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Politics vs. The Environment: The Spatial Distributions of Mississippian Mound Centers in Tampa Bay

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by

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Abstract

The Safety Harbor culture that resided in West-Central Florida during the Mississippian period (~1000-1500 CE) was distant from the Mississippian heartland but built similar platform mound complexes and exhibited social hierarchies despite practicing an estuarine lifestyle that likely did not rely on extensive agriculture. To determine whether this coastal culture exhibited similar spatial patterns of platform mound centers to traditional inland cultures, GIS spatial analyses including distance matrices, density analyses, and least cost analyses (LCA) were performed within the Safety Harbor geographical nexus of Tampa Bay. The results were able to detect temporal changes in settlement patterns and estimate the extents of basic clusters from a single site, with LCA delivering the best results. Consistent with previous research, coastal site patterns exhibit less distinct clustering and more dispersed spatial patterning than interior site patterns, suggesting less sociopolitical centralization and greater self-reliance that likely manifested in polities different in size and nature than Mississippian chiefdoms yet utilized similar themes in the monuments and political structures. Improved theories about coastal settlement patterns and mound formations will be needed to understand the social organizations and relationships outside of the traditional Mississippian horizon.

Chapter 1: Introduction

Background on Research

The Mississippian Southeast has been a significant focus in North American archaeology, largely due to the considerable quantity of fascinating artifacts and earthwork features these societies left in the archaeological record, from mounds as tall as modern buildings to exotic goods decorated with mysterious iconographies that have been studied to understand their religious beliefs. Mounds especially have intrigued archaeologists because of their dualist nature as both cultural symbols and material objects within the environment. Accurate research of them requires firmly integrating ecological and sociocultural frameworks and data to ask questions regarding where and why they exist and what they meant to the people who created them. Despite its distance from the Mississippian heartland, artifacts and general site characteristics of portions of Florida suggest the partial adoption of Mississippian cultural characteristics, but studies connecting these two regions have been minimal. Studies of the spatial distribution of mounds in this region, as has been done in other regions, may reveal whether coastal societies exhibited similar settlement or political patterns of Mississippians farther to the north or if these practices were particular to their natural and cultural environments. The latter possibility would reveal some of the diversity of political and sociocultural systems societies interacting with Mississippian groups utilized.

The Mississippian period, beginning roughly around 1000 CE and ending with the arrival of the Spanish Empire in modern Florida around 1513, is an archaeological timespan and cultural construct grouping together contemporaneous cultures that shared general characteristics such as large chiefdoms, social hierarchies, platform mounds, intensive agriculture with an emphasis on maize, and a distinct prestige goods trade network known as the Southeastern Ceremonial Complex (Anderson 2012:78; Ashley and White 2012:9; Kelly 2012:296; King and Meyers 2002:113). A chiefdom is a discrete political unit with centralized administration, with one or more settlements governed by a single chief or hereditary leader (Worth 1998:5). While these characteristics originated earlier in various places, they coalesced unevenly during this time across a wide region possibly due to a few powerful chiefdoms in the Midwest.

Where, when, and why social complexity arose in the American Southeast is one of the oldest research topics in American archaeology. However, figuring out where and when large populations, intensive agriculture, and social hierarchies developed and in which order has been a major challenge, as they can hypothetically occur in any order. To avoid circular arguments, independent evidence is needed (Rosenwig and Burger 2012:7). One hypothesis is that social complexity arose in areas that had high resource productivity which led to large populations and unequal access that resulted in concentrated political power as a solution to the problems with the transition to agriculture (Jones 2017:56; Worth 1998:7-8). It is the consensus that the extensive trade networks of Mississippian societies spread their characteristics, particularly their religious and political ideologies, across a large region of eastern North America, with other societies at the periphery adopted some of these characteristics to suit their own purposes.

Florida's geography as a peninsula with climatic regions ranging from temperate to tropical, with land suitable for agriculture limited to parts of the north, makes it a unique peripheral region compared to the frontiers in the Northeast and Great Plains (Ashley and White 2012:15). This encouraged its peoples to adapt to their surroundings in different ways, potentially explaining some of the distinctions between their cultures and the adoption of some

Mississippian features. Some North Florida cultures such as Fort Walton exhibited enough of these features, including maize agriculture, to be considered Mississippian by most researchers (Milanich 1994:355; Willey 1949:455), whereas those in the South continued the riparian and marine subsistence traditions practiced by Archaic groups, although some like the Calusa achieved social complexity, including chiefdoms, by the historic period (Ashley and White 2012:18-19; Marquardt 2014).

Aside from agricultural patterns, mound distributions and functions also varied between regions spatially, temporally, and culturally. Many theories over their changes in form, function, and distribution have been proposed and debated since their discovery by European settlers in the early nineteenth century. Early theorists in the cultural evolutionist tradition thought nearly all mounds within the same timespan shared the same characteristics and transitioned linearly everywhere from circular tumuli to platform mounds used as chiefdom complexes (Kassabaum 2018:4; Williams and Harris 1998:47). Today it has been established with radiocarbon dating that earthen mounds, including platform mounds, were first created in North America no later than the Middle Archaic period (5900-3800 BCE), with hotspots in the Lower Mississippi River valley and St. Johns River valley. Mound building flourished during the subsequent Woodland (1200 BCE-900 CE) and Mississippian periods for a variety of reasons. This pushback of time suggests transitions from egalitarian to hierarchical societies happened earlier and more sporadically than previously thought. While their later expansion correlates with growing sociopolitical complexity, no features are exclusively found in one time period, with at least as much variation within one time period as between periods (Kassabaum 2018:193,229). If studies of mound characteristics are to be improved upon, they should first be analyzed within a restricted region, culture, and time to limit variability. Scholars can then compare these characteristics to those found in other regions and time periods to find patterns and differences that can be explained by historic and geographic circumstances.

This project used a geographic information system (GIS) database based on public, confidential, and custom data to analyze the distribution of Late Woodland and Mississippian platform mound sites on the coast of West-Central Florida (Figure 1). The goal was to understand whether a quantitative study could hypothesize the number and geographical extents of clusters that could have been polities, compare them to polities in other regions that have been similarly studied, and determine any differences and potential explanations.

Mississippian mound sites in the Southeast have been theorized to represent chiefdom capitals or secondary administrative centers based on the number of mounds and their spatial clustering due to the common pattern of contemporaneous single-mound sites nucleating around multi-mound sites. Writing during a time when archaeologists thought political power could be measured by proxy with mound sizes and numbers, Hally (1993, 1999) measured the distances between mound sites in North Georgia with coterminous mound construction episodes and ceramic assemblages and hypothesized chiefdoms were site clusters no more than 40 km wide and situated 32 to 60 km from each other. He determined about 27 chiefdoms existed, with gaps 10 to 30 km wide he hypothesized were buffer zones for sharing resources and reducing violence (1993:161-162; 1999:104,106,108). Livingood (2012) reproduced these studies in GIS with least cost analysis (LCA), focusing on factors such as time and physical exertion he believed Native peoples would have directly experienced, and proposed that chiefdoms without subdivisions maximized in extent to half a day’s worth of walking, making diplomatic trips regarding domestic needs more feasible and increasing long-term stability.

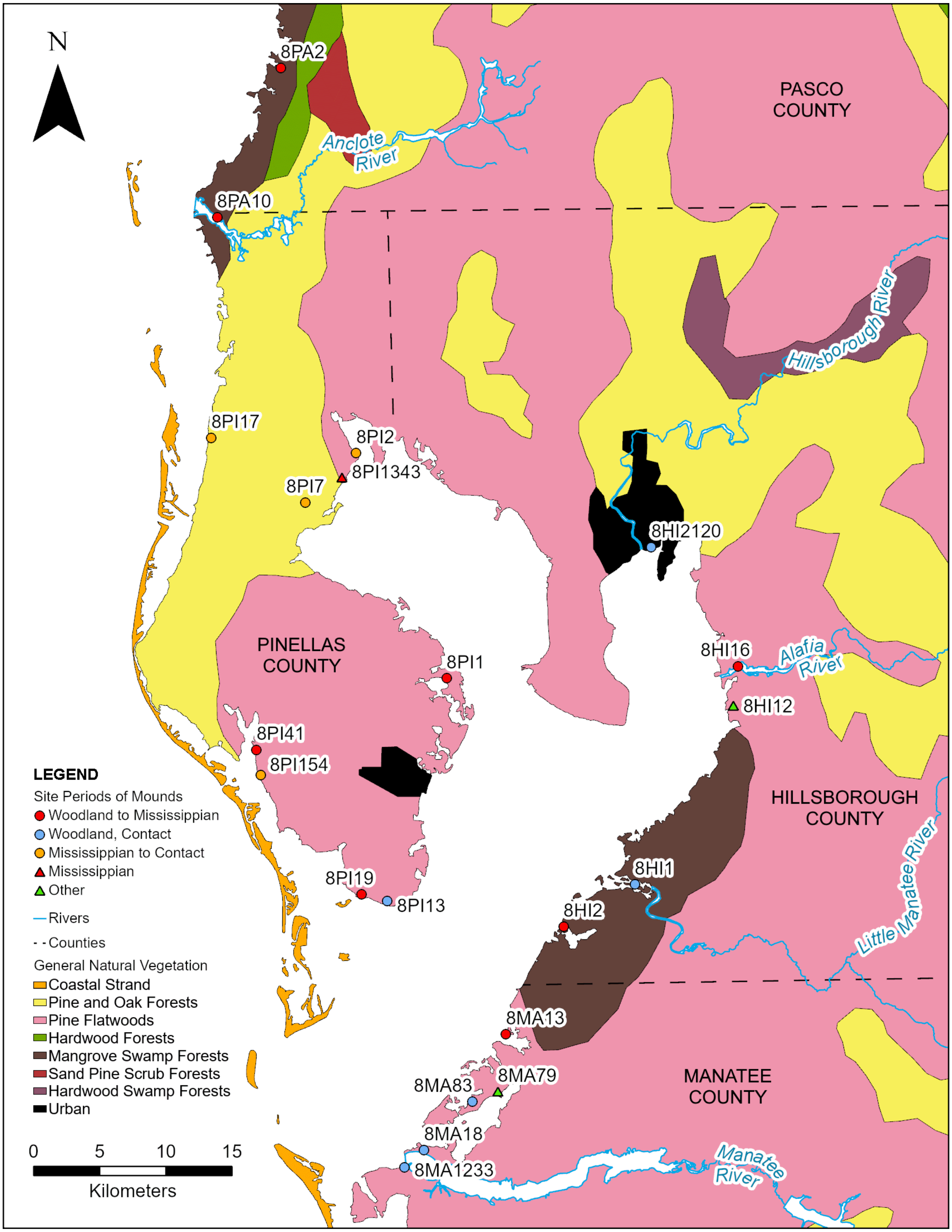

Figure 1: Map of analyzed mound sites in Tampa Bay, Florida with general vegetation based on Davis (1967)

If varieties of mound sites in Southeastern societies represented political and ceremonial differences, they can also be viewed as differences in architectural grammar, or systems of rules related to symbols and meanings used to design communities (Anderson 2012:79; Pluckhahn and Jackson 2019:2). Several West-Central Florida mound sites resemble the architectural and terrestrial forms or grammar of Southeastern mound sites, including a variety of forms found throughout the state, with the most common template being a single platform mound with a ramp leading into a plaza and surrounded by a series of burial mounds and shell middens (Pluckhahn and Jackson 2019; Willey 1949). Based on current evidence about mound functions and regional interactions, it is possible that while their physical forms slightly differed, the largest mound sites in Tampa Bay shared similar functions as their northern counterparts due to the extent of trading, ideological sharing, and possible immigration present by the Mississippian period, best supported by artifact changes implying changes in beliefs and ideas (Mitchem 2012:184). However, most of these mounds were first constructed during the Woodland period, over 500 years before the Mississippian, so they likely changed in purpose such as from ceremonial to elite uses. At the same time, it is also likely, based on settlement patterns and economic systems, the political complexity of Tampa Bay's settlers was limited due to relatively small populations and equal access to resources, but the timing of their political emergence and why coastal societies to the north and south with similar environments differed in complexity is still being researched (Milanich 1998b:258). By properly analyzing their spatial distributions, the nature of these polities could be elucidated, but there have been few comparative studies between social patterns of coastal and inland areas (Pluckhahn and McKivergan 2002). Any similarities or differences could determine the uniformity, distributions and relations of polities, and the significance of the environment on settlement patterns throughout the Mississippian world.

While human agency and cultural history play a major part, differences in polity developments are also partially attributable to the environment restricting available space and resources that affected population growth and social complexity. Large water bodies such as Tampa Bay may have had a significant effect on polity sizes and their social networks, whereas in the Lower Appalachia region the most significant geographical barriers were rivers and mountains, downplayed by Hally (1993:156) as affecting the spatial patterns he found and corroborated by Livingood (2012) whose travel model rarely utilized them. This makes Tampa Bay a challenging but suitable location to test hypotheses about the uniformity of polities in geographically distant and unique locations. My null and alternative hypotheses are:

N_0: Hally's distances are consistent everywhere in Mississippian North America

N_1: If not, social and environmental differences affected polity sizes in Florida and Georgia

Overview

Chapter 2 discusses the cultural and environmental backgrounds to the research area of the greater Tampa Bay region, which falls between the Pithlachascotee River and Sarasota Bay. The cultural focus is on the Circum-Tampa Bay extent (Southern Pasco, Pinellas, Hillsborough, and northern Manatee Counties) of the Safety Harbor culture, which continued the estuarine, sedentary lifestyles of the preceding Weeden Island culture, in addition to the northernmost extent of the Bell Glades culture, which tended to settle on raised and mangrove islands in Southwest Florida. The Safety Harbor culture is known to have continuously occupied earlier sites and it is plausible they adopted similar sociopolitical patterns with contemporaneous cultures from their proximity and the trading of ideas (Milanich 1994:226 cf. Mitchem 1989).

Chapter 3 discusses the research and theories on Southeast mounds and the use of monuments and GIS in settlement pattern studies. These mounds have frequently been studied as proxies for Mississippian chiefdoms, but the wide variety of mounds and middens in Florida and the coasts make them difficult for comparative studies. This research formed the basis for my preliminary assumption that the mounds of Tampa Bay have enough similarities with their interior analogues to make cross-comparisons possible, but they should still be judged as unique features representing differences in social organizations and expressions and differences in environments and subsistence.

Chapter 4 details my site sampling methods and the history and features of the mound sites. Chapter 5 describes my research methods for analyzing the sites which include distance matrices, nearest neighbor analysis, Thiessen polygons, density-based spatial clustering (DBSCAN), and LCA done with GIS software. Chapter 5 discusses my results. The distance matrices found that the distribution of site distances changed over time but with consistently fewer distances beyond 40 km between the periods. None of these distributions resembled those found in the Lower Appalachian region, supporting my alternative hypothesis. The nearest neighbor results showed site distribution clusters shifted from random in the Late Woodland period towards very minor clustering in the Mississippian period and towards dispersion in the Contact period. Thiessen polygons visualized site density changes I hypothesized were due to expansions into new areas followed by the need to survive during colonialism. DBSCAN clustering based on possible breaks in the distributions were inconclusive due to the relatively low clustering and separation compared to interior site distributions – similar to settlement patterns in coastal Georgia found by Pluckhahn and McKivergan (2002). LCA that estimated travel time between sites were superior at visualizing site clusters and determined, based on a maximum travel time of five or six hours between core and peripheral sites, clusters from the Mississippian period on average included eight sites and spanned 300 km^2, and as many as 12 sites and over 800 km^2 – comparable in area but far denser in site numbers than clusters in North Georgia, alluding to sampling problems.

In conclusion, the null hypothesis was rejected because virtually all of the characteristics between Tampa Bay and North Georgia were different. The results were consistent with the alternative hypothesis, that social and environmental factors significantly affected distances between mound sites previously unaccounted for. The specific factors remain unexplained – for example, social organizations clearly differed between Tampa Bay and Lower Appalachia, but villages on the Georgia and Florida coasts also had significant differences. Nonetheless, there was enough data to speculate the sites that served as chiefdom capitals described by Hernando de Soto: the Safety Harbor (8PI2) or Weeden Island (8PI1) sites in Old Tampa Bay, Pinellas Point (8PI13 and 8PI19) in St. Petersburg, and Thomas Mound (8HI1) and Cockroach Key (8HI2) near the mouth of the Little Manatee River. There is still the possibility the Safety Harbor people did not value size and smaller clusters served as their chiefdoms, which would put into question how much it has been valued by Southeastern archaeologists studying polities.

There is still much to be discovered about the mound sites of Tampa Bay that could be revealed with new, modern excavations: their genuine size, formation history and use, and whether these sites exhibited large populations and structures used for ceremonial or elite purposes. It is unfortunate they have been overlooked and disregarded by conservationists and even archaeologists in the state of Florida, for they have much to teach us about the universality and diversity of monuments and what they can tell us about the social structures and beliefs of an obscure hunter-gatherer society just before the collapse of precolumbian America.

Chapter 2: Background to Research Area

Geology and Environment

The surface of the Florida peninsula consists of karst limestone that is the exposed portion of the Florida Platform, which formed about 530 million years ago and largely stayed above sea level (resulting in a land size three times larger than modern times) until the end of the last glacial period around 5000 BP. The karst terrain shaped by weakly acidic groundwater has developed sinkholes, vertical shafts, streams, springs, and underground caves and drainage systems. Sediment originating from the Appalachian Mountains and southeastern coastal plain transported through rivers and the ocean, covering the coastal areas with quartz sand and phosphate (Allen and Main 2009).

The southern Florida peninsula consists of two broad physiographic regions: the gently sloping Central Highlands and flat Coastal Lowlands, with the former mainly extending into portions of Polk and Highlands Counties. The Coastal Lowlands are further subdivided into the Gulf Coastal Lowlands between Pasco and Lee Counties, Eastern Valley between Brevard and Palm Beach Counties, Osceola Plain west of Eastern Valley, DeSoto Plain centered around DeSoto County, and the Everglades in the southwest. The Central Highlands include many sinkhole lakes and paleo-sand dunes lying on Eocene or Oligocene limestones or Hawthorn Group sands and clays, with the Hawthorn Group rich in phosphate sediments and fossils (Scott and Rupert 1994). The Gulf Coastal Lowlands consist of Oligocene to Miocene carbonate sediments for bedrock overlain by Neogene and Quaternary sediments, with phosphate gravel and quartz pebbles found in the contacting lag deposit. The area is low and swampy with many rivers, streams, springs, and sinkholes. The highest elevation in West-Central Florida is 92 meters in Pasco County, but most of the area is well under 50 meters with very few prominent features (Peakbagger 2004).

As part of the Southeast, most of Florida exhibits a humid subtropical climate except for South Florida, where a tropical savanna climate exists in the Everglades in the southwest and a monsoon climate in the southeast. On the central peninsular Gulf Coast estuaries and wetlands with marshes, mangrove swamps, hardwood hammock forests, and cypress plants are abundant. In precolumbian times wetlands were more prevalent with several rivers draining through pine and palmetto flatwood and scrub forests, but overall, the ecology has remained similar for the last 3,000 years (Fuhrmeister 1992:12; Milanich 1994:224; Newsom 1998:218). The main types of soil in Tampa Bay are medium fine sand and silt on the northern inland and Pinellas Peninsula's Gulf Coast, shelly sand and clay on the eastern shores of the bay and Pinellas Peninsula, and exposed limestone on the Interbay Peninsula (Florida Department of Environmental Protection 2001). All are highly acidic, poorly drained sand and clay which limits most potential for agriculture. Tampa Bay's vegetation primarily consists of palmetto and Spanish moss, pine forests upland, and cypress and mangrove swamps lowland (Sutherland 1981).

Tampa Bay is the largest estuary in Florida with a surface area over 1,000 km^2 divided into two embayments, Old Tampa Bay to the west and Hillsborough Bay to the east, by a peninsula. It has a modern average depth of 4 m resulting from dredging in the twentieth century and more than half of its shoreline has been modified. Four major rivers with hundreds of tributaries flow into Tampa Bay from the eastern shore: Hillsborough, Alafia, Little Manatee, and Manatee (Raulerson et al. 2019). Lakes are abundant in the north where the elevation is relatively high. Given that the length of the shoreline of Tampa Bay (over 3,000 km) is nearly equal to the rest of Florida's Gulf Coast, it is expected that settlements in this area would be particularly dense due to the especially rich density of resources.

After the Late Archaic period, due to higher than present rainfall conditions, sea level stabilization, and formation of wetlands, it was most desirable to settle in places that were relatively dry and resistant to flooding than places with the nearest freshwater sources and abundant resources (Fuhrmeister 1992:13-14). The importance of freshwater and stable areas appears to have been a strong influence on settlement locations and the rivers may have later served as polity boundaries (Shapiro 2019). For thousands of years, aboriginal populations of Tampa Bay consumed mollusk-heavy diets, especially oysters, as well as clams, mussels, *Busycon* whelks, and snails. They also consumed a large array of fish that live in salt, estuarine, and freshwater environments, including several species of sharks and rays. Reptiles such as turtles and alligators were consumed as well as occasionally mammals and birds such as deer, raccoons, opossums, mergansers, and eagles (Milanich 1994:225). Recent evidence suggests coastal societies in South Florida had more mixed subsistence economies including terrestrial plants and animals than previously assumed (Hutchinson et al. 2016). The most common cultivars partially domesticated in peninsular Florida were squash, bottle gourds, chili peppers, and papaya (Newsom 1998; Newsom and Scarry 2013).

Zooarchaeological and archaeobotanical analyses conducted in West-Central Florida give a sound basis for a mixed diet with a preference for marine resources and the absence or scarcity of maize consumption before the Contact period. Stable-isotope analysis of carbon and nitrogen levels in bone collagen and apatite offer better quantitative measurements of dietary components than faunal remains. Carbon values can distinguish between plants that have different photosynthetic processes, known as C3 (e.g. rice and wheat) and C4 (e.g. maize and Poaceae grasses) plants. Different nitrogen values distinguish marine and terrestrial resources (Tykot et al. 2005:518). Newsom (1998) discovered remains of nuts and seeds from the Palmer site (8SO1902), suggesting marine and terrestrial resources were utilized at some coastal sites. At Tatham Mound (8CI203), bone collagen from Safety Harbor burials had very negative mean delta 13C isotope values consistent with exclusively C3 plants and delta 15N isotope values lying between marine and terrestrial resources, with little change in dietary patterns between 1200 and 1550 CE. Bone collagen from Bayshore Homes (8PI41) had more positive delta 13C isotope values but similar delta 15N isotope values, showing a stronger dependence upon marine resources (Hutchinson et al. 1998; Tykot et al. 2005). Tooth enamel from Tatham Mound showed relatively good dental health, also consistent with the absence of maize (Hutchinson and Norr 2006). Osteological analyses from the Tierra Verde Mound site (8PI840) also had good dental health on all but one individual, which had cribra orbitalia, a condition which can be caused by maize-induced anemia but in this case was more likely caused by parasitic infections (Hutchinson 1993:269-271). Other Central Gulf Coast samples of human bone collagen and apatite carbonate dating between 500 and 1550 CE showed large ranges of carbon and nitrogen isotope values, similar to individuals in other coastal areas in the Southeast, consistent with marine resources as the primary food sources, with some C3 plants as terrestrial food sources (Hutchinson 2004; Hutchinson et al. 2016).

Cultural History

It is commonly accepted that the first settlers of Florida, continuing the hunter-gatherer lifestyles of Paleoindians, arrived approximately 11,000-13,000 cal BP (Table 1) by land from the northwest, possibly following the Gulf Coast (Milanich 1994:38). This coincided with the beginning of the Younger Dryas Period, a glacial climate period after a temporary warming during the Last Glacial Maximum, resulting in a savanna climate with abundant megafauna in the lower Southeast and the sea level of Florida being 50 meters lower and 64-113 km further west than today's shoreline (Faught 2004:276-277). The extensive surface limestone in Florida can produce clay, chert, and flint, all widely utilized by Indigenous people up to the historical period (Burns 1998). As a result of sea level rise, the earliest signs of prehistoric occupation in Florida that are usually recoverable are lanceolate projectile points and temporary camps near isolated watering holes and springs, far from the more resource-heavy coasts now submerged (Milanich 1994:44). The most prominent Paleoindian sites in West-Central Florida are possibly Little Salt Spring in Sarasota County, a peat-filled sinkhole with burned animal bones and wooden stakes (Clausen et al. 1979); and Harney Flats in Hillsborough County, a base camp with a Middle Archaic component (Milanich 1998a:16).

The greater Archaic period consisted of a gradual transition to more sedentary lifestyles and reliance on surplus resources that eventually led to the rise of social complexity and power-based ideologies throughout North America. The Early Archaic period (9550-5900 BCE) includes the earliest identified cultural complexes for Tampa Bay, when the climate became warmer and wetter, requiring people to adopt new ways to gather new resources. The Florida Master Site File's (FMSF) spatial database, a polygon shapefile, includes 38 Archaic sites in the Circum-Tampa Bay area potentially dating to the Early Archaic, consisting mainly of randomly distributed campsites and lithic scatters including stemmed projectile points (e.g. Kirk) and scrapers, often located near wetlands, which suggest a transition from Paleoindian big game hunting to coastal Archaic procurement of estuarine resources supported throughout Florida

(Austin 1985, 1987a, 1987e; Milanich 1994:61-64). The Early Archaic is also known in Florida for several sinkholes containing well-preserved human burials with ritualistic aspects, including Windover Pond in Brevard County and Little Salt Spring in Sarasota County (Milanich 1998a:16-17).

Table 1: Southeastern Precolumbian Timescale

Precolumbian Periods	**Calendrical Span**	**Florida Cultural Complexes**	**Southeastern Cultural Complexes**	**Climate Periods**
Early Pleistocene	19,700-11,050 BCE		Pre-Clovis	Last Glacial Maximum
Middle Pleistocene	11,050-10,500 BCE	Little Salt Spring	Clovis	Younger Dryas Period
Late Pleistocene	10,500-9550 BCE		Dalton, Sloan	Younger Dryas Period
Early Archaic	9550-5900 BCE	Windover, Kirk	Notched points, bifurcate points	Boreal Chronozone
Middle Archaic	5900-3800 BCE	Newnan, Marion	Benton, Watson Brake	Mid-Holocene Warm Period
Late Archaic	3800-1200 BCE	Orange, Norwood	Stallings Island, Poverty Point	Sub-Boreal Chronozone
Early Woodland	1200-300 BCE	Deptford, Pasco Plain	Adena	Subatlantic Chronozone
Middle Woodland	300 BCE-550 CE	Santa Rosa-Swift Creek, Manasota, Yent	Hopewell	Roman Warm Period
Late Woodland	550-930 CE	Weeden Island	Coles Creek, McKeithen	Vandal Minimum
Early Mississippian	930-1050 CE	Safety Harbor (Englewood)		Medieval Warm Period
Middle Mississippian	1050-1350 CE	Safety Harbor (Pinellas), Fort Walton (Lake Jackson)	SECC	Medieval Warm Period
Late Mississippian	1350-1500 CE	Safety Harbor (Pinellas), Fort Walton (Velda)		Little Ice Age
Contact	1500-1700 CE	Calusa, Tocobaga, Timucua	Spanish, British, French	Little Ice Age

Note: Copied from Anderson and Sassaman (2012:5)

The Middle Archaic period (5900-3800 BCE) in Florida is distinguished by larger longer-term settlements near water sources and pine and palmetto forests, specialization of tool kits and activities, the first regionalized cultures (Table 2), and the first shellfish middens or mounds, with sea levels reaching close to modern levels by the period's end. The first long-distance exchanges of exotic goods could have happened this early, according to a study by Bonomo et al. (2013) on the provenance of minerals found in Little Salt Spring pendants. Projectile points (e.g., Newnan and Marion) have stems with broad, sharp blades, and stone and bone artifacts are larger and have greater variety than Early Archaic artifacts but consist of the same general types. The St. Johns River region in Eastern Florida clearly exhibits these characteristics, but otherwise Tampa Bay had yet to develop a central culture. The trends of the Middle Archaic are reflected in the FMSF shapefile including 67 Middle Archaic sites with greater clustering toward rivers and shorelines, large amounts of campsites and habitation areas, and the emergency of quarries and specialized sites, but very few shell middens are present in the Tampa Bay area with only one containing human remains (Milanich 1998a:28).

Table 2: West-Central Florida Cultural Sequences

Cultural Sequences	**Timescale**	**Southeastern Periods**
Orange	2000-500 BCE	Late Archaic/Early Woodland
Deptford	500 BCE-300 CE	Middle Woodland
Glades I	500 BCE-750 CE	Middle to Late Woodland
Weeden Island I (Manasota)	300-700 CE	Late Woodland
Weeden Island II	700-930 CE	Late Woodland
Glades II	750-1200 CE	Late Woodland to Middle Mississippian
Englewood (Safety Harbor)	930-1050 CE	Early Mississippian
Pinellas (Safety Harbor)	1050-1500 CE	Middle to Late Mississippian
Glades III	1200-1500 CE	Late Mississippian
Tatham (Safety Harbor)	1500-1600 CE	Contact

Note: Based on dates from Milanich (1994)

With the cessation of climatic fluctuations and generally modern sea levels and ecological zones, the Late Archaic period (3800-1200 BCE) continued and increased in scale the trends of the Middle Archaic. People now had more control over their environments and developed sedentary lifestyles and more regionalized adaptations, including the proliferation of shell middens in coastal areas such as Tampa Bay. The biggest change, undoubtedly, was the first pottery in North America, hypothesized to have arisen in Georgia, South Carolina, or Tennessee due to the greater need to store seeds and nuts during the winter season that could not have been accomplished with woven baskets (Anderson and Sassaman 2012:116). Pottery likely diffused from the mainland across Florida around the same time because southern Florida has far less kaolin and clay deposits that in the Piedmont Southeast ecoregion (Hosterman 1984). Early Florida pottery was tempered with fibers from palmetto or Spanish moss, later incorporating quartz sand for temper. While different ceramic assemblages are given different names based on Florida's subregions (e.g. Orange for East Florida and Norwood for Northwest Florida), fiber-tempered ceramic assemblages during this time are generally similar (Milanich 1994:86, 96-97). In Tampa Bay, campsites and artifact scatters are still abundant (likely a consequence of sea level rise inundating the largest settlements on the coast) with clustering inland in Pasco and Hillsborough Counties. Shell middens during this time period are rare in Tampa Bay relative to other regions in Florida, but this may be more of a testament to the extent of their modern destruction for road fill than regional differences.

The beginning of the Woodland period (1200-300 BCE) is represented by the development of significant regional cultures and greater long-distance interactions. While social complexity and stratification are evident as early as the Middle Archaic, they become more evident at coastal sites dating to this time due to the preservation of monumental earthworks and shell middens hypothesized to be the result of large-scale feasts organized by elites. Settlement patterns shifted with groups expanding into coastal and riverine areas with greater population densities, while inland sites remained smaller and more dispersed and possibly occupied only seasonally. This pattern remained in Tampa Bay and across much of Florida until Spanish contact, reflecting Native reliance upon marine resources.

Deptford pottery is one of the first North American ceramics stamped with groove or check patterns from wooden paddles and was tempered with quartz sand or limestone. Its distribution in Florida is centered around the Apalachicola River watershed, covering the entire panhandle and terminating in Tampa Bay, distinguishing itself from Midsouth pottery with cord or fabric impressions evident by 700 BCE (Anderson and Sassaman 2012:116). It has a limestone variation, Pasco Plain, and site concentrations of the two vary widely, leading to the hypothesis of two spatiotemporal cultures (Milanich 1994:211-213). However, because of its geographic and temporal overlap with succeeding Santa Rosa-Swift Creek pottery, they are all likely to have been used by the same people. Deptford sites in Tampa Bay are more concentrated on the coast and rivers near salt marshes and hammock forests and include several burial mounds. A typical Early Woodland coastal village – a pattern found in Georgia and Florida's panhandle and peninsula – contained between five and 20 residential areas and included middens consisting of shell, potsherds, animal bones, and other detritus, and were as large as 10 meters in diameter. Houses were wall-trenched, with shells packed at the base for support and protection, and as large as 56 sq m. Other features commonly found included hearths, refuse deposits, and fire and storage pits. While their social organization is little understood, the features of these villages suggest a family- or kin-based system more egalitarian than hierarchical, and heterarchical organizations were likely precursors to hierarchies throughout Florida during the Woodland and Mississippian periods (Milanich 1994:122-125).

Outside of Florida, ceremonialism was growing, defined as religious beliefs and rituals reflected in material features such as earthworks, burials, and paraphernalia. Tampa Bay's strategic midway point between the southern glades and temperate forests in the north (Figure 1) made it a significant region for the exchange of goods and ideas throughout Florida. Throughout North America, natural population growth combined with the desire for more trade goods is a plausible impetus for the growth and spread of hierarchical social organizations. The Adena tradition, centered around the Ohio River in the Lower Midwest, is known for its isolated conical burial mounds and prominent graves with nonlocal ritual objects, foreshadowing the Hopewell tradition that has been enthusiastically credited with the continental spread of elaborate cosmologies, ritual goods from widespread regions, and social hierarchies that have defined the traditions of the Late Woodland and Mississippian periods (Milanich 1994:133-134).

The Middle Woodland period (300 BCE – 550 CE) is characterized by material cultural changes throughout the Southeast toward more elaborate, complex pottery, increasingly placed in ritualized burials and mound complexes hypothesized to have partially diffused from the ceremonial Adena and Hopewell traditions centered in the Lower Midwest. Swift Creek pottery was used by Middle Woodland cultures in southern Georgia and northern Florida, featuring complicated stamps of abstract features and motifs that have long been assumed to represent a cosmological system. During this period, multi-mound complexes that included platform mounds proliferated in the Southeast, including at the McKeithen and Crystal River sites in Florida. Excavations of the stratigraphy and summits of these mounds suggest, during this time in general, they were used for public ceremonies which increasingly became more restricted during the Mississippian period when they were used as the residential or ritual domains of elites. Most of these early mound centers had great ceremonial significance but were rarely used for civic or political purposes until the growth of chiefdoms (Anderson and Sassaman 2012:121-124; Wallis and Thompson 2019:276-277).

In Florida, shell middens and rings remained widespread on the Gulf Coast, while earthwork burial mounds and ceremonial mound centers reminiscent of the Hopewell tradition appeared around 100 CE, including the Crystal River site (8CI1). The first large villages appeared in North-Central Florida at the same time due to population growth and the need to expand to new environments. Sears (1962) defined the Yent culture as the regional transition from Deptford to Hopewellian traditions centered in the Big Bend area where the panhandle and peninsula meet. Its relationship with the northern Swift Creek culture is unclear but both show signs of extensive trade extending into the Midwest. Another sign of increased trading is that Swift Creek pottery is more geographically widespread than Swift Creek sites, which are limited to special-use campsites outside of the panhandle (Milanich 1994:134-135, 141-142).

The Manasota culture was defined by Luer and Almy (1982), later temporally refined by Milanich (1994:221-223), as the earliest (300-700 CE) spatiotemporal extent or a precursor of the Weeden Island culture in the Tampa Bay area, which practiced burial ceremonialism consisting of primary, flexed burials and mounds of shell and sand, made undecorated, sand-tempered pottery, and relied on shellfish tools rather than stone or bone tools. Animal effigy vessels are abundant, representing the importance of ceremonialism and exotic trade networks in Woodland societies. The broader Weeden Island culture covered during this period a large extent of the Gulf Coast from Mobile Bay to Charlotte Harbor as well as southeastern Alabama and southern Georgia. Given the similar geographical extents, it is likely the people who produced Deptford and Swift Creek gradually transitioned to using Weeden Island at different places and times, with the first Weeden Island ceramics appearing in North Florida around 200 CE with the McKeithen site being a significant nexus (Milanich 1997:10). Spatially, Deptford to Weeden

Island coastal settlements were independent of river systems and truncated mounds were located within the regions with the densest populations (Smith and Stephenson 2018:118-119).

Archaeologists from Fewkes (1924) to Sears (1973) have noted the practice of a secular-sacred dichotomy where different ceramic assemblages may delineate (sacred) burial and platform mounds from (secular) shell middens, with decorated pottery more likely appearing in mortuary contexts (Milanich 2012:184). Shell middens, some deposited for over a thousand years by later populations, were often linear features parallel to shorelines and sometimes had ramps to easily access the summit – a template found at many Manasota sites like Shaw's Point (8MA7) (Schwadron 2000). Early Weeden Island settlements generally continued the same previous long-term patterns of coastal villages with large middens and ceremonial mounds and smaller short-term and special-use villages and campsites inland (Milanich 1994). Excavations at the largest sites in Tampa Bay show that many new villages built by the Manasota were continuously occupied by late Weeden Island and Safety Harbor cultures, the latter of which rarely contain Englewood phases (Mitchem 2012:175; Sears 1960). Weeden Island mound sites tend to have nucleated villages and larger platform mounds built more quickly than earlier Swift Creek mound sites that were continuously used in Florida and Georgia (Seinfeld et al. 2015).

Willey (1949) divided all Weeden Island ceramics into two phases, Weeden Island I and II, due to the chronological distinction first (ca. 200-750 CE) from earlier incised, punctuated, and complicated ceramics similar to Swift Creek, to later (ca. 750-1000 CE) Wakulla and St. Johns check-stamped ceramics. Weeden Island II is characterized by a large increase in sites, expansion up the Apalachicola River, and the introduction of maize in northern Florida, the latter of which may have been the catalyst for population growth and small kin-based groups competing for land. Compared to the previous phase, cooperative ceremonialism and economic systems all but disappeared, with less centralized settlement patterns and less mound building and ceremonial activities, often interring the dead in previously built mounds (Milanich 1994:159, 196-197).

Weeden Island's vast geographical extent manifested in local cultures mainly distinguished by their subsistence adaptations. Chronological phases in peninsular Florida have proven difficult because of the later trend of undecorated wares and lack of ceremonial motifs, but Percy and Brose (1974) proposed a five-phase sequence from 200 CE to 1000 CE based on proportions of Swift Creek, Weeden Island, and Wakulla in panhandle sites. The Caloosahatchee culture in Southwestern Florida also has a six-phase chronological sequence from 500 BCE to 1750 CE developed by Marquardt (1992:13). West-Central Florida cultures including Weeden Island and Safety Harbor need a similar resolution if temporal research is to be improved. The most promising methods to update and refine phases are radiocarbon dating and large samples of ceramics (Milanich 1994:206).

The Mississippian period (930-1500 CE) can best be summed up by the politicization of ceremonialism, with widespread concentration of power in the hands of a few leaders at the local level and powerful settlements at the regional level. Multi-mound centers which transitioned from public to restricted spaces proliferated between northern Florida, the Midwest, and the eastern edges of the Great Plains, and studies of artifact distributions support the strong influence of a handful of these centers upon distant polities – the most famous and theoretically powerful being Cahokia in modern Illinois, Moundville in Alabama, and Spiro in Oklahoma. In addition to the rise of polities theorized to be chiefdoms and early states, maize agriculture had diffused from the Southwest or Mexico and was adopted wherever it could be grown, and this distinction has fueled debate over the extent of Mississippian influences and contact in Florida.

There is very little evidence for prehistoric maize in South Florida, but interest in the possibility has remained since Sears's (1976) discovery of maize pollen in circular ditches around earthworks at Fort Center near Lake Okeechobee. He hypothesized the ditches were used for agricultural plots beginning in the Woodland period and that the maize came from South American trading. The accuracy of his data was not evaluated until Thompson et al. (2013) used microbotanical methods and radiocarbon dating at the site. While they found carbonized maize specimens dated to the historic Seminole period, the pollen likely identified by Sears appeared to be grasses closely related to maize, such as river cane, in addition to maize phytoliths resulting from mixing and contamination. However, Kelly et al. (2006) analyzed prehistoric bone collagen and apatite from West-Central Florida coastal sites that suggested diverse mixtures of dietary components, including C4 plants. The strongest evidence for precolumbian maize in peninsular Florida remains the Spanish accounts by Narvaez and de Soto, who recorded the absence of maize fields in West-Central Florida and intermittent maize fields north of the Witlacoochee River (Kelly et al. 2006:251). It is plausible precolumbian maize in South Florida could have been consumed in limited amounts as a foreign trade item from North Florida, but it did not serve as the primary crop the way it did in the rest of the Southeast.

The arrival and local acceptance of Mississippian elements in Florida may have occurred in a few concentrated areas, spreading out once they became more developed (Austin and Mitchem 2014:84). It is also possible in some places earlier cultures continued later or skipped succeeding cultures (Mitchem 2012). Around the panhandle, the Fort Walton culture exhibited traditional characteristics of a Mississippian society, including maize agriculture, attributable to the Chattahoochee and Apalachicola watersheds with Piedmont-like soils and hardwood forests. While it had a similar extent along the Gulf Coast as the Late Weeden Island culture, the relation between the two is not clear-cut. Around 1000 CE in the Apalachicola River valley, Weeden Island sited gradually shifted to Fort Walton, whereas little continuity exists in the Apalachee region (Payne and Scarry 1998). Unlike peninsular societies, Fort Walton multi-mound centers were more common inland than on the coast and settlements followed upper and lower river extents. Another contrast from South Florida is that common exotic artifacts found at Lake Jackson, Etowah, and Moundville suggest a Middle Mississippian interaction sphere (Blitz and Lorenz 2006:134), and excavations by Seinfeld et al. (2015) revealed similar practices in mound building, suggesting closer interactions with the north than the south. All this strongly suggests fundamental differences between inland and coastal regions, possibly because of different origins. On the other hand, Fort Walton ceramics appear very similar, tempered with sand or grit, to Safety Harbor ceramics, but with Mississippian vessel shapes and motifs (Payne and Scarry 1998). More precise dating, surveys in the rural intermediate area, hypothesized to be an uninhabited buffer zone by Scarry (1990), and excavations of residential areas in the smaller mound sites will clarify the curious relationship between inland Fort Walton cultures and those on the Gulf Coast (Marrinan and White 2007).

Scarry (1990) divided Fort Walton into two phases. The Lake Jackson phase (1100-1400 CE) had clear segregation of individuals by residence, diet, and labor, with chiefdoms controlling a mound center and surrounding villages. The Velda phase (1400-1600 CE) exhibited disruptions in trade due to political collapse and reestablishment with a permanent decline after colonialism. Settlement pattern densities within and outside of river valleys suggest the existence of buffer zones between multiple polities similar to those in Lower Appalachia (Hally 1993, 1999). Scarry categorized Lake Jackson sites hierarchically based on the number of houses, larger buildings, and mounds, but not all Fort Walton regions exhibit this site diversity even where agricultural soil is plentiful. West of the Aucilla River along the Gulf Coast, village sites resemble those in West-Central Florida with platform mounds, burial mounds, and middens near estuaries and bays. Commoners were buried in cemeteries as well as burial mounds in primary and secondary flexed or extended positions, whereas nobles were buried only in platform mounds and temples (Milanich 1994:356-370). Site like Lake Jackson demonstrate Mississippian societies regularly built mounds in new fashions but utilized the ancestral memories and pre-mound structures of earlier Woodland societies, blurring the differences between the mound construction and functions attributed to the two periods (Seinfeld et al. 2015).

The Safety Harbor culture developed from the Late Weeden Island cultures between the Witlacoochee River and Charlotte Harbor on the Gulf Coast after 900 CE and continued into the Contact and Colonial periods between 1567 and 1725 CE (Mitchem 2012). Like Fort Walton, subregions are divided by ceramic assemblages and differences in village patterns and lifeways, and both shared some ideological aspects including mound ceremonialism and social organization. Northern Safety Harbor encompassed Citrus, Hernando, and Pasco counties with dispersed settlements, limestone-tempered (e.g. Pasco Plain) and undecorated ceramics, and limited signs of squash agriculture. The Circum-Tampa Bay subregion encompassed the four counties – Pasco, Hillsborough, Pinellas, and Manatee –Tampa Bay around the Tampa Bay area, consisting of nucleated mound-village complexes somewhat reminiscent of the Lake Jackson phase of Fort Walton. The South-Central subregion extended from southern Manatee County to Charlotte County and consisted of dispersed settlements and undecorated sand-tempered sherds. The Inland subregion extended into Polk, Hardee, and eastern DeSoto Counties and consisted of dispersed settlements, isolated burial mounds, and St. Johns Plain and Belle Glade Plain sherds (Milanich 1994:389-401). Settlement locations in both Circum-Tampa Bay and South-Central have been correlated with poorly drained soils and access to both springs and estuarine resources. Inland Safety Harbor sites in Polk, Hardee, and DeSoto Counties exhibit greater dispersal and isolated burial mounds and contain St. Johns Plain and Belle Glade Plain ceramics common in South Florida.

Safety Harbor is divided into three temporal artifact phases. The first phase, Englewood, (900-1000 CE) is marked by Englewood Incised, Sarasota Incised, and Lemon Bay Incised sherds. The second phase, Pinellas (1000-1500 CE), includes Lemon Bay Incised in addition to Pinellas Plain, Safety Harbor Incised, Point Washington Incised, and Pinellas Incised sherds. This phase resembles Lake Jackson pottery but the first phase does not (Willey 1949:138,191). The third phase, Tatham (1500-1567 CE), adds Spanish artifacts with the continuation of Safety Harbor Incised and Point Washington Incised sherds (Mattick 1993).

Within the Circum-Tampa Bay subregion, along the Gulf Coast and at river mouths, there are approximately 15 sites with at least one platform mound, often with a ramp extending into a plaza, and several burial mounds and shell middens (Luer and Almy 1981, Pluckhahn and Jackson 2019, Tables 3 and 4). Unfortunately, most of these mounds were destroyed in the nineteenth and twentieth centuries for road fill and housing. While direct evidence for temples, elite burials, and exotic nonlocal artifacts has largely been elusive, it has been hypothesized based on general theories and Spanish accounts the larger mound sites represented small, simple chiefdoms with one mound-village center that grew into short-lived confederacies before and during the Contact period. Milanich (1994) hypothesized only a few of these sites were contemporaneous, making Safety Harbor's polities smaller in size and lower in population than Mississippian chiefdoms, and that most shell middens on the coast were household detritus outside of the main village. Excavations suggest some platform mounds, such as 8MA2 and

8MA83b, exhibit foundations for charnel houses rather than elite domiciles and were built on top of earlier burial mounds. The similarities in subsistence and technology between Safety Harbor and earlier coastal cultures suggest social and political change was relatively minor and mostly a response to growing populations. However, some parallels exist between Safety Harbor and Fort Walton, including general settlement patterns and village layouts. How much they shared ideologically and whether their differences are due to subsistence or trading networks is unknown. Safety Harbor's closest analogous culture may be the Pensacola culture between the Mobile and Choctawhatchee Bays, which was similarly close to the Fort Walton region and whose social complexity is beginning to be understood (Klein 2012) after years of being seen as a "fringe" or secondary society (Milanich 1994, Scarry 1990).

Throughout the Safety Harbor region, exotic artifacts are rare but suggest limited ties to Mississippian interaction networks, mainly exporting shell in return for stone and metal artifacts (Mitchem 2012:181-182). Fort Walton appears to have had more direct Mississippian interactions that Safety Harbor, resulting in different political organizations and population densities (Milanich 1994:398-401). Contrasts between Floridian cultures were affected by distances and the settlement potential of their environments, but a better understanding of individual developments and connections will require studying their individual economic and political systems as well as developing theories of identity and group belonging.

At the beginning of the Contact Era (~1500-1700 CE), when Native populations suffered from the effects of the colonialization and economy of the Spanish Empire, Florida was dominated by three large societies: the Timucua, Apalachee, and Calusa. All have been hypothesized to have engaged in a fluid process fluctuating between simple and complex chiefdoms based on short-term allegiances and changes in political organization (Milanich

1998b:247). In addition, environmental differences contributed to different scales in agricultural production that resulted in the development of simple to paramount chiefdoms and varying stability (Worth 1998).

The Timucua were a loose allegiance in southern Georgia and North-Central Florida of several dozen culturally diverse groups, including hunter-gatherers and agriculturalists, bound by the same mother tongue. They consisted of 15 to 30 provinces or chiefdoms with different dialects, and whether they were simple chiefdoms (Milanich 1998b:256) or a mixture (Hann 1996:73) is uncertain, but Spanish accounts are likely clouded by ethnocentrism and synchrony. While plazas and burial mounds existed, platform mounds were absent (Payne and Scarry 1998), but effigies similar to the SECC have been found in St. Johns burial mounds, suggesting some Mississippian traditions continued or long-distance trade was still practiced (Boyd 1986).

The Apalachee lived between the Ochlockonee and Aucilla Rivers in Northwest Florida, in the Tallahassee Hills and Gulf Coastal Lowland regions. They continued Fort Walton practices and controlled the large multi-mound centers of Lake Jackson and Letchworth near Lake Miccosukee (unlike the traditional Mississippian river settlements). Large settlements included as many as 250 large houses made of grass or palm leaves like southern Florida, had one or two platform mounds, and were surrounded by smaller, dispersed satellite farmsteads. The Apalachee had three chief variants – paramount, principal, and local, according to the Spanish terms – and a dual chief system for times of peace and war may have been employed. Similar to the Timucua, there were three general classes: nobles (including elite female burials at Lake Jackson), commoners, and intermediate members. While they may have existed as a diluted complex chiefdom just before Spanish contact, they had practiced a democratic oligarchy during the seventeenth century, possibly due to Spanish influence. (Hann 1988, 1998; Payne and Scarry 1998).

The Apalachee had stronger connections to Mississippian culture than the Safety Harbor or Timucuan cultures for several hypothesized reasons. One, their southern extent near a delta connecting several river networks gave them an important role in trading between less Mississippian Gulf Coast cultures and the inland Mississippian cultures. Two, settled in the rich soils of the Tallahassee Hills, they were more adapted to agricultural subsistence. Three, the limited land in the Apalachicola River basin pushed them further inland into southeastern Alabama and southwestern Georgia, whereas the Timucua had more dispersed villages throughout land in plentiful supply. Lake Jackson could be viewed as an outpost emphasizing trade and one of the outermost Southeastern Mississippian centers, making it an outlier within Florida’s cultures due to the state’s unusual geography (Marrinan and White 2007; Payne and Scarry 1998)

The Calusa were a fisher-hunter-gatherer society in Southwest Florida that achieved considerable social complexity within their environment, including a complex or paramount chiefdom, a capital city in Mound Key, complex ritualism and art, and a military. They developed from the Woodland Caloosahatchee culture that traded extensively with other Floridians, fluctuating between heterarchical and hierarchical systems, and had a population large and dispersed enough to resist colonialism and disease more than many other societies, existing with little change for 200 years after contact. After studying the heterogeneity and limited reliability of Florida’s estuary environments, previously thought to be stable and highly productive, Marquardt (2014) theorized that their power and social connections were closely correlated to climatic patterns such as the Medieval Warm Period and Little Ice Age which affected sea levels and resources in southern Florida.

In the Circum-Tampa Bay region, the Safety Harbor culture had transitioned into loosely organized polities with hostile relations with the Calusa. According to DeSoto's 1539 expedition, there were at least three chiefdoms around the bay: Tocobaga, around Old Tampa Bay; Mocoso, on the east side of Hillsborough Bay between the Hillsborough and Alafia Rivers; Uzita, between the Little Manatee River and Sarasota Bay; as well as the Pohoy people to the north (Milanich 1998a). Spanish artifacts possibly from the Narvaez and DeSoto expeditions, as well as plunder from shipwrecks and from trading, have been found at many of Tampa Bay's mound-village sites including 8HI1 and 8HI94 on the Little Manatee River, 8MA18 and 8MA919 on the Manatee River, and 8PI2 and 8PI7 on Old Tampa Bay, in addition to the Gulf Coast. This closely matches the geography of DeSoto's accounts, but they disintegrated shortly after his arrival as Natives succumbed to disease and the Pohoy assumed power until they were coopted by the Calusa in the seventeenth century (Milanich 1998a).

In the sixteenth century, several Spanish conquistadores attempted to settle in Florida but found the Natives to be resilient. Establishing Spanish Florida in 1513, Juan Ponce de León became the first known European to land in the modern United States, reaching Sanibel Island in Florida until attacked by the Calusa. He returned in 1521 landing near Charlotte Harbor to form a settlement but was mortally wounded during a skirmish with the Calusa. In 1528 Pánfilo de Narváez started the first overland expedition of La Florida, landing most likely near Johns Pass in Tampa Bay (possibly at the Narvaez/Jungle Prada site) to split, with Narváez sailing north to the St. Marks River where the Apalachee lived. His scribe, Alvar Nunez Cabeza de Vaca, recorded that Tampa Bay was "uninhabited and…poor" and could not find Indians or food south of the Witlacoochee River in the Ocale province. Narvaez's fleet made it to Galveston Island in Texas but had been decimated by storms and Indigenous encounters leaving de Vaca and two men as the only survivors to return to Spain (Clayton et al. 1995; Milanich and Hudson 1993).

The 1539-42 expedition of Hernando de Soto was the first of its kind by Europeans, likely covering the Southeastern states south of the 37th Parallel, as far west as Texas. Based on de Vaca's accounts, de Soto searched for a more promising landing site but appeared to have landed south of Tampa Bay, roughly near or at Sarasota Bay, in May of 1539. De Soto described the town of Uzita as containing seven or eight houses made of timber and palmetto leaves, a platform mound with the chief's house near the beach. Outside of Uzita his men found Juan Ortiz, a Spaniard who knew a Timucuan chief and had lived as a captive of the Mocoso people for the past 11 years. Ortiz claimed that the Mocoso governor never traveled greater than ten leagues (41.8 km) from his capital and that another chief, Paracoxi (Timucua for "war chief"), could be found 20 to 30 leagues (84-125 km) away where maize could be found. De Soto's crew of over 500 men trekked the interior, traveling five to six leagues (21-25 km) a day using maize fields as guides, but found most of the towns were uninhabited and had poor maize. They crossed the Alafia River (close to the Mocoso capital) by building a bridge near the coast, proceeding northeast between present-day Lakeland and Zephyrhills. After five months they reached Anhaica, the Apalachee's central town in modern Tallahassee, and spent the winter there before crossing over into Georgia and experiencing turmoil in Arkansas in 1541 that would end the expedition (Clayton et al. 1995; Milanich and Hudson 1993).

The Spanish were motivated by power, wealth, and religion, with theology justifying political expansion and use of force. Ultimately, they desired a passageway to Mexico and the Pacific Ocean that would grant them global circumnavigation and land before anyone else

(Milanich 1998a:154). The text of the Spanish requerimiento of 1513, explaining that the Spanish monarchy had the divine right to take possession of the New World’s land and resources and fight resistance, was read to all Natives in a language they couldn’t understand (Milanich and Hudson 1993). A significant aspect of the transformation of the Southeast was missionization, assimilating Natives into Catholicism and Spanish culture to make them workers in the colonial system. It was employed as a compromise between two unequal societies who theoretically shared benefits and is contrasted with the more violent methods of conquest in Latin America. Missionization and settlements did not begin immediately after Native contact, stymied for 25 years and concentrated in northern Florida, with the first large settlement of St. Augustine being established in 1565 and the first formal mission forming in 1587. While initially planned, the Spanish did not establish missions or settlements where European agriculture was impractical, and after the Narváez and De Soto expeditions, the peoples of Tampa Bay mainly experienced secondary effects from colonialism (Worth 1998).

Even from the very first personal contacts with the outsiders, the Mississippian world started to unravel as pandemics of smallpox and other diseases were spread by the first carriers across settlements, quickly plummeting population levels reducing the power of chiefdoms, further increasing instability and vulnerability to the Spanish forces. The chiefdoms of Florida were uniquely affected, with the most vulnerable being the agricultural, sedentary chiefdoms of the north, while the interior Timucua persevered for several centuries and the southern Tequesta and Calusa escaped Spanish assimilation (Bushnell 2006). Aside from disease, the most devastating force upon the Natives was the European trade network, including slavery. While many Indigenous people in the Southeast practiced forms of slavery, often on war captives, European slavery was fundamentally different and changed their practices as well. The Spanish *encomienda* system was the first form of European slavery practiced in the New World until its replacement with the *repartimiento* system in 1542. The English enslaved both Native and African people in the colonies of Virginia and Carolina beginning in the seventeenth century, and the Yamasee War from 1715-1717, between the English and a large federation of Natives, represents a turning point for the Southeast. Natives began selling deerskin and their own slaves to colonists in return for exotic materials including firearms, contributing extensively to the "shatter zone" created from colonialism that created conflicts within and between chiefdoms that quickly transformed their makeup and allegiances (Anderson and Sassaman 2012).

The number of raids by Native tribes and quarreling European powers in the early eighteenth century effectively destroyed the remaining chiefdoms of Florida, fueling civil warfare and diasporas to the north. The last Indigenous people to stay were tribes around the Miami River consisting of 100 to 200 people. Their interactions with Spanish Caribbean fishermen resulted in intermarriage and cultural fusions, one of Florida's first mestizo cultures that would spread across the state, including Tampa Bay. Members of the Creek confederacy, one of the last of its kind, began to migrate into northern Florida and by the middle of the century had developed into the Seminoles. They would persevere until President Andrew Jackson's policies led to numerous wars and forced migrations, culminating with genocide after the Indian Removal Act of 1830. A few managed to survive and stay in Florida but they would have to accept they were now Americans and adopt new ways of living very different from any of their ancestors (Milanich 1998a).

Chapter 3: Previous Research

Theories Over Mound Functions and Symbolism

Southeastern mounds can be made of soil, clay, rock, shell, ash, or wood, and are quadrilateral, truncated, conical, circular, and other shapes (Lindauer and Blitz 1997:170). While archaeological, ethnographic, and linguistic analyses have detailed mound site layouts and chronologies and proposed various symbols, the activities that occurred there are little understood (Saunders 2012). Traditional models of sociocultural complexity based on unilinear cultural evolution required monumental architecture to be preceded by large, sedentary communities with hierarchical organization, but empirical evidence for earlier dates for monuments throughout the world have made archaeologists realize the heterogeneity of mound builders and question the relationship between monuments and complexity (Kassabaum 2018:189,219). The earliest mounds in the Southeast, concentrated in the Lower Mississippi Valley, are currently theorized to have been built by Archaic hunter-gatherer societies for a variety of reasons, whose low populations could carry small amounts of earth to gradually construct them over anywhere between a decade to a hundred years. Not only were both conical and platform mounds commonly constructed during the Woodland period, even Middle Archaic mounds in Louisiana featured plazas, implying some form of public role in their use, but their forms, purposes, and activities of mounds all changed over time (Kassabaum 2018:190-191; Saunders 2012; Wallis and Thompson 2019). Understanding mound sites should be determined by limiting evidence to contemporaneous, nearby sites and analyzing stratigraphic layers to determine timespans, materials, and activities associated with each layer that could elucidate how they were constructed and used over time. However, when stratigraphic data have been lost or unrecorded, it is sometimes necessary to cross-compare mound sites as long as there is empirical evidence they were built by the same people utilizing the same site layouts and stratigraphic patterns.

Mounds served as symbols of the earth (as mountains, navels, or wombs), the underworld, birth, death, stability, and protection, and were used either as tombs, monuments, stages for public world-renewal rituals, or foundations with elite domiciles, temples, or public spaces on top (Knight 1989:425; Lindauer and Blitz 1997:175; Miller 2001:165). Most of these symbols are not mutually exclusive and they share in common a place where dispersed peoples could safely gather to engage in rituals promoting identity (Anderson 2012:80) or stability in a constantly changing world as a weight against some uncontrollable force like floods or earthquakes (Miller 2001:161). Through mound building, past Native Americans inscribed their worldviews onto the landscape as an expression of power over the control of labor, which led to them becoming proxies for social complexity and polity centers because they represent the power each culture possessed (Wallis and Thompson 2019:276-277). In some cases, mounds also functioned as an *axis mundi* connecting three worlds – the Upper World of the sun and ancestors, the Middle World of the earth and the living, and the Beneath World of water and the future (Kassabaum and Nelson 2014:114-117). From an individual's perspective, mounds could either enhance one's perspective and put them closer to godhood if viewed from the top, but from the bottom, they represented a stage for elite performers to separate themselves during ceremonies to visualize and reinforce social identities and ideologies (Lindauer and Blitz 1997:171; Seinfeld et al. 2015:222).

Regardless of these divisions, mound building was a communal activity imbued with symbolism in conjunction with other ethnographically observed communal activities such as feasts and setting posts, which are now understood to have taken place in both egalitarian and hierarchical societies (Kassabaum and Nelson 2014:113). Many mounds have been built on top of earlier mounds made by previous peoples, a repeating ritual of world renewal, suggesting long-term occupations of persistent places with a continuation of traditions based on (literal) common ground, as well as recognizing and legitimizing new rulers (Blitz and Lorenz 2006:137; Lindauer and Blitz 1997:183-184; Seinfeld et al. 2015:225, 233).

There has been continuous debate over the significance of mound works whose scale implies the need of great labor to build them. Mound volume and the number of mounds at village sites have been hypothesized by two general viewpoints: sites with larger or more mounds either represent increased duration of use and expansion or increased chiefly power due to the necessary labor allocation in a presumed relatively short period of time. For example, Scarry and Payne (1986) adhered to the chiefly power hypothesis while Williams and Shapiro (1990) adhered to the duration of use hypothesis. This conflicts with properly identifying Mississippian settlement hierarchies and their political relationships.

Attempting to reconcile the two hypotheses, Blitz and Livingood (2004) categorized data on 35 Mississippian platform mounds in nine Southeastern states and determined their volume, number of construction stages, and duration of use. They concluded that 10 to 41 percent of the variation in mound volume could be explained by duration alone, and that the number of mounds at each site or the number of construction stages of each mound did not explain the remaining percent. They also determined that larger sites conformed to different patterns than the smaller sites, possibly because of different social rules. In other words, both viewpoints could be valid, depending on the nature of the site in question.

Mound Studies in Florida

Early archaeologists in Florida focused on basic questions about mounds, including their locations, their sizes and forms, their cultural affiliations, and associated artifacts and burials (Moore 1900, 1903; Walker 1880). While their main theoretical framework for Florida cultures was external diffusion from the Midwestern United States, their most significant contributions to archaeology were their chronicles of hundreds of sites in the Southeast that have now been destroyed before the development of heritage management. During the middle of the century, Willey (1949) and Bullen (1955) were the first to synthesize Florida's culture histories. Willey defined the West-Central Florida cultural region with Taylor County as the upper limit and Charlotte Harbor as the southernmost extent, modified later by Mitchem (2012) to make the Witlacoochee River its upper limit. He distinguished different cultural complexes in sand burial mounds with small shell middens nearby and larger shell middens associated with burial mounds made of shell and detritus (1949:182). He categorized the Weeden Island culture to the Mississippian period (1000-1500 CE) and Safety Harbor to the Contact period (1500-1700 CE), which today are known to each be older by five centuries. Similarly, Mitchem (1989) classified Willey's Englewood cultural categorization as the earliest Safety Harbor phase.

Bullen (1955) theorized pre-Weeden Island shell middens were primarily created as sustenance refuse but started to be used for burials after influence from northern Deptford and Swift Creek cultures during the Woodland period. Otherwise, he considered cultural influence from neighboring regions to be minor due to the continuity of the interactions in West-Central

Florida not just from the north but from the south and east as well. He characterized the Safety Harbor culture by the partial adoption of agriculture, increased ceremonial life, bundled burials, and platform mounds with temples or elite domiciles on the summits.

Burial mounds and large platform mounds with ramps, both found in isolated and village settings, were common in Tampa Bay, suggesting distinct functions for each. While general and volumetric analyses of mounds accounting for coevality and cultural relations are useful, analyses of the internal structures and construction histories more accurately reflect usage and meaning over time (Seinfeld et al. 2015:222).A contemporary review of older surveys by Luer and Almy (1981) categorized “temple mounds” according to their recorded volume, height, and summit shape (Table 3) and observed the largest mounds were often accompanied by plazas, shell middens, and burial mounds, and situated at 25- to 30-km intervals along the Tampa Bay coastline, often near riverway mouths. Pluckhahn and Jackson (2019) categorized Tampa Bay’s mound sites according to their architectural grammar into “arcuate middens” integrated with burial mounds or cemeteries, mound-plaza complexes on midden islands, discrete mound and midden complexes, and isolated mounds (Table 4). They viewed mounds first not as symbols of social complexity but utilizations of linguistic and memetic frameworks. They compared the physical layouts of the sites and noted their similarities with mounds in other regions of Florida and beyond. For example, mounds at 8HI2, 8HI12, and 8MA13 all appeared to have been constructed on anthropogenic islands during the Woodland period, like the Calusa Mound Key site. Another common layout was a platform mound ramped into a plaza, found along the coasts of Tampa Bay and Pasco County in villages and isolated sites. They suggested this architectural grammar spread in some fashion across the state and manifested in the central location of Tampa Bay where ideas from the north and south coalesced in a kaleidoscope of forms.

Table 3: Mounds categorized by Luer and Almy (1981)

ID	Site	Mound Class	Volume (m^3)	Summit Type	Summit Area (m^2)	Height (m)	Height Class	Ramp
8PA10	Anclote Mound	A	7000	Large-Broad	1500	3	Low	Yes, S
8PI41	Bayshore Homes	B	6900	Medium-Broad	760	4.5-5.5	High	Yes, S
8PI17	Dunedin Mound	C	1900	Small-Narrow	440	2.7	Low	Yes, SW
8HI2120	Fort Brooke Midden	C	1800	Small-Broad	480	2.5	Low	No
8MA13	Harbor Key	C	3500	Small-Narrow	270	6	High	Yes, W
8MA83b	[Madira] Bickel Mound [Terra Ceia Complex]	C	3100	Small-Narrow	160	6	High	Yes, WNW
8PI19	Maximo Point	C	1600	Small-Broad	270	3	Low	Yes, S
8HI16	Mill Point Midden	C	1900	Small-Narrow	n/a	3.4	Low	Yes, W
8MA31	Pillsbury Mound [Shaw's Point Complex]	C	2100	Small-Broad	350	3.7	Low	Yes, ESE
8PI108	Pinellas Point/Hirrihigua Mound	C	2000	Small-Narrow	190	5.2	High	Yes, S
8PI2	Safety Harbor	B	6500	Medium-Broad	460	6.1	High	Yes, W
8MA919	Snead Island/Portavent Mound	A	7700-8600	Large-Broad	900-1100	4	Low	No
8PI1	Weeden Island	C	650	Small-Narrow	320	1.4	Low	Yes, S

Note: Other mounds mentioned: 8HI12, 8MA14, 8MA79, and 8PI54

Table 4: Mounds categorized by Pluckhahn and Jackson (2019)

ID	**Site**	**Category**
8HI12	Bullfrog Mound	Island Mound-Plaza Complexes
8HI2	Cockroach Key	Island Mound-Plaza Complexes
8MA13, 8MA14, 8MA15	Harbor Key	Island Mound-Plaza Complexes
8PI11	Long Key Mound	Isolated Mounds
8HI16	Mill Point Midden	Multi-mound Complexes
8PI54	Narvaez Midden	Multi-mound Complexes
8PI13, 8PI14, 8PI61, 8PI108	Pinellas Point	Multi-mound Complexes
8HI7, 8HI89, 8HI90, 8HI91, 8HI92	Rocky Point	Arcuate Midden with Integrated Mounds
8PI2	Safety Harbor	Multi-mound Complexes
8HI22	Shell Bluff	Isolated Mounds
8MA919	Snead Island [Portavent Mound]	Multi-mound Complexes
8MA83a, 8MA83b, 8MA83c	Terra Ceia	Multi-mound Complexes
8HI1	Thomas Mound	Multi-mound Complexes
8PI51, 8PI840, 8PI1264, 8PI1692	Tierra Verde	Isolated Mounds
8HI2120	Fort Brooke/Vodges Mound	Isolated Mounds
8PI1	Weeden Island	Arcuate Midden with Integrated Mounds

Mounds in West-Central Florida were often built with sand and shells in multiple stages across a wide timespan. Many competing purposes of shell deposits have been proposed including mortuary ceremonialism, architectural features, the commemoration of new chiefs, and/or feasting, but it is plausible they served a combination or changed purposes based on site histories. Marquardt (2010) believed unsubstantiated inferences are used too often to interpret shell mounds and argues that more solid interpretations require recording the exact makeup and stratigraphy of shell deposits, ethnographic knowledge of the processing of shellfish and detritus, knowledge of geological forces and the environmental conditions at the time of deposition, and consistent use of terms can clarify what they are and the forces that formed them. For example, applying commonly used geomorphic characteristics such as dense, clean, loose, or unconsolidated shell sediments to indicate feasting or monumentality is too broad. From his studies of shell mounds in southwestern Florida, he postulated that platform or temple mound construction was unlikely to have largely taken place until at least 800 CE and those that were constructed were made almost entirely out of sand.

Other studies on shell piles in Florida, which can be circular, semicircular, or U-shaped, show more work must be done to determine their functions and formation history. Thompson et al.'s (2016) work on Mound Key suggests some large shell mounds in southwestern Florida were redeposited middens based on layer chronology and intentionality of form, while Marquardt (2010:562-563) proposes truncated shell mounds in the region were domiciliary and did not serve as temples mounds until about 800 CE. Thompson and Pluckhahn (2012:61) noted similarities with the landscape surrounding Fort Center and its earthworks suggest it was an anthropogenic model of the Natives' world, such as a circular sand feature resembling an oxbow lake and a charnel pond representing Lake Okeechobee. While Late Woodland and Mississippian mounds served as mortuary monuments situated in villages or separate cemeteries, both suggest similar symbolic functions and spatial patterns with the mounds of Central and South Florida cultures during the Mississippian period. Modern perspectives of mounds are trending towards the view that they brought people together to assert their power over the landscape using a wide variety of functions and symbols held at once or changed over time.

Categorizing Mississippian societies based on their geography and cultural characteristics has evolved since broad generalizations have been scrutinized by modern archaeologists. King and Meyers (2002:114) proposed three types of edges of the Mississippian world characterized by different relations and features to the greater area. Peripheries are the physical margins where chiefdoms and other Mississippian characteristics ceased to exist, such as Southwestern Florida, but possibly still had social and economic interactions. Frontiers are areas within the fluxing area of Mississippian influence that existed in a transitional phase. Backwaters are enclaves that existed within the Mississippian region but were inhabited by non-Mississippian groups. Many regions shifted from one type to another as time passed. In Florida, the panhandle region was proposed to be a frontier where Mississippian societies like Fort Walton developed via migration using evidence from regional continuity in ceramics and settlement patterns (Blitz and Lorenz 2002). The St. Johns II culture of Northeastern Florida has characteristics identifying it as a Mississippian periphery, including proximity to a contemporaneous Mississippian chiefdom and a shell-based subsistence and economy possibly the origin of marine exotic goods (Ashley 2002). A simpler model includes the horizon concept first proposed by Willey and Phillips (1958), or the spatial continuities of cultural traits and assemblages that linked different societies, which can illustrate the uniqueness of cultures that nonetheless were integral players in cultural transmissions.

It is generally accepted that, for most of their timespan, Florida mound sites south of the Fort Walton horizon were ceremonial in nature and not political centers, due to theories that they were too far from the Mississippian horizon, that agriculture was a determinant for social complexity, and that social organizations in the region were more egalitarian due to abundant resources leading to fewer labor roles. The most well-known mound site in the peninsula, Crystal River, appears to have been a ceremonial center that flourished between 250 and 550 CE (contemporaneous with the early Weeden Island or Manasota culture), began to decline between 550 and 750 CE, and was abandoned by the Early Mississippian period – dates that strongly correlate to warm and cool climatic periods, respectively (Marquardt 2010; Pluckhahn and Jackson 2017; Wang et al. 2013). While the functions of peninsular Florida mound sites are little understood, most began construction in the Woodland period, according to radiocarbon dating, but several prominent mound sites in Tampa Bay, such as Safety Harbor and Narvaez, were constructed during the Mississippian period. It is possible the newer mound centers were used for other purposes such as polity centers than older traditions such as ceremonial platforms or charnel house foundations, but more extensive excavations are needed to determine their functions.

Regarding the Safety Harbor culture, Milanich (1994:387) did not identify it as a distinct, strictly Mississippian culture but more of a continuation of the Fort Walton culture north of it. Mitchem (2012:173-4,181) found it possessed most Mississippian characteristics with the exception of maize agriculture. Mitchem's current proposal for Safety Harbor's occupational extent lies between the Witlacoochee River in Citrus County and Charlotte Harbor in Charlotte County, with an inland extent of 30 to 110 km. Settlements near Tampa Bay show greater nucleation with the presence of more platform mounds, while inland settlements are more dispersed and with fewer platform mounds (Mitchem 1989:104,586; 2012:176). Within horizons such as Safety Harbor and St. Johns II, coastal societies maintained previous lifestyles while adopting Mississippian-like ceremonies, symbols, and social differentiation and participated in an extensive trade network giving northern cultures shells involved in elite rituals in exchange for prestige goods (Kelly 2012).

Mound Sites in Settlement Pattern and Chiefdom Studies

Archaeologists emphasizing the study of monumental structures to illuminate cultural changes and behaviors have long been interested in settlement patterns. Sites with notable features that define their type and function, such as mounds, tumuli, and other earthworks, have been studied heavily as they are of great significance and easily distinguished from more common general sites. However, this had led to criticism that the remnants of people who lived ordinary lifestyles have been pushed aside in favor of studying those with the most power (help with a citation). Recent frameworks such as landscape archaeology and cultural ecology have attempted to combine the usage and perceptions of social and physical environments to fully characterize the worlds of past peoples.

The earliest monumental sites in the Southeast appear to exhibit signs consistent with Archaic lifestyles: base camps used year-round were surrounded by hunter-gatherer procurement sites. Estuarine environments such as the Mississippi Delta and Tampa Bay both exhibit abundant resources theorized to promote stability and cooperation rather than reliance on mobility and trade (Saunders 2012:41-43). In the Southeast, the observed dispersed distribution of smaller villages and singe-mound sites from larger, more nucleated settlements and multiple-mound sites in the Woodland and Mississippian periods has led to the proposition of several theories and a variety of tests over the structure and distribution of polities. Milanich (1997:40-41) hypothesized Weeden Island mound distributions in North Florida were based on site patterns around Kolomoki and McKeithen: medium-sized civic centers with a single burial or platform mound resided by a chief or leader and surrounded by other villages that budded off forming communities of related families. However, evidence for hierarchies at this time is more likely a result of subsistence and population factors rather than political processes that developed later. On the coast, however, they settled more near small creeks and tributaries rather than major rivers, which gave them a short distance to a variety of marine resources.

An early quantitative method of measuring the settlement distributions and political power of Fort Walton sites was developed by Scarry and Payne (1986) using an algorithm based on theories postulated by Renfrew (1978) about hierarchical societies. Site size and political power were determined based on the number of mounds and total mound volume. Using a range of values for ambiguous variables such as the relationship between political influence and distance from a site, their algorithm generated between 6 and 9 polities, but they chose the conservative estimate due to their closer proximities and further modified the circular buffers to better conform to the basin's hydrography. For example, if the Ochlockonee and Aucilla Rivers formed the western and eastern boundaries of a Lake Jackson chiefdom, it would have extended over 90 km at the widest point. They concluded that these regions represented spheres of influence rather than distinct polities and noted that paired centers with high volume mounds could be the result of movement of capitals during different elite ascensions. The paired site idea was expanded upon by Williams and Shapiro (1990), who hypothesized sites with mounds in Piedmont Georgia that stayed 8 to 16 km from each other may have been occupied alternatively due to diminishing resources or administrative changes rather than co-continuous as allied towns.

Based on ceramic assemblages and a distance matrix of mound sites in North Georgia, Hally (1993) hypothesized that mound sites more than 32 km apart distinguished primary chiefdoms, which included secondary administrative centers located less than 18 km away. He later expanded his hypothesis with environmental characteristics and found predictive traits for Georgia mound sites included fertile floodplains, physiographic transition regions, and conjoining trails (Hally 1999). Williams and Harris (1998) searched for patterns of Middle Woodland mounds in the Piedmont regions of Georgia and South Carolina and found patterns similar to Hally's – major mound complexes were 29 to 35 km apart, but the smallest sites had no evidence for habitation and there was little to no correlation with environmental settings. While they were unable to explain why their distributions were similar despite differences between regions and cultures, they understood that different principles had to have been responsible. Livingood (2012) offered an alternative explanation for Hally's radial patterns accounting for travel time by using least cost analysis (LCA), proposing that 5 hours' worth of travel either by canoe or foot explained the mound distribution patterns at least as well, and explained this was due to the need for political leaders to be able to respond to any of their subordinates in a day. Hally and Chamblee (2019) expanded to more Southeastern states and used theories of political collapse and resilience to explain large-scale patterns in polity cycles. They found that Mississippian polities in four states – Georgia, Alabama, Mississippi, and Tennessee – were largely similar in occupation span and showed construction and use only during a single ceramic phase, approximately a century or two. While individual polities rose and fell with some regularity across space and time, macroregional patterns were far more static, except for the presence of macroregional change in the Middle Cumberland area of Tennessee, suggesting Mississippians were inter-regionally connected and behaved with a degree of uniformity and predictability.

Blitz (1999) also hypothesized the processes and causes of settlement distributions in addition to searching for patterns. He critiqued the simple-complex model of chiefdoms (hierarchical patterning of primary-secondary mound centers) for being too simplistic and proposed four patterns of mound centers in southern Appalachia: simple chiefdoms with a single-mound center surrounded by secondary communities, complex chiefdoms with multiple mounds surrounded by secondary communities as well as simple chiefdoms, paired single-mound centers, and isolated multiple-mound centers, with the first and fourth varieties the most common within a 40-km diameter area. Under a fission-fusion model, political units oscillated between dispersed and clustered spatial distributions to efficiently manage administration during periods of upheaval balancing autonomy and security. He also found a wide variety of expansions and contractions over a 700-year period from the Late Woodland to Late Mississippian attributed to social and environmental factors such as population movement, the mobilization of surpluses, polity interaction, and climate change. His most interesting findings concern the latter, where high rainfall was measured between 1251 and 1359 and drought succeeding between 1359 and 1475 in the Lower Chattahoochee region. The former period was characterized by greater migration and polity interaction due to the mobilization of surpluses by elites, and the latter by reduced mound building, abandonment of multiple-mound centers, and the collapse of exotic exchange networks. His theories have incorporated a fission-fusion process of chiefdom organization, the frontier model for polity spreading and replication, the use of platform mounds the production of social memories and ideologies, and the relationship between climate change and polity growth and decline (Blitz and Lorenz 2006).

In a rare study of coastal settlement and monument patterns, Pluckhahn and McKivergan (2002) found very few large Mississippian sites with platform mounds on the Georgia coast, with low site clustering but large cluster sizes, less space or smaller buffer regions between clusters, and little architectural differentiation of sites compared to inland distributions. They suggest coastal areas were less centralized and had less developed hierarchies, but the spacing with large sites central to smaller and intermediate sites, including platform mounds and burial sites, was consistent with inland patterns distinguishing primary and secondary administrative centers. Like the Tampa Bay region, small burial mounds are far more common rather than large platform mounds, potentially due to a struggle for elites to keep control over peripheral regions on coasts due to limited space. Comparing these areas suggests major differences in the duration and nature of mound construction traditions between the Atlantic and Gulf Coasts.

GIS in Settlement and Monument Studies

GIS can refer to either a geographic information system – a database system consisting of computer software and hardware where geospatial data are stored and can be managed, modified, visualized, and analyzed – or geographic information science, the discipline that studies the use of geospatial data (Chapman 2006:14-15). A wide variety of data with references toward their geographic locations can be utilized, but the data most widely used include vector data (based on discrete points in the forms of points, lines, or polygons), raster data (continuous data based on the values of cells), and tables. Because of its broad framework and the acceleration of computer power, it has become omnipresent in many industries and disciplines, including archaeology. The first use of GIS in archaeology occurred in the United States in the 1980s when processual archaeology was dominant and personal computers became affordable, with Europeans gaining interest in the 1990s for the use of interpreting survey data. Early applications included predicting site locations based on correlations with landscape characteristics, analyzing intra-site artifact distributions, and data management – which are all still common today and broadly fit into three main archaeological applications: methods, interpretation, and management (Chapman 2006:17-18; Wheatley and Gillings 2012:18-21). GIS is appealing for archaeologists because of the possibility of conducting large-scale, mathematically complex analyses previously infeasible; integrating different data and layers at any scale level; the greater accuracy of maps and site locations and layouts; and managing databases convenient for referencing and further analysis (Schieffer 2013:43).

While GIS greatly eases analyses of site distributions and large-scale patterns, methods such as predictive modeling LCA have had a mixed reception in research because of a perceived reliance on environmental determinism and inability to integrate archaeological theories and non-geospatial, sociocultural variables. Llobera (1996) and other spatial archaeologists have argued these are merely theoretical problems and that the technology is already able to answer valuable questions about landscapes, settlements, and even human perceptions. GIS models in archaeology can be thought of as highly technical yet heuristic experiments, where imperfect outcomes can be compared to the material record to test hypotheses and assumptions (Howey and Burg 2017:3). It is advised to think before starting research what GIS methods and data can test one's hypotheses, find and prepare the cultural and archaeological data, and properly contextualize the data and analyses (Jones 2017:54). While some archaeologists have been able to integrate cultural knowledge and agency perspectives into spatial models (Llobera 1996, 2001; Supernaut 2017), GIS as a tool for understanding settlement decisions and meanings continues to be underutilized and misunderstood. However, even without extensive cultural and qualitative data, or any references to causation, there are specific cases where systematic patterns between cultures and the environment have been revealed using a combination of methods such as predictive modeling, viewshed analysis, and landscape archaeology (Fry et al. 2004; Howey et al. 2016).

Landscape archaeology is an approach utilizing the landscape as a broader unit of analysis, encompassing all human-modified remains across a region, rather than individual sites (Bahn 1992). Methods include revealing older layers of the landscape via surveying, reconstructions of the past environment using organic remains or computer models, and qualitative interpretations relying upon phenomenology (Chapman 2006:11-14). GIS can become a valuable tool in visualizing humanist perceptions and exploring the relationships between a single location and its surroundings and can work as one of the elusive bridges between method and theory in archaeology. However, building effective models based on occurrence data is a primary challenge. The key to working with limited data and theoretical bases is to form a sound methodology that manages space, time, and form simultaneously; understand the way landscapes are contextualized; and employ proper analytical methods to integrate cultural variables and quantitative data (Jones 2017:54; Smith and Stephenson 2018:112). Jones (2016) deconstructed the modern landscape in a study of Haudenosaunee settlements by using soils as a proxy for historic forest coverage. Supernaut (2017) implemented local and historical knowledge with LCA to understand the mobility strategies of Métis people in Alberta and changes in patterns over seasons and years.

When using state site file databases as a main source, care must be taken because information such as exact locations, dates, and proportions of cultural assemblages are often absent or lack detail, especially in older reports. Regardless, proper methods can rectify low quality information, even at regional scales where problems are magnified. Smith and Stephenson (2018) used sampling methods on site and radiocarbon datasets to map spatial distributions of Woodland cultures in Florida over time and reveal spatiotemporal gaps. They found characteristics that conformed to previous research, including site distributions becoming more spatially restricted in succeeding stylistic traditions, and coastal settlements being broader than interior settlements mainly constrained to major rivers, but that more dating was required to improve site file data and spatial distribution studies. Howey et al. (2016) used a maximum entropy model, which predicts habitat suitability, based on present environmental data to replicate the spatial distribution of Mississippian period burial mounds and earthwork enclosures in Michigan, and found proximity to water had high prediction and met local needs for resource procurement.

Least cost analysis can help archaeologists understand movement between two points across a landscape with varying elevation, barriers, and social prohibitions, measuring the cost of these restrictions that affect the time and energy spent traveling. LCA assumes that people make rational, cost-effective decisions when they travel to a familiar place and choose the most efficient path according to the parameters set. LCA relies on raster-based cost surfaces, or continuous data based on features of landscapes containing values representing travel cost that approximate the physical exertion an individual would experience moving across a particular cell. The results, lines of cells connecting two points, can be measured either by distance or time. Measuring the direction of movement determines if the algorithm is isotropic (no) or anisotropic (yes) (Wheatley and Gillings 2012:151).

In archaeological studies, LCA have often been based upon slope as the primary cost because of large elevation differences in most regions, the wide availability of precise elevation data, and its ease in calculating with algorithms such as Tobler's hiking function. While the latter of which has found theoretical support (Aldenderfer 1998; Kantner 1997), more refined algorithms have been proposed and used in more recent studies (Rosenwig and Tuñón 2020; Seifried and Gardner 2019). However, terrain has a similar effect on cost but is rarely used due to difficulties in recreating past vegetation patterns, but soil and palynologic data can be used as proxies for historic vegetation. Partially as a result, spending more time improving cost surfaces has been one of the most significant pushes in GIS for archaeology (Seifried and Gardner 2019:392). Another methodological consideration is that, because the cost path is based on cardinal directions rather than all possible directions, minor deviations from a straight line can add up to major additions in distance length over long distances (Wheatley and Gillings 2012:157-158).

While terrestrial LCA have frequently been performed (Kantner 1997; Rosenwig and Tuñón 2020; Seifried and Gardner 2019; Supernaut 2017), marine least cost studies have also been done using costs similar to terrestrial studies including bathymetric elevation, aspect, experiment-based speeds, and viewsheds (Gustas and Supernaut 2017). One study by Newhard et al. (2014) integrated terrestrial and marine pathways with cultural variables, accounting for poorly drained land, wind patterns, and attractive forces of cultural features. Due to the limited cultural data in Florida's master site files, I instead relied on a detailed recreation of the landscape while assuming a consistent, uniform travel surface over water.

Chapter 4: Mounds Complexes of Tampa Bay

Sampling Methodology

Determining which Tampa Bay mound sites to include in my sample (Table 5) – ideally, all sites with at least one platform mound in addition to plazas, burial mounds, and middens inhabited during the Mississippian period – involved a mixture of deduction, guesswork, and literature review of official field notes and survey reports. USF Professor Thomas Pluckhahn first sent me the Florida Master Site File (FMSF) sites in Hillsborough, Pinellas, Manatee, and Pasco Counties as a polygon shapefile with metadata including site numbers and names, site categories within six fields, cultural affiliations within eight fields, National Register for Historic Preservation (NRHP) evaluation and listings, State Historic Preservation Office (SHPO) evaluation, and presence or lack of human remains. The location and size of the polygon shapefiles are usually based upon USGS topo map illustrations or are squares surrounding the UTM coordinates with the approximate area.

The FMSF records include 193 sites in these four counties with “mound” listed in the name or any of the site type fields, of which 48 include “Safety Harbor” in any of the cultural fields. I started my sample with Safety Harbor mound sites restricted to a buffer extending 1,400 meters from the coastline, which eliminated 15 sites that appeared to be isolated burial mounds. Nine more sites were eliminated as isolated burial mounds even though they fell within the buffer area. Two other sites, 8HI22 and 8PI8, were eliminated because the former was considered unrelated to the complex, Mill Point, it was close to, and the latter because its site file was merged with 8PI7. Finally, 8HI2120 was added even though it fell outside of my filters because it was categorized it as a midden (the presence of a mound was noted but never confirmed archaeologically), which left 21 Safety Harbor mounds. I added 27 other mounds mentioned by Luey and Almer (1981) and Pluckhahn and Jackson (2019) after site file checks determined many errors with the digital FMSF's cultural affiliations and confirmed plausible Mississippian usage for almost all of these mound sites. Larger mound complexes included burial mounds, shell middens, and indeterminate mounds and midden. Ten multi-site complexes (listed in the Complex column in Table 5) were each reduced to a single point based on their polygon centroids for analysis purposes, with total site areas ranging between 20,000 and 600,000 m^2.

Because of the wide disparity in information recorded over a period of 100 years, determining sociopolitical complexity from these sites requires educated guesswork more than empirical evidence. I have assumed that, of the sampled sites, most were simple or emerging chiefdom centers designed by elite leaders to distribute secular resources efficiently and maintain sacred power to distribute special materials across regions and keep relatively peaceful relations between one another. Based on the sparse evidence for agriculture, they could achieve in situ social complexity, but stressful times occurred when the climate was unfavorable to estuarine resources (Marquardt 2010:11,15). Like most chiefdoms, they probably ebbed and flowed in complexity over time and narrowing down the timespans of these sites to learn more about this process will require more excavations to determine mound stratigraphy and the provenience of SECC artifacts. For now, their timespans (see Table 7) have been based on ceramic assemblages along with some radiocarbon dates from site forms. The sites most likely to be chiefdom centers or major sites (N=12, Table 6) are those with clear village presences, Late Weeden Island and Safety Harbor-related platform mounds with ramps leading into plazas and other earthen features, and other mound sites adjacent (within 3 km).

Table 5: Analyzed mound sites on the coast of Tampa Bay

Complex	ID	Sites	Site Features	Cultures	Complex Timespan (Height of Activity)
Anclote Complex	8PA10, 8PA136[a]	Anclote Mound	Platform mound, Burial mound, Shell midden	Middle Archaic, Weeden Island, Safety Harbor	5900-3800 BCE, 300-1500 CE (550-930 CE)
	8PI12	Myers Mound	General mound	Unknown	
	8PI43	Burnt Mill	Village, General Mound	Unknown	
	8PI44	*Murphy's Mounds*	Village, General Mounds, Shell Middens	Archaic, St. Johns II, Santa Rosa-Swift Creek, Weeden Island, Safety Harbor	
Bayshore Homes Complex	8PI41	Bayshore Homes	Platform mound, 2 Burial mounds, 3 Shell middens, Plaza	Weeden Island, Safety Harbor	300 BCE-550 CE, 950-1500 CE (200-530 CE, 1010-1260 CE)[b]
	8PI58	*Abercrombie Park*	Village, Shell midden, General mound	Orange, Weeden Island, Safety Harbor	
	8PI10650	Kuttler Mound	Shell midden	Weeden Island, Safety Harbor	
	8PI7, 8PI8[a]	*Bayview/Seven Oaks Mound*	Burial mound	Safety Harbor, Spanish	1000-1600 CE
	8HI12	Bullfrog Mound	3 Shell middens, Burial mound, Plaza	Unknown	Unknown
	8HI2	Cockroach Key (Indian Key)	2 Shell middens, Burial mound	Glades I-III	1000 BCE-1500 CE
	8PI17	*Dunedin Mound*	Platform mound	Safety Harbor, Spanish	1000-1600 CE
	8HI13a[a], 8HI2120	*Fort Brooke Midden*	Platform mound, Shell midden, Village	Weeden Island, Safety Harbor	200-1600 CE (800-1600 CE)
Harbor Key Complex	8MA13	*Harbor Key 1*	Platform mound, Plaza	Deptford, Perico Island, Weeden Island I	1200 BCE-700 CE, 1000-1500 CE (180 BCE-350 CE)
	8MA14	Harbor Key 2	Burial mound	Safety Harbor	
	8MA15	Harbor Key 3	Village, Shell middens	Safety Harbor	
	8MA79	Kennedy Mound	Platform mound	Unknown	Unknown
	8PI19	*Maximo Point (Sheraton Midden)*	Platform mound, General mound	Weeden Island II, Safety Harbor	700-1500 CE

Italics = Safety Harbor mounds according to digital FMSF

[a] Deprecated IDs

[b] Based on radiocarbon dating

Table 5 (continued)

Complex	ID	Sites	Site Features	Cultures	Complex Timespan (Height of Activity)
Mill Point Complex	8HI16	Mill Point Midden	Shell midden	Archaic, Manasota	5900-1200 BCE, 300-1500 CE
	8HI17	Mill Point 2	Platform mound, Plaza	Unknown	
	8HI18	Mill Point 3	Burial mound	Weeden Island, Safety Harbor	
	8HI19	Mill Point 4	General mound	Unknown	
	8HI20	Mill Point 5	General mound	Unknown	
Narvaez Mounds	8PI54	*Narvaez Midden*	Platform mound, Plaza	Safety Harbor, Spanish	300-1600 CE (1300-1500 CE)[b]
	8PI1242	*Pelham Road Mound*	Shell midden	Weeden Island, Safety Harbor	
	8PA2	*Oelsner Indian Mound*	Platform mound, Shell midden, Burial mound	Weeden Island II, Safety Harbor	700-1500 CE
Pinellas Point Complex	8PI13	Pinellas Point 1	Burial mound	Unknown	300-1600 CE (700-1000 CE)
	8PI14	Pinellas Point 2	Burial mound	Unknown	
	8PI61	*Tenth Street/Pinellas Point Midden*	Shell midden	Archaic, Weeden Island, Safety Harbor, Spanish	
	8PI108	*Hirrihigua Mound*	Platform mound	Weeden Island, Safety Harbor, Spanish	
	8PI1343	*Pipkin Mound*	Platform mound	Safety Harbor	1000-1500 CE
	8PI2	*Safety Harbor*	Platform mound, Burial mounds, Village	Safety Harbor, Spanish	1150-1700 CE (1500-1700 CE)
Shaw's Point Complex	8MA31	*Pillsbury Mound*	Platform mound, Plaza, Burial mound	Weeden Island II, Safety Harbor	345 BCE-1395 CE (300-800 CE)[b]
	8MA310	Tallant Mound	Burial mound, Village	Deptford, Weeden Island, Safety Harbor, Spanish	
	8MA1233	Shaw's Point Archaeological District	General mounds, Shell middens	Deptford, Santa Rosa-Swift Creek, Weeden Island, Safety Harbor	

Table 5 (continued)

Complex	ID	Sites	Site Features	Cultures	Complex Timespan (Height of Activity)
Snead Island Complex	8MA18	Snead Island I	Shell midden	Manasota, Safety Harbor	300-1750 CE
	8MA19	Snead Island II	Shell midden	Safety Harbor	
	8MA20	Snead Island III	Shell midden	Unknown	
	8MA84	Snead Island IV	Shell midden	Manasota, Safety Harbor	
	8MA85	Snead Island Burial Mound	Burial mound	Unknown	
	8MA919	*Portavent Mound*	Platform mound, 3 Shell middens, Plaza	Weeden Island, Safety Harbor, Spanish	
	8MA1114	*Job Box*	General mound	Safety Harbor	
Terra Ceia Complex	8MA83a	Able Shell Midden	Village, Shell midden	Weeden Island	1-1600 CE (1450-1600 CE)
	8MA83b	*Madira Bickel Mound*	Platform mound, Plaza, Shell midden	Weeden Island, Safety Harbor, Spanish	
	8MA83c	*Prine Mound*	Burial mound	Weeden Island, Safety Harbor	
Thomas Complex	8HI1	*Thomas/Hoey Farm Mound*	Burial mound	Weeden Island II, Safety Harbor, Spanish	300-1600 CE
	8HI23	Mound Near Thomas Mound	General mound	Unknown	
	8HI30	*Selner Mound*	Shell midden	Weeden Island, Safety Harbor	
	8PI1	Weeden Island	Platform mound, Burial mound, Shell middens, Village	Archaic, Orange, Swift Creek, Manasota, Weeden Island II, Safety Harbor	5900-1500 CE

Table 6: Summary of mound site features

	Villages	Plazas	Dual Mounds (3 km)	Connected Mounds	Ramps	Features
Anclote Complex	2				Ramped	
Bayshore Homes Complex	2	Yes	With Narvaez Complex		Ramped	
Bayview/Seven Oaks	0					
Bullfrog Mound	0	Yes	With Mill Point	Yes		
Cockroach Key	Unknown					225 burials
Dunedin Mound	0				Ramped	Summit feature
Fort Brooke Mound	1				Not ramped	1 burial
Harbor Key Complex	1	Yes			Ramped	
Kennedy Mound	0		With Terra Ceia			
Maximo Point	0		With Pinellas Point	Yes	Ramped	
Mill Point Complex	Unknown	Yes	With Bullfrog Mound		Ramped	Burials
Narvaez Complex	1	Yes	With Bayshore Homes		Ramped	
Oelsner Mound	1					51 burials
Pinellas Point Complex	1	Yes	With Maximo Point	Yes	Ramped	1 burial
Pipkin Mound	0		With Safety Harbor		Ramped	Summit feature
Safety Harbor	1		With Pipkin Mound			
Shaw's Point Complex	1	Yes	With Snead Island			147 burials
Snead Island Complex	1	Yes	With Shaw's Point	Yes		Human remains
Terra Ceia Complex	Unknown	Yes	With Kennedy Mound	Yes	Ramped	
Thomas Complex	Unknown					112 burials
Weeden Island	1					Human remains

Mound Site Descriptions

Anclote Complex: Anclote Mound (8PA10), Burnt Mill (8PI43), Murphy's Mounds (8PI44), and Myers Mound (8PI12)

8PA10, previously recorded again as Spanish Wells (8PA136), is a large sand and shell platform mound on the northern shore of the mouth of the Anclote River, with a shell midden and burial mound measuring 7 x 7 x 2 m. The platform mound was described by Walker (1880) as oblong, low with a broad summit, with a ramp on the south side, and measured 72 x 51 x 3 m. Luer and Almy (1981) categorized it as a large, broad, A-class mound, the second largest mound by volume. Despite its large size and ramp, Goggin (1952b) and Penton (1972) thought it was a second burial mound. The discovery of only a few chert flakes makes its dating uncertain but was probably constructed between the Woodland and Mississippian periods. Burnt Mill is only described as a mound and village site and is assumed to be on the northern shore of the Anclote River directly southeast of 8PA10 (Silbereisen 1958). 8PI44, across the river from 8PA10, is a village site containing several mounds and middens with Archaic, Weeden Island, and Safety Harbor sherds. The site is covered by homes, but subsurface features may remain (Kolianos 2002). 8PI12, about a kilometer east of 8PA10, is a possibly domiciliary sand mound with no cultural affiliation measuring 51 x 27 x 1.5 m (Goggin 1952b).

Bayshore Homes Complex: Abercrombie Park (8PI58), Bayshore Homes (8PI41), and Kuttler Mound (8PI10650)

8PI141, called Four-Mile Bayou by Moore (1900:2-3) after the water body known today as Boca Ciega Bay, is a mound-village site radiocarbon dated to Middle Woodland, Late Woodland and Mississippian period occupations with possible breaks in between. It includes a sand and shell platform mound accompanied by two burial mounds to the southeast and west all along a small stream; a series of three to four large shell middens and mounds, including 8PI10650, along the coastline; and a plaza to the south containing small shell middens and scatters (Austin and Mitchem 2014). The platform mound is approximately 43 x 56 x 5 m – a tall, broad, B-class mound (Luer and Almy 1981) – with a ramp connected to a plaza (Sears 1960). 8PI58 consists of a village occupied between the Late Archaic and Late Mississippian periods, with potential abandonment during the Vandal Minimum (550-900 CE), as well as a shell midden and a shell mound 16-18 m in diameter. Radiocarbon dating determined this mound was constructed during the Late Woodland and Early Mississippian periods (Austin 2016).

Bayview and Seven Oaks (8PI7)

Bayview or Seven Oaks was a burial mound that measured 14 m in diameter and 1 m high located ~1,700 m inland from Cooper Bayou near a creek and swamp. While several Archaic artifact scatters surround the mound, artifacts collected by Walker (1880), since lost, are associated with Safety Harbor and Spanish cultures. A dairy farmer who once owned the land claimed that "he leveled an Indian platform mound [northwest of the burial mound] bigger than the once at Philippe Point" (Brinton 1999:2). If his testimony and description were accurate, this could be a larger habitation site than reported. However, the burial mound was destroyed in 1984 for constructing townhouses (Brinton 1999). Evidence against it being a more significant site is its location relatively far from the shoreline, farther inland than any other sampled site.

Bullfrog Mound (8HI12)

Bullfrog Mound was destroyed in the early twentieth century, but Shepard (1886:905-906) and Walker (1880:421-422) recorded it as a very large heap of oyster shells or two mounds connected with a shell bridge and a possible plaza southeast between the mound and a linear shell midden. The largest heap was 9-18 m tall and the complete feature measured 61 m in diameter. The only artifacts found were truncated conches and the summit provided a wide view of Hillsborough Bay and a salt marsh at the mouth of Bullfrog Creek.

Cockroach Key (8HI2)

Cockroach Key, previously named Indian Key, is a Middle to Late Woodland human-constructed or modified mangrove island characteristic of the Bell Glades culture of South Florida, although Tampa Bay is far north of its epicenter around Mound Key. The key appears to be an anthropomorphic island made of discarded shells now 10.67 m above the water level and is covered by mangrove forests except for the north side. The southern end of the key includes two very large shell mounds and to the north is a long shell ridge serving as the refuse of an occupation area. Northeast of the midden ridge is a shell burial mound 4.5 m tall where Moore (1900:8-10) and Willey (1949) recorded over 225 burials, mostly flexed (Bullen 1951). Willey (1949) and Penton (1971) theorized its location represents some form of cultural exchange between the Glades and Weeden Island or Safety Harbor cultures utilizing trading or political dominance.

Dunedin Mound (8PI17)

Dunedin Mound was a small, narrow C-class mound (Luer and Almy 1981) sand mound 47.5 x 24 x 3 meters in dimensions with a ramp descending southwest. Walker (1880) noted the explicit presence of the remains of a temple on top, and the lack of burials lowers its chances of being a charnel house. Safety Harbor and Spanish artifacts were recovered, making it coeval with the Safety Harbor site located on the opposite side of the peninsula (Goggin 1952a). The mound appears to have been destroyed by the construction of Josiah Cephus Weaver Park.

Fort Brooke Mound (8HI2120)

The Fort Brooke Mound, previously known as Vodges Mound (8HI13a), was associated with a large village now destroyed in downtown Tampa dating between 200 and 1700 CE. It was investigated by Walker (1880) and Willey (1949) who described it as a platform sand and shell mound 31 x 33 x 2.5 m in dimensions – a small, broad, C-class mound (Luer and Almy 1981) – with one burial and no discernible ramp. The presence of limestone-tempered sherds suggests its deposit began around 800 CE (Hardin 1996).

Harbor Key Complex: Harbor Key 1-3 (8MA13-15)

The Harbor Key complex is located on a peninsula forming the mouth of Bishop Harbor. 8MA13 contains a tall, narrow shell platform mound measuring 45 x 25 x 6 m, a summit 30 x 9 m, and a ramp on the west side – a small, narrow, C-class mound – connected to a plaza (Bullen 1955; Luer and Almy 1981; Milanich 1979). 8MA14 is a burial mound southwest and 8MA15 is a village with middens farther southwest. While AMS dating and Deptford, Perico Island, and Weeden Island I pottery indicate construction occurred between 180 BCE and 350 CE (Wheeler

2005), the layout is very consistent with Safety Harbor and Tocobaga villages and Safety Harbor ceramics were allegedly recovered as well (Milanich 1979).

Maximo Point (Sheraton Midden) (8PI19)

Maximo Point is located only two kilometers away from the Pinellas Point complex at the tip of Pinellas Peninsula. Maximo Point included a platform mound and a sand burial mound to the north and a sand and shell midden to the south but has mostly been destroyed by apartment construction. Walker (1880) and Moore (1900:3-4) described the platform mound as made of sand and shell and circular, 30 x 30 x 3 m – a small, broad, C-class mound (Luer and Almy 1981) – with a ramp on the south side connected to a sand and shell midden (Sheraton Midden) parallel to the coast. Sheraton Midden measured 213 m long east-northeast by west-southwest with a maximum height of 2 m and a width of 21 m. A small steatite effigy was discovered near the platform mound's base. Habitation has been dated to the Late Woodland and Mississippian periods, and the rich burial mounds on Cabbage Key six kilometers southwest suggest a plausible connection between the sites (Austin 1987b; Bothwell 1961; Nelson 1985).

Mill Point Complex: Mill Point Midden (8HI16), Mill Point 2-5 (8HI17-20)

The Mill Point complex, portions of which have been destroyed by park and railroad construction, is located on the mouth and northern shore of the Alafia River. 8HI17 was recorded by Moore (1900:6-7) as a platform mound measuring 49 x19 x 3.5 m – a small, narrow C-class mound (Luer and Almy 1981) – and made of white sand, shell, and loam, with a 25-m long, 9-m wide ramp extending west to a plaza, along with middens (8HI16) south and west along the riverbank and a white sand burial mound (8HI18) west. Two other sand mounds (8HI19 and

8HI20) lie north of the bank midden. 8HI16 and 8HI18 contained human remains and artifacts within the complex date the site to the Woodland and Mississippian periods, mostly from the former (Pluckhahn and Jackson 2019).

Narvaez Complex: Narvaez Midden (8PI54) and Pelham Road Mound (8PI1242)

The Narvaez complex is located near the mouth of Long Bayou and the Bayshore Homes complex. 8PI154 is a domestic site occupied between 1000 and 1600 CE with radiocarbon dates from shell suggesting principal activity occurred between 1300 and 1500 CE. It features a platform mound measuring 30 x 30 x 3 m with a ramp on the western side connected to a plaza (Pluckhahn and Jackson 2019; Simpson 1998). An unexcavated burial mound since destroyed lay to the north. 8PI1242 is 600 m north of 8PI154, measures 69 x 23 x 1.8 m, and likely started as earlier refuse later used by the Narvaez village (Austin 1987c).

Oelsner Mound (8PA2)

Oelsner Mound lies near the northernmost extent of the Circum-Tampa Bay Safety Harbor area. The site appears to represent the remains of a nucleated village located near the mouth of the Pithlachascotee River, with evidence of Late Weeden Island and Safety Harbor habitation. The associated platform mound has a rectangular flat top 28 m long and 6 m wide, with a base 40 m long north to south, 15 m wide east to west, and 10 m high. It is made of layers of sand and primarily oyster shells 20 to 30 cm thick. Other features of the site include a shell midden 435 m long parallel to the river and a sand burial mound 100 m east of the platform mound, recorded by Walker (1880) as measuring 53 m long, 5-15 m wide, and 3 m high and including 31 flexed burials, 18 bunched burials, and two straight burials (Mattick 1993; Moore 1903:64-67).

Pinellas Point Complex: Hirrihigua Mound (8PI108), Pinellas Point 1 (8PI13), Pinellas Point 2 (8PI14), and Tenth Street/Pinellas Point Midden (8PI61)

The Pinellas Point complex is located near the southernmost extent of Pinellas Peninsula. 8PI108 is a sand and shell platform mound with two possible northern and southern ramps, all surrounded by a shell midden 60 meters in diameter. The mound currently measures 40 x 17 x 4.5 m with a flat summit 23 x 11 m – a small, narrow, C-class mound according to Luer and Almy (1981). At least one burial was recorded by Moore (1900:5-6). The southern ramp may have extended as a causeway connected to a smaller sand mound (8PI13) 270 m south. The circular midden has Manasota artifacts, but the mound appears to have been constructed later in the Late Woodland period. A 1992 field school found in adjacent test pits common bivalves and gastropods as well as Spanish bottled glass in test pits surrounding the mound. The mound's name derives from a historic anecdote regarding Juan Ortiz, Hernando de Soto's interpreter, being captured by Hirrihigua, the village chief, but spared by his daughter, but the connection is considered tenuous (Austin 2019).

8PI13 is a sand mound 30 x 30 x 1.67 m south of 8PI108, but at least one-third of the mound has been destroyed by a road. While likely a burial mound, no burials or diagnostic artifacts have been recovered (Goggin 1952c). 8PI14 is identical in dimensions and materials but located 400 m east of 8Pi13 (Austin 1987d). 8PI161 extends almost 1,000 m along the coastline 400-700 m southeast of the complex and includes Deptford, Swift Creek, Perico, and St. Johns sherds, as well as glass beads (Austin 1987f).

Pipkin Mound (8PI1343)

Pipkin Mound was located two kilometers southwest of the Safety Harbor site. The little information available is that it was a "Timucuan ceremonial mound" with an eastern ramp and a house at the end (Greer 1973). It has been disturbed and possibly destroyed by development around a library.

Safety Harbor (8PI2)

The type-site of the Safety Harbor culture lies in the Safety Harbor area of Old Tampa Bay and consists of a platform shell mound 46 x 46 x 8 m with a summit measuring 30 x 15 m – a medium, broad B-class mound according to Luer and Almy (1981). A village with a burial mound was located northwest. A wide variety of ceramics have been collected including the following: Pinellas Plain and Incised, Safety Harbor Incised, St. Johns Plain and Check-Stamped, Lake Jackson Plain, Fort Walton Incised, Glades Plain, Wakulla Check-Stamped, Sarasota Incised, Pasco Plain, Pensacola Plain, and Spanish olive jar sherds. It was very active during the Contact Period, possibly constructed then, and plausibly served as the capital of the Tocobaga chiefdom (Weiss 1981).

Shaw's Point Complex: Pillsbury Mound (8MA31), Tallant Mound (8MA310), and Shaw's Point Archaeological District (8MA1233: 8MA7a-n)

The Shaw's Point complex consists of dozens of shell mounds, ridges, middens, and platform and burial mounds located near De Soto Point on the southern shore of the Manatee River's mouth, mostly within the boundaries of De Soto National Memorial. It is characteristic of Manasota villages, with shell ridges parallel to coastlines and ramped middens (Milanich

1994:225), continuously occupied for over 1,800 years. 8MA31 lies about a kilometer west-southwest of De Soto Point and is a Late Weeden Island to Safety Harbor platform mound made of sand with a ramp descending to a plaza on the east side abutted with a burial mound on its northern side. It measures 34 x 26.5 x 4 m – a small, broad, C-class mound according to Luer and Almy (1981) – with 147 burials in the burial mound (Bettini et al. 1941). Numerous mounds and middens within 8MA1233 have been dated to between 365 BCE and 1395 CE, including 8MA7a, a small mound constructed between 15 and 345 CE; 8MA7b, a shell mound accumulated between 45 BCE and 895 CE with mean dates between 90 and 535 CE; and 8MA7c, an oyster shell mound dated between 265 and 800 CE (Schwadron and Mattick 2001). 8MA310 is a mound and village area southwest of De Soto Point with sand, shell, and human bone, included Columbian golden artifacts seemingly salvaged by Natives and fashioned into objects and motifs associated with the SECC. The function of the shell ridges is not clear but are likely randomly accumulated middens. The strongest evidence for habitation features is two ridges (6 and 7) due to their associated artifacts (tools, pottery, food remains) (Canter 1987; FMSF Staff 1996; Schwadron 2000).

Snead Island Complex: Job Box (8MA1114), Portavant Mound (8MA919), Snead Island I (8MA18), Snead Island II (8MA19), Snead Island III (8MA20), Snead Island IV (8MA84), and Snead Island Burial Mound (8MA85)

The Snead Island complex is located on the eponymous Snead Island, forming the northern side of the mouth of the Manatee River. 8MA919 is a platform mound 72 x 43 x 3.5 to 4 m – a large, broad, A-class mound and the largest by volume in Tampa Bay (Luer and Almy 1981) – with three shell mounds connecting to it via an embankment as well as a subsidiary platform northwest of the mound. A plaza separates the platform mound and embankment from four other shell mounds to the north and west. Artifacts indicates continuous occupation between the Woodland and Colonial periods (Weisman 1994). 8MA1114 is a sand mound measuring 6 x 6 x 0.4 m located just west of 8MA919 and contained Safety Harbor plain and incised sherds (Burger 1999a). 8MA18 is a long shell midden along the Manatee River's northern bank primarily consisting of oyster and clam with human remains and measures 300 x 10 x 0.75 m. In line with 8MA919, shell tools and ceramic sherds indicate Weeden Island I to Safety Harbor deposits. 8MA19 is a shell midden 25 x 7 x 0.5 m deposited after 800 CE. 8MA20 is similar to 8MA18 and measures 56 x 15 x 1.5 m. 8MA84 is a crescent-shaped shell midden mostly consisting of oyster and measuring 200 m east-west by 10 m north-south. Horse conch hammers and Pinellas Plain sherds indicate the same temporal extent as 8MA18 but no human remains are present. 8MA85 is a shell mound 20 x 15 x 0.75 m with human remains and *Mercenaria* tools, sand-tempered plain sherds, and vertebrate remains in nearby subsurface deposits (Burger 1999b).

Terra Ceia Complex: Able Shell Midden (8MA83a), Kennedy Mound (8MA79), Madeira Bickel Mound (8MA83b), and Prine Mound (8MA83c)

The Terra Ceia complex is located near McGill Bay and was occupied between 1 and 1600 CE, active most between 1450 and 1650 CE, and consisted of an oblong ceremonial mound (8MA83b) 6 m high with a ramp leading to a plaza, two round tumuli connecting it with a curved causeway to two mounds (8MA83a and 8MA83c), since destroyed, to the south, and a small shell midden. 8MA83b was measured by Bullen (1952) as 6 m tall with a base 52 x 30 m and a summit 21 x 7.5 m – a small, narrow, C-class mound according to Luer and Almy (1981) – with a ramp extending west-northwest to a plaza and midden. Early historians of the De Soto expedition hypothesized this was the location of the Utica chiefdom, which was more likely to be farther north (Morgan 1999:219-220). The nearby 8MA79 (analyzed separately) was made of shell and black dirt and originally 30 m north to south, 18-24 m east to west, and 5 m high, but was destroyed by the US-19 highway (Plowden 1954).

Thomas Complex: Thomas/Hoey Farm Hill Mound (8HI1), Mound Near Thomas Mound (8HI23), Selner Mound (8HI30), and Ruskin Shell Mound (8HI94)

The Thomas Mound complex is located near the mouth of the Little Manatee River on both bank sides and included a burial mound (8HI1) measuring 18 x 18 x 2 m and shell middens along the river. 8HI1 contained 112 bundled and single skull burials and metal artifacts. Willey (1949:119-121) collected a large volume of Weeden Island and Glades ceramics with a few Safety Harbor intrusions, suggesting long continuous usage. The surface features of the site have been destroyed by agriculture and river dredging, while the following sites have been destroyed or disturbed by housing construction. 8HI23 was 400 m northeast of 8HI1, both on the northern bank, measured 22 x 22 x 1 m, and contained no artifacts or burials (Moore 1900:8-9). 8HI30 was a shell midden 500 m long on the southern bank containing human remains and Weeden Island ceramics. 8HI94 is presumed to include a village based on pottery locations, but no structure remains have been found (Wharton 1977). While the complex does not contain an identified platform mound, it resembles the Anclote complex and its presence at the mouth of a major river makes it likely there was a village and the platform mound has since been destroyed.

Weeden Island (8PI1)

Weeden Island is a large village complex within a peninsula (not an island) covered with mangrove forests that contained domiciliary mounds with sand bases, shell middens, and a sand burial mound with flexed primary burials in its lower zones and secondary burial in the upper zones. Today, only the middens remain. The largest platform mound, as measured by Luer and Almy (1981), was a small, narrow, C-class mound and the smallest mound in volume they measured at 46 x 14 x 1.4 m. The primary burials were in pits lined with shells, indicating high status. While it is known as the type-site of the Weeden Island culture, it has been continuously occupied for thousands of years, representing multiple cultures including Safety Harbor (Pluckhahn and Jackson 2019). One historical theory maintained that the conquistador Narvaez landed here and met the chief Hirrihigua in April 1528, but there are inconsistencies with where the chief resided and which conquistadores he encountered (Robinson 1970).

Timespan of Sites

The most difficult aspect of building an accurate timeline of mound sites in Tampa Bay is the limited methods and their accuracy. Dates have mostly been estimated using ceramic assemblages, which have only been broadly dated to approximately 500-year spans in peninsular Florida. Only three mound complexes (Bayshore, Narvaez, and Shaw's Point) have radiocarbon dates, which are prone to contamination from marine carbon sources. As shown in Table 7 and Figure 2, the coevality of mound sites is consistent with patterns across the Southeast. Although Southeastern platform mound construction proliferated in the Middle Woodland period, including in North and South Florida (Kassabaum 2018:209-211), only a few mound sites in West-Central Florida existed before 300 CE, gradually appearing afterwards until virtually all were inhabited at some time during the Mississippian period. Excavations and radiocarbon dates suggest burial mounds and shell middens accumulated before platform mounds (Austin and Mitchem 2014; Schwadron and Mattick 2001), pointing to the likelihood most platform mound construction in this region happened during the Late Woodland and early Mississippian periods, with Harbor Key being a major exception (Wheeler 2005). The Contact period is known for the collapse of Indigenous societies from disease and colonialism, represented by half of the sites disappearing from the record with the other half represented by Spanish metal and glass artifacts. All three periods were individually analyzed because of the importance of studying each: the first allows us to understand where the first platform mounds were built and expanded upon by succeeding societies, the second to understand the growth of and relationship between polities and settlements, and the third to understand their decline.

Analyzing further, while some sites have Archaic components, Cockroach Key and Weeden Island are the only sites continuously occupied from the Archaic to Mississippian periods, whereas Anclote and Mill Point were abandoned until about 300 CE. Five sites – Bayshore Homes, Harbor Key, Shaw's Point, Terra Ceia, and Thomas – began occupation during the Early Woodland period. Four sites – Anclote, Fort Brooke, Mill Point, Pinellas Point, and Snead Island – were occupied roughly conterminously but likely not continuously between 250 and 1600 CE. Bayshore Homes, Harbor Key, and Shaw's Point all appear to have had high activity and early mound building during the Middle Woodland period. The next period when mound construction is mostly absent is consistent with the Vandal Minimum, a period of lower temperatures that resulted in reduced activity in some regions of North America including South Florida (Wang et al. 2013), which may have negatively affected mound construction and site formations in Tampa Bay. While Bayshore Homes and Harbor Key exhibit occupational breaks in radiocarbon dates suggesting abandonment episodes, other sites such as Fort Brooke, Pinellas Point, and Shaw's Point were relatively active. Even though Maximo Point and Oelsner Mound were the only new sites built, it is possible construction of platform mounds began at several sites during this period. Four sites – Bayview/Seven Oaks, Dunedin, Narvaez, and Pipkin – formed during the Early Mississippian period, with reoccupation at Bayshore Homes and Harbor Key and Safety Harbor forming about 150 years later. Ten sites have metal or glass artifacts originating from Spanish cultures or colonies, making them good candidates for the centers of the historic chiefdoms described by Narvaez and De Soto. Two mounds, Bullfrog Mound and Kennedy Mound, have no dates and have been destroyed, but were categorized as Mississippian period mounds for the purpose of analysis; regardless, they had very little effect on site distances.

While the paucity of radiocarbon dates and low temporal resolution from using ceramics in West-Central Florida for dating purposes make determining a timeline for Tampa Bay's mound sites less definitive than in other Southeastern regions, it is still helpful in determining possible coevality between sites for analytical purposes. However, assigning sites to the same broad time period such as the 500-year Mississippian period opens the possibility of including sequentially occupied rather than contemporaneous sites (Pluckhahn and McKivergan 2002:149). It is important to note that in Tampa Bay later peoples occupied earlier sites using them for new purposes in addition to using ceramics and shells deposited earlier (Austin and Mitchem 2014). Without stratigraphy or radiocarbon dating, there is the possibility of later habitation not evident from artifact assemblages. However, since all of the dated mound sites were occupied at some point during the Mississippian period, assumptions about the sociopolitical relationships between them should generally hold.

Table 7: Coeval mounds sites in Tampa Bay

Coeval Period	**Coeval Sites**	**Coeval Period**	**Coeval Sites**
Deptford 500 BCE-300 CE N = 7	Bayshore Homes Complex Cockroach Key Harbor Key Complex Shaw's Point Complex Terra Ceia Complex Thomas Complex Weeden Island	Safety Harbor 1000-1500 CE N = 19	Anclote Complex Bayshore Homes Complex Bayview/Seven Oaks Mound Cockroach Key Dunedin Mound Fort Brooke Mound Harbor Key Complex Maximo Point Mill Point Complex Narvaez Mounds Oelsner Pinellas Point Complex Pipkin Mound Safety Harbor Shaw's Point Complex Snead Island Complex Terra Ceia Complex Thomas Complex Weeden Island
Weeden Island I (Manasota) 300-700 CE N = 12	Anclote Complex Bayshore Homes Complex Cockroach Key Fort Brooke Mound Harbor Key Complex Mill Point Complex Pinellas Point Complex Shaw's Point Complex Snead Island Complex Terra Ceia Complex Thomas Complex Weeden Island		
Weeden Island II 700-1000 CE N = 12	Anclote Complex Cockroach Key Fort Brooke Mound Maximo Point Mill Point Complex Oelsner Mound Pinellas Point Complex Shaw's Point Complex Snead Island Complex Terra Ceia Complex Thomas Complex Weeden Island	Contact 1500-1600 CE N = 10	Bayview/Seven Oaks Mound Dunedin Mound Fort Brooke Mound Narvaez Mounds Pinellas Point Complex Safety Harbor Shaw's Point Complex Snead Island Complex Terra Ceia Complex Thomas Complex

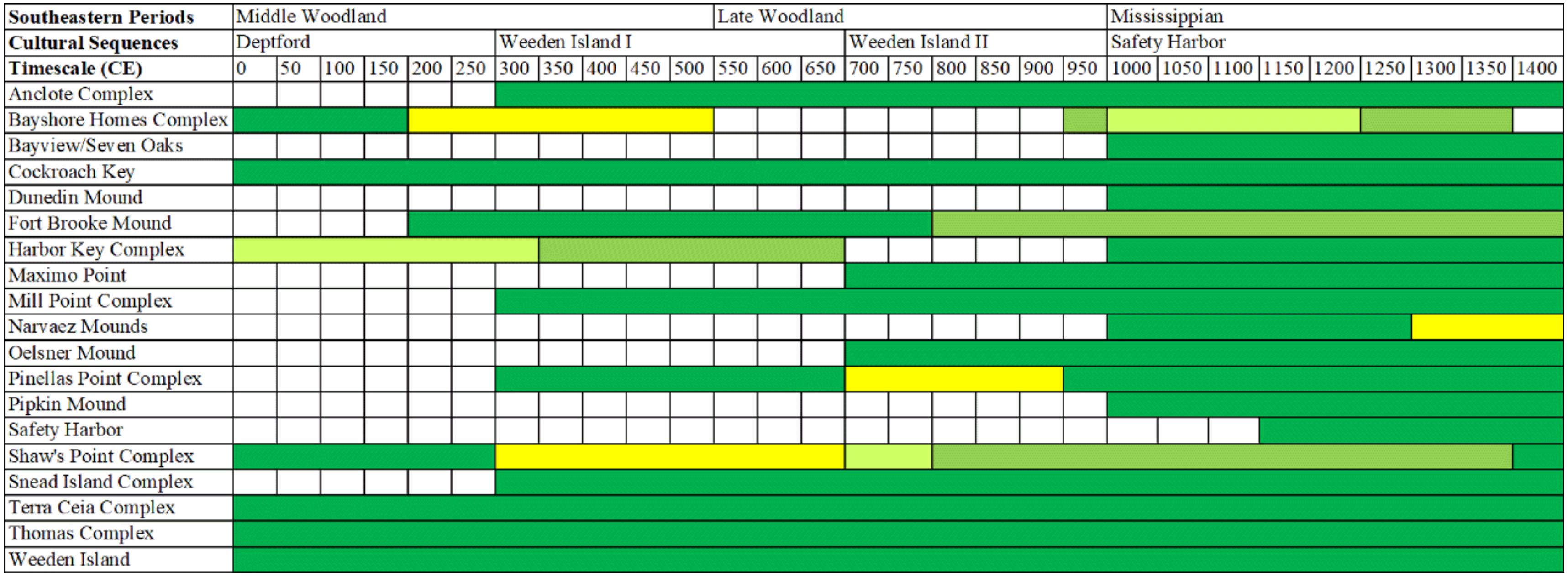

Figure 2: Timeline of analyzed mound sites
Dark green = total timescale
Medium green = platform mound timescales (if distinct)
Light green = platform mound timescale/height of activity
Yellow = height of activity
Note: See Appendix B for dating references

Chapter 5: Methodology

Distance Matrix, Density and Cluster Analyses

Hally (1993) hypothesized the size of Mississippian chiefdoms based on a matrix of the unique distances between all contemporaneous sites with one or more platform mounds [for *k* sites, the matrix should have 0.5k(k+1) values] and graphed these distances with a histogram to illustrate which distances had a greater frequency of sites. After determining which pairings were coterminous based on dates from the site files, I made distance matrices for the Late Woodland, Mississippian, and Contact periods by listing each site with another one once so there were no modes in the matrices (Appendix C).

Nearest neighbor analysis determines if there are any patterns found in a set of points by finding the distance of each point to the nearest other point and comparing the observed mean distance to the expected mean distance from a randomly spaced set of points: $R = r_{observed}/r_{expected}$. The series of points will have a range R (also known as the index or ratio) that is clustered if between 0 and 1, random if very close to 1, and dispersed if greater than 1 (Wheatley and Gillings 2002:129). It should be noted that the area used is a minimally enclosed triangle which assumes points can fall anywhere in its space, which is an issue when used to study site distributions with barriers such as mountains and water bodies.

Thiessen polygons, also known as Voronoi tessellation, are formed so that each polygon surrounds one point to be closer to it than any other point (Smith and Stephenson 2018:119). These allow a visually distinct way to determine site density and clusters that are not apparent from a total sample and are more suitable for regions with strong barriers affecting site locations.

Distance-based spatial clustering (DBSCAN) determines densities between discrete points within a given radius and groups points with many nearest neighbors (Schubert et al. 2017:2). If the radius of polities can be estimated from the distribution breaks when shortest distances are measured, this can be used as the parameter radius in addition to the minimum cluster size.

Building the GIS Model and Cost Surfaces

Most cost surfaces used in archaeological research and least cost analyses are simple representations of the present landscape based on a digital elevation model (DEM) where rasterized elevation values are converted to slopes. Simple algorithms such as Tobler's hiking function are often used to calculate the average speed a hypothetical individual travelled factoring in the landscape's slope as a burden affecting their hypothetical route. This is the most typical model mainly due to the simplicity of setting up and executing as well as the fact that most environmental data, such as vegetation and resources for crafting and sustenance, are unable to be recovered with fair accuracy. While it was much more time-intensive, I chose to use historic vegetation and coastlines using NOAA T-sheets and USDA soil maps as the basis for developing a terrain-based cost surface due to the highly developed, coastal setting. While areas researched in archaeology tend to be rural and undeveloped, Tampa Bay has been heavily developed since the early twentieth century, with prominent periods of growth after the two world wars (Grismer 1950:248-250,285-286). In addition, the coastal setting necessitates factoring in the long-term changes in the coastline and wetlands that would affect travel routes.

The NOAA maintains historic survey maps, known as T-sheets, of the American coastline, dating back to the early nineteenth century. While T-sheets from Tampa Bay date back to 1859, those dating to the World War Two period (1939-1945), based on aerial photography set at a 1:10,000 scale, were chosen for several reasons. First, using T-sheets based on aerial photography eliminate errors based on older surveying methods and include a greater variety of landscape features including forests and swamps. Second, they have all been georeferenced, unlike most older T-sheets, which lack consistent markers that made manual georeferencing too difficult. Third, while earlier USGS topo maps were high quality and georeferenced, they did not cover enough of my sample's extent. Based on visual comparisons between the 1940 T-sheets and 1921 topo maps, general coastline differences were minimal when docks were ignored, and it was possible the increased detail offset the effects of some modernization on precolumbian travel routes. Regardless of the maps chosen, coastlines are always in flux and it is inevitable that some changes, possibly major, have occurred within the 400-plus-year time span.

The GIS model was built with two GIS software programs: QGIS for vector files and ArcGIS Pro for raster files. I obtained a line shapefile of the 2004 Florida coastline from the Florida Geographic Data Library (FGDL) and hydrographic shapefiles and datasets from the National Hydrographic Dataset (NHD) (Appendix B). T-sheets and land cover rasters were obtained from the NOAA Data Access Viewer to aid in modifying the previous files to the historic coastline, islands, lakes, streams, and vegetation. These files were converted to polygons conforming to the T-sheets within 10 meters of accuracy and historic USGS topo maps were used to remove most docks and outlying artificial features. Lakes were clipped from the coastal shapefile as travel barriers. While Livingood's (2012:178) least cost model implemented stream flow rates as a time cost, only rates greater than 10 cubic feet per second (cfs) added a delay. Only 10 percent of the historic streams in Tampa Bay could be associated with modern streams with flow rates, which according to the NHD dataset were all less than 8 cubic feet per second (cfs) with a mean of 1.932 cfs. Therefore, streams drawn as a thin black line on the T-sheets were ignored as costs.

Due to the passage of time, modern land cover data did not conform well to historic vegetation, other than wetlands, making vector digitization and categorization for some vegetation necessary. T-sheet symbology was determined from a National Geodetic Survey (1949) topographic manual. The T-sheet vegetation layer included marsh and glade lands; cypress and mangrove swamps; coniferous, deciduous, and palm trees; and sand (Figure 3). To simplify the categories for costs (Table 8), Estabrook's (2012:223) vegetation costs were used as the primary basis along with Howey's (2007:1835) Michigan vegetation costs. Shapefiles and databases for modern soils were obtained from the USDA NRCS Web Soil Survey for the four counties covering my sample, merged into one shapefile, and categorized by drainage (Figure 4) – a fair proxy for general vegetation as marshlands tend to have poorly drained soils and forests have well drained soils (Møller et al. 2019:314). Vegetation (Table 8) and soil (Table 9) costs were determined based on educated guesses for difficulty in crossing and the strength of effect on each layer. The costs for vegetation were based on time in seconds for how long it would take to cross 10 m of a type of vegetation and the costs for soils were multipliers adding time to the vegetation.

Due to the difficulty of predicting how the least cost paths would be generated from initial costs, the default cost surface resulted in satisfying paths for 67 percent (130 out of 194) of my site pairs (16 out of the initial 210 pairs were skipped due to the obvious infeasibility for travel). To generate the remaining 33 percent, two other cost surfaces were made to include only travel over land (22 paths) by changing the water speed from 6 kph to 2, and only travel over water (43 paths) by clipping out the land and moving the site points to the nearest ocean cell.

Due to their location on a peninsula, 8MA79 and 8MA83 had two points used depending on the direction of travel. For the water-only paths, some additional time no more than half an hour should be factored into reaching their sites, in particular paths connecting to 8MA79, 8MA83, 8PI7, and 8PA10 due to the amount of land separating the site location from the shore. However, none of the paths for these particular sites were close to between five and six hours to complicate estimates for the farthest travelable sites. For 8PA10's paths only over land, 8PI44 across the river was used to reach sites to the south. Finally, for simplicity, the two mound sites without dates (8HI12 and 8MA79) were analyzed in both the Late Woodland and Mississippian periods when no change in the least cost clusters happened and included only in the Mississippian when there was a change. A distance matrix of all paths including the data used for my other analyses is in Appendix C.

Estimated travel times for canoes vary greatly due to measurements of different water bodies, wind and stream resistances, time spent canoeing, units of measurement, and cultural methods. Ames (2002:30-31) estimated dugout canoes traveling the Hood Canal in Washington could travel 64 km from Skokomish in 10 to 13 hours, averaging 2.7-4.4 kph in poor weather and 4.5-6.5 kph in good weather; Little (1987:58-59) measured a range between 16 to 32 km a day upstream and 45 to 145 km per day downstream (assuming 12-hour days for travel, this converts to 1.33-2.67 kph upstream and 3.75-12 kph downstream), based on accounts of French expeditions of North American rivers between the seventeenth and nineteenth centuries; and Livingood (2012) estimated 19 to 110 km a day downstream and 16 to 45 km a day upstream rivers (corresponding to 2-5.6 kph upstream and 2.4-13.75 kph downstream for 8-hour travel days) using similar sources to Little (1987). For my cost surface, I assumed marine travel to be faster than terrestrial travel to generate enough paths over water by default. Therefore, a consistent speed of 6 kph was chosen because of its plausibility as an average speed for a 10-12-hour round trip in a moderately loaded canoe across a small bay with favorable winds. According to the Windy Weather World service (Windy.app 2020a-c), wind direction is very well rounded for the entire Tampa Bay area, making an anisotropic cost surface featuring wind unnecessary. My speed of 5 kph as a base cost over level terrain was also used by Livingood (2012:178). To complete the cost surface, the T-sheet vegetation and soil drainage were converted to two 10-meter cell resolution rasters and merged together with the Raster Calculator tool by multiplying the costs of the two rasters (Figure 5).

While five-hour sites were Livingood's hard limit for a one-way trip, the seasons make a sizeable difference in how long trips were possible, especially at higher latitudes. Trips were most likely more frequent in the spring and summer, which have 12 to 14 hours of daylight in Florida (Time and Date 2020). If trips started right at sunrise, they would have allowed for a two-hour meeting in the spring and either a four-hour meeting or a two-hour meeting with sites six hours away in the summer. Most of the 23.5-km-radius extents from DBSCAN clustering ended up comparing very well with the least cost paths for most sites within five hours from another, once geography was accounted for, but LCA was better for paths that took more than five hours.

The straight distances and Thiessen polygons were made and measured with ellipsoidal calculations in the NAD83 geographic coordinate system for the project and shapefiles. The nearest neighbor analysis, DBSCAN clusters and buffer zones, least cost pathways, and Delaunay triangulation (used to measure areas between sites) were made and measured with Cartesian calculations in the NAD83 (HARN) variation of the Florida GDL Albers (EPSG code 3087) projected coordinate system.

Table 8: Vegetation categories and costs

USNGS 1949	**Howey 2007**	**Estabrook 2012**	**Speed Cost (kph)**	**Speed Cost (s/10m)**
Conifer trees	Forested	Pine flatwoods	5	7.2
Deciduous trees	Forested	Hardwoods	5	7.2
Mixed trees	Forested	Mixed woods	5	7.2
Palm trees	n/a	Sand pine scrub	4	9.1
Sand	Sparsely vegetated	Sand pine scrub	4	9.1
Glades	Non-forested wetland	Hardwood swamps	2	17.9
Marshes	Non-forested wetland	Hardwood swamps	2	17.9
Cypress (Taxodium)	Forested wetland	Mangrove swamps	1	35.7
Mangroves	Forested wetland	Mangrove swamps	1	35.7

Table 9: Soil costs

Soils	**Multiplier**
Water	1.0
Excessively drained	1.1
Well drained	1.1
Moderately well drained	1.2
Somewhat poorly drained	1.3
Poorly drained	1.4
Very poorly drained	1.5

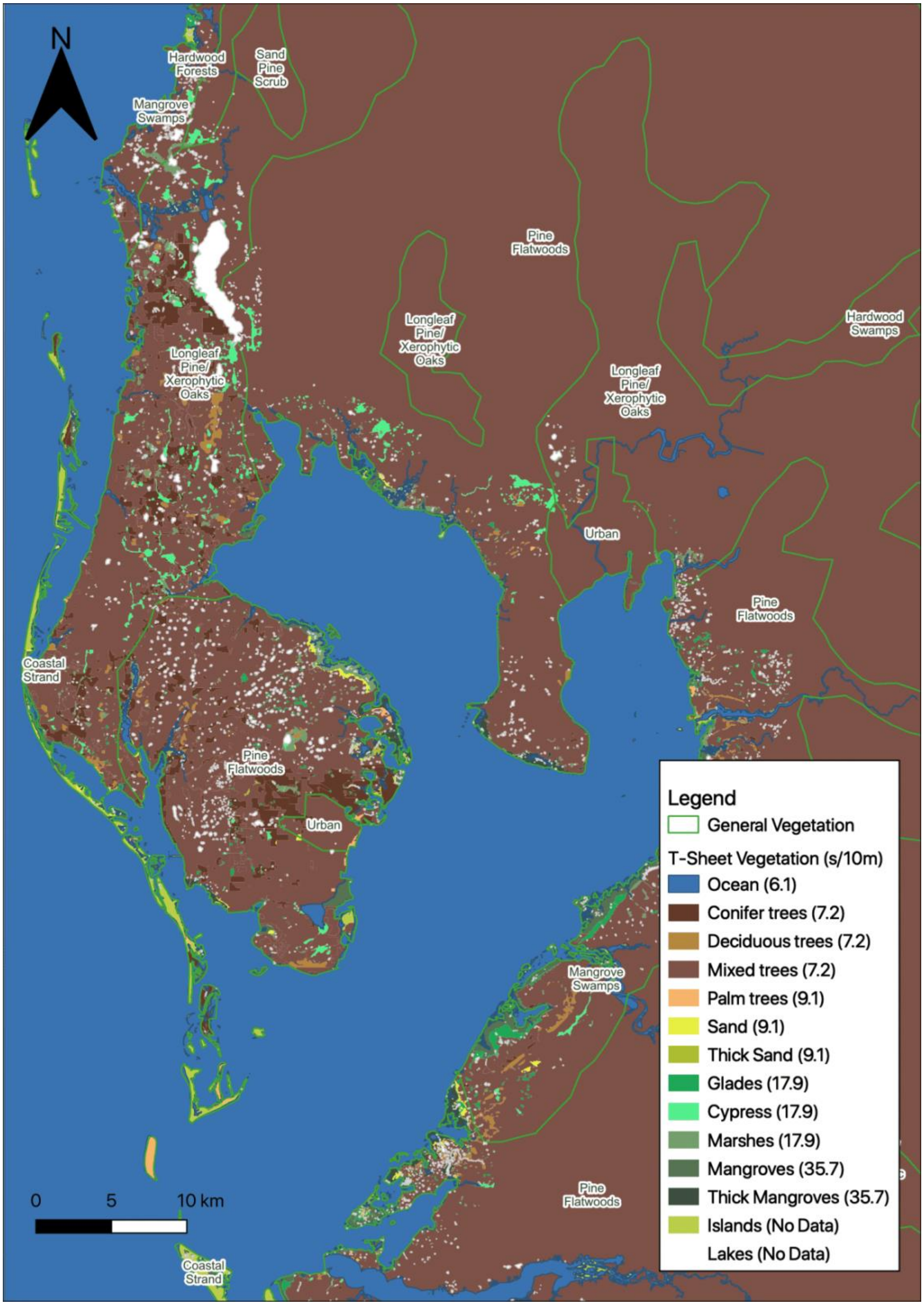

Figure 3: Vegetation based on Davis (1967) and T-sheets

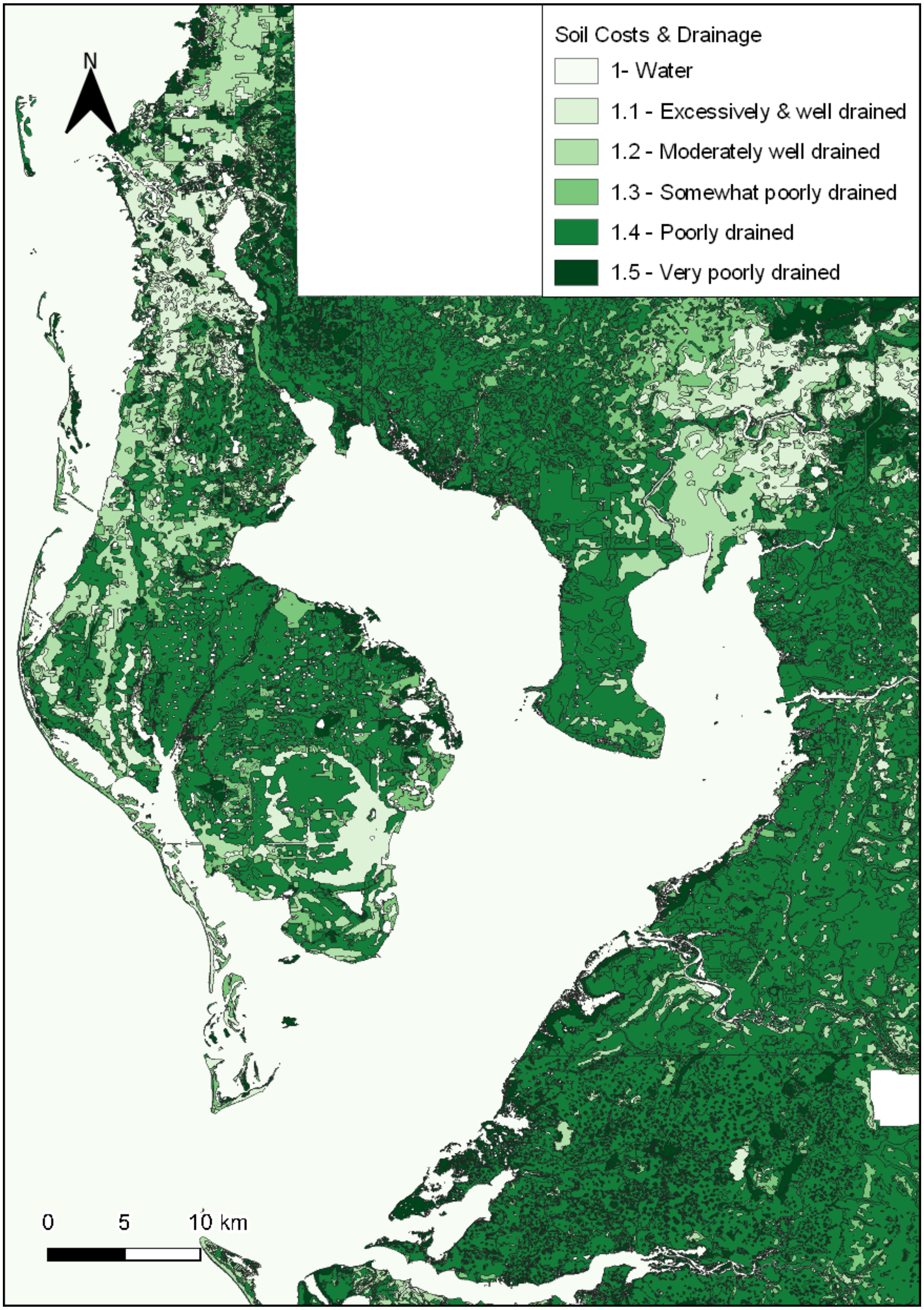

Figure 4: Soil costs and drainage

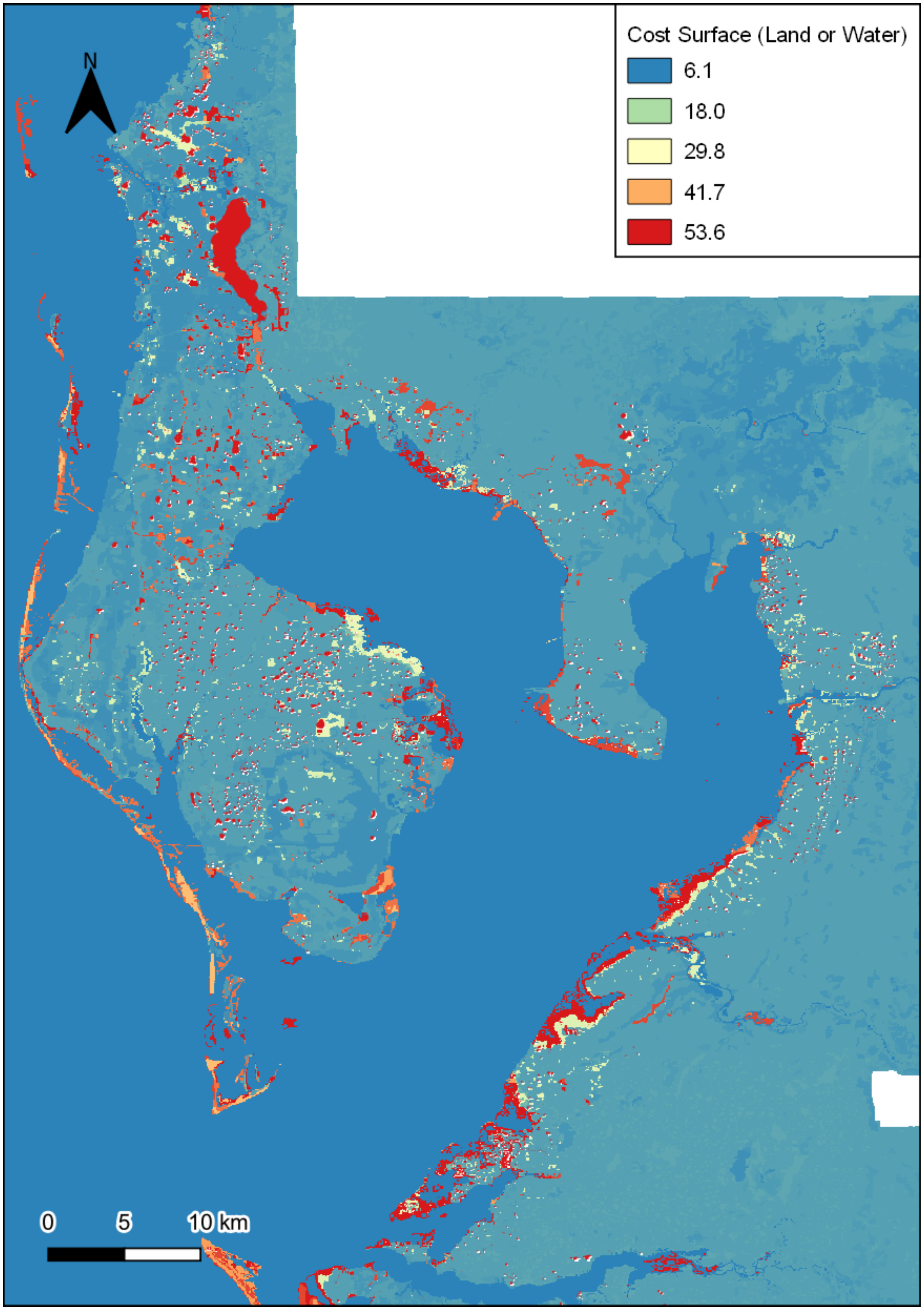

Figure 5: Cost surface assuming land or water travel
Note: White space represents space absent from vegetation and soil layers

Concerns

My methods are prone to errors involving the quality and objectivity of surveys, the accuracy of survey reports and site file data, limitations of LCA, and differences between regional studies. One of the largest limitations of my study, but also a source of inspiration, was the extent of site destruction in Tampa Bay. Beginning with Tampa's population growth around the turn of the twentieth century, most mounds have been destroyed by urban development and for road fill. Out of all the analyzed sites, only about half are listed in the National Register of Historic Places, giving them some protection, but most features have been demolished before any salvage archaeology was done. If these mounds ever had inspections, most were done during the infancy of American archaeology before it had developed standardizations and a firm knowledge of the region's cultural history. Early reports by Walker (1880) and Moore (1900, 1903) have been greatly appreciated and are better than nothing at all, but most of their accounts from Tampa Bay are concise and lack stratigraphic data (although Walker is known for detailing stratigraphy in other regions), cultural affiliations improved later by Willey (1949), and information about the villages and artifacts surrounding the mounds. Their notes mostly detail the mound's forms and sizes and associated burials and "notable" artifacts rather than the ceramic compositions and faunal taxonomy by layer, as well as features in the villages, that would have given a great deal of information about the timespan, subsequent changes, the sizes, and social complexity of the sites. As a result, it is nearly impossible to determine with any certainty if these former mounds or middens were used for secular, ceremonial, or elite purposes or if they were the centers of large villages that could have been sacred or political places. Determining the functions of shell heaps in Florida requires a great deal of analysis of the composition and surroundings. While excavations have greatly improved over time that make these hypotheses more testable, most mounds on the Florida coast have only deteriorated further making regional analyses a daunting task that must be filled in with guesswork and speculation.

The data in the FMSF, like all site files, is often limited by differences in survey goals, experience of surveyors, and time granted. Some sites are extensively surveyed and excavated with a report available that can guide research, but most surveys are phase I and II surveys mainly designed to determine NRHP eligibility rather than analyze the sites for research purposes. An experienced surveyor is more likely to fill in all information, recommended and optional, but a less experienced surveyor may only include rudimentary information such as site type, location, and very general artifact and feature descriptions. In addition, older site forms have far less information than those more recent. Most sites do not get follow-up surveys unless required by development, so many sites have been surveyed only a long time ago when site reports had minimum required information. In addition, survey locations and known sites are affected by bias due to economic circumstances being the most common determinant rather than more neutral research goals (Schieffer 2013:50-53). Platform mounds on coastlines are rarely discrete and situated in areas of high development – a double-edged sword making survey discoveries more likely but also more likely for destruction and harming research samples.

Time periods and cultural affiliations in Florida's digital MSF are very general and speculative, determined from cultural history diagnoses of ceramics or lithics, which had mixed accuracy compared to more modern but expensive techniques such as radiocarbon dating. After reviewing site forms and survey reports from the original FMSF, it was determined that many cultural affiliations in the digital FMSF were unfounded or contradicted those in the site files, such as in cases where affiliations were actually unknown, but cultures were speculatively named and accepted. It is sensible management to add hyperlinks in MSF databases to the site forms to improve quality control and corroborate data.

Despite these problems, using site file data for large-scale analyses can decrease the effect of errors as long as they are not pervasive, and still provide answers to research questions about landscapes and other concepts beyond single sites (Schieffer 2013:53). On the other hand, comparing or integrating different databases and regions can illustrate differences in quality and environments. Mounds in Georgia are made of materials with distinct sediment layers, compared to mounds in Florida made of dry sand and shells difficult to determine temporal duration and use. Many Georgia mounds also have better protection due to their general locations in more rural areas, whereas Tampa Bay's mounds are located in very dense urban areas. These characteristics make sampling mounds and determining coevality in Georgia less prone to error than the latter (Livingood 2012:174; Mitchem 1989).

Least costs analyses are limited by the number of variables the researcher can think of and obtain, and how much of the research problem can be quantified (White 2015:408). They are optimal scenarios that rely on information that no prehistoric human could have completely known and may partially resemble or completely deviate from actual routes, and they rely on the assumption humans evaluated time, energy, or other factors in choosing routes and valued efficiency over cultural factors such as social avoidance or ritual-based routes. LCA is useful for comparing to other spatial and network models to elucidate possible relations between sites, such as the sizes of territories (Livingood 2012) or potential resource locations (Estabrook 2012).

Hally had advantages to his study regarding dating that I was unable to replicate. Georgia Mississippian ceramics can be cross-dated to within a 100-year period (Hally 1999:100), whereas most Florida ceramics have a roughly 500-year timespan, and the extent of series cooccurrence and use of sand tempering make series distinctions more ambiguous. In addition to cross-dating, he used contemporaneous construction episodes that are relatively easy to establish for traditional earthworks, whereas Florida mounds are mostly made of sand and shell that are much more difficult to determine contemporaneousness. For my study, I have assumed all sampled sites were coeval for at least one subperiod of the Mississippian period, but this is far from guaranteed. Lastly, Hally's (1999:99) study area covered 55,000 km^2 of the state of Georgia, an area 16 times larger than the 3,500 km^2 of my study area, which may affect the distances measured and number of clusters.

Chapter 6: Results

Descriptive Statistics of the Distance Matrices

Hally (1993:148) determined that the distances between most coeval Mississippian mound sites, after all unique straight-line distances were measured and graphed, had a bimodal distribution that illustrated distances between chiefdoms and their maximum extents. Straight lines as opposed to following water bodies or least cost paths were chosen because historical documents and settlement patterns suggested direct, on-foot travel was the preferred transportation method between villages in Georgia. Out of 141 site pairs with contemporaneous components (1993:153-155), 29 were less than 18 km apart, 24 were between 18 and 32 km, and 88 were between 32 and 60 km. Sites 18 km apart or less were hypothesized to be part of the same chiefdom or administrative sphere (complex chiefdoms if the central site had multiple mounds and surrounding sites had one or less) while those more than 32 km apart were independent chiefdoms. After checking anomalies for sites that fell in between, he concluded only four were exceptional and the others had multiple contemporaneous mound-building episodes that could be measured differently.

The correlation between settlement patterns and environmental features has often been studied and Hally considered their effects on site distances. He noted that rivers in northern Georgia are often separated by 40 km or more, which could theoretically explain his measurements, but measuring contemporaneous sites on the same river revealed the same bimodal patterns (1993:156). In the Piedmont bioregion, there was a strong correlation with site locations and floodplains with two clusters near rivers crossing the Great Smoky Fault, a transitional zone into the Valley and Ridge bioregion where the site-soil connection became weaker. Therefore, factors other than rich soils affected site distributions in North Georgia. In the case of West-Central Florida, where soils are acidic and poorly drained and transportation by boat should have been widespread, the distances ended up being completely different.

Based on evidence that most platform mounds in the region were constructed or occupied during the Late Woodland, Mississippian, and Contact periods, I created distance matrices representing the three periods (Appendix C), visualized them with histograms and box plots (Figures 6-11), and ran descriptive statistics in SPSS (Table 10), doing the same for Hally's (1993) data for comparison. For all time periods in the Tampa Bay sample (Figure 6), the general distribution remained stable but with changes in the fourth quartile, where the farthest distances were distributed. The mean distance between roughly contemporaneous mound sites slightly decreased over time from about 35 to 31 km, the median remained stable between 30 and 32 km, and the interquartile range changed the most between the Late Woodland and Mississippian. The skewness shifted most between the Mississippian and Contact periods, from moderately positive (more smaller values) to barely negative but closer to normativity. The kurtosis was negative (a flat distribution) in the Late Woodland and Contact periods but positive (a narrower distribution) in the Mississippian. The Kolmogorov-Smirnov test tests for normativity and determined only the Contact period distribution was normal.

In contrast with the Tampa Bay samples, the distribution of Georgia Mississippian mound sites distances (Figure 9) exhibited a higher mean and a much higher median than any other samples, stronger negative skewing, and greater distributions in the third and fourth quartiles. The distribution displays a bimodal distribution with few distances between 11 and 40 km (an outlier exists at 22 km) consistent with Hally's hypothesized break between 18 and 32 km that is much clearer when mound layers are used to determine contemporaneousness).

Table 10: Descriptive statistics for contemporaneous mound site distances (km)

	Late Woodland	Mississippian (FL)	Contact	Mississippian (GA)
Count	66	210	141	45
Mean	34.970	32.438	36.178	31.378
Variance	453.599	308.659	332.675	238.786
Std. Deviation	21.298	17.569	18.239	15.453
Minimum (Q0)	2	2	0	2
Q1	18.75	19	22	20.50
Median (Q2)	30.5	31.5	45	31
Q3	50.5	44	51	47
Maximum (Q4)	83	83	58	57
Range	81	81	58	55
Interquartile Range	31.75	25	29	26.50
Skewness	0.594	0.559	-0.735	-0.040
Kurtosis	-0.618	0.057	-0.942	-0.917
Significance of One-Sample Kolmogorov-Smirnov Tests	0.001	0.007	0.000	0.200

The map of sampled Late Woodland mound sites (Figure 22) shows that, with two exceptions, 8PA2 and 8PA10, they clustered in the southeast of the bay with none in Old Tampa Bay or the Gulf Coast side of Pinellas Peninsula. The distribution of site distances (Figure 7) has strong kurtosis with the only range with a high frequency being the distances between 18 and 21 km. This is close to the break Hally found after 18 km, but unlike in Georgia there is no tendency for mound sites to settle at consistently far distances. This suggests a preference of consistent, medium-range distances between Late Woodland villages with early mound construction but with little distinction between clusters that could distinguish polities.

For the Mississippian period (Figures 1 and 22), it is plausible based on the available data all sampled sites were utilized, but only six sites within a 21-km radius on the Pinellas Peninsula newly formed, possibly due to interest in Old Tampa Bay and Long Bayou or due to a need for the upper Gulf Coast sites to join social networks in the south – both possibilities are inclusive. The distribution of all Mississippian site distances in Tampa Bay (Figure 8) has similar skewness but less variance and kurtosis compared to Late Woodland distances, and a much broader distribution of distances between 15 and 40 km with only a minor break roughly between 22 and 30 km. The positive skew and lack of multiple clear modes makes it fundamentally different from Georgia mound site distributions and make cluster distinctions as well as distance preferences ambiguous. If the bin size is changed to five kilometers to confirm these patterns (Figure 11), there are still no multiple modes and the high frequency around 30 km and low frequency around 25 and 40-50 km are more apparent. These drop-offs may represent light restrictions that somewhat distinguished polities, but given that wetlands were plentiful in Tampa Bay, buffer zones would have been less necessary except during stressful conditions such as climate change and warfare. The distribution of Mississippian site distances in Georgia (Figure 9) differ in almost every respect. The mean and median are higher due to the negative skew, skewing and kurtosis are stronger, and the upper quartile ranges have higher frequencies than any other quartile.

The Contact period (Figures 10 and 24) experienced the greatest change with the loss of half of the mound sites and two bimodal peaks around 30 and 50 km. Even with the range and fourth quartile reduction, the median remained close to the previous period. It has the least skewed distribution but strong, negative kurtosis. While the distribution of high frequencies started at 20 km in the Late Woodland, it shifted to 30 km in the Mississippian and Contact, with sparser distributions in the latter. Even with the kurtosis, it had the lowest variation of all the samples. The 5-km bin size (Figure 11) reveals the bimodality is as strong as the Georgia

Mississippian distances but with one of the peaks in the distribution's center rather than its ends. In addition, the break between 35 and 50 km is clearer than the one between 10 and 25 km Although the boxplot is similar to the Georgia Mississippian mounds, the median differences make the Contact distribution more similar to the preceding Florida Mississippian distribution.

In summary, at the beginning of the prehistoric Florida periods when platform mounds were most likely constructed and occupied, distances between contemporaneous sites had a strong tendency to cluster between 15 and 25 km, roughly at the start of a break in mound distances in Georgia, but did not have clear breaks distinguishing polities. In the Mississippian, the distribution begins to coalesce around a variety of distances, including 15-25 km and 30-35 km, but a break between 18 and 32 km is not clear but possible. In the Contact period, the range and number of sites drop abruptly, creating a more dispersed settlement pattern, but the distribution remained similar to the previous period. It was the only Florida sample to exhibit a bimodal distribution like in Georgia but with more sites in the center that do not match Hally's hypothesized breaks. All of Florida's periods consistently have fewer distances after 35 km, but the lack of peaks afterwards makes distinguishing clusters less clear than in Georgia.

As natural features and ecological characteristics impact settlement patterns to an extent, it is worth considering how they may affect mound site locations. The Tampa Bay sample covers a grid of approximately 3,500 km^2, with a greater number of contemporaneous sites in a smaller region than what Hally studied in North Georgia. The large number of distances between 18 and 32 km or the paucity of distances after 35 km may be a result of the bay's shape – if the bay is often 18 to 32 km wide, this would be the main cause. However, of the distances between 18 and 32 km (Figures 12 and 13), many cross over large extents of land and there is not extensive clustering in the high-percentage distributions. Therefore, the bay's shape cannot be the main cause. On the other hand, a visual inspection of Late Woodland sites appears to show half of the distances between 15 and 25 km cross the bay, forming a pattern similar to a truss bridge, so it may be possible early sites were strategically triangulated using the bay as a basic measuring stick. Yet for the Contact period sites, site distances between 18 and 32 km also only cross the bay half as much, so the relationship between distances and the bay size is more apparent in the earliest period than overall.

Predictive modeling is used to determine places with a high probability of containing sites based on environmental variables related to where recorded sites have been previously found. Woodland and Mississippian villages in coastal Florida were often settled near locations favorable for transportation and gathering resources including freshwater sources, rivers, and bays. Out of the 21 sampled mound sites in Tampa Bay, eight are located on the shores of bays and eight at the mouths of major rivers (Figure 1). According to Fuhrmeister's (1992:47-51) predictive model for archaeological sites in Manatee County, 80% of all sites were within 300 m from a water source, 49% of coastal sites were less than 50 m from bay resources, 77% of all site occurred within poorly drained and very poorly drained soils, and most sites clustered near large rivers than smaller streams – all in line with Tampa Bay's platform mound sites. This implies that access to coastal resources was more important than access to freshwater, but freshwater sources changed frequently due to climate change and the bias of most surveys performed near the coast where development is most common should be factors to consider. Fuhrmeister observed that burial mounds did not exhibit any patterns that implied cultural factors were stronger than environmental factors. While an expanded predictive model is beyond the scope of this project, the prevalence of platform mounds near the coast and marshlands suggests the environment was a larger factor in where they were constructed than burial mounds, but whether it is the strongest factor in determining site distances is not clear from the distance matrices.

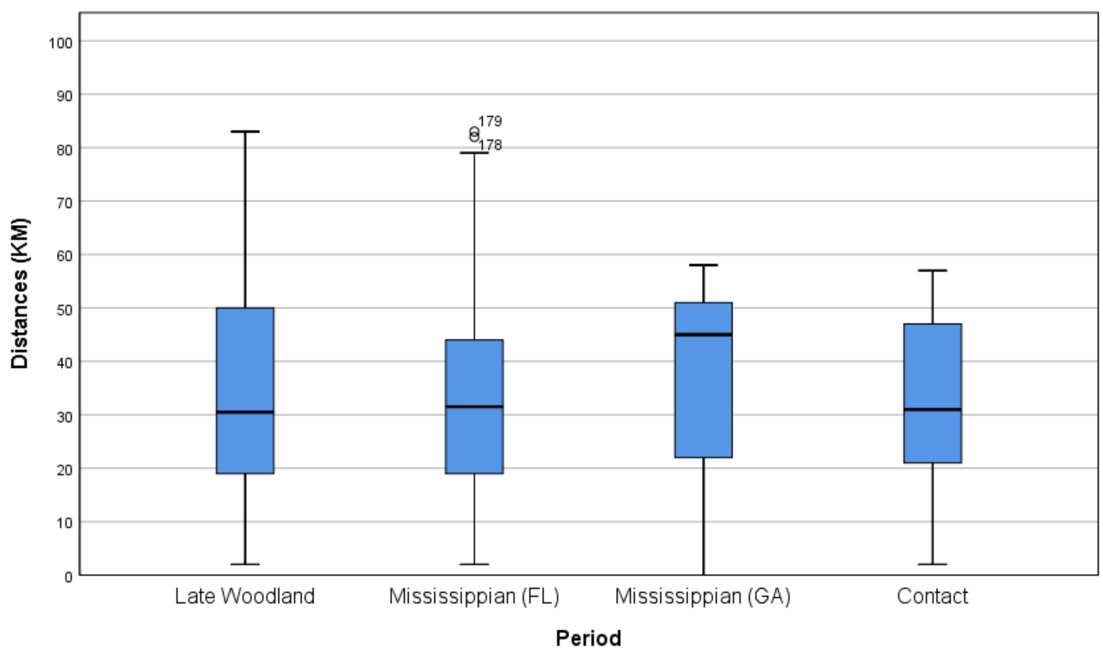

Figure 6: Box plots of site distances by period

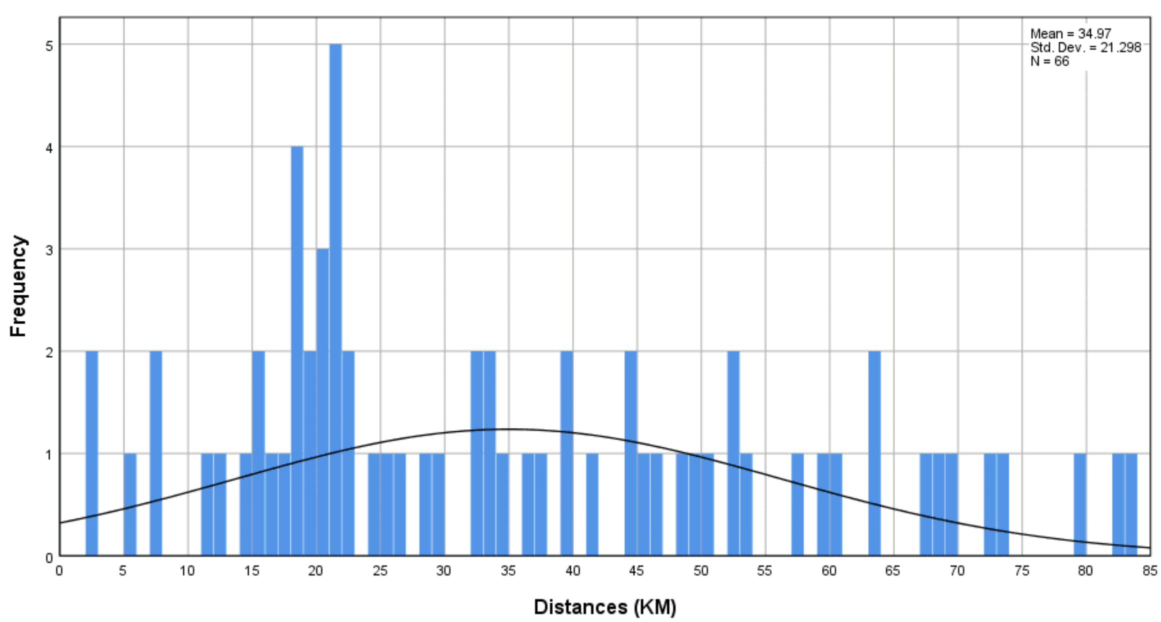

Figure 7: Histogram of Late Woodland site distances in Tampa Bay

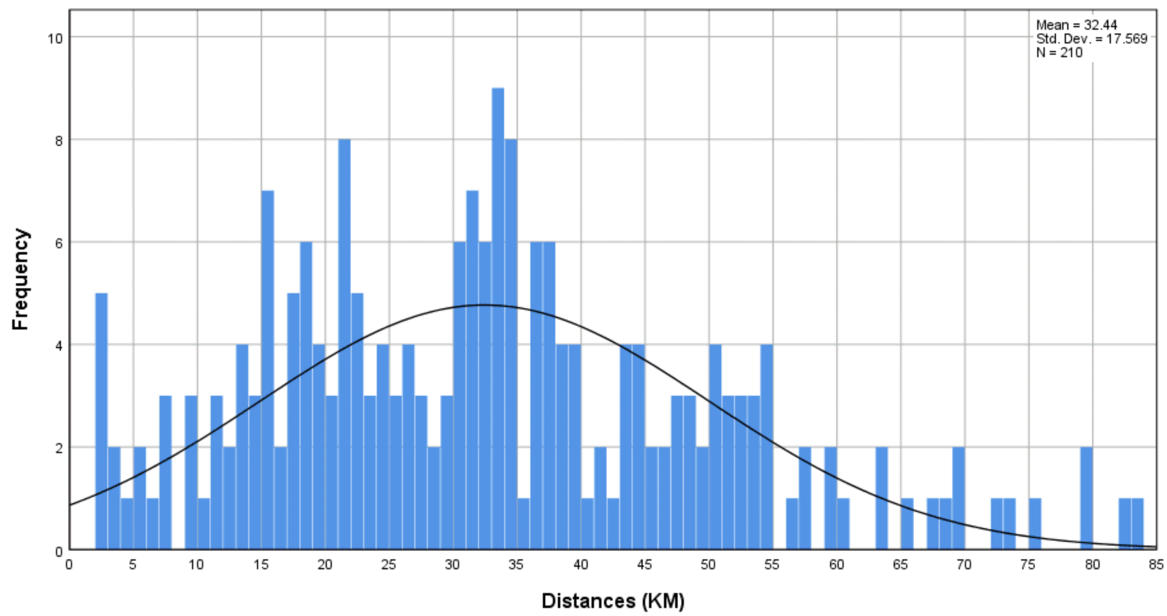

Figure 8: Histogram of Mississippian site distances in Tampa Bay

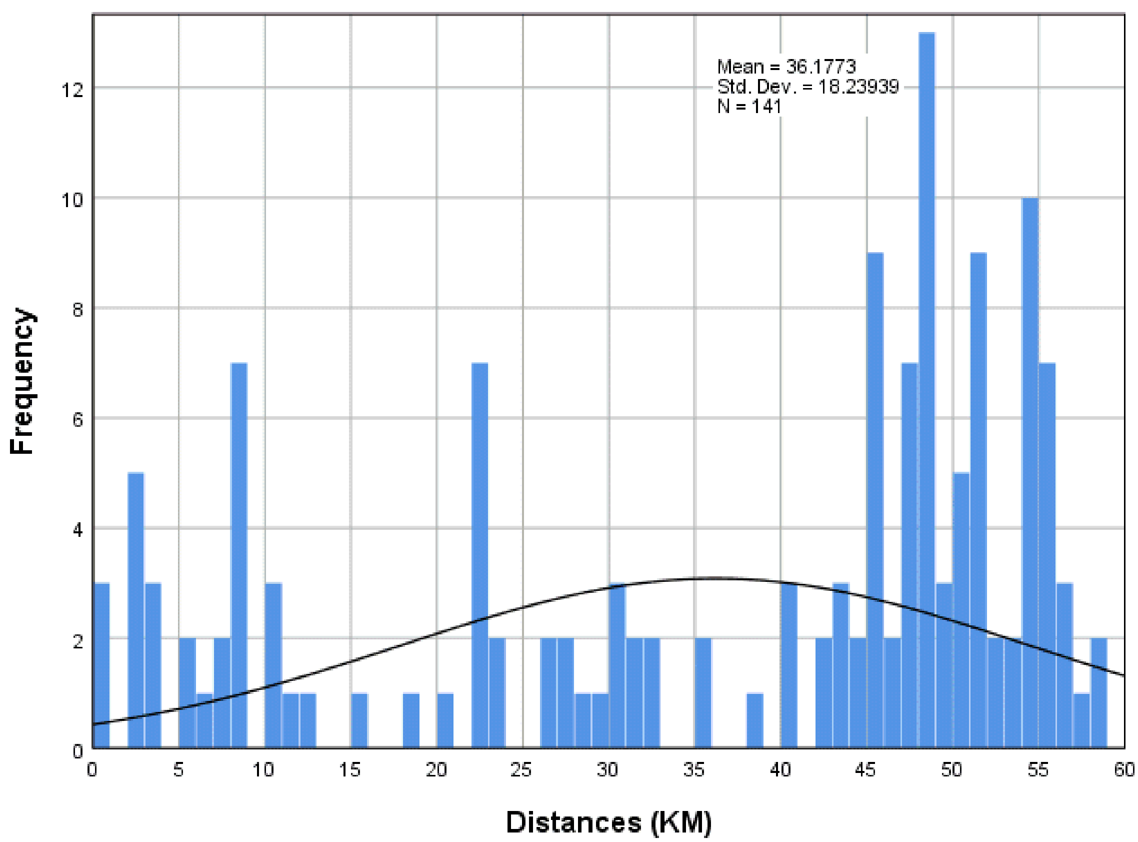

Figure 9: Histogram of Mississippian site distances in North Georgia

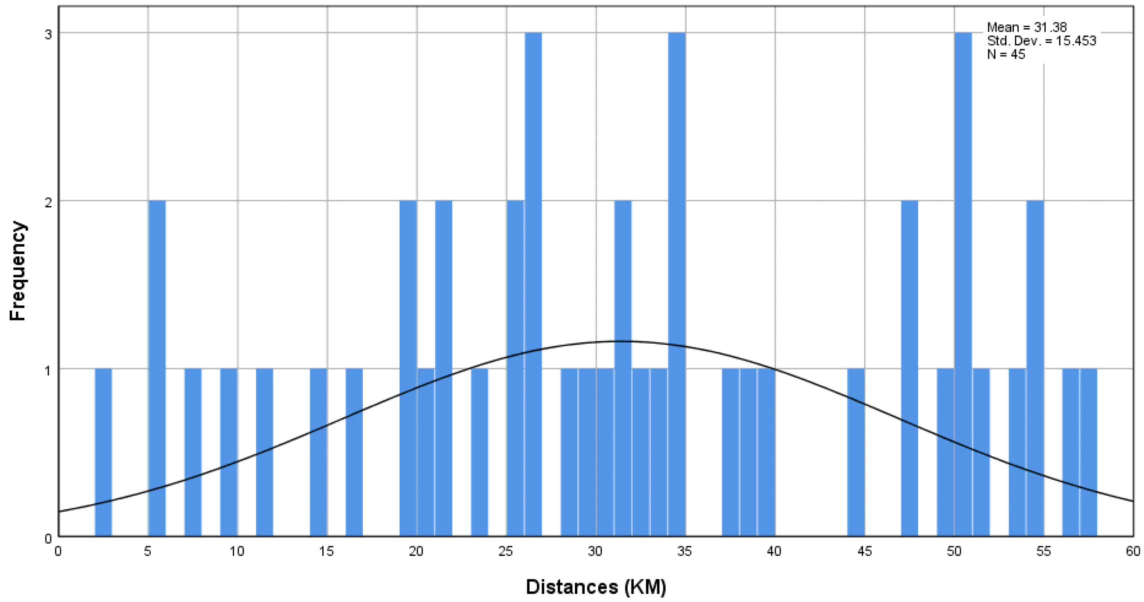

Figure 10: Histogram of Contact site distances in Tampa Bay

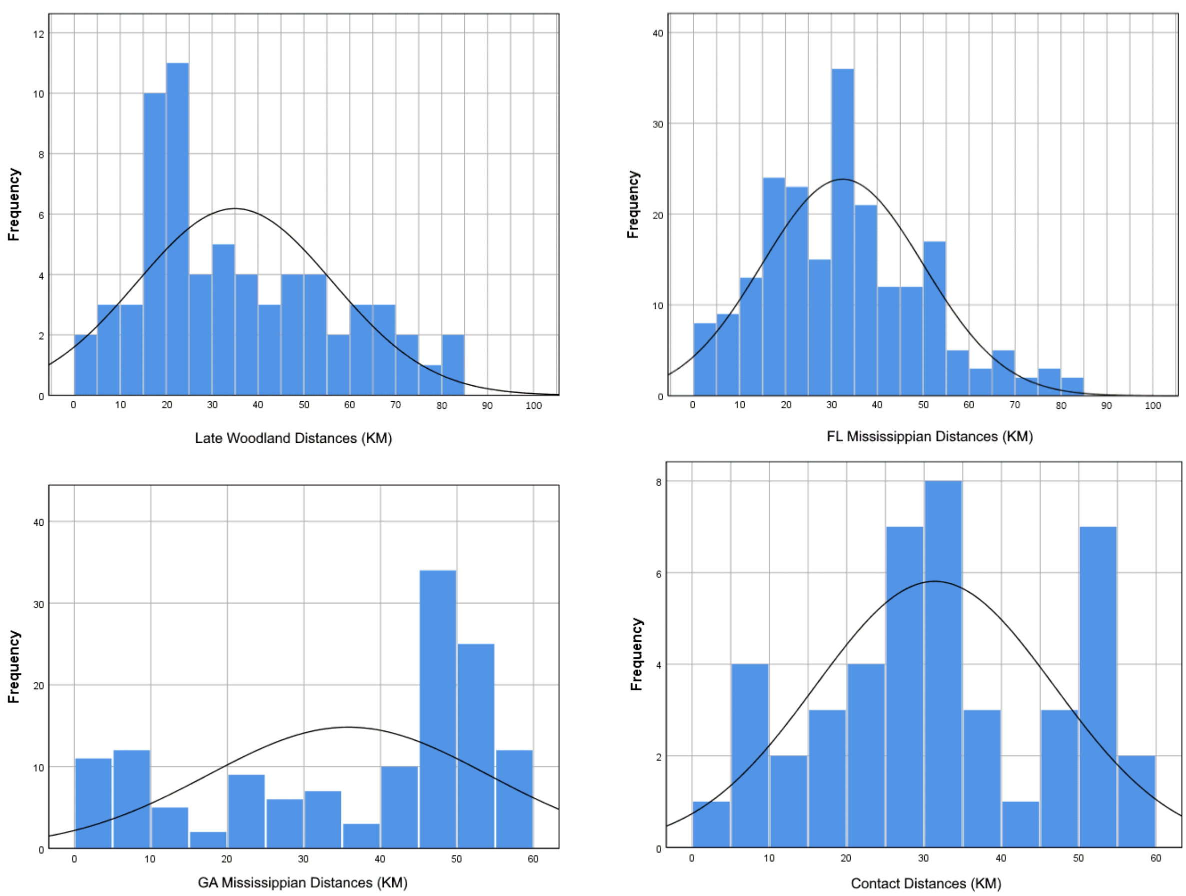

Figure 11: Site distance histograms with 5-km bin sizes

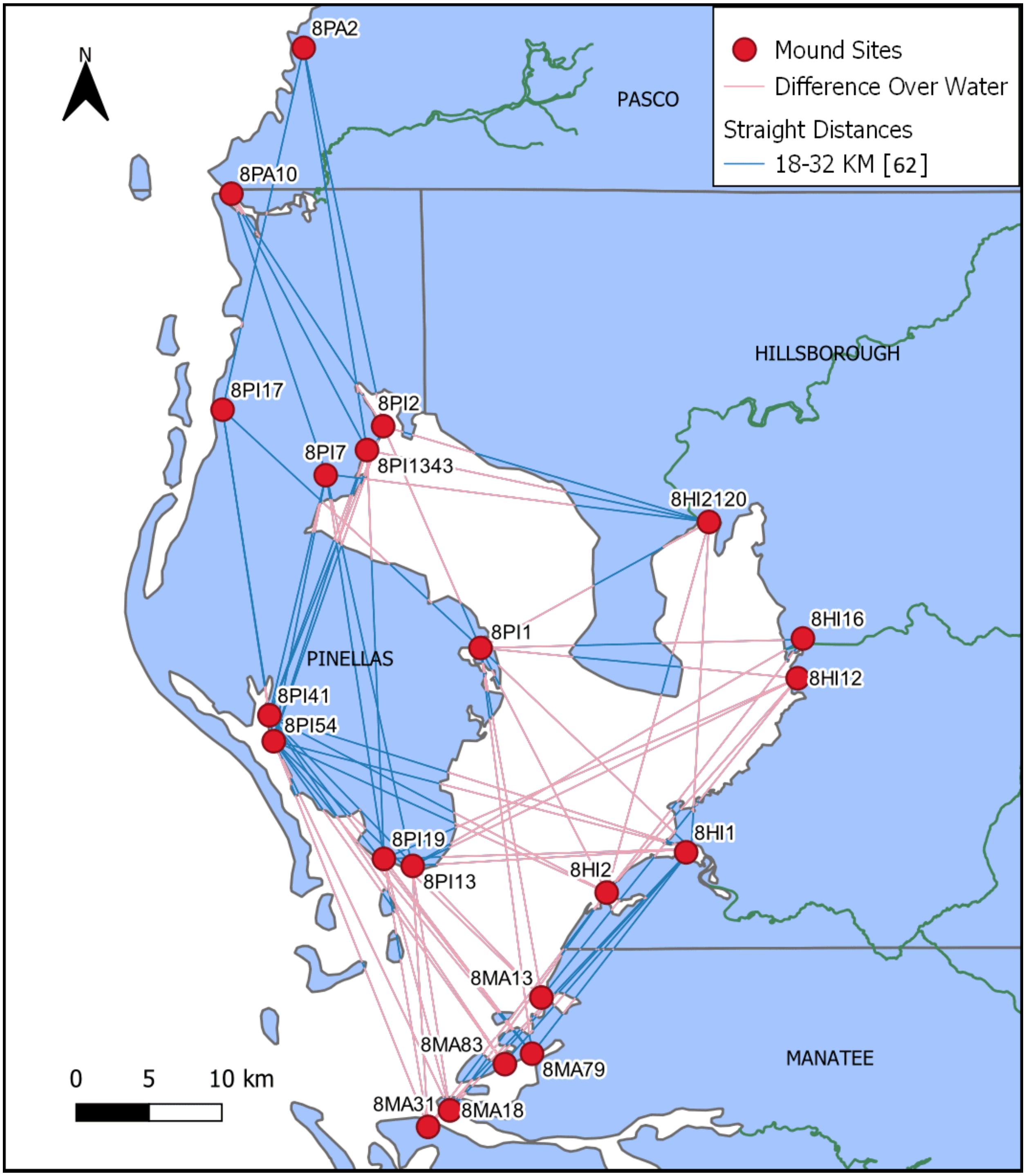

Figure 12: High-frequency straight distances

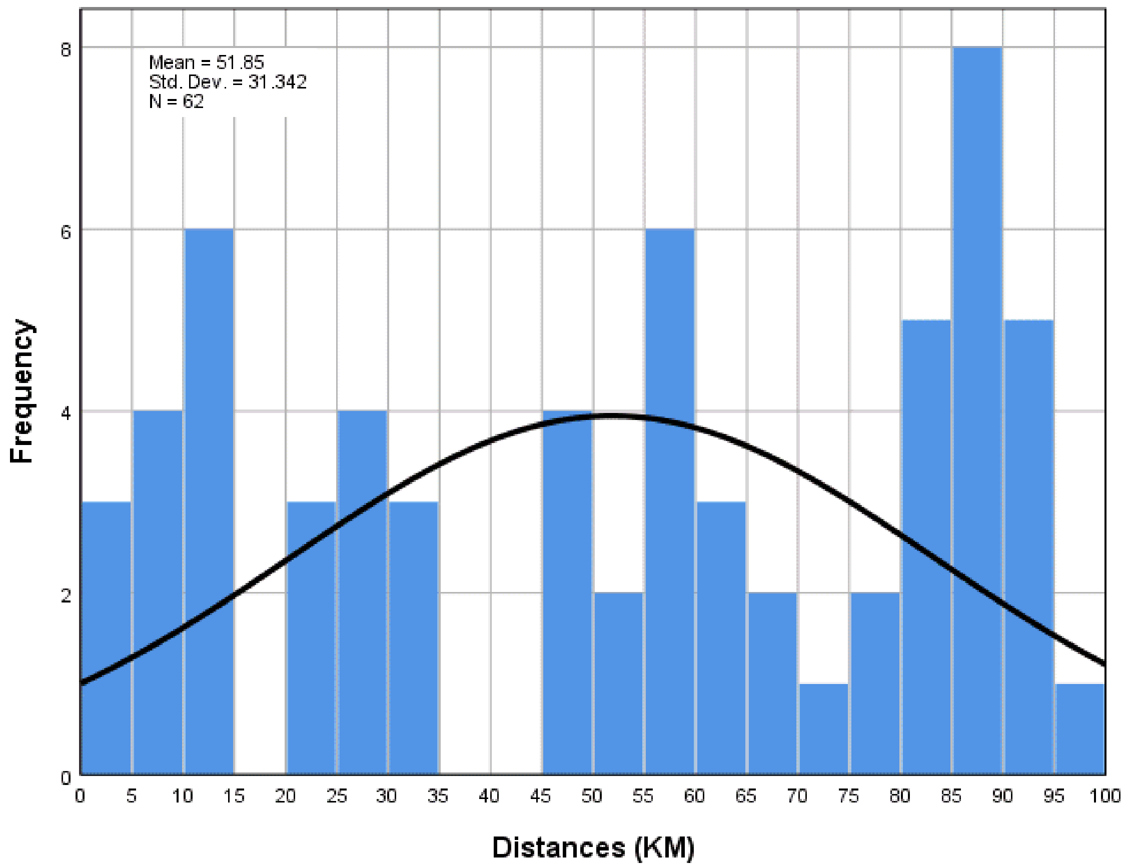

Figure 13: Histogram of high-frequency straight distances

Density and Cluster Analyses

Results from a nearest neighbor analysis (Table 11) show trends consistent with the distance matrix histograms and suggest spatial clustering of mound sites only existed in Tampa Bay in the Mississippian period but not as explicitly clustered in Mississippian Georgia. Distributions in the Late Woodland fall well within the random range (Z-scores between -1.65 and 1.65) but start to become more clustered in the Mississippian, falling in a nebulous range between random and clustered, with sites clearly dispersed in the Contact. In contrast, Georgia Mississippian sites have a highly clustered Z-score. The mean distances for all Florida periods are smaller than in Georgia due to the smaller sample area in Tampa Bay, which dampens the effects of clusters separated by long distances.

Table 11: Nearest neighbor analysis results for contemporaneous mound site distances (km)

	Observed Mean	Expected Mean	Index	Z-Score	Distribution
Late Woodland	7.5	8.3	0.9	-0.6	Random
Mississippian (FL)	5.1	6.3	0.8	-1.7	Slightly Clustered
Mississippian (GA)	15.6	22.5	0.7	-4.0	Clustered
Contact	9.8	6.8	1.4	2.7	Dispersed

Thiessen polygons work better at visualizing density than their previous applications at estimating territorial boundaries. When smaller polygons, corresponding to denser site clusters, are restricted to linear features like a coastline, they tend to create long thin polygons that do not conform to the environment or a personal perception of space. However, they are used here to visualize the spatiotemporal changes in site clustering and potential trends in using resources. They have been restricted to a 20-km buffer from the coastline (a plausible extent people would have traveled out to sea) and colored from lightest to darkest by area. The polygons show that in the Late Woodland (Figure 14), the densest region was the mouth of Tampa Bay, between the Manatee and Little Manatee Rivers, with a cluster of six to seven sites. Notably, the eastern side of this area had a particularly long stretch of wetlands, according to historic T-sheets. 8PI19 and 8MA31 should show higher densities, but the lack of a clear outer boundary from the Gulf Coast misleadingly enlarges their Thiessen polygons. The inner bays east and west of Hillsborough Peninsula, (Hillsborough Bay and Old Tampa Bay, respectively) were somewhat dense with four sites located within a 22-km diameter. In addition to three sites located at river mouths, wetlands were plentiful around most of these sites except for 8HI2120, but the historic urbanization probably destroyed prehistoric wetlands in the area. Only 8PA10 and 8PA2 are unusually isolated and are both located on dry land near wetlands.

The polygons show Mississippian densities increased across Tampa Bay (Figure 15), especially with the addition of three new sites in Old Tampa Bay that may have developed from population growth from Weeden Island. The relative isolation of 8HI2120 appears to be due to Hillsborough Peninsula restricting travel to the sites immediately south. The revival of 8PI41 from the Middle Woodland period and the addition of 8PI54 show increased interest in Long Bay and expansion along the Gulf Coast, possibly from 8PI13 or 8PI1. The density in the north shifts from 8PA2 to 8PA10 and 8PI17, which were relatively close to 8PI2 (Lake Tarpon may have made travel more reliable), but it begs questions about the currently ambiguous age and cultural association of 8PA10 and how 8PA2 was able to persist in such isolation, farther from the Crystal River site (8CI1) than 8PI1.

During the Contact Period, based on currently known presence of Spanish artifacts, Thiessen polygon areas increased for most sites (Figure 16), with small pockets of denser regions around Tampa Bay's mouth and Old Tampa Bay, but, according to nearest neighbor analysis, most sites increased in dispersion but were not particularly isolated. Ethnographic accounts from Narvaez and De Soto claim two powerful rival chiefdoms, the Tocobaga and Uzita, were located somewhere near these dense regions with the Mocoso chiefdom located somewhere north or east of modern Tampa. Even during colonialism, at least initially, it is possible most of the sites that were still inhabited relied on each other for support and stability, but they no longer enjoyed the reach of control or unity they had in previous periods.

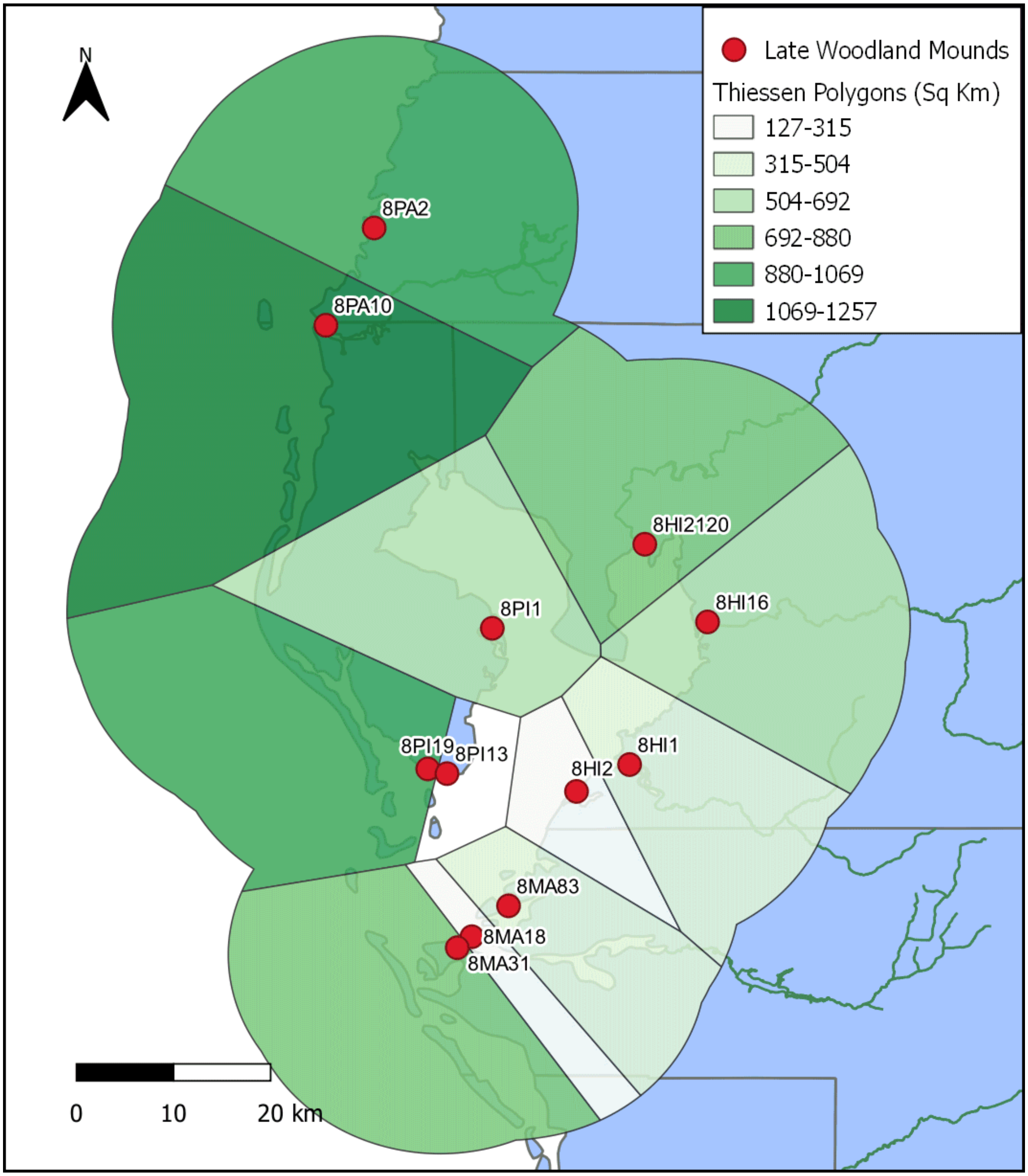

Figure 14: Thiessen polygons of Late Woodland mound sites in Tampa Bay

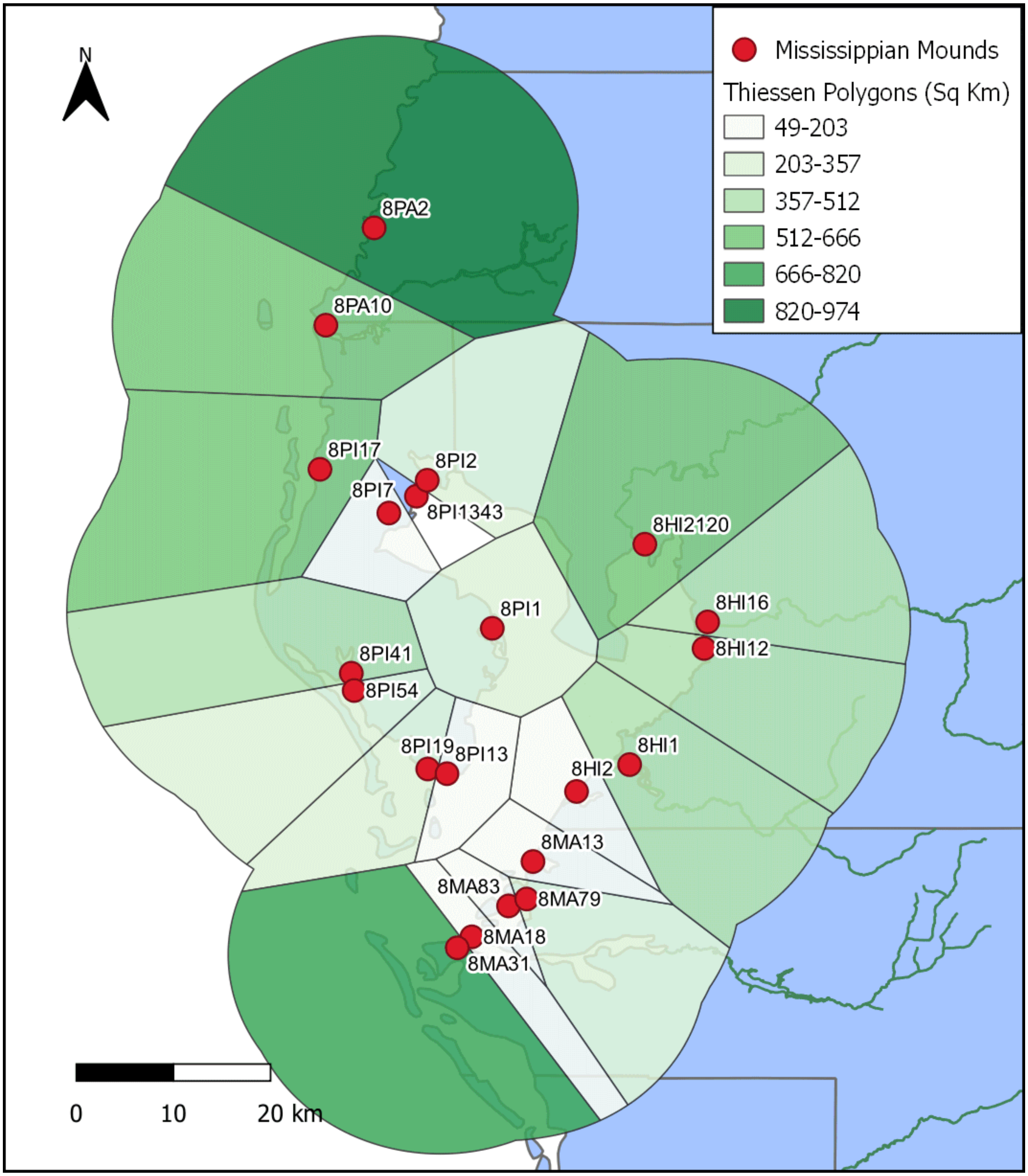

Figure 15: Thiessen polygons of Mississippian mound sites in Tampa Bay

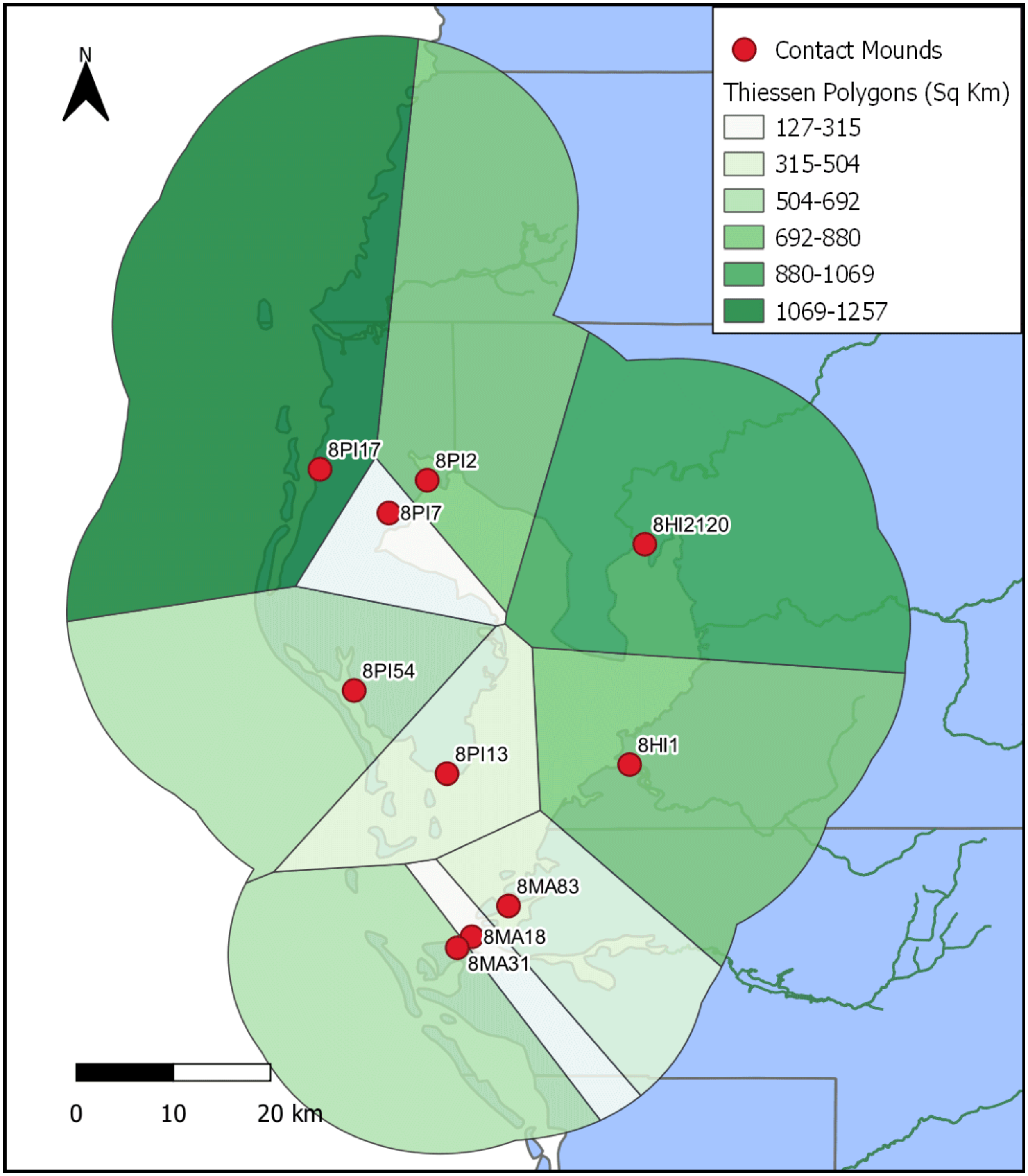

Figure 16: Thiessen polygons of Contact mound sites in Tampa Bay

According to Hally's line of reasoning, the beginning of breaks in distance matrix distributions corresponds to the maximum distance between two mound sites before they are considered members of the same polity, whereas the ends of breaks correspond to the minimum distances between two sites that acted as polity centers. His concept corresponded very well with DBSCAN clustering, which was invented a few years after his first study was published (Schubert et al. 2017). Hally's map (1999:108) identified 27 chiefdoms based on the centermost site of clusters, whereas DBSCAN clustering with an 18-km maximum distance found 12 clusters (complex chiefdoms) and 10 isolated sites (simple chiefdoms) (Figure 17). DBSCAN clustering was done in Tampa Bay on the three periods with parameters of a minimum cluster size of two and maximum distances between points based on the beginning of the first breaks in distributions: 21.5 km for the Late Woodland and Mississippian periods and 26.5 km for the Contact period. Not only is 21.5 km close enough to the 18-km break, both values closely correspond to the farthest distance a person could walk over level forested terrain for half a day, i.e. 4.8 kph for 5 hr.

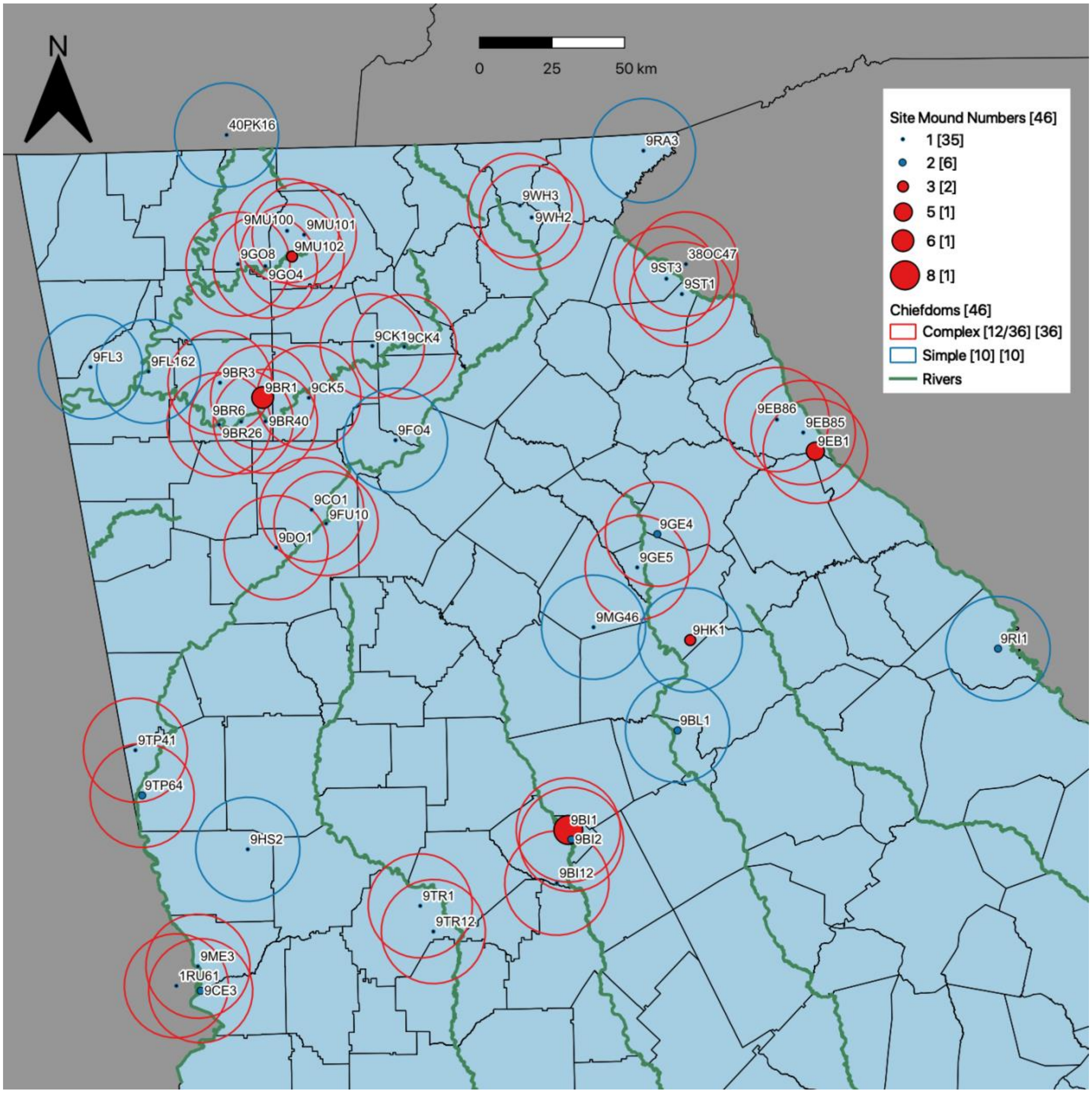

Figure 17: DBSCAN clustering of Georgia chiefdoms

The Late Woodland had two clusters (Figure 18) with all ten sites in the southeastern bay section in one cluster – four more than even the largest cluster in Georgia, which suggests few mound sites in Tampa Bay could have been administrative centers, but based on the cluster's center would most likely have been the sites near the mouth of the Little Manatee River. The cluster itself had a 21 by 50-km extent (8HI2120 is the only site clearly outside the radial extent from 8HI1), about the length of the largest Mississippian chiefdoms in the Lower Southeast chiefdoms but average in area, in addition to a greater area possibly acting as a buffer zone. Not only are 8HI1 and 8HI2 old enough to have established themselves as large, developed villages, the latter has two elevated features that could have been used as platform mounds, making it one of the likeliest multi-(platform)-mound sites in Tampa Bay. Both sites also feature a large amount of Weeden Island and Glades ceramics making a close, contemporaneous relation very likely.

There was only a single DBSCAN cluster of 21 Mississippian mound sites (Figure 19), but a 21.5-km radius is not enough to contain every mound site, as implied by the clustering. At most, 13 sites are within the radius around 8PI1, 12 sites around 8PI13 or 8PI19, or 11 sites around 8HI2. Either of these sites would have made an unlikely large polity via the number of sites even at the peak of the Mississippian, so DBSCAN further supports the likelihood that some of the mound sites, including clear settlements, could not have been administrative centers. While not supported by DBSCAN, it is not only possible but likely, based on Spanish accounts, a northern and southern chiefdom existed. However, their radii would have overlapped if they were close to 21.5 km unless the southern chiefdom was closer to the Manatee River. In addition, the largest clusters would unlikely have corresponded to chiefdom status, unless there are more clusters than implied by DBSCAN.

The Contact period also had a single DBSCAN cluster with a maximum distance of 26.5 km (when 21.5 km is used, 8HI2120 is flagged an isolated outlier) and none of the sites are near the center (Figure 20). Two clusters around 8PI2 and 8PI13 form only when the radius is reduced to 18 km, rendering 8HI1 and 8HI2120 isolated, with the first two strong candidates for chiefdom centers based on archaeology and ethnography. While 18 km is not supported by the distance matrices or DBSCAN clustering, it fits well with their least cost paths (Figures 24-26) and it may be possible chiefdom areas on coasts were allowed some leeway, due to limited space, in overlapping at their edges. While DBSCAN clustering works well when clusters are very distinct (i.e. corresponding to low nearest neighbor indices) and separated by long distances, it seems to be limited by geography on the coast and is less supported from breaks in distance matrix histograms the way inland mound sites are.

Least Cost Analysis

The least cost analyses (Figures 21-23) appeared to give the clearest patterns in the possible relationships of Tampa Bay's mound sites, due to travel time being one of the likeliest factors a Native person would have been able to perceive (Livingood 2012:177), as opposed to geostatistical concepts such as nearest neighbor and clustering. However, they share and reinforce some characteristics regarding which sites may have been related the most and all consistently uphold Tobler's first law of geography: "Everything is related to everything else, but near things are more related than distant things" (Tobler 1970). Applied to Blitz's (1999) fission-fusion model, their geographical and social relations changed as multiple sites changed in how near or far they were from one another.

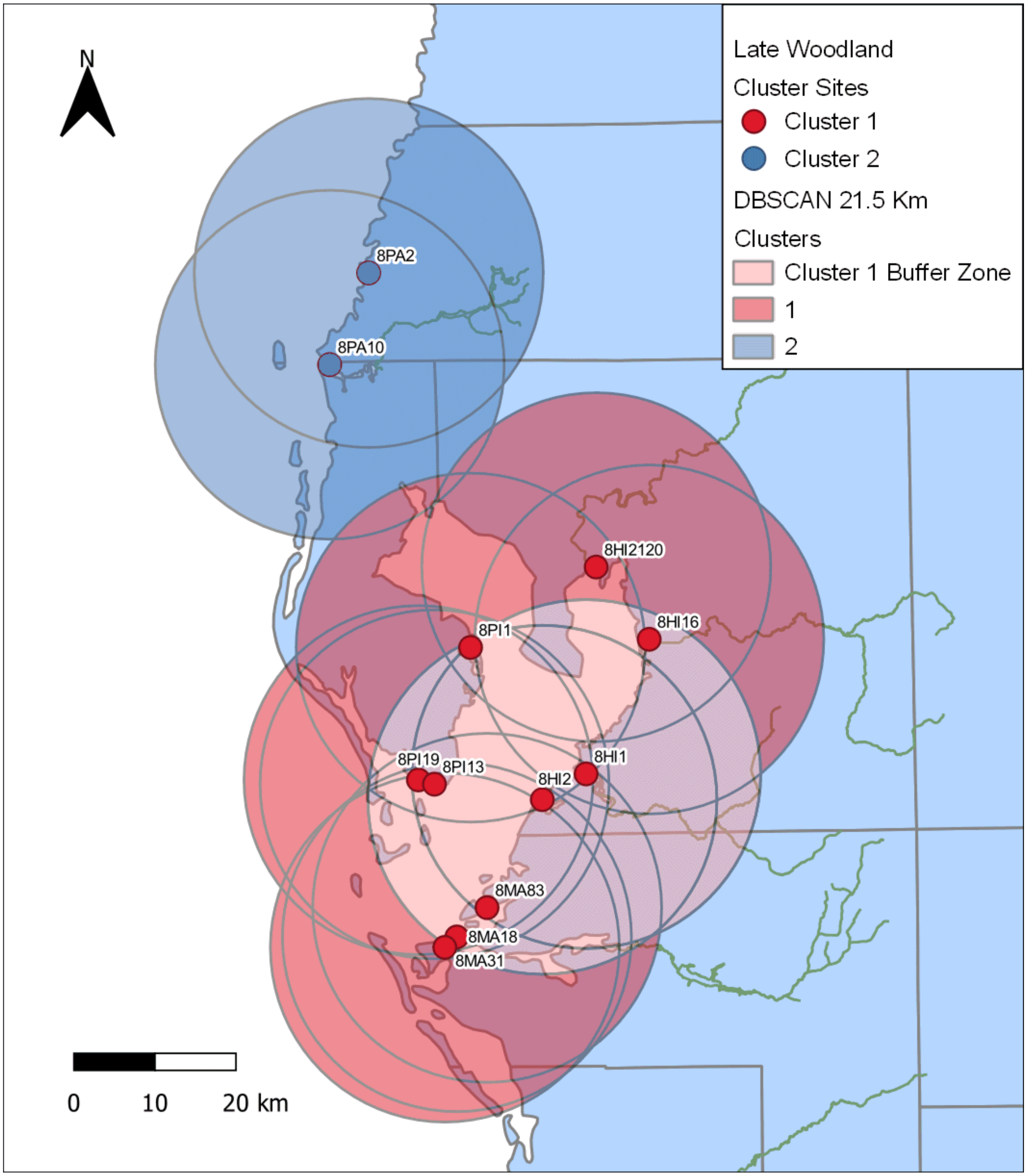

Figure 18: DBSCAN clustering of Late Woodland mound sites with 21.5-km buffers

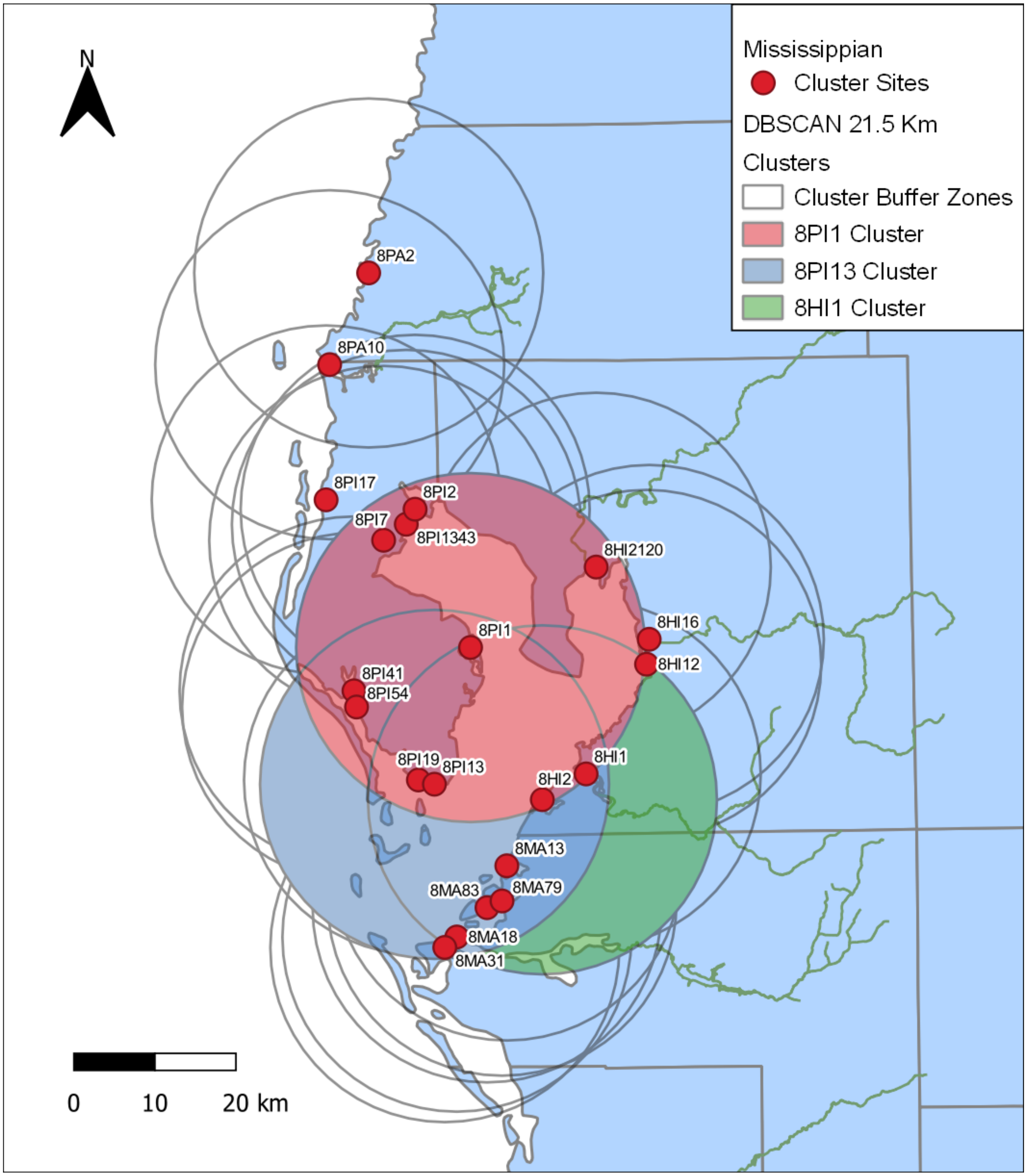

Figure 19: DBSCAN clustering of Mississippian mound sites with 21.5-km buffers

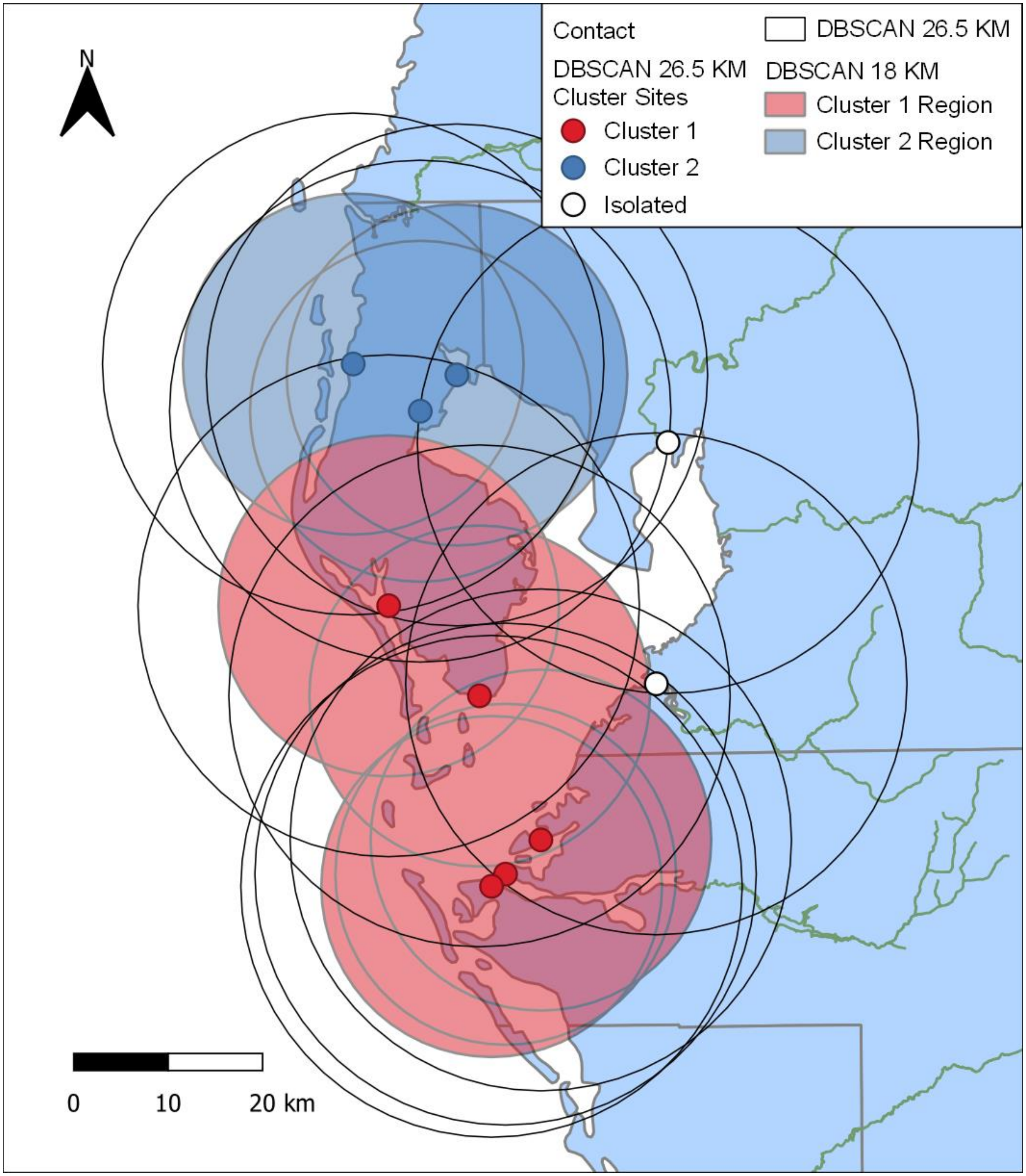

Figure 20: DBSCAN clustering of Contact mound sites with 26.5-km and 18-km buffers

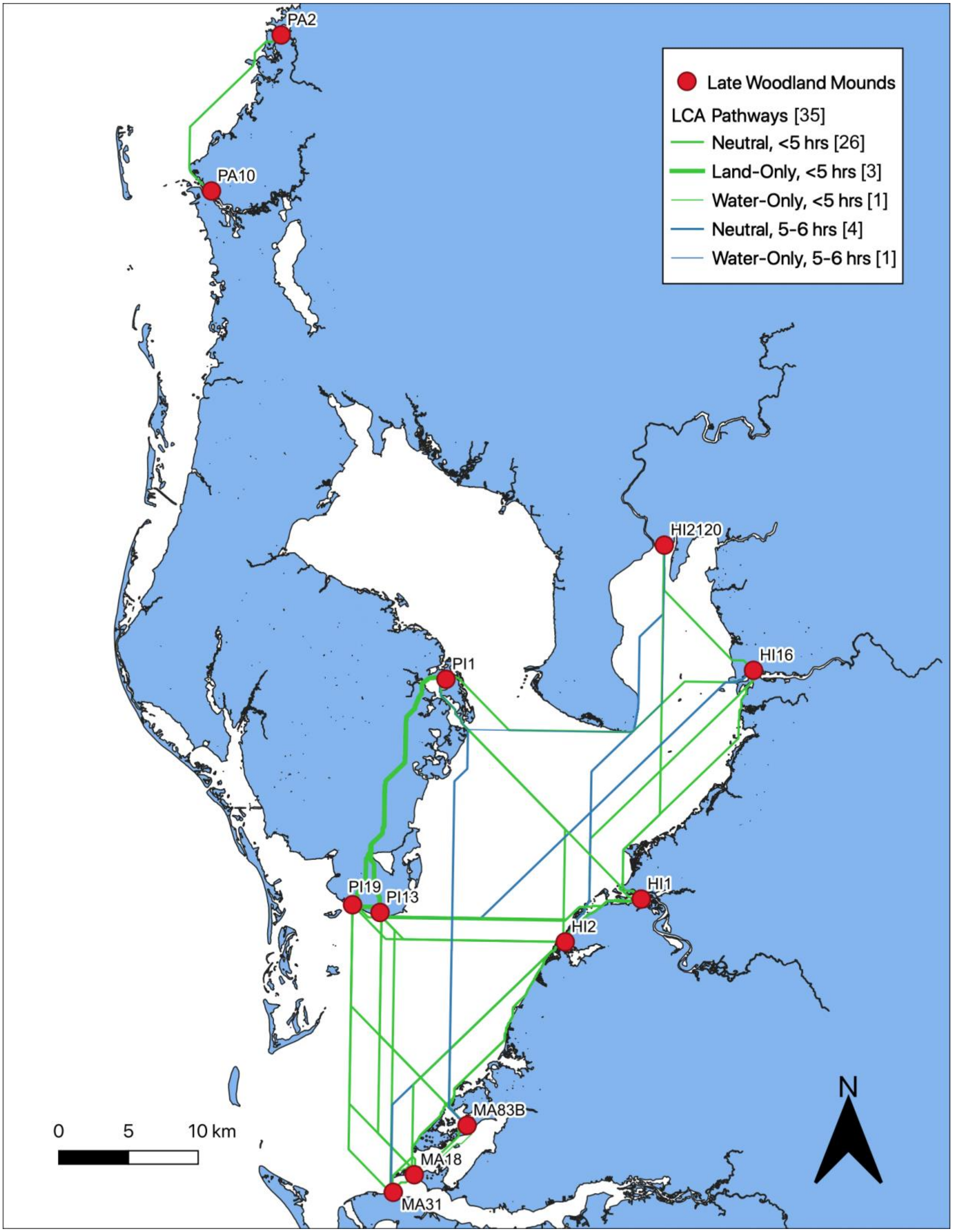

Figure 21: Least cost paths for Late Woodland mound sites

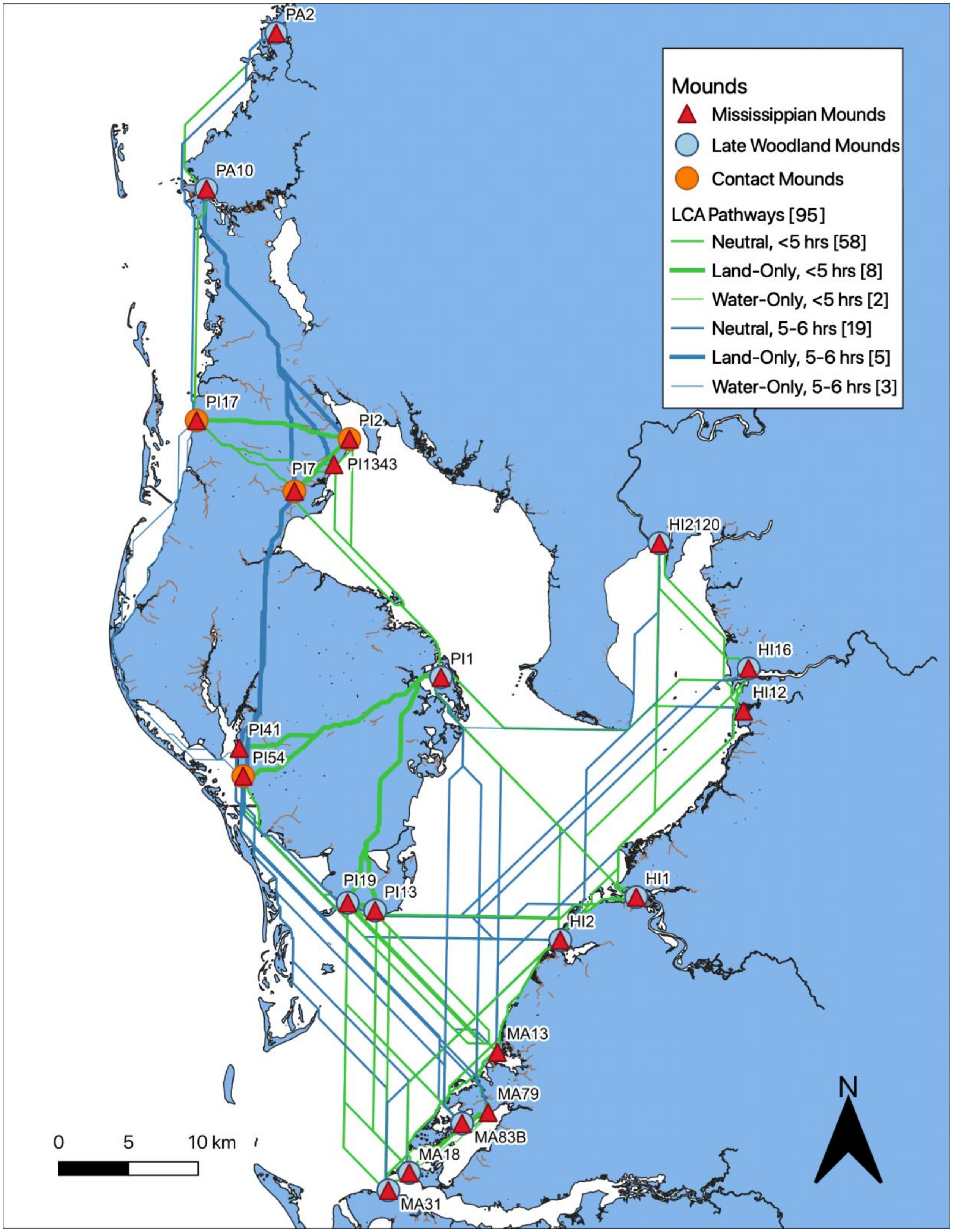

Figure 22: Least cost paths for Mississippian mound sites

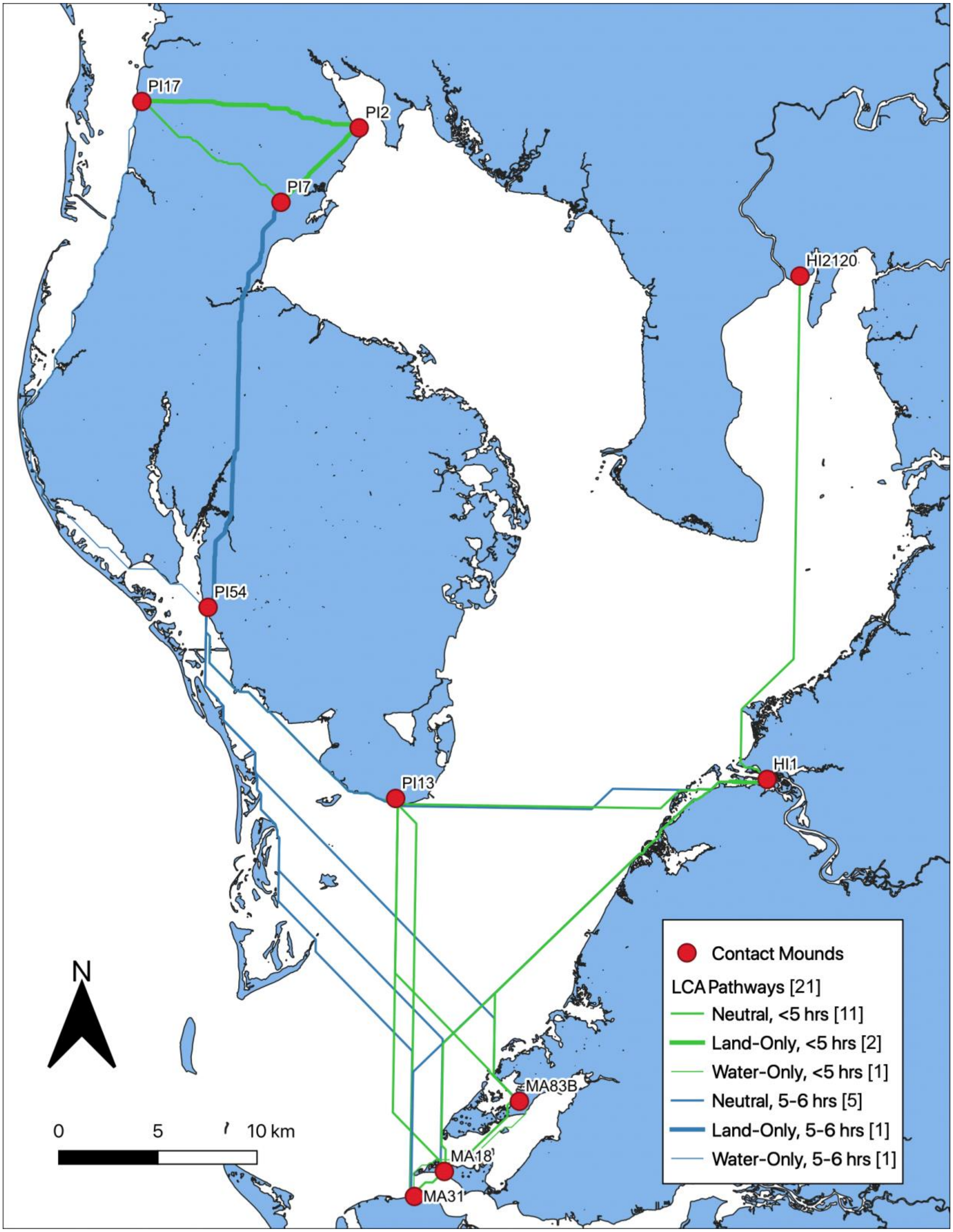

Figure 23: Least cost paths for Contact mound sites

For the purpose of analyzing the least cost paths, I started with a hypothesis regarding the possible sizes of polities in Tampa Bay, particularly simple chiefdoms, the likeliest polity to manifest on the Southern Gulf Coast (Pluckhan and McKivergan 2002:157-158). One of the largest issues with this thesis and other regional studies in Florida is the weakly established connection between mound sites, monuments, and polities in this region. Compared to inland regions which have more evidence backing theories connecting polities and monuments, platform mounds are much more heterogeneous on the Florida coast where middens and burial mounds made from shell, sand, and other materials are frequently mistaken for platform mounds due to anthropogenic changes in uses and physical changes in shapes and materials, as well as differences in assumptions and perceptions by archaeologists (Marquardt 2010). In order to properly study the sociopolitical organizations of the societies of peninsular Florida, more nuanced concepts of hierarchies and polities beyond burials and monuments will be needed unless the ambiguity of shell features can be resolved and their uses more objectively supported. To partly deviate from a completely mound-centric model that suggests all mound sites were primary or secondary administrative centers (Blitz 1999:578; Hally 1993:159; Scarry and Payne 1986:81), I suggest that the largest mound-village sites roughly in the center of least cost clusters of contemporaneous mound sites are the likeliest candidates for political or corporate centers, supported by previous evidence that large sites tend to be surrounded by smaller sites with clusters increasing in size along with the central site. This does not have to assume all mound sites were administrative centers but considers the possibility these smaller sites could have been notable sites for ceremonial or residential purposes. This model would still have achieved a high efficiency in individuals maintaining power and their successors would have easily been able to travel throughout their domain in a consistent fashion.

Anclote Complex (8PA10, 8PI43, 8PI44, and 8PI12) (Figure 24a)

The Anclote complex was well isolated in the Late Woodland and Mississippian periods, only able to travel within a five-hour limit to 8PA2 (2.6) in the Late Woodland and 8PA2 and 8PI17 (both 3), possibly to 8PI2 (5.1) and its neighboring sites (8PI7, 5.6, and 8PI1343, 5.4), in the Mississippian, for a total cluster size of three to six. If multiple canoes were able to traverse partially up the Anclote River to Salt Lake, cross land for about 300 meters to Lake Tarpon, go south across the lake in a second canoe down South Creek and Lake Branch into St. George Lake, cross land for about 1300 meters and take in a third canoe Possum Branch into Safety Harbor (USGS 1943a, 1943b), people could have theoretically gotten to 8PI2 in less time. However, no village sites have been discovered along this hypothetical route, other than some small mounds along the southwestern shore of Lake Tarpon. It is likely the Anclote complex maintained some independence during its timespan, somewhat cut off from Tampa Bay's villages for average trips but able to travel to the new Mississippian villages in Old Tampa Bay for urgent needs.

Bayshore Homes Complex (8PI41, 8PI58, and 8PI10650) (Figure 24b)

The Bayshore Homes complex had four Mississippian mound sites in the southern Pinellas Peninsula within five hours (8PI54, 0.4; 8PI19, 2.6; 8PI13, 3; and 8PI1, 4.3), and five more sites within six (8MA13, 5.3; 8HI2, 5.4; 8PI17, 5.6; 8MA83, 5.8; and 8MA79, 5.9), giving it a fair spot for traveling in southern Tampa Bay. Its least cost cluster is centered a bit more to the south than the DBSCAN area, likely due to land travel to reach the Old Tampa Bay sites having a higher cost than water travel to the south.

Bayview and Seven Oaks (8PI7) (Figure 24c)

8PI7 had four Mississippian mound sites in Old Tampa Bay and near modern Clearwater within five hours (8PI1343, 0.9; 8PI2, 1.4; 8PI17, 2.3; and 8PI1, 3.3), and three other sites within six (8PI44, 5.6; 8PI41, 5.4; and 8PI54, 5.9). Its least cost cluster is well centered between the Anclote River and Long Bayou. During the Contact period, its least cost cluster reduced to two or three sites but maintained its central distribution. If this site was larger before development compromised it, according to the farmer's information (Brinton 1999:2), it could have had a stronger relation with 8PI2 – either sharing or comparable in influence – than the only archaeological investigation implied.

Bullfrog Mound (8HI12) (Figure 24d)

8HI12 had five Mississippian mound sites within five hours (8HI16, 0.7; 8HI2120, 2.5; 8HI1, 3.3; 8HI2, 4; and 8PI1, 4.3) and 8MA13 within 5.8. Its proximity to 8HI16 makes it a likely companion site close to a small river with a large mouth and a fresh water source – it could even be a midden resulting from discarded faunal remains and tools after at-site activities.

Cockroach Key (8HI2) (Figure 24e)

During the Late Woodland, the inhabitants of 8HI2 could travel to eight mound sites within five hours (8HI1, 1.3; 8PI13, 2.5; 8PI19, 2.8; 8MA83, 3.1; 8MA18, 3.8; 8PI1, 3.9; 8MA31, 4.1; and 8HI16, 4.4) and 8HI2120 within 5.4 – every single Late Woodland site inside of Tampa Bay. This sizeable number increased even more during the Mississippian when it could travel to three additional sites within five hours (8MA13, 1.9; 8MA79, 2.9; 8HI12, 4) within five hours and three more within six (8PI54, 5; 8PI41, 5.4; and 8HI2120, 5.4) making it the largest

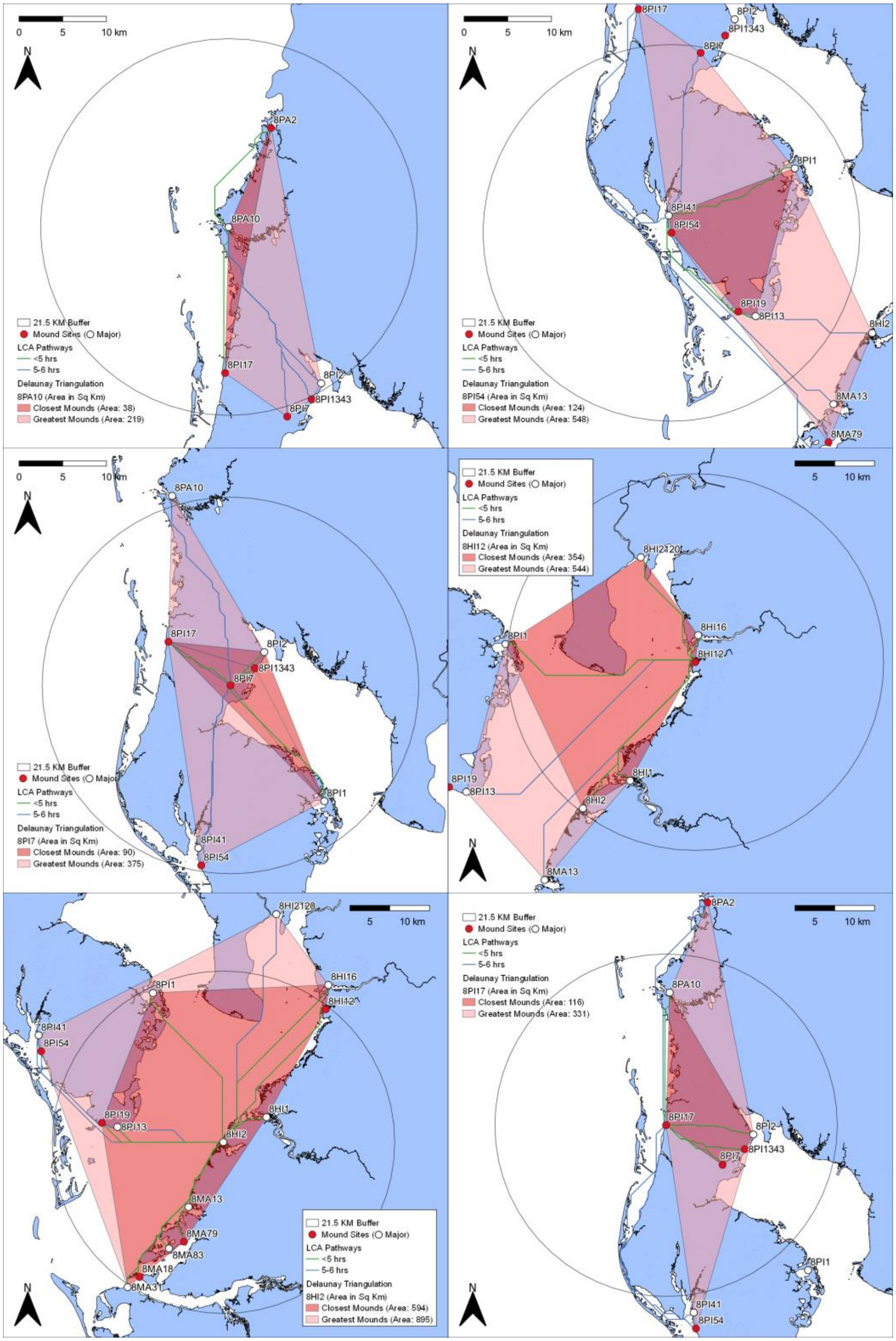

Figure 24: Least cost paths for 8PA10(a), 8HI58(b), 8PI7(c), 8HI12(d), 8HI2(e), and 8PI17(f)

least cost cluster in my sample. The central distribution of 8HI2 with a cluster this large makes it among the best candidates for a polity center, possibly a complex chiefdom later on.

Dunedin Mound (8PI17) (Figure 24f)

8PI17 had four mound sites within five hours (8PI7, 2.3; 8PI1343, 2.7; 8PI2, 3; and 8PA10, 3) and three more within six (8PA2, 5.4; 8PI41, 5.6; and 8PI54, 5.7). During the Contact period, only three of these sites remained, leaving 8PI17 at the northernmost point of the least cost cluster. Its least cost cluster is similar to 8PI7, Pipkin, and Safety Harbor, given the proximity of the sites, with all four sites centered within their DBSCAN and least cost clusters.

Fort Brooke Mound (8HI2120) (Figure 25a)

During the Late Woodland and Mississippian periods, 8HI2120 had three mound sites within five hours (8HI16, 2.3; 8HI12, 2.5; and 8HI1, 4.7) within five hours and two more within six (8PI1, 5.2, and 8HI2, 5.4). Only 8HI1 remained in the Contact period, making 8HI2120 a particularly isolated even during its peak. While this limited proximity to other settlements, being proximate to two or three large rivers would have been a benefit. If it weren't for this, it may have been possible to travel to Safety Harbor, as seen by the DBSCAN area.

Harbor Key Complex (8MA13-15) (Figure 25b)

8MA13 is interesting in that it is one of the oldest sampled mound sites, guarding a medium-sized bay with lush mangrove forests, and triangulated between 8PI13 and the Manatee and Little Manatee Rivers – giving it unprecedented access to a wide variety of ecosystems at the mouth of Tampa Bay. While it may have experienced an abandonment during the Late Woodland

(Wheeler 2005), it afterwards had nine mound sites within five hours (8MA79, 1.2; 8MA83, 1.5; 8HI2, 1.9; 8MA18, 2.2; 8PI13, 2.5; 8MA31, 2.5; 8PI19, 2.8; 8HI1, 3; and 8PI54, 5) and three more within six (8PI1, 5.1; 8PI41, 5.3; and 8HI12, 5.8). The DBSCAN area contained all of the five-hour sites except for 8PI54, with the six-hour sites three to six kilometers outside the perimeter. This continues to support the idea this site could have contained a relatively large chiefdom like Uzita.

Kennedy Mound (8MA79) (Figure 25c)

8MA79 probably has some social connection to 8MA83, but its proximity to 8MA13 gave it a similar least cost cluster, able to reach eight sites within five hours (8MA83, 0.7; 8MA13, 1.2; 8MA18 1.4; 8MA31, 1.7; 8HI2, 2.9; 8PI13, 3.2; 8PI19, 3.4; and 8HI1, 4) and three within six (8PI54, 5.5; 8PI1, 5.8; and 8PI41, 5.9).

Maximo Point (Sheraton Midden) (8PI19) (Figure 25d)

During the Late Woodland, 8PI19 had seven mound sites within five hours (8PI13, 0.5; 8HI2, 2.8; 8MA83, 3.3; 8MA18, 3.7; 8HI1, 3.7; 8MA31, 3.8; and 8PI1, 4.9). with four more that could be reached (8PI54, 2.3; 8PI41, 2.6; 8MA13, 2.8; and 8MA79, 3.4) in the Mississippian. The DBSCAN area continues to illustrate how well 23.5 km works as a general limit for round-trip excursions and how the mouth of Tampa Bay would have made the most ideal location for a polity.

Mill Point Complex (8HI16-20) (Figure 25e)

During the Late Woodland and Mississippian, the Mill Point complex had five mound complexes within five hours (8HI12, 0.7; 8HI2120, 2.3; 8HI1, 3.7; 8HI2, 4.4; and 8PI1, 4.5) and 8PI13 within 5.8. Along with 8HI12, it is the only least cost and DBSCAN cluster to have daily access to three major rivers.

Narvaez Complex (8PI54 and 8PI1242) (Figure 25f)

The Narvaez Mounds had five Mississippian mound sites within five hours (8PI41, 0.4; 8PI19, 2.3; 8PI13, 2.7; 8PI1, 4.4; and 8MA13, 5) and eight more within six (8HI2, 5 hrs; 8MA83, 5.4; 8MA79, 5.5; 8PI17 5.7; 8MA18, 5.7; 8MA31, 5.9; 8PI7, 5.9; and 8HI1, 5.9). During the Contact period, only 8PI13 was easily traversable when most of its closest sites were lost. The DBSCAN cluster fares poorly in this case as all of the southeastern sites are outside its perimeters, which include distant 8PI1343. This looks due to the straight distances to the southeast made possible from the location of 8PI54.

Oelsner Mound (8PA2) (Figure 26a)

Similar to its closest mound site, 8PA2 had only two sites possible to travel to within six hours (8PA10, 2.6, and 8PI17, 5.4). It had few conceivable connections with the sites inside of Tampa Bay, but even north of the Anclote River there are almost no mound-village sites along the Gulf Coast until Crystal River (Willey 1949:316-330). Future research should investigate possible reasons why this area was sparsely inhabited or has more sites, given the presence of a large lake in Lake Tarpon and a salt marsh in modern Werner-Boyce Salt Springs State Park.

Pinellas Point Complex (8PI13, 8PI14, 8PI108, and 8PI161) (Figure 26b)

During the Late Woodland, 8PI13 had seven mound sites within five hours (8PI19, 0.5; 8HI2, 2.5; 8MA83, 3.1; 8HI1, 3.4; 8MA18, 3.5; 8MA31, 3.6; and 8PI1, 4.9) and 8HI16 within 5.8. During the Mississippian, four more sites were reachable within five hours (8MA13, 2.5; 8PI54, 2.7; 8PI41, 3; and 8MA79, 3.2) and 8HI12 within 5.7. During the Contact period, five sites remained: 8HI1, 8MA18, 8MA31, 8MA83, and 8PI54.

Pipkin Mound (8PI1343) (Figure 26c)

8PI1343 had four Mississippian mounds within five hours (8PI2, 0.5; 8PI7, 0.9; 8PI17, 2.7; and 8PI1, 3.3) and 8PA10 within 5.4. While the path for 8PA10 is about the same length as that for 8PI41 (Appendix C), the former's greater speed due to the well-drained soil west of Lake Tarpon (Figures 4 and 5) made travel possible.

Safety Harbor (8PI2) (Figure 26d)

During the Mississippian, 8PI2 had four mound sites within five hours (8PI1343, 0.5; 8PI7, 1.4; 8PI17, 3; and 8PI1, 3.5) and 8PA10 within 5.1. During the Contact period, only PI7 and PI17 could have stayed in close contact. Although its rich archaeological assemblage and number of mounds makes it a plausible chiefdom center, its least cost cluster was never especially large even at its peak and it is unknown why more villages did not develop given the area's number of freshwater sources.

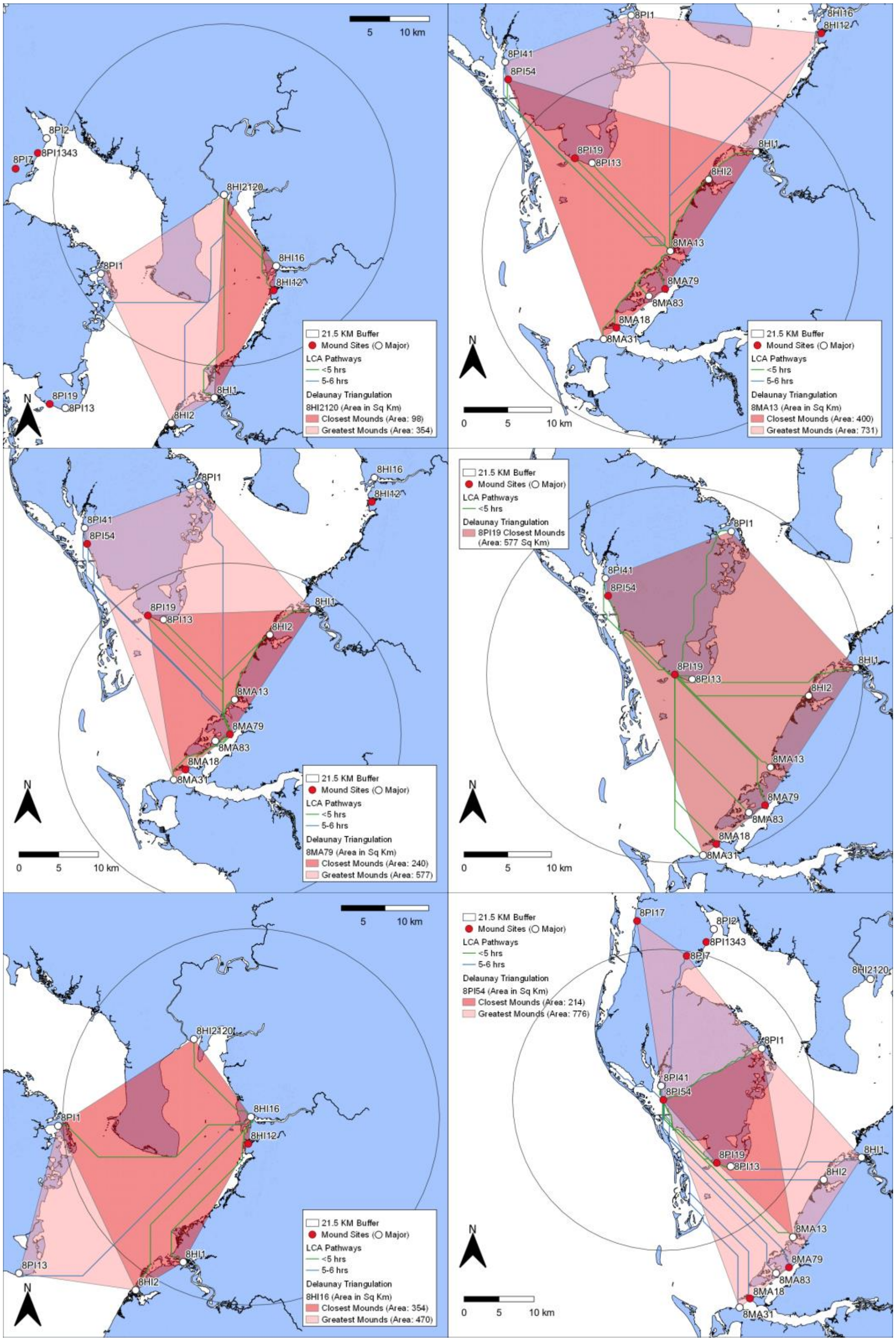

Figure 25: Least cost paths for 8HI2120(a), 8MA13(b), 8MA79(c), 8PI19(d), 8HI16(e), and 8PI54(f)

Shaw's Point Complex (8MA7, 8MA31, 8MA310, and 8MA1233: 8MA7a-n) (Figure 26e)

During the Late Woodland, 8MA31 had five mound sites within five hours (8MA18, 0.5; 8MA83, 1.4; 8PI13, 3.6; 8PI19, 3.8; and 8HI2, 4.1) and 8HI1 within 5.3. During the Mississippian, 8MA79 (1.7) and 8MA13 (2.5) were reachable within five hours, and 8PI54 within 5.9. During the Contact period, four of these sites remained.

Snead Island Complex (8MA18-20, 8MA84, 8MA85, 8MA919, and 8MA1114) (Figure 26f)

During the Late Woodland, 8MA18 included the same six total mound sites within five hours as 8MA31 (8MA31, 0.5; 8MA83, 1.1; 8PI13, 3.5; 8PI19, 3.7; 8HI2, 3.8; and 8HI1, 5.3). During the Mississippian, 8MA79 (1.4) and 8MA13 (2.2) were reachable within five hours, and 8PI54 within 5.7. There were no changes during the Contact period.

Terra Ceia Complex (8MA83a-c) (Figure 27a)

During the Late Woodland, 8MA83 had six mound sites within five hours (8MA18, 1; 8MA31, 1.4; 8HI2, 3.1; 8PI13, 3.1; 8PI19, 3.3; and 8HI1, 4.2) with 8PI1 within 5.8. During the Mississippian, two more sites were reachable within five hours (8MA79, 0.7, and 8MA13, 1.5) and two sites within six (8PI54, 5.4, and 8PI41, 5.8). During the Contact period, the same six sites as with 8MA31 and 8MA18 remained.

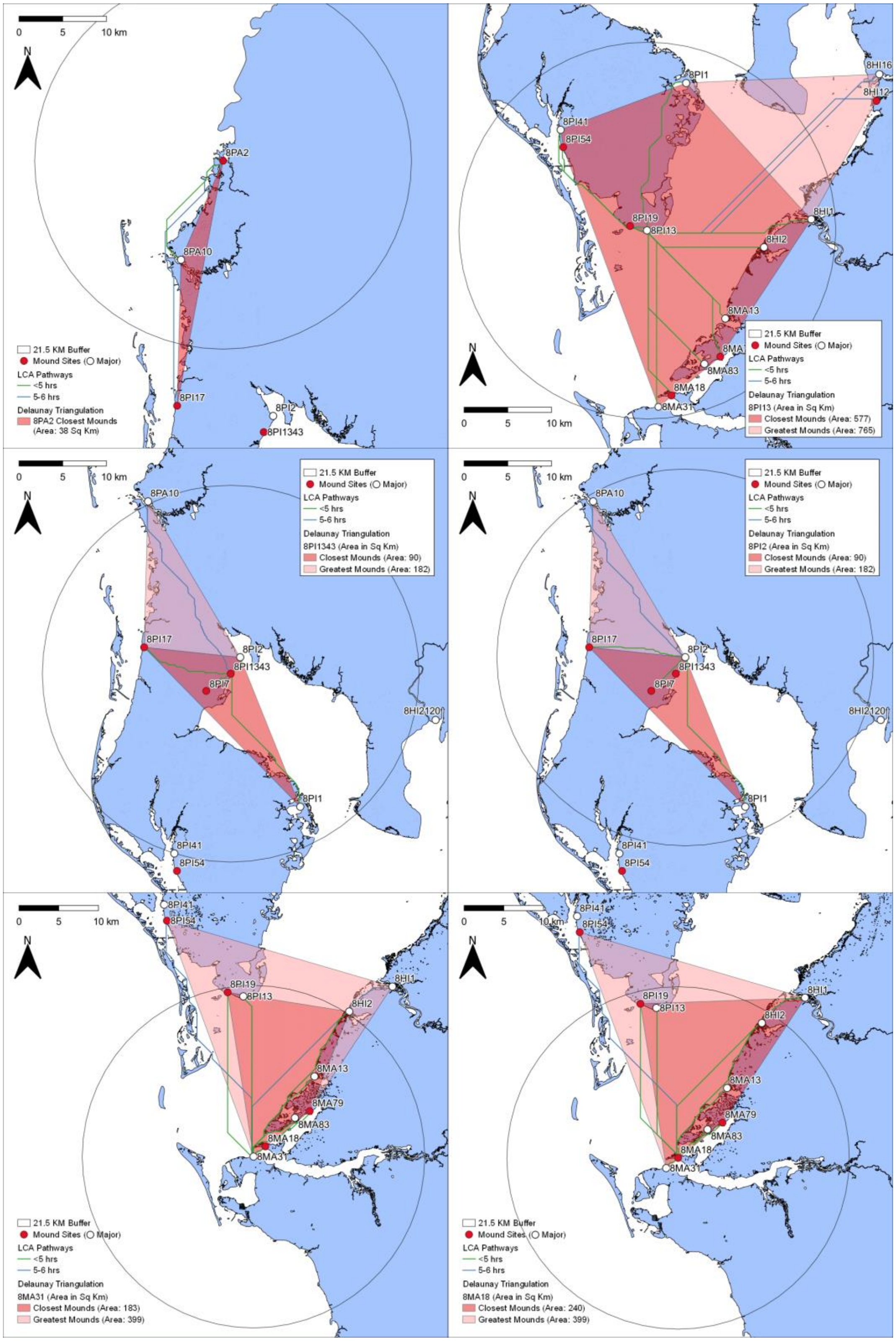

Figure 26: Least cost paths for 8PA2(a), 8PI13(b), 8PI1343(c), 8PI2(d), 8MA31(e), and 8MA18 (f)

Thomas Complex (8HI1, 8HI23, 8HI30, and 8HI94) (Figure 27b)

During the Late Woodland, 8HI1 had eight mound sites within five hours (8HI2, 1.3; 8PI13, 3.4; 8PI19, 3.7; 8HI16, 3.7; 8PI1, 3.8; 8MA83, 4.2; 8HI2120, 4.7; and 8MA18, 4.9) and 8MA31 within 5.3. During the Mississippian 8HI1, three more sites were within five hours (8MA13, 3; 8HI12, 3.3; and 8MA79, 4) and 8PI54 within 5.9. During the Contact period, six of these sites remained.

Weeden Island (8PI1) (Figure 27c)

During the Late Woodland, 8PI1 had five mound sites within five hours (8HI1, 3.8; 8HI2, 3.9; 8HI16, 4.5; 8PI19, 4.9; and 8PI13, 4.9) and two within six (8HI2120, 5.2, and 8MA83, 5.8). During the Mississippian, six more sites were within five hours (8PI7, 3.3; 8PI1343, 3.3; 8PI2, 3.5; 8HI12, 4.3; 8PI41, 4.3; and 8PI54, 4.4) and two within six (8MA13, 5.1, and 8MA79, 5.8). 8PI1 has several unusual characteristics. One, it is the only site to be greater than three hours from its nearest site, so while it could have exerted power over many sites, it could have had some level of independence like 8PA10 or 8PA2. Two, it is the only site to double the number of adjacent sites during the Mississippian than it had previously during the Late Woodland.

Concluding which site was the center of the largest cluster depends on considering different methods for grouping least cost paths (Table 12). If we hypothesize the site within the largest (as in number of sites) cluster corresponds to the largest chiefdom, there are five strong candidates – 8HI1, 8HI2, 8PI1, 8PI13, and 8PI19 – that started with six to nine adjacent sites during the Late Woodland and all expanded to 12 – the largest expansions – during the Mississippian, with 8PI1's cluster doubling in size. Only 8HI1 and 8PI13 remained in the

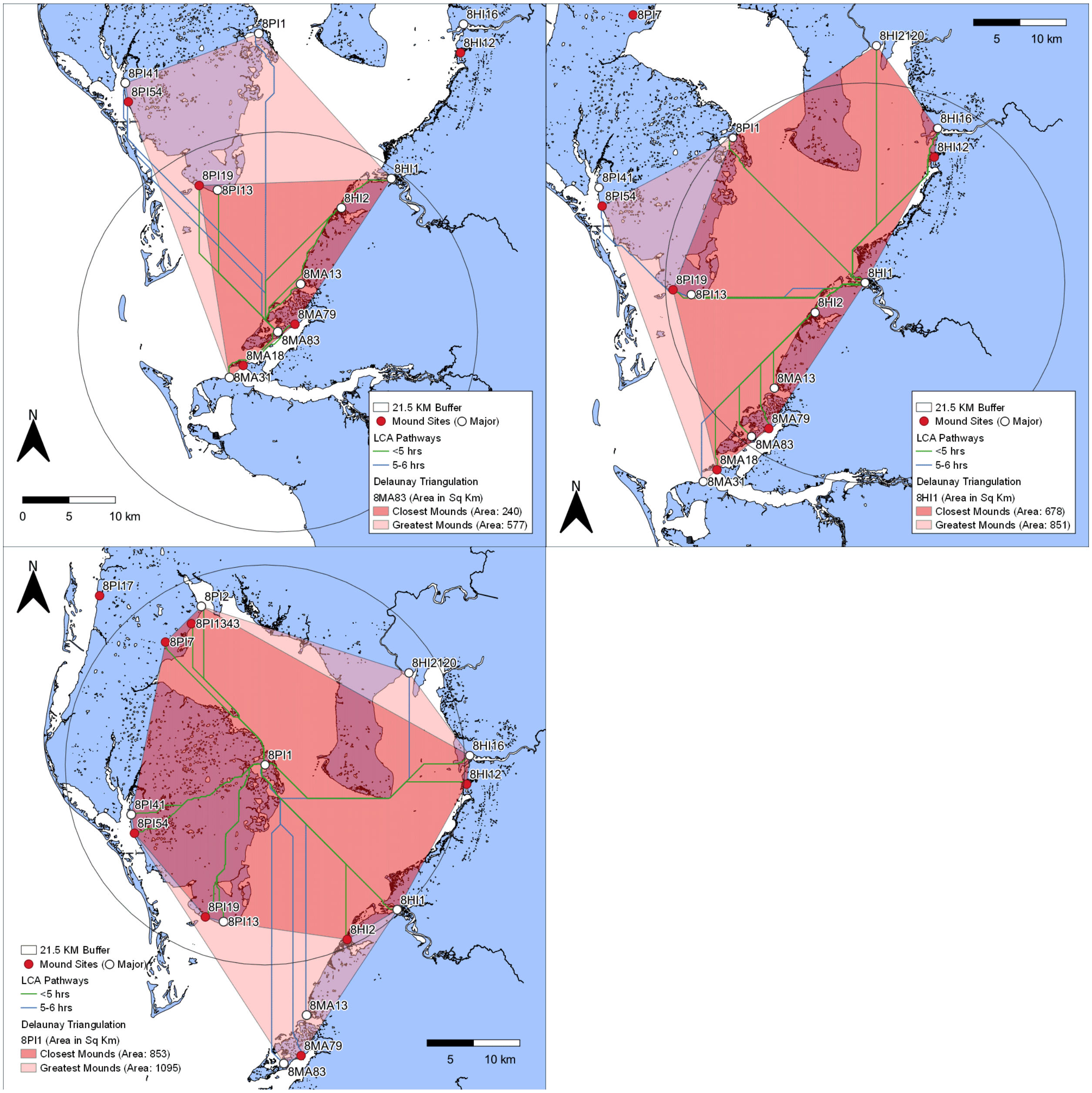

Figure 27: Least cost paths for 8MA83(a), 8HI1(b), and 8PI1(c)

Contact period, with five and six sites, respectively, remaining in their clusters, a sign they were able to maintain power even during colonialism. If we include sites within six hours from each other (a day's journey in the summer), the three largest least cost clusters were for 8PI1, 8HI2, and 8PI13 (16, 15, and 14, respectively).

Table 12: Least cost clusters by time period, Delaunay triangulation, and number of sites

Cluster Origin	Area (km^2)	Number in Late Woodland
Thomas Complex	657	9
Cockroach Key	573	9
Maximo Point	394	8
Pinellas Point Complex	394	8
Weeden Island	377	6
Mill Point Complex	345	5
Snead Island Complex	228	7
Terra Ceia Complex	228	7
Shaw's Point Complex	172	6
Fort Brooke Mound	89	3

Cluster Origin	Area (km^2)	Number in Largest Polygon
Weeden Island	1095	16
Cockroach Key	895	15
Thomas Complex	851	14
Pinellas Point Complex	765	14
Narvaez Complex	754	13
Harbor Key Complex	731	13
Kennedy Mound	577	12
Maximo Point	577	12
Terra Ceia Complex	577	12
Bayshore Homes Complex	548	10
Bullfrog Mound	544	7
Mill Point Complex	470	7
Shaw's Point Complex	399	10
Snead Island Complex	399	10
Bayview/Seven Oaks	375	8
Fort Brooke Mound	354	6
Dunedin Mound	331	8
Anclote Complex	219	6
Pipkin Mound	182	6
Safety Harbor	182	6
Oelsner Mound	38	3

Cluster Origin	Area (km^2)	Number in Mississippian
Weeden Island	853	12
Thomas Complex	678	12
Cockroach Key Mounds	594	12
Maximo Point	577	12
Pinellas Point Complex	577	12
Harbor Key Complex	400	10
Bullfrog Mound	354	6
Mill Point Complex	354	6
Snead Island Complex	240	9
Terra Ceia Complex	240	9
Kennedy Mound	240	9
Narvaez Complex	230	6
Shaw's Point Complex	183	8
Bayshore Homes Complex	124	5
Dunedin Mound	116	5
Fort Brooke Mound	98	4
Bayview/Seven Oaks	90	5
Pipkin Mound	90	5
Safety Harbor	90	5
Anclote Complex	38	3

Cluster Origin	Area (km^2)	Number in Contact
Thomas Complex	424	5
Pinellas Point Complex	388	6
Snead Island Complex	202	5
Terra Ceia Complex	202	5
Shaw's Point Complex	56	4
Bayview/Seven Oaks	23	3
Dunedin Mound	23	3
Safety Harbor	23	3

Note: All numbers of sites are inclusive

In addition to using the number of mound sites at most five hours from one another, the area of the land and bay covered by each cluster can be roughly estimated with minimum bounding geometry, such as Delaunay triangulation, which form a polygonal perimeter of the outermost points of a point cluster (Wheatley and Gillings 2012:130). This method was used because of its simplicity and estimation on the minimal side. Measuring area also has the benefit of minimizing the effect of the number of sites if some are suspected to be much smaller than the mound-village sites that are the center of this research.

Some areas, in particular those for the sites in the northern part of Pinellas County, were skewed when some sites were particularly distant from the others, but most (Figures 24-27). resulted in roughly triangular or ellipsoidal shapes similar to chiefdom areas estimated by Hally (1999:104-105), who considered a 40-km-diameter circle (an area of 1,257 km^2) to be the largest hypothetical chiefdom size and found clusters in Lower Appalachia forming ellipses 20 by 30 km across (471 km^2). However, as my findings show (Tables 12), Delaunay triangulation formed some areas larger than the Appalachian clusters but well under the maximum area. Compared to these clusters, two site's least cost clusters (8HI1 and 8HI2) were larger by the Late Woodland period, five Mississippian period site clusters were larger, and 8HI1's cluster shrank by about 36 percent to a similar size as the Appalachian clusters in the Contact period.

The final aspect of the LCA is one used by Livingood (2012:181-182) that compared the bimodal histogram pattern in Hally's (1993; 1999) straight distances to a histogram of paired least cost paths by hours. He discovered that both were bimodal and close enough that a strong correlation could be made between average distances apart and travel time. Specifically, secondary mound sites in North Georgia were all less than five hours (typically less than four) from their cluster center and 26 km or 5.6 hours distinguished mound sites in different polities. The scarcity of site pairs that were more than four hours but less than six was even more evident than from Hally's method.

In my Tampa Bay sample of Mississippian mound sites (Figure 28), there was still a lack of bimodality or normality (one-sample Kolmogorov-Smirnov test sig: 0.04), with the distribution having a similar positive skew (0.468) as its straight-distance histogram, and clustered well below 12 hours but with an empty gap between 11.6 and 13 hours. Regardless of the bin size, the distribution has many drops and peaks, with the largest contrast being the two peaks and large drop between five and seven hours – the opposite pattern found in North Georgia's mound sites. Once again, this determines that any polities that existed in Tampa Bay did not have the same autonomy and strong clustering they had farther north and must have been smaller or more closely aligned.

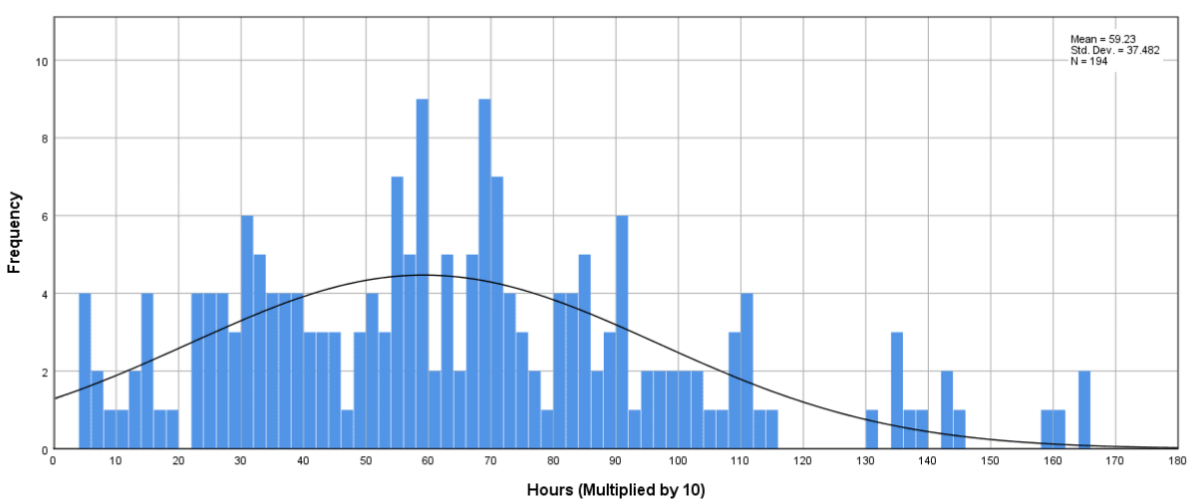

Figure 28: Histogram of travel times between Mississippian mound sites in Tampa Bay

In summary, while the number of sites within the least cost clusters often matched well with those within the default 21.5-km radii based on possible breaks in the distance matrix data, LCA offered a more detailed and nuanced picture visualizing a plausible window into how the precolumbian Natives of Tampa Bay could have navigated within their environment, which I suggest significantly impacted the sizes and extents of their polities due to the irregular layout of the bay. It showed maritime travel was just as efficient, possibly more, than terrestrial travel, and that a uniform circular area is unlikely to approximate the extents of polities on coasts, while minimally enclosed polygons may offer a rough approximation. Weighing all of the evidence over which mound sites would have served as the most logical capitals for polities based on size in numbers and areas, it appears that 8HI1 and 8HI2 consistently had the largest clusters by all methods in the Late Woodland period, generally but not always displaced at the top by 8PI1 and 8PI13 during the Mississippian period, while 8PI13 and 8HI1 had the largest clusters in the Contact period. These sites are all closely located around the central distribution of all of the sampled sites and could have acted like ports, points of departure or arrival of traffic passing through the northern and southern extents of Tampa Bay as well as the Gulf Coast. While there is archaeological evidence 8PI2 was a larger site during the Mississippian than 8PI1 and 8HI1, it is a curiosity that the former was nestled within the interior of Old Tampa Bay where the closest mound sites were minor isolated mounds shortly to the south and villages with mounds on the Gulf Coast. Several possibilities exist, including that polity size was not an important factor for these particular societies, and that 8PI2 has simply been excavated more than the other sides, giving a misleading image of its size and significance.

While more excavations of Tampa Bay's mound sites to determine potentially lost features and more accurate site sizes are recommended, I suggest from GIS analyses that their polities would best have been distributed along eastern (the Manatee, Little Manatee, and Alafia Rivers) and western (Pinellas Peninsula) or northern (Old Tampa Bay through the Anclote River) and southern (between Pinellas Point and the Manatee and Alafia Rivers) divisions, and that these divisions appear to have shifted over time, apparently from the inner coast to the outer peninsula, as a result of external forces, natural and anthropogenic. At the same time, their settlement patterns were fundamentally different from those of inland polities, with less clustering if any but possessing more mound sites within five-hour extents for the most centrally distributed sites. These are atypical characteristics of simple chiefdoms, long suspected to be employed by the bay's hunter-gatherer societies, but are more consistent with larger chiefdoms with subdivisions and close alliances of neighboring factions.

Chapter 7: Discussion

While various methods in combination revealed plausible developments in mound site distributions and usage of surroundings, they could not clearly determine distinctive clusters analogous to polities reconstructed elsewhere in the Southeast. In particular, the straight-distance and travel time histograms, the nearest neighbor analysis, and DBSCAN clustering all showed that Mississippian period mound site distributions in Tampa Bay were neither particularly clustered nor dispersed, with longer distances consistently less common than shorter distances and no visible short-distance data breaks that distinguished between primary sites, secondary sites, and sites in distinct polities. Aside from genuine settlement pattern differences, another factor is the broad temporal span I had to use for coevality which increased the number of mound pairs for each site. Less prominent breaks were possible, but all of them appear to result in a single DBSCAN cluster. Any cluster distinctions could only have been made from using smaller maximum distances that lacked empirical bases. This lack of clusters is consistent with the theory the Safety Harbor culture had very small polities where secondary administrative centers either were not utilized or were oriented in a less nucleated fashion than elsewhere (Milanich 1994:398). In addition to revealing coevality problems, this would also mean few of my sampled mound sites were actual villages and that their site forms are too speculative with evidence for habitation.

My methods could have been adapted better for coastal areas and more dispersed populations. It is probable polities could not achieve large, roughly round extents when natural and cultural barriers were present, but least cost analysis was intended to show travel constraints and maximum extents more complex than geometric shapes. For research short on time, DBSCAN clustering could be more effective at determining polity sizes and numbers when mound site distances have a better contemporaneous association and when sites have a stronger distinction between nearby sites and distance sites (nearest neighbor clustering). Using DBSCAN clustering in a relatively small region and with sites with random or dispersed clustering does not work as well unless there is strong empirical evidence for the necessary parameters.

Hally's (1993, 1999) model was intended to show that Mississippian polities in the Southeast did not vary as widely in size (previously estimated between 30 and 200 km in diameter) or duration (a hundred years or less rather than hundreds) as previously thought, but were all relatively close to how far a person could travel in a day. There would still be levels of variation due to the environment and historical contexts, such as large territories where societies were more self-reliant and less prone to conflict. In other words, it envisioned polities as modular systems, or based on basic components that can be combined and used in different ways. Models like this are useful for determining hypothetical spaces where peoples were socially and politically connected to a greater degree than elsewhere and testing them with archaeological data. Based on the Florida data, this concept of polities is not baseless but could be expanded to other areas and cultures based on new variables such as different site rankings and environmental landscapes and features.

However, issues arise when Hally's proposal is applied to coastal areas and areas outside the core Mississippian region. I suspect his findings regarding bimodal distances and distances between polity centers were exclusive to his research area and that he did not properly separately test certain characteristics. The bimodal pattern is simply a visualization of the strength of nearest neighbor clustering, where cluster sizes are represented on the left side and the distances between clusters are on the right. The maximum distance between two sites in the same cluster being about 20 km happened to be present in his data, but he did not consider that this could be a very common delineation for single-unit polities in the world. As my findings show, even with a higher range for boat speed, 20 km and five hours closely match the distance and time it takes to travel between two points anywhere there is relatively flat land or water without barriers – in only a few cases did marshlands and glades noticeably reduce the average travel speed on land from 4 kph. Therefore, cluster density and distances between clusters are probably unique to each environment, but cluster sizes (if they were polities) were probably no larger than 20 km if they had a single administrator. Distance of travel seems to be pretty universal (according to Juan Ortiz, ten leagues or 41.8 km was the farthest a chief would travel), but Southeastern polities are most distinguished by differences in population density and political structure. It would be worth researching why leaders of paramount chiefdoms with several administrative levels could cover much more land in a single productive day also appeared to stick relatively close to a 40-km extent, but Hally's basis for distinguishing paramount chiefdoms from simple chiefdoms was based primarily on the number of mounds in their centers, which has been critiqued for being too materialist and ignoring factors affecting mound sizes and numbers (Blitz and Livingood 2004:299; Marrinan and White 2007:296).

Despite these issues, I may have identified with corroborative, geospatial evidence Safety Harbor's chiefdoms, but only if the sites I used were appropriate. If the chiefdoms corresponded to the sites with the consistently largest clusters by site pairs or area, the Tocobaga capital would have been Pinellas Point (8PI13/8PI19), Weeden Island (8PI1), or in Boca Ciega Bay (8PI41/8PI54); the Mocoso capital Cockroach Key (8HI2) or Thomas Mound (8HI1); and the Uzita capital Snead Island (8MA18) or Terra Ceia (8MA83). However, if Milanich's (1998b) interpretation of De Soto's geography of Tampa Bay is accurate, they would correspond closer to Safety Harbor (8HI2, in Old Tampa Bay) for Tocobaga, Mill Point (8HI16, at or north of the Alafia River) for Mocoso, and any of the sites between the Little Manatee and Manatee Rivers for Uzita. These sites had clusters with only two to seven villages with mounds, with areas based on Delaunay triangulation less than 400 km^2, which would mean simple chiefdoms cannot be valued by the greatest number of sites, area, or largest mounds the way complex chiefdoms have been. They also have least cost clusters that overlap in the middle of Tampa Bay, making the boundaries between them murky.

Whether there is any evidence from archaeological or GIS data for any type of chiefdom or level of organization more complex than a tribe or big man system is complicated by the lack of evidence in this region for characteristics often used to categorize chiefdoms. Simple chiefdoms have small populations and territories, often with a single large mound center surrounded by smaller villages without mounds, and a simple hierarchy separating nobles and commoners. Complex chiefdoms have large populations with clear settlement and monument hierarchies, relatively large territories, a hierarchy of chiefs, and extensive accumulation of wealth and exotic goods by elites from tributes (Milanich 1998b:247-248). While Safety Harbor villages have been assumed to be small due to their lifestyles, there have been very few large-scale excavations at these sites only done recently (Austin and Mitchem 2014; Schwadron 2000; Simpson 1998), and they have not focused on domestic areas to estimate population demographics. There is some evidence for elite burials and exotic goods, mostly from barrier islands (Bothwell 1961; Nelson 1985), but individual burials tended to have shell, stone, and European artifacts rather than SECC-like artifacts (Willey 1949:185). While this implies relative egalitarianism, curation and provenience problems from early excavations have affected research on their social systems. More testing and new research models will be needed to answer detailed questions about Safety Harbor's demographics and social structures.

Some of the mound site patterns I have elucidated suggest their polities had respectable sizes and political power compared to Mississippian polities. With a relatively large sample, the largest clusters in Tampa Bay were over 500 km^2 as a low estimate and contained as many as half a dozen to a dozen villages with platform mounds or large middens with embankments and structures – much larger than estimates by Milanich (1994, 1998b). Several Safety Harbor mound sites of similar sizes less than 4 km from each other (e.g., 8PI13 and 8PI19, 8PI41 and 8PI54, 8MA18 and 8MA31) resemble Blitz's (1999) "grouped single-mound sites," which he defined as representing simple chiefdoms with two or more centers controlling surrounding villages – possibly an intermediate form between simple and complex chiefdoms. On the other hand, sites with varieties of mounds increases the possibility they served different uses and categorizing them in Florida has been difficult (Marquardt 2010). A lower estimate would be closer to clusters with an average area of 300 km^2 and size of five sites.

Early Spanish expeditions recorded all of the Florida chiefdoms they encountered along the Gulf Coast were bounded by rivers (Shapiro 2019), rather than within river floodplains as for inland chiefdoms, but there are no mound complexes between the rivers on Tampa Bay's eastern coast except for 8MA13. There are also no major rivers between the Hillsborough and Anclote Rivers where several large mound complexes lie. Interestingly, 8HI2 is located midway by about 20 km between these rivers, but its least cost paths show that few known mound complexes would have been accessible. Rather than between the rivers, the Tampa Bay mound complexes were more often found at river mouths where the richest resources lay. Regardless, it is also interesting that the distances between river mouths ranges from 11 to 24 km, a plausible chiefdom width or radius.

Possibly the largest questions revolving around my project are: what cultures were Safety Harbor most closely associated with? How did less centralized and coastal societies develop into polities differently from inland and centralized societies? Due to distances and differences in subsistence, Mississippian interactions would be limited, and it would be expected to share more in common with the Pensacola and Caloosahatchee/Calusa cultures on the Gulf Coast than Fort Walton/Apalachee, the latter of which was deeply linked geographically and culturally to the Mississippian heartland (Milanich 1994). These coastal cultures are now understood to be more complex than the credit given by environmental determinists, but clear evidence for precolumbian Safety Harbor chiefdoms and hierarchies are still elusive. Similarly, Timucuan society appear to have been complex at various places and periods. Is it really plausible that Safety Harbor was the black swan of its neighbors, or does the truth lie deeper?

Some archaeologists have considered models beyond the strict simple-complex chiefdom dichotomy and proposed intermediate or alternative forms. Milanich (1998b:256-261) theorized social complexity could be temporary or long-term but was dependent on environmental productivity to foster large populations. Those who lived in less productive environments, including the Timucua and Tocobaga, were able to exercise complexity briefly to maintain autonomy and flex their muscles, so to speak, against more powerful neighbors. Blitz (1999) formed a fission-fusion model with varieties of mound villages, with chiefdom power varying more from the aggregation and dispersal of political units rather than mound hierarchies. For example, to increase their influence or power against adversaries, clusters of single-mound and multiple-mound sites could have fused together to form complex networks temporarily administered by a single authority or coalition. It is logical to assume that many Southeastern polities oscillated between levels of complexity, resulting in dispersed and clustered spatial patterns, in an effort to enhance autonomy and security and deal with changing alliances and feuds. Complex chiefdoms including paramount chiefdoms could be conceived as networks or confederations of simple chiefdoms, so the distinction between the two would be more about alliance durations rather than environmentally determined settlement patterns.

On the peripheries of the Mississippian zone, with rich estuaries and a lack of limited river floodplains, coastal polities were less centralized, needed less defense than interior polities, and exhibited greater independence while engaging in alliances and trade with larger polities (Pluckhahn and McKivergan (2002:153). This is in line with Milanich's (1998b:246-258) views that most coastal societies had simple chiefdoms that joined in alliances or confederations as a historically late resort to defend themselves against the Spanish or Indigenous rivals. Confederacies of egalitarian fisher-hunter-gatherers organized into multiple simple chiefdoms of about a thousand people each could act and appear like a paramount chiefdom at broad spatiotemporal scales. According to De Soto, the chiefdoms of Tampa Bay paid tribute to a paramount chief, Urriparacoxi, who lived 130 km north, somewhere beyond the Withlacoochee River. This is consistent with the Tocobaga and other small tribes being less powerful than their neighbors, but whether this was always the case or a short development can only be answered with precise dates from tribute items in combination with dates from their largest villages.

If Safety Harbor had less political power or social hierarchies than its neighbors, what restricted the growth and spread of their complexity? Using the Calusa as the first comparison, environmental history may be a major factor, given the strong effect it has on shallow-water angler societies. After the cold climate and low sea levels associated with the Late Woodland period, the Early Mississippian period in Southwestern Florida is associated with favorable climatic conditions and high sea levels that increased marine resources and enlarged rivers for travel. Around 1000 CE, at the beginning of this warm period, Caloosahatchee ceramic forms diversify (likewise, Englewood pottery is very distinct from Weeden Island) and the first burial mounds and graves with ceramics appear, trends that first appeared elsewhere. These cultural changes are best explained by growing political influences of other societies and even immigration, possibly due to a rush for new resources. The Calusa were clearly networked with most of Florida's largest societies as well as Mississippians, due to the presence of exotic minerals like quartz and galena originating from the Midsouth and Midwest (45-47). They began intra-site spatial reorganizations that during the Caloosahatchee III/IV phases (1200-1500 CE) became standardized village plans, with two prominent island mound villages (Mound Key and Pineland) having plans unique from Mississippian plans and grammar (Marquardt and Walker 2012). It is obvious this period represented a significant change in their society towards greater expansion and political power.

Was Charlotte Harbor more productive than Tampa Bay during this time, leading to larger populations and greater concentrations of wealth? Both lie in the Gulf Coast Lowlands ecoregion and the vegetation in Tampa Bay and Charlotte Harbor is very similar with mangrove forests along the coast and pine flatwood forests inland (Davis 1967). Based on 2019 mangrove extents (Figure 29), Charlotte Harbor is positively filled with mangroves along its shoreline and large barrier islands, much of it in a preservation state park, encompassing nearly 256 km^2 of mangroves between Sarasota and Naples. In comparison, the area between Shaw's Point and Oelsner Mound in Tampa Bay only has 68 km^2 of mangroves. While this looks like a clear advantage for the Calusa under present conditions, Marquadt (2014) and Savarese et al. (2016)

found their historic environment was much more heterogeneous with resources unevenly spread out and periods of oyster overharvesting and returning neutral to the climate. They might have had an advantage over the Safety Harbor or Tocobaga in resources or other drivers of population growth, but they both likely fluctuated in complexity in tandem with environmental conditions, resorting to both cooperation and warfare with neighboring tribes during stressful times. After all, they became adversaries just before Spanish colonization, so the rivalry between them could have been prolonged and an intense desire for power.

In Georgia, Pluckhahn and McKivergan's (2002) study of Savannah culture site clustering along the Georgia coast offers a notable example in how similar environments can exhibit broadly similar settlement patterns but minor to moderate differences in political structures. Georgia's coastline lies within the South Atlantic coastal plain, like peninsular Florida, and like Tampa Bay has poorly drained soils, shallow waters, an estuarine system of tidal creeks, salt marshes, and barrier islands, only more prone to storms (Reitz et al. 2020:93-94). They found the coastal clusters had little separation, unlike inland clusters, but similar to Tampa Bay. Unlike Tampa Bay, there were only two platform mound sites near the Georgia coast that were not centralized within their cluster – another characteristic of Tampa Bay mound sites.

The relatively consistent spacing of burial mounds with one another (but not with platform mounds) and within clusters in the Savannah region, and the possible existence of consistent site rankings by size, suggested they served some administrative function in addition to sites that seem to have lacked architecture (Pluckhahn and McKivergan 2002:156). In the Circum-Tampa Bay region, 78 burial mounds exhibited nearest neighbor clustering (Z-score: -5.19), but Safety Harbor burial mounds (27 including 11 platform mound sites, 16 without) were randomly distributed (Z-score, N=27: 1.07; N=16: 1.36), appeared to have a smaller extent closer to the coast than Weeden Island burial mounds, and were generally associated with water bodies and platform mound sites (Figure 30). A distance matrix of Safety Harbor burial mounds (Figure 31) showed a broad, normal distribution with some positive skewing and a drop in longer distances – roughly similar but less bunched together than Safety Harbor platform mounds.

While this suggest differences in ceremonial or political practices in the two regions, both have been categorized as simple chiefdoms (Milanich 1998b; Reitz et al. 2020). While settlement patterns in inland and coastal Georgia changed significantly between the Late Mississippian and Contact periods, there were no settlement pattern changes in Tampa Bay between these periods, other than the reduction of sites, but it is hard to tell when any decline started due to the broader cultural phases in Florida. One aspect that could have affected differences in the Savannah and Safety Harbor cultures was Irene Mound's location 24 km from the coast, offering it both a visible vantage point and access to both estuarine and Appalachian resources, with a closer connection to Georgia's complex chiefdoms than the long route in open water from Tampa Bay to the Apalachee Bay. It is difficult to say whether one society was more centralized than the other based on mound and midden patterns alone, given how difficult it has been to distinguish them by function.

The last comparison is between Safety Harbor and the cultures of North Florida. While the Apalachee historic chiefdom exhibited a classic Mississippian culture, the Timucua, believed to have been separated from them by the Ancilla River, had a population more dispersed across a large region of moderately to poorly drained soils that encouraged a mixed subsistence economy. This restricted the population growth needed for a stable complex chiefdom, but their complexity could be dependent on scale. They could have been based on simple chiefdoms at local levels and at large scales to have enough of a labor pool under multi-level administration to act like a complex chiefdom (Worth 1998:16-18). The Safety Harbor people practiced only a hunter-gatherer-fisher lifestyle, but whether this inevitably resulted in low populations is uncertain because of the sparsity of domestic site excavations throughout their extent.

Across the panhandle, in the center of the northern Gulf Coast, the Pensacola culture were also directly adjacent to the Fort Walton culture but exhibited all the core characteristics of Safety Harbor: the same hunter-gatherer-fisher lifestyle, the same environment with estuaries and short rivers, and the same village layouts with plazas, middens, and a few platform mounds. Fort Walton and Pensacola ceramics overlap spatially and temporally in the Middle Mississippian period, a phenomenon that traditionally implies the presence of different coastal/peripheral and inland/core cultures, including sites that appear to fall into a third category. Artifacts show that iconography and rituals were similar to Mississippian cultures in the area, and the evidence for a coastal migration might have been due to a need for intensive trading with Fort Walton. Large surveys have shown the interior was very sparsely populated, possibly even abandoned, after the Weeden Island phase. The best currently known evidence for social complexity is the nucleated pattern of small villages and activity sites around mound centers and cemeteries. Like the Safety Harbor region, more surveying continues to significantly change the views recently held about the cultures of the Florida Gulf Coast and hypotheses about their sizes, complexity, and social relations (Klein 2002).

One model that explains the widespread extent of similar cultures in Africa but which has been applied to the Southeast (Blitz and Lorenz 2006; King 2003:118-119) is Kopytoff's (1987) Internal African Frontier model. Groups that do not conform to more powerful polities will tend to move to the polities' outer edges and frontiers, where their power is reduced, forming new societies and small-scale, independent polities for temporary and long durations that contain elements of the previous political cultures. This resembles the makeup of Florida's societies, but immigration cannot be the main driver of acculturation because of how little evidence there is for mass levels during the Mississippian period. The model remains useful for emphasizing how non-conforming cultures are able to resist more powerful cultures while still relying on them for their own needs and desire for hybrid identities.

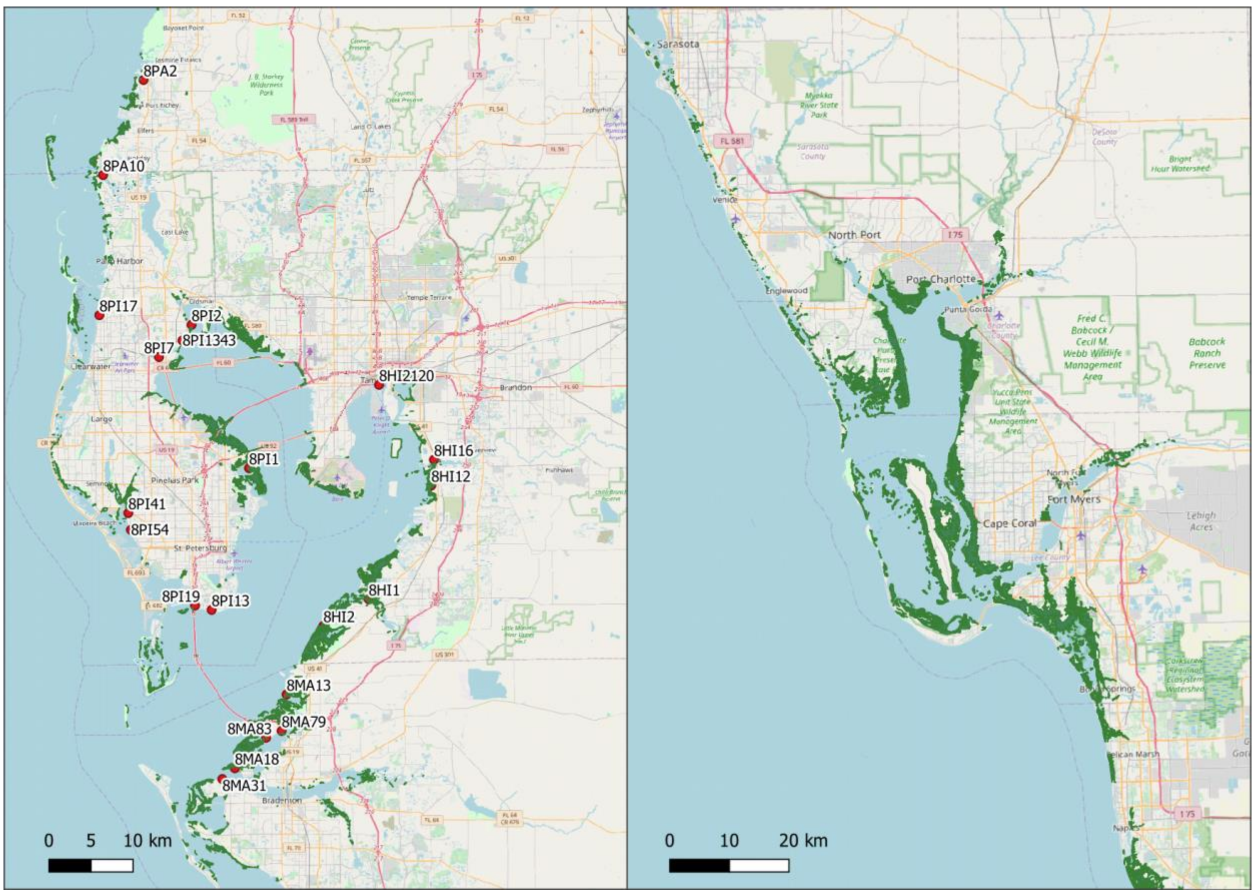

Figure 29: Mangrove forests in Tampa Bay and Charlotte Harbor

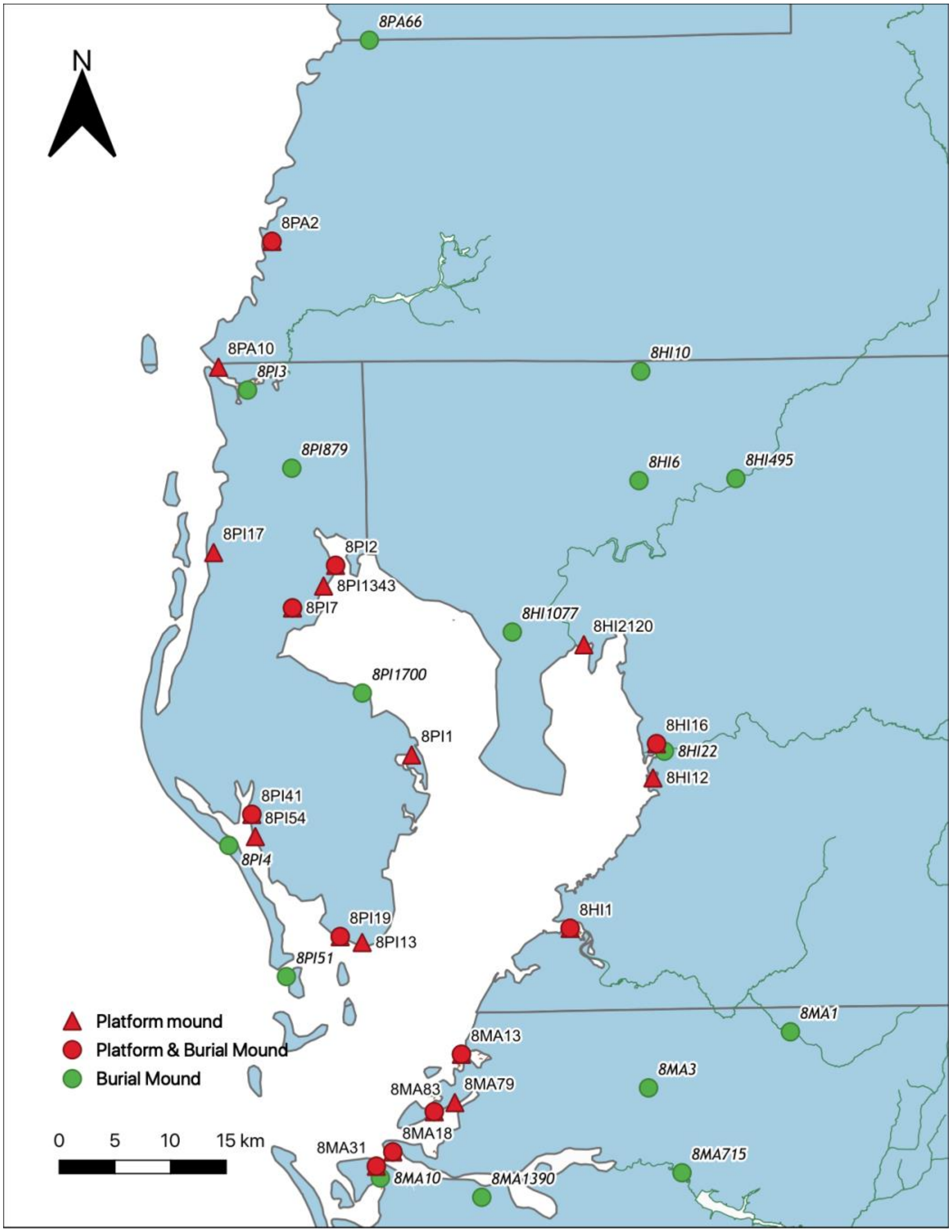

Figure 30: Safety Harbor burial mounds in Tampa Bay

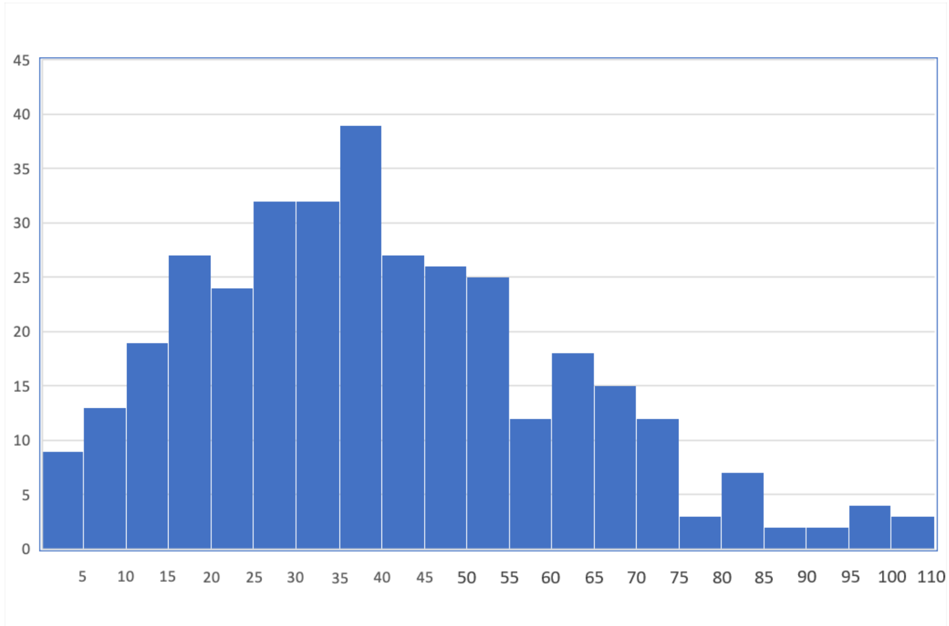

Figure 31: Histogram of Mississippian burial mound site distances in Tampa Bay

Chapter 8: Conclusion

While the spatial analyses I used had good theoretical bases, they could not determine with good certainty which sites were the most significant, or when and where any chiefdoms arose, but research continues into how chiefdoms and other complex social organizations developed in a diverse array of societies. It was a tentative hypothesis to assume that the sampled coastal mounds in West-Central Florida signified large, politically significant villages while the region's social history has barely been studied (and hunter-gatherer societies in the Southeast and other non-Mississippians continue to be overlooked). It is often the case for scientific theories to start with empirically based hypotheses, and continually gather evidence to support or reject these suppositions. The spatial patterns I found are valuable evidence for the settlement patterns of coastal polities, and more evidence from excavations and better dating should come next.

Until recently, Mississippian archaeologists had been carried away by taxonomic systems based on mound numbers, settlement distributions, and the availability of agricultural land. While many models have not been completely debunked, they are too general to account for the variations between polities in core and frontier regions (Pluckhahn and McKivergan 2002; Kowalewski 2008:235), so they should be refined to explain differences between polity sizes and structures due to environmental and cultural forces such as different population densities and partial adoption of ideologies. The differences between simple and complex chiefdoms are not that significant (the latter are better thought of as multiple single chiefdoms acting as one) and both types are known to have acted more complex in temporary situations.

Finding spatial patterns for any single site characteristic and attributing those patterns to agency without understanding that agency in detail is guaranteed to find insignificant patterns. We need to bolster evidence of polities beyond circular reasoning using platform mounds and maize agriculture and find more evidence for social hierarchies and the regional durations of sites, especially along the coasts of the Southeast. Polity size is an important topic because it allows archaeologists to study the rise and fall of cultures and how long they would have been able to last (Hally 1999:106-107), but it is difficult to determine the best ways of measuring it and to the extent it was determined by travel time.

It is unknown if Hally's findings apply to other mound sites deep in the interior in regions with floodplains such as the American Bottom or Lower Mississippi Valley, but it should be settled that they do not apply to loosely clustered coastal mound sites with poorly drained soils. This is partially due to the environment, in keeping with my alternative hypothesis, but the far distances from the Mississippian sphere and different paths toward social complexity also explain differences between coastal and interior societies. The limited layout of floodplains in the Piedmont of the Southeast could have partially caused the dense clustering and wide separation of Mississippian settlements, whereas coastal settlements had less distinct and separate clusters due to almost ubiquitous resources available for fisher-hunter-gatherers. The limited space for floodplains may also factor into why warfare was prevalent as settlements had to compete for both space and resources (Worth 1998:7). Perhaps the location and restriction of areas with the potential of productive resources is a more reliable indicator of which communities had greater status than the existence of clusters without an environmental correlation.

Hally's (1993:159) more agreeable observation was that the spatial distribution of mound sites in all regions could reflect the societal "political and economic nature…internal organization and external relationships…and characteristics of chiefdoms." While platform mounds with distinct stratigraphy may be a valid proxy for chiefdoms in the inner Southeast, research in the coastal regions suggests other aspects are better suited at measuring sociopolitical organizations and relationships. Research continues on how coastal mounds and middens can be taxonomically organized and distinguished and whether the purposes of mound construction for expressing power or gathering diverse peoples were universal. While knowledge about mounds have improved in the past 25 years, using them as proxies for social organization is not recommended until the very existence of a particular social organization is established.

Outside of Florida's regions with famous mound sites like Lake Jackson, Crystal River and Mound Key, the lack of extensive studies of the regional and historical contexts of Tampa Bay's mound sites is problematic. Inland mounds and other monumental features have been studied far more than those near coasts, resulting in a better and biased understanding of their functions and construction histories, a serious problem that has clouded understanding differences as well as relationships between the two regions. While preferable to theoretical generalizations, finding the specific historical processes of mound construction, abandonment, and meaning are daunting tasks given the scales they require and the fact many mound sites have been destroyed by development or early excavations that had little to no geophysics or radiocarbon dating done. Florida archaeologists have been burdened with relatively little data to work with along the Gulf Coast and finding new evidence is dependent on economic needs and the sensitive political nature of human remains. When utilized properly, technologies such as

GIS, remote sensing, and Bayesian statistics can greatly aid researchers, increase efficiency, and fill in gaps in theoretical knowledge.

Burial mounds are even more important than platform mounds for determining social stratification and evidence of high-status individuals and groups. While Moore and Willey's work laid the foundations for modern Florida bioarchaeology, modern archaeologists have the scientific tools to test demographic and health data including sex, age, pathology, and diet (Hutchinson 1993, 2004; Hutchinson and Norr 2006; Hutchinson et al. 1998, 2016; Kelly et al. 2006; Tykot et al. 2005) that are valuable in determining social differences and measuring long-term temporal changes. However, obtaining this data is complicated by modern repatriation laws and politics that requires developing trust with Indigenous peoples and defending the necessity and cultural compatibility of scientific research. Bioarchaeology is also crucial for better population and size estimates of Woodland and Mississippian villages in peninsular Florida with more excavations of habitation areas and improving the curation and research of human remains from earlier burial mound excavations. Non-destructive surveys of the remaining platform mounds in Tampa Bay can reveal features on the summits that would reveal what their last functions were and help expand when and where ceremonialism and chiefdoms developed in the region. Subsurface deposits of leveled middens and mounds are still valuable data sources and more mass-scale ground-penetrating radar and LiDAR surveys will rediscover or reveal them.

Many improvements to my project and others like it are recommended. The sample of mound sites I used to determine contemporaneousness and distinguish mound villages from isolated burial mounds and middens could be significantly improved from radiocarbon dates, a better cultural history, and more data on the development of mounds and middens on Florida's coasts. The use of plain pottery later by Tampa Bay's heterogeneous cultures makes chronology and cultural affiliations more difficult than in other regions, but scientific methods including radiocarbon dating and stable-isotope analysis can distinguish pottery types with greater precision. Determining secular and sacred uses of shell features could involve comparative assemblages of vertebrates (e.g., sacred animals tend to be exceptional in their environment and harder to catch; and assemblages are more diverse), but equifinality is a problem (Reitz et al. 2020). The dates, layouts, size, and full histories of these mound sites are only beginning to be understood and to be able to compare them with both the Mississippian societies that built platform mounds and Florida societies like the Timucua and Glades who did not build sand or earth mounds. More evidence for chiefdom capitals in Tampa Bay will include evidence for platform mound structures that were not charnel houses built in Mississippian times, elite burials (several of which have been found on Cabbage Key near Pinellas Point), and large structures like council houses to estimate population sizes and transitions from egalitarian to restricted residences.

Regional studies would also greatly benefit from improvements in data accumulation and curation. Better, more specific predictive models will help identify in Florida environmental associations with sites that may differ from other regions, such as the broad spatial extent of burial mounds or the apparently weak correlation between rivers and site clusters. More regional paleoclimatological studies will determine the regional extents of climate patterns that affected site habitation and more paleobotanical research could recreate the historic extents of wetlands that were highly correlated with habitation and resource extraction sites. If site file data is to improve its usefulness for regional studies, states could begin by standardizing and reconciling temporal spans and cultural affiliations to improve temporal resolutions that would narrow down coevality and improve understanding site relationships and diachronic changes. This will also require new surveys and excavations of sites that have yet to be discovered or haven't been inspected for decades.

If anyone is interested in applying my techniques elsewhere in Florida, I would recommend the Apalachee and Calusa since they have long been assumed to have been complex chiefdoms but formed in environments very different from Mississippians. They are known to have exhibited settlement patterns different as well (e.g. the Apalachee settling near lakes rather than rivers and the Calusa near the coastline), so they will make interesting comparisons to test how much the environment affected the settlement patterns of complex chiefdoms. My research could also serve as a basis for expanding research and protection of the remaining mound sites of Tampa Bay that deserve better recognition. In addition to preserving for the sake of research and Indigenous rights, additional knowledge of the region's precolumbian societies could increase interest and appreciation by laypeople.

I concur with Ashley and White (2012:1) that Florida has been neglected for too long in southeastern archaeology for being "different" from traditional Mississippian cultures and more research should investigate the degree to how it was different and was still able to develop levels of social and political complexity without the more common catalysts. Even the Glades region, at the southeastern most tip of America, was influenced by Mississippian culture and trade, and it is increasingly becoming clearer from more extensive excavations the extent to which all of Florida's precolumbian societies influenced each other and were connected to the Mississippian world.

Very little is known about the Safety Harbor culture compared to its neighbors, especially its social organization. It is certainly possible it was always organized as a simple chiefdom with three or four small-to-medium clusters of villages who paid tribute to the Calusa and Alachua.

Judging from the poor resolution of its cultural periods, it is also just as possible it centralized late in prehistory, with better dates and periods to determine if this was the case. The inhabitants of Tampa Bay have been overlooked but are historically important for being among the first Indigenous people to interact with Europeans and affect their views of Native Americans. Peripheral regions of greater territories and horizons are often the most overlooked, but more research and comparisons between the two will improve the understanding of the development of both. With more excavations, evolving theories, and better data management, these neglected regions and societies should receive the attention they deserve.

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Appendix A: Dating references for timeline (see References)

Anclote Complex: Kolianos 2002
Bayshore Homes Complex: Austin 2016
Bayview/Seven Oaks Mound: Brinton 1999
Cockroach Key: Penton 1971
Dunedin Mound: Goggin 1952a
Fort Brooke Mound Hardin: 1996
Harbor Key Complex: Milanich 1979; Wheeler 2005
Maximo Point: Austin 1987b
Mill Point Complex: Pluckhahn and Jackson 2019; Weiss 1981
Narvaez Mounds: Simpson 1998
Oelsner Mound: Mattick 1993
Pinellas Point Complex: Austin 2019
Pipkin Mound: Greer 1973
Safety Harbor: Pluckhahn and Jackson 2019; Weiss 1981
Shaw's Point Complex: Schwadron and Mattick 2001
Snead Island Complex: Weisman 1994
Terra Ceia Complex: Morgan 1999
Thomas Complex: Willey 1949
Weeden Island: Pluckhahn and Jackson 2019

Appendix B: GIS Data Sources

Category	Name	File	Source	Derivatives
Public Data				
Florida coastline	coast_feb04	Shapefile, Line	FGDL	Historic coastline
T-sheets of Tampa Bay, c. 1940	t58%_dd	GeoTIFF	NOAA	Historic custom data
Florida archaeological sites	TB_sites	Shapefile, Polygon	FMSF	Mound Points
General vegetation	vcom67_multi	Shapefile, Polygon	FGDL	Figure 1
Mangrove forests	mangroves_2019	Shapefile, Polygon	FGDL	
Soils by county	soilmu_a_fl%_mapunit	Shapefile, Polygon	NCRS	Cost surface
Soil database with drainage	soildb_FL_2003/muaggatt	MDB database	NCRS	Cost surface
Custom Data				
Historic coastline	coast_1940	coast_feb04		Land, Ocean
Merged historic soils	soilmu_1940	soilmu_a_fl%_mapunit		Cost surface
Historic vegetation	veg_1940	t58%_dd		Cost surface
Historic lakes	lakes_1940	t58%_dd		Cost surface
Historic islands	islands_1940	t58%_dd		Cost surface

Appendix C: Distance Matrix (straight distances and least cost paths) of Tampa Bay mound sites with least cost data

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Anclote (Water)	*Bayshore Homes (Water)*	M	Water	40.3	51.1	8.7	5.9
Myers Mound	Bayview/Seven Oaks	M	Land	22.5	24	5.6	4.3
Anclote	Bullfrog	M	Skipped	53.7			
Anclote (Water)	*Cockroach Key (Water)*	WM	Water	59.6	79.9	13.5	5.9
Anclote	Dunedin	M	Default	16.6	17.1	3	5.7
Anclote	Fort Brooke	WM	Skipped	41.3			
Anclote (Water)	*Harbor Key (Water)*	M	Water	65.4	78.8	13.4	5.9
Anclote (Water)	*Kennedy North (Water)*	M	Water	69.3	80.8	13.7	5.9
Anclote	Maximo Point	WM	Default	52.2	62.5	10.7	5.9
Anclote	Mill Point	WM	Skipped	52			
Anclote (Water)	*Narvaez (Water)*	M	Water	42.2	51.6	8.8	5.9
Anclote	Oelsner	WM	Default	12.3	15.2	2.6	5.8
Anclote	Pinellas Point	WM	Default	53.2	64.8	11.1	5.9
Myers Mound	Pipkin	M	Land	21.8	23.2	5.4	4.3
Myers Mound	Safety Harbor	M	Land	20.7	21.8	5.1	4.2
Anclote (Water)	*Shaw's Point (Water)*	WM	Water	73.1	84.1	14.3	5.9
Anclote (Water)	*Snead Island (Water)*	WM	Water	72.1	83.1	14.2	5.9
Anclote (Water)	*Terra Ceia North (Water)*	WM	Water	69.5	81.6	13.8	5.9
Anclote (Water)	*Thomas (Water)*	WM	Water	59.4	85.4	14.5	5.9
Myers Mound	Weeden Island	WM	Land	38.9	43.8	10.9	4.0
Bayshore Homes	Bayview/Seven Oaks	M	Land	19	20	5.4	3.7
Bayshore Homes (Water)	*Bullfrog (Water)*	M	Water	36.3	50.2	8.5	5.9

Appendix C (cont'd)

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Bayshore Homes	Cockroach Key	M	Default	26.8	31.5	5.4	5.8
Bayshore Homes (Water)	*Dunedin (Water)*	M	Water	23.8	33	5.6	5.9
Bayshore Homes (Water)	*Fort Brooke (Water)*	M	Water	33.6	55.3	9.4	5.9
Bayshore Homes	Harbor Key	M	Default	28.6	30.5	5.3	5.7
Bayshore Homes	Kennedy	M	Default	31.6	33.7	5.9	5.7
Bayshore Homes	Maximo Point	M	Default	13.5	15.2	2.6	5.7
Bayshore Homes (Water)	*Mill Point (Water)*	M	Water	37	51.6	8.7	5.9
Bayshore Homes	Narvaez	M	Default	1.9	2.4	0.4	5.5
Bayshore Homes (Water)	*Oelsner (Water)*	M	Water	51.7	64.2	10.9	5.9
Bayshore Homes	Pinellas Point	M	Default	15.1	17.5	3	5.8
Bayshore Homes	Pipkin	M	Land	21.5	23.2	6.2	3.7
Bayshore Homes	Safety Harbor	M	Land	23.6	25.6	6.8	3.8
Bayshore Homes	Shaw's Point	M	Default	33.4	36.6	6.3	5.8
Bayshore Homes	Snead Island	M	Default	32.8	35.8	6.1	5.8
Bayshore Homes	Terra Ceia	M	Default	31.2	33.7	5.8	5.8
Bayshore Homes	Thomas	M	Default	30.7	37	6.3	5.9
Bayshore Homes	Weeden Island	M	Land	15.4	16.8	4.3	3.9
Bayview/Seven Oaks (Water)	*Bullfrog (Water)*	MC	Water	35.9	39.4	6.7	5.9
Bayview/Seven Oaks	Cockroach Key	M	Default	37.5	40.3	7.1	5.7
Bayview/Seven Oaks	Dunedin	MC	Default	8.6	9.2	2.3	4
Bayview/Seven Oaks (Water)	*Fort Brooke (Water)*	MC	Water	26.4	44.5	7.5	5.9
Bayview/Seven Oaks	Harbor Key	M	Default	42.9	46.6	8.2	5.7
Bayview/Seven Oaks	Kennedy	MC	Default	46.8	50.8	9	5.7

Appendix C (cont'd)

Origin Site (for LCA Paths)	**Destination Site**	**Time Periods**	**Cost Surface**	**Straight Distance (km)**	**Path Distance (km)**	**Path Cost (h)**	**Average Speed (kph)**
Bayview/Seven Oaks (Water)	*Mill Point (Water)*	M	Water	35	40.7	6.9	5.9
Bayview/Seven Oaks	Narvaez	MC	Land	20.8	21.9	5.9	3.7
Bayview/Seven Oaks	Oelsner	M	Skipped	32.8			
Bayview/Seven Oaks	Pinellas Point	MC	Default	30.7	39.3	6.9	5.7
Bayview/Seven Oaks	Pipkin	M	Default	3.3	3.6	0.9	4.1
Bayview/Seven Oaks	Safety Harbor	MC	Land	5.4	5.6	1.4	4
Bayview/Seven Oaks	Shaw's Point	MC	Default	50.7	58	10.1	5.7
Bayview/Seven Oaks	Snead Island	MC	Default	49.7	55.9	9.7	5.8
Bayview/Seven Oaks	Terra Ceia	MC	Default	47	51.7	9	5.7
Bayview/Seven Oaks	Thomas	MC	Default	38.2	39.9	7	5.7
Bayview/Seven Oaks	Weeden Island	M	Default	17	17.9	3.3	5.4
Bullfrog	Cockroach	M	Default	21.1	22.9	4	5.7
Bullfrog	Dunedin	MC	Skipped	44.4			
Bullfrog	Fort Brooke	MC	Default	13.5	14.6	2.5	5.7
Bullfrog	Harbor Key	M	Default	30.2	32.8	5.8	5.7
Bullfrog	Kennedy	MC	Default	34.2	38.1	6.7	5.7
Bullfrog	Maximo Point	M	Default	31.6	35.1	6	5.8
Bullfrog	Mill Point	M	Default	3	3.9	0.7	5.3
Bullfrog (Water)	*Narvaez (Water)*	MC	Water	36.2	48	8.1	5.9
Bullfrog	Oelsner	M	Skipped	59.1			
Bullfrog	Pinellas Point	MC	Default	30.1	32.8	5.7	5.8
Bullfrog (Water)	*Pipkin (Water)*	M	Water	34.3	39.2	6.6	5.9

Appendix C (cont'd)

Origin Site (for LCA Paths)	**Destination Site**	**Time Periods**	**Cost Surface**	**Straight Distance (km)**	**Path Distance (km)**	**Path Cost (h)**	**Average Speed (kph)**
Bullfrog (Water)	*Safety Harbor (Water)*	MC	Water	34.4	40.6	6.9	5.9
Bullfrog	Shaw's Point	MC	Default	42.8	46.3	8	5.8
Bullfrog	Snead Island	MC	Default	40.9	44.3	7.6	5.8
Bullfrog	Terra Ceia	MC	Default	35.8	40	6.9	5.8
Bullfrog	Thomas	MC	Default	15	18.8	3.3	5.7
Bullfrog	Weeden Island	M	Default	21.8	24.3	4.3	5.7
Cockroach Key (Water)	*Dunedin (Water)*	M	Water	45.5	61.8	10.5	5.9
Cockroach Key	Fort Brooke	WM	Default	29.4	31.5	5.4	5.8
Cockroach Key	Harbor Key	M	Default	9.2	10.3	1.9	5.3
Cockroach Key	Kennedy	M	Default	13.4	15.6	2.9	5.5
Cockroach Key	Maximo Point	WM	Default	15.5	16.3	2.8	5.7
Cockroach Key	Mill Point	WM	Default	23.7	25.5	4.4	5.8
Cockroach Key	Narvaez	M	Default	25.7	29.3	5	5.8
Cockroach Key (Water)	*Oelsner (Water)*	WM	Water	68.2	93.1	15.8	5.9
Cockroach Key	Pinellas Point	WM	Default	13.5	14.2	2.5	5.7
Cockroach Key	Pipkin	M	Default	37.8	40.9	7	5.8
Cockroach Key	Safety Harbor	M	Default	39	42.3	7.2	5.8
Cockroach Key	Shaw's Point	WM	Default	21.8	23.7	4.1	5.7
Cockroach Key	Snead Island	WM	Default	19.9	21.7	3.8	5.8
Cockroach Key	Terra Ceia	WM	Default	14.9	17.5	3.1	5.7
Cockroach Key	Thomas	WM	Default	6.7	7.1	1.3	5.6
Cockroach Key	Weeden Island	WM	Default	20.7	22.8	3.9	5.8
Dunedin	Fort Brooke	MC	Skipped	34.4			

Appendix C (cont'd)

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Dunedin (Water)	*Harbor Key (Water)*	M	Water	50.2	60.7	10.3	5.9
Dunedin	Kennedy	MC	Default	53.9	63.9	11	5.8
Dunedin	Maximo Point	M	Default	36.3	45.4	7.8	5.9
Dunedin	Mill Point	M	Skipped	43.5			
Dunedin (Water)	*Narvaez (Water)*	MC	Water	25.7	33.5	5.7	5.9
Dunedin	Oelsner	M	Default	28.4	31.7	5.4	5.8
Dunedin	Pinellas Point	MC	Default	37.4	47.7	8.2	5.9
Dunedin	Pipkin	M	Default	10.3	11.2	2.7	4.1
Dunedin	Safety Harbor	MC	Land	11	11.5	3	3.8
Dunedin	Shaw's Point	MC	Default	57	66.3	11.3	5.9
Dunedin (Water)	*Snead Island (Water)*	MC	Water	56.1	65.6	11.1	5.9
Dunedin (Water)	*Terra Ceia North (Water)*	MC	Water	53.9	63.5	10.8	5.9
Dunedin (Water)	*Thomas (Water)*	MC	Water	46.6	67.3	11.4	5.9
Dunedin	Weeden Island	M	Land	25.4	27.7	7.4	3.8
Fort Brooke	Harbor Key	M	Default	38.3	41.4	7.2	5.8
Fort Brooke	Kennedy	MC	Default	42.7	46.7	8.1	5.8
Fort Brooke	Maximo Point	WM	Default	34.2	40.2	6.9	5.9
Fort Brooke	Mill Point	WM	Default	11.1	12.1	2.3	5.3
Fort Brooke (Water)	*Narvaez (Water)*	MC	Water	34.2	53.1	9	5.9
Fort Brooke	Oelsner	WM	Skipped	45.8			
Fort Brooke	Pinellas Point	WMC	Default	33.4	37.9	6.5	5.9
Fort Brooke (Water)	Pipkin	M	Water	24	44.3	7.5	5.9
Fort Brooke (Water)	Safety Harbor	MC	Water	23.5	45.7	7.7	5.9

Appendix C (cont'd)

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Fort Brooke	Shaw's Point	WMC	Default	50.4	54.9	9.4	5.8
Fort Brooke	Snead Island	WMC	Default	48.6	52.9	9	5.9
Fort Brooke	Terra Ceia	WMC	Default	44	48.6	8.3	5.9
Fort Brooke	Thomas	WMC	Default	25.2	27.4	4.7	5.8
Fort Brooke (Water)	Weeden Island	WM	Water	18.4	30.5	5.2	5.9
Harbor Key	Kennedy	M	Default	4.4	5.7	1.2	4.7
Harbor Key	Maximo Point	M	Default	15.2	15.3	2.8	5.5
Harbor Key	Mill Point	M	Default	32.9	35.4	6.2	5.8
Harbor Key	Narvaez	M	Default	27	28.3	5	5.7
Harbor Key	Oelsner	M	Skipped	74.9			
Harbor Key	Pinellas Point	M	Default	13.5	13.8	2.5	5.5
Harbor Key	Pipkin	M	Default	43.8	47.2	8.2	5.8
Harbor Key	Safety Harbor	M	Default	45.3	48.6	8.4	5.8
Harbor Key	Shaw's Point	M	Default	12.6	14.1	2.5	5.5
Harbor Key	Snead Island	M	Default	10.7	12	2.2	5.5
Harbor Key	Terra Ceia	M	Default	5.7	7.8	1.5	5.4
Harbor Key	Thomas	M	Default	15.4	17.2	3	5.6
Harbor Key	Weeden Island	M	Default	27.2	29.1	5.1	5.7
Kennedy	Maximo Point	M	Default	18.1	19.3	3.4	5.6
Kennedy	Mill Point	M	Default	36.9	40.8	7.1	5.8
Kennedy	Narvaez	MC	Default	29.9	31.5	5.5	5.7
Kennedy	Oelsner	M	Skipped	79			
Kennedy	Pinellas Point	MC	Default	16.6	17.9	3.2	5.6

Appendix C (cont')

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Kennedy	Pipkin	M	Default	47.8	51.3	8.9	5.8
Kennedy	Safety Harbor	MC	Default	49.4	52.7	9.1	5.8
Kennedy South (Water)	*Shaw's Point (Water)*	MC	Water	9.1	9.9	1.7	5.9
Kennedy	Snead Island	MC	Default	7.1	7.6	1.4	5.5
Kennedy	Terra Ceia	MC	Land	2.1	2.3	0.7	3.5
Kennedy	Thomas	MC	Default	19.2	22.5	4	5.7
Kennedy	Weeden Island	M	Default	31.4	33.2	5.8	5.7
Maximo Point	Mill Point	WM	Default	33.3	36.4	6.2	5.9
Maximo Point	Narvaez	M	Default	11.8	13	2.3	5.7
Maximo Point	Oelsner	WM	Default	62.7	76	13	5.9
Maximo Point	Pinellas Point	WM	Land	2	2.2	0.5	4.1
Maximo Point	Pipkin	M	Land	31.5	35.6	9.2	3.8
Maximo Point	Safety Harbor	M	Land	33.3	38	9.8	3.9
Maximo Point	Shaw's Point	WM	Default	20.8	22.1	3.8	5.8
Maximo Point	Snead Island	WM	Default	19.9	21.3	3.7	5.8
Maximo Point	Terra Ceia	WM	Default	17.8	19.3	3.3	5.8
Maximo Point	Thomas	WM	Default	21.1	21.8	3.7	5.9
Maximo Point	Weeden Island	WM	Land	17.5	19.9	4.9	4.1
Mill Point (Water)	*Narvaez (Water)*	M	Water	37.1	49.4	8.4	5.9
Mill Point	Oelsner	WM	Skipped	56.9			
Mill Point	Pinellas Point	WM	Default	32	34.1	5.8	5.8
Mill Point (Water)	*Pipkin (Water)*	M	Water	33.2	40.5	6.9	5.9

Appendix C (cont'd)

Origin Site (for LCA Paths)	**Destination Site**	**Time Periods**	**Cost Surface**	**Straight Distance (km)**	**Path Distance (km)**	**Path Cost (h)**	**Average Speed (kph)**
Mill Point (Water)	*Safety Harbor (Water)*	M	Water	33.1	41.9	7.1	5.9
Mill Point	Shaw's Point	WM	Default	45.5	48.9	8.4	5.8
Mill Point	Snead Island	WM	Default	43.6	46.9	8	5.9
Mill Point	Terra Ceia	WM	Default	38.5	42.7	7.3	5.9
Mill Point	Thomas	WM	Default	17.8	21.5	3.7	5.8
Mill Point	Weeden Island	WM	Default	22.1	25.6	4.5	5.7
Narvaez (Water)	*Oelsner (Water)*	M	Water	53.4	64.7	11	5.9
Narvaez	Pinellas Point	MC	Default	13.5	15.3	2.7	5.7
Narvaez	Pipkin	M	Land	23.3	25	6.7	3.7
Narvaez	Safety Harbor	MC	Land	25.3	27.5	7.3	3.8
Narvaez	Shaw's Point	MC	Default	31.6	34.4	5.9	5.8
Narvaez	Snead Island	MC	Default	30.9	33.6	5.7	5.8
Narvaez	Terra Ceia	MC	Default	29.4	31.5	5.4	5.8
Narvaez	Thomas	MC	Default	29.8	34.8	5.9	5.9
Narvaez	Weeden Island	M	Land	15.9	17.2	4.4	3.9
Oelsner	Pinellas Point	WM	Default	63.4	78.2	13.4	5.8
Oelsner	Pipkin	M	Skipped	31.3			
Oelsner	Safety Harbor	M	Skipped	29.6			
Oelsner (Water)	*Shaw's Point (Water)*	WM	Water	83.5	97.2	16.5	5.9
Oelsner (Water)	*Snead Island (Water)*	WM	Water	82.4	96.7	16.4	5.9
Oelsner (Water)	*Terra Ceia North (Water)*	WM	Water	79.3	94.7	16.1	5.9
Oelsner	Thomas	WM	Skipped	67.1			
Oelsner	*Weeden Island*	WM	Skipped	47.7			

Appendix C (cont'd)

Origin Site (for LCA Paths)	Destination Site	Time Periods	Cost Surface	Straight Distance (km)	Path Distance (km)	Path Cost (h)	Average Speed (kph)
Pinellas Point	Pipkin	M	Default	32.1	39.8	6.8	5.8
Pinellas Point	Safety Harbor	MC	Default	33.9	41.2	7	5.9
Pinellas Point	Shaw's Point	WMC	Default	20.1	20.8	3.6	5.7
Pinellas Point	Snead Island	WMC	Default	19	20	3.5	5.8
Pinellas Point	Terra Ceia	WMC	Default	16.5	17.9	3.1	5.8
Pinellas Point	Thomas	WMC	Default	19.2	19.5	3.4	5.8
Pinellas Point	Weeden Island	WM	Land	17.4	20.2	4.9	4.1
Pipkin	Safety Harbor	M	Default	2.1	2.6	0.5	5.6
Pipkin	Shaw's Point	M	Default	52.3	58.5	10	5.8
Pipkin	Snead Island	M	Default	51.1	56.5	9.7	5.9
Pipkin	Terra Ceia	M	Default	48.1	52.3	8.9	5.8
Pipkin	Thomas	M	Default	37.9	40.4	6.9	5.9
Pipkin	Weeden Island	M	Default	17.1	18.5	3.3	5.6
Safety Harbor	Shaw's Point	MC	Default	54	59.9	10.2	5.9
Safety Harbor	Snead Island	MC	Default	52.9	57.9	9.9	5.9
Safety Harbor	Terra Ceia	MC	Default	49.7	53.7	9.1	5.9
Safety Harbor	Thomas	MC	Default	38.8	41.8	7.1	5.9
Safety Harbor	Weeden Island	M	Default	18.3	19.9	3.5	5.7
Shaw's Point	Snead Island	WMC	Default	2	2.5	0.5	4.8
Shaw's Point (Water)	*Terra Ceia South (Water)*	WMC	Water	7.2	8.1	1.4	5.9
Shaw's Point	Thomas	WMC	Default	28	30.6	5.3	5.8
Shaw's Point (Water)	*Weeden Island (Water)*	WM	Water	37	39.7	6.7	5.9
Snead Island	Terra Ceia	WMC	Default	5.2	5.8	1.1	5.4

Appendix C (cont'd)

Origin Site (for LCA Paths)	**Destination Site**	**Time Periods**	**Cost Surface**	**Straight Distance (km)**	**Path Distance (km)**	**Path Cost (h)**	**Average Speed (kph)**
Snead Island	Thomas	WMC	Default	26.1	28.6	4.9	5.9
Snead Island (Water)	*Weeden Island (Water)*	WM	Water	35.6	37.8	6.4	5.9
Terra Ceia	Thomas	WMC	Default	20.9	24.4	4.2	5.8
Terra Ceia	Weeden Island	WM	Default	32	34	5.8	5.8
Thomas	Weeden Island	WM	Default	21.2	22.3	3.8	5.8