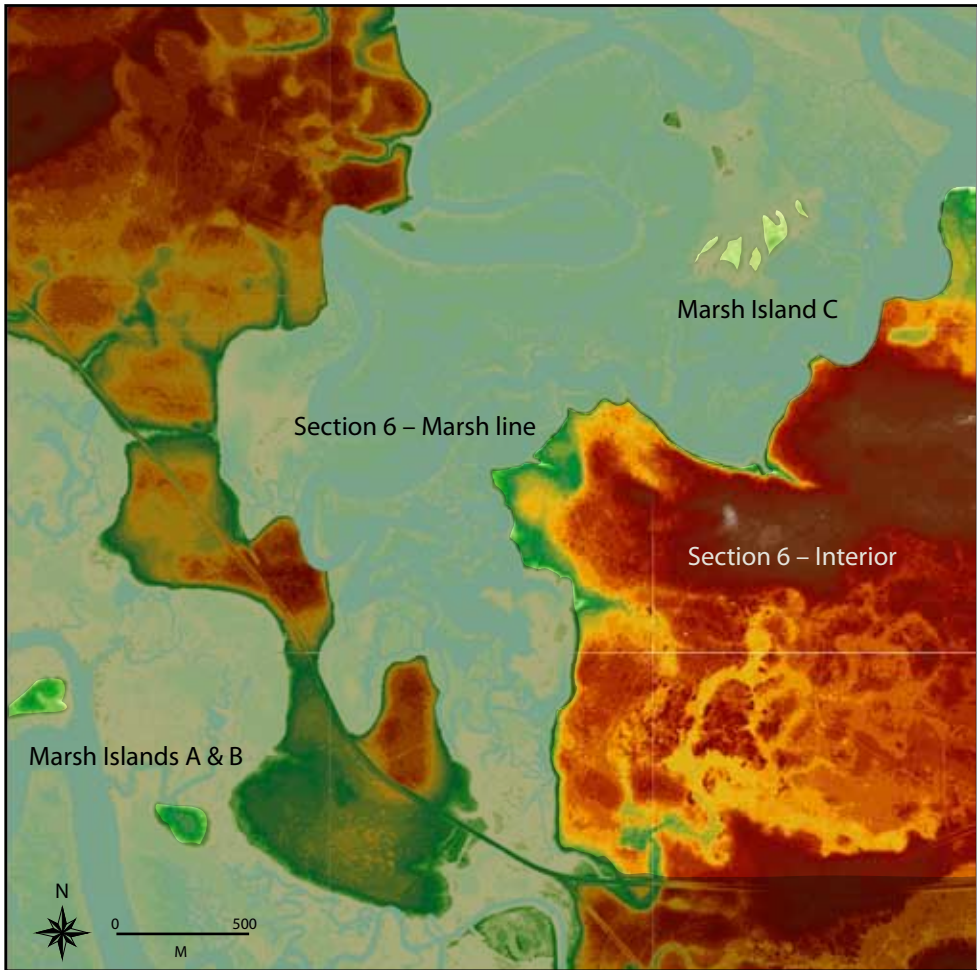


Figure 9.4. LiDAR data of study area.

suggesting that distributional data derived from STP surveys are equivalent to actual past landscape usage. Past experiments have shown that small sites are underestimated using STP data (Nance, 1979), and that the distribution and density of cultural materials within an archaeological site, regardless of size, can have a dramatic effect on the resultant STP dataset (Nance and Ball, 1986). While mathematical formulas are available to quantify the level of accuracy found within an STP survey (Sundstrom, 1993), they do not alleviate the partial and somewhat biased results obtained by this technique. With these limitations in mind, STP surveys are still a critical technique

for areas, such as the southeastern United States, in which vegetation and subsequent soil deposition obscures the visibility of underlying archaeological signatures.

A three-tiered stratified systematic STP survey methodology was utilized at SLAP in which the study area was divided into sections based on assumed density of archaeological materials. Based on a small-scale pedestrian surface survey and a pilot shovel test pit project of the study area prior to our field season, it was clear that the density and occurrence of archaeological phenomena were positively influenced by proximity to waterways. Our first tier was therefore based on being

TABLE 9.1  
Shovel Test Pit Results from SLAP Survey

Survey Area	STP (no.)	Pottery (%)	Shell (%)	Both (%)	Sterile (%)
Tier 1 – Marsh line	827	28.17	5.07	7.9	58.86
Tier 2 – Interior	323	8.05	0	0	91.95
Tier 3 – Marsh Island	97	3.09	1.03	0	95.88
TOTAL	1247	21	3.44	5.3	70.26

adjacent to the marshland. Within the first tier we placed an STP every 10 m along a 100 m wide transect that mirrored the marsh line. Our second-tier research area was in the inland portions of Colonel's Island, an area that our pilot projects suggested contained fewer archaeological remains. Within this area, we placed STPs every 20 m along 100 m wide east-west transects that were spaced 500 m apart. The three marsh islands were our third-tier research area. Previous visits suggested that these islands were relatively free of cultural remains. We were concerned with overlooking these small islands, a recurrent problem in coastal archaeology (see Keegan et al., 2008; Thompson and Turck, 2010; Turck and Alexander, chap. 7 and Napolitano, chap. 8, this vol.) and considered the possibility that the apparent lack of cultural materials was a sampling error. We therefore decided to pursue a very thorough survey of these small marsh islands. This portion of the project was very similar to that conducted near the marsh edge on Colonel's Island. STPs were placed every 10 m across 100% of the island. All STPs excavated within this project were standard 50 cm circles, were excavated to the sterile C-horizon, and all materials were screened through ¼ in. screens.

In total, 1247 STPs were excavated within the study area. Of these, 827 STPs were placed in our first study zone, the 100 m wide transect following the marsh line, while 323 STPs were placed in the second study zone along three east-west transects, each 100 m wide, that cut through the interior of Colonel's Island (table. 9.1). Another 97 STPs were excavated in the third study zone (the three marsh islands). The STPs near the marsh line of Colonel's Island were highly productive in terms of recovering archaeological

materials; 36% of these STPs were "positive" for containing archaeological materials ( $N = 299$ ). Another 5% contained no artifacts, but excavators did encounter shell deposits. This is in direct contrast to the STPs placed within the interior of Colonel's Island where only 8% were positive ( $N = 26$ ). Even fewer cultural remains were encountered on the marsh islands where 3% were positive ( $N = 3$ ).

By far the most common archaeological material encountered in all areas was ceramics of Native American manufacture. Less common finds included historic building materials (tabby and brick), stone tool debitage, shell tools, and assorted historic materials (primarily nails and glass). Not surprisingly, almost all of the archaeological materials discovered were found within the excavations as opposed to being located on the surface. Only two artifacts were found on the surface, which highlights both the lack of visibility and the geologically accretionary environment within the study areas.

#### ANALYTICAL UNITS: LANDSCAPE, SITE, AND COMPONENT

One of the ramifications of the rise in popularity of systematic surveys in the 1960s and 1970s was the slow acceptance that archaeological "sites" are exceedingly difficult to define in a manner that does justice to past events and practices as well as being useful to current archaeologists (Thomas, 1973, 1975; Thomas and Bettinger, 1976; Lewarch and O'Brien, 1981; Dunnell and Dancy, 1983; Dunnell, 1992). As systematic surveys encounter small pot drops, ephemeral lithic scatters, isolated finds, as well as artifact-rich habitation locales, the definition of

archaeologically relevant spatial areas is difficult and largely dependent on the idiosyncrasies of the researcher and analytical goals of individual projects. This has led some archaeologists to call for a true “siteless” archaeology in which the distribution of objects is analyzed directly rather than from the analytical units derived from the empirical record (Ebert, 1992; Ebert et al., 1996; Galaty, 2005). While the goals of “siteless” archaeology are appreciated, it is impossible to pursue such a program within the coastal Southeast because of the difficulty in encountering archaeological materials without excavation. In areas in which archaeological materials are regularly encountered on the modern surface, it is feasible to recover a relatively accurate sample of past materials and to fill a distributional map with those results. Projects, such as the one conducted by SLAP, in which almost all of the materials are recovered from excavated contexts are necessarily skewed in ways that preempt any attempt to produce an accurate “siteless” map.

Instead, in an effort to increase cross-project comparability, SLAP has adopted the nomenclature and analytical partitioning used on nearby St. Catherines Island. From 1977 to 1979 the American Museum of Natural History team, under the direction of David Hurst Thomas, conducted an islandwide survey of St. Catherines Island, the results of which were published in a recent three-volume set (Thomas, 2008). Thomas, who was heavily involved in the widespread adoption of systematic surveys in the 1970s, as well as a re-evaluation of how archaeologists define “sites” (Thomas, 1973, 1975), used three different terms to define spatially bounded areas of archaeological interest on St. Catherines Island—sites, components, and landscapes (2008: 875–876). Thomas’s tripartite division of archaeological locales allows a level of scalar flexibility in analyzing and presenting archaeological information that was found to be beneficial within this study and acts to structure our data presentation.

Twenty-four different archaeological sites were defined within the SLAP study area (fig. 9.5). Sites are “anyplace where material evidence exists about the Native American past” (Thomas, 2008: 875). As Thomas notes, the definition of archaeological sites is based on somewhat subjective judgment calls and different archaeologists can draw spatial delineations within archaeological data in diverse ways (2008: 520). In general, archaeological sites within the SLAP data are de-

finied as areas with a “significant” amount of cultural material that is bounded by archaeologically “empty” space. Thomas defined an ordinal scale for site size based on horizontal extent of cultural materials in which areas are divided into small (less than 50 m<sup>2</sup>), medium (50–500 m<sup>2</sup>), and large (greater than 500 m<sup>2</sup>) sites (Thomas, 2008: 520). A similar division was followed within this analysis.

Thomas also provides definite parameters for recognizing temporal components within archaeological sites. A component is “a culturally homogeneous unit within a single archaeological site” (Thomas, 2008: 875). Single sites can, and often do, have multiple components if they show evidence of being used during multiple time periods. Thomas suggests a division between major and minor components based on the ratio of temporally diagnostic items found from each time period (2008: 520). Using Thomas’s methods, 47 components were recognized within the SLAP study area.

The final analytical unit used by Thomas is a “presence” or “occupation” based on a landscape approach to the data. Concerned with the potential that rare finds and ephemeral material traces would be ignored through his focus on sites and components, Thomas offered a broad and inclusive category that “incorporates the totality of all available archaeological indicators (termed a ‘presence’ or ‘occupation’), partitioned according to a specific temporal period and plotted across a well-defined and bounded geographical space” (Thomas, 2008: 875–876). Based on this definition, 65 occupations were found within the SLAP study area.

The following section will first detail the overall presence of temporally diagnostic items across the entire study area (the landscape approach) before delineating these areas into sites that are then further divided into components. Up to the historic period, all of the temporally diagnostic items recovered were ceramic sherds. While several lithic flakes ( $N = 18$ ) and a whelk tool were found during the survey, they cannot be limited to a specific point in time and so play a minor role within this analysis.

#### CERAMIC CHRONOLOGY AND THE SLAP LANDSCAPE

Beginning with the work of Joseph Caldwell and Antonio Waring (1939a, 1939b), and continuing through the work of Lewis Larson (1958a, 1969, 1978, 1980a) and Chester DePrat-

ter (1977a, 1979, 1984, 1991, 2009), the chronological ordering of diagnostic ceramics from the Southeast has been refined for more than 70 years. The Springfield Legacy Archaeological Project utilized this chronology to track the changing usage of space over time.

The oldest ceramics found in the Southeast, as well as the study area, date to the Late Archaic. These ceramics, known locally as St. Simons, are recognizable by the vegetable fiber that was used for tempering (Waring, 1968; DePratter, 1978).

St. Simons ceramics were encountered very rarely during our STP survey and they only make up less than 1% ( $N = 6$ ) of the ceramic collection and are found in less than 1% of the total positive shovel test pits (see table 9.2). With such a small sample, it is difficult to discern any spatial distribution, but the few Late Archaic ceramics recovered are limited to three occupations in the northern section of the survey area (fig. 9.6).

After the Late Archaic, the Woodland Period begins and is largely recognized by the emer-

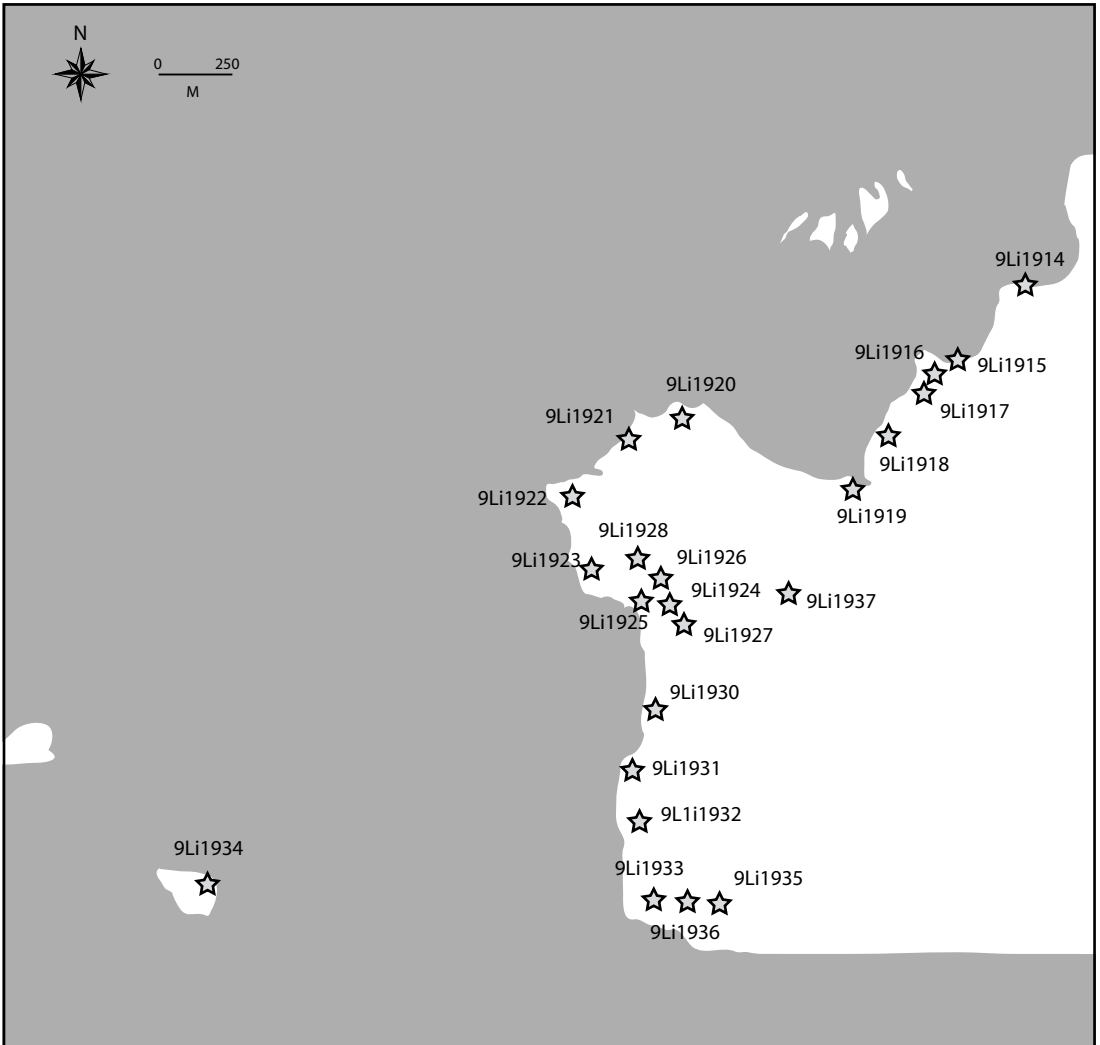


Figure 9.5. Site locations (9Li1929 removed from map by request of the land owners).

TABLE 9.2  
**Shovel Test Pit Ceramic Count and Weight**  
 (does not include untypable pottery,  $N = 22$ )

Ceramic type	Count	Count (%)	Weight (g)	Weight (%)	Positive STPs	Positive STPs (%)
St. Simons	6	.9	35.96	1.2	3	1
Refuge/Deptford	105	15.5	556.203	18.4	76	27.5
Refuge	14	–	62.1	–	12	–
Deptford	36	–	289.485	–	27	–
Unknown grit	55	–	204.618	–	40	–
Grog-Tempered	192	28.3	703.673	23.3	91	33
Wilmington	20	–	65.013	–	15	–
St. Catherines	94	–	363.687	–	60	–
Walthour	3	–	35.8	–	3	–
Unknown grog	75	–	239.173	–	41	–
Savannah	71	10.4	270.618	8.9	45	16.3
Irene	305	44.9	1456.231	48.2	153	55.4
TOTAL	679	–	3022.685	–	276	–

gence of grit- and sand-tempered ceramics (Waring, 1968; DePratter, 1979). The earliest grit- and sand-tempered ceramics are the Deptford type, with Refuge ceramics occurring later in the sequence (Waring, 1968; DePratter, 1979). Other archaeologists have commented on the difficulty in differentiating between Refuge and Deptford ceramics because both utilize small- and medium-grade grit as well as sand for tempering (Thomas and Larsen, 1979; Thomas, 2008). While there are some decorative elements that are recognizable as being either Deptford or Refuge (such as Deptford Check Stamping), these decorations were rarely found within the SLAP STP collection. We have therefore combined the two types into a single analytical category that spans the Early to Middle Woodland. Fifteen percent of the recognizable ceramics from the STP survey and more than a quarter of the positive shovel test pits contain Refuge/Deptford ceramics (table 9.2). The 12 Refuge/Deptford occupations are focused along the marsh edge, with negligible evidence of any usage in the interior of the study area (fig. 9.7). The presence of

Refuge/Deptford pottery along the marsh edge is concentrated in the northwestern portion of the survey area with a decrease in occurrence farther to the south. Beyond a small cluster that is immediately north of a relict waterway, the southern three-quarters of the project area contain only a couple of sporadic finds that date to the Early/Middle Woodland periods.

Following the use of grit and sand as tempering agents, pottery constructed during the Late Woodland/Early Mississippian periods is defined based on the use of ground ceramics as temper (Caldwell and Waring, 1939b; DePratter, 1979). This ceramic, or grog, tempered pottery can be further divided into three types: Walthour, St. Catherines, and Wilmington, based on the size of the grog being used as temper as well as the method of surface decoration (DePratter, 1979). Walthour pieces are recognizable as the only grog-tempered ceramics that are stamped (both complicated and check stamping) and as a rare pottery type within the SLAP STP collection, as well as for the Southeast in general (DePratter, 1979). Walthour ceramics are thought to occur

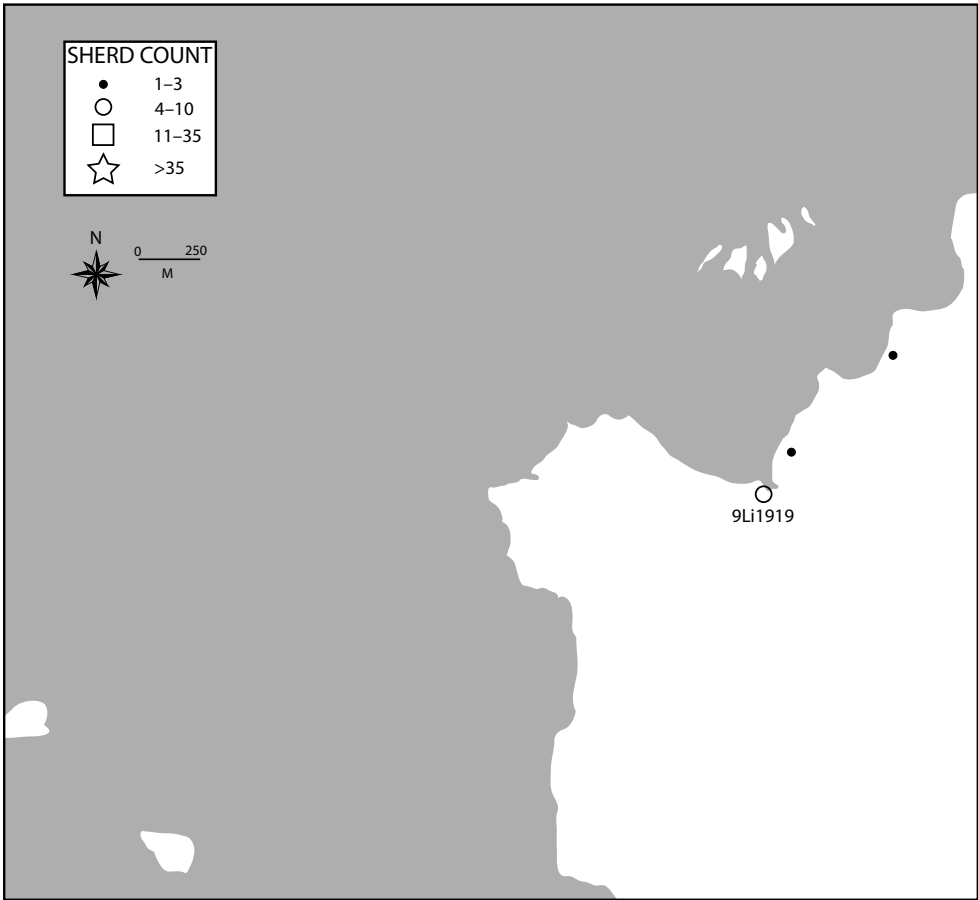


Figure 9.6. Location of Late Archaic occupations.

only during the earliest portion of the Late Woodland (the Wilmington I phase) and were likely constructed for fewer than 100 years (Thomas, 2008: 383). The more common grog-tempered ceramics within the SLAP STP collection are the St. Catherines and Wilmington types. While it is possible to differentiate between the two types when looking at larger sherds, a significant portion of the SLAP collection is made up of very small ceramic fragments that are not large enough to determine their specific type. We could positively identify slightly more than half of the clay-tempered sherds as being either St. Catherines or Wilmington, with the vast majority being St. Catherines. The sherds that were too small to differentiate between St. Catherines and Wilm-

ington are classified as being “grog-tempered” and are assigned to the broad temporal span of Late Woodland–Early Mississippian.

In total, a little more than a quarter of the SLAP ceramic collection from the STP survey was grog-tempered and a third of the positive STPs had grog-tempered ceramics within them (table 9.2). Seven St. Catherines and four Wilmington occupations can be defined, along with seven occupations defined by unidentified grog-tempered ceramics. This division overestimates the number of Late Woodland–Early Mississippian occupations in that many overlap with one another, but without larger samples of diagnostic ceramics it is impossible to further differentiate between these similar types. As with the pre-

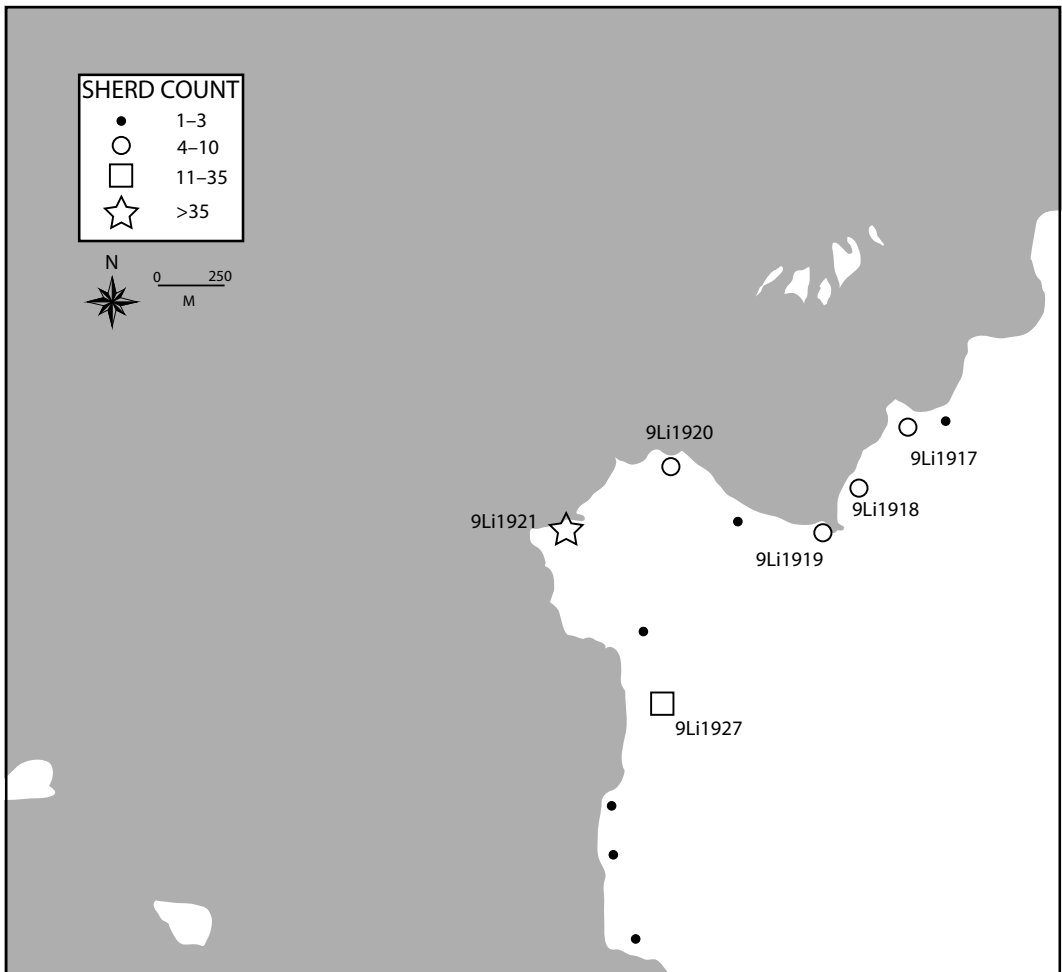


Figure 9.7. Location of Early-Middle Woodland occupations.

ceding Early/Middle Woodland ceramics, the grog-tempered ceramics are largely found near the marsh edge, although there is a slight shift toward the interior within the southern portion of the study area (fig. 9.8).

A significant increase in the use of sand as a tempering agent defines the Savannah pottery type (DePratter, 1979). While there is little controversy in delineating Savannah pottery as a morphological type, recent work on St. Catherines Island has questioned whether this pottery type is isomorphic with a well-defined time period (Thomas, 2008: 430–432). Savannah pottery

appears to span a temporal range (1200–700 B.C.) on St. Catherines Island that is related to both the St. Catherines Period on the early end and the Irene Period in the later portion (Thomas, 2008). This has led David Hurst Thomas to suggest that while there is a Savannah morphological type on St. Catherines Island, it is not directly related to a Savannah time period (Thomas, 2008). Other archaeologists have also attempted to better understand the temporal relation of Savannah ceramics (Crook, 1978a; Pearson, 1979a, 1984; DePratter, 1984; Braley, 1990; Saunders, 2000b) with little consensus. It would appear that Savannah



ceramics are a ceramic type either used in conjunction with other types, temporally limited to a very small time period, or varying in usage and temporal placement based on region. Without a directly applicable radiocarbon record, this project has little to contribute toward this ongoing discussion beyond noting that there are Savannah type ceramics recovered within the study area, but they are relatively rare.

As with the other ceramic types, the Savannah occupations are found primarily within 100 m of the marsh line. The 10 Savannah occupations are relatively ephemeral in that many of

them are made up of fewer than 10 sherds with only two locations, one in the southern section of the survey area and the other in the northwest, showing a significant presence of Savannah ceramics (fig. 9.9).

The most recent Native American ceramics found in coastal Georgia are tempered with relatively large grit (Caldwell and Waring, 1939; DePratter, 1991). Large grit-tempered ceramics can be further divided between an earlier Irene, which was initially burnished or stamped with a complicated pattern and then later was incised with more regularity, and a later Altamaha type,

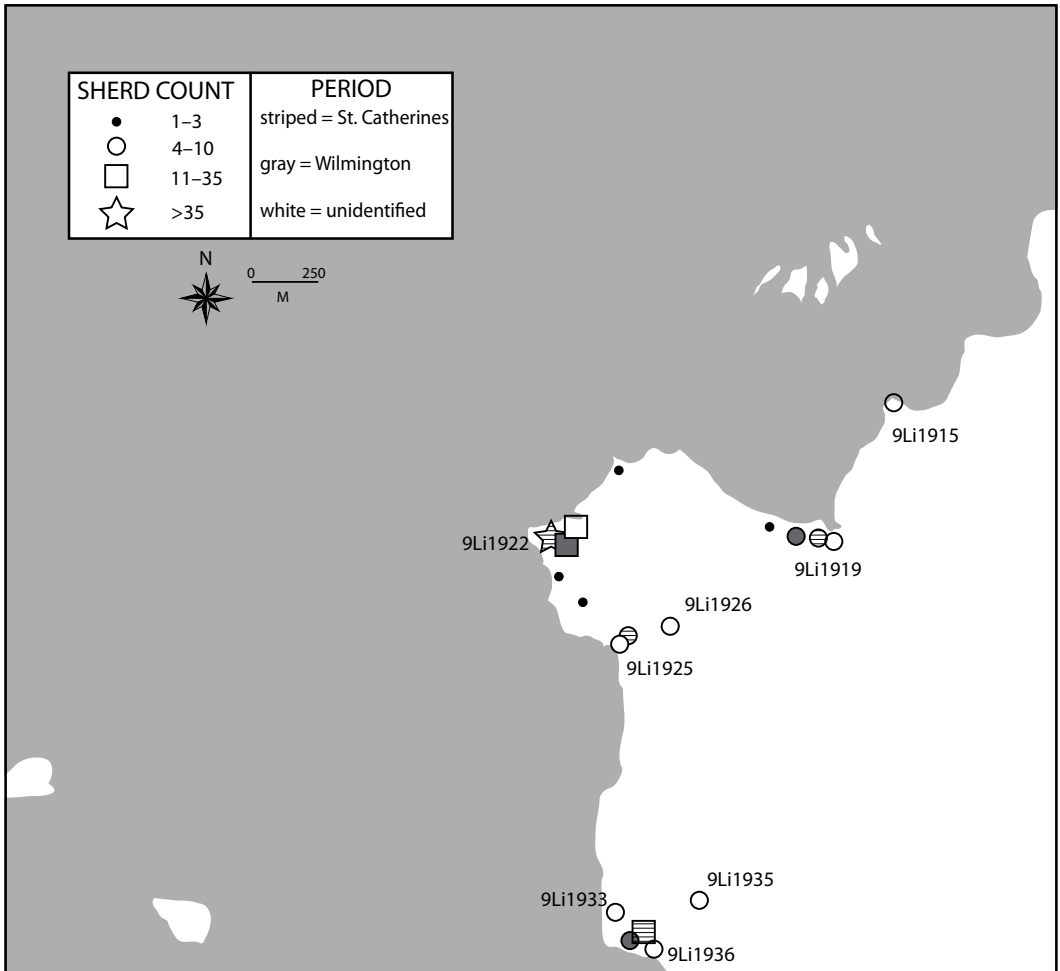


Figure 9.8. Location of grog-tempered ceramics.

which is similar to the Irene type, but is often stamped with different patterns or painted with a red slip (DePratter, 2009: 21–35). While Irene ceramics dominate the SLAP assemblage, no recognizable Altamaha sherds were recovered during the survey (table 9.2). As with all of the cultural materials recovered during the STP survey, the Irene ceramics were more abundant closer to the marsh edge, with a significant decline toward the interior of the study area. Irene ceramics were a relatively common find throughout the marsh edge STPs, occurring in more than half of the positive STPs from this

section. The ubiquity of Irene ceramics in the SLAP collection is demonstrated by the fact that there are 22 defined occupations from this time period including the only precontact occupation encountered on the marsh islands (fig. 9.10). Irene ceramics are the most common ceramic type found within coastal Georgia (Thomas, 2008; Thompson and Turck, 2009; Napolitano, chap. 8), so it comes as little surprise that they dominate the SLAP assemblage.

Artifacts dating to the historic period are very rare (found within 5% of total STPs) and are generally found in small, near-surface con-

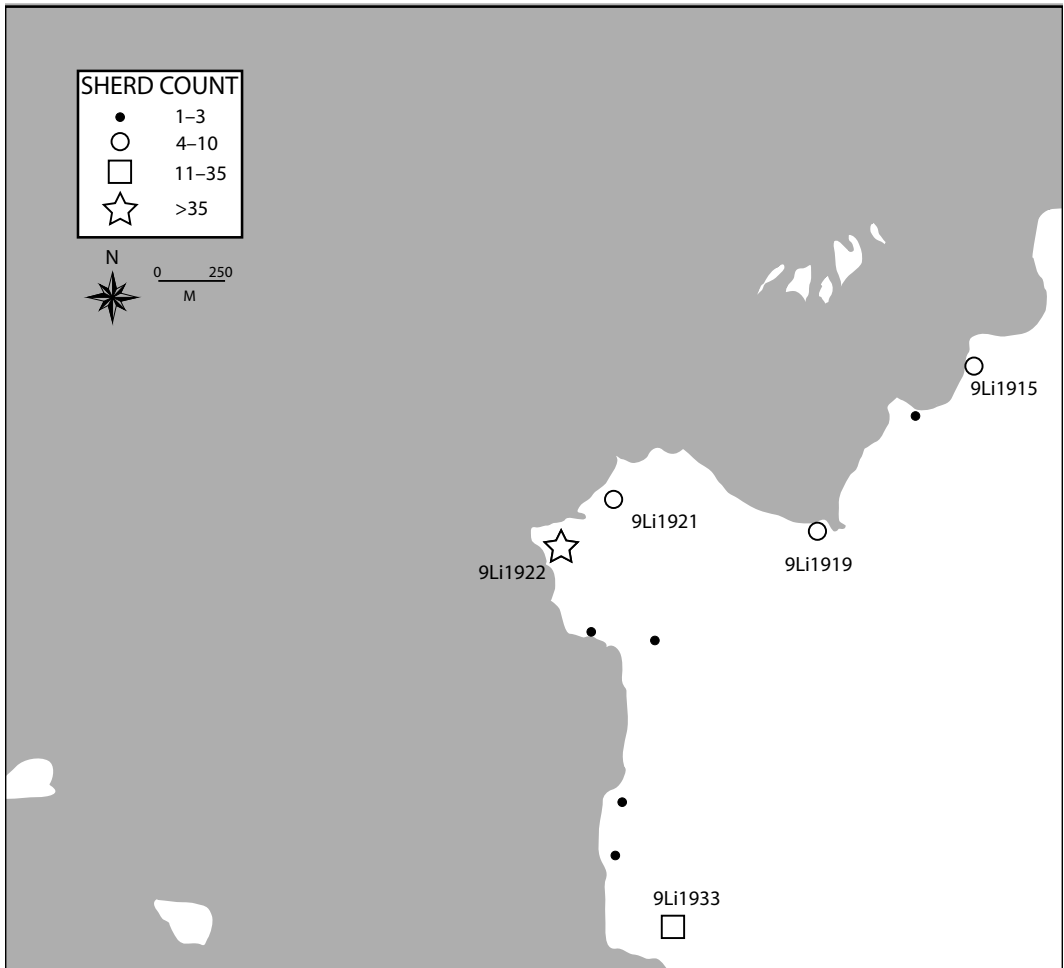


Figure 9.9. Location of Savannah occupations.

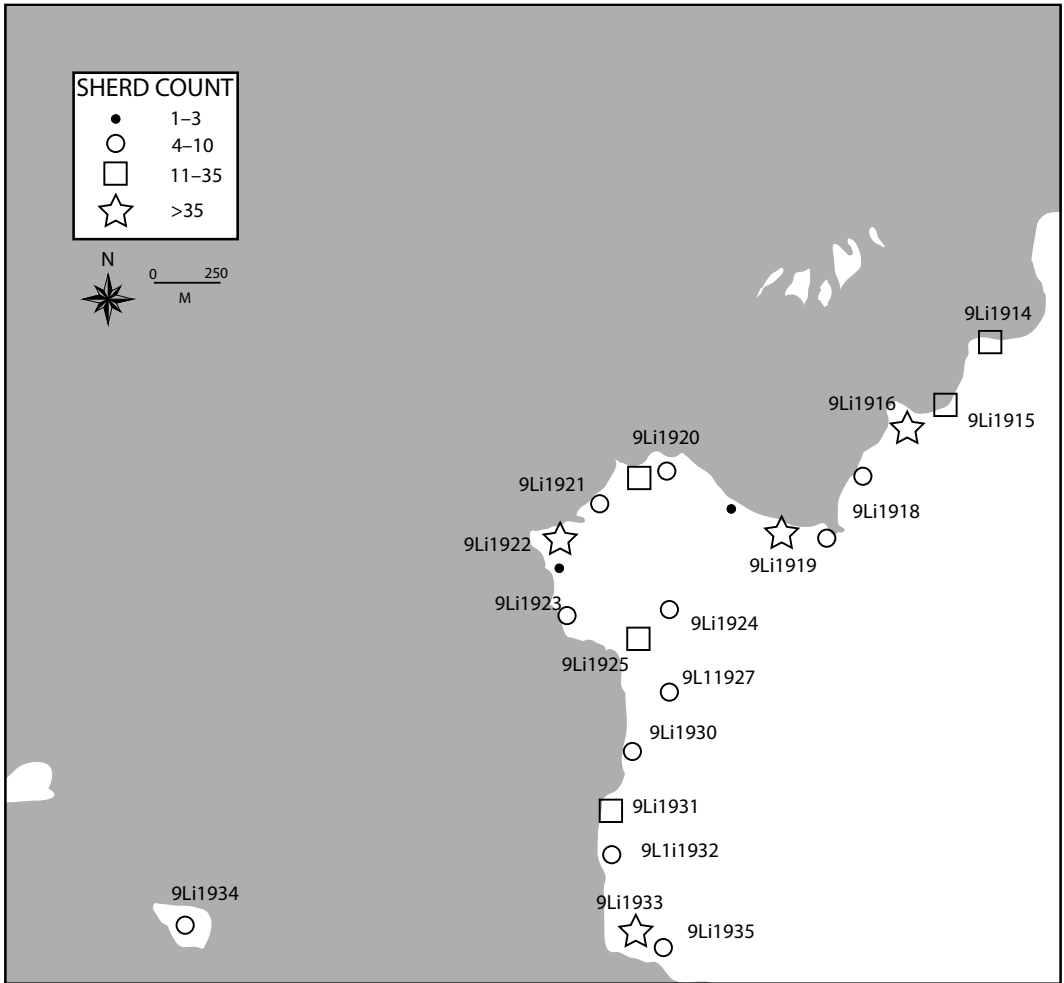


Figure 9.10. Location of Irene occupations.

centrations or as isolated items. Most of the historic period finds are small, unidentifiable ceramic sherds, along with numerous metal nails, fragments of window and bottle glass, as well as a small amount of tabby and brick. In total, the rarity of historic ceramics is surprising considering that this portion of Colonel’s Island has been occupied by European and African families for more than 300 years. While most of the historic period artifacts were found along the marsh line, a small number were also recovered within the interior, often in association with roadways.

### SITE DESCRIPTIONS

As noted earlier, 24 distinct locales have been designated as sites based on the presence of archaeological materials. The site designation is purely a spatial division, which is then temporally divided into individual components. Many of the sites contain temporally diagnostic materials from numerous time periods—often within a single excavation unit—suggesting a great deal of continuity in landscape usage through time. In total, 47 individual components were defined within the survey area. Each site, and its atten-

TABLE 9.3  
Archaeological Sites and Their Attendant Components from SLAP Survey

Site Number	Site Size	Distance to Water (m)	Elevation (m)	Presence of Shell - Time Period Association	Primary (secondary components)
9Li1914	Medium	48	5.1	Yes - Irene	Irene
9Li1915	Large	23	2.2	Yes - Irene	Irene, Savannah (St. Catherines-Wilmington)
9Li1916	Medium	52	4.5	Yes - Irene	Irene
9Li1917	Small	24	3.6	No	Refuge-Deptford
9Li1918	Large	19	2.5	Yes - Historic	Irene (Refuge-Deptford)
9Li1919	Large	22	2.2	Yes - Irene and St. Catherines-Wilmington	Irene, St. Catherines-Wilmington, Refuge-Deptford (Savannah, St. Simons)
9Li1920	Large	78	3.1	Yes - Historic and Irene	Irene, Refuge-Deptford
9Li1921	Medium	26	2.5	No	Savannah (Irene, Deptford)
9Li1922	Large	52	3.5	Yes - Irene	St. Catherines, Irene, Historic (Wilmington, Savannah)
9Li1923	Small	21	3	No	Irene
9Li1924	Small	86	3.2	No	Irene
9Li1925	Large	21	3	Yes - Irene and Refuge-Deptford	Irene (Refuge-Deptford, St. Catherines-Wilmington)
9Li1926	Medium	126	4.1	No	St. Catherines-Wilmington
9Li1927	Small	12	3.5	Yes - Irene	Refuge-Deptford, Irene
9Li1928	Small	164	3.5	No	Historic
9Li1929	Medium	141	4.2	No	Unknown
9Li1930	Small	8	0.8	Yes - Irene	Irene
9Li1931	Medium	18	1.5	Yes - Irene	Irene (Historic)
9Li1932	Large	46	1.8	Yes - Historic	Irene, Historic
9Li1933	Large	41	4.1	No	Irene, Historic (St. Catherines-Wilmington, Savannah)
9Li1934	Small	6	1.6	No	Irene, Historic
9Li1935	Medium	72	3.5	No	St. Catherines-Wilmington (Irene)
9Li1936	Medium	31	1.9	No	St. Catherines-Wilmington
9Li1937	Small	456	4.1	No	Historic

dant components, is summarized in table 9.3.

Several of the sites encountered during this survey are worthy of additional description because of their unique characteristics and potential importance for further research. The first one is a small clustering of three mounds (site 9Li1929). Mounds are relatively common within the American Southeast, first becoming common

in the Early Woodland and continuing through historic time periods. The mounds that make up this site are modest in size, ranging from 1 to 2.5 m in height and 7–9 m in diameter. Two of the mounds are conical while the third appears to have been built in several stages as it has a “stepped” appearance to it unlike the smooth shape of the other two mounds. The largest of the

conical mounds and the “stepped” mound each have depressions at their apexes, suggesting that they have been looted. The third, and smallest, mound appears untouched.

All of the mounds are covered with small pine trees and bushes, as are the surrounding environs. Investigating these mounds was considered outside the purview of this project, and so a minimal amount of effort was put into mapping the area and conducting a proper surface survey. In order to ensure that the current project did not impact the mounds, or any surrounding archaeological resources, a 100 m wide buffer was established within which no excavations took place. As per the request of the landowners, who fear further looting of the mounds, this site has not been marked on the map.

The second site that merits further discussion was discovered through an analysis of the LiDAR data and was then investigated through field visits and limited excavations. It is a large rectangular depression (site 9Li1935) roughly 4° off true north (fig. 9.11). Measuring 94.5 m along its north-south axis and 97.2 m east-west, this depression is almost a perfect square. There is a 15–20 cm rise along the edge of the feature before it quickly drops (roughly 18–20° slope) a meter in elevation. The interior is relatively level, with occasional low points that were filled with standing water during our visit. Within the feature, the vegetation was similar to that found beyond its edges (largely young pine trees) but was decidedly more open because of a lack of undergrowth and a greater spacing between trees.

The LiDAR shows that this square depression is related to a relict waterway that is linked to a low area within the interior of Colonel’s Island (see fig. 9.11). This low area in the interior is now dry, but the geology of the area along with historical records suggests that this was once wetlands. Much of coastal Georgia’s wetlands have been drained during the last 400 years in an attempt to reclaim the land for agricultural production and we assume that this interior area was likewise drained. The rectangular depression is at the confluence between a deep waterway, which leads to the marsh and these interior wetlands. At this point of confluence it appears that the waterways leading both into the interior of the island as well as those leading out toward the marsh have been either accentuated or created through anthropogenic means. The edges of the waterways were

relatively steep, far more so than other natural streams encountered elsewhere on the property. The waterways near the depression took dramatic turns at times—lending credence to the possibility that they were modified through anthropogenic means. A visual surface and a subsurface survey over this entire feature were conducted, resulting in the discovery of 11 grog-tempered sherds along with two Irene ceramics. While the lack of historic artifacts does not mean this feature was constructed precontact, it does raise this interesting possibility. Other researchers in the Southeast have encountered precontact waterways that have been associated with trade, symbolic meaning, agricultural needs, and movement by canoe (Luer, 1989; Kidder and Saucier, 1991; Wheeler, 1998; Rodning, 2003).

While we have not discounted the possibility of precontact construction, our current working theory is that this rectangular depression was constructed during the historic period, possibly as a containment feature for overflow from the draining of the interior of Colonel’s Island. Perhaps this overflow was contained for agricultural usage. Another possibility is that this feature was not based on draining the interior of the island, but was instead a catchment for tidal waters coming up the river. These waters could have been trapped during high tides and then allowed to evaporate leaving behind a thin layer of salt that could be sold, traded, or used for personal consumption. All of these theories are “best guesses” and need to be directly tested by further fieldwork as well as a more detailed investigation of historical records—both of which were considered beyond the immediate goals of the current project.

#### LANDSCAPE USAGE THROUGH TIME

As with any survey project, SLAP has produced a wide array of data from multiple time periods. It is beyond the scope of this chapter to comment on every potential aspect of this dataset. Instead, I will highlight three points at which the SLAP data have suggested interesting avenues of further research. These avenues include: a deeper investigation into the demographic shifts associated with the transition between the Archaic and the Woodland periods within the coastal Southeast; the differential use of shellfish between the mainland and nearby islands prior to the Late Mississippian; and the long-term population trends found within the SLAP data.

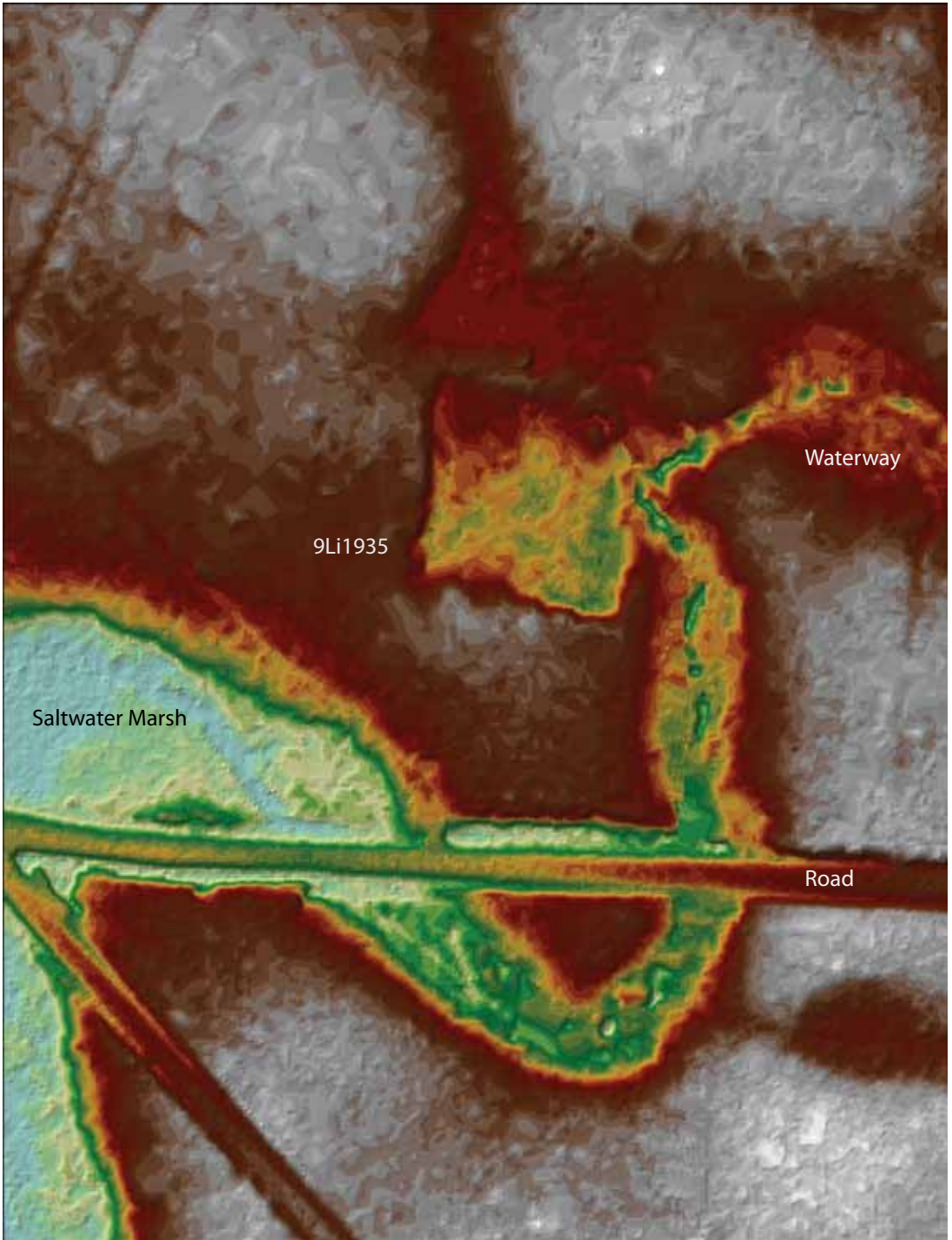


Figure 9.11. LiDAR data for 9Li1935.

## ARCHAIC–WOODLAND TRANSITIONS

The earliest evidence of human activity within the SLAP study area dates to the Late Archaic. Our evidence from this time period is based on a small handful of ceramics, which are found in several small concentrations in the northernmost portion of our study area. The rarity of Late Archaic artifacts can be contrasted with the dramatic increase of Woodland Period materials, as seen in the 105 pieces of Refuge/Deptford ceramics. As noted earlier in this paper, the Refuge/Deptford type used within this study is an amalgam of two different ceramics from consecutive time periods, so our temporal controls are not as robust as one would like. However, it is clear that a significant shift in artifacts has occurred with the onset of the Woodland, and is likely connected to a shift in population and settlement strategies.

These shifts are better understood on nearby St. Catherines Island where Late Archaic components were rarely found during the survey with a moderate increase in the number of components defined by Refuge/Deptford ceramics. While there is an increase in overall number of components between these two periods, the transition is far more complicated than a simple demographic increase. During the Late Archaic, there were three large sites on St. Catherines Island, including two shell rings (Thomas, 2008: 840; Sanger and Thomas, 2010). These two rings are similar to the nearly 50 other rings found throughout the coastal Southeast in that they were large-scale middens constructed through highly proscribed depositional practices (Russo, 2006). In terms of artifact density, quantity of food remains, and impact on the surrounding landscape, the shell rings on St. Catherines Island are significantly larger than any other archaeological site on the island until large village sites appear during the Mississippian. The presence of these two shell rings, which appear to be nearly contemporaneous (Sanger and Thomas, 2010), suggests an intensive use of the island during the Late Archaic.

Following the abandonment of the shell rings on St. Catherines Island and the end of the Archaic, there is a significant shift in usage of the island. Thomas found that there was a gap of 800–1000 years in the radiocarbon record starting around 1350 B.C. that corresponds to the Late Archaic and Early Woodland transition (Thomas, 2010a). This gap is attributed to humans abandoning the majority of the island as dropping sea levels destroyed local salt marshes, the main subsistence

resource for the Late Archaic populations living on St. Catherines Island (DePratter and Howard, 1980, 1981; Gayes et al., 1992; Thomas, 2008).

During this gap, perhaps as early as 1000 B.C., the radiocarbon record shows that an Early Woodland population returned to St. Catherines Island, but unlike the Late Archaic populations that preceded them, they did not build shell middens. Instead, the primary evidence for any activity on St. Catherines Island between 1000 B.C. and 350 B.C. comes from mortuary contexts (Thomas, 2008, 2010a). It is unclear whether St. Catherines was home to many, or any, Early Woodland peoples, or if it was used only as a mortuary locale. It is not until around 350 B.C. that shell middens are again deposited on the island and evidence for villages is found.

Archaeological research conducted on Ossabaw Island, immediately to the north of St. Catherines (fig. 9.12), suggests that the findings on St. Catherines Island may reflect a broad trend across the region. While there are very few Late Archaic sites on Ossabaw, at least one of them, Cane Patch (9Ch28), is an extremely large shell midden that appears to be the result of long-term occupation (Pearson, 2001: 14–16). In contrast, there are no Early Woodland (Refuge) sites on the island and only 10 very small Middle Woodland (Deptford) sites (Pearson, 2001: 18). Likewise, while only limited surveys have taken place on St. Simons Island, located south of St. Catherines, evidence suggests that after the abandonment of two Late Archaic shell rings, the island did not support any significant habitation sites for a millennium (Marrinan, 2010: 97).

The findings on the barrier islands can be further contextualized by looking at Victor Thompson and John Turck's (2010) work on the small marsh islands between the barrier islands and the mainland (fig. 9.12). Thompson and Turck surveyed four of these small marsh islands and found a small, yet significant, Late Archaic presence on all but one of the islands (Thompson and Turck, 2010). The presence of Late Archaic materials ( $N = 69$ ) is greater than the following Early ( $N = 12$ ) and Early-Middle Woodland periods ( $N = 27$ ) (Thompson and Turck, 2010), suggesting a significant shift in landscape usage between these two periods that parallels the findings on St. Catherines and Ossabaw. Taken together, these works suggest that the Georgia islands, both large and small, were heavily utilized during the Late Archaic. With the end of the Archaic, the small

islands along the Georgia coast appear to be visited less frequently, while St. Catherines Island, and likely other larger islands, were abandoned for significant periods of time before being used as mortuary sites, perhaps without accompanying residences or procurement camps.

The archaeological record of the mainland areas surveyed by SLAP portrays a very different account of landscape usage. The minimal number of Late Archaic ceramics in comparison with the 15-fold increase in Refuge/Deptford ceramics suggests a demographic shift that is the mirror opposite of what was found in the island contexts. The most plausible explanation is that sea level change occurring at the onset of the Woodland brought with it a movement of people away from the coast and into more mainland locales (DePratter, 1976, 1977a, 1978; DePratter and Howard, 1980; Thompson and Turck, 2010; Sanger, 2010). Other researchers working on the mainland routinely encounter Early Woodland sites, although they are often relatively small seasonal camps (Stoltman, 1974; Anderson, Cantley, and Novick, 1982; Sassaman et al., 1990; Sassaman, 1993b; Elliott and Sassaman, 1995; Sassaman and Anderson, 1995; Sassaman, 2010).

Not only did the transition between Late Archaic and Early Woodland bring with it a shift in landscape usage, but almost every aspect of the material culture, from pottery construction and style, lithic tool morphology, refuse disposal, and residential architecture changed between these two time periods, suggesting a dramatic realignment of social decision making. These changes are widespread along the southeastern coastline from South Carolina to Florida (Russo, 2010). The shift between Archaic and Woodland traditions is beginning to be unraveled by numerous researchers across the Southeast (see chapters within Thomas and Sanger, 2010). The research conducted by SLAP suggests that the coastal region of Georgia is an important point at which the Archaic–Woodland shift can be further investigated.

#### SHELLFISH PARADOX REVISITED

Regardless of time period, a consistent trend throughout the SLAP data is a positive relationship between proximity to marsh and quantity of archaeological materials. Ninety-six percent of precontact materials was found within 100 m of the marsh edge or relict waterway despite only 66% of the excavations taking place in this

area. A similar relationship was recognized on St. Catherines Island and was considered a positive demonstration of the predictive power of central place foraging theory (Thomas, 2008: 930). Central place foraging models are based on the assumption that humans will choose specific residential locales in an attempt to maximize their access to highly ranked subsistence patches (Winterhalder, 2001). Based on a series of projects in which different subsistence resources were evaluated, Thomas built a settlement model for St. Catherines Island that suggested the two highest ranked resource patches available were salt marshes and the maritime forest (2008: chap. 31). Central place foraging theory modeling suggests that all things being equal, the residents of St. Catherines Island should establish their residences near the marsh line at the intersection of these two patches, a model that was borne out by Thomas's survey results (2008) and generally replicated within this project. One of the primary resources drawn from the saltwater marshes is shellfish and their remains are ubiquitous within the archaeological contexts on St. Catherines Island (2008: 979).

This is in direct contrast with the results from the SLAP excavations in which marine shells are almost never found in conjunction with any material culture that predates the Late Mississippian (Irene). More than half of the sites within the survey area had substantial shell middens associated within them; however, all but two of the shell middens (at 9Li1919 and 9Li1925) were associated with Irene or historic period artifacts. Even the two associations between shellfish and pre-Irene ceramics are somewhat tenuous in that the stratigraphic integrity of these finds appeared mixed. On St. Catherines Island, shellfish remains are found in association with every ceramic type except Refuge/Deptford (2008: chap. 15). Likewise, shovel test pit surveys on nearby marsh islands routinely encountered shell middens associated with a wide range of ceramic types (Thompson and Turck, 2010; Turck and Alexander, chap. 7 and Napolitano, chap. 8, this volume). While changing sea levels are generally considered the cause of the lack of association between Refuge/Deptford sherds and shell (Thomas, 2008: chap. 5), they do not account for the general lack of shell middens predating the Irene in the SLAP survey area. Instead, it would appear that either other environmental factors precluded the development of shellfish beds in



the study area or there was a purposeful selection against shellfish before the Late Mississippian.

While shellfish are currently present within the study area, and the archaeological evidence shows that they have been available since the Late Mississippian, it is possible that the environmental conditions necessary for their existence

are a relatively recent occurrence. The presence of shellfish in middens dating from the Middle Woodland up to present day on nearby marsh and barrier islands suggests that there was no widespread environmental condition, such as temperature or sea level changes, which precluded the existence of shellfish throughout the region.

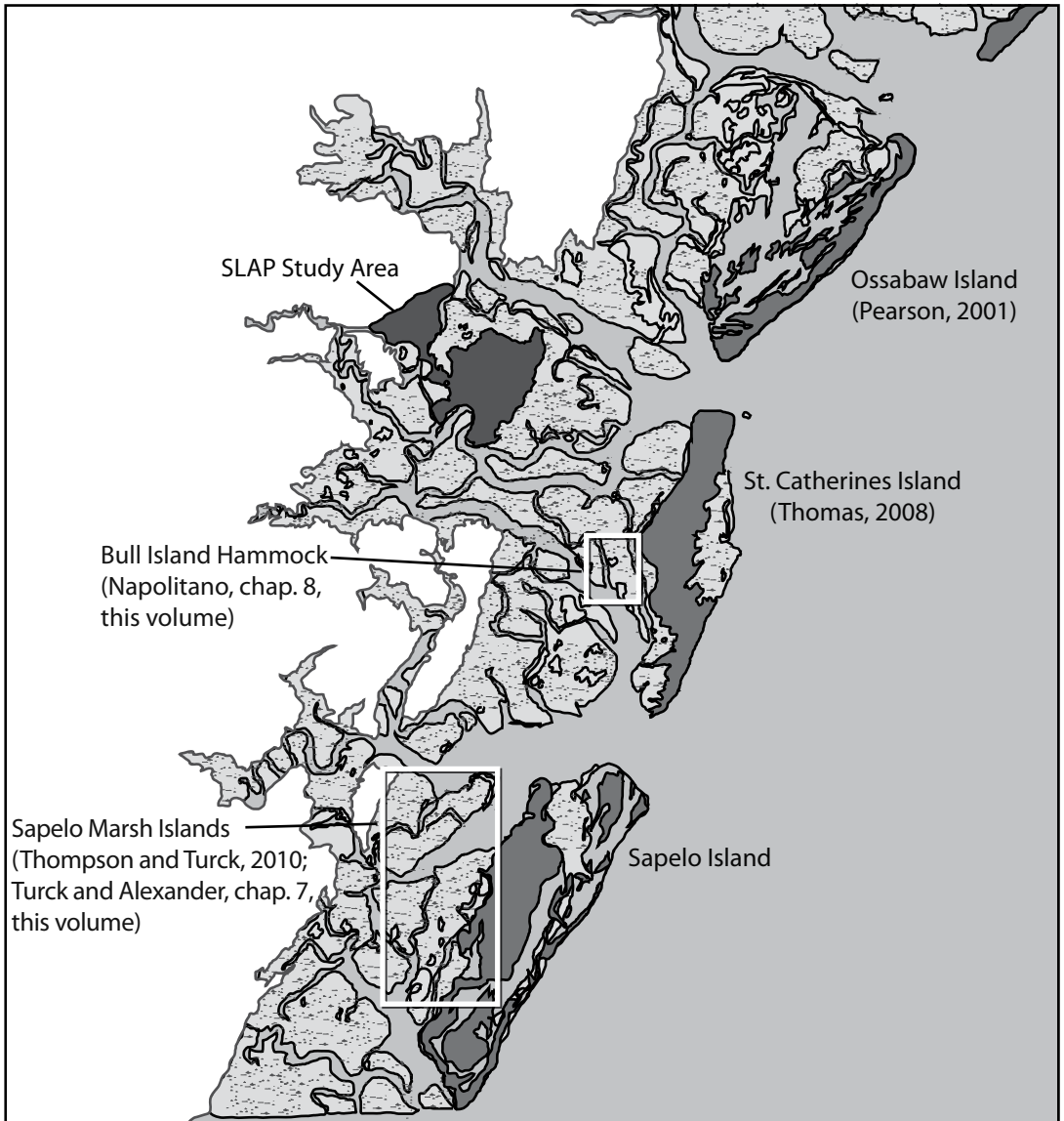


Figure 9.12. Overview of nearby studies.

Instead, any environmental condition that impeded the presence of shellfish would necessarily have been relatively limited in terms of spatial impact. The most likely environmental shift that would be this localized and yet highly effective in changing suitability for shellfish is a change in water flow, especially fresh water from the mainland. All shellfish have a limited range of salinity in which they can survive and reproduce (Galtsoff, 1964; Odum, Copeland, and McMahan, 1974). The primary factor in determining salinity within the study area is the amount of fresh water flowing down the rivers and tributaries from inland areas. While these waterways currently appear relatively stable, recent research suggests that they may be more dynamic than we imagine and have shifted course many times in the last 4000 years (Chowns, 2011).

While a local environmental shift could explain the lack of shellfish within the pre-Late Mississippian archaeological record, we currently have no evidence of such a change. A dramatic change in flow within a large waterway such as the Medway River, or even some of the smaller streams and creeks, should leave visible traces within the geological record. Currently, research into these waterways is minimal, and further work should be conducted to recreate their histories. In lieu of evidence for environmental change, it is wise to entertain other ideas, including the possibility that people were actively choosing not to subsist on shellfish prior to the Late Mississippian.

Thomas suggested a similar possibility in his recent work on St. Catherines Island when he asked why individuals would utilize shellfish at all. Working with the theories of human behavioral ecology, especially diet breadth, Thomas ranked the value of many of the foodstuffs found in the nearby environs based on the caloric return rate individuals could expect based on the amount of time they invested in acquiring and processing a given resource (2008: chaps. 6, 7, and 8). He found that shellfish were consistently ranked very low, which made their ubiquity within the archaeological record paradoxical (2008: 979). Thomas solved this apparent paradox by suggesting that a single ranking of foodstuffs based on energetic returns was not fine-grained enough to reflect the conditions presented to past peoples and that different groups of people valued foods differently. One of the largest divisions in terms of subsistence choices was between

men and women, especially women who were engaged in care giving to small children (2008: 981–982; also see Claassen, 1991). Thomas suggests that men and women often have different goals when it comes to subsistence, with women often choosing foods based on their ubiquity and predictability, such as shellfish, while men went for the larger payoff, yet higher risk foods.

Accepting this hypothesis, the archaeological record from the SLAP study appears to suggest that the difference in the faunal record between St. Catherines Island and this portion of the mainland is based on the decision making of women. Rather than gathering shellfish, the women within the SLAP study area may have spent their energy on other subsistence tasks, such as hunting in the nearby forest or fishing in the salt marshes. What would cause such a significant difference in subsistence practices conducted by contemporary populations on the islands and the mainland is not clear. It seems unlikely that the past residents of the coastal mainland were either ignorant of shellfish consumption or opposed to it based on ideological reasons. It would seem more likely that there were other resources that were particularly valued, perhaps by women in particular, that were available to such an extent that they precluded the gathering of the lower valued shellfish. Unfortunately, our faunal collection is extremely sparse, so it is difficult to address this question directly. Perhaps future research will provide more evidence regarding what pre-Late Mississippian peoples were subsisting on in the absence of shellfish.

#### LONG-TERM DEMOGRAPHIC CHANGES

Attempting to reconstruct past demographic trends is a perennial goal within archaeology (Hassan, 1978; Milner and Oliver, 1999; Cobb and Butler, 2002; Kowalewski, 2003; Bandy, 2004; Kintigh, Glowacki, and Huntley, 2004; Osborne, 2004). Quantity of temporally sensitive objects, such as ceramics, is a common approach, which is not without its dangers. Of primary concern is whether ceramics were used in similar manners throughout the study's temporal and spatial boundaries. This is of concern in all time periods, but perhaps even more so during the Late Archaic. Ceramics were first constructed during the Late Archaic and the archaeological record suggests that substantial populations did not use ceramics (Sassaman, 1993a). Research also sug-

gests that hunter-gatherer groups who were engaged in pottery production, such as some of the Late Archaic peoples in coastal Georgia, produce fewer vessels per individual than agricultural peoples (Eerkens, Neff, and Glascock, 2002). Finally, we also know very little regarding how and where pottery was used and discarded during the Late Archaic. While we often assume that pottery was commonly used as daily cooking containers, it has been suggested that early pottery served a very particular symbolic function and was used in relatively limited social contexts (Hayden, 1995b; Rice, 1999). With these concerns in mind, a comparison of the relative frequency of ceramics is presented, along with potential demographic interpretations.

As noted previously in this chapter, the Late Archaic presence within the SLAP study area is ephemeral. Largely limited to several sites in the northern section of the surveyed area, the Late Archaic landscape would appear to be lightly occupied. With the emergence of the Woodland and Refuge/Deptford ceramics, the number of components increases and begins to be found further into the southern sections of the study area. However, these components are frequently defined by small numbers of ceramics, and it is very rare to find a significant concentration of Refuge/Deptford ceramics.

This is in direct contrast to the later grog-tempered ceramics, which are found in well-delineated areas in which they often make up the majority of the artifactual assemblage. These concentrations are then bounded by wide areas in which no contemporary remains were recovered. This concentration of grog-tempered ceramics in well-defined locales surrounded by “empty” space is suggestive of a consolidation of populations around dedicated settlement areas. A similar conclusion was drawn by Charles Pearson on Osabaw Island based on a centralization of material remains from St. Catherines/Wilmington time periods (Pearson, 2001: 35).

Further research into the grog-tempered sites already encountered and additional survey work are needed to first confirm the apparent pattern of residential nucleation as well as pursue theories regarding its cause.

The distribution of grog-tempered ceramics also suggests that there is a great deal of continuity in landscape usage between peoples who made St. Catherines and Wilmington ceramics. In almost every context, the two types occur in close

proximity. Currently, our dataset is too small to draw any conclusions regarding the cause or effect of such apparent nucleation and stability within and between these two time periods.

As noted earlier in this chapter, Savannah pottery may not correlate with a unique time period. Nonetheless, there is a significant number of Savannah sherds within the SLAP collection ( $N = 71$ ), especially if the sherds were either a secondary ceramic type used in conjunction with other types, or if they date to a very small time period between grog-tempered and later Irene ceramics. The overall landscape usage seen within the distribution of Savannah ceramics is similar to that found with grog-tempered ceramics in terms of location but the Savannah ceramics are often found in more widespread, smaller concentrations, perhaps suggesting a dispersal of population from the very limited areas utilized previously.

The wide dispersal of Irene ceramics could be seen as a continuation of the redistribution of people across the landscape. Irene ceramics are by far the most common item found within this project and are often found in locations with no signs of previous usage, such as portions of the interior of the study area as well as one of the marsh islands. The Late Mississippian landscape (as defined by the distribution of Irene ceramics) was one in which new areas were clearly being utilized, but it is also a time of intensification of usage of areas that had been occupied previously.

As noted earlier in this chapter, at the onset of the Late Mississippian, and the beginnings of Irene pottery, shellfish began to be deposited in numerous middens within the SLAP study area. It is unclear what caused this shift toward a greater utilization of shellfish, but most likely, it is related to the general increase in population along the coast during the Late Mississippian. The dramatic increase in the number of Irene ceramics found in the SLAP study is mirrored by similar increases on nearby barrier (Pearson, 1979a, 1980, 2001; Thomas, 2008: 1035–1037) and marsh islands (Thompson and Turck, 2010; Napolitano, chap. 8, this vol.) and across coastal Georgia (Thompson and Turck, 2009). Generally, this increase in ceramics is thought to relate to an increased population during this time period (Thomas, 2008; Thompson and Turck, 2009). Increasing populations have numerous social repercussions, one of which is the increasing dif-

faculty in acquiring highly valued food and finding desirable living space. The archaeological record from SLAP shows that during the Late Mississippian, there was a dramatic increase in usage of areas that had largely been left vacant. It seems likely that these areas were not used previously because they were thought to be less amenable to settlement, but as populations increased and the most desired locales were filled, these secondary locales began to be utilized. Likewise, diet breadth models suggest that as higher-ranking resources become less available, less valued resources enter the diet (Winterhalder, 2001). As noted earlier in this chapter, shellfish are often ranked very low in terms of caloric returns per hour of labor and were largely ignored as a food in the SLAP study area until the Late Mississippian. With an increase in population, high-ranking foods would likely become rarer, or were perhaps controlled and consumed by a limited portion of the population. In either case, accessibility of highly ranked and valued living locations and food resources appears to drop at the onset of the Late Mississippian not just within the study area, but also on the nearby barrier islands (Thomas, 2008).

### CONCLUSIONS

As noted at the beginning of this chapter, this project is based on a single field season of research and has only begun to scrape the surface of the archaeological record. That being said, through the application of an STP survey, in combination with GIS applications and LiDAR data, several interesting patterns are ap-

parent within the SLAP data that would appear to deserve further research. A wide subregional approach is suggested in which numerous geographic zones, including inland areas, coastal zones, and marsh and barrier islands, are seen not as separate social spheres bounded by impenetrable barriers, but instead as deeply interconnected portions of the landscape with numerous layers of relation between them. Environmental shifts along the coast can have broad social repercussions for more inland areas, as the analysis of the Archaic–Woodland transition suggests. A broad comparison within subregions also allows the recognition of anomalous results, such as the general lack of shell middens predating the Late Mississippian within the SLAP study area. The coastal Southeast, in particular the Georgia coast, is experiencing a revitalization in terms of archaeological research (see Thompson and Worth, 2011), as indicated by this volume, and shows remarkable promise for transcending geographical boundaries and attaining a deeper understanding of the social landscapes of past peoples.

### NOTE

1. This work would not have been possible without the generosity of Springfield Legacy and the Devendorf family. Financial assistance was also provided by Columbia University and the Steigler Fund. The project was also heavily dependent on the crew of undergraduates from Columbia and Barnard College, as well as their supervisors drawn from across the discipline, all of whom can attest to the challenges of excavating more than a thousand STPs in coastal Georgia during the summer.



CHAPTER 10  
A PALEOECONOMIC MODEL  
OF THE GEORGIA COAST (4500–300 B.P.)  
THOMAS G. WHITLEY

INTRODUCTION

The study presented here is aimed at describing and analyzing the collection, storage, trade, and consumption of faunal and floral resources in the Georgia coastal region between 4500 and 300 years B.P. Its application is to the period prior to full European colonization (i.e., pre-1733) and refers specifically to Native American economic systems up through the Spanish Period, after which Native American groups were effectively removed from the coastal zone. The post-Spanish historic period is not included because comparing colonial and preexisting strategies may be inappropriate since new food sources and preferences were brought in, and the native ones were no longer relied upon. On the other end of the spectrum, prior to around 4500 B.P., modern sea level had not stabilized (although there is considerable debate on local sea level before 1500 B.P.—see the numerous discussion points in Thomas and Sanger, 2010, especially) and our knowledge of some of the baseline environmental variables, upon which this analysis relies, is fairly incomplete. It may be possible to recreate periods of lower shoreline by using bathymetry as a proxy for former topography, however the more recent Holocene barrier islands have fundamentally altered what that topography was, and geological reconstructions of the paleo-shorelines are not currently sufficient to extend this analysis any earlier than 4500 B.P.

Because this study provides a theoretical and methodological framework, as well as simulations of different spatial surfaces, it is a model of past systems, not merely an analysis of them. The theoretical underpinnings for this derive from be-

havioral ecology; most notably from the combination of Optimal Foraging Theory (MacArthur and Pianka, 1966; and Emlen, 1966) and Central Place Theory (Christaller, 1933) known as Central Place Foraging (Orians and Pearson, 1979; Stephens and Krebs, 1986) and particularly its applications within archaeology (e.g., Simms, 1987; Jones and Madsen, 1989; Metcalfe and Barlow, 1992; Kelly, 1995; Zeanah, 1996; Bettinger, Malhi, and McCarthy, 1997; Bird, 1997; Grayson and Cannon, 1999; Winterhalder and Kennett, 2006); and especially the recent research in coastal Georgia (e.g., Thomas, 2008; Thomas and Sanger, 2010; Reitz et al., 2010). Additionally, theoretical studies such as the diet breadth model (Hames and Vickers, 1982; O'Connell and Hawkes, 1984; Winterhalder, 1987; Smith, 1991; and Grayson and Delpech, 1998) and Prospect Theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992; Wakker, Timmermans, and Machielse, 2003) play a large role in driving the assumptions of this study. A more complete discussion of the theoretical basis for this is provided in Whitley (n.d.). The focus here is primarily to provide an overview of the methods involved and a presentation of the interpretive results.

Initially, the primary concern of any attempt at model building would be to find a standard unit of measure by which accurate comparisons could be derived. In many contemporary economic models, the unit of measure may be a monetary standard corrected for inflation or by exchange rate. In archaeological studies of prehistoric economies there is often no attempt made at extracting a standard unit of measure because the focus is usually on interpreting the sociopolitical relation-

ships between people or groups, which is rarely reducible to anything more than broad generalizations. Typically the validation, or support, for such a theory of prehistoric economics will be based on the presence or absence of exotic, or prestige, goods or some other evidence for social stratification (such as monumental architecture or “elite” burials) with little understanding of what those items may have meant in terms of the specific energy cost to acquire, build, trade, or consume them.

This analysis is explicitly focused on understanding the relative energy costs of subsistence activities, and as such must use a standard unit of measure for nutritional energy: calories, or more properly, kilocalories (kcal—the energy needed to increase the temperature of 1 kg of water by 1°C). This is not to presume that prehistoric people used or understood the concept of calories, or that all food sources were treated only with respect to the quantity, or even the quality, of calories they provided. Obviously some foods were selected over others for reasons of personal or cultural preference. But it does assume that prehistoric people were able to make choices based on a relative understanding of the amount of energy, or nutrition, to be acquired from any particular source, and they were able to maximize their caloric benefit, dietary sufficiency, storage, and trade potential. Moreover, they were able to conceptualize, and predict, the spatial distribution of resources in the areas of their greatest familiarity. The model presented here is a digital reconstruction of how such knowledge was likely conceived of, and used, by prehistoric foragers.

On some level, this is also an exploratory analysis, so there is no attempt made to definitively address specific sociopolitical perspectives, even if they have been long accepted in the region. Rather, the model is designed to provide some different perspectives on the paleoeconomy of the Georgia coast, and may be interpreted in different ways or for different purposes. Because the concern is on subsistence, the model is at its heart a spatial analysis. This can only be carried out within a GIS framework—a representative spatial manifold with consistent geographic limits.

### THE STUDY AREA

The study area includes the six coastal counties of Georgia, plus the next five immediately

inland (fig. 10.1). This area is flat, wet, and heavily forested, and has probably been so for the last 10,000 years or more—or at least as far back as the extent of this model. The elevation ranges from mean modern sea level to no more than 56 m (183 ft) above mean sea level (amsl) at a point around 100 km inland. Steep slopes exist almost entirely along very narrow eroded river bluffs, and always occur as small breaks in elevation. Much more gradual slopes exist as wide, low interriverine ridges and particularly along the ridgelines formed by the remnants of Pleistocene shorelines and barrier islands (the Silver Bluff, Princess Anne, Pamlico, Talbot, Penholoway, and Wicomico shoreline complexes). There are currently at least 7027 known archaeological sites recorded within the terrestrial portion of the study area (GASF, 2011), and they represent more than 10,000 years of occupation.

Although the study area covers almost 1.9 million ha (4,669,484 acres), more than 1 million ha of it (about 57%) are marsh or wetlands. The named soil types are quite numerous, yet are very similar and tend toward either a very sandy or saturated clay texture. They are typically poorly drained in low elevations and excessively or well drained in the slightly higher ones. Historically, old growth live oak and hickory forests covered the higher, sandy elevations of the ancient and now land-locked Pleistocene barrier islands and former shorelines. Forests also occurred along the coast itself, as well as along dry bluffs overlooking salt marsh or rivers. In the interior of the mainland and larger barrier islands, longleaf, slash, and loblolly pine, along with cypress, dominated the wetter marshes, and expanses of low interriverine ridges. Today, modern logging has changed most of the upland climax growth forest (which would have had a fairly open pinegrass understory) to a denser scrub understory with mixed secondary or maintained evergreen and deciduous forest. Wetlands have remained largely unaffected, with the exception of the 18th- to 19th-century rice fields (now brackish marsh) within the narrow tidal rice agriculture zone, and cypress logging in the late 19th to early 20th centuries, largely in the Okefenokee and Altamaha basins.

Along the coastal estuaries, protected by the barrier islands, lie vast expanses of salt marsh with shallow muddy tidal flats and emergent grasses. These brackish wetlands are often bor-

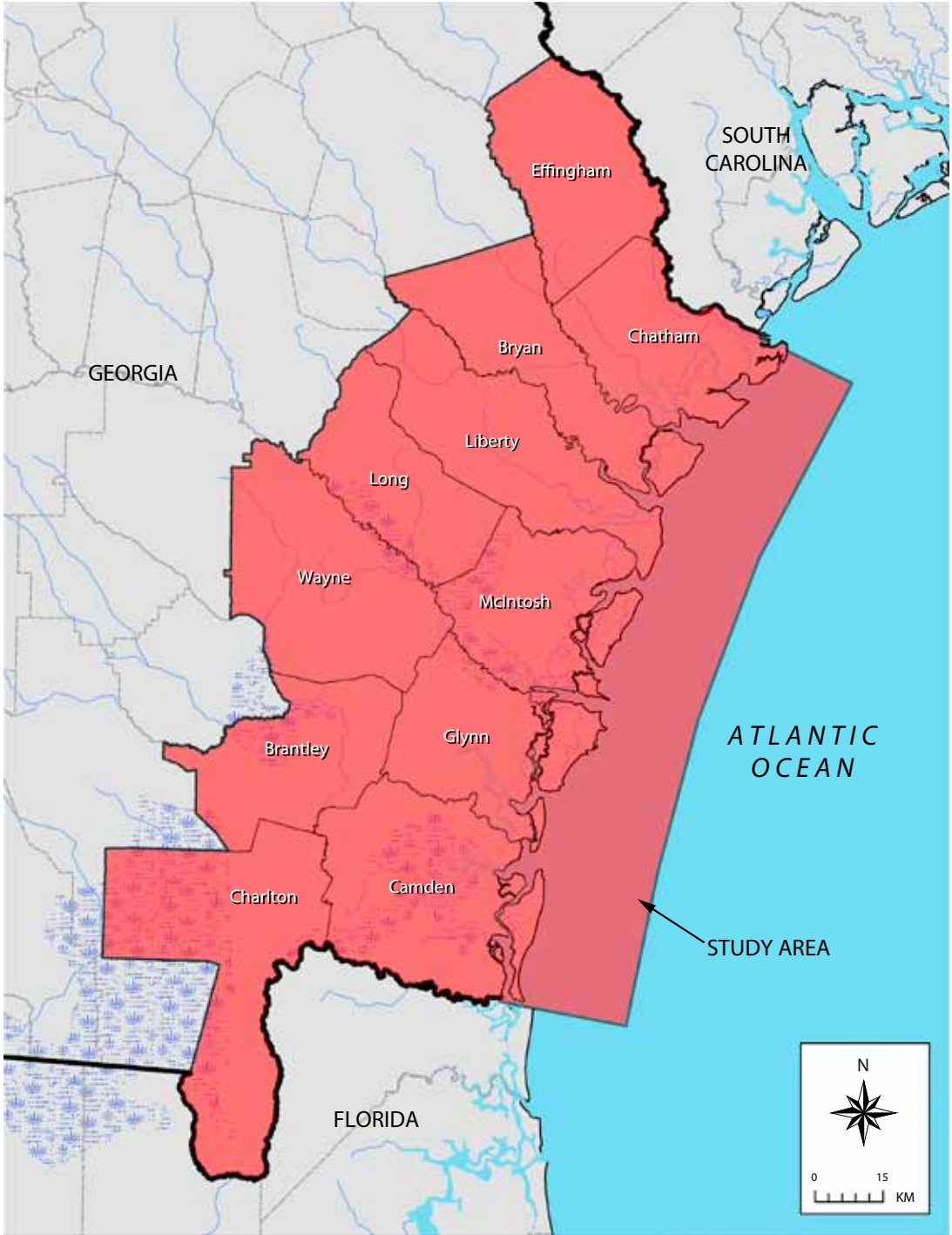


Figure 10.1. Study area.

dered immediately by mixed oak, pine, and hickory forest along with thick palmettos and other scrub. The eastern sides of the barrier islands typically exhibit long stretches of narrow, sandy beaches backed by dunes, scrubby deciduous trees, and sea oats. The ends of the islands give way to the fast-moving and variable tides at the mouths of the wide, slow flowing rivers (the Savannah, Ogeechee, Altamaha, Newport, Satilla, and St. Marys rivers) which traveled several hundred kilometers from the Piedmont or other parts of the Georgia Coastal Plain to empty into the Atlantic. The still visible historic modifications to these native landscapes include the former rice fields and logging canals in the wetlands, plus farms, roadways, small communities, a few urbanized areas, and military fortifications in the uplands or on islands.

This environment is not at all conducive to building a correlative (i.e., regression-based) archaeological predictive model. The absence of steep slopes entirely and the presence of fresh water almost everywhere make it impossible to use the two most common predictive variables (slope and distance to water) as a means to limit our expected distribution of settlement choice. The use of soil types in their raw form also does not strongly limit site placement because archaeological sites from all periods are known from virtually all soils that are not currently underwater.

Though there is a large sample of known sites, correlative analysis does not work for any portion of that population with these traditional environmental variables. The only generally accepted method to defining archaeological probability areas has been to use an intuitive model built upon the physical limitations of not being able to survey areas underwater with terrestrial methods (i.e., surveyable = high potential and unsurveyable = low potential). Consequently, the Coastal Plain has been largely thought of as predictably homogeneous with respect to prehistoric settlement choice; one place is environmentally almost as good as any other. However, when you consider that the key characteristics of moisture, salinity, water depth, cover, vegetation type, soil texture, and soil drainage work together as modifiers, or attractors, to the distribution of forage species, you begin to see the actual diversity of habitats that is present and can provide the framework within which an explanatory paleoeconomic model operates.

## THE HABITAT MODEL (HM)

If we recognize that human foraging targets have specific requirements for food, shelter, water, and protection from predators, then we should be able to build weighted formulaic representations of the combination of environmental variables that are important to them (i.e., a predicted habitat model for each one). Moreover, individual formulas may change with the seasons as different species grow, reproduce, and protect their young in different ways throughout the year. The first step in modeling habitats is to define the categories of food items that were being sought prehistorically. For this analysis, I chose to define 37 forage categories (table 10.1); based largely on the same categories defined by Thomas (2008). Some of these categories are individual species (such as “white-tailed deer”) while others are combinations of numerous species based on family or genus groupings (such as “freshwater turtles”), or size/habitat limitations (such as “large saltwater fish”). These groupings include both wild faunal and floral resources, as well as domesticated (or semidomesticated) species.

The purpose of grouping foraging targets in this way was to try and reproduce as closely as possible the likely manner in which prehistoric individuals may have conceptualized food categories. This is as opposed to the way we would organize them—by species. For example, there are 27 species of freshwater turtle common to the Georgia coast (GDNR, 2010), and we could define habitats for each of them. However, prehistoric foragers would not likely have distinguished between them as distinctive populations, and may have considered them all more or less the same; they would have defined a habitat for the group rather than each individual species. The forage categories defined for this analysis have taken that into consideration, or at least made some reasonable assumptions about that. Additionally, the categories include several groups that were probably not frequent targets of foraging, but could have been supplemental, opportunistic, or even starvation foods, so as to add a range of different kinds of caloric sources to the analysis. Examples of these may be reptiles, amphibians, sea turtle eggs, and cattails. Notably, this is also not an exhaustive list of food sources. There are species or groups of them that may have been consumed at times (or even commonly), but are not included in the analysis, most notably manatees, coyotes,



TABLE 10.1  
Forage Categories Used in the Study

Forage Categories	
Very large saltwater fish	Wading birds
Large saltwater fish	Sea turtles
Medium saltwater fish	Freshwater turtles
Small saltwater fish	Reptiles
Very small saltwater fish	Amphibians
Large freshwater fish	Shellfish
Medium freshwater fish	Sea turtle eggs
Small freshwater fish	Maize ( <i>Zea mays</i> )
Very small freshwater fish	Bean ( <i>Phaseolus vulgaris</i> )
White-tailed deer ( <i>Odocoileus virginianus</i> )	Squash ( <i>Cucurbita pepo</i> )
Black bear ( <i>Ursus americanus</i> )	Amaranth ( <i>Amaranthus</i> spp.)
Alligator ( <i>Alligator mississippiensis</i> )	Sunflower ( <i>Helianthus annuus</i> )
Wild turkey ( <i>Meleagris gallopavo</i> )	Maygrass ( <i>Phalaris caroliniana</i> )
Raccoon ( <i>Procyon lotor</i> )	Sumpweed ( <i>Iva annua</i> )
Opossum ( <i>Didelphis virginiana</i> )	Acorns ( <i>Quercus</i> spp.)
Rabbits ( <i>Sylvilagus</i> spp.)	Hickory nuts ( <i>Carya</i> spp.)
Squirrels ( <i>Sciurus</i> spp.)	Cattails/bullrushes ( <i>Typha</i> spp.)
Upland birds	Chenopods ( <i>Chenopodium</i> spp.)
Waterfowl	

Florida panthers, and birds of prey, among others. But these tend to be species with different modern habitats, or for whom we do not know the extent of their distribution prehistorically, or that were probably very infrequently selected as part of the diet anyway, even if they were hunted for other reasons.

Ultimately, the goal was to be able to develop a GIS model surface for each forage category, for each month of the year that depicted the habitat suitability on a range of 0 to 1, where 0 represents no potential habitat and 1 represents the best potential habitat. All map units would have a decimal value in between that indicates the potential habitat for that forage category, at the highest resolution possible. To do this, the baseline variables that comprise the elements of

habitat needed to be identified and standardized. This is essentially a predictive habitat model for each species for each month based on existing digitized environmental data.

The state of Georgia has already developed a series of habitat models for almost all of the species included in these forage categories (NARSAL, 2010). However, that series of models has some severe drawbacks for this analysis. First, it is strictly a dichotomous model. The habitat values are the equivalent of 0 and 1, rather than a decimal value between 0 and 1. In other words, you can assess whether habitat is present or absent but not the strength of that assessment. Second, the habitat assessment itself is not based on an explicit formula, but on collection records and generalized (typically unspecified)

expert assessment for areas between collected specimens. This makes it hard to assess the likelihood of encountering a species in any given area, even when the habitat value is considered positive. Additionally, the resolution of the data is at  $90 \times 90$  m map units ( $8100 \text{ m}^2$ ; nearly a hectare)—too large to distinguish between many small stream areas, islands, hammocks, or other pockets of suitable habitat within larger expanses of unsuitable habitat.

For this analysis, the goal was to develop explicit formulas based on as many variables as possible, and with as high a resolution as possible. These formulas are behavioral models and are meant to include what a prehistoric forager could have conceptualized as attractors for the specific forage target she or he had in mind. The model's limitations, though, are dependent upon the digital data available, and the ability to determine the presumed correlative relationships (especially as abstracted from modern data). There are several high-quality digital datasets available that proved invaluable for this:

- (1) the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) maps,
- (2) the Natural Resources Conservation Service's Soils Survey Geographic (SSURGO) database,
- (3) the U.S. Geological Survey's National Elevation Dataset (NED),
- (4) the National Oceanic and Atmospheric Administration's Hydrographic Survey Dataset (HSD),
- (5) the Georgia Department of Natural Resources' Land Use/Land Cover (LULC) data, and
- (6) the U.S. Environmental Protection Agency's Level 4 Ecoregions (L4E) data.

The NWI and SSURGO datasets are polygon layers developed from a mixture of ground surveys and aerial imagery analysis. The NED dataset is a raster dataset with a pixel size of  $30 \times 30$  m based on a seamless, and corrected, mosaic of smaller quadrangle-based digital elevation models derived from aerial imagery analysis and satellite data. The HSD is a point dataset of depth readings from more than 120 years of ship-based hydrographic surveys, using different methods and techniques. The LULC dataset is a raster surface based on aerial and satellite imagery analysis. The L4E dataset is a polygon layer based on

evaluation of many of the other datasets and additional biological or environmental information.

Some elements were extracted from each of these variables to define secondary or "derived" datasets useful for this analysis. A detailed discussion of how each of the derived datasets was developed is presented in appendix 10.1. These secondary variables are the ones to which habitat is keyed, and the ones upon which the predictive formulas are based. They include:

- Water availability (WA)—typical permanence of water
- Water salinity (WS)—average percent of salinity
- Soil texture (ST)—average grain size for the soil type
- Soil fertility (SF)—mean soil productivity
- Vegetation density (VD)—typical density regardless of vegetation type
- Vegetation type (VT)—two variables:
  - VT1—the proportion of deciduous trees in general
  - VT2—the proportion of live oaks
- Water depth (WD)—three variables:
  - WD1—shallow water
  - WD2—medium depth water
  - WD3—deep water
- Elevation zone (EZ)—five variables:
  - EZ1—salt marsh/sea level
  - EZ2—river bluff/shore margin
  - EZ3—Silver Bluff/Princess Anne formations
  - EZ4—Talbot/Penholoway formations
  - EZ5—Trail Ridge/Wicomico formations

Ultimately, 15 derived environmental variables were created. Figures 10.2 through 10.5 illustrate close-up views of some of these datasets. They are all standardized as ranging between 0 and 1, and they are tied to natural limits at either end (WA, WS, ST, SF, VD, VT1, and VT2) or are represented by a normal curve centered on a target value with ends at  $\pm 4$  m from the target (WD1, WD2, WD3, EZ1, EZ2, EZ3, EZ4, and EZ5). The predictive habitat formulas were based on both qualitative and quantitative assessments of preference for each of the modeled derived datasets extracted from Thomas (2008), Smith (1992), Reitz et al. (2010), NARSAL (2010), GDNR (2010), and other resources, such as the U.S. Fish and Wildlife Services Habitat Suitability Index Model Series (<http://el.ercd>).

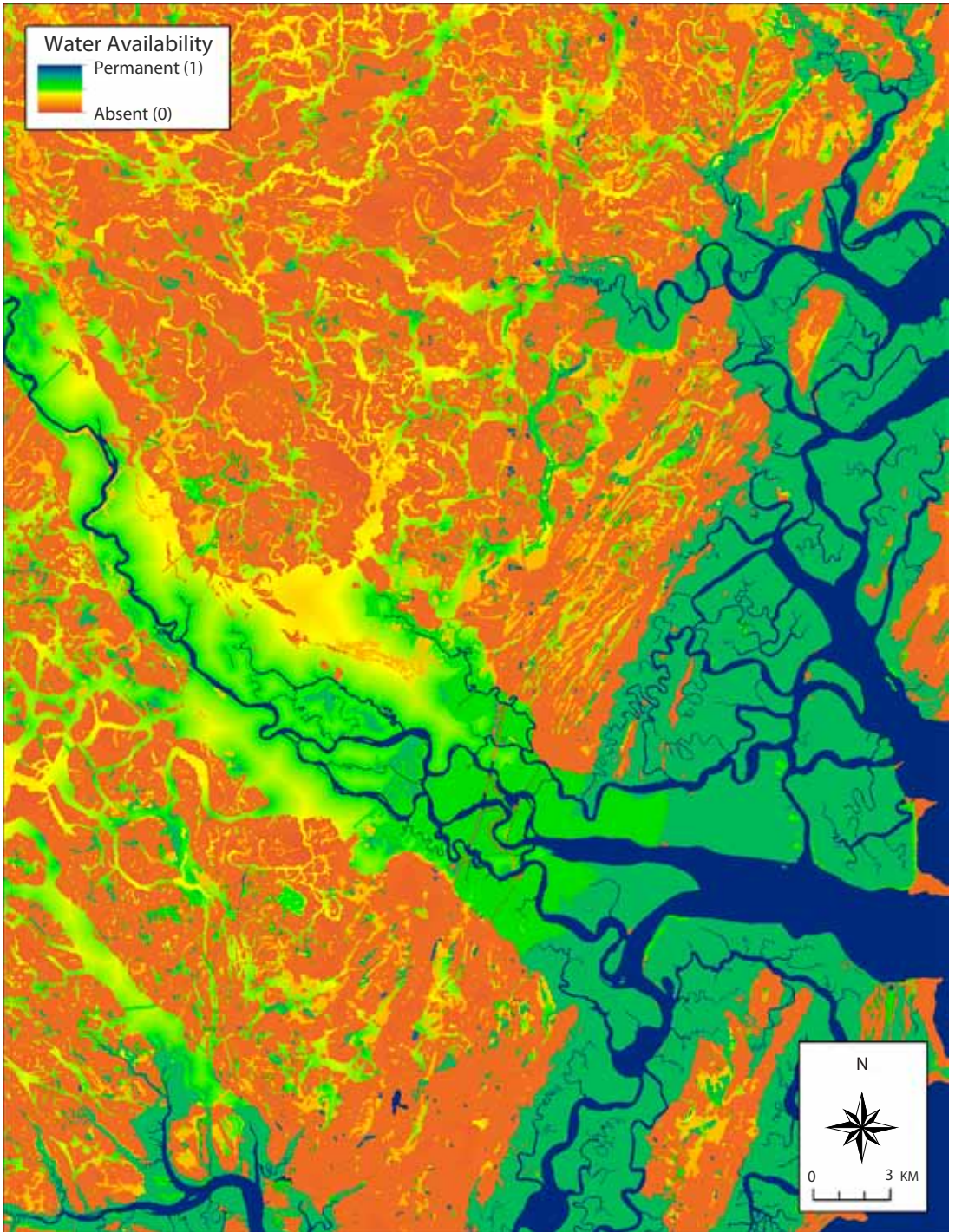


Figure 10.2. Water availability, mouth of Altamaha River.

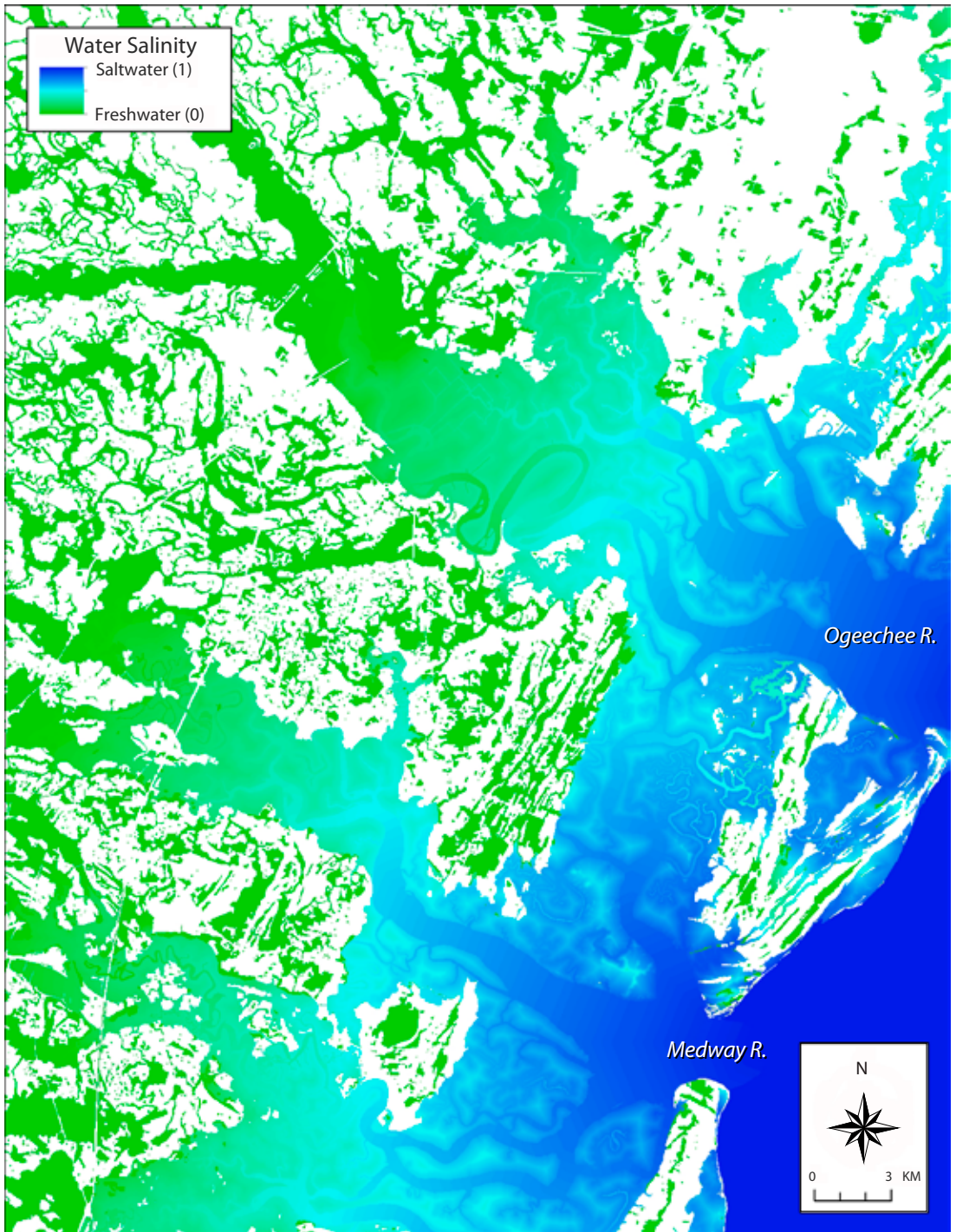


Figure 10.3. Water salinity, mouths of the Ogeechee and Medway rivers.

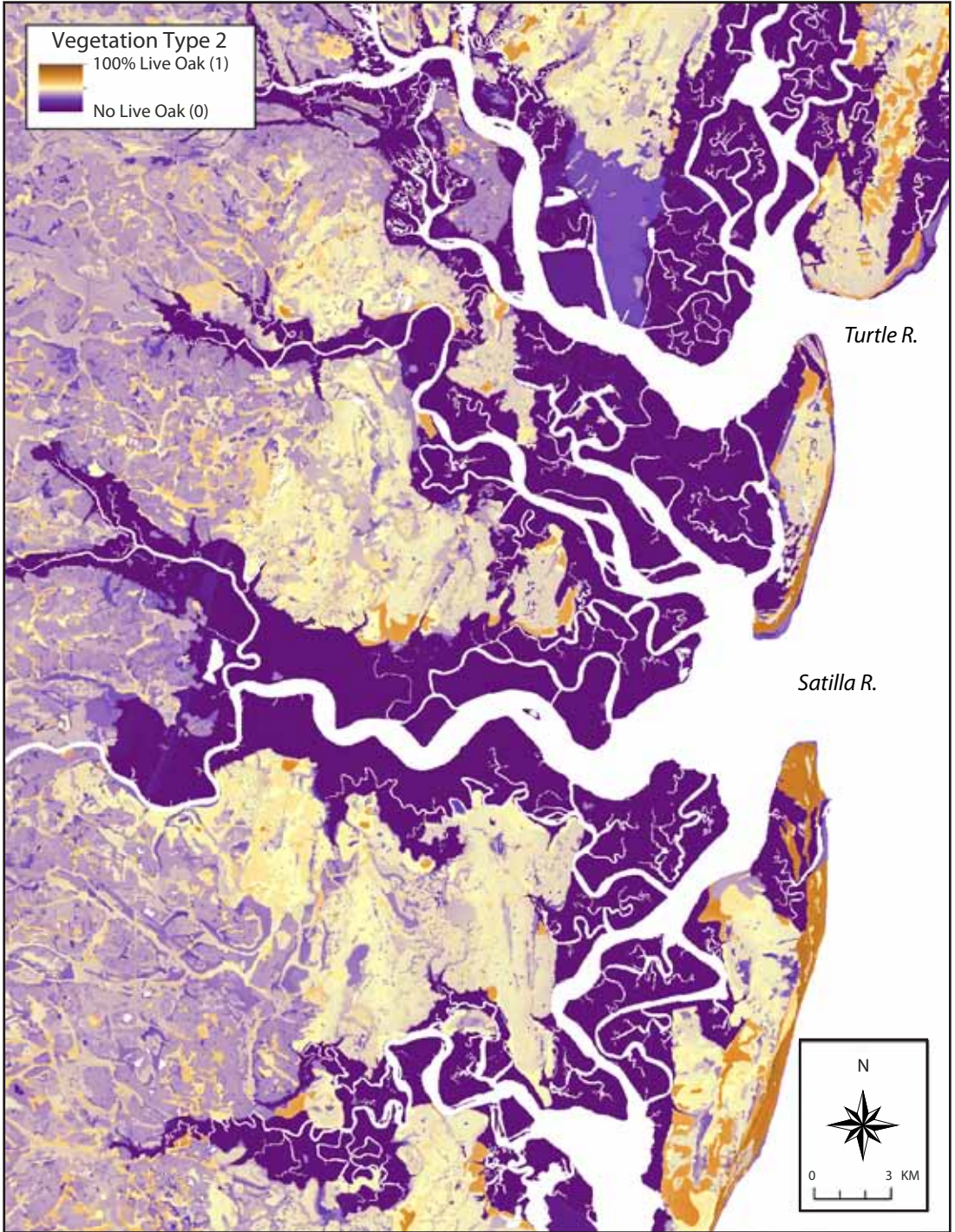


Figure 10.4. Vegetation type 2, mouths of the Turtle and Satilla rivers.

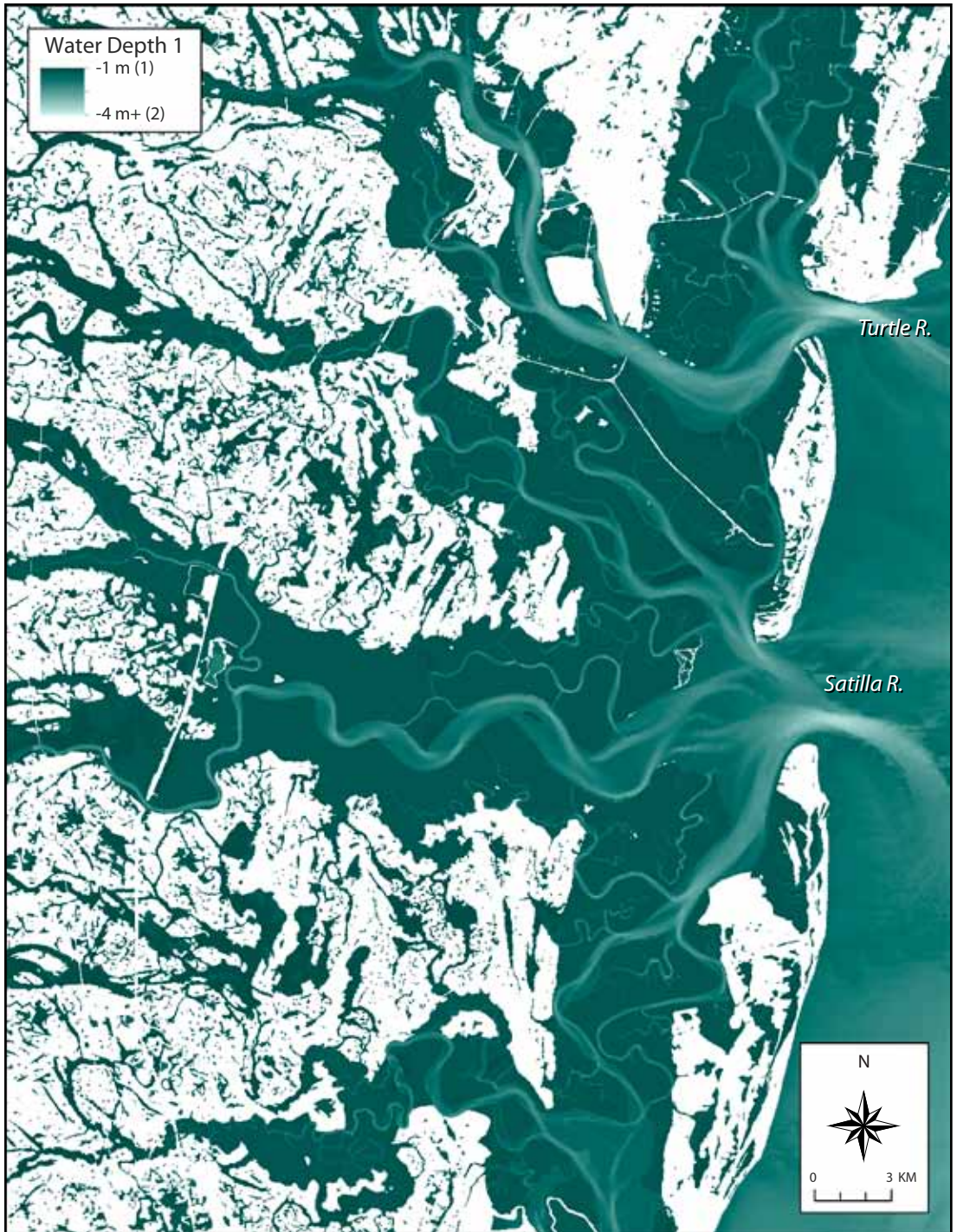


Figure 10.5. Water depth 1, mouths of the Turtle and Satilla rivers.

usace.army.mil/emrrp/emris/emrishelp3/list\_of\_habitat\_suitability\_index\_hsi\_models\_pac.htm). Formulas were generated for each environmental variable, for each month of the year (table 10.2). A brief overview of the methods by which the modeled habitat surfaces were created is presented in appendix 10.1.

The results of the HM analysis are a series of 444 individual GIS surfaces (37 forage categories \* 12 months), each of which covers all 4,669,484 acres with a resolution of 30 × 30 m (900 m<sup>2</sup>). Each of the 20,996,530 map units has a decimal value ranging between 0 and 1, which represents the predicted habitat suitability for each forage category for each month. Figures 10.6–10.8 are detailed views of several of the HM surfaces. Some habitats do not change monthly even when their productivity might, such as the plant forage categories. Chenopod habitat, for example, is always chenopod habitat throughout the year. However, available calories from chenopods may differ during different months based on their stage of development. This is the domain of the Available Caloric Model (ACM).

#### THE AVAILABLE CALORIC MODEL (ACM)

To transform the Habitat Model surfaces into caloric expressions, a series of additional variables were assessed (table 10.3), including ones based on population size, reproduction rates, average body mass, group size and range, and usable meat weights. All of these assessments were based on the same sources of information as the habitat preferences, or were projected as reasonable quantitative estimates where no specific data, or only qualitative data, were available. It should be noted again that the framework of this GIS model is not dependent upon the initial values chosen and inserting better, or alternative, data is always possible when it becomes available. The following were defined:

(1) **Population**—Each forage category was assessed for three population estimates: the total population in the state, the total in the study area, and the proportion in the study area. Because statewide population estimates are not commonly available for some species, a reasonable estimate was made for some based on density values by acreage (averaged from as many sources as possible and as close to the study area as possible), or from discus-

sions in the biological or archaeological literature. Since the study area represents about 12% of the state, any forage category that occurs relatively evenly statewide (e.g., raccoon) was calculated to have about 12% of its statewide population represented in the study area. For any forage category that is limited to the Coastal Plain (e.g., alligator), its study area population was estimated to be around 50% of its total statewide population, because the study area represents about 50% of the Coastal Plain. The study area represents about 45% of the freshwater habitat statewide (excluding all modern reservoirs), so freshwater forage categories were set at 45%. Since all saltwater habitats within the state are included in the study area, saltwater forage categories have the same statewide and study area population estimates (100%).

Most of the statewide and study area population estimates are based on modern values (and GDNR, 2010, proved to be the most valuable source of information). However, several forage categories were changed to reflect probable higher or lower prehistoric populations. For example, the modern statewide deer population is approximately 1.2 million, but a somewhat higher population is probable prehistorically, so the estimate was made of ~250,000 in the study area, or just over 2 million statewide (an average of about 20 acres of nonoverlapping habitat per deer—well within modern estimates for the region; cf. Short, 1986). Likewise, the black bear population is currently estimated to be around 1500 in the study area. That was increased to ~4000 as a prehistoric estimate. This estimate is also reasonable, averaging almost 2 nonoverlapping square miles per bear (cf. Rogers and Allen, 1987). For any of the plant categories, or resources gathered in bulk (i.e., shellfish and sea turtle eggs) statewide or study area population estimates were excluded, as caloric values were based on a per kilogram assessment.

(2) **Reproduction**—Five reproduction variables were recorded: full birth/harvest range (in months), peak birth/harvest period, average number of offspring, average years to reach maturity, and survival rate (assuming a stable population). The first four variables were based on information available in the biological literature and particularly those sources already cited above. The fifth variable





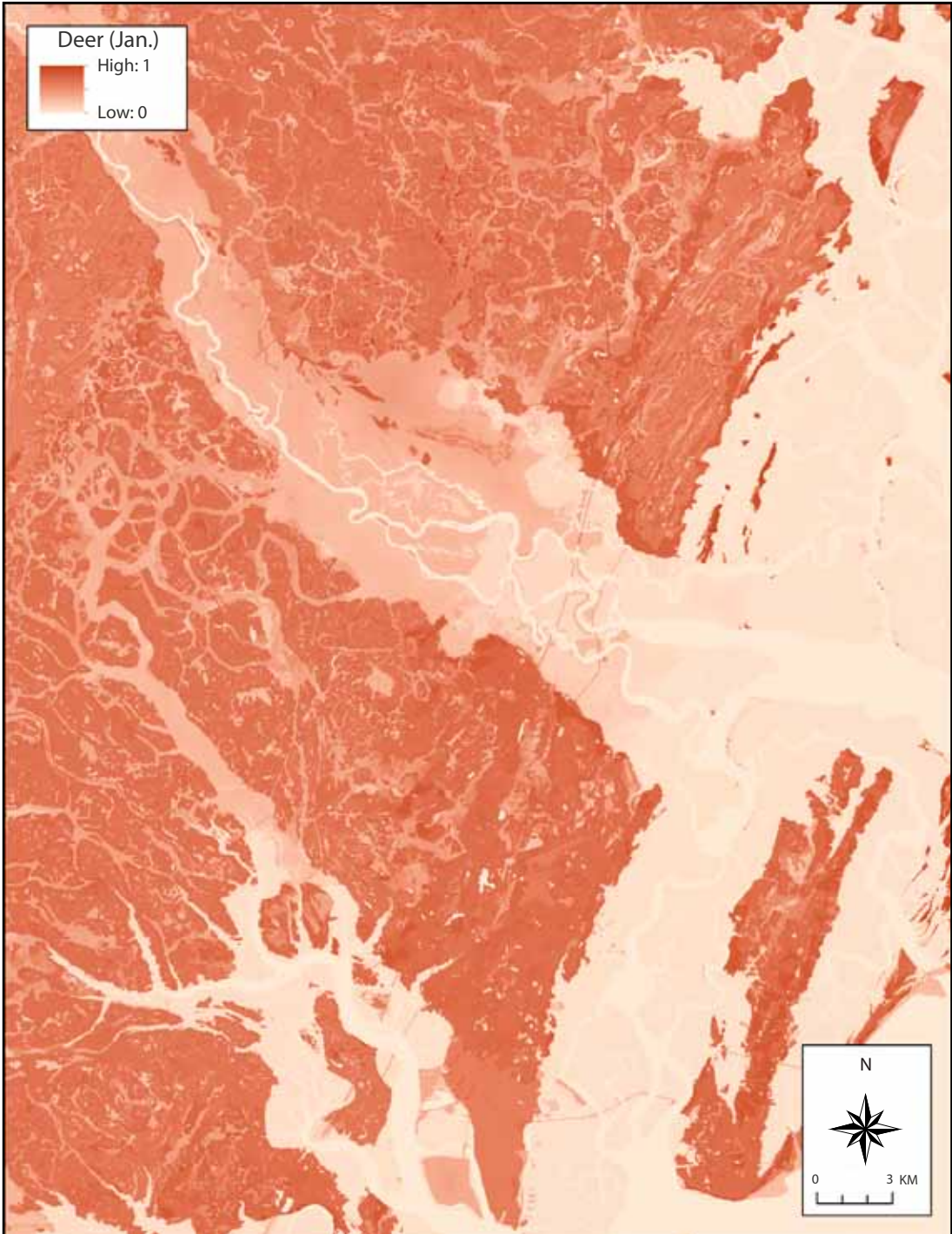


Figure 10.6. January deer habitat, mouth of the Altamaha River.

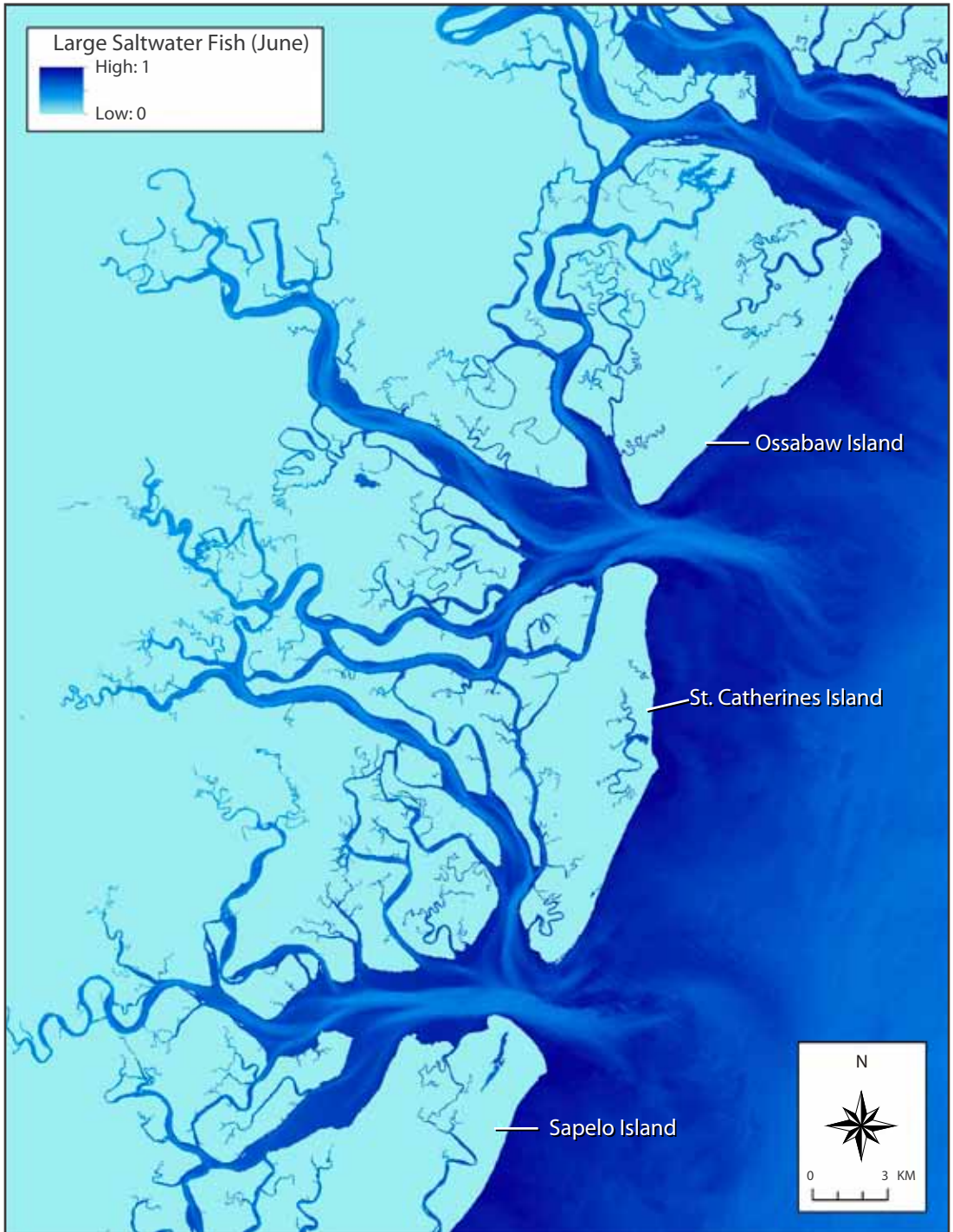


Figure 10.7. June large saltwater fish habitat, Ossabaw, St. Catherines, and Sapelo islands.

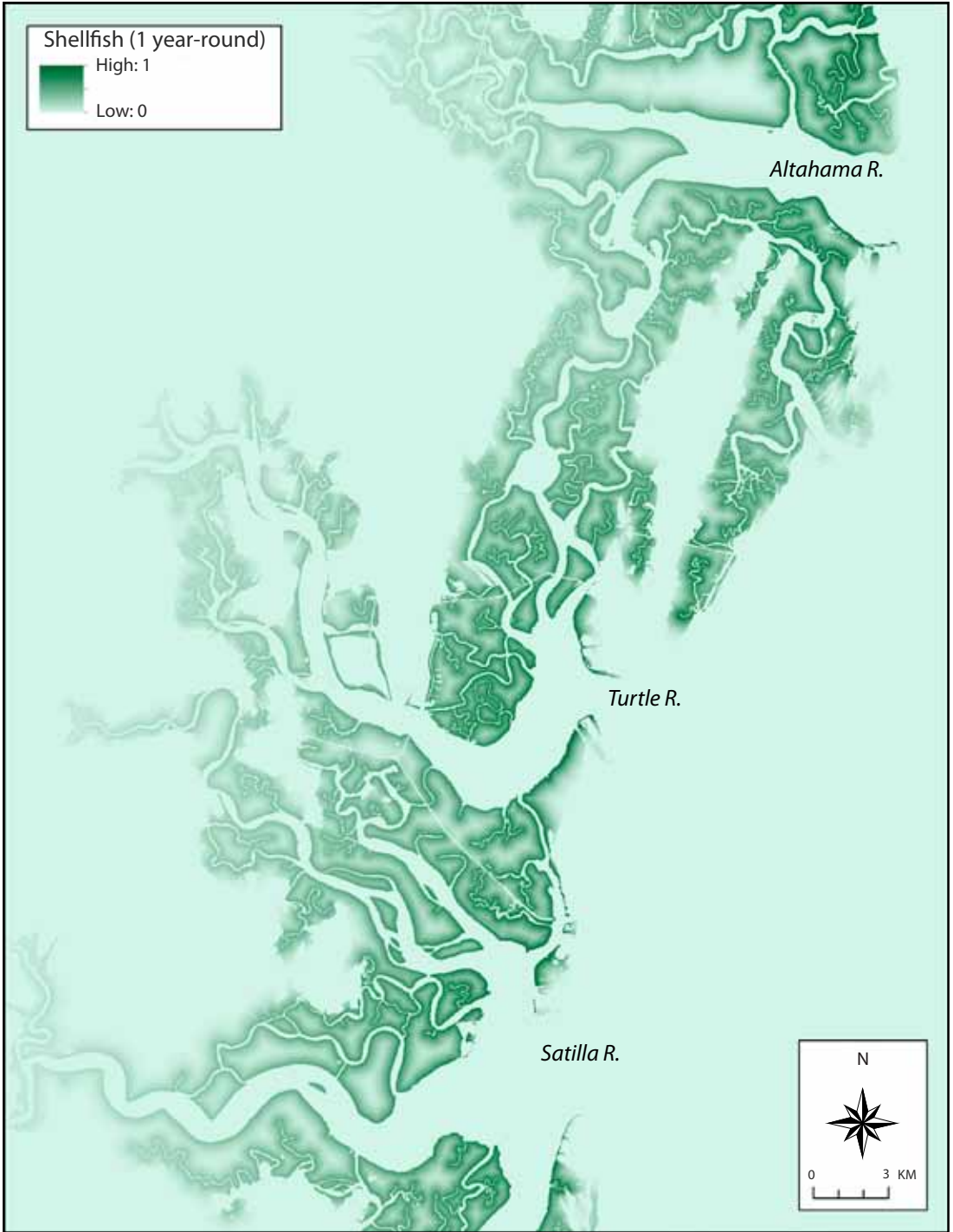


Figure 10.8. Shellfish habitat, between the Altamaha, Turtle, and Satilla rivers.

TABLE 10.3  
**Population and Reproduction Estimates by Forage Category**  
 Abbreviations: St. = study; SA = study area; Brth/harv. = birth rate or harvest rate; unk. = unknown; Ac. = acres.

Forage category	Population estimates			Reproduction harvest (year)				Average size: Max = male; Med = female; Min = juvenile				Groups/range			Caloric values				
	State	St. Area	% in SA	Brth/harv.	Peak	Offspring (no.)	Maturity	Survival (%)	Max. (lbs.)	Med. (lbs.)	Min. (lbs.)	Max. (kg)	Med. (kg)	Min. (kg)	Individuals (no.)	Ac. (max.)	Ac. (min.)	Usable (%)	kcal/kg
Very large saltwater fish	500,000	500,000	100	Apr-Jul	May-Jun	100	2.00	2.00	50.00	20.00	10.00	22.68	9.07	4.54	1 to 2	unk.	unk.	75	1100
Large saltwater fish	1,000,000	1,000,000	100	Apr-Jul	May-Jun	3,000	1.00	0.07	20.00	10.00	2.00	9.07	4.54	0.91	1 to 4	unk.	unk.	75	1100
Medium saltwater fish	2,000,000	2,000,000	100	Apr-Jul	May-Jun	10,000	1.00	0.02	10.00	4.00	1.00	4.54	1.81	0.45	1 to 20	unk.	unk.	75	1100
Small saltwater fish	3,000,000	3,000,000	100	year-round	May-Jun	50,000	0.50	0.004	2.00	0.60	0.20	0.91	0.27	0.09	1 to 100	unk.	unk.	75	1100
Very small saltwater fish	4,000,000	4,000,000	100	year-round	May-Jun	200,000	0.50	0.001	0.50	0.20	0.10	0.23	0.09	0.05	10 to 100s	unk.	unk.	75	1100
Large freshwater fish	1,111,111	500,000	45	Apr-Jul	May-Jun	3,000	1.00	0.07	30.00	4.00	2.00	13.61	1.81	0.91	1 to 4	unk.	unk.	75	1100
Medium freshwater fish	2,222,222	1,000,000	45	Apr-Jul	May-Jun	10,000	1.00	0.02	4.00	1.00	0.50	1.81	0.45	0.23	1 to 20	unk.	unk.	75	1100
Small freshwater fish	4,444,444	2,000,000	45	year-round	May-Jun	50,000	0.50	0.004	0.50	0.20	0.10	0.23	0.09	0.05	1 to 100	unk.	unk.	75	1100
Very small freshwater fish	6,666,667	3,000,000	45	year-round	May-Jun	200,000	0.50	0.001	0.10	0.05	0.02	0.05	0.02	0.01	10 to 100s	unk.	unk.	75	1100
White-tailed deer	2,083,333	250,000	12	May-Aug	June	4	0.50	50.00	200.00	125.00	20.00	90.72	56.70	9.07	3 to 12	1200	150	60	1200
Black bear	33,333	4,000	12	Jan-Feb	Late Jan	3	3.00	66.67	352.74	154.32	44.09	160.00	70.00	20.00	1 to 3	6250	1565	50	1610
Alligator	80,000	40,000	50	Aug-Oct	Sep	37	10.00	5.41	363.76	198.42	4.41	165.00	90.00	2.00	1 to 40	2500	500	43	1000
Wild turkey	1,250,000	150,000	12	May-Jun	Late May	10	0.50	20.00	20.00	10.00	2.00	9.07	4.54	0.91	4 to 15	1000	200	70	1600
Raccoon	1,000,000	120,000	12	May-Jun	Late May	4	0.50	50.00	20.00	8.00	2.00	9.07	3.63	0.91	1 to 3	800	200	70	1680
Opossum	2,000,000	240,000	12	year-round	Mar, Sep	14	0.50	14.29	6.00	4.00	1.00	2.72	1.81	0.45	1 to 8	350	160	70	1460
Rabbits	5,000,000	600,000	12	year-round	Jan, May, Sep	15	0.50	13.33	4.00	2.00	0.50	1.81	0.91	0.23	1 to 12	20	4	70	1140
Squirrels	4,166,667	500,000	12	Jan-Sep	Feb, Aug	5	0.50	40.00	3.00	0.80	0.20	1.36	0.36	0.09	1 to 4	10	1	70	1200

TABLE 10.3 — (Continued)

Forage category	Population estimates			Reproduction harvest (year)					Average size: Max = male; Med = female; Min = juvenile					Groups/range			Caloric values		
	State	St. Area	% in SA	Brth/harv.	Peak	Offspring (no.)	Maturity	Survival (%)	Max. (lbs.)	Med. (lbs.)	Min. (lbs.)	Max. (kg)	Med. (kg)	Min. (kg)	Individuals (no.)	Ac. (max.)	Ac. (min.)	Useable (%)	kcal/kg
Upland birds	5,833,333	700,000	12	Mar–Oct	May–Aug	12	1.00	16.67	0.50	0.30	0.10	0.23	0.14	0.05	5 to 20	200	10	70	1400
Waterfowl	333,333	150,000	45	Mar–Jul	Apr–Jun	10	1.00	20.00	5.00	2.00	0.10	2.27	0.91	0.05	4 to 12	unk.	unk.	70	1420
Wading birds	666,667	300,000	45	Feb–May	Mar–Apr	6	1.00	33.33	5.00	2.00	0.10	2.27	0.91	0.05	1 to 100s	unk.	unk.	70	1400
Sea turtles	3,000	3,000	100	Jul–Oct	Aug–Sep	110	20.00	1.82	200.00	150.00	20.00	90.72	68.04	9.07	1 to 2	unk.	unk.	80	890
Freshwater turtles	4,444,444	2,000,000	45	Jun–Oct	Aug–Sep	12	5.00	16.67	15.00	3.00	0.10	6.80	1.36	0.05	1 to 50	30	1	20	1300
Reptiles	16,666,667	2,000,000	12	Aug–Oct	Sep	10	1.00	20.00	1.00	0.30	0.10	0.45	0.14	0.05	1 to 12	15	1	50	1100
Amphibians	6,666,667	3,000,000	45	Sep–Nov	Aug–Sep	10,000	0.50	0.02	0.50	0.10	0.05	0.23	0.05	0.02	10 to 100s	2	1	70	1100
Shellfish	n/a	n/a	n/a	year-round	Aug–Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	500	1	1	100	720
Sea turtle e+A6eggs	n/a	n/a	n/a	Jul–Oct	Aug–Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	113	1	0.2	100	1995
Maize	n/a	n/a	n/a	Aug–Oct	Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	1500
Beans	n/a	n/a	n/a	Aug–Oct	Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	800
Squash	n/a	n/a	n/a	Sep–Nov	Oct	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	750
Amaranth	n/a	n/a	n/a	Jul–Oct	Aug–Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	1359
Sunflower	n/a	n/a	n/a	Jul–Oct	Aug–Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	489
Maygrass	n/a	n/a	n/a	May–Aug	Jun–Jul	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	457
Sumpweed	n/a	n/a	n/a	May–Aug	Jun–Jul	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	272
Acorns	n/a	n/a	n/a	Aug–Oct	Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	1214
Hickory nuts	n/a	n/a	n/a	Aug–Oct	Sep	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	2150
Cattail/bullrush	n/a	n/a	n/a	Apr–Jul	May–Jun	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	1745
Chenopods	n/a	n/a	n/a	May–Aug	Jun–Jul	n/a	n/a	n/a	2.20	0.00	0.00	1.00	0.00	0.00	n/a	n/a	n/a	100	433

(survival rate) was calculated by dividing two by the average number of offspring, assuming that a stable population is one in which the reproducing pair of individuals ultimately replace only themselves in the population. All other offspring are eliminated from the population by predation, disease, or some other demise, without reproducing. Obviously, populations do not always function like this in real life; instead they go through cycles of spikes and crashes. However, over the long run, the assumption here is that at any given time from 4500 to 300 B.P., forage category populations are more or less internally stable. For those forage categories assessed on a per kilogram basis, only the first two variables (birth/harvest range and peak) are applicable.

(3) **Resilience**—Forage category resilience has a rather vague definition. Within the field of ecology, resilience was introduced as a measure of ecosystems to describe how quickly they bounce back from disturbance (Holling, 1973; Gunderson, 2000), which is usually from human-induced causes. Resilience has also been thought of as how much disturbance an ecosystem is able to absorb and still remain unaffected (Walker et al., 2004). Within this modeled context, resilience on the part of a single species or forage category is thought of as a relative assessment of how sensitive the population is to external stress from hunting or collection. To measure this, a resilience formula was developed:

$$R = \sqrt{P \left( O \left( \frac{I * S}{M} \right) \right)}$$

where I = the number of individuals per 100 ha, S = the survival % rate, M = the length of time (in years) to reach maturity, O = the number of offspring per year, and P = 100% plus the percentage of yearly influx from external populations (for migratory and semimigratory species). A resilience (R) value was calculated for each forage category for each month; this is assuming that some species are more vulnerable during certain times of the year because of clustering or low population densities (table 10.4). A high R value represents populations that are generally not easily impacted by external pressures. These are typically high

population, short maturation species, even those with low survival rates. The most resilient forage categories are very small saltwater fish ( $R\mu = 68.68$ ), very small freshwater fish ( $R\mu = 49.30$ ), and amphibians ( $R\mu = 43.57$ ). The least resilient ones were low population, long maturation ones such as sea turtles ( $R\mu = 0.49$ ), black bears ( $R\mu = 0.67$ ), and alligators ( $R\mu = 1.35$ ). Notably, this resilience measure does not account for sensitivity to drought or incidences of mass die-offs (such as from red tides, or chemical poisoning).

A proportional version of this resilience measure was also calculated as the specific R value divided by the maximum R value for all forage categories. Resilience and proportional resilience were used to help fine tune the HM maps (to derive the exponential multipliers), and as a means of interpreting some of the available and returned caloric assessments of foraging radii (used in the resilience maximums for estimating sustainable population). For bulk collected species the calculated resilience measure is not applicable and was not used; if a proportional resilience measure was required for any bulk species calculations, the average of all measures was used.

(4) **Average Size**—Average body mass was assessed for three categories: maximum (typically males), medium (typically females), and minimum (typically juveniles). These values were most readily available in pounds, but were also calculated in kilograms. Where possible, the average weights were taken from the Coastal Plain region and not elsewhere. For bulk forage items, a single value of 1 kg (2.2 lb) was used.

(5) **Group and Range Size**—Because some of the available calories are based on the clustering of individuals (e.g., some species can be gathered in multiple units at the same time), it was important to gather information regarding typical group size, and their effective foraging ranges. Three variables were assessed; average group size (as a range), and the maximum and minimum foraging ranges of the species. These estimates were all based on the available literature, or are reasonable estimates based on similar species.

(6) **Caloric Content**—The final category of assessed variables relates to their inherent caloric value. To record this, two assessments were made: the useable proportion of



the animal (e.g., meat weight divided by body weight), and the number of calories per kilogram. This information is readily available from the sources already cited, and also online at several game nutritional calculators (e.g., <http://www.gunnersden.com/index.htm>, <http://www.gunnersden.com/hunting-game-nutrition-value.html>).

For the per kilogram forage categories, an estimate of kilograms per acre was calculated directly based on the available literature (primarily Smith, 1992, and Thomas, 2008), and a baseline established at the highest productivity that could be expected given an appropriate fallow cycle. For example, the assessment for maize assumes the highest density of maize one would expect to encounter for full-scale agriculture in the best potential habitat, but then divided by five (for a five-year fallow cycle; derived from two or three years of harvest within a 10+ year period; Thomas, 2008: 198). This assumes that at any given time, only one-fifth of the maize habitat would be in production as a maximum. Any count of available calories would then be based on the HM value multiplied by that estimate. This is further modified by seasonal availability and growth cycle and also corrected for domesticated species as a function of their date of introduction (discussed further later).

For the other categories, the population density is calculated by first summing the total values within the study area of each of the HM surfaces (this is the value of each 30 m map unit added together for the entire ~4 million acres) and dividing those values by the total number of 30 m map units in the study area. This provides the proportion of habitat that exists within the study area for any given forage category for each month. Then, the assumption is that the total population estimate within the study area must fall within that proportion of habitat. So a population density is then calculated by dividing the population estimate by that acreage, or ultimately their map units. The result is the estimated number of individuals one would expect to find in any given map unit for each forage category, for each month.

However, we know that the population does not directly translate into kilograms because there are different ratios of males to females to juveniles, plus there are population flows into, or out from, the project area at different times of the year for some species. To address this, the re-

production rate and group size values are used to define specific gender ratios for each month. The body mass statistics are then multiplied by those ratios to produce an average kilogram value per individual per month for each forage category. The same ratios are used to calculate a clustering factor—the number of individuals within an average group for that month divided by the minimum number of individuals in a group for the year. Additionally, a population multiplier was used for some specific categories that change drastically when populations arrive from outside the study area. (This is most important for migratory waterfowl, wading birds, sea turtles, and larger saltwater fish.)

The final number of calories one would expect to find in a given map unit is then based on either (1) the estimated population density modified by the clustering factor, and the population modifier, times the average useable kilogram, or (2) the bulk estimates from the baseline maximums. Table 10.5 illustrates the maximum calculated available calories by forage category and month, assuming climatic conditions similar to today and a stable (modern) sea level. The caloric values were then multiplied by each of the appropriate HM surfaces. The result is the transformation of each of the 444 surfaces into an expression of the ACM. The ACM is, in essence, a representation of the maximum exploitable ecological landscape by species and month.

One advantage of this simplest form of the ACM is its predictive capacity. Paleoeconomic modeling is essentially an analysis on the local scale, and as such involves modifications to the ACM based on local travel and transport costs, foraging radii, and technological capacities; all of which relate to specific known site locations and/or temporal periods. However, a regional scale predictive model is generally going to be applied to an unsurveyed area, and as such there is little information regarding specific sites. Traditionally, predictive models have used simple environmental variables as correlative proxies for identifying “rules” of site placement with varying success. (See Verhagen and Whitley, 2011, for a more detailed discussion about theoretical perspectives on predictive modeling that relate specifically to this study.) The ACM provides a new suite of variables that reflect resource procurement directly. The three most commonly used traditional predictive variables (distance to water, slope, and soil type) are generalized limi-



TABLE 10.5  
Available kcal/30 m<sup>2</sup> Unit of Prime Habitat

Forage category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Very large saltwater fish	1018	1356	1755	2462	3653	4723	4723	3653	2814	2006	1356	1018
Large saltwater fish	807	1025	1436	1995	2864	3614	3614	2864	2128	1532	1093	807
Medium saltwater fish	904	983	1478	2133	2729	3187	3054	3160	2384	1795	1123	969
Small saltwater fish	327	324	389	697	1078	1321	1216	1078	757	583	449	373
Very small saltwater fish	118	106	134	360	618	737	672	552	426	361	226	157
Large freshwater fish	951	791	733	697	707	703	703	707	738	776	838	951
Medium freshwater fish	235	212	200	246	273	358	340	328	283	261	254	258
Small freshwater fish	60	51	57	118	184	217	196	184	132	106	88	74
Very small freshwater fish	13	12	14	37	64	76	70	57	44	38	24	17
White-tailed deer	1804	1804	1804	1754	1734	1866	2292	2573	2656	2453	2170	1883
Black bear	32	35	36	36	36	43	49	54	55	50	42	38
Alligator	430	430	539	639	639	539	430	394	421	420	394	394
Wild turkey	123	125	145	184	254	309	268	195	167	145	140	128
Raccoon	157	157	157	148	162	190	214	258	243	214	198	177
Opossum	39	34	67	56	51	45	39	34	67	56	51	45
Rabbits	98	90	82	78	142	135	123	87	107	99	80	67
Squirrels	41	46	43	47	44	46	46	53	53	48	46	44
Upland birds	8	11	14	18	34	55	60	54	37	26	18	12
Waterfowl	173	137	106	80	58	61	86	114	145	178	217	214
Wading birds	45	45	66	93	124	153	187	184	147	115	88	64
Sea turtles	17	24	156	481	1089	2065	2065	1089	481	156	24	17
Freshwater turtles	390	390	390	390	390	395	399	412	416	408	403	395
Reptiles	33	33	33	33	33	33	38	48	58	53	48	38
Amphibians	63	52	45	45	45	45	45	45	100	119	119	82
Shellfish	4003	4003	4403	4804	5604	6405	7206	8006	8006	6805	5204	4403
Sea Turtle Eggs	0	0	0	0	0	985	1477	1642	1313	821	328	0
Maize	0	0	0	0	0	0	0	22684	28355	14178	0	0
Beans	0	0	0	0	0	0	0	9252	11564	6939	0	0
Squash	0	0	0	0	0	0	0	1668	6672	8340	4170	0
Amaranth	0	0	0	0	0	1904	7616	9520	9520	4760	0	0
Sunflower	0	0	0	0	0	979	3915	4894	4894	2447	0	0
Maygrass	0	0	0	0	732	1829	1829	1098	366	0	0	0
Sumpweed	0	0	0	0	436	1089	1089	653	218	0	0	0
Acorns	0	0	0	0	0	0	3037	5467	6075	4252	0	0
Hickory nuts	0	0	0	0	0	0	7531	13555	15062	10543	0	0
Cattail/bullrush	0	0	1746	4075	5821	5821	4657	3493	2328	1164	0	0
Chenopods	0	0	0	433	1011	1444	1444	1156	722	289	0	0

tations based on broad assumptions about human behavior, namely that people need to be close to a source of drinking water, that people are uncomfortable (or expend an excessive amount of energy) living on steep slopes, and that certain soil types are better for agriculture. These “rules” may be broadly applicable and are occasionally useful for prediction, but they are not behaviorally explanatory; they are least common denominators. With the ACM, it is possible to develop predictive models keyed toward individual behavioral tasks, such as hunting, fishing, or collecting specific foraging targets, processing resources, or just for habitation sites in general. One would expect to find habitation sites, for instance, in locales that provided access to the best combination of all resources; this would likely vary depending on the diet and the season.

Because the ACM represents a broad range from 4500 to 300 B.P., it does not currently incorporate any modifications from existing paleoclimatic models. However, to address the often dramatic changes in climate that can affect a species’ population, some consideration of existing paleoclimatic data should be possible. Cook and Krusic (2004), for example, provide an annual estimation of the Palmer Drought Severity Index (PDSI) values for North America. The use of PDSI data has added considerably to the interpretation of cultural developments in similar regions (e.g., Benson, Pauketat, and Cook, 2009; Nolan and Cook, 2010). Within the study area, there are three data points that correspond approximately to the north coastal area (80°W, 32.5°N), the south coastal area (82.5°W, 30°N), and the interior (82.5°W, 32.5°N). Data from these points were downloaded from the Internet (<http://iridl.ldeo.columbia.edu/SOURCES/.LDEO/.TRL/.NADA2004/.pdsi-atlas.html>). The data provided yearly PDSI estimates ranging from 300 to 1644 B.P. These data were placed into an Excel file and several additional calculations were made, including 3 year, 5 year, 10 year, 20 year, 50 year, and 100 year averages (based on ranges of yearly estimates preceding the data value—i.e., a 100 year average for 300 B.P. is the average of all yearly values from 400 to 300 B.P.). No values exist for the period prior to 1644 B.P., but Webb et al. (1998) suggest that the study area was approximately 20% wetter than modern conditions at 6000 B.P. Proportional representation of that increase was approximated for 4500 B.P. through 1644 B.P. in the Excel spreadsheet. These data are

currently not included in the model because ACM and RCM estimates discussed in the following analyses are based on 100 year increments, and it is unlikely that a 100 year average would truly represent a realistic population modifier for any of the forage categories. However, at some point in the future, when estimates may be based on specific years, it may be appropriate to incorporate the PDSI index as a population modifier, perhaps in combination with the resilience measure, temperature models (e.g., NOAA, 2006), and/or sea level analyses (e.g., Tanner, 1991).

### THE RETURNED CALORIC MODEL (RCM)

In the meantime, we know that there are limitations to how much of the available calories are actually “returnable” or otherwise useable to prehistoric humans. To be useful in understanding the economics of specific sites and regions, available calories need to be transformed into a model for returned calories (those calories that could actually be consumed, and the extraction of which historically affected human subsistence). To do this, a third model (the Returned Caloric Model) was created based on understanding the costs of acquiring, processing, and storing calories.

In general, we can assume that proximity and technological innovation are the primary means by which acquisition, processing, and storage costs are reduced. Thomas (2008) provides a very detailed discussion of processing time and calories consumed for most of these forage categories on the Georgia coast during the Late Prehistoric, and his proportional return values (as expressions of calories per hour of effort) were assumed as a baseline, given modifications for earlier time periods where somewhat inferior methods may have been employed in resource acquisition success, or processing (particularly for harvested plant species). Once again, methods employed in using these variables are not dependent upon the initial values chosen, and changing them may lead to additional insight regarding the costs of acquisition, processing, and storage not discussed here.

The effect of proximity on the costs of acquiring calories is directly applicable to the landscape. Principally, this is the travel cost to go from one’s location to the place at which the calories are gathered, and back to the location of processing, consumption, and/or storage. Budgeting the travel costs associated with subsistence is a basic underlying assumption of both

Optimal Foraging Theory and Central Place Foraging. Those calories most easily acquired and consumed are those closest at hand. To address this, two friction surfaces were created: foot travel (terrestrial) and canoe travel (aquatic). These represent the only applicable methods of travel used in the region prehistorically. Figures 10.9 and 10.10 show detailed views of a portion of these two travel cost surfaces.

Each map unit was given a value based on the caloric cost of crossing it, i.e., travel friction. In highly dissected areas, travel friction would be a function primarily of slope and vegetation density. Because of the lack of terrain slope in coastal Georgia, travel costs are instead a function of vegetation density, water depth, the strengths of tidal, river, and ocean currents, and the firmness of the substrate. Each of these constraints was modeled from the baseline variables employed in the HM in a way that made it possible to estimate the number of calories that would be consumed (by one person carrying a load of less than 20 kg) to cross any given map unit in the study area by foot and/or by canoe. That range included a minimum cost for crossing an open 30 m map unit unimpeded by vegetation on foot at 2 kcal and 1 kcal by canoe over open slow water. The upper limits reached 20 kcal for swimming across 30 m of deep tidal water, or for portaging a small canoe through relatively dense vegetation. Calories burned in this way were estimated from online calorie counters (<http://www.exrx.net/Calculators/Calories.html> and <http://www.nutristrategy.com/activitylist4.htm> are two examples) using smallish male adult size and weight characteristics (assuming that modern values are somewhat higher than would be expected prehistorically).

From any given point, the accumulated calories over distance (i.e., cost distance) by either foot or canoe travel is a representation of the “fall off” of available calories. For example, if one collected a deer within 120 m of home, it would represent an expenditure of at least 16 kcal for one person to travel to that location and carry the processed deer back. If that same deer were collected at 5 km away from the home site, it would have required more time traveling between the kill/processing point and back. The investment at 5 km would have been at least 667 kcal, or more if the terrain were difficult, sloping, or obstructed by vegetation. That expense is subtracted from the potential caloric return and would represent a loss to individual or family consumption, trade,

and even time spent doing other tasks.

Given that some species provide only a modest number of calories, while others much more so, the cost distance (i.e., foraging radius) at which it is no longer efficient to collect them would vary depending on their probable caloric return, ability to be gathered in quantity, dietary attractiveness, potential for other uses, and the current caloric or nutritional stress of the foragers. Similarly, the cost distance radius at which it is more efficient to process the collected resource rather than bring it back whole (i.e., processing radius) would also be a function of its weight and its processing time or difficulty. Thomas (2008) provides a very detailed discussion of the probable foraging and processing radii for many species or forage categories in the coastal Georgia region. In general, he finds that for most species, an effective one-way daily foraging radius of 450 kcal consumed (or around 5 km in his estimation) is likely (Thomas, 2008: fig 11.12). He also charts processing radii as a function of distance and categorical thresholds (Thomas, 2008: table 10.7). With a friction surface we can model the actual radius more precisely, as a function of individual foot or canoe travel, or as a representation of shared caloric costs (such as multiple person canoes).

Additionally, we need to consider that the success of any foraging activity is a function of perception and terrain familiarity. The cognitive map employed by the forager to help her/him collect a given resource is going to be most complete and accurate in areas that they most commonly frequent. Even though we may have a fairly complete and accurate GIS model of the terrain for many miles around the site, the prehistoric individual living there has only the cognitive perception of their daily terrestrial and aquatic foraging areas and perhaps some distance outward. The accuracy of that perception diminishes further away from their central place. As a result, there should be a corresponding decrease in foraging success as the forager transitions from the immediate familiarity of using repeatedly successful locations to making decisions “on the fly” with regard to unfamiliar terrain. This particular kind of falloff in caloric returns is probably most notable with fishing where the underwater (and hence not visible) terrain has a great effect on the success of foraging. Successful fishing spots are recognized only over a long period of repeated use.

In contrast, the nontravel costs of acquiring

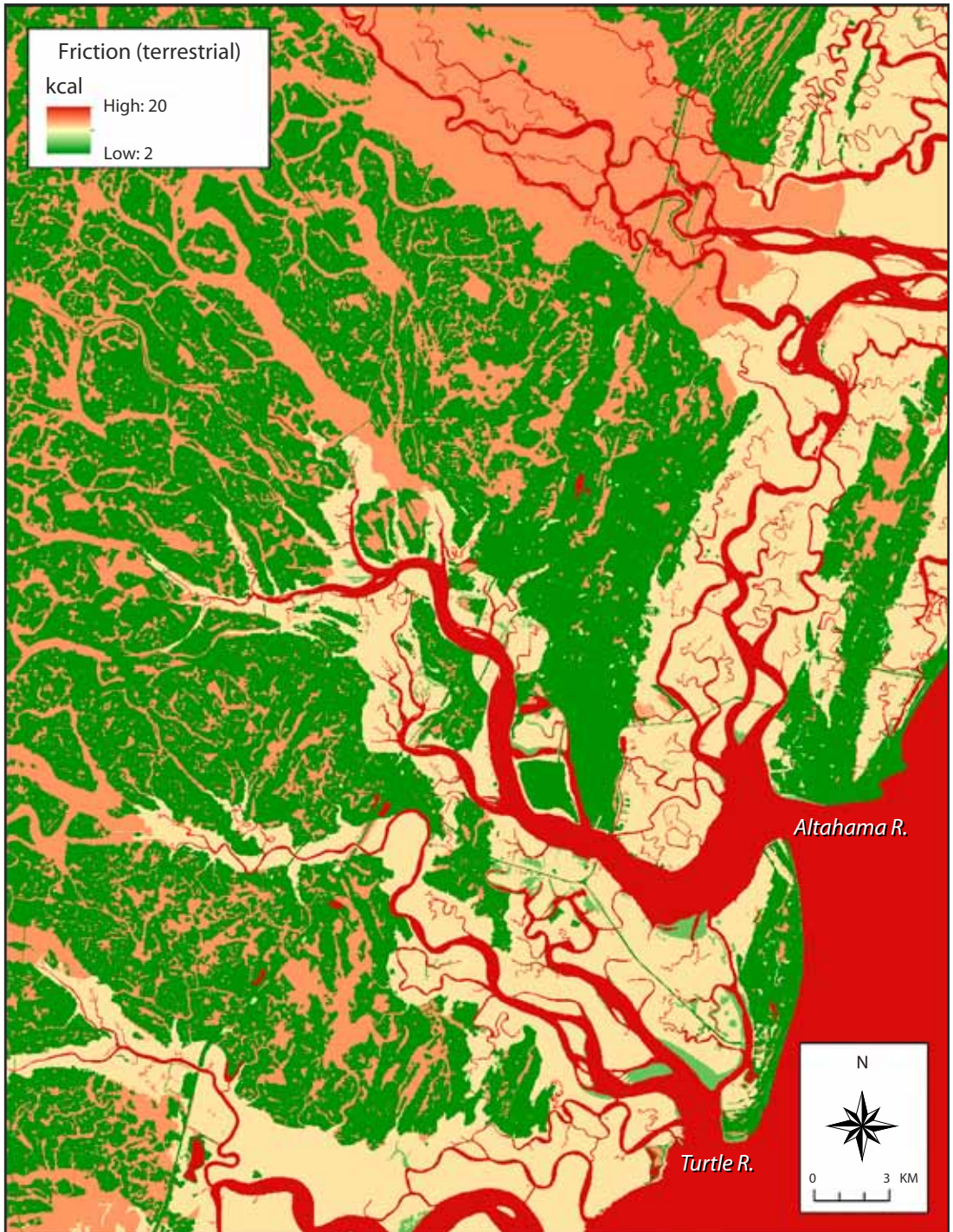


Figure 10.9. Terrestrial travel friction, between the Altamaha and Turtle rivers.

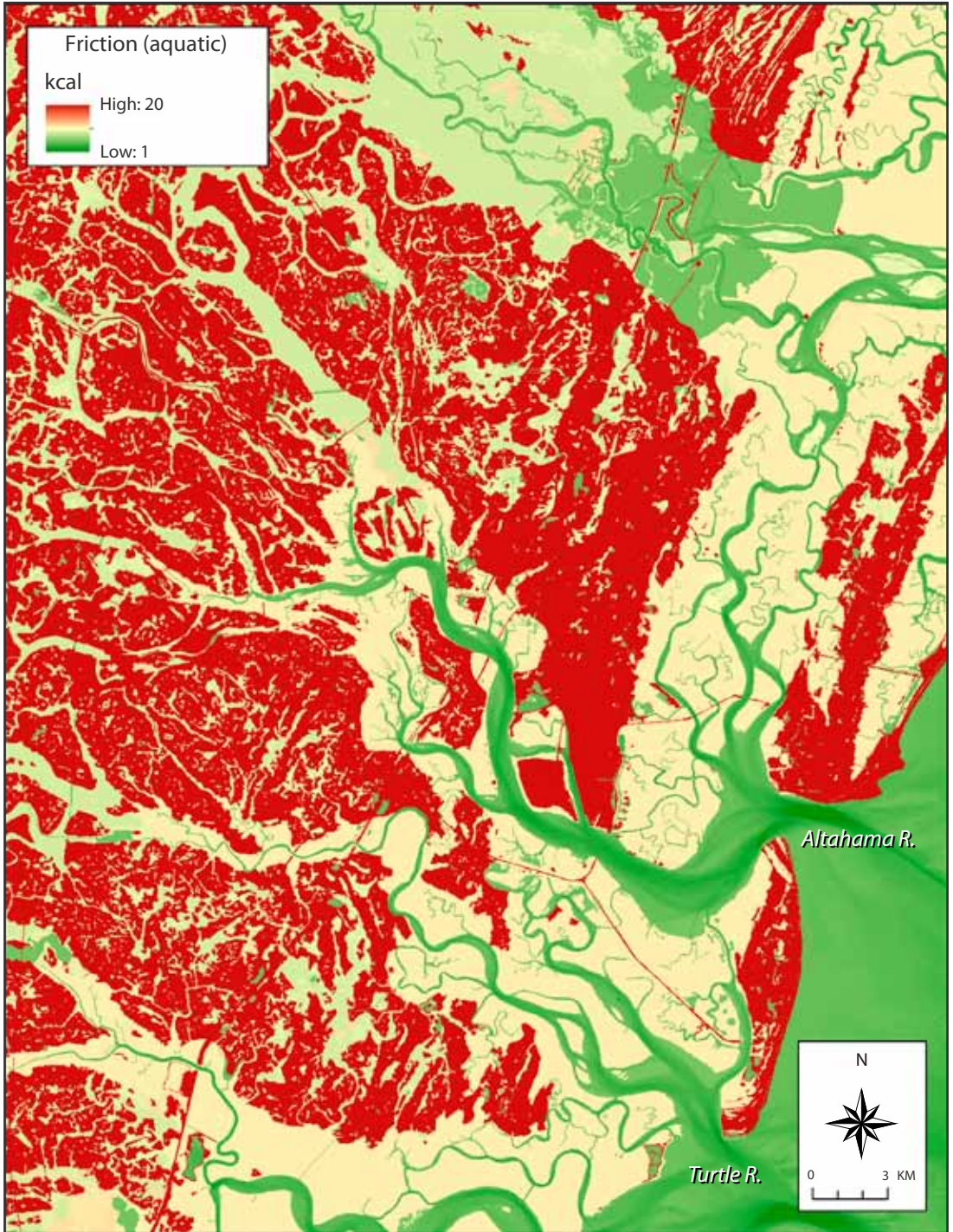


Figure 10.10. Aquatic travel friction, between the Altamaha and Turtle rivers.

calories are not directly applicable to a GIS landscape, but they can be subtracted from the ACM nonetheless. These break down into three primary caloric expenditures: maintenance, harvesting, and processing. For this analysis, maintenance is assumed to be all activities related to preparing to acquire a resource, establishing/maintaining habitats, or planting crops. For example, collecting lithic raw materials, making projectile points, hafting, and resharpening points are all activities related to the maintenance of deer hunting (as well as hunting other species). Making fish traps or small mammal snares are examples of other maintenance tasks. Similarly, burning undergrowth may be an activity related to preparing maize fields, but also establishing deer habitat. Harvesting is used here to describe tasks related to the collection of the resource, specifically time spent waiting, tracking, and actually dispatching hunted or fished prey, or collecting shellfish, turtle eggs, or plant resources, etc. Processing is the act of reducing the item from its raw form to its useable form; e.g., butchering meat, shucking oysters, stripping the husks from maize, but also cooking and serving it.

The range of nontravel acquisition costs for each forage category was modeled first by assuming a standard foraging time of one day. The assumption was made that a range between 1600 and 2000 calories would represent minimum and maximum daily expenditures for one person. This range may not be truly representative of all prehistoric occupations in the region, but it seems reasonable as the initial model input. Estimations were made for the percentage of maintenance, harvesting, and processing activities for each forage category, that could be representative of the overall use of that resource. In other words, it is not assumed that one would spend one day collecting or processing any resource. Rather, given a year spent collecting any one resource, the estimated proportion of time spent maintaining, harvesting, and processing that resource was multiplied by both 1600 and 2000 calories to come up with standardized daily minimum and maximum caloric investment (table 10.6). Additionally, the number of kilograms of each resource that could be collected with that range of investment was estimated, along with the proportional retention of collected calories for periods of one day, one week, one month, six months, and one year. The retention numbers are an estimate of storage capacity and attrition due

to caloric decay, not consumption.

Based on these variables, the initial estimates for transforming the available calories into returned calories were made. Return rates were calculated that expressed the range in caloric efficiency given daily brackets of 1600–2000 kcal expended. This was done for each forage category and for each month. To simulate a return rate for each 100 year increment between 4500 and 300 B.P., the assumption was made that efficiency generally increased, and that the least efficient rate was at the earlier end of the temporal bracket, while the most efficient was at the latter. To include increases in efficiency based on technological innovations, several of these were modeled:

- (1) **Hunting**—innovations in hunting technology included the introduction of dart points (at around 4000 B.P.), increasing availability of multipurpose lithic tools (around 3000 B.P.), and the bow and arrow (at 1600 B.P.).
- (2) **Fishing**—fishing technology improved with the adoption of fishing nets (around 3200 B.P.), fish weirs/traps (around 2500 B.P.), and seaworthy canoes (around 1400 B.P.).
- (3) **Collecting**—changes in collecting efficiency were modeled with improved (ceramic) storage containers (around 3000 B.P.), grinding stones (around 2000 B.P.), and above-ground corn cribs (around 1000 B.P.).

The temporal points of introduction are based on well-known assemblage-related interpretations, or are inserted as reasonable estimates. A formula was generated that increased the rate of return on any forage category upward in a stepped fashion at the introduction of any technological innovation that was useful for it specifically. This model assured that the transitions were gradual, and the initial minimum/terminal maximum range was never exceeded. Additionally, the rate of return for domestic species was zeroed out for all periods prior to their introduction (around 3000 B.P.), but increased exponentially as they were adopted.

Ultimately, the RCM can be calculated as two separate values. The first is a caloric return based on multiplying the ACM value in any given cell by the appropriate return rate (using any specific

TABLE 10.6  
Return Rate Estimates as a Function of One Day's Activity

Forage category	Min. calories/day		Max. calories/day		Daily activity (%)		kcal/day		Individual/kg/day		Min. retention (%) after:					Max. retention (%) after:						
	Maint	Harvest	Maint	Harvest	Maint	Harvest	Process	Min.	Max.	Min.	Max.	1 day	1 wk	1 mth	6 mths	1 year	1 day	1 wk	1 mth	6 mths	1 year	
Very large saltwater fish	320	640	400	800	20	40	40	1600	2000	0.50	4.00	80	0	0	0	0	100	50	0	0	0	0
Large saltwater fish	240	560	300	700	15	35	50	1600	2000	1.00	10.00	80	0	0	0	0	100	60	0	0	0	0
Medium saltwater fish	160	480	200	600	10	30	60	1600	2000	10.00	50.00	80	0	0	0	0	100	70	0	0	0	0
Small saltwater fish	160	480	200	600	10	30	60	1600	2000	50.00	200.00	80	0	0	0	0	100	80	0	0	0	0
Very small saltwater fish	160	320	200	400	10	20	70	1600	2000	100.00	500.00	80	0	0	0	0	100	90	0	0	0	0
Large freshwater fish	240	720	300	900	15	45	40	1600	2000	1.00	5.00	80	0	0	0	0	100	60	0	0	0	0
Medium freshwater fish	160	640	200	1000	10	40	50	1600	2000	4.00	20.00	80	0	0	0	0	100	70	0	0	0	0
Small freshwater fish	160	480	200	1200	10	30	60	1600	2000	20.00	100.00	80	0	0	0	0	100	80	0	0	0	0
Very small freshwater fish	160	480	200	1200	10	30	60	1600	2000	100.00	200.00	80	0	0	0	0	100	90	0	0	0	0
White-tailed deer	80	800	100	900	5	50	45	1600	2000	0.20	2.00	100	20	0	0	0	100	60	0	0	0	0
Black bear	80	960	100	1200	5	60	35	1600	2000	0.05	0.50	100	20	0	0	0	100	60	0	0	0	0
Alligator	80	640	100	1100	5	40	55	1600	2000	0.50	4.00	100	10	0	0	0	100	50	0	0	0	0
Wild turkey	80	720	100	1000	5	45	50	1600	2000	1.00	8.00	100	20	0	0	0	100	60	0	0	0	0
Raccoon	160	400	200	500	10	25	65	1600	2000	1.00	5.00	100	20	0	0	0	100	60	0	0	0	0
Opossum	160	320	200	400	10	20	70	1600	2000	4.00	8.00	100	20	0	0	0	100	60	0	0	0	0
Rabbits	160	320	200	1400	10	20	70	1600	2000	6.00	12.00	100	15	0	0	0	100	50	0	0	0	0
Squirrels	160	320	200	1400	10	20	70	1600	2000	6.00	16.00	100	15	0	0	0	100	50	0	0	0	0
Upland birds	160	400	200	500	10	25	65	1600	2000	15.00	25.00	100	15	0	0	0	100	50	0	0	0	0
Waterfowl	80	480	100	1300	5	30	65	1600	2000	4.00	12.00	100	15	0	0	0	100	50	0	0	0	0
Wading birds	160	400	200	500	10	25	65	1600	2000	3.00	12.00	100	15	0	0	0	100	50	0	0	0	0
Sea turtles	32	480	40	1360	2	30	68	1600	2000	0.40	2.00	100	20	0	0	0	100	60	0	0	0	0

TABLE 10.6 — (Continued)

Forage category	Min. calories/day		Max. calories/day		Daily activity (%)		kcal/day		Individual/kg/day		Min. retention (%) after:				Max. retention (%) after:						
	Maint	Harvest	Maint	Process	Maint	Process	Maint	Process	Min.	Max.	1 day	1 wk	1 mth	6 mths	1 year	1 day	1 wk	1 mth	6 mths	1 year	
Freshwater turtles	160	400	200	1300	10	25	65	1600	2000	4.00	16.00	100	20	0	0	100	50	0	0	0	0
Reptiles	80	640	100	880	5	40	55	1600	2000	15.00	30.00	100	15	0	0	100	50	0	0	0	0
Amphibians	80	400	100	1120	5	25	70	1600	2000	25.00	40.00	100	15	0	0	100	50	0	0	0	0
Shellfish	32	240	40	1328	2	15	83	1600	2000	50.00	250.00	100	10	0	0	100	50	0	0	0	0
Sea turtle eggs	32	960	40	608	2	60	38	1600	2000	10.00	200.00	100	15	0	0	100	30	0	0	0	0
Maize	640	400	800	560	40	25	35	1600	2000	2.00	12.00	100	90	60	20	100	100	90	70	40	40
Beans	560	400	700	640	35	25	40	1600	2000	2.00	12.00	100	80	30	0	100	98	80	50	20	20
Squash	560	400	700	640	35	25	40	1600	2000	3.00	18.00	100	70	20	0	100	95	70	20	5	5
Amaranth	80	800	100	720	5	50	45	1600	2000	3.00	5.00	100	80	50	0	100	98	80	50	20	20
Sunflower	160	640	200	800	10	40	50	1600	2000	5.00	8.00	100	90	50	10	100	100	85	60	25	25
Maygrass	240	720	300	640	15	45	40	1600	2000	5.00	8.00	100	80	50	0	100	98	80	30	10	10
Sumpweed	160	880	200	560	10	55	35	1600	2000	8.00	12.00	100	80	40	0	100	95	70	20	5	5
Acorns	32	1200	40	368	2	75	23	1600	2000	8.00	12.00	100	80	20	0	100	98	70	30	10	10
Hickory nuts	32	400	40	1168	2	25	73	1600	2000	2.00	4.00	100	80	30	0	100	100	75	40	15	15
Cattail/bullrush	32	1040	40	528	2	65	33	1600	2000	2.00	4.00	100	80	20	0	100	90	40	5	0	0
Chenopods	80	800	100	720	5	50	45	1600	2000	6.00	8.00	100	80	40	0	100	95	70	20	5	5



year, or the mean across a range of years). This is an expression of the RCM that does not assume travel costs given that we are not talking about a specific site location. This version of the RCM is useful for both predictive and analytical purposes. Second is a caloric return tied to travel costs from a specific locale. This is the ACM times the return rate that also subtracts the cumulative cost distance from any given point. The first RCM value is applied in an Excel spreadsheet that allows one to insert any year between 4500 and 300 B.P. and the result is an estimate of the mean kcal per map unit using a baseline assumption that the HM value is 1. Table 10.7 is an example that represents the ACM (see table 10.5) modified for the year 1237 B.P. (chosen randomly). The second RCM value is assessed based on specific site locations and was calculated on 100 year increments using a comparative and a local scale analysis.

### COMPARATIVE ANALYSIS

The comparative paleoeconomic analysis began with the collection of known site information. Of the 7027 known archaeological sites from the study area currently recorded in the Georgia Archaeological Site Files (GASF, 2011), 278 of them have been specifically identified as Native American “habitation” sites (this includes camps, villages, or farmsteads). Of these, 113 sites have temporal designations between Late Archaic and Protohistoric/Historic Indian. There are no doubt other known dated sites that were habitations, but are not recorded as such in the GASF. Likewise, there are known habitation sites that have not been given dates within the GASF, but this does not mean they are not datable; only that their site forms may be incomplete. They too are excluded from the comparative analysis. This is not an ideal situation; however, it is the only dataset currently available.

Cost distance evaluations were made from each of the 113 locations using both the foot travel and canoe travel friction surfaces individually and for the two surfaces combined. The individual surfaces assume that travel is either on foot or by canoe (not both), whereas the combined surface uses the lowest cost of either one. The combined cost essentially assumes that one would be able to canoe across a river and then gather resources by foot travel from there and still return to the habitation site by canoe. Polygon buffers

were created at 450 kcal (for both aquatic and terrestrial friction) and at 900 kcal (just for aquatic friction). The 450 kcal buffers represent a one-way one-day foraging radius for one person, either on foot or in a canoe. The 900 kcal buffer represents a one-way one-day foraging radius for a two-person canoe.

Some of the 113 polygon buffers were rejected. The reason for this was twofold: First, ArcGIS was unable to calculate summaries for several sites because too many other foraging buffers overlapped them. This could have been corrected by rerunning the analysis with those sites separated, but it was not done in this analysis. Second, several sites were located close to the edge of the study area and their foraging radii were artificially severed by its boundary. It is very likely that a large portion of utilized landscape falls outside the study area for those sites, and thus they were rejected for this analysis due to that edge effect. In the end, there were 101 sites that contributed to this comparative analysis (appendix 10.2).

For each of these locations several values were calculated in ArcGIS using the zonal statistics and geometric calculation tools. This includes: a count of the total number of map units that fell within the 450 and 900 kcal buffers, the total and mean caloric friction costs, the acreage of buffered terrestrial and aquatic foraging habitats, and the total and mean habitat values within each buffer for each of the 444 GIS surfaces. From these numbers it was possible to calculate, for any site or combination of sites:

- (1) **Total ACM Calories**—Calculated for each forage category and each month by multiplying the sum of all HM values for the map units within the buffer by the monthly ACM estimate for the chosen period of analysis. The combined buffers representing 450 kcal of foot travel and 900 kcal of canoe travel were used.
- (2) **Mean ACM Calories**—Calculated for each forage category and each month by multiplying the mean of all HM values for the map units within the buffer by the monthly ACM estimate for the chosen period of analysis. The purpose of using the mean values was to provide a standardized comparison between sites with different size foraging buffers. The primary comparative analysis (with a few exceptions) was based on mean values per map unit.
- (3) **Mean RCM Calories**—Calculated by

TABLE 10.7  
Returned kcal/30 m<sup>2</sup> Unit of Prime Habitat (example: 1237 B.P.)

Forage category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Very large saltwater fish	946	1260	1631	2288	3395	4389	4389	3395	2615	1864	1260	946
Large saltwater fish	745	947	1326	1843	2645	3338	3338	2645	1966	1415	1010	745
Medium saltwater fish	885	962	1446	2087	2670	3118	2989	3091	2332	1756	1099	948
Small saltwater fish	318	316	379	679	1050	1286	1185	1050	738	568	437	364
Very small saltwater fish	111	100	126	339	583	695	634	521	402	341	213	148
Large freshwater fish	867	721	668	635	644	640	640	644	672	707	763	867
Medium freshwater fish	199	180	170	209	232	304	288	279	241	221	216	219
Small freshwater fish	47	40	44	93	144	170	154	144	104	83	69	58
Very small freshwater fish	7	6	8	20	34	41	38	31	24	20	13	9
White-tailed deer	1745	1745	1745	1696	1676	1804	2216	2488	2568	2371	2098	1821
Black bear	29	31	32	32	32	39	44	49	50	45	38	34
Alligator	423	423	531	630	630	531	423	388	415	414	388	388
Wild turkey	116	119	138	175	241	293	254	185	158	137	133	122
Raccoon	146	146	146	139	151	177	200	240	227	200	185	165
Opossum	33	28	56	47	42	37	33	28	56	47	42	37
Rabbits	84	77	70	67	122	116	106	74	92	85	69	58
Squirrels	34	38	36	39	37	38	38	44	44	40	38	37
Upland birds	5	7	9	11	20	33	36	32	22	16	11	7
Waterfowl	155	122	95	72	52	55	77	102	129	159	194	191
Wading birds	39	39	58	81	109	135	164	162	129	101	77	57
Sea turtles	17	24	152	471	1065	2020	2020	1065	471	152	24	17
Freshwater turtles	338	338	338	338	338	342	346	357	361	353	349	342
Reptiles	20	20	20	20	20	20	23	30	36	33	30	23
Amphibians	37	30	26	26	26	26	26	26	58	69	69	47
Shellfish	3959	3959	4355	4750	5542	6334	7126	7917	7917	6730	5146	4355
Sea turtle eggs	0	0	0	0	0	954	1431	1590	1272	795	318	0
Maize	0	0	0	0	0	0	0	15205	19006	9503	0	0
Beans	0	0	0	0	0	0	0	4496	5620	3372	0	0
Squash	0	0	0	0	0	0	0	935	3739	4674	2337	0
Amaranth	0	0	0	0	0	1317	5270	6587	6587	3293	0	0
Sunflower	0	0	0	0	0	464	1858	2322	2322	1161	0	0
Maygrass	0	0	0	0	320	801	801	480	160	0	0	0
Sumpweed	0	0	0	0	169	422	422	253	84	0	0	0
Acorns	0	0	0	0	0	0	2621	4717	5241	3669	0	0
Hickory nuts	0	0	0	0	0	0	5531	9956	11062	7744	0	0
Cattail/bullrush	0	0	1175	2742	3917	3917	3133	2350	1567	783	0	0
Chenopods	0	0	0	195	455	651	651	520	325	130	0	0

multiplying the mean ACM value by the mean RCM return rate for the chosen period of analysis and also subtracting twice the sum of all friction values in the buffer. It is assumed that the minimum travel cost for collecting any resource would be twice the friction value of the map unit that contains it (i.e., crossing the map unit in two directions—coming from and going back to a habitation site). By subtracting the friction costs of all map units, number of mean RCM calories gives an estimation of the travel costs if all of the ACM calories were returned. This represents the number of calories one would expect to be returned in an average map unit within the selected site's buffer. On the local level this is calculated using a cost distance evaluation.

(4) **Mean Selective Calories**—This is a model for how many of the returnable calories would actually have been preferred and what proportion is likely to have been selected for consumption. To estimate this, a generalized dietary model was used. This model uses all 37 forage categories and is pinned at either end by generalized proportional estimates based on Late Archaic and contact period faunal and floral assemblages. The values in between are calculated as exponential or logarithmic percentages of the difference between the end values. This dietary model is not intended to definitively represent an archaeological interpretation of the range in past diet; rather it is meant to provide a simulation that can be used to express an overall impression of the transition from Late Archaic to contact period diet as we currently understand it. It would be possible to use specific recovered faunal proportions as a model instead, but those data are not currently available for most of these sites, and the generalized dietary model was used as a proxy. If the monthly forage category's RCM value represented a lower proportion of the total RCM calories than the proportion represented by the dietary model, then all of those calories were estimated to have been consumed. If the RCM calories represented a higher proportion, then the dietary estimate was assumed to be the consumed portion, while the rest was considered potential surplus. The basic function of this rule was to make the model of selective calories as proportionally close to the dietary model as possible given the conditions within the foraging

areas of the site(s).

(5) **Mean Potential Caloric Surplus**—This was calculated by subtracting the mean selective calories from the mean RCM calories. This represents the portion of available calories that were not immediately consumed, but which could have been collected and stored for later consumption or for trade.

(6) **Mean Retained Caloric Surplus**—This was calculated using the one day, one week, one month, six months, and one year retention percentages developed for the RCM, and multiplying them by the mean potential caloric surplus. This is an expression of the falloff rate for those calories stored (or traded) rather than consumed immediately. These caloric values are applied to the appropriate period later than the month in which they were collected. In other words, the surplus calories become available at the modeled rate to calculate sustainable population estimates.

(7) **Caloric Efficiency**—Calculated by dividing the selective calories by the ACM calories; this gives a proportion of calories captured for each forage category, for each month. The mean caloric efficiency is then the mean of all months for all forage categories. The maximum caloric efficiency is the maximum value for all months and all forage categories. Any category for which no ACM calories are available is excluded from the analysis. This is not the same as the RCM return rate, which is based on the amount of calories expended versus the amount returned for any one resource. The caloric efficiency is an expression of the amount of calories consumed versus the amount left on the table, so to speak.

(8) **Sustainable Population**—Several assumptions were made to generate a model for what the sustainable population would have been for any given site. Using the mean friction value for the combined buffer, an estimate was made of the number of map units that could be harvested in one day by one person. Then the minimum population was assumed to be the total number of calories (including retained surplus calories) that could be produced by a single forager within the daily foraging area divided by the number of required calories (minimally set at 1600 per person per day). In contrast, the maximum population was estimated by assuming all portions of the buffer could be harvested

and all calories were available. The resilience limit is based on the maximum times the resilience proportion, which produced a population figure that simulated the point at which the forage category would theoretically begin to reach a serious stress point. Finally, using the caloric efficiency as a guide, sustainable population estimates were based on the mean and maximum caloric efficiencies. These were, in essence, the populations that could be supported strictly by the selective calories (i.e., no surplus was used), and if all of the surplus calories were used (but the resilience maximum was not reached).

A spreadsheet was developed that allows one to select any given site and the temporal range for the analysis and produce a series of charts and graphs that illustrate these calculations. The spreadsheet also summarizes the data for groups of sites based on selective attributes. In this analysis the categories used were: all habitation sites (HS,  $N = 101$ ); habitation sites associated with a shell midden (SM,  $N = 20$ ); habitation sites that included an earthen mound (MD,  $N = 47$ ); and groups of each temporal period—Late Archaic (LA,  $N = 40$ ), Early Woodland (EW,  $N = 22$ ), Middle Woodland (MW,  $N = 48$ ), Late Woodland (LW,  $N = 46$ ), Early Mississippian (EM,  $N = 2$ ), Middle Mississippian (MM,  $N = 29$ ), Late Mississippian (LM,  $N = 33$ ), and Protohistoric/Historic Indian (PH,  $N = 13$ ).

#### MEAN FORAGING AREAS AND TRAVEL FRICTION

Although the mean travel friction value for all of these groups tends to be between 5 and 6 kcal per map unit, there is a slight increase as one moves from the Late Archaic through the Early Mississippian, with a drop during the Middle Mississippian and a rebound during the Late Mississippian, only to fall again during the Protohistoric/Historic Indian period. When comparing the mean acreage of the terrestrial, aquatic, and combined foraging buffers, the average sizes are generally pretty much in the same range (with the exception of the Early Mississippian, which only has a sample size of two sites). However, there is a trend toward decreasing terrestrial foraging area over time. This is clear especially when you look at the proportional representation of the 450 kcal aquatic and terrestrial areas by temporal periods (fig. 10.11). With the exception of the Middle Mississippian, there is a gradual decrease

in the terrestrial foraging area until the Protohistoric/Historic Indian period.

Aquatic friction in the vast estuarine portions of the study area tends to average slightly more than terrestrial friction because of the large amounts of salt marsh along with many small islands (considered portages); both salt marsh canoeing and portaging are calorically fairly high cost. So, aquatic foraging areas with lots of islands and salt marsh tend to have somewhat higher friction values per map unit than terrestrial ones, even though open-water canoeing is generally half the caloric cost of walking. But the more open water there is in the foraging zone, the lower the mean becomes. Beginning with the Late Archaic, it appears that a larger proportion of terrestrial foraging area helped reduce the mean cost of travel. As the amount of estuarine aquatic foraging increased, starting in the Early Woodland, mean friction costs tended to go up slightly. However, in the Middle Mississippian, it appears that there is a trend back toward a lower mean travel friction, and a jump in terrestrial foraging area (at least based on the 29 Middle Mississippian sites in the analysis). By the Late Mississippian, the trend reverses and decreasing terrestrial foraging, along with increasing overall travel friction, is reestablished.

This Middle Mississippian blip may be the result of a shift back toward more inland sites. The dataset appears to indicate that Middle Mississippian sites in the analysis do tend to fall more frequently in the interior than along the coast, or on the barrier islands. But is this a real settlement shift, perhaps toward interior riverine trade routes rather than coastal estuaries? Or is this the result of a tendency to define coastal sites as not Middle Mississippian? It's hard to say because there is a real absence of Early Mississippian habitation site designations on the coast as well (there were only two examples used in the analysis). But the Early Mississippian sites did not change the trend, despite being such a small sample. There may also be some confusion over Middle Mississippian diagnostic indicators that could result in this pattern, for example, items that tend to be defined as Middle Mississippian in the interior, but Late Mississippian on the coast.

During the Protohistoric/Historic Indian period the trend goes back once more to a lower average travel friction, very similar to the Middle Mississippian. There is no corresponding shortage of sites on the barrier islands, however, as

there is for the Middle Mississippian. Furthermore, the relative proportions of aquatic and terrestrial foraging areas are quite similar to the Middle Mississippian proportions, despite the fact that the Protohistoric/Historic Indian sites are clearly more coastal in nature. There may be two attributes that could account for this trend. First, greater access to more open water could reduce the overall travel friction costs by averaging in less marsh and small island areas. Placement of sites in locations more closely tied to the open ocean or deeper water could account for this. Additionally, the slight increase in terrestrial habitat over that seen in the Late Mississippian could be accounted for by movement of the primary settlements into more upland terrain away from the shoreline, but on the barrier islands, not in the interior of the study area. Both of these trends could result from native groups settling in close proximity to previously existing Spanish missions where deep-water ship access could have

played a role in their locations, plus a greater emphasis placed by the Spanish on maize agriculture subsistence.

MEAN AND MONTHLY DIETARY COMPONENTS

To summarize the overall trends in subsistence by period and by month, a series of graphs was produced that illustrates trends both between aquatic and terrestrial faunal sources and between wild and domestic plant usage. Each of the faunal categories was defined as either a terrestrial resource (they spend most of their time on land) or an aquatic one (they spend most of their time in water). The proportion of calories was calculated for each resource for each month and multiplied by -1 if aquatic. The totals were summed for each month, with the result that the calculated decimal value ranged between -1 and 1, and represented the trend between an aquatic (negative) and terrestrial (positive) diet, with zero indicating a diet of even amounts of aquatic and terrestrial resources. There is no assumption made regarding the methods of foraging with respect to the nature of the resource; aquatic resources can be collected on foot just as terrestrial resources can be collected by canoe.

Each of the plant resources was assessed as either a wild (native) resource or a domesticated (introduced) one (i.e., maize, beans, and squash). For this analysis, semidomesticated resources (such as amaranth, or sumpweed) were classed with other native, or wild, species. The proportion of each wild resource was multiplied by -1, and the totals produced a decimal value between -1 (wild) and 1 (domesticated). A scatterplot was created for each temporal period, where the x-axis represents the range between aquatic and terrestrial fauna, and the y-axis the range between wild and domesticated flora, for each month. The mean values for the entire year were then calculated and applied to a single scatterplot (fig. 10.12). This analysis includes not only the resources consumed quickly upon collection (i.e., the selective calories) but also the retained surplus calories. For example, the increasingly high proportion of the diet contributed by domesticated plants during the winter over time is not from resources collected during that month, but from stored calories collected during the fall or late summer months. Bear in mind, though, that there is still considerable debate about when maize, beans, and squash were introduced to the Coastal Plain (especially the Sea Islands) and the dietary

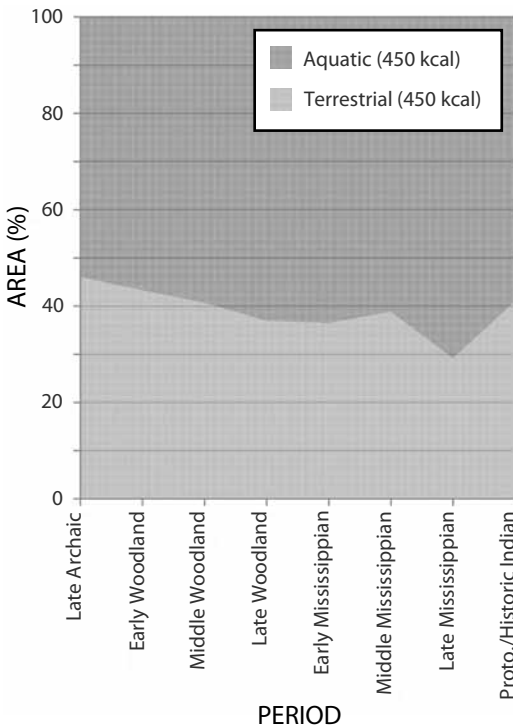


Figure 10.11. Ratio of aquatic to terrestrial foraging area.

model used may be overemphasizing the trend toward increasing domestic plant usage, since it is not based on real archaeobotanical assemblages at any points other than the Late Archaic and the Protohistoric/Historic Indian period.

But, in general, the trends indicate an increase toward more aquatic faunal resources over time. The trend toward increasing domesticates (if not the actual date of introduction) is obviously expected. But the total ACM value (i.e., productivity) for maize, beans, and squash increases slight-

ly, or remains at the same level, even though the overall trend in amount of terrestrial foraging area is decreasing, suggesting an intentional selection of better domestic plant habitat over time. The trend toward a greater mean aquatic diet is also expected given our knowledge of the regional history and the patterns built into the dietary model. But the general increase in the proportion of aquatic foraging area over time (discussed earlier, and which is based solely on travel friction, not on diet or the ACM or RCM values) reinforces

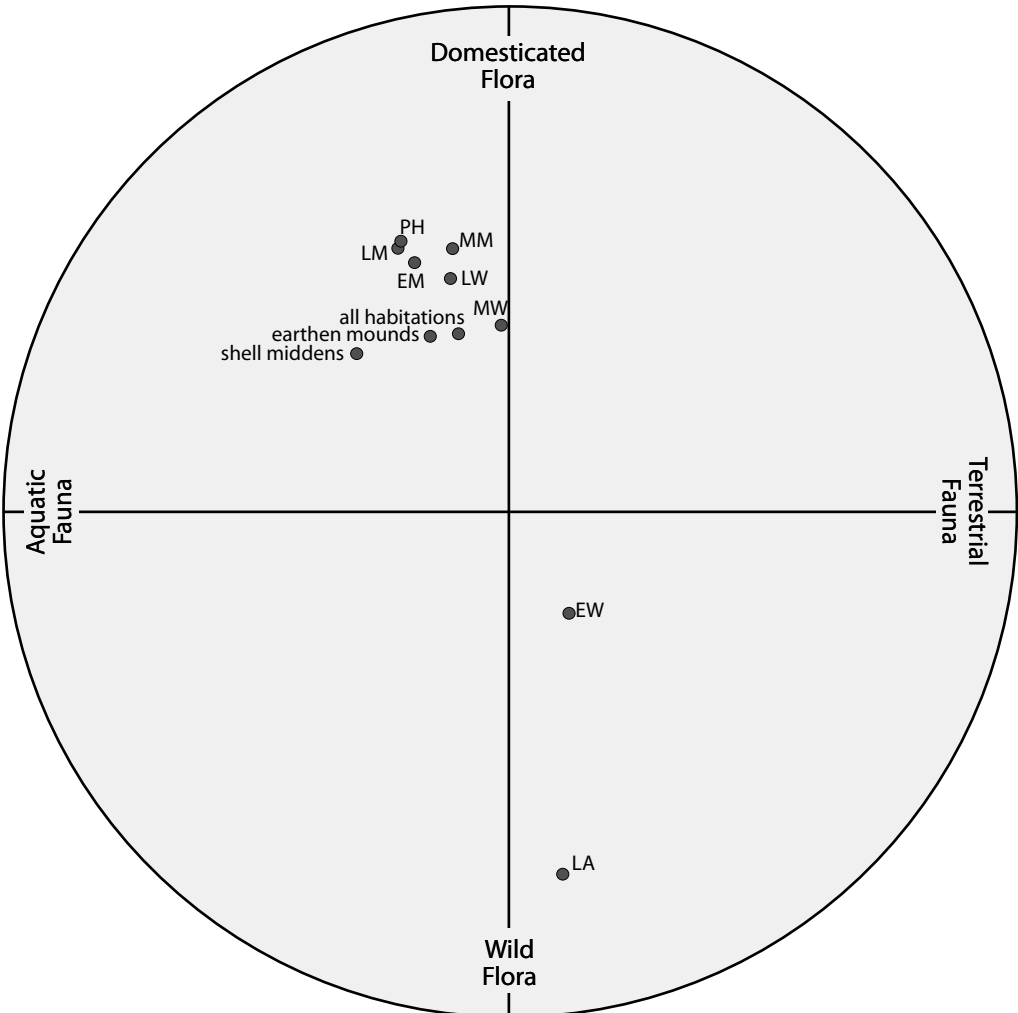


Figure 10.12. Mean dietary balance as a function of temporal periods and site types.

es this interpretation.

To investigate this, a second analysis was run in which the mean ACM calories were used, and all assumptions about caloric availability were kept even across the board. In other words, this secondary analysis does not include any considerations of return rates or dietary preference. If we assume that all calories are equally available across all temporal periods, then figure 10.13 illustrates the yearly mean aquatic/terrestrial ratio of just the available calories for all periods in the analysis. It also includes the mean values for all habitation sites, all shell middens, and sites with earthen mounds. The results clearly indicate that there is a real trend toward greater quantities of available aquatic resources over time, regardless of how they might have been exploited. This can also be accounted for by an overall movement toward the estuarine environments already suggested, but it independently reinforces the observed trend in the RCM and selective data.

The breakdown of the ACM analysis by month (fig. 10.14) shows, as expected, that the shell midden sites have a higher mean availabil-

ity of aquatic fauna than all periods throughout the year. The sites with earthen mounds also have higher aquatic means than all temporal periods except the Early and Late Mississippian. The trends suggested by figures 10.12 and 10.14 indicate that, prior to the Middle Woodland, the bulk of the faunal resources available within the foraging buffers defined was terrestrial and collected in the winter, fall, and spring. By the Middle Woodland, the balance was almost even between terrestrial and aquatic resources. By the later periods, more aquatic resources were available through most of the year.

CALORIC EFFICIENCY AND SUSTAINABLE POPULATION

There is a gradual rise in mean caloric efficiency rates over time, from around 30% to about 40%. But, in general, the level of caloric efficiency derived from these buffer zones suggests that, from the Late Archaic through the Protohistoric/ Historic Indian periods, people were exploiting the available resources at nearly the same rate. Excluding periods of drought or other climatic issues (which are yet not modeled), the amount

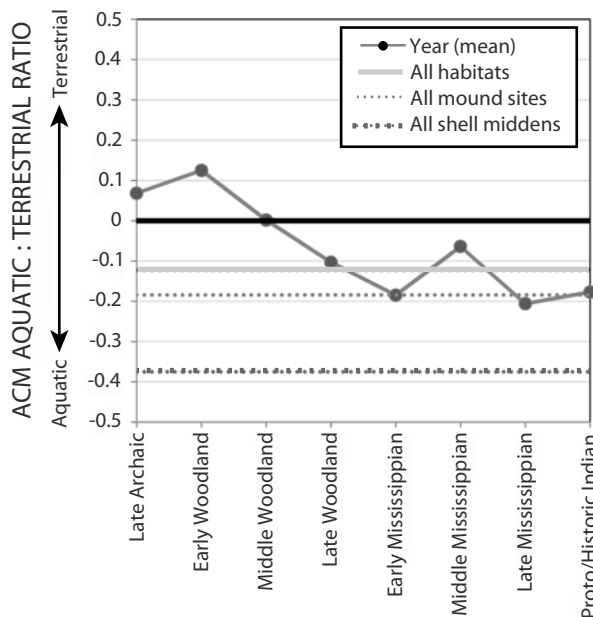


Figure 10.13. Available caloric model (ACM) ratio of aquatic to terrestrial fauna by temporal period and site types.

of calories available per person in the Late Archaic (regardless of source) was not much less than that available to people in the Protohistoric/Historic Indian period—given the same level of effort. The focus may have been on more aquatic resources later on, but, in general, people from all periods focused their efforts on the forage categories that provided them the most efficient return (i.e., those with specific RCM return rates over 50%).

Given the previously mentioned stipulations regarding their calculation, table 10.8 shows the sustainable population estimates by month for each of the periods. The average estimated monthly population for all Late Archaic sites in the study ranges from 19 in January to 163 in September, while the mean value falls at 60. This suggests that a 450/900 kcal foraging radius around a typical Late Archaic habitation site could support about 60 people on average during most of the year, but permanent residents probably would only have been around a third of that

number. Figure 10.15 illustrates the mean and minimum values by temporal period.

The population estimates rise fairly rapidly through the Early Mississippian (multiplying at factors between 1.6 and 2.2), but then drop again during the Middle Mississippian (the minimum population of which is only 73% of the Early Mississippian). The numbers for the Late Mississippian are comparable to those of the Early Mississippian. The Protohistoric/Historic Indian period increases slightly over the Late Mississippian. In this case, the anomaly in the analysis seems to be during the Early Mississippian. The two Early Mississippian sites appear to be somewhat better situated than what would have been expected if an average of more sites had been available.

Regardless, it appears that most Mississippian period habitation sites in coastal Georgia could comfortably support more than 200 people on average year-round, given the assumptions of maize agriculture and storage defined earlier.

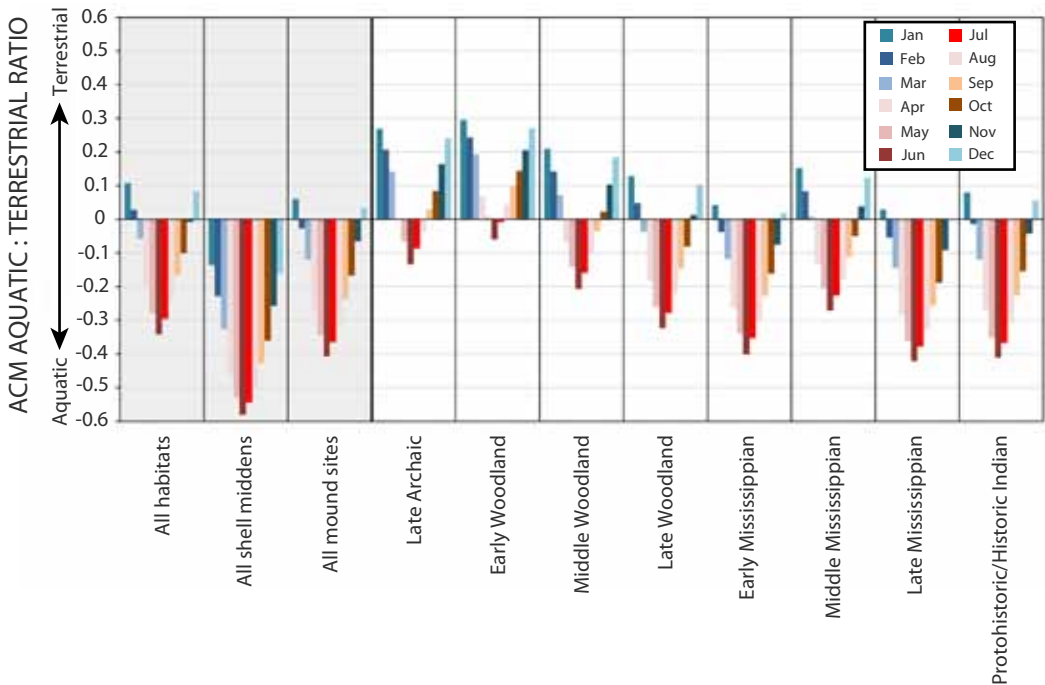


Figure 10.14. Available caloric model (ACM) ratio of aquatic to terrestrial fauna by month by temporal period and site types.



TABLE 10.8  
Sustainable Population Estimates by Temporal Period

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Late Archaic	19	21	21	27	33	38	81	136	163	115	47	20	<b>60</b>
Early Woodland	46	43	36	42	50	57	113	283	427	318	134	56	<b>134</b>
Middle Woodland	143	115	81	80	86	92	144	641	1137	912	432	194	<b>338</b>
Late Woodland	239	194	134	128	134	143	201	867	1535	1327	705	334	<b>495</b>
Early Mississippian	452	366	251	232	244	268	360	1476	2629	2320	1269	624	<b>874</b>
Middle Mississippian	377	301	201	180	173	171	230	1135	2089	1872	1059	530	<b>693</b>
Late Mississippian	470	379	257	235	231	242	318	1364	2478	2233	1286	658	<b>846</b>
Proto-/historic Indian	542	435	294	263	253	258	337	1501	2754	2503	1461	758	<b>946</b>

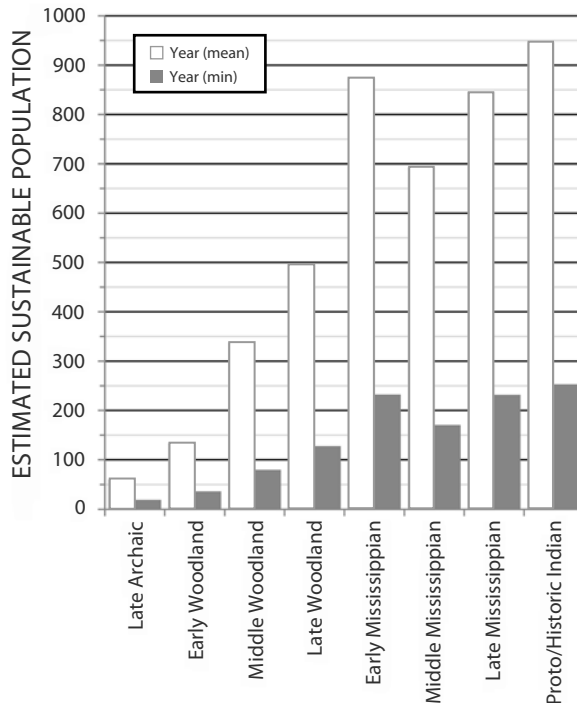


Figure 10.15. Calculated sustainable population estimates (minimums and means) by period.

Spring and early summer appear to be the times in which the sustainable population is the lowest for all periods, with the exception of the Late Archaic (where midwinter has the lowest caloric availability). March through May is when the stored plant calories are beginning to run out, but the abundant resources of summer and fall are not yet available. If stored calories are not included in the mix, midwinter is then the least productive period. However, minimum population levels could also have been increased by pushing the stress limits on some of the available faunal resources during the spring and early summer, and by trading with other locales for supplemental calories. The Middle Mississippian sites in particular seem to be poorly situated for early summer resources, so they could have followed the trading strategy. Alternatively, the sustainable population could have been increased by planting a second crop during the year and harvesting in the spring, which is possible in the region, but was not considered in this analysis.

#### LOCAL-SCALE ANALYSIS

On the local scale, the goal was to provide more intensive examination of the foraging areas of a specific site and perhaps to examine the nature of resource collection activities during the year more directly. Whereas the comparative analysis focused on groups of sites and their temporal periods—and is presented primarily in table and graph form—the local analysis is an exercise in creating many interpretive GIS surfaces based on the 444 HM surfaces and the terrestrial and aquatic travel friction. For this analysis, site 9Cm471 is used as an example. Any other site in the analysis, or the GASF for that matter, can be analyzed, but 9Cm471 is excellent for illustrative purposes.

Site 9Cm471 is a village site located in Camden County at the margin of a remnant barrier island of the Pamlico shoreline complex. It has numerous associated small shell scatters and a large earthen mound. It is situated near the mouth of the Satilla River, but with good access to both terrestrial and aquatic foraging areas. The site dates from about 1600–500 B.P. (Late Woodland through Late Mississippian). Figure 10.16 shows the site and its 450 kcal terrestrial and aquatic (and 900 kcal aquatic foraging buffers) over the 15 minute USGS quadrangle map. The values de-

finied for the site in tabular and graph form were used to derive estimates of returnable calories for each of the species for each month.

#### EFFECTIVE FORAGING AREAS

A cost distance evaluation was conducted from site 9Cm471 based on the combined travel friction and translated into an accumulated caloric distance. Any map unit in the resulting surface was then a representation of how many calories it took to reach that location from 9Cm471 on foot and/or by canoe. Using map algebra, the accumulated caloric distance was doubled (simulating a round-trip from the site) and subtracted from the RCM surface (as a mean for the period between 1600 and 500 B.P.) for each forage category for each month. Any areas that were caloric deficits (i.e., where the cost of reaching that location exceeded the expected return) were then revalued to zero; these are made transparent in figures 10.17 and 10.18. Each final surface then illustrates the RCM calories for the time frame with an accurate representation of the costs of acquiring those calories considered. Rather than buffering the returns at a specific daily distance (as in the comparative analysis), it is assumed that once the travel costs exceed the expected returns the theoretical foraging limit has been reached (regardless of how long it may take to reach it).

Looking specifically at saltwater fish resources as an example, figure 10.17 shows the potential caloric returns for small, large, and all saltwater fish during the months of January and July predicted for approximately 500 B.P. The display is standardized to range between zero and a maximum of 2796 calories per map unit (the highest RCM value reached for any single saltwater fish category during any month at 9Cm471). The modeled surfaces indicate a restricted foraging area in January, expanding through the spring, but essentially not going much beyond the 900 kcal range at any time. During the fall and winter, the potential caloric returns begin to decrease and the effective foraging range contracts again. At no time during the year does the expected caloric return per map unit rise very high for small saltwater fish (never exceeding 630 kcal). But the area within which small saltwater fish are potentially available and would be worth the travel investment is fairly broad. In essence, small saltwater fish are a local resource probably collected by single individuals mostly in the summer months, but potentially year-round.

In contrast, the middle part of the image illustrates the same surfaces for large saltwater fish for the same temporal range and the same months, and also standardized to the same display values. Large saltwater fish are a productive resource very early in the spring even well beyond the 900 kcal range. By the summer months, the expected caloric return is very high well out into the Satilla River estuary, making it worthwhile for a forager to travel quite a distance to collect large saltwater fish. This suggests that three- or four-person canoes could easily have traveled into the estuary and still procured a positive caloric return within a single day's foraging. It would have been more difficult for an individual forager, or even a two-person canoe, and might have required an overnight trip to make it worthwhile. Like the other saltwater fish resources, the potential return drops

dramatically in the winter, and at that time, even large saltwater fish would likely have been collected locally and much less frequently, because the expense of traveling into the Satilla River estuary would have been inefficient.

For all of the saltwater fish categories combined, by springtime there is a wide range of calories available both within a short distance of the site, and well out into the estuary. This suggests that a broadly diverse diet could easily have been supported with daily aquatic foraging, but the caloric returns from saltwater fish alone (regardless of size) are still effectively low in winter. Low winter saltwater fish calories would have been supplemented by terrestrial resources, but probably also with shellfish. If shellfish are included in the aquatic analysis (along with freshwater fish), the caloric returns for January look some-

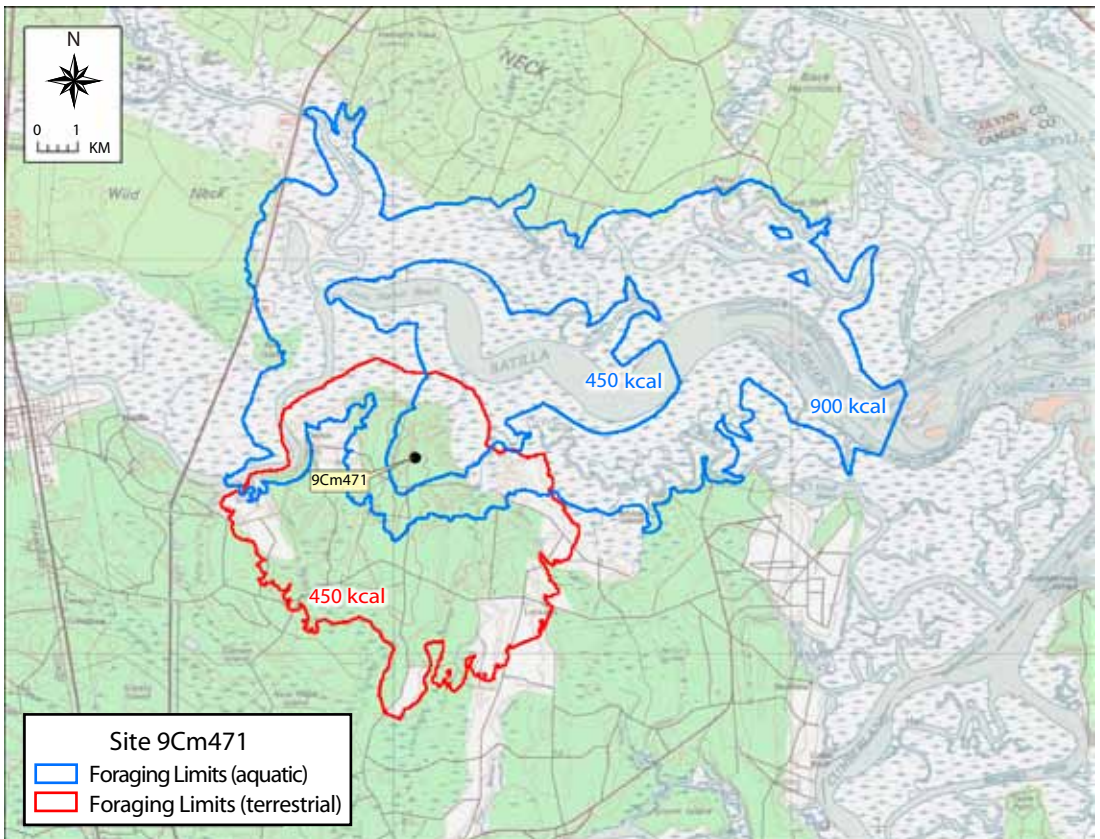


Figure 10.16. Site 9Cm471 location and calculated foraging buffers.

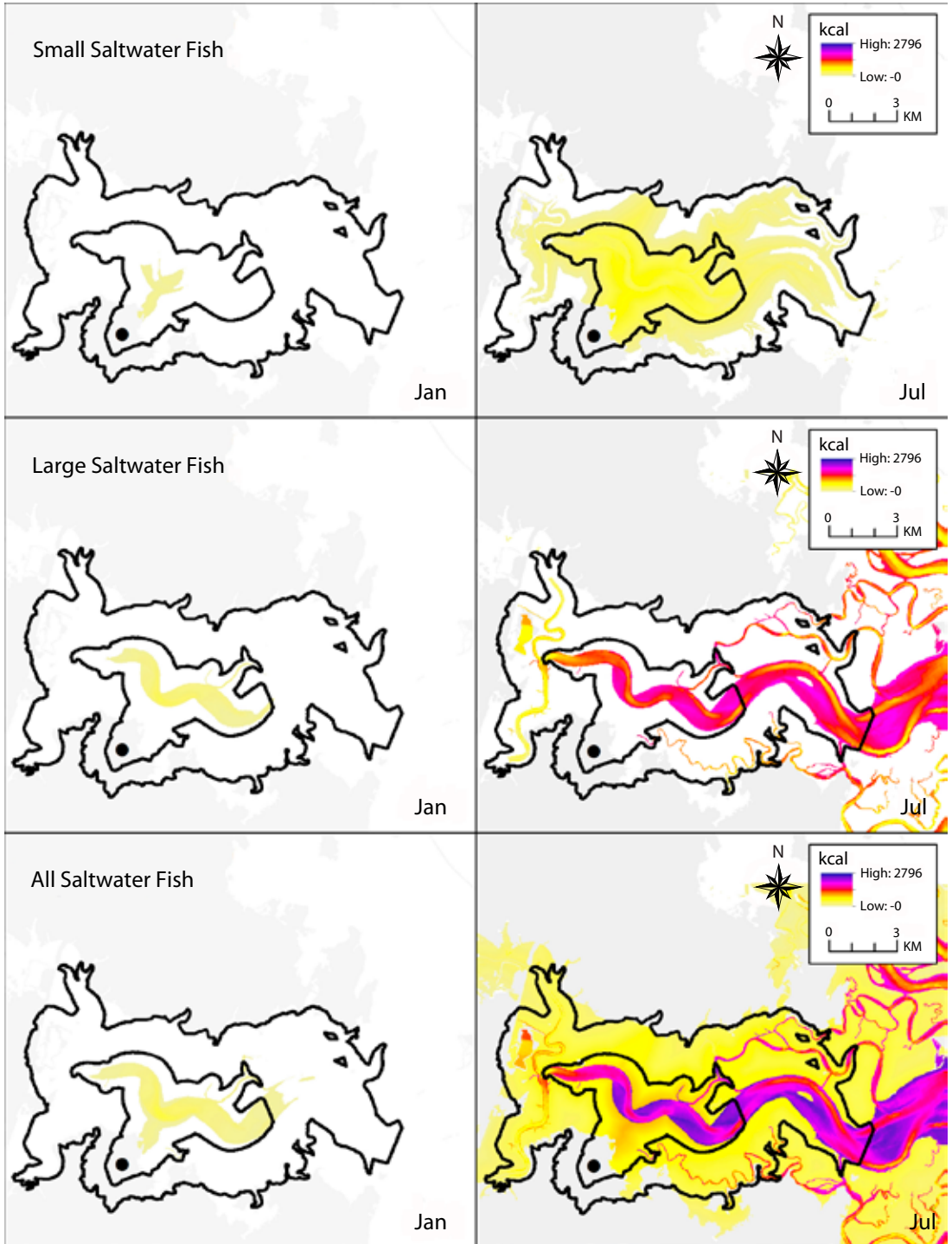


Figure 10.17. Caloric landscapes (ca. 500 B.P.) around 9Cm471 for January and July (small, large, and all saltwater fish).

what different (fig. 10.18). The highest return rates are from shellfish in the Satilla River estuary, but also from mixed size brackish water fish close to the site. Acquiring shellfish could have been carried out by canoe, or it is very likely that the shellfish resources available beyond the 900 kcal foraging range could have been collected by people living at smaller communities who then traded them to larger settlements in exchange for maize or other terrestrial resources. There are numerous shell middens along Crews Point, Dover Bluff, and Black Point that may have traded with 9Cm471 or sites on Cumberland Island, Jekyll Island, and Hazzards Neck, in this way.

**RESOURCE COLLECTION PATHWAYS**

The most productive pathways to acquiring any of the forage categories can be modeled us-

ing a modified hydrology analysis. Hydrology analysis uses directional terrain slope to determine the drainage characteristics of any map unit, projecting how many other map units flow into it, and in which direction surface water would flow out. Normally, a hydrology analysis uses a digital elevation model to recreate actual stream flows. However, if we translate the caloric surface into a pseudotopography, we can use the hydrology analysis in a different way as a means to determine the most productive paths into the resource collection areas.

Cost distance is an algorithmic accumulation of cost values (or friction) as one progresses outward from the point of origin. In this case we can modify the caloric surface by inverting it so that the higher calorie areas are lower values, while the lower calorie areas are higher. This can then

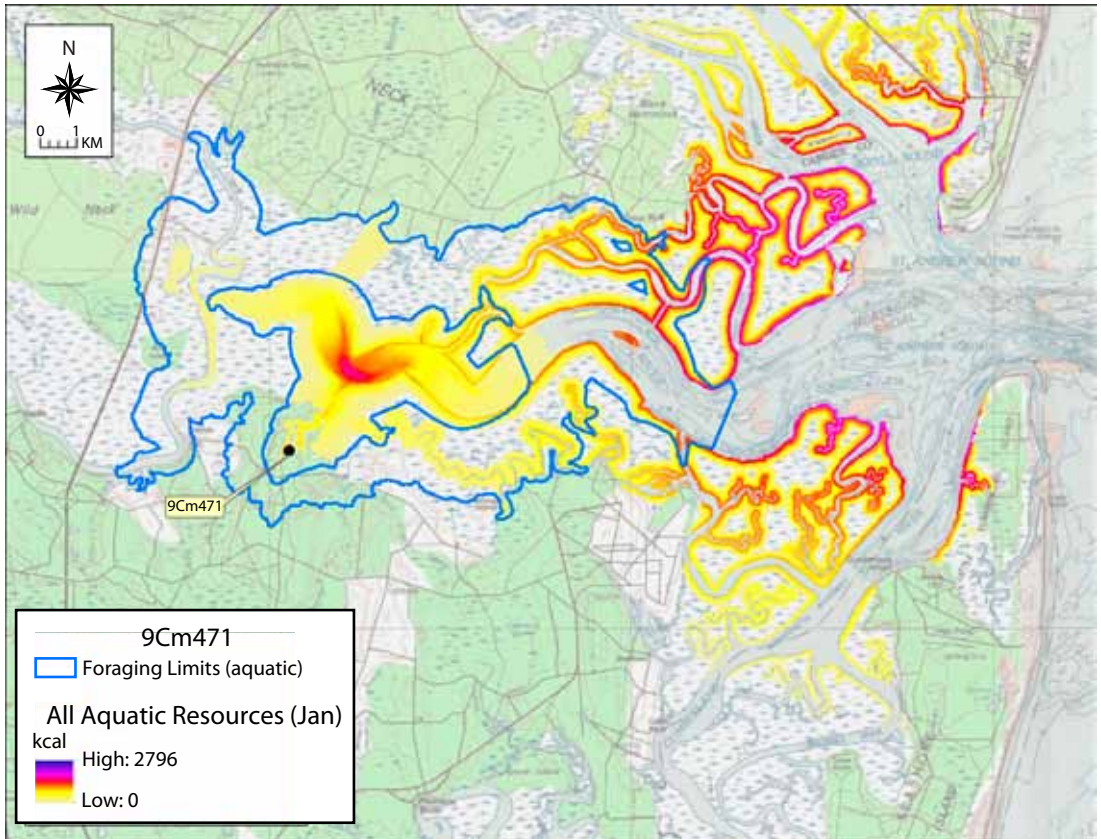


Figure 10.18. Caloric landscapes (ca. 500 B.P.) around 9Cm471 for January (all aquatic resources).

be used as a friction surface, in the same way that terrestrial and aquatic caloric costs were used to generate real travel friction. A cost distance evaluation using the inverted RCM surface then gives an algorithmic accumulation of values as one progresses outward from 9Cm471. The result is a pseudotopography in which 9Cm471 represents “sea level” and the lower the caloric return, the higher the “elevation” in the model. When a hydrology analysis is conducted on this surface it produces a false stream network that follows the pathways that accumulate the highest total calories (i.e., the “valleys” in the analysis). The number of paths identified is dependent upon the cutoff value assigned: the lower the threshold, the more paths illustrated. This is essentially the same as stream order: higher-order streams accu-

mulate more water from the surrounding terrain and smaller intersecting streams. Higher-order pathways defined in this model accumulate more calories in the same way.

Figure 10.19 shows some of the highest-order aquatic foraging pathways identified for all saltwater fish categories combined in the vicinity of 9Cm471 during June; notably this does not include shellfish. It is clear that the most productive paths are in the major stream channels, and they move eastward into the estuary. There are some cutoffs through dense marsh areas, but more than likely smaller saltwater fish and other marsh resources could have been exploited by short local (low order) paths used frequently, but that did not accumulate large caloric returns in a single episode. They also could have eas-

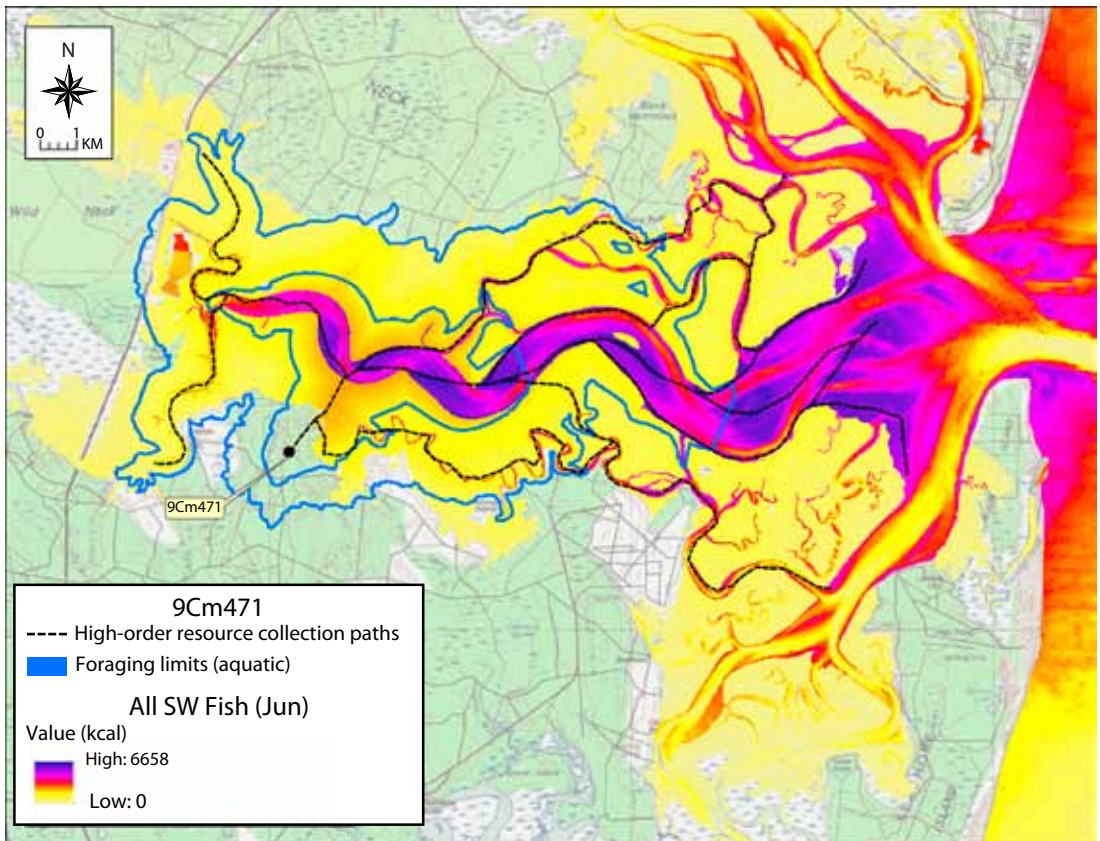


Figure 10.19. Aquatic resource collection paths (ca. 400 B.P.) plotted with the caloric landscape of all saltwater (SW) fish in June at 9Cm471.

ily been exploited by terrestrial travel (see fig. 10.18 where the terrestrial foraging buffer overlaps marsh areas). It is possible to identify paths in this way that represent foraging for any given resource, or group of resources, both aquatic and terrestrial, for any given month, and any chosen period, or year, of analysis.

Defining resource collection paths in this way may help us to identify the associations between residential sites and activity areas. Many undated lithic scatters, for example, could be the remnants of hunting-specific resources that can be linked to pathways to and from known sites. A model can be developed that gives a probability value for the likelihood that one site is associated with any other one, perhaps allowing us to date or understand the function of the small quantity of material recovered. In many cases, the activity that is being modeled by resource collection paths may not have resulted in the deposition of any artifacts at all (or the artifacts are not recoverable, or were perishable), and therefore is not recognizable archaeologically; this is especially true for fishing locales. Knowing how people could have used their environment for a wide range of tasks can help us fill in the gaps of our archaeological knowledge. Integrating the PDSI values, or temperature models, on this level can help establish where resource stress may have occurred, and how people at any given site may have responded to it spatially.

The resource collection paths can also theoretically be used to define gender-based activity areas. For example, if we believe that females may have primarily foraged for plant resources or tended maize fields, we can define the pathways of highest productivity for such resources and build an argument that defines task landscapes for females—perhaps by season, as well. Similarly, hypothetical locational models of daily activities by gender or age group can be created by combining specific resource collection paths with other types of activities, such as ceramic raw material collection areas, areas defined as representing domestic activities, etc. The possibilities are numerous for additional research trajectories. Perhaps some of the most interesting are interaction, trade, and competition with neighboring groups.

#### FORAGING COMPETITION

As an example of modeling foraging competition, two other sites were added to the local analysis of 9Cm471. They are both habitation

sites with earthen mounds; one (9Gn47) is located on Jekyll Island, the other (9Cm11) located on Cumberland Island. Neither of these two sites is included in the regional scale analyses because they are officially undated in the GASF. However, they (along with 9Cm471) are spaced almost equidistant from each other (~20 km) and all three are situated at the edge of the Satilla River estuary. It is also very likely that all three may have been occupied at the same time. For this analysis, the data were generated for June of 400 B.P., and the focus is only on aquatic resources.

First, a cost-distance evaluation was carried out from all three sites using aquatic friction. The intersection of foraging areas falls in the middle of the estuary, south of Horseshoe Shoal and near the south bank of the Satilla River. The threshold of caloric friction is around 1200 kcal, meaning most of the estuary is accessible from any of the three sites at a cost of about 1200 kcal (within a one-day foraging radius for a three-person canoe). Theoretically, the areas of most intense competition would fall near that threshold, and would be those locales that have the greatest potential caloric return. Intensity of foraging competition was then modeled by multiplying the RCM caloric surface for all saltwater fish by a modified version of cost distance from the 1200 kcal threshold (i.e., the more expected calories and the closer to an opposing foraging territory, the higher the potential for competing over the resource with someone else). Figure 10.20 illustrates this for June of 400 B.P.

The most intensive competition (at least for saltwater fish) would have been at Horseshoe Shoal and south of it and also at the tip of Cumberland Island. The main channel of the Satilla just offshore may have been less competitive because of strong tidal currents, which resulted in both poorer productivity and higher caloric friction. Superimposed over this competition surface are some of the higher-order resource collection paths. Where they intersect the 1200 kcal boundary, they are equidistant calorically from the sites. Even though they join together and can be seen as routes between the sites, they are based on the pseudotopography, not the aquatic travel friction alone. This means that they are not necessarily the same as the least-cost paths between the sites. Instead, they are, in essence, the highest productivity paths between the sites. Put into context with regard to trade and interaction, it is clear that control over the resources within the

area of highest competition would have been extremely important either during certain times of the year or other periods of resource stress.

### CONCLUSIONS

In general, this form of paleoeconomic modeling can be seen as analogous in some ways to weather forecast modeling. Spatial data are used to represent the initial conditions, specific variables are introduced, and standardized predictive surfaces are created. Our interpretations of these predictions (or in this case “retrodictions”) are compared between localities and put into the context of what we know about past behavioral activities (i.e., subsistence actions). There are several levels of feedback within the model,

which help to bring out certain aspects that are important. In the final analysis, though, the model is only as good as the data and our assumptions about those data. As I have emphasized throughout the chapter, some of the initial variables are based on qualitative assessments and not quantitative ones. This means that better data could theoretically improve, or change, the results.

However, this framework was specifically designed so that better data could be incorporated with as little difficulty as possible. If a new HM weighting of any variable is chosen, then the ArcGIS syntax can be quickly generated and a new surface created. If changes to the ACM or RCM constants are required, then those variations are automatically incorporated by the spreadsheets into the outputs. Likewise, the dietary and return

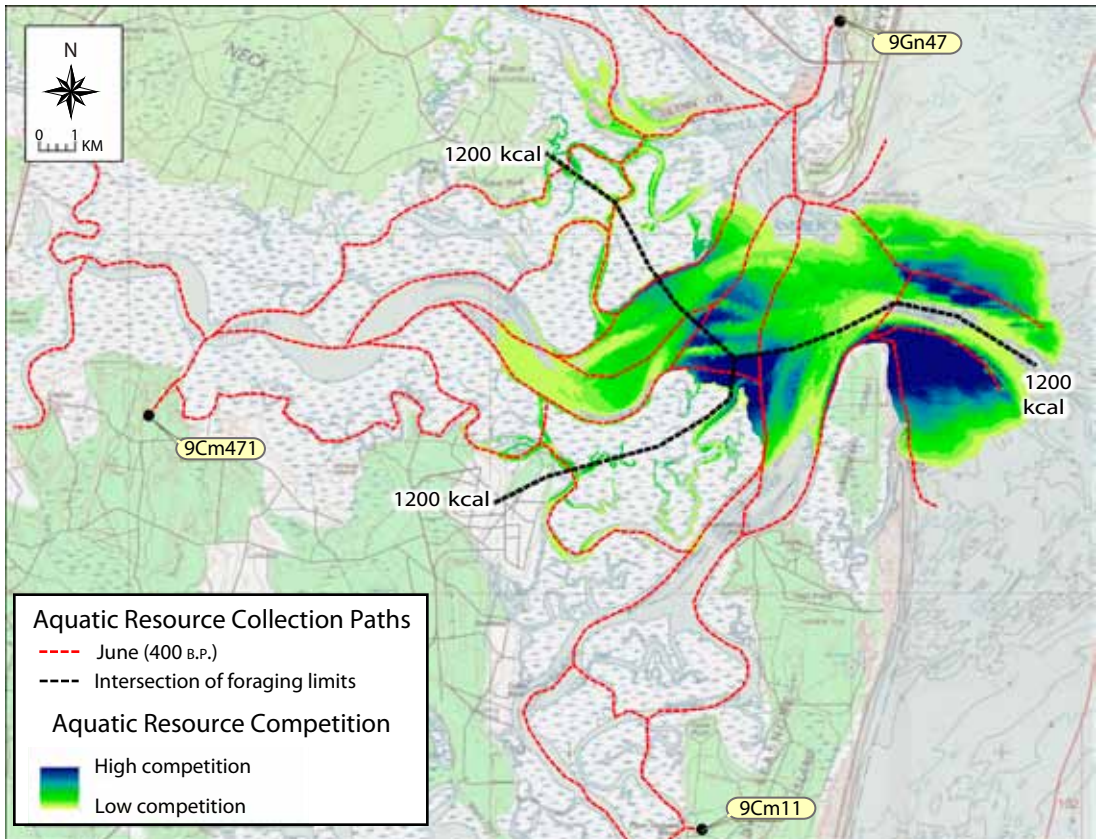


Figure 10.20. Aquatic resource collection paths (ca. 400 B.P.) plotted with the resource competition ratio of all aquatic resources in June at 9Cm471.



models can easily be changed to produce alternative results. Ultimately, the goal would be to incorporate all of these attributes into a more cohesive, programmatic tool that can be deployed in ArcGIS. This may also be integrated with simulation studies that incorporate agent-based modeling methods. The framework for the analysis need not change if new data are introduced, but such changes could have profound effects on the interpretations.

Obviously, there are numerous interpretive potentials to be derived from direct caloric paleoeconomic modeling presented here. But one thing not considered is how caloric surfaces may be used to represent noncaloric resources. For instance, lithic sources are important attractors to settlement, but lithics themselves do not obviously translate into calories. However, we can calculate caloric offsets for many resources in the same way that we calculate carbon offsets today. Buying a plastic item consumes a certain amount of carbon because carbon was generated in the process of making it. Planting a tree offsets some of that because trees consume atmospheric

carbon. A carbon offset then is a representation of the amount of atmospheric carbon that was canceled out. In this case, the offset is used to express a standardized characteristic for activities that do not obviously relate to carbon generation.

The act of collecting lithics involves a caloric cost, which can be measured, but a source of lithic raw materials has no inherent caloric content that could be directly illustrated as a caloric landscape. However, the quality of the lithic material may represent an offset of the calories expended to collect it by increasing the caloric return rate of its use. If high-quality chert increases the amount of calories returned from hunting deer by a certain percentage (over poorer-quality quartzite, for example), then it has a measurable net caloric offset. Comparing the caloric cost to acquire a resource with its potential offset may be a way to standardize many different kinds of nonsubsistence resources (or even concepts such as trade, reciprocity, and political organization) and to spatially map and analyze them. Clearly, the potential uses for caloric surfaces are still yet to be explored.

## APPENDIX 10.1

GIS METHODS USED IN THE DEVELOPMENT  
OF SPECIFIC SURFACES

Because this analysis is fundamentally based on map algebra (i.e., production of composite spatial probabilities by adding, subtracting, or multiplying surfaces together), the required model output is a raster dataset. The highest-resolution raster dataset is the USGS National Elevation Dataset (NED) with a pixel size of  $30 \times 30$  m (LiDAR data was available only for a narrow strip along the modern shoreline and for a large section around Ft. Stewart, in the interior of Bryan and Liberty counties). Therefore, all the polygon data was converted to raster datasets at this resolution. The HSD point dataset was transformed through a surface analysis using *splining* (fitting a curve by polynomial interpolation) to produce a bathymetric grid at a resolution of  $30 \times 30$  m. A somewhat better bathymetric model would have come from using *kriging* (a measure of distance weighting using least-squares estimation), but it proved too difficult to process the more than 9 million datapoints in the study area, repeatedly crashing ArcGIS. Nevertheless, the close spacing of hydrographic points was usually such that the entire underwater area (often including many miles upriver) had a high level of accuracy, even somewhat better than the above sea level digital elevation model. The LULC data is the most generalized raster surface (at  $90 \times 90$  m), so it was resampled to a  $30 \times 30$  m resolution. However, the LULC data were only used as a means to find correlations between soil and vegetation types and were not used in map algebra calculations.

## DERIVED VARIABLES

The secondary or derived datasets include the following:

**WATER AVAILABILITY (WA):** Each map unit was ranked as a decimal value between 0 (always dry) and 1 (permanent water) based on the National Wetlands Inventory (NWI) categorization as none, intermittent, seasonal, or permanent. This was moderated by depth classification (e.g., shallow wetlands being quicker to dry out than deeper ones), plus saturation/drainage characteristics from the SSURGO dataset (e.g., sandy soils hold water for shorter periods of time than clay ones), and a cost distance evaluation (using

the NED) from permanent water sources, to capture the potential for uplands to retain water (e.g., flat areas near permanent water are likely to hold more water longer).

**WATER SALINITY (WS):** Decimal values were calculated from freshwater (0) to saltwater (1) based on a simple distance evaluation (connected water only) from the NWI saltwater zone to the furthest area of tidal influence, but also moderated by vegetation density (e.g., denser floating or flooded vegetation is less permeable to tidal flow than open water). This model is a generalization of the complex nature of salinity in an estuarine environment, but it is a significant key indicator of habitat, and more accurate spatial data is currently not available.

**SOIL TEXTURE (ST):** Decimal values range from the finest texture (clay, 0) to the coarsest (coarse sand, 1). This is based on ordering all 18 represented soil texture classifications from the SSURGO dataset by grain size (clay = 0, silty clay = 1, silty sandy clay = 2, sandy clay = 3, clayey silt = 4, ... coarse sand = 17). The results were then given decimal values by simply dividing by the maximum value of 17. Anything coarser than coarse sand is not considered soil in this analysis, and does not occur in the study area anyway.

**SOIL FERTILITY (SF):** Decimal values range from poor (0) to very good (1) based first on the categorical value presented by the SSURGO crop-capacity classes (poor, moderate, good, or very good). This is modified by adding in a reranking of the soil-texture values so that the loamiest soils ranked highest and the clay soils ranked lowest (sandy soils were in-between). Soil drainage was also added in as a secondary factor, with good (but not excessive) drainage improving fertility.

**VEGETATION DENSITY (VD):** Decimal values range from open (0) to dense (1). For the wetlands this is based on the NWI maps and their indications of open, emergent, scrub, and forested, plus their depth (deeper water being less likely to contain dense vegetation), and substrate (sandier substrates supporting less dense vegetation). For upland areas, vegetation density is derived from the open land, grassland, and forest capacity classes from the SSURGO dataset, as the LULC is not particularly suited to identifying prehistoric vegetation density.

**VEGETATION TYPE (VT):** The goal was to define the specific vegetation types that function as

attractors to different species at different times of the year. The primary attractor in this sense is deciduous trees; for the production of nuts and seeds (specifically hickory nuts and acorns). Additionally, live oak acorns are such a localized highly abundant resource, that one variable was specifically extracted to represent the density of live oaks. Two variables were derived:

*VT1.* The proportional ratio of deciduous trees, from none (0) to 100% (1). This evaluation is based on correlating the SSURGO soil names with the LULC, NWI, and L4E data to find the proportion of deciduous wetlands and forest types associated with each soil type, and then projecting those values to respective map units with that soil type (i.e., accuracy is derived from the SSURGO dataset not the LULC or L4E). By using the soil types in this way, it eliminates the problem of modern artifacts (such as roadways) and lower resolution found in the LULC dataset; the only assumption is that modern land practices (such as timbering) have not disproportionately affected specific soil types in a way that has fundamentally changed their ratio of deciduous trees. If this assumption is not supportable, the effect will very likely be inversely proportional to the rarity of the soil type; and thus common soils may still hold up well.

*VT2.* The proportion of live oaks, from none (0) to 100% (1). This variable was created using the same methods as *VT1* to identify the proportion of live oaks associated with each soil type, and then projecting that to each map unit.

**WATER DEPTH (WD):** The goal here was to define the depths at which fish and shellfish (those in the estuarine, marine, and freshwater environments included in this study) congregate, breed, and feed at different times of the year. The maximum depth in the study area is -11 m, while the average maximum depth for all underwater areas is -4 m. Neither water depth nor ground surface elevation is naturally "pegged" at either end by finite definitions (in the same way that water availability can be considered "absent" or "permanent"). Rather they are tied to a single measure (sea level) and are open on the other end (limited only by the maximum value found in the study area). To avoid rescaling effects that would be created by changing the limits of the analysis, the methods employed here were to define a particular target depth, assign it the value of 1, and then to calculate the decimal value for any map unit as a z-value on a normal curve that extends

4 m in either direction. Three variables were derived in this category:

*WD1.* Shallow water: the value of 1 was given to the splined HSD surface water depth of -1 m; the decimal values fall off along a normal curve in either direction (reaching 0 on the deeper side at -4 m).

*WD2.* Moderate depth: the value 1 is set at -2 m.

*WD3.* Deep water: the value 1 is set at -4 m.

**ELEVATION ZONE (EZ):** Calculated in the same way as the water depth variables, the goal was to identify those elevation targets that were sought out or functioned as attractors on some level for the terrestrial species in the analysis. These were identified as the salt marsh/sea level, the bluffs of rivers or modern shorelines zones, the Silver Bluff and Princess Anne Shoreline complexes (which form the highest elevations of the next most recent Pleistocene barrier islands and are high in hickory/live oak woodlands), the Talbot and Penholoway formations (which form the most prominent ridgelines in the interior and which sit above the interior freshwater marshes), and the Trail Ridge and Wicomico complexes (which are the next prominent elevation breaks; the long ridgeline of which forms an excellent north-south travel corridor). Five variables were thus derived in this category:

*EZ1.* Salt marsh/sea level: the value of 1 was given to NED elevation of 0 m; the decimal values fall off along a normal curve until they reach 0 at 4 m.

*EZ2.* River bluff/shore margin: the value 1 is set at 3 m.

*EZ3.* Silver Bluff/Princess Anne formations: the value 1 is set at 11 m.

*EZ4.* Talbot/Penholoway formations: the value 1 is set at 21 m.

*EZ5.* Trail Ridge/Wicomico complexes: the value 1 is set at 31 m.

#### HABITAT SURFACES

To prepare a habitat surface (HM) for each forage category, the strength of the association was determined to be either positive or negative and based on its interpreted intensity. Each forage category was assigned a weight ranging between -10 and 10, which represented its strength of association for each environmental variable, for each month of the year. These attractor/repulsor strengths were the basis for the HM, but any one can be changed at any time and a revised surface

can be recalculated without affecting the theoretical framework or other formulas.

To derive a habitat surface for each forage category for each month, a formula was created that followed a set format:

$$HM = \sum_{i=1}^n W(V_i)$$

Each formula was transformed into ArcGIS syntax and calculated using the map algebra tool in ArcGIS's Spatial Analyst extension. Weights (W) for neutral variables (V) were set at 0. Because the model is weighted additive in nature, negative correlations had to first be inverted by multiplying the negative weight by the variable and then adding the absolute value of the weight to the product. This allowed the inclusion of both attractor and repulsor type effects in a single formula. The weights are stored in an Excel spreadsheet where the ArcGIS syntax is automatically generated for them. An example of one formula (for turkey during May) generated in ArcGIS syntax is:

$$HM(\text{turkey5}) = (([wa] * -8) + 8) + (([ws] * -8) + 8) + (([st] * 6) + 0) + (([sf] * 1) + 0) + (([vd] * -6) + 6) + (([vt1] * 0) + 0) + (([vt2] * 0) + 0) + (([wd1] * 0) + 0) + (([wd2] * 0) + 0) + (([wd3] * 0) + 0) + (([ez1] * -3) + 3) + (([ez2] * -1) + 1) + (([ez3] * 1) + 0) + (([ez4] * 2) + 0) + (([ez5] * 3) + 0).$$

The resulting surfaces were each transformed exponentially as a factor of the forage category's

interpreted overall dependence on high-ranking habitat. This transformation was designed to inject the relative adaptability of the species into the final output and was largely based on the resilience factor (discussed in more detail in the main body of the chapter). Those forage categories with high resilience were assumed to have high adaptability, and less dependence upon pristine habitat. Those with low resilience were generally assumed to be more dependent upon pristine habitat elements.

After any exponential transformation of the results they were each multiplied by a masking surface to eliminate algebraic remainders. Because the formulas are additive and not multiplicative, there will always be some remaining very low-scoring values within habitat areas that are not suitable for the forage category at all. For example, a very low potential for maize in the open ocean is possible because the additive formula must include all areas of the water availability surface despite the fact that the soil texture surface makes maize habitat impossible in water. In other words, in an additive formula one restrictive surface will not cancel out the others as it would in a multiplicative formula. To correct for this, and eliminate such remainders, several surface masks were created. These were surfaces keyed to specific limitations including; marine (no salt marsh), marine (with salt marsh), marine (with beach), freshwater (no estuarine), freshwater (with estuarine), terrestrial (no water at all), and terrestrial (with freshwater and estuarine). They were valued as 0 for the masked area and 1 for the unmasked area then multiplied by the appropriate habitat surfaces. The resulting layers were then divided by their maximum value to produce a decimal surface (to six decimal places) that ranged from 0 to 1.

APPENDIX 10.2  
Habitat Sites in the Analysis

Sites		Site Type				Temporal Period								Daily Foraging Limits (acres)				Travel Friction	
GASF #	County	HS	SM	MD	LA	EW	MW	LW	EM	MM	LM	PH	HI	Terr. (450)	Aq. (900)	Comb. (450/900)	Mean	Total	
9Bn9	Bryan	X	X	X	X	X	X	X		X	X			8456.08	31925.80	36095.70	7.33	198449	
9Bn10	Bryan	X	X	X				X						13937.20	18284.80	25272.20	5.79	620556	
9Bn17	Bryan	X	X								X			7183.99	12436.00	15360.10	7.45	376352	
9Bn39	Bryan	X		X	X	X	X	X		X	X			11260.90	5029.22	13343.00	3.86	121790	
9Bn67	Bryan	X												14971.60	12854.10	22300.10	4.40	44473	
9Bn101	Bryan	X			X	X	X	X		X	X			5897.00	19383.90	22592.10	5.76	552284	
9Bn119	Bryan	X			X	X	X							6840.84	8118.71	10139.60	4.72	203115	
9Bn188	Bryan	X		X										2014.22	33314.60	33320.20	6.52	615482	
9Bn475	Bryan	X			X					X	X		X	13845.40	22360.80	27676.50	4.32	464604	
9Bn540	Bryan	X				X	X	X						8579.29	8877.52	13428.40	4.10	79867	
9Bn557	Bryan	X			X	X	X							12936.00	12937.30	17711.70	3.44	64045	
9Bn1132	Bryan	X		X				X						7503.35	25048.00	26797.60	6.67	738826	
9Cm3	Camden	X		X										11273.60	24135.50	30554.70	5.17	352469	
9Cm7	Camden	X		X		X	X						X	9392.81	16907.50	21527.10	3.93	338150	
9Cm10	Camden	X		X						X				4195.91	1447.23	4196.35	3.55	63219	
9Cm72	Camden	X	X	X				X		X			X	9622.10	14627.50	20629.90	3.45	49080	
9Cm152	Camden	X	X					X						7050.33	17375.90	21718.50	6.26	577212	
9Cm170	Camden	X			X		X	X						13170.60	25570.90	33700.00	5.04	547390	
9Cm177	Camden	X	X					X			X			13405.90	15588.00	22140.40	5.30	141038	
9Cm220	Camden	X				X								12075.30	24452.20	30872.70	4.88	639265	
9Cm233	Camden	X	X		X	X	X	X	X					16086.20	12047.10	22690.20	4.86	418399	
9Cm268	Camden	X			X		X							9051.21	14638.00	18742.70	4.91	390112	
9Cm314	Camden	X			X									8294.41	3686.62	8682.26	3.76	77136	
9Cm471	Camden	X		X				X		X	X			11489.50	26677.00	34113.70	6.66	890792	
9Cm540	Camden	X			X								X	24264.50	4524.60	24281.20	3.54	339292	
9Cm543	Camden	X			X									15443.50	3356.59	15522.70	4.22	150359	
9Cr1	Charlton	X		X	X	X	X	X		X	X			4276.19	4288.42	5758.00	6.58	160481	
9Cr2	Charlton	X		X			X	X		X	X			1750.91	9010.07	9239.58	8.58	336207	
9Cr6	Charlton	X		X	X	X	X	X						18688.90	3103.29	19005.80	3.41	274834	
9Cr7	Charlton	X		X	X	X	X	X						11082.60	4510.82	12442.70	4.37	164810	
9Cr10	Charlton	X		X	X	X	X	X						10355.30	4401.84	11354.30	4.27	205414	
9Cr22	Charlton	X		X				X						1001.44	7259.38	7259.38	9.13	281239	
9Cr34	Charlton	X		X	X	X	X	X		X		X		15269.60	4933.14	17708.10	4.27	208730	
9Cr35	Charlton	X		X	X	X	X	X						565.99	11934.10	11934.10	9.24	467526	
9Cr182	Charlton	X			X									8327.54	4289.53	10825.90	5.02	230473	

APPENDIX 10.2 — (Continued)

Sites		Site Type			Temporal Period							Daily Foraging Limits (acres)			Travel Friction			
GASF#	County	HS	SM	MD	LA	EW	MW	LW	EM	MM	LM	PH	HI	Terr. (450)	Aq. (900)	Comb. (450/900)	Mean	Total
9Ch1	Chatham	X		X	X	X	X	X	X	X	X			7943.13	28838.30	29804.60	5.33	393663
9Ch2	Chatham	X			X	X	X	X		X	X			16521.00	18117.10	27750.10	4.58	325602
9Ch10	Chatham	X		X	X	X	X	X						6497.46	6659.81	9429.06	4.30	171870
9Ch15	Chatham	X		X				X	X	X				23499.30	4588.43	23678.50	3.00	233967
9Ch27	Chatham	X	X	X							X			8773.22	14088.40	16789.00	7.06	80243
9Ch30	Chatham	X	X	X				X			X			1776.93	10532.80	10697.40	6.00	150590
9Ch100	Chatham	X						X		X				2451.67	20382.00	20382.00	6.37	550456
9Ch137	Chatham	X					X						X	11931.20	26504.50	31297.50	5.08	554193
9Ch150	Chatham	X	X	X							X			5075.03	6522.81	9283.84	5.03	94705
9Ch310	Chatham	X		X				X						9063.00	10429.80	14882.80	5.39	227896
9Ch683	Chatham	X		X				X						15900.70	11690.60	20206.00	4.64	377081
9Ch721	Chatham	X					X							14926.60	15654.30	25660.90	6.15	71602
9Ch727	Chatham	X					X			X	X			8595.53	22522.70	25779.90	6.65	525050
9Ch814	Chatham	X					X			X				17140.80	7904.33	18712.90	3.94	206588
9Ch892	Chatham	X								X				4716.09	17290.70	17720.60	4.86	67330
9Ch944	Chatham	X			X									16743.60	7071.02	17143.20	3.74	41301
9Ch965	Chatham	X					X	X						12570.40	4244.61	12902.40	3.69	60852
9Ch1097	Chatham	X			X		X	X		X		X	X	10744.10	4238.38	11063.90	3.60	122925
9Ef169	Effingham	X	X										X	11103.20	7453.76	14172.30	4.44	267196
9Ef243	Effingham	X			X	X	X							9302.52	10571.30	14427.80	4.58	279719
9Ef253	Effingham	X		X			X							11946.10	5937.25	14249.90	3.65	61815
9Gn22	Glynn	X	X		X		X							10840.40	17671.20	23788.80	4.49	449954
9Gn51	Glynn	X		X							X			8112.93	11218.70	16471.20	4.14	97175
9Gn87	Glynn	X	X		X		X	X		X				17503.30	5735.54	20470.90	3.44	58627
9Gn211	Glynn	X			X									8303.52	19904.30	22882.80	7.09	688765
9Gn250	Glynn	X		X			X				X			3494.25	27377.60	27377.60	5.94	690469
9Gn255	Glynn	X						X						4781.03	21777.00	22105.30	5.38	324165
9Gn276	Glynn	X			X	X								18913.90	6332.22	18915.70	3.97	306437
9Gn278	Glynn	X				X	X	X						6708.51	44652.00	47446.90	6.74	1355930
9Gn290	Glynn	X				X								8374.02	32525.10	36047.40	6.73	355755
9Gn343	Glynn	X			X	X	X		X	X	X	X	X	10040.20	32626.10	36236.90	6.04	803808
9Gn351	Glynn	X		X										13179.70	13824.20	23258.20	3.70	167704
9Li4	Liberty	X									X			8434.29	28401.90	32374.10	5.67	272185
9Li18	Liberty	X		X				X			X			4631.35	16781.60	18706.00	3.88	307927
9Li20	Liberty	X		X			X	X						3372.60	20204.30	20610.40	3.80	180366
9Li191	Liberty	X		X							X			3698.63	14356.60	15477.30	4.42	197977

APPENDIX 10.2 — (Continued)

Sites		Site Type						Temporal Period							Daily Foraging Limits (acres)			Travel Friction	
GASF#	County	HS	SM	MD	LA	EW	MW	LW	EM	MM	LM	PH	HI	Terr. (450)	Aq. (900)	Comb. (450/900)	Mean	Total	
9Li197	Liberty	X	X								X			1793.61	15431.50	15854.50	7.01	391324	
9Li273	Liberty	X		X				X		X				6872.20	39404.90	39923.30	7.19	327765	
9Li278	Liberty	X			X	X								10484.80	14615.30	18707.80	3.72	136643	
9Li287	Liberty	X		X			X							8297.52	24263.20	27933.80	6.56	539989	
9Li288	Liberty	X	X	X							X			7017.20	23852.40	26709.10	8.16	253844	
9Li305	Liberty	X				X	X							22064.10	3528.95	22206.30	3.91	368157	
9Li367	Liberty	X			X	X	X	X						17336.90	8130.95	22045.20	3.36	200474	
9Li544	Liberty	X			X	X	X							7153.97	13921.40	16187.80	4.27	117845	
9Li1152	Liberty	X			X	X	X							11910.30	22636.40	28320.50	6.02	685296	
9Li1159	Liberty	X				X	X	X						8458.31	17719.50	20390.90	5.70	224671	
9Li1350	Liberty	X			X	X	X	X	X		X			15862.50	29155.00	36057.00	4.89	309396	
9Li1379	Liberty	X			X	X	X	X	X					17656.50	9837.60	20828.10	4.00	121336	
9Lg295	Long	X						X						5889.66	27942.20	30544.30	7.03	903458	
9Mc1	McIntosh	X		X							X			7403.72	10659.60	13479.70	5.55	282138	
9Mc6	McIntosh	X		X	X	X								14001.90	28178.20	36705.50	6.58	136855	
9Mc10	McIntosh	X									X			1498.49	11677.70	12121.40	6.56	149186	
9Mc32	McIntosh	X						X	X		X			8111.15	29958.50	32970.60	6.41	887649	
9Mc61	McIntosh	X	X	X							X		X	10786.80	21408.10	26906.10	8.44	139835	
9Mc64	McIntosh	X	X	X		X				X	X			9435.51	4550.85	10309.50	3.82	70955	
9Mc67	McIntosh	X	X	X				X					X	8704.72	20752.20	24834.70	5.28	220048	
9Mc71	McIntosh	X	X	X				X			X		X	7283.85	16773.40	19640.50	4.38	232190	
9Mc101	McIntosh	X	X	X	X	X								14729.64	33779.09	48333.50	7.62	163729	
9Mc281	McIntosh	X	X	X							X		X	4004.65	17762.20	19229.10	4.89	361330	
9Mc318	McIntosh	X		X				X						1546.97	11921.20	11921.20	8.22	178285	
9Mc338	McIntosh	X	X	X		X		X			X			3413.30	25608.00	26078.10	5.52	73228	
9Mc404	McIntosh	X		X							X			6785.46	18840.80	21322.70	7.01	574052	
9Mc420	McIntosh	X			X	X		X		X	X			8573.95	24527.40	28413.10	5.25	302663	
9Wy9	Wayne	X		X						X				9983.04	25139.20	30899.20	5.88	311296	
9Wy15	Wayne	X			X									8532.14	18392.00	23042.50	5.45	294269	
9Wy19	Wayne	X			X	X								17728.40	3317.23	17733.90	4.49	325155	





**PART III**  
**ARCHITECTURE AND VILLAGE**  
**LAYOUT BEFORE CONTACT**







## CHAPTER 11

### A SURVEY OF IRENE PHASE ARCHITECTURE ON THE GEORGIA COAST

DEBORAH A. KEENE  
AND ERVAN G. GARRISON<sup>1</sup>

#### INTRODUCTION

The remains of Irene phase (A.D. 1300–1450) prehistoric architecture from the Georgia coastal plain are rarely found in the archaeological record, and therefore, poorly understood. Excavations at the Grove's Creek site (9Ch71) have uncovered five structures. Only nine other Irene phase structures have been described, and these are primarily found in unpublished reports. The purpose of this chapter is to consolidate this information and describe each of the nine structures. A comparison is then made between architectural characteristics found in the archaeological record and those described in ethnohistorical accounts, in order to characterize Irene phase structures on the Georgia coast. The architectural characteristics of shape, size, and construction are found to vary considerably among all archaeological examples as well as between archaeological and ethnohistorical accounts. There appears to be no universal model for these Irene phase structures—rather, variation is the norm. This variation is likely due to the various structures having different functions.

Studies of indigenous architecture in the southeastern U.S. are hampered by the preservation difficulties that abound in the area. From termites to torrential storms, structures are assaulted on a daily basis both while they are in use and long after the structure is uninhabited. The coastal region has more than its share of destructive forces, which, combined with the sandy soil, result in a very poor archaeological record. Very few Irene phase (A.D. 1300–1450) structures have been recovered on the Georgia coast, and

only nine structures have been described in the literature. These structures come from the Irene site (Caldwell and McCann, 1941), Seven-Mile Bend (Cook, 1971), 9Ch112 (Goad, 1975), Harris Neck (Braley, O'Steen, and Quitmyer, 1986), and the Redbird Creek site (Pearson, 1984; Sipe, this volume, chap. 12) (fig. 11.1). At most of these sites, the preservation was either poor or the sites were part of a salvage project, which limited the amount of research that could be done. Excavations at Grove's Creek site uncovered five structures, almost doubling the number of Irene phase structures known from the Georgia coast, and the excellent preservation of structures at Grove's Creek site provides new data that can be used to shed some light on the information we already possess.

Several researchers in the Southeast have already used the concept of architectural grammar, or finding patterns in local and regional architecture, to learn more about the societies that design, construct, and inhabit these structures and areas. Some have worked on a regional scale (Hally, 2006), others on a village scale (Lewis and Stout, 1998), and some on a structural scale (Gougeon, 2007). A necessary precondition for defining an architectural grammar is having data about the architecture in question. Given the dearth of structures along the Georgia coast, defining an architectural grammar for the area is not currently possible on the village scale, and is only now becoming possible on the structure scale. The purpose of this chapter is to draw together the disparate information that is available to begin the process of defining an architectural grammar for the Irene phase on the Georgia coast. To that end,

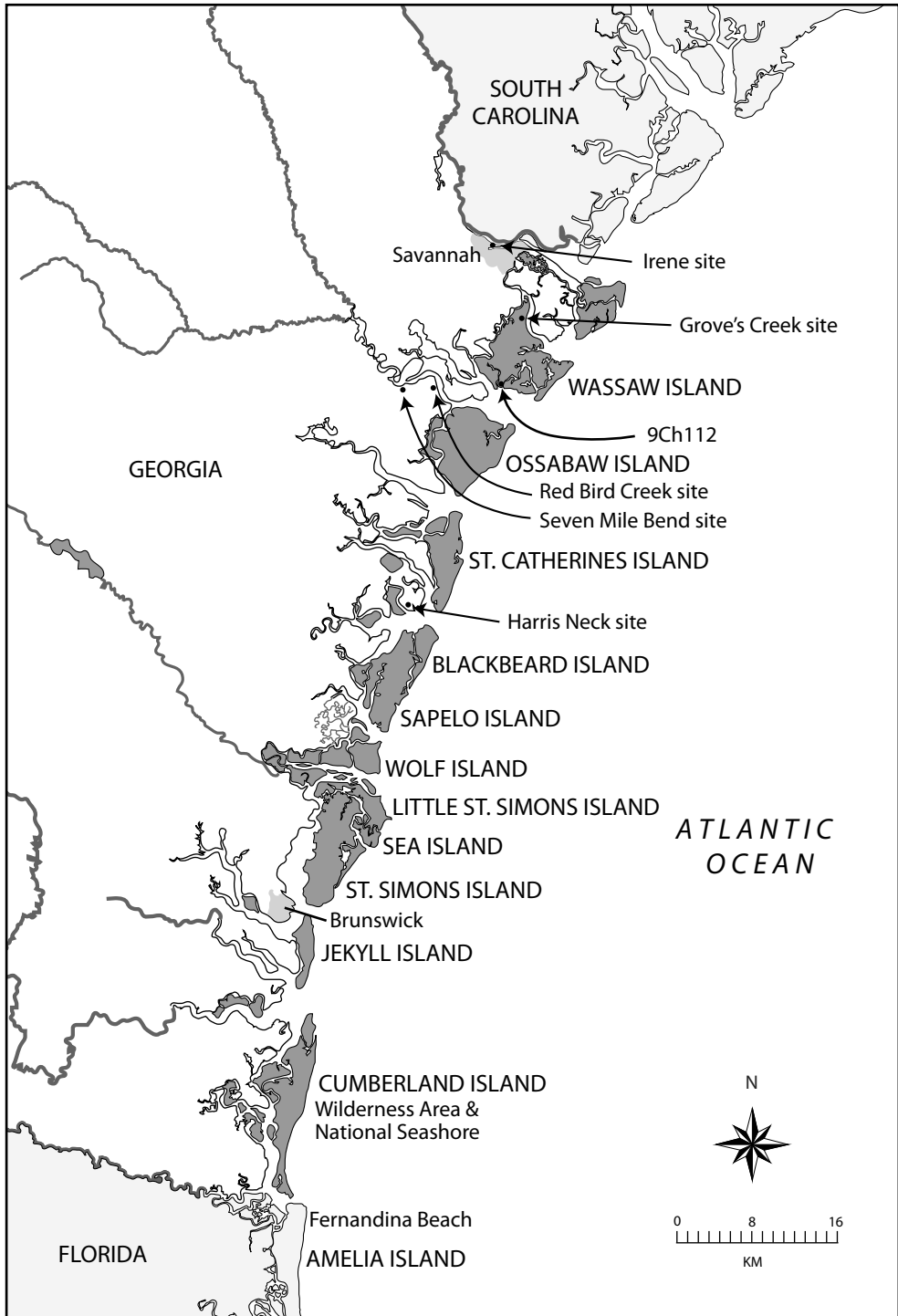


Figure 11.1. Map of the Georgia coast indicating approximate location of archaeological sites mentioned in the text.

this chapter examines characteristics of each of the structures that have been found, including the date and the methods by which the dates were obtained, shape, size, construction, and associated features. These attributes are compared to ethnohistorical accounts of early-contact architecture in an effort to help further our understanding of Irene phase architecture on the Georgia coast.

Although the record of Late Mississippian coastal architecture is scant, there are numerous examples of Mississippian architecture elsewhere in Georgia. These structures are either round, square, or rectangular, range in size from 5 m per side to more than 10 m per side, were constructed of wattle overlain by either daub or mats, were generally semisubterranean, usually contained a centrally located hearth and often included other features such as storage pits and burials (Kelly et al., 1965; Hally, 1970, 1979, 2002, 2008; Anderson and Schuldenrein, 1985; Kowalewski and Williams, 1989; Poplin, 1990; Smith, 1994; Hatch, 1995; Hally and Kelly, 1998). Many of these architectural characteristics can also be seen across the greater southeastern U.S. (cf. Walling, 1993; Lewis, Kneberg Lewis, and Sullivan, 1995; Hally, 2002; O'Brian, 2002). This information, in addition to the ethnohistorical information and archaeological data that follow, was drawn upon while interpreting the architectural descriptions from the Georgia coast.

#### ETHNOHISTORICAL DESCRIPTIONS OF ARCHITECTURE ALONG THE GEORGIA COAST

Few ethnohistorical accounts provide details concerning prehistoric architecture of the Georgia coast. Some accounts describe the Guale and the Cusabo, whose ancestors were the likely inhabitants of Irene phase sites in South Carolina and Georgia, and the Timucua, who lived south of the Guale in present-day Florida. The earliest descriptions come from Jean Ribault, who came to the New World in 1562 (Ribault, 1927 [1563]). In the vicinity of St. Marys River, he encountered a village in which houses were made of wood and covered with reeds. He describes many of them as similar to pavilions, suggesting that not all had walls. One larger structure in the center of the village was described as "verry great, long and broode" (Ribault, 1927 [1563]: 84). This could have been a townhouse. In that building only, he describes benches along the walls.

In 1564, René Goulaine de Laudonnière led an expedition from present-day Florida to South Carolina. He was accompanied by the artist Jacques Le Moyne de Morgues, who made drawings throughout the journey (Le Moyne, 1875). Le Moyne's engraving 2 depicts an area near St. Johns River, Florida. The houses are all round and appear to have thatched roofs. Engraving 3 represents a village seen north of St. Johns River, perhaps in southern Georgia. One round and two rectangular structures are shown. Engravings 5, 6, 22, 31, and 40 are scenes from Port Royal, South Carolina, and each depicts round, thatched roof structures. Engraving 7 depicts the French asking Ouade (Guale) for supplies. It is difficult to determine the shape of one of the structures, but it appears to be rectangular, while the other is round. A sentinel cottage or alligator blind is also depicted. The sentinel cottages and alligator blinds both appear throughout the engravings as small, thatched roof structures, constructed with solid walls (of unknown material) having holes cut out in regular intervals (engravings 26 and 30). Engraving 30 depicts a fortified town. It consists of a mix of square and circular structures. One large, rectangular structure in the center of the village is referred to as the chief's house but is probably a townhouse. Engraving 33 and several of the unnumbered engravings depict very long, thin rectangular structures. It is unclear what these structures represent or where they were seen.

Le Moyne (1875) describes some aspects of architecture as well, such as roofs made of dried palm branches. He writes that the chief's house was partly underground because of the heat (Le Moyne, 1875: 12). He does not suggest that common houses were built partly underground, but the engraving does not depict the chief's house as any different from the other houses. He notes that houses were burned down both by enemies and when a chief or priest died (Le Moyne, 1875).

Fray Andrés de San Miguel was a Spanish monk who visited the town of Asao, near present-day St. Simons Island, in 1595. He noted that the houses were small, made of unfinished wood, and covered in palmetto. The chief's house was made of several small rooms, suggesting that the structure had interior walls acting as partitions; however, it was no larger than any other house. San Miguel and his companions were housed in a large, circular structure made of "entire pine trees" (San Miguel, 2001: 65). All of the trees

came together in a point at the apex of the roof. Beds lined the walls, and San Miguel estimated that 300 men could sleep there (San Miguel, 2001: 65).

In the 17th century, Bishop Gabriel Diaz Vara Calderón wrote of several Native American groups, including the Guale. He described their houses as round and made of straw, and indicates that at least one structure contained a bed made of reeds. He mentions a characteristic that is not described elsewhere: a granary on the side of the structure. It is not clear whether it is attached to the main structure or not, only that it is "supported by 12 beams" (Wenhold, 1936: 13).

Swanton writes that "Most of the houses of the common people were undoubtedly circular" (Swanton, 1977 [1946]: 407). He speculates that the houses north of the St. Johns River were thatched with reeds, while those south of the river were thatched with palmetto; the reed-thatched roofs were daubed, while the palmetto ones were not. He writes that the roofs were wattle-and-daub "like the walls." This suggests that all the walls were wattle-and-daub construction, although he cites no explicit ethnohistorical source for that description (Swanton, 1977 [1946]: 408).

The general consensus among the ethnohistorical descriptions is that the houses were round, fairly small, and thatched with palmetto or reeds; however, Le Moyne's (1975) drawings depict structures that were rectangular and square. The majority of structures were described as either wattle-and-daub construction or covered with palmetto. There is only one reference to a structure being semisubterranean and one for partitions within structures. The only features mentioned were beds or benches along the outer walls of larger buildings.

## GROVE'S CREEK SITE

### SITE BACKGROUND

The site is located on Skidaway Island, Georgia, and is a village associated with a large shell midden (fig. 11.2). There are at least five structures at the site. Four of the structures are oriented approximately north-south with one located to the east on a bluff overlooking the marsh. The midden is to the west of the structures. The bulk of the ceramics at the site are from the Irene phase, although ceramics from earlier time periods were also uncovered. There was a rice planta-

tion near Grove's Creek site and some irrigation system remains can still be seen, however none appear to be at the site. The site has been used for dumping garbage and is littered with both personal and construction debris, however this disturbance is superficial and only affected the geophysical survey.

Multiple excavations have been conducted at Grove's Creek site (fig. 11.2). The first documented excavations were conducted from 1985 to 1991 by Larry Babits, in association with Armstrong College (now Armstrong Atlantic State University) and the Elderhostel program (now called Road Scholar). Garrison headed the Elderhostel program from 1993 through the present and conducted a two-month excavation during the summer of 2007 to uncover and document structure 4. Additional work continues with both Elderhostel and volunteers. Keene directed an excavation in the summer of 2001 with volunteers and students from the University of Georgia and opened three units in 2007 with the University of Georgia field school. In addition, there appear to have been numerous unknown excavators working at the site. Evidence of past excavations has been found throughout the site area. Some are so large that it is probable that they are borrow pits for modern construction activities. Others appear to be archaeological excavations, but no documentation from these exists.

Given the fragmented history of this site, the authors felt that it was important to bring as much of the architectural data together in one place as possible. It should be noted, however, that each team of excavators used its own excavation, analysis, and documentation procedures. Babits excavated structures 1–3. Garrison excavated structure 4 and incorporated information from the Babits excavations that was relevant. Keene excavated structure 5. Each author wrote the descriptions of his or her own excavation, and Keene compiled the information from Babits's investigations to describe structures 1–3. For clarity during discussion, each excavation will be referred to by the name of the person who conducted it.

The information gathered from the Keene excavations, coupled with information from the remaining notes and maps of the Babits excavations, was used to help determine the characteristics of structures 1–3 and inform the excavation of structure 5. However, the existing data for structure 5 are the most complete, and so the data

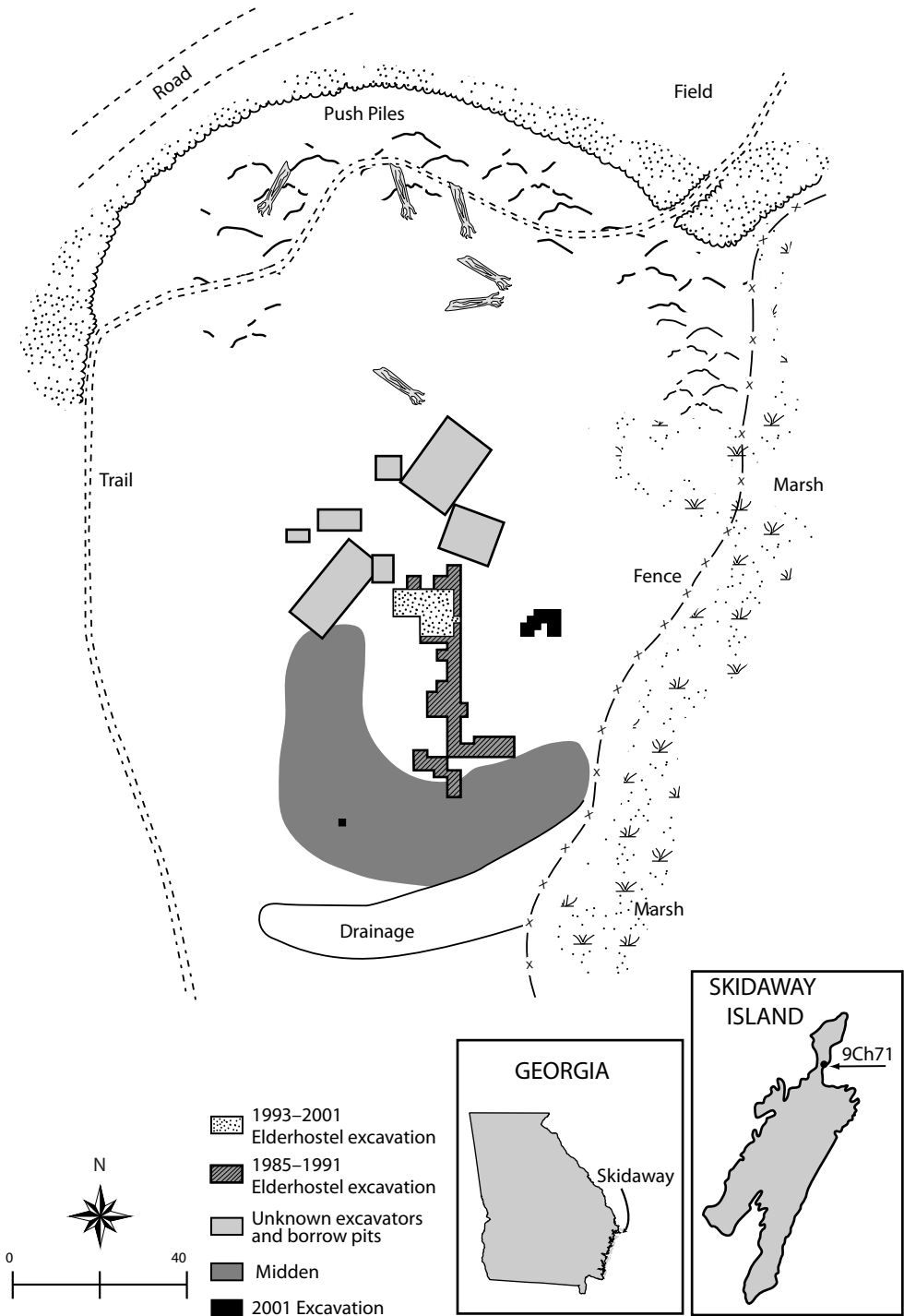


Figure 11.2. Map of Grove's Creek site (9Ch71), depicting all excavations.

from structure 5 are given first as a reference for the discussion concerning structures 1–3. The description of structure 4 will follow.

#### STRUCTURE 5

Structure 5 consisted of two perpendicular rows of in situ charred posts, many charred timbers, a yellow clay floor, a wattle-and-daub interior wall, and a large quantity of daub. The high level of preservation suggests that it was burned during or shortly after occupation. Only a portion of structure 5 has been excavated, and at this time, it is not possible to determine how much.

**EXCAVATION METHODS:** Structure 5 was located with a gradiometer survey, and the first units were placed in the area of highest concentration of magnetic activity. The excavation units were tied into the existing site grid. Each unit was 1 m<sup>2</sup> and was excavated in 10 cm levels. Soil was screened through ¼ in. and ⅙ in. mesh. Soil samples were taken in each unit and level, although only the structure floor samples were later subject to flotation. All large pieces of daub were collected and saved for further study. Small fragments of daub were weighed and discarded. All timbers and upright posts were wrapped in plastic wrap and then duct tape, removed intact, and given individual identification numbers. All artifacts on the structure floor were piecemealed if seen; all other artifacts were bagged by unit number.

**DATE:** Both absolute and relative dates were determined for the structure. Absolute dates were obtained through accelerator mass spectrometry. The uncalibrated and calibrated dates are seen in table 11.1. All the post dates are from upright, exterior wall posts found in situ. The wall date is from a post found in an interior daub wall. The dates of the posts and wall have a large range. However, this is to be expected as all of the upright posts were split, so the date would vary depending on the age of the tree and the part of the tree from which each section derived. In addition, some older pieces of wood may have been reused. As the most recent date is cal A.D. 1415–1527, this is likely the date of the structure.

Ceramic chronology provided the relative dates for structure 5. Ceramic types were identified using the methods of Caldwell and Waring (1968), DePratter (1991), and Williams and Thompson (1999). The majority of sherds were Irene Filfoot Stamped, with a small percentage of Irene Incised, placing the site in the Late Irene

phase (A.D. 1350–1450) (Braley, 1990; Saunders, 2000a: 42). Thus, the radiocarbon and ceramic chronology dates overlap.

**SHAPE:** The house appears to be square or rectangular with rounded corners (fig. 11.3). A dark stain was associated with the entire northernmost row of posts. While the northern edge of the stain was distinct, the southern border of the stain could not be isolated due to debris. A similar wall stain was found on the west side of the structure in conjunction with a north-south trending line of postholes and posts (fig. 11.3). The only area in which the wall stain was not visible was the northwest corner of the structure. The exterior wall posts of the structure were approximately 25 cm apart except in the northwest corner, where the posts were 60 cm apart. The larger gap in posts and the lack of a wall stain suggests that there may have been a doorway in this corner.

**SIZE:** Portions of only two walls have been uncovered; thus it is difficult to give exact dimensions of the structure. As hearths are often found in the center of structures (Kelly et al., 1965; Hally, 1970, 1979, 2002, 2008; Anderson and Schuldenrein, 1985; Kowalewski and Williams, 1989; Poplin, 1990; Smith, 1994; Hally and Kelly, 1998), the distance from the hearth to the nearest wall could be used to determine size. However, no hearth has been uncovered in structure 5 to date. Assuming that a hearth is in one of the unopened units immediately to the southeast of the excavation (fig. 11.3), the structure would be about 6 × 8 m wide. If there is no hearth in the structure, and the remaining walls are in the next unexcavated unit, the structure would be at least 5 × 6 m wide.

**CONSTRUCTION:** Figure 11.4 is a composite map of all excavation levels, showing the full extent of the daub debris. The interior portion of the structure contained large quantities of daub, but the area around the exterior walls contains very little, indicating that the exterior walls were not daubed (Poplin, 1990: 146; Hally, 2002). Pieces of burned cane were found in the dark stains surrounding the exterior wall, suggesting that the outside walls were constructed of cane matting that fell around the posts as it burned or rotted, staining the surrounding soil. The stain is not representative of wall trench construction, as it begins well above the floor level, does not extend below the floor level, and the postmolds associated with the charred posts extend up to 33 cm



TABLE 11.1  
**Radiocarbon Dates for Grove's Creek Site Structures**  
 Calibrated dates calculated with OxCal v.4.1.7 (Bronk Ramsey, 2010);  
 atmospheric data from Reimer et al. (2009).

Sample ID	Lab no.	Material	Uncalibrated date B.P.	Corrected date	$^{13}\text{C}\%$	cal A.D. $2\sigma$
Structure 5						
Wall 1	UGA-10116	wood charcoal	430 +/- 50	420	-25.42	1415–1527 ( $P = 70.5$ ) 1555–1633 ( $P = 24.9$ )
Post 8	UGA-10117	wood charcoal	560 +/- 70	540	-26.04	1285–1462 ( $P = 95.4$ )
Post 15	UGA-10118	wood charcoal	640 +/- 50	600	-27.62	1288–1417 ( $P = 95.4$ )
Post 19	UGA-10119	wood charcoal	830 +/- 50	830	-25.03	1148–1279 ( $P = 82.5$ ) 1046–1093 ( $P = 9.6$ ) 1148–1279 ( $P = 82.5$ )
Post 27	UGA-10120	wood charcoal	620 +/- 60	610	-25.62	1281–1422 ( $P = 95.4$ )
Structure 4						
Post 2	Beta-155443	wood charcoal		310+/-50	-25	1455–1663 ( $P = 95.4$ )
Post 7	UGA-02226	wood charcoal		540+/-40	-26.7	1386–1442 ( $P = 58.4$ ) 1307–1362 ( $P = 37$ )
Post 24	UGA-02225	wood charcoal		510+/-40	-24.7	1390–1450 ( $P = 80.8$ ) 1318–1353 ( $P = 14.6$ )
ash pit	Beta-157089	shell		380+/-80	0	1410–1664 ( $P = 95.4$ )
corn cob	Beta-82812	corn cob		430+/-60	-10.8	1406–1635 ( $P = 95.4$ )
Palm 13	UGA-02263	wood charcoal		970+/-40	-25.5	994–1160 ( $P = 95.4$ )

below both the floor and dark stain. Therefore, the method of construction was single-set post. Some exterior wall posts were split in half or in quarters. Some could be identified as pine (Henri Grission-Mayee, personal commun., 2001); the wood type of the others is not known.

One intact, upright interior wall was excavated. It was constructed of daub with cane wattle (fig. 11.5). The daub was most likely tempered with Spanish moss, as it was porous and contained a large quantity of organic material. The wall was removed, and an attempt was made to transport it to the laboratory intact. It broke into three sections during the move; however, it could still be carefully excavated from one side to the

other. Evidence from this excavation indicated that the wall was originally hollow, with cane tied to both sides and then plastered. The interior of the wall was filled entirely with sandy soil, and there was a large quantity of charred cane remains at the base. These were likely the remains of the wattle, which had rotted and fallen, or been pushed by the influx of soil, to the base. Although the actual cane had been displaced, the impressions in the daub remained intact, as did three of the interior posts. Figure 11.6 is a reconstruction of the interior wall. There were posts on each end and one in the middle. One of the end posts also acted as an exterior wall support. The other end post had daub molded around it to

create a smooth, rounded edge. The posts were approximately 50 cm apart. The horizontal cane impressions always appeared as pairs and were approximately 5 cm apart. One knot impression was found, suggesting that the cane pairs were tied with cordage to the vertical posts rather than woven between them, explaining how the wall could be hollow. A hollow wall would provide the advantage of using much less clay.

All of the daub fragments from Keene's 2001 excavation were inspected for impressions. Cane impressions were most often found as pairs, although rarely as triplets and once with four together. These groupings of cane were 5–7 cm apart. It could not be determined whether the cane bunches were originally oriented horizon-

tally or vertically; however, the intact wall contained only horizontal cane, so this is believed to be the pattern throughout the structure.

The most likely explanation for why the interior walls were wattle-and-daub while the exterior walls were not is that they were plastered to make the structure more fire retardant. This technique has been noted elsewhere in Georgia (Poplin, 1990: 146; Hally, 2002). This explanation is further supported by the daub distribution. The excavation unit with the upright wall section contained 31 kg of daub. However, the 1 m × 50 cm unit seen in figure 11.4 contained 56 kg, and all four units in the southeastern section of the excavation block contained between 24 and 36 kg of daub. This amount of daub could result from

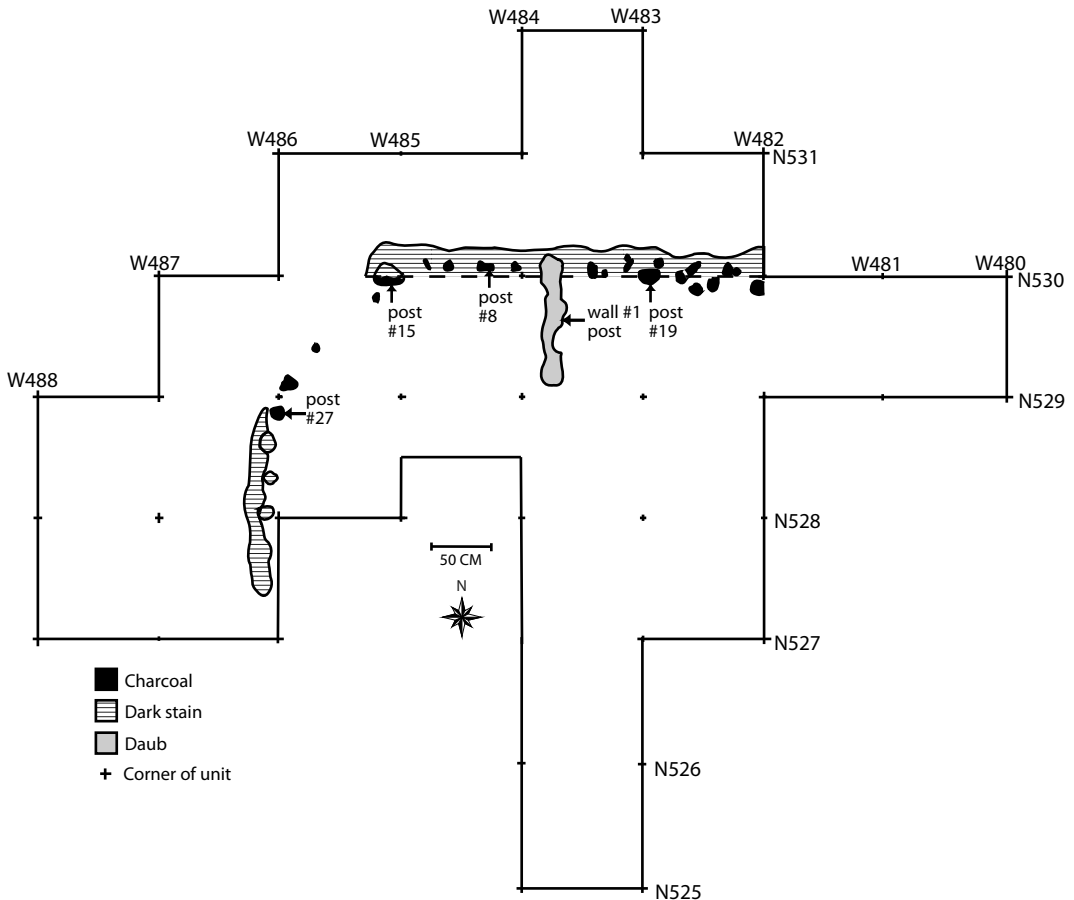


Figure 11.3. Plan map of structure 5, Grove's Creek site (9Ch71).

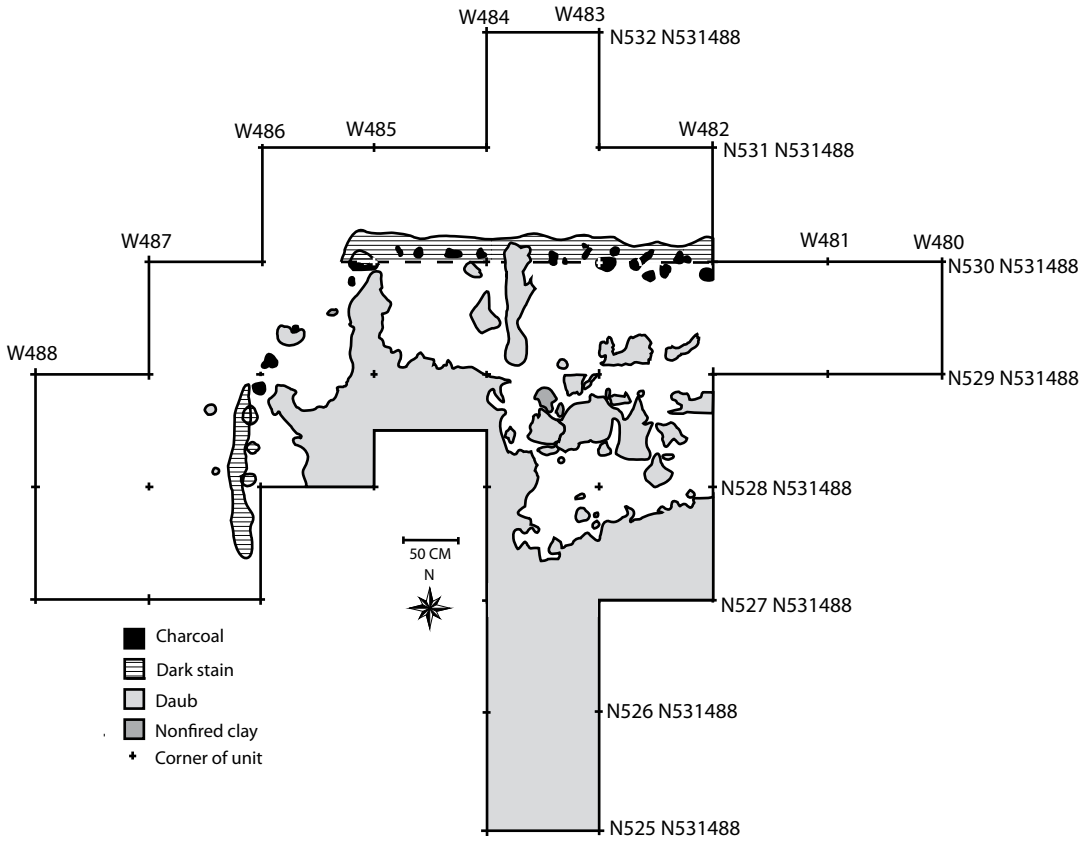


Figure 11.4. Composite plan map of structure 5, Grove's Creek site (9Ch71) depicting the daub recovered from all levels.

the debris from more interior walls; however, these walls would need to be very close together to produce this distribution. A daubed roof interior, above the fire pit or hearth, could produce the distribution pattern seen in the excavation and would help explain why there are larger amounts of daub toward the middle of the structure than at the edges (Poplin, 1990: 146; Hally, 2002).

No isolated central support posts have been found in any of the Grove's Creek site structures. However, the interior wall in structure 5 suggests an explanation. This wall was constructed of three upright posts, each as large in diameter as the exterior wall posts. The post nearest the center of the structure most likely acted as a central support post.

The structure floor was a very thin, yellow clay layer. In most areas, the daub was lying di-

rectly above it and many of the sherds were found lying horizontal either on or in it. This layer abutted the interior wall and scalloped around the postholes of the exterior wall. It terminated at the exterior wall; however, it was discovered again in the north profile of the excavation block. Further excavation in 2007 showed that it only extended a short distance beyond the structure wall. This discovery led to the hypothesis that the structure was bigger in the past and had been rebuilt smaller or shifted laterally, as seen so often elsewhere in the Southeast (Kelly et al., 1965; Hally, 1970, 1979, 2002, 2008; Polhemus, 1987; Walling, 1993; Smith, 1994; Lewis, Kneberg Lewis, and Sullivan, 1995). No indication of a previous structure built on the same spot has been found; however, this hypothesis cannot truly be tested without further excavation.

Semisubterranean construction is widespread throughout the Late Mississippian Southeast (Kelly et al., 1965; Hally, 1970, 1979, 2002, 2008; Anderson and Schuldenrein, 1985; Kowalewski and Williams, 1989; Poplin, 1990; Walling, 1993; Smith, 1994; Hatch, 1995; Lewis,

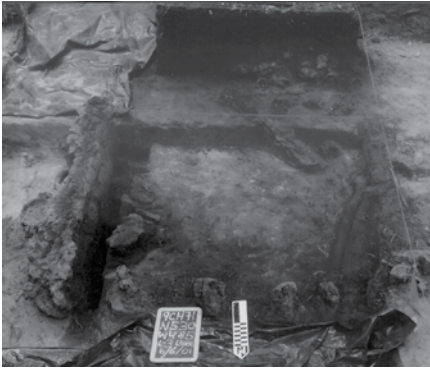


Figure 11.5. The interior wall of structure 5.

Kneberg Lewis, and Sullivan, 1995; Hally and Kelly, 1998; Schroedl, 1998). It is unlikely that structure 5 was semisubterranean. Admittedly, the difference in elevation between the prehistoric ground surface and the structure floor was difficult to determine. The south and east sides of the excavation block did not extend outside the structure (fig. 11.3). The yellow clay floor layer, as mentioned above, was found outside the structure on the north and northwest sides. If this does indicate that the structure was rebuilt and shifted laterally, then the original prehistoric ground surface in this area has already been altered. Therefore, the difference in structure floor and prehistoric ground surface elevation on these sides of the structure cannot be resolved until further excavations are completed. Due to a palm tree disturbing the soil, the elevation difference between the structure floor and the prehistoric ground surface on the west side of the excavation could only be measured in one unit, and was between 3 and 6 cm, with the prehistoric ground surface being slightly higher.

An argument can be made against the structure being semisubterranean. Along the north

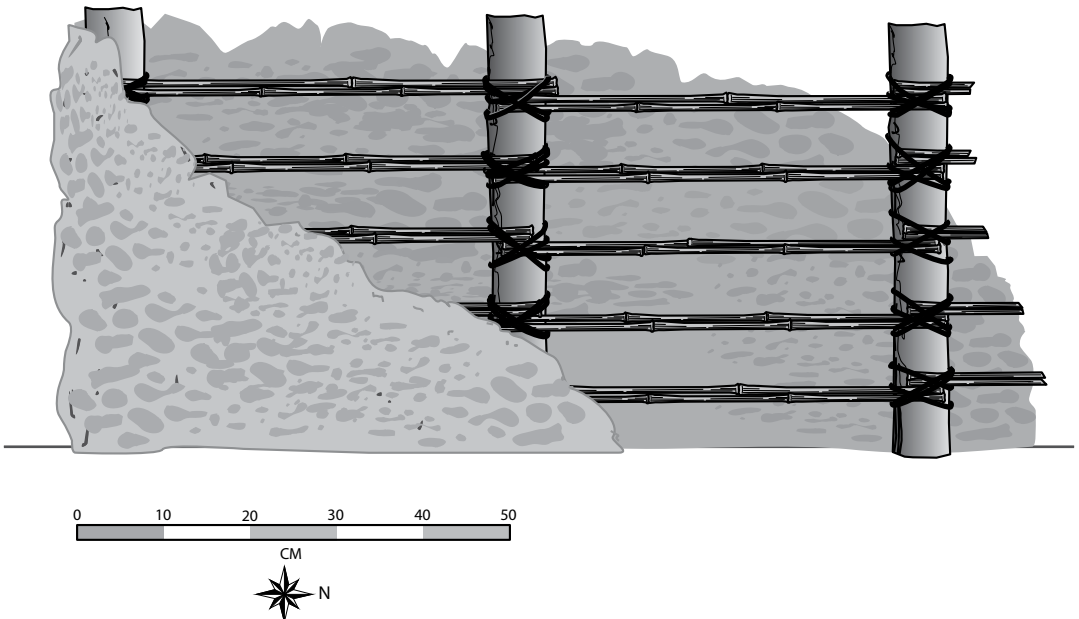


Figure 11.6. Reconstruction of the interior wall of structure 5 (courtesy of Darla Huffman).

wall of the structure, where the excavation unit went outside the prehistoric structure boundaries, a large, black, charcoal-filled stain was found extending the length of the structure. That large stain is likely the remains of the roof thatch, which slid off the roof as it burned and landed on the ground. The exterior roof debris is therefore on the same level as the interior floor of the structure. The personal experience of the excavators also argues against a semisubterranean floor. The general consensus was that there were many more mosquitoes and gnats down in the excavation units than at the ground surface due to the lack of a sea breeze in the hole. Also, the excavation unit was fairly damp for most of the summer. Both of these conditions led us to believe that semisubterranean architecture was not the norm in the area, at least in the summer.

**ASSOCIATED FEATURES:** No features were uncovered in the vicinity of structure 5. Neither a prepared hearth nor a fire pit was found. There was no evidence of storage pits either inside or outside the structure. There was a cluster of small, burned posts on the east side of the north wall that may be the remains of benches along that wall.

#### STRUCTURES 1, 2, AND 3

**EXCAVATION METHODS:** Structures 1, 2, and 3 were excavated by Larry Babits with the Elderhostel program. Notes taken by Elderhostel participants along with brief summaries written by Babits were stored at the University of Georgia Marine Extension Service (MAREX). Babits stored his own notes and the photographs at Armstrong College. When he left for a new position, he left the notes and photos for the next researcher; however, his notes disappeared shortly thereafter. Both authors have tried at various times to track them down, but they appear to be lost forever, and there are reasons to believe that they were thrown out. There are notes and maps made by the Elderhostel participants; however, these are not always complete, and many of the maps are sketches rather than graphs. Therefore, the excavation results are not always clear. Excavation units were 2 × 2 m squares. It appears that most units were excavated in 10 cm levels, soil was screened with ¼ in. mesh, and daub was weighed and discarded.

Because the maps were lost, other methods were used to determine the presence of structures

throughout the site. The center of structure 5 has a great quantity of daub associated with it, and by extension, other large concentrations are also likely to be the remains of structures. To help determine the location of the Elderhostel structures, the daub weights for all units were tallied and mapped. In some cases, the notes did not include numerical data but did include verbal descriptions of areas with heavy concentrations of daub. Figure 11.7 displays the frequency distribution of daub in the Elderhostel excavations for which there are numerical data and indicates the units that were described as having a heavy concentration of daub. The smallest amount of daub recovered was 1000 g per 2 m<sup>2</sup> unit and the largest was 50,791 g per 2 m<sup>2</sup> unit. Several of the units have no data, and it is acknowledged that with the loss of some notes, several of the units may have their daub weights underrepresented. However, this method appeared to be reliable as the four daub clusters seen on figure 11.7 coincide with remaining fieldnote descriptions of walls, post-holes, hearths, and house floors. The frequency distribution map, coupled with the surviving excavation notes and ceramics, provided all the information concerning the following structures.

**DATE:** Based on ceramic chronology, all three structures date to the Irene phase. Ceramic types were identified using Caldwell and Waring (1968), DePratter (1991), and Williams and Thompson (1999). Irene phase ceramics accounted for nearly 96% of all sherds found during the Babits excavations. Frequency distribution maps were made for the Irene, Savannah, and Deptford sherds (Keene, 2002: figs. 3-8, 3-9, 3-10) and indicate that all ceramic types were evenly distributed. As none of the non-Irene phase ceramic types were clustered near them, the structures were probably all inhabited during the Irene phase.

**STRUCTURE 1:** Structure 1 was the first found during the Babits excavations and is currently the structure closest to the drainage (fig. 11.7). It is not possible to determine its shape or size with existing information. The notes indicate that postholes and postmolds were found, suggesting single-set post construction rather than wall trenches. Very large pieces of daub with impressions were found in some units, but there is no indication of whether these are from walls or a plastered ceiling. Although a floor was mentioned, it is not possible to determine if it is semisubterranean. There were several small trash

pits, and the notes indicate that they may be filled postholes. A clay hearth was found, but the size and shape were not given.

STRUCTURE 2: Structure 2 was north of structure 1 (fig. 11.7). A daub wall, interpreted by Elderhostelers to be an exterior wall, was excavated. Several postmolds and postholes were found as well. This suggests single-set post construction with daubed walls. It is not possible to deter-

mine the orientation of the daub wall or whether it was straight or curved. A line of postholes is described as an "arc," but as there is no map, the shape of the structure is unclear. The size of the structure cannot be calculated, because no other walls were found. It is not possible to determine if the structure was semisubterranean. The floor was identified as a clay layer, and there may have been two superimposed floors. As floors were

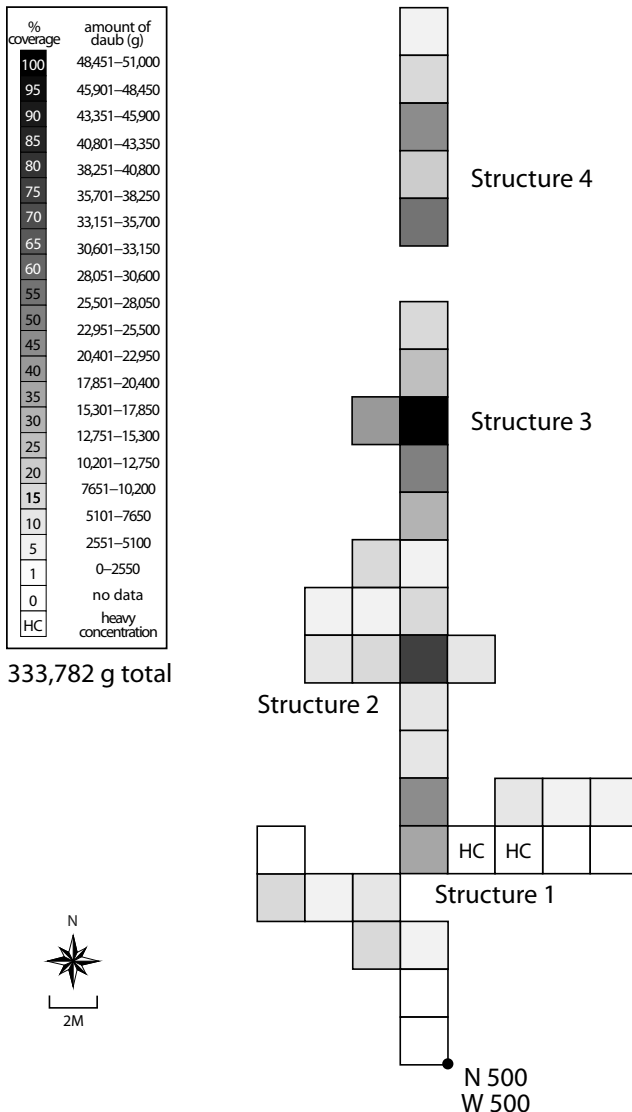


Figure 11.7. Frequency distribution map of daub from the Elderhostel excavations.

described in eight contiguous north-south 2 m<sup>2</sup> excavation units, there are either multiple floors, or a natural clay layer. The only features associated with structure 2 were several trash pits in or near the structure, along with a feature described as a midden.

**STRUCTURE 3:** Structure 3 is directly north of structure 2 (fig. 11.7). It is not possible to determine the shape or size of structure 3. At least one posthole was mentioned, which suggested single-set post construction. One fallen wall appeared to be constructed of single-set posts and plastered in daub. The house floor was described as gray and sandy and in some areas had a reddish layer directly above it; however, this sounds like the

layer under the floor in structure 5. No associated features were mentioned.

**STRUCTURE 4**

Structure 4 consisted of daub rubble and burned timbers. The structure was not excavated in its entirety. Babits's teams originally located structure 4 in two different field sessions—one in the spring of 1991 and again in the fall of the same year. The spring team was composed of Armstrong College students, whereas the fall team was made up of Elderhostel volunteers. The spring team opened units 126, 127, 146, and 151 (fig. 11.8). These units, we now know, were in the eastern half of the structure. None of these units

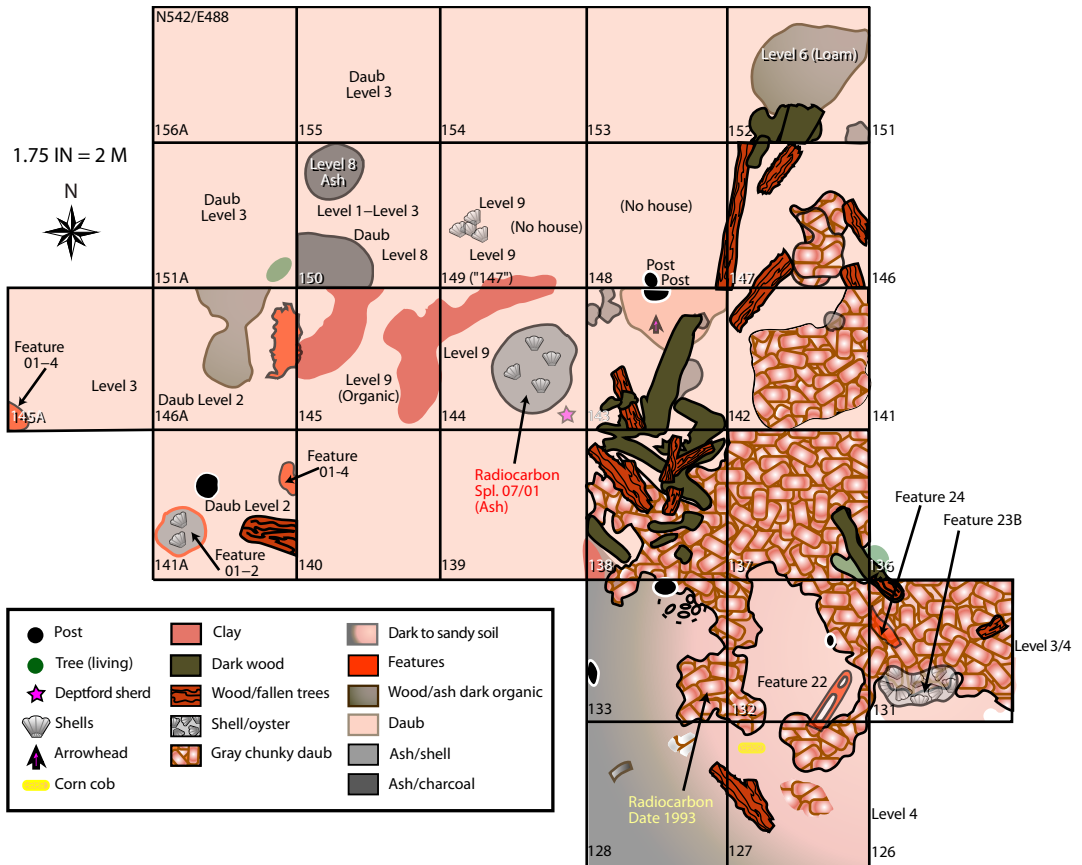


Figure 11.8. Archaeological base map of the Grove's Creek site (9Ch71) showing results of the University of Georgia/Elderhostel excavations of 1993–2005. Units not shown, begun in 2005–2006, are 130A, 131A, 135A, and 136A. These latter units are adjacent to units 141A and 145A.

were excavated below a half meter according to the Babits excavation notes. The fall team uncovered more of the structure in units 127, 128, 131, 132, and 133 (fig. 11.8). Expansion of the Elderhostel units was continued at intervals up to the summer of 2007 when a two month excavation was undertaken.

**EXCAVATION METHODS:** Much of structure 4 was uncovered by the Elderhostel program over several years (1993–2008) of excavation. The units were excavated to the daub rubble and then covered with a wooden structure to protect them. In preparation for the summer 2007 excavations, several activities were conducted during the previous December Elderhostel program. These activities consisted of cleaning off the structure, restabilizing the wooden frame for the site's covering, reestablishing the site grid markers over the area of the structure, and creating a 25 cm elevation map for the excavation area of structure 4. A total of 1200 data points form the basis of the map shown in figure 11.9. The elevation map was produced using the Surfer (Golden Software) mapping program. Areas on the map that appear lighter in color are deeper, while darker areas are higher in elevation. This map guided the excava-

tion of structure 4 in the summer field session.

The plan view shown in figure 11.10 is composed of the 10 individual unit plans drawn by the excavation team. This map complements both the 25 cm topographic map (fig. 11.9) and the photographic view shown in figure 11.11. For instance, the areas of higher elevation shown in figure 11.9 are now seen to be the result of a pavement of burnt clay daub (fig. 11.11) across the central units. This daub layer was subsequently removed across the entire surface. Below the daub was an ashy, black layer, the so-called destruction level that lay in stratigraphic contact with the floor level of structure 4. It should be pointed out that the excavations did not completely expose the whole structure's remains. In a review of the Babits fieldnotes from 1991, it was readily apparent that structure 4 continues in units 126, 141, 146, and 151 (fig. 11.8).

In 2007, the progression for excavation began with unit 127 and ended with unit 152, or south to north. There was no particular reason for such a progression other than it maintained a numerical "rationality" because sequentially numbered units are adjacent in the Grove's Creek site grid.

The techniques used to excavate this portion

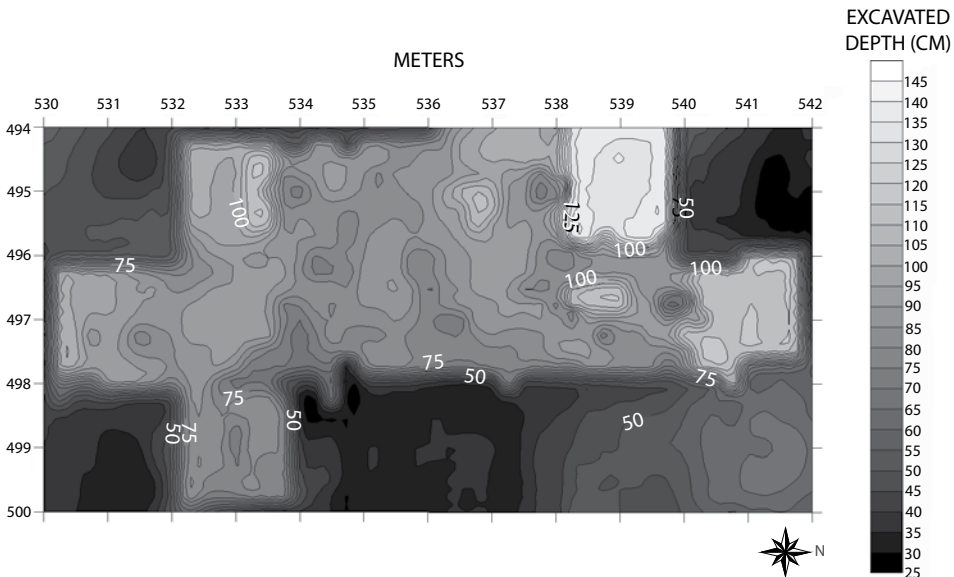


Figure 11.9. A 25 cm topographic contour map of 10 units of structure 4. The darkest areas are unexcavated/filled areas. The lightest areas (-100 to -125 cm) are the deepest units (127, 131) and the central portion of Structure 4 is indicated by the gray area with contour intervals of -75 cm.



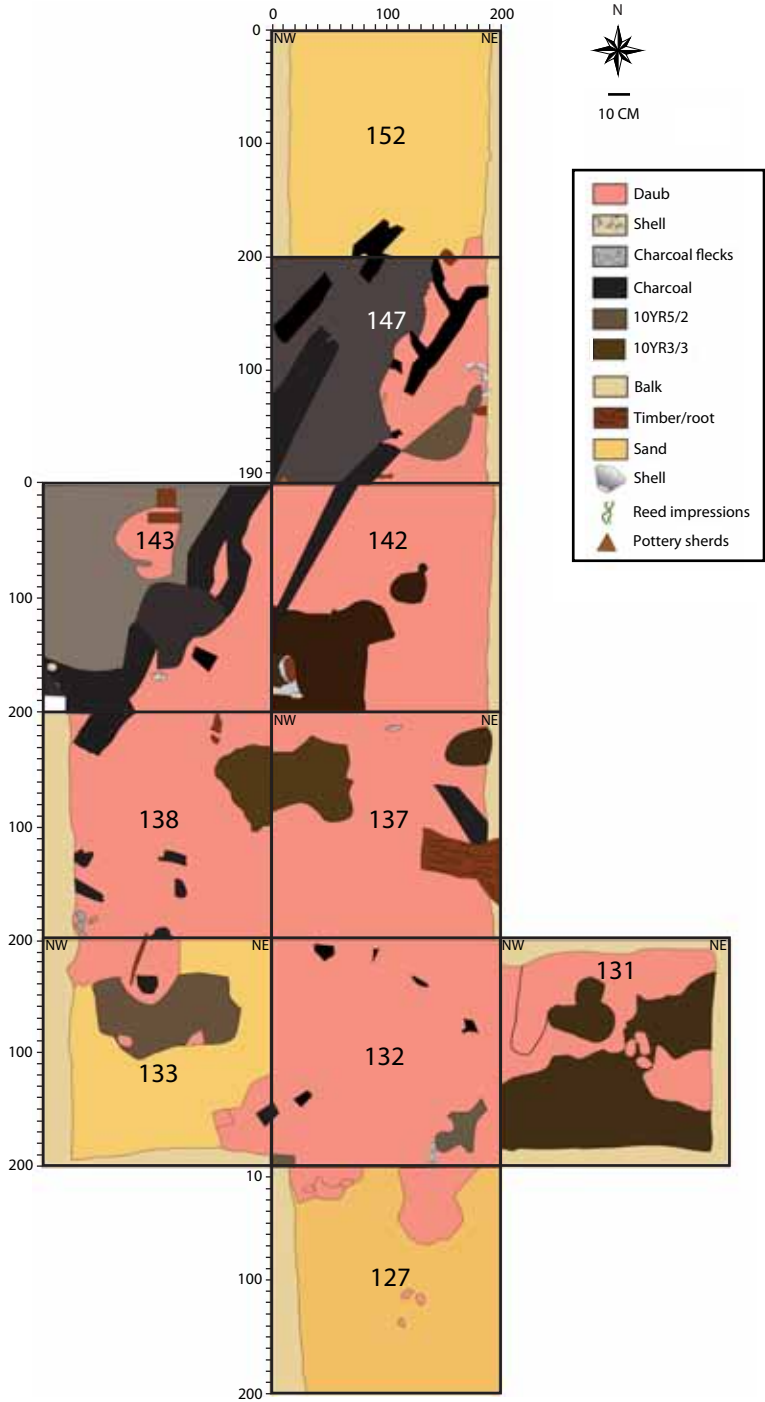


Figure 11.10. Plan view of 10 units of structure 4 prior to excavation. Each unit is 2 m<sup>2</sup>.

of structure 4 differed somewhat from those used during the earlier Garrison or Babits excavations. One difference involved the use of what are termed “natural” levels rather than arbitrary levels, typically 10 cm in vertical thickness. Since the structure’s remains were presumed to be extensive amounts of collapsed wood and clay daub, the decision was made to excavate this material, at whatever thickness, as the “debris layer/level.” The stratigraphy of the structure took a simple form of: (1) debris, (2) floor, and (3) subfloor levels. The debris level was subsequently subdivided, based on content and coloration, into a “destruction level” composed of black ash, charcoal, and artifactual debris. The stratigraphy for structure 4 is illustrated in figure 11.12. This is the east cross-sectional profile of units 137, 142, and 147, a total length of 6 m. Shown clearly is the upper, overlying “fill” layer that followed the destruction of structure 4. It is shown as a light gray, sandy sediment. The “debris” layers are shown in orange-brown



Figure 11.11. Structure 4 overview photograph. View is of the 10 units before excavation activities in June–July, 2007. The direction of the view is south to north from unit 127, foreground, to unit 152 (the most northward with a timber across the unit), and the excavation area is composed of scattered daub concentrations and burnt posts/timbers. For reference, the north arrow and menu board are in unit 133.

and the charcoal-rich stratum (black) lies in contact with the floor (dappled gray-white). The subfloor is shown in gray.

Removal of the debris level typically required the use of rock/masonry hammers, and in unit 131, steel pry bars with a six-pound hammer. These implements were necessary to break up the bricklike daub, which at times was much like a pavement, particularly in the south half of unit 131. Once the daub was broken up it could be removed by trowels and small scoops. After removal of the debris, the destruction and floor levels could be worked with trowels. Architectural features such as exterior and interior wall sections were left in situ until all surrounding materials were removed. These were the last elements to be removed from any unit. All structural elements—timbers, posts, and walls—were pedestaled as the floor and subfloor levels were excavated. At the conclusion of the excavation, these latter elements were photographed and drawn in place before their removal. All major structural elements were numbered with plastic tags, shrink-wrapped, and curated. The daub from the debris level was weighed and sorted into three categories—(1) wall face, (2) daub with impressions, and (3) rubble. Only the rubble was discarded while the other two categories were bagged and then placed in storage boxes for further study.

Finally, all materials excavated from a unit, with obvious exceptions, such as unique artifacts or features, were removed in buckets to  $\frac{1}{8}$  in. screens for hand screening. A  $\frac{1}{16}$  in. screen was used in a few cases, and on rare occasions water-screening was done using this finer mesh screen.

DATE: Absolute dates were obtained using both accelerator mass spectrometry and conventional radiocarbon techniques (table 11.1). Two of the dates come from posts 2 and 7, which were from the west wall of the structure, while a timber (post 24) found within the structure provided a third direct date of the building materials. Posts 7 and 24 have comparable dates while post 2 is slightly later. Three other radiocarbon ages relate to structure 4 as well. These dates were taken on (1) shell from an ash pit west of structure 4; (2) a corn cob found with the wall rubble of the structure; and (3) a palmetto palm stump next to the west wall. The age ranges for the shell and corn overlap with the age ranges for all three structural elements, while the date for the tree is clearly older than any of the other radiocarbon ages. The

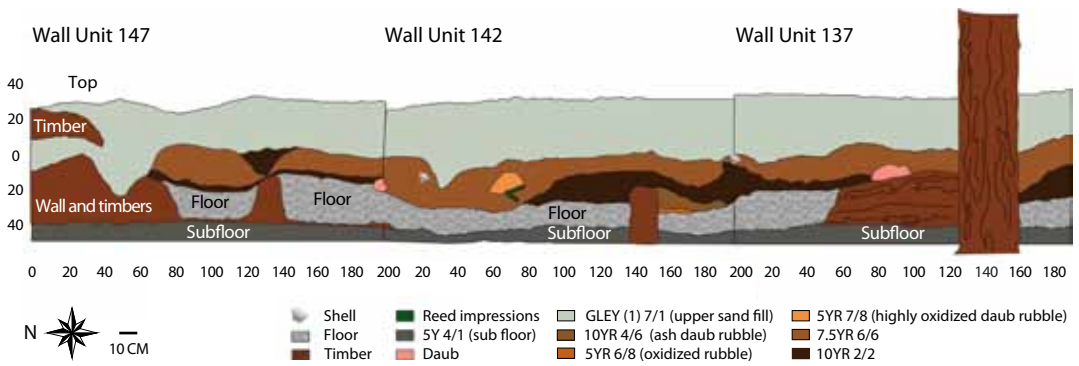


Figure 11.12. East cross-sectional profiles of wall units 147, 142, and 137 of structure 4. Scale units are in cm.

date of post 2 is the most likely date of the structure as it is the youngest at cal A.D. 1455–1663.

Ceramic types were determined for sherds found in and around structure 4. Rim forms, vessel shape, and design were used to determine chronological placement (Williams, 1968; Pearson, 1984). About 32% of the rims were decorated with reed punctations, the second most popular rim (28%) was the undecorated rim, and the third most frequently used rim (16%) was appliqué. The majority of the sherds (67%) were Irene Filfoot Complicated Stamped, with a small percentage of Irene Incised (2%), placing the structure near the beginning of the Late Irene ceramic phase (A.D. 1350–1450) (Braley, 1990; Saunders, 2000a: 42). The radiocarbon and ceramic chronology dates correlate roughly at A.D. 1450.

**SIZE AND SHAPE:** Structure 4 is a burned wattle-and-daub building of moderate dimension (ca. 30 m<sup>2</sup>). It had 6.8 m long parallel walls on its east and west. It is therefore a rectangular structure. Corroborative support for this is seen in the angles of the two corners exposed in the 2007 excavations. A line drawn from the southwest corner (unit 133) through the interior wall section (unit 132) terminates in the east wall of unit 126 where the daub concentration is more “inside” than “outside” of this line (figs. 11.8, 11.10). Additionally, the “turn” of the west wall, from that of a straight line of fallen timbers, at the northwest corner suggests a right angle or at least that of a rounded corner of a rectangular structure.

**CONSTRUCTION:** Structure 4 was a postframe

building with clay walls and a palm-thatched roof. One portion of an interior wall was discovered perpendicular to the line of the south wall. A section of this south wall was recovered to an estimated height of 1.25 m (fig. 11.13). Where the west wall was preserved, at its southwest and northeast ends, the posts are roughly 20–25 cm apart, composed of either young saplings used as vertical posts or bundles of 3–4 cane stalks used as vertical posts or bundles of 3–4 cane stalks tied together and used as vertical posts. Pearson (1984: 7) describes this use of both actual trees and cane bundles. Structure 4 seems to mimic this type of wall design. The only portal found to date was on the southwest corner of the building.

Clay daub formed the bulk of the architectural remains removed during the 2007 excavation. Structure 4’s remains, as excavated, represent just

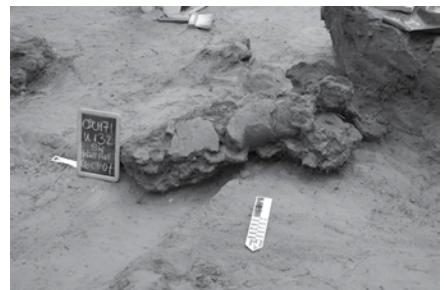


Figure 11.13. Wall corner, south wall section, unit 132.

less than 50% of the burned structure. Nonetheless, more than a metric ton (>3200 lb) of daub was removed in 2007. Prior to 2006 only 77.6 kg had been removed from the 10 excavation units (table 11.2). The daub is the result of first, intentional air-drying during wall/roof construction and second, hardening by the fire that consumed structure 4. The daub exists in two color classes, gray and red-orange. The reason for these two general colors is thought to be the location of the daub during the fire, such that some daub experienced low-oxygen conditions (reducing) and some daub experienced higher oxygen availability (oxidizing). It is well known that clay fired under these very different conditions will turn either gray-to-black or orange-to-red in color. Specific Munsell chart colors for both color classes are 10YR2/1 (dark gray-black) and 7.5YR6/6 for the red-orange color class.

As can be seen in table 11.2, the largest concentration of daub was in what could be termed the “west-central” portion of the structure. These units include 131, 132, 133, 137, 138, and 142 (fig. 11.8). Unit 148 could also be included in this list, while units 147 and 152 clearly did not have appreciable amounts of daub and are considered to be “outside” the structure. Unit 143 has 44.5 kg of daub but this could be simply debris that fell outside the west wall.

The daub was classified into three categories: (1) rubble, (2) wall face, and (3) impressed. All of category 1 was discarded after weighing. The other two categories were sorted, weighed, and curated. To be categorized as wall face daub, the fragment only had to have one smooth side while the impressed category had evidence of wattle/cane, roofing, or matting impressions. There was some overlap in the classification of some daub fragments and the sorter made a decision based on what the particular daub fragment seemed most likely to be. This is clearly a subjective decision, but the end result appears to give a basic picture of how the daub was distributed within the walls or roof of structure 4. Since 2008, the three categories of daub were examined in the laboratory in roughly even amounts—unit 127 ( $N = 51$ ); unit 131 ( $N = 66$ ); unit 137 ( $N = 105$ ); and unit 142 ( $N = 108$ )—for a sum total of 330 pieces closely examined for color, weight, dimensions, and impressions.

Special attention was paid to impressions on both interior and exterior surfaces of the daub along with the type of interior wattle. In figure

TABLE 11.2  
Daub Totals for Structure 4

Unit	1993–2006 (kg)	2007 (kg)
127	0.0	69.4
131	1.16	150.9
132	0.2	242.2
133	2.5	91.6
137	39.6	344.7
138	11.3	162.96
142	11.1	307.6
143	4.5	44.5
147	0.8	48.7
148	3.17	0.02
152	3.3	—
Totals	77.6	1462.6

11.14 we see the clearest evidence of the use of cordage in knots to bind the river cane (*Arcandina gigantea*) wattle. The paired cane wattling was used throughout the structure. Another facet of the wall daub was the use of fiber—probably Spanish moss (*Tillandsia usneoides*)—to amend the raw clay. This addition to the clay helps explain the prevalence of fiber impressions on the surface of much of the exterior and interior wall daub. If the fibers decayed, or in the case of structure 4 (and 5), simply carbonized or turned to ash by fire, they persist as negative impressions in the daub. Figure 11.15 shows what we interpret to be *Sabal palmetto* frond impressions or that of saw palmetto (*Serenoa repens*) used as thatch and covered by clay to help waterproof the roofs of Irene phase structures.

In the 2007 excavation of structure 4, a relatively well-preserved section of a wall corner was recovered and moved to the University of Georgia for detailed study. The wall section was examined in the past year as part of a larger analysis involving several hundred pieces of structure 4’s daub. A partially complete circular design had been incised on the surface of the wall (fig. 11.16A). This design, while less than com-

plete, immediately brought to mind similar types of incised designs seen on Irene and post-Irene pottery. Cook and Pearson (2011) have recently discussed this symbolism on Irene phase and later pottery. Likewise, Cook, in an unpublished manuscript (1971), presented evidence for similar wall decoration at the Seven Mile Bend site not more than 10 km from Grove's Creek site and dating from a Late Irene phase context (ca. A.D. 1350–1550).

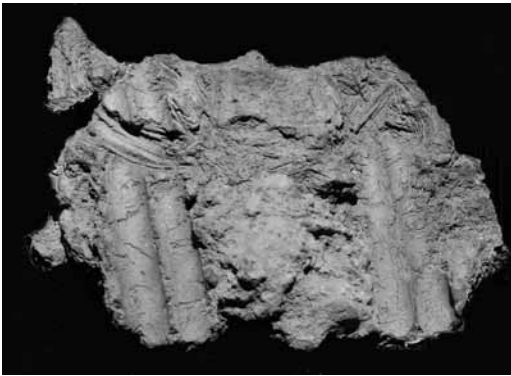


Figure 11.14. Knot impressions in the daub of structure 4 (unit 133).



Figure 11.15. A palm frond impression in the daub of structure 4.

The incised design seen on the wall section from structure 4 is a simple multiple (five) circle design. The height of the preserved portion is 7.5 cm, with a preserved width of roughly the same dimensions (~8 cm). As seen in figure 11.16B, the clay on which the design appears differs from that of the bulk of the wall in color and texture. The clay is more red-orange and is more like an appliqué or wash applied to the wall.

Cook and Pearson (2001), as do Knight and Steponaitis (1998), point out in their comparison of Late Prehistoric ceramic surface designs that concentric patterns are common. Porth (2011), following Knight (2010) and Knight and Steponaitis (1998), illustrates this concentric circular pattern on Moundville Engraved, varieties *Hemphill* and *Tuscaloosa*. The significance of the patterns varies, if one reads them as symbols as many researchers of Mississippian iconography do (Brown, 1985, 1989; Knight and Steponaitis, 1998; Knight et al., 2001; and Knight, 2010). Knight et al. (2001) state that concentric circles in the art of Moundville are similarly locatives, in this case for “night sky.”

The structure 4 design is simple and somewhat poorly executed if one compares it to those

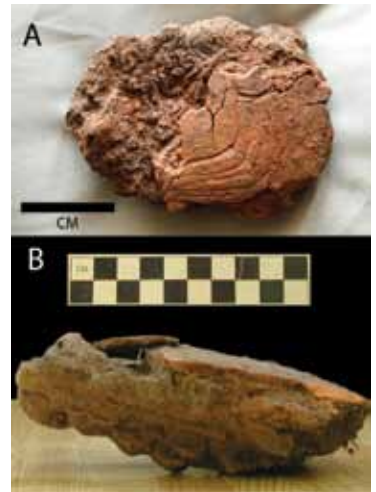


Figure 11.16. **A**, Portion of incised wall daub from structure 4; **B**, same, side view (photographs courtesy of Steve Nicklas).

seen on pottery like that of the Moundville types. Its key significance derives from the fact that this design was clearly and intentionally done. Beyond this, we can only speculate as to its meaning in the context of Irene phase architecture.

Forty-four wood elements—basically categorized as either timbers or posts—were cataloged and mapped. Of these, 37 were recovered for further study: taxonomic, dating, etc. The wood elements were mapped in situ before recovery. While most elements remained after removal of the overlying daub, some elements were recovered during daub removal. Our “After” map (fig. 11.17) shows the location of most of the remaining wood elements. Thirteen wood samples were submitted to the U.S. Department of Agricultural Wood Products Laboratory, Madison, Wisconsin and found to be pine (*Pinus* sp.). Tree-ring counts for five timbers show clear overall ages for the respective trees used in the construction of structure 4. Table 11.3 summarizes the dimensions and tree ring counts for the wooden elements analyzed thus far.

As can be seen in figure 11.17, the south portion of the excavation (units 131, 132, 133, and 138) contains elements—mostly posts—that are associated with collapsed walls. The section called “west wall,” which begins in unit 133 and continues into unit 138, contains five posts, four of which are in a direct line, and the fifth can be reasonably placed on a possible wall line that turns to the east. To the north of this wall section, in unit 138, are several timber elements seen in a crisscross pattern where they fell. Extensive amounts of wall face daub were associated with these timbers: 163 kg in units 127, 132, and 133 (see table 11.2). Another wall section collapsed in the south portion of the structure—units 127, 132, and 133. The first, and only, interior wall section, found in unit 132 by an Elderhostel team in 1991, may have adjoined this collapsed exterior wall, which has a post encased in a rounded wall end. There were no posts found in the interior wall section, only ash.

Daub continued into unit 126, which was excavated by Babits in 1991. Notes from this excavation mention the discovery of significant amounts of burned daub but only a small amount (33 kg) was recovered before the unit was closed by that excavation team. Seen in the profile of the south wall of unit 131, the unit immediately adjacent to unit 126, is a massive

daub layer more than 40 cm thick.

This daub layer topped a charcoal-rich layer we term the “destruction layer” (10YR2/1) below which lies the floor of structure 4. Excavation of unit 131 to this floor zone revealed large, fallen timbers across the east floor and into the east balk (fig. 11.18). The size of these timbers suggests their function as vertical supports of the structure. Large amounts of wall daub were removed in their immediate vicinity. Between these timbers and those of the west and south wall section are a few wooden elements. The daub overlying the floor in 132, and just adjacent in unit 137, contained evidence of palmetto fronds impressed into the daub.

Between unit 137 and the northeast corner of unit 147, across unit 142, there are large timbers or posts; but little in the way of vertical, in situ, elements are seen until the northeast corner area of unit 147. In this area the northernmost portion of the west wall was uncovered. It mimics the construction of that found in units 133/138 (fig. 11.17). Here the corner vertical post (35) was in line with several fallen smaller diameter posts roughly in parallel. While fewer in number, relative to units south and north of them, units 142, 143, and 147 have the largest continuous timber sections, which also have the largest diameters (fig. 11.17).

ASSOCIATED FEATURES AND ARTIFACTS: Few artifacts were found under the wall and roof debris of structure 4. The floor, or floors, of the structure were remarkably free of artifacts or food debris such as shell, corn, etc. This implies that the fire that destroyed structure 4 was not accidental but, more than likely, intentionally set.

Upon excavation of the “south wall” collapse, a portion of the flat exterior surface was recovered. It was here that two sections of a ceramic pipe bowl in the form of an effigy of a sea turtle were recovered. This is also in the immediate vicinity of the 1993 find of a corn cob in unit 127. Since unit 128 is adjacent to units 127 and 133, which had been excavated and closed by 1995, a search of the materials recovered in unit 128 was made and a possible pipe stem was found in that unit’s level 4, which appears to match the finish and color of the two pipe bowl fragments. Electron microprobe tests were done to determine if the three fragments are mineralogically comparable. Two of the elements were determined to be part of the same artifact.



TABLE 11.3  
**Tree-ring Counts for Five Timbers Recovered from Structure 4**

Post	Unit	Length/diameter (cm)	Ring count
1	132		13
11	138	6/8	15
13	137	28/5.1 <sup>a</sup>	9–10
23	137/143	78/11	13
26	142/147	90/25	39

<sup>a</sup> Diameter is estimated from fragments.

#### GROVE'S CREEK SITE SUMMARY

A 5 cm topographic contour map of the central area of Grove's Creek site was created during the 2007 University of Georgia field school headed by Mark Williams (fig. 11.19). Two large house mounds, both at 4.4 m in elevation, are apparent. Structure 4 is the larger mound and structure 5 is the slightly smaller mound to the east. The contour map does not indicate other probable house mounds at the site, and an extensive geophysical survey in 2000 only found one structure (structure 5) that hadn't already been excavated. The geophysical survey was more likely to find daubed structures than non-daubed ones; so while it is likely that the five found daubed structures are the only ones still existing at the site, it is possible that there are non-daubed structures to be found. In at least one location on the earliest Elderhostel maps there appears to be a cluster of postholes with no associated daub, suggesting that there is at least one non-daubed structure. Given the site's history of destruction, it is likely that there were other structures, both daubed and non-daubed, during the Irene phase. This uncertainty as to the number of structures makes it difficult to come to any firm conclusions as to the overall nature of the site. It appears to be a small town or hamlet. The inhabitants were certainly engaging in corn, bean, and sunflower horticulture and living at the site year-round (Keene, 2004). Evidence for this permanent occupation is seen in the architecture of the site. The use of daub indicates a time investment and a desire for four seasons of comfort. Structure 5 appears to have

exterior walls made of cane matting with wattle and daub in the interior, making it useful in both the summer and winter.

Structures 1–4 are found in a north-south line, and structure 5 is east of structure 4, creating a small open area to the south and east of the structures that is hemmed in by the creek and slough. Future excavations could investigate the possibility of this being a small plaza-type feature. There appears to have been at least one shell mound at the site (seen at the edge of one of the large borrow pits), which was located directly northeast of structure 4. However, it is unknown whether this was a burial mound. There is no evidence that any of the structures were communal or ceremonial, nor is there any evidence that one of the structures was occupied by an elite person or family. The site appears to be a farming hamlet, possibly of an extended family. The configuration of architecture as we currently understand it suggests that it was planned or at least grew in a structured way since the structures appear to be arranged by cardinal direction.

There does appear to be several similarities between the structures themselves. The structures were rectangular, single-set post, and wattle-and-daub construction with palm thatch roofs. It appears unlikely that they were semisubterranean. One difference between the structures is their wall construction. Structure 4 appears to have had daub walls throughout the structure, while structure 5 appears to have had a daubed roof and interior walls with cane matting on the exterior walls. No nonarchitectural features were found in or around either structure.





Figure 11.18. Wall section and timbers, northeast corner unit 147.

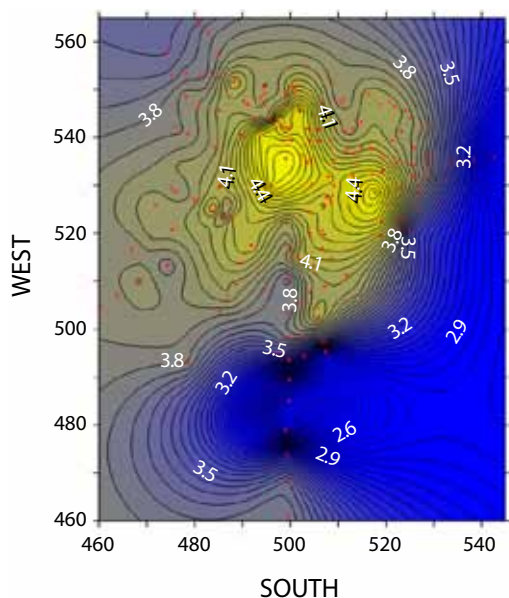


Figure 11.19. Topographic 5 cm contour map of the central area of Grove's Creek Site (9Ch71).

#### INTERSITE COMPARISON

In comparing the architecture of Grove's Creek site to other Irene phase sites along the Georgia coast, it becomes clear that very few regional patterns can be discerned. Seven-Mile Bend (Cook, 1971), 9Ch112 (Goad, 1975), and

Harris Neck (Braley, O'Steen, and Quitmyer, 1986) each contain only one Irene phase structure; the Irene site (Caldwell and McCann, 1941) contains one Irene phase structure and one transitional Savannah/Irene phase, and the Redbird Creek site (Pearson, 1984; Sipe, this vol., chap. 12) has four partially preserved structures. Therefore, it is not possible to compare the layout of Grove's Creek site with other Irene phase coastal villages. However, there is information to compare individual structures and try to construct an architectural grammar for Irene phase structures. The structures found on each site are described below. The original reports did not always explicitly describe all structure characteristics. In these cases, interpretations were made using maps, photographs, or by piecing together information in the reports.

#### IRENE SITE

The Irene site is located in Savannah, Georgia (fig. 11.1) and was excavated as part of the Works Progress Administration (WPA) (Caldwell and McCann, 1941). It is a multicomponent ceremonial center with one large mound, several ceremonial structures, and five domestic structures. Although the mortuary building is Irene phase, it will not be discussed here as it is clearly a special-use structure. Of the five structures found at the site, one was Irene phase and one was transitional Savannah/Irene. Dates were determined through ceramic chronology. The Irene phase structure (feature 55) was rectangular with squared corners, made of wattle-and-daub, single-set post construction, and not semisubterranean. Exact dimensions were not given, other than to say it was "considerably larger than the Savannah period structure" (Caldwell and McCann, 1941: 35) below it, which was approximately  $4.5 \times 5.2$  m ( $15 \times 17$  ft) and was semisubterranean. The only interior feature it contained was a prepared clay hearth (Caldwell and McCann, 1941: 35).

The transitional phase structure (feature 61) was rectangular, and in the photograph it appears as though the corners are rounded. It measured  $3 \times 3$  m ( $10 \times 10$  ft). It was made of wattle-and-daub, but the daub was plastered only on the interior of the exterior walls. The construction was single-set post, although the photograph suggests wall trench entryways. It was not semisubterranean. The only interior feature mentioned was a "shallow fire basin." The report does not state if the hearth was clay lined (Caldwell and McCann, 1941: 36).

## SEVEN-MILE BEND

The Seven-Mile Bend site is on the Ogeechee River near Richmond Hill (fig. 11.1) (Cook, 1971). The site had at least one burial mound and one Irene phase structure. The structure date was determined by ceramic chronology. The dimensions of the structure are not known because it was not completely exposed by the excavation. The report describes an east-west trending wall intersecting with a north-south trending wall, suggesting that the structure was rectangular or square. Both walls were constructed of daub tempered with Spanish moss or palmetto fiber, and in some cases, the daub was incised. One wall contained remains of marsh grass wattle. On the map, there appear to be lines of postmolds under the daub debris. The postmolds did not all align with the daub walls, but were very straight, and suggestive of a rectangular or square structure. The postholes suggest single-set post construction. It is not known whether the structure was semisubterranean. A pit of burned corncobs was found under one of the walls. Based on the description, it is difficult to determine whether this is a smudge pit, trash pit, or storage pit. A feature containing burned human bone and a shell pit were found, but it is not clear whether they were inside or outside the structure. A round shell midden was found south of the structure.

## 9Ch112

Site 9Ch112 is on Skidaway Island (fig. 11.1) and comprised of a single structure with several discrete middens (Goad, 1975). The date was determined with two ceramic bowls found near the hearth. The structure consisted of several postholes. It was rectangular and measured 10 m by at least 7 m. The description suggested single-set post construction. No mention was made of daub or what material the walls may have been constructed of. The floor was gray sand and described as "depressed slightly (4 cm)" (Goad, 1975: 42), suggesting that it was not truly semisubterranean. There were two interior features, a hearth and fire pit turned trash pit. The hearth was an oval-shaped basin made of clay (Goad, 1975).

## HARRIS NECK

The Harris Neck site is located in McIntosh County, Georgia (fig. 11.1). It is a large, multi-component site represented by an extensive num-

ber of features and postmolds (Braley, O'Steen, and Quitmyer, 1986). Seven postmolds were dated to the Irene phase with a rim sherd found in an associated daub pit. The postmolds were filled with daub, suggesting to the excavators that the structure was constructed of wattle and daub, which fell into the postholes as the structure rotted (Braley et al., 1986: 47). Due to the number of other temporal components at the site, using it as an example of an Irene phase structure should be done with caution.

## REDBIRD CREEK

The Redbird Creek site is found near the Ogeechee River (fig. 11.1). The first excavations located a very well-preserved Irene phase structure, two burial mounds, and a number of discrete shell middens (Pearson, 1984). A roof beam was radiocarbon dated to A.D. 1145 ± 60. Pearson considered this too early based on a ceramic chronology that indicated Irene phase, but did not discuss why the radiocarbon date itself may have been incorrect. The structure is most likely rectangular, although this is not certain. It is estimated to be 5.2 m across, based on the position of the hearth and two intersecting wall fragments. The walls were constructed of pine posts set approximately 45 cm apart, with bunches of cane in between as added vertical supports. Single pieces of cane were tied horizontally to the upright crossbeams. Daub tempered with Spanish moss was applied to both sides of the wall. The floor was not prepared but recognized by the amount of ceramics. As excavations did not continue under the floor, it could not be determined whether the structure was single-set post or wall trench construction. No mention was made of whether the structure was semisubterranean. A prepared clay hearth with a raised rim is in the center of the structure. No other features are mentioned, although there may be some under the unexcavated floor.

Recent excavations have added to the number of structures from the Redbird Creek site (Sipe, this volume, chap. 12). These excavations are still under way, but some preliminary data on three additional structures have emerged. Each of the three structures is only partial, however they all appear to have been wattle-and-daub construction. These structures are different from all the other structures described in that they show evidence of wall trench construction. A possible explanation for that difference is that at least one

(structure 2) may be a series of walls intended to divide the site into sections (Sipe, this volume, chap. 12). Structures 3 and 4 are superimposed with structure 3 being under and structure 4 being on a mound. Further excavations may help determine if these structures are constructed in a significantly different manner from other Irene phase structures.

## DISCUSSION

Archaeological and ethnohistorical evidence can be compared in order to define some characteristics of Irene phase architecture. Ethnohistorical evidence must always be used with caution for a number of reasons. The bias of those who chronicle ethnohistory can make descriptions less than accurate because they do not understand new cultures and their new surroundings. Their motives in writing must be taken into account as well. For example, if they are trying to impress a superior, they may embellish or lie. Archaeological evidence has its own bias as well, as can be seen in this study. Most of the archaeological structures have not been excavated fully, and so it is difficult to determine whether characteristics are present that either have not or cannot be found. The issue of preservation must be considered. Because daub is more durable than plant material, wattle-and-daub structures are much more likely to be found than structures made entirely of palmetto thatch or cane matting. The following discussion is a comparison of all the size, shape, construction, and associated feature information from both archaeological and ethnohistorical sources.

### SHAPE

All of the archaeological structures appear to be square or rectangular. The difference in structure shape focuses on the corners, as some are rounded and others are squared. This trait may or may not be of geographic or temporal significance. Swanton (1977 [1946]: 407) notes that there may be a difference in construction techniques between groups above and below the St. Johns River. It is possible that minor attributes, such as corners, may vary over a smaller geographic area. More structures will have to be compared before this can be determined.

The ethnographic accounts generally indicate circular structures. The discrepancy between these descriptions and archaeological discoveries

of square or rectangular structures could be due to a number of factors. The rounded corner found on structure 5 at Grove's Creek site was very broad (fig. 11.3). It may be that Europeans perceived any building without 90° corners as rounded, and therefore described structures, such as structure 5, as round rather than square. Alternatively, the shape of the houses may have changed between the Irene phase and the contact period. As ~100–200 years passed between the Irene phase and the first chronicler, it is likely that building styles evolved. Lastly, Le Moyne's (1875) drawings depict both rectangular or square and circular structures. If the two types were used at the same time, the rectangular and square structures may be vestiges of earlier construction techniques, have different functions, or be constructed of different materials. For example, it may be possible that round structures were always thatched while rectangular structures were daubed, leading to a bias in the archaeological record. These questions may not be answerable without excavations of villages rather than isolated hamlets.

### SIZE

The archaeological structures that could be measured have a wide size range. With only nine structures, and most measurements being minimum estimates, only two structures could be compared. These two structures are at the Irene site, and are the only two excavated in their entirety. The smallest is 9 m<sup>2</sup>, and the largest is approximately 23.4 m<sup>2</sup> (255 ft<sup>2</sup>) (Caldwell and McCann, 1941). This great size range suggests that the structures had different functions. The ethnohistorical drawings depict alligator blinds and sentinel cottages as smaller than the other structures of the village (Le Moyne, 1875). The chief's house or townhouse was often depicted or described as larger than other structures (Le Moyne, 1875; Ribault, 1927 [1563]: 84; Swanton, 1977 [1946]). Most written ethnohistorical accounts only describe the common houses as "small." These descriptions cannot add any insight into structure size, as it cannot be determined what "small" meant to a 16th-century European.

### CONSTRUCTION

The most noticeable difference in construction is wattle-and-daub versus wattle-and-thatch. Archaeological and ethnohistorical accounts indicate that both construction techniques were

employed. However, the archaeological record shows much greater use of daub than is described in the ethnohistorical record. San Miguel (Swanton, 1977 [1946]) states that the houses were covered with palmetto, suggesting wattle-and-thatch construction. However, only the interior walls and roof of Grove's Creek site structure 5 are covered with daub; the exterior wall is cane matting. The Irene site has one structure that was daubed on the interior of the exterior walls only (Caldwell and McCann, 1941: 36). If the Europeans did not enter the structure, they may have described it as thatched although it was daubed on the interior. Swanton (1977 [1946]: 408) does indicate that structures north of the St. Johns River were thatched with reeds and constructed of wattle and daub. However, he does not indicate the source of this description. It appears that there were likely several construction types, including wattle and daub, wattle and thatch, and stages between the two.

Other variations in construction technique are more difficult to determine. Grove's Creek site structure 5 is the only archaeological structure with interior partition walls, and only one ethnohistorical account mentions interior partition walls (Swanton, 1977 [1946]: 405). There is no concrete archaeological evidence to suggest semisubterranean construction. Only one of the archaeological structures was conclusively described as not semisubterranean (Irene feature 55). The other site descriptions do not contain enough data to assess. One of the ethnohistorical accounts describes a semisubterranean structure, which was a chief's house in the Timucuan region (Le Moyne, 1875: 12). With scant archaeological and ethnohistorical data, it is not possible to determine if this building technique was widely used along the Georgia coast.

There may be several explanations for the different construction techniques found in both the archaeological and ethnohistorical accounts. As with the size of the structures, variability in construction may relate to function. Swanton (1977 [1946]: 408) suggests that different temperature zones or geographic areas may account for the contrasting construction techniques. Status of the individual who built the structure might also be a factor.

Several functional differences have already been mentioned. Alligator blinds and sentinel cottages were fairly small in size, and at least alligator blinds appear to have been constructed differently from other types of structures (Le Moyne,

1875). In the southeastern inlands, the use of summer and winter houses during the Mississippian Period is well documented (McConaughy, Jackson, and King, 1985; Sullivan, 1987, 1995; Pauketat, 1989; Hatch, 1995; Smith, 1995; Hally and Kelly, 1998; Hally, 2008). The two structure types are often found next to each other, used by the same household at different times of the year. Winter houses are usually identified by their substantial wattle-and-daub construction and prepared hearths. Summer houses are lighter in construction and may or may not contain a hearth or fire pit. In some cases, interior storage pits were identified with winter structures (Smith, 1995).

Redbird Creek structure 1 and the Seven-Mile Bend structure are both wattle-and-daub construction. It is possible that corn was stored under the floor at Seven-Mile Bend (Cook, 1971: 6) and a hearth was in the center of one of the Redbird Creek structures (Pearson, 1984: 8). The presence of daub—and, in one case each, of possible stored food and a hearth—fits the definitions of winter structures as given earlier. The structure at 9Ch112 had a fire pit on one side (Goad, 1975: 44). Neither daub nor the presence of large amounts of clay in the surrounding soil was mentioned in the 9Ch112 report, so this structure may fit the definition of a summer type structure.

This particular functional difference may be difficult to confirm. There are no ethnohistorical records of summer and winter houses north of the Timucuan area. Furthermore, the Timucuan summer structures are described as little more than arbors, which suggests that they would be difficult to find in the archaeological record (Swanton, 1977 [1946]: 408). Summer and winter structures are often found together in the interior (Smith, 1995: 231), and most of the archaeological structures discussed in this study were the only ones found at their sites. As a consequence, it will be difficult to determine whether the architectural differences observed in the archaeological structures are due to differing summer and winter construction techniques until more multistructure villages are excavated.

Swanton (1977 [1946]: 408) suggests that the change in construction materials he noticed above and below the St. Johns River was due to latitude. The structures to the south were more open. He also suggests that the change from palmetto mats in the south to reeds in the north was due to the abundance of those materials in each region. However, it is unlikely that the changes in

construction seen in the archaeological examples for this study were related to available building materials, as all of the structures were found in a 55 km radius of one another (fig. 11.1).

Several of the ethnohistorical accounts describe the chief's house or a townhouse as different from common houses. The only account of a semisubterranean structure (Le Moyne, 1875: 12) or of partition walls (Swanton, 1977 [1946]: 405) are for a chief's house. The chief's house is also often described as larger than the other structures (Le Moyne, 1875; Ribault, 1927 [1563]: 84; Swanton, 1977 [1946]). It is possible that some of the differences seen in the archaeological record, such as the incised daub on the Seven-Mile Bend structure and Grove's Creek site structure 4 (Cook, 1971: 6), indicate either special use or elite structures.

The trend found in both archaeological and ethnohistorical accounts is one of variability. A variety of construction materials were used to make structures that were round, square, or rectangular and of numerous sizes. There are several possible explanations for these differences. However, the most likely explanation is one of function, such as different construction materials for summer and winter structures or size differences between single-family and community structures. It is not likely that these differences are due to dissimilar temperature zones or geographic areas.

#### ASSOCIATED FEATURES

The types of features associated with the structures varied as well. Hearths were found in three of the archaeological structures. Seven-Mile Bend and 9Ch112 both contained pit features. The feature at 9Ch112 appeared to be a cooking pit turned into a trash pit (Goad, 1975: 44). Seven-Mile Bend had a pit containing burned corncobs (Cook, 1971: 6), which could be a trash, storage, or smudge pit. The other feature at Seven-Mile Bend was a shell feature that wasn't excavated (Cook, 1971: 7). Given that many of the structures were only partially excavated, and some not below the floor, it is difficult to determine which features were actually present and which were simply never found. Therefore, no archaeological trends could be established for this category. The ethnohistorical data cannot add much more. Beds or benches were described along the walls of large structures that were likely townhouses, but there is only one such description for common houses (Wenhold, 1936).

#### CONCLUSIONS

A comparison of the Irene phase structures found on the Georgia coast with ethnohistorical accounts reveals several interesting similarities and differences. One of the characteristics that all the archaeological structures share is that they are either rectangular or square in shape. Ethnohistorical accounts, however, most often describe circular structures. This discrepancy may be due to either Eurocentric views on the part of the chroniclers or changes over time. Construction methods vary considerably among different archaeological structures and ethnohistorical descriptions. Wattle-and-daub and wattle-and-thatch construction are both found archaeologically and ethnohistorically. There is not enough data to determine any kind of pattern to the distribution at this time. It is also not possible to determine how widespread semisubterranean construction or partition walls are, or what types of associated features are common in Irene phase structures. There appears to be no single typical Irene phase structure. Rather, there is considerable variation in all aspects from size and shape to construction techniques. The various size, shape, and construction differences likely relate to the different functions of the various structures, but there is not yet enough data to determine the kinds of structures of which we have examples.

This chapter illustrates how far we are from determining an architectural grammar for the Irene phase of the Georgia coast. At this time, the most important obstacle is the lack of data. It appears that the only architectural characteristics we can assume at this point are (1) rectangular or square structures and (2) architectural variability along the coast that may point to different uses of the structures. It is not possible to determine if these differences are due to summer and winter structures, community versus individual use, elite versus nonelite use, geographic and/or cultural variation, or something else. However, with the current renewed interest in coastal archaeology, it is likely that more data are forthcoming and that some of these questions will soon be answered.

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## CHAPTER 12

### LIFE AND DEATH ON THE OGEECHEE: A VIEW FROM THE REDBIRD CREEK VILLAGE

RYAN O. SIPE<sup>1</sup>

#### INTRODUCTION

Coastal archaeologists have long struggled with the enigma of Late Mississippian/proto-historic settlement patterns. The matter becomes more complicated when attempting to reconcile the ethnographic descriptions of a people called Guale with the archaeological manifestation known as Irene. Ethnohistoric accounts provide conflicting descriptions of Guale lifeways, which have led archaeologists to propose models based on both seasonal population movement and sedentary villages (Larson, 1969; Crook, 1978b; Jones, 1978; Thomas, 2008). Most recently, experimental and site-based archaeology on St. Catherines Island has provided extensive evidence that the resources necessary to support a population year-round were readily available within distances that did not require a shift in residence (Thomas, 2008). Based on this, it seems that sedentary villages within the barrier island system were not only possible but were likely the norm by the time of the Spanish arrival in the Georgia Bight.

But what did these villages look like? Jones (1978) proposed that a Guale village would resemble a “dispersed town,” consisting of a centralized village core surrounded by smaller hamlets situated around horticultural fields and oyster beds. Archaeologically, this phenomenon presents itself as a series of varied Irene sites in relative proximity to one another including a large village surrounded by smaller habitations and a series of briefly occupied “special use” sites established to exploit necessary re-

sources. While work on St. Catherines Island has provided ample archaeological evidence for the dispersed town model and other islandwide surveys hint at similar results (DePratter, 1978; Pearson, 1979b), Irene research on the mainland has tended to focus on individual sites, specifically those large habitations (Seven-Mile Bend, Pine Harbor, Harris Neck, etc.) representing the village cores. These projects provided data on architecture, subsistence tactics, mortuary practices, and village layout, which continue to guide archaeological research at Irene sites today. But are these reconstructed village landscapes always slightly incomplete without the inclusion of the remainder of the dispersed town?

In 2005, Environmental Services, Inc. (ESI) was contracted to perform an intensive cultural resource survey of the 2300 acre Genesis Point development tract, which is located just west of Ossabaw Island in eastern Bryan County, Georgia. During this survey, ESI archaeologists imposed regular interval shovel testing across all upland portions of the property. As a result of this investigation, 80 new archaeological sites were recorded and three previously recorded sites were revisited. Thirty-one of the 83 sites were determined to contain Irene components (fig. 12.1). Six of these were recommended as eligible for National Register of Historic Places inclusion and five have been exposed to large-scale excavation with one being preserved in place.

Of all the sites documented and revisited, the most notable by far was the Redbird Creek site (9Bn9), which is located in the southeastern portion of the Genesis Point property. The site is best categorized as a population center that served the

much larger dispersed town arrangement. It is clear that Redbird functioned as a mortuary complex, residential center, and likely a political hub for the Irene landscape spread across the environs of Genesis Point. Within the model, Redbird is supported by five other habitations of small to moderate size, with at least 25 other sites reflecting the short-term and special-use areas that make the sedentary lifestyle possible. The following chapter presents data from the investigations at Genesis Point in order to showcase Redbird Creek as an important village site, yielding new data on architecture and layout, and to present it within the “macro” view of the “dispersed town” by introducing several of Redbird’s supporting sites and their role within the big picture.

## SETTING

As noted earlier, 9Bn9 is located on a broad landform known as Genesis Point. This peninsula is formed by a prominent bend in the Ogeechee River just before it forms an oxbow known as the Seven-Mile Bend. Genesis Point was named for its original owner Paul Jenys, the Speaker of the House of Assembly for the Colony of South Carolina. Jenys was granted land that included Genesis Point in 1733 and the landform became known as “Jenys’ Point,” which soon became corrupted into its modern place name “Genesis Point” (Sullivan, 2000b). Historically, the landform is perhaps more famous as the location of Fort McAllister, a set

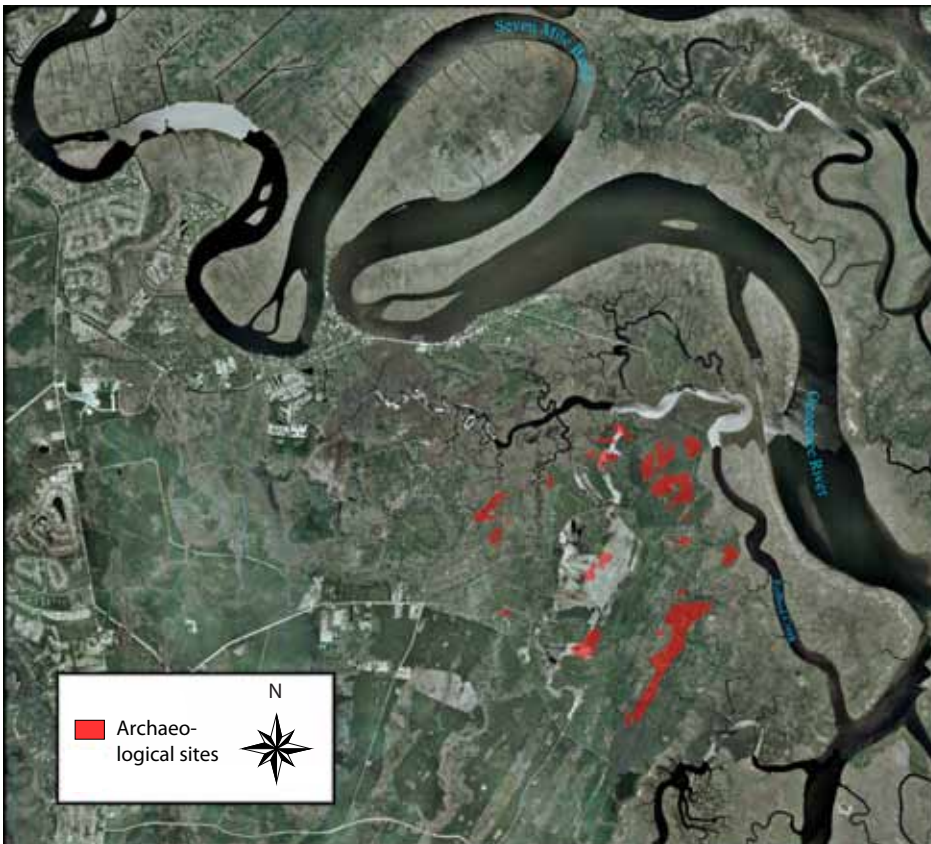


Figure 12.1. Map of Ogeechee coastline showing Genesis Point (landform extending from Seven Mile Bend to the Intracoastal), just below the river containing 31 Irene phase archaeological sites.



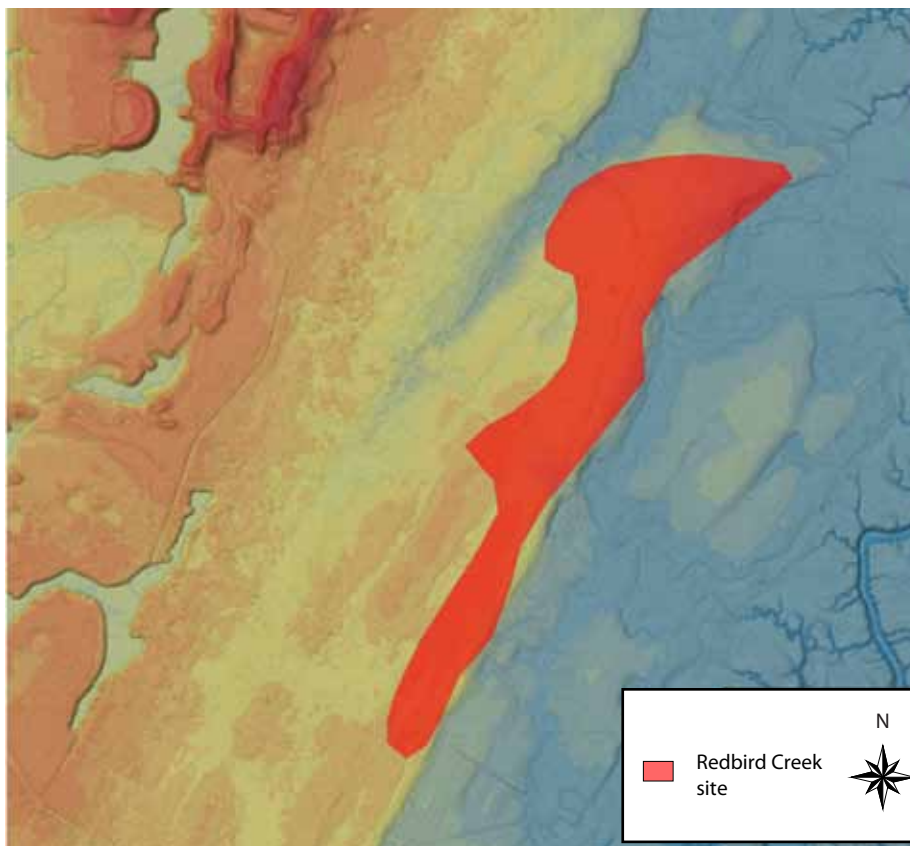


Figure 12.2. Boundaries of 9Bn9 shown on 2009 Chatham County Georgia Aerial LiDAR Survey.

of earthwork fortifications that repelled several Union advances during the Civil War. More recently, “Genesis Point” is used to describe the entire landform created by the Ogeechee including the smaller tributary known as Redbird Creek and its associated uplands and marshes. This southern portion of Genesis Point is also known as Cottenham, after a Sea Island cotton plantation of the same name. This encompasses what has become the Genesis Point development tract: a 2300 acre proposed housing development that has undergone several attempts at development and archaeological investigation since the late 1960s.

Genesis Point comprises varying ecological communities but is best summarized as a series of marine terraces vegetated with mixed hardwood

forest located in proximity to wetland systems or adjacent to salt marsh. These terraces are part of the barrier island sequence of the coastal plain province, which was formed by the advance and retreat of former sea levels that have left shoreline deposit complexes in the form of steplike terraces of decreasing elevation parallel to the present coastline (Hodler and Schretter, 1986). Along with the terraces, these ancient sea level fluctuations have also formed relict dunal ridges along much of Georgia’s coastline. Where once these dune formations protected the coastline from the Pleistocene ocean, they now separate interior wetlands from the coastal salt marshes associated with the current barrier island system. These Pleistocene ridges provide unique opportunities for human habitation, allowing for a di-

verse set of ecological zones to be concentrated within a relatively small area. By settling these landforms, prehistoric populations were able to take advantage of varied and diverse resources at an efficient rate of energy expenditure through a reduced travel/collection time. This phenomenon is much the same as the settlement pattern models documented at length on St. Catherines Island and proposed for many of the other barrier islands along the Georgia coast (Pearson, 1979b; Thomas, 2008).

The Redbird Creek village is located on a Pleistocene ridge within the southern portion of the Genesis Point property (fig. 12.2). This relatively large landform begins at the east-central portion of the development tract just south of Hammerhead Point and extends southwest along the coastline past the southern property boundary for a total distance of around 3 mi. It slopes to the east where it meets the salt marsh of Redbird Creek and to the west into an interior wetland system. Redbird is located at the northern extent of this formation, which is formed by the wetland system sloping into the salt marsh, a physiographic signature of a creek system that may have once flowed into the Pleistocene-era sea. The core village portion of the site is located at the northern tip of the relict ridge, which contains the best soil drainage and highest topographic relief; however, cultural material associated with the site was identified through shovel testing over a length of 1 mi across the landform. Smaller sites also dot the ridge to the south of Redbird and are only considered separate from 9Bn9 because of the strictly institutional definition of an archaeological site. These smaller, less significant sites also contain Irene deposits and likely represent additional signatures of activities associated with the larger Redbird Irene complex.

#### PREVIOUS RESEARCH

Site 9Bn9 was originally recorded by Fred C. Cook in 1968 when a local resident made him aware of a burial mound (mound A) that had been impacted by an isolated trail road leading to the tip of a small peninsula overlooking an unnamed tributary of Redbird Creek. Cook visited the location and identified two filfoot-stamped burial vessels eroding from the disturbed portion of the mound. One of them, the unique vessel seen in figure 12.3, appeared very similar to the morphology of Spanish olive jar; however,

it was made from traditional aboriginal pottery and decorated with the filfoot-stamped motif (Fred Cook, personal commun., 2010).

Cook contacted the Department of Anthropology at the University of Georgia in the early 1970s when he was made aware of pulpwood logging at the site. This silvicultural activity had revealed a large concentration of burned daub, which he believed to be the remnants of an aboriginal structure. Charles Pearson and Chester DePratter quickly responded and began test excavations at the site with the help of a volunteer crew from the Savannah Science Museum and the Benedictine Military Academy. During these efforts, Pearson and DePratter made the first map of the site layout, which included 25 individual shell deposits, Cook's original burial mound (now dubbed mound A), and a low earthen mound suspected to contain additional burials (mound B) (fig. 12.4). The boundaries of the site were based on the distribution of visible surface features (i.e., shell heaps and mounds) and the limits of a pocket of Lakeland fine sand, an excessively drained soil type that Pearson reports is frequently associated with the location of Irene sites (Pearson, 1979b, 1984).

Fieldwork during this investigation included a large block excavation at the location of the daub scatter, test units atop five of the more prominent shell deposits, and an excavation block within mound A (Pearson, 1984). The block excavation around the daub scatter revealed large amounts of structural debris including portions of daub walls with visible hand prints, burned remains of the reeds that were used as wattle, and large sections of burned support posts and beams, which held the structure upright. Intact portions of the base of the wall were also encountered beneath the debris, which contained in situ wall posts, as well as a clay-lined hearth presumed to be in the center of the structure. The results of this investigation were published in an article featured in a special edition of *Early Georgia* focused on the Irene Period (Pearson, 1984).

Mound A was also formally mapped and tested during Pearson and DePratter's investigation. The low earthen mound had been heavily impacted by the trail road and a large hole was dug into its center along with several smaller holes on its slopes (Pearson, 1984). Elevation measurements were taken at regular intervals atop the mound producing the topographic map seen in figure 12.5 (Charles Pearson, personal commun.). As



Figure 12.3. Filfot jar recovered by Fred Cook at 9Bn9 in 1968 (photo by Fred Cook, used with permission).

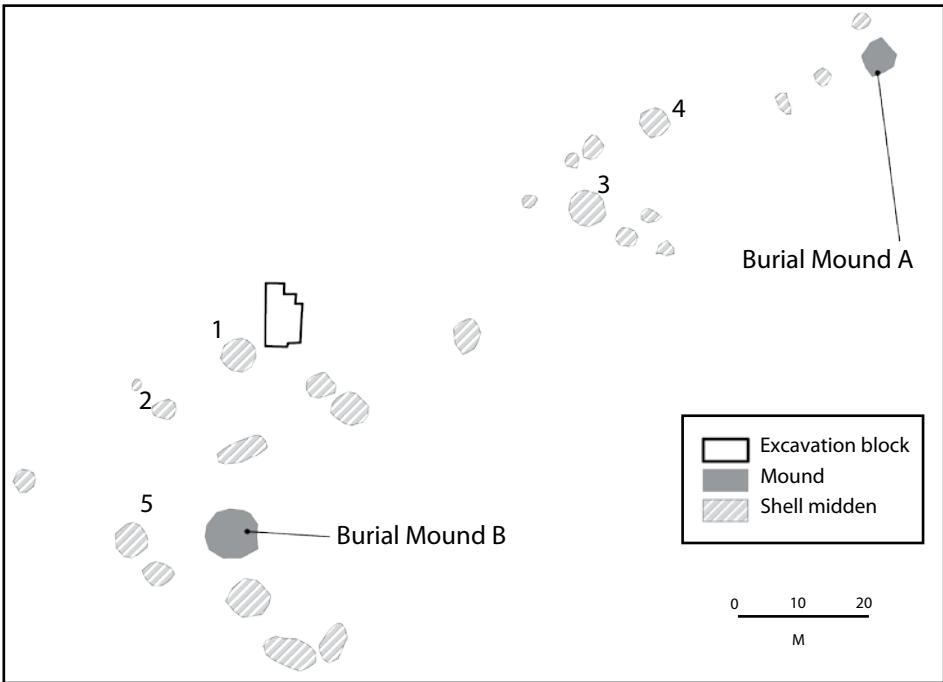


Figure 12.4. Location of surface features at the Redbird Creek site showing middens investigated by Pearson (1-5) (adapted from Pearson, 1984).

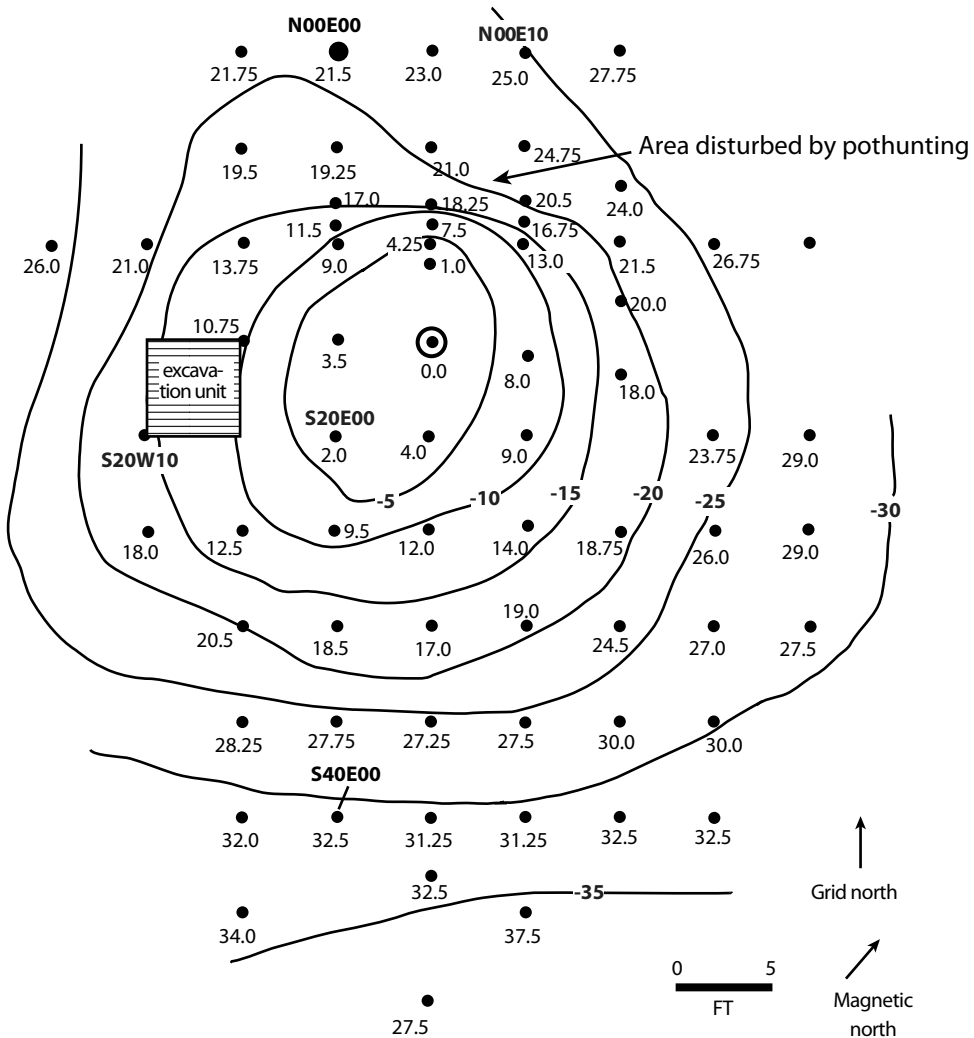


Figure 12.5. Topographic map of burial mound A at the Redbird Creek site (9Bn9) by Charles Pearson and Sharon Goad, 1973 (figure provided by Charles Pearson, used with permission).

a result, mound A was determined to be around 6 m across and approximately 0.7 m high (Pearson, 1984). The excavation unit that was established within the western portion of the mound did not reveal any intact burials; however, burned and nonburned human bone was encountered in contexts that were disturbed by previous digging. The excavation block showed the extent to which the mound had been disturbed causing very little data to be available on mound construction.

It was clear that the mound was primarily constructed of sand with scattered shell and several concentrated shell lenses (Pearson, 1984).

During the phase I survey of the Genesis Point property, ESI revisited the site and defined the site boundaries at 1710 × 1140 m based on the distribution of positive shovel tests. In total, 555 shovel tests were dug across the site, including 330 that were positive and 225 that were negative. The original record of the site identified its

boundaries as corresponding with an area of excessively drained Lakeland fine sand; however, the 2005 survey by ESI illustrated that the site extended southward and also crossed a broad area of moderately well drained Chipley fine sand.

### THE “TOWN” OF REDBIRD CREEK

On a map, 9Bn9 spans a little more than 1 mi in length. This simply refers to the boundaries established through the use of shovel testing in accordance with the Georgia Standards and Guidelines for Archaeological Surveys (Georgia Council of Professional Archaeologists, 2001). It is important to note, however, that while these boundaries are useful for mapping the distribution of material culture and village layout, they are far from the limits of the settlement they represent.

#### VILLAGE CORE

Archaeologically defined, the Redbird Creek site extends across more than one-third of a Pleistocene ridge. The dense artifact deposits and cultural features, however, are restricted to the northern tip of this landform within a pocket of excessively drained Lakeland fine sand. Pearson (1984) originally used this soil type to define the boundaries of the site without the benefits of shovel testing. It is here that the remains of the Redbird Creek village can be recognized by approximately 25 shell middens that are oriented in semicircular arrangements around two low,

earthen burial mounds (mounds A and B) on a NE–SW axis. Figure 12.6A provides a view of the Redbird Creek village on the 2009 Chatham County Georgia LiDAR survey (NOAA, 2009). Within this view, the shell middens and earthen mounds are clearly visible along with Pearson’s excavation unit located within the east-central portion of the village. Figure 12.6B presents the same LiDAR view; however, each of the surface features is identified to provide a point of reference. The majority of these middens formed in discrete heaps of shell, which represent individual refuse piles presumably associated with residential debris and are often thought to represent the disposal patterns of nearby structures. Pearson’s (1984) own research helped bolster this hypothesis by documenting the remains of a daub structure (structure 1) adjacent to one of the refuse heaps in the southwestern portion of the village. Furthermore, ESI’s current investigation revealed at least three additional structures associated with the shell middens oriented around mound B. By this rationale, it seems that each of the burial mounds had a cluster of structures oriented around them, forming two distinct zones within the village, which were dubbed loci A (southwest) and B (northeast) during the present investigation. These were also separated by a broad, flat area that shovel testing indicates is almost devoid of artifacts and may represent a central plaza separating the discrete zones of habitation. More investigation is needed to assess this model.

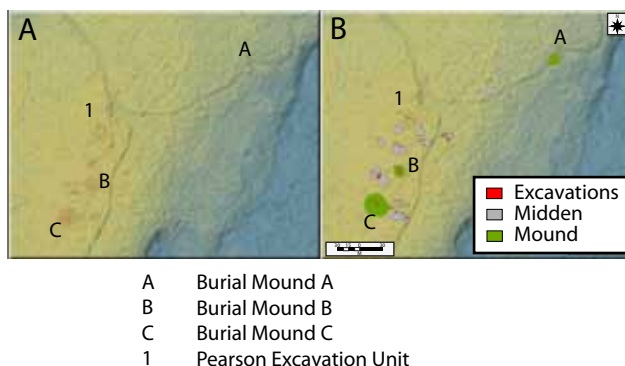


Figure 12.6. Village layout at the Redbird Creek site shown on the 2009 Chatham County, Georgia, aerial LiDAR survey (A) and with features (excavations, middens, and mounds) highlighted (B).

### STRUCTURE 1

Structure 1 represents the daub structure that was documented during Pearson and DePratter's excavations in 1973 (Pearson, 1984). The basal sections of the daub structure were identified directly beneath the humic zone where large portions of burned daub were encountered. These daub fragments bore the impressions of Spanish moss, which was used as a tempering agent, along with the impressions of the wooden and river cane framework (wattle), which supported the clay walls. Even the palm prints of the original builders could be seen clearly in several pieces. Based on the impressions in the daub, Pearson was able to interpret that the wattle was constructed using posts made from sapling pines, which were spaced approximately 45 cm apart and bundles of three to eight pieces of river cane were used to fill the gaps between the support posts. Single river canes were also oriented horizontally across this framework to lash the individual elements together and provide support for the heavy clay exterior (Pearson, 1984). Daub was applied to both sides of the framework and was determined to be approximately 5 cm thick on each side. Cook (1971) reported a very similar daub wall construction at the Seven-Mile Bend Site (9Bn7), located only 4 mi northwest of the Redbird Creek site.

As is seen in Pearson's (1984) plan view (fig. 12.7), the base of a daub wall with burned portions of 10 posts was encountered within his block excavation, along with a clay-lined fire pit and several sections of burned support beams. He reports that there was no prepared floor within structure 1, just a thin sandy layer, which was interpreted as the floor because of a concentration of ceramics. If the fire pit is presumed to be the center of the structure, then Pearson predicts that it may have been around 5.2 m across (Pearson, 1984). Pearson submitted carbon samples from the pine posts within the basal fragment of the wall (UGA 5350) with a resulting date of A.D. 1145 ± 60. This date is around 200 years too early for an Irene site and he cautions that it should be viewed with skepticism as it may be the result of the old wood effect or a flawed radiocarbon reading.

The structure was revisited during the ESI Phase III investigation and the location of Pearson's block unit was still visible with daub fragments scattered about the surface. Much of this scattered daub can likely be attributed to the re-

mains of the exposed structural elements depicted in figure 12.7. Two exploratory 1 × 2 m units were excavated on the eastern and western sides of the original block in order to identify unexposed portions of the walls. These units encountered daub fragments and post features; however, no intact daub wall sections were found.

During the most recent fieldwork at the site, a small backhoe was used to mechanically remove the overburden within a large trench oriented around Pearson's excavation unit to expose additional sections of structure 1. This provided around 400 m<sup>2</sup> of exposure within an irregularly shaped area caused by the necessity to preserve the large hardwoods that dot the site. Figure 12.8 provides a plan view of the more than 400 features that were documented in this trench. Many of these features are structural, including post-holes and wall trenches, and many alignments are apparent in the vicinity of structure 1. Although very little remains of the intact daub wall elements seen in the 1973 photographs, Pearson's hearth feature was identified and provided an easy point of reference. Using Pearson's plan map as a guide, it is also possible to make out the line of 10 postmolds left by the sapling posts preserved within the daub wall just west of the hearth. There is also a unique L-shaped feature, which appears to have a high clay concentration located between the original wall and the hearth. Based on this and the other post features that correspond to structure 1 and form other alignments, it seems that several structures likely stood at this location over time. Due to the presence of large trees and the limits of the backhoe equipment, the mechanical stripping trench fell short of exposing structure 1 in its entirety. Further investigation at 9Bn9 will need to extend the excavation trench to the east and south in order to expose structure 1 and others.

### STRUCTURE 2

Additional structural signatures were identified within block 3, a 4 × 6 m excavation that intersected with Pearson's midden 5 (P-5) and shell midden 1 (SM-1), located due west of mound B (fig. 12.6). Two well-defined linear features (features 28 and 29) were encountered directly beneath the middens (fig. 12.9A). Feature 28 was the longest of these and is oriented approximately northeast to southwest across the entire block excavation. Feature 29 is oriented almost east-west and thus intersects feature 28 at an approximately



Figure 12.7. Plan view of structure 1 as seen in Pearson, 1984.

30° angle. At first glance it would seem that these may represent different structural signatures that have impacted each other; however, the trenches appear to begin at the same depth and also share a post at their intersection. Clay inclusions, noted within the trench fill, as well as within the sur-

rounding matrix, suggest that the post construction was once covered in daub.

Representative portions of both features were bisected to reveal closely spaced postmolds within. These bisections revealed fairly large posts of similar morphology. As seen in figure 12.9B,

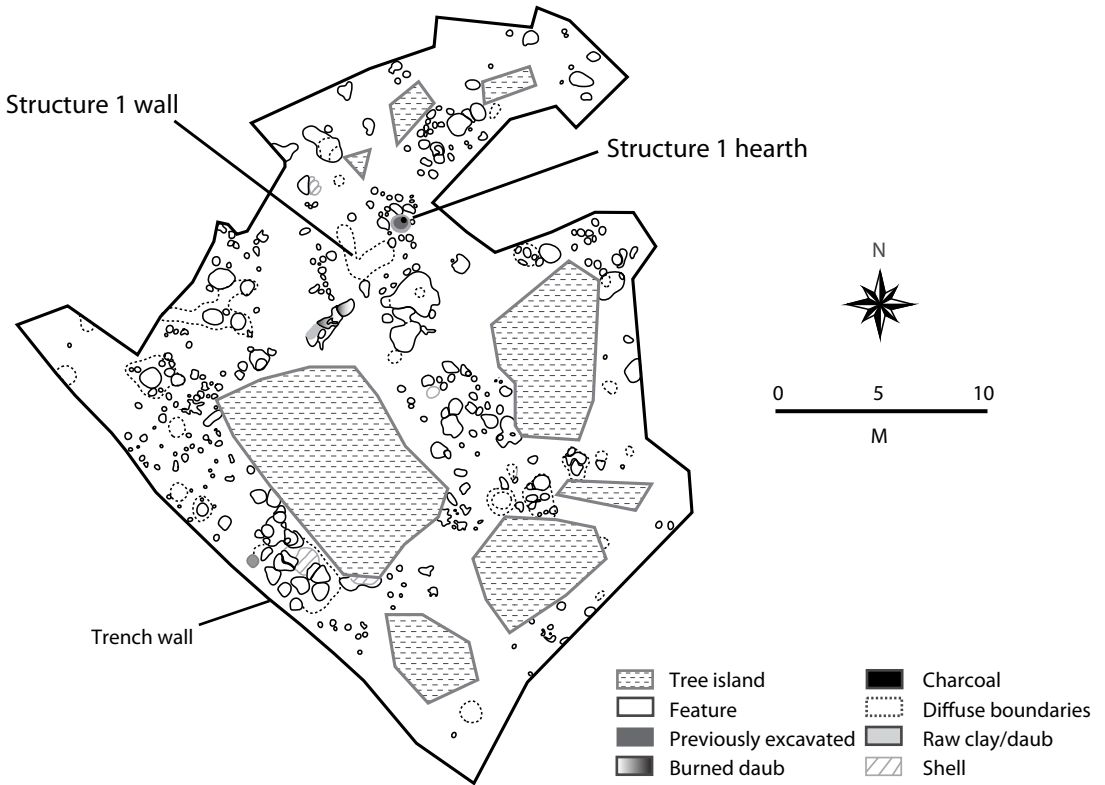


Figure 12.8. Plan view of mechanical stripping trench around Pearson's excavation block.

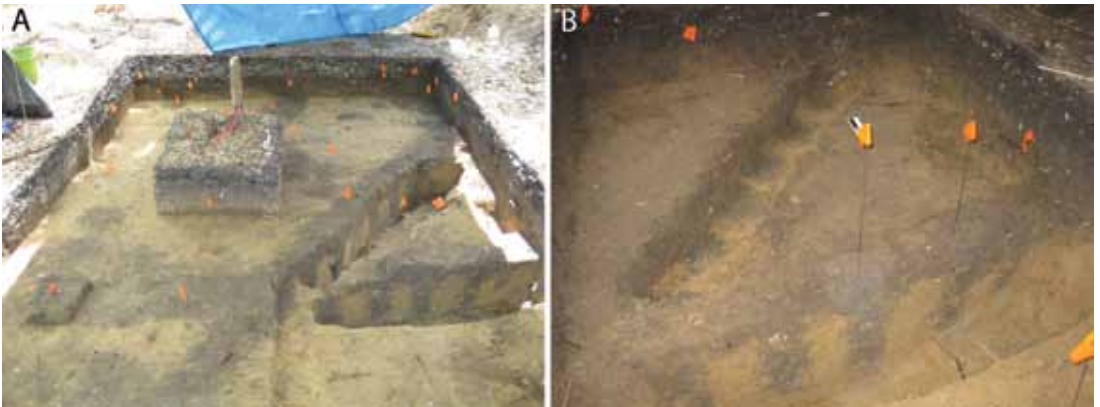


Figure 12.9. Photographs of structural features associated with structure 2 at 9Bn9 showing (A) linear features and (B) post profiles.



they are approximately 20 cm in diameter and extend between 30 and 60 cm beneath the trench itself. The posts are spaced around 40 cm apart. Two of the posts identified within feature 29 had clay lenses at their initiation, likely representing concentrated deposits of the unburned daub that has slumped into the posthole itself. Interesting-

ly, Pearson (1984) reports a similar spacing and morphology for the wooden support posts, which remained within the intact portion of the daub wall identified within structure 1. It is unclear; however, if structure 1's posts extended as deep below ground. Future work at the site should shed light on this matter.

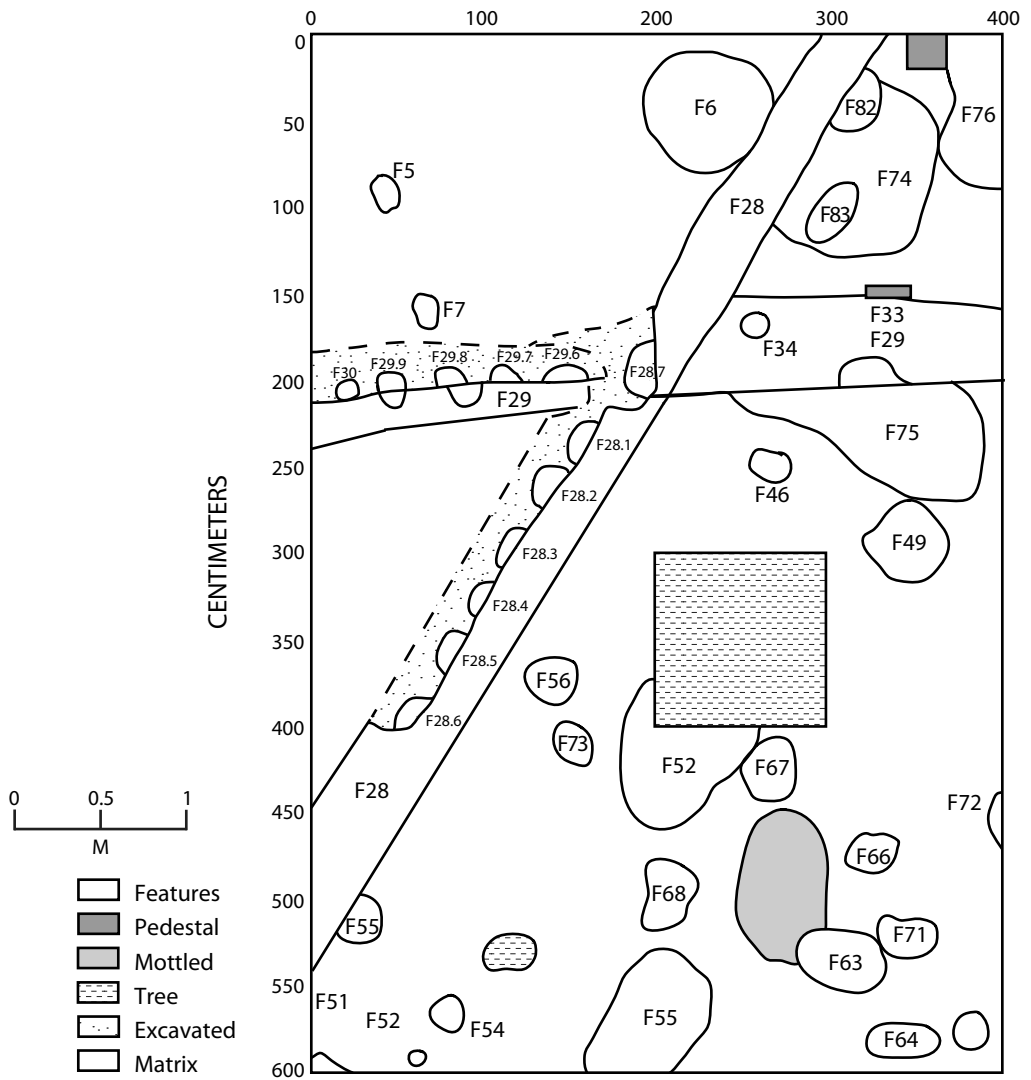


Figure 12.10. Plan view drawing of features associated with structure 2 at 9Bn9.

Additional excavation within block 3 revealed a series of structural features that included posts and smaller trenches that seemed to be oriented parallel and perpendicular to feature 28 (fig. 12.10). This layout may represent a series of secondary constructions oriented along an exterior wall (feature 28) within the interior of the structure, such as benches or dividers. Feature 29 appears inconsistent with this layout and could possibly represent an addition or repair to the structure.

An alternative, and more intriguing, explanation for these linear alignments can be found at the Irene site (9Ch1) itself, which is located approximately 20 mi north of Redbird Creek on the western bank of the Savannah River. Outside the primary platform mound at Irene, a series of “screens” or divisive walls (some of which were apparently daubed) were identified. These were

frequently interconnected and intentionally divided the site into specific zones (Caldwell and McCann, 1941: 18). Many of these were also tied in to the rotunda, a large community structure associated with the Irene occupation of the site, as well as the large mound itself. Caldwell and McCann (1941) describe one of these divisive features as being constructed of shallow “troughs” within which 5–8 in. (13–20 cm) posts were spaced about 12 in. (30 cm) apart. This description is quite similar to the portions of features 28 and 29 that have been documented thus far. Extensive additional excavation is needed in the vicinity of block 3 in order to address this hypothesis.

#### MOUND C AND STRUCTURES 3 AND 4

Mound C may represent the most unique surface feature identified to date at the Redbird



Figure 12.11. Photograph of mound C at 9Bn9.

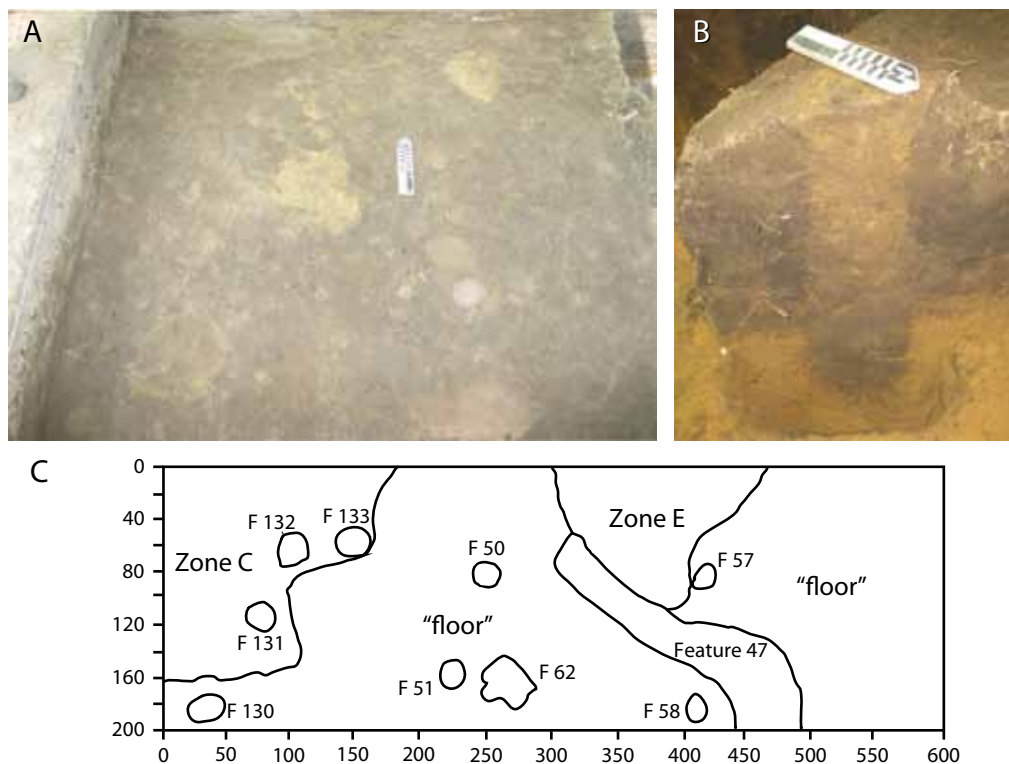


Figure 12.12. Structural features associated with structure 3 at Redbird Creek. **A**, Plan view of post features; **B**, representative photo of structural post in profile; **C**, plan view drawing of structural features associated with structure 3 at 40–60 cm below datum (cmbd); scale units = cm.

Creek site. This large earthen mound is located southwest of mound B (fig. 12.6). It measures just over 1 m higher than the surrounding landscape and spans an impressive 20 m in diameter (fig. 12.11). This, coupled with its location atop the highest point of the natural elevation of the landform, grants mound C an imposing presence at the site.

A 2 × 6 m excavation trench (block 9) was established at the crest of mound C in order to determine the nature of the surface feature. The stratigraphic sequence of this trench revealed that natural topsoil extends approximately 40 cm deep at which point a layer of densely packed, clayey sand becomes apparent. This soon gives way to dense, mottled marsh clay deposits that contained iron concretions and charred cane inclusions. It was believed that this layer may represent the diffused signature of unfired daub walls. Suspicions

were confirmed once the clay layer was removed and a darkly stained floor layer with post features was encountered beneath it at approximately 55 cm. Figure 12.12 shows the first images of structure 3 at Redbird Creek and the sharply defined post signatures created by clay settling into the postmolds. The plan view drawing shows the alignment of posts encountered at around 55 cm below datum (cmbd). While more excavation is needed in order to get a true structural layout, it clearly shows that architectural elements were constructed at the apex of mound C.

Pearson's excavations of structure 1 provided an important view of the signature left behind when an Irene phase structure decomposes. Pearson's (1984) discussion of removing the large fragments of daub to reveal charred roof beams and finally an intact portion of the wall give an impression of the process involved in the collapse

of that structure (similarly, Keene, 2002; Keene and Garrison document additional examples of this process in this vol., chap. 11). Much of the preservation and detail that Pearson documented was made possible by the fact that structure 1 was destroyed by fire. As it burned, the daub walls, made from marsh clay and fibrous inclusions, hardened to the consistency of fiber-tempered pottery. Structure 3, it seems, did not burn. Instead, its walls collapsed, capping the structure floor in a layer of dried but unfired daub, river cane, and wooden debris. As time progressed and the wooden wattle framework decomposed, the marsh clay daub seems to have partially diffused into the surrounding matrix, filling postmolds and capping the structure floor in an almost purely clay lens. The profile photo included in figure 12.13 provides a clear view of this phenomenon. It shows the postmold representing the exterior wall and the gray marsh clay slumped over the hard packed dark lens representing the structure floor.

Continued excavation within block 9 revealed additional clay concentrations and diffused daub signatures to a depth of 76 cmbd, at which point new postmold features were encountered. These are the remains of structure 4, an earlier daub structure that was constructed at or near the initiation of mound C and is overlain by structure 3. Structure 4 features include a series of posts within the eastern portion of the trench and a large daub pit (fig. 12.14). This daub pit displayed a clear, ovoid signature in plan, and its profile was bowl shaped, revealing that it was composed of dense, unfired clay with iron concretions. Daub pits such as this were used to mix the fibrous inclusions into clay to create the daub and are often found on the interior and exterior sides of daub walls (Thomas, 1987).

Structural features continued to appear within block 9, originating as deep as 102 cmbd. These features include posts within possible wall trenches located in the eastern portion of the unit and large, dark, bowl-shaped stains within the western part of the trench. These may be associated with structure 4 or may even represent an additional structure or other activities associated with the first stages of mound C.

While more excavation is clearly needed at mound C, it does seem that the large earthen rise was formed by the construction of at least two Irene Period wattle-and-daub structures built one on top of the other. This phenomenon of succes-

sional construction suggests that mound C may represent the early stages of a platform mound and thus structures 3 and 4 may represent buildings of political or ceremonial importance to the village. This, along with the possible divisive walls/screens, suggests that Redbird may share features with the Irene mound site that are typically absent from other mid-to-late Irene Period village sites on the coast. Equally important will be the acquisition of radiocarbon dates from secure contexts associated with both structures to try to assess a measurable temporal framework for the accumulation of mound C.

#### MOUND B

One of the primary objectives of the ESI investigation at 9Bn9 was to determine if mound B was a burial mound. Identified during the 1973 investigation, this feature was a subtle earthen rise approximately 50 cm above the ground surface. The mound is surrounded by a semicircular alignment of shell middens, which may represent the general location of structures. Pearson suspected that this rise represented a burial mound similar to mound A on the eastern portion of the site; however, human remains were not confirmed to be present during his fieldwork. During the present investigation, this mound was revisited and an excavation block was established at its apex to determine its function.

The excavation block measured 2 × 3 m and revealed a dense buried oyster shell lens at approximately 30 cm below surface. Several "voids" were identified within the oyster midden that represented intentional deposits invasive within the layer. One of these voids contained a portion of a large filfot bowl (fig. 12.15). This void was bisected in order to reveal the vessel and its position within the deposit. As was suspected, bisection of the void revealed that the filfot bowl (vessel 1) was deposited on top of a larger urn style vessel (vessel 2) as a cover. Urn style vessels with lids are frequently documented within Irene burial contexts by archaeologists as early as C.B. Moore (1897). In fact, one of the most famous examples of such an urn is depicted on the original monograph cover of *The Georgia and South Carolina Expeditions of C.B. Moore* (Moore, 1897). When found in burial contexts, these urns frequently contain cremated or bundled remains of infants. This phenomenon has also been extensively reported within archaeological investigations at Irene sites all along the



Figure 12.13. Representative profile photo of diffused clay signatures of structures 3 and 4 at the Redbird Creek site (9Bn9).

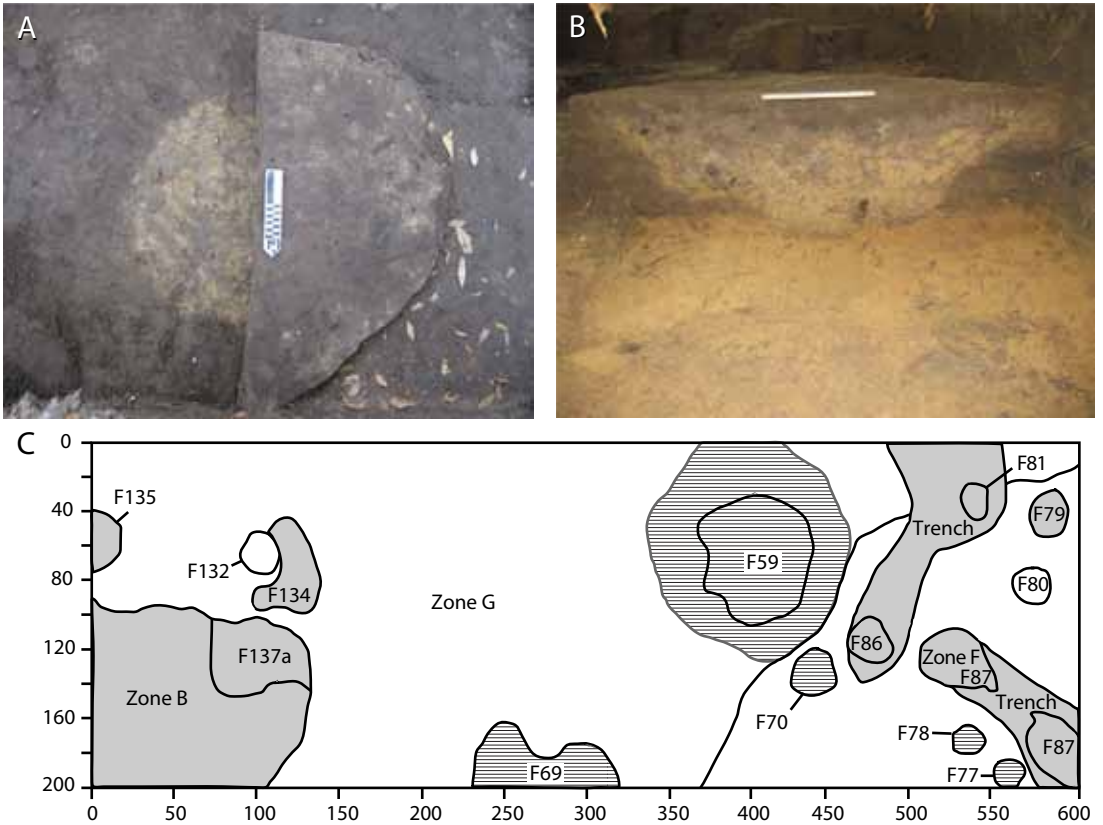


Figure 12.14. Structural features associated with structure 4 at 9Bn9. **A**, Photo of daub pit feature in plan; **B**, photo of daub pit feature in profile; **C**, plan view drawing of structural features associated with structure 4 at 76–102 cmbd; scale units = cm.



Figure 12.15. Initial excavations at mound B. **A**, Photograph of vessel 1 in situ; **B**, photograph of vessels 1 and 2 in profile during excavation; **C**, photograph of mound B excavation block in plan at 30 cm bd; scale units = cm.

Georgia coast (Moore, 1897; Caldwell and McCann, 1941; Cook, 1978, 1979; Thomas and Larsen, 1986; Thomas, 2008). As seen in figure 12.15, vessel 2 was placed upright within a hole dug into the shell layer.

Vessel 1 has a bowl-shaped morphology and measures 19 cm tall with an orifice diameter of 31 cm (fig. 12.16). Interestingly, the rim of this vessel appears ground down and irregular. This may indicate that it was reclaimed from a larger broken vessel. Given its morphology, it may have been the base of an urn-style pot similar to vessel 2. The larger vessel is a typical Irene urn-style pot; it is filfot stamped across its entire exterior surface and featured a segmented rim strip (fig. 12.16). It measured 40 cm tall with a flaring orifice diameter of 34 cm. An intentional “kill hole” was noted within the base of the vessel. No human remains were encountered within this urn burial; however, Moore (1897) and others have also reported “empty” urn burials, which were interpreted as being infant remains that did not

survive the test of time. Urn burials at the Irene site were also frequently determined to be empty or containing trace amounts of human bone determined to be from an infant (Caldwell and McCann, 1941).

Interestingly, it appears that three postholes extend across the plan view revealed by the excavation unit within mound B. One of these is recognized by its circular clay signature, while the other two appear as a pocket of dense shell, darkly stained, with soil and a void in the shell layer. Large chunks of burned daub and iron concretions, which have been seen in the marsh clay deposits throughout the site were documented in high concentrations within the shell lens and immediately adjacent to the northernmost post feature. This may indicate that there was some type of structure associated with mound B, perhaps a mortuary structure similar to the one that was documented at the Irene site itself (Caldwell and McCann, 1941). The Irene mortuary is described as a low, broad rise and excavation

within it revealed a wattle-and-daub structure with four burials in the floor. The structure was believed to have been intentionally demolished and filled with several burials discovered in the

fill itself. After the filling episode, two concentric enclosures were established around the former location of the daub structure. Caldwell and McCann (1941) also noted the presence of burial



Figure 12.16. Photographs of vessels 1 (top) and 2 (bottom).

urns among the flexed burials, many of which had infant remains in various levels of preservation. While very little work has been done within mound B, it is intriguing to think that perhaps this area was utilized like the mortuary at the Irene site. Mound B, however, was confirmed as a burial mound and has been placed in a preservation easement with an appropriate buffer to protect it from future impact.

#### THE DISPERSED TOWN

It is widely accepted that Irene ceramics represent the prehistoric and protohistoric manifestations of the Guale, the aboriginal inhabitants of northern coastal Georgia. It has not been as easy, however, to reconcile the settlement patterns implied by the Irene components scattered along the coast with the ethnohistoric accounts of the Guale lifeways found in the contact era and mission period documents. The discussion began with Larson (1969), and later Crook (1978b), proposing a semisedentary lifestyle for the Guale/Irene inhabitants of the Georgia coast. These theories were based largely on ethnohistoric accounts gleaned from the documentary records of Friar Rogel, a resident friar at Orista during the early Jesuit attempts at missionizing the Georgia Bight. In 1570, Rogel complained that the Guale frequently relocated within the forest and never stayed in one place for long (Larson, 1969; Jones, 1978). He blamed the poor quality of the coastal soil, which forced them to find suitable patches for maize cultivation wherever possible.

Jones (1978) inferred a different vision of the protohistoric Guale from the ethnohistoric record. He believed that many of the Jesuit accounts of Guale lifeways were unreliable because they were written as an excuse for the failure of their mission efforts in La Florida. He also pointed out that much of the scattered and fractionalized nature of the Guale at Orista may have been a direct response to the newly established settlement of Santa Elena, as well as the presence of the friars themselves. Jones proposed that through the highly stratified Guale chiefdom, the principal chief is the primary means of redistribution and seasonal movement is unnecessary. He proposed the concept of the "dispersed town" in which communities strategically organized themselves at the forest-marsh transition. Each of these towns featured a large permanent village associated with the chiefly lineage and community buildings, surrounded by smaller hamlets

organized around horticultural fields and oyster beds (Jones, 1978). He also points out that, within this arrangement, it is unnecessary to shift residence to exploit varying resources, as the oak forests, oyster beds, hunting land, and agricultural fields can all be found within reasonable distances within the maritime hammocks of the coastal zone.

Thomas (1987, 1993a, 2008) refers to the conflicting views on coastal settlement patterns as "the Guale problem." Much of the research conducted on St. Catherines Island has been specifically oriented toward addressing this query and providing an archaeological solution to conflicting ethnohistoric interpretations (Thomas, 2008). In the 2008 synthesis of this research, Thomas and contributors present three volumes of site-based and experimental archaeology to test the effectiveness of these models within the setting of the barrier island ecosystem. As a result, it seems that all of the resources needed for a year-round occupation on St. Catherines Island were located within the range of "day-trip" expeditions conducted by small community groups. A strategically located "dispersed town" system efficiently organizes access to vital resources through varied settlement and small deployments of community labor needed to sustain permanent residence. Thomas (2008) points out that, while it is always necessary for groups to be temporarily absent from a community to gather resources, it is not necessary to shift residence.

The viability of the dispersed town model has been clearly demonstrated within the barrier island environment, but can this model be extended to the mainland? The environmental variables provided by the dunal ridges of the immediate coastal zone certainly seem identical to the maritime forests of the islands; however, broad scale archaeological investigations of the mainland Irene populations are less common. Instead, much of this research has been focused on specific sites representing large villages such as the Irene site (Caldwell and McCann, 1941), Seven-Mile Bend (Cook, 1971), Pine Harbor (Cook, 1979; Larson, 1984), and Harris Neck (Braley, O'Steen, and Quitmyer, 1986). Data collected at the Redbird Creek site along with the larger Genesis Point investigation provide the opportunity to apply this hypothesis to a mainland Irene polity. The "town" of Redbird is part of a system of Irene occupations that are represented at 30 other sites that span the Genesis Point develop-



ment tract (fig. 12.17). These 31 sites represent the full spectrum of special-use sites, extraction areas, base camps, and permanent habitations associated with an Irene population that occupied the mouth of the Ogeechee River. Five sites (including Redbird) were determined to represent habitation areas based on the occurrence of raised shell middens and structural features such as posts and/or wall trenches. Four of these sites have been exposed to large-scale excavation—9Bn104, 9Bn872, 9Bn887, and 9Bn9—and are briefly described later.

Site 9Bn104, or the Genesis midden, was recorded in 1993 when an earlier attempt at developing the Genesis Point property led to an ESI survey within the northern portion of the tract (Ashley, Smith, and Ferrell, 1995). The site was also revisited during ESI's 2006 survey (Hendryx, O'Brien, and Sawyer, 2006), subjected

to phase II evaluation in 2007 (Burkhart et al., 2007), and full-scale excavation in 2009. This habitation featured a sprawling oyster midden within the southern portion of the site and several linear procurement middens along the edge of the marsh. The southern midden was dominated by Irene pottery and overlaid a large Irene oyster pit. Samples of oyster shell from both the midden and the pit feature were submitted for radiocarbon dating, the results of which are presented later in this chapter. Very few structural features were encountered at this site and it is believed that it represents a small, relatively sparsely occupied special-use habitation centered around the collection and processing of oysters.

Sorting and measuring of impressed odostome shells (*Boonea impressa*) was employed during this investigation to address seasonality at 9Bn104. Impressed odostomes are small para-

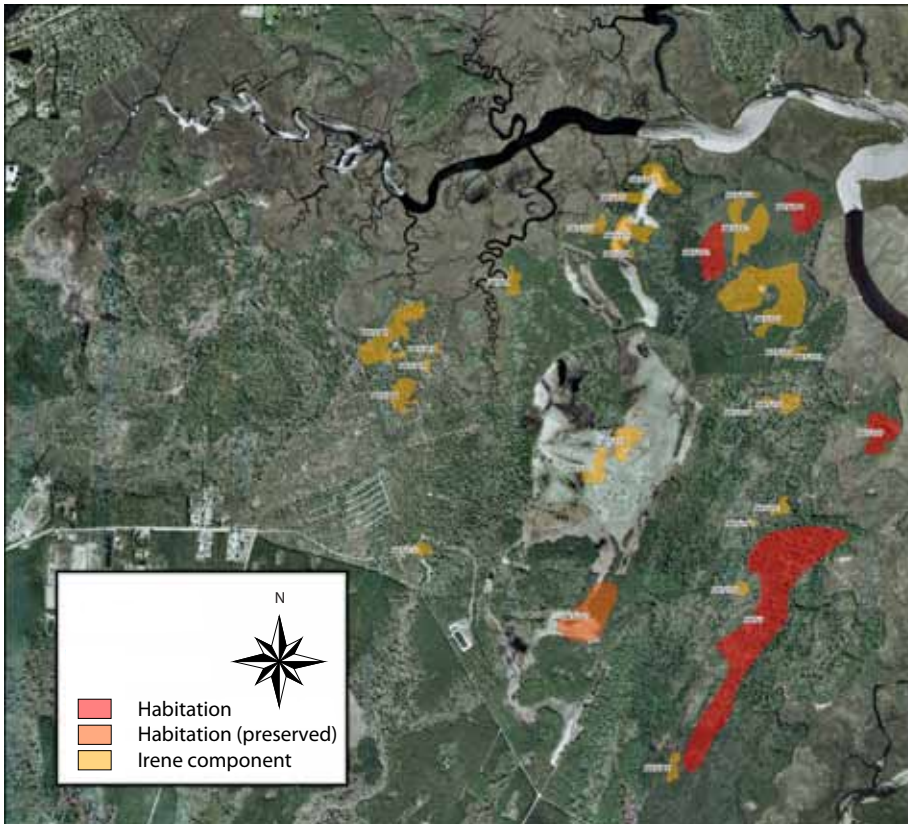


Figure 12.17. Irene habitation sites of the Genesis Point development tract.

sites that feed on oysters. These organisms are inadvertently collected along with shellfish and are eventually incorporated into cultural deposits. *Boonea* spawn in the spring or early summer (May and June) and have a life cycle of approximately one year. Over their lifetime, the parasites undergo measureable and predictable accretionary growth, making them an ideal subject for seasonality studies (see Reitz, Quitmyer, and Thomas, 2012 for a refined discussion of this method). Length measurement of impressed odostomes at their time of death has been used to suggest the time of year when the oysters within a given cultural deposit were harvested (Russo, 1991; Russo, Cordell, and Ruhl, 1993). This allows researchers to infer the season(s) in which a site was occupied. The *Boonea* samples were measured to the nearest tenth of a millimeter, placed into 1 mm increment size categories, and were compared by modal frequency. The samples were divided by depth within the midden or within feature 1. In order to interpret the season(s) represented, the data were compared to a master seasonal graph developed by Russo (1991), based on live odostomes collected over a 14-month period. As a result, it was determined that *Boonea* were present in stages of their life cycle that represent late spring, summer, fall, and winter. This of course suggests that oysters were harvested at this site throughout most of the year (Sipe, Dye, and Handley, 2012a, report in progress).

Site 9Bn872 is characterized by a small cluster of three raised oyster shell middens within the southern portion of the site, adjacent to a small seasonal drainage that leads to the salt marsh associated with Redbird Creek. While structural signatures were relatively sparse, at least one rectangular structural alignment was recognized in the vicinity of the possible household middens, as well as a faint, possible wall trench. The middens at 9Bn872 are located hundreds of meters from the marsh and even further from the main channel of Redbird Creek. As such, they are clearly not the result of onsite shellfish procurement. It is believed that the middens are the refuse of a small cluster of residences that may have been oriented around a small family horticultural plot. A column sample was taken from the most prominent of the oyster middens at the site and a shell sample from the heart of the midden was submitted for radiocarbon testing, discussed later. A similar study of *Boonea impressa* was performed using the shell collected from

the column sample at 9Bn872. Interestingly, this sample produced almost three times the *Boonea* observed at 9Bn104, but revealed comparable results (Sipe, Dye, and Handley, 2012b, report in progress).

Site 9Bn887, or the Hammerhead Point site, is located on a jutting peninsula overlooking Redbird Creek and is aptly named for its appearance similar to the head of a hammer (fig. 12.18). This represents the most intensive Irene component outside of Redbird and is characterized by a series of oyster middens arranged in a semicircular pattern to the south of a tidally influenced lagoon located at the eastern tip of the “hammer’s head” (fig. 12.18). The lagoon provides an interesting element to this site. This small, circular low spot is clearly fed by tidal fluctuation and is connected to the main channel of Redbird Creek by a small stream, currently navigable by canoe at high tide. The most interesting part, however, is that the extreme eastern portion of the lagoon, which separates it from the salt marsh, has been built up by an enormous oyster procurement midden. The midden is dubbed a procurement midden based on the low density of artifacts and faunal remains in comparison with those in the interior portion of the site. This midden effectively constricts the mouth of the small creek leading into the lagoon to only a few meters wide. One possible explanation for the apparently intentional constriction or blockage may be that the lagoon was a freshwater source during the prehistoric period. The artesian water pressure was higher at this time and the midden, which was accumulating anyway, could have been intentionally deposited in such a way as to protect the water source from the salt marsh. After the site was abandoned, the lagoon may have reconnected itself with the tidal creek over centuries of erosion. Alternatively, the small tidal creek may have been intentionally constricted but not blocked in order to turn the lagoon into a natural fish weir.

What is clear, however, is that the convenience of the lagoon and proximity to Redbird Creek provided access to the maritime oak forest for mast, the marsh for shellfish collection, and the excessively drained soil suitable for maize horticulture. Eight discrete raised oyster middens were identified at the site within a distinctive half circle pattern also recognized at 9Bn9. Excavations in and around these oyster shell middens revealed dense deposits of Irene-style pottery and the signatures, albeit faint, of at least two rectangular wall trench structures. These were only rec-

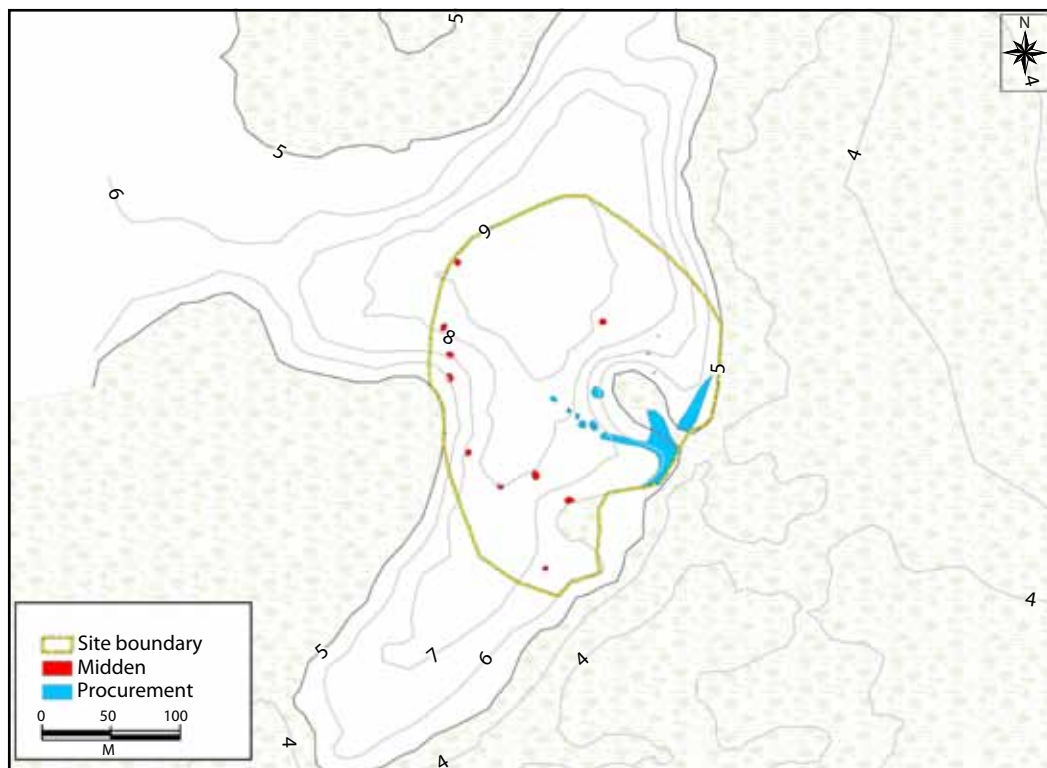


Figure 12.18. Site layout at 9Bn887: the Hammerhead Point site.

ognized by the presence of staining; no daub was identified at the site. Several other structures are suspected to have been located at Hammerhead based on the preponderance of post alignments, which do not easily form coherent structural patterns. A sample of soot from a large fragment of an Irene Filfoot–Stamped vessel with a segmented rim was submitted for accelerator mass spectrometry (AMS) dating that revealed that the site was indeed contemporaneous with 9Bn9, as discussed later. Based on the ongoing research at the site, it seems that Hammerhead Point functioned as a relatively large outlying residential center which was apparently focused on the collection and processing of oysters.

#### RADIOCARBON DATA

Although these sites can be culturally connected based on the preponderance of Irene pottery, the use of radiocarbon data can help confirm

whether they were indeed contemporaneous. A total of six new radiocarbon dates were acquired from Irene contexts during the ESI investigations at the Genesis Point property. These include three samples obtained using radiometric dating from samples of oyster shell acquired from raised middens or shell pits at two of the smaller habitation sites (9Bn104 and 9Bn872). The remaining three samples are AMS dates obtained through carbon from charred corn or sooted vessels encountered at Redbird Creek and Hammerhead Point. These dates are presented in tabular form (table 12.1) and discussed in greater detail later.

**Beta-258627** was collected from a large oyster midden located in the southern portion of site 9Bn104. This sprawling midden was located more than 300 m south of the marsh edge and appeared to be the primary focus of activity at the site. The midden also yielded more than 500 pieces of Irene pottery, making it a promising candidate for radiocarbon dating. The returned  $2\sigma$

TABLE 12.1  
Radiocarbon Data from Irene Contexts at Genesis Point

Lab no.	Site	Provenience	Type	2 $\sigma$ calibrated date range
Beta-258627	9Bn104	Midden 1	radiometric (shell)	cal A.D. 1450–1650
Beta-258626	9Bn104	Feature 1 (directly beneath Midden 1)	radiometric (shell)	cal A.D. 1420–1620
Beta-263675	9Bn872	oyster midden	radiometric (shell)	cal A.D. 1450–1640
Beta-270236	9Bn9	oyster midden	AMS (charred corn)	cal A.D. 1440–1540 (cal 510–420 B.P.) and cal. A.D. 1540 to 1630 (cal 400–320 B.P.)
Beta-297416	9Bn9	Vessel 2	AMS (sooted vessel)	cal A.D. 1420–1460 (cal 530 to 490 B.P.)
Beta-297415	9Bn887	oyster midden	AMS (sooted sherd)	cal A.D. 1400–1440 (cal 550–510 B.P.)

calibrated date range for this sample was cal A.D. 1450–1650. The midden overlaid a large oyster pit feature (feature 1), which was also dominated by Irene ceramics ( $N = 57$ ). Beta 258626 represents a sample of oyster that was collected from feature 1 for radiometric dating, which yielded a 2 $\sigma$  calibrated date range of cal A.D. 1420–1620.

**Beta-263675** was an oyster sample collected from midden 1, one of a small cluster of middens at 9Bn872. A column sample was collected in 10 cm levels from this midden and a sample of oyster from the heart of the midden was submitted for radiometric testing. The returned assay for this sample provided a 2 $\sigma$  calibrated date range of cal A.D. 1450–1640.

**Beta-270236** represents the first AMS date retrieved from the Genesis Point sites. It was collected from a sample of charred corn cob recovered by Keith Ashley and his student volunteers from the Savannah College of Art and Design (SCAD) from the block 2 midden at the Redbird Creek site. This sample yielded a split 2 $\sigma$  range of cal A.D. 1440–1540 (cal 510–420 B.P.) and cal A.D. 1540–1630 (cal 400–320 B.P.) (Keith Ashley, personal commun., 2010).

**Beta-297415** and **Beta-297416** were taken from sooted Irene ceramics from Hammerhead Point and Redbird Creek, respectively. The sample from Hammerhead Point (297415) was collected from a heavily sooted portion of a large

filifot-stamped rim sherd from an Irene urn-style vessel that was recovered within one of the shell middens south of the lagoon. This yielded a 2 $\sigma$  range of cal A.D. 1400–1440 (cal 550–510 B.P.). Beta-297416 was taken from a sample of soot recovered from the exterior of vessel 2 at Redbird Creek. This returned a 2 $\sigma$  range of cal A.D. 1420–1460 (cal 530–490 B.P.).

Table 12.1 shows the returned results of the six samples. The three dates returned from oyster samples have been calibrated using the latest reservoir correction determined for St. Catherines Island (approx. 10 mi south of Genesis Point) as presented here (Thomas, Sanger, and Hayes, this volume, chap. 1). As a result, the returned dates of these occupations span from as early as A.D. 1400 for the earliest AMS dates to as late as 1650 on the latter end of the radiometric results. It is also interesting to note that the three dates acquired from terrestrial sources and those from marine sources form two statistically different groups. The mean age of the terrestrial samples is cal A.D. 1420–1450, while the mean age of the marine shell samples is cal A.D. 1450–1620. Figure 12.19 provides a visual distribution of this phenomenon. Much of this statistical difference may be the result of the different techniques used to date the samples. The terrestrial samples were dated using the more refined (and expensive) AMS technique, which can often give re-

sults within a margin of error around 40 or 50 years, while radiometric assays are typically less refined. While moderately useful, the dates collected at Genesis Point so far simply illustrate the necessity for more <sup>14</sup>C data from these sites, specifically using the tighter AMS technique.

DISCUSSION

This chapter is best seen as an introduction to the lifeways and culture of a mainland Irene population that will lead to an extensive body of research similar to that which has been conducted for its barrier island counterparts (Pearson, 1979b; DePratter, 1978; Thomas, 2008). As such, it is perhaps inappropriate to offer a conclusion here. Instead, this section gives a brief summary of what has been gleaned so far and makes suggestions for future research.

First and foremost, the research at Genesis Point should provide a vital new step toward a coastal understanding of Late Mississippian lifeways. Thomas’s (2008) *Native American Landscapes of St. Catherines Island, Georgia* provides a holistic approach to studying a population of

people over time; however, some have wondered whether the data gathered from this study has broader implications due to its island focus. The research presented in this chapter sets the foundation for the application of a similar analysis on mainland settings. For example, much of the research on residential mobility and settlement selection can be applied directly to the sites at Genesis Point, as the environmental zones of the island are almost identical to those provided by the mainland within the coastal zone.

The archaeological signature of the Irene population at Genesis Point is also similar to signatures documented on barrier islands. Much like Pearson’s (1979b, 1980) work on Ossabaw Island, the Genesis Point project has revealed a series of Irene components of varying complexity spread across the property. Pearson created a four-tier ranking system to describe the role each of these sites played during the Irene phase on that island. For the purpose of discussion, Pearson’s ranking system can be loosely applied to the Genesis group. Redbird, which was classified as a class III site during the initial investigation (Pearson, 1984), has been determined to be much

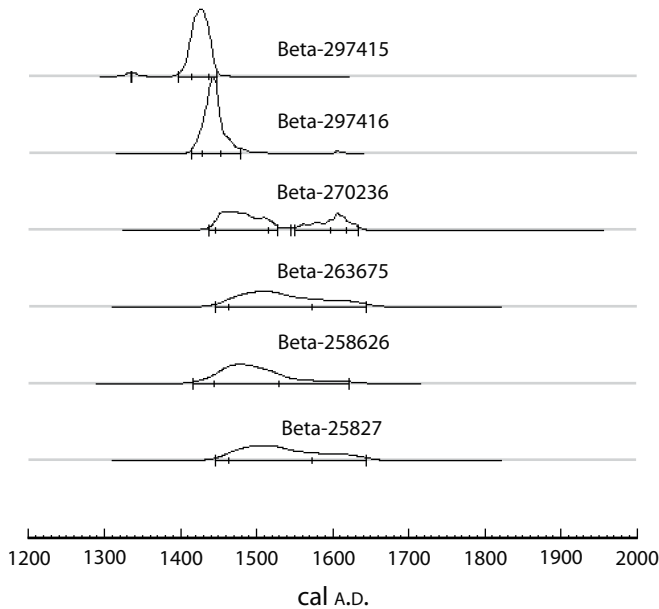


Figure 12.19. Probability distributions of radiocarbon data collected from six Genesis Point samples (figure by David Hurst Thomas).

larger and contain multiple burial mounds with a possible platform mound. It seems now that Redbird more accurately represents a class I site within his hierarchical system and played the role of a village core within the dispersed town framework. The class II level of Pearson's hierarchy, however, does not seem to be represented within the Genesis Point sample. On Ossabaw, these sites are of moderate size, represent permanent habitation, and often contain a burial mound. The Hammerhead Point site is the next largest Irene habitation after Redbird at Genesis Point; however, there is no burial mound present and the scale of the occupation drops to a point where it more appropriately represents a class III. Sites 9Bn104 and 9Bn872 also represent class III level sites and serve as the scattered hamlets described in the dispersed town model. The remaining 25 Irene components at Genesis Point represent class IV sites, which are temporary occupations that consist of a single shell midden (if any) and are utilized as resource extraction areas (Pearson, 1979b, 1980).

One possible reason that the Ossabaw settlement hierarchy only loosely fits at Genesis Point is that, on Ossabaw, Pearson was dealing with an Irene population that seemed to have grown out of a significant Middle Mississippian Savannah occupation. While Savannah artifacts were identified in small quantities at Genesis Point, they were typically included within Irene assemblages. No large Savannah components were present. It is possible that the Irene polity represented at Genesis Point is part of the general proliferation of Irene sites resulting from the splintering of the more concentrated Savannah population centers.

The recent excavations at the Redbird Creek site have also provided a renewed glimpse at the layout of an Irene village core. Interestingly, Redbird has yielded several features that are underrepresented at other major Irene centers outside of the Irene mound site. Mound C is probably the most prominent of the surface features identified at Redbird Creek. This large earthen mound forms the highest point on the Redbird landform and was accumulated through the construction of at least two wattle-and-daub buildings, one on top of the other. This unique feature may represent the early stages of a platform mound and these buildings could be the remains of community or religious structures significant to the site's function as the political center of the dispersed town. Structure 2 is also

unique, as it may represent the intersection of two walls or screens that may have divided the site into specific areas or districts. The postmold and wall trench signatures identified within this feature fit well with the description of divisive walls identified at the Irene mound site, down to almost identical post size, spacing, and depth (Caldwell and McCann, 1941). These walls connected to an Irene phase community building known as the rotunda at the Irene mound site, and even with the limited excavation conducted thus far, the angle of these linear features at Redbird are oriented toward the possible community focal point at mound C. Burial mounds A and B also insinuate divisions within the community living at Redbird Creek. The exploratory units within mound B revealed a dense shell lens into which interments were added, a layout similar to many Irene phase burial mounds (Moore, 1897; Caldwell and McCann, 1941; Cook 1978, 1979; Thomas and Larsen, 1986; Thomas, 2008). Interestingly, several postholes were noted within the plan view at mound B along with dense concentrations of daub found throughout the initial levels of the excavation. Based on this, mound B may represent a burial structure similar to that which was dubbed the "mortuary" at the Irene mound site. Pearson (1984) did not report anything similar to this in his investigation within mound A. While this mound was reportedly heavily looted, Pearson did encounter a pocket of calcined human bone representative of a cremation burial. No post features or daub were reported for mound A. Both mounds A and B were surrounded by a series of discrete shell middens. The middens around mound B (locus A) were determined to be domestic refuse and representative of a series of structures surrounding the burial mound. To date, no significant investigation has taken place within or around the middens surrounding mound A. If these middens also represent structure locations, then mounds A and B may represent two distinct zones within the Redbird Creek site, each with a separate, and perhaps distinct, mortuary custom.

#### FUTURE RESEARCH

The investigations at the Redbird Creek site are ongoing and more than 2000 m<sup>2</sup> have been exposed through manual and mechanical techniques. As a result, approximately 1100 features have been identified; however, many of these must be mapped and documented before a true

picture of the site can emerge. The areas of the site considered most significant, including burial mounds, the possible platform mound, and the long wall trenches documented within block 3, will be located within parks and preservation easements, never to be threatened by the proposed development. As such, the Cultural Resource Management investigation of those areas was effectively suspended, because it was aimed at mitigating impacts to the site. Despite the suspension, further work within the significant areas is critical to a true understanding of the nature of the village center. The following research objectives and methodology are essential to interpreting Redbird Creek:

(1) Determine the function of mound C—While the existing excavation block within mound C was helpful in determining the existence of sequential structures, it has proven much too small to document a feature as large as an Irene structure. A large block excavation across the top of the surface feature would provide a plan view of the structural signatures. Excavating this block in broad, controlled levels will allow the structures to be accurately mapped and samples to be taken from the respective surface floors for flotation analysis. Additional AMS dates from carbon samples taken from each structure are also recommended.

(2) Determine the nature of the structure 2 wall trenches—These trenches span the length of the current block excavation and a 2 × 2 m exploratory unit dug 5 m south and west of the block revealed that the trench extended unbroken across its length. The posts are deeply buried and closely spaced, indicating that the trenches formed a significant structure. It is clear that additional excavation is needed to expose this feature, and, given its proximity, its relationship with mound C.

(3) Collection and processing of column samples—This process has already begun for three 30 × 30 cm column samples collected from three of the shell middens oriented around mound B. Pearson excavated test units on five other middens and used 1/8 in. screen during fieldwork. The limits of these excavation units are difficult to discern within these middens and it would be difficult to collect a controlled column sample from them. Pearson's results were analyzed and published in *Early Georgia* (Pearson, 1984). Bates (1976) published additional paleoethnobotanical

data from this fieldwork. As such, the middens Pearson investigated should be considered sufficiently documented. At least five more column samples should be collected in order to provide a broad-scale picture of the subsistence practices of the site's residents and to collect temporal data that may indicate how long the site was occupied.

(4) More excavation in locus B—Due to the preservation easement created around mound A and the relatively sparse assemblage encountered within the shovel tests in the area, locus B has been largely neglected by the current investigations at the site. While this area is not immediately threatened by development, it is a vital part of interpreting the site. The area includes a burial mound and several shell middens, which are notably smaller than those encountered within locus A. It will be important for future investigations to determine if different activities, social groups, or even different time periods are represented in locus B.

#### NOTE

1. First and foremost, I would like to express my appreciation to David Hurst Thomas and Victor D. Thompson for organizing this collaboration and to the AMNH, as well as the Edward John Noble Foundation, for providing the support and funding that make endeavors like Caldwell conferences possible. The investigations at the Redbird Creek site presented tremendous opportunities that would not have been possible without the help and guidance of the following individuals and organizations. The owners of Waterways Township, LLC, have provided funding and support throughout the project and have been great supporters of cultural and natural resources on their property. Specifically, Ronald Lamm, Jr., has been a great client to work for and Wyndham Stewart, who maintains the property, has always provided timely access to whatever or wherever we needed. None of this research would have been possible without the experienced ESI crew that worked on the project. This, of course, begins with the effective guidance of Brent Handley, who served as principal investigator, and the field crew consisting of Melissa Dye, Rebecca Gorman, Blue Nelson, and Brian Marks. Much of the data collected during the current ESI investigation was made possible through the efforts of previous ESI work on the property. This work was accomplished through the guidance of principal investigators Greg Hendyryx and Angus Sawyer, as well as a large and varied list of field crew—too numerous to mention here. One of our greatest assets during fieldwork at Redbird has been the generous and talented group of volunteers who have assisted us over the years. Fred Cook started it all. He found Redbird in 1968 and still supports her today, volunteering many hours of his own time to assist our investigation. He has also provided a wealth of background information and served as a mentor for me in interpreting and conceptualizing much of the Redbird data. Charles Pearson also continues

to support Redbird and has provided photos and maps from the investigations conducted in the 1970s, which led to the site's notoriety. Local resident Frank Chance has been absolutely vital to the efforts at Redbird, spending many weekends helping me and even taking time off work to provide assistance. Keith Ashley provided guidance throughout this process and he, and a group of students from Savannah College of Art and Design, dug some of the recent excavations at Redbird and provided one of the vital

AMS dates. Hannah Morris, a St. Catherines Island field crew veteran, spent a week with me moving a stadia rod one meter at a time. Several of my fellow graduate students at Georgia Southern University also deserve mention, including Matt Luke and Blake Ayala. Matt provided me with coastal LiDAR data and the ability to use it as a figure, and Blake provided review and comments on several drafts of this chapter. I thank all of you for the help and opportunities you have provided.



**PART IV**  
**MISSION-PERIOD ARCHAEOLOGY**







## CHAPTER 13

### MISSION SAN JOSEPH DE SAPALA: MISSION-PERIOD ARCHAEOLOGICAL RESEARCH ON SAPELO ISLAND

RICHARD W. JEFFERIES  
AND CHRISTOPHER R. MOORE<sup>1</sup>

#### INTRODUCTION

The nature of contact and interaction between the Native Americans of coastal Georgia and members of the Spanish clergy and military who attempted to missionize this region has been of great historical and archaeological interest for many years (Swanton, 1922, 1946; Lanning, 1935; Jones, 1978; Milanich and Proctor, 1978; Larson, 1980b; Deagan, 1983; DePratter, Hudson, and Smith, 1983; Hann, 1987; Smith, 1987; Thomas, 1987; Milanich and Milbrath, 1989; Bushnell, 1994; Worth, 1994, 2004a, 2007b; Hudson, 1997; Saunders, 2000a). At the time of Spanish contact in the early 1500s, much of the Georgia coast was inhabited by the Muskogean-speaking Guale Indians. The roughly 120 years following the arrival of the Spanish, known as the mission period (A.D. 1568–1684), was marked by the total cultural collapse of Guale society and the eventual retreat of the Guale from their coastal homeland (Worth, 2007b).

Sapelo Island, one of the Georgia barrier or sea islands, figures prominently in this story of Guale culture change. Sapelo is situated near the mouth of the Altamaha River in McIntosh County (fig. 13.1). It is the fourth largest of the Georgia barrier islands, positioned between St. Catherines Island to the north and St. Simons Island to the south. Sapelo lies approximately 4 mi east of the Georgia mainland, separated by a wide sound containing numerous hammocks and expansive marshes.

Ethnohistorical data indicate that the 17th-century Spanish mission of San Joseph de Sapala, located on Sapelo Island, played a critical role in

the story of Guale cultural decline (Worth, 2007b: 194). The mission, situated in the Guale town of Sapala, functioned throughout most of the 17th century as an aggregation point for other Guale mission towns forced to relocate due to threat of attack by the English and their Native American allies. Of particular interest is that brief period from ca. A.D. 1660 to 1684 when extensive demographic shuffling and relocation led to the reorganization of many formerly separate Native American social groups and the emergence of Yamasee cultural identity (Saunders, 2000a; Worth, 2004a, 2004b). Despite more than 50 years of ethnohistorical and archaeological research, investigators have yet to verify the locations of the town of Sapala or Mission San Joseph de Sapala.

In 2003, University of Kentucky archaeologists initiated field investigations just north of the famous Sapelo Shell Ring complex (Site 9Mc23). The purpose of this research was to investigate the site's Late Archaic component; however, test units and shovel probes placed north of Shell Ring II yielded several items of European origin, including majolica and olive jar fragments and part of a small brass bell.

Associated with these European artifacts were hundreds of Native American ceramic sherds representing several temporal periods ranging from the Late Archaic (ca. 4500 B.P.) to the 17th century. Initial classification of the Native American pottery by Victor Thompson (Jefferies and Thompson, 2006) indicated that many of the sherds were parts of Altamaha vessels made by the Guale. This suggested that this part of the site represented the long sought after Guale town of Sapala and its associated 17th-century

Spanish mission. Subsequent field investigations conducted from 2004 to 2008 yielded additional Guale and European artifacts and located several mission period pit features and postmolds.<sup>2</sup>

This chapter discusses the nature of 17th-century Native American–Spanish interactions on the Georgia coast, the results of previous mission period archaeological research in the Sapelo Island area, and the results of our ongoing mission period archaeological project at the Sapelo Shell Ring complex. More complete information can be found in Jefferies and Moore (2009).

### ENVIRONMENTAL SETTING

Sapelo Island (fig. 13.1) is approximately 12 mi long and 2–4 mi wide, having a total area of nearly 28 mi<sup>2</sup> (Olsen, n.d.). The island is part of the 3200 mi long Atlantic Coastal Plain Province (USGS, 2008). Sapelo's climate is characterized by short, mild winters and long, humid, hot summers (SRCC, 2007).

Sapelo's natural environment contains a variety of rich and diverse wetland and terrestrial resource zones that provided the island's prehistoric Native American inhabitants with the bulk of their food. These resource zones include inshore waters, beaches, dunes, tidal rivers and creeks, salt marshes, and forests (UGaMI, 2008). The island's interior forests primarily consist of oak, pine, and palmetto trees. A variety of dune grasses and shrubs grow along the inlet margins and the island's wide, sandy beaches. Marsh vegetation includes smooth cordgrass, with black needlerush, spiked saltgrass, and glassworts growing in the higher areas (Reitz et al., 2008: 51).

In his study of coastal Georgia Native American settlement and subsistence strategies, Thomas (2008: chap. 11, 234–292) identified two major prehistoric settlement types found on the barrier islands. Marshside settlements were located on stabilized dune remnants adjacent to the salt marshes and tidal streams, offering access to the highest ranking marine and terrestrial patch types (Thomas, 2008: chap. 11, 278). A secondary seaside settlement type was located on the leeward side of the dune ridge. Collectively, these locations provided sufficient space for conducting daily activities, places where boats could be stored and launched, and soils suitable for Native American gardening (Thomas, 2008: chap. 11, 278). The probable

location of the Guale town of Sapala, north of the Sapelo Shell Ring complex, is situated in a prime marshside setting (fig. 13.1).

### PRECONTACT AND MISSION PERIOD CULTURE CHANGE

People have lived on Sapelo Island for more than 4500 years (Waring and Larson, 1968; Crook, 1978b, 1986; Simpkins, 1980; Thompson, 2006). The first evidence of human presence on Sapelo dates to the Late Archaic period (ca. 4500–3000 B.P.). Late Archaic hunter-gatherers of the Georgia coast and barrier islands are best known for the large and small shell rings, which dot the southeast coastal region, and for the manufacture of the first ceramic vessels in North America. It is these people who are responsible for the three circular shell rings at the north end of the island designated as Site 9Mc23 (Waring and Larson, 1968; Thompson, 2006).

Native American people continued to occupy Sapelo Island and, to a varying extent, Site 9Mc23 for the remainder of the next 3500 years prior to European contact. Evidence for the presence of these groups largely consists of ceramic pottery dating to the Woodland (Refuge, Deptford, and Wilmington) and Late Prehistoric (Savannah and Irene) periods (DePratter, 1991; Moore and Jefferies, 2007).

The transition from the Late Prehistoric Irene phase to the historic mission period Altamaha phase (ca. 400–300 B.P.) was a gradual process, and distinctions between their respective ceramics are subtle. Although Altamaha components are defined based on ceramics and the presence of European artifacts, some archaeologists continue to use the term “Irene” when referring to mission period components (e.g., Braley, 1990), while others borrow the term “San Marcos” from Florida (e.g., Brewer, 1985). Despite the specific terminology used, the Altamaha phase on the Georgia coast is typically associated with the Guale Indians and related coastal groups documented by Spanish and other European observers from the late 16th to the early 18th centuries.

At the time of Spanish contact, Guale Indians occupied the south Atlantic coast from the Edisto River in South Carolina to the Satilla River in southeastern Georgia (fig. 13.2). The Guale were organized into several small matrilineal chiefdoms, each consisting of a principal town situated along the mainland rivers and tidal creeks,

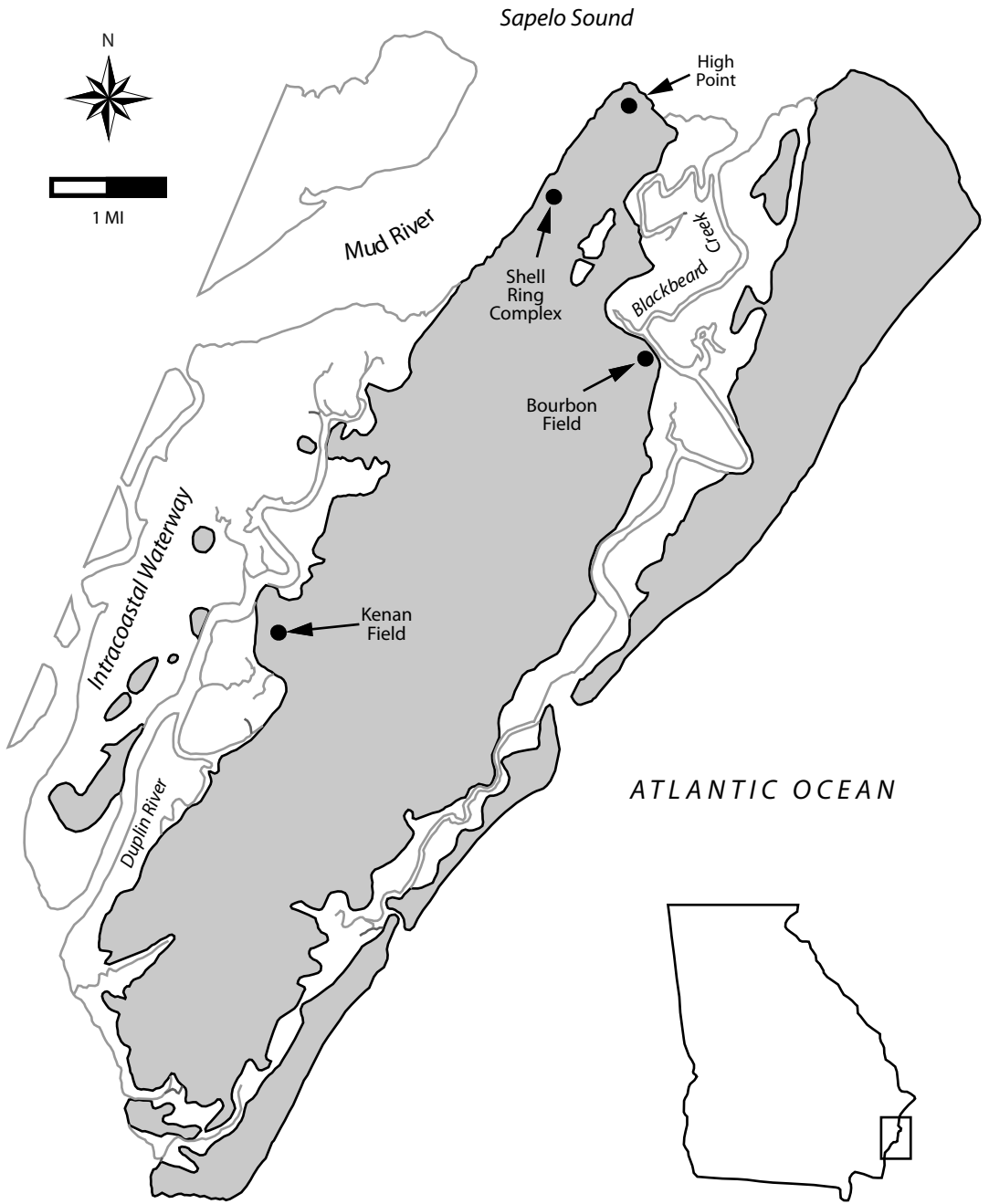


Figure 13.1. Archaeological sites on Sapelo Island, Georgia, with mission period components.

as well as smaller outlying settlements. Guale subsistence was highly diversified, incorporating hunting, fishing, shellfish and wild plant collecting, and gardening (Jones, 1978: 178–179).

The Guale were among the first Native American groups encountered by the early European explorers of eastern North America. As early as 1526, Spanish explorers led by Lucas Vasquez de Ayllón established a presence within Guale territory. The founding of St. Augustine in 1565 initiated a period of protracted Spanish–Guale interaction as missionaries constructed missions in Guale towns (Jones, 1978: 179–186). By 1572, Spanish Jesuit missionaries had preached all along the southeastern coast to as far north as Virginia, but were unsuccessful in establishing a permanent mission. Later, Franciscan missionaries began building missions between St. Augustine, Florida, and Santa Elena, near present-day Beaufort, South Carolina, but no successful conversions were recorded until after A.D. 1600 (Saunders, 2002b: 34).

Prior to the mission period, most Guale settlements were located on the mainland (Jones, 1978: 178). In fact, in 1595 a Spanish shipwreck survivor reported Sapelo Island to be uninhabited. However, by the early 1600s, Spanish missionaries were encouraging the Guale to move to the barrier islands, with a new mission established on Sapelo Island by about 1610 (Jones, 1978: 184–185; Worth, 2008).

During the first half of the 17th century, large-scale disease-related population loss and slave raiding resulted in a major reorganization of the Guale settlement system. By the mid-17th century, many of the Guale who had lived at the smaller, outlying subordinate villages had relocated to the principal towns where the Spanish built their missions (Worth, 2007b: 10–12).

With the consolidation of the Spanish mission towns, many Guale began practicing a more strongly agricultural way of life that involved the tending of both plants and animals. The Spanish introduced various European fruits and vegeta-

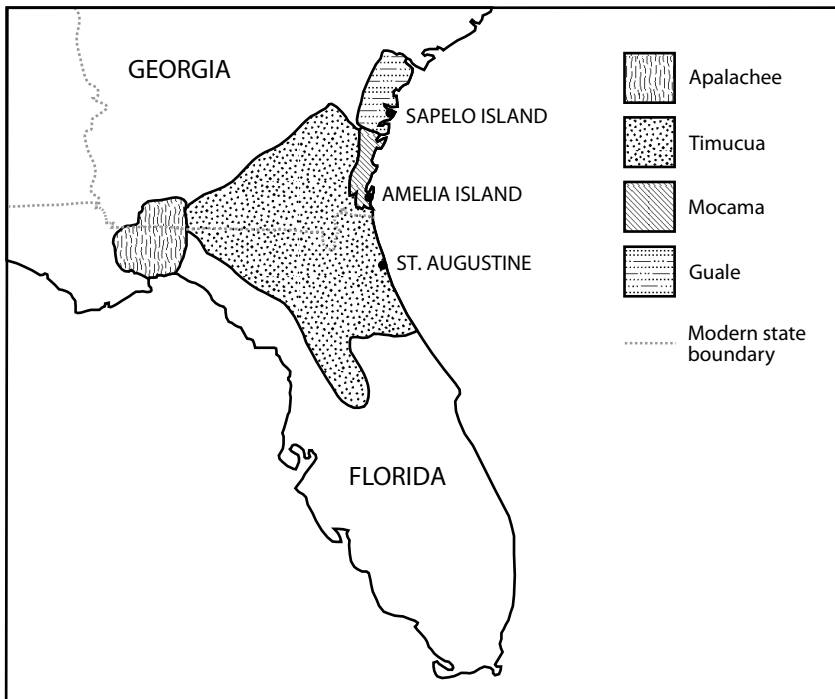


Figure 13.2. Guale territory and territories of surrounding 17th-century Native American groups.

bles to the Guale, along with pigs, chickens, and some cows. Wild resources like deer, fish, and shellfish remained major dietary contributors, as well (Reitz et al., 2010). Aside from some changes in ceramic technology, Spanish influence on Guale material culture was relatively minor. Larson (1978: 138) maintains that the Spanish did not give guns, gunflints, brass and silver ornaments, or white clay pipes to their Native American allies:

Spanish contact was reflected dimly in pot manufacture and in the substitution of the iron hoe for its conch shell counterpart, but only a handful of beads and no gun flints, rifles, mirrors, brass or silver ornaments, or white clay pipes ever found their way into Indian hands. These were the things that gave England superiority (Larson, 1978: 138).

Although this depiction certainly underestimates the amount of European material culture possessed by the Guale, it does reflect the difference between the Spanish, who were interested in conversion, and the English and French, who were interested in trade (Larson, 1978: 135). It also explains why northern groups like the Chichimeco (also known as the Westo), who were equipped with English-supplied firearms, were so successful in their raids on southern groups (Worth, 2007b: 17).

Spanish influence on Guale ceramic technology is reflected by the manufacture of new vessel forms like wide-brimmed plates and bowls made to imitate European serving ware (Saunders, 2000a: 108). These vessels were commonly painted red and are known archaeologically as Altamaha Red Filmed pottery. The Guale began producing these vessels no earlier than 1587, and they commonly occur on Spanish mission sites (Saunders, 2000a: 46–48, 2009; DePratter, 2009).

By 1655, the Spanish had divided their possessions in the Southeast into the colonial provinces of Guale (along the northern and central Georgia coast) and Mocama (along the southern Georgia and extreme northern Florida coasts) (fig. 13.2). Ten mission towns were spread throughout the two provinces and presided over by eight Spanish friars. Six of the missions were in the Guale province (fig. 13.3): Santa Catalina on St. Catherines Island (the provincial capital), San Joseph de Sapala on Sapelo Island, San Diego de Sat-

uache near the mouth of the Ogeechee River, San Felipe de Alave (probably located on the Newport River), Santo Domingo de Talaje/Asajo at the site of the later English Fort King George near Darien, and Santa Clara de Tupiqui on the mainland west of de Sapala (Worth, 2007b: 10).

Starting in 1661, the Guale mission towns became targets of English-backed slave raiding parties. For example, in 1661 as many as 200 canoes carrying from 500 to 2000 Westo warriors armed with firearms provided by the English sacked the mainland town of Talaje. This raid resulted in its residents fleeing to the seemingly more secure Mission San Joseph de Sapala on Sapelo Island. Excavation of part of the Fort King George site in the mid-20th century (J. Caldwell, 1943; S. Caldwell, 1954) yielded evidence supporting the hurried evacuation of Talaje in the form of burned structures and enclosure walls and unusual numbers of relatively complete ceramic vessels. After attacking and destroying the Talaje mission, some of the Westo warriors tried to attack the Sapelo Island mission by boat, but were unsuccessful in their efforts (Worth, 2007b: 16). Later that year, the Talaje mission was reestablished on St. Simons Island under the new name of Santo Domingo de Asajo (Worth, 2007b: 18). Figure 13.3 illustrates changes in mission locations during the mid-17th century.

Although the Westo were only partially successful on the coast, they were much more so in the interior. In 1662, they attacked the town of Huyache, causing the Spanish to move the nearby Mission San Diego de Satuache to the south, where it became incorporated into Santa Catalina de Guale on St. Catherines. In 1662, the Spanish established a small military garrison on St. Catherines to provide more protection for the mission (Worth, 2007b: 16–19).

Also at this time, Spanish records first make mention of the Yamasee, located between the Westo (entrenched in the middle Savannah River region) and Guale provinces (Worth, 2007b: 19–20). According to Saunders (2001), the Yamasee consisted of a clearly defined sociopolitical entity that probably formed out of the collapsed chiefdoms of the Ocute, Altamaha, Ichisi, and possibly Toa. Once on the Georgia coast, the Yamasee became major players on the sociopolitical landscape, sometimes allying with the Spanish and living among the Guale (Worth, 2007b: 20–22). The Yamasee established at least one new community at the southern end of Sapelo Island dur-

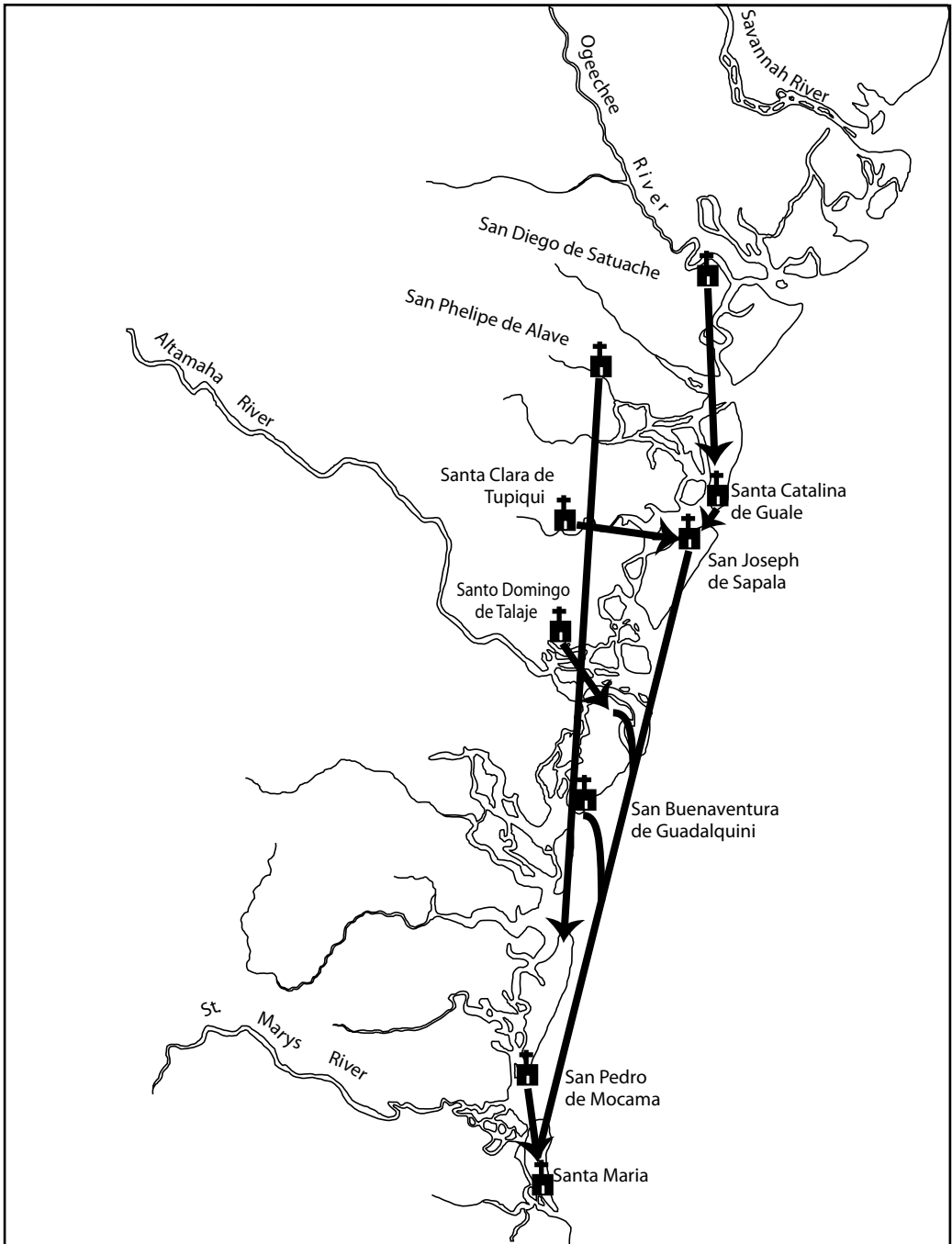


Figure 13.3. Locations and movements of Spanish missions from 1655 to 1684 (adapted from Lanning, 1935).



ing this time (Worth, 2008).

The remaining Guale mission towns existed in relative tranquility during much of the 1660s, largely due to the presence of the Spanish military. However, the founding of Charles Towne in South Carolina in 1670 resulted in increased competition between English and Spanish interests (Worth, 2007b: 22). Shortly thereafter, Mission San Phelipe de Alave relocated southward to Cumberland Island, leaving the northern frontier of Spanish Florida exposed to the English. By the early 1670s, the last remaining mainland mission, Santa Clara de Tupiqui, relocated to the Mission San Joseph de Sapala (Worth, 2007b: 23).

By 1675, only four Guale mission towns remained. The St. Catherines Island town of Santa Catalina, along with the remnants of Satuache, was the largest and farthest north. San Joseph de Sapala, along with Tupiqui, remained on Sapelo Island. Santo Domingo de Asajo, which had relocated in 1661, was on the north end of St. Simons Island, and San Phelipe was far to the south on Cumberland Island (Worth, 2007b: 28).

In 1680, the Westo and their English-backed allies once again attacked the Spanish settlements in Guale province. Their first attack was against the Yamasee town of San Simón on St. Simons Island. Next, they launched an unsuccessful attack against Santa Catalina de Guale, burning the town and mission in the process. Frightened by this attack, the town's native inhabitants refused to rebuild. Shortly thereafter the combined populations of Santa Catalina and Satuache retreated southward, joining the residents of Sapala and Tupiqui on Sapelo Island (Worth, 2007b: 31–34).

By 1683, the water-edge locations of the Guale mission towns had become highly vulnerable to attack by English and French pirates. In that year, the French pirate Grammont attacked the Spanish at St. Augustine, overrunning the guard post at Matanzas. A Spanish counterattack was able to retake the outpost and capture one pirate vessel, but the remaining vessel escaped to the north where it attacked the Mission San Juan del Puerto in Florida and San Phelipe on Cumberland Island, causing the majority of the Yamasee to flee north and ally themselves with the English. This Yamasee retreat left the Spanish highly vulnerable and greatly diminished their labor force, so plans were made to abandon the Guale and Mocama provinces (Worth, 2007b: 37–38). By August 22, 1684, the towns of Santa Catalina and Satuache had already relocated to

the town of Santa Maria on Amelia Island, Florida (Worth, 2007b: 39).

In October 1684, a second pirate assault began against the Spanish coast. In response, the provincial lieutenant ordered the Sapala missionaries to retreat, taking the church furnishings to the mainland. Soon thereafter, the inhabitants of Sapala and Tupiqui were relocated to the mainland where they were joined by the residents of Asajo and virtually the entire population of St. Simons Island following a pirate raid there. The small Spanish garrison on Sapelo followed a short time thereafter, leaving what remained of the town undefended. Two days later, pirates sacked the Sapelo mission, ultimately leading to the Spanish/Guale abandonment of the Georgia coast (Worth, 2007b: 36–42).

The final chapter in the history of the Mission San Joseph de Sapala occurred in 1686 when the Spanish returned to Sapelo to attack the Yamasee who had taken up residence there (Worth, 2007: 194). The Spanish apparently burned the priest's brick house (probably wattle-and-daub) during this raid, along with the mission and several other houses. William Dunlop, who visited Sapelo Island from the Carolinas in 1687, reported that the Spanish had not only destroyed the mission, but also cut down many of the remaining citrus trees that grew in the priest's gardens (Dunlop, 1929b: 131–132).

#### PREVIOUS MISSION PERIOD ARCHAEOLOGICAL RESEARCH

Excavations in Georgia and Florida since the 1940s have provided a great deal of information to complement and augment this ethnohistoric account of the Guale and the mission period on the Georgia coast. Major excavations at Mission sites containing evidence of Guale occupation have been conducted at St. Augustine (Deagan, 1983, 1987), Fort King George (J. Caldwell, 1943; S. Caldwell, 1951, 1954; Kelso, 1968), Harris Neck (Braley, O'Steen, and Quitmyer, 1986), the Thomas Landing site (Larson, 1958b), and on St. Catherines Island (Thomas, 1987, 2008: chaps. 11 and 15).

Sapelo Island has been the subject of mission period research, namely a search for the Mission San Joseph de Sapala, for some time. Post-Spanish descriptions of the mission were first offered by Captain William Dunlop (1929b [1687]), who visited the island soon after a series of Spanish

attacks in 1686 (Grimball, 1928 [1686]; Dunlop, 1929a [1686]). The following is Dunlop's (1929b: 131–132 [1687]) account of the island:

Moving early we came about noon to Sapale to very large plantations where we see the ruins of houses burned by the Spaniards themselves We see the Vestiges of a ffort; many great Orange Trees cut down by the Spaniards in sept' last There was great plenty of ffigs peaches; Artechocks onions etc. growing in the preists garden his house had been of Brick & his small chappell, but all had been burned to Ashes last harvest by themselves; we see the remains & rags of old clothes wch.some of our people know to have belonged to the Inhabitants of Port Royall [sic].

Of note are the facts that the priest's house was small but constructed of "brick" and that the Spanish had burned this structure and several houses that had remained standing after their retreat in 1684.

The first recorded Irene/Altamaha Period ceramics from Sapelo were sherds recovered by Waring and Larson (1968: 274) from Shell Ring I at Site 9Mc23 and classified by them as Lamar. Although of little interest considering the Archaic focus of the project, subsequent surveys and excavations by West Georgia College (now University of West Georgia) from 1974 to 1979 resulted in the identification of mission period Spanish ceramics and Irene/Altamaha wares at Kenan Field, Bourbon Field, High Point, and Site 9Mc23 north of Shell Ring II (fig. 13.1) (Larson, 1980b). Additionally, Larson (1980b: 37) stated that, while structures identified on the 1760 Yonge and DeBrahm map are "in all likelihood the product of settlement that had occurred after the founding of the Georgia colony by Oglethorpe in 1733, they certainly appear to have been placed where there may already have been clearings or old field situations."

West Georgia College test excavations in the vicinity of Shell Ring II indicated intact Late Archaic deposits overlain by mission period ceramics and artifacts possibly related to the Mission San Joseph de Sapala. These historic materials, discussed by Simpkins (1980), extended south to Shell Ring I but were concentrated near Shell Ring II, where wrought nails/spikes, glass, white clay pipe stems, European

ceramics, including blue-on-white majolica and olive jar sherds, and low-fired brick fragments were recovered. Irene and Altamaha ceramics were also in association (Simpkins, 1980: 68). Examination of these artifacts by Jefferies in 2011 indicated that they are identical to specimens recovered by the University of Kentucky investigations north of Shell Ring II.

Additional contenders for the location of the Mission San Joseph de Sapala include the Kenan Field and Bourbon Field sites (fig. 13.1). At Kenan Field, the mission period is represented by a large sectional wall trench building containing Irene/Altamaha pottery and European ceramics (Crook, 1986: 45).

At Bourbon Field, investigators found Irene/San Marcos (Altamaha) ceramics over a 13.7 ha area. Olive jar fragments were recovered from the site and an Irene/Altamaha shell midden was radiocarbon dated to  $310 \pm 90$  radiocarbon years B.P. (Crook, 1984: 253).

Based on existing archaeological and ethno-historical data, most researchers have placed the site of San Joseph de Sapala at Bourbon Field (Larson, 1980b; Worth, 2007b: 194). However, intensive testing of the site by University of West Florida archaeologists in 2007 and 2008 yielded only limited evidence for a Spanish presence (two olive jar sherds) (V. Thompson, personal commun., 2008). The low frequency and diversity of Spanish artifacts suggest that Bourbon Field is no longer a strong candidate for the mission site.

#### UNIVERSITY OF KENTUCKY MISSION PERIOD RESEARCH (2003–2008)

Beginning in 2003, University of Kentucky archaeologists initiated a new research program designed to assess the nature, intensity, and extent of mission period activity near Shell Ring II (Jefferies and Thompson, 2006). Initially, the University of Kentucky research focused on a  $60 \times 60$  m area within the larger, more generally defined Shell Ring II project area (fig. 13.4). The  $60 \times 60$  m area is situated immediately north of Shell Ring II's northern perimeter.

The selection of this area for intensive investigation was based on several factors. First, the recovery of several Spanish artifacts (e.g., a brass bell and olive jar sherds) from a 2003 test unit suggested that this area had a high potential for yielding mission period features. Second, shovel probing yielded numerous artifacts of Guale and

Spanish origin and fragments of pig (*Sus scrofa*) bone (M. Compton, personal commun., 2005), suggesting relatively intensive mission period activities in this portion of the site. Third, the area contained all or parts of 10 low shell piles likely representing mission period household middens (e.g., Pearson, 1984). Field investigations conducted outside the 60 m square largely consisted of systematic shovel probing conducted in 2007 and 2008.

Data recovery strategies employed during the University of Kentucky field investigations were designed to identify the spatial extent and diversity of mission period activities. To date (2012), we have excavated 314 shovel probes and 24 test units and conducted geophysical survey and detailed topographic mapping in the vicinity of Shell Ring II. Only those investigations conducted prior to 2009 are reported herein.

Shovel probing has yielded numerous objects

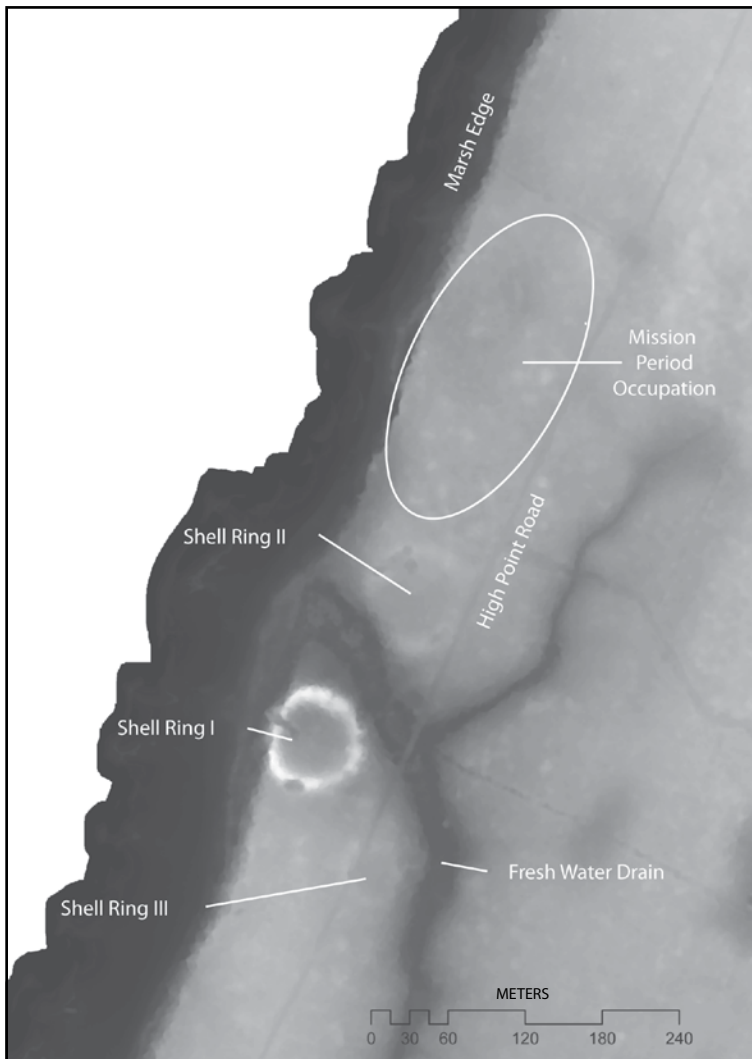


Figure 13.4. Natural and cultural features at site 9Mc23.

of European manufacture and hundreds of Guale-manufactured Altamaha ceramic sherds. These probes have confirmed our original assessment that, while there is a light scatter of mission period artifacts throughout the Shell Ring II area, these materials are concentrated immediately to the north (fig. 13.4). This area also contains at least 15 circular to oval shell piles ranging from 10 to 20 m in diameter and up to 60 cm high (fig. 13.5). Clusters of circular shell piles like these are typical of Late Prehistoric Period sites on the Georgia coast (Pearson, 1984: 5). The association of Altamaha ceramics and test excavations in two of the Sapelo shell piles supports a mission period origin for these features. Preliminary surface reconnaissance indicates that dispersed shell piles like these extend north of the shell ring complex for several hundred meters.

Test units excavated north of Shell Ring II (fig. 13.6) yielded abundant evidence for mission period activity including pit features, postmolds, and an assortment of Guale and Spanish ceramic, glass, and metal artifacts. Mission period features include three deep, circular shell-filled pits (features 2B, 3, and 5), averaging about 80 cm in diameter and 55 cm in depth (figs. 13.7 and 13.8). In addition to abundant oyster and clam shells, the pits contained Altamaha Red Filmed pottery, fragments of Spanish olive jars and majolica vessels, wrought iron nails, a fancy button, and glass beads. The three pits were separated by less than 3 m, suggesting that they are contemporaneous and perhaps associated with the same event or activity. Analysis of the ceramics from the pits supports the hypothesis that they are refuse pits used in the disposal of subsistence remains and broken cooking and serving vessels after one or more short-term meals or feasting events. Several smaller pits or large postmolds occurred near the shell-filled pits, some containing wrought iron nails and other objects of European origin.

Postmolds located near the features suggest that one or more structures were present nearby (fig. 13.7). Several of the postmolds contained mission period artifacts, indicating that the posts and their associated structures date to the mission period.

Interestingly, features resembling the three shell-filled pits were excavated at the Harris Neck Airfield site (9Mc41) in the late 1980s (Braley, O'Steen, and Quitmyer, 1986: 50–54). These Irene/Pine Harbor phase (ca. A.D. 1400) pits, measuring approximately 2 m in diameter

and 1.5 m deep, were flat-bottomed, straight-sided, and filled largely with densely packed oyster shell, sherds, and vertebrate skeletal remains. The pits, located within 4 m of each other, were situated about 15 m from the remains of a structure (Braley, O'Steen, and Quitmyer, 1986: 50–51). Ceramic refits indicated that at least two of the pits were used contemporaneously (Braley, O'Steen, and Quitmyer, 1986: 54). The similarity in morphology, contents, and age of the Harris Neck and Shell Ring II shell-filled pits suggests that they reflect similar kinds of activities.

A fourth large, oval, midden-filled pit (feature 9-2003) contained Altamaha and Spanish ceramics, a wrought iron nail, and part of a small brass flushloop bell (fig. 13.9). Based on the exposed portion, the diameter of the entire feature, if circular, would be between 3.5 and 4.5 m. Maximum depth of the intact portion of the feature was approximately 60 cm. Three circular shell concentrations ranging from 15 to 25 cm in diameter located along the feature margin may represent postmolds. The basin's size and shape, along with the possible postmolds, suggest that this feature marks the location of a semisubterranean structure. Based on the presence of Spanish and Altamaha pottery and other European artifacts, the feature is interpreted to derive from the mission period component. However, numerous older sherds indicate that the feature fill is a mixture of mission period and prehistoric debris. Many of these earlier sherds are ceramic hones and may represent items that were scavenged and recycled by later site occupants.

## NATIVE AMERICAN MISSION PERIOD ARTIFACTS

### CERAMICS

Analysis of Native American ceramics from the Shell Ring II vicinity was divided into a typological analysis of all sherds larger than 4 cm<sup>2</sup> and an attribute level analysis of all sherds larger than 1 cm<sup>2</sup>. Of the 1062 recovered sherds and ceramic artifacts larger than 4 cm<sup>2</sup>, 725 (68.3%) could be classified as belonging to the mission period Altamaha ceramic series. With the exception of smaller fragments of Altamaha Red Filmed colonoware sherds briefly mentioned later, only these diagnostic Guale-manufactured ceramics are discussed in this section.

The distribution of Altamaha ceramics recovered during shovel probe survey confirms that the

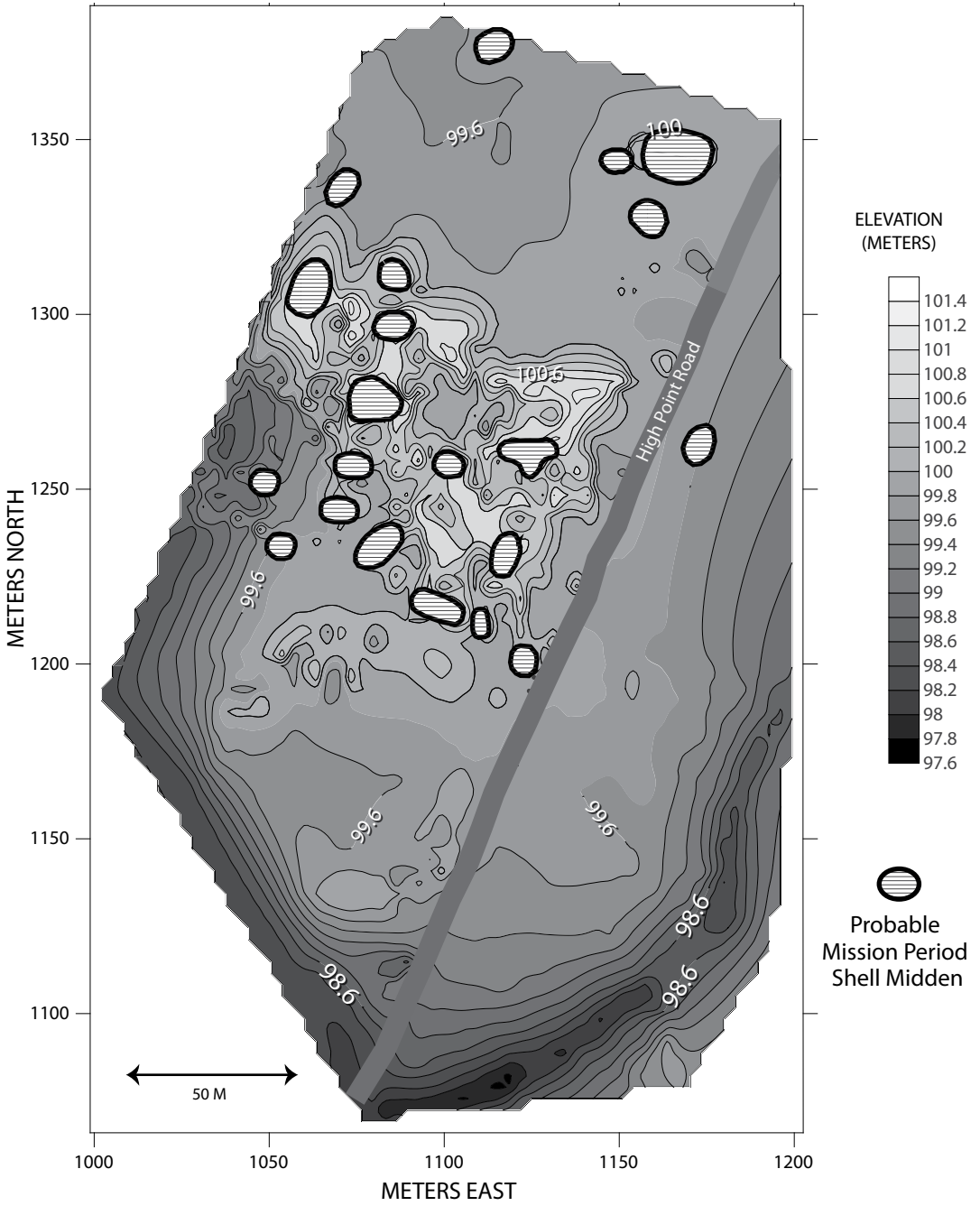


Figure 13.5. Distribution of probable mission period shell midden piles north of Shell Ring II.

mission period component is concentrated north of Shell Ring II (fig. 13.10), although some use of Shell Ring II itself is indicated by the presence of Altamaha sherds in and around this Late Archaic feature. All major features and postmolds excavated during the 2003–2008 field seasons, including the three shell-filled pits, also can be positively associated with this component. Altamaha ceramics comprise between 88% and 98% of the ceramics found in each of these pits. Only Altamaha ceramics were recovered from the four postmolds that contained sherds larger than 4 cm<sup>2</sup>. The only small pit or large postmold containing more than one sherd contained 85% Altamaha ceramics. The aforementioned possible house basin contained 45% Altamaha ceramics and a mixture of Refuge/Deptford, Savannah, and Irene period sherds and ceramic hones that may have been recycled during the mission period use of this feature.

A combined analysis of the vertical distribu-

tion of ceramics from four adjacent excavation units indicates that the site is relatively well stratified. Although all excavation levels of these units contain a majority of Altamaha ceramics, within-type relative frequencies of sherds indicate that St. Simons ceramics are most prevalent in the lowest levels, while Middle Woodland, Refuge/Deptford, and Savannah period ceramics are most prevalent in levels 3 and 4. A notable increase in Altamaha ceramics occurs in level 4, but most Irene and Altamaha sherds are found in levels 2 and 3. The relative dearth of sherds in levels 1 and 2 illustrates continued postoccupational deposition and partial burial of the site (fig. 13.11).

Like all major Altamaha components on the Georgia coast, the Site 9Mc23 assemblage contains predominantly Altamaha Overstamped ceramics. This type comprises 54.8% of all Altamaha series sherds, followed by unidentifiable eroded/spalled Altamaha sherds (24%), and

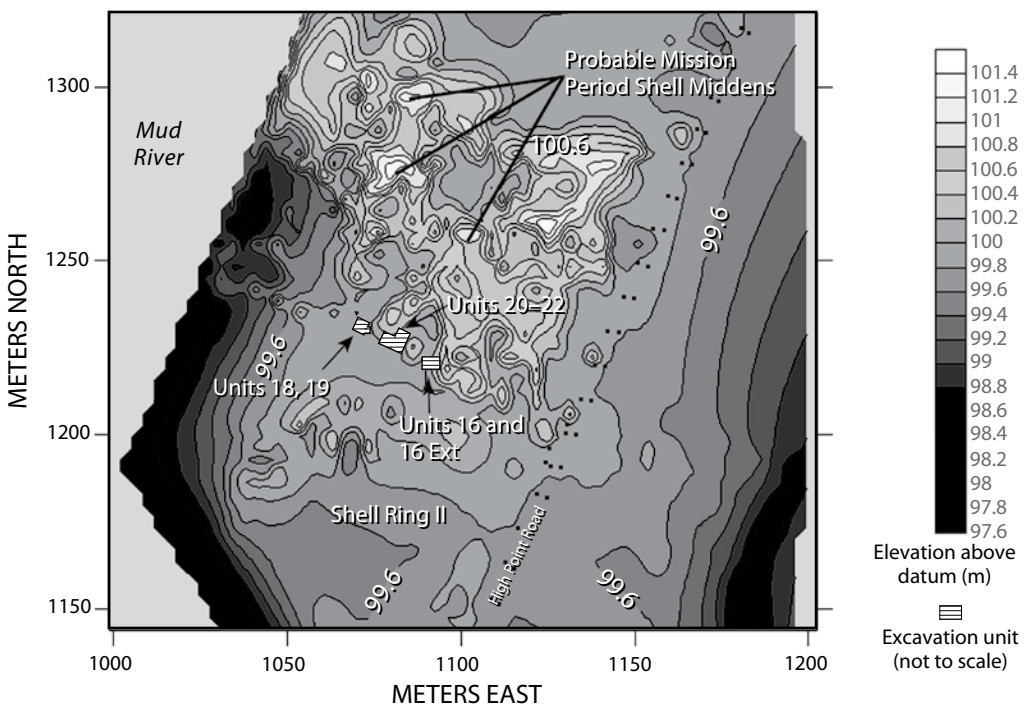


Figure 13.6. Locations of test units excavated by the University of Kentucky Mission Period Archaeological Project from 2003 to 2007.

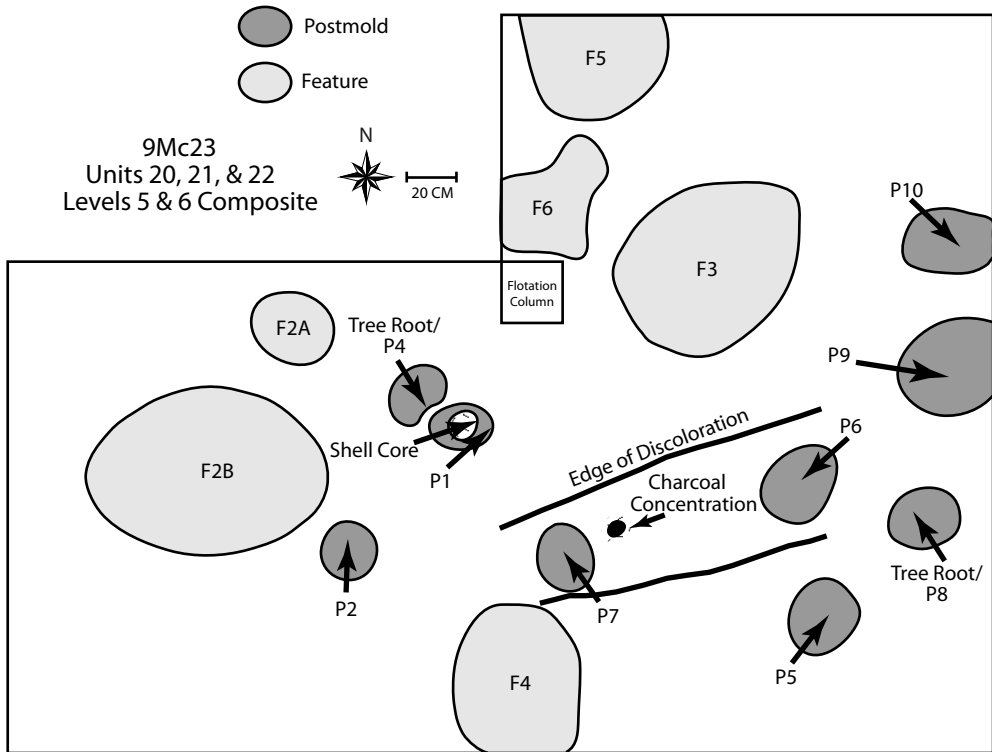


Figure 13.7. Plan view of units 20–22 of 9Mc23 showing the distribution of features and postmolds of composite levels 5 and 6. Exterior line shows extent of excavation.

lower frequencies of Altamaha Plain, Complicated Stamped, Burnished Plain, Incised, and Check Stamped sherds (fig. 13.12). A total of 37 sherds (5.1%) could be classified as Altamaha Red Filmed colonoware, although the red filming attribute was recorded on 130 sherds larger than 1 cm<sup>2</sup>.

As discussed earlier, the Altamaha Red Filmed type is commonly associated with Spanish missions and military garrisons, so the high frequency of red filmed sherds at Site 9Mc23 provides strong support for this being the location of the Mission San Joseph de Sapala. Unfortunately, most red filmed sherds are too small to identify vessel types, and all larger sherds were from wide brimmed colonoware plates (fig. 13.12A). Of the 130 sherds with some evidence of red filming, most are red filmed only on their interiors, although rimsherds tend to have red filmed lips as

well. Ten sherds are red filmed on their exteriors, four of which are red filmed on both the interior and the exterior of the vessels. Most sherds are over stamped, plain, or burnished plain. The diversity of surface treatments present in the Site 9Mc23 red filmed assemblage suggests that a variety of vessel forms are present.

Most Altamaha sherds from Site 9Mc23 are grit/sand-tempered (81.2%), but a diverse array of other temper recipes is present. Single and mixed temper constituents include clay, bone, shell, and broken sherds. Fine sand tempering is most common in Altamaha Plain and Incised vessels, possibly indicating that finer pastes were preferred for these serving vessels. The highest within-type diversity of temper recipes and the highest relative frequency of mixed clay tempering are found in Altamaha Red Filmed vessels, possibly indicating the diverse social contexts

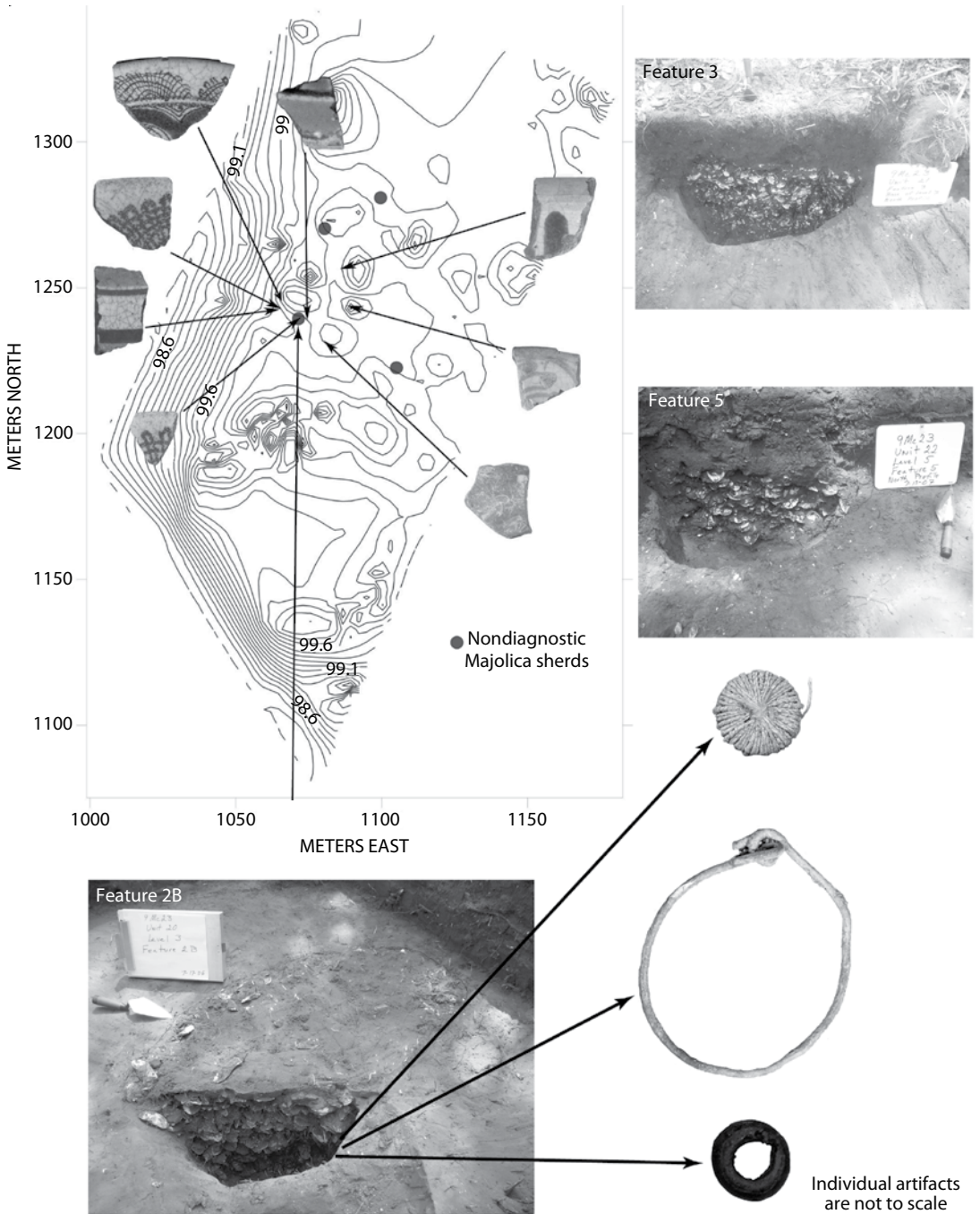


Figure 13.8. Distribution of selected mission period features and artifacts. Features 2B, 3, and 5 are large shell-filled pits that contained Altamaha ceramics and Spanish artifacts.



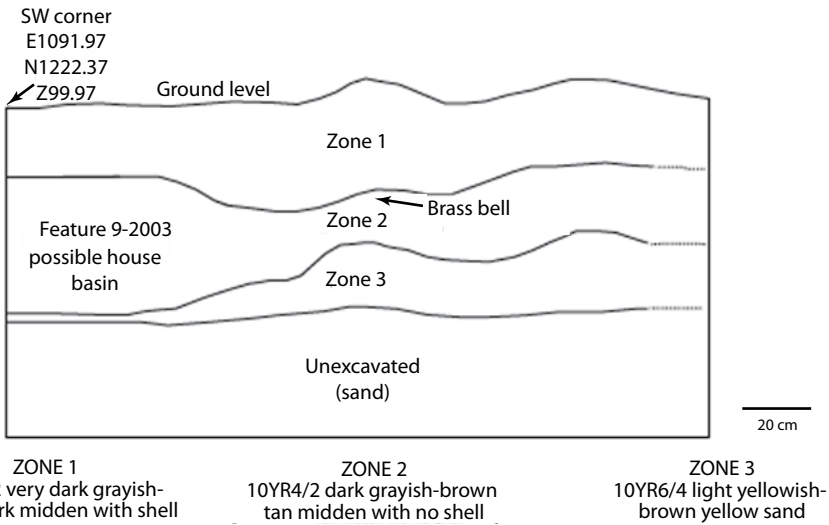
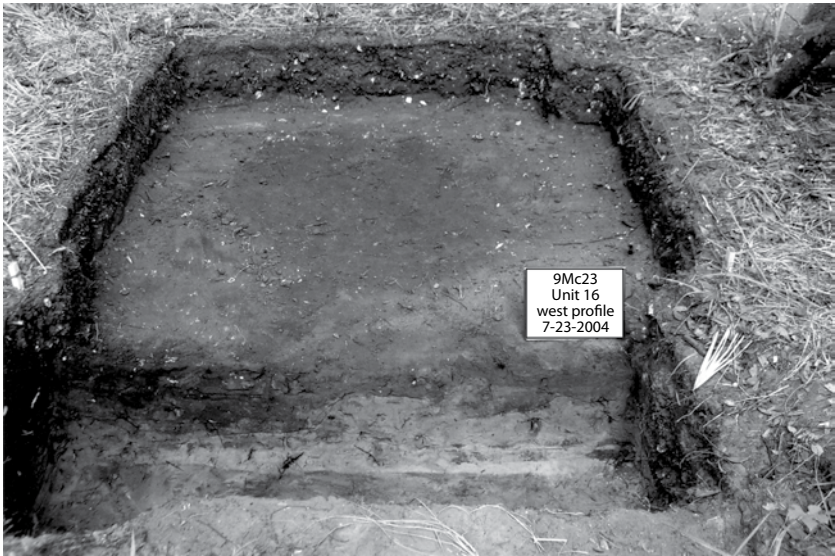


Figure 13.9. Profile and plan view of Unit 16 Extension.

within which these vessels were manufactured. Interestingly, 33% of all grit/shell-tempered Altamaha sherds and 57% of all clay/sand-tempered Altamaha sherds were recovered from shell-filled pits.

Like Altamaha temper types, Altamaha decorations are highly diverse (fig. 13.12). All decorated body sherds are incised ( $N = 9$ ), although incised rims also occur. The majority of deco-

rated rims have rim fold/strips decorated with a single row of punctations created using a number of distinct styluses including fingers, fingernails, partial or whole canes, jagged edged knives or flakes, and several unidentified tools that left triangular, round, crescent, square, semicircular, and oval punctates. One rim is decorated with vertical stamping.

One unique decorated rim form contains what

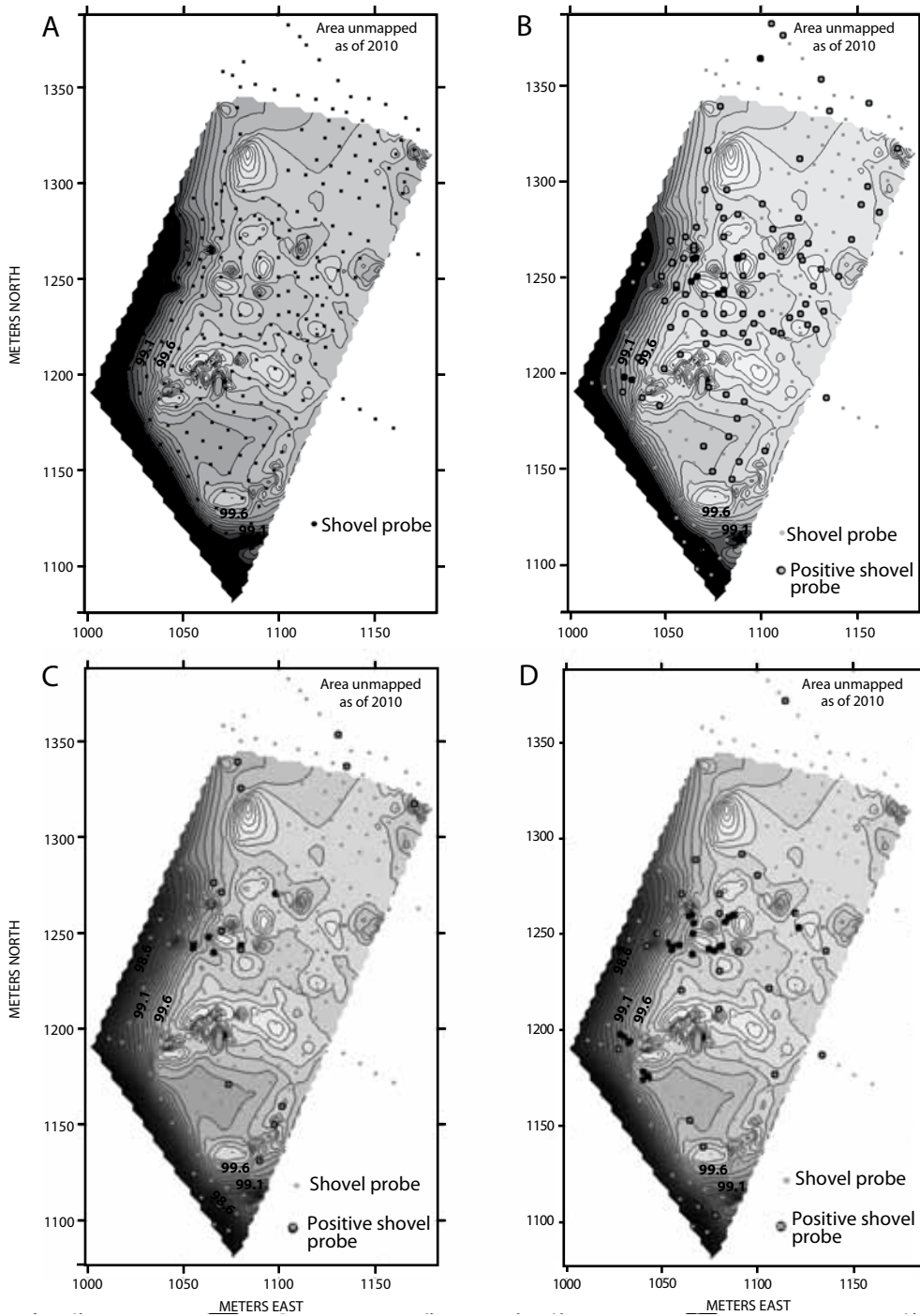


Figure 13.10. Distribution of **A**, shovel probe locations; **B**, all shovel probes containing Altamaha ceramics; **C**, probes containing Altamaha Red-Filmed ceramics; and **D**, shovel probes containing probable Spanish artifacts.

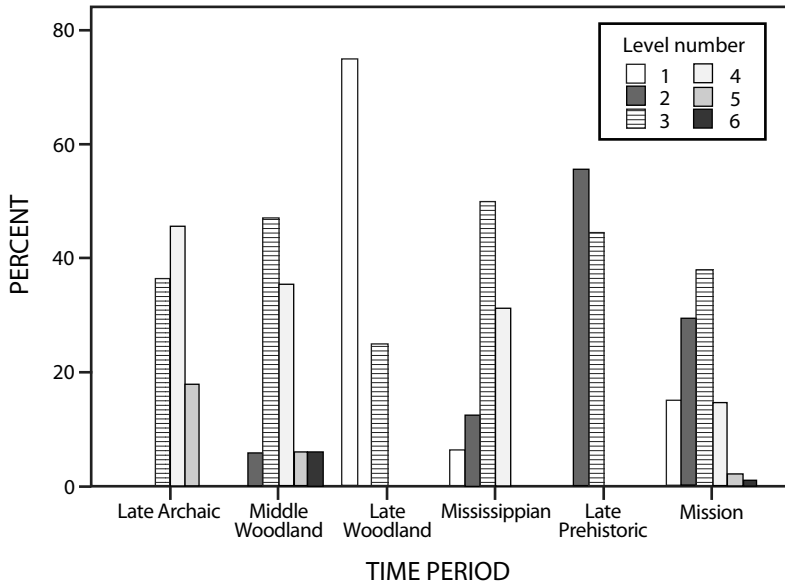


Figure 13.11. Distribution of Native American ceramics by level in units 19–22.



Figure 13.12. Mission period Altamaha series ceramics from north of Shell Ring II exhibiting diagnostic rectilinear line block and overstamped surface treatments (B, D, E, G–I); wide punctated rim fold/strips (B, D); complex punctated and trailed line motifs (E, F); fine line incising on burnished plain bowls (C); and red filming on colonoware vessel forms (A).

we are calling the *deer track punctate* motif (fig. 13.12E and F). These sherds contain two rows of punctations created by pressing a narrow, pointed stylus into the clay twice at acute angles to form a “V” that resembles a deer track. These two rows of deer track punctations run in opposite directions around vessel necks above and below a trailed scroll. This decoration type is found on Altamaha Overstamped vessels and has also been identified in mission period assemblages at Santa Catalina de Guale on St. Catherines Island and at the mission-period component of Fort King George near Darien.

The majority of Altamaha rims are either unmodified or contain wide rim fold/strips, consistent with a later Altamaha occupation of the site (fig. 13.12B and D). A few sherds contain narrower rim fold/strips that may indicate an earlier, poorly represented Altamaha component. The few sherds with rim strips set below vessel lips were classified as Irene. With the exception of the deer track punctate rims and a few Lamar bowls, no Altamaha sherds exhibited nodes or

punctations on unmodified rims (i.e., rims without rim fold/strips).

Consistent with Altamaha ceramics elsewhere along the coast, all but 10 of the Altamaha Overstamped and Complicated Stamped sherds had relatively wide lands and grooves. Altamaha Complicated Stamped sherds tended to be stamped with a line block motif (fig. 13.12B, D, E, and G–I).

Analysis of body sherd thicknesses indicates an increase in sherd thickness during the Altamaha Period. A comparison of all sherds from Site 9Mc23 found the highest mean body thickness occurring among St. Simons sherds (9.4 mm) and declining steadily thereafter to the Savannah Period. Savannah Period ceramics are the thinnest sherds at the site, with a mean maximum body thickness of 6.5 mm. After the Savannah Period, average body thickness increases through the Irene Period into the Altamaha Period. Altamaha body sherds have a mean maximum body thickness of 8.2 mm (fig. 13.13). Braun (1987) noted a similar trend in the Midwest where thinner ves-

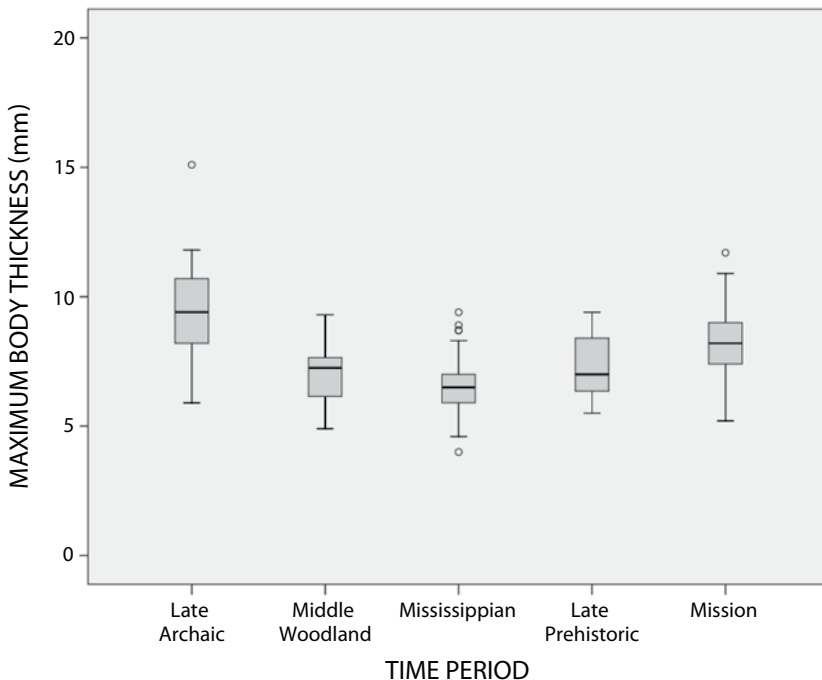


Figure 13.13. Box plot showing body sherd thickness (in mm) by time period.

sel walls were interpreted as evidence of a need for greater thermal shock resistance for processing greater quantities of starchy seeds. This trend was confounded by a trend toward thicker walls needed to support larger vessels. Unfortunately, the lack of significant numbers of reconstructable vessels at Site 9Mc23 precludes an assessment of changes in vessel sizes that would allow a better assessment of these trends.

Typological analysis of the Altamaha ceramics from Site 9Mc23 indicates that it is very similar to other late mission period sites on the Georgia coast and confirms the presence of a significant Guale/Spanish presence to the north of Shell Ring II. The addition of a detailed attributes analysis illustrates the within-series diversity of temper recipes and decoration forms, as well as several other traits not discussed here. This diversity suggests that much more remains to be learned from detailed ceramic studies along the coast. Unfortunately the current lack of comparable data from other Georgia mission period sites precludes such a comparison at this time.

#### SHELL

Although most shell artifacts could not be assigned a specific cultural affiliation, the association of several shell beads and a shell cup with definite mission period artifacts (e.g., glass beads, military items, Altamaha pottery) suggests that they were manufactured and used by the Guale. Shell beads consisted of small disc-shaped specimens ranging from 3.1 to 9.2 mm in diameter. These beads often occurred in the same contexts as European glass beads.

The shell cup or dipper was made from a whelk shell. It is 11.4 cm long and has a maximum width of 10.4 cm. Native Americans who lived throughout the Southeast and Midwest during the Mississippian/Late Prehistoric period used shell cups as serving vessels for many different kinds of beverages. Among these was yaupon tea or the Black Drink (Milanich, 1979; Eyles, 2004: 124). The use of marine shell cups in the ritual lives of the southeastern Indians was documented in drawings and writings of early European visitors to the region (Merrill, 1979: fig. 4). *Ilex vomitoria*, the plant used to make yaupon tea, grows along the Georgia coast, so it seems likely that the Guale participated in ritual activities that incorporated the consumption of the Black Drink (Merrill, 1979: maps 1, 2). According to Merrill (1979: 51–52), the early 16th-century histo-

rian Peter Martyr described the possible use of *Ilex vomitoria* by the Chicora and Duhare Indians. Swanton (1922, cited in Merrill, 1979: 51) equated these groups with the historically known Guale or Cusabo Indians of the Georgia coast. About 1595, Fray Andrés de San Miguel reported that the Guale Indians who lived on St. Simons Island used cassina or *Ilex vomitoria*. The priest reported that the Guale used this beverage in a ceremony in which only the leading men of the town participated (Merrill, 1979: 52).

Analysis of shell from excavation units and features identified more than 100 possible tools. Most of these ( $N = 25$ ) are hammers made from Knobbed Whelk (*Busycon carica*) shell. These objects exhibit evidence of hafting (notching and a hole in the body whorl) and have extensive chipping or spalling on the end of the columella. An additional 21 columella sections display beveling on the end, suggesting that they functioned as adzes, gouges, or choppers. At least 122 bivalve shells display chipping, notching, smoothing, or beveling along one or more edges, suggesting that they are expediently produced scraping, cutting, engraving or woodworking implements (Webb, n.d.).

#### EUROAMERICAN CULTURAL MATERIAL

Field investigations conducted from 2003 to 2008 yielded more than 150 items of probable Spanish/European origin, most of which came from test units. European artifacts were classified using a modified version of Stanley South's Carolina Artifact Pattern format (South, 1977), which he used to analyze Spanish artifacts from Santa Elena in South Carolina (South, 1988a: 19–20).

South's classification system was designed to organize artifacts into eight functional groups or categories that would permit archaeologists to detect relationships at a generalized level of site analysis and allow for intersite comparisons (Van Wanner, 1996: 1). However, Native Americans did not necessarily use European items for the same purposes as their manufacturers, and in some cases, they substantially altered their form and function and used them in a completely different cultural context. Because of this and other potential sources of bias, the Sapelo artifact analysis used South's artifact groups for strictly descriptive purposes with no functional implications.

The Sapelo Spanish-related artifact collec-

tion ( $n = 159$ ) includes eight of South's (1977) artifact groups: (I) Kitchen ( $N = 59$ ), (II) Architecture ( $N = 32$ ), (III) Furniture ( $N = 2$ ), (IV) Arms ( $N = 9$ ), (V) Clothing ( $N = 1$ ), (VI) Personal ( $N = 43$ ), (VII) Activities ( $N = 3$ ), and (VIII) Other ( $N = 10$ ).

#### KITCHEN GROUP

The kitchen group includes ceramics, glassware, and kitchenware associated with the "patterned acquisition, preparation, and serving of food and the breakage of associated items of material culture, and the discard of such by-products in a frequently patterned manner" (South, 1977: 99). Thirty-seven percent ( $N = 59$ ) of the Shell Ring II Spanish/European artifacts belong to the kitchen group. These consist largely of coarse earthenware and majolica sherds, a few pieces of porcelain and glass, and a carved bone knife handle (fig. 13.14). Temporally diagnostic sherds generally date from A.D. 1600 to 1700, roughly conforming to the time of the mission period occupation.

**COARSE EARTHENWARE:** According to Deagan (1987: 30), the term "coarse earthenware" refers to soft-pasted pottery fired at temperatures ranging from 1100° to 1200°C. Excluding the majolica group, most coarse earthenware vessels are included in the utilitarian or nontableware category of ceramics. One of the most common kinds of coarse earthenware vessels found on Spanish-occupied sites in the Americas is the olive jar. These vessels were made from ca. A.D. 1500 to the 1800s and are particularly common at archaeological sites dating to the 16th and 17th centuries. According to Deagan (1987: 31) and others (Goggin, 1960; James, 1985 cited by Deagan, 1987), olive jars were primarily used to store liquids for long-distance transport.

The University of Kentucky excavations yielded 39 sherds of coarse earthenware pottery. Most appear to be parts of Spanish olive jars (fig. 13.14K–M, O, and P). Of the 31 probable Spanish olive jar sherds, 28 are body sherds; the remainder include a jar neck from a middle style jar (ca. A.D. 1560 to 1800) and a handle from a possible early style jar (ca. early to mid-1500s).

Nineteen specimens exhibit evidence of interior or exterior slipping, glazing, or painting, while the remaining sherds have no obvious surface treatment. Fourteen sherds have a white exterior slip. The interiors of four body sherds are

glazed; one is glazed green. The 16 body sherds for which wall thickness could be measured range from 7 to 13 mm thick with a mean of 10.4 mm. The thicknesses and surface treatments represented by the Shell Ring II body sherds generally conform to those described by Deagan (1987: 34) for middle-style Spanish olive jars.

The coarse earthenware collection includes one piece of Pisan slipware manufactured in Italy from ca. A.D. 1600 to 1650 (fig. 13.14J). In other parts of the Americas, Pisan slipware is often found in association with late 16th- (e.g., Columbia Plain, Ligurian Blue on Blue, and Santo Domingo Blue on White) and early 17th-century (e.g., Ichtucknee Blue on White or Sevilla Blue on White) majolica wares (Deagan, 1987: 47). The Shell Ring II sherd came from a red-bodied vessel, the exterior of which was covered with a cream or white marbled slip.

**MAJOLICA TIN-ENAMELED EARTHENWARE:** According to Deagan (1987: 53), majolica is a distinctively Hispanic kind of glazed, wheel-thrown pottery that is distinguished by its soft earthenware paste and an opaque vitreous glaze or enamel covering. Majolica ceramics were probably introduced to southern Spain by Moors during the 13th century, becoming firmly fixed in the Spanish ceramic tradition by A.D. 1500. Varieties of majolica pottery were produced throughout Spain and other parts of the Mediterranean region, ultimately being introduced to the Americas by the Spanish during the 16th century.

Excavations near Shell Ring II yielded 10 small pieces of majolica pottery, six of which could be assigned to a probable type (figs. 13.8 and 13.14 A–I; table 13.1). Identification of ceramic types is based on photographs and data contained in the Florida Museum of Natural History historical archaeology digital type collection (Deagan, 2004) and Deagan's (1987) work on Florida's Spanish colonial artifacts. All of the Shell Ring II majolica sherds were found north of the ring in the vicinity of the shell piles. Recent (2011) examination of artifacts collected from the interior of Shell Ring II in the 1970s by University of West Georgia archaeologists identified several similar majolica sherds.

Majolica sherds from the University of Kentucky investigations consist of examples of glazed Aucilla Polychrome, Puebla Polychrome, San Luis Blue on White, and possibly Ichtucknee Blue on White or Puebla Blue on White wares. With one possible exception, all of the



Figure 13.14. Examples of kitchen group artifacts: majolica pottery (A–I); Pisan slip ware (J); olive jar rims (K–L); olive jar body sherds (M, O–P); porcelain (N); bone knife handle (Q); bottle fragment (R); and iron cauldron fragment (S).

TABLE 13.1  
Shell Ring II Majolica Sherds

Catalog number	Type	Dates	Place of origin
UK666	Ichtucknee Blue on White or Puebla Blue on White	1600–1650 1675–1800	Spain Puebla
UK669	Aucilla Polychrome	1650–1700	Mexico City
UK671	Aucilla Polychrome	1650–1700	Mexico City
UK667	San Luis Blue on White	1550–1650	Mexico City
UK668	Puebla Polychrome	1650–1725	Puebla
UK678	Puebla Polychrome	1650–1725	Puebla

Shell Ring II majolica was produced in either Puebla or Mexico City, Mexico.

The small size of the sherds makes a functional assessment of the represented vessels difficult; however, the thickness and shape of the five rimsherds suggest they are fragments of serving vessels such as plates, cups, or bowls. Based on the dates of production of the different types of majolica, most of the Shell Ring II majolica pottery was probably brought to the site sometime between A.D. 1650 and the Spanish abandonment in 1684. A mid-17th-century date fits well with the age of the temporally diagnostic olive jar sherds. In addition to ceramic vessels, a 2010 metal detector survey of the shell piles yielded part of a cast iron cooking pot resembling specimens found at Jamestown, Virginia (Cotter and Hudson, 2005) and Plymouth, Massachusetts (Pilgrim Hall Society, 2005) (fig. 13.14S).

A well-preserved whittle-tang knife handle found in a postmold dates to the early 17th century or before (B. Straube, personal commun., 2007). The handle (fig. 13.14Q), which has been extensively modified by carving, is 83 cm long, and has a 4 mm diameter hole drilled from one end to the other. The metal tang of the knife passed through this hole and was attached to the handle at its butt end. A similar knife handle was found during the excavation of the 1607 fort at Jamestown, Virginia. In this case, the iron knife tang and associated blade were attached to the handle by a copper alloy finial still fixed to the

butt end of the handle (Buchanan and Jordan, 1998). A similar method of attachment probably was used to hold the Site 9Mc23 specimen in place.

#### ARCHITECTURE GROUP

The architecture group represents those items directly related to the architecture on a site and includes objects such as nails and spikes lost during building construction or the remains left after a building has been burned, torn down, or abandoned (South, 1977: 100). Nails, spikes, and tacks represent important by-products of architectural construction on sites containing 16th- and 17th-century Spanish occupations, as exemplified by the abundance of these items at Santa Elena (South, 1988b: 33–57) in South Carolina and Mission San Luis in northern Florida (Friends of Mission San Luis, Inc., 2008). The architecture artifact group comprises 20.1% ( $N = 32$ ) of the total sample of Spanish/European artifacts from the site.

Archaeological investigations in the vicinity of Shell Ring II yielded numerous iron items that were classified as belonging to the architecture group (fig. 13.15). Based on the morphology of their heads and shafts, 23 specimens appear to be wrought iron nails, spikes, or tacks that probably date to the mission period. Differentiation of these three categories was based on size and overall design and morphology. The close proximity of these iron artifacts to ceramics and glass beads dating to the mission peri-



od strongly supports their association with the Spanish occupation.

The presence of large iron spikes suggests the construction of substantial mission period architecture north of Shell Ring II (fig. 13.15G–M). Two of the specimens were more than 10 cm long, and the square shaft portions of two other spikes measured 11 × 11 mm. The size range of the nails probably reflects a variety of construction and maintenance activities (fig. 13.15A–F). The use of nails in mission period building construction is supported by the presence of part of a large (46 mm long) nail in a postmold. Smaller nails may have been employed in the construction of wooden boxes, furniture, or architectural detailing.

Large-headed tacks, known as *estoperoles* (South, 1988b: 57), were used to fasten grass matting to the stanchions of ocean-going ships as a way of holding cargo in place (fig. 13.15N). Once the cargo was unpacked, the tacks were probably recycled for land-based purposes (South, 1988b: 57).

Shovel probe and test unit excavations yielded four very small red brick fragments. Interestingly, Simpkins (1980: 68) also reported fragments of low-fired brick from the Shell Ring II

area. William Dunlop (1929b: 131–132 [1687]), the English traveler who visited Sapelo Island in 1686, reported that the priest's house was built of brick. However, it remains uncertain as to the exact nature of the "brick" to which he refers; that is, it is not certain whether he saw high-fired bricks used in modern construction or burned clay from a wattle-and-daub structure. If the brick fragments recovered during our excavations are attributable to mission period activity, then they provide strong support for the proximity of the actual Spanish mission and its associated structures.

#### FURNITURE GROUP

The furniture group largely consists of furniture hardware such as latches, handles, tacks, and locks (South, 1977: 95). The furniture artifact group comprises 1.3% ( $N = 2$ ) of the Spanish/European artifacts from the site. One of these items was part of a small iron box hinge that was associated with numerous other items of Spanish/European origin, including a large iron tack, olive jar and majolica sherds, iron spike fragments, numerous glass beads, and lead shot. Excavations also yielded an iron handle or drawer pull from a piece of furniture.



Figure 13.15. Examples of architecture group artifacts: nails (A–F); spikes (G–M); and tack (N).

## ARMS GROUP

The arms group consists of musketballs, gun parts, shot, sprue, and by-products resulting from the use, maintenance, and repair of weapons (South, 1977: 100–101). The arms group comprises 5.7% ( $N = 9$ ) of the Spanish/European artifacts from the site, consisting of a probable trigger mechanism from an arquebus matchlock gun, a lead musketball, miscellaneous lead shot, part of an iron cannonball, and a possible iron projectile point (fig. 13.16).

The arquebus was a matchlock gun developed by the Spanish in the late 1400s and used by European armies until the late 17th century (Quest, 2007). Along with the crossbow, these guns were important parts of the Spanish military's arsenal in 16th and early 17th century America (Steen, 1988: 96). The Spanish used two types of arque-

buses. One was a light *caliver* having a 4 ft long barrel that shot a 0.75 in. diameter lead ball, and the other a heavier *musket* that had a 5 ft long barrel and a larger bore.

The trigger mechanism found near one of the shell midden piles north of Shell Ring II appears to be from an arquebus like one of those described above (fig. 13.16E). However, it is possible that it was part of a crossbow since the two weapons had similar trigger mechanisms (Steen, 1988: 97). Since most of the other Shell Ring II Spanish artifacts date to the 17th century, the arquebus seems the more likely possibility.

The Shell Ring II investigations yielded five examples of musketballs or lead shot (fig. 13.16C). The largest specimen was 17.8 mm (0.70 in.) in diameter. Carl Steen's (1988) analysis of lead shot from Santa Elena and Fort San



Figure 13.16. Examples of arms group artifacts: outer surface of cannonball (A); obverse of cannonball (B); lead musket balls and shot (C); possible iron projectile point (D); and possible matchlock trigger mechanism (E).

Felipe found that musketballs measuring less than 0.75 in. in diameter were the preferred ammunition, so the Shell Ring II specimen would have been an ideal size. The musketball's diameter would have made it well suited for arquebus ammunition. Excavations also yielded several smaller pieces of lead shot ranging from 2 to 21 mm in diameter.

Test unit excavations yielded approximately 60% of an iron cannonball (fig. 13.16A and B). The specimen weighs 1715 g or 3.78 lb and is approximately 96 mm (3.7 in.) in diameter. The complete cannonball would have weighed about 6 lb, a standard size for European cannons during the 16th and 17th centuries (NPS, 1955). Comparison of the Sapelo cannonball with historical records for Spanish and English cannons suggests that a 6 lb ball would have been fired from a gun using a 4–6 lb powder charge. A typical Spanish gun of this type was the *Media Sacre*, which shot a 5–7 lb ball, or the *English Saker*, which shot a 6 lb shot using 4 lb of powder. The *Saker* gun barrel weighed 1400 lb and was nearly 7 ft long. This kind of cannon had a “point blank” range of approximately 400 m and a maximum range of ca. 3500 m (NPS, 1955).

Site investigations also yielded a small piece of lead sprue associated with the casting of musketballs. Sprue occurs in the form of irregularly shaped masses of lead or narrow lead strips from which cast musketballs were cut. Analysis of lead sprue from Santa Elena and nearby Fort San Felipe revealed that more lead shot casting was conducted inside the fort than in the town of Santa Elena, demonstrating the close association of this material with military activities (Steen, 1988: 87).

#### CLOTHING GROUP

The clothing group includes buttons, buckles, straight pins, and related materials associated with the manufacture, use, and repair of clothing (South, 1977: 101). The clothing artifact group comprises 0.6% ( $N = 1$ ) of the Spanish/European artifacts from the site. A fancy cloth-covered button found in the midden from immediately above a shell-filled pit is the sole example of a clothing group artifact (fig. 13.17). The button is covered with a composite woven fabric, probably a plain weave with a warp of one fiber and a weft of another. One of the elements has degraded in the soil, probably the warp since it would have been difficult to use the complex yarns that remain as

warp (L. Welters, personal commun., 2006).

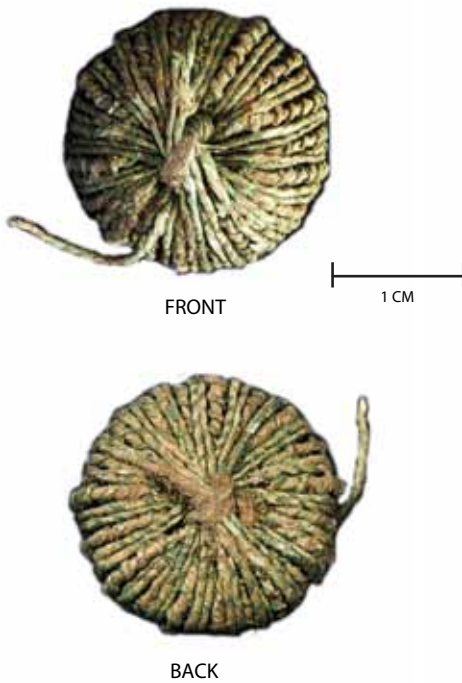
Buttons having mixtures of fabric like the Shell Ring II specimen are sometimes found on 17th-century sites. Fabric combinations include silk/wool, cotton/wool, and cotton/silk. The original fabric may have had a striped appearance with two smaller yarns alternating with a larger yarn. Two things about this button imply that it came from a rather expensive garment. First, composite fabrics were more expensive than plain wool, cotton, or linen. Second, the complex yarns that created the striped effect also imply a more costly garment. Seventeenth-century western European “high fashion” clothing was known for its buttons, bows, and lace; therefore, this button may not have been functional. It could have been sewn onto the side seam of a pair of breeches or applied to embellish a cuff (L. Welters, personal commun., 2006).

#### PERSONAL GROUP

The personal group largely consists of small objects that are carried on or used by a person while conducting his or her daily activities. Artifacts that fall into this group include keys for locks and doors, beads, coins, crucifixes, earrings, ornaments worn on clothing, and dice and other gaming pieces (South, 1988c: 157). Shell Ring II personal artifacts comprise 27% ( $N = 43$ ) of the total sample of Spanish/European artifacts from the site. The items consist of glass beads, shell disc beads, part of a small brass bell, and a small brass wire earring (fig. 13.18).

The Spanish exchanged glass beads of all sizes, colors, and shapes with the Indians. Blair, Pendleton, and Francis's (2009) comprehensive analysis of beads from Santa Catalina de Guale clearly demonstrates that Spanish missionaries gave many beads to the Guale Indians, as evidenced by the more than 70,000 beads recovered by the American Museum of Natural History's archaeological investigations. Most of these beads came from the cemetery where they were found in direct association with the Guale individuals interred there (Blair, Pendleton, and Francis, 2009), contradicting Larson's (1980b: 138) opinion that the Guale received few beads from the Spanish.

Most of the Shell Ring II specimens are small ( $\leq 4.0$  mm in diameter) spherical to oval glass beads that probably were used for decorating Guale clothing, as well as in necklaces and other kinds of ornaments (fig. 13.18A). The smaller



Source: Arnold, 1983: fig. 178

Figure 13.17. Examples of clothing group artifacts: cloth-covered button and 16th-century garment sleeve having similar buttons.

members of this group (< 3 mm diameter) fall into the class of beads that are traditionally called “seed” or “embroidery” beads (Deagan, 1987: 169). These beads range from 1.2 to 3.0 mm in diameter, with a mean diameter of 2.6 mm. All beads are monochromatic, consisting of dark blue to black ( $N = 13$ ), blue ( $N = 5$ ), yellow ( $N = 2$ ), red ( $N = 1$ ), white ( $N = 4$ ), green ( $N = 3$ ), and unknown ( $N = 1$ ) colored specimens.

Larger beads include a broken, barrel-shaped bead; a faceted, barrel-shaped bead; and a Seven Oaks Gilded Molded bead. The recovered portion of a broken black or very dark blue barrel-shaped bead was approximately 5 mm in diameter, but the estimated diameter of an unbroken bead like this one would be about 6 or 7 mm. The estimated original length is around 6 mm. This bead resembles the type 17 bead from Santa Catalina de Guale (Blair, Pendleton, and Francis, 2009: pl. 1p). A dark blue or black faceted, barrel-shaped bead measured 6.1 mm in length

and 3.3 mm in diameter (fig. 13.18B). The bead is hexagonal in cross section.

Perhaps the most informative of the Shell Ring II beads is a Seven Oaks Gilded Molded bead from one of the shell-filled pits (fig. 13.18D). The specimen is 8.3 mm in diameter and 11.2 mm long. The bead is decorated with a series of incised longitudinal lines with alternating rows of punctations. Gold foil once covered the entire bead, but most of what now remains occurs in the recesses of the punctations and lines. John Goggin reported identical gilded beads from several Florida mission period sites, estimating that they dated from the late 16th to the early 17th centuries (M. Smith, personal commun., 2007).

Incised gilded beads like the one from Shell Ring II are not commonly found at southeastern mission period sites. The exception is Santa Catalina de Guale, where excavations yielded 437 gilded beads. Most of the Santa Catalina specimens were spherical ( $N = 264$ ), oval ( $N = 22$ ), or

ring ( $N = 46$ ) varieties. Fewer than 100 specimens were incised like the Sapelo bead, and, of those, only 11 were the same Oval Dot-Incised Gilded Glass bead (comb A) type (type 104) (Pendleton, Blair, and Powell, 2009: 46–47). The Santa Catalina de Guale specimens ranged from 5 to 8 mm in diameter and from 9 to 11 mm in length. They were made of translucent green glass gilded with gold (Pendleton, Blair, and Powell, 2009: 47).

In addition to the beads of obvious European manufacture, the Shell Ring II excavations yielded eight small shell beads found in direct association with items of European/Spanish origin. Although there is no historical record of the Guale using shell beads, shell bead making did take place at Mission Santa Catalina de Guale. Therefore, it seems likely that the Guale collected local shells and made beads from them (Francis, 2009: 106).

In addition to beads, other “personal” items from the Shell Ring II area included the upper hemisphere of a small brass bell and a brass wire loop, possibly from an earring (fig. 13.18I and J). Both items came from feature contexts. The Spanish commonly gave or traded small metal bells to the Indians, who either wore them as items of personal adornment or attached them to other items (Brown, 1979a: 197). Unlike earlier bells that were cast metal, the Sapelo bell was modeled from thin brass or brass alloy sheet metal. Although crushed sometime prior to its excavation, the specimen was originally about 24 mm in diameter. The small brass suspension loop soldered to the top of the bell is about 3 mm wide and has an inside diameter of 6 mm. Two narrow grooves encircle the specimen near its equatorial seam. Traces of a silver-colored metal around the bell’s equatorial seam indicate



Figure 13.18. Examples of personal group artifacts: small glass “seed” beads (A); miscellaneous larger beads (B–H); brass bell fragment (I); and brass wire ring (J). Abbreviation: **dia.** = diameter.

that the upper and lower hemispheres were once joined by soldering.

Based on his analysis of artifact photographs, Marvin Smith identified the Sapelo specimen as a flushloop bell (M. Smith, personal commun.). Flushloop bells, which first appeared in the Southeast early in the 17th century and remained popular throughout the 18th century (Smith, 1987: 43), are typical of bells found at Georgia coastal mission period sites (M. Smith, personal commun., 2003)

A small, ringlike object made from thin brass or copper wire probably represents part of an earring. The loop, from one of the shell-filled pits, is approximately 18 mm in diameter and the wire forming the loop is 0.7 mm in diameter. The two ends of the wire are joined together by bending the wire to form small interlocking loops. Figure 94 (right bottom) of South's (1988c: 159) report on Spanish artifacts from Santa Elena is a Spanish painting (ca. A.D. 1555) of a woman wearing an earring made from a wire loop similar to the Shell Ring II specimen. A garnet bead is suspended from the loop in the painting.

#### ACTIVITIES GROUP

The activities group represents a diversity of functions reflecting a wider range of activities than the other artifact groups. These activities include basket making, brass working, fishing, establishing and maintaining Indian relation-

ships, and performing maritime activities (South, 1988d: 173).

The activities artifact group comprises 1.3% ( $N = 3$ ) of the Spanish/European artifacts from north of Shell Ring II. These objects include an iron cotter pin, a sheet iron pail, and a brass harness rivet (probably post-mission period), and were found during metal detector survey. The cotter pin is represented by the eye portion of the pin and part of the shaft. The pin has been split approximately 25 mm below the eye, with the two shaft sections diverging at an approximately 45° angle. South (1988d: 179) indicates that several cotter pin-shaped iron objects were found at Santa Elena and Fort San Felipe (South, 1988d: fig. 114). Some of these pins were interlocked, suggesting they may have functioned as hinges for doors or lids. One was attached to what may be a hasp or fastener (South, 1988d: 179).

The well-preserved sheet iron pail was found near the edge of one of the circular shell piles (fig. 13.19). Photographs of the artifact were sent to curators at the Association for the Preservation of Virginia Antiquities (APVA), who are working with roughly contemporary (ca. A.D. 1607) European artifacts found at historic Jamestowne. Based on their examination of the photographs, they supported our preliminary identification of the object as being a riveted sheet iron pail. They indicated that while 16th/17th-century copper pots made in this way are relatively common,



Figure 13.19. Sheet iron pail representing the activities group.

similar containers made of sheet iron are rare (D. Gamble, personal commun., 2008).

The Shell Ring II container has been smashed, resulting in one side of the pail being pressed inward against the interior of the opposite side. Despite its condition, some minimal observations on the pail's size, shape, and method of manufacture were possible. Before crushing, it was approximately 18 cm tall and 16 cm in diameter. Its cylindrical body is made from one piece of sheet iron. The bottom of the pail is made from a separate piece of metal. The edges of the bottom are bent upward at a 90° angle, forming a 10 mm high flange. This flange, positioned exterior to the body walls, appears to have held the body in position once it and the bottom were joined. The pail's rim is folded over, producing a ca. 7 mm wide rim strip. The metal used to make the pail's body and bottom was approximately 2 mm thick.

#### FOOD REMAINS

Excavations of the mission period midden yielded a variety of faunal and botanical remains, many of which relate to Guale/Spanish subsistence practices. For the most part, these materials still await analysis. In contrast, the recovery and identification of the partial skeletal remains of two young pigs (*Sus scrofa*) provide an interesting insight on Guale-Spanish interaction. Morphological attributes of the pigs' teeth and skull fragments indicate that the animals were less than 1.5 months old when they died. The identical ages of the two individuals, combined with the fact that pigs of that age are generally not weaned and thus stay together as a group near their mother, suggest that the piglets came from the same litter (M. Compton, personal commun., 2004). The direct association of the pig remains with Altamaha ceramics suggests that the animals were associated with a Guale household.

Spanish explorers introduced pigs into the Southeast in the 16th century. De Soto brought a herd of pigs with him in the mid-16th century, many of which were lost or escaped during the four-year long expedition (Hudson, 1997: 439). Many southeastern Indians liked to eat pork, as indicated by numerous accounts of their attempts to steal Spanish pigs (Hudson, 1997: 266).

Elizabeth Reitz (1982) analyzed faunal remains excavated by Lewis Larson from the Shell Ring II area. Although originally considered to date to the Irene Period, these materials are now

thought to be associated with the mission period occupation of the site (E. Reitz, personal commun., 2012). The Site 9Mc23 faunal assemblage analyzed by Reitz (1982: 55) consisted of 8.4% terrestrial mammals; 0.9% marine mammals; 4.7% birds; 1.9% turtles and alligators; 1.9% snakes; 78.5% fish, sharks, and rays; and 3.7% nonfood species like rodents. Additional faunal remains and soil flotation samples were collected during the 2004 to 2008 field investigations. These samples will be analyzed as funding becomes available.

#### SUMMARY AND CONCLUSIONS

Starting in 2003, University of Kentucky archaeological investigations have yielded important new information concerning prehistoric and historic cultural activities in and north of Sapelo Island's Shell Ring II. Of particular significance are the artifacts, features, and postmolds attributable to the island's 17th-century mission period occupation. Excavation of the well-stratified cultural deposits has yielded thousands of Altamaha sherds attributable to Sapelo's Guale inhabitants. The presence of high densities of Altamaha pottery immediately north of Shell Ring II indicates that this location was the scene of intensive mission period Native American activity that is probably associated with the Guale town of Sapala or one of its outliers (fig. 13.10). The technological and stylistic attributes of the site's Native American ceramic assemblage generally conform to those documented at other nearby mission period sites. Some of the Guale-manufactured vessels are colonoware forms made for the island's Spanish residents. Melcher (2008) and Saunders (2000a) have linked the presence of these red filmed colonoware vessels to sites where the Spanish lived, as exemplified by their abundance at Mission Santa Catalina de Guale on nearby St. Catherine's Island (Saunders, 2000a: 45–48) and missions near Pensacola, Florida (Melcher, 2008).

Field investigations also have yielded numerous Spanish/European artifacts, reflecting a variety of activities. These items include coarse earthenware olive jar and majolica sherds, a bone knife handle, hand-wrought spikes and nails, brick fragments, spherical or oval glass beads, a brass wire earring, part of a brass flushloop bell, the trigger mechanism from a matchlock musket, an iron cannonball, lead musketballs, and a

fancy cloth-covered button. The military items, like the matchlock trigger, musketballs, and the cannonball, suggest that the Spanish garrison was located nearby.

Worth (2006: 200–201) maintains that ethno-historic information and artifact distribution studies suggest that many items of European manufacture found on mission sites were not normally used by mission Indians. Instead, they were discarded by “resident friars, soldiers, and passing Spanish visitors” (Worth, 2006: 201). Based on these observations, the artifact assemblage from north of the Sapelo shell rings supports an argument for an occupation of the site by not only Guale Indians, but also the Spanish.

Three shell-filled pits containing Altamaha pottery and European-manufactured artifacts may reflect ritual and/or feasting activities that involved both the Guale and the Spanish. The diversity of ceramic stylistic and technological attributes exhibited by the features’ ceramics may be indicative of greater Native American cultural diversity brought on by the aggregation of formerly independent Guale groups at Shell Ring II after 1660. Postmolds near these features, along with the large circular basin located to the east, may represent the remains of structures built and used by the community’s Guale and/or Spanish inhabitants.

Collectively, these data make the area north of Shell Ring II a strong candidate for the location of the Spanish mission of San Joseph de Sapala and its associated Guale communities. Future archaeological research should focus on further defining the size and composition of this important mission period occupation and exploring the kinds and intensity of cultural interactions and exchanges that took place between mission period Native American groups, like the Guale and the Yamasee, and the Spanish clergy and military personnel who lived among them.

## NOTES

1. As with most archaeological projects, the University of Kentucky Sapelo Island mission period Archaeological Project (SIMPAP) would not have been possible without the assistance of many individuals, agencies, foundations, colleges and universities, and museums. When you work on an island with no access other than by boat, you rely on the assistance of others even more. In our case, this involved giving us permission to work on Sapelo, providing transportation to and from the island by boat, giving us a very comfortable place to stay, providing vehicles to assist in our fieldwork and helping us to keep the ones we brought with us running, cooking meals for our field school students, and answering the many questions we had about conducting archaeological research in such an isolated location as Sapelo Island. Being able to work on Sapelo is a privilege that few archaeologists ever experience, and we thank all of those who made our work possible.

We would especially like to acknowledge the assistance and support of Georgia State archaeologist David Crass and Fred Hay, Dorsett Hurley, and Buddy Sullivan of the Sapelo Island National Estuarine Research Reserve. Without their long-term interest in our work and their strong backing over the years, none of our work would have been possible. Other individuals and groups who have provided invaluable guidance, assistance, support, and advice include Dennis Blanton, Chester DePratter, Ed Henry, Kim and Stephen McBride, Phil Mink, Elizabeth Reitz, Marvin Smith, Stanley South, Beverly Straube, John Worth, David Hurst Thomas, Victor D. Thompson, and the residents of the Hogg Hammock community. We would particularly like to acknowledge the late George Walker of Hogg Hammock who, along with his wife, Lula, cooked the wonderful, delicious, and very filling barbecues and Low Country boils during our stays on the island. This paper is a revised and expanded version of a paper presented at the 2008 meeting of the Society for Georgia Archaeology and published in *Archaeological Encounters with Georgia’s Spanish Period, 1526–1700* as a joint publication of the Society for Georgia Archaeology and the Institute for Global Initiatives and edited by Dennis B. Blanton and Robert A. DeVillar (2010). We thank the editors for giving us permission to use this information in this new paper.

2. Most of the information contained in this chapter is based on field investigations and artifact analyses conducted before 2009. However, a few artifacts recovered since 2008 are shown in the figures because they are better examples of artifact types found earlier.





CHAPTER 14  
THE GUALE LANDSCAPE OF SANTA  
CATALINA DE GUALE:  
30 YEARS OF GEOPHYSICS  
AT A SPANISH COLONIAL MISSION  
ELLIOT H. BLAIR<sup>1</sup>

COLONIALISM AND PRACTICE

For the last two and a half decades, theories of practice have had increasing influence on archaeological thinking (e.g., Shanks and Tilley, 1987: 71–72; Dobres, 2000; Barrett, 2001; Pauketat, 2001; Dornan, 2002). In particular—most often drawing upon the work of Anthony Giddens’s (1979, 1984) structuration theory or Marshall Sahlins’s (1981, 1987, 1990) explorations into the relationship between structure, event, and history—colonial archaeologies have employed or advocated practice-based approaches (Lightfoot, 1995, 2005, 2006; Lightfoot, Martinez, and Schiff, 1998; Martinez, 1998; Silliman, 2001a, 2001b, 2006, 2009, 2010; Mills, 2002; Wesson, 2008). These approaches have had considerable influence because they successfully shift the analytical framework of colonial archaeology from objects to actions. This is of particular importance for archaeological studies of culture contact that have increasingly rejected acculturation models that often rely upon simplistic and problematic artifact ratios to quantify culture change (e.g., Redfield, Linton, and Herskovits, 1935, 1936; Herskovits, 1938; Quimby and Spoehr, 1951; Foster, 1960; Spicer, 1961; White, 1975; Brain, 1979; Brown, 1979b, 1979c; Farnsworth, 1987, 1992; Smith, 1987). Such approaches have been rejected, among many reasons, for being either too unidirectional in how they model the effects of power relationships for culture change or for failing to account for structural power imbalances (e.g., Cusick, 1998; Worth, 2006). While other approaches for theorizing and describing colonial culture change have been employed, such as cre-

olization (Ferguson, 1992; Deetz, 1996; Cusick, 2000; Dawdy, 2000; Delle, 2000; Mullins and Paynter, 2000; Wilkie, 2000), hybridization (e.g., van Dommelen, 2005), and ethnogenesis (Sider, 1994; Hickerson, 1996; Hill, 1996, 1998; Voss, 2008a, 2008b; Stojanowski, 2010), practice-based approaches have been effective by highlighting native agency, as well as by being particularly well suited for archaeological materials. Indeed, as Lightfoot, Martinez, and Schiff (1998: 201–202) have argued:

Change and persistence in multi-ethnic contexts pertaining to the construction of social identities may be best addressed by considerations of daily practices involving domestic life and the organization of space.... it is through daily practices—how space is structured, how mundane domestic tasks are conducted, how refuse is disposed of—that people both organize and make sense of their lives... The ordering of daily life may be observed in archaeological contexts by examining the arrangement and use of space in the built environment (both intramural and extramural areas), the organization of domestic activities (e.g., food preparation, cooking, tool production and maintenance), and the spatial pattern of refuse disposal.

In addition to focusing on *what* objects are incorporated into peoples’ daily lives, rather than *how* they are incorporated, acculturation models have also been heavily critiqued for reifying a simplistic colonized/colonizer dichotomy that

fails to account for indigenous diversity. But, in addition to shifting the locus of investigation from things to actions, a focus upon daily practices also allows closer attention to be paid to the interactions and associations of multiple subordinated communities within colonial settings. That is, such an approach can allow us to move beyond a colonized/colonizer dichotomy and consider the entanglements of diverse native peoples brought into contact during colonial situations. In this vein, Lightfoot and Martinez (1995: 488) argue that while colonial interactions must be explored at multiple scales, an emphasis upon the microscale investigation of multiple, and overlapping, axes of social organization is particularly warranted. Specifically, they suggest that:

cross-cutting, overlapping groups and boundaries may be defined and recombined at different temporal and spatial scales of analysis in colonial contexts. Depending on the axes of variation used to recruit members into factional groups (e.g., kin, gender, social relations, political affiliations, religion, class), different combinations of people may be mobilized together for social, political, and economic reasons.

Both of the above points—that a practiced-based colonial archaeology can both avoid the pitfalls of acculturation studies and help frame research questions around the intersections of new factional groups in colonial contexts—are appropriate for thinking about mission research in the southeastern United States. This is particularly true as we increasingly understand that colonial communities (at Spanish missions and elsewhere) were comprised of diverse, and sometimes poorly integrated, populations. In this chapter I explore how ongoing work at Mission Santa Catalina de Guale on St. Catherines Island is currently addressing these concerns. I begin by giving a brief overview of the limited spatial information available on mission pueblos in Spanish Florida (see fig. 14.1), followed by a discussion of indigenous diversity and identity in the Spanish mission province of Guale. I follow this with an overview of 30 years of geophysical survey at Mission Santa Catalina, suggesting that this research provides one possible methodological foundation for engaging with contemporary theories of colonialism. Specifically, I argue that

geophysical surveys—by providing broad-scale spatial data about how communities are organized—facilitate practice-based archaeological investigations that explore interactions between households, neighborhoods, and diverse, multi-ethnic residential units.

#### MISSION SANTA CATALINA DE GUALE AND LA FLORIDA: THE SPATIAL ORGANIZATION OF COMMUNITIES

Following Pedro Menéndez de Avilés's 1565 founding of St. Augustine, the administrative capital of the Spanish colony of La Florida, missionization was quickly initiated among the indigenous populations of Florida, Georgia, and South Carolina. And, after several missionization attempts and failures in the 16th century (Lowery, 1905; Oré, [1617–1620] 1936; Marrotti, 1984, 1985; Lyon, 1984, 1987, 1992; Hoffman, 2002; Francis and Kole, 2008, 2011; Kole, 2009; Worth, 2009b), Mission Santa Catalina de Guale, the principal *doctrina* of the province of Guale, was firmly established on St. Catherines Island in 1605 (Lanning, 1935; Geiger, 1937; Thomas, 1990; Worth, 1995; Milanich, 2006; Worth, 2009b).

Archaeological survey and excavations at Mission Santa Catalina, conducted by David Hurst Thomas and the American Museum of Natural History in the late 1970s and 1980s, in conjunction with documentary research, systematic augering, and geophysical evidence, established the location of the mission and defined the general structure of the central mission quadrangle. These excavations have yielded considerable information about the architecture of the mission quadrangle (Thomas, 1987, 1988a; Saunders, 1990; Thomas, 1993b, 2009a, 2009b, 2010a), the biocultural and bioarchaeological makeup of the mission population (Griffin, 1989; Larsen, 1990; Schoeninger et al., 1990; Griffin, 1993; Griffin, Lambert, and Driscoll, 2001b; Larsen, 2001a; Larsen et al., 2001; Stojanowski, 2001, 2004, 2005a, 2006, 2010; Winkler, 2011), mission burial practices (Thomas, 1988a; Blair and Sanger, 2007; Blair, 2008a; Blair, 2009a; Blair, Pendleton, and Francis, 2009; Winkler, 2011), the exploitation of vertebrate resources (Dukes, 1993; Reitz and Dukes, 2008; Reitz et al., 2010), and mission-era ceramics (Brewer, 1985; Saunders, 1992, 2000a, 2009; May, 2008; Thomas, 2009a). The mission complex itself (see fig. 14.2), likely

surrounded by a stockade, consists of the church (*iglesia*), two friaries (*conventos*) built sequentially, one on top of the other in the 16th and 17th centuries, a 17th-century kitchen (*cocina*), two wells, and a central plaza. Associated with the church is a shell-covered *atrio* and the mission cemetery (*campo santo*) (Thomas, 1987, 1988a; Saunders, 1990; Thomas, 1993b, 2009b).

The cemetery, located beneath the floor of the church, was excavated by Clark Spencer Larsen from 1982 to 1986 and yielded the remains of 431 native neophytes, many found with extensive grave furnishings (Larsen, 1990; Blair, Pendleton, and Francis, 2009; Winkler, 2011; Russell, Hutchinson, and Larsen, n.d.). Surrounding the mission complex is the aborigi-



Figure 14.1. Map of Spanish Florida showing Spanish missions and provinces mentioned in the text.

nal habitation area (pueblo), including the sites designated as Fallen Tree (9Li8) and Wamassee Head (9Li13) (Thomas, 1987; May, 2008). This surrounding area (see fig. 14.3) has been variously subdivided as the Pueblo North, Pueblo East, Pueblo West, and Pueblo South for a variety of analytic purposes (Blair, Pendleton, and Francis, 2009; Thomas, 2009a; Reitz et al., 2010; Thomas, 2010a), but the designations of these sectors have not been demonstrably linked to any type of emic spatial structure (e.g., ethnic

neighborhoods, chiefly lineages).

While no historic maps exist of the pre-1680 mission on St. Catherines Island, archaeological identification and interpretation of excavated features were aided by a 1691 map of Mission Santa Catalina de Guale de Amelia (Florida) (Thomas, 1987, 1988a, 1993b) (see fig. 14.4). This site, located on Amelia Island, Florida, was the post-1684 iteration of Mission Santa Catalina de Guale (Georgia) (Milanich and Saunders, 1986; Saunders, 1988, 1993; Worth, 1995, 2009b,

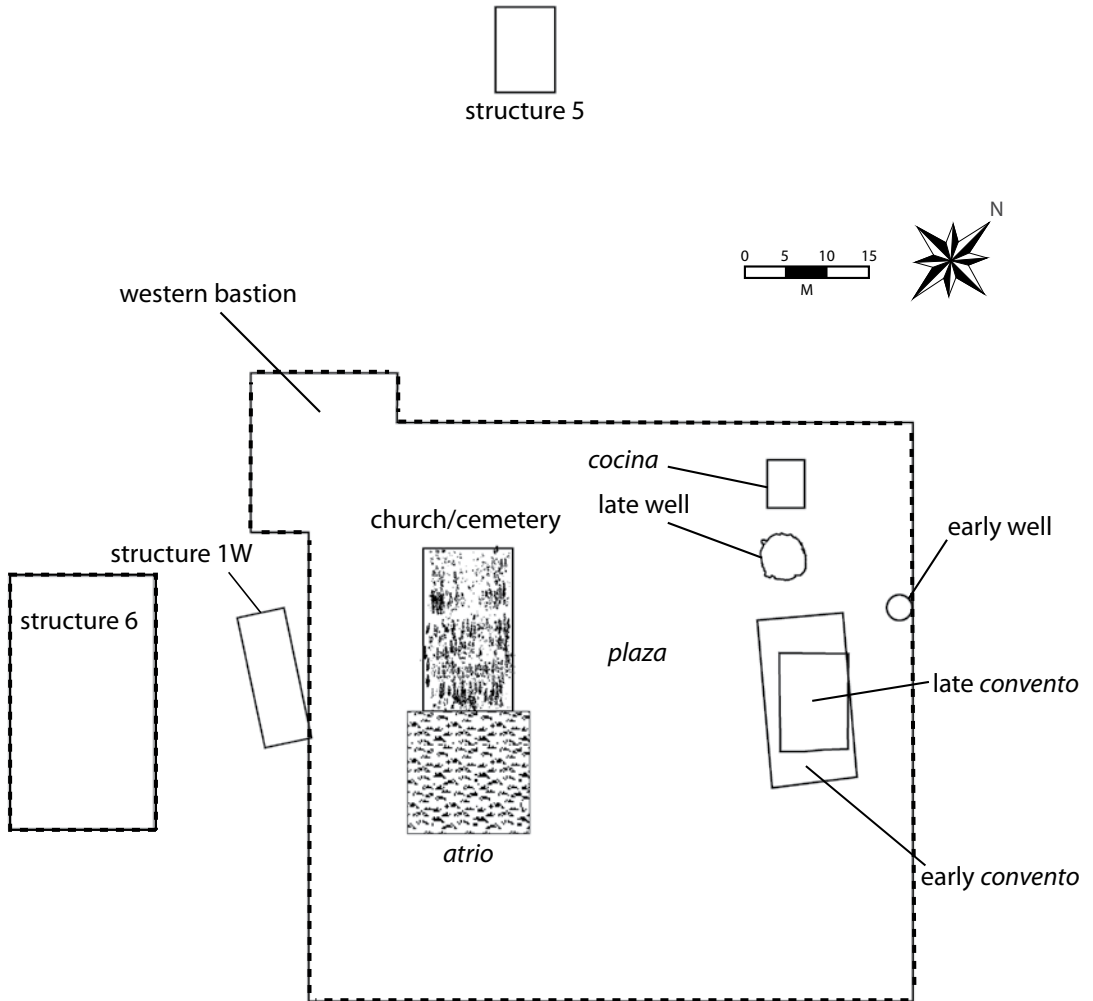


Figure 14.2. Map of Mission Santa Catalina de Guale quadrangle, oriented along the mission grid system, with “mission north” at the top of the page (after Blair, Pendleton, and Francis, 2009: fig. 15.8).

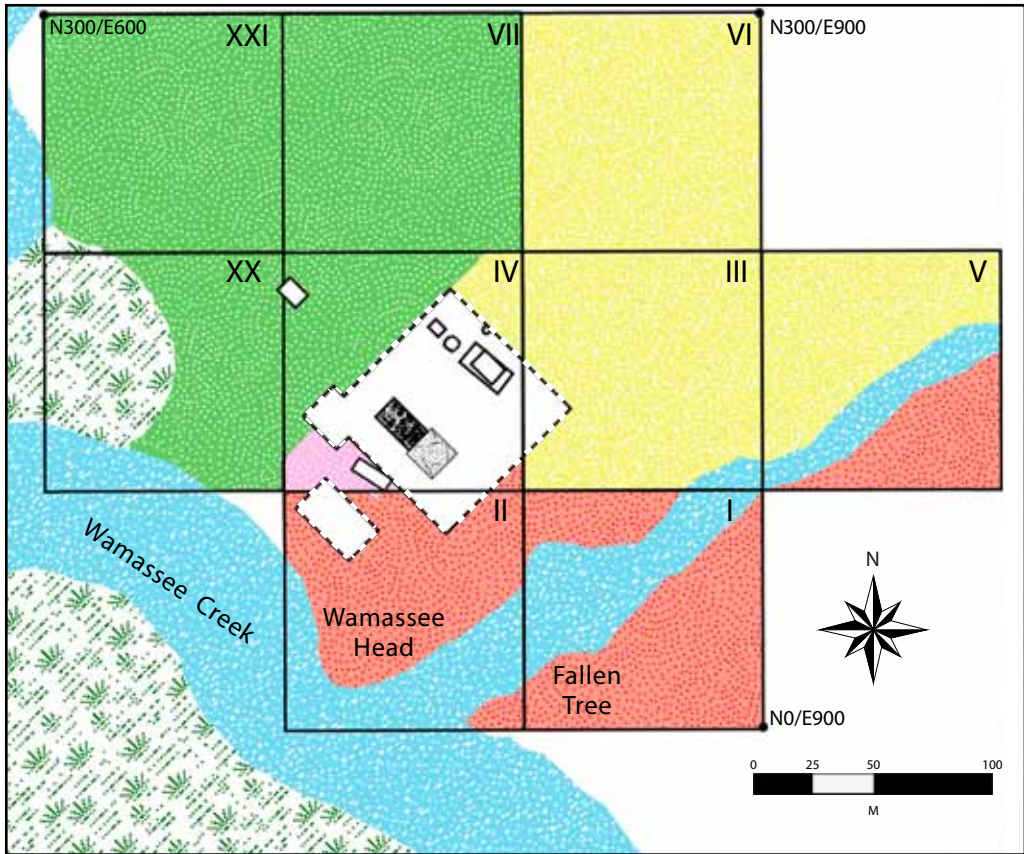


Figure 14.3. Map of Mission Santa Catalina de Guale and Pueblo (after Blair, Pendleton, and Francis, 2009: fig. 15.7).

2009a). Several researchers have suggested that this map might represent a more generalized plan for Spanish missions in Florida, and thus may be directly applicable to the St. Catherines Island mission (Thomas, 1987; Saunders, 1990, 1993).

Additional details and expectations for the site structure can be derived from the 1573 Laws of the Indies, City Planning Ordinances, particularly the spatial relationship between the plaza, church, etc. (Crouch and Mundiño, 1977; Mundiño and Crouch, 1977; Crouch, Garr, and Mundiño, 1982; Thomas, 1987; Saunders, 1990).<sup>2</sup> Both the historic maps and the planning ordinances, however, emphasize the organization of the mission quadrangle, not the outlying habitation areas of the mission residents. At Mission Santa

Catalina, systematic augering conducted within a roughly 150–200 m radius around the mission quadrangle overwhelmingly confirmed the presence of dense concentrations of mission-era occupational debris in this region (Thomas, 1987: 114–116, figs. 25, 27).

Recently, Thomas (2008: chap. 32, fig. 32.14), has extensively described the distribution of Altamaha (mission) period sites on St. Catherines Island, noting the contraction of mission period components to the vicinity of Mission Santa Catalina. Indeed, he documents only 14 sites on the entire island having Altamaha or Spanish ceramics—most of which occur within 1 km of the mission. Figure 14.5 plots the location of all sites on St. Catherines Island from which either Alta-

maha ceramics and/or 16th–17th-century European ceramics have been recovered. This figure differs slightly from that presented in Thomas (2008: chap. 32, fig. 32.14) in that it also includes sites from the St. Catherines shoreline survey (DePratter, Paulk, and Thomas, 2008), burial mounds with contact-era interments (Larsen and Thomas, 1982; Larson, 1998), as well as isolated finds and recent survey and excavation data. Tables 14.1 and 14.2 briefly summarize these mission period sites and isolated finds.

Even with this updated redraft of Thomas’s

(2008: chap. 32) figure 32.14, the pattern is the same: mission-era ceramics on St. Catherines are almost entirely concentrated in the immediate vicinity of Mission Santa Catalina (see also Thompson et al., chap. 16, for further discussion of this distribution). Indeed, if we exclude burial sites and sites where fewer than five Altamaha and/or colonial-era historic sherds were recovered, the picture becomes even more circumscribed.

Altamaha ceramics have been recovered in small quantities at transect sites to the north of the mission: site 9Li210, located roughly 300 m

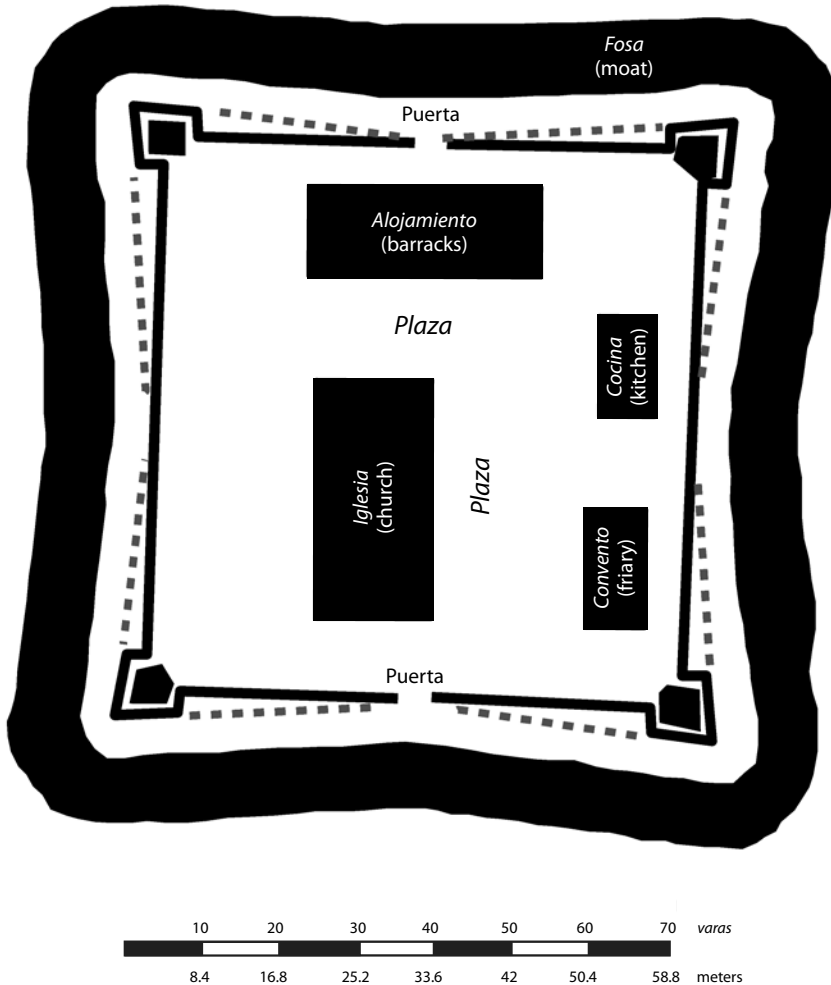


Figure 14.4. Redraft of the Mission Santa María map (after Thomas, 1987: figs. 7 and 8).

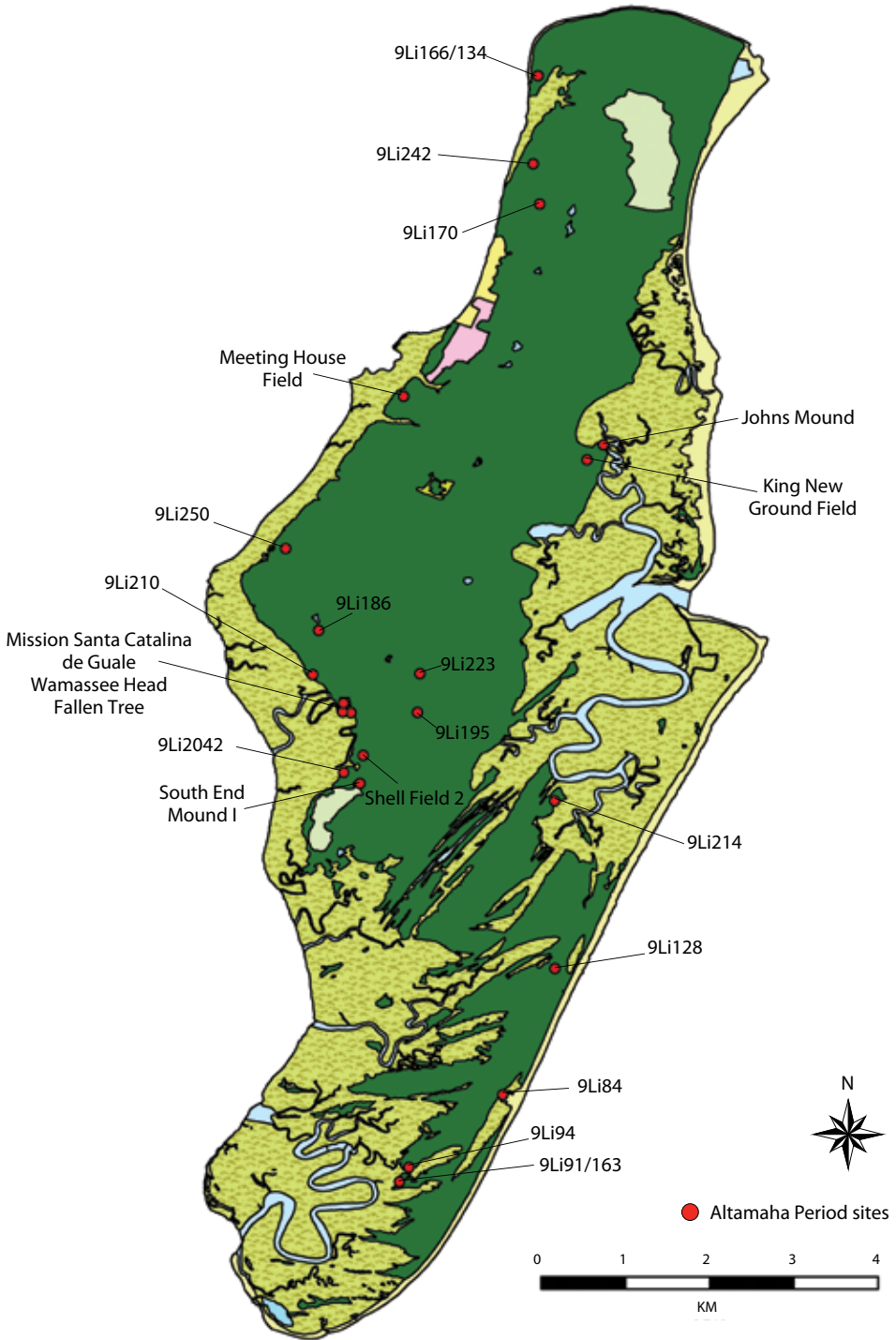


Figure 14.5. Distribution of Altamaha Period sites and isolated finds on St. Catherines Island (after Thomas, 2008: fig. 32.14).

TABLE 14.1  
Distribution of Altamaha Period Sites on St. Catherines Island

State no.	Common name	AMNH no.	Transect	Altamaha ceramics	All diagnostics	Non-diagnostics	Historic sherds	Total ABO
9Li003	South End Mound I	114	—	32 <sup>a</sup>	—	—	—	—
9Li008 <sup>b</sup>	Fallen Tree	441	I-6	345	382	920	3	1302
9Li013 <sup>b</sup>	Wamassee Head	208	I-6	2926	3374	1637	265	5011
9Li015	Shell Field 2	473	I-1	1	47	43	2 olive jar	90
9Li018	Johns Mound	110	—	30	—	—	—	975
9Li019	King New Ground Field	202	F-6	1	859	260	—	1119
9Li021	Meeting House Field	203	—	0	—	—	1 Columbia Plain	—
9Li084	Jungle Road 3	335	M-1	3	90	32	—	122
9Li091/163 <sup>c</sup>	—	342	N-1	0	38	83	6 El Morro; 1 annular ware	121
9Li094	—	345	—	13	13	75	—	88
9Li128	—	379	L-6	1	65	5	—	70
9Li166/134 <sup>d</sup>	—	385	A-1	2	7	2	—	9
9Li170	—	411	C-6	2	—	—	—	58?
9Li186	—	430	H-6	92	176	34	—	210
9Li195	South New Ground Field 7	443	I-6	3	4	30	—	34
9Li210	—	475	H-1	63	98	187	—	285
9Li214	Cracker Tom Hammock	483	J-6	4	70	63	—	133
9Li223	South New Ground Field 4	492	H-1	1	26	20	—	46
9Li242	Little Sam Field	517	B-1	21	30	30	—	60
9Li250	—	525	G-6	2	57	7	—	64
9Li274	Mission Santa Catalina de Guale	600	I-6	—	—	—	—	—
9Li2042	—	663	—	present	—	—	1 olive jar	—

<sup>a</sup> This number does not include the Altamaha Line Block burial urn illustrated by Moore (1897).

<sup>b</sup> The ceramic counts reported from these sites only include sherds recovered in the transect survey excavations (Thomas, 2008).

<sup>c</sup> Ceramic counts from this site only include sherds recovered during transect survey excavations (Thomas, 2008). Ceramics recovered during excavations in 1992 and 2007 are not included, though Altamaha sherds are noted in the 1992 fieldnotes.

<sup>d</sup> Thomas (2008: table 14.1) reports this site as 9Li134; elsewhere it is designated 9Li166.



TABLE 14.2  
**Distribution of Altamaha Period Isolates on St. Catherines Island**

Shovel test	Transect	Closest site	Note
31	F-6	40 m from 9Li178	1 Altamaha stamped
50	G-6		1 Irene complicated or Altamaha Line Blocked and a glass fragment
1	I-6	associated with 9Li8/13	1 Irene/Altamaha punctated rim
6	I-6	associated with 9Li8/13	1 Altamaha Incised, 1 Altamaha stamped or Irene
17	I-6	60 m to 9Li196	1 Altamaha or Irene stamped
21	I-6	45 m north of 9Li193	1 Altamaha stamped
22	I-6	25 m south of 9Li192	1 Altamaha Line Blocked
23	I-6	17 m north of 9Li192	1 Altamaha Incised and punctated
28	I-6	9Li190	1 Altamaha
29	I-6	9Li190	3 Altamaha
7	J-6	9Li194	1 Irene/Altamaha
16	J-6	9Li194	2 Irene/Altamaha (1 decorated)

to the northwest of the current extent of mapping at SCDG, appears to be primarily an Altamaha Period site,<sup>3</sup> with site 9Li186, 500 m further north, also potentially containing Altamaha ceramics. To the south, Shell Field 2 (9Li15) contains olive jar fragments and Altamaha sherds (Griffin, 1965; Thomas, 2008: chap. 20, 582–583) as does the adjacent site 9Li2042.<sup>4</sup> To the east of the mission, Altamaha ceramics have been found in low concentrations for almost the full width of the island—most recovered in a number of shovel test pits excavated along transect I-6 (Thomas, 2008: chap. 20). Outside of this area, the only nonburial mound concentrations and nonisolate mission-era materials recovered have been from Little Sam Field (9Li242) and 9Li94 (DePratter, Paulk, and Thomas, 2008; Thomas, 2008: chap. 32, 1041). Very broadly then, we might suggest that the mission pueblo spans an area of roughly 1.5 km north-south and about 1.5 km east-west—much of this, particularly as the site extends to

the east, likely consists of outlying fields, rather than habitation areas (Thomas, 1993b).

While this is a large area, it does not come close to the area described by Captain Dunlop in 1687, who wrote: “...where the great Settlement was we see the ruins of severall houses which we were informed the Spaniards had deserted for ffear of the English about 3 years agoe; the Settlement was great, much clear ground in our view for 7 or 8 miles together” (Dunlop, 1929c: 131). And, even though his description is very likely considerably “exaggerated” (Thomas, 1993b: 25), it is clear that the mission pueblo at SCDG was a very extensive settlement.

Beyond this brief overview of the archaeology of the central quadrangle of Mission Santa Catalina and of the distribution of mission-period artifacts on St. Catherines Island, the question remains: what do we actually know about the spatial organization of mission pueblos? The answer to this question is pretty simple: not really that much. In 1978, Lewis Larson described

contact period Guale settlements (his Sutherland Bluff Complex) as follows:

The Sutherland Bluff villages, like those of their pre-Spanish Guale ancestors, were located along the tidal creeks and rivers. These sites present a different picture from the Pine Harbor sites. The numerous shell middens of the earlier sites are absent during the Spanish period—not that shell was no longer present in the middens, rather the low moundlike heaps were not now built. The Sutherland Bluff shell seems to have scattered over the entire site in rather an even layer. Perhaps, as evidence from the Harris Neck site seems to indicate, the shell was deposited along the edge of the site bordering the marsh or river.<sup>5</sup> One has the feeling that, quantitatively, the amount of shell on the sites is much smaller than that on Pine Harbor sites. [Larson, 1978: 132]

In more detail, and drawing upon historical documents describing the 1666 town of Orista, Jones (1978) described the likely appearance of a mission-era Guale town, categorizing it as having a “dispersed” pattern, with individual homes and field plots scattered around the town plaza and ceremonial buildings (see also Thomas, 1987, 1988a, 1993b; Saunders, 2000a, 2000b; Worth, 2004a; see also Sipe, this volume, chap. 12). But, beyond these two descriptions—one an impressionistic observation and the other a documentary account of an unmissionized, non-Guale town (cf. Jones, 1978)—we still have little archaeological data about the actual physical layout of a mission pueblo.<sup>6</sup> The most detailed descriptions of Guale mission communities, in fact, are primarily drawn from considerably limited ethnohistoric and archaeological data and are somewhat, and openly, speculative (Thomas, 1987, 1988a, 1988b, 1990, 1991, 1993b, 2011b; Saunders, 2000a, 2000b; Worth, 2004a). But, almost certainly, as described by Thomas (2009a: 72), the pueblo likely consisted of rectangular structures, separated by streets, and perhaps divided into neighborhoods. Also present would have been a ball court and a council house (perhaps two!—see Worth, 1995: 30).

In addition to the work at Mission Santa Catalina, excavations have occurred at several mission sites within the province of Guale (for an ex-

tensive review of these excavations see Thomas, 1987). At Fort King George, the likely location of Mission Santo Domingo de Talaje (through 1661) (J. Caldwell, 1943; S. Caldwell, 1953, 1954, n.d.; Kelso, 1968; Thomas, 1987: 94–97, fig. 14, 15; Worth, 1995), excavations have yielded a number of overlapping native structures dating to the Spanish period. A posthole pattern, located beneath a midden at the Pine Harbor site, the possible location of Mission Santa Clara de Tupiqui (through 1674) (Larson, 1978, 1980b: 42, fig. 44), is the lone interpretable set of structural remains excavated at this site. Moreover, much of the site was destroyed prior to extensive mapping (Larson, 1984), leaving us with a poor understanding of its broader spatial organization. Larson (1953) does report, however, more than 100 discrete shell middens ranging for about a mile along the marsh edge and up to a quarter of a mile inland. Mortuary excavations by Cook (1980a) provide much of the evidence for mission-era components at this site.

The Sutherland Bluff site has been proposed by Francis and Kole (2011) and Jones (1978: 205) as the location of Nuestra Señora Guadalupe de Tolomato. Excavations there (Larson, 1953), revealed a number of postholes with mission-period artifacts, but no alignments were discernible (see Thomas, 1987). Excavations at the Thomas landing site at Harris Neck, proposed by Worth (2009a) to be the early location of Mission Tolomato and by Francis and Kole (2011) to be the location of Mission Talapo, have revealed seven Spanish period structures (Larson, 1980b: 39, fig. 32; Braley, O’Steen, and Quitmyer, 1986: 35, fig. 3 and 13; Thomas, 1987: 100, fig. 116). Additionally, mapping of both shell middens and subsurface features has occurred at this site, but the overall town plan is still little understood.

Most recently, excavation and survey at Mission San Joseph de Sapala (Jefferies and Moore, 2010; this volume, chap. 13) on Sapelo Island provides some detail about mission site structure. They note at least 10 discrete shell middens containing mission-era materials in the immediate vicinity of Shell Ring II that continue to the north for several hundred meters (Jefferies and Moore, 2010: 78, figs. 6.5 and 6.7).

To the south, in the province of Mocama, on Amelia Island, Florida, significant excavations have been conducted at the sites of Mission Santa María de la Sena (through 1665) and the relocated site of Mission Santa Catalina (1683–1702)

(Saunders, 1988, 1990, 1993, 2000a). Additionally, recent work has also occurred at San Juan del Puerto (Dickinson and Wayne, 1985; Dickinson, 1989; Gorman, 2008a), San Pedro de Mocama (Rock, 2006, 2010), and Santa Cruz y San Buenaventura de Guadalquini (Ashley, Rolland, and Thunen, this volume, chap. 15). In neither Guale nor Mocama to the south, however, has substantial work taken place within the habitation areas of the native pueblos to the extent necessary to yield detailed evidence of either settlement structure or to provide extensive architectural detail regarding domestic structures.

Elsewhere in Spanish Florida (e.g., interior Timucua and Apalachee), excavations outside of mission quadrangles have happened at San Martín de Timucua (Weisman, 1992; Saunders, 1996), Mission Patale (Marrinan, 1993), and Mission San Luis de Talimali in Apalachee province in western Florida (McEwan, 1991, 1992; Scarry and McEwan, 1995; Shapiro, McEwan, and Vernon, 1992), as well as extensively at the Nombre de Dios site at Fountain of Youth Park in St. Augustine (Deagan, 2009c). In most cases, however, these investigations have yielded little data about the spatial patterning of the pueblo areas of the mission complex (cf. McEwan, 1992; Deagan, 2009c), focusing instead on architectural details of individual structures. There are some more extensive details of town plans provided by research in the Apalachee province (Shapiro, 1987; Bryne and Marrinan, 1988; Marrinan, 1990; McEwan, 1991, 1992; Shapiro, McEwan, and Vernon, 1992; Marrinan, 1993; Scarry and McEwan, 1995; Hann and McEwan, 1998), but these too generally highlight individual structures rather than broader spatial patterning. For example, at Mission San Luis, archaeological work—particularly topographic mapping and intensive auger survey—identified the fort, church complex, cemetery, central plaza, and Apalachee and Spanish villages (including evidence of animal corrals) (McEwan, 1992; Hann and McEwan, 1998). Testing in the Apalachee village area, however, only revealed evidence of one aboriginal domestic structure—a round building roughly 20 m in diameter. This has been interpreted as a likely elite (chief's) residence. The absence of additional domestic structures, as well as additional settlement pattern survey data (Bryne, 1986) and ethnohistoric accounts, has been interpreted as an indicator that the broader community was dispersed in a series of hamlets

and farmsteads, rather than nucleated around the mission itself (McEwan, 1992; Scarry and McEwan, 1995; Hann and McEwan, 1998).

This brief summary highlights the still considerably limited understanding of the spatial organization of mission communities in La Florida. As emphasized by Lightfoot, Martinez, and Schiff (1998), however, this is exactly the type of research that is crucial in order to engage in a practice-based archaeology of colonialism.

#### NATIVE IDENTITY AND MISSION SANTA CATALINA

At the time of first contact, Guale can best be described, at least sociopolitically, as a complex chiefdom—consisting of roughly 50 communities organized with two tiers of political organization above the community level (Jones, 1978; Worth, 2003, 2004a). While there has been debate over the boundaries, membership, and organization of the Guale chiefdom, most researchers agree that it can be subdivided into between three and six constituent local chiefdoms. Each local chiefdom likely consisted of principal paired towns, alternating as the local seat of power, and a number of smaller subordinate communities (Jones, 1978). During missionization it was the principal towns within each subordinate chiefdom that were initially established as *doctrinas*. Following the establishment of the *doctrinas* the Spanish initiated various *reducción* policies, where native peoples residing outside the *doctrina* were relocated into aggregated communities, to both combat population loss and to facilitate conversion and missionization (Stojanowski, 2006; Worth, 1995, 1998, 2009a).

While it seems intuitive that such population movements would have significant implications for internal community solidarity and integration, during the 17th century the Spanish argued that the social effects of such population aggregation were negligible. Indeed, in 1617, in response to significant population loss in the Timucuan administrative province, several Franciscan friars petitioned the king, writing:

We request that Your Majesty would be served to command that, whenever these necessities occur, as long as the governors are advised by the [Franciscan] prelate, these disordered [settlements] should be drawn together since there is not one

inconvenience, *through those that have to join together not being from different families or languages, but rather friends of friends, brothers of brothers, and relatives of relatives beforehand* [Worth, 1998: 28; emphasis added by Stojanowski, 2006: 40, citing Pareja et al., 1617].

Such an argument (extrapolated to Guale), however, would presuppose a cohesive “Guale” identity. Discussing just this issue, for both the Guale and their precontact ancestors, Rebecca Saunders (2001: 82–83) states that “the primary allegiance and identity of the Guale ... was with the village that served as the [local] chief’s residence and area ceremonial center ... [and] it is still unclear from the documents the extent to which the historic Guale considered themselves a coherent group. [The Guale] ... seemed to have maintained more allegiance to a town... than to any larger group.” Recent ethnohistorical research, considering factionalism and intrachiefdom conflict, has also explored this same issue, asking similar questions about the degree of political and social solidarity within Guale (Kole, 2009; see also Thomas, 2010b; Francis and Kole, 2011).

Additionally, the Pareja quotation above refers to only one variety of population relocation and minimizes the extent and importance of social identities internal to the various provinces of Spanish Florida. Christopher Stojanowski (2006: 29) has defined four different varieties of population aggregation in Spanish Florida: stage 1 and 2 *congregación* and types 1 and 2 *reducción*. Stage 1 *congregación* refers to the aggregation of local villages into a single *doctrina* while stage 2 is the aggregation of different *doctrinas* of the same province to a single location. Type 1 *reducción* is the complete replacement and relocation of populations across provincial boundaries and type 2 *reducción* refers to the immigration of nonmissionized native groups from outside Spanish Florida. Each of these types of population movements and consolidations would have different implications for the social and biological structure of mission communities. Here I will briefly provide an overview of how Mission Santa Catalina de Guale was involved in each of these stages of population aggregation (see table 14.3).

Beginning in 1605 with the redistribution of Franciscan friars after the resolution of the

1597 Guale rebellion, it is certain that stage 1 *congregación* began, at least informally (Stojanowski, 2006: 38). While the specifics of such community-level aggregation are little documented and are rarely mentioned by the Spanish, the names, lineages, and identities of the relocated subordinate communities persist in the documentary record throughout the 17th century—that is, spatially distinct satellite and subordinate communities continue to be documented as distinct lineages and entities even after being physically relocated and aggregated within central towns (Worth, 2002).<sup>7</sup> Episodes of stage 2 *congregación*—in which principal *doctrinas* are aggregated—are much better documented than stage 1. Mission Santa Catalina was involved in several such moves. These include the aggregation of Mission San Diego de Satuache with Mission Santa Catalina on St. Catherines Island in 1663 and the 1680 relocation of this aggregated community with the combined San Joseph de Sapala and Santa Clara de Tupiqui missions on Sapelo Island. In 1683–1684 this aggregation of four Guale *doctrinas* (Santa Catalina, San Diego, San Joseph, and Santa Clara) was involved in an episode of type 1 *reducción* when the aggregated community was moved to Amelia Island within the Mocama mission province, the latter to the north end of the island and the three former to the previous location of Mission Santa María de Sena. While immigrant Yamassee and Escamaçu groups were involved in episodes of type 2 *reducción*—short-term relocations into the Guale and Mocama provinces—there are no clearly documented instances where such incidents of *reducción* would have directly affected the structure of the Mission Santa Catalina community (at its original location), nor is there documentary evidence that type 1 *reducción* affected Mission Santa Catalina at its original location on St. Catherines Island (for detailed discussions of this process see Worth, 1995, 2009a).

But, did the well-documented examples of stage 1 and stage 2 *congregación* at Mission Santa Catalina have any substantial effect on either the social or biological structure of the mission community? The previously discussed letter from Father Pareja et al. (1617 [translated by Worth, 1998]) suggests that such episodes of *congregación* should have been a virtual nonevent in terms of social effects. Similarly, Christopher Stojanowski (2001, 2005a, 2006) has argued that because both stage 1 and stage 2 *congregación*

TABLE 14.3  
**Types of Population Aggregation in Spanish Florida,  
 with Examples Involving Mission Santa Catalina de Guale**

Aggregation process	Definition	Example	Source
Stage 1 <i>Congregación</i>	Aggregation of local villages	Largely undocumented aggregation of subordinate communities of the Guale-Tolomato chiefdom aggregating at Mission Santa Catalina	Stojanowski, 2006: 38
Stage 2 <i>Congregación</i>	Intraprovincial consolidation of <i>doctrinas</i>	Relocation of Mission San Diego de Satuache to Mission Santa Catalina de Guale ca. 1663–1666	Worth, 2009a: 186
Type 1 <i>Reducción</i>	Interprovincial consolidation of <i>doctrinas</i>	Relocation of Mission San Diego de Satuache and Mission Santa Catalina de Guale to the former Santa María on Amelia Island in 1684	Worth, 2009a: table 8.4
Type 1 <i>Reducción</i>	In-migration of nonmissionized groups	Yamasee community established at Santa María on Amelia Island (1667–1683)	Worth, 2009a: table 8.3

operated entirely within Spanish defined provinces and extant indigenous chiefdoms, there should be no biological significance to such aggregation. John Worth (1995: 47, 2002) has demonstrated, however, that population aggregation—even intraprovincial consolidation—was not a process of aggregating and “homogenizing,” but rather a process during which (some) preexisting social identities were maintained and perpetuated.

Indeed, Stojanowski’s own evidence from Santa Catalina shows a level of biological heterogeneity, postaggregation, that is unexpected if “Guale” is understood to be a biologically integrated group. Using dental measurements from the Mission Santa Catalina cemetery, Stojanowski evaluated the phenotypic variability of the population—comparing the assemblage with precontact communities and with other mission populations, both from Guale and from elsewhere in Spanish Florida. Importantly, he found significantly increased phenotypic variability at Mission Santa Catalina (GA) compared with precontact Irene communities on the Georgia coast (Stojanowski, 2001, 2003, 2004, 2005a, 2005b, 2006; Stojanowski and Schillaci, 2006). While other biodistance studies of the Guale missions have suggested that there may not be a direct ancestral relationship between the precontact resi-

dents of the Georgia coast and the burial population at Mission Santa Catalina (Griffin, 1989, 1993; Griffin, Lambert, and Driscoll, 2001a; see also Kole, 2009), the important point in Stojanowski’s study is that while measurements of phenotypic variability are not a means of assessing direct biological relationships, the phenotypic variability within this temporally and geographically distinct precontact population is significantly less than the Mission Santa Catalina population—emphasizing increased biological diversity of the mission community. There are several conclusions—none mutually exclusive—that can be drawn from this: (1) There were significant, and undocumented, incidents of type 1 and type 2 *reducción* occurring and restructuring the biological population at Mission Santa Catalina; (2) individuals of Spanish, African, etc. descent may have contributed more to the biological population at Mission Santa Catalina than has previously been considered; (3) the phenotypic variability documented by Stojanowski is more directly related to factors other than population aggregation (e.g., epidemics, changes in diet, the inclusion of commoners within mission cemeteries); and/or (4) the biological impact of stage 1 and 2 *congregación* has been significantly underestimated.

What seems clear—especially if this final possibility is entertained—is that the enhanced diversity documented by Stojanowski, the persistence of distinct chiefly lineages, and perhaps little loss of town-level social identities during aggregation would indicate that reduced mission settlements—including “single-ethnicity” ones (Worth, 2009a) like Mission Santa Catalina—were actually diverse and pluralistic communities. The question then is: how can the social entanglements that must be correlates of mission aggregation be explored archaeologically? The answer, in my opinion, as expressed earlier, is certainly a practice-based approach to colonialism, which, if taken seriously, necessitates a greater emphasis on household archaeology (e.g., Wilk and Rathje, 1982; Hirth, 1993; Tringham, 1995; Allison, 1999; Tringham, 2001; Wesson, 2008; Pluckhahn, 2010) specifically paying attention to intrasite diversity (e.g., Thomas, 1993b: 25; Reitz et al., 2010) and how households interact across the neighborhood and community scales.

#### GEOPHYSICAL SURVEYS AT MISSION SANTA CATALINA DE GUALE

In the previous two sections I presented two discussions that connect to the theoretical introduction to this chapter. First, I suggested that the spatial organization of neophyte pueblos at southeastern Spanish missions has been considerably underexplored, but that this is precisely the type of data needed in order to conduct a robust, practice-based study of mission-era colonial entanglements. Second, I suggested that the indigenous diversity and factionalism internal to the province of Guale needs to be better explored and the same type of data (i.e., the spatial organization of mission pueblos) from aggregated (both within and across provincial boundaries) mission communities is also precisely what is needed to address this research question. In the following section I discuss how geophysical survey at Mission Santa Catalina has been, and continues to be, a powerful methodological tool for addressing such concerns.

Geophysical survey has been an important methodological tool for archaeologists working on the Georgia coast for a considerable period of time (Shapiro and Williams, 1984; Garrison, Baker, and Thomas, 1985; Thomas, 1987; Keene, 2002; Thompson et al., 2004; Thomp-

son, 2006; Mahar, 2010, this volume, chap. 3). For the last 30 years, geophysical surveys have played a critical role in archaeological and geological research on St. Catherines Island. While many of these surveys have had notable successes as prospection methods, much of this research has also proceeded with an agenda specifically designed to link the “technology into the mainstream of archaeological theory” (Thomas, 1987: 64). Thomas (1987: 64–67) forcefully argues that geophysical surveys must be integrated into archaeological middle-range theory building—specifically linking archaeological concepts with observed phenomena. Somewhat similarly, Thompson et al. (2011) argue for an “inquiry-based geophysics” in which the theoretical justification for an archaeological project must be directly connected with the geophysical methods employed (see also Thompson and Pluckhahn, 2010). In their example they suggest that shallow geophysical techniques can be linked with theoretical approaches such as persistent place (e.g., Schlanger, 1992; Barton et al., 1995; Dooley, 2004; 2008; Daehnke, 2007; Thompson, 2010) grounded in landscape archaeology. Kvamme (2003) discusses the potential for geophysics to be linked to landscape-based approaches due to the increased survey coverage that is possible because of the increasing speed of newer geophysical instruments and the increased processing power of modern computers. At Mission Santa Catalina, such enhanced coverage—if not broad enough to facilitate a landscape approach—can allow for a “community study approach” (e.g., Cusick, 1995) and provide the type of resolution necessary to facilitate comparative analyses of households and neighborhoods. Indeed, such enhanced resolution is essential in order to obtain the degree of community spatial understanding necessary to conduct a comparative, practice-based archaeology of colonialism as advocated earlier—particularly one concerned with internal social diversity.

At Mission Santa Catalina, the history of geophysical surveys can be roughly divided into three iterations, occurring in the 1980s, 1990s, and at present, each of which can be explicitly articulated as an “inquiry-based approach” (Thompson and Pluckhahn, 2010; Thompson et al., 2011). The first iteration had three specific goals: (1) locating and defining the mission complex; (2) defining the configu-

ration of unexcavated structures and features, and (3) employing remote sensing as a tool for middle-range theory building (Thomas, 1987). The second iteration, discussed in Thomas (1993b), had similar goals but was additionally oriented toward specific questions about the spatial layout of the Guale pueblo. The most recent iteration has the same goals as both of the previous series of surveys, but with a theoretical focus transformed by recent developments in archaeologies of colonialism, household archaeology, and guided by new insights emerging from ethnohistoric research (discussed earlier). Each iteration has also capitalized on advances in geophysical instrumentation and increased computing power.

#### EARLY GEOPHYSICAL SURVEYS ON ST. CATHERINES ISLAND<sup>8</sup>

**MAGNETOMETRY:** The very first shallow geophysical survey at Mission Santa Catalina occurred in May of 1981. At this time, using a Geometrics Proton Magnetometer, Model 806A, Ervan Garrison and James Tribble conducted a magnetometer survey of Quad IV at 2 m intervals (Garrison, Baker, and Thomas, 1985; Thomas, 1987). Initial field testing of high-magnitude anomalies resulted in the identification of three mission-era structures: the church (St. 1), the *cocina* (St. 2), and a barrel well (St. 3). Because the initial results were so promising, magnetometry survey was expanded to cover portions of 9 ha (Quads I, II, III, IV, VI, VII, XX, XXI, and XXII) (Garrison, Baker, and Thomas, 1985; Thomas, 1987: 122, fig. 134). In this follow-up survey a Geometrics G-816 proton magnetometer was employed using similar field procedures. These data, including a re-survey of Quad IV using the latter instrumentation, is what is presented in Thomas (1987) and Garrison, Baker, and Thomas (1985). Based on these initial surveys, several initial conclusions were drawn about site structure at Mission Santa Catalina and some middle-range theories, equating specific magnetic signatures with their archaeological correlates were proffered (Thomas, 1987: 118–126; fig. 132–137).

**RESISTIVITY:** In May of 1982 an electrical resistivity survey was initiated at Mission Santa Catalina when Mark Williams and Gary Shapiro, using a Williams Model 103 resistivity meter (Williams, 1984), surveyed portions of Quad IV (Thomas, 1987: 126–134). The initial results

were so successful that the survey was expanded to Quad IV in its entirety, and some quite extraordinary conjectural interpretations of site structure across Quad IV were generated (Shapiro and Williams, 1984; Thomas, 1987: fig. 42–43). These surveys directly resulted in the identification and excavation of structure 4, the mission *convento*.

**GROUND PENETRATING RADAR:** Ground Penetrating Radar (GPR) was also employed within Quad IV, and while the results have been described as a considerable success (identifying potential palisade and bastion architectural features to the northwest of the mission quadrangle), the profiles are still mostly unanalyzed (Thomas, 1987: 140). Additionally, because they were conducted prior to the use of GPR time slice software (Goodman, Nishimura, and Rogers, 1995; Conyers, 2010), they provide little broad-scale interpretable imagery.

At roughly the same time these “first generation” surveys were taking place at Mission Santa Catalina de Guale (and the Pueblo North and Pueblo East sectors), similar geophysical exploratory surveys were occurring south of the freshwater creek at the Fallen Tree site (9Li8) (May, 2008)—elsewhere subsumed as a portion of the Pueblo South sector (Blair, Pendleton, and Francis, 2009; Reitz et al., 2010). In 1983, May conducted limited GPR surveys at Fallen Tree; these were most successful in identifying the extent of shell middens and the location of Lewis Larson’s 1959 excavations (May, 1985). May (1983; 2008) also completed roughly two-thirds of a hectare of magnetometry survey at Fallen Tree, using similar instrumentation and protocols to those described earlier (conducted in portions of Quads I, II, and XXVIII). These surveys were hindered by the large quantity of modern metal debris scattered across the site (May, personal commun., 2011) but provided some assistance in placing excavation units.

#### GEOPHYSICAL SURVEY ON ST. CATHERINES ISLAND IN THE 1990S

As was strongly articulated by Thomas (1987), the initial geophysical surveys at Mission Santa Catalina were not conceived merely as prospection tools, but rather they were intended as tools for delineating site structure and building middle-range theories linking geophysical signatures and archaeological features. As part of this vision, and building upon a belief in multitechnique geophysical methods, begin-

ning in the early 1990s, a second iteration of geophysical survey with new instrumentation and data processing techniques was initiated at Mission Santa Catalina (Thomas, 1991; 1993b). This second phase of geophysical research was designed to both help delineate the broader site structure of Mission Santa Catalina, as well as test the utility of additional geophysical techniques (e.g., electrical conductivity). Based upon preliminary testing at Meeting House Field (9Li21) using paired proton precession magnetometers, a fluxgate gradiometer, and an EM conductivity meter, as well as testing of 1200 m<sup>2</sup> in Quads IV and XX at the mission pueblo using conductivity and gradiometry, a broad-scale geophysical survey of the mission pueblo was initiated using paired proton precession magnetometry and electrical resistivity (Weymouth, 1990a, 1990b, 1991, 1992, n.d.). During this time, approximately 7.3 ha (Quads I, II, III, IV, VII, XX, XXI) were surveyed using a Geoscan RM-15 resistivity meter and approximately 2.3 ha of magnetometry data were collected using two Geometric 856 magnetometers. While these surveys were promising, and in fact were highly successful in terms of prospection—directly leading to the partial excavation of two Mission Period structures (structures 5 and 6, see Blair, 2009b: 155)—because of the lack of powerful geophysical data processing software and modern mapping software, the potential for these surveys to reveal large-scale community patterning was significantly limited. However, Weymouth (1992) correctly noted that the resistivity surveys were particularly good at identifying broad-scale patterns, but that the magnetometry data appeared to be limited to identifying metal point features—either artifacts from the colonial period or modern trash. This latter conclusion, however, is partially due to a limitation of the technology used in the survey. While the Geometric 856 instrument was quite sensitive ( $\pm 0.2$  nanoteslas [nT]) the sampling interval (1 m) was not nearly fine-grained enough to identify low-magnitude features or identify low-magnitude broad-scale patterning.

#### 21ST-CENTURY GEOPHYSICAL SURVEY ON ST. CATHERINES ISLAND

Beginning in 2006, a third round of geophysical surveys on St. Catherines Island was initiated and continues to be conducted. While these initially focused upon the two Late Arch-

ic shell rings on the island, the St. Catherines Shell Ring (9Li231) and the McQueen Shell Ring (9Li1648) (Sanger, Blair, and Semon, 2007; Mahar, 2008, 2010, this vol., chap. 3; Elliott, 2009; Sanger and Thomas, 2010), there has also been a renewed interest in geophysical data from Mission Santa Catalina de Gualle. In 2007, Lauren Hayden (2007), as part of her Master's thesis research, initiated a reexamination of the extant geophysical data from Mission Santa Catalina. From this she was able to resurrect large portions of the second-generation resistivity data, transforming unformatted data files into interpretable xyz data spreadsheets, which she subsequently imported into Surfer. But, due to the difficulties inherent in attempting to utilize a mapping software as a substitute for a geophysical processing software (see Keene, 2002), she found many edge discontinuities in the data due to the fact that the St. Catherines pueblo surveys had occurred over several years and had employed varying instrumentation settings (primarily determined by varying soil moisture conditions). Additionally, she also found much of the magnetic data to be stored in now unreadable file formats, though, as noted earlier, these data had previously been largely useful only as a means of identifying specific metallic point features.

In part based on her observations, in 2009 we began a multistage geophysical project at Mission Santa Catalina that was designed to begin addressing some of the “gaps” in the previous research. First, while it was clear that magnetometry has great potential at the site (Garrison, Baker, and Thomas, 1985; Thomas, 1987), we were still unable to clearly identify broad-scale, low-magnitude magnetic anomalies from the site. And, as was evident from the second-generation survey (see Weymouth, 1992), significantly greater sampling density was required for the benefits of magnetic survey to be truly reaped. Therefore, we began conducting additional magnetic surveys across all quads of the mission pueblo using a Geoscan FM256 fluxgate gradiometer (0.1 nT resolution), with a sample interval of 0.125 m and a traverse interval of 0.5 m. To date, approximately 9 ha of magnetometry survey have been conducted using this instrument configuration at the mission pueblo, including Fallen Tree. This survey includes all of Quads I, II, III, V, VI, VII, XX, XXI, XXVI, and XXVIII, as well as portions of Quad X.



The second stage in the reinitiated geophysical research involved importing the 1990s resistivity data (primarily decoded by Hayden [2007]) into the Geoplot geophysics processing software. Importing the old data into a geophysical processing software allowed despiking, edge-matching, multiplication, and high-pass filtering to be applied to the data to remove the majority of edge discontinuities, enabling broad-scale patterns to become increasingly discernible across a uniform dataset. Additionally, the ability to high-pass filter the data allows higher and lower resistance data to be readily separated for independent analysis. Because the entire mission pueblo was not surveyed in the 1990s, we are also collecting additional resistivity data from unsurveyed areas (specifically Quads V, VI, X, and XXVI) striving to ensure graphical continuity between data collected on multiple instruments over a 30-year period. Figure 14.6 shows the clear congruency between these data.

## DISCUSSION

The collection, analysis, and interpretation of the shallow geophysical data collected at Mission Santa Catalina is a continuing endeavor, with the integration of several decades of surveys and an enormous quantity of data presenting significant analytical hurdles. Nevertheless, the three decades of geophysical surveys already conducted continue to provide important insights into the site structure and community organization of Mission Santa Catalina, and these insights are critically important as we strive to conduct a practice-based archaeology of colonialism that examines how native peoples selectively incorporated both new and traditional material items into their daily practices within a variety of contexts.

Focusing on one area of the mission pueblo (see fig. 14.6)—the area located to the north and west of the mission quadrangle (Quads VII, X, XX, XXI, and XXVI)—it is quite apparent from the resistivity data that shell middens (some buried, some mounded), unequivocally correlated with low-resistance features, are not undifferentiated sheet midden.<sup>9</sup> It is very clear from the geophysical patterning that mission-era shell middens have a discrete and bounded configuration similar to those found during the late prehistoric Irene Period, though generally lesser in elevation.<sup>10</sup> Likewise, they are presumably as-

sociated with individual households or clusters of households (Crook, 1984, 1986; Pearson, 1984; Saunders, 2000b, 2000c; Thomas, 2008). It also seems highly likely that the high resistance, rectilinear features found interspersed among the discrete shell middens can be equated with domestic structures and open-space features. Indeed, Thomas's (1988a; 1993b) speculation about the spatial patterning of the mission pueblo (i.e., rectangular buildings separated by "streets") is well supported by the geophysical data. A close look at the data appears to show roughly linear areas of low resistance ("streets") separating the low-resistance shell deposits. These inferences from the geophysical data provide the foundation for future analyses at Mission Santa Catalina grounded in household archaeology and investigations of pluralistic social identities in a colonial context.

Zooming out, it is also clear that the pueblo surrounds all sides of the mission quadrangle, with the densest concentrations of midden deposits appearing to occur to the north, south, and west, with sparser deposits to the east. While these have previously been identified generically as the Pueblo East, Pueblo North, Pueblo West, and Pueblo South, these may have a rough correlation with differentiated neighborhoods within the pueblo.

Reitz et al. (2010: 153–158; see also Thomas, 2010b) have noted that the pueblo sector located to the south of the freshwater creek within what is known as the Fallen Tree site had access to greater quantities of venison and differential access to high-quality cuts of meat than did the people living north of the creek—both to the south and the north of the mission quadrangle. There were also significant differences in fishing strategies, fish diversity, and trophic-level exploitation between the different regions of the pueblo (Reitz et al., 2010).

Elsewhere I have observed that shell bead blanks occur in significantly greater quantities at Fallen Tree than at other regions of the pueblo, suggesting that the individuals living south of the freshwater creek were engaging in shell bead manufacture more intensively than those in other regions of the pueblo (Blair and Francis, 2008: 760; Blair, 2008b, 2009b: 155). While there are clearly multiple explanations for such spatial diversity across the pueblo, and Reitz et al. (2010) mention the use of different screen sizes, localized activity areas, and social differences (e.g.,

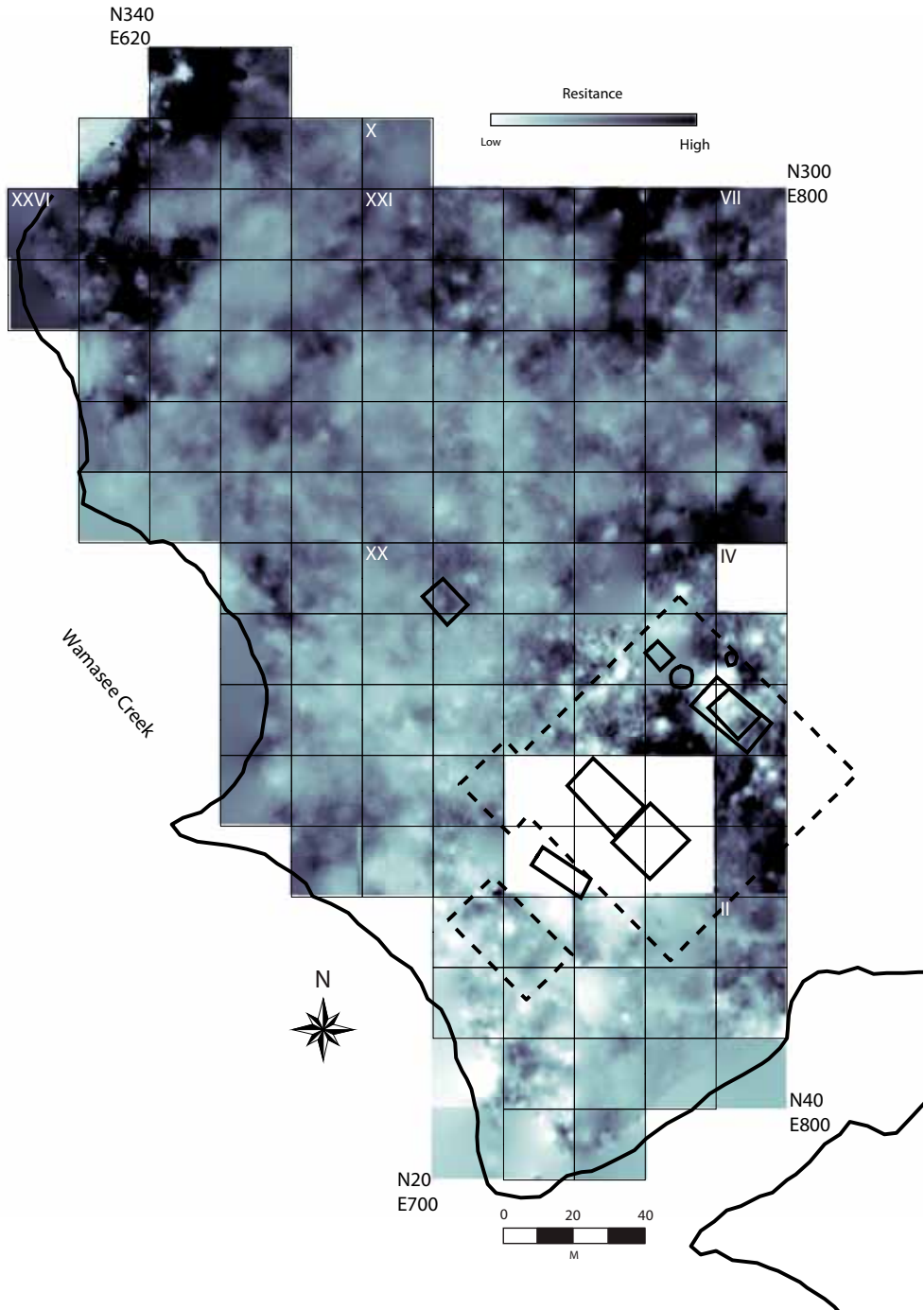


Figure 14.6. Composite image of 1980s, 1990s, and 2010 resistivity data at Mission and Pueblo Santa Catalina de Guale (Quad IV; Quads II, VII, X, XX, XXI, and XXVI).

status or ethnicity) as possibilities, this differentiation highlights my earlier point that greater attention needs to be paid to multiple axes of indigenous diversity in colonial contexts. While these two pieces of archaeological data highlight more general differentiation, it is only when we can look within neighborhoods and among households that we can truly begin to tease apart the various factional alliances that emerge and persist in colonial settings.

## CONCLUSIONS

Shallow geophysical surveys have been conducted at Mission Santa Catalina for more than three decades, and these have directly resulted in the identification and excavation of numerous archaeological features at the site (Thomas, 1987; 1988a; 1993b). Since the initial surveys were conducted in the early 1980s, geophysical instrumentation, computing power, and software processing capabilities have increased so that more, and higher resolution, data can be examined with more sophisticated graphical modeling techniques. Indeed, geophysical survey should not be a “one and done” enterprise—new surveys can continue to enrich our interpretive capabilities. Much has been made of the nondestructive nature of geophysical survey, and one implication of this is that sites can (metaphorically) be reexcavated, yielding new data and enabling new archaeological understandings to emerge. At Mission Santa Catalina this ability to survey and resurvey is allowing us to continue to address both the current relative lack of understanding of the spatial organization of mission communities and our emerging understanding of the diverse and pluralistic nature of colonial communities of Spanish Florida—providing precisely the types of information necessary to explore how “people repeatedly enact and reproduce their underlying structural principles and belief systems in the performance of ordering their daily lives” (Lightfoot and Martinez, 1998: 201). High-resolution, broad-scale geophysical surveys are a particularly powerful means of delineating community structure, providing the foundation for us to utilize practice-based theoretical approaches to culture contact on the household and community scales.

## NOTES

1. I would like to thank David Hurst Thomas and Lorann Pendleton for many years of support while working on St. Catherines Island. I would like to also thank the many field crews that have helped me collect geophysical data at Mission Santa Catalina—particularly Rachel Cajigas, Christina Friberg, Matthew Napolitano, Jennifer Salinas, Anna Semon, and Martin Walker, who helped me survey on many brutally hot August days without any complaint. Royce Hayes and the St. Catherines Island staff also provided extraordinary assistance in preparing the site for survey. I am also indebted to Lewis Somers for many hours of discussion about geophysical data collection and processing. Finally, I would like to thank Kent Lightfoot and the volume reviewers for helpful comments on earlier drafts of this paper.

2. Thomas (1987: 75) has argued that “The laws of the Indies theoretically applied only to permanent civic settlements—not temporary missions or military encampments—but in practice there was little distinction between the two types of settlement in North America. The familiar ordinances were applied equally to urban centers and mission outposts (Crouch et al., 1982: 28; see also Bolton 1917: 44).” Setha Low (1993, 1995, 2000), however, makes a strong argument that many of the features associated with Spanish communities in the New World in fact have many of their origins in pre-Hispanic architectural and spatial forms (e.g., plazas). She convincingly suggests that many of the rules established by the Laws of the Indies were actually appropriated by the Spanish from colonial settlements influenced by indigenous spatial conventions.

3. Surface collections at 9Li210 in February 2012 yielded significant numbers of Altamaha ceramics.

4. Slightly further to the south, South End Mound I also contains an Altamaha Line Block, Circle in Square, burial urn (Moore, 1998 [1897], Larson, 1998; Larsen, 2002; Thomas, 2008). Shovel test pits also yielded several possible Altamaha sherds at South End Field (9Li194) (Thomas, 2008: chap. 20, table 20.5) and Griffin (1965: 9) reported Altamaha ceramics from Shell Field I and suggested that it might be an “outlying portion” of the mission settlement.

5. However, more recent work at Harris Neck (Braley, O’Steen, and Quitmyer, 1986: 32) has described middens as “discrete,” and “compact and well circumscribed,” in addition to having areas of sheet midden. The areas of sheet midden however, only yielded sand tempered or undiagnostic sherds—seemingly predating the mission-era deposits.

6. But see Thompson et al. (this volume, chap. 16) for a discussion of postcontact Guale settlement on a regional scale.

7. This is similarly true for the other varieties of *congregación* and *reducción*.

8. Here I only briefly discuss the early geophysical surveys at Mission Santa Catalina; these have been covered in considerable detail by others (Garrison, Baker, and Thomas, 1985; see especially Thomas, 1987).

9. The isomorphic relationship between shell deposits and low-resistance features is supported by subsurface mapping of shell deposits with a total station, as well as by geophysical surveys elsewhere on St. Catherines Island.

10. Though there are some areas of sheet midden adjacent to the marsh and creek edges that are somewhat less discrete.





## CHAPTER 15

### MISSIONS SAN BUENAVENTURA AND SANTA CRUZ DE GUADALQUINI: RETREAT FROM THE GEORGIA COAST

KEITH H. ASHLEY, VICKI L. ROLLAND,  
AND ROBERT L. THUNEN<sup>1</sup>

#### INTRODUCTION

The Spanish Mission San Buenaventura de Guadalquini<sup>2</sup> was first established by the Franciscan Order at the southern end of St. Simons Island, Georgia, during the opening decade of the 17th century. For about 75 years it represented the northernmost Mocama mission. Threats of attack by English-sponsored slave raiders and French corsairs in the early 1680s, however, forced its removal to northeastern Florida as part of a widespread southward retreat of Georgia coastal missions. In Florida, the mission (renamed Santa Cruz y San Buenaventura de Guadalquini) was occupied from 1684 until 1696 when its inhabitants moved again, this time to the nearby Mocama mission of San Juan del Puerto. Though the exact location of the original St. Simons Island mission is unknown, we propose that the relocated community of Santa Cruz is associated primarily with the Cedar Point site (8Du81) on Black Hammock Island, Florida.

In this chapter, we first explore the pre- and postcontact Guale and Mocama territories of the Georgia coast, as we grapple with the possible shifting cultural affiliation of southern St. Simons Island or “Guadalquini.” Next, we review the mission period archaeology of St. Simons Island in an attempt to gain insights into the location of the original San Buenaventura mission. Following a brief overview of the mission’s history, our attention turns to the northeastern Florida coast as we summarize the results of recent excavations by the University of North Florida at the Cedar Point site. Emphasis

is placed on the site’s temporally restricted material assemblage (1684–1696) and how it compares to other coastal mission sites.

#### DELINEATING THE GUALE AND MOCAMA PROVINCES

The 16th-century social landscape of maritime Georgia included scores of native villages dispersed along the mainland coast and on most, if not all, barrier islands (fig. 15.1). Early historic accounts identify two primary indigenous tide-water groups: Timucua (Mocama) and Guale. Both maintained political organizations based on elite lineages and hereditary leadership and mixed subsistence economies that combined coastal foraging and maize farming (Ribault, 1964; Solís de Merás, 1964; Barrientos, 1965; Bennett, 1975; Lawson, 1992). The Guale<sup>3</sup> dominated the northern coastal sector, although the precise geographical extent of their territory has been subject to varying interpretations (see Jefferies and Moore, chap. 13; Blair, chap. 14; and Thompson et al., chap. 16, this volume for discussions on the Guale). Some researchers, such as Grant Jones (1978: 179), extend the Guale spatial range from the lower Satilla River (Georgia) to the North Edisto River (South Carolina). John Worth (2004a: 239–240), on the other hand, describes a smaller domain situated between the mouths of the Altamaha (south) and Ogeechee (north) rivers.

Two main factors account for the discrepancy between these two estimates. First, Jones includes the Orista/Escamaçu (Cusabo) chiefdoms of South Carolina in his depiction of the Guale

province, whereas Worth does not. Documentary evidence indicates that the Guale and Orista/Escamaçu were distinct polities during postcontact times, and archaeological data suggest a buffer zone centered at the mouth of the Savannah River separated them (Worth, 2004a: 240). Second, Jones places the Guale's southern boundary along the Satilla River, a supposition predicated on a once-held belief that San Buenaventura de Guadalquini was a Guale mission located on Jekyll Island. Probably for this same reason, Larson (1978: 120) placed the Guale's southern border at St. Andrews Sound, where the Satilla River empties between Jekyll and Cumberland islands. But

documentary evidence clearly places the 17th-century Guale mission province between the Altamaha and Ogeechee rivers.

Camden County, the southernmost of the Georgia coastal counties, was home to Timucua speakers at the dawn of European contact. In the decades following Hernando de Soto's *entrada* through northern Florida, Europeans learned that Timucua speakers covered a broad area, in fact, some 19,000 mi<sup>2</sup> of northern peninsular Florida and southeastern Georgia (Milanich, 2004: 219). They also discovered firsthand that the various and dispersed Timucua-speakers were not unified politically, but rather were a diverse collection

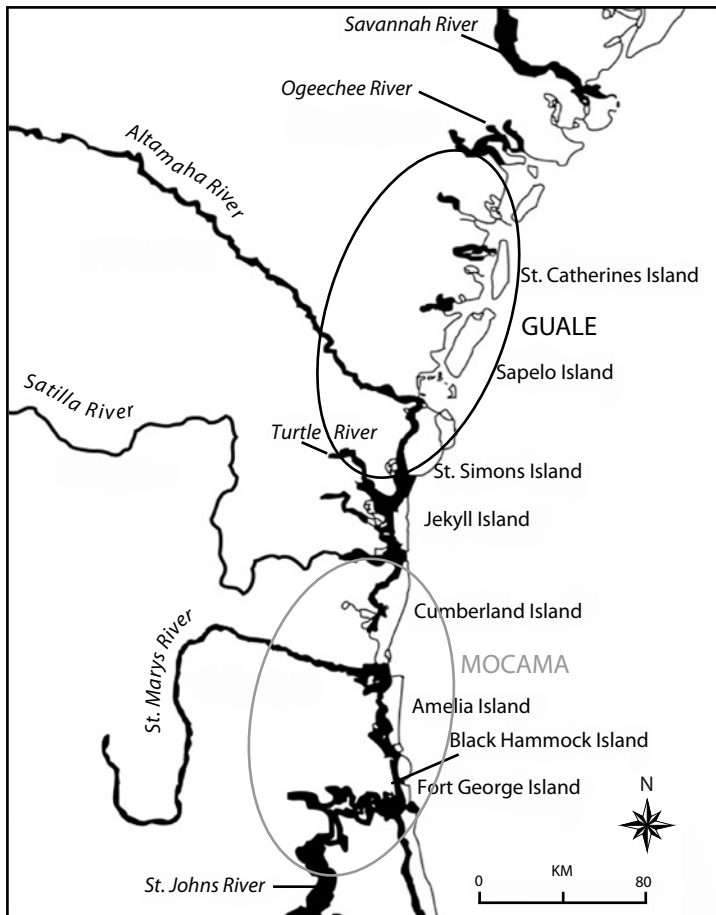


Figure 15.1. Georgia and northeastern Florida coast, including historic Mocama and Guale territories.

of autonomous chiefdoms actively engaged in mutually hostile rivalries and peaceful alliances (Hann, 1996: 4). Linguistically, they were divided into at least 11 regional dialects.

Along the Atlantic coast, the Mocama or maritime dialect was spoken by the natives of northeastern Florida and southeastern Georgia (Swanton, 1922; Milanich and Sturtevant, 1972; Deagan, 1978: 91; Granberry, 1993: 6). As the 17th century wore on, Spanish officials frequently referred to the coastal mainland-barrier island region from the St. Johns River (Florida) north to southern St. Simons Island as San Pedro or the Mocama Province (Hann, 1996: 18; Milanich, 1996: 98, 1999: 47; Worth, 2007a: 12). At the same time, the word *Timucua* was used specifically to refer to the natives of interior northern Florida, west of the St. Johns River and into the southern hinterlands of Georgia (Hann, 1996: 1; Milanich, 1996: 44; Worth, 1998: 16–17).

#### WHERE IS GUADALQUINI?

Beginning with John Swanton (1922: 41, 89), Guadalquini<sup>4</sup> was routinely equated with Jekyll Island by a litany of modern scholars (e.g., Lanning, 1935; Jones, 1978; Hann, 1986, 1990; Thomas, 1987; Bushnell, 1994). Ross (1923), who correlated Guadalquini with St. Simons Island, was a notable exception. In the mid-1990s, relying on information gleaned from newly translated Spanish documents along with a reassessment of previously available archival and cartographic evidence, John Worth (2007a: 195–196) convincingly argued that the Island of Guadalquini was St. Simons Island not Jekyll Island. The latter was in fact given the name “Isla de Ballenas” (Island of Whales) by the Spanish. Guided by the premise linking Guadalquini to Jekyll Island, past researchers erroneously situated the mission San Buenaventura on Jekyll Island instead of its correct position at the southern tip of St. Simons Island (Worth, 2007a: 195).

#### GUADALQUINI: MOCAMA OR GUALE?

The question is simple: were the pre- and postcontact inhabitants of the southern end of the Island of Guadalquini Timucua (Mocama) or Guale? The answer, however, is not simple. Or, rather, we think it is not. It is our opinion that a direct ancestral (or ethnic) link between the island’s 16th-century populations and those who

occupied the post-1605 Guadalquini mission has yet to be demonstrated. Moreover, it is quite possible that a Spanish-inspired remodeling of the social geography of coastal Georgia in the aftermath of the 1597 Guale rebellion transformed what had been an indigenous Guale island into a Mocama island by the first decade of the 17th century. In the following discussion, we attempt to marshal evidence that casts doubt on any presumed cultural continuity between pre- and post-contact Guadalquini populations. In doing so, we project a social and political dynamic onto the coastal landscape.

We begin with what is currently known about the occupants of Guadalquini. Seventeenth-century visitation records identify the inhabitants of Mission San Buenaventura de Guadalquini as Timucua, specifically Mocama speakers (Worth, 2007a: 195–196). A 1648 visitation reports that from Guadalquini one moved “on to the province of Guale,” providing indirect support for a Mocama ethnic affiliation (Hann, 1996: 176). Three decades later a more definitive cultural link is made to Mocama. As a Spanish emissary moved from the Guale Mission Santo Domingo de Asao at the northern end of St. Simons Island to Guadalquini, he switched from a Guale interpreter to one “of the language of Timucua” (Hann, 1993: 91; 1996: 234). In the early 1680s, as plans were being made to evacuate the Georgia coastal islands, Spanish officials suggested moving the villagers at San Buenaventura de Guadalquini to the Mocama-speaking mission of San Juan del Puerto in northeastern Florida, since both were “of the same tongue” (Bushnell, 1994: 165; Worth, 2007a: 39). There is nothing in the primary literature to suggest that San Buenaventura was anything other than Timucua.

What, if anything, can we garner from the earliest premission documents about Guadalquini? At present, the first known written reference to Guadalquini (Gualquini) appears in Spanish accounts relating to excursions along the lower Atlantic seaboard by French corsairs during the final quarter of the 16th century. In the fall of 1580, two French ships passed through the harbor of “Gualquini” (St. Simons Sound) and soon sought council with the local natives (Ross, 1923: 274, 276). Taking advantage of a warm reception, the French attempted to entice the Guadalquini to participate in a punitive plot against the Spanish and their Indian allies to the north. Lured into an alliance with gold coins, items of silver, and other

trade goods, the Guadalquini *caciques* apparently agreed to seek out allies and sow the seeds of Spanish contempt until the French returned the next spring to launch an assault on the Spanish garrison at Santa Elena (Ross, 1923: 278). Although the French plan of revenge, and perhaps usurpation, never materialized, the Guadalquini seem to have achieved some success in inciting anti-Spanish sentiments north of the Altamaha River, as 22 chiefs joined their alliance and 2000 warriors prepared for battle (Ross, 1923: 280).

Some researchers conclude that in A.D. 1580 the Guadalquini were Mocama, although Ross (1923) provides no direct evidence for this in the primary Spanish documents she cites. Both Hoffman (1990: 280) and Hann (1996: 10) apparently interpret Guadalquini's acceptance of the French proposal as indication of a rift between Guadalquini and the Guale and Escamaçu to the north. Hoffman (1990: 280) further construes Guadalquini's agreement to assist the French in an attack on the Spanish and their native supporters as a way for both the French and Guadalquini to "settle their scores with their enemies." This rendering of events, combined with the absence of Guadalquini from all primary lists of Guale villages and the now-known fact that the 17th-century Mission San Buenaventura de Guadalquini was occupied by Mocama, has led to the conclusion that the Guadalquini of the 1580 documents also were Mocama.

Such an inference, however, is open to question. First, it was the French who were intent on revenge, not the Guadalquini. We see no unequivocal passage in Ross (1923) that implicates the Guale and Escamaçu as enemies of Guadalquini. The Guadalquini appear to have been drawn into the French overture more by the promise of spoils that would make them "very rich" (Ross, 1923: 275) and less by the desire for revenge. The fact that the Guadalquini chief (*mico*) conveyed specific details of the French plan to at least two Guale chiefs implies little concern for protecting French interests (Ross, 1923: 276, 278). During the 1580 encounter, the French also established good relations with the Guale *mico* of Tolomato, who appears to have been a coconspirator in fostering anti-Spanish activities (Ross, 1923: 275, 280). The Guale were not united politically at this time, as both pro-French and pro-Spanish factions existed (Bushnell, 1994: 63). Villages seemingly allied themselves with one or the other foreign power in pursuit of their own agendas.

The tendency of scholars to depict the province of Guale as politically centralized under a paramount chief and possessing unity of purpose and action in their dealings with Europeans is a criticism of recent historiography (Kole, 2009; Francis and Kole, 2011). By the end of the 16th century, Guale political organization appears somewhat decentralized with varying degrees of chiefly autonomy.

Does the late prehistoric archaeological record of coastal Georgia provide any insight into where St. Simons Island fits in relation to the boundary between Mocama and Guale? While we understand the dangers of correlating pottery types with specific ethnic or political groups (Worth, 2009a: 179–181), we also believe an examination of coastal Georgia ceramics can cast light on the contact-era Mocama-Guale frontier. Since the 1940s, archaeologists working along the northern Georgia coast have attributed the manufacture of grit-tempered Irene pottery to the late prehistoric and contact-era Guale (Caldwell and McCann, 1941: 3; Caldwell and Waring, 1968: 123; Larson, 1978: 121; Pearson, 1978: 56; Cook, 1988: 2; Saunders, 2000a: 39–45; Deagan and Thomas, 2009). Irene pottery was also produced by the Orista-Escamaçu societies of coastal South Carolina as far north as Santa Elena (DePratter, 2009). While regional differences in assemblages likely exist, the Irene series is made up of plain, incised, and complicated (filfoot) stamped wares, adorned with a variety of temporally sensitive rim elaborations.

To the south, recent research in southeastern Georgia and northeastern Florida has put an end to any lingering suspicions that the St. Johns tradition is the archaeological correlate of contact (or even precontact) period Mocama (see Ashley, 2009). Clearly, grog-tempered San Pedro pottery is the signature ware of the 16th-century Mocama. The San Pedro pottery series consists mostly of Plain, Obliterated, Cob-Marked, and Check Stamped varieties, but Cord-Marked, Textile Impressed, and Complicated Stamped types also occur in small amounts (Ashley and Rolland, 1997). This is the same sherd-tempered ware collected by Milanich (1971, 1972) from shell middens at the mission site of San Pedro de Mocama on Cumberland Island, Georgia, in the early 1970s.

So where is the dividing line between the distribution of Irene and San Pedro ceramics along the Georgia coast? First, it is important to point



out that the southern Georgia coast, between the Altamaha and St. Marys rivers, has long been perceived by archaeologists as a “transitional zone” during the late prehistoric and early historic periods (Larson, 1958b; Cook, 1977; Deagan, 1978; R. Smith, 1984; Crook, 1986). From this perspective, past researchers viewed Glynn County as the southern periphery of Irene (Guale) populations and Camden County as the northern extent of St. Johns II (Timucua) peoples. Although we now know that San Pedro and not St. Johns is the material correlate of the 16th-century Timucua (Mocama) of Camden County, the transitional or buffer zone idea still holds merit.

Moving south from the Altamaha River into coastal Glynn County, there is a clinal decrease in the frequency of Irene pottery. Although a few sites near the northern tip of St. Simons Island and the Kent Mound at the island’s southern end contain occupational middens and burial mounds, little Irene pottery has been found on the adjacent mainland near Brunswick or Jekyll Island to the south (Cook, 1977; Crook, 2007). The quantity of Irene wares reported from these locales pales in comparison to that on sites north of the Altamaha River. South of the Turtle River in Camden County, Irene wares are rare and only occur in protohistoric contexts dominated by mission period San Marcos pottery (Kirkland, 1979: 22; Smith, 1984: 74–75; Espenshade, 1985: 333). San Marcos wares are most often referred to as Altamaha along the Georgia coast (see Jefferies and Moore, chap. 13 and Thompson et al., chap. 16, this volume, for discussions on Altamaha pottery). There are no Irene sites reported for Camden County.

A mirror distribution exists for San Pedro pottery, but this time the gradual decrease is from south to north starting at the St. Marys River in Camden County. San Pedro pottery occurs in high frequencies on sites south of the Satilla River, particularly in the Kings Bay area and on Cumberland Island (Milanich, 1971; Kirkland, 1979; Adams, 1985; Borremans, 1985; Rock, 2009). However, it has not been recorded for sites north of the Satilla River in northern Camden County, along mainland Glynn County, or on Jekyll Island. While perhaps partly influenced by sampling bias and lack of survey data, the tidewater zone between the Turtle and Satilla rivers has produced little, if any, San Pedro or Irene ceramics.

Spanish documents of the late 16th century

portray the Atlantic coast of La Florida as a dynamic and volatile landscape marked by both internal and external hostilities. The Guale were known to have had hostile relationships with neighboring groups, including the Orista and Mocama (Worth, 2002: 241). In fact, during the early days of the 1597 uprising, a group of Guale Indians undertook an aborted assault on the Mocama of Cumberland Island in an effort to kill their chief and other Christian Indians “for being allies of the Spanish” (Kole, 2009: 77). If the Guale and their neighbors were as antagonistic as European accounts lead us to believe, then it is likely that buffer zones might have existed between the differing coastal groups. As stated, an uninhabited zone existed from just north of the Ogeechee River to north of the Savannah River in South Carolina, separating the Orista and Guale groups. To the south, we propose that the area between the Turtle and Satilla rivers served as a wedge of unoccupied (or at least sparsely occupied) land between the 16th-century Guale and Mocama populations (see fig. 15.1).

Acceptance of such a buffer zone would place St. Simons Island within the southern limits of the Guale domain. The island<sup>5</sup> has been described as “minimally occupied” during the late prehistoric–early historic period by Cook (1988: 10), although he and others note that appreciable quantities of Irene pottery have been found at three sites (Taylor Mound, Couper Field, and Indian Field) at the northeastern end of the island and one (Kent Mound) near its southern tip (Wallace, 1975; Cook, 1977, 1978; Pearson, 1977a; Pearson and Cook, 2003). Only the latter demonstrated both early and late Irene components, which enabled Cook (1978, 1980b) to document stylistic changes in Irene pottery over time. The Taylor Mound was originally constructed during the Savannah II phase (A.D. 1100–1300), but was revived as a mortuary facility during the late Irene phase (Wallace, 1975; Pearson, 1977a; Pearson and Cook, 2003).

The Kent and Taylor mounds both contained intrusive postcontact Irene burials (flexed) with east-side pottery caches and historic artifacts that included copper coins, iron knife blades, awls, spikes, axes, and glass beads (Wallace, 1975; Pearson, 1977; Cook, 1978). Interestingly, many of these same items were given to the Guadalquini by the Spanish in 1580 (Ross, 1923), although the archaeological materials might somehow be associated directly or indirectly with

the failed 1526 Spanish colony of San Miguel de Gualdape (Hoffman, 1992). One significant shortcoming of Irene excavations on St. Simons Island has been an emphasis on burial mounds or other mortuary contexts.

Kent Mound, an Irene “burial mound-village site,” is situated a short distance north of the likely location of San Buenaventura (Cook, 1978: 1). The fact that it contained 16th-century historic burials suggests it was in use during the early postcontact period, perhaps at the same time as the 1580 encounter between Guadalquini and French corsairs. Thus, it would not seem too far of a stretch to equate the cultural affiliation of 1580 Guadalquini to those Irene peoples who interred their dead in the Kent and Taylor mounds. Nearly everything about the Kent Mound shows affinity to Irene phase mounds along the middle and northern Georgia coast, particularly the Pine Harbor mound on the mainland opposite Sapelo Island (Cook and Snow, 1983; Cook and Pearson, 1989). Not only is the pottery stylistically the same (including some late designs suggestive of broadly shared cosmological motifs), but so is the manner in which some vessels were interred in the mound (e.g., side caches) as well as their specific condition or modification (e.g., rim damage, basal perforation, encrustation) (Cook, 1980b: 168). A noticeable percentage of the Irene wares from the Kent Mound, however, were tempered with grit and finely crushed grog, a paste composition not known from any other Irene sites (Cook, 1978: 98).

Beyond pottery, the Kent, Taylor, and Pine Harbor mounds exhibited similar structural composition in the form of a shell core flanked and surmounted by sand fill. Each contained intrusive, 16th-century flexed burials, some of which were associated with European artifacts. Moreover, Kent and Pine Harbor, as well as Townsend mound along the mainland north of the Altamaha River, display “a high correlation between late Irene ceramics and SCC [sic] symbolism, exotic artifacts, and shell cups” (Cook, 1988: 19). A conspicuous difference between Irene mounds on St. Simons Island and those to the north is the absence of cremations and urn burials in Taylor and Kent mounds. Adjacent to all Irene mounds are villages marked by scores of individual shell heaps. While regional variation in Irene pottery and sites certainly exists along the Georgia coast, taken as a whole, a high degree of similarity in refuse disposal, pottery technology, and mortu-

ary ritual suggests a shared culture between Irene sites on St. Simons Island and those north of the Altamaha River—a cultural connection we would label Guale not Mocama.<sup>6</sup> This leads to a final query. If St. Simons Island was a Guale island at contact then why was the Mission San Buenaventura inhabited by Mocama? Admittedly, we do not know, but an answer might rest in the restructuring of the cultural landscape of the Georgia coast following the Guale rebellion of 1597. Subsequent to the killing of five friars by Guale dissidents, Spanish soldiers descended upon the Guale province and burned all villages, surplus stores, and agricultural fields in their sight (Geiger, 1936: 95; Francis and Kole, 2011: 45). In response the Guale fled inland, and “since they were removed from the sea, they could neither fish nor gather shellfish” (Geiger, 1936: 95). It is likely that if St. Simons Island was occupied in 1597, it was abandoned in the wake of Spanish reprisals. With the return of friars to the Guale province in 1605, missionization resumed, but the social geography of Guale was different (Kole, 2009: 69–90).

The raising of a cross at San Buenaventura during the first decade of the 17th century was critical for the Spanish colony, because this new mission represented the only barrier island *doctrina* between San Pedro on Cumberland Island and Santa Catalina on St. Catherines Island. Owing to its strategic location, this frontier mission would have served as a vital communication and island ferrying point between the Guale and Mocama provinces. To ensure success, did the Spanish move loyal Timucua/Mocama to the St. Simons Island to inhabit this start-up mission, in effect, altering the invisible boundary separating Guale and Timucua speakers? Perhaps Mocama villagers from Icafui/Cascange who were mainland subjects of San Pedro, or from the Mocama mission village of Puturiba at the north end of Cumberland Island, were relocated to the southern tip of St. Simons Island. Coincidentally, the Icafui/Cascange “were awaiting conversion” at the time the uprising broke out (Bushnell, 1994: 67). Interestingly, Cascange disappears from the primary literature around the same time that the Guadalquini mission emerges (John Worth, 2009, personal commun.). The placement of a nonlocal Mocama population at San Buenaventura, while intriguing, lacks documentary support at this time. But, on the other hand, there is nothing in the primary literature to reject such a hypothesis.

### MISSION PERIOD ARCHAEOLOGY ON ST. SIMONS ISLAND

Mission-period occupation of St. Simons Island was restricted temporally to the 17th century and included the Mocama mission of San Buenaventura de Guadalquini (ca. 1607–1684), the transplanted Guale mission of Santo Domingo de Talaje/Asajo (1661–1684), the unmissionized Escamaçu (Colones) community of San Simon (ca. 1672–1683), and the “pagan” Yamasee settlement of Ocotonico (ca. 1672–1683) (Worth, 2007a). At present, no formal archaeological investigations have been directed at uncovering evidence of any of these mission period sites. This, however, does not mean that artifacts reflective of these mission-related communities have not been found. To the contrary, 17th-century San Marcos/Altamaha pottery has been recovered from several locations on the island. Unfortunately, at some sites, information regarding the quantity and context of mission-period wares is obscured by the use of broad ceramic temper groupings that likely combine temporally distinct pottery types (e.g., Martinez, 1975; Wallace, 1975; Milanich, 1977).

Cannon’s Point, the northeastern fingerlike extension of St. Simons Island, has yielded mission-period sherds. San Marcos pottery was recovered from Couper’s Field (north and south) and Indian Field, being most prevalent at Couper’s Field North (Wallace, 1975). The co-occurrence of Irene and San Marcos vessels in a pottery cache in the Taylor Mound suggests a transitional assemblage (Wallace, 1975). The Taylor Mound vessels were similar to those of the Kent Mound (Fred Cook, 2010, personal commun.). Several archaeologists have implicated Cannon’s Point as the location of Mission Santo Domingo, which was moved to the north end of St. Simons Island in 1661 (Larson, 1980b; Thomas, 1987; Worth, 2009a). Worth (2009a) mentions Hampton (Butler) Point, the island’s northwestern fingerlike extension, as another possible area for this mission (Mullins, 1978).

While primary Spanish documents describe San Simon as 2 leagues south of Santo Domingo and Ocotonico as an additional league to the south, the archaeological locations of these 17th-century “pagan” communities are virtually unknown (Worth, 2007a: 195). Worth (2009a) recently proposed that San Simon might be found within the vicinity of the 18th-century English site of Fort Frederica.

In the 1681 Fuentes census, San Buenaventura is recorded as “being located on the southern point of this stated island [St. Simons] at a distance of three leagues” from Ocotonico on the Bar of Guadalquini (Worth, 2007a: 195). Unfortunately, little can be said at present about its archaeological whereabouts. Larson (1980b: 38) presents a map in which Cannon’s Point and the St. Simons Lighthouse (at the island’s south end) are denoted as “sites of the Spanish period that have been identified archaeologically,” but he does not discuss exactly what this means or what was found at these sites. Thus, it is unclear as to whether or not these represent Spanish mission locations. However, a San Marcos vessel fragment was purportedly part of a pottery collection from the lighthouse vicinity (Fred Cook, personal commun., 2010). A recent examination of the extreme southern shoreline of St. Simons Island by Fred Cook and Keith Ashley resulted in the recovery of a handful of water-worn sherds from the southwestern edge of the island, about one mile northwest (290°) of the modern lighthouse/pier. Diagnostic wares included Savannah check stamped, Irene filfot stamped, San Marcos line blocked, and Spanish olive jar. Thus, the most likely location for San Buenaventura is the southern end of the island between the lighthouse on the east and the Sea Island Golf Club on the west.

### SAN BUENAVENTURA Y SANTA CRUZ DE GUADALQUINI: A BRIEF HISTORY

Spanish documents detailing the establishment of San Buenaventura de Guadalquini have yet to be discovered (fig. 15.2). It is not mentioned in any of the friars’ letters of 1602–1604 or listed on visitation registers of village confirmations in 1606 and 1607. Its name, however, first emerges in a series of ecclesiastical papers penned between 1609 and 1616 (Hann, 1996: 75). This archival information places the founding of San Buenaventura likely between 1607 and 1609. The inland Timucua mission of Santa Isabela de Utinahica, situated up the Altamaha River, is believed to have aggregated at San Buenaventura sometime before 1655 (Worth, 2007a: 124). Census data are spotty, but the mission is reported to have had 40 persons (men?) in 1675 and 87 individuals older than 12 years of age in 1681 (Hann, 1996: 263; Worth, 2007a: 37, 199–201). The latter included 45 men and 28 married and 14 unmarried women. Among the

adults were 13 chiefs—a situation that attests to the persistence of chiefly lineages in the face of missionization and village aggregation (Worth, 2002). A 1683 census reports an adult male population of 43 for Guadalquini.

Other than an occasional passing reference or inclusion on mission lists, little primary information is available on San Buenaventura prior to the 1660s. In 1661 it is reported that a large contingent of Chichimeco raiders moved down the Altamaha River in canoes and rafts and descended upon the La Florida coast, seeking human merchandise meant for sale at slave markets in English Virginia (and later, the Caro-

lina colony). This was the first of a two-decade long string of slave raids that targeted Spanish coastal missions, signally what has been deemed “the beginning of the end for Guale and Mocama mission provinces” (Worth, 2007a: 15). Though the island of Guadalquini was spared on this occasion, it would not be as lucky in 1684. In the spring of that year a party of warriors invaded the community of San Simon. Although the English-supported slave raiders were repulsed by a mixed band of Spanish soldiers and Christian Indians from San Buenaventura, they reemerged a few days later on St. Catherines Island (Hann, 1996: 268–269; Worth, 2007a: 30–32). It was appar-

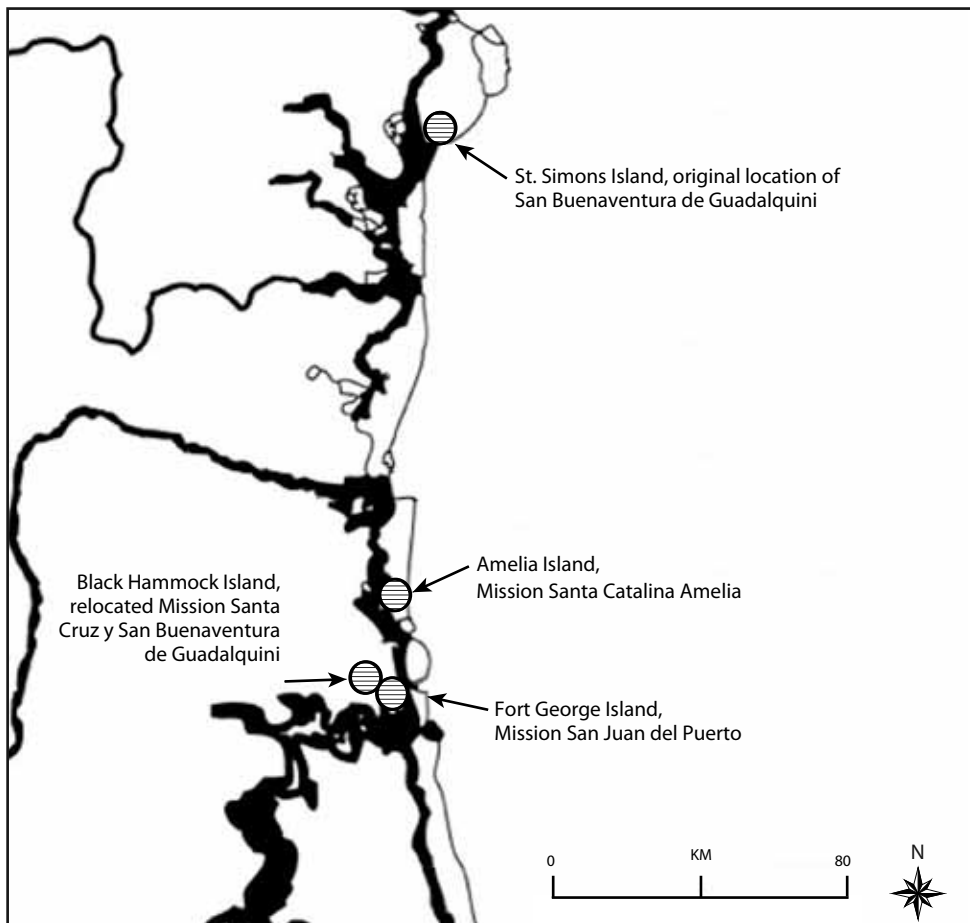


Figure 15.2. The Georgia and Florida locations of San Buenaventura de Guadalquini.

ently around this time that a briefly occupied garrison was placed at San Buenaventura.

The final blow to the San Buenaventura mission was not delivered by slave raiding forces, but rather by French pirates (Hann, 1996: 269–271; Worth, 2007a: 41–42). In 1683, corsairs launched a largely unsuccessful attack on St. Augustine and then commenced to loot their way up the coast in an offensive that included pillaging the Cumberland Island missions of San Juan del Puerto and San Felipe (Bushnell, 1994: 162). The following year pirates assaulted the sparsely occupied San Buenaventura mission, burning its church and *convento*. Having caught wind of the impending mission strike, most of the mission's villagers withdrew to the mainland opposite the island (possibly near modern Brunswick), taking with them most of their possessions and surplus corn.

Spanish officials could no longer tolerate the onslaught of Indian slave raiders and French pirates, so a decision was made to hasten their planned evacuation of the Georgia coast (see Jefferies and Moore, this volume, chap. 13). The abandonment of San Buenaventura was part and parcel of this coordinated and wholesale retreat of Spanish missions to northeastern Florida. Thus in 1684, the mission's residents were relocated to a wooded area on the northern side of the St. Johns River, one league west of the primary Mocama mission of San Juan del Puerto on Ft. George Island (Hann, 1996: 271; Worth, 2007a: 198). The Spanish governor apparently wanted the San Buenaventura villagers to move directly to San Juan from their St. Simons Island home, but instead settled a league away. Although the reason for not moving to San Juan is unknown, it appears Guadalquini preferred to remain an autonomous community.

With the transfer to Florida complete, the mission received the name Santa Cruz y San Buenaventura de Guadalquini (or simply Santa Cruz de Guadalquini). In 1685, visitation records mention a principal chief (Lorenzo Santiago), three *caciques*, and two *cacicas*. Of the latter is Clara, *cacica* of Utinahica, the Timucuan mission village that merged with San Buenaventura prior to 1655 (Hann, 1996: 263; Worth, 2007a: 111). According to the same visitation record, Mocama living at Santa Cruz petitioned the colonial government to grant scattered communities of Colones, Yguajas [Guale], and Yamasee residence in their village (Hann, 1996: 271–272; Worth,

2007a: 111, 124). Although their request was approved, it is not known whether these St. Simons Island refugees actually relocated to the mission. Santa Cruz was said to have had a population of 300 (60 families) in 1689, a size estimate more than double that recorded at the same time for the provincial mission of San Juan.<sup>7</sup> Thus, Santa Cruz was the largest Mocama mission at this time. The following year it was reported that Santa Cruz lacked a resident friar, and it is unclear if a priest ever resided there (Hann, 1996: 275). If not, it is likely that the ecclesiastical needs of the community were met by the missionary stationed nearby at San Juan.

According to Captain don Juan de Pueyo, who visited Santa Cruz in 1695 as part of a formal visitation on behalf of the governor of Florida, the community housed the main chief (Lorenzo de Santiago), five other *caciques*, and at least two *inihas* (second in command); the named *caciques* included two non-Mocama Indians from Simon and Colon (Hann, 1993: 241, 1996: 288). This seems to clearly indicate that non-Mocama Indians were living at Santa Cruz in 1695. With regard to Pueyo's inquiry as to why they had not yet moved to San Juan, Santa Cruz leaders blamed demands made on their time by farming and work they did in service of the king.

Within a year, however, mounting pressure from Spanish officials and "knowing clearly how endangered they are ... of being infested by enemies of the mainland," the community of Santa Cruz packed up and moved to San Juan del Puerto in 1696 (Worth, 2007a: 198). A council house was waiting at San Juan for the villagers of Santa Cruz, having been built at least two years earlier. Shortly after aggregation, the Santa Cruz *cacique*, Lorenzo Santiago, became the principal chief of the Mocama province (Hann, 1996: 288; Worth, 2007a: 198).

The missions of northeastern Florida came to an effective end in 1702, when Colonel John Moore and a contingent of Carolina militia and Indian slave raiders attacked and burned all Guale and Mocama missions on Amelia and Fort George islands. In the hours prior to the assault on their mission communities, the natives fled the region for safer surroundings near St. Augustine. Although Charles Arnade's (1959: 15, 21) account of the sacking of San Juan in 1702 implies that Santa Cruz still existed as a separate community, this interpretation is incorrect and based on a later map (discussed later and depicted in

fig. 15.3). However, it is possible that the former mission location contained a small sentinel post at this time. Spanish documents suggest that a refugee community known as Pilijiriba surfaced on the south bank of the St. Johns River after Moore's raid in 1702 or 1703 (Arnade, 1960). Little is known about this community, other than the fact that it housed both Guale and Mocama Indians and that it may have contained two mission churches. By 1705 (perhaps 1704), Native Americans had again vacated extreme northeastern Florida, but this time they never returned.

#### WHERE IS SANTA CRUZ DE GUADALQUINI?

As was the case with its St. Simons Island counterpart, the transplanted Guadalquini mission was initially placed in the wrong area by scholars. Until the mid-1990s, it was assumed that Santa Cruz was positioned well south of the St. Johns River, in fact, within 10 mi of St. Augustine (Hann, 1990: 500). Confusion surrounding the real location of Santa Cruz stems from information provided in Jonathan Dickinson's journal. Dickinson, an Englishman shipwrecked along the Atlantic coast of Florida in 1696, wrote of visiting the mission community of "Santa Cruce" some 3 leagues north of St. Augustine, prior to arriving at "San Wans" (San Juan) (Andrews and Andrews, 1981: 65–66). However, Dickinson was mistaken and the settlement he actually visited was not Santa Cruz, but Mission Nuestra Señora de Guadalupe de Tolomato near St. Augustine (Hann, 1996: 271; Worth, 2007a: 198).

A clue to the real locality of Santa Cruz is revealed on an undated Spanish map that Hann (1996: 298) contends was drawn between 1703 and 1705, after San Juan's destruction by English raiders (fig. 15.3). The map shows Santa Cruz on a mainland point or bulge slightly northwest of San Juan Island (modern Fort George Island); a general location supported by other documentary references that place Santa Cruz 6 leagues south of Santa María on Amelia Island (Worth, 2007a: 198). Present-day Black Hammock Island is separated from the mainland by a thin band of salt marsh divided by a shallow tidal creek, giving an impression that it is part of the mainland. In fact, on most early maps of the area, Black Hammock Island is often represented by a large mainland projection and not as a discrete island. William Jones (1967: 2; 1985), who con-

ducted excavations on the island in the 1960s, long suspected that the southern end of Black Hammock Island, known today as Cedar Point, was the archaeological location of Santa Cruz. The name Santa Cruz may have been bestowed upon the relocated San Buenaventura community because it was settled near the former San Juan *visita* (i.e., outlying mission settlement visited periodically by nonresident priest) of Vera Cruz, which likely was abandoned before 1630. In 1602, Fray Francisco Pareja reported that Vera Cruz was "half a league" (or a little more than a mile) from his residence at San Juan del Puerto. Cedar Point is a mere 1.4 mi northwest of the northern tip of Fort George Island, and within clear view. Spanish continuity in place names would suggest that the Cedar Point vicinity was known as Santa or Vera Cruz for decades prior to Guadalquini's relocation.

Taking this information into account, archaeologically we should expect to find evidence of a late 16th/early 17th-century *visita* (Vera Cruz) at or close to a late 17th-century mission (Santa Cruz de Guadalquini). This appears to be exactly what we have uncovered at the southern end of Black Hammock Island. Archaeological evidence of late mission-period activity, including late 17th-century majolica, olive jar, and appreciable quantities of San Marcos, is found at the Cedar Point site (8Du81) on the southeastern side of the island (Ashley and Thunen, 2009). In contrast, vast amounts of contact-era and early mission-era San Pedro ceramics occur immediately to the west at the Cedar Point West site (8Du63). Being situated on the eastern edge of the island would have been a preferred location for the mission of Santa Cruz because it was in plain sight of both Spanish travel along the inland waterway and the mission of San Juan (fig. 15.4).

#### CEDAR POINT SITE: LOCATION AND BRIEF DESCRIPTION

The Cedar Point site (8Du81) is one of a series of archaeological sites at the southern end of Black Hammock Island, a leeward barrier island located approximately 6 km west of the Atlantic Ocean and 18 km east of downtown Jacksonville, Florida (fig. 15.5). The southern and eastern boundaries of the site are formed by tidal marshes, except in areas where Horseshoe Creek (natural tributary of the Intracoastal Waterway) breaks through and abuts the island edge. The

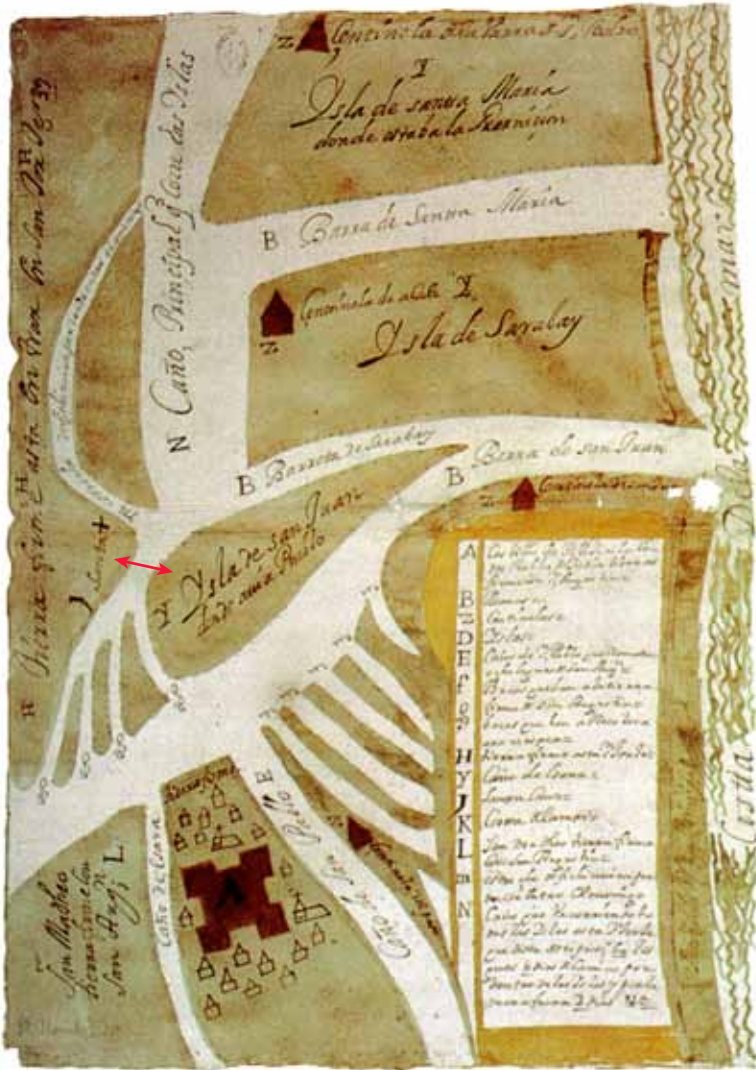


Figure 15.3. Color-enhanced version of Spanish map of coastal northeastern Florida, ca. 1705, with red arrow pointing to Santa Cruz and to San Juan.

northern<sup>8</sup> and western site boundaries are more arbitrary and contiguous with the Cedar Point North (8Du64) and Cedar Point West (8Du63) sites, respectively. Spread over these sites is evidence of more than 4000 years of intermittent occupation, spanning Late Archaic through early American plantation periods. Native habitations are revealed as widespread midden deposits that include buried shell middens and scatters, as

well as densely packed, mounded shell heaps and ridges. The latter appear randomly distributed across the sites, occurring more frequently near the shoreline, but extending several hundred meters inland. At present, much of the Cedar Point site is covered in a maritime forest of oak, magnolia, southern red cedar, and sabal palm. Sections of recent disturbance and land clearing are indicated

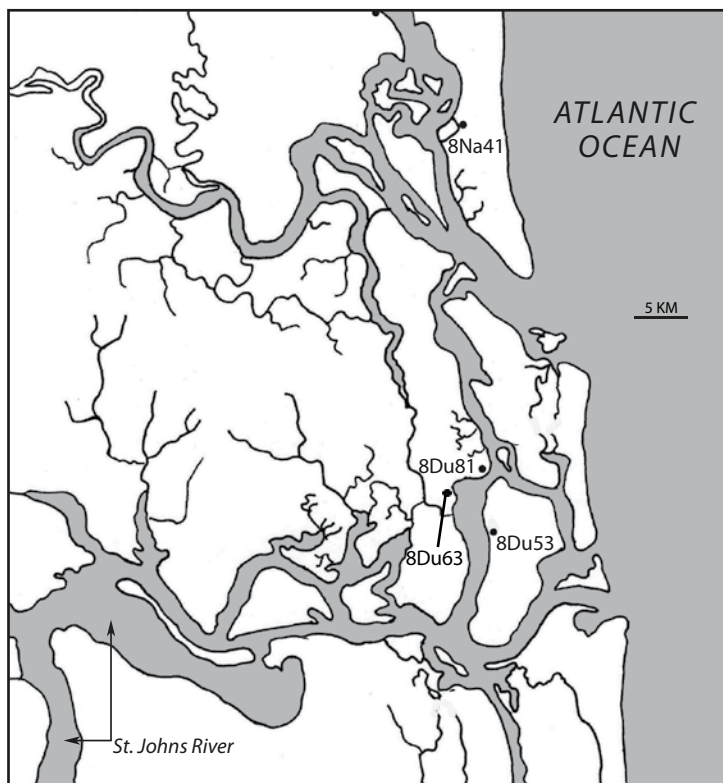


Figure 15.4. Map of northeastern Florida, giving location of sites mentioned in the text.

by secondary scrub and herbaceous ground cover. Evidence of subsurface impact varies, but in most areas is restricted to the upper 20–30 cm. A paved road (Cedar Point Road) divides the northern part of the site into eastern and western halves. Its east-central section includes the location of a former 20th-century fish camp that now serves as a public boat launch. The southern part of the site once housed a series of early to mid-20th-century homes, none of which is currently standing. A network of dirt roads and dim trails facilitates movement across the site.

First recorded in 1958 on private property, the site now lies within the boundaries of the Timucuan Ecological and Historic Preserve, a 46,000-acre preserve managed by the National Park Service (NPS). Limited shovel testing of the site was performed by the University of Florida in the early 1990s (Russo, Cordell, and Ruhl,

1993). Between 2003 and 2009, the University of North Florida (UNF) devoted portions of five archaeological field schools to testing within the broad boundaries of the site. These summer projects, which involved 2–4 weeks of work, were a joint and cooperative endeavor between NPS and UNF. The 2003 field season was confined to a Late Woodland Colorinda component in the southern end of the site (Ashley, 2004), whereas the 2005–2007 and 2009 field schools focused on the site’s mission-period component to the north (Thunen, Ashley, and Rolland, 2006, Thunen, 2007; Thunen and Rolland, 2008). The following summarizes the last four field seasons.

#### EXCAVATIONS (2005–2009)

Our work at the Cedar Point site involved systematic shovel test sampling and limited unit excavations (fig. 15.6). Fifty cm<sup>2</sup> shovel tests were



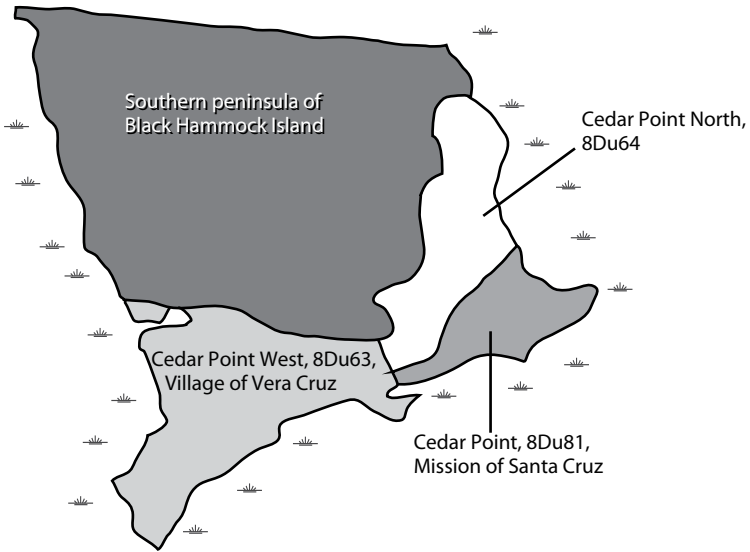


Figure 15.5. Archaeological sites at the southern end of Black Hammock Island.

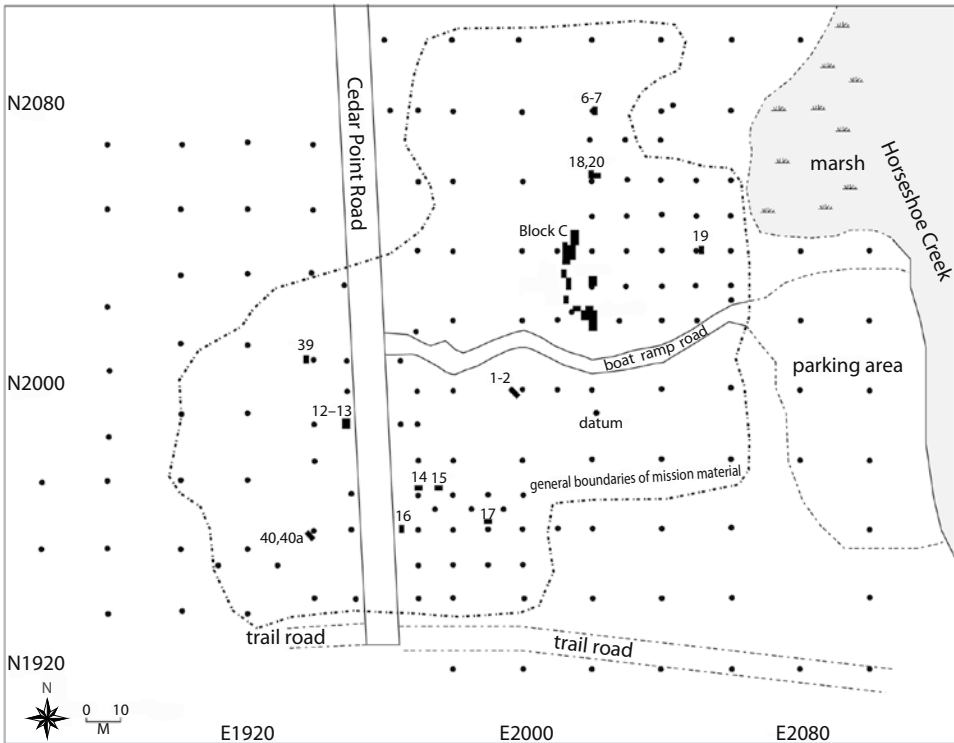


Figure 15.6. Cedar Point site map.

dug at 20 m intervals across the site, with reduced 10 m interval testing performed in selected areas. In all, 169 shovel tests were excavated. Units measuring 1 × 2 m were distributed across the site in locations determined by shovel test results. Factors affecting unit placement included high mission-period pottery density, presence of unique artifacts, and identification of intact features. In some places units were combined to form slightly larger blocks that ranged from 4 to 18 m<sup>2</sup> in size. Each unit was dug in 10 cm (or fewer) levels within observable zones. Fill was dry screened through 6.35 mm hardware cloth in the field, while column and soil samples were taken to the laboratory and washed through 1.6 mm mesh. Excavations, to date, total a modest 119 m<sup>2</sup> sample of a site area that measures about 4 ha. Unit excavations concentrated in the north-eastern part of the site summed 57.3 m<sup>2</sup>.

#### SITE STRUCTURE

Mission-period artifacts, mostly in the form of San Marcos pottery, came from an area about 2 ha in size. This location contained far less shell than areas to the north and south, which were marked by mounded shell middens dating mostly to the Woodland and early Mississippi periods, respectively. Shovel testing across this section of the site revealed a low-density scatter of discarded shell, with localized, yet thin (ca. 10–15 cm), concentrations of shell midden. It is unclear how much construction and operation of Buddy's Fish Camp (ca. 1920–1990) altered the distribution of shell heaps across this part of the site, but block excavations revealed minimal disturbances and little modern building debris or occupational refuse was recovered. Mission-period deposits are most prevalent east of Cedar Point Road, immediately north and south of the boat ramp access road. Vertically, this is not a deeply stratified site. It is worth reiterating that the Santa Cruz mission was only occupied for 12 years. The overwhelming majority of artifacts were recovered in the upper 40 cm. Intact cultural features were identified.

Analysis of the Cedar Point ceramics shows that while Woodland, early Mississippi, and late mission-period ceramics are well represented, late Mississippi, contact, and early mission-period pottery types are rare. The latter, however, are the dominant wares at the Cedar Point West site, about 500 m to the southwest (see fig. 15.5). Mission-period pottery was easily winnowed from

mixed plow-zone contexts, owing to the distinguishing characteristics of San Marcos wares and the virtual absence of a contact/early mission-period San Pedro component at the Cedar Point site. Assigning a depositional or temporal affiliation to animal bone refuse and nondiagnostic artifacts from mixed plow-zone proveniences, however, proved much more difficult and was not attempted in this study. Fortunately, mission-period subsistence information was retrieved from contextually secure shell midden layers and features. Other than identifying the horizontal distribution of mission-period artifacts within the Cedar Point site, few specifics can be offered at this time about village or mission layout. We will, however, offer some general thoughts on this topic in the following sections.

#### FEATURES AND ARCHITECTURAL REMAINS

Mission-period features at Cedar Point were strikingly elusive until the end of the 2007 field season when a few pitlike deposits were exposed wholly or partially in two contiguous units (units 28 and 30). These units, along with an adjacent shovel test (ST-163), together yielded San Marcos and colonoware sherds, olive jar, carbonized corn cobs, and a peach pit. In 2009 an additional 14 m<sup>2</sup> were excavated north and south of units 28 and 30. Figure 15.7, a composite map of block C, shows a shell midden revealed at a depth of 20 cm below surface and features mapped at 40 cm below surface as a result of the 2007 and 2009 fieldwork. These features contrasted sharply with the natural yellow brown sandy subsoil.

Features 4, 7, 9, 10, and 13 are large shell-filled postholes that together form a right angle suggestive of a building corner. In reality, these postholes were filled with shell midden including mission-period artifacts. Of particular note was feature 13, which contained more than 20 San Marcos sherds, one colonoware, one majolica (Puebla Polychrome), one olive jar, one Spanish storage jar, one glass bead, one Spanish liquor bottle fragment, and one hand wrought nail, along with bone and shell (both modified and unmodified). Figure 15.8 depicts several artifacts from feature 13. Older aboriginal potsherds (e.g., St. Johns) were occasionally found in post fill as well, but were assumed to be incidental inclusions. In horizontal size, feature 10 was the smallest (45 × 52 cm) and feature 9 was the largest (93 × 70 cm). Feature 10 was also the shallowest (35 cm deep) posthole, whereas fea-

ture 9 was the deepest (83 cm). Post fill included densely packed shell that was crushed near the top of each posthole, likely due to tamping the timber into place. In most cases, it appears that flat-bottomed posts were worked into the hole at an angle, then placed upright against the opposite wall before backfilling (fig. 15.9).

Features 13, 4, 7, and 9 are aligned in a row with an orientation of 14° east of north. Feature

10 appears to be set perpendicular to the line and west of feature 13 at an angle of 284° east of north. Falling within the posthole alignment are features 3 and 8, which differed dramatically from the others in terms of composition. The former was a narrow, linear deposit nearly 1.5 m long. The central section of feature 3 had a depth of about 25 cm, although at the two ends, roughly circular areas dropped to depths of more than 40

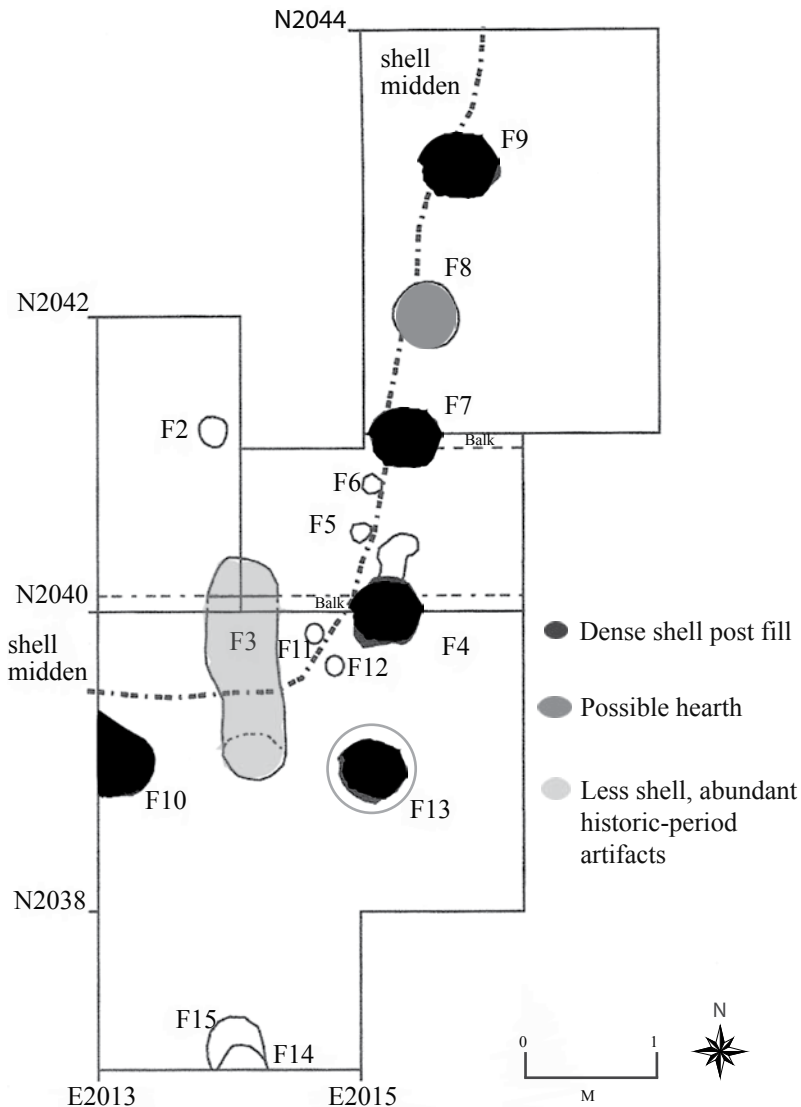


Figure 15.7. Composite plan map of block C. Feature 13 is circled.



Figure 15.8. Feature 13 artifacts: A, olive jar; B, Puebla polychrome majolica; C–D, San Marcos complicated stamped.



Figure 15.9. Feature 7 profile, view to the south.

cm. The southern dip (about 20 cm in diameter) was positioned between features 13 (east) and 10 (west). This might represent a postmold, but the feature lacked the shell midden fill of the other postholes. It did, however, contain abundant mission-period household debris including pig bones. Feature 8, on the other hand, consisted of a black, organic fill with abundant charcoal flecks, suggesting that it served as a hearth. Surprisingly, the feature yielded four glass seed beads, which were not thermally altered.

Another conspicuous deposit partly intersected by block C was a thin (10 cm) mission-period shell midden situated slightly above and immediately west and north of the right angle alignment of postholes (see fig. 15.7). This is, by far, the most productive mission-period shell midden excavated at the site to date. It was first encountered at 15–20 cm below surface and had a depth of 8–12 cm. The other features were mostly indistinguishable from the surrounding very dark gray matrix at this depth, and did not start becoming discernible until about 30–35 cm below surface. At first glance, the mission-period shell deposit appeared to be within the posthole alignment, bringing to mind some form of flooring, but the lack of shell crushing and vast amounts of refuse suggest it is a midden.

Compared to the oyster shell footers uncovered at Santa Catalina (8Na41) on Amelia Island (Saunders, 1993: 46), the shell midden appears too wide to be a sleeper or building foundation, plus the posthole alignment is set off instead of on the shell. It might represent an apron or midden along the exterior wall of a building that also served to deflect water running off the structure roof. It is somewhat similar in appearance to the walkway or “sidewalk” feature partly exposed around the *convento* at Santa Catalina Amelia (Saunders, 1993: 45–46), but again it appears to represent a mission-period refuse deposit. Its precise relationship to the posthole alignment is unclear at this time.

Noticeably absent from block C are daub and raw clay fragments, although a few tiny pieces of burned clay were recovered during fine-mesh screening. There is no evidence that the building had been torched, and it appears that the upright posts decayed in situ. Also lacking is architectural hardware such as nails and spikes, which were common at Santa Catalina Amelia. Because the abandonment of Santa Cruz was a deliberate and planned move to San Juan, everything worthy of

reuse may have been taken when the mission’s inhabitants left. Alternatively, instead of reflecting a wattle-and-daub building or hand-hewn board structure, the posthole pattern might be associated with a more open-sided building or *ramada*. At this time, not enough area has been excavated to interpret with a high degree of confidence what is actually represented. More excavations are needed to expand block C and fully expose the horizontal limits of the structure.<sup>9</sup> Reported here for the first time was an unanticipated discovery in 2005. Following the UNF field school, NPS personnel excavated a line of shovel tests along the artificially banked western side of Cedar Point Road to document the degree of roadside impact and to assess the potential for intact subsurface deposits. The road is elevated about 50 cm above a drainage swale to the west. While excavating ST-88, several large bone fragments were encountered at a depth of 80–90 cm below surface. Subsequent to encountering these remains, the shovel test was backfilled. After consultation with NPS officials, UNF excavated a 2 m square (units 12 and 13), with ST-88 in its center, to determine if this was an isolated occurrence of human bone or an intact burial. Only the eastern halves of the units were excavated below a depth of 50 cm.

Unit excavation revealed an upper 30 cm of disturbance followed by 50 or more cm of loose, fluffy dune sand. In the extreme northeast corner of unit 12, slightly below the layer of disturbance, was an arc-shaped concentration of shell that continued into the unit’s north and east walls. Extending west from this shell feature, along the unit’s north wall, was a linear deposit of dense shell. Because we exposed only a small section of this feature, the total size, function, and period of deposition are uncertain. Moreover, the feature’s relationship, if any, to the deeper burials is not known at this time.

About 80 cm below surface, we recognized two slightly darker, yet still loose, gray-brown stains spaced about 20 cm apart. The shovel test had penetrated the larger of the two features, which now looked like a burial pit. Excavation of this feature soon exposed the articulated lower legs of an extended, supine adult burial. The upper portion of the skeleton extended eastward into the unit wall and beneath the existing asphalt road. In a separate smaller pit were the remains of an infant (full term). The burials were in surprisingly good condition given their depth, lack

of shell, and exposure to acidic sand. Once the condition and the orientation of the burials were determined, NPS officials required the units to be backfilled. The skeletal materials were viewed in the field by UNF bioarchaeologist Gordon Rakita prior to reburial. The only artifact recovered during excavation was a black, barrel-shaped glass bead from the loose sand well above the burial.

Although excavations were too limited to determine with certainty the cultural affiliation of the interments, burial style and orientation, location within the site's mission-period component, lack of grave goods or coffin hardware, and presence of small pieces of raw clay in the burial pit fill suggest it is more likely associated with the mission of Santa Cruz than with later plantation or American period occupation of the island. Raw clay has been observed in the mission-period burial pits at Santa Catalina (8Na41) on Amelia Island (Saunders, 1993: 53) and San Juan del Puerto (8Du53) (Gorman, 2008b: 8). It is surmised that pieces of raw clay are inadvertently included in pit fill as a result of burials dug through the clay floor of a church by the mission's residents. It is worth noting that preparations are currently under way to conduct a GPR survey of this area.

#### BRIEF COMMENT ON SUBSISTENCE

The villagers of Santa Cruz relied mainly on the natural bounty of the local estuarine salt marsh and maritime hammock environments (table 15.1). With creeks situated literally outside their front door, fishing was a focal point of subsistence, as demonstrated by the recovery of small seatrout, mullet, catfish, redfish, and drum. Oyster is the dominant species in mission-period middens/features followed by quahog and marsh clam, stout tagelus, and Atlantic ribbed mussel, all harvested from the adjacent mudflats and salt marshes. Terrestrial and wetland turtles were also collected and eaten. They hunted or trapped deer, raccoon, opossum, rabbit, squirrel, and bird. The only domesticated animal conclusively identified to date is pig. The primary skeletal elements of pig recovered consist of low-meat portions of the carcass, namely toes, possible butchered vertebrae, and teeth. Evidence of other meatier body parts is likely hidden in the high numbers of shattered long bone indistinguishable from deer.

The villagers at Santa Cruz not only hunted and gathered, but farmed. At present, an ethno-

botanical study has yet to be undertaken of the carbonized plant remains from the site, but a cursory inspection identified charred hickory hulls, peach pits, oval beanlike seeds, and maize cobs, kernels, and cupules. In a metric analysis of 42 charred cob fragments from block C, UNF student Mike Foster (2009) determined an average cob width of 14.1 mm and cupule width of 8.4 mm (and an adjusted cupule width of 9.6 mm to compensate for shrinkage due to carbonization). Sixty-nine percent of the cobs contain 8 rows.

#### MISSION PERIOD MATERIAL CULTURE

With additional excavations planned for the near future, our aim here is to provide a general inventory of the site's historic artifacts, aboriginal ceramics, and items of modified bone and shell. With regard to pottery, we report baseline information on the range and percentages of San Marcos surface decorations. We also present the results of a preliminary study of San Marcos and colonoware vessel forms based on sherd samples derived mostly from our 2009 excavation of block C. A more comprehensive ceramic analysis of the entire assemblage is currently under way.

#### EUROPEAN ARTIFACTS

The mission-period material culture of the Cedar Point site includes a variety of European manufactured items (table 15.1). In terms of ceramics, coarse earthenwares (e.g., olive jar, storage jar, green basin) are much more prevalent than tablewares (e.g., majolica). Although 37 storage jar fragments were recovered, the majority were from block B and might be part of a single vessel. Recognized types of majolica consist of Puebla Polychrome, Aucilla Polychrome, Aranama, or Abo Polychrome, all of which post-date 1650 (fig. 15.10). Most of these tablewares are lip fragments, suggesting that the remaining vessel bodies were still usable. Metal artifacts include a small collection of hand-wrought rose head nails and two brass objects. Other than a coil-shaped piece of brass jewelry accoutrement, the most notable metal artifact is a brass sacred heart of Jesus finger ring (fig. 15.11), similar to the one found at Santa Catalina de Guale on the Georgia coast (Thomas, 1988a: 99; Deagan, 2002: 83). Eleven glass seed beads (aqua, pale green, or blue in color) were recovered from features in block C, and a black glass bead was retrieved from the same unit as the human burials

TABLE 15.1  
**Historic Artifacts from the Cedar Point Site**

	Block B		Block C		Other units		Shovel tests		TOTAL	
	Sum	Weight (g)	Sum	Weight (g)	Sum	Weight (g)	Sum	Weight (g)	Sum	Weight (g)
Historic ceramics:										
Olive jar	18	191.3	11	588.0	2	53.0	3	33.1	<b>34</b>	<b>865.4</b>
Storage jar	35	413.0	2	4.7	—	—	—	—	<b>37</b>	<b>417.7</b>
Green basin	—	—	—	—	3	97.5	—	—	<b>3</b>	<b>97.5</b>
Coarse earthenware	—	—	9	4.7	—	—	—	—	<b>9</b>	<b>4.7</b>
Majolica	8	8.0	4	12.1	2	3.1	5	5.9	<b>19</b>	<b>29.1</b>
<b>Total</b>	<b>61</b>	<b>612.3</b>	<b>26</b>	<b>609.5</b>	<b>7</b>	<b>153.6</b>	<b>8</b>	<b>39.0</b>	<b>102</b>	<b>1414.4</b>
Metal artifacts:										
Hand-wrought nails	4	22.6	2	19.6	—	—	—	—	6	42.5
Unidentified nails	—	—	—	—	—	—	5	80.1	5	80.1
Brass finger ring	—	—	—	—	1	2.1	—	—	1	—
Brass ornament	—	—	—	—	1	1.0	—	—	1	1.0
Glass:										
Green bottle	—	—	4	6.1	—	—	—	—	4	6.1
Modified fragment	—	—	1	3.1	—	—	—	—	1	3.1
Beads	—	—	11	.04	1	1.5	—	—	12	1.54
Lithic:										
Gunflint	—	—	1	3.5	—	—	—	—	1	3.5
Kaolin pipe:										
Bowl	1	4.9	—	—	—	—	—	—	1	4.9
Stem	3	7.7	—	—	—	—	1	0.7	4	8.4

(but well above them). A few dark green liquor bottle fragments, including one modified into a punchlike tool, a gunflint, and four kaolin pipe fragments round out the assemblage of historic artifacts from the Cedar Point site.

#### MODIFIED BONE AND SHELL

An interesting aspect of the site's mission-period faunal assemblage is the large number of modified pieces of animal bone. Such artifacts are rarely reported or discussed for mission sites,

which usually focus on more formalized tools of European origin (see Jefferies and Moore, this volume, chap. 13 for a similar discussion). Table 15.2 presents the percentages of modified bone by animal class from the 2009 block C excavations. Two-hundred and thirty-nine bone fragments (739.43 g) show direct and/or indirect evidence of alteration as the result of secondary human use. Modified or utilized bone often displays multiple evidence of use-wear. This situation suggests that block C might represent a liv-

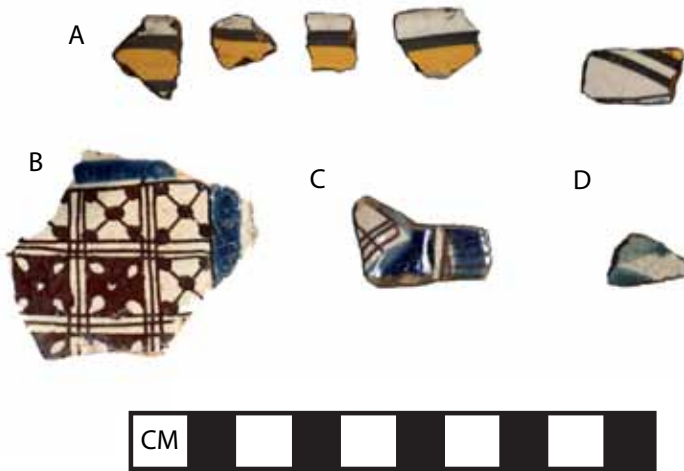


Figure 15.10. **A**, Abo polychrome; **B-C**, Puebla polychrome, **D**, Majolica



Figure 15.11. Brass finger ring, unit 10.

ing or activity area where expedient bone tools were modified, utilized, and discarded.

The most common form of surface alteration is polishing (53% of modified bone), most frequently seen on the exterior surface of bone. Interior crushing of epiphyseal bone structures as the result of hafting was rarely observed, although interior polishing hints at this attachment process. Exterior surface attrition along shaft fragments (22%) in the form of pitting, loss of thin layers of compact bone, lash scars, or areal

abrasion offers indirect evidence of the side effects of tip use. Another category of tool use is suggested by a few of the long bones, which are medially split (8%) and likely employed as broad flat-edge scrapers. Though they varied in length, the linearly split edges are noticeably smoothed.

The ends of many long bones show a repeated pattern of “knapping” to form a tapered point, roughly 2–4 cm long (16%). The extreme tips of these punchlike objects are often snapped, but side-wear reveals light polish. One redfish pectoral spine (midspine to anterior tip) is highly polished. Few double pointed tools were recovered. The inhabitants of Santa Cruz also purposefully fashioned a variety of rough, but efficient smaller hand tools (26%). V-shaped tips, although reminiscent of spokeshave scarring, are cut deeper into the bone circumference. V-shaped use-wear is concentrated on the bone exterior and base of the V. Often thermally altered, round-tipped bone implements were identified. Again, tip-beveling from use is seen on the exterior of this type of tool. U- and C-shaped tips or side-modifications are less frequent. Also observed were squarish wedge-shaped tips and asymmetrical side-wear scrapers in which wear evidence is visible on the interior of the surviving bone.

Single side-notching was noted on 5% of the tool fragments. Notches are frequently associated with hafting scars. Fine cut marks and



TABLE 15.2  
Faunal Remains and Modified Bone from Block C (2009)

Classes	Comments	Total Bone		Modified Bone	
		Sum (%)	Weight (%)	Sum (%)	Weight (%)
Mammals	Deer, pig, large and medium mammals; rarely mink, opossum, raccoon, squirrel, small rodent	17.0	69.3	50.6	91.1
Birds	Medium and very large	2.0	1.9	2.5	0.3
Reptiles	Snake; small, medium, large pond turtles, gopher tortoise; alligator	8.5	8.8	1.3	0.2
Bony fish	Seatrou, mullet, catfish, redfish and drum	39.8	4.9	1.3	0.1
Cartilaginous fish	Rays only	0.2	0.1	0.0	0.0
Invertebrates	Crab claws	0.2	0.0	0.0	0.0
Unidentified bone		32.3	14.9	44.4	8.2
TOTAL		100.0	99.9	100.1	99.9

hacked or cleanly severed butchering cuts (25%) suggest contact with Spanish metal. Only 3% of the modified bone displayed drilled holes. Finally, few modified bone pieces appear to have served as personal adornment. Only one partial bone pin and one possible bird-bone bead were identified. The small pin fragment reveals modest incising and a partial drill hole. Given the amount of shatter of deer metapodials, perhaps the initial construction of a pin took place in this area with finishing performed elsewhere.

Quahog and marsh clams also were chosen for detail-oriented work. One-hundred eight (1487.6 g) whole and fragmented clams bear lip and/or edge wear. Small spokeshave lip indentions are found on 62 shells; multiple notches on a single shell are rarely observed. Perpendicular lip abrasions are more common on the shell exterior. Clams were also fashioned into square or rectangular spacing or scraping tools ( $N = 50$ ) with two or more worn sides. Eight clams display deep V- or U-shaped scars similar to those observed on bone tools.

#### ABORIGINAL POTTERY ASSEMBLAGE

By far the dominant artifact category is aboriginal pottery. UNF excavations to date have yielded 2706 aboriginal potsherds, of which 1373 (50.1%) are San Marcos and 188 (6.9%) are colonowares. The remaining 43% of the collection consists of earlier Woodland and Mississippi period pottery types; contact-period San Pedro wares are rare. Because San Marcos wares are so easy to separate from the earlier pottery types (e.g., St. Johns, St. Marys, and San Pedro) recovered from the site, we have an essentially pure mission-period ceramic assemblage dated to 1684–1696. This represents the most tightly dated assemblage along the Atlantic coast. It offers a benchmark against which to compare other late 17th-century San Marcos/Altamaha assemblages (see Jefferies and Moore, chap. 13 and Thompson et al., chap. 16, this volume). With this in mind, we use the same stylistic and technological attributes and surface decoration categories as Saunders (2000a, 2009) to facilitate comparisons with the San Marcos ceramic

TABLE 15.3  
**San Marcos Surface Decorations, Cedar Point Site**

	Count		Weight (g)	
	Sum	%	Sum	%
Plain	121	8.8	847.8	7.8
Burnished	16	1.2	130.4	1.2
Simple stamped	208	15.2	1202.9	11.1
Cross simple stamped	294	21.4	2510.4	23.1
Line blocked	159	11.6	1575.9	14.5
Complicated stamped (curvilinear)	38	2.8	378.5	3.5
Complicated stamped (rectilinear)	34	2.5	459.2	4.2
Complicated stamped (unidentified)	84	6.1	844.3	7.8
Stamped with punctations	16	1.2	102.8	1.0
Stamped (unidentified)	188	13.7	1300.6	12.0
Check stamped	36	2.6	330.8	3.1
Incised	20	1.5	217.5	2.0
Other	159	11.6	959.1	8.8
TOTAL	1373	100.2	10854.9	100.1

collection from the relocated Guale mission of Santa Catalina de Amelia (1683–1702) at the Harrison Homestead site.<sup>10</sup>

Exterior surface decorations associated with San Marcos wares from the Cedar Point site include plain, burnished, stamped, check stamped, incised, and other (table 15.3). The latter consists mostly of unidentified surfaces. The preponderance of sherds falls into the stamped category, which includes simple stamped, cross simple stamped, line blocked, complicated stamped (rectilinear, curvilinear, and unidentified), and unidentified stamped. *Simple and cross-simple stamped* make up 36.6% of the entire assemblage by count (34.2% by weight) and 49.2% of the stamped category by count (44.3% by weight). *Line blocked* comprises 11.6% of the entire assemblage by count (14.5% by weight) and 15.6% of the stamped category by count (18.9% by weight). *Complicated stamped* sherds exhibit very similar results, comprising 11.4% of the entire assemblage by count (15.5% by weight) and

15.3% of the stamped category by count (20.1% by weight). Nearly equal amounts of rectilinear and curvilinear complicated stamped were recovered. The central or raised dot element of line blocked or complicated stamped patterns (fig. 15.12) is evident on 15 sherds (1.1%), less than half the 2.3% recorded for Santa Catalina Amelia (Saunders, 2009: 105).

Table 15.4 presents the totals for each of the five major exterior surface decoration categories. Stamped comprises an impressive 84% of the San Marcos assemblage in terms of both weight and count. Plain surfaces are next at 10% by count and 8.6% by weight, followed by minor amounts of check stamped, incised, and burnished. Table 15.5 shows how the Cedar Point site (Santa Cruz) assemblage compares to that of the Harrison Homestead site (Santa Catalina Amelia). The percentages of incising and check stamping are very similar, but the proportion of stamped to plain/burnished surfaces differs markedly. The Cedar Point site displays significantly more



Figure 15.12. San Marcos line blocked with raised dot.

stamped and fewer plain and burnished surface decorations than Harrison Homestead.

The only other late San Marcos assemblage with comparable data is 8SJ3190, located a few miles north of St. Augustine in St. Johns County, Florida (Smith, Handley, and Ferrell, 2004). This site is believed to represent the short-lived Guale-Mocama refugee village of Capuaca (1702–1710). Testing of locus 5 at 8SJ3190 produced 331 San Marcos sherds, of which 89.4% were stamped, 5.7% were plain, and 4.8% were punctated (Smith, Handley, and Ferrell, 2004: 216). The latter were actually stamped rim sherds with hollow tool punctations, bringing the total amount of stamped wares in the assemblage to 94.3%. A developing trend among late 17th- and early 18th-century San Marcos assemblages is the increasing proportion of stamped relative to plain wares.

At present, the best evidence for a structure or activity area at the Cedar Point site comes from block C. Table 15.6 provides a comparison of surface decorations between block C at Cedar Point and the proposed “aboriginal structure” and “kitchen” of Santa Catalina de Amelia. These latter two contexts were selected for comparison because of their high incidence of stamped wares. The percentage of stamped wares for block C is higher than that for both Santa Catalina contexts. Although all categories vary, the general surface decoration profile for block C is more in line with the Santa Catalina “kitchen” than any other provenience there. Labeling the structure at block C “kitchen” is a little premature at this time. But the presence of domestic refuse in the form of

a shell midden, the high incidence of expedient bone and shell tools, and the possibility that the structure was open-sided does not preclude such an interpretation. A GPR survey and excavations to expand block C are part of a research design to be submitted to NPS in the near future.

With respect to San Marcos vessel forms and sizes, currently available data for the Cedar Point site derive from a sample of 30 rims from block C (table 15.7). Simple vessels representing hemispherical or straight-walled construction and incurving globular bowls are the most common. Carinated, excurvate, or open rim forms—while recognized less often—were produced in similar size ranges and median vessel sizes. In most cases not enough vessel sherds were available to reconstruct wall length in order to distinguish bowl from jar forms. Unidentified (UID) rim sherds typically were large enough to determine orifice diameter, but not deep enough to register form. The vast majority of vessels recovered near the block C structure are medium-sized containers (11–30 cm orifice diameters). These make up 70% of the measurable ceramic data. The smallest measurable rims are 10 cm in diameter (both for simple rims), and two large vessels (1 open and 1 UID form) are 52 cm in diameter. Median vessel sizes are tightly clustered between 16 and 24 cm. It appears that both storage and cooking needs were satisfied by moderate-sized containers that could be moved with little trouble or easily sealed against the elements.

Besides San Marcos pottery, colonowares are part of the site’s mission-period assemblage. Colonowares reflect the negotiated interaction between native women and Spanish male administrators, soldiers, colonists, and friars to reproduce aspects of Spanish culture in La Florida (H. Smith, 1948, 1951; Deagan, 1983). As a result, Spanish medieval serving or tableware forms, such as inflected brimmed bowls or deep plates, mugs and pitchers, and candlesticks were manufactured by aboriginal potters using local clays and generations-old vessel building and firing techniques. Some of these forms exhibit European-style foot rings. Other traits often associated with colonowares include burnishing—especially interior surfaces—and red slipping (a solution of nonlocally available hematite finely ground and mixed with water and clay). At Cedar Point, these finishing techniques varied in application. It was not unusual to recover sherds from a brimmed vessel on which red filming had

**TABLE 15.4**  
**Five Major Categories of San Marcos Surface Decorations**

	Count		Weight (g)	
	Sum	%	Sum	%
Plain	121	10.0	847.8	8.6
Burnished	16	1.3	130.4	1.3
Stamped	1021	84.1	8374.6	84.6
Check stamped	36	3.0	330.8	3.3
Incised	20	1.6	217.5	2.2
Total	1214	100.0	9895.8	100.0

**TABLE 15.5**  
**Cedar Point site (Santa Cruz) and Santa Catalina Amelia Surface Decoration**  
Abbreviation: Ch. St. = Check Stamped.

			Stamp	Plain	Burnish	Incised	Ch. St.	Total
Santa Catalina Amelia Island, FL	A.D. 1684–1702	Sum (%)	76.1	15.7	3.9	1.4	2.9	100.0
		Weight (%)	77.3	13.9	3.9	1.4	3.5	100.0
Santa Cruz	A.D. 1684–1696	Sum (%)	84.1	10.0	1.3	1.6	3.0	100.0
		Weight (%)	84.6	8.6	1.3	2.2	3.3	100.0

**TABLE 15.6**  
**Surface Decorations, Block C (Cedar Point site) and the Proposed Kitchen and Aboriginal Structure at Santa Catalina Amelia**

	Block C		Santa Catalina Kitchen		Santa Catalina Aboriginal Structure	
	Sum (%)	Weight (%)	Sum (%)	Weight (%)	Sum (%)	Weight (%)
Plain	7.5	6.4	9.9	9.5	15.9	13.2
Burnished	2.2	1.2	3.2	3.7	2.4	4.3
Stamped	87.5	88.6	82.6	81.8	77.5	78.6
Check stamped	0.7	0.2	2.6	3.5	0.8	0.3
Incised	2.0	3.5	1.6	1.5	3.4	3.5
TOTAL	99.9	99.9	99.9	100.0	100.0	99.9

been applied only above the point of inflection. Occasionally we find small, simple rim sherds with painted zoned red-film interiors that visually mimic an inflected brim. These faux-brimmed bowls, which we consider colonowares, are usually highly burnished.

To date, 188 (869.6 g) sand- or grit-tempered colonoware sherds have been recovered from the Cedar Point site. Combining these numbers with those of the San Marcos series, colonowares represent 12% of the total mission-period pottery assemblage by count and 7.3% by weight. More than half of the colonowares were recovered from block C (59% by count and 63% by weight). The majority of colonoware sherds represent either the thickened or reinforced points of brim or plate marley inflection or small chips of vessel lips. The numbers of lip fragments and incomplete marleys strongly suggest that, although chipped, the container remained serviceable and continued to be used. No foot rings or candlesticks have been recovered from the Cedar Point West site, although we did uncover three mug or pitcher handles, including one from block C. Table 15.8 summarizes the results of a formal analysis of 71 colonoware sherds recovered from block C in 2009. Included in this analysis are 11 complete plate marley (inflection to lip) sherds from outside block C, which were added to provide information on a wider range of formal stylistic choices associated with colonowares.

As shown in table 15.8, both brimmed bowls and plates were constructed in largely the same diameter sizes (average = 20 cm); the same average diameter size is true for the San Marcos sample (see table 15.7). The main difference between bowls and plates is wall depth. Likewise, the two forms exhibit comparable lip thicknesses. Although the present sample is small, brim and marley widths appear more disparate. Marley depths ranged from 19 to 36 mm. Sherd thickness also varies between the two forms. With a measurement taken below the thickened interior part of the brim, the thickness of brimmed bowl sherds averaged 6.7 mm. Plate sherd thickness, taken from below the inflection point separating the marley and the base, averaged 7.5 mm. This probably reflects greater reinforcement of a cantilevered marley versus an upright or only slightly excurvate brim. In somewhat of a contrast, San Marcos sherd thickness and vessel sizes are far more diverse. For example, San Marcos sherds from block C range from 4.1 to 17.3 mm, with an

average thickness of 8.2 mm. Theoretically, the same potters were producing both types and staying true to each tradition.

Exterior surface treatments were especially difficult to identify on plate forms. Pressing a carved paddle onto the inflected underside of a plate was certainly more challenging than decorating a straight-walled simple bowl, yet the stamping tradition persisted on colonowares. Simple stamped and cross simple stamped (11%) and unidentified stamped (13%) were most prominent among colonowares in block C. Across the site, however, a far greater number of plain colonoware surfaces were documented (26%), while simple and cross simple stamped (14%) and unidentified stamped patterns (17%) were recovered in comparable numbers.

The frequency of interior surface finishing for colonoware bowls varies from that of San Marcos bowls. Sixty-nine percent of the colonoware bowls from block C are burnished, while 31% display interior surfaces with hard-tooled or less compacted finishes. San Marcos wares from block C reveal a different ratio. For this type, there is a higher percentage of less compacted surfaces (59%) versus burnished interiors (41%).

## CONCLUSIONS

If we step back from the Georgia Bight for a moment and take a broader look at Spanish missionization of the Americas, the Mocama come to serve as another example of the myriad ways indigenous groups responded to European presence. Although we know that the Mocama's (or more broadly, Timucua's) entanglement with the Spanish ended in their fading from the American landscape, details of how the final century and a half of their history unfolded are far from certain. Case after case of culture contact in the New World has shown that the process of colonization did not play out in an orderly and predictable manner. One reason for this should be obvious: Native Americans were active agents in the colonial experience. And theirs was an agency that varied along many lines including gender, status, age, and ethnicity (Lightfoot, 1995; Siliman, 2005a, 2005b; Thompson et al., this volume, chap. 16). A recognition of native agency should not lead us to discount the active role of differing priests, soldiers, and colonial officials in the colonial encounter.

Living within a colonial setting constrained

TABLE 15.7  
**San Marcos Rim Forms and Orifice Diameters, Block C (2009) Sample**  
 Abbreviation: Med. = Median

Orifice (cm)	Carinated <i>N</i> = 5 14–26 cm Med. = 24 cm	Excurvate <i>N</i> = 2 16, 38 cm	Globular <i>N</i> = 7 16–30 cm Med. = 22	Open <i>N</i> = 4 15–52 cm Med. = 21	Simple <i>N</i> = 7 10–46 cm Med. = 16	UID <i>N</i> = 5 16–52 cm Med. = 18	Total	
							Sum	%
0–10	–	–	–	–	2	–	2	6.6
11–20	2	1	3	2	2	1	11	36.7
21–30	3	–	4	1	2	1	11	36.7
31–40	–	1	–	–	–	2	3	10.0
41–52	–	–	–	1	1	1	3	10.0
TOTALS	5 (16%)	2 (7%)	7 (23%)	4 (13%)	7 (23%)	5 (15%)	30	100

TABLE 15.8  
**Summary of Colonoware Container Forms**  
 All sherds in the sample are from block C unless denoted with \*; *N* = 71 sherds

	Orifice Diameter (cm)	Lip thickness (mm)	Brim depth (mm)
Brimmed Bowl ( <i>N</i> = 6)	<i>N</i> = 4 Range: 14–26 Average: 20	<i>N</i> = 4 Range: 4.9–5.5 Average: 5.2	<i>N</i> = 2 Range: 12.4, 16.4 Average: 14.4
Plate ( <i>N</i> = 10)	<i>N</i> = 7 Range: 12–24 Average: 20	<i>N</i> = 9 Range: 3.7–6.9 Average: 5.1	<i>N</i> = 11* Range: 19.1–35.5 Average: 26
Unidentified forms ( <i>N</i> = 4)	<i>N</i> = 4 Range: 12–20 Average: 12		

by forces of exploitation, oppression, and population decline, the historic Mocama negotiated a new tradition by making choices and invoking actions that transformed and redefined their way of life. Although the Mocama of Guadalquini were perceived by the Spanish as mission Indians, they retained an identity that was not Spanish, and in the process, they continued to distinguish themselves from the Guale along the north Georgia coast and from other coeval native converts to Catholicism in La Florida. Even after a century of Spanish mission life, and against a turbulent cultural backdrop marked by the threat of French piracy and British-backed slave raiding, Guadalquini refused to heed to the Spanish plea to move their community to Mission San Juan del Puerto. Instead, they reestablished themselves near San Juan but in a new location that afforded them a degree of social and political autonomy.

Archaeology holds the potential to provide valuable insights into the culture-building process during the mission period; that is, how local native groups internalized the process of European colonization through accommodation, resistance, integration, and even hybridization. Because all contact situations are complex and uniquely conditioned by the social and historical processes specific to the groups involved, we must approach colonial encounters from a long-term historical perspective that crosses the divide between prehistory and history (Lightfoot, 1995). We must also keep in mind that Spanish experiences throughout the Americas also led to an array of ways in which they dealt with indigenous populations that varied across time and space. Not all colonial encounters were the same and the specific courses these interactions followed were far from uniform. These local stories add to the broader effort to decolonize the archaeology of European contact and colonization.

Casting postcontact indigenous societies as watered-down versions of what they once were renders them passive and denies them any culture-making ability. Mocama life under the mission bell in the 1680s clearly differed from that first encountered by the French in the 1560s, as they instructed converts to Catholicism and Spanish moral codes and devoted more time to maize farming. But change is nothing new, because culture is always in motion and its formation is always a mediation between local and large-scale processes (Wolf, 1982). An empha-

sis on local histories and processes should not preclude comparisons because the archaeology of culture contact and colonialism is well-suited to a comparative approach. Only through cross-cultural comparison are we able to “discuss some of the real commonalities” experienced by native communities and Europeans throughout the Americas (Silliman, 2005a: 274).

In this chapter, we have considered the contact period social landscape of the Atlantic coast of southern Georgia and northern Florida and reviewed the history of Mission San Buenaventura y Santa Cruz de Guadalquini from its establishment on St. Simons Island (Georgia) during the early 17th century to its movement to northeastern Florida and final abandonment in 1696. While the mission was occupied categorically by Timucua speakers during its nearly century-long existence, we are less convinced that the late prehistoric occupants of St. Simons Island (Guadalquini) were Mocama. Our assessment of the archaeological record of the Georgia coast suggests that the island’s precontact inhabitants were rooted in the Irene archaeological culture—not just manufacturing Irene pottery—likely making their cultural affiliation Guale not Timucua (Mocama). The social geography of the middle Georgia coast was altered in ways that we still do not fully comprehend as a result of European contact, native rebellion, and missionization. As Kent Lightfoot (1995: 207) puts it, “[w]ithout a solid grounding in prehistory, it may be impossible to determine the timing, magnitude, and sources of changes involved [in cases of European contact], and to evaluate whether significant cultural transformations were really taking place.”

On the basis of archaeological and documentary evidence, it seems very likely that the original San Buenaventura mission was located at the southern tip of St. Simons Island in the general vicinity of the modern lighthouse. We are more confident of the archaeological location of the relocated mission (renamed Santa Cruz), which we contend is at the Cedar Point site on southern Black Hammock Island, Florida. Though our work at the site has been limited to 119 m<sup>2</sup>, it has been quite productive. We have identified and bounded the primary spatial concentration of San Marcos pottery, recovered a range of mission-period artifacts, identified a burial area, and partly exposed a structure. The research potential of the site is immense, and our

future plans are to resume broad-scale excavations to better understand the physical layout of the entire mission community and daily life of a refugee community trying to reestablish itself in a time of grave uncertainty.

## NOTES

1. We express our sincere gratitude to Fred Cook, Charles Pearson, and Ray Crook for freely sharing their knowledge and enlightening us on the archaeology of the lower Georgia coast. University of Northern Florida students Michael Stull and Michael Foster helped with the final stages of analysis and data input and we thank them. Thanks also to John Whitehurst and the NPS staff at the Timucuan Ecological and Historic Preserve. We appreciate the constructive comments of the volume's three reviewers. Finally, many thanks to Victor and Dave for inviting us to participate in the Sixth Caldwell Conference.

2. Alternatively rendered in the primary literature as Boadalquibior, Guadalquina, Guadalquine, Guadarquine, Gualequini, Gualiquini, Gualquini, Hoadalquini, Oadalquini, Obadalquini, Obadalquiny, and Ubadalquini.

3. In primary Spanish documents the term *Guale* is used in multiple ways. It refers to a specific village, a regional province, and a language (by extension, those who spoke the language).

4. Guadalquini was the Spanish name for St. Simons Island and appears to have been used in a general fashion to refer to natives living on the island. There is no direct evidence to suggest that it was the name of a specific group or village. San Buenaventura de Guadalquini is merely St. Bonaventure of Guadalquini, again simply a reference to St. Simons Island.

5. The northern end of the island was subjected to extensive survey and testing by the University of Florida in the 1970s (Martinez, 1975; Wallace, 1975; Milanich, 1977). Robin Smith (1984: 74) reports that a 1981 survey by Sue Mullins Moore of a large tract on the western side of St. Simons Island "produced very little other evidence of Irene

occupations." Limited archaeological work, however, has taken place in the middle and southern parts of the island, so little is known about the occupational history of these areas.

6. Worth (2009), however, offers an alternative interpretation by suggesting that precontact Mocama were living on St. Simons Island, but that they were manufacturing Irene, not San Pedro, pottery. No San Pedro pottery (nor sherd-tempered Timucua ware) has been reported for St. Simons Island.

7. This increase in population compared to the 1683 census on St. Simons Island suggests the refugees did indeed move to Santa Cruz.

8. Mission-period artifacts covered the northeastern part of the Cedar Point site and the extreme southern edge of the Cedar Point North site. The boundary between these two sites is arbitrary and defined by Russo, Cordell, and Ruhl (1993: 39–42) on the basis of limited shovel testing and observed difference in shell distributions. We see no reason to distinguish between the two sites in discussing the mission-period component. Thus we refer to the area of UNF testing as the Cedar Point site.

9. Since this was written, UNF has conducted additional excavations in 2011 and 2012 that will be published subsequently. Substantial amounts of daub were recovered to the west, and the structure was determined to be rectangular (10.5 x 7 m) and partially daubed.

10. Not only is the Harrison Homestead site the indisputable location of Santa Catalina de Guale on Amelia Island (Santa María), but it is also the place of the late 16th-/early 17th-century Mocama *visita/doctrina* of Santa María de Sena and the late 17th-century Yamasee settlement of Santa María (pre-1673–1683) (Saunders, 1990, 1993, 2000a, 2000b: 8–10; Worth, 2007a: 11, 20, 28, 197). With this said, we need to bear in mind the triple occupation of the site by sequential Mocama, Yamasee, and Guale populations, particularly given the now-accepted notion that all three groups manufactured San Marcos pottery during the 17th century. Therefore, we cannot assume that all the San Marcos pottery from the site was manufactured by late Guale immigrants. It was also produced by the earlier Mocama and Yamasee. Thus site contexts based on the presence of San Marcos pottery might not be as exclusive to the Guale as once thought.





## CHAPTER 16

### ENTANGLING EVENTS: THE GUALE COASTAL LANDSCAPE AND THE SPANISH MISSIONS

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The Guale, known primarily from ethnohistoric documents, are a group of Native Americans that once inhabited the northern half of the Georgia coast during the 16th century. Like most indigenous coastal groups in the Southeast, the Guale experienced intense interactions with Europeans (Worth, 1995; Thompson and Worth, 2011). In many circumstances, these interactions and events shaped Guale lifeways. The questions of how and to what extent such encounters altered the Guale's traditional patterns of subsistence (Ruhl, 1990, 1993; Reitz, 1993; Worth, 1995; Reitz et al., 2010), settlement (Jones, 1978; Crook, 1986; Reitz, 1988; Keene, 2004; Thomas, 2008: chap. 35), health (Larsen, 1990, 2001b), and material culture (DePratter and Howard, 1981; Saunders, 2000a; Deagan and Thomas, 2009) are the subject of ongoing research by both ethnohistorians and archaeologists (see Thompson and Worth, 2011).

While the studies previously mentioned add to our overall understanding of the Guale, they have for the most part focused on specific sites. Pearson (1977b) and Thomas (2008) have conducted some large-scale studies, but these, by and large, focus on either the large barrier islands as a whole, or data derived from large sites on the mainland and barrier islands. As a complementary perspective to these studies, we take a regional approach to exploring change and continuity among the Guale at contact by including information not only from sites on the barrier islands and the mainland, but also from the smaller islands in between, in the back-barrier area. Specifically, our research seeks to address the following question: to what extent

were the traditional land use practices of the Guale altered after the arrival of the Spanish?

In order to address this question and its implications, we first briefly outline some of the theoretical considerations of our study. Specifically, we situate our research within the growing body of literature regarding colonial encounters (e.g., Silliman, 2005b; Stein, 2005; DiPaolo Loren, 2008). Next, we provide a short background on the previous research in the region with a focus on the centuries just before and after European settlement, and the establishment of the Spanish mission system. Following this, we outline our dataset and the analysis. Two main types of data are used to evaluate the research question, a regional dataset of coastal Georgia sites obtained from the Georgia Archaeological Site File (GASF), and intensive shovel test surveys of specific islands. As a supplement to the main analysis, we present excavation data from one small back-barrier island site as an additional line of evidence. From these data, we argue that while some of the Guale population continued to utilize the landscape of the coast, this land use was not as intense as during the period prior to European colonial endeavors. In the concluding section, we suggest that, despite the relatively intense debate regarding Guale settlement patterns, few have looked at them in terms of regional analysis—perhaps the most appropriate scale at which to address such an issue. Our results, beyond simply documenting shifts in land use, have implications for the way the Guale experienced and mediated colonial entanglements.

## AGENCY, HISTORICAL ARCHAEOLOGY, AND COLONIAL EVENTS

For more than 40 years, colonial encounters have been an important component of archaeological research along the Georgia coast (e.g., Caldwell, 1954; Larson, 1978; see Milanich, 1999 for an overview). The work at Mission Santa Catalina de Guale on St. Catherines Island by Thomas and colleagues has perhaps had the greatest impact as the most extensive work to date has been carried out on this island. In addition, they regularly place their studies within the larger context of colonial studies (see Thomas, 1988b, 1990, 1993a, 2008 for an overview). Other older and more recent projects have also added to the information on Spanish mission period archaeology (e.g., Saunders, 2000a; Jefferies and Thompson, 2006; Gorman, 2007; Jefferies and Moore, 2009). Finally, the ethnohistoric research of Worth (2004a, 2007a) and Jones (1978) provides insight into Guale lifeways during the time that the Spanish occupied the coast.

This previous research of mission period archaeology along the Georgia coast allows us to contextualize social interaction theoretically in terms of both events and actors. Recent historical archaeology, especially “culture contact” studies, is influenced by postmodernism, deconstructionism, critical theory, gender relations, and an “overarching concern with human agency” (Deagan, 1998: 25; 2004). This specific concern with human agency is present in several studies along the Georgia coast, particularly in the work of Saunders (1998, 2000a, 2002a, 2009) regarding Guale resistance to Spanish hegemony. While we applaud this research as it brings to light the various actions and intentions of actors, recent theoretical scholarship questions traditional applications of agency (Joyce, 2004; Blanton and Fargher, 2008: 5–6). Therefore, these theoretical constructs require some modification, refinement, and exposition in the context of the current study.

Applications of agency, practice, praxis, and the like are *de rigueur* in anthropological historical archaeology; however, many such studies are critiqued for their lack of attention to structure (Joyce, 2004; see also Francis and Kole, 2011). In addition, the use of agency in archaeology often assumes that all social change comes from the action of individuals, usually the self-interested kind, ignoring other sources of social change (Kristian-

sen, 2004; Carr and Case, 2006: 36–42). Further, the majority of the time, archaeologists speak only of the agency of rulers, leaders, and the like, often neglecting the agency of commoners (see Paukettat, 2000, for an exception), as well as other agents with a diversity of interests that may or may not be self serving (Blanton and Fargher, 2008: 5–6).

Recent work by Beck et al. (2007) and Blanton and Fargher (2008) attempts to mediate many of the problems associated with previous applications of agency theory by drawing on the work of Sewell. Sewell’s (1992, 2005) refinement of agency and structure, as well as his notion that events are also sources of structural change, has implications for both method and theory in the historical archaeology of colonial encounters. Sewell (1992, 2005), as well as others, posits that agency is universal among people, rather than only limited to leaders. However, agency is not homogeneous between groups, individuals, or social systems (Sewell, 2005: 144–145; see also Beck et al., 2007: 834). That is, an agent or group of agents will vary in their ability, desire, and creativity to engender social change, as these things change across different social situations.

While Sewell’s writing on agency is important, the real contribution of his work comes in his reformulation of Giddens’s (1979) theory of structure. Like Giddens, Sewell (2005: 136) argues for a duality of structure. Sewell (2005: 136) also includes both a virtual aspect (i.e., cultural schemas) and an actual component (i.e., resources), each being the effect of the other. Schemas in this sense are mental structures (see Bourdieu, 1977). Resources, on the other hand, can be both human and nonhuman. Human resources include “strength, dexterity, knowledge, and emotional commitments,” and the like, while nonhuman resources are “objects, animate or inanimate, naturally occurring or manufactured, that can be used to enhance or maintain power” (Sewell, 2005: 133).

Sewell’s (2005: 100, 218) notion of the “event” provides the final theoretical piece that bridges historical thinking with social science concepts (Beck et al., 2007: 833; see also Bolender, 2010). As Beck et al. (2007: 833) explain, an “event is defined as a happening or encounter that transforms the articulation of social structures” and events are the “catalysts for durable structural change.” Further, events are spatial as well as temporal. Finally, it is within the context of events that agents have novel opportunities

to engender change. This last point by Sewell is limited in that it only views events as providing opportunities for agency. Theoretically, this may not adequately describe the full range of social situations available to agents for enacting change. Pragmatically, for archaeology, we argue that such archaeological case studies provide some of the best data to examine these types of phenomena in the past.

Such a reformulation of agency and structure, with its focus on both virtual and actual aspects, provides a powerful framework to examine the archaeology of colonial encounters. For the Americas, we think it is safe to say that the entanglement of multiple ethnic groups (e.g., Spanish and Native Americans) that have been separated both temporally and spatially fall into Sewell's definition of an event. In fact, we would characterize this as a specific type of an event, or series of events, which we refer to as "entanglement events." In addition to this, however, we must consider the fact that as Silliman (2005b) points out, there are differences between short-term (e.g., first contact) and more protracted interactions (e.g., entanglements). In the case of the Georgia coast, there was a longer history of direct and sustained interactions between Native Americans and colonial groups than was the case in other areas of the American Southeast. The entanglement of Spanish colonists and Native Americans in La Florida was shaped both by long-term structures (i.e., cultural schemas) and short-term structures (i.e., resources). Changes in native and colonial cultural schemas, and changes in resources available to native people and colonists in the Georgia Bight, led to ruptures and structural transformations that are amenable to the kinds of analysis and interpretation outlined by Sewell (2005) and Beck et al. (2007).

The use of Sewell's work has implications in historical archaeology, some of which have been voiced previously (e.g., Lightfoot, 1995). Specifically, this approach requires us to dispense with notions of "prehistory" that posit that such analyses are somehow substantively different from those where there are written records (see Beck et al., 2007: 835). Lightfoot (1995: 210) argues that the intellectual and methodological divide between historical and prehistoric archaeologists has hindered the ability of archaeology to "evaluate the full implications of Columbian consequences." Thus, the implication of Lightfoot's ideas, particularly for those working across event

boundaries like the ones we describe here, is that there must be a methodological coherence, or as Lightfoot (1995: 211) states, an integrated research design across the so-called boundaries of "prehistoric, protohistoric, and historic" periods.

There are two relevant points in Lightfoot's discussion regarding the divide between prehistoric and historical archaeology and the use of Sewell's concept of event for our research along the Georgia coast. First, since Sewell's notion of agency, structure, and event contain the view that these concepts are contingent on time and space, then the scale of analysis must incorporate multiple time frames as well as varying spatial scales. Similarly, Lightfoot (1995: 211) suggests that an integrated approach to prehistory/history necessitates "shifting the unit of analysis from the artifact ratios to the spatial organization of the archaeological record." As such, our analysis of the Georgia coastal colonial event is multiscalar, incorporating regional, islandwide, and site-specific data. The second point relates to the treatment of historical documents in our analysis, or rather, how others have used them to characterize the Guale—specifically their mobility and settlement patterns. Sewell's concept of the event, as structure changing, forces us to view documents, written accounts, and the like in light of this concept. Thus, we must consider the event as structure changing in any interpretation of written records. While the concept of being critical of written documents is hardly novel, flagrant abuses of direct historical analogy continue, as well as the privileging of documents over other sources of data (Lightfoot, 1995: 205–206). Further, taking this viewpoint forces us to explicitly consider the context in which the document was written, again also advocated by Lightfoot (1995: 205).

In the following section, we outline some of the major studies directly relevant to our current research. This summary will provide the background information along the Georgia coast necessary to evaluate our current arguments. Specifically, we provide information on the coastal environment followed by important research on mobility, health, and subsistence. We then present the methods and results of our regional analysis of the northern Georgia coast. Finally, we frame our concluding discussion in terms of the theoretical constructs that we previously outlined and articulate our findings with past research on this topic.

## ENVIRONMENT AND BACKGROUND

The Georgia coast is composed of the tidally influenced mainland, a series of barrier islands, smaller back-barrier islands, and expanses of marsh intersected by tidal estuaries, creeks, and rivers. This area is part of a large, complex ecosystem known as the Georgia Bight, which extends from Cape Hatteras in the north to Cape Canaveral at its southernmost extent (Hubbard, Oertel, and Nummedal, 1979; Pennings et al., 2012). The Guale area of this region, at least during historical times, is thought to fall between the Savannah and Altamaha rivers, encompassing some of the larger barrier islands, such as St. Simons, Sapelo, St. Catherines, and Ossabaw (Worth, 2004a, 2007a).

It is clear from the archaeological research carried out on the large barrier islands and the coastal mainland that large villages of Guale were situated in these areas. More recent research on the smaller back-barrier islands, located in the intertidal areas between the barrier and the mainland, also indicates intensive use by the Guale people (Thompson and Turck, 2010; Turck, 2011; Thompson, Turck, and DePratter, 2013). The back-barrier environment contains numerous islands that date to the Holocene or are former Pleistocene remnants (Hoyt and Hails, 1967; Hubbard, Oertel, and Nummedal, 1979). These back-barrier islands vary in size from relatively small areas of uplands (< 1 ha) to large expanses of land covering several square kilometers (Hubbard, Oertel, and Nummedal, 1979).

Due to the relatively small amount of habitable upland area within the back-barrier area (because of the small size of many of these back-barrier islands compared to the extent of the marsh), the density of archaeological sites in this area is higher than on either the mainland or the barrier islands (Thompson, Turck, and DePratter, 2013). Native peoples occupied many of these smaller islands for much of the time from 2200 B.C. onward, indicating general intensive settlement of the Georgia coast (Thompson and Turck, 2010; Thompson, Turck, and DePratter, 2013). We highlight the marsh islands of the back-barrier environment, as they will be central to our analysis of changes in Guale land use and concomitant changes in the structure of their lifeways.

The distribution of sites in the Guale region, as well as the information gleaned from the zoo-

archaeological record, reveals that the individuals and groups that occupied this area had a deep knowledge of the coastal environment and its resources (Reitz, 2008; Thomas, 2008; Reitz, Quitmyer, and Marrinan, 2009; Thompson and Turck, 2009; Reitz et al., 2010). While we cannot say definitely that the Guale were the descendants of the first peoples to occupy the coast of Georgia, we can say that they were part of a coastal tradition that spanned over four millennia. It is during the Late Archaic (2200 B.C. to 1100 B.C.) that we see archaeological evidence of large-scale use of estuarine resources, such as those found at shell rings along the coast (e.g., Thompson, 2007; Colaninno, 2010; Thompson and Andrus, 2011). Despite major environmental shifts related to changes in sea level and the overall available land, the Guale and their predecessors utilized coastal resources to varying degrees (Thomas, 2008; Thompson and Turck, 2009, 2010; DePratter and Thompson, this volume, chap. 6).

Reitz et al. (2010: 176–178) nicely summarize the changes in vertebrate subsistence patterns for the Guale during the Irene Period (A.D. 1325–1580) and for the period of European occupation (A.D. 1580–1700). Largely based on work from Santa Catalina de Guale, they find that Eurasian animals were not a part of either the Spanish or Guale diet. Instead, fishes were the most common dietary resource for both groups. The use of fish as a staple resource was common among the Guale and was, most likely, part of long-term traditional subsistence practices. However, several changes were to accompany the arrival and establishment of the missions, at least from the perspective of St. Catherines Island. During the Spanish occupation of the coast, the Guale pattern shifted to incorporate fewer small-bodied fishes. Further, the Guale began to capture fish from higher trophic levels. Sea catfish (Ariidae, *Ariopsis felis*, *Bagre marinus*) were also captured with greater frequency (see Reitz et al., 2010).

In addition to certain kinds of fish, the consumption of white-tailed deer also increased during the Spanish occupation of the coast. Reitz and colleagues (2010: 162) interpret this greater reliance on deer as, in part, a product of increased demand by the Spanish. This, of course, would have an effect on traditional hunting practices of the Guale in terms of time allocation. Thus, while garden hunting most likely played a part in deer hunting, on the whole, more labor was expended than prior to the 17th century (Reitz et

al., 2010: 162).

The bioarchaeological record complements many of the shifts that Reitz et al. (2010) note for the use of vertebrate fauna. Studies of the skeletal assemblages from St. Catherines Island and elsewhere along the Georgia coast by Larsen and colleagues (Larsen, 1982, 2002; Larsen and Thomas, 1982, 1986; Larsen et al., 1990, 1992, 2001; Larsen, Shavit, and Griffin, 1991; Larsen, Ruff, and Griffin, 1996; Hutchinson et al., 1998; Ruff and Larsen, 2001) have elucidated several patterns associated with the colonial event. Foremost among these are changes connected to the inclusion of maize as a greater proportion of the diet and shifts in degree of mobility of some Guale.

There is considerable debate as to the nature of pre-Hispanic maize consumption for the Guale (Thompson and Worth, 2011). While Keene (2004) documents maize in pre-Hispanic context, this study is the exception rather than the rule. This is largely because archaeologists have not systematically evaluated the archaeobotanical record for the Georgia coast (Reitz et al., 2010: 50). Therefore, we must depend on the skeletal record for insight into the degree to which farming was a part of the Guale economy. The bioarchaeological record of the Guale and their predecessors along the Georgia coast indicates an increasing reliance on maize beginning around A.D. 1150, based upon isotopic and skeletal markers (Larsen, 1982; Hutchinson et al., 1998; Larsen et al., 2001). Prior to the arrival of the Spanish, this increasing dependence on, or use of, maize led to a decline in oral health and included increases in dental caries and infections (Larsen, 2002: 64). After the arrival of the Spanish, the Guale became even more reliant on maize, and there was a decline in the consumption of the marine component relative to the terrestrial one (Larsen et al., 2001). This shift in dietary patterns, in the context of demographic collapse, engendered a precipitous decline in the overall health of the Guale (Hutchinson et al., 1998; Larsen et al., 2001; Larsen, 2002; Stojanowski, 2006).

In terms of mobility, the dietary patterns and bioarchaeological record lend insight into how the Guale made use of the broader coastal landscape. Particularly interesting is the finding that mobility among the sexes differed in some cases. At Santa Catalina de Guale, women and some men were less mobile, as indicated by skeletal markers, than their pre-Hispanic ancestors (Ruff

and Larsen, 2001: 137). However, many men at the mission experienced an increased mobility when compared to the pre-Hispanic period. This is perhaps a product of the *repartimiento* draft labor system (Bushnell, 1981; see also Larsen et al., 2001). However, increased forays into the estuaries and small islands for subsistence resources and concomitant returns to mission settlements could also be contributing factors.

The information discussed earlier must be considered in light of opposing models of Guale settlement and subsistence, which are heavily rooted in perspectives influenced by ethnohistoric documents. Dubbed the “Guale problem” by David Hurst Thomas (Thomas, 1987: 57–64; 2008: chap. 35, 1095), the debate centers on the relative degree of Guale mobility during the pre- and postcontact eras. One view is that these groups were highly mobile, moving seasonally as they exhausted resources (Larsen, 1980a; see also Steinen, 1984; Crook, 1986). Alternatively, others posit a more sedentary existence where the rich estuarine environment supplemented by maize agriculture supported large year-round villages (Pearson, 1977b, 1978; DePratter, 1978; Jones, 1978; Keene, 2002, 2004; Thompson and Worth, 2011).

The view that the Guale practiced residential mobility is largely derived from the ethnohistoric documents of the Jesuit priests that were part of the mission effort in the region (Zubillaga, 1946; Thompson and Worth, 2011) (fig. 16.1). Both Worth (1999) and Thomas (2008) reevaluate the ethnohistoric evidence in light of its climatological context as well as detailed archaeological research on Guale settlement systems, subsistence strategies, and social organization on St. Catherines Island. Worth and Thomas suggest that the Jesuits actually observed the Guale responding to both the strain brought on by climatic changes as well as stresses of the growing Spanish presence on the coast. Increased mobility on the part of coastal Native Americans may have been a deeply ingrained response to environmental stress. For example, Thompson and Turck (2009) argue that a higher degree of residential mobility was one of the ways that Early Woodland groups responded to sea level lowering around 1100 B.C. Did the Guale respond similarly to both environmental and social stressors (i.e., drought and the arrival of the Spanish)? While Worth’s and Thomas’s work provide compelling evidence to support the assertion that this is indeed the case,

we provide additional lines of evidence regarding this question. Further, we offer additional insight into this question by contextualizing it within a framework that allows for a more nuanced discussion of the implications of Spanish and Guale cultural entanglements.

## METHODS

In order to examine the effect that the arrival of the Spanish and the establishment of the mission system had on the Guale of the Georgia coast, we use the distribution of both sites and ce-



Figure 16.1. The location of the Guale region with known and hypothesized mission locations. Mission locations in red are Worth's (2004) suggested locations. Mission locations in yellow are currently under consideration by Michael Francis (with input from John Worth and David Hurst Thomas).

amics across the landscape to determine the extent and intensity of Guale use of the landscape. Locational data of Irene and Altamaha sites documented in the GASF database are used to assess changes in settlement patterns across the broader region. The second dataset consists of intensive surveys of several back-barrier islands along the coast of Georgia. While there are issues with extrapolating land use from the distribution of both sites and ceramics, taken together, they provide two independent lines of evidence to answer our research question.

#### CERAMIC BACKGROUND

The premission and mission ceramic types include both the Irene and Altamaha series. In general, the Irene ceramic wares date to the premission era, while Altamaha wares are a postmission phenomenon. Unfortunately, a simple pre- and postmission era designation oversimplifies the dynamics of material culture change in this case. DePratter (1984; see also Thomas, 2009a: 62) originally postulated an end date of A.D. 1550 for the Irene Period. However, recent research at Santa Elena indicates that at least for some areas of the Georgia Bight, Irene Period ceramics continue to be made well into the historic period, suggesting a later end date of A.D. 1580 (DePratter, 1991, 2009).

For the central to northern Georgia coast, the transition from Irene to Altamaha designs may have been abrupt according to research on St. Catherines Island (Thomas, 2008, 2009a; Saunders, 2009: 86). Thomas (2009a: 62) notes the upper 1 $\sigma$  range of available radiocarbon dates associated with Irene ceramics appears to be cal A.D. 1530. Saunders's (2000a, 2009: 83, 86) research also suggests a rapid change from the filfot cross designs of the Irene ceramics to the less complicated cross simple stamped designs of Altamaha ceramics. Indeed, she posits that this change may have occurred within one generation of pottery between A.D. 1580 and 1595 (2009: 86).

For our purposes, following DePratter (1991, 2009; see also Thomas, 2009a), we recognize the historic date of A.D. 1580 as the terminal date of the Irene Period. While Irene ceramics continue to be fashioned to some degree, Altamaha series ceramics become more prevalent and dominant in most assemblages. This is not only the case for the central to northern Georgia coast, but also for the southern Georgia coast and northern Florida, where Altamaha (also called San Marcos) ce-

ramics were produced (Ashley, 2009; Saunders, 2009). The ending date for the Altamaha ceramic range, according to the radiocarbon dates from St. Catherines Island, falls between cal A.D. 1660 and cal A.D. 1800 (Thomas, 2009a: 79). While the radiocarbon dates indicate a broader range, we use here the historically derived date of A.D. 1700 following DePratter (1991) and Thomas (2009a: 79).

#### GASF DATABASE

During the 1970s and early 1980s, DePratter instituted an extensive shoreline survey of the Georgia coast. This research involved geoarchaeological research as well as archaeological survey (e.g., DePratter and Howard, 1980). The survey methodology included traveling by boat to small islands, mapping sites visible in surface and shoreline exposures, and extensive probing to find and map buried shell deposits. The survey crew collected artifacts and recorded collection locations. All artifacts were then classified, and all information was recorded in the GASF database. Since this time, many more site data have been added to this database. Thus the GASF database from March of 2010 was used to obtain site location data for the distributional analysis in this chapter. These data reveal a broad perspective on the use of the landscape by the Guale and their ancestors.

#### ISLAND SURVEY AND EXCAVATION

In order to examine how intensively the Guale utilized the landscape, data from back-barrier islands were also analyzed. In 2007, Thompson instituted a survey project for the Georgia coast that focused on back-barrier islands (also called marsh islands or hammocks). This project was specifically designed to complement the shoreline survey conducted by DePratter. To date, four islands along the central Georgia coast have been surveyed, including Little Sapelo Island (44.9 ha), Pumpkin Hammock (3.3 ha), Patterson Island (18.2 ha), and Mary Hammock (10.4 ha) (fig. 16.2). Thompson and Turck (2010) provide a broad discussion of the specific methodology and the long-term occupational history of these islands (e.g., Late Archaic through historic period). Briefly, the field crew conducted shovel test probes at 20 m intervals across entire islands. These shovel tests were 50 cm in diameter and were excavated until two sterile (ca. 20 cm) levels were encountered.

To supplement these survey data, small-scale

excavations and mapping were conducted on Pumpkin Hammock. These excavations included small ( $1 \times 2$  m) units in middens, as well as a trench ( $10 \text{ m}^2$ ) through one of the larger shell midden piles on the island. The purpose of these excavations was to determine the time frame of the greatest midden accumulation on the island. We deemed such information significant to the overall question of how the economic importance of resources (including islands in general) changed over time, specifically with regard to the early historic contact period.

## RESULTS

### GASF DATABASE

There are 312 sites dating to the Late Mississippian Period on the northern Georgia coast from Jekyll Island and north (fig. 16.3). Of those

sites, only 12.8% ( $N = 40$ ) were continually occupied into the contact period. In other words, only 40 sites have evidence of both Irene and Altamaha ceramics. Thus, 87.2% ( $N = 272$ ) of the Late Mississippian sites are abandoned at the time of contact. In addition, 37 new Native American historic contact period sites were established (i.e., 37 sites have Altamaha, but no Irene, ceramics) (fig. 16.4). Part of the explanation for this pattern may be due to the abandonment of the northern Georgia coast in the 1500s, or as early as A.D. 1450 (see Anderson, 1994: 249 for a discussion about the Savannah River Valley), resulting in sites in this region not having an Altamaha component. However, site file data indicate that there are, in fact, seven sites with Altamaha components in this area.

Survey information from St. Catherines Island (as part of the GASF database) was also analyzed



Figure 16.2. The location of the four marsh islands in the present study, and their relation to the mainland and Sapelo Island, one of the major barrier islands on the Georgia coast.



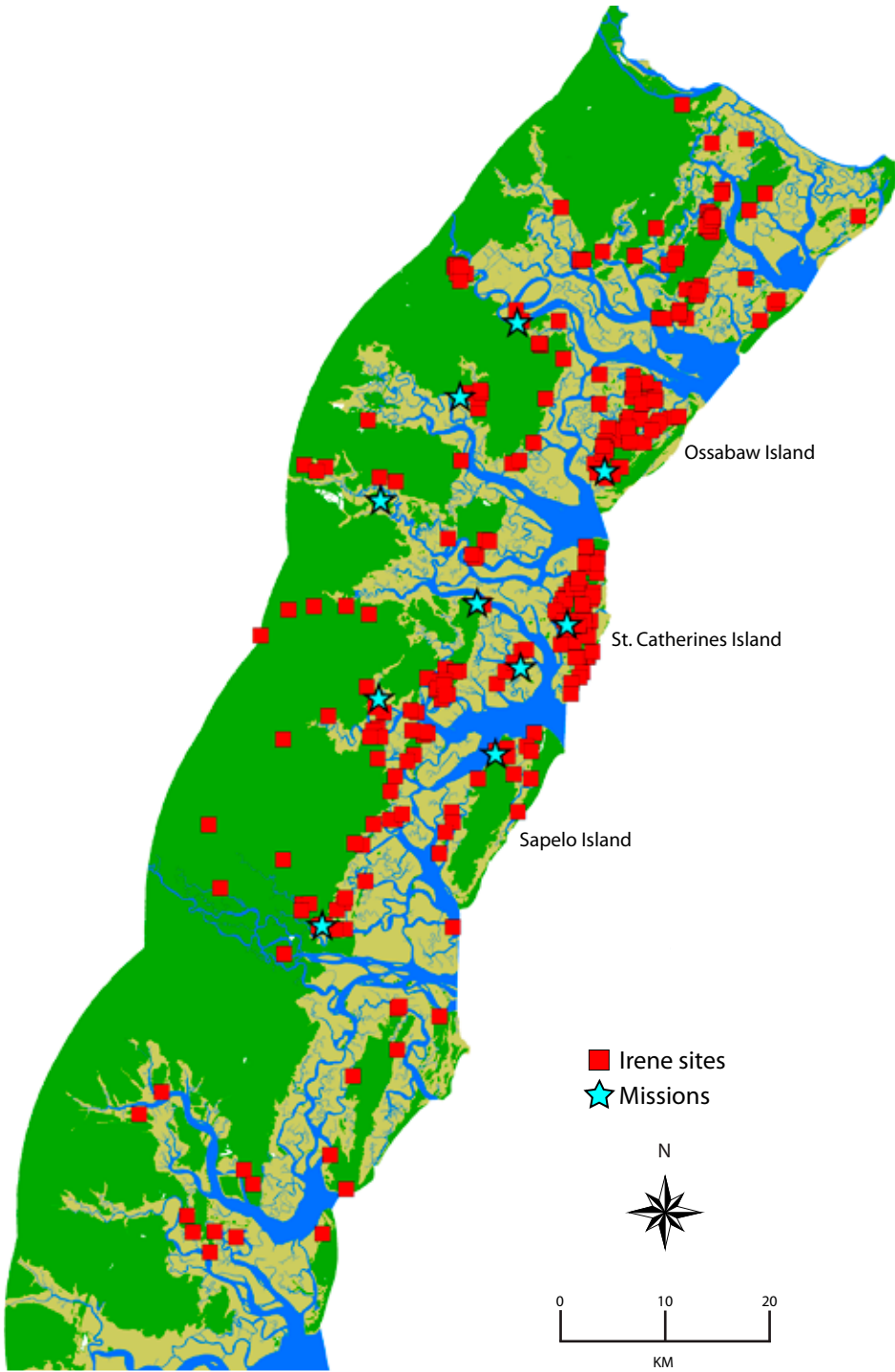


Figure 16.3. The location of Irene Period sites (red boxes) in relation to missions (blue stars) along the Georgia coast.

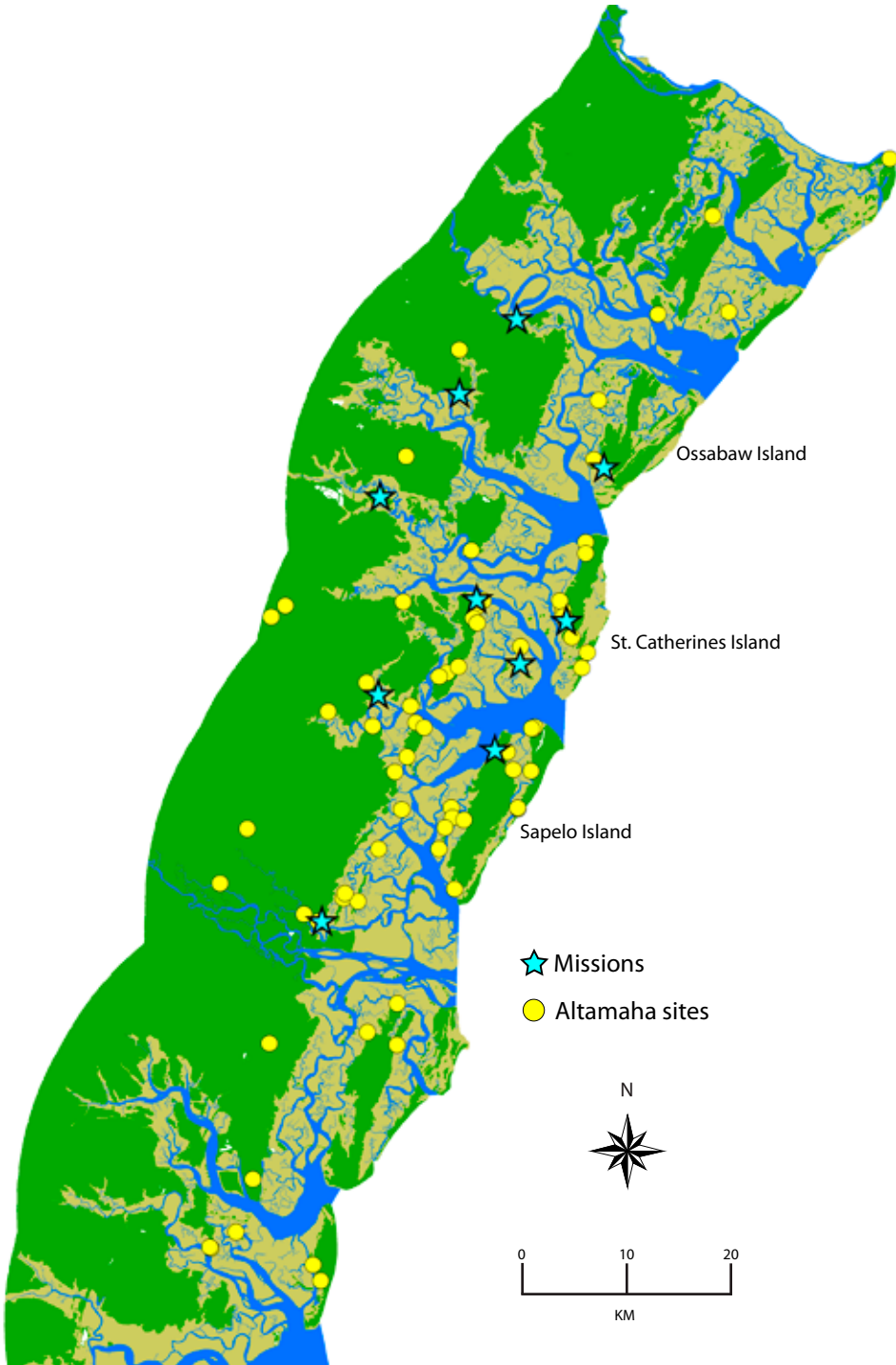


Figure 16.4. The location of Altamaha Period sites (yellow dots) in relation to missions (blue stars) along the Georgia coast.

as a more detailed example of the GASF locational data (figs. 16.5 and 16.6). Of the 66 Late Mississippian sites on St. Catherines Island, only 12.1% ( $N = 8$ ) are continually occupied into the contact period, with 87.9% ( $N = 58$ ) of the sites no longer used. Only three new Native American historic contact period sites were established, and they are all associated with the Santa Catalina mission (i.e., within 100 m of the mission).

#### ISLAND SURVEY AND EXCAVATION

On three of the four back-barrier islands surveyed, there was a large drop in the number of sherds between the Late Mississippian Period and the historic contact period. The respective differences for each of these islands are as follows: Little Sapelo Island (Late Mississippian  $N = 247$ ; Historic Contact,  $N = 17$ ), Mary Hammock (Late Mississippian  $N = 130$ ; Historic Contact,  $N = 5$ ), and Patterson Island (Late Mississippian  $N = 82$ ; Historic Contact,  $N = 8$ ). This suggests that while there was not a complete abandonment of these islands, there was a marked decline in the intensity of occupation (using sherd count as a proxy for intensity of occupation).

In contrast, the survey on Pumpkin Hammock revealed a slight increase in the number of sherds between the Late Mississippian Period ( $N = 5$ ) and the historic contact period ( $N = 16$ ). While excavation of a shell midden on this island revealed a large amount of both Irene and Altamaha ceramics, there are actually slightly more Irene ceramics (table 16.1). This indicates a similar intensity of occupation during the Late Mississippian and historic contact periods on Pumpkin Hammock (again using sherd count as a proxy). In addition, the basal date for the shell midden is cal A.D. 1410 to 1470 at the  $2\sigma$  level, indicating that midden accumulation began during the middle of the Late Mississippian period (see Thompson and Roberts Thompson, 2010). This suggests that intensive occupation of this part of the island occurred during the Late Mississippian and early historic contact periods.

#### ENTANGLEMENT EVENTS

Does the archaeological record indicate substantial continuity in pre- and postcontact use of the broader landscape by the Guale? Based on our analysis, the answer is no. As such, we should not take the ethnohistoric Jesuit descriptions of Guale mobility, outlined earlier in our back-

ground section, as being representative of their land use practices prior to contact (i.e., with Irene phase sites). As both Worth (1999) and Thomas (2008: 1095) note, the idea that the Guale were highly mobile must be considered in the context of climatic changes as well as stresses the Spanish placed on these populations as a result of missionization. While some Guale used new areas of the landscape after the arrival of the Spanish, many areas were abandoned. Furthermore, where the Guale continued utilizing the landscape, it was not as intensive as during the precontact time frame (e.g., on back-barrier marsh islands).

Given what we know from the ethnohistoric and the archaeological records regarding Guale practices in the context of the arrival of Spanish missionaries and the mission system, how do we talk about this event in a meaningful way? We argue that the Beck et al. (2007) application of Sewell's reformulation of agency into cultural resources and cultural schemas provides the necessary framework to explore some of the more nuanced aspects of the changes we observe on the coast of Georgia.

As we suggested at the outset of this chapter, Spanish contact with the Guale qualifies as an event in terms of Sewell's definition, because the establishment of the mission system engendered considerable lasting structural change. We take this one step further and argue that this actually represents a very specific kind of event or series of events: an entanglement event. Such events are defined as happenings that engender significant structural changes in multiple communities whose individual histories were, prior to this point, independent of one another. Finally, while individual agents vary, relationships and interactions within these communities have overarching themes of hegemony and subjugation that are expressed physically, ideologically, and/or economically. Though the initial settlement attempts by the ill-fated Ayllón expedition in 1526, as well as settlements outside the immediate area, such as Santa Elena in 1566, were important to understanding the overall process of interaction, they fall under what Silliman (2005) calls short-term encounters, rather than the protracted interactions that we discuss here. In addition, while there is interaction between these groups, such events do not engender the intimate and intertwined histories emphasized here that affect both indigenous and colonial agents alike. We now return to our question: how did individuals and groups negoti-

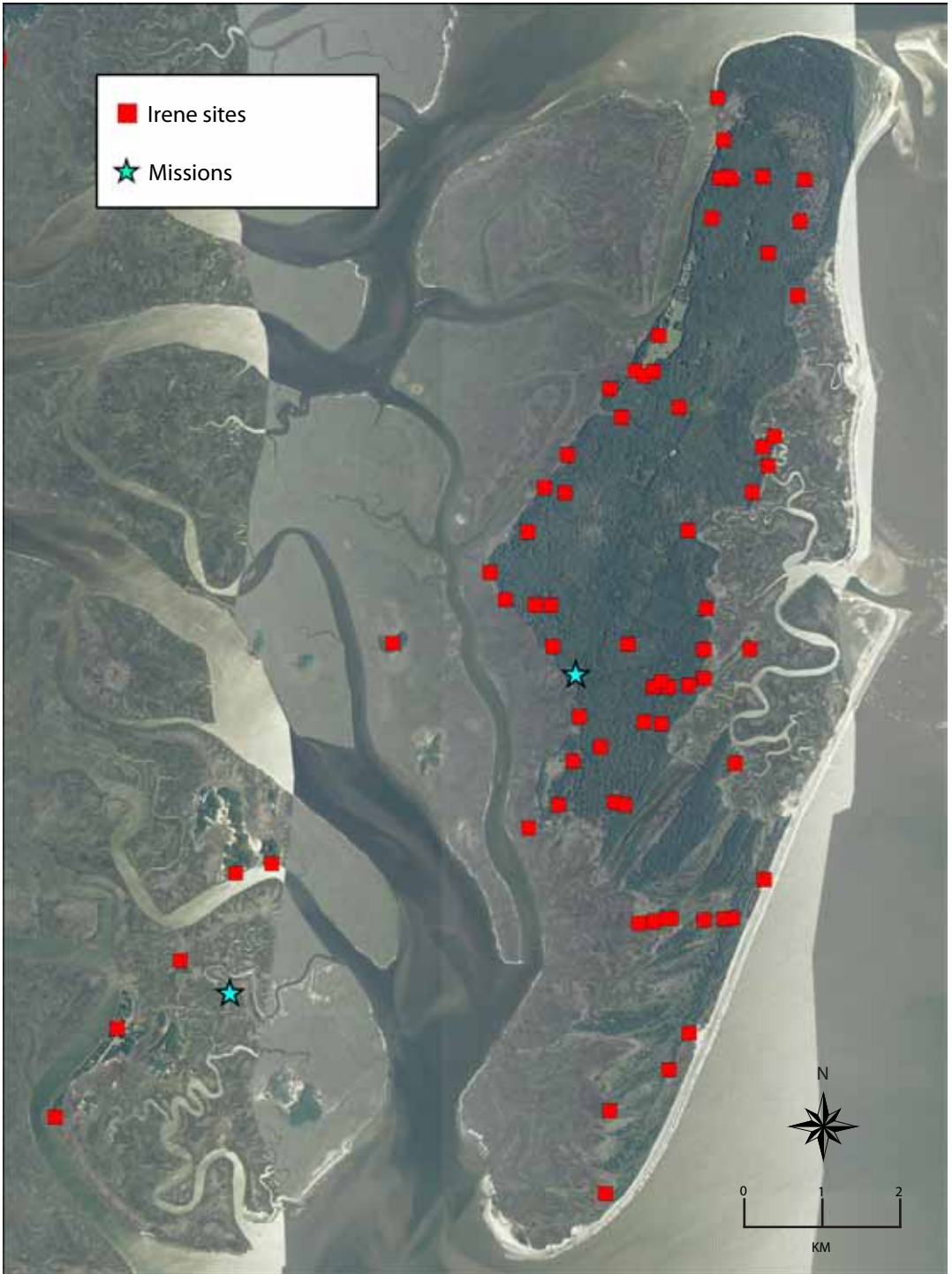


Figure 16.5. The location of Irene Period sites (red boxes) on St. Catherines Island and the nearby coast in relation to known/hypothesized mission sites (blue stars).

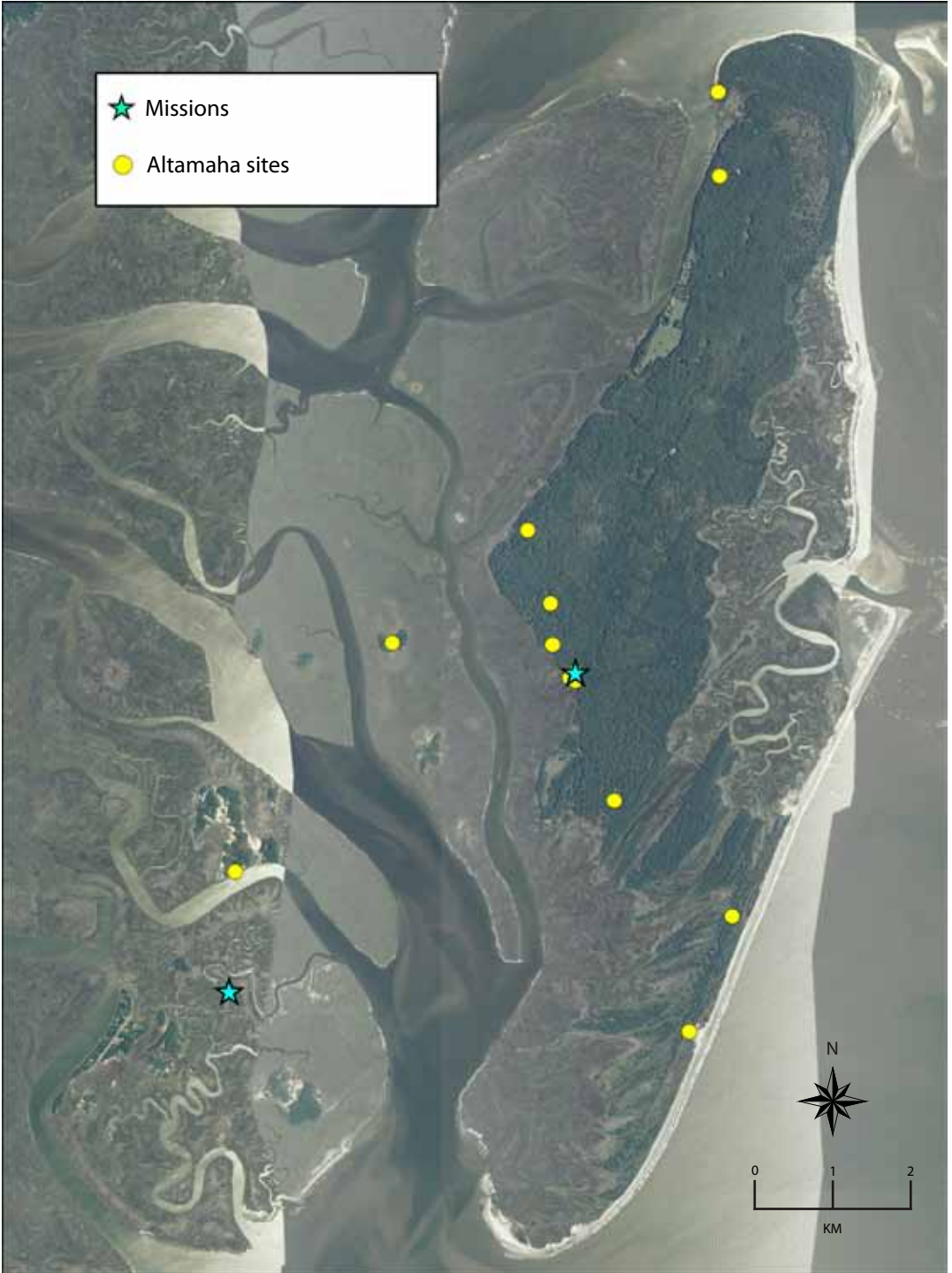


Figure 16.6. The location of Altamaha Period sites (yellow dots) on St. Catherine's Island and the nearby coast in relation to known/hypothesized mission sites (blue stars).

TABLE 16.1  
Ceramic Totals from Pumpkin Hammock Excavations (9Mc350)

Ceramic Type	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total
Altamaha Check Stamped	—	—	2	2	1	5
Altamaha Red Filmed	—	—	2	2	2	6
Altamaha Complicated Stamped/ Line Blocked	—	—	4	1	6	11
Altamaha Complicated Stamped	—	5	26	24	28	83
<b>Total Altamaha:</b>	—	5	34	29	37	105
Irene Complicated Stamped	—	3	22	23	33	81
Irene Incised	1	1	6	10	19	37
Irene Burnished Plain	—	—	3	1	4	8
Irene Plain	—	—	3	2	5	10
Irene Punctated	—	—	—	1	—	1
<b>Total Irene:</b>	1	4	34	37	61	137

ate these events?

To some degree, we can conceptualize the entanglement event in terms of Sewell's (2005: 133) notions of cultural resources and schemas. Given what we know about the archaeological record of the Georgia coast at this time, we view the back-barrier area as a significant cultural resource for the Guale in terms of negotiating tensions created by the mission system. The natural resources available here (which included terrestrial, marsh, and estuarine species) would have provided the Guale with the necessary actual resources to react to the Spanish presence on the coast in a variety of ways.

Based on our analysis here and in previous studies (Thompson and Turck, 2010), we find that, prior to Spanish contact, the Guale (or rather, their Late Mississippian counterparts) intensively occupied the back-barrier landscape, with probable settled villages on the larger marsh islands. After Spanish contact, our analysis indicates a large reduction in the utilization and/or occupation of these islands. While occupation also continued in other areas, for the most part, the Guale's archaeological footprint over the

broader landscape is greatly reduced. This is seen as an abandonment of a large number of sites throughout the coastal zone. In addition, only a small number of new areas were settled. Some of this new settlement was associated with mission locales, as seen with our analysis on St. Catharines Island. Taken together with the idea that the ethnohistorically known Guale were fairly mobile, we suggest that this mobility was a reaction of some of the postcontact Guale population to the increased presence of the Spanish in their territory. In addition, the Georgia coast was experiencing major droughts during the 16th and 17th centuries (Anderson, 1994; Anderson, Stahle, and Cleaveland, 1995; Blanton and Thomas, 2008), which also would have influenced Guale decisions to become part of mission towns. The Guale cultural schema was altered by the contact entanglement event, which in turn allowed the Guale to mediate that event.

We attribute this shift of the Guale cultural schema to two factors. The first is a demographic effect. The sheer number of abandoned sites between the pre- and postcontact times suggests a population decline. It is likely that many of the

Guale had begun to suffer the effects of European disease. Related to the abandonment of sites, and thus the demographic effect, is that some parts of the Guale population were drawn into the mission settlements. The second factor is mobility. While the distributions of archaeological sites on the landscape are not isomorphic with mobility patterns, our analysis provides insight into the nature of how use of the broader landscape differed between the pre- and postcontact eras. We argue that the difference in settlement pattern between the Late Mississippian and historic contact period archaeological sites, taken together with the ethnohistoric accounts indicating a highly mobile Guale population at the time of contact, suggests an increased mobility of some portion of the Guale population during the contact era. We suggest that Guale knowledge (i.e., cultural schemas) of the intertidal landscape (e.g., island locations, tides, fishing locations) provided at least some of the population with a way to resist overt control by the Spanish (i.e., through mobility and the broader use of the landscape).

The portion of the Guale population living within the mission boundaries was also able to mediate this new social landscape. However, this impacted their health negatively, as the Spanish pressured them to alter their subsistence practices. As we outlined at the beginning of this chapter, shifts in dietary patterns stimulated a precipitous decline in the overall health of these populations (Hutchinson et al., 1998; Larsen et al., 2001; Larsen, 2002; Stojanowski, 2006). However, we should not take this to mean that they were merely passive participants in an event that would eventually lead to the decimation of their lifeways and of their very existence. Quite the contrary, we argue that by viewing the subject of culture contact through the theoretical lens outlined here and derived from Beck et al. (2007), we are better able to understand and begin to address the varied ways that multiple groups and individuals experienced such events. The event outlined in this chapter can actually be looked at from multiple points of view, from groups that negotiated the events in varied ways, such as Guale living under the mission system, Guale choosing to move about the landscape, Spaniards who resided at the missions, and stakeholders who remained in Spain. We suggest that a future productive area of research would be to articulate these varied experiences in order to present a more holistic view of these colliding worlds.

## FINAL THOUGHTS

In addition to the histories of the Guale and Spanish on the Georgia coast, the study presented in this chapter has implications for the nature of archaeological inquiry, specifically as it relates to studies that center on boundaries between time periods with and without written records. For North American archaeology, this is typically the boundary between prehistoric and historical archaeology. As we outlined at the beginning of this chapter, Lightfoot (1995; Deagan, 1988) notes that there is considerable disparity in methods between so-called prehistoric and historical archaeology. Following Lightfoot's thinking, we suggest that historical archaeology has, for the most part, undervalued regional survey and analysis. Indeed there are few instances of its use beyond locating historical sites mentioned in texts (see Kowalewski, 2008, for a review; but see Braje et al., 2007, for an exception). If investigations into the nature of both space and place provide insight into how people negotiate the social and ecological landscape, then regional analysis can be a powerful tool to explore the nature of such changes during initial shifts, as well as tracking their trajectories over extended time frames.

## NOTE

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# **PART V**

## **DISCUSSION**







## CHAPTER 17 ISLAND AND COASTAL ARCHAEOLOGY ON THE GEORGIA BIGHT

SCOTT M. FITZPATRICK<sup>1</sup>

### INTRODUCTION

I was deeply honored to be invited by David Hurst Thomas and Victor Thompson to this year's Caldwell Conference to serve as one of the discussants for "Life Among the Tides: Recent Archaeology on the Georgia Bight." While my initial selection may have appeared unusual to some participants given that my research focuses almost exclusively on islands in the Pacific and Caribbean, there is (I think) a method to their madness. I believe this because their underlying philosophy essentially mirrors my own. Early on as a doctoral student at the University of Oregon, I decided to organize a special session at the 2002 Society for American Archaeology conference in Denver, Colorado entitled, "The Archaeology of Insularity: Examining the Past in Island Environments." Though I had never done this before, I felt that as I became more interested in issues related to the archaeology of islands, it was an opportune time to bring together a methodologically, theoretically, and geographically diverse group of scholars working on islands in different regions of the world to discuss various issues. The papers and discussions were stimulating, informative, and eventually led to the publication of an edited volume (Fitzpatrick, 2004b).

Encouraged by what transpired in Denver, I later founded (and now coedit with Jon Erlandson and Torben Rick) the *Journal of Island and Coastal Archaeology* (Taylor and Francis/Routledge), realizing shortly thereafter that given the increasing interest in the field, there was also a need to have a venue for publishing research that archaeologists were doing in island and coastal

environments. And continuing the same approach with the journal as I did with the SAA session, we make a concerted effort to select reviewers for submissions who are outside the author's immediate scope of interests. Not only do I believe this provides important and alternative views that help authors think about their research in new ways, but that it facilitates discussion among those working in various regions. Although I will let others reserve judgment on my performance in this capacity as discussant at Caldwell, I can honestly say that it was a pleasure to have met and interacted with so many established and rising scholars in southeastern U.S. archaeology during the conference and I learned a great deal during my time there. To have the opportunity to see firsthand what has transpired archaeologically on St. Catherines Island over the last three decades is something that is difficult to put into words. Perhaps that is why the collections of research thus far are so voluminous. To put it mildly, it is one of the most extraordinary archaeological research projects I have yet witnessed.

This year's gathering for Caldwell was equally impressive, with a group of scholars and papers that presented a wide array of research, ranging from various analyses crucial to archaeological interpretation (e.g., radiocarbon dating, chemical composition of artifacts, zooarchaeology, GIS) to broader questions of landscape use and coastal transformation across both the prehistoric and mission periods. The inclusion of geoscientists, graduate students, and those working in CRM firms was a welcome addition to archaeologists based at universities and museums. Overall, I commend Dave and Victor for continuing

to recognize the usefulness of such an approach and bringing everyone together as they did. The result was an extremely diverse, interesting, and informative session in a relaxed atmosphere—something rarely found in academic settings and in which I was pleased to participate.

#### ISSUES IN ISLAND AND COASTAL ARCHAEOLOGY

Before I begin my review of the papers presented at the sixth Caldwell conference, I would like to highlight a few of my general comments to help provide some context. As someone who specializes in the archaeology of islands and coasts—albeit ones that are usually on a different scale in terms of distance and remoteness from other land masses than the islands along the Georgia Bight—I am always interested in learning the past history of a particular island or group of islands and seeing whether there might be something about them that follows a pattern comparable to other parts of the world or that makes them unique in their own right.

As a preface, it is worth mentioning that there has been some debate in the literature over the years about whether islands can or should be considered different than other types of geographical formations and whether archaeology *on*, and comparisons made between, islands is different than “island archaeology” (e.g., Rainbird, 1999, 2007; Boomert and Bright, 2007; Fitzpatrick, 2007; Fitzpatrick et al., 2007). I, and many of my colleagues, have argued that they are. To us,

island archaeology is both the application of archaeology to islands and the study of the culturally distinctive developments and ecological changes that characterize the history of human settlement of islands around the world. The fact that there are similarities between many coastal and island societies does not negate the validity of the comparative study of island societies (Fitzpatrick et al., 2007: 230).

While I will not spend a great deal of time here detailing the reasons why I believe islands themselves are different than other types of landforms—and as such can be approached differently from an archaeological standpoint (see chapters in Fitzpatrick, 2004b; Fitzpatrick, 2007)—I will point out an obvious fact: humans are just

not good swimmers, though they *are* good at inventing things. In the case of islands, this invention was watercraft and the means to navigate across diverse aquatic realms. Through time, and over the course of hundreds of thousands or even millions of years, many different plants and animals were able to colonize even the most remote islands through a variety of natural mechanisms. But because this was not always a frequent occurrence, island biotas developed in near, or sometimes complete, isolation. As humans developed more sophisticated seafaring technologies and strategies (but very late in time on a geological or even human scale), they were then able to overcome this aquatic barrier (see Erlandson, 2001; Fitzpatrick and Anderson, 2008). Even so, seafaring was highly variable and not always accessible to each and every member of society. This was certainly the case for many Pacific islands where building watercraft and navigating using the stars were highly specialized knowledge not shared with everyone (e.g., Lewis, 1972; Finney, 1988, 1994; Irwin, 1992).

So that leaves us with a view of prehistory in island and coastal regions whereby the ability to build some type of watercraft, whether it be a raft, dugout canoe, or outrigger, opened up tremendous new opportunities for humans who were then able to conquer seas, oceans, and other bodies of water. But upon reaching islands, humans also enacted a heavy toll on these “pristine” island ecologies, wreaking havoc as a result of widespread land clearance, the introduction of nonnative flora and fauna, overexploitation of resources, population expansion, and so on (e.g., Kirch, 1986, 1997a, 1997b, 2007; Kirch and Hunt, 1999; Fitzpatrick and Keegan, 2007; Rick and Erlandson, 2008). While we should not assume a priori that humans were the sole cause of each and every ecological problem observed in the archaeological record, there is a strong correlation that is often hard to ignore.

From a broader perspective, Erlandson and Fitzpatrick (2006) proposed eight major issues in island and coastal archaeology that have brought these environments from marginalization to the forefront of discussion in many different areas of study, ranging from anthropology to biology, history, and historical ecology and that we thought deserved further attention. These included: (1) the antiquity of coastal adaptations and maritime migrations; (2) spatial and temporal variations in marine or coastal

productivity; (3) the development of specialized maritime technologies and capabilities; (4) the archaeology of submerged coastlines and terrestrial landscapes; (5) cultural responses to insularity, isolation, and circumscription; (6) cultural contacts and historical processes in island and coastal settings; (7) human impacts and historical ecology in island and coastal ecosystems; and (8) the conservation and management of island and coastal archaeological sites. Before coming to Caldwell, I was interested in knowing how research along the coast of Georgia had addressed these particular issues and whether islands along the Georgia coast, ranging from the larger barrier islands such as St. Catherines and Sapelo, to the smaller marsh islands, can be conceived of in an “island archaeology” context. While the first question was in part the focus of a recent paper by Thompson and Turck (2010), what I propose to do here is provide a review and some comments on the papers as they were presented at the Sixth Caldwell Conference, and then come back to the issue of how St. Catherines, as well as the other islands fringing the coast of Georgia, can be integrated within a broader scope of island and coastal archaeological research.

#### COMMENTS

As mentioned previously, the papers presented at this year’s Caldwell conference, and which are now included in this volume, comprised a slew of different topics in archaeology along the Georgia Bight. These were organized into four main themes: (1) analytical approaches to time, exchange, and site layout; (2) modeling coastal landscapes; (3) architecture and village layout before contact; and (4) mission period archaeology. As Thomas and Thompson note in their introduction, the current volume developed somewhat differently than previous Caldwell series that were focused on either specific methodological issues or ones rooted within a specific temporal framework. In contrast to the other conferences, the sixth Caldwell conference had a geographical focus that not only served to highlight the importance of the Georgia Bight to a general understanding of the development of maritime adaptations, but the need to look beyond the coast toward the hinterlands where exchange systems and social interactions became critical to the development of societies in both areas. I will first

discuss each of the chapters within this volume separately and then tie together some of the common themes at the end.

#### ANALYTICAL APPROACHES TO TIME, EXCHANGE, AND SITE LAYOUT

The first chapter by David Hurst Thomas, Matthew C. Sanger, and Royce H. Hayes on marine reservoir corrections ( $\Delta R$ ) around St. Catherines Island emphasized the necessity of conducting rigorous dating of marine shell in archaeological deposits to ensure that radiocarbon offsets are as accurate as possible. In my opinion, this is exactly how radiocarbon chronology issues should be approached—through continued testing and retesting of various samples whether they are terrestrial or marine (or both, in the case of human or mammal bone, for example). Thomas’s remark that “you can never have enough dates” is good advice, and something that many archaeologists working in island and coastal environments should seriously consider, given what we know of marine reservoir effects elsewhere. Those working in the Pacific Basin are well aware of such issues and the importance of dating various sample types to weed out issues such as the “old wood” or “old shell” problem (Rick et al., 2005b). It is also important to examine differences in the  $\Delta R$ , however subtle, of certain marine molluscs (as this can vary depending on feeding behaviors, geological substrates, etc.), which is something not widely practiced in the Caribbean. I was amazed to see that dozens of marine reservoir corrections exist for St. Catherines and surrounding areas, which contrast with only a handful we have for all of the Caribbean islands, none of which are in close proximity to most of the Antilles and thus are not particularly useful. Given the rigid classifications of pottery types in the Caribbean, which have not all been adequately anchored chronologically (see Fitzpatrick, 2006; Cooper and Thomas, 2012), and molluscs that are a dominant component of many pre-Columbian sites, the need for conducting marine reservoir testing is quite clear. In general, however, this is something we require in island and coastal regions around the world so that we can better understand how samples in the archaeological record are affected by varying and temporally fluctuating oceanographic and atmospheric processes. St. Catherines can serve as a model for how such an approach is accomplished.

In terms of establishing good chronologies,

something that has proven useful in many parts of the world, and applied previously in the Pacific and Caribbean, is the use of something called “chronometric hygiene.” This method, developed by Matthew Spriggs (1989, 1996) and initially applied to the Island Southeast Asian Neolithic, was an attempt to “weed out” anomalous or culturally ambiguous radiocarbon dates based on a strict set of criteria. For example, the material being sampled could not be from a long-lived species, multiple dates were needed from the same context (e.g., layer or feature), multiple dates were needed from stratified sites, and the association with cultural remains must be well established. Spriggs’s (1989) initial evaluation led him to develop new ideas on Austronesian expansion based on the critical assessment of the available radiocarbon data. Others have followed the chronometric hygiene approach in the Pacific (e.g., Liston, 2005; Rieth and Hunt, 2008) and the Caribbean (Fitzpatrick, 2006), which has helped tremendously in defining both local and regional chronologies. Given some vagaries in southeastern U.S. archaeology and a tradition of extensive radiocarbon dating, a similar exercise might ultimately prove useful in establishing a refined and more accurate chronological framework.

The next chapter by Alexandra L. Parsons and Rochelle A. Marrinan reports on southeast coastal faunal assemblages from the Late Archaic and Early Mississippian periods that had been collected since the 1970s. In an effort to synthesize and standardize the data, they: (1) excluded some sites, accepting only those that were definitely representative of indigenous occupation from coastal Georgia and northeast Florida and that had access to a similar suite of estuarine resources; (2) included samples for which data on the number of identified specimens (NISP), weight, estimated biomass, and minimum number of individuals (MNI) calculations were available; and (3) used only those that had a representative chronological spread. The authors also addressed some important methodological concerns; paramount among these was the fact that differential recovery methods (primarily mesh size) can dramatically affect quantification measures, which prevented them from using some of the dataset. Regardless, the remaining faunal data were used to address a host of issues regarding sedentism and seasonality and demonstrated that, even in the Late Archaic, groups were well established in coastal villages year round, but that seasonal

exploitation of resources also occurred. The authors also mentioned issues of possible human impacts in the coastal zone (e.g., land clearance), including fisheries (e.g., Reitz, 2004) and noted that many areas were cleared extensively during the plantation era and are now reforested. Given the available archaeological and historical data now available, a valuable next step might be to determine how faunal diversity changed through time across the overall assemblages as well as discrete taxa of finfish, shellfish, and other marine or estuarine resources to see if there are any statistically significant changes that could be attributed to humans—something that often occurs in island settings.

Continuing with methodological aspects of archaeology, Ginessa J. Mahar’s chapter discussed the use of geophysical techniques on shell rings found on St. Catherines. Scholars are still deciphering what these rings—which are a unique feature along parts of the southeast littoral from Florida up to South Carolina—were really used for. Regardless of the reasons behind why the rings were truly constructed, Mahar does a nice job of emphasizing that geophysical techniques such as resistance survey and magnetometry, which have been used on St. Catherines since the 1980s, can be an excellent primary source of data that is then integrated with other datasets. Too often archaeogeophysical techniques are used after more intensive survey or excavation when ideally they should be part of the technological component of field projects (Thompson et al., 2011). Interestingly, the still as yet unexplained circular features found within shell rings that look like postholes that *should* be observed archaeogeophysically do not readily show up. This again demonstrates the importance of comparing multiple sources of information, such as mapping and excavation, to decipher the archaeological record. Mahar makes a good point too that geophysical data have a tendency to be written up separately in reports, which can hamper our ability to satisfactorily interpret the archaeological record.

Neill J. Wallis’s and Ann S. Cordell’s chapter on using petrographic and chemical compositional analysis of Swift Creek pottery found across Georgia, northern Florida, and eastern Alabama represents a welcome effort to use very different, but complementary analytical techniques to, in the authors’ own words, “establish patterns in the manufacture and distribution of

vessels and infer corresponding modes of social interaction.” Particularly intriguing to me were the stamped decorations seen on prehistoric vessels that can be linked up with specific wooden paddles. Called “paddle matching,” this phenomenon is indicative of either vessels, or the paddles themselves, being transported between sites, which may be hundreds of kilometers apart. This is somewhat reminiscent of Lapita pottery in Melanesia and Polynesia, which was decorated using dentate (toothed) stamps impressed into the clay. Unlike the wooden paddles found in the southeastern United States, we unfortunately have no evidence of what these stamps may have been made from, though it was most certainly from a perishable material, such as wood, that rarely survives in tropical climates like those found in the South Pacific. Nonetheless, given the potential for tracking both the vessel and decorative medium (paddle), there seems to be a good opportunity to also investigate the underlying meaning behind the designs. Recent research by Terrell and Schechter (2007) on the “Lapita Face” motif seen on prehistoric pottery and modern wooden bowls from along the Sepik coast of New Guinea provides a particularly enriching explanation that demonstrates linkages to sea turtles, which is embedded in the lore and cosmology of Pacific Islanders who were intrinsically linked to the coast. I am curious to know whether the decorations seen in Swift Creek pottery can reveal more abstract meanings that could be inextricably linked to the exchange behaviors observed through compositional and mineralogical analysis.

Overall, I was pleasantly surprised that Wallis and Cordell were able to so effectively couple petrography and neutron activation analysis (INAA). This can be a difficult endeavor with results having an ambiguity that is not always easily resolvable. As the authors continue to research the subject of pottery distribution in the Southeast as elucidated through different compositional and/or mineralogical techniques, I encourage them to think about additional questions. How does pottery, perhaps as an exchange item, correlate with other possible types of exchange behaviors such as food, feasting, and a host of other artifact types? What is the significance of the designs (could they represent ethnic origins or kin/clan groupings)? And as they test clay samples to help formulate patterns of resource acquisition and distribution, the possibility that

multiple clay sources are being admixed in single vessels should also be considered as this could cause results to be equivocal. Archaeologists sometimes have the tendency to treat clay used in producing ceramic vessels similar to the way they treat lithics—as a single source that has a unique geochemical fingerprint—when this may not necessarily be the case for pottery.

Ann S. Cordell and Kathleen A. Deagan also applied mineralogical analysis to prehistoric pottery but at a mission period site called Fountain of Youth Park (8SJ31) in St. Augustine, Florida. The site is significant for a number of reasons. It had been occupied for more than 2000 years by the Timucua Indians and their predecessors, it was the first permanent European town in the United States, and it houses the remains of Nombre de Dios, the first Franciscan mission to the American Indians (established in 1587), and which persisted until about 1650. In terms of pottery use, the authors noted that before contact, native groups almost exclusively produced St. Johns chalky ware ceramics, but this quickly changed in the second half of the 16th century when nonlocal pottery manufactured by the Mocama and Guale groups significantly increased in quantity. As they note, “this situation raises interesting questions about the resilience of traditional pottery production practices in the face of social and demographic disruption.”

For analysis, the authors selected 89 sherds from different types, including Timucuan St. Johns chalky, Mocama Timucua San Pedro grog-tempered, Guale-associated San Marcos/Altamaha/Irene tradition sand/grit-tempered tradition, and 17 that were unassigned. This was accompanied by nine clay samples. In total, four clay resource groupings were identified and, though the results were somewhat unclear, Cordell and Deagan were successful in demonstrating that either Mocama and Guale people (or their pottery, or both) were present at the site, indicating more complex multi- and cross-cultural interactions than were thought previously. While there is an abundance of ceramic compositional studies around the world that attempt to investigate interaction spheres using a few samples from multiple sites, it was nice to see a more in-depth study from a single site such as the Fountain of Youth. Increasing the number of samples from here will surely improve what we know from this turbulent period.

## MODELING COASTAL LANDSCAPES

One cannot discuss island and coastal systems without addressing geomorphological changes that took place before and during human settlement. The paper presented by John A. Turck and Clark R. Alexander on the human use of past coastal landscapes in Georgia clearly illustrates the utility (and, one might easily argue, necessity) of incorporating geological and geomorphological research into studies of past human behavior. Sediment cores of several hammock islands retrieved through vibracoring, which were then radiocarbon dated, demonstrate how, as shoreline positions changed through naturally occurring processes, human occupation and use followed shortly thereafter. Also important, as the authors note, is that “the timing of landform creation cannot be estimated based solely on the position of that landform on the landscape” and “that differing stratigraphic architectures in nearby settings allowed for a range of environments from which humans could choose when settling the coast.” Simply put, both geoscience and archaeology are complementary techniques that for researchers working in littoral zones are critical for identifying estimates of shoreline changes, when they occurred, and how human groups utilized these dynamic landscapes over time.

In terms of human utilization of islands around the Georgia Bight, I am particularly fascinated with the smaller back-barrier “marsh” islands, which are so common in the area. While smaller islands may at first seem peripheral to understanding the nature of coastal adaptations by prehistoric peoples given their relatively minute size and perceived lack of resources, this view is gradually changing as more research is conducted in places like the Caribbean (Keegan et al., 2008), Pacific (Burley, Steadman, and Anderson, 2003; Weisler, 2003; Jones et al., 2008), and islands along both the west (e.g., Rick et al., 2005b) and east coasts of North America (Thompson and Turck, 2010).

Like Turck and Alexander, Chester B. DePratter and Victor D. Thompson also examined paleoshoreline data along the Georgia coast, but focused on two major phenomena and their implications for coastal settlements. The first was the recognition that sea level fluctuation has altered coastal landforms in Georgia during the last 5000 years (a time when intensive human occupation can first be seen archaeologically). The second was that progradation and retrogradation

occurs at different points of time along the coast, which would have impacted human settlement and resource use. For their research, they parceled out the Georgia coast into three sections: (1) Ossabaw, Wassaw, and Tybee islands; (2) St. Catherines and Sapelo islands; and (3) the St. Simons Island and Little St. Simons Island section. DePratter and Thompson reiterate that most of the archaeological research done along the Georgia coast has focused on the larger islands, but note that after examining paleoshoreline changes over the last five millennia, the small marsh islands (though seemingly harsh), were used by native groups extensively and intensively.

In support of this finding was Matthew F. Napolitano’s work on Bull Island Hammock near St. Catherines, which helps build on Thompson and Turck’s (2010) investigations along these back-barrier islands that suggest this system was being used increasingly over time, peaking for the most part during the Late Mississippian Period. Systematic shovel testing across Bull Island by Napolitano, the most easily accessible hammock near St. Catherines and that had surface scatters of pottery and faunal refuse, found a pattern of intermittent use for subsistence, but probably not permanent settlement. The overall assessment was that “small islands often played a role in the economies of groups that inhabited larger islands and coastal zones.” Based on continuing research worldwide, my guess is that we will be slightly altering this phrase to suggest that smaller islands such as hammocks played “key” roles in the subsistence strategies of local groups, a phenomenon that makes sense when you consider the plentiful and diverse types of resources available. Napolitano’s work in addition to the larger study by Thompson and Turck (2010) is clearly opening the door to new ideas about how estuaries and smaller (e.g., marsh) islands were occupied and utilized prehistorically.

Matthew C. Sanger then reported on an ambitious survey of 9000 acres between Midway Island and Colonel’s Island in Liberty County, Georgia. The survey included upland pine forests, coastal marshland, as well as marsh islands. Given that some archaeological work had been done in the area, but with little reporting of the results, Sanger’s work represents an important step in the investigation of an area that has implications for understanding inland to coastal resource use and interaction. For the survey, the research relied heavily on Airborne LiDAR sys-



tems, which take advantage of a laser scanner placed on a low-flying helicopter or airplane that sends pulses of energy to the ground to create accurate topographical models. The mapping data was then coupled with data retrieved from shovel test pits to examine site distribution and occupation intensity. Although the data recovered are only based on a single field season, preliminary findings suggest that there was a major increase in the use of a previously vacant area during the Late Mississippian, as evidenced by greater quantities of shellfish and pottery. This could be for a number of reasons, including population expansion, which would seem to mirror other findings along the Georgia coast.

One of the more methodologically sophisticated papers presented at the conference was by Thomas G. Whitley who has spent years developing a GIS model of resource availability. The research area comprised the six counties situated along the Georgia coast, as well as adjacent ones inland across 1.9 million ha of land. By integrating a vast number of variables into “group foraging targets,” Whitley created a database with the goal of “understanding the relative energy costs of subsistence activities” through time in terms of caloric expenditure and intake that was then framed within a central place foraging model. The overall goal is to “develop explicit formulas based on as many variables as possible, and with as high a resolution as possible.” While I jokingly commented at Caldwell that Whitley’s research was “OFT *par excellence*” and that he would easily win a contest for having the most Ph.D. dissertation topics in a single paper, it is clear that his approach is extremely well refined and robust. One of the more interesting findings from this research was that the exploitation of available resources and the amount of calories available per person remained virtually the same from the Late Archaic through the protohistoric/historic periods, given the same level of effort. While it is possible that people may have focused more on aquatic resources later in time, people from all periods in general focused their efforts on the forage categories that provided them with the most efficient return.

#### LATE PREHISTORIC SITE

##### LAYOUT AND ARCHITECTURE

Ryan O. Sipe’s work described a large contract project focused on recording sites in a 2300 acre area west of Ossabaw Island in eastern Bry-

an County, Georgia. The survey located 80 new sites and relocated several others, including the important Irene Period Redbird Creek site that “functioned as the mortuary complex and likely political center of a larger habitation complex of Late Mississippian/Protohistoric site.” Sipe also makes reference to the “dispersed town” model first proposed by Jones (1978) and expounded on by Thomas (2008), which attempts to resolve inconsistencies between the ethnohistorical accounts of Guale settlement patterns and those of archaeological research. The model suggests that in contrast to what was reported historically, these groups did not necessarily need to shift residences and become disconnected from their larger community base to effectively exploit seasonal resources.

In addition, I was astounded, as were most of my colleagues in the room, at the exceptional preservation of subsurface features, such as post-holes, that were found. I also thought it was an excellent example of how contract archaeology can provide important new data that many scholars housed at universities or museums would find challenging to generate given issues related to scheduling, labor, time, and difficulties with securing external grant funding. The downside is that rarely do contract archaeologists have the opportunity to expand on or interpret their findings within a grounded theoretical perspective. This reinforces the notion of just how important it is for those in CRM, such as Sipe and Whitley, to be included in conferences such as this—not only to show what they have found, but to help facilitate communication and collaboration between students, academics, and contractors so that the archaeological record can provide us with the best possible opportunities to reveal what the past has to offer.

While not presented at Caldwell, the inclusion of the paper by Deborah A. Keene and Ervan G. Garrison is a wonderful addition to the volume. They describe five newly discovered and beautifully preserved structures at the Grove’s Creek site on Skidaway Island built during the Irene Period just prior to European contact. In part, the importance of these structures lies in their exceptional preservation, but also because they more than double the known number of Irene structures excavated to date. Coupling their findings with four others previously reported (including the Irene site), they note some interesting contrasts in how the structures were built as seen in

the archaeological record versus that reported in ethnohistorical accounts. While the authors find that the structures were square or rectangular and primarily built using wattle-and-daub, ethnohistorical documents report them as being circular with wattle-and-thatch instead. Could these differences be due to changes made by native inhabitants in the intervening century between the Irene Period and contact? In addition, there seemed to be no standard size in construction, perhaps the result of structures not being solely residential, but having differing uses. Overall, the presence of these structures at Grove's Creek substantially enhances what we know of how people were living in later prehistory on the coast and nicely enriches the other lines of data already collected.

#### MISSION PERIOD ARCHAEOLOGY

The final session at Caldwell and last section of the volume includes four chapters dealing with the influence of European contact and the roles that missions had on native groups inhabiting Georgia that began in the mid-1500s and lasted until 1684. The leadoff chapter by Richard W. Jefferies and Christopher R. Moore describes what occurred with the local Muskogean-speaking Guale Indians in the area after Spanish arrival, which "was marked by the total cultural collapse of Guale society and the eventual retreat of the Guale from their coastal homeland." Their research on Sapelo, the fourth largest barrier island along the Georgia coast, revealed an important trove of mission-era artifacts, including thousands of pottery sherds, a bone knife handle, hand wrought spikes and nails, brick fragments, glass beads, and military weaponry, such as the trigger mechanism from a matchlock musket, and an iron cannonball, suggesting that the Spanish garrison was nearby. Overall, I thought this was a great example of how archaeologists normally accustomed to doing research on prehistoric sites have transitioned to examining historical ones. All too often these subareas fail to collide, with many scholars preferring to specialize in one or the other. This is certainly the case for much of the Caribbean, and one wonders, given the rich prehistoric and historic record in the region, why the intersection of the two is not more widely addressed (for a good exception, see Cherry, Ryzewski, and Leppard, 2012). I actually recall quoting Dave Thomas in one of my comprehensive exams during graduate school more than 15 years ago who said something to

the effect that it does not matter whether you are working with projectile points or musket balls, the methods are the same. While one cannot be overly critical of this approach, it was refreshing to see it happening, given how this interval of time so drastically shaped the cultural and natural landscape of the United States.

Elliot H. Blair's paper on Mission Santa Catalina de Guale, established in 1605 on St. Catherines, exemplifies one of the more important aspects of archaeological investigation on the island—conducting long-term research using the most advanced methods possible. That geophysical research has been used for more than 30 years on both prehistoric and historic sites here is one of the most impressive aspects of the project. And given the importance of the site in understanding early missionization and the fact that it was used as a large cemetery (with more than 430 individuals identified!) (see Larsen and Thomas, 1982; Larsen, 1990) only amplifies its importance. Apart from the continuing sources of rich data still coming out of this site, I appreciate that so many students have become interested in the long-term history of the island, the training that is accompanied by state-of-the-art investigative techniques, a continuing theme on St. Catherines that I have referred to frequently. Another addition to the suite of methods already employed was the initiation of geochemical data, which was presented at the session (but not reported in the current chapter). The melding of so many lines of evidence—chemical, geophysical, archaeological, historic, biological—provides (and continues to provide) a reservoir of information about this turbulent period in Georgia history. I look forward to reading about further discoveries.

In chapter 15, Keith H. Ashley, Vicki L. Roland, and Robert L. Thunen discuss an interesting case of a Spanish mission for the Mocama Indians, known as San Buenaventura on St. Simons Island (Guadalquini) in southern Georgia, that had been moved progressively southward due to outside pressure from the English and French. In a review of the history of interaction between these various European powers and native peoples, coupled with archaeological investigation of subsistence remains and artifacts, the authors make an effective argument that despite decades of Spanish influence, the Mocama of Guadalquini retained much of their self-identity and autonomy by continually resisting colonial efforts on many different levels, including at one

point in time the refusal to move their community to another mission (San Juan del Puerto). What their research demonstrates is that culture contact and subsequent interactions that took place between Europeans and native groups was extremely complex and “uniquely conditioned by the social and historical processes specific to the groups involved.”

The final chapter by Victor D. Thompson, John A. Turck, Amanda D. Roberts Thompson, and Chester B. DePratter continued the discussion of how Europeans impacted the native Guale. I was amazed that almost 90% of the Guale sites in the area were abandoned at European contact, giving a good indication of the almost immediate effect this incursion had. By using an approach that examines the distribution of sites and ceramics in the area at this time, Thompson et al. attempted to discover whether there were any changes in settlement across the coastal landscape. They took advantage of the Georgia Archaeological Site Files (GASF) as well as data recovered in shovel test surveys on smaller islands. By harnessing this vast wealth of site data and utilizing a theoretical perspective derived from culture contact studies (e.g., see Lightfoot, 1995; Beck et al., 2007), they suggest that some of the “Guale reacted to the increased presence of the Spanish in their territory ... via increased mobility and extensive use of the landscape, as opposed to the intensive use of the landscape that occurred prior to Spanish arrival.” This was in part possible given the sheer number of small back-barrier islands situated in a complex series of narrow waterways within an estuarine environment.

Overall, the papers presented in the mission period session reaffirmed the importance of melding aspects of prehistoric and historic archaeology as has been advocated by Lightfoot (1995) and others. I have always been fascinated by the processes that occur when different cultures come into contact, and though there is no dispute that the overarching result in the Americas was catastrophic to native peoples, it is true as Thomas mentioned at Caldwell that Europeans were often seen as just “another other.” Many indigenous groups sought to solicit favoritism from Europeans, used them to gain access to various resources they did not have, such as metal, and often did what they could to reduce conflict despite the problems caused by colonialist powers. The investigation of this critical juncture in time remains a fascinating aspect of

our history and one to which the presenters at Caldwell absolutely did justice.

## FINAL THOUGHTS

As mentioned at the beginning of the chapter, I wanted to come back to the questions posed earlier about whether islands along the coast of Georgia (and others across the southeastern littoral) can be placed within the realm of island archaeology (and if so, how?), and how research thus far fits within the broader issues outlined in a previously published paper by Jon Erlandson and myself (2006).

While the size and proximity to the mainland of barrier islands are not equally comparable to the islands I am more accustomed to in the Caribbean or Pacific, I do believe they can in fact be seen, and henceforth analyzed, as different and unique in an island archaeological field of study for a variety of reasons. I agree with the view cogently argued by Thompson and Turck (2010) who noted that the smaller “hammocks” were the locus of concentrated and widespread occupation by native groups over the past 5000 years due to the availability of marine and estuarine resources that also provided a sheltered reprieve from their neighbors, including Europeans. Despite the fact that some of the marsh islands can be accessed by walking at low tide, the environment was extremely suitable for navigating with low draft dugout canoes and the islands could essentially be used as miniature stepping stones from one to another. As Thompson and Turck (2010) stated, “it was the small islands found in the intertidal environment, along with the knowledge of the large tides that dominate this region, that eased connections and the use of the broader landscape, which includes the tidally influenced portions of the mainland.” Essentially, the arrangement and proximity of these islands facilitated communication and enhanced the broader economy of native peoples along the Georgia coast that a single uninterrupted coastline might fail to achieve with such regularity or intensity.

In terms of broader issues in island and coastal archaeology discussed by Erlandson and Fitzpatrick (2006), the research presented at the sixth Caldwell conference, along with that conducted over the last 30 years, has tremendously enhanced our understanding of native maritime adaptations in the southeastern United States. Scholars now have a much better grasp on the

antiquity of coastal occupation, the development of specialized technologies for foraging and hunting, and the extent to which paleoshorelines and landforms changed over time. Apart from some issues that may not be directly applicable to the Georgia Bight, such as notions of isolation and circumscription, opportunities to investigate questions related to human impacts and historical ecology seem to exist. While vertebrate analysis has been a facet of research on St. Catherines, with sites belonging to both the prehistoric and historic periods (e.g., see Reitz et al., 2010), the invertebrates remain understudied (Reitz et al., 2008: 51), as does the paleobotany (Thomas, 2008: chap. 12, 307–308). As Thomas (2008: chap. 12, 308) notes, “no systematic examination of the nonvertebrate faunal remains has been attempted for St. Catherines Island,” and “[w]e likewise lack comprehensive data on plant remains preserved in the archaeological sites...” Because islands in general are much more conducive to studying the effects of humans on the landscape, St. Catherines and other surrounding islands would seem to be an ideal place to develop a greater understanding of “the complex, historical interactions between human populations and the ecosystems they have inhabited” (Kirch, 1997a: 2), particularly given the early and extended occupation by the Spanish with later intensive use of the islands for oyster harvesting (Thomas, 2008) and a slew of other activities. As Bill Keegan and I noted several years ago as we synthesized what we knew of the Caribbean,

To satisfactorily measure the influences and impacts on island ecosystems, it is critical to determine when they were first colonized by humans, using archaeologi-

cal, palaeoecological, and/or palaeoenvironmental data. With information garnered from subsequent periods of human activity up until the modern era, we can then begin to measure the effects of human arrival on the landscape and whether they are partially or completely attributable to natural, prehistoric, historic, or more recent phenomena (Fitzpatrick and Keegan, 2007: 31).

Although the current (and disparate sources of) data available may be a drawback to any modeling of past environments, “the more lines of corroborating evidence, the more refined the model will be” (O’Brien, 2001: 30). As a result, St. Catherines—and by extension, the Georgia Bight—could serve as a “model system” of how island landforms and biota were transformed as the result of human intervention over the course of five or more millennia. In summary, the collection of chapters in this volume is a fair reminder that the southeastern coast of the United States holds important clues about ancient maritime adaptations that scholars everywhere can use as comparisons in their own research.

## NOTE

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COVER DESIGN: Kevin B. Havener

BOOK DESIGN AND LAYOUT: Kevin B. Havener

**ON THE COVER:** Springfield Legacy Archaeology Project team returning from the field on Colonel's Island, Georgia. The SLAP fieldwork took place during the summer of 2009 and was the first systematic archaeological investigation conducted at the study area. It combined traditional field techniques, such as field survey and intensive subsurface sampling, with newer techniques, like Light Detection and Ranging (LiDAR) and Geographic Information Systems (GIS) to analyze topographic features and create spatial models (see chap. 9, this volume). The photograph depicts Martin Walker, Matthew Sanger, and Elizabeth Drolet (photograph by Hannah Cain).



cover design by Kevin Havener

These carefully crafted papers will make enduring contributions to the archaeology of ever-changing coastal landscapes of the southeastern United States. Meanwhile, this research and these researchers contribute substantially to global perspectives on the archaeology of coastal, estuarine, wetland, and island environments.

– Christopher B. Rodning, Associate Professor of Anthropology, Tulane University

This book is a much-needed compendium of current research on the Georgia Bight, from emerging and established scholars working across a broad sweep of human history and from a variety of theoretical and methodological perspectives; as such, it provides something for virtually everyone with an interest in the region and in coastal societies more generally.

– Thomas J. Pluckhahn, Associate Professor of Anthropology, University of South Florida

From culture contact to geoarchaeology and everything in between, this exceptional volume provides an in-depth and timely synthesis of Georgia's coastal archaeology for a worldwide audience.

– Torben C. Rick, Curator of Human Ecology and Archaeobiology,  
Smithsonian National Museum of Natural History

**L**IFE AMONG THE TIDES is a collection that brings the most current archaeology being conducted along the Georgia Bight together in a single volume. The chapters in this work cover an expansive breadth of topics ranging from subsistence and settlement to issues of culture contact and landscape evolution. The contributors to this volume explore multiple time periods, including Archaic, Woodland, Mississippian, and contact periods, and they employ a diverse assortment of specialized analysis techniques ranging from petrographic point counting to shallow geophysics.

Though the contributions to this volume cover a wide and varied array of topics, they share fresh and valuable insights into the past of the American Southeast. The unique scope of this collection makes it invaluable for researchers seeking a broader perspective on the exciting state of current archaeology on the Georgia Bight. These papers were initially

presented at the Sixth Caldwell Conference, cosponsored by the American Museum of Natural History and the St. Catherines Island Foundation, held on St. Catherines Island, May 20–22, 2011.

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