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Southwest Florida during the Mississippi Period

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This book focuses on the Mississippi period, ca. A.D. 1000 to 1500. In the archaeology of the southeastern United States, "Mississippian" generally means chiefdom-level societies that "practiced a maize-based agriculture, constructed (generally) platform mounds for elite residences and various corporate and public functions, and shared, to a considerable extent, a common suite of artifact types and styles, particularly in the realm of pottery (usually shell-tempered) and certain symbolic or prestige related artifacts" (Welch and Butler 2006: 2). Often implicit is an assumption that Mississippian chiefdoms represent the most complex cultural developments in the aboriginal southeastern United States.

In southwest Florida, their contemporaries had no maize agriculture, constructed no platform mounds, and made a rather undistinguished pottery. Even so, Spaniards who encountered the historic Calusa in the sixteenth century observed a stratified society divided into nobles and commoners, with hereditary leadership, tributary patronage-clientage that extended throughout south Florida, ritual and military specialists, far-ranging trade, an accomplished and expressive artistic tradition, complex religious beliefs and ritual practices, and effective subsistence practices that supported thousands of people and allowed a sedentary residence pattern (Fontaneda 1973; Hann 1991; Solís de Merás 1964). Furthermore, for nearly two centuries after contact, the Calusa maintained their identity and beliefs, effectively repulsing European attempts to conquer and convert them to Christianity, while many southeastern United States chiefdoms were in cultural ruin within a few decades (Hann 1991).

The Calusa heartland was in the coastal region encompassing Charlotte Harbor, Pine Island Sound, San Carlos Bay, and Estero Bay (figure 2.1). This

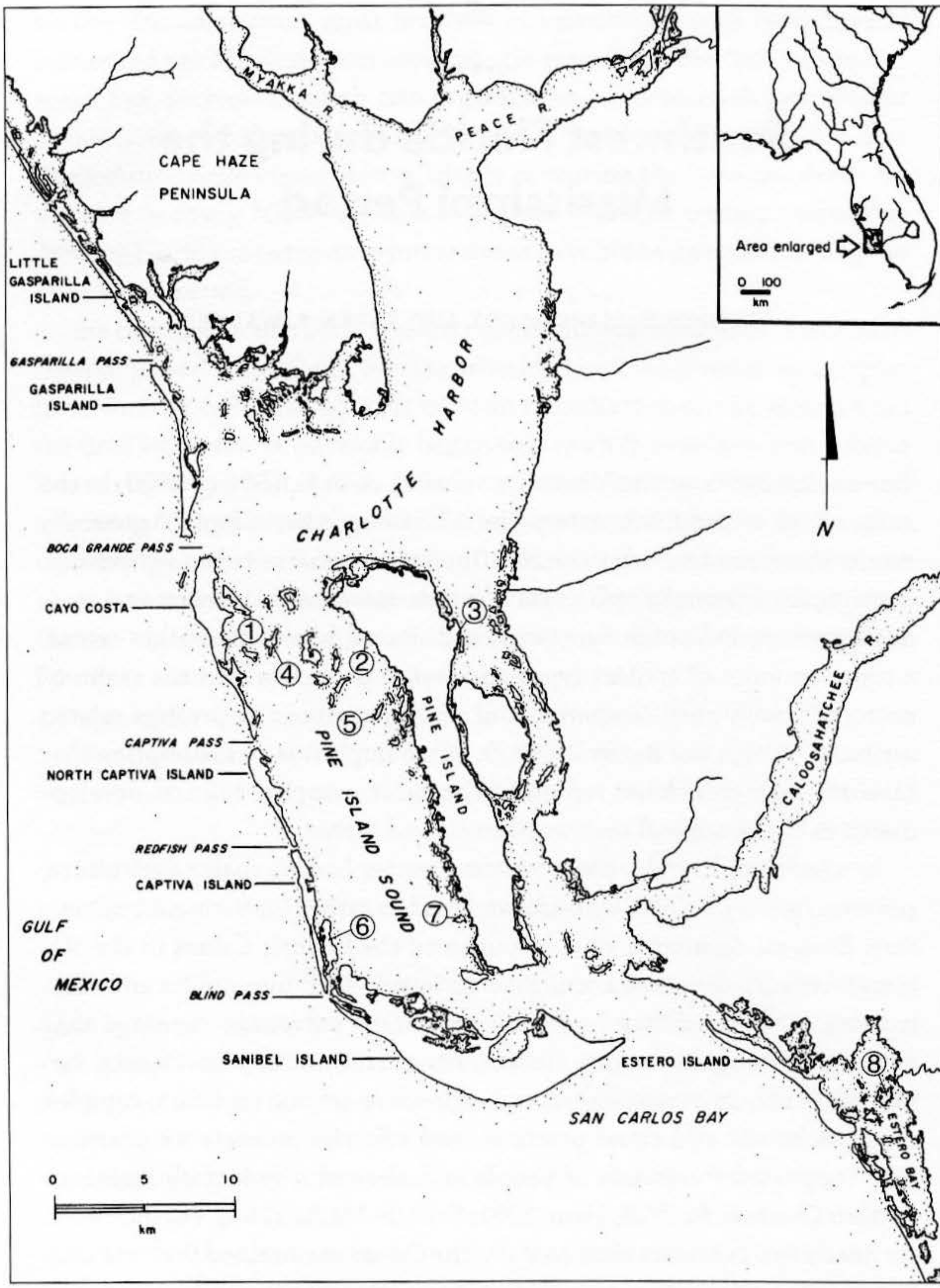

Figure 2.1. The Charlotte Harbor–Pine Island Sound–San Carlos Bay estuarine system. Numbers indicate sites discussed in text: (1) Mark Pardo; (2) Pineland Site Complex; (3) Indian Field; (4) Useppa Island; (5) Josslyn Island; (6) Buck Key; (7) Galt Island; (8) Mound Key. Drawing by William Marquardt.

estuarine region is fed by fresh water from the Myakka, Peace, and Caloosahatchee rivers and from lesser streams in the Estero Bay area. Centrally located within this complex estuarine system is Pine Island Sound, a broad, flat, shallow, grassy inshore body of water fringed by mangroves and protected by barrier islands. Because the large, linear landform of Pine Island acts as a barrier to freshwater streams emptying into Pine Island Sound, the latter's waters are more marine than are the estuaries of Charlotte Harbor and San Carlos Bay. The region is subtropical, characterized by warm winters, in contrast to the temperate greater southeastern United States. For this reason, here marine/estuarine fish and shellfish are available year-round and, at least in protohistoric and historic times, in great quantities. We now know that this productivity fluctuated through the past several millennia but was generally high during the tenth through sixteenth centuries, surely a factor underlying the emergence of the Calusa as a complex society.

In this chapter, we focus on southwest Florida and first sketch the environmental background against which cultural changes took place during the Mississippi period. We then discuss environmental and cultural changes during that period. Finally, because interregional connections, large-scale communal construction projects, and hierarchical social structure are all generally associated with Mississippian chiefdoms, we examine these topics in terms of southwest Florida and consider the evidence for influence on the area by Mississippian peoples.

Environmental Change in the Caloosahatchee Region during the Mississippi Period

To date, there is still an absence of highly resolved climate records from Florida. However, this void is no longer a barrier to our considering the role of climate in the state's cultural trajectory, even for the recent two millennia. This is because the many new climate studies of the past 20 years, concerning both modern and past climates, indicate that broad-scale regions are characterized by widespread atmospheric-oceanic teleconnections. Paleoclimatic records from within these regions indicate that change can occur relatively rapidly and synchronously in both low and high latitudes. The collective result of all this new research has been recognized as a paradigm shift in the field of paleoclimatology (NRC 2002: 1), characterized by the acceptance that climate can and does change rapidly and that it has done so at scales relevant to past ecosystems and human societies,

<table>
<tr><th>Time</th><th>Greater North Atlantic Climate</th><th>Southwest Florida Sea Level</th><th>Southwest Florida Chronology</th><th>Glades Area Chronology</th><th>Greater SE United States Chronology</th></tr>
<tr><td>AD 1800-1850</td><td rowspan="13">Little Ice Age
AD 1200-1850</td><td rowspan="13">Sanibel II Low
ca. AD 1200-1850</td><td rowspan="2">Creek/Seminole/
Miccosukee</td><td rowspan="2">Creek/Seminole/
Miccosukee</td><td rowspan="7">Protohistoric/Historic</td></tr>
<tr><td>AD 1750-1800</td></tr>
<tr><td>AD 1700-1750</td><td rowspan="5">Caloosahatchee V
AD 1500-1750</td><td rowspan="3">Glades IIIc
AD 1600-1750</td></tr>
<tr><td>AD 1650-1700</td></tr>
<tr><td>AD 1600-1650</td></tr>
<tr><td>AD 1550-1600</td><td rowspan="4">Glades IIIb
AD 1400-1600</td></tr>
<tr><td>AD 1500-1550</td></tr>
<tr><td>AD 1450-1500</td><td rowspan="3">Caloosahatchee IV
AD 1350-1500</td><td rowspan="2">Late Mississippian
AD 1400-1500</td></tr>
<tr><td>AD 1400-1450</td></tr>
<tr><td>AD 1350-1400</td><td rowspan="4">Glades IIIa
AD 1200-1400</td><td rowspan="4">Middle Mississippian
AD 1200-1400</td></tr>
<tr><td>AD 1300-1350</td><td rowspan="3">Caloosahatchee III
AD 1200-1350</td></tr>
<tr><td>AD1250-1300</td></tr>
<tr><td>AD 1200-1250</td></tr>
<tr><td>AD 1150-1200</td><td rowspan="7">Medieval Warm Period
("Mississippian Optimum")
AD 850-1200</td><td rowspan="7">La Costa High
ca. AD 850-1200</td><td rowspan="8">Caloosahatchee IIB
AD 800-1200</td><td rowspan="2">Glades IIc
AD 1100-1200</td><td rowspan="4">Early Mississippian
AD 1000-1200</td></tr>
<tr><td>AD 1100-1150</td></tr>
<tr><td>AD 1050-1100</td><td rowspan="4">Glades IIb
AD 900-1100</td></tr>
<tr><td>AD 1000-1050</td></tr>
<tr><td>AD 950-1000</td><td rowspan="10">Late Woodland
AD 500-1000</td></tr>
<tr><td>AD 900-950</td></tr>
<tr><td>AD 850-900</td><td rowspan="3">Glades IIa
AD 750-900</td></tr>
<tr><td>AD 800-850</td><td rowspan="7">Vandal Minimum
ca. AD 500-850</td><td rowspan="7">Buck Key Low
ca. AD 500-850</td></tr>
<tr><td>AD 750-800</td><td rowspan="3">Caloosahatchee IIA-late
AD 650-800</td></tr>
<tr><td>AD 700-850</td><td rowspan="5">Glades I - late
AD 500-750</td></tr>
<tr><td>AD 650-700</td></tr>
<tr><td>AD 600-650</td><td rowspan="3">Caloosahatchee IIA-early
AD 500-650</td></tr>
<tr><td>AD 550-600</td></tr>
<tr><td>AD 500-550</td></tr>
<tr><td>AD 450-500</td><td rowspan="12">Roman Warm Period
ca. 350 BC-AD 500</td><td rowspan="12">Wulfert High
ca. 100 BC-AD 500</td><td rowspan="12">Caloosahatchee I
500 BC-AD 500</td><td rowspan="11">Glades I - early
AD 1-500</td><td rowspan="12">Middle Woodland
100 BC-AD 500</td></tr>
<tr><td>AD 400-450</td></tr>
<tr><td>AD 350-400</td></tr>
<tr><td>AD 300-350</td></tr>
<tr><td>AD 250-300</td></tr>
<tr><td>AD 200-250</td></tr>
<tr><td>AD 150-200</td></tr>
<tr><td>AD 100-150</td></tr>
<tr><td>AD 50-100</td></tr>
<tr><td>AD 1-50</td></tr>
<tr><td>50 BC-AD 1</td></tr>
<tr><td>100-50 BC</td><td>Pre-Glades</td></tr>
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Figure 2.2. Climatic fluctuations, sea-level episodes, and cultural chronologies for southwest Florida and the greater Southeast, ca. 100 B.C.–A.D. 1700.

sometimes as rapidly as within a decade. Additionally, in step with this research is the new recognition that sea level also can respond rapidly, within 50 years or less.

This research and its funding base continue to accelerate in part because of the National Research Council's (NRC 2002) call for a focus on "abrupt" climate change based on the recognition that sudden change increases the potential for societal and ecological impacts (see also Alley et al. 2003). So very relevant for Florida archaeology is the definition the NRC (2002: 14) provides of abrupt climate change from a societal and ecological view: "[A]n abrupt change is one that takes place so rapidly and unexpectedly that human *or* natural systems have difficulty adapting to it."

The greater North Atlantic atmospheric-oceanic region is the most relevant for thinking about the human-environment history of Florida and the greater southeastern United States. Whereas regional temperature patterns may be relatively synchronous, precipitation and storminess trends are much more geographically variable within the region. Drawing on an extensive literature review presented elsewhere (Walker 2012), we examine the A.D. 850–1500 portions of a group of records most relevant to southwest Florida and its archaeological periods, Caloosahatchee IIB, III, and IV. These periods correspond with the end of the greater Southeast's Late Woodland period and all of its Mississippi period, A.D. 1000–1500. We project our environmental context back to A.D. 850 (figure 2.2), a time prior to the beginning of the Mississippi period, because it is important for setting the stage for cultural change, and forward to 1850, the end of the Little Ice Age.

Several of the cited climate and sea-level records come from the subregion of the southwestern or tropical North Atlantic (Gulf of Mexico and Caribbean areas), areas closest to southwest Florida. Others are from more northern latitudes, illustrating the teleconnectivity of the greater North Atlantic region. The Florida Straits records (Lund and Curry 2004) offer the closest paleoclimate data, and the sea-level model of Stapor and colleagues (1991) is based on southwest Florida's beach ridges. For fluctuations in the records, the time spans and individual events are only approximations, as dates for the different records are expected to vary because of radiocarbon error ranges and variation in correction/calibration usage. The trends referred to below (warmer versus cooler, higher versus lower, and wetter versus drier) are relative in relation to previous and subsequent trends and for the most part are not quantified.

Climate and Sea Level, ca. A.D. 850–1200

A Sargasso Sea sea-surface temperature (SST) record (Keigwin 1996) shows a warming beginning at A.D. 850 that by A.D. 1000 reached the warmest temperature of the 3,000-year record. There was a subsequent cooling until A.D. 1050 followed by a slight warming at A.D. 1150 followed by another cooling. An SST record from off Puerto Rico (Nyberg et al. 2002) suggests a warm period between A.D. 700 and 950. A Chesapeake Bay SST record (Cronin et al. 2003) documents relative warmth from A.D. 800 to 1000. Sediment cores from the Florida Straits (Lund and Curry 2004) possibly record warmth for this time span, peaking in one core at about A.D. 900 and in another at about A.D. 1100–1150. A cooling follows. An SST record off the coast of western Africa (deMenocal et al. 2000) shows warmth until about A.D. 1150.

A precipitation record from the Cariaco Basin (coastal Venezuela) (Huag et al. 2003) indicates two wet subepisodes: one from about A.D. 900 to

1050 and a moderately wet one from about A.D. 1050 to 1200. A Yucatán precipitation record from Lake Punta Laguna (Curtis et al. 1996) reveals a highly variable time with dry conditions from A.D. 900 to 1050 and a major wet event between A.D. 1050 and 1150 followed by a relatively drier span until A.D. 1250. Another Yucatán record (Hodell et al. 1995) shows the wet event earlier, at A.D. 900, followed by relatively dry conditions until about A.D. 1350.

This time span correlates roughly with what has been variously named by climate historians as the Early Medieval Warm Epoch, Medieval Optimum, or Medieval Warm Period. In the recent climate literature, its signature of warmth has been extended both temporally, to roughly A.D. 900–1300, and spatially, although not uniformly. When compared with the preceding (Vandal Minimum, or VM) and subsequent (Little Ice Age, or LIA) cooler time spans (figure 2.2), the signature appears often enough now in climate records that it is commonly referred to by climate scientists as the "MWP" (Medieval Warm Period). Yet its temporal and spatial extent as well as its magnitude of warmth (especially this last item as compared with the twentieth-century record) have been topics of debate (Bradley 2000; Bradley et al. 2003; Broecker 2001; Crowley 2000; Mann 2000; Osborn and Briffa 2006). A well-known human-climate association with this episode is that of the Norse people who established settlements on the west coast of Greenland during this relatively warm episode but then experienced drastic depopulation during the subsequent LIA (McGovern 1994; Pringle 1997). In the context of the southeastern United States, and of relevance to this chapter, Gunn (1997: 144) uses the term *Mississippian Optimum* to refer to the MWP. However, this overall warm period was punctuated by periods of drought as well as periods of plentiful rainfall, which would have affected the fortunes of Mississippian chiefs and their followers. Dendrochronological data indicate a major drought along the Georgia coast at A.D. 1176–1220 (Blanton and Thomas 2008: 801–5). Anderson and colleagues (1995: 272–73) propose that the period A.D. 1056–1152 would have been difficult for Mississippian agriculturalists in the Savannah River valley, especially during the intervals A.D. 1056–61, 1076–90, and 1124–52. Harvest shortfalls also were likely during A.D. 1162–64 and 1359–77.

Tanner's (1993, 2000) Denmark sea-level record indicates a sharp rise beginning at A.D. 850. If accurate, this signature would push back the beginning of the MWP to A.D. 850. In this record, by A.D. 950, sea level was as high as it was during the late Roman Warm Period (RWP). It remained high until A.D. 1050. An abrupt regression followed, dramatically bottoming out at A.D. 1100. An alpine glacial record shows an eleventh-century advance (Haeberli and Holzhauser 2003: 14). Consistent with this pattern is the isotopic analysis of an A.D. 1050 oyster shell from southwest Florida (Blackwater River estuary), indicating winter conditions colder than those indicated by modern (1990s) oyster shells (Surge et al. 2003: 749). Another sharp rise in the Denmark record brought sea level to its former position by A.D. 1150. A Red Sea record (Siddall et al. 2003: 854) shows a higher sea level compared to previous and subsequent levels between A.D. 800 and 1200. A well-known record from South Carolina (Colquhoun and Brooks 1986: 276) documents a high sea level centered on A.D. 950.

Archaeological research in the Mayan area of the Yucatán indicates a sea level 1 m higher than the twentieth-century mean for the period between A.D. 800 and 1200, based on well excavations (Bruce Dahlin, personal communication 2002). Tanner's (1991, 1992) Gulf of Mexico record exhibits an overall high sea level for the period. Stapor and colleagues (1991: 815, 835) estimate that sea level began to rise around A.D. 850, reaching a level near the twentieth-century mean and possibly as much as 0.3 m above it. They name the associated beach-ridge sets "La Costa." Thus, in this chapter, we refer to the southwest Florida high sea-level episode as the La Costa High (figure 2.2).

Although details (timing and magnitude) of the environmental variability within the A.D. 850–1200 time span vary from record to record, this period, at least in the greater North Atlantic region, including the greater Southeast and southwest Florida, can be argued to have been characterized by general warmth and high sea level but punctuated with at least one shorter-term, but abrupt, cooler event with an associated abrupt sea-level regression. The time span is commonly referred to by both climate historians and paleoclimate scientists as the Medieval Warm Period, and, in southwest Florida, the overall episode of high water as the La Costa High (figure 2.2). Precipitation during this period varied from subregion to subregion. The Yucatán and Cariaco records indicate variable wetness and dryness for much of the tropical North Atlantic. However, Florida, like the greater Southeast, may have been wetter overall rather than drier during the MWP.

Sea-level records suggest a rise at least up to the twentieth-century mean and in the case of the Denmark record, an abrupt short-term regression centered on A.D. 1100. Tanner's (1993, 2000; see also Gunn 1997) Denmark record, despite its high-latitude origin, is consistent with the other sea-level and climate records (including the southwest Florida model), an important point because it is a sea-level record constructed at 50-year intervals, thus providing archaeologists with needed detail at a human and ecosystem time scale. Of particular relevance for the topic of this chapter is Tanner's (2000) presentation of the record for the A.D. 1–1850 time span. The record's consistency with or support by other records closer to southwest Florida indicates its validity for application in southwest Florida as well as other parts of Florida; thus, we emphasize it in our cultural change section below.

Climate and Sea Level, ca. A.D. 1200–1850

The Sargasso Sea record indicates that cooling began by A.D. 1150 and continued until it was interrupted by a warming spike at A.D. 1400–1550. Sea-surface temperatures (SSTs) again cooled, with the coolest temperatures of this period centered on A.D. 1650. After a slight warm-up, temperatures leveled off from A.D. 1750 to 1850. The Puerto Rico record exhibits a similar pattern. The Chesapeake Bay record documents three cool subepisodes between A.D. 1000 and 1900. All three Florida Straits cores record a cool period, and at least two of them show an intervening warm spell, as seen in the Sargasso record. The western African record is consistent with the Sargasso and Florida records. A coral core dating to the eighteenth and early nineteenth centuries collected from off of Puerto Rico indicates SSTs two to three degrees cooler than those determined for a 1980s core (Winter et al. 2000).

The Cariaco record shows a rapid drying event followed by an equally rapid wet event centered on A.D. 1250. From about A.D. 1300 to 1750, a general drying trend is recorded, with one wet spike at A.D. 1500 and three dry punctuations at A.D. 1575, 1650, and 1750. In the Lake Punta Laguna core, the period is marked by two subepisodes. The first is dominated by drying, with wetter punctuations at A.D. 1250, 1400, and 1500. After A.D. 1500, wetness dominates with three events at A.D. 1550, 1700, and 1800. In the Chinchacanab record (Curtis et al. 1996), the variability is less extreme. Both Yucatán cores record a wet event centered on A.D. 1450 coincident with the warm-up seen in the ocean cores. Another Yucatán sinkhole sediment core from Aguada X'caamal records an abrupt change in constituents between A.D. 1450 and 1500, indicating an increased salinity associated with a drier climate (Hodell et al. 2005). Dendrochronological data suggest prolonged drought periods on the southeastern U.S. coast, ca. A.D. 1564–71, 1585–95, and 1627–67 (Blanton and Thomas 2008: 805; Stahle et al. 1998).

The time span of roughly A.D. 1200/1300 to 1850 is known climatically as the Little Ice Age (LIA) because it was a time of cooler temperatures and glacial advances compared to the MWP. Three cool subepisodes are documented in the Haeberli and Holzhauser (2003: 14) alpine glacial record: A.D. 1250–1350, 1500–1650, and 1750–1850. The cooling subepisodes are generally thought to have been widespread if not of global occurrence. The LIA's initiation date varies depending on the data set being considered, but it is usually set anywhere from A.D. 1200 to 1300. The end date of A.D. 1850 is more often agreed upon, based on an undisputed rapid warming after this date. Even so, the solar history presented by Eddy (1994: 30) would suggest A.D. 1715, the end of the Maunder Minimum, as an end date. In his book on the LIA, Fagan (2000) brings together many well-known examples of historical events and processes (including the Black Plague and the French Revolution) intricately associated with the climate of the LIA.

Considering sea-level fluctuations, Tanner's Denmark record indicates a lowered level from ca. A.D. 1200 to 1850 that is less severe overall and less erratic than the one that characterizes the earlier Vandal Minimum (VM) episode. Of relevance for the topic of this chapter is that LIA sea levels were relatively uninterrupted by abrupt changes compared with the dramatic A.D. 1100 event. Minor short-term regressions were centered on A.D. 1350 and 1700. The South Carolina record documents a low stand centered on A.D. 1450. Tanner's Gulf of Mexico record, not as finely resolved as the Denmark record, exhibits a sea-level drop at around A.D. 1200/1250 that lasted to around 1800/1850. Stapor and colleagues (1991: 815, 835) estimate that the Gulf's sea level began to fall around A.D. 1450, reaching about 0.3 m to perhaps 0.6 m below the twentieth-century mean. They estimate its duration to have been as long as 400 years and name the associated beach-ridge sets "Sanibel II." Thus, in this chapter, we refer to this episode as the Sanibel II Low (figure 2.2). Isotopic analysis of an A.D. 1220 oyster shell from southwest Florida's Blackwater River estuary indicates winter conditions similar to those indicated by modern (1990s) oyster shells (Surge et al. 2003). The Puerto Rico salinity record indicates that the lowest values of the LIA centered on A.D. 1400.

While the timing and magnitude details of the environmental variability observed within this interval of A.D. 1200–1850 vary from record to record, the argument can be made that, for the greater North Atlantic region, including the greater Southeast and southwest Florida, the Little Ice Age was characterized by general coolness and lowered sea level but punctuated with shorter-term, slightly warmer events and small rises in sea level. The Denmark record, in particular, portrays an overall stable span of time. Of particular note, however, are two minor regressions, even though they do not come close to comparing with the magnitude of the MWP's A.D. 1100 and VM's A.D. 850 events. Precipitation during this period varied from subregion to subregion; the Yucatán and Cariaco records indicate general dryness for much of the tropical North Atlantic, and this may have been the case for Florida and the greater Southeast as well.

Cultural Change in the Caloosahatchee Region during the Mississippi Period

Caloosahatchee IIB, A.D. 800–1200

We begin this discussion at A.D. 850, environmentally a pivotal point in time, to set the stage for exploring change during that portion of southwest Florida's Caloosahatchee cultural sequence that corresponds with the Southeast's Mississippi period. People living during the first century of the Caloosahatchee IIB period (A.D. 800–900) likely were adversely affected by the most detrimental of three sea-level regressions associated with the VM climatic episode. The cooling event centered on A.D. 850, and its associated sea-level regression must have been devastating for a people who depended on shallow-water aquatic foods, especially being the third and most severe in a cascading series of such cooling/sea-level events (Marquardt and Walker 2012; Walker 2012). For example, given the shallowness of Pine Island Sound, residents along its eastern margin (Pine Island's western shoreline) at such sites as the Pineland Site Complex (8LL33, 34, 36, 37, 38, 757, 1612), Josslyn Island (8LL32), and Galt Island (8LL27, 81) would have abandoned their homes to seek better access to aquatic resources farther west, resettling on both the barrier islands (e.g., Cayo Costa, Sanibel Island) and the westernmost inshore islands (e.g., Useppa Island, Buck Key). The inshore marine fish populations would have been impacted first; the fish responded simply by moving to deeper waters. At that point, the collecting of shellfish would have intensified until either the diminishing water level could no longer sustain those populations or human collection pressure became too great, or both.

The Caloosahatchee IIB period tentatively has been assigned a beginning date of A.D. 800 by Cordell (1992: 168, 2012), largely based on pottery assemblages from Josslyn and Pineland. It is recognized by small amounts of Belle Glade Red and the eclipsing of sand-tempered plain by Belle Glade Plain as the dominant pottery. (Originally made in the Lake Okeechobee area ca. A.D. 200, Belle Glade Plain first appears in limited amounts in southwest Florida ca. A.D. 500.) Weeden Island pottery also is present, as are wares with chalky sponge-spiculate (St. Johns) and limestone-tempered (Pasco) pastes. As more assemblages from other sites are studied, A.D. 900 might emerge as a more accurate date for the appearance of the new IIB assemblage. An examination of the IIB radiocarbon dates from Pineland, Josslyn, and Galt reveals an absence of midden deposits securely dated to the ninth century. This void supports the idea that sites in shallow-water locales were sparsely populated or even abandoned between A.D. 800 and 900. In contrast, for example, Useppa Island's (8LL51) Shell Ridge has midden deposits dating predominantly to the IIB period (Marquardt 1999: 79, 89–91), with three dates falling securely within the ninth century (see figure 2.1 for site locations).

As the MWP began its rapid warming trend, sea level quickly responded so that by A.D. 900, the La Costa High was well on its way to refilling Pine Island Sound and other shallow areas. Between A.D. 900 and 950, the inshore waters were highly productive, with ample fish and shellfish for the taking. Sites in shallow areas were reoccupied, as evidenced by midden deposits dating to A.D. 900 to 1200 that exhibit faunal assemblages of high diversity and high salinity (characteristics likely due to a raised sea level) and indicate overall great abundances of fish and shellfish remains (deFrance and Walker 2012; Walker 1992). Technologically, the faunal assemblages and their associated artifacts (net weights, hooks, sinkers) reflect efficient net fishing as well as hook-and-line fishing, techniques that served the Calusa and their predecessors well for many centuries (Walker 2000).

Based on deposits at Pineland, we see a major change in settlement in the tenth century: a decisive shift from a more extensive settlement along the shoreline to a more intensive one, largely, if not completely, restricted to the summits of midden-mounds. Caloosahatchee IIB midden accumulation was intensive and spatially constrained, with midden-mounds at Pineland rising to seven meters in height by the end of IIB, ca. A.D. 1150 to 1200. (During the Caloosahatchee I and IIA periods [e.g., ca. A.D. 50 to 750 at Pineland], habitation had been extensive along the shoreline but had moved episodically inland or shoreward through the centuries in response to significant sea-level fluctuations; see Marquardt and Walker 2001, 2012; Walker et al. 1994, 1995.) Although not well supported by pottery assemblages, the radiocarbon-date sequence at one of Pineland's mounds (Randell Complex Mound 1) suggests that some purposeful mound building may have taken place during this time (Wallace 2012). Nonetheless, the timing correlation between an abruptly rising (over a 50- to 100-year interval) sea level and the intensive vertical growth of midden-mounds is impossible to dismiss, leading us to speculate that ever-higher water levels were a significant factor in a spatial reorganization of Pineland and other mound complexes, including Estero Bay's Mound Key (8LL2). In other words, whereas the pre-IIB settlement response to sea-level fluctuation was to move back (inland) and forth (shoreward) along the shifting shoreline, the new IIB response was to move upward in response to rising water levels. With the warming of SSTs (see above) during the MWP, tropical storms would have been more powerful, if not more frequent (Walker 2012), and their associated storm surges would have provided even more motivation for coastal peoples to build upward and live on elevated ground.

These Pineland IIB linear mounds were perpendicular to the shoreline, in contrast to earlier deposits, and they paralleled a canal situated between the highest two mounds. Centrally located, the canal was later extended beyond the site complex all the way across Pine Island, a distance of 4 km (see discussion below). The central canal section at Pineland (between the highest two mounds) may have been an altered natural waterway that once emptied into the sound and was fed in part by artesian water. Its location may have contributed to the IIB spatial reorganization, including the formalization of the central water court and the eastward extension of the canal. A rise in water levels (sea and freshwater) as abrupt as that indicated for the A.D. 850–950 period surely was a factor in the realization of a structural need for managing the ever-increasing amounts of water around and within Pineland and other settlements. In the absence of any absolute or relative dating, we hypothesize that the innovative beginnings of what later became an elaborate system of constructed waterways at Pineland were coeval with the early part of the IIB vertical mound growth, ca. A.D. 900 to 950, and that both changes were associated with the A.D. 850–950 sea-level rise. Additionally, this is the time when Belle Glade pottery, initially made in interior south Florida, became the predominant ware at

Pineland and elsewhere in the region. Higher water levels compared to those of the preceding few centuries would have facilitated travel to and from the interior, along constructed canals as well as natural waterways.

Just when things were going well, in the midst of the warm MWP, an abrupt reversal occurred in the temperature trend, resulting in a sudden (within 50 years) sea-level regression, centered on A.D. 1100. Although not as severe as the A.D. 850 event, it nonetheless may have disrupted the productive estuarine ecosystem enough to force a new move westward, following the aquatic resources. Despite extensive testing and dating of deposits across the Pineland Site Complex, no conclusive evidence has been found there for midden accumulations ca. A.D. 1100. A soil analysis (Scudder 2012) at Pineland's burial mound (known as Smith Mound, 8LL36) identified an A horizon that had developed along the top of the lowest of three major strata. In this lowest stratum was an in situ human burial radiocarbon-dated to cal A.D. 1020–1170. The A horizon indicates abandonment of the mound for a time before the second stratum began to accumulate and/or was deposited. This may be evidence for an abandonment ca. A.D. 1100. If that is the case, then the burial, and thus the earliest (so far that we know of) practice of mound burial at Pineland, may date sometime between A.D. 1000 and 1050. All of Pineland may possibly have been vacated during the severest part of the ca. A.D. 1100 short-term low-sea-level event. Radiocarbon-dated midden deposits at Josslyn and Galt, both in similar shallow-water locales, also present gaps in time centered on the twelfth-century low-sea-level event (as well as during the earlier VM low-water episode ca. A.D. 550–850). Such a significant lowering of the water would have presented a serious setback for the region's population. Pineland was reoccupied probably by A.D. 1150; Josslyn and Galt's reoccupation dates are closer to A.D. 1200 (Marquardt 1992b: 11, 14–25).

Dietler (2008: 437–42) has demonstrated that production of lightning whelk (*Busycon sinistrum*)[1] shell cutting-edged tools became more precise, standardized, and efficient during the Caloosahatchee IIB period (A.D. 800–1200), possibly to satisfy elite demand. The more favorable climatic conditions of the IIB period may have increased demand for shell tools to manufacture dugout canoes. During the same period, large-scale construction projects included the Pine Island Canal and the accumulation of midden deposits to form high mounds at such places as Pineland (8LL33) and Mound Key (8LL2). Increased quantities of Belle Glade Plain pottery probably indicate increased commercial and sociopolitical relations with the

Lake Okeechobee area. In sum, during a time of mostly favorable climatic conditions, the Calusa of southwest Florida experienced an overall period of prosperity and expanded their influence throughout south Florida.

Caloosahatchee III, A.D. 1200–1350, and IV, A.D. 1350–1500

Between A.D. 1150 and 1200, sea level began a moderate drop associated with the LIA climatic episode. Sea level continued in an overall lowered position until around A.D. 1850, roughly the end of the LIA. Relative to the MWP's La Costa High, the LIA's Sanibel II Low was clearly lower, but compared to the VM's Buck Key Low of ca. A.D. 550 to 850, it was neither as low nor as erratic. Rather, the LIA and its Sanibel II Low in coastal southwest Florida could even be considered comparatively stable, with little or no detrimental effect on the region's aquatic ecosystems and human populations.

The cultural transition from Caloosahatchee IIB to III occurred around A.D. 1200. Again, there was no radical departure from established subsistence practices or technology during this period. The accumulation and/or buildup of midden-mounds continued in a constricted spatial pattern as in the IIB period. On Josslyn Island and on Buck Key (Marquardt 1992b: 19, 35–36), significant deposits of large lightning whelk shells date to Caloosahatchee III, suggesting that environmental conditions during this time favored an abundant supply of these large shellfish. Production of cutting-edged tools continued as well. While Belle Glade Plain remained the dominant plainware and Weeden Island pottery lingered, St. Johns Check Stamped appeared in middens for the first time, marking the beginning of the III period. St. Johns Check Stamped was originally made in northeastern Florida as early as A.D. 750 (Milanich 1994: 246–48). At Pineland, about 90 percent of Safety Harbor–related pottery from mortuary contexts was of nonlocal "Lake Jackson" sherd-tempered paste, as defined by Cordell (2005: 107, 109; but cf. White et al., chapter 10, this volume, on Lake Jackson paste).

Caloosahatchee IV began at A.D. 1350, when sea level was at one of the two lowest points within the overall Sanibel II Low episode (nonetheless at a level much higher than those of VM [Caloosahatchee IIA] times). But between A.D. 1350 and 1400, it returned to its previous A.D. 1300 level. Again the basic fishing-gathering-hunting technology continued much as before. Zooarchaeological samples from Pineland document continued abundant molluscan and fish populations (deFrance and Walker 2012) but with a lowered diversity and salinity compared to IIB samples, likely because of a lower water level. At the Mark Pardo site (8LL606) on Cayo Costa (see figure 2.1), a deposit of large lightning whelk shells dates to Caloosahatchee IV, suggesting a continuation of an abundant supply and continued use of these large whelks during this period. Although again not conclusively supported by pottery assemblages (Cordell 2012), the radiocarbon-date sequences (Walker and Marquardt 2012) within two of Pineland's mounds (Brown's Complex Mounds 1 and 2) suggest purposeful mound building ca. A.D. 1300 to 1500.

Caloosahatchee IV is recognized archaeologically by the first appearance of Glades Tooled pottery and the relative decrease of Belle Glade Plain in favor of sand-tempered plain. This may indicate political realignments to the south (Ten Thousand Islands) and away from the east, or perhaps a reorganization of exchange relationships. Belle Glade Plain continued to dominate in the Lake Okeechobee area, even as it diminished in importance on the southwest coast relative to sand-tempered plainware. Lowered water levels may have hindered travel between the coast and the interior. Present in small numbers are grog-tempered sherds, with pastes similar to those associated with Lake Jackson and Baytown. Most Pinellas-style ticked rim sherds at Pineland are locally made and found in Brown's Complex Caloosahatchee IV strata. Most Caloosahatchee IV, nonlocal Safety Harbor–related pottery in Pineland's middens is of Pinellas paste (frequent to common quartz sand; laminated/contoured paste texture; frequent rounded clay lumps, no sherd inclusions). Minor amounts of shell-tempered pottery, not made in south Florida (Pensacola series), are found in mortuary contexts. The Caloosahatchee IV period lasts until the time of the first likely contacts with Europeans in south Florida ca. A.D. 1500 (Marquardt 1988: 176–79).

If one examines Tanner's (2000: 93) sea-level graph, an interesting correlation is the timing of fluctuations within the LIA/Sanibel II Low. A.D. 1350 marks the lowest point in sea level of the first series of drops between A.D. 1150 and 1350. Beginning at A.D. 1350, sea level rose back to where it had been in A.D. 1300, after which, very minor fluctuations occurred until A.D. 1650. Between A.D. 1650 and 1700, sea level dropped to its lowest point of the LIA before it rose again between A.D. 1700 and 1750. The A.D. 1150–1350 time span of the sea-level fall was closely coeval with Caloosahatchee III (A.D. 1200–1350). The A.D. 1350–1500 time span of the partial recovery was coeval with Caloosahatchee IV (A.D. 1350–1500). Later, during the Caloosahatchee V period (A.D. 1500–1750), the Maunder

Minimum–associated A.D. 1650–1750 drop in sea level may have reduced the inshore fish populations, placing the Calusa in a vulnerable position during a time of increasing political-economic pressure from European interests (see below).

Summary, A.D. 800–1500

In southwest Florida, the latter half of Caloosahatchee IIB and all of the Caloosahatchee III and IV periods coincide with the "Mississippi" period of A.D. 1000–1500. Generally speaking, the first part of this 500-year period, coeval with Caloosahatchee IIB, was warmer with higher sea levels, and the second half, coeval with Caloosahatchee III/IV, was cooler with lower sea levels, but fluctuations—especially the A.D. 1100 event—within these overall trends undoubtedly had local and regional effects, as discussed above. Before A.D. 800, habitation was more extensive, often along shorelines, and shifted position several times, sometimes within 50 years, as a result of shoreline transgressions and regressions. The most pronounced of three significant sea-level regressions took place ca. A.D. 850, perhaps finally leading to depopulation of sites situated in shallower parts of the estuary, such as at Josslyn Island and Pineland. After A.D. 900, as sea level recovered, renewed habitation at Pineland became more intensive, shifting to the tops of linear midden-mounds situated perpendicular to the shoreline. By A.D. 1000/1050, burials were placed in separate sand mounds not far from living areas; craft specialization became more pronounced; and large-scale public works, such as canals and mounds, were undertaken. Throughout this period, subsistence and technology remained conservative, and fish remained the main dietary staple. Although the III/IV periods (A.D. 1200–1500) correlate with LIA lowered sea levels, the latter were neither as severe nor as erratic as the IIA sea levels of the VM. In fact, the III/IV Calusa people of southwest Florida may have experienced the most stable and salubrious climatic and sea-level conditions of the preceding 2,000 years.

Analysis and Interpretation

Our perspective is that of historical ecology, the holistic study of social formations in their dynamic environmental contexts (for more on this theoretical orientation, see Balée 1998; Crumley 1994, 2007; Marquardt 2012). For us, culture and environment are historically situated, influencing one another in a basic and fundamental manner. Cultural changes cannot be fully understood in the absence of environmental context, nor can environmental conditions be considered the sole or even the principal drivers of cultural changes. In short, culture and environment are dialectically related and mutually constitutive (Marquardt 1992a) and form a totality that can be studied regionally and through time (Marquardt and Crumley 1987).

People interact not only with the physical structures of their environments (landforms, rivers, estuaries, forests, etc.) but also with sociohistorical structures that are built up by human actors in the course of interacting with physical structures and with one another. Sociohistorical structures include property relations and power relations that characterize a particular social formation (Marquardt 1992a: 104–8). Furthermore, physical structures are often conceived, approached, propitiated, and interacted with within the framework of belief systems. Finally, sociohistorical structures are not static; they emerge and mutate through time as impinging conditions offer opportunities and present challenges that must be responded to based on established knowledge systems. Although they may be cognized in terms of historically situated belief systems (religion, myth, and the like), climate changes and dramatic weather events, such as hurricanes, are significant impinging conditions.

With this orientation in mind, we now consider interregional connections, large-scale communal construction projects, and social complexity for southwest Florida during the Mississippi period because these phenomena are often associated with Mississippian chiefdoms. We also speculate on the degree to which developments among southwest Florida people were influenced by those of their contemporaries in the greater Southeast.

Interregional Connections

Based on extensive research on Pineland pottery by Cordell (1992, 2012), we think that southwest Florida people lived in relative cultural isolation until the Caloosahatchee IIB period. Ceramic technology was conservative, with plain, incurved bowls with rounded rims being made from local clays. Belle Glade pottery, first made in the Lake Okeechobee area about A.D. 200, made its way to the southwest Florida coast by A.D. 500 but was slow to become popular there. Not until the latter part (A.D. 650–800) of Caloosahatchee IIA did ceramic forms become more diverse, with outslanting bowls and vase or vertical forms being added to the inventory.

By Caloosahatchee IIB times (A.D. 800–1200), the latter part of which includes the Early Mississippi period, Belle Glade pottery had become the most prominent plainware. Small quantities of micaceous, chalky, and limestone-tempered wares were present along with Weeden Island pottery. These changes in pottery use signal much-increased interaction with other regions of the Florida peninsula. The higher water levels of the MWP may have facilitated exchange through improved travel routes, especially compared with the previous lows of the VM.

During Caloosahatchee III (A.D. 1200–1350, or middle Mississippian) times, interaction with other areas became even more pronounced. A check-stamped chalky ware (St. Johns Check Stamped) originally made in northeastern and eastern Florida was added to the inventory, as was Pinellas Plain from Florida's central Gulf coast. Interregional exchange within the Florida peninsula would have increased the possibilities for diplomacy, political alliance, formal trading agreements, and intermarriage. But trade and exchange were not limited to Florida. Exotic materials from the Midsouth and Midwest (e.g., quartz, galena) are also found in Caloosahatchee III contexts (Walker and Marquardt 2012).

For example, Stratum 19 in our excavation of Brown's Complex Mound 2 at Pineland partially documents a structure, and we tentatively interpret the stratum as a house floor. A date of cal A.D. 1270–1340 is associated with the floor, and its ceramics are consistent with Caloosahatchee III. Aside from the numerous pottery sherds, ark-shell net weights, shell tools, drilled shark teeth, and bone point/pin fragments, several unusual artifacts came from Stratum 19. They include a silicified coral hafted biface of a Marion or Putnam type; a utilized chert flake; a piece of quartz; a cone-shaped, chalky object, possibly of dolomite; a cube of galena; a possible net-mesh gauge of quahog clam shell; and a complete, finely pointed bone perforator. The quartz, galena, and perforator were found within 25 cm of one another, and the chalky object was about 80 cm from these. In addition, specimens of sandstone and ochre were recovered. A few of the former may have been used as sharpening stones. The quartz cannot have come from Florida and is likely to be from no nearer than the Georgia piedmont. Mass spectrometer measurements of lead isotopes revealed that the galena originated in southeastern Missouri (Austin et al. 2000). We interpret the house represented by Stratum 19 as a special structure in which ritual preparation took place.

It seems clear that the Calusa exchange network reached into the Midwest and Midsouth, at least indirectly, by middle Mississippian times, if not earlier. What could coastal people have offered in return? A possibility that immediately springs to mind is the lightning whelk shell, large, robust specimens of which are found along the southwest as well as northwest Florida coast. One need only think of the many thousands of lightning whelk and other marine-shell beads manufactured at Cahokia (Kelly 2006: 246), where some 18 species of marine shells were fashioned into artifacts by specialists and probably used in ritual and political displays, to imagine a significant demand for Gulf-coast marine shells. Indeed, the Caloosahatchee III/IV examples of concentrations of large whelk shells noted above may be related to such demand. Of course, some lightning whelk shells had moved into the Midwest much earlier, being found in burials of the Shell Mound Archaic of Kentucky and Tennessee (e.g., Webb 1974: 205–15; Webb and DeJarnette 1942: 197–98 and plates 222–23; see Watson 2005: 555). Nevertheless, the demand for marine shells, particularly the lightning whelk, in the Midsouth and Midwest during the Mississippi period may have drawn the coastal Calusa more firmly into the Mississippian world in spite of their geographic distance from major Mississippian centers where the beads, pendants, and engraved shell cups were ultimately produced.

Large-Scale Construction Projects

A hallmark of Mississippian societies is the flat-topped, rectangular platform mound. Both the number of mounds in Mississippian towns and the sheer volume of some of the larger earthworks are impressive. The largest mounds in Mississippian towns may have been the locations of chief's houses, rather than of temples or other ritual structures (Payne 2006: 96–97, 104). Towns in southwest Florida did not have truncated pyramidal mounds, but during Mississippian times Calusa people did create impressive linear midden-mounds that probably supported communal domiciles (in middle Mississippian times they may have redeposited older middens to build their midden-mounds higher), and they did use sand mounds for burying their dead. Perhaps more important, as early as the beginning of IIB times they began intrasite spatial reorganizations that during III/IV times became conventionalized village plans. Let us consider briefly the two largest known Calusa towns: "Calos" and "Tampa," today known as Mound Key and Pineland, respectively (figure 2.1).

Mound Key is an island in Estero Bay.[2] Archaeological deposits occupy most of the 51-ha island, although some parts of the island have been

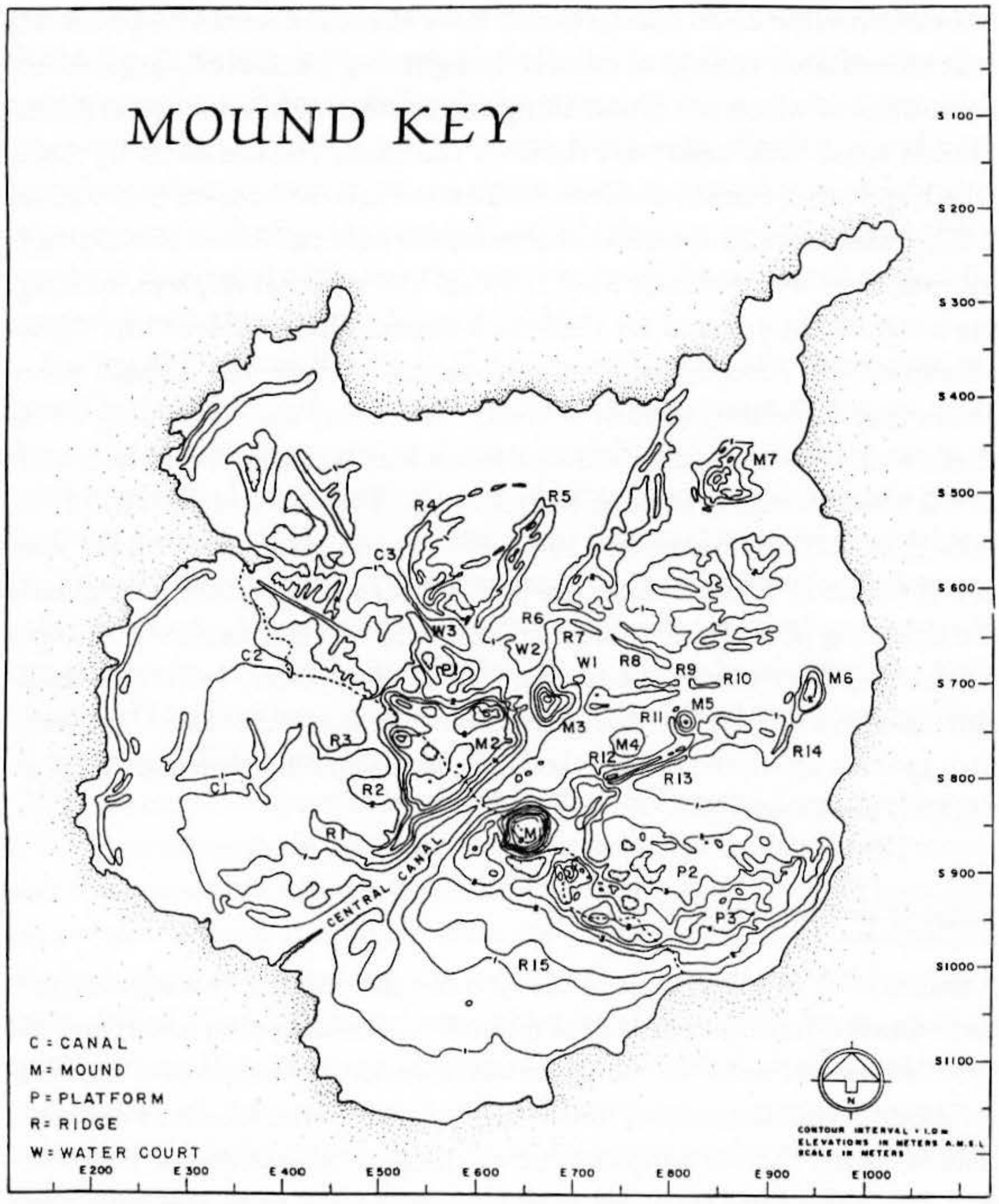

Figure 2.3. Topographic map of Mound Key (8LL2). Drawing by Corbett Torrence.

reduced by mining for road construction materials. Still visible are substantial midden-mounds (the largest about 10 m high), a large artificial canal, smaller midden ridges, and burial mounds (figure 2.3). Only limited mapping and testing of the site have been accomplished to date (Torrence et al. 1994), but radiocarbon dates (data on file, Anthropology Division, Florida Museum of Natural History) show that the island was inhabited by A.D. 300 and it was a major Calusa town during the protohistoric Caloosahatchee V period (Wheeler 2000b).

The two major mound groups of Mound Key are bisected by a substantial entrance canal; subsidiary canals probably branched off from it to reach other parts of the town. In the sixteenth century, Calos—almost surely the Mound Key site—was the capital of the Calusa polity, with more than one thousand inhabitants. The Spaniards report that in 1566, governor Pedro Menéndez de Avilés met there with Calusa king Caalus in a building large enough for two thousand people to stand without being very crowded (Solís de Merás 1964: 145). Inscribing a rectangle around the main mounds at the site yields an area of 30 ha, and the height of the tallest mound is 9.8 m (Torrence et al. 1994).

The Pineland Site Complex, known to the historic-period Calusa as Tampa,[3] is composed of multiple midden-mounds, some of which are grouped in spatially discrete mound complexes (figure 2.4). In addition, to the east and south, buried shoreline middens and other midden-mounds began to accumulate as early as A.D. 1. As discussed above, the habitation pattern before A.D. 900 was more extensive and shoreline oriented, and subsequent to A.D. 900 it was oriented to the tops of midden-mounds. Thus, what we envision as the late prehistoric manifestation of Pineland is in fact the result of as much as 1,700 years of aboriginal occupation, not just solely that of the Mississippi period. Today the peak elevation of Brown's Complex Mound 1 is 9.0 m, although it was probably somewhat higher before being reduced in the early twentieth century.[4]

Similar to the configuration of Mound Key, the two major mound complexes at Pineland are bisected by a large canal. It led into a central water court, and smaller canals led to water features, including a pond, a canal that surrounded a burial mound, and another canal that surrounded another mound. The principal canal continued eastward, running the entire width of Pine Island, about 4 km. Late nineteenth-century eyewitnesses recorded the width of the canal itself as 30 feet (9 m) and its depth as 6 feet (2 m), with a width of 50 feet (15 m) from berm to berm on either side of the feature. Luer and Wheeler (1997) estimate its width as varying between 18 and 23 feet (5.5–7.1 m), with channel depths of 3 to 5 feet (0.9–1.5 m). They confirm a total length of 2.5 miles (4.0 km) and identify several water-control structures and feeder ponds that allowed water to flow into or out of the canal as needed.

Excavating and maintaining a 4-km-long canal and its associated water-control features would have been a formidable task requiring much coordinated labor. To get a rough estimate of the amount of sediment that would have to be removed, using Luer and Wheeler's conservative figures,

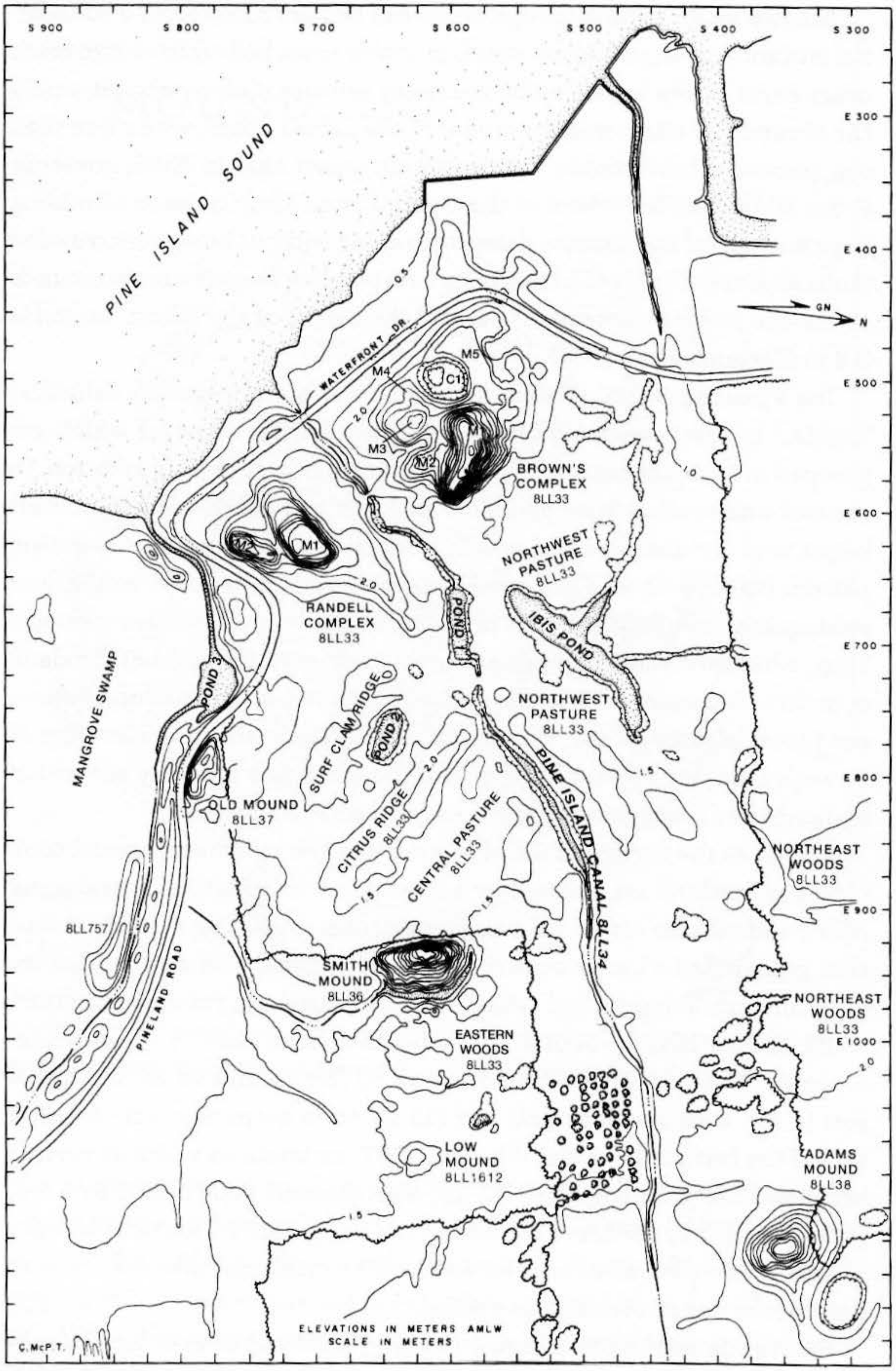

Figure 2.4. Topographic map of the Pineland Site Complex (8LL33, 36, 37, 38, 757, 1612). Drawing by Corbett Torrence and Sue Ellen Hunter.

one can multiply the width (20') by the depth (4') by the length (2.5 miles), yielding an estimate of 1,056,000 cubic feet, or 29,903 cubic meters. This figure for the canal sediments alone (not counting control structures and feeder ponds) compares favorably with the volumes of some of the larger mounds at major Mississippian sites such as Etowah and Moundville. For example, Mound A at the latter site is estimated to have occupied 30,150 cubic meters (Lacquement 2010: 348).

That the Pine Island Canal is an engineering achievement rivaling any in aboriginal North America seems clear, but why was it built? As a result of Luer and Wheeler's (1997) detailed analysis, we know how the canal was structured and how it worked. And thanks to the practical knowledge won through years of canoe-based exploration of the Pine Island Sound–Matlacha Pass area by Charles Blanchard (2002, 2008), we can confidently assert that the canal would have facilitated the movement of goods and people from the Calusa heartland to and from interior south Florida because it provided a strategic advantage "in avoiding the wildly variable navigational problems presented by wind, tide, and current at the northern end of Pine Island in order to reach Matlacha Pass" (Blanchard 2008: 62).

Although one tends to think of the canal in terms of trade goods, raw materials, and foodstuffs, the transport of people—diplomats, traders, leaders, warriors, captives—would also have been important to the Calusa and their client polities (e.g., the Tequesta, Mayami, Ais, Jeaga) and trading partners across south Florida. In addition to the strategic, practical advantage the canal provided, surely it enriched the prestige and personal wealth of the leaders who caused it to be built and maintained. Pineland on the western end and the Indian Field site (8LL40) on the eastern end would have been especially important as ports of entry and exit from the Calusa domain.

The canal must have had local ecological effects, but we imagine that it also had profound political-economic importance. Once built and put into use, it became a part of regional history and its presence had to be accounted for. Human-made, the Pine Island Canal functioned as a major waterway for transportation, much as would a natural river. The canal would have been aggrandizing for the individuals who created and controlled it, and undoubtedly its formidable presence on the landscape would have been noted by all.

Pineland's habitation mounds, composed of accumulated—and in some cases possibly redeposited—middens (shells, bones, ashes, charcoal, dirt, etc.), were also of noteworthy size in late prehistoric times. Widmer (2002:

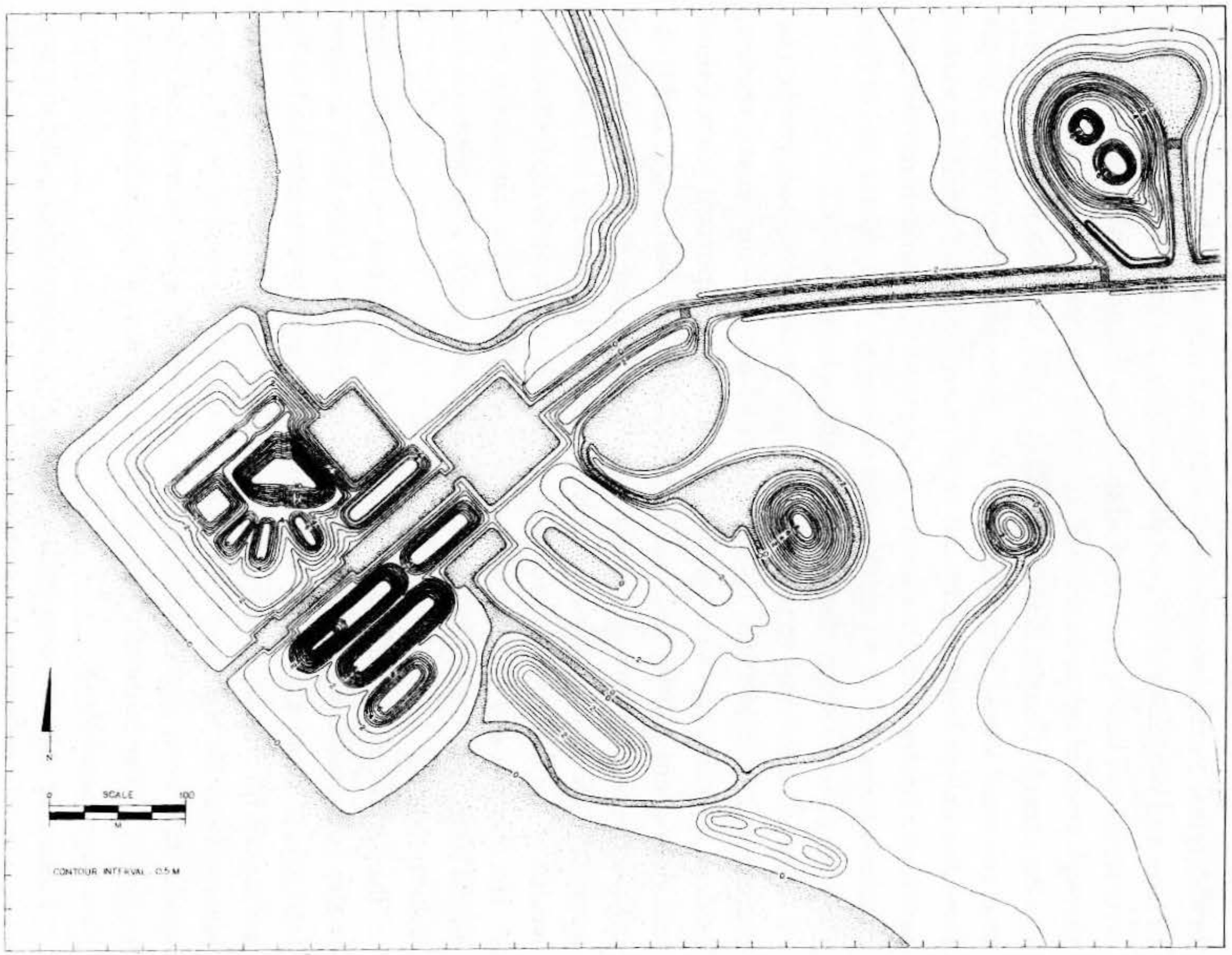

Figure 2.5. Topographic model of the Pineland Site Complex as it appeared before twentieth- and twenty-first-century land modification. Drawing by William Marquardt and Sue Ellen Hunter.

389) refers unequivocally to "temple mounds . . . at all large village sites in [southwest Florida]" by A.D. 800. Goggin and Sturtevant (1964: 194–95) mention "temple mounds" in a broader discussion of "extensive shellworks and earthworks" in Calusa sites but comment that "it is not clear whether [the shellworks and earthworks] gradually accumulated from refuse or were deliberately built by moving refuse from elsewhere in the site."

We are not sure what Widmer and others mean by "temple mounds." Our extensive investigations at the Pineland Site Complex suggest that the high mounds are in fact domiciliary midden-mounds. Based on extensive testing and auger surveys at Pineland, coupled with oral-history interviews with previous landowners, examination of all available aerial photographs, and extensive study of Frank Cushing's notes, diaries, and sketch maps (Kolianos and Weisman 2005a, 2005b), we have suggested a configuration (figure 2.5) for the Pineland Site Complex as it might have looked when abandoned by the Calusa in 1710 (Worth 2012). If we are correct, the site complex encompassed some 42 ha, or 104 acres. We have no archaeological evidence that anyone ca. A.D. 1500 lived anywhere but on top of the habitation mounds, although it is possible that some structures were built along the shoreline fronting the mound complexes (under today's Waterfront Drive) or on stilts over the water. Because archival evidence suggests that the historic Calusa lived in large thatched communal houses, and because several of Pineland's midden-mounds are linear, we imagine the domiciles as longhouses or perhaps as a series of long, narrow structures in a line on top of each of the habitation mounds.

Social Complexity

The postcontact Calusa social formation was hierarchical and tributary and functioned intermittently as a weak tribute-based state between A.D. 1500 and 1700 (Marquardt 1987b: 98–101). Inasmuch as the Calusa paramount leader inherited his position, had ultimate political and religious authority, commanded elite military specialists, and had the power of life or death over his subjects, he may properly be called a "king."

In the absence of firm evidence, it is impossible to know how far back in time to project this level of social complexity. Like their Mississippian contemporaries, the precontact Calusa were surely a chiefdom, but the degree of precontact Calusa organizational complexity is still a matter for discussion. One of us has argued elsewhere (Marquardt 1987b: 103–10, 2001: 166–68) that the intensity of the hierarchical and tributary system described by the Spaniards was at least partly a direct response to the Spanish invasion. In other words, the apparatus of kingship may have been an attempt to adapt to the new broader-scale political economy that had been thrust upon them by the European invasion. This is not to say that the Calusa were not a chiefdom, even a complex chiefdom, before the Spaniards arrived but simply that the statelike organization observed postcontact may have been in part a response to Spanish presence. Based on ethnohistoric sources, the postcontact period shows continuities in basic fisher-gatherer-hunter subsistence and a persistence of native ideology that confounded Spanish attempts to convert the Calusa into Christian agriculturalists (Hann 1991: 184–85, 420, 428).

The legitimacy of the Calusa king was intertwined with his presumed connections with the spirit world, as reported by Laudonnière (1975: 110) in 1564: "The king was held in great reverence by his subjects and . . . he made them believe that his sorceries and spells were the reason why the earth brought forth her fruit." In 1567, Rogel (Hann 1991: 247) commented, "[I]t is expedient for [the Calusa king] to show to his vassals and to his neighboring kings that he is the legitimate king . . . because to that end during his childhood they taught and instructed him in all the things that it is expedient for the king to know about the cult and veneration of the idols, and if he were suddenly to forsake the idolatry at the beginning of his reign, the aforementioned kings and vassals would say that he was not a legitimate king, as he did not know what kings are obliged to know."

A high priest, who was kin to the Calusa king, was keeper of the temple and its idols. Such priests were said to have the power to summon the winds (Sturtevant 1978: 148). If we assume that this was the case prior to contact, it is interesting to speculate on the possible effects of abrupt climatic fluctuations or short-term catastrophic weather on the leadership structure. Might the sea-level low of A.D. 1350 and its implied dampened fishery have had a destabilizing influence on leadership? We believe it is prudent to keep noncultural phenomena in mind when we are searching for explanations of the nature and timing of significant changes in social structure.

Mississippian Influences

Were southwest Florida chiefdoms influenced by developments in the Mississippian world? Surely they were. If they were drawn into the exchange networks that moved marine shells into Mississippian town centers, their awareness of broader-scale political economies and ideologies must have been heightened. The Calusa use of dedicated mounds for burial beginning in the eleventh century and the placement with the dead of pottery sherds from extralocal places may be indications of ideological shifts ca. A.D. 1000 that were at least in part stimulated by contact with Mississippian peoples.

If an alternative ideology with new ways of regarding the ancestors was adopted in the eleventh century by the Calusa, it need have come from no farther away than the central Gulf coast region to the north, where the Safety Harbor culture was established by A.D. 1000 (Milanich 2002: 369; and see Mitchem, chapter 8, this volume). Indeed, Weeden Island burial ceremonialism (interment in sand mounds with inclusion of ceramic vessels with the dead) had developed in the modern-day Tampa Bay area well before A.D. 1000 (Willey 1949a: 105–13). In Manatee and Sarasota counties, just to the north of Charlotte Harbor, burial mounds with inclusions of Weeden Island–series and St. Johns Check Stamped pottery were used after A.D. 700 (Luer and Almy 1982: 42, 46–47). Near Punta Gorda, the Aqui Esta mound (8CH68), which dates to the Englewood period (A.D. 1000–1200), included a number of Mississippian-influenced sherds as well as some chalky-paste pottery associated with late Weeden Island (A.D. 700–1000) (Luer 2002a: 105). Late Weeden Island pottery vessels are found in other mounds in northern Charlotte Harbor (Willey 1949a: 131–35, 344–45).

Some Mississippian-influenced vessels found in the central Gulf coast area are of nonlocal origin, while others were made by local potters who had knowledge of Mississippian-style vessel forms and decorative techniques (Luer 2002a: 105, 2002b: 157). Cordell (2012) found that much of the Safety Harbor–related decorated pottery of the Caloosahatchee IV period (A.D. 1350–1500) at Pineland was probably locally made using Pineland paste (frequent to common sponge spicules; common to abundant very fine to medium quartz sand, occasional coarse quartz; medium to fine paste texture; can be slightly laminated; sandy tactual quality). Based on her analysis, she proposes a dichotomy for Pineland's Safety Harbor pottery between sand-tempered and Pineland pastes on the one hand (local or proto-Calusa manufacture) and grog- and sherd-tempered wares on the other (Safety Harbor proper, or proto-Tocobaga manufacture). Some pottery found in Pineland's burial mound is sherd-tempered "Lake Jackson" paste, possibly originating in the Tallahassee Fort Walton area (see Marrinan, chapter 9, and White et al., chapter 10, this volume).

Burial in mounds is, of course, not exclusively a trait of the Mississippian period. Burial mounds had been used in the greater Southeast as early as Early Woodland times (1000–200 B.C.; Anderson and Mainfort 2002: 4–9). They are known in northeastern Florida during the Early Woodland St. Johns I period (500 B.C.–A.D. 100; Milanich 1994: 260) and in northern, northwest, and south Florida by the Middle Woodland period (100 B.C.–A.D. 500; Austin 1993; Dickel and Carr 1991; Milanich 2002: 359). Surely this was an idea not unknown to the Calusa in southwest Florida; yet they did not apparently adopt the practice until ca. A.D. 1000, when the influence of Safety Harbor culture in the modern-day Tampa Bay area spread to both the north and the south along the Gulf coast (Milanich 2002: 367).

We think it likely that the adoption of mound burial at Pineland and Mound Key was a reaction to the increasing political influence of the Safety Harbor culture in the central Gulf coast region. If establishing a burial mound is a way for a lineage to make claim to a region through links to founding ancestors, as many archaeologists surmise, then the adoption of this practice in southwest Florida may have been a response to the rising influence of a chiefdom located in the central Gulf coast region. By the sixteenth century, the Calusa of southwest Florida were said to be bitter enemies of the Tocobaga, who then controlled the central Gulf coast region (Solís de Merás 1964: 223–24).

In spite of these influences, we assert that southwest Florida chiefdoms never became fully "Mississippianized." Three hallmarks of Mississippian—maize agriculture, special-purpose nonmortuary earthworks, and the manufacture of shell-tempered pottery—were never adopted in south Florida. Maize agriculture was impractical and culturally unsavory (Hann 1991: 184–85) to Calusa fisherfolk. Fishing-gathering-hunting continued to be the dominant mode of production even as exchange relations and exposure to new ideas brought the Calusa and their neighbors more fully into the cultural realm of the greater Southeast. Calusa society was far from a pale reflection of Mississippian social formations farther north. In fact, as we have discussed above, the Calusa lived atop high domiciliary mounds and engineered intricate canals and waterworks that compare favorably in scope with coordinated civil projects anywhere in the Southeast. Although their pottery was unremarkable, their carving, painting, and engraving compare favorably with any art in aboriginal North America.

We do believe that the Calusa were influenced indirectly by developments in the Mississippian world. Their participation in broad-scale southeastern U.S. exchange networks brought extralocal goods to southwest Florida from the Midsouth and Midwest, and they integrated some

Mississippian ideas into their own belief system. Nevertheless, the Calusa maintained their traditions and never abandoned their fisher-gatherer-hunter subsistence strategy, even after being devastated by population loss and driven from their homeland in the eighteenth century (Hann 1991: 428; Sturtevant 1978: 147).

Conclusion

In this chapter, we have reviewed human-scale climatic and sea-level changes and considered their roles in Caloosahatchee IIB, III, and IV (A.D. 800–1500) cultural changes within southwest Florida during the time known in the greater Southeast as the Mississippi period (A.D. 1000–1500). The most noticeable pattern overall is the correlation in timing between Caloosahatchee IIB and the MWP/La Costa High and between Caloosahatchee III/IV and the LIA/Sanibel II Low. Similar correlations can be observed between early Mississippian times (A.D. 1000–1200) and the MWP and between middle/late Mississippian times (A.D. 1200–1500) and the LIA.

Environmental fluctuations—whether they were centuries-long episodes of an erratic or stable nature or individual abrupt or gradual events—would have impacted subtropical Florida's shallow-water estuarine ecosystems.[5] These impacts would primarily have been in the form of changing water levels, which would have affected availability and distributions of resources, primarily fish and shellfish. We think that especially pronounced low-sea-level events (those centered on A.D. 850 and 1100) caused population movements away from normally reliable shallow estuarine habitats (e.g., at the Pineland Site Complex) and toward deeper waters nearer the barrier islands (e.g., at Useppa Island). At the other extreme, abrupt rises in sea level, perhaps combined with short-term severe weather events such as hurricanes, likely contributed to a conscious effort to build high domiciliary midden-mounds rather than continue a pattern of extensive but shifting shoreline habitation.

We also suggest that environmental fluctuations may have influenced exchange, large-scale construction projects, social structure, and interactions with the broader Mississippian world. Inasmuch as the legitimacy of hereditary leaders was bound up with the productivity and predictability of a bountiful natural environment, we think it likely that climate, sea level, and even weather also profoundly influenced political developments.

The Calusa achieved levels of cultural complexity comparable to those of

Mississippian peoples, but neither was immune to environmental factors that provided both opportunities for and obstacles to continued prosperity. For example, in the Calusa heartland, the MWP's sea-level rise of A.D. 850–900 provided a productive fishery that contributed much to their development between A.D. 900 and A.D. 1050. Yet that fishery would have been adversely impacted by the A.D. 1050–1100 sea-level drop (although not to the extent of the earlier A.D. 800–850 event).

Meanwhile, Mississippian maize-agriculture-based societies prospered during the Warm Medieval Period (A.D. 850–1200), but some, such as Cahokia, faltered or underwent reorganization during the subsequent Little Ice Age (A.D. 1200–1850), which was less favorable to staple-crop agriculture. After ca. A.D. 1300 (and somewhat earlier in the environs of Cahokia), mound building and ritual display diminished while warfare increased among Mississippian societies, and some major mound centers were abandoned (Bense 1994: 197, 218; Milner 1996: 47–51; Williams 2001: 191, 193–95). The fifteenth century witnessed further turmoil and the virtual abandonment of previously heavily populated regions of the central Mississippi Valley (Bense 1994: 239–48; Mainfort 2001: 175, 188–89).

As the Little Ice Age unfolded, however, the Calusa were at a distinct advantage over more northern agriculturalists. Although it would have been cooler in southwest Florida, the Little Ice Age drew sea level in Pine Island Sound down only moderately, while lessening the frequency of severe storms. While Mississippian societies downsized and reorganized, the Calusa became stronger and expanded their influence southward. Thus, in 1513 and 1521, Ponce de León was met by well-organized and disciplined Calusa warriors, and in 1566 Pedro Menéndez de Avilés found in the Calusa king a shrewd and calculating paramount leader who controlled significant resources over a vast area. In the same century, Pánfilo de Narváez, Hernando de Soto, and others who ventured into the Mississippian Southeast often encountered little resistance and abandoned towns.

Following European contact, the Calusa kingdom bent but did not break, conserving its traditions and reasserting its control. From 1570 through the late 1600s, the Calusa chose to avoid both the English and the Spanish. In the end, a combination of environmental and cultural factors may have been to blame for their demise. A sudden drop in sea level between 1650 and 1700 (known in the climatic literature as the Maunder Minimum) may have left the Calusa in a vulnerable position just as native societies throughout the greater Southeast were succumbing to the slave-based political economy of the broader world system (Gallay 2002: 127–54). By the

1680s, the Tocobaga were no longer a threat and the Calusa had established patron-client relations with groups in the central Gulf coast, who protected them from surprise invasions from the north (Marquardt 2001: 170; see Hann 1991: 23–30). Those same patron-client relations would have guaranteed movement of supplies into southwest Florida in times of diminished resources.

Isolation from European colonial society allowed the Calusa to enjoy regional autonomy and consolidate political power, but it also left them and their clients dependent on the traditional military technology of bows, clubs, and throwing sticks. In spite of their reputation as fierce warriors, they were defenseless against the muskets of well-armed Creek and Yamassee slave raiders, who drove them from their lands and waters between 1704 and 1711, enslaving many and killing those who resisted (Hann 1991: 325–35; Marquardt 2001: 170–71).

In this chapter, we have used a historical-ecological method to characterize the dynamic interplay between environmental and cultural changes in southwest Florida ca. A.D. 850–1850, and we have situated the Calusa social formation in the context of developments elsewhere in Florida and the southeastern United States. We first outlined well-documented climate changes that influenced both the greater Southeast and Florida and suggested opportunities and challenges that may have influenced social formations in south Florida to change or to remain the same. Cultural intercourse with Mississippian peoples can be demonstrated—at least indirectly—so surely south Florida people were aware of other Mississippi-period social formations and how they differed from their own. Even so, they did not adopt iconic Mississippian traits such as shell-tempered pottery or flat-topped temple mounds.

Judging from the remarkable Pine Island Canal, the Calusa were obviously capable of mobilizing a work force and could have built extensive Mississippian-style temple mounds had they wished to. Only in the eleventh century did the Calusa begin to bury their dead in mounds, perhaps an imitation (or emulation) of Mississippian-influenced Safety Harbor people to the north, whose political power had begun to rival their own.

We firmly believe that consideration of political-economic changes must go hand in hand with consideration of environmental changes because the latter often provide significant challenges and opportunities that can impede or enhance cultural developments. Although they may be cognized within the social formation in terms of historically situated belief systems (myth, religion, and the like), climate changes and dramatic weather events, such as hurricanes, can be significant impinging conditions, facilitating or frustrating sociopolitical initiatives. Steponaitis (1991: 227) writes that "particular trajectories of chiefly development may be inexplicable unless they are considered in the context of broader political and economic processes that transcend the boundaries of any single region." We heartily agree, but to "political and economic" processes we would add "environmental." As Gunn (1997: 135) puts it, "[M]ost if not all regional landscapes have a global-scale environmental context that must be understood before any meaningful analysis of culture change can be undertaken." Global climatic fluctuations can have salutary or detrimental local effects, and these effects can be abrupt: on the order of 50 to 100 years, just two to three human generations. Thanks to remarkable advances in climate research over the past 20 years, we can now begin to consider the potential effects of climate changes at temporal scales relevant to human decision making. It makes no sense to ignore these formidable forces in the study of Mississippi-period culture, whether in Florida or elsewhere.

Notes

1. The scientific name of this animal has fluctuated during the past 20 years, from *Busycon contrarium* to *Busycon sinistrum* and now, because of recent genetic studies (Wise et al. 2004), to *Busycon perversum* L. Wise and his colleagues assert that all North American sinistral whelks are conspecific. Here we retain the *sinistrum* species name, the current official nomenclature at this writing. Wise and colleagues (2004) recommend that *Busycon perversum* be applied to all North American sinistral whelks, with subspecies qualifiers *perversum* for the Yucatán peninsula, *laeostomum* for the Atlantic coast, and *sinistrum* (Hollister 1958) for the northern and eastern Gulf of Mexico. All lightning whelks in southwest Florida waters would thus be *Busycon perversum sinistrum*.

2. Mound Key is an archaeological state park, situated in Estero Bay near Fort Myers Beach. The site is listed in the National Register of Historic Places. Mound Key is open from 8 a.m. to sundown daily and is accessible by boat. Private crafts are allowed to land, or visitors may patronize one of several tour-boat companies that travel regularly to the site. An unimproved path with interpretive signs traverses the island, leading the hiker through the main canal trench and up and over the highest mound. There are no docks or facilities (www.floridastateparks.org/moundkey/default.cfm).

3. On early maps, Charlotte Harbor was known as the "Bay of Tampa," named for the large Calusa town at present-day Pineland, while the large bay to the north was known variously as "Bay of Pooy" (Hann 1991: 12) or "Bay of the Holy Spirit." A mapmaker's error in the late seventeenth century transposed "Bay of Tampa" northward, hence the former Bay of Pooy is today known as "Tampa Bay." The modern place-name of Tampa is in fact the Calusa name for the Pineland Site Complex (Worth 2012).

4. The Pineland Site Complex is located on the northwestern shore of Pine Island in coastal Southwest Florida, near Fort Myers. First inhabited about 2,000 years ago, Pineland was occupied by Native Americans until 1710. The site was partially reduced in the twentieth century by the removal of portions of some midden-mounds for road material and fill dirt and by the filling of low areas. Nevertheless, enormous shell mounds still overlook Pine Island Sound, and remains of many centuries of Indian village life blanket the old pastures and groves. Remnants of the Pine Island Canal are still visible. The site is listed in the National Register of Historic Places. Thanks to a grant of land from Donald and Patricia Randell and funds raised from private donors, agencies, and foundations, in 1996 the Florida Museum of Natural History established the Randell Research Center at Pineland as a permanent program of archaeological and environmental research. The site is open to the public daily, and visitors may walk the Calusa Heritage Trail, a 3,700-foot path (about 0.7 miles, or 1,128 m) that winds among and over the mounds, wetlands, and canal. The trail includes museum-quality interpretive signs and wayside benches, as well as stairways to the top of both primary shell mounds, observation platforms atop the tallest mound, and a bridge and boardwalk over low-lying areas. Also available are public restrooms, a picnic area, and a teaching pavilion featuring interpretive materials and a bookshop (http://www.flmnh.ufl.edu/RRC).

5. We are mindful of the widely held contention that "the effects of climate change are likely to be most pronounced on societies heavily dependent on agriculture" (Anderson et al. 1995: 259), but we assert that effects of climate change on fishing-gathering-hunting societies can also be profound, depending on local physiographic conditions and established subsistence strategy.