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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
</tr>
<tr>
<td>ABSTRACT</td>
</tr>
<tr>
<td>1 - INTRODUCTION</td>
</tr>
<tr>
<td>2 - THE BELLE GLADE WORLD: ENVIRONMENTAL CONTEXT OF THE STUDY</td>
</tr>
<tr>
<td>The Hydraulic Regime of the Kissimmee-Okeechobee-Everglades</td>
</tr>
<tr>
<td>Wetlands Ecosystems of the Kissimmee-Okeechobee-Everglades</td>
</tr>
<tr>
<td>Upland Ecosystems of the Kissimmee-Okeechobee-Everglades</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>3 - ARCHAEOLOGY OF THE BELLE GLADE WORLD: HUMAN CULTURE AND HISTORY</td>
</tr>
<tr>
<td>Pottery</td>
</tr>
<tr>
<td>Lithics</td>
</tr>
<tr>
<td>Bone</td>
</tr>
<tr>
<td>Shell</td>
</tr>
<tr>
<td>Artistic Depictions</td>
</tr>
<tr>
<td>Exotic Materials</td>
</tr>
<tr>
<td>Subsistence Patterns</td>
</tr>
<tr>
<td>Settlement Patterns</td>
</tr>
<tr>
<td>Social Organization</td>
</tr>
<tr>
<td>Mortuary Practices</td>
</tr>
<tr>
<td>Monumentality</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>4 - ENGAGING THE MONUMENTAL: PREVIOUS RESEARCH ON BELLE GLADE MONUMENTALITY</td>
</tr>
<tr>
<td>Belle Glade I Architecture</td>
</tr>
<tr>
<td>Belle Glade II–III Architecture</td>
</tr>
<tr>
<td>Belle Glade IV Architecture</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>5 - ENGAGING THE ONTOLOGICAL: REALITIES AND LIVED WORLDS AS A FRAMEWORK FOR ARCHAEOLOGICAL UNDERSTANDING</td>
</tr>
<tr>
<td>Table</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>3-1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3-2</td>
</tr>
<tr>
<td>4-1</td>
</tr>
<tr>
<td>4-2</td>
</tr>
<tr>
<td>4-3</td>
</tr>
<tr>
<td>7-1</td>
</tr>
<tr>
<td>7-2</td>
</tr>
<tr>
<td>8-1</td>
</tr>
<tr>
<td>8-2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-3</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-4</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-5</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-6</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-7</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-8</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-9</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8-10</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Azimuths, celestial alignments, and site alignments exhibited by Big Mound City. ................................................................. 381

Alignment probabilities and site distributions by azimuth range from Tony's Mound. ........................................................................ 386

Azimuths, celestial alignments, and site alignments exhibited by Hendry Earthworks........................................................................................................ 391

Alignment probabilities and site distributions by azimuth range from Hendry Earthworks........................................................................................................ 394

Azimuths, celestial alignments, and site alignments for Maple Mound. ....... 396

Azimuths, celestial alignments, and site alignments for South Lake Mounds... 401

Alignment probabilities and site distributions by azimuth range from South Lake Mounds........................................................................................................ 403

Azimuths, celestial alignments, and site alignments exhibited by Kissimmee Circle Earthworks. ................................................................. 407

Alignment probabilities and site distributions by azimuth range from South Lake Mounds........................................................................................................ 411

Azimuths, celestial alignments, and site alignments exhibited by Fort Center.. 414

Alignment probabilities and site distributions by azimuth range from South Lake Mounds........................................................................................................ 419

USDA NRCS Web Soil Survey data for Big Mound City site location.......... 429

Breakdown of basic information about Stirling's excavations at Big Mound City. ...................................................................................... 431

AMS dates from the 2015 KORES Project at Big Mound City. ................. 436

All AMS dates from Big Mound City sorted by depth.................................. 444
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>The Kissimmee-Okeechobee-Everglades (KOE) watershed.</td>
</tr>
<tr>
<td>2-1</td>
<td>Mesic temperate hammock ecosystem surrounded by wet prairie ecosystem on the Brighton Seminole Indian Reservation.</td>
</tr>
<tr>
<td>2-2</td>
<td>Hammock ecosystems amidst wet prairie in the Kissimmee River Basin.</td>
</tr>
<tr>
<td>2-3</td>
<td>Bare earth model of hammock ecosystems in the Kissimmee River Basin.</td>
</tr>
<tr>
<td>2-4</td>
<td>Hammock zones of Florida.</td>
</tr>
<tr>
<td>3-1</td>
<td>Sites mentioned in text.</td>
</tr>
<tr>
<td>3-2</td>
<td>All Belle Glade sites listed in the Florida Master Site File.</td>
</tr>
<tr>
<td>3-3</td>
<td>All Type B monuments.</td>
</tr>
<tr>
<td>4-1</td>
<td>Distributions of different earthwork forms.</td>
</tr>
<tr>
<td>4-2</td>
<td>Open-faced and enclosed variants of circular ditches.</td>
</tr>
<tr>
<td>4-3</td>
<td>Distribution of circular ditches in the KOE watershed overlaid on water features of the watershed.</td>
</tr>
<tr>
<td>4-4</td>
<td>Circular-linear earthworks.</td>
</tr>
<tr>
<td>4-5</td>
<td>LiDAR-derived DEM of Fort Center's Type A and B circular-linear earthwork.</td>
</tr>
<tr>
<td>4-6</td>
<td>Variants of Type A circular-linear earthworks exhibiting a single embankment rather than dual parallel embankments.</td>
</tr>
<tr>
<td>4-7</td>
<td>Adaptation of Stirling's map of Big Mound City.</td>
</tr>
<tr>
<td>4-8</td>
<td>Longyear's west wall profile of excavation unit from southern parallel embankment associated with Mound 1 at Fort Center circa 1966-1967.</td>
</tr>
<tr>
<td>4-9</td>
<td>Sample of circular-linear earthwork orientations relative to primary direction of sheet flow.</td>
</tr>
<tr>
<td>6-1</td>
<td>Deer antler headdress from Belle Glade Mound.</td>
</tr>
<tr>
<td>6-2</td>
<td>Columella pendants from Belle Glade Mound.</td>
</tr>
<tr>
<td>6-3</td>
<td>Duckhead effigy from the Blueberry site.</td>
</tr>
<tr>
<td>6-4</td>
<td>Duckhead effigy from Fort Center.</td>
</tr>
</tbody>
</table>
6-5  Paddle effigies from Belle Glade Mound. ......................................................... 251
6-6  Ceramic effigy head from the Blueberry site....................................................... 252
6-7  Human effigy carving from Belle Glade Mound. ............................................... 253
6-8  Human effigy carving from Lakeport................................................................. 254
6-9  Padgett figurine from Palm Hammock site. ...................................................... 255
6-10 Zoomorphic effigy carvings from Belle Glade Mound. ..................................... 256
6-11 Zoomorphic effigy carving from Belle Glade Mound. ..................................... 257
6-12 Sample of zoomorphic effigies from Fort Center depicting mammals............. 259
6-13 Sample of zoomorphic effigies from Fort Center depicting birds. .................... 261
6-14 Sample of zoomorphic effigy carvings from Fort Center depicting movement. . 263
6-15 Carved sandstone nodule from the Blueberry site..................................... 265
7-1  Figures showing the removal point cloud data associated with architectural
     features at Big Mound City. ................................................................................ 301
7-2  Figure showing two aerials of the location of Hendry Earthworks, one of the
     sites destroyed by land conversion................................................................. 303
7-3  Compass rose diagram depicting 10° azimuth range divisions and site
     distributions used for calculating probabilities. ............................................. 312
7-4  Glades Circle circa 1985. .................................................................................. 315
7-5  Flow Direction (FDR) model of Big Mound City. ............................................ 318
7-6  Flow Accumulation (FAC) model of Big Mound City .................................... 319
8-1  Distribution of circular ditches showing emplacement along celestial
     azimuths. ......................................................................................................... 327
8-2  Circular ditches emplaced along equinoctial azimuths. .................................... 328
8-3  Circular ditches emplaced along solstitial azimuths....................................... 329
8-4  Circular ditches emplaced along lunar azimuths. .......................................... 330
8-5  Circular ditches emplaced along meridians. .................................................... 332
8-6  The nine Type A circular-linear earthworks included in this analysis............. 334
Aerial photograph showing Drasdo Earthworks in 1941. .................................................. 336
Celestial alignment exhibited by Drasdo Earthworks. ......................................................... 337
Aerial photograph showing Kissimmee Circle in 1944. .................................................. 338
Azimuths present in Kissimmee Circle. ................................................................. 339
Alignment exhibited by Kissimmee Circle. ................................................................. 340
Aerial photograph showing Barley Barber I in 1971.................................................... 342
Celestial alignments exhibited by Barley Barber I......................................................... 343
Site alignment exhibited by Barley Barber I. A) Close-up of Barley Barber I showing alignment origin. ................................................................. 344
Aerial photograph showing Whitebelt II Earthworks Complex in 1938............... 345
Celestial alignments exhibited by Whitebelt II Earthworks Complex....................... 346
Site alignment exhibited by Whitebelt II Earthworks Complex. ................................ 347
Hydrological model of the Whitebelt II Earthworks Complex showing primary flow accumulations. ............................................................... 348
Aerial photograph showing Summer Earthworks in 1974. ........................................ 349
Celestial alignments exhibited by Summer Earthworks. .............................................. 350
Site alignments exhibited by Summer Earthworks......................................................... 351
Aerial photograph showing Ortona Earthworks’ Type A architecture in 1949... 353
Celestial alignments exhibited by Ortona Earthworks Type A architecture....... 354
Site alignment exhibited by Ortona Earthworks Type A architecture. ..................... 356
Aerial photograph showing Lakeport Earthworks in 1948................................. 357
Celestial alignment present in Lakeport Earthworks................................................. 358
Site alignment exhibited by Lakeport Earthworks...................................................... 358
Hydrological modeling of Lakeport Earthworks and its immediate surroundings showing primary flow accumulations............................... 360
Aerial photograph showing Candler Mound & Earthworks in 1941................. 361
8-52 Spatial circularity exhibited by Maple Mound

8-53 Celestial alignments exhibited by Maple Mound

8-54 Hydrological modeling of Maple Mound showing flow accumulations

8-55 Aerial photograph of South Lake Mounds in 1957 showing numbered architectural features

8-56 Celestial alignments exhibited by South Lake Mounds

8-57 Site alignments exhibited by South Lake Mounds

8-58 Aerial photograph of Kissimmee Circle Earthworks in 1957 showing numbered embankments

8-59 Spatial circularity exhibited by Kissimmee Circle Earthworks

8-60 Celestial alignments exhibited by Kissimmee Circle Earthworks

8-61 Site alignments exhibited by Kissimmee Circle Earthworks

8-62 Hydrological modeling of Kissimmee Circle Earthworks showing flow accumulations

8-63 Aerial photograph of Fort Center in 1948 showing numbered embankments

8-64 Spatial circularity exhibited by Fort Center

8-65 Celestial alignments exhibited by Fort Center

8-66 Site alignments exhibited by Fort Center

8-67 Hydrological modeling of Fort Center showing primary flow accumulations

9-1 Florida geologic formations showing location of Big Mound City

9-2 USDA NRCS Web Soil Survey map of the Big Mound City site location

9-3 Adaptation of Stirling’s map of Big Mound City

9-4 Locations of carbonized wood samples within shovel test and sediment core from 2015 KORES project. Modified from Lawres and Colvin (2017)

9-5 Stratigraphic profile of the south wall of Test Units 1–5 & 7 showing locations of in situ carbonized wood samples

9-6 All AMS dates from Big Mound City sorted by depth
9-7 Locations of analyzed auger tests from Big Mound City .................................................. 461

10-1 Cross-section of Embankment 1 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 474

10-2 Elemental and particle size distribution data for Embankment 1 .................................. 475

10-3 Cross-section of Embankment 2 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 478

10-4 Elemental and particle size distribution data for Embankment 2 .................................. 479

10-5 Cross-section of Embankment 3 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 482

10-6 Elemental and particle size distribution data for Embankment 3 .................................. 483

10-7 Cross-section of Embankment 5 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 486

10-8 Elemental and particle size distribution data for Embankment 5 .................................. 487

10-9 Cross-section of Embankment 6 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 489

10-10 Elemental and particle size distribution data for Embankment 6 ................................ 489

10-11 Cross-section of the Semi-Circle showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 491

10-12 Elemental and particle size distribution data for the Semi-Circle ................................. 492

10-13 Cross-section of Mound 6 showing location of auger tests and the stratigraphy of analyzed profiles ................................................................. 493

10-14 Particle size distribution and elemental data for Mound 6 ........................................ 495

10-15 Cross-section of midden-mound (Mound 4) showing location of auger tests and the stratigraphy of the analyzed profile ............................................. 497

10-16 Elemental and particle size distribution data for the midden-mound (Mound 4) ........ 499
The Belle Glade archaeological culture is a notably understudied area of Florida archaeology. Yet, this culture, and the environment it is associated with, provides a level of distinctiveness and complexity that deserves attention. Situated within the Kissimmee-Okeechobee-Everglades watershed, the Belle Glade Culture exhibits a freshwater focused fisher-hunter-gatherer strategy that supported high levels of cultural complexity resulting in the construction of a monumental landscape unlike anything else in North America. However, previous interpretations of the Belle Glade monumental architecture have largely been restricted to functional economic explanations that do not stand up to additional testing. With few exceptions, the interpretations of this architecture have not sought to tie into the broader anthropological discussions of monumentality. This research evaluates the issues with previous interpretations and provides a new one that bridges the topics of monumentality and ontologies.

Many archaeological studies in the past decade have begun engaging with the ontological turn that has been occurring in the discipline of anthropology. Of primary interest to archaeologists is how ontologies are materialized and thus become visible in the archaeological record. However, few archaeologists have evaluated how ontologies
can affect monumental practices and their products. This research focuses on how an ontology can be materialized as monumental architecture by presenting a case study of the Belle Glade archaeological culture.

I argue that Belle Glade monumental architecture is the materialization of three principles—relatedness, circularity, and place-centeredness—exhibited in Native American ontologies. These principles are embodied in the form of the monuments, which invoke citations to the relatedness between the earth, sky, and water, and between places through their emplacement in flowing water, alignments to celestial events, alignments to other monumental places and mortuary contexts on the landscape, and through patterns of recurrent rapid monumentalization.
The Kissimmee-Okeechobee-Everglades (KOE) watershed is a notably understudied region in Florida archaeology (Griffin 2002:140; Johnson 1991:1–3; Milanich 1994:281; Milanich and Fairbanks 1980:181). In fact, John Griffin said that it is “the least known of the South Florida areas” (Griffin 2002:140). Yet, the region offers a distinctive context in North America (Schwadron 2010:114; Widmer 2002:374) that warrants more attention than it has received in the past. It provides an environmental context that includes a freshwater aqueous landscape stretching north-south approximately 400 km across peninsular Florida (McPherson and Halley 1996), with water flowing from north to south across that landscape for the majority of the year.

The people who inhabited this watershed, known to archaeologists as the Belle Glade archaeological culture, practiced a way of life that provides a contrast to contemporaneous groups throughout the interior Southeast (Schwadron 2010; Widmer 2002). This way of life was entangled with the environmental characteristics of the KOE. Instead of an agricultural focus supplemented by hunting, fishing, and gathering, they focused heavily on fishing supplemented with hunting and gathering (Hale 1984, 1989; Johnson 1990, 1991; Milanich 1994:279–298; Thompson et al. 2013; Thompson and Pluckhahn 2014; Widmer 2002). They placed the majority of their settlements in the tree island hammocks dotting the landscape, because they provided the only naturally occurring dry ground. They almost exclusively manufactured plainware pottery rather than producing the intricately decorated wares seen elsewhere (Porter 1951; Sears 1994). While they did inter people in mortuary mounds, they also practiced subaqueous burial (Davenport et al. 2011:484, 518–519; Hale 1989:161; Sears 1994). Further, even
though they did not practice agriculture (Johnson 1991; Hale 1989; Thompson et al. 2013), they reached an incredible level of cultural complexity that is often overlooked. Milanich and Fairbanks made note of this as early as 1980: “When examining the archaeology of South Florida, one cannot help but feel that the most complex prehistoric cultures were centered, not on the coasts but inland in the Lake Okeechobee Basin” (Milanich and Fairbanks 1980:181).

Figure 1-1. The Kissimmee-Okeechobee-Everglades (KOE) watershed.
Yet, this region continues to be considered one of the least known in Florida archaeology. This is because the majority of our knowledge base is drawn from two major archaeological projects and several important theses and dissertations. The first major Belle Glade project was Matthew Stirling’s work at the Belle Glade, the type-site for the region, and Big Mound City sites during the early portion of the 1930s (Stirling 1935). The excavations at the Belle Glade site produced a wealth of data about the peoples that inhabited the site and provided the basis for creating the initial culture-historical trait lists for Belle Glade culture. The work at Big Mound City was also extensive, but, unfortunately, the majority of the collections recovered during excavations, along with the majority of the excavation records, were misplaced.

This work, however, was not widely available until Gordon R. Willey’s publication of *Excavations in Southeast Florida* (1949) a decade and a half after the work was conducted. These detailed excavations predated the radiocarbon revolution, leading Willey to create the initial two-period cultural chronology of the region based entirely on the seriation of culture traits derived from the excavations at the Belle Glade site. Because the materials and records from the Big Mound City investigations were lost, Willey’s report of the site was limited, and based entirely on the field notes of the site foreman (Willey 1949:73–77). Further, the only remaining portion of the collection, 30 pottery sherds, constrained his ability to align Big Mound City with the cultural chronology he produced from the Belle Glade materials (Willey 1949:76–77).

William Sears’ (1994) work at the Fort Center site during the 1960s and 1970s provides the other major source of information regarding the Belle Glade archaeological culture. This important work refined Willey’s initial chronology with the addition of a very
thorough dataset and a series of chronometric dates. Drawing on the data collected through his work at the site, along with colleagues from Colgate University and University of Florida, Sears was able to create a four-period chronology based on a tight-knit seriation of ceramic materials, settlement patterns, the incorporation of imported materials into the cultural repertoire, and construction activities.

Subsequent to Sears’ (1994) work at Fort Center several archaeologists began addressing the Belle Glade archaeological culture from a regional perspective. First, Steven Hale (1984, 1989) and Scott Mitchell (1996) evaluated Belle Glade subsistence patterns based on data obtained from several sites throughout the Kissimmee-Okeechobee-Everglades watershed. Second, William Johnson (1991, 1996) assessed monumental constructions throughout the region by drawing on the chronometric data from Fort Center as well as artifact associations from monumental features throughout the region. Third, Robert Austin (1997) considered lithic use behaviors in terms of economic perspectives. Importantly, Sear’s (1994) chronology had become the go-to for Belle Glade culture history, being extrapolated to the totality of the region for all of these studies. While these studies have been extremely important in elucidating our understanding of the Belle Glade peoples by drawing on the chronological data from a single site they have also led to a biased view of changes in culture, landscape use, and architectural construction.

Following these important regional studies, very few archaeologists have ventured back into the Kissimmee-Okeechobee-Everglades watershed outside of the context of cultural resource management surveys. It is only in the past nine years that academic archaeologists have returned to the region to re-ignite work aimed at gaining
a more thorough understanding of this archaeological culture. However, many of them have also focused on Fort Center (Austin 2015; Thompson 2016; Pluckhahn and Thompson 2012; Thompson and Pluckhahn 2012, 2014; Thompson et al. 2013). This work has done an excellent job of shifting our understandings of Fort Center by elucidating the subtleties of cultural change from a microscalar perspective, illuminating the role of political and ritual economy, and by casting further doubt on the role of maize agriculture at the site. These fresh perspectives have been long overdue, but they have also had the concomitant effect of further establishing a regional chronology based on chronometric understandings of a single site: Fort Center.

Furthermore, one of the main reasons that this region is considered poorly understood is due to a lack of synthetic works on the archaeology of the Belle Glade culture. In addition to the work focused on Fort Center there have been many studies devoted to singular aspects of this culture, but none of them have focused on tying the data into a synthesis of Belle Glade culture. The totality of the research into Belle Glade culture has provided us with many insights into various aspects of the material culture of the fisher-hunter-gatherers of the region. The work of Hale (1984; 1989) and Mitchell (1996) has provided a strong view of the subsistence patterns at several Belle Glade sites, and this view has been strengthened by smaller studies of individual hearth features at sites (Allgood 2008; Fradkin 2012). Austin’s (1997) investigations of lithic use behaviors has provided an extremely detailed view of the Belle Glade economy as it pertains to lithic tools and materials, which is further built upon by his later studies (Austin 2004, 2015; Davenport et al. 2011) and by my collaborative work with a colleague (Butler and Lawres 2014). Porter (1951) and Sears (1994) have provided
important studies of Belle Glade Plain pottery, and Cordell (1992, 2007, 2013) has substantially added to our knowledge of this pottery type, but from the study of sites outside of the core Belle Glade area. Belle Glade artistic depictions have been assessed by Wheeler (1996, 2011), Seinfeld and Spivey (2016), and Marquardt (2019). Shell tools in the region have been studied by Steinen (1994) and Mount (2011), bone tools by Steinen (1994), and shark tooth tools by Steinen (1994), Kozuch (1993), and Keller and Thompson (2013).

While producing a synthetic work on Belle Glade culture is not the primary goal of this research, it is sorely needed. As such, a step towards this is taken as part of this research by synthesizing a portion of this literature to provide a cultural context for this study. The primary focus of this study is on the most conspicuous part of Belle Glade culture: monumentality.

The conspicuous nature Belle Glade monumentality is reflected in the fact that the majority of studies on this culture have been focused on the monumental architecture of the region (Carr 1985, 2016; Colvin 2014, 2015; Hale 1984, 1989; Johnson 1990, 1991, 1994, 1996; Lawres 2015, 2016a, 2016b, 2017; Lawres et al. 2018; Lawres and Colvin 2016; Sears 1994; Thompson 2016; Thompson and Pluckhahn 2012, 2014; see also Austin 2015 for a study of lithics from monumental contexts). The peoples of the Belle Glade culture built a variety of types of monumental architecture that ranged from conical mounds to circular ditches to geometric earthwork complexes, and many of these architectural types are unlike anything else in North America. Further, these architectural forms were not static through time, but rather the different forms have been proposed to align with the Belle Glade culture-historical
Monumentality is a widely discussed topic in the archaeological literature, and these discussions run the gamut in the arguments put forth. As but a brief selection of these, it has been argued to play a role in asserting differences in identity and marking territorial boundaries (Buikstra and Charles 1999; Charles and Buikstra 1983), as a symbolic reference to mythology and cosmological beliefs (Kidder 2011; Knight 1986, 2006, 1998; Lewis et al. 1998; Wesson 1998) or landscape features (Sassaman 2010; Sassaman and Randall 2012; Thompson and Pluckhahn 2012), as the materialization of ideology and social memory (Meskell 2003; Mills 2008; Pauketat 2000; Sinopoli 2003; Van Dyke 2003; Wallis 2008), and as a reflection of sociopolitical organization at both the site scale and landscape scale (Anderson 1994; Beck 2003; Blitz 1999; Blitz and Livingood 2004; Blitz and Lorenz 2006; Hally 1993; Knight 1998; Russo 2004; Sassaman 2005b; Sassaman and Heckenberger 2004; Steponaitis 1983). Additionally, there has been an increasing amount of literature on the earliest forms of monumentality (Burger and Rosenswig ed., 2012; Gibson and Carr, ed., 2004; Russo 1994; Sassaman 2010; Saunders 2010; Thompson 2010).

However, with few exceptions (Colvin 2015; Lawres 2015, 2016a, 2016b, 2017; Lawres and Colvin 2016; Thompson 2016; Thompson and Pluckhahn 2012, 2014), discussions of Belle Glade monumentality have not attempted to place the role of Belle Glade monumental architecture into these broader discussions. Rather, the interpretations and discussions have been largely parochial and restricted to functional economic interpretations. Such interpretations include arguing that the architecture
functioned as part of an agricultural system (Sears 1994) or as fish traps (Carr 2012, 2016), as a functional method of creating drainage for artificial islands (Hale 1989), and for redirecting water flow away from living areas (Hale 1984). There has also been work aimed specifically at creating a typology and chronology of the architecture (Johnson 1991, 1996). Additionally, while there are some studies of Belle Glade monumentality that attempt to bridge the gap with broader discussions of monumentality in the archaeological and anthropological literature (Colvin 2015; Thompson 2016; Thompson and Pluckhahn 2012, 2014), they do so from a site-specific perspective.

This research builds upon my previous work on Belle Glade monumentality (Lawres 2015, 2016a, 2016b, 2017; Lawres and Colvin 2016) to provide a regional scale study of Belle Glade monumental architecture tied to broader anthropological discussions. As I show in this work, there are underlying issues with the previous interpretations of Belle Glade architecture, and this is related to overlooking the dissimilarities—relative to other Southeastern groups—exhibited in both the environmental and cultural contexts. Because of this, it is necessary to evaluate the relationships between these contexts and how they reciprocally structured one another. Thus, there are two overarching research questions this study seeks to address:

1: What underlying structures—the schemas and resources that inform cultural practice (Sewell 1992)—informed Belle Glade monumentality and why did it result in such distinctive monumental forms?

2: How were the Belle Glade monuments built?

Addressing these questions involves delving into the interrelationships between environment and culture, and more specifically, how they structure one another.
Because of the differences exhibited in both of these aspects of the region, it is likely that there is an underlying cultural mechanism that translates the distinctive characteristics of the environment into a similar distinctiveness in culture. Thus, it becomes necessary to try to understand how the Belle Glade peoples understood their world to exist and operate.

How people understand their lived world, or reality, to exist is known as an ontology (Graeber 2015), which is a topic that has become increasingly popular in the anthropological and archaeological literature. Even so, there are very few studies that address the underlying ontological structures of monumentality (see Borić 2013; Harrison-Buck 2012; Pauketat 2013, Romain 2015a, 2015b; Weismantel 2013). Further, these studies limit their discussions of the ontological aspects of monumentality by focusing on certain architectural elements and their relations to specific landscape features, the relationships between materials deposited within the architecture and the ontologies of the builders, or artistic depictions in the architecture. As such, these studies are not applicable to all contexts because not all monumental architecture is built of multiple materials or contains specialized deposits nor is all monumental architecture built of materials conducive to artistic depictions. The Belle Glade monumental architecture provides just such a context: it is comprised entirely of sandy sediments, does not exhibit specialized deposits (i.e., caches), and does not consist of stone materials for carving artistic depictions. There are important elements missing from these discussions. Thus, this study seeks to add an important component to the discussion of the relationship between ontologies and monumentality.
This study is divided into 12 chapters, including this one. Chapters 2–4 develop the context for the study. Chapters 5–6 discuss the theoretical framework, drawn from the ontological turn in anthropology, and establish the presence of certain ontological features in Belle Glade material culture. Chapters 7–10 discuss the methods and results of the analyses used in the study Belle Glade monumentality, while Chapters 11–12 discuss how those results relate to the Belle Glade ontology.

Chapter 2 describes the environmental context by discussing the Belle Glade world in terms of the environmental and hydrological characteristics as they would have existed prior to the drainage projects of the late nineteenth and early twentieth centuries that drastically reduced the amount of water in interior South Florida. The focus of Chapter 2 is on the Kissimmee-Okeechobee-Everglades (KOE) watershed, which is a much different landscape today than it was 1,000 years ago, or even 150 years ago for that matter. Prior to the drainage projects this was an aqueous landscape that saw water flowing across the majority of it for 9–10 months of the year. The ecosystems of the KOE watershed were once part of an integrated landscape, and the water that flowed across it was an integrative mechanism for the watershed as a whole. The development of these various ecosystems created a dynamic, integrated landscape of vast expanses of wetlands juxtaposed with small islands of uplands that were encircled by torpid water flow. This water flow, in turn, linked the numerous tree island hammocks dotting the landscape.

Chapter 3 explores the material remains of the culture associated with the people that once dwelled within this aqueous world. To archaeologists, these people are simply known as the Belle Glade archaeological culture, and a synthesis of the knowledge of
various aspects of the Belle Glade culture provides a cultural context for this study. This culture is one focused on, even defined by, relationships. The peoples of this culture formed long-lasting relationships with the physical structures of their surrounding environment, and these relationships changed very little over time. These relationships were developed and honed through a long-term fisher-hunter-gatherer subsistence lifestyle. Social relationships also form an inextricable part of this culture, especially given the physical characteristics of the landscape the Belle Glade peoples inhabited and dwelled within, which provides ample subsistence resources but also offers constraints in terms of materials for tool production. This led the peoples associated with the Belle Glade culture to reach beyond the boundaries of their immediate landscape to form meaningful social relationships with other cultural groups.

Chapter 4 explores a single aspect of Belle Glade culture in great detail: monumentality. There is a long history of monumentality in the KOE, and there is variability in the materializations of monumental practice in the region. When examining this variability through time it is evident that the transformations in monumental practice involve both environmental and cultural drivers, but it is also evident that there is a strong persistence in certain characteristics of Belle Glade monumentality, such as the circular form that appears consistently over the course of more than two millennia. Many of the previous interpretations of Belle Glade monumental architecture have focused narrowly on functional economic explanations for the architecture, and these have failed to stand the test of time and additional archaeological investigation. The issues with previous interpretations are explored in detail before arguing for a new view of Belle Glade monumentality that involves an ontological approach.
Chapter 5 develops a theoretical framework drawn from the ontological turn from which to approach Belle Glade monumentality. The ontological turn has shifted the focus of anthropological inquiry towards the ways people understand their reality to exist. However, the ontological turn has come under critical fire over the past several years. Because of this, there is a need to engage with these criticisms to ensure the continued growth of this lens of evaluating what it is to be human. In engaging these criticisms, I set forth a framework that enables us to incorporate the major criticisms into ontological studies, and by following the suggestions of this framework, it is possible to effectively circumvent the pitfalls of the ontological turn identified by its critics. Unlike the study areas for many other archaeological studies of ontologies, the Belle Glade archaeological culture does not have an extant descendent population to collaborate with. Due to the lack of descendants to work with to establish the foundations of a Belle Glade ontology, I draw on the philosophical literature of numerous Native American cultural groups to identify persistent themes or principles that cross-cut cultural boundaries. The three persistent themes identified are the principles of relatedness, circularity, and place-centeredness.

However, because of the lack of ethnohistoric and ethnographic documentation of these principles, it is necessary to find independent lines of evidence demonstrating their presence in Belle Glade culture. Chapter 6 explores the material culture and cultural practices of the Belle Glade archaeological culture to build the case for these ontological principles. I show that several lines of evidence support the presence of relatedness, circularity, and place-centeredness in the Okeechobee Basin: ceremonial
regalia, columella pendants, effigy carvings, cosmological depictions, and mortuary practices.

Because very few researchers have evaluated monumental architecture in terms of ontologies, and because of the peculiar contexts provided by the Belle Glade architecture, it is necessary to develop some expectations and methods to test for them. Chapter 7 develops these expectations for what should be seen archaeologically in the Belle Glade monuments if the ontological principles outlined in Chapter 5 are materialized within the form of the monuments. These expectations are developed by drawing on the few archaeological studies focused on the relationships between monuments and ontologies, the work of Native American philosophers, and other archaeological insights into monumentality. Using these expectations as a basis, I then provide a discussion of the methods used to test for the presence of the ontological principles in the Belle Glade monuments. These methods are all non-invasive and relied on both microscale (i.e., site-level) and landscape-scale spatial analyses.

Chapter 8 presents the results of these analyses. It is divided into three sections based on architectural type. Because the architecture is temporally sensitive, the sections are organized chronologically. The first section focuses on the circular ditch architecture, the second section concentrates on the Type A circular-linear earthworks, and the third section is devoted to the Type B circular-linear earthworks. The results of these analyses suggest that the ontological principles outlined in Chapter 5 are present in the Belle Glade monumental architecture.

Chapter 9 focuses specifically on the principle of place-centeredness and addresses the second overarching research question: How were the Belle Glade
monuments built? Using Big Mound City as a case study, Chapter 9 presents the results of excavations on the midden-mound of this site, which suggest rapid construction. However, this is one of 39 architectural features at the site, and it is the only that exhibits evidence of human occupation. Yet, the other architectural features do not exhibit the typical evidence of construction needed to assess how they were built. The remainder of Chapter 9 is devoted to developing methods to evaluate construction sequences in contexts lacking visible stratification.

Chapter 10 presents the results of the methods developed in Chapter 9. The results characterize micromorphological properties of soils, suggesting multiple building episodes in some features and single episodes in others. Additionally, the results suggest the use of multiple soil sources for some of the architectural features.

Chapter 11 provides a discussion of how the data presented in Chapters 8 and 10 relate to the theoretical framework outlined in Chapter 5. Specifically, the discussion revolves around the principle of circularity in both its spatial and temporal forms, the principle of relatedness, and the principle of place-centeredness. Further, the implications of the presence of these principles in the monumental architecture to the broader social, environmental, and temporal contexts is discussed.

Chapter 12 provides a summary of the study and offers some concluding remarks. This study concludes that the Belle Glade monuments materialize the principles of relatedness, circularity, and place-centeredness in very specific ways that resulted in distinctive monumental forms emplaced in specific environmental contexts. Further, the monuments were built with their agency in mind, and this agency allowed the monuments to rebalance relationships between earth, sky, water, people (both
human and other-than-human), place, and ancestors. These concluding remarks discuss how well this study addressed the research questions posed, and they briefly discuss the social significance of the ontological principles and why they would have been important to monumentalize. Further, future avenues of research are discussed as well as an outline of the long-term research program I have initiated on the Belle Glade culture.
Chapter 2
THE BELLE GLADE WORLD: ENVIRONMENTAL CONTEXT OF THE STUDY

The peoples associated with the Belle Glade archaeological culture dwelled in an area of south Florida known as the Kissimmee-Okeechobee-Everglades (KOE) watershed (Figure 2-1). This watershed looks nothing like it did when the Belle Glade peoples lived in the region. It has been altered in numerous ways over the span of many years. When Florida first became a U.S. territory in 1821, this area was considered a no man’s land. It was too mosquito-filled to be healthy for human habitation, too wet to be productive in an agricultural sense, and it was in all senses a massive swampland. Over the course of many years this was to change, though. In the late 19th century, entrepreneurs such as Hamilton Disston and Henry Flagler began following through on the years of public sentiment regarding the need to transform the south Florida landscape into something more hospitable to the American way of life (Grunwald 2006; McCally 1999, 2005). They initiated the first in a series of drainage projects aimed at removing water from the southern Florida peninsula to create vast areas suitable for agriculture and cattle husbandry as well as areas suitable for the establishment of urban life. These drainage projects culminated in the creation of a network of canals and ditches running from Lake Okeechobee and through the Everglades that effectively drained a large portion of south Florida. This created the Everglades Agricultural Area we know today on the southern shore of Lake Okeechobee, which now produces a large proportion of the cane for today’s sugar industry, as well as led to the establishment of such interior cities as Clewiston and Belle Glade and coastal cities such as Fort Lauderdale and West Palm Beach.
The drainage of so much water completely transformed the landscape of south Florida. A plethora of recent studies have demonstrated just how much the landscape has changed, and these studies have shifted the opinions of both the public and governmental agencies towards a view seeing the need to restore the landscape to its predrainage condition. This shift has resulted in the Comprehensive Everglades Restoration Project (CERP) led by the U.S. Army Corp of Engineers (USACE). This project seeks to restore a large portion of the water to the interior of the peninsula while also rerouting it around major areas of human habitation. This drainage has drastic implications for this study of the archaeology of the region.

In this chapter I elucidate the predrainage characteristics of the KOE watershed to paint a picture of what the environment would have been like when the people associated with the Belle Glade culture inhabited the watershed. In doing so I draw on recent studies of the predrainage hydrology and ecology of the region to emphasize the very different landscape that existed before the drainage projects. Additionally, I show how the hydrology of the region acted as an integrating mechanism for the entirety of the landscape, and how the fauna of the region developed specific behaviors that emphasized the importance of this hydrology. Finally, this predrainage illustration of the Kissimmee-Okeechobee-Everglades landscape will provide a strong baseline to identify the relationships that the Belle Glade peoples developed with various aspects of this landscape in subsequent chapters.

**The Hydraulic Regime of the Kissimmee-Okeechobee-Everglades**

The Kissimmee-Okeechobee-Everglades (KOE) watershed is part of the Floridian section of the Atlantic Coastal Plain physiographic province (Fenneman 1928).
The Floridian section is subdivided into multiple smaller physiographic provinces, and the KOE encompasses seven of these subdivisions: Osceola Plain, Okeechobee Plain, Bombing Range Ridge, Lake Wales Ridge, Caloosahatchee Incline, Caloosahatchee Valley, and the Everglades Trough or Province (Davis 1943; White 1970). The Floridian section of the Coastal Plain, originally a part of the African continent during the time of Pangea, was submerged in a shallow sea for millions of years. This submergence played a pivotal role in the creation of a flat, relatively homogenous marine limestone base (McCally 1999:6).

During this time, millions upon millions of marine creatures perished in the waters above this limestone base. The limestone itself became their final resting place, their skeletal calcium further adding to the thickness of the limestone. The flat, homogenous characteristic of the marine limestone base was also instrumental in the deposition and survival of strata formed during glacial advances (McCally 1999:8). These strata, which are correlated with the physiographic subdivisions listed above, formed during periods of glaciation when the limestone base of the Florida peninsula was exposed above sea level to the forces of weathering and erosion. During these times, high winds and an arid climate produced a pattern of shifting aeolian dunes across the peninsula, which submerged again and again during interglacial periods. This cycle of exposure and inundation ultimately ended up creating thin, highly porous, and highly variable calcitic strata (Webb 1990; White 1970). However, the flat marine base minimized erosional forces, thus allowing these strata to survive. Because of the variability in the level of their porosity, these strata are the backbone of the hydroperiod diversity exhibited in the Everglades’ myriad ecosystems (McCally 1999:8).
Generally, as one moves south to north, following the rising elevation of the peninsula, one is also moving through areas subject to shorter and shorter hydroperiods (McCally 1999:12–15). However, even though there is a general gradient, which is reflective of the longer period of exposure to air and freshwater associated with the central and northern portions of the peninsula, there is still quite a bit of variability due to the heterogeneity of the topography of the glacial-period strata formations. This heterogeneity, while not directly visible above the water surface, is the result of the undulation of these strata that were originally formed as shifting oolitic sand dunes during glacial periods of exposure (McCally 1999). The undulations in these strata formed catchments for water and sediments that ultimately led to the formation of different ecosystems adapted to longer hydroperiods.

The variability in hydroperiods is also related to the formation of peat sediments, because the overall hydrological regime of the Everglades is not due to precipitation alone, but groundwater, solution processes, and water storage also play major roles in the overall hydrology of the watershed (Kushlan 1990; McCally 1999; McVoy et al. 2011), a point I return to below. This same hydrologic regime played a major role in the formation of the KOE itself. This watershed, which is technically three distinct drainage basins—the Kissimmee River Basin, Okeechobee Basin, and Everglades Trough—formed through solution processes involving both ground and surface water (McCally 1999:10). These processes caused the erosion of the glacial formations to create a sag valley that spans approximately 400 km north-south in the center of the peninsula (McCally 1999; McPherson and Halley 1996; Toth et al. 1998). This sag valley is extremely shallow and is more of a massive trough than a valley in its strictest sense.
However, the shallow gradient of the trough, along with the overall shallow gradient of the peninsula and its low topographic relief, caused the boundaries of what would typically be considered three distinct drainage basins to become blurred to the point of forming a singular coherent hydraulic system stretching across a major portion of the Florida peninsula (McCally 1999; McPherson and Halley 1996; White 1970). The trough of the KOE generally aligns with the slope gradient of the southern portion of the Florida peninsula as a whole, which slopes southward at an average rate of 0.30 m for every eleven kilometers (Davis 1943).

Central to the entire watershed is Lake Okeechobee, the largest freshwater lake in Florida (Brenner et al. 1990; McCally 1999; Steinman and Rosen 2000). Currently, its surface waters stretch over 1,770 km$^2$ and have a relatively shallow depth of 2.7 m (Brenner et al. 1990:364; McVoy et al. 2011; Steinman and Rosen 2000:734), but this differs drastically from its previous dynamic state due to the drainage of the Florida landscape over the past century. Much earlier in its history the lake’s size and depth varied in accordance with both localized and more northerly rainfall as well as the base flow from surficial aquifers (McCally 1999; McVoy et al. 2011). Although this massively sized lake is the central feature of the watershed, it is interconnected with the basins to the north and south to create a continual flow of water.

Beginning in the Kissimmee River Basin, water flowed southwards in a shallow valley bounded by the Lake Wales and Bombing Range ridges to the west and upland marshes to the east. This water flow occurred in two forms. First, as the Kissimmee River itself, with its headwaters being the Kissimmee Chain of Lakes. This river provides drainage for approximately 7,550 km$^2$ and extends 172 km through the Osceola Plain
over an average gradient of 0.07 m/km, resulting in an average flow of 62 m$^3$s$^{-1}$ (Nordlie 1990:398, Table 12.2; Toth et al. 1998:758). The second form of water flow in the Kissimmee River Basin was sheet flow. The Osceola Plain contains numerous ecosystems within its geographic confines, but wetlands provide the major proportion of these ecosystems, and wet prairies are one of the most common wetlands in this area today. This water—fed by precipitation and overspill of Lake Istokpoga, the Kissimmee Chain of Lakes, and numerous sloughs and ponds—would slowly flow, at an average of less than 2.41 kmh and a depth ranging from 0.30 to 0.45 m, over the Osceola Plain into the Okeechobee Basin, filling the lake (McVoy et al. 2011:225–226; Toth et al. 1998). This sheet flow would have occurred for five to six months of the year while the Kissimmee River would have flowed continuously.

Along with precipitation and base flow, this water would help to fill Lake Okeechobee. Additionally, this water flow provided the conduit for the sediment that created the sill along the southern shore of Lake Okeechobee that aids in retaining water within the lake (McCally 1999:24). In addition to the sill itself, the surface flow of the sawgrass plains would have aided in retaining water in the lake and controlling the volume of outflow by providing a hydraulic barrier (McVoy et al. 2011:170–171). Once the lake reached its spill point threshold, the water would discharge to the south over the sill, through the custard apple swamp that rimmed the southern shore, and into the sawgrass plains to the south. This discharge occurred along more than 110 km of the southern shoreline—“from Fisheating Creek on the west to Pelican Bay on the east” (McVoy et al. 2011:258)—for at least 9 months of the year. During these months there was no definable boundary between Lake Okeechobee and the sawgrass plains to the
southwest and custard apple swamp to the south; rather it was a continuous flat plain of water with the only differentiation being the vegetation it flowed through. It should be noted, however, that it is possible that the custard apple swamp is a post-drainage phenomenon; paleoecological studies have yet to confirm this, but descriptions of this swamp do not appear until post-drainage times (McCally 1999:64–65; McVoy et al. 2011:258).

The outflow itself would also be aided by the presence of eight small, short rivers that flowed through the custard apple swamp; these rivers are now dried out due to the post-drainage hydrological conditions of the area (McCally 1999:28–29; McVoy et al. 2011:170–171). The predrainage conditions saw these as shallow rivers, ranging from 30–60 m in width, and only extending a few miles in multi-pronged fashion. Because of their shortness, some have questioned their role in the outflow of Lake Okeechobee’s waters (McVoy et al. 2011:170–171), but others have placed priority on these rivers as the primary conduits of the lake’s outflow (McCally 1999:28–29). In all likelihood these waterways were more akin to large, open water sloughs than they were to typical rivers.

Once the water discharged into the sawgrass plains, it would move southward across the plains as a singular mass of sheet flow. This sheet flow was not a direct outflow from the southern shore of Lake Okeechobee. Rather it occurred in a radial fashion, discharging from eastern and western shores as well, and flowing outwards until reaching the lateral geological boundaries of the KOE before flowing south into the Everglades Trough (McVoy et al. 2011:258–260). In the northern portion of the Everglades Trough, comprised of the sawgrass plains, water would have flowed openly through the sawgrass for 9–10 months of the year at an average depth of 0.45 m
(McVoy et al. 2011:246, Table 11.4). The remainder of the year the sawgrass plains would have remained saturated, due to the water-retaining characteristic of the peat soils, but the flow would have dissipated until heavy precipitation occurred.

The water flowing southward through the sawgrass plains would have transitioned into the ridge-and-slough landscape, the region most commonly associated with the Everglades in today’s public eye. While the sawgrass plains have a characteristically homogenous sediment base (i.e., there is no topographic relief), the ridge-and-slough landscape exhibits a characteristic undulation, creating the sawgrass ridges and deeper catchment sloughs that give it its namesake (McCally 1999:10–12; McVoy et al. 2011:175–199). Because of these undulations, there is variation in the depth and flow rate of water through the landscape. Further, the undulations create variability in hydroperiod, and thus localization of ecosystems, throughout the area. The sawgrass ridges would have been inundated for 9–10 months of the year under an average depth of 0.45 m while the sloughs would have remained inundated throughout the entirety of the year with a depth ranging from 0.30 m (average low) through 0.91 m (average high) (McVoy et al. 2011:246, Table 11.4). From the ridge-and-slough landscape, the water would have flowed further south into the Ochopee, Rockland, and Marl marshes and further into several outflow waterways such as the Shark River Slough, Transverse Glades, and Taylor Slough to name a few. However, these areas take us beyond our study area and the immediate scope of this work.

The hydrology of the KOE is one of the key characteristics of this watershed. Indeed, for 5–6 months of the year the entirety of watershed is inundated under flowing water, and for 9–10 months of the year approximately three quarters of the watershed
exhibits this quality. Because of this, Marjory Stoneman Douglas’ famous description of the Everglades as a “River of Grass” is not only applicable to the Everglades Trough itself but to the entirety of the KOE watershed. This is a key point that many archaeologists have overlooked in their investigations of the area, but the hydraulic characteristics of this watershed are extremely important to understand in order to properly investigate the people that dwelled within this region.

As briefly mentioned earlier, the hydraulic regime of the KOE is not solely reliant on precipitation and/or surface water. Rather it is a combination of precipitation, surface water, ground water, low topographic relief, solution processes, the porosity of substrata, and a dynamic system of water storage all play major roles in creating and maintaining water levels and water flow throughout the watershed (McCally 1999). Precipitation does play a major factor, because the wet season in South Florida—officially running May through October (Brown et al. 2006:255–256; McCally 1999:19) with the heaviest amount of rainfall occurring from July through August (Brown et al. 2006:Figure 2; Willard and Berhardt 2011:65)—provides torrential downpours on a nearly daily basis. In fact, the majority (up to 75%) of the annual precipitation is received during the months of June, July, and August (Willard and Bernhardt 2011:65). This creates a large portion of the sheet flow that slowly moves throughout the entirety of the watershed over the north-south gradient during the summers, but throughout the remainder of the year the other variables play a larger role. This is particularly true of groundwater, solution processes, and water storage. Groundwater feeds the sheet flow throughout the entirety of the year, and it is able to do so because of the solution processes that erode small holes in the limestone substrata, thus creating open
connections between surficial aquifers and surface water to maintain a base flow (McCally 1999:27–28; White 1970).

A dynamic system of water storage also adds to the base flow and maintains water retention throughout the dry season (Brown et al. 2006; Kushlan 1990; McCally 1999; Whitney et al. 2004). This is primarily achieved through the characteristics of the organic peat soils that occur throughout the watershed, but primarily in the southern portion. There is a large amount of variation in the peat soils of the KOE because certain peat types form in association with specific vegetation associated with specific ecosystems adapted to specific hydroperiods (Brown et al. 1990:46; McCally 1999:15–18; McVoy et al. 2011). Essentially, these soils are highly absorbent and retain high moisture levels because of their organic content. The actual level of water content varies between peat type, but typically falls between 80–95% water content (McCally 1999:27). These levels are retained throughout the year because when these soils start to dry the surface exposed to air takes “a granular form, and this transformation reduces the capillarity of the soil. In this condition, the dried surface of the peat serves almost as a sealant, retarding the evaporation of subsurface water” (McCally 1999:27).

This feature of Everglades’ peat soils helps to maintain the level and flow of water throughout the wetter portion of the year, but it also changes the nature of the dry season by not allowing the landscape to ever truly dry out. Combine this characteristic with the light winter rains of the region and you have something different than your typical four-quartered annual season of Spring, Summer, Fall, and Winter. Instead, you have a biannual cycle of wet and damp (Whitney et al. 2004:169). The damp portion of the cycle would not necessarily see continuous water flow, if any at all. However, given
the saturated sediments and the dense vegetation, it is likely that the addition of rainfall would cause water levels to rise enough for temporary sheet flow to occur. It is also important to note that this same portion of the biannual cycle also coincides with the hurricane season, and these storms typically have high precipitation output and are often associated with heavy flooding, both of which would cause sheet flow to activate during the damp cycle.

Another key characteristic of the KOE watershed is the heterogeneity of ecosystems throughout its geographic boundaries (McCally 1999:23). This characteristic is the result of the variability in hydroperiods, sedimentary substrata, peat development, and several other interdependencies. The ecosystem heterogeneity provides the basis for a very high level of biodiversity, which is further increased due to the subtropical climate that invites the ingress of large numbers of migratory birds every winter. The remainder of this discussion of the KOE focuses on the major ecosystem types found within the watershed. I emphasize the floristic and faunal characteristics of these ecosystems in order to provide a better idea of the types of resources that were available to the Belle Glade peoples, but this discussion also highlights the important, and often neglected, fact that this watershed was in actuality an integrated landscape for much of the year. The integration was forged through the hydraulic regime discussed above. As we have seen, there was water flowing across this landscape, and this water flow acted as a bridge between ecosystems, providing a highway system for numerous animal species, especially aquatic ones, to cross easily between these ecosystems.

**Wetlands Ecosystems of the Kissimmee-Okeechobee-Everglades**

The vast majority of the ecosystems of the KOE are considered wetlands environments. Wetlands are defined as ecosystems considered transitional between
upland ecosystems and their aquatic counterparts because of the saturation of their sediments (Ewel 1990; Kushlan 1990; Whitney et al. 2004:125, 130–132). The duration of this saturation, known as a hydroperiod, is variable and dependent on several factors, but the hydroperiod itself is one of the primary variables that determines the floristic affinities of a wetland ecosystem (David 1996; Ross et al. 2006; Whitney et al. 2004:130). This is because the saturation deprives the soil of oxygen and thus literally drowns species that are not adapted to such anaerobic conditions. However, the duration of the saturation is critical as well because many wetlands-adapted species need a period of dry sediments in order to propagate (Kushlan 1990:346; Whitney et al. 2004:125, 130). There are many different forms that wetlands take, but in general they are classifiable as either forested wetlands (i.e., swamps) or herbaceous wetlands (i.e., marshes) (Ewel 1990; Kushlan 1990).

Forested wetlands are characterized by a dominance of woody vegetation that in certain ecosystems can form a closed canopy. In general, forested wetlands are divided into river swamps and stillwater swamps, the latter of which are more prevalent in the KOE. River swamps, characterized by short hydroperiods (associated with river flooding) and high species diversity, are restricted to the fringes of the Kissimmee River and Fisheating Creek, both of which provide inflows into Lake Okeechobee. The floodplains of both of these rivers are considered river swamps. Typically, these swamps are dominated by bald cypress (*Taxodium distichum*), with subcanopy vegetation primarily comprised of an extensive variety of woody shrubs that include species such as Carolina ash (*Fraxinus caroliniana*) and titi (*Cyrilla racemiflora*), but they also have a highly variable and species-rich ground cover (Brown 1981; FNAI
2010; Ewel 1990; Whitney et al. 2004). This is the case for Fisheating Creek, but there is also an extensive amount of floodplain marsh along this waterway close to its outflow into Lake Okeechobee (Florida Fish and Wildlife Conservation Commission 2015). However, along the upper Kissimmee River, floodplain marsh prevailed over floodplain swamp, and the swamp that was present contained a large amount of willow (Salix caroliniana), which is indicative of successionary growth (Milleson et al. 1980).

Along the lower Kissimmee River, the most prevalent river swamp communities were buttonbush shrub swamp (Milleson et al. 1980). Buttonbush swamps are dominated by the shrub known as buttonbush (Cephalanthus occidentalis), which can grow to heights of between one and two meters, with a spreading canopy extending up to 3 m horizontally (Milleson et al. 1980:22). Because they are river swamps, the hydroperiod of buttonbush swamps is short and associated with river flooding (Ewel 1990). Water depths in buttonbush swamps may reach 0.9 m during the wet season, and the understory is essentially the same as the broad-leaf marshes described below (Milleson et al. 1980). Historically, the buttonbush swamps of the KOE were much more prevalent along the lower Kissimmee River, but small patches of these ecosystems were observed in the ridge-and-slough landscape as well (McVoy et al. 2011:188–190).

The KOE watershed also exhibits several types of stillwater swamps, which, unlike river swamps, are characterized by long hydroperiods and a low species diversity (Ewel 1990; Whitney et al. 2004). The stillwater swamps of the KOE are cypress swamps of two types: cypress strands and cypress domes (also known as cypress ponds or basin swamps). Cypress domes are a form of basin wetland that have a canopy dominated by pond cypress (Taxodium ascendens) and a subcanopy
dominated by swamp black gum (*Nyssa biflora*) (Brown 1981; Ewel 1990; FNAI 2010; McPherson 1974; Mitsch and Ewel 1979). These ecosystems are variable in size but form in depressions in the limestone substrate of the region; due to the deepest water depth being located in the center of the depression the tallest cypress tree grow here, giving the profile of the ecosystem a dome-like appearance. The water depths in these ecosystems are highly variable but tend to range between no water during the driest part of the year—although soils remain saturated due to peat accumulation—to approximately 0.5 m during the wet season (Brown 1981). It has generally been thought these ecosystems do not produce outflows or overspills (Brown 1981), but the recent hydrological reconstructions of South Florida suggest that during the periods of wet-season sheet flow, the cypress domes would flood to the point of overspill (Ewel 1990; McVoy et al. 2011). Within the KOE, cypress domes have a distribution restricted to the Kissimmee River Basin and Okeechobee Basin and are also prevalent in the Eastern and Western Flatwoods that border the northern Everglades and Okeechobee Basin (FNAI 2010; McVoy et al. 2011).

Cypress strands are similar to cypress domes. They also form in depressions in the limestone substrate, but rather than the more circular depressions associated with cypress domes, cypress strands form in more elongate depressions (Ewel 1990; FNAI 2010; McPherson 1974; Whitney et al. 2004). One of the characteristics that truly separates these ecosystems is the presence of water flow. While cypress strands are technically classified as stillwater swamps there is an actual flow of water, typically imperceptible except during periods of heavy rainfall (Ewel 1990:302–303; Whitney et al. 2004:179). Some researchers have additionally noted that when rainfall is especially
abundant, a series of cypress domes can become enchained in water flow, due to overspill, and become classifiable as a cypress strand (Ewel 1990:303). The floristic composition is also slightly different from cypress ponds. Rather than the canopy being dominated by pond cypress, it is dominated by bald cypress (FNAI 2010), with the subcanopy being more species rich and containing a variable number of woody vegetation classified as tropical or semitropical. Subcanopy species can include red maple (*Acer rubrum*), cabbage palm (*Sabal palmetto*), strangler fig (*Ficus aurea*), swamp laurel oak (*Quercus hemisphaerica*), and pond apple (*Annona glabra*). Within the KOE, cypress strands are restricted to the boundaries of the watershed. Specifically, they are found in the southernmost portion of the Everglades Trough, in the Big Cypress Swamp along the western boundary of the Everglades Trough, in the southern portions of the Eastern and Western Flatwoods, along the peripheries of the Okeechobee Basin, and in the southernmost portion of the Kissimmee River Basin. They play an important role in the KOE by providing inflows into the watershed (McVoy et al. 2011).

Herbaceous wetlands are a stark contrast to forested wetlands. They are characterized by a predominance of herbaceous vegetation and typically lack large amounts of woody vegetation (Kushlan 1990). Within the KOE there are several types of herbaceous wetlands, and in general herbaceous wetlands are more prevalent than forested wetlands within the watershed. In the northern portion of the watershed, the Kissimmee River Basin, herbaceous wetlands covered approximately 24.0% of the river’s floodplain (Milleson et al. 1980). Prior to the channelization of the Kissimmee River the dominant herbaceous wetlands were broad-leaf marshes and wet prairies (Milleson et al. 1980:8), with the largest herbaceous wetland, known as the Lake
Istokpoga-Indian Prairie, covering approximately 12,000 ha (Kushlan 1990:329). Broad-leaf marshes, also known as flag marshes, generally have moderate hydroperiods of 5–6 months with water depths varying between 0.30 and 1.0 m during the wet season (Kushlan 1990:339; Milleson et al. 1980:18–19). These marshes are typically dominated by pickerelweed (*Pontederia lanceolata*) and arrowhead (*Sagittaria lancifolia*) but contain numerous other herbs such as Piedmont marshelder (*Iva microcephala*), rushes (*Juncus* spp.), and spikerushes (*Eleocharis* spp.), and small woody shrubs such as swamp hibiscus (*Hibiscus grandiflorus*) (FNAI 2010; Kushlan 1990; Milleson et al. 1980). Broad-leaf marshes are distributed throughout the Kissimmee River Basin; throughout the Everglades Trough they exist as smaller pockets within vast expanses of sawgrass marsh (Kushlan 1990).

Wet prairies have characteristics that are similar to broad-leaf marshes, but the vegetation in these ecosystems is more variable due to heterogeneity in the drainage capabilities of the underlying sediments. These have the shortest hydroperiods of herbaceous wetlands in peninsular Florida, lasting as little as 2 months in a relatively dry year to an upwards of 5 months during a particularly wet year (Kushlan 1990; Milleson et al. 1980). However, pre-channelization estimates place the Kissimmee Valley wet prairie hydroperiod at as much as 265 days per year (Toth et al. 1998:758). The water depths of these ecosystems are also much shallower than the broad-leaf marshes, ranging from an average annual low of 0.15 m to an average annual high of 0.45 m, with an overall annual average of 0.30 m during the wet season (Milleson et al. 1980:20). Because of the shorter hydroperiods wet prairies have a higher vegetative biodiversity and are dominated by grasses such as maidencane (*Panicum hemitomon*)...
and torpedo grass \((Panicum repens)\) or sedges such as inundated beakrush \((Rynchospora inundata)\). These dominant species are often found in association with each other as well as with pickerelweed, arrowhead, and many of the other herbs found in broad-leaf marshes (FNAI 2010; Kushlan 1990; Milleson et al. 1980).

Within the KOE wet prairies are primarily distributed throughout the Kissimmee River Basin and along the eastern and western peripheries of the Okeechobee Basin in the Eastern and Western Flatwoods (Kushlan 1990; McVoy et al. 2011). There are wet prairies present in restricted areas throughout the Everglade Trough, however, pedological and paleoecological studies suggest that what we now classify as wet prairies in the Everglades Trough are post-drainage phenomenon that would originally have been white water lily sloughs (McVoy et al. 2011:182–183, 257). These would have had water depths between an annual low of 0.30 m to an annual high of 0.91 m (McVoy et al. 2011:253). A variant of the wet prairie known as a marl prairie is likely a predrainage ecosystem found throughout the sawgrass plains and ridge-and-slough landscape. This ecosystem is characterized by marl substrata—formed from processes of hydrating and dehydrating the periphyton and algae that exist in sparse sawgrass marshes (discussed below) to form a hardened, calcareous sediment with poor drainage qualities (FNAI 2010:122; Whitney et al. 2004:164)—with the dominant vegetation being grasses such as gulf hairawn muhly \((Muhlenbergia sericea)\) and sedges such as spreading beaksedge \((Rynchospora divergens)\) (FNAI 2010:121–123). The hydraulic characteristics of this ecosystem are almost identical to the wet prairies discussed above.
Another type of herbaceous wetland present in the KOE is the sawgrass marsh. This is the dominant form of herbaceous wetland in the KOE, with nearly monospecific sawgrass (*Cladium jamaicense*) stands extending over approximately 70% of the Everglades Trough (Herndon et al. 1991:18; Kushlan 1990:340). Sawgrass marshes appear in two forms: dense and sparse (David 1996; Kushlan 1990). These two forms are the result of differences in the amount of accumulated peat substrate. It is important to note that in both forms, the peat or marl substrate always lies directly on top of limestone bedrock (FNAI 2010; Kushlan 1990). In other words, sawgrass does not thrive in areas with any sort of sandy substrate.

Dense sawgrass marshes are associated with greater peat accumulations, and thus higher elevations, that provide a greater amount of nutrients and water retention to support more substantial growth of the peat-loving sedge (Brown et al. 2006; Kushlan 1990). The hydroperiod of dense sawgrass marshes is moderate, lasting approximately 9–10 months during which time the water depth would average 0.45 m but could reach as much as 1.0 m in some areas (McVoy et al. 2011:246, Table 11.4). While dense sawgrass marshes may appear monospecific, upon closer inspection they do contain other emergent species such as maidencane, various species of rushes, and small woody shrubs such as buttonbush (*Caphalanthus occidentalis*) (FNAI 2010). However, sawgrass is definitively dominant in this ecosystem and can grow up to 3 m in height (Whitney et al. 2004:168). In contrast, sparse sawgrass marshes typically overlie much shallower peat accumulations and sometimes may overlie marl rather than peat. Unlike their dense counterparts, the sparse sawgrass marshes are not necessarily dominated by sawgrass itself. Rather, periphyton—comprised of diatoms and blue- and green-
algae—grows in vast mats between individual sawgrass plants (FNAI 2010; Kushlan 1990; McVoy et al. 2011; Whitney et al. 2004). Additionally, the sawgrass grows much shorter in this ecosystem, and other herbs, such as arrowhead and maidencane, exist in greater numbers than in dense sawgrass marshes. The hydroperiod and water depth of the sparse sawgrass marsh is the same as the dense form, thus the differences between the two ecosystems are likely due to the differences in the underlying peat accumulations.

In the KOE sawgrass marshes are predominantly found within the Everglades Trough, but they are also historically known to occur in isolated pockets in the Kissimmee River Valley (Milleson et al. 1980:26) and in the northern portion of the Okeechobee Basin as well. Journals and reports from U.S. military personnel in the Second Seminole War (1835–1842) describe a sawgrass marsh the Seminoles used as a prepared battlefield for the famous Battle of Okeechobee (25 December 1837) that occurred along the north shore of the lake in a hammock surrounded by sawgrass marsh (Lawres 2012, 2014). The soldiers described the marsh as containing “three feet of mud and water” (Mahon 1985:227) with the sawgrass growing to a height of approximately five feet (Mahon 1985; Sprague 2000; White 1950). Thus, when the soldiers traversed this ecosystem they encountered it when water depths were likely at their highest. It is interesting to note, though, that this occurred in the midst of the dry season so it is possible that there may have been hydrological differences in these ecosystems on the north side of the lake versus the south, or possibly that the most recent hydrological reconstructions have underestimated the depths in general.
The Everglades Trough itself is divided into a northern and southern section based on geologic factors as well as the vegetative patterns exhibited in the two different sections, which are primarily differences in the distribution of sawgrass marsh. The northern section is known as the sawgrass plains, which covers approximately 265,000 ha, while the southern section is known as the ridge-and-slough landscape, which covers approximately 600,000 ha (McVoy et al. 164, 175). Prior to the drainage projects the sawgrass plains, which are now the Everglades Agricultural Area, were essentially one large, dense sawgrass marsh with a handful of deeper catchments that formed broad-leaf marshes (McCally 1999:65–69; McVoy et al. 2011:164–174). An important implication of this relatively homogenous landscape involves the drying of the landscape during the dry season (McVoy et al. 2011:251–252). Because of the homogeneity, the entirety of the sawgrass plains would witness a homogenous drying event, which would force aquatic species to migrate northward to Lake Okeechobee, southward to the ridge-and-slough landscape, or to the isolated refuges of small, scattered catchment basins. Species with the ability to burrow into the saturated soils would not have faced this problem, but the others would have to recolonize the sawgrass plains with the return of the rainy season each year.

In contrast, the ridge-and-slough landscape is comprised of linear, monospecific sawgrass stands surrounded by linear sloughs of deeper water with emergent vegetation (Brown et al. 2006; McVoy et al. 2011; Ross et al. 2006). These ridges, which in some cases form tree island hammocks (discussed below), run parallel to the primary direction of water flow in the landscape. The majority of these ridges, however,
are classifiable as dense sawgrass marshes. This landscape is vastly different from sawgrass plains immediately to the north. McVoy et al. (2011:254) best describe it:

As a whole, the predrainage Ridge-and-slough landscape may be thought of as a vast “lake country,” an expanse of many, many long, narrow lakes each only 100–200 m (300–700 feet) wide… Each lake was bordered on the long east and west sides by sawgrass ridges functioning essentially as littoral zones… Those littoral zones dried in most years, causing annual spikes in the slough populations of species that migrated from the ridges.

The water flow in this landscape also would have differed from that in the sawgrass plains. McVoy et al. (2011:273) use the term “slough flow” to emphasize the fact that water flow was not uniform across this landscape but that directionality and flow rate typically followed the course of the sloughs, with the rate partially determined by the amount and density of vegetation within those sloughs.

A slough is defined as “the deepest drainageways within swamps and marsh systems. They are broad channels inundated with slow moving or nearly stagnant water, except during extreme droughts” (FNAI 2010:153). In essence, sloughs are small rivers or creeks within larger bodies of slower moving water. They are inundated year-round (i.e., their hydroperiod is 12 months), and prior to drainage their water depths had an annual variability ranging from 0.30 m to 1.0 m (McVoy et al. 2011:246). They are the only ecosystem heavily associated with marsh systems in the KOE that are always inundated, with the only exception being during extreme drought circumstances. Their floristic affinities are highly variable and dependent on average water depth. For instance, deeper water sloughs may be dominated by floating aquatic plants such as white waterlily (*Nymphaea odorata*) or duckweed (*Lemma valdiviana*), while sloughs with more moderate water depths are characterized by emergent species such as pickerelweed and alligatorflag (*Thalia geniculata*) (FNAI 2010:153). Periphyton is also
common as a floating mat in KOE sloughs (FNAI 2010; McVoy et al. 2011). There are also some areas with canopied sloughs, where pond apple (*Annona glabra*) and Carolina ash (*Fraxinus caroliniana*) are the dominant canopy species and emergent and aquatic vegetation comprise the understory. Canopied sloughs technically fall under the forested wetland category, but they are rare in the KOE.

The final major type of herbaceous wetland to describe for the KOE is the depression marsh, which is also known as an ephemeral pond, flag pond, or flag marsh (FNAI 2010; Whitney et al. 2004). This ecosystem is formed in small depressions in an otherwise relatively flat landscape. In the KOE they are common in the wet prairies of the Kissimmee River Basin but are also found in smaller numbers in the sawgrass plains (McVoy 2011; Milleson et al. 1980; Toth et al. 1998). In most cases the depth of the depression can cause concentric rings of different vegetation adapted to different water depths. In the center they are typically dominated by emergent vegetation such as alligator flag (hence the moniker flag pond or flag marsh) and pickerelweed, while in the shallower areas they are typically dominated by beaksedges (*Rhynchospora* spp.) and maidencane (FNAI 2010; Whitney et al. 2004). The water depth of these ecosystems is highly variable and is dependent on the depth of the depression itself; the hydroperiod is also highly variable and dependent on this depth. However, one of their primary characteristics, and one of the most important, is that they do dry out annually (Whitney et al. 2004:161–162). Yet this desiccation occurs at a different rate than the surrounding landscape so they provide a temporary refuge for some fauna. For instance, in the Kissimmee River Basin wet prairies, these marshes will dry out several months later in the year than the surrounding prairies, providing a refuge for aquatic animals, but prime
hunting for others. Thus, they play important ecological roles for numerous animal species.

An important point in discussing herbaceous wetlands, and wetlands in general in the KOE is that the structure of the faunal composition of these ecosystems revolves around the hydraulic cycle while the fauna aid in integrating the different ecosystems into a singular system (Brown et al. 2006; Diffendorfer et al. 2001; Heymans et al. 2002). It is a given fact that the fauna themselves are adapted to the ecosystems, otherwise they would not survive. However, the structure of the faunal populations shifts as the water levels rise and fall. In general, the fish of the KOE are considered “depauperate” in their species diversity (Kushlan 1990:350). However, in Lake Okeechobee itself there is a greater diversity of fish species, with numerous game species—such as largemouth bass (Micropterus salmoides), black crappie (Pomoxis nigromaculatus), and channel catfish (Ictalurus punctatus)—inhabiting the lake (Bull et al. 1995; Havens et al. 1996).

Within the herbaceous wetlands there are only 22 native species of fish, while there are 30 freshwater fish species endemic to the Everglades as a whole (Brown et al. 2006; Heymans et al. 2002; Kushlan 1980; Kushlan and Lodge 1974). In addition, within the Everglades and Kissimmee marsh environments the fish populations are dominated by mosquitofish (Gambusia affinis) and other topminnow species such as least killifish (Heterandria formosa), Seminole killifish (Fundulus seminolis), golden topminnow (F. chrysotus), and flagfish (Jordanella floridana). Small sunfish species, such as the Everglades pygmy sunfish (Elassoma evergladei) and the bluespotted sunfish (Enneacanthus glorius), and small individuals of other centrarchid species, such as
warmouth (*Lepomis microlophus*) are also common, but in smaller numbers than topminnows (Brown et al. 2006; Kushlan 1980, 1990). In the deeper waters of ponds, sloughs, rivers, and floodplain swamps, larger fish species are dominant; these species include bowfin (*Amia calva*), Florida gar (*Lepisosteus platyrincus*), pirate perch (*Aphredoderus sayanus*), and bullhead catfish (*Ictalurus natalis*) (Ewel 1990; Kushlan 1990). Crayfish (*Procambarus alleni*) are another common species in the marshes of the KOE (Kushlan and Kushlan 1979).

The restricted nature of the fish populations is due to the extreme hydraulic cycle. As the landscape of the KOE dries out, fish populations seek refuge in ponds, creating highly concentrated populations in small, restricted areas of water catchment (Ewel 1990; Gaff et al. 2000, 2004; Kushlan 1974, 1976, 1980, 1990). These deeper catchment areas, notably sloughs and depression marshes (i.e., ponds and cypress domes) are the most hydrologically stable in the KOE watershed, thus they act as refugia for fish populations during the dry season. While the majority of the fish population seeks refuge in these restricted areas, many of the topminnow species are able to survive prolonged periods in water depths of less than 3 cm (Kushlan 1980). With the onset of the wet season and the reflooding of dehydrated marshes, the fish move out of these refugia to repopulate the sawgrass marshes and wet prairies. While there is a general trend of the overall fish population to seek refuge among these catchment areas, there are some species, such as centrarchids and gar, that characteristically inhabit them rather than the shallower marsh areas (Kushlan 1976). This is because they are not adapted to the fluctuating water levels, and prefer deeper water habitats due to their larger body sizes. However, during the wet season, when the
marsh depth is greater, these larger fish will take the opportunity to inhabit the marshes (Kushlan 1976).

Not only does the hydraulic cycle restrict species diversity among fish in the KOE, it also creates a shifting balance in the composition of fish populations between predators and prey. During the dry season there is a high mortality rate among fishes in the Kissimmee River Basin and Everglades Trough due to declining water levels, which leads to low population numbers and greater predominance of the small fishes that can survive shallower waters (Chick et al. 2004; Gaff et al. 2000, 2004; Kushlan 1980, 1990). Conversely, during the wet season the populations of small fish decrease while large fish increase. This is because the large fish feed on the small fish, thus reducing the numbers of smaller fish while increasing the overall biomass of the large fish themselves (Kushlan 1980, 1990). This pattern becomes exacerbated during years of higher precipitation and water levels, with overall species diversity increasing along with the overall fish biomass (Kushlan 1976). The increase in biomass occurs in both predator and prey communities, but the overall shift turns towards a predator-dominated aquatic ecosystem with a generally smaller total number of fish. Furthermore, the hydraulic cycle affects spawning among numerous fish species.

Shifts in the cycle (i.e., rises and drops in water level outside of the annual rise and fall) have been observed to have negative effects on spawning in fish species. This has been well-documented among largemouth bass in Lake Okeechobee as well as survival into the one-year range among black crappie (Johnson et al. 2007:114–115). The rise and fall of water levels in the lake also affect the effective range of fish because the shifting water levels cause shifts in vegetation growth in the littoral zones, which are
important habitats for multiple species. This has further implications in that vegetative shifts can have drastic impacts on the structural composition and range of fish communities more generally as they move between vegetated areas in search of food (Bull et al. 1995; Havens et al. 1996; Johnson et al. 2007).

Fish are not the only aquatic fauna adapted to this hydraulic cycle; there is also a very high number—nearly 100 species (Brown et al. 2006)—of reptiles and amphibians that thrive within the KOE. Some of these species, such as the Everglades dwarf siren (*Pseudobranchus axanthus belli*), never leave the water and burrow into the mud during the dry season. The majority of the reptiles and amphibians of the KOE, however, spend time both above and below the water surface, and thus are well adapted to seasonal fluctuations in water level. The American alligator (*Alligator mississippiensis*) is considered a keystone species in the KOE because of the important role it plays in landscape manipulation (Kushlan 1974, 1990; Whitney et al. 2004). This species creates, maintains, and modifies what are known as gator holes, which are essentially shallow ponds that have a greater depth than the surrounding ecosystem. Sometimes these are naturally occurring ponds that an alligator inhabits and modifies by removing emergent vegetation and digging out the base for greater water depth, while in other cases an alligator might dig a fresh gator hole to create a water catchment area for the dry season (Kushlan 1974). These gator holes provide additional refugia for other aquatic organisms during the dry season. Additionally, because of the water levels restricting the amount of dry ground for nesting among oviparous reptiles, the nests of the American alligator, built along the banks of aquatic habitats, provide a medium for
dry nesting among several reptilian species in the marshes of the KOE (Enge et al. 2000; Kushlan and Kushlan 1980; Whitney et al. 2004).

While alligators, along with the water moccasin or cottonmouth (Akistrodon piscivorous), are found in all of the wetland ecosystems of the KOE, other reptiles are primarily found in the herbaceous wetlands (Ewel 1990; Kushlan 1990). Turtles are very common in these marshes, as well as in rivers and lakes. In the deeper sawgrass marshes and sloughs, mud (Kinosternon bauri and K. subrubrum) and musk turtles (Sternotherus odoratus) are the most common, while in shallower marshes the chicken turtle (Deirochelys reticularia) is more common (Kushlan 1990). In the stillwater swamps, such as cypress ponds, turtles are not very common (Ewel 1990). However, in the rivers, lakes, and ponds, red-eared sliders (Trachemys scripta elegens), Florida red-bellied turtles (Pseudemys nelsoni), and Florida soft-shell turtles (Apalone ferox) are more common. As the water levels rise and fall in the KOE turtles are able to move between different ecosystems depending on their preferential habitat and their specific feeding behaviors. Further, turtles are known to travel long distances in search of new habitats when a water body they are inhabiting dries out (Whitney et al. 2004).

The snakes of the watershed also situate their lives around the hydraulic cycle of the KOE, and much like the fish discussed above are considered depauperate in their species diversity because of the low habitat diversity and low diversity of prey animals (Dalrymple et al. 1991; Ewel 1990; Kushlan 1990). Studies in the southern portion of the watershed have shown that in more upland areas where the hydraulic cycle does not dominate the ecosystem, serpents—the most common being eastern ribbon snake (Thamnophis sauritus), the common garter snake (Thamnophis sirtalis), Florida banded
water snake (*Nerodia fasciata pictiventris*), and water moccasin (*Akistrodon piscivorus*)—are active year-round, but have an activity peak during the summer and fall months (Dalrymple et al. 1991). In other words, snakes in upland habitats tend to be more active during the wet season. In contrast, in the herbaceous wetland ecosystems of the ridge-and-slough landscape serpents—the most common in this landscape being common garter snake (*Thamnophis sirtalis*), pygmy rattlesnake (*Sistrurus miliarius*), eastern ribbon snake (*Thamnophis sauritus*), and black racer (*Coluber constrictor*)—are more active during the winter months when the landscape is much drier (Dalrymple et al. 1991).

Mammals, too, have adapted their behaviors to the hydraulic cycle of the KOE. Many mammals reside in the watershed, and they almost all cross ecosystem boundaries, moving from uplands to wetlands and back again. However, the mammals of the KOE primarily use the wetland ecosystems for feeding while they actually reside in upland ecosystems. Because of this, I discuss mammals alongside upland ecosystems. Yet, there are a few that have specifically adapted their behaviors to the hydraulic characteristics of this watershed, which is important to the discussion of wetland ecosystems. Key among these is the white-tailed deer (*Odocoileus virginianus*). This species commonly inhabits wetlands throughout peninsular Florida, but in south Florida, specifically in the Everglades Trough, it has developed not only a reduced size but also aquatic habits that are peculiar to the herds in this region (Loveless 1959). Most unusual among these habits is an altered rut season based on water levels in the watershed (Richter and Labisky 1985). The deer in this region typically breed in July and August, which is much earlier than herds in other areas of peninsular Florida. This
early rut coincides with the heaviest period of precipitation in the wet season, but it also places the actual fawning in February and March, the driest part of the year in the watershed (Richter and Labisky 1985:969; see also Fleming et al. 1994). Populations of river otter (*Lutra canadensis*) and Everglades mink (*Mustela vision evergladensis*) in the KOE also have breeding seasons that coincide with higher water levels (Humphrey and Zinn 1982). There may be similar behavioral adaptations among many of the other mammals of the KOE watershed, but there is little known, relative to aquatic species, about mammalian ecology in this watershed (Brown et al. 2006:265).

Even so, it is well known that mammals did move through multiple wetland ecosystems in their quest for food, whether that be vegetal or game. For instance, the aforementioned otter and mink move between different wetlands ecosystems in order to maintain a pattern of aqueous hunting even during the dry season (Humphrey and Zinn 1982); Florida panthers (*Felis concolor coryi*) are known to hunt in both forested and herbaceous wetlands, especially during the dry season (Dalrymple and Bass 1996; Maehr et al. 1990); Florida black bears (*Ursus americanus floridanus*) move through multiple wetlands ecosystems in their home ranges to forage for different vegetal matter that varies from season to season—sabal palm heart and early alligatorflag and saw palmetto (*Serenoa repens*) during the spring, berries (blueberry, raspberry, inkberry, saw palmetto) in the summer, and hard mast during the fall months (Maehr and Brady 1984; Mykytka and Pelton 1990).

Although there have been relatively few studies of the relationships between mammals and the hydraulic cycle of the KOE, a number of studies demonstrate multiple associations between wading bird behaviors and the KOE hydrology. While wading
birds—species such as great blue heron (*Ardea herodias*), white ibis (*Eudocimus albus*), great egret (*Ardea albus*), and wood stork (*Mycteria Americana*)—are known to have behavioral adaptations geared towards wetland ecosystems, which makes them subject to the effects of hydraulic patterns, the relationships between wading birds and hydrology in the KOE are more pronounced than in other areas of the world (Bancroft et al. 2002). Furthermore, because of the semi-tropical climate and the specific habitat of the southern portion of the KOE, specifically the Everglades Trough, myriad migratory bird species make the journey from more northerly climes during the fall and winter months. Some of these are classifiable as wading birds but most are not. However, the combination of the warm winter climate and the concentration of aquatic prey during the dry season provide favorable conditions for the ingress of hundreds of thousands of birds each year. Some of these species are highly aquatic—such as several species of duck, like the ring-necked duck (*Aythya collaris*), hooded merganser (*Lophodytes cucullatus*), and ruddy duck (*Oxyura jamaicensis*); others are raptorial—such as the peregrine falcon (*Falco peregrinus*) and American kestrel (*Falco sparverius*); while still others are classified as wood warblers—such as the blue-winged warbler (*Vermivora cyanoptera*), hooded warbler (*Setophaga citrina*), and Tennessee warbler (*Leiothlypis peregrina*). The point is that the shifting hydrology of the watershed is the attractor of these migratory birds.

Water depth and hydroperiod are two variables that have strong effects on the distribution and reproductive success of wading birds in the KOE (Bancroft et al. 2002; Frederick and Collopy 1989; Kushlan 1986; Lantz et al. 2011). Water depth is an obvious factor because of the specific biology of wading birds. The length of their legs is
a biological determinant constraining the effective safety of water depths they can stand in, and their beaks only grow to certain lengths which constrains their ability to forage in deeper waters. Hydroperiod also has strong effects on wading birds because it provides the constraints on vegetative composition of specific ecosystems, which then affects the fish population within a specific wetland area (Lantz et al. 2011). It also constrains fish movements during the dry season, which as previously discussed causes fish to become concentrated in small ponds and sloughs. In turn this affects the distribution of wading birds across the landscape because they take advantage of the opportunity to forage in these ponds (Frederick and Collopy 1989).

Comparative studies of multiple wading bird species in both wet and dry years have demonstrated that changes in the hydroperiod causes shifts in vegetation and water depth that causes shifts in the actual distributions of wading birds between years (Bancroft et al. 2002). These studies have also shown that in years of exceedingly abundant precipitation, which caused very high water levels throughout the year, wading birds were forced out of the watershed into more coastal areas for foraging. Similar studies have also demonstrated positive correlations between unanticipated shifts in water levels and reproductive success in wading bird species (Frederick and Collopy 1989; Kushlan 1986; Russell et al. 2002). Specifically, reductions or increases in water levels in the areas immediately surrounding nesting sites among wading birds are correlated with nest abandonment and thus reproductive failure. In contrast, severe drought years have been shown to have an association with subsequent years of pulsed productivity in small fish populations that in turn cause an influx of wading birds.
leading to supranormal nesting activity, in which hundreds of thousands of wading birds flock to breeding colonies (Frederick and Ogden 2001).

**Upland Ecosystems of the Kissimmee-Okeechobee-Everglades**

Thus far this discussion of the ecosystems within the KOE has been focused on the wetlands of the watershed in order to emphasize the interdependencies of these various ecosystems as well as their integration through the mediums of water and fauna. I now turn to the upland ecosystems of the watershed, which were much more geographically restricted. By this I do not mean they were only found in one part of the watershed, but rather they are spatially restricted in their size. The uplands of the watershed are referred to as hammocks, which are defined as “dense, hardwood forests that occur in limited areas amid the wet prairies, marshes, and pine forests of the coastal plain” (Vince et al. 1989:1) (Figure 2-2). Essentially, these hammocks existed as islands amidst the vast expanses of flowing water throughout the entirety of the watershed, with the exception of the central Okeechobee Basin. They provided the only dry ground in the watershed during the overall hydroperiod of the total watershed. Because of their locations amid the wet prairies and in the ridge-and-slough landscape, the hammocks were connected by flowing water during the hydroperiods of their surrounding environs, making them part of the integrated landscape that is the KOE watershed.

Their locations amidst flowing water also played an important role in the geomorphology of these ecosystems. While there is variability in their form, hammocks generally take the form of a teardrop, with the head of the hammock being broad and rounded and the tail tapering to a point (see Figure 2-3 for variability in hammock shapes). Overall the hammocks are oriented to the prevailing flow of water (Ross et al.
This is because the flow of water causes sedimentation to occur along the original sedimentary accumulation point. Thus, over time the head of the island, which receives the initial contact with flowing water and the sediments it is transporting becomes the primary accumulation point for sediment deposition while the tail receives sediments as the water flows around both sides of the head and the flows from both sides converge on the tail side of the island. In other words, the tail is the result of the convergence of the remaining sediment in the flowing water after initial deposition on the head of the island (McCally 1999).

Figure 2-1. Mesic temperate hammock ecosystem surrounded by wet prairie ecosystem on the Brighton Seminole Indian Reservation. From Lawres, Nathan R. 2012. “You Have Guns and So Have We”: An Ethnohistoric Analysis of Creek and Seminole Combat Behavior (Page 49, Figure 1). Masters thesis, University of Central Florida, Orlando.
The developmental history of hammocks is much different than that of the various wetland ecosystems of the KOE. In fact, their development can be considered the opposite of the wetlands development because it involves sedimentary accumulation leading to topographic rises rather than formation within depressions and catchments. There are several theories of how this occurred. Some of the hammocks
occur on elevated bedrock outcrops, providing a higher elevation base for soils to accumulate and vegetation to attach (Armentano et al. 2002; Platt and Schwartz 1990; Graf et al. 2008). However, this does not account for the majority of hammocks. Rather the hammocks associated with these bedrock outcrops have specific floristic affinities and thus are classified as a specific type of hammock and are geographically restricted to southernmost portion of the ridge-and-slough landscape (Armentano et al. 2002).

In other areas of the KOE hammocks typically form atop a marl substrate (Armentano et al. 2002; Graf et al. 2008). Because these hammocks form above marl, their formation is associated with hydraulic processes involving periphyton (Whitney et al. 2004:164). Marl forms as periphyton is saturated and dehydrated, and because the algae that comprise part of the periphyton absorb calcium from the underlying limestone when the periphyton dries, it forms a hardened, calcified mud. Over time the repeated formation of this marl substrate in the same location can form dense, thick strata that can provide the elevated location for hammock formation. Hammocks are also associated with underlying peat deposits. These hammocks could have formed as thick layers of peat became unattached during times of higher water levels to become floating islands that eventually reattached to peat deposits in other areas, creating an area of greater peat accumulation as well as a topographic rise that higher elevation vegetation could attach to (McCally 1999:24–25). The peat-associated hammocks are typically restricted to the ridge-and-slough landscape (Armentano et al. 2002; McCally 1999).

Although numerous types of hammocks exist throughout the coastal plain (see Grellar 1980, 2003 for a detailed discussion), three types occur in the KOE watershed. Each of these hammock types is distinguishable based on their dominant floristic

Figure 2-3. Bare earth model of hammock ecosystems in the Kissimmee River Basin. Model based on LiDAR elevation data from FDEM 2007 Herbert Hoover Dyke Project.

Mesic temperate hammocks, also known as temperate broad-leaved evergreen forests (Grellar 1980, 2003; Platt and Schwartz 1990) or prairie mesic hammock (FNAI 2010), are defined as “closed canopy forests, dominated by evergreen tree species of
temperate affinities, primarily live oak and cabbage palm” (U.S. Fish and Wildlife Service 1998:3-98). This hammock type is considered to have a lower species diversity than other hammocks in the KOE or the broader coastal plain (Platt and Schwartz 1990; Schwartz 1988; U.S. Fish and Wildlife Service 1998). Although the canopy is densely vegetated, the understory is typically open and easily navigated. The dominant canopy species of this hammock type typically consists of southern live oak (Quercus virginiana), but can also include laurel oak (Quercus laurifolia) and water oak (Quercus nigra) towards lower elevation edges of the ecosystem. The subcanopy is typically dominated by sabal palm (Sabal palmetto), also known as cabbage palm. Understory vegetation is dominated by wild coffee (Psychotria nervosa), marlberry (Ardisia escallonoides), myrsine (Myrsine floridana), and several other herbaceous species. These ecosystems lack high species diversity in herbaceous vegetation but may contain large amounts of rare epiphytic flora such as resurrection fern (Polypodium polypodioides) and bromeliads such as giant wild pine (Tillandsia utriculata) (FNAI 2010; Grellar 1980; Platt and Schwartz 1990; U.S. Fish and Wildlife Service 1998).

Generally, this hammock type has an elevation approximately 20–40 cm greater than the surrounding ecosystems, which in the KOE is most commonly wet prairie (Figure 2-4). The distribution of this hammock type occurs in what is generally considered a transitional or tension zone (Grellar 1980; Schwartz 1988; U.S. Fish and Wildlife Service 1998). This zone, referred to as the temperate broad-leaved evergreen forest zone (Grellar 1980), is a horseshoe-shaped zone with the arms running along the coasts of the Florida peninsula and the main U crossing south of Orlando and just south of Lake Okeechobee (Figure 2-5). In regards to the KOE, this distribution of mesic
temperate hammocks equates to the Kissimmee River Basin and the lateral portions of the Okeechobee Basin. To the north of this zone southern hardwood forests predominate while to the south there is a second transitional zone where both mesic temperate hammocks and tropical hardwood hammocks co-occur, with the mesic type occurring in much smaller numbers; further south there is a zone where tropical hardwood hammocks solely occur (FNAI 2010; Grellar 1980, 2003; Platt and Schwartz 1990; U.S. Fish and Wildlife Service 1998).

The primary distinguishing factor between the mesic temperate hammocks and the tropical hardwood hammocks is the percentage of tropical plant species present in the specific ecosystem. Mesic temperate hammocks contain less than 70% tropical species while tropical hardwood hammocks typically contain 70–80% (sometimes more) tropical species (FNAI 2010; U.S. Fish and Wildlife Service 1998). A second distinguishing characteristic is the hydric quality of the soils in these ecosystems. Mesic temperate hammocks are classified as mesic because their soils retain moisture throughout the year (FNAI 2010; U.S. Fish and Wildlife Service 1998). This is achieved in two ways. First, the closed canopy created by the evergreen live oaks provides year-round shade that provides protection against moisture loss (i.e., evaporation). Second, these ecosystems retain a thick layer of leaf litter across the forest floor. While live oaks are considered evergreen trees, in contrast to the majority of oak trees, they do shed leaves throughout the year. These leaves, along with the fronds of sabal palms and the leaves of smaller woody shrubs and herbaceous vegetation, provide the matrix for an extensive duff layer that further aids in retaining moisture (U.S. Fish and Wildlife 1999).

The combination of the leaf litter and closed canopy also plays a role in minimizing species diversity in these ecosystems (Milleson et al. 1980).

Tropical hardwood hammocks, also referred to as tree island hammocks (Griffin 2002; McCally 1999; Graf et al. 2008) or rockland hammocks (Snyder et al. 1990; Whitney et al. 2004), are defined as “closed canopy forests, dominated by a diverse assemblage of evergreen and semi-deciduous tree and shrub species, mostly of West Indian origin” (U.S. Fish and Wildlife Service 1998:3–122). These hammocks are listed as biodiversity hotspots that are among the most endangered ecosystems in the world.
(Gillespie 2005:35). This high level of biodiversity occurs because of the absorption of high levels of phosphorous in their developing soil horizons (Ross and Sah 2011). Like mesic temperate hammocks, this hammock type has a densely vegetated canopy with a relatively open understory; the understory is less open than mesic temperate hammocks, though (FNAI 2010). Unlike mesic temperate hammocks, however, the canopy vegetation is much more diverse. There is also spatial diversity among this hammock type, with notable differences in canopy vegetation between hammocks in the southern vs. northern Florida Keys vs. the ridge-and-slough and rockland landscapes (U.S. Fish and Wildlife Service 1998). This discussion focuses on those tropical hardwood hammocks in the ridge-and-slough landscape because it is within the study area.

Ridge-and-slough hammock canopy vegetation is typically dominated by gumbo-limbo (*Bursera simaruba*), strangler fig (*Ficus aurea*), pigeon-plum (*Coccoloba diversifolia*), paradise tree (*Semiarouba glauca*), West Indian mahogany (*Swietenia mahagoni*), and wild mastic (*Sideroxylon foetidissimum*); along the hammock margins live oak and laurel oak may also be present (FNAI 2010; Snyder et al. 1990; U.S. Fish and Wildlife Service 1998; Whitney et al. 2004). Subcanopy vegetation is typically dominated by marlberry (*Ardisia escallonoides*), inkwood (*Exothea paniculata*), ironwood (*Krugiodendron ferreum*), poisonwood (*Metopium toxiferum*), and white stopper (*Eugenia axillaris*). Herbaceous vegetation is typically sparse with a low species diversity. The most common herbaceous vegetation is wild coffee, false mint (*Dicliptera hirtellus*), and rouge plant (*Rivina humilis*). Additionally, epiphytic vegetation is quite common and can include several species of orchids (Snyder et al. 1990; Whitney et al.
2004). As this brief list demonstrates, this hammock type has a much higher level of species diversity than mesic temperate hammocks, and the vegetation associated with this hammock type is much more tropical and mostly of West Indian origin which makes them very similar to the coastal hardwood forests found throughout the Greater Antilles (Snyder et al. 1990).

In the ridge-and-slough landscape the tropical hardwood hammocks have an average elevation of 87 cm, ranging from 16–174 cm, higher than the marshes surrounding them and 65 cm higher than the average water surface (Ross and Sah 2011:636–637, Table 1). These hammocks are geographically restricted to a range south of the Okeechobee Basin. They are present in very small numbers in the sawgrass plains landscape—the zone labeled as the temperate broad-leaved forest/tropical forest transitional zone—where they are found alongside even smaller numbers of mesic temperate hammocks, but they are primarily found in the ridge-and-slough landscape, along with the Ochopee, Rockland, and Marl marsh regions further south (FNAI 2010; Grellar 1980, 2003; McVoy et al. 2011; U.S. Fish and Wildlife Service 1998).

The final hammock type of the KOE that I discuss is the hydric hammock. Hydric hammocks are defined as “an evergreen hardwood and/or palm forest with a variable understory typically dominated by palms and ferns occurring on moist soils, often with limestone very near the surface” (FNAI 2010:181). Hydric hammocks, as isolated forested communities, are most typically found north of Lake Okeechobee, but they are very commonly found as ecotonal communities in mesic and tropical hardwood hammocks and within hammocks that have seepage springs (Ewel 1990; FNAI 2010;
Vince et al. 1989). In contrast to the mesic temperate and tropical hardwood hammocks discussed above, which typically occur on well-drained soils and have short hydroperiods, hydric hammocks occur in areas with moderate hydroperiods with poorly drained soils (FNAI 2010; Simons et al. 1989; Vince et al. 1989). Because of their hydroperiod these ecosystems are technically considered a type of forested wetland (Williams et al. 2007). However, because of their association with the marginal areas or ecotones of other hammock ecosystems in the KOE I have included them in the discussion of uplands. Indeed, one of their most notable qualities is their marginality (FNAI 2010; Vince et al. 1989; Williams et al. 2007).

Several subtypes of hydric hammock are associated with specific geographic areas, each of which have different floristic associations (Simons et al. 1989; Vince et al. 1989). Those within the KOE are known as the inland hydric hammock. This hammock type has a canopy dominated by sabal palm, swamp laurel oak, and live oak, but variable amounts of sweetgum (*Liquidambar styraciflua*), red maple, sweetbay (*Magnolia virginiana*), and red cedar (*Juniperus virginiana*) are also present (FNAI 2010; Simons et al. 1989; Vince et al. 1989; Williams et al. 2007). The presence of sweetbay, red maple, and other water-tolerant species is used as a distinguishing factor in delineating hydric hammock from mesic temperate hammock (FNAI 2010:27). The understory vegetation is also useful in delineating these two ecosystems because of the water tolerance of the species characteristic of hydric hammocks. These include woody shrubs such as swamp dogwood (*Cornus foemina*), swamp bay (*Persea palustris*), and American hornbeam (*Carpinus caroliniana*); ferns and sedges are also common forms of herbaceous vegetation (FNAI 2010).
There are numerous animals that inhabit the hammocks of the KOE, which made them especially important ecosystems to the people that came to inhabit the watershed. Almost all of these animals make use of various ecosystems, both uplands and lowlands, throughout the KOE, providing another integrating mechanism for the entirety of the watershed. Further, there is little variation in the faunal composition between mesic temperate and tropical hardwood hammocks. The primary variation is in avian species and this is due to the geography of the mesic temperate versus tropical hardwood hammocks. As noted above, the mesic temperate hammocks are primarily distributed north of the Okeechobee Basin, with smaller numbers occurring in the transitional area of the sawgrass plains, while tropical hardwood hammocks occur primarily in the ridge-and-slough landscape of the Everglades Trough. This thus places the tropical hardwood hammocks in a more subtropical climate conducive to large influxes of migratory birds. In fact, tropical hardwood hammocks have been noted to “support more species of resident and migratory birds than any other habitat in the central Everglades” (Ogden 2005:814).

While hammocks have been noted for their importance to bird species, they have a much greater amount of wildlife diversity in general than the wetlands of the KOE. Mammals, reptiles, amphibians, birds, and numerous species of insects and arachnids inhabit these ecosystems. Tropical hardwood hammocks have the greatest amount of diversity, but there is a significant amount of species overlap between mesic temperate, tropical hardwood, and hydric hammocks because of the overlap in their distributional range, but also because they provide the only annually dry land within the KOE watershed. The following list focuses only on the most common species that are found
in each of the hammock types. Among mammals the most common are the gray squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), opossum (*Didelphis marsupialis*), raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*) (FNAI 2010; Platt and Schwartz 1990). Species that were once common and have now become extremely rare include the Florida black bear (*Ursus americanus floridanus*), Florida panther (*Felis concolor coryi*), and Florida red wolf (*Canis rufus floridanus*) (FNAI 2010). Notably, all of these animals, with the exception of the squirrels, make extensive use of the wetlands as well and are known to range over large areas.

The hammocks are also home to numerous reptilian species. Some of the most common are snakes such as the black racer (*Coluber constrictor*), yellow rat snake (*Elaphe obsolette quadrivittata*), eastern diamondback rattlesnake (*Crotalus adamanteus*), and pygmy rattlesnake (*Sistrurus milarus*) (FNAI 2010; Platt and Schwartz 1990). Numerous other snakes that occur in smaller numbers in the hammocks and many more that utilize the edge of these ecosystems for basking while residing more permanently in the wetlands that surround them. Numerous lizards also inhabit the hammocks, such as the green anole (*Anolis carolinensis*), eastern glass lizard (*Ophisaurus ventralis*), and southeastern five-lined skink (*Eumeces inexpectatus*). The only common turtle in these ecosystems is the Florida box turtle (*Terrapene carolina bauri*). Amphibians are also common in the hammocks, but only a few are common in all of the different hammock types. These include the southern toad (*Bufo terrestris*), green tree frog (*Hyla cinerea*), and squirrel tree frog (*Hyla squirella*). Frogs
are much more common in hydric hammocks than other hammock types due to the longer hydroperiod and thus greater amount of moisture in the ecosystem (FNAI 2010).

Finally, a large diversity of birds inhabits the hammocks of the KOE, and this number increases annually during the fall and winter months as hundreds of thousands of birds make the journey to the south in their annual migrations. There are quite a few species that are annual residents of all the hammock types, however. Some of the more common ones include raptors such as the red-shouldered hawk (*Buteo lineatus*) and bald eagle (*Haliaeetus leucocephalus*), crows such as the American crow (*Corvus brachyrhynchos*) and fish crow (*Corvus ossifragus*), owls such as the barred owl (*Strix varia*) and barn owl (*Tyto alba*), and carrion eaters such as the turkey vulture (*Cathartes aura*) and black vulture (*Coragyps atratus*). Many more avian species inhabit and make use of these ecosystems, but this brief list gives an indication of the diversity of avian species in the uplands of the KOE. Much like the mammals of the KOE, avian species do not reside just in the hammock ecosystems, but rather they make use of all the ecosystems in their home range. This is especially true of the wetlands, as raptorial birds ingest fish in large amounts.

**Summary**

The Kissimmee-Okeechobee-Everglades watershed is a much different landscape today than it was 1,000 years ago, or even 150 years ago. Prior to the drainage projects of the late 19th and early 20th centuries this was an aqueous landscape that saw water flowing across the majority of it for 9–10 months of the year. This landscape developed gradually by approximately 6,000 years ago (McCally 1999; McPherson and Halley 1996; Widmer 2002; Willard and Bernhardt 2011). It was at this time that the hydraulic regime of the watershed took hold, and, in combination with the
geomorphology, topography, sedimentation, and precipitation patterns, a regional climate conducive to the formation of specific ecosystems adapted to moderate (6–9 months) and long (9–12 months) hydroperiods took hold in the watershed. These ecosystems include the vast expanses of wet prairie in Kissimmee River Basin and the lateral sides of the Okeechobee Basin, Lake Okeechobee itself, and the world-famous Everglades that includes the sawgrass plains and ridge-and-slough landscape.

All of these different ecosystems were once part of an integrated landscape, and the water that flowed across it was the primary integrative mechanism. The many animals that inhabited these waters also acted to further integrate it as they moved between different wetland habitats as the waters rose and fell across the landscape. Avian and terrestrial animals also situated their behaviors around the rising and falling of these waters, taking advantage of the constraints placed against the aquatic animals during the dry season. The avian and terrestrial animals also aided in linking the upland environments, known as hammocks, to the aquatic habitats as they moved between them. These upland habitats, however, formed much later than the wetlands that surrounded them due to the slower processes of long-term sedimentation that formed them (Bernhardt 2011; McCally 1999; Willard and Bernhardt 2011).

The development of these various ecosystems created a dynamic, integrated landscape of vast expanses of wetlands juxtaposed with small islands of uplands that were encircled by torpid water flow. This water flow, in turn, linked the numerous hammocks dotting the landscape. It is this dynamic landscape that people entered into and inhabited. As seen in the following Chapter 3 the people that dwelled within this landscape, known to us primarily through the Belle Glade archaeological culture,
created a cultural landscape, a material world, centered on this dynamic dichotomy of wet and dry.
In Chapter 2, I presented the environmental context for this study by painting a detailed picture of the Kissimmee-Okeechobee-Everglades watershed from both a hydraulic and ecosystem perspective. I now shift the focus to the people who lived within this watershed. These people are known to us almost entirely through the archaeological record. Among archaeologists they are referred to by their associated archaeological culture: the Belle Glade culture.

Historically, the peoples associated with the Belle Glade archaeological culture were known as the Mayaimi and Serrope. However, they are only known to us through two historical accounts, one by Hernando de Escalante Fontaneda, the other by René Laudonnière. The latter account discusses a bread made from roots as being a dietary staple along with some details of enmity between the Serrope and Calusa while the Fontaneda account provides details on the Calusa peoples of the Southwest Gulf Coast. As part of these details, Fontaneda discusses the geopolitical landscape of South Florida and describes the Calusa as having political authority over a number of different peoples throughout the region. One of these peoples were the Mayaimi, who he describes as living on the shores of Lake Okeechobee, then known as Lake Mayaimi. He does not provide many details about the Mayaimi, other than that they primarily ate a bread made from roots, along with fish and turtles and some mammals, and that they paid tribute to the Calusa.

The archaeological record provides some verification for this description in regard to the zooarchaeological collections from various Belle Glade sites (Allgood 2008; Fradkin 2012; Hale 1984, 1989; Mitchell 1996). It also documents a relationship
with the Calusa, but not necessarily one of a tributary nature. Rather, it documents a reciprocal trade relationship through the presence of Belle Glade ceramics at Calusa sites and marine resources at Belle Glade sites. Yet, as discussed in Chapter 1, the archaeological record of the Belle Glade peoples is still not well understood in comparison to other areas of Florida (Griffin 2002; Johnson 1991; Milanich 1994; Milanich and Fairbanks 1980). Our current understanding is primarily based on William H. Sears’ work at Fort Center in the 1960s and Matthew W. Stirling’s work at Belle Glade in the 1930s, and, to a lesser extent, on CRM reports and three dissertations (see Austin 1997; Hale 1989; Johnson 1991).

While there have been several iterations of the Belle Glade cultural chronology, the overwhelming majority of these have been based on Sears’ (1994) Fort Center research because he was the first to produce chronometric dates. These chronologies have ranged from Willey’s (1949) initial two-period chronology for the Belle Glade site to the four-period chronology developed by Sears (1994) for Fort Center. This latter chronology has been extrapolated to the entire region and formed the basis of several subsequent variations (see Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014). The most current version, proposed by Thompson and Pluckhahn (2014), is the most precise and is the one followed in this research. While there are variations in each of the proposed chronologies, what they all have in common is that they note the primary indices of cultural change are pottery and monumental architectural styles.

Here in Chapter 3 I outline various aspects of the Belle Glade archaeological culture. This includes different aspects of the material culture as well as the larger cultural patterns such as subsistence and settlement patterns as well as social
organization. In the course of doing so I emphasize the different relationships developed between the Belle Glade peoples and the physical structures—the tangible components such as specific flora and fauna (sensu Marquardt 1992b; Marquardt and Crumley 1987)—of the KOE watershed as well as with other social groups throughout the region and beyond. Throughout this discussion I bring in information about several sites throughout the region. The locations of these sites are depicted in Figure 3-1.

Figure 3-1. Sites mentioned in text.

**Pottery**

In contrast to other peoples throughout Florida and the Southeast, the peoples associated with the Belle Glade culture manufactured a very limited range of pottery. The principle pottery type associated with this culture, which is often hailed as the
diagnostic identifier of a Belle Glade component of a site, is known as Belle Glade Plain. Even though pottery manufacture was limited in type, pottery is the main chronological marker for cultural change used in the establishment of the Belle Glade cultural chronology.

Early descriptions of this pottery type emphasize surface treatment as the primary identifying characteristic, with paste and form playing a smaller role. Goggin (n.d.:458–459) describes it as being hard and intermediate in paste between the Glades and Biscayne Series. Some fine grit tempering is found. The surface is poorly finished with broad tool marks frequently present. The smoothing appears to have been done while the clay was still damp resulting in a characteristic dragged surface. The vessel forms are medium sized bowls with a flat lip.

Willey (1949:25) similarly describes it as being in an “intermediate position between the Glades Series and the Biscayne Series in temper, hardness, and density.” He also describes the surface as exhibiting “long streaks made by the smoothing implement. In smoothing, temper particles are often pulled out of the paste and extrude onto the surface” (Willey 1949:25). Unlike Goggin, Willey (1949:25–26) also emphasizes the rim and lip treatments in his description, stating that the rims are often thickened and the lips as being either flat or beveled towards the interior of the vessel.

Porter (1951) also describes Belle Glade Plain as intermediate between the same series as Goggin and Willey. However, she also notes that it is sand-tempered and has a chalky appearance similar to St. Johns and Biscayne wares. She also notes the tooled surface treatment that both Goggin and Willey commented on. She describes the exterior as “roughly faceted through the use of a smoothing implement” (Porter 1951:68).
Sears (1994:21) also uses surface treatment as the primary characteristic of Belle Glade Plain pottery. He describes the surface treatment as:

Tooled and compacted. A wooden tool picked up grains of sand and dragged them for some variable distance, leaving the surface, frequently faceted because of tool size and shape, scratched and pitted. The effect resembles a brushed surface at times, except for the frequent pits left by the removal of sand grains… This scratched and pitted finish is the only characteristic that permits Belle Glade Plain to be consistently sorted from other types with which it shares vessel form, color, temper, hardness, and faceting… unless analysts use this single characteristic as the major class determinant, the type is not a useful tool.

Sears (1994:21–22) also notes the importance of rim and lip variation. He describes four lip treatments in detail and mentions four others. He also notes that lip treatment is temporally sensitive.

In contrast to previous researchers, Cordell (1992) argues that the paste alone is a more reliable identifier of Belle Glade Plain pottery than surface treatment. She describes the paste as being:

characterized by common to abundant minute sponge spicules and common quartz sand very fine to coarse in size (very fine and fine predominant)… The size of sponge spicules… ranges within silt size in diameter and very fine in length. In addition the spicules exhibit preferred orientation (Cordell 1992:111)

The paste exhibits variability in the frequencies of and ratios between spicules and quartz sand grains, but the average is 14% spicule to 22% quartz sand (Cordell 2007:121). Further, in comparison to other spiculate-tempered wares in Florida (e.g., St. Johns, 47%), Belle Glade Plain paste contains a lower percentage of aplastics (39%) (Cordell 2007:122).
The variability in Belle Glade Plain pastes is also noted by Schneider, who is studying pottery assemblages from several sites in the Okeechobee Basin and northern Everglades Trough. He notes that:

The relative quantities of either of the tempering materials [spicules and quartz sand grains] varies drastically between sites, as well as within any given assemblage. The spicules found within the paste do not appear to be uniform in either species of sponge nor in their orientation. The one aspect of Belle Glade ceramics that appears to have consistency is in the aural characteristics of Belle Glade sherds. (Schneider, personal communication, 2018)

Schneider also argues that the fuel used in firing Belle Glade pottery is one of the primary characteristics of the ware. He claims that the experiments he and his colleagues conducted show that using muck or peat briquettes provides temperatures high enough to vitrify the pottery, which plays a role in creating the consistent tonality when tapping a Belle Glade sherd with a piece of metal (i.e., tuning fork, trowel, or other). He adds, “If they used muck as a fuel for firing, this would explain the higher firing temps and higher quality all around from a utilitarian standpoint, making it much more akin to prehistoric Pyrex instead of just prehistoric Tupperware” (Schneider, personal communication, 2018).

Austin (1996:75) argues for a middle ground, claiming that it is the combination of paste and surface treatment that is characteristic of the Belle Glade Plain pottery type. He notes that “secondary attributes such as surface treatment, paste characteristics, and aplastic inclusions” become the necessary identifying characteristics in South Florida because of the overall dearth of decorated wares (i.e., the dominance of plain wares). As such, Austin uses the characteristic tooled surface, with its faceting, drag marks, and pits, along with the spiculate-tempered paste as the primary identifying characteristics of this pottery type.
While the surface treatment and paste do not change through time, there are certain characteristics that do. Porter (1951) was the first to note temporal trends in this plain ware, and the trend she discusses is related to lip treatment. She identified a total of 15 different lip treatments that are divided into two general categories, flat and rounded, that each have multiple variations or subtypes. While her sample was limited, she notes that there is a shift towards greater use of the flat lips through time, and more specifically, the flat, expanded lips.

Sears (1994:192–201, see also Figure 7.1 for a seriation chart) also notes a temporal trend in lip treatment. Like Porter (1951), he discusses a trend towards an emphasis on the expanded flat lip treatment, which he describes as resembling a T-shape (Sears 1994:22), and a comma-shaped lip treatment. These both appear late in his Belle Glade III period and increase quickly in frequency with the onset of his Belle Glade IV period.

He also notes a general increase in the frequency of Belle Glade Plain pottery through time, with a concomitant decrease in Sand-Tempered Plain. Further, he notes an increase in control over firing techniques over time, which is reflected in the exterior coloration of the vessels as well as a characteristic tonality that he describes as producing a “ring when struck” (Sears 1994:200), which is similar to Schneider’s comment on aural characteristics. However, Cordell (1992:154) does not find the same trends in coloration and thus control over firing techniques in her study of Belle Glade pottery from Calusa sites. Because of this she notes that many of the trends in Belle Glade pottery might be site-specific rather than regional. This is echoed by Schneider (personal communication, 2018, see above).
Cordell’s (1992:154–161) study of Belle Glade pottery does confirm the temporal trends in lip treatment, though. She describes a trend towards expanded flat lips through time, confirming both Porter’s (1951) and Sears’s (1994) observations. She also discusses a general emphasis on thinner-walled vessels in later time periods. She confirms both of these observations in a later study of a large sample of Belle Glade Plain pottery at Pineland, another large Calusa site (Cordell 2013:494–496). She also states that there is an increase in mean rim thickness through time but explains that this is associated with the emphasis on expanded flat rims.

In addition to these temporal trends in Belle Glade Plain pottery, all trends in what are considered microvariables (Creese 2012; Hill 1977; Martelle 2002), the presence of imported ceramic types is an important chronological indicator. Sears (1994:25–32) is the earliest to make this observation, and he includes it as a necessary criterion in his chronology for Fort Center. However, there is variation between sites as to what types of pottery are imported over time. This variation is related to differences in the social relationships formed between Belle Glade communities and those outside the Kissimmee-Okeechobee-Everglades watershed.

In the Belle Glade I Period (1000 BC–AD 200), the predominant pottery type is semi-fiber-tempered pottery that is gradually replaced by sand-tempered pottery. Sears (1994) and Griffin (2002) note that the amount of fiber-tempering slowly decreases while the amount of quartz sand grain temper increases before true sand-tempered pottery becomes dominant. Orange fiber-tempered pottery is also noted during this period at Fort Center, drawing a connection to the St. Johns culture to the north.
In the Belle Glade II Period (AD 200–1000), Belle Glade Plain pottery first appears and gradually increases in popularity (Austin 1996; Griffin 2002; Sears 1994). It is during this period that the imported ceramic ware variation appears. Sites on the west and north sides of Lake Okeechobee contain pottery from the northern portion of Florida and southern Georgia, primarily of the Cartersville, Crystal River, Deptford, Pasco, and St. Johns types (Austin 1996; Sears 1994:194–199). Sites on the eastern and southern sides of the lake contain pottery affiliated with the Glades archaeological culture to the south and southwest, such as Fort Drum Incised, Gordons Pass Incised, Key Largo Incised, and Sanibel Incised (Griffin 2002; Willey 1949). This suggests a marked difference in the social relationships formed between communities, with those on the southern and eastern sides of Lake Okeechobee focusing their relationships with neighboring groups while communities on the western and northern sides of the lake focused those relationships with groups more distant. However, it is possible these pottery types were made locally by either nonlocal or local potters.

In the Belle Glade III Period (AD 1000–1513), Belle Glade Plain becomes the dominant pottery type. Additionally, during this time period there is an emphasis on the flat lip treatment of Belle Glade Plain. Sand-tempered plain pottery is still ubiquitous, but it is found in lesser frequencies than Belle Glade Plain (Austin 1996; Griffin 2002; Sears 1994). The spatial differentiation seen in the previous period carries into this time. Small amounts of St. Johns plain and St. Johns check-stamped are present in the western and northern sites (Austin 1996; Sears 1994:199–200); in the southern and eastern sites small amounts of Biscayne check-stamped, Fort Drum Incised, Key Largo Incised, Sanibel Incised, and Englewood types are present. This suggests some shifts in social
relationships in Belle Glade communities. Those on the northern and western sides of Lake Okeechobee seem to have retracted their social reach while those on the southern and eastern sides of the lake expanded their relationships to include more distant communities to the North and West.

The Belle Glade IV Period (AD 1513–1763) is associated with a preponderance of Belle Glade Plain with expanding flat lips and comma-shaped lips along with small amounts of sand-tempered plain pottery (Sears 1994:Figure 7.1). Extralocal pottery diminishes almost completely, but European artifacts, traded from areas outside of the KOE watershed, appear. This again suggests shifts in social relationships. The European artifacts include glass beads and various metals (silver, gold, copper, and iron) that were either salvaged from Spanish shipwrecks by Calusa, Tequesta, and Ais along the coasts or traded southward from the established mission system in the North (Luer 1994).

**Lithics**

In the KOE watershed, lithics are among the rarest of artifact types. This is because the closest outcrops of siliceous stone are located well outside the boundaries of the watershed (Austin 1997; Austin and Estabrook 2000; Butler and Lawres 2014; Endonino 2007; Upchurch et al. 1982). The closest outcrop, the Peace River outcrop, is located in Zolfo Springs in Hardee County, approximately 50 km west of the watershed (Lawres and Butler 2014). Because of the lack of local sources of lithic raw materials, knappable stone was imported into the watershed in various quantities and in various forms. The ways in which lithic materials were brought into the region is tied to provisioning strategies. As I have argued elsewhere (Butler and Lawres 2014) there are two provisioning strategies exhibited in the region: place provisioning and individual
provisioning (Kuhn 1995:21–37). These two strategies, in turn, are tied to the locational context of the sites where lithics were imported to.

The majority of Belle Glade sites—which are typically small, located on the tree island hammocks of the region, and are some distance from deep, perennial waterways—exhibit small lithic assemblages, if any at all, relative to other categories of artifacts. The lithic assemblages of these sites are typically comprised of finished or nearly finished bifaces and other lithic tools (i.e., scrapers, blades, etc.). They additionally exhibit minimal evidence for lithic reduction sequences, with late stage retouch being the predominant form of debitage. These characteristics point to a lithic-use strategy aimed at abating transport cost and maximizing the use-life of lithic tools (Thacker et al. 2012). Further, the importation of select finished tools rather than the raw materials for manufacture is suggestive of a provisioning strategy aimed at provisioning an individual or select group of individuals with the materials needed for tasks involving lithic tools (Butler and Lawres 2014:127).

In contrast, the large, permanent settlements located in the vicinity of deep, perennial waterways show a different provisioning strategy that is aimed at provisioning an entire community. These sites—such as Fort Center, Ortona Earthworks, and Ritta Island—contain quite large lithic assemblages that are comprised not only of finished tools, but of entire reduction sequences and caches of chert nodules. These kinds of assemblages are indicative of what Kuhn (1995) refers to as place provisioning strategies, where entire communities are provided with the requisite materials for the manufacture of lithic tools. Place-provisioned sites are rare in the KOE watershed, however, and with the exception of the Ortona Earthworks, they are restricted to the
large, permanently occupied sites along the Kissimmee River-Lake Okeechobee corridor (Butler and Lawres 2014).

The locations of these sites along this corridor ties into the importation of the raw materials. Provenance studies of the lithic materials in the region point to North Florida as the source for the majority of the lithic materials found in the KOE watershed (Austin 1997, 2004, 2008; Butler and Lawres 2014; Davenport et al. 2011). Austin (1997, 2004; Davenport et al. 2011) argues that a form of down-the-line exchange of lithic materials occurred along this corridor, with the line extending southwards to end at the Miami Circle site. I agree with this assessment. Sites along this corridor are the ones with the greatest amount of lithic material in the region. It is, however, plausible to extend this argument to include a secondary down-the-line exchange moving east and west from the corridor. During this secondary line of exchange, the lithic materials would no longer be in the form of chert nodules, but would rather consist of finished or nearly finished tools so that individuals or small groups of individuals may be provisioned (Butler and Lawres 2014).

**Bone**

Bone artifacts comprise a large portion of Belle Glade material culture. In his discussion of the Belle Glade site, the type site for the culture, Willey (1949:37) states, “Bone implements and ornaments are characteristic of the Belle Glade site. They are numerous and show a considerable diversity of form.” This statement can easily be extended to say that bone artifacts are characteristic of the entire Belle Glade archaeological culture. Outside of the type site, Fort Center exhibits a large bone artifact assemblage with a high diversity (Steinen 1994), as does the Blueberry site (Butler 2008; Butler and Lawres 2014). Additionally, Goggin (1949) and Griffin (2002), both of
whom refer to the Belle Glade culture as a variant of a larger Glades culture, also note the prevalence of bone artifacts.

There is significant variability exhibited in the forms bone artifacts take at Belle Glade sites, and their function ranges from tools to ornaments. However, no single site encompasses the entire spectrum of this variation. Rather, some sites exhibit a large variety of types while others only exhibit a handful. For instance, Willey (1949:37–46) discusses 16 distinct types, plus one miscellaneous category for unidentifiable fragments of worked bone, from the Belle Glade site, but in his survey of multiple sites throughout Dade and Broward counties he only discusses 12 types plus one miscellaneous category for unidentifiable fragments (Willey 1949:102–105). Steinen (1994:87–90) discusses five distinct types plus a miscellaneous catch-all category for bone artifacts recovered from the charnel pond. He separates this category due to the vastly different context of recovery. In Griffin’s (2002:108–117) discussion of the Glades archaeological region, which includes the Belle Glade region in his analysis, there are 32 distinct types discussed. This is a significantly larger number of types because Griffin’s Glades region also includes many coastal sites, so there are many marine variants of bone artifacts included in his discussion.

One thing to note is that even for sites that have low levels of diversity in bone artifact types there is still a relatively large number of actual bone artifacts. However, there are exceptions to this. Two island sites in the waters of Lake Okeechobee, Ritta Island and Kreamer Island, exhibit both low diversity and low numbers of bone tools (Davenport et al. 2011). This differential variation in both bone artifact types and numbers is likely related to two factors. First, the specific location of a site affects the
specific species targeted in Belle Glade subsistence patterns because of the vicinity of the site to specific ecosystems (Mitchell 1996). These variable patterns in faunal exploitation are discussed in detail below. Because of the differential targeting of species, we can expect variation in the types of bone tools produced and used at Belle Glade sites. Second, differential access to resources for tool production can lead to increased or decreased diversity in bone artifact assemblages. As discussed above, there is variability in communities' access to raw lithic resources based on their location relative to the down-the-line exchange network of knappable stone. This is reflected in the lithic provisioning strategies at Belle Glade sites. The variability in both types and numbers of bone artifacts is likely directly related to access to this network. Sites that are distant from this network, such as the Belle Glade site, have a low diversity and number of stone artifacts but a high diversity and number of bone artifacts. Conversely, sites closer to or directly along this network have a higher diversity and number of stone artifacts and a lower diversity and number of bone artifacts. Thus, the inhabitants of sites with less access to knappable stone turn to bone as a medium for making projectile implements.

This is best illustrated by looking to the bone artifact assemblages of the Belle Glade site and Fort Center. The prevalence of the socketed projectile point at Belle Glade substantiates the need for a different medium for projectile implements for subsistence. Willey (1949:38) describes these as being:

made by cutting a long bone transversely, usually just below an articular surface, and then again, tangentially, farther down the shaft. This resulted in a tubular piece of bone, open at both ends, and cut flat at one end and diagonally, or blade-like, at the other… Quite often the blade or piercing end is formed merely by the diagonal cutting of the end of the bone; however, in some instances the point was sharpened to a conical, rather
than blade-like end. Presumably, the points were attached by inserting the end of the arrow or dart, or a foreshaft of the same, into the hollow socket.

As this description shows, there is some variation to this tool type. Willey divides the tool type into four varieties (short, slender, large, extra large or lance) based primarily on size but with the distal end variation accounted for as well. This bone tool type comprises 40.36% \((n=197)\) of the 488 total bone artifacts at the Belle Glade site. Of the 197 socketed projectile points, the short variety \((n=124)\) is the most pervasive, comprising 62.94% of these points. The fact that bone projectile points are so common implies that bone is an efficient alternative medium for implements used as projectiles in an area lacking locally available stone.

Another prevalent bone artifact type is the bi-pointed projectile point. Willey (1949:39) defines these as “[b]one splinters, sharpened at both ends.” Walker (1992:231–232) posits that this type of bone artifact could be used as (1) part of composite fishing gear such as hooks or leisters, (2) a hafted projectile point, or (3) a throat gorge. These are not as common in the Belle Glade site assemblage, comprising only 19.46% \((n=95)\) of the 488 bone artifacts. However, at Fort Center these are the most common bone artifact, comprising 38.8% \((n=97)\) of the 250 total bone artifacts. It is important to note that in the Fort Center literature these are not referred to as bi-pointed projectile points. Instead, Steinen (1994), who conducted the analysis of the bone tool assemblage, classifies them differently. His classification is based on their shape in cross-section and use-wear. He neglects overall morphology and makes no attempt to liken them to Willey’s (1949) description of bi-pointed bone points. From a morphological point of view, they are very similar artifacts, the one difference being the shape in cross-section. Whereas the bi-pointed bone points of Willey (1949) and Walker
(1992) are roughly ovular or even rectangular in cross-section, the examples from Fort Center are triangular, and in a few cases turtle-backed (to borrow from lithic terminology).

In contrast to Walker (1992), Steinen adamantly opposes their use for hunting or fishing. He claims they are fids related to textile and basketry production. He states:

[they] were subjected to use over their entire distal ends. They seem to have been hafted in a handle that served as the female member of a compound tool. They were not used in association with hard or abrasive materials; striation patterns on the surfaces are light, indicating wear from only slightly abrasive material. Lack of heavy wear on the tips support this deduction. A few show old breaks that had been smoothed over through use, indicating a lot of light wear over a long period. Their use as projectile points is doubtful, and it is difficult to imagine that a point could be used enough to acquire the sheen that implements have and still remain intact. The same could be said for their use as leister points or gorges. Compound fishhooks are a possibility, but size and sheen make this improbable.

It is important to point out that this kind of sheen he is discussing is not always the result of use-wear. Burnishing is one possibility. During the manufacture of these tools, it is possible that they were polished using burnishing techniques, which would give them a sheen. The use of pitch can also produce such a sheen, as can a limited amount of fire hardening. However, it is also important to point out that, based on my personal inspection of the artifacts, the level of sheen on these specimens is minimal in comparison to similar bone artifacts from other sites. For example, the bi-pointed bone points from Josslyn Island that Walker (1992) discusses have a much greater amount of sheen on them, and it is present along the entirety of the artifacts rather than restricted to specific areas of use-wear.

I am not denying Steinen’s analysis and conclusions, but it is beneficial for us to consider that these artifact types have differential uses based on the particular needs of
a site’s inhabitants. In the case of Fort Center, there was less of a need for bone projectiles, gorges, or leisters because the inhabitants of the site employed a place provisioning strategy for stockpiling knappable stone allowing the production of stone cutting-edge and projectile tools. This is further substantiated by the complete absence of socketed bone projectile points at the site. At other places, such as the Belle Glade site, the bi-pointed bone projectile points likely played a much different role, most likely as fishing gear, as posited by Walker (1992). In fact, Willey (1949:39) discusses them as likely playing this role or possibly the role of awls or gravers.

Shark teeth are another artifact type to be discussed along with the more typical bone artifacts. This is an important artifact class to discuss for several reasons. First, like bone artifacts more generally, shark teeth are present at the majority of Belle Glade sites and should thus be considered an important aspect of Belle Glade material culture. This is likely due to the lack of locally available knappable stone and the need for alternative mediums for cutting-edge tools. (Keller and Thompson 2013; Milanich 1994:292). Second, shark teeth provide that medium in the form of a very efficient, minimal-modification-required cutting-edge tool. However, in contrast to the linear relationship seen with the increase or decrease in bone artifact diversity and frequency in relationship to access to knappable stone resources, shark teeth appear in great numbers at sites that employ lithic place provisioning strategies, such as Fort Center where nearly two hundred shark teeth were recovered as well as large quantities of provisioned stone resources (Steinen 1994). A divergent pattern is seen at the Belle Glade site, where lithic place provisioning was not employed, there was a high diversity and number of bone tools, but only four shark teeth (Willey 1949:45). This pattern could
also be spatially correlated as well. Willey (1949:105) notes that the four collections he reviewed from Belle Glade sites Southeast of Lake Okeechobee only contained a total of 13 specimens of shark teeth, and my own investigations at Big Mound City resulted in the recovery of 17 shark teeth. These are much smaller numbers of shark teeth than exhibited in collections from the north and west side of Lake Okeechobee.

A third reason that shark teeth are important to this discussion is that they provide an excellent proxy that indicates social and/or trade relationships with cultural groups dwelling in coastal areas. The Belle Glade culture is restricted to the KOE watershed and is thus geographically separated from both the Atlantic and Gulf Coasts, which means these artifacts were imported over long, but variable, distances. Given the spatial pattern mentioned above, with smaller frequencies of shark teeth tools South and East of Lake Okeechobee when compared to the large frequencies to the West and North of the lake (Fort Center: \( n=227 \); Blueberry: \( n=108 \)), it is likely that shark teeth were obtained from the Gulf Coast rather than the Atlantic Coast, a possibility echoed by evidence presented by Kozuch (1993:34).

The function of shark teeth may also be variable based on the needs of a site's inhabitants. Steinen’s (1994) use-wear analysis of the Fort Center shark tooth assemblage from the Mound-Pond Complex (\( n=197 \)) suggests a limited function of shark tooth tools. Given the context of recovery (i.e., an area associated with large amounts of woodworking), the evidence of use-wear orientation and location, and the morphology of production wear on zoomorphic wooden artifacts (e.g., parallel striations with spacing identical to shark tooth serrations), Steinen argues that Belle Glade peoples, or at least those living at Fort Center, used specialized shark tooth tool kits
reserved primarily for carving ceremonial wooden objects. However, Keller and Thompson (2013) question this based on the recovery of multiple shark teeth through very limited testing in midden areas away from the Mound-Pond Complex. This is based on the assumption that further testing in these non-ceremonial areas will produce many more shark teeth. Further, it is assumed that the use of shark teeth in these additional areas of the site would be for the production of more quotidian objects such as posts for living structures, canoes, and bone artifacts, but it is important to note that the production of utilitarian and ceremonial objects was not mutually exclusive.

Kozuch (1993) posits another possible function for shark teeth. She argues they could be used as chips in grater boards for tuber processing. This would be an efficient use of shark teeth in producing the bread discussed in historic documents (see subsistence section below). However, Kozuch (1993:32) argues that the best evidence for grater boards comes in the form of rhomboidal shark tooth artifacts from the Granada site. These types of modified shark teeth are not currently known from any Belle Glade sites, but I would argue that using a lighter, more porous wood for the board itself would allow for the same grater effect. For example, the trunk of a sabal palm is both light and fibrous. The fibrous structure would allow for a much deeper inset of shark teeth while still retaining enough elasticity to hold the teeth in place. This would reduce the amount of modification needed to get the grater effect. In other words, it would not be necessary to remove the lateral root lobes to create rhomboidal chips. Instead, the roots would help to lash the teeth in place because the fibers of the palm would grip them. For a grater board of this type, lemon shark teeth would be well suited.
Shell

Artifacts produced from marine shell are another major class of artifacts found at the majority of Belle Glade sites. Much like the bone artifacts and shark tooth artifacts discussed above, the frequency of shell tools is variable between sites, with some exhibiting none at all while others, like the Belle Glade site producing nearly two thousand. The types of shell artifacts and their frequencies also vary between sites.

For example, Steinen (Sears 1994) reports a total of 441 shells, shell tools, and shell fragments recovered from Fort Center, while the Belle Glade site produced 1,858 shell artifacts (Willey 1949:47). This is a drastic difference in the frequency of shell tools, but the two sites are located quite a distance from one another and on opposite ends of Lake Okeechobee. The locations of these two sites also differ in terms of distance to the coast, with Fort Center being many more kilometers distant from a coastal zone than the Belle Glade site. In contrast, Ritta Island and Kreamer Island are located very close to one another and are both island sites within Lake Okeechobee. Ritta Island produced only three shell artifacts while Kreamer Island produced 469 (Mount 2011). These are also drastic differences, but distance to the coast only differs by less than five kilometers, with Kreamer Island being slightly closer. This suggests that distance from a coastal zone is not the primary factor in shell acquisition but rather differential social relations at the regional scale exist among different Belle Glade communities, a point I return to below.

The types of artifacts produced from marine shells at all of the Belle Glade sites falls within the continuum of shell tool types formulated by Marquardt (1992c), with the exception of four artifacts from Kreamer Island that Mount (2011) claims do not fit within any of Marquardt’s types. While the vast majority of Belle Glade shell tool types fit within
Marquardt’s typology, the frequency of the tool types being produced varies between sites. For example, at the Belle Glade site the emphasis is on what Willey (1949:46–53) describes as picks, adzes, or hammers. He reports a total of 66 occurrences of these tools, while a total of 43 celts are reported. In contrast, Mount (2011:657) reports that celts are the most common tool type at Kreamer Island. Much like with the bone tools discussed above, this is likely associated with variations in the needs of the various communities.

One aspect of shell artifacts that Belle Glade sites have in common is that the lightning whelk (*Sinistrofulgar sinistrum*; formerly *Busycon sinistrum*, World Register of Marine Species 2018b) is the most common marine gastropod used to produce artifacts (Mount 2011; Steinen 1994; Willey 1949). The ratios of lightning whelk to other marine shell artifacts does vary from site to site, but at each site with shell species identifications and reported frequency counts, *Sinistrofulgar sinistrum* is the most common. For example, Willey (1949:46–53) reports that 90 (76.92%) of the total 117 shell artifacts with species identifications are *Sinistrofulgar sinistrum*. If the columnella artifacts and shell beads had species identifications, this number would likely increase exponentially (shell beads $n=1,648$). In contrast, at Kreamer Island the ratio is much different, with 30 (25.42%) *Sinistrofulgar sinistrum* artifacts out of 118 total shell artifacts with species identifications. It is interesting to note that Kreamer Island exhibits another difference in species frequency distributions in that quahog clams (*Mercenaria* spp.) are the most common marine shell at the site, comprising 37 (31.35%) of the total 118 species-identified shell artifacts. These were not used to produce formal tools, however. Rather, they represent a form of expedient tool (Mount 2011).
This brings me to the point about the aforementioned differences in social relations between communities. The different marine gastropods have different biogeographies, with *Sinistrofulgur sinistrum* being more prevalent along the Florida Gulf Coast, while the queen conch (*Lobatus gigas*; formerly *Strombus gigas* World Register of Marine Species 2018a) is more commonly found along the Atlantic Coast of Florida, and the helmet conch (*Cassis tuberosa*) around the Florida Keys (Mount 2011). On initial inspection the species frequency distributions would seem to suggest that the predominant social relationships, at least for trade purposes, are with the Calusa of the Southwest Gulf Coast.

However, as Kozuch and colleagues (Kozuch et al. 2017) have demonstrated, there are biological variations among lightning whelk populations that are correlated with biogeographic ranges. They also show that it is possible to differentiate the sources of *Sinistrofulgur sinistrum* shells based on the length of the shells and their spire angle, which is “formed by the apex and extends to the shoulder of the shell” (Kozuch et al. 2017:4). According to their study it is possible to differentiate between lightning whelk shells from the Atlantic Coast, the Eastern Gulf of Mexico (i.e., Florida), the Western Gulf of Mexico (i.e., Texas), and the Yucatan Peninsula. The lightning whelks from the Western Gulf of Mexico and Atlantic are typically able to be ruled out on the basis of length because they rarely exceed 270mm, but their spire angles are also typically lower, with averages of 93.3° and 100.1°, respectively (Kozuch et al. 2017). In contrast, the lightning whelks from the Eastern Gulf of Mexico, which are most abundant along the Southwest Florida Gulf Coast (Kozuch et al. 2017:4), commonly exceed lengths of 280mm (up to 430mm) and have an average spire angle of 104.4° (Kozuch et al. 2017).
The lightning whelks from the Yucatan are easily distinguished by shell morphology because they have much heavier and larger spines along their shoulder.

Drawing on the findings of Kozuch and colleagues’ study, I examined a sample of 28 lightning whelks from several Belle Glade sites, including the Belle Glade site, the Blueberry site, Fort Center, and Kreamer Island. All of the specimens from Kreamer Island and three specimens from Belle Glade were examined in photographs (Kreamer Island: Davenport et al. 2011: Figure 177 F-K, Figure 178 L-P, Figure 179 A-E; Belle Glade: Willey 1949:Plate 11 H-J). The other specimens I examined are curated at the Florida Museum of Natural History (Belle Glade: Cat. Nos. 104881, 104897; Blueberry: Acc. No. ANT 2012-49; Fort Center: Cat. Nos. A-15287, A-15191). The results of this brief examination suggest that lightning whelks were indeed being imported from the Eastern Gulf of Mexico. All but three specimens have spire angles of 105° or greater. It is possible that two of the specimens, with spire angles of 100° and 101° originate from the Atlantic, and the remaining specimen, with a spire angle of 96° and a greater amount of turreting, may originate from the Western Gulf of Mexico.

Artistic Depictions

There are limited extant examples of Belle Glade artistic depictions, but the examples are found throughout the region and on several types of media. This section will provide only a limited discussion of artistic depictions associated with this culture. Chapter 6 provides more detail on the various types of depictions because they provide strong evidence for certain ontological understandings.

The most famous examples of Belle Glade artistic depictions are the wooden zoomorphic effigy carvings from Fort Center and Belle Glade Mound. These realistic carvings include the likenesses of eagles, panthers, vultures, and other species. These
carvings are all large in scale and found in contexts that can be considered public. The wooden carvings are not limited to zoomorphic effigies, though. There are examples of human effigies, such as the Padgett Figurine, as well. In contrast to the large zoomorphic carvings, the human effigy carvings are much smaller.

Another medium for carved depictions in the Belle Glade culture is bone. Several bone carvings were recovered from the Belle Glade Mound, and they take on various shapes. Willey (1949:43–44) describes five highly polished, carved bone objects resembling canoe paddles (three perforated for adornment, two unperforated), carved bone beads (n=5) and ear ornaments (n=2), a pendant-shaped bone ornament, and two deer antler headdresses. The Blueberry site has also produced several bone carvings of different varieties, such as a possible owl effigy (Butler 2008; Butler and Lawres 2014). Engraved bone pins were also recovered from both the Belle Glade Mound and Blueberry sites. These examples exhibit incised cross-hatching or diamond-like shapes alongside other geometric designs (Willey 1949:41).

Stone effigies were also recovered from Fort Center and Blueberry. These carved stone ornaments are worked into the likenesses of ducks. The Blueberry specimens exhibit two varieties. One is an entire duck head with a suspension hole in the head while the other is just the bill of a duck with a grooved suspension tenon. The Fort Center specimen is an entire duck head with a grooved tenon (Steinen 1994:83–84). None of these specimens appear to be made of stone endemic to the Florida Peninsula.

Fired clay provides another medium for artistic depictions. However, unlike the majority of other areas of Florida and the Southeast, fired clay art is not typically found
on ceramic vessels. Rather, it is restricted to ceramic pendants, pipes, and human effigies (Goggin 1951; Reynolds 2000; Willey 1949). Willey (1949:33) describes the ceramic pendants as occurring in both single-grooved and double-grooved varieties. The grooves are equivalent to the grooved tenons used for suspension found on the duck head and duck bill effigies described above. Incised ceramic pipe fragments are also found in the region and were recovered from both Belle Glade Mound and Fort Center (Sears 1994:32–36; Willey 1949). Fired clay human effigies are also described from the Blueberry and Platt sites (Goggin 1951; Reynolds 2000).

Some of the most breathtaking examples of Belle Glade depictions, however, are found in the medium of metal (see also the section on exotics below). Sears (1994:59–67) describes several different varieties of metal objects from the Fort Center site. There are three examples of the famous metal ceremonial tablets from Fort Center, or “symbol badges” as Sears refers to them (Sears 1994:60). There have been a number of these recovered from throughout South Florida (Allerton et al. 1984; Austin and Mitchell 1998; Lee 1988; Luer 1985, 1994, 2000, 2010; Mitchell and Luer 2010; Sears 1994). While there is variation in the materials used—ranging from copper to lead to silver to gold—the materials themselves are indicative of a shift in artistic medium during the First Spanish Colonial Period (1513–1763). These materials are likely the result of the Calusa salvaging Spanish shipwrecks along the coast (Luer 1994). Additionally, there is remarkable consistency in the motifs engraved on the tablets. The motifs do vary slightly from specimen to specimen, but this variability is likely related to artistic flair.

In addition to the metal tablets, Sears (1994) describes many other examples of metal objects from the Fort Center site. There are 38 specimens of undecorated disc-
shaped ornaments with buttons in the center. The majority of these are constructed using contrasting metallic colors so that the disc itself is one color, while the central button provides a stark color contrast. There are both hammered and cast varieties of these disc-shaped ornaments. There are also seven examples of decorated disc-shaped ornaments. The decorations on these specimens includes embossing, perforation, and engraving. The two engraved specimens exhibit motifs associated with the Mississippian Ideological Interaction Sphere (formerly referred to as the Southeastern Ceremonial Complex or the Southern Cult; Reilly and Garber 2007; Reilly III et al. 2011). One exhibits a petaloid motif while the other is adorned with a hand and eye motif.

Other metal objects from Fort Center includes several objects that Sears (1994:64–65) likens to gorgets. Some of these are embossed and engraved with rayed lines. He also describes two blade-shaped objects. While he does not describe any designs or motifs on these blade-shaped objects, they may be similar in style to those recovered from the Nicodemus site just south of Fort Center (Purdy 1996; Wheeler 1996). The examples from the Nicodemus site, part of the Montague Tallant collection curated at the South Florida Museum, exhibit a variety of motifs, with some designed to resemble woodpeckers and other birds. The only metal artifact from Fort Center exhibiting animal characteristics is a cast gold jaguar, likely originating from Central or South America (Sears 1994:64).

**Exotic Materials**

The Belle Glade culture relied extensively on materials imported into the Kissimmee-Okeechobee-Everglades watershed. In fact, with the exception of the bone to make tools and ornaments, the wood used in producing artistic depictions and
canoes, and the clay to produce pottery, all of the artifacts discussed above were manufactured using materials imported into the watershed. There is some contention over whether clay is available locally within watershed or not, as there have been no clay sources officially identified by the USGS or State Geologists in the region (Mount 2011). However, during my work at Big Mound City a Bht horizon, which includes a very high clay content, was encountered adjacent to one of the linear embankments, and it was shallowly buried at approximately 40cm below the modern ground surface. This high clay content horizon would have been easily accessible to the inhabitants of the site, and it is likely that other shallowly buried horizons with high clay content will be found in the region. Davenport (personal communication, 2017) has also identified a Bht horizon in the region, though it would not have been easily accessible. It is located in the river bed of the relict Democrat River and is buried several meters below the surface.

Nonetheless, the majority of Belle Glade material culture is produced using imported materials. This is due to the lack of sufficient materials to produce such artifacts, a point noted by earlier researchers in the region. Steinen (1994:102) notes that “The Okeechobee Basin, while rich in subsistence resources, is poorly equipped to supply raw materials to a sophisticated technological system.” As the discussion above shows, many of the cutting-edge tools were produced from knappable stone resources imported primarily from northern Florida and from shark teeth imported from the coasts. Heavy chopping and hammering tools were produced using marine shells, primarily gastropods, imported from the coasts. The metal objects created in the Colonial Period were produced using materials salvaged from Spanish shipwrecks and imported to the
region. Most of the tools used in daily life were made from such imported materials. Further, many of the objects made from imported stone were brought to sites in finished, or nearly finished, form (Butler and Lawres 2014; Steinen 1994). This includes both knapped lithic tools as well as ground stone plummets.

There are additional types of imported materials that have been recovered in the region as well, most of which are types of stone imported from outside the geographic confines of what is today the Florida peninsula. These various types of stone—including quartz crystal, granodiorite, gneiss, travertine, granite, rhyolite-granite, diorite, sandstone, and greenstone—were primarily used in the manufacture of plummets. According to Austin (1993) and Steinen (1994), the nearest possible source is the Piedmont region of both Alabama and Georgia. There is variability in the shape of the plummets, with the classic teardrop shape, plumb-bob shape, and expanded center shape being the most common (Austin 1993; Steinen 1994; Willey 1949). The duck head and duck bill plummets from the Blueberry and Fort Center sites mentioned above offer a glimpse of the opposite end of the morphological spectrum. Further, Steinen (1994) reports several fragments of greenstone at Fort Center.

Additionally, fragments of mica and quartz crystal were recovered in the region. Steinen (1994) reports quartz crystal debitage at Fort Center. I recovered several quartz crystal debitage specimens during excavations of the midden-mound at Big Mound City. Fragments of mica are also reported for Fort Center (Steinen 1994), the Belle Glade site (Willey 1949), and the Royce Mound (Austin 1993); I similarly recovered two fragments of mica from Big Mound City.
Pumice and galena are also found at Belle Glade sites throughout the region. Galena is reported for the Blueberry site (Butler 2008; Butler and Lawres 2014), the Whitebelt I site (Wheeler 2006), the Royce Mound (Austin 1993), and Fort Center (Steinen 1994). Pumice is also reported for several Belle Glade sites, including Fort Center, Belle Glade, Blueberry, Whitebelt I, and Fulford (Wheeler 2006). It is likely, however, that pumice was not imported to Florida by humans. Rather, sourcing studies point to an origin in the Trans Mexico Volcanic Belt (Kish 2006), and further studies have shown that the currents in the Gulf of Mexico commonly transport pumice—sometimes singly and sometimes in large rafts of the material—to the southeastern Florida coast (Kish 2006; Wheeler 2006). It is from the southeastern Atlantic coast that the pumice is most likely to be transported into the Kissimmee-Okeechobee-Everglades watershed.

**Subsistence Patterns**

The subsistence patterns exhibited in the Belle Glade archaeological contexts is one that drastically differs from the inland portions of the Greater Southeast. Throughout the interior Southeast agrarian practices were an important component of life from very early times, with the crops of the Eastern Agricultural Complex undergoing the domestication process during the Middle to Late Archaic periods (7000–3000 BC and 3000–1000 BC, respectively). The importance of these plants increased more and more through time, and by the Mississippian period (cal. AD 1050–1540), maize (*Zea mays*)—more commonly referred to as corn in today’s society—became the predominant dietary staple throughout the interior Southeast (Gremillion et al. 2008; Smith 1989; Smith and Yarnell 2009).
In contrast, the Belle Glade peoples concentrated the majority of their subsistence practices on the capture of large amounts of aquatic resources, which were exceedingly abundant in the wetlands ecosystems of the KOE watershed. There is, however, variability between sites in the actual resources being targeted, and this variability is related to the location of a site relative to its surrounding ecosystems (Mitchell 1996). At sites located in the uplands bordering the KOE, such as Ortona and Blueberry, fish and turtles provide the largest proportion of the MNI of the zooarchaeological assemblages, but mammals provide the bulk of the biomass (Allgood 2008; Fradkin 2012; Hale 1995; Mitchell 1996:171–178). This is likely due to the easy access to upland ecosystems where mammals are more abundant while also maintaining easy access to aquatic resources.

Sites along creeks and rivers reveal a different pattern. At sites such as Taylor Creek and Orange Hammock, bony fish provide the majority of the edible biomass (Mitchell 1996:171–178), but at Fort Center turtles were the primary protein source (Hale 1984, 1989). While all three of these sites are located adjacent to waterways, the waterways themselves exhibit different characteristics that affect the diversity of animals inhabiting them. For instance, the Taylor Creek site is located alongside the waterway of the same name (Taylor Creek). This waterway is part of the Taylor Creek-Nubbin Slough drainage basin (Heatwole et al. 1987; Miller 2007). As noted in Chapter 2, turtles do not occur in high frequencies in slough ecosystems, and thus Taylor Creek, connected as it is to Nubbin Slough, would be expected to have relatively small turtle populations. In contrast, Fort Center is located adjacent to Fisheating Creek, which is a relatively deep blackwater stream that has a high level of aquatic biodiversity that
includes large numbers of multiple species of turtles (Florida Fish and Wildlife Conservation Commission 2015). Thus, we should expect higher frequencies of turtles in the zooarchaeological assemblages of sites located in proximity to ecosystems where turtles are found in abundance.

At sites located in the southern portion of the KOE watershed (i.e., the sawgrass plains and ridge-and-slough landscape) bony fish and turtles comprise the majority of edible biomass. In this region of the watershed, the tree island hammocks are more limited in their distribution. This affects the frequencies of terrestrial animals available to the people dwelling in the area, which is reflected in the zooarchaeological assemblages. For instance, at Tony’s Mound bony fish and turtles together comprise the majority of the fauna represented, while mammals comprise a small percentage (Mitchell 1996).

In contrast, the sites located along the shores of Lake Okeechobee exhibit faunal assemblages suggesting that bony fish were the primary target for subsistence (Hale 1989; Mitchell 1996). At Pahokee Ridge, located near the eastern shore of Lake Okeechobee, bony fish comprised the vast majority of the faunal assemblage, while turtles and mammals together comprised a small portion of the assemblage (Hale 1989:Table 10). This is interesting given the prevalence of turtles in the lake, and it may have implications for the role of differences in dietary preference between residents of the sites of the region. A discussion of this, however, is beyond the scope of this research.

While there is variation between sites in terms of the primary focus of subsistence strategies (i.e., fish versus turtles), what remains constant is the emphasis
on aquatic resources. A second aspect of Belle Glade subsistence strategies that remains constant between sites is the species of fish being captured. The zooarchaeological assemblages of all the sites in the KOE that have been systematically analyzed demonstrate an overwhelming predominance of bowfin (*Amia calva*) and gar (*Lepisosteus* spp.) (Austin 1996; Allgood 2008; Fradkin 2012; Hale 1984, 1989; Mitchell 1996). These are both predatorial species that are easily caught because they tend to remain near the surface and are thus conducive to using gigs or spears. Following bowfin and gar, bass and other centrarchids are quite common in assemblages, as are catfish (*Ictaluridae* spp.). A common theme in the fish assemblages from Belle Glade sites is the relative standardized size—approximately 10 cm—of the catfish and centrarchids represented, which is suggestive of the use of nets for mass capture of small fish (Allgood 2008; Fradkin 2012).

Subsistence practices in the KOE watershed remain relatively stable through time. However, there is evidence at Fort Center that reflects nuanced changes in subsistence. At this site, turtles remain the dominant source of protein during all temporal periods, but the frequency of bony fish decreases, and the frequencies of mammals increases through time (Hale 1989). The Fort Center data, with the numerous associated chronometric dates, demonstrate that while there is change through time, the overall subsistence patterns, at least at this site, remain relatively stable in their focus on certain types of animals.

The Belle Glade peoples also undoubtedly utilized plant resources in their everyday subsistence practices. Early work in the region, namely that of William Sears (1977, 1982), argued for maize agriculture among the Belle Glade peoples based on
pollen samples recovered from Fort Center. This has been criticized and largely debunked by more recent studies, however. Hale (1989:146, 154) notes the unproductive and nonnutritive nature of the soils in the hammocks of the KOE, leading him to question the ability of the Belle Glade peoples to cultivate enough maize for it to be a subsistence crop. Specifically, he cites the presence of Immokalee Sands, with their typically acidic nature, as being the cause for the unproductive nature of the local ecosystems.

Johnson (1990, 1991) also questions this, but he adds further data to support his conclusion that Sears’ hypothesis regarding agricultural systems is not supported by the evidence. Johnson approached this a little differently than Hale. Rather than focusing on the sediments of the hammock ecosystems, Johnson sought to test Sears’ hypothesis that the circular ditch feature of Fort Center was constructed for agricultural purposes (see Chapter 5 for a more in-depth discussion of this hypothesis). To test this, Johnson examined the sediments of the ditch and the interior field of the ditch both chemically and morphologically. Similar to Hale’s argument, Johnson found the spodosols of the ditch and interior field to be too acidic and to contain aluminum levels too high to support maize (Johnson 1991:62–66). Particle-size distributions of the sediments also failed to support Sears’ hypothesis, which involved periodic cleaning, or mucking, of the ditch to maintain water flow and drainage (Johnson 1991:67–72). The particle-size distribution data presented by Johnson suggests that the ditch was never mucked and thus would not have acted to effectively drain the interior field. Further, the muck was an essential aspect of Sears’ hypothesis because it was supposed to have been used as a
fertilizer for the interior field. Thus, not only was the ditch never cleaned for effective drainage, the accumulating muck was not used as fertilizer.

More recently, Thompson and colleagues (2013) returned to Fort Center to evaluate Sears’ claims for maize pollen. They focused their excavations to specifically address the question of maize agriculture, and thus undertook the necessary methods to ensure collection of palynological and macrobotanical data from multiple contexts. They note that the definitive identification of pollen grains as *Zea mays* by Sears has been called into question due to the high degree of similarity between maize pollen grains and the pollen grains of several naturally occurring grassy species in the region such as river cane (*Arundinaria* sp.) and wild cane (*Gynerium* sp.) (Thompson et al. 2013). Part of this is due to Sears’ criteria of how to identify maize pollen as being very loose. Thompson and colleagues (2013:190) note that the only positively identified maize pollen grain is associated with historic deposits at the site (related to a Second Seminole War fort). They did also recover three maize kernels, but they were all from mixed contexts that contained both historic and prehistoric materials (Thompson et al. 2013:190–191). Two of those kernels were submitted for AMS dating, and the results confirm that they are of historic origin, with one dating cal. AD 1660–1960 (2 sigma) and the other cal AD 1680–1950 (2 sigma) (Thompson et al. 2013:190). This suggests that the samples recovered by Sears were likely in similar mixed contexts.

While a full discussion of the conduciveness of the regional ecosystems to supporting maize agriculture is beyond the scope of this dissertation research, and indeed there is a distinct lack of archaeological evidence suggestive of agricultural practice (excluding the evidence purported by Sears) in the region, it is important to
point out that the environment was quite capable of supporting maize agriculture. This is made abundantly clear by 19th and 20th century land-use practices among the Seminole Indians.

The Seminoles living in the KOE watershed during this time adhered to a practice of living in *istihapos*—or clan camps—that are comprised of several chickees surrounding a small, square area and inhabited by a matrilocal family of a singular clan (Spoehr 1941; Lawres 2014; Weisman 1999). Each *istihapo* was located in the interior of a hammock ecosystem, which provided not only the necessary dry ground for comfortable living space, but also a dense vegetative barrier that was used for military protection (Lawres 2014). Each of the *istihapos* also had associated gardens and agricultural fields. In some cases, these agricultural fields are located within the same hammock as the *istihapo* itself, while in other cases they are located in adjacent hammocks. In his 1880 census of the Seminoles, Clay MacCauley (2000[1887]:510) noted that these fields varied in size, but generally ranged from “one to four acres in extent.” This variability in size is likely related to the size of the hammocks being used for agricultural purposes, since the hammocks themselves are spatially restricted to begin with. MacCauley (2000[1887]) further describes maize as being the primary crop produced by the Seminoles in 1880, with supplemental production of sugar cane, bananas, beans, sweet potatoes, and melons. Much like the *istihapos*, these fields are also located in the interior of the hammock, likely because of the higher elevations towards the center of the ecosystems. MacCauley (2000[1887]:510) further notes that the Seminoles were able to make use of the natural fertility of the hammock soils:

The ground they select is generally in the interiors of the rich hammocks which abound in the swamps and prairies of Southern Florida. There, with
a soil unsurpassed in fertility and needing only to be cleared of trees, vines, underbrush &c., one has but to plant corn, sweet potatoes, melons, or anything else suited to the climate, and keep weeds from the growing vegetation, that he may gather a manifold return. The soil is wholly without gravel, stones, or rocks. It is soft, black, and very fertile.

It is worth noting, however, that in my personal experience conducting archaeological surveys in such hammock ecosystems, the soils are typically a gray to light gray color (10YR5/1–10YR6/1 by Munsell standards) unless an archaeological site is present. The midden soils within these environments typically have a very dark gray to black color (10YR3/1–10YR2/1). Thus, it is possible that the Seminoles were specifically choosing archaeological sites for their agricultural fields because of the higher phosphorous levels present in the middens, which is similar to some of the practices noted by Balee (2013) in the Amazonian rainforest.

In addition to the example of the Seminoles using the hammocks for agricultural production, it is also necessary to point out that Hale (1984, 1989) cited the presence of Immokalee soils in hammocks as being unproductive for agricultural purposes. However, evaluating the USDA NRCS Soil Survey data suggests that he is incorrect to point to Immokalee soils. Rather, the majority of the hammocks in the region have Hallandale soils—“shallow, poorly and very poorly drained, rapidly permeable soils formed in thin deposits of marine sandy materials over limestone” (USDA NRCS Web Soil Survey 2017a)—or Pople soils—“very deep, poorly drained, slowly permeable soils that formed in sandy and loamy marine deposits” (USDA NRCS Web Soil Survey 2017b)—or a combination of the two, referred to as Hallandale-Pople Complex, as their primary sedimentary matrix. In many cases, the Hallandale-Pople Complex is associated with archaeological sites, and thus may form as a result of anthropogenic activity (Lawres and Labate 2010). Importantly, the Pople series of soils is not
considered poor for agricultural production by the USDA NRCS, but rather is noted for its usage in vegetable, and to a lesser extent, citrus production (USDA NRCS Web Soil Survey 2017b). This is not necessarily the case for Hallandale soils, but the fact remains that there is variability in the sediments that underlie hammock ecosystems. This is something that Hale (1984, 1989) does not account for in his discussions, so we should allow for variability in the ability of hammock ecosystems to support agricultural production.

What this suggests is that the lack of agricultural evidence is not due to environmental factors as Hale (1989) has argued. Rather, the dearth of evidence is likely related to three factors. First, the depositional contexts of any palynological or macrobotanical remains may not be conducive to the preservation of such materials. The pollen samples recovered by Sears at Fort Center were discovered primarily in coprolites and a white pigment from a wooden zoomorphic effigy carving, both of which were recovered from the muck of the charnel pond (Sears 1994), which provides an excellent depositional context for the preservation of organic materials. Other samples were recovered in sediments from various areas of the site that were excavated, but in smaller concentrations. If these were correctly identified as *Zea mays* then it is possible that more evidence for maize production could be recovered from other sites in the region given the correct depositional environment. However, this remains to be the case.

There is also the possibility that maize could have been produced in small quantities for ceremonial consumption (Hale 1989:154; Milanich and Ruhl 1986:2). If this is the case, then we should not expect to see much evidence for maize production,
and where it is found, we can expect it to be in minute quantities. In terms of palynological data, this would mean finding very small quantities of maize pollen grains, which would be difficult to distinguish from modern, intrusive specimens because the small size of the grains themselves can lend to post-depositional vertical migration in sediments.

A third factor to consider in the dearth of additional evidence for maize production in the region is that of cultural tradition. Because the hammock ecosystems are quite capable of producing substantial crops of maize, as evidenced by the Seminoles in the 19th and 20th centuries, it is quite possible that the reason for a region-wide lack of evidence associated with Belle Glade archaeological sites is based in a tradition of fishing-hunting-gathering. The neighboring Calusa followed a similar tradition but with the addition of gardening and plant maintenance practices focused on papaya, gourds and squashes, peppers, and several endemic species of fleshy fruits and grain producing grasses and herbs (Newsom and Scarry 2013), and when the Spanish missionaries attempted to instill maize agriculture in them they essentially scoffed at the idea of inputting labor into such an investment (Hann 1991:111, 184–185). The peoples associated with the Belle Glade tradition may have had a similar outlook on agricultural practices, and actively decided against making such changes to their subsistence pattern.

There are, however, ethnohistoric data that point to other plant resources being utilized in the region. Hernando de Escalante Fontaneda said of the peoples living around Lake Okeechobee:

They have bread from roots, which is the ordinary food during the greater part of the time, although in the case of the lake, which rises greatly, they
cannot reach these roots due to the obstacle of high water, and thus they leave off eating this bread for some time. [They also have] much and very good fish, and other roots in the manner of truffles like the sweet ones here, and other different ones in many varieties (Worth 2014:201)

There has been some discussion of what tuberous flora were used to make this bread, with Hale (1984, 1989) providing the most in-depth evaluation of the topic. Some possibilities include kunti (Zamia integrifolia), koonti (Smilax bona-nox), cattail (Typha augustifolia), and groundnut (Apios tuberosa). Both kunti and koonti were used historically by the Seminoles (Hale 1989; MacCauley 2000[1887]), which they distinguished as kunté hvteke and kunté cate, respectively (Austin 2004:723–724).

Based on the biogeographies and ecosystem affiliations these are the best possible candidates for the source of this bread.

**Settlement Patterns**

The settlement patterns of the Belle Glade peoples exhibit a relationship between the type of site (i.e., residential, resource extraction camp, monumental architecture), the location of emplacement, and the characteristics of both the regional and local environment. The pattern of site locations is dependent on a strong knowledge of the KOE’s environment, especially its hydrological characteristics, and the functional of the sites themselves. Thus, when discussing the Belle Glade settlement pattern, two distinct patterns warrant attention: (1) habitation locales and resource extraction camps, and (2) monumental architectural locales. In this section I focus on the pattern exhibited in habitation locales and resource extraction camps, while the pattern surrounding monumental architectural locales is discussed in Chapter 4.

Throughout the KOE watershed there are 398 archaeological sites listed as having Belle Glade components, and of these 35 are monumental architectural sites.
The remaining 363 include habitation locales, resource extraction camps, and isolated finds. These latter, while not technically considered to have a full-blown Belle Glade archaeological component, are locations with less than three artifacts, and for them to be listed as Belle Glade in the Florida Master Site File (FMSF) those artifacts must be diagnostic of Belle Glade (e.g., Belle Glade Plain pottery).

Figure 3-2. All Belle Glade sites listed in the Florida Master Site File.

The majority of Belle Glade settlements are located on tree island hammocks, which not only provide the only consistently dry ground in the region but also access to the aquatic creatures inhabiting the water that surrounded the hammocks. Furthermore, there are numerous small catchment basins—depression marshes or flag ponds (FNAI
— amidst wet prairies and sawgrass marshes that retain sufficient water during the dry season. The majority of settlements are located in the hammocks adjacent to these perennial water bodies (Lawres and Mahoney 2011a, 2011b). Further, the majority of Belle Glade settlements do not include monumental architecture other than the occasional mortuary mound. Rather, there is a relatively small number of monumental architectural sites. These differ from settlement sites because they are built features in their entirety, and they are not located within the confines of the hammocks like most of the sites in the region but instead are built within flowing water ecosystems. In addition to mortuary mounds, there are also several sites in the KOE that exhibit subaqueous mortuary contexts. At Fort Center there is a constructed mortuary pond (Sears 1994; Thompson and Pluckhahn 2012, 2014), and there are several island sites on Lake Okeechobee (Ritta, Kreamer, and Observation Islands) where people were interred within the waters of the lake itself (Davenport et al. 2011; Hale 1984, 1989; Will 2002).

Hale (1989:158–168) notes changes in settlement patterns in the Belle Glade culture. Specifically, he notes broad-scale geographic changes related to rising water levels. During the Archaic Period, there are a larger number of sites located closer to Lake Okeechobee. However, during the transition from the Archaic to Woodland Periods, the majority of sites were relocated farther away from the basin containing the lake. This coincides with rising water levels in the lake itself as it continued to fill the entirety of the basin. This pattern of locating sites farther and farther from the shores of Lake Okeechobee continues into the Woodland Period and culminates with the pattern discussed above.
Social Organization

The preponderance of the available evidence suggests that the peoples associated with the Belle Glade culture participated in an egalitarian form of social structure prior to the 16th century. This was originally noted by Sears (1994:192–201) based on his work at Fort Center. He does, however, contradict himself. In a discussion of Period I (1000 BC–AD 200) at the site, he states that “In contrast with the next period, there is absolutely no evidence for differential treatment of persons, individually or as a class” (Sears 1994:193). Yet, in his discussion of Period II (AD 200–1000), which marks a shift in residential patterns away from the shores of Fisheating Creek to the Mound-Pond Complex, he states that “All of the inhabitants of Fort Center during the time of this ceremonial center episode constituted a single social class that had sacred status” (Sears 1994:197). This continues during Period III (AD 600 or 800–AD 1200 or 1400 in Sears’ chronology, AD 1000–1513 in others), which is described as a period of little to no cultural change outside of the increased use of Belle Glade Plain ceramics. Sears (1994:199) states, “The same people, with essentially the same culture, continued to occupy the site, and in the same places.”

The only definitive evidence of social differentiation in the Okeechobee Basin currently available comes from the First Spanish Colonial Period (Belle Glade Period IV). This evidence rests on the association of European or European-derived objects, such as glass beads and metal ceremonial tablets, with a small number of burials throughout the region (Allerton et al. 1984; Austin and Mitchell 1998; Lee 1998; Luer 1985, 1994, 2000, 2010; Sears 1994:66–67, 190, 200; Willey 1949:22, 113–114). The only exception to this is the Opa Locka I site, where “[c]onch shell vessels were sometimes placed with the dead” (Willey 1949:113, emphasis added).
Even at the Fort Center site, where the most intensive excavations have taken place in the basin (Sears 1994; Thompson et al. 2012), there is no evidence of definitive social differentiation, and thus no evidence for authority figures. Individual burials at this site prior Period IV are not definitively associated with grave goods. The only artifacts that may have a positive association with burials have questionable contextual associations because a portion of the midden from Mound A was redeposited in the pond at some point between AD 200 and AD 800 (Sears 1994:196). Further, the burials in Mound B were redeposited from the charnel pond as well as excavated with a backhoe (Sears 1994:150–162). Additionally, the distribution of exotic materials does not reflect vast differentiation between habitation areas. Rather the distribution of these materials follows the shifts in residential patterns. For example, prior to AD 200 these materials are found in the middens alongside Fish eating Creek. After this time the focus of habitation shifts away from these middens to the mound-pond complex and the exotic goods follow (Sears 1994:96–110, 199–201). Because of this, along with evidence for ceremonial activities related to mortuary ritual around the mound-pond complex, Sears (1994:197) posits that “[a]ll of the inhabitants of Fort Center during the time of this ceremonial center episode constituted a single social class that had sacred status.”

While Thompson and Pluckhahn (2012, 2014) implicitly question the egalitarian structure of Belle Glade society, the only researcher to explicitly argue against it is Hale (1984). He bases this counter argument on the analysis of faunal remains from Fort Center. His analysis demonstrates differential faunal deposits across the site, which leads him to argue that “the differences seen in the faunal remains reflect status differences at different parts of the site” (Hale 1984:183). However, his argument, along
with his analysis, neglects the temporal shifts in occupational patterns at the site. The different assemblages Hale analyzed were each associated with different chronological occupations (e.g., Sears’ Periods I–IV). Accounting for these temporal shifts in living locations (i.e., Midden A vs. Midden B vs. Mound-Pond Complex, etc.) undermines the differences exhibited in Hale’s analysis rather than reflecting differential access to subsistence resources.

However, it is possible that authority might be manifest among Belle Glade individuals in archaeologically invisible ways. At a broader scale it might be materialized in the landscape itself through monumental construction (sensu Sassaman and Heckenerberger 2004). This, of course, would be related to the ability of people in authority to recruit and mobilize a labor force (Abrams 1989; 1994; Abrams and Bolland 1999; Arnold and Ford 1980; Carmean 1991; Kolb 1997), which would draw on different forms of labor organization (Abrams 1994:96–108). The monumental landscape can provide basic evidence for differential access to labor in the form of site hierarchies. Currently, it is necessary to take a slightly different approach than calculating volumetric assessments of monuments because there is a lack of topographic and three-dimensional maps of architectural features. Nonetheless, it is possible to provide a basic hierarchy by calculating the two-dimensional spatial extent of monumental architecture. This is most clearly visible in the Type B circular-linear earthworks, or Type B monuments. These are defined as being comprised of a semi-circular earthen embankment from which multiple linear embankments project outwards to terminate in conical mounds that are sometimes surrounded by smaller semi-circular embankments; the large, primary semi-circle partially encloses an oblong midden-mound (Johnson
1991, 1996). Table 3-1 provides the total area of architectural features (in both square meters and hectares), along with the total number of mounds and embankments, for each of the Type B monuments, and Figure 3-3 provides a visual comparison of all Type B monuments.

Table 3-1. Spatial Extent of All Architectural Features, Number of Mounds, and Number of Embankments for All Type B Monuments in the Okeechobee Basin.

<table>
<thead>
<tr>
<th>Site</th>
<th>Size (m²)</th>
<th>Size (Ha)</th>
<th>Mounds</th>
<th>Embankments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kissimmee Circle Earthworks</td>
<td>5241</td>
<td>0.5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Hendry Earthworks</td>
<td>15181</td>
<td>1.5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Maple Mound</td>
<td>15321</td>
<td>1.5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fort Center</td>
<td>15697</td>
<td>1.5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>South Lake Mounds</td>
<td>19324</td>
<td>1.9</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Tony’s Mound</td>
<td>51038</td>
<td>5.1</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>Big Mound City</td>
<td>81884</td>
<td>8.1</td>
<td>29</td>
<td>10</td>
</tr>
</tbody>
</table>

As this table shows there is a clear hierarchy visible if the amount of monumental architecture is taken to represent the ability of authority figures to mobilize labor. Because the population of the Okeechobee Basin was small (likely 1,500 or less) and these individual monumental sites were inhabited by populations of 40 people or less (Widmer 1988:275; Worth 2014:201) it is highly probable that the labor force was drawn from the entire basin, if not from beyond. Thus, to construct Big Mound City (the largest example of Belle Glade monumental architecture), a substantial labor force would have been necessary if the site was built rapidly. Conversely, the construction of the
Figure 3-3. All Type B monuments. A) Tony’s Mound (USDA 1957b); B) Big Mound City (USDA 1949b); C) Fort Center (1948c); D) Kissimmee Circle Earthworks (USDA 1957c); E) Maple Mound (USDA 1963a); F) Hendry Earthworks (USDA 1957a); G) South Lake Mounds (USDA 1957d).
Kissimmee Circle Earthworks may have been able to simply rely on the site population alone.

Abrams (1994:97–101) shows that the recruitment and mobilization of labor forces is highly variable and does not need rely on power or authority but can also involve reciprocal obligations. It is possible that peoples outside of the Belle Glade region (possibly the neighboring Calusa and Tequesta peoples) were recruited on the basis of a community contractual labor system (Abrams 1994:99). On the other hand, it is possible that labor was recruited under the auspices of a festive custodial system (Abrams 1994:99–100), where labor was compensated in the form of a ceremony or festival, which would tie back in to the previous discussion. However, this system of labor organization falls under custodial recruitment and is typically associated with social groups portraying evidence of “differences in power and status… evident through differential economic access” (Abrams 1994:99), which, as previously mentioned, is not evident in the Okeechobee Basin.

**Mortuary Practices**

In the KOE there are two primary patterns of mortuary practice. The first is interment within earthen mounds, and the second is burial within water. This practice has been encountered at multiple sites in the KOE, such as Belle Glade (Stirling 1935; Willey 1949), Blueberry (Butler 2008), Fort Center (Sears 1994), Nicodemus Earthworks (Ambrosino et al. 2013), Ortona Earthworks (Carr et al. 1995), South Lake Mounds (Carr and Steele 1992), Big Mound City (Willey 1949), and Tony’s Mound (Carr and Steele 1994), to name but a few. There is variability between sites in regards to the size and shape of the mounds and in the mode of interment. Because they were excavated
prior to the implementation of NAGPRA, Fort Center and Belle Glade provide the best
documentation of variability in the mode of interment.

The Belle Glade mound is comprised of three separate constructions: an early
muck mound, a first sand mound built on top of the muck mound, and a second sand
mound built on top of the first sand mound (Stirling 1935:375; Willey 1949:20–22). The
first sand mound was much larger than the muck mound, and was offset to the west
from the center of the muck mound. This mound also had a series of limestone slabs
that were placed on top of the muck mound and leading towards the midden-mound to
the east (Stirling 1935:375). Stirling posits that this mound was possibly destroyed by a
hurricane “as the area around it has been covered by water-washed sand containing
many complete and broken human bones” (Stirling 1935:375). The second sand mound
was built directly on top of the center of the first sand mound. Because the first sand
mound was off-centered from the muck mound, the second sand mound, which is
smaller than the first, only partially overlaps the muck mound (Willey 1949).

Stirling (1935:375–376) provides the following description of the interments
encountered during excavations of the Belle Glade mound:

The early muck burial mound contained a tangled mass of burials. Each
new interment seems to have disturbed several former burials, resulting in
an almost solid mass of skeletal material. Artifacts rarely accompanied the
burials. The few… from this stratum consist mostly of bone pins that may
have been in the hair when the burials were made. Among these bones
was found the remains of a cup or bowl made from a human skull. The
undisturbed burials were nearly all extended on the back with no regard
for direction.

The second burial period, or the first sand mound, is represented only by
disturbed burials. Some of the lower burials in the sand under the mound may belong to
these, as no stratigraphy shows in the white sand and as sand extends down to the
muck to an absolute level below that of some of the water-deposited material. These deeply deposited burials in the sand mound are also extended on the back.

The burials in the second sand mound show the same type of interment. Several near the surface were accompanied by glass beads. Two of the burials near the surface had tubular shell beads with them, and one had been buried with a dagger manufactured from a human femur. Only those burials that were near the surface were accompanied by cultural remains. As these were mostly articles of a post-European nature, a change in burial custom may be indicated.

Stirling's description of these burials suggests two primary patterns. First, grave goods are rare among the burials at Belle Glade until the historic period, when European materials and other artifacts begin to accompany human bodies to the grave. Second, interments tended to be extended and face up during all three periods of mound use.

This differs in some regards from the patterns reported by Sears (1994:150–157) for the burials at Fort Center. In contrast to Belle Glade, human interments were encountered in Mound B, Mound 13, and in the charnel pond (see below). While the mode of interment for the three interments in Mound 13 are not discussed—Sears (1994:141) simply notes they “were badly decomposed, and the bone fragments were heavily encrusted with iron compounds”—there is evidence demonstrating how people were interred in Mound B. It should be noted, however, that Sears’ use of a tractor for excavation of this mortuary mound limited the amount of data recovered regarding these interments. Nonetheless, there were four distinct contexts of interment. The earliest is related to the use of the charnel pond discussed below. In this pattern there
were numerous burials encountered on the top of the original flat-topped mound structure. These interments were associated with wavy mud streaks that Sears (1994:157–158) interpreted as being the result of transporting bundle burials from the pond to the mound surface for secondary burial. There was a second deposit in the mound that may be temporally associated with these burials. This deposit included “a single adult human skull in poor condition, the skull cap of an infant with traces of cutting on its margins, seven *Busycon* dippers, three *Venus* clam shells, a set of nested shells consisting alternately of four clam and four scallop shells, two bird-bone tubes, and the cut and worked mandible of a small carnivore” (Sears 1994:157).

In a deposit above this, several other interments were encountered. Sears (1994:153) states that:

> A few well-decayed burials and a few small and rather poorly defined postholes were associated. These burials, and those to follow in this central area, were “discovered” by the tractor, meaning they were observed after a tractor cut had gone just above them, revealing the brownish stain. In all cases, the only facts recoverable were whether the bones were human, sometimes whether they were adults or children, and usually whether the burial was a bundle or flexed. Most were flexed. There were a few bundles and no extended burials.

Importantly, Sears (1994:153) also notes that these were “artifact-free burials,” which seems to also be the case with the bundle burials removed from the charnel and deposited in the mound.

The final context of interment is the topmost stratigraphic layer of Mound B, where several historic-period burials were encountered by looters in 1961 (Sears 1994:59, 150). Because of the haphazard nature of the looters’ excavations, there is no data available that points to mode of interment. When Sears re-excavated the area, he encountered fragments of human bone and artifacts (Sears 1994:150). The looters,
however, recovered quite a few extravagant artifacts from these burials, including metal ceremonial tablets, metal discs with embossing and engraving, and a golden jaguar figurine.

Sears also cites some evidence for the preparation of bodies prior to burial. This evidence comes from the original flat-topped mound surface, just beneath the secondary burials. In this area, Sears encountered numerous conch shells along with fragmented human teeth and small, dark stains associated with small fragments of human bones. He cites this as evidence indicative of the use of the mound as “a ceremonial area devoted to the preparation of bodies for interment on the charnel pond platform” (Sears 1994:160).

The Fort Center mortuary data contrast starkly with the Belle Glade data. At Belle Glade, interments were always extended and face up, while at Fort Center interments were typically flexed, with some bundling present. Fort Center also exhibits both of the patterns of mortuary practice present in the region (see below), while Belle Glade only exhibits the one. Further, if Sears’ (1994:160) interpretation of the mortuary preparation area is correct, then this is something else that was not encountered at Belle Glade. Two aspects are consistent between the two sites, though. First, grave goods are not a common occurrence until the historic period, when European-derived materials begin to be included in interments. Second, the use of human skeletal material to manufacture material goods is exhibited at both sites. At Fort Center the infant skull cap exhibits evidence of cutting along its margins (Sears 1994:157), while at Belle Glade the adult skull cap “had been sawed off just above nasion and below the occipital boss… There is a small hole, as though for suspension, on the right side near the cut edge” (Willey
1949:45). At Belle Glade there were also two daggers recovered, one in association with a historic interment, manufactured from human long bone (Willey 1949:40).

While the Belle Glade mound exhibits extended burials and Fort Center is characterized by flexed and bundle burials, Big Mound City presents a much different view. This site contains two separate burial mounds located in completely different areas of the site (Mound 8 and Mound 11). Mound 8 contained three human skulls at approximately 45cm below surface and pottery sherds throughout (Willey 1949:45). In contrast, Mound 11 contained only postcranial remains. Willey (1949:76) states, “Three human skeletons were discovered, all with the skulls missing. It is not clear if these were articulated or secondary interments.” It is not mentioned whether other cultural materials were interred with the postcranial remains or not. Furthermore, it is not known whether the postcranial remains from Mound 11 and crania from Mound 8 were the same individuals or not.

The second pattern of mortuary practice is subaqueous burial. This practice of interring the dead in aqueous contexts, what I refer to as subaqueous ossuaries, is exhibited at several sites in the KOE watershed. The most famous of these sites is Fort Center, where Sears (1994:164) encountered a human-constructed pond with at least 150 burials in it. Sears (1994:165) interpreted the pond as being constructed to “provide the culturally correct environment for a charnel platform; evidently the water was a ceremonial requirement.” The evidence he cites for the presence of such a platform consists of the numerous zoomorphic effigy carvings and the logs they were attached to that were recovered during excavations of the pond. This interpretation of the wooden materials as being part of a platform has been called into question (Wheeler 1996), and
I tend to agree that this interpretation, while plausible, does not hold up to scrutiny of the actual wooden materials, which are suggestive of the presence of wooden posts where the carvings were attached but not of an actual platform supported by these posts.

Nonetheless, Fort Center stands out as an anomaly among the sites with subaqueous ossuaries. It is the only one where the ossuary was constructed. What I mean by this, is that the pond itself was a constructed feature. The other subaqueous ossuaries are located at island sites in Lake Okeechobee. They include Ritta Island, Kreamer Island, Grassy Island, and between the shoreline of Lake Okeechobee and Observation Island (Davenport et al. 2011:483–484, 518–519; Hale 1984, 1989:54–55, 161–162; Will 2002:105–107). In contrast to Fort Center, these ossuaries were not constructed, but were located within the waters of Lake Okeechobee itself. Historian Lawrence Will (2002:105–107) notes that early American pioneers to the Okeechobee region encountered these ossuaries each time the water levels in the lake dropped significantly. The descriptions they provided Will suggest that there is variation in the spatial distribution of the burials themselves, with some being tightly confined while others are more dispersed. For instance, the ossuary off of Ritta Island was not located directly along the shore of the island, nor was it spatially restricted. Rather, the bodies, mostly decomposed and visible primarily through dark staining of the soil, were spread out over nearly 1,400 meters (Will 2002:106).

Hale (1989:161–162) questions whether these interments actually occurred within the water itself. Rather, he posits that the skeletal groupings off Ritta Island that were closer to the 1,400-meter distance, along with the dark staining of the soils, is indicative of the bodies being interred when water levels were much lower. However, I
question his logic because the tradition of subaqueous burial dates back to the Archaic period in Florida, and at the Windover site, the prime example of this Early and Middle Archaic practice, bodies were staked down to the peat bottom (Dickel 2002). If the peat at this site were a lighter color, the sediments surrounding the bodies would have been just as stained as those surrounding the Ritta Island burials.

**Monumentality**

One of the most salient aspects of Belle Glade culture is monumentality, and based on the amount of monumental architecture found throughout the KOE watershed monumental architecture played a key role in Belle Glade culture. They built a variety of monumental architecture ranging from simple conical earthen mounds to large circular ditches to highly complex and massive geometric arrays of earthen architecture. These monumental constructions are one of the hallmarks of the Belle Glade archaeological culture, and they were from the onset. Some of these constructions are associated with the earliest Belle Glade contexts, suggesting that manifestations of monumentality were part of the Belle Glade cultural milieu from the get-go and likely played a large role in Belle Glade identity.

However, unlike many other aspects of Belle Glade culture, monumentality was not something static, but rather fluidly changes over the course of generations as well as exhibits variability across the region. These changes and variations are visible in the products of their monumental practices; that is, in the monumental architecture itself. This is something else that separates Belle Glade culture from most of the broader Southeast. Rather than the diagrammatical mound centers, with their arrangement of flat-topped pyramid mounds around a central plaza, the Belle Glade monuments exhibit geometric patterns with each architectural center displaying flourishes to show
community variations in architectural ideas. The Hopewell earthworks are the only examples of similar architectural styles in the Southeast.

William Johnson (1991, 1996) has proposed a typology and chronology for this architecture that traces the changes in Belle Glade monumental architecture through time. He divides the architecture into several types: mounds, mound groups, circular ditches, Type A circular-linear earthworks, Type B circular-linear earthworks, squared/rectangular earthworks, geometric and effigy barrows, and linear embankments. Drawing on the chronological data from William Sears' work at Fort Center and the artifact associations from archaeological surveys in the region, Johnson proposed a chronology that ordered these different architectural types according to specific culture-historical periods. However, some of these types, particularly mounds and mound groups, transcend the chronological framework by being built throughout the entire Belle Glade sequence. Additionally, two types—squared/rectangular earthworks and geometric and effigy barrows—have yet to be dated and are extremely rare throughout the region. Because of this, these two types have not been placed with the chronological framework.

Table 3-2 presents Johnson’s chronology of monumental architecture for the Belle Glade culture. Note that in this table the squared/rectangular earthworks and the
geometric and effigy barrows are not included because of the lack of temporal knowledge regarding them. The details of the different architectural types are discussed in the Chapter 4, which will not only provide the reader with descriptions of the architecture but also with previous work and interpretations regarding the architectural types.

**Summary**

As the above discussion of the various aspects of Belle Glade culture shows, this culture is one focused on, even defined by, relationships. The peoples of this culture formed long-lasting relationships with the physical structures of their surrounding environment, and these relationships changed very little over time. These relationships were developed and honed through a fisher-hunter-gatherer subsistence lifestyle. As they traversed their landscape to catch and collect food, they encountered many different nonhuman animal species and many different plant species. These same species were targeted year after year, leading to the development of long-term relationships. As such, relationships were developed with the plants and animals inhabiting the upland hammock ecosystems, which provided innumerable food resources. Relationships were also developed with the waters, and all that dwells within, of the vast wetlands that dominated the landscape.

Social relationships also form an inextricable part of this culture, especially given the physical characteristics of the landscape the Belle Glade peoples inhabited and dwelled within. As Steinen (1994:102) notes, the Kissimmee-Okeechobee-Everglades watershed provides ample subsistence resources, but it provides constraints in terms of materials for tool production (see also Goggin 1949:30). This led the Belle Glade peoples to reach beyond the boundaries of their immediate landscape to form
meaningful social relationships with other cultural groups to not only create and maintain important social ties, but to garner the resources necessary for daily life.

Belle Glade material culture provides us with an index of these social relationships. Imported pottery wares suggest relationships with the Tequesta and Calusa peoples of South Florida, eastern and western Timucuan-speaking groups of North and Central Florida, and with peoples living in what is now southern Georgia, even if it was indirectly. The lithic technology shows relationships established with peoples in North Florida and Central Florida. Ground stone ornaments, mica, galena, and quartz crystal point to even more distant relationships to the north, though these are likely indirect. Marine shells and shark teeth provide a picture of the relationships developed with coastal peoples, particularly the Calusa of the Southwest Florida Gulf Coast. This relationship is also documented by the presence of Belle Glade Plain pottery at Calusa sites (Cordell 1992, 2013; Marquardt 2014; Marquardt and Walker 2012, 2013). The metal objects of the Colonial Period/Belle Glade IV Period also point to this relationship (Goggin 1949; Luer 1994).

The peoples of the Belle Glade culture did not exist in a vacuum. They were part of a much larger world, and they participated at this larger scale through developing social relationships throughout the Florida peninsula and likely beyond. This was partly facilitated by the aqueous landscape of the Kissimmee-Okeechobee-Everglades watershed. As discussed in Chapter 2, this landscape was inundated for long portions of the year, which would have provided a medium for travel via canoe (although it should be noted that the water was not deep enough to completely impede foot travel). This is a point that Carr (2012b:73–79) discusses at length. This watery world would
have provided conduits to the south and the west via the Everglades Trough. A second western route is found in the Lake Okeechobee Basin and its connection to the Caloosahatchee River. A northern route is provided by the Kissimmee River and the vast marshes of the Kissimmee River Basin sag valley.

In Chapter 4, I shift the focus towards a narrower view of one aspect of Belle Glade culture: monumentality. While I briefly touched on it in this chapter by discussing the physical and temporal characteristics of Belle Glade monumental architecture, Chapter 4 engages with the topic in more detail.
Towards the end of Chapter 3 I briefly discussed the variability in monumental architecture in the KOE watershed. In doing so I introduced William Johnson’s (1991, 1996) chronology of Belle Glade monumental architecture. His chronology is extremely important for the region, but it is not without its flaws. The primary flaw in his chronology is that he relied solely on the chronometric data from Fort Center in order to establish the initial temporal ties for the different forms of architecture in the watershed. This was not Johnson’s fault, however. At the time he conducted his research the only chronometric data in the region was from Fort Center. Thus, it was necessary for him to establish a baseline from actual data, and that data had to be from Fort Center and Fort Center alone. Even so, the use of chronometric data from a single site to establish a chronology for the entire region is problematic because it masks intersite variability. This problem informs a large part of my research, much of which is based on obtaining chronometric data from other sites in the region in order to better understand the temporal aspects of Belle Glade monumentality (see Lawres and Colvin 2017). In other words, I am interested in knowing how the monumental architecture at other places in the KOE relates to the construction patterns exhibited at Fort Center, and whether these constructions were built all at once or over a longer span of time.

A second major flaw in his chronology is that he misread or misinterpreted some of Sears’ (1994) data in regards to the use of certain architectural features. Specifically, he posits that the terminal mounds of the Type A and B circular-linear earthworks were inhabited during the temporal periods he associates them with (e.g., the Belle Glade II and III culture-historical periods, respectively). However, Sears (1994:133, 137)
specifically states that the Type A and B circular-linear earthwork at Fort Center—comprised of a semi-circular ditch with three radiating embankments terminating in Mounds 1, 2, and 5—was occupied during later temporal periods: “we have concluded that Mound 1 represents a single occupation and a single structure for a relatively short period of time in the late sixteenth or early seventeenth century… The mound [2] is assigned to Period IV on the basis of environmental location and the attached linear mound” (Sears 1994:133, emphasis added). Only Mound 5 was identified as having a possible earlier occupation, but this interpretation by Sears (1994:136–137) should be cautiously approached because it was made on the basis of identifying a few St. Johns check-stamped sherds recovered from tire ruts adjacent to the mound that were formed when their vehicle became stuck.

As discussed above and in Chapter 3, Johnson (1991, 1996) used these data to temporally order the variability in Belle Glade monumental architecture on a regional scale. His resulting chronology placed four primary earthwork forms in association with the culture-historical periods established by Sears (1994). Thus, circular ditches were placed in the Belle Glade I period; Type A circular-linear earthworks in the Belle Glade II period; Type B circular-linear earthworks in the Belle Glade III period; and detached linear earthworks in the Belle Glade IV, or Historic, period. These forms were assigned to these categories on the basis of associated material culture, primarily in the form of ceramics. In addition to these four primary types, he identified conical earthen mounds, within which he includes both habitation mounds or midden-mounds as well as mortuary mounds, as transcending the regional temporal categories. That is, they were constructed throughout the entirety of the Belle Glade occupation of the KOE
watershed. He also identified two other forms of architecture that were unable to be associated with temporal periods: squared/rectangular earthworks and effigy borrows. There is currently a dearth of archaeological investigation of these architectural features, which limited his ability to assign them to temporal categories.

Nonetheless, Johnson was able effectively deal with the variability in Belle Glade monumentality, but, given the two major issues with the chronology, it is necessary to approach temporal change in the architecture with caution and a healthy degree of skepticism. What I question is the exact temporal span he associates the specific forms with. In other words, while his relative ordering may be correct, the exact timing of that ordering may differ from the culture-historical periods established by Sears (1994).

Even though Belle Glade architecture changes through time there is one characteristic that remains constant. Among the larger manifestations of monumental practice (i.e., circular ditches and circular-linear earthworks), the location of the monuments is nearly always in areas of flowing water during the wet season. This includes the wet prairies, saw grass marshes, and sloughs discussed in Chapter 2. Essentially, this placed these monuments in association with water and with movement because of the flowing nature of the water itself. This connection between water and monumentality is something not realized in the majority of the previous interpretations of Belle Glade monumentality. The only scholar to realize there was a connection between water and monumentality in the KOE watershed was H. Stephen Hale (1984, 1989), but as you will see below the connection he argues for is not correct.

In the remainder of Chapter I look at the different forms of Belle Glade architecture and critically evaluate previous interpretations of them. In doing so I use
Johnson’s chronological framework to structure the overall discussion in a coherent manner. This has the dual effect of emphasizing the changes in architecture and how those changes led to the variability exhibited in the Belle Glade monumental landscape while also allowing me to tie the different temporal periods into the most current paleoenvironmental data to provide a more nuanced environmental context for the different architectural features. Following the critical evaluation of these previous interpretations I present my own argument—that the monuments are materializations of core aspects of the Belle Glade ontology—and the reasons why this argument provides a more robust framework for re-evaluating Belle Glade monumentality.

**Belle Glade I Architecture**

The earliest architectural manifestations are associated with the Belle Glade I period and roughly span 800 BC–AD 200 (Johnson 1991, 1996; Sears 1994; Thompson and Pluckhahn 2012, 2014). Recent paleoenvironmental studies have characterized this period as one of relative aridity in comparison to periods both before and after (Glaser et al. 2013). Prior to this period, the regional watershed had much deeper water levels that, in turn, affected the development and distribution of local ecosystems. Lithological and palynological data suggest these raised water levels, which would have been deeper throughout the region than those described in Chapter 2, were associated with a vegetative regime described as a “slough-like assemblage… marked by deeper water levels and longer hydroperiods indicated by the dominance of Nymphaea and the presence of other aquatics, such as Utricularia, Sparganium, and Sagittaria” (Glaser et al. 2013:17213). This regime was established by approximately cal. 4300 BP, and is what started the process of peat development in the Everglades Trough. Further, these raised water levels appear to have extended beyond the KOE watershed into adjacent
areas, limiting the ability of pine flatwoods and mesic hardwood forests to become
established in upland areas. However, this all shifted by approximately cal. 2800 BP
(800 BC), when water levels dropped significantly and there was a shift in ecosystem
compositions across the watershed (Glaser et al. 2013). This shift is likely tied to the
solar forcing event documented elsewhere at cal. 2800 BP, when there was reduced
solar activity around the globe (Plunkett and Swindles 2008; Swindles et al. 2007). In
the KOE watershed this solar anomaly led to the shift in water levels that, in turn, led to
the slough-like palynological assemblage of the preceding period being replaced by an
assemblage dominated by sawgrass (Cladium), and thus shorter hydroperson period
ecosystems (Glaser et al. 2013:17213; see also Lamertsma et al. 2015). What this
means for the people dwelling in the region during this period is that there was a shift
from perennial inundation of the entire watershed to seasonal drying of the landscape
during the winter months (Willard and Bernhardt 2011).

During this temporal span two monument types were constructed in the KOE, all
of which have been found associated with fiber-tempered and semi-fiber tempered
ceramics (Johnson 1991, 1996; Milanich 1994; Sears 1994; Thompson and Pluckhahn
2012, 2014). The first, which persisted throughout all Belle Glade occupations (Belle
Glade I–IV), is mounds (Johnson 1991, 1996; Thompson and Pluckhahn 2012). These
mounds are comprised of earthen materials, are typically conical in shape, and are
distributed throughout the KOE watershed (Figure 6a). They occur in both isolation and
as groupings (Johnson 1991) and are divisible into habitation mounds and
mortuary/ceremonial mounds, the former having been posited as an environmental
adaptation to a region subject to inundation (Sears 1977, 1994; Widmer 2002). Based
on evidence from Fort Center, mortuary mounds began to be constructed in the region by at least cal. 800–540 BC (Thompson and Pluckhahn 2012:59).

The second form of monumental architecture constructed during this period is the circular ditch (Figure 4-1b and 4-2) (Austin 1992; Carr 1985, 2012; Johnson 1991, 1996; Sears 1994; Thompson and Pluckhahn 2012, 2014). These features are exactly as their name implies: they are relatively shallow channels or trenches cutting into the surface of the landscape and they exhibit a circular shape. A number of these architectural features are known throughout the KOE (Table 3) (Carr 1975, 1985; Milanich 1994), and their construction began by at least cal. 750–690 BC (Thompson and Pluckhahn 2012:57). They vary in size from 61 to 366 m (Carr 1985:289) in diameter, there is typically an earthen mound located at or very near the geographic center of the circle, and they typically have one or more causeways allowing entrance into the structures (Carr 1985; Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014). Further, the fill from the excavation of the ditches was mounded around the edge of the ditches to create berms (Sears 1994:175). They also exhibit two forms: open-faced and enclosed (see Figure 4-2; Table 4-1) (Colvin 2014). The open-faced form generally reflects the shape of a three-quarter circle while the enclosed form takes the shape of a fully-formed circle.

The exact function of these ditches is not known, but several interpretations have been proposed. Sears (Sears 1994:178), while noting an initial hypothesis that they could have played a role in ceremonialism, explains their function in terms of
Figure 4-1. Distributions of different earthwork forms. A) conical mounds; B) circular ditches; C) Type A circular-linear earthworks; D) Type B circular-linear earthworks.
Table 4-1. Known circular-ditch architectural features in South Florida.

<table>
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<th>Name</th>
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<th>Morphology</th>
<th>Diameter (m)</th>
<th>Environment</th>
</tr>
</thead>
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<td>Open-Faced</td>
<td>366</td>
<td>Hammock</td>
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<td>8GL50</td>
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<td>275</td>
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<td>Glades Circle</td>
<td>8GL38</td>
<td>Enclosed</td>
<td>150</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Caloosahatchee Circle</td>
<td>8GL33</td>
<td>Open-Faced</td>
<td>360</td>
<td>Wet Prairie</td>
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<tr>
<td>West Okeechobee Circles</td>
<td>8GL57</td>
<td>Enclosed &amp; Nested</td>
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<td>Miami Circle Ditch</td>
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<td>Enclosed</td>
<td>60</td>
<td>Upland</td>
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<td>Upland</td>
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<tr>
<td>North Fisheating Creek Circle</td>
<td>8GL75</td>
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<td>260</td>
<td>Broad-leaf Marsh</td>
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<td>Martin Circle Ditch</td>
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<td>Wet Prairie</td>
</tr>
<tr>
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<td>8MT41</td>
<td>Unknown¹</td>
<td>n/a</td>
<td>Wet Prairie</td>
</tr>
<tr>
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<td>8OS1787</td>
<td>Open-faced</td>
<td>240</td>
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</tr>
<tr>
<td>Whitebelt #1/L-8 Canal Circle</td>
<td>8PB220</td>
<td>Enclosed</td>
<td>245</td>
<td>Upland Marsh</td>
</tr>
</tbody>
</table>

economics. Basing his argument on his excavations at Fort Center, he claims they played a drainage role for maize production, because maize pollen was recovered from sediment samples associated with the ditch (i.e., the Great Circle Complex) as well as from paleofeces and lime pigments elsewhere on the site (Sears 1994:118–129; Sears 1994:176). However, as discussed in Chapter 3, this argument has been rigorously disputed. Johnson (1990:210, 1991:62–72) notes limitations of the soils within the Great Circle Complex as being too acidic and needing fertilizer; Thompson and colleagues (Thompson et al. 2013:191) note the recovery of several macrobotanical maize samples and one phytolith, but they all are from mixed deposits (due to bioturbation of pollen) dating to a historic period occupation (a Second Seminole War fort was located less than 25 m from the ditch) suggesting that Sears’ pollen data is also originally from the

¹ These circular ditches were partially destroyed in the earliest available aerial photographs.
same context. This, however, does not definitively rule out the early use of maize at the site. As Hale (1989:154) and Milanich and Ruhl (1986:2) note, maize may have been grown in very small amounts for ceremonial consumption, much like some arguments for the early use of the plant in Mesoamerica (see Iltis 2000, and Smalley and Blake 2003, on the sweetness hypothesis).

Figure 4-2. Open-faced and enclosed variants of circular ditches. A) Open-faced variant: Caloosahatchee Circle (USDA 1949d); B) Enclosed variant: Glades Circle (USDA 1948a).

Carr (2012a:98, 2012b:72, 2016) posits a second economic function, suggesting that the ditches acted as water control mechanisms for the impoundment of fish and other aquatic fauna (see also Thompson 2015). This is a reasonable argument because the available data from Fort Center speak to the feature’s use as a water control mechanism. Further, Sears (Sears 1994:189) notes that to be a drainage mechanism it is necessary to clear the feature of muck and debris, which would then be deposited on
the interior field as fertilizer. However, Johnson’s (1990:210, 1991:67–71) sedimentological analysis demonstrates there is no evidence in particle grain size distributions to indicate periodic cleaning; instead, it seems that the ditch was excavated only once. By allowing the buildup of muck and debris, the ditch may have acted to hold water, along with aquatic organisms, rather than drain it, making Carr’s interpretation more plausible than Sears’.

However, when assessing the plausibility of this interpretation from a regional scale, the spatial distribution and form (i.e., enclosed vs. open-faced) of the ditches this interpretation is called into question (see Figure 4-3). The majority of the circular ditches are located in ecosystems much different than that exhibited in the emplacement of Fort Center’s Great Circle Complex, which is located along the banks of Fisheating Creek. The locational choice at Fort Center would be conducive to the impoundment function proposed by Carr. The Great Circle itself is what Colvin (2014) classifies as an open-faced circular ditch, with the ditch itself connecting to the banks of the river to allow water to enter its confines. As the water levels in Fisheating Creek rose following heavy precipitation events, water—along with fish and other aquatic fauna—would have entered the ditch, and as the river’s water levels dropped back down the water and aquatic organisms would have remained trapped in the ditch. However, there are very few examples of such a locational choice for this architectural type. The two prime examples are found at Fort Center’s Great Circle Complex and the Caloosahatchee Circle. The latter Carr (2016) argues exhibits further evidence for water control in the form of the branching arms of the open end of the circle. These, he argues, could have supported some sort of gate structure to control the flow of water in and out of the ditch.
However, this circular ditch has since been destroyed in the land conversion process in the region, so Carr’s (2016) argument for water control mechanisms is not able to be tested.

In contrast to Fort Center’s Great Circle and the Caloosahatchee Circle, the majority of the circular ditches of the KOE are constructed as enclosed circles (Colvin 2014) and are located in wet prairie ecosystems, where they would have been inundated for at least five to six months of the year in the Kissimmee River Basin and for nine to ten months of the year in the Okeechobee Basin and Everglades Trough. During this time, fish could have freely moved in and out of the features due to sheet flow not having the tidal characteristic necessary for a weir of this sort to work. As the landscape dried up during the winter months it is possible that a single catch of fish could have been made, but after that they would not have been functional for another year. It should be noted that it is possible that these features could have functioned in Carr’s proposed manner if wooden posts were added to create a weir type trap for the wet season, but thus far there is no evidence for such additions to the circular ditches.

Hale (1989:162–166) puts forth a third functional argument. In contrast to those made by Sears (1994) and Carr (2012a, 2012b, 2016), Hale argues that the circular ditches functioned in a similar manner as Sears proposes. Specifically, Hale claims that some of them functioned to create drained fields that provided dry ground—artificial islands of a sort—in an otherwise aqueous landscape. The logic here is that the enclosed ditches would have pulled moisture from the field in the interior of the circle, similar to Sears’ agricultural argument above. For Hale, this suggests they were built to create living spaces in the landscape. It is important to note that these were built during
a time of increased aridity and thus decreased water levels across the entirety of the landscape (Glaser et al. 2013). In fact, recent palynological studies suggest that this

Figure 4-3. Distribution of circular ditches in the KOE watershed overlaid on water features of the watershed.

was a time when the hydroperiods across the region were much shorter and there was a shift in ecosystems to the point where the deeper-water sloughs were shifting towards sawgrass marsh ecosystems at a rapid rate (Glaser et al. 2013; Lawres and Colvin
2016). This lends some credence to Hale’s interpretation. Indeed, he argues that these were built because the lower water levels required shifts in settlement patterns to place people closer to perennial water sources such as lakes and ponds.

However, the fact remains that not all of the ditches were built in this way, but rather there are a number that are open-ended and located along the edge of waterways, which would be conducive to allowing water to flow in and through the ditches (Colvin 2014). Further, he is arguing that people were living within the confines of the circles, in these drained fields or artificial islands. Yet, there is a distinct lack of evidence for occupation within their confines. Instead, many of them have conical mounds in their center. While the only one of these mounds to be excavated is at Fort Center, Sears (1994:176) notes that the mound was completely devoid of cultural materials. Because of this sterility, Sears concluded that “the ‘mound’ is a spoil remnant from one of the older, small ditches” (Sears 1994:176). While Sears may have come to this conclusion, it is highly likely that this was an actual, intentionally built conical mound (Thompson and Pluckhahn 2012:56). Although disregarded by Sears at the time, and as described above, a number of other circular ditches have mounds within their confines, and often in the geometric center (Carr 1985; Thompson and Pluckhahn 2012). Further, the depression created by Sears’ excavation of the mound is in the exact mathematical center point of the Great Circle, as determined through GIS analysis (Thompson and Pluckhahn 2012:56). While little excavation has been conducted on these features outside of Fort Center, it is highly unlikely that Hale’s interpretation holds because of the variation in form (enclosed vs. open-ended) and location (along riverbanks vs. wet prairies and sawgrass marsh) of these architectural features. The only other site where
excavation of the interior of a circular ditch has occurred is the Glades Circle, where burials were encountered (Ambrosino et al. 2013).

In contrast to the functional and economic arguments above, Hall (1976), Thompson and Pluckhahn (2012, 2014), Colvin (2015), and Thompson (2015) posit ceremonial functions (see also Goggin and Sturtevant 1964) for the circular ditches. While not directed specifically at the Belle Glade circular ditches, Hall (1976) provides one of the earliest ceremonial arguments for these architectural features. In his important article Hall argues that the many circular features in the Eastern Woodlands—be they ditches, enclosures, charnel houses, or otherwise—may be more closely related to spiritual beliefs and ideologies than most interpretations account for. Drawing on a range of ethnohistoric, ethnographic, and archaeological details, Hall notes the significance of the circle in Native American ideas regarding magic, witchcraft, and the transmigration of the soul (see also Chapter 5 on the significance of the circle in Native ontologies). He notes that the circle acts as a binding agent to retain a soul within its confines in many Native cultures. Additionally, he notes that many Native groups believe that water also acts as a spiritual barrier, not only against migrant souls (which can include both benevolent and malevolent spirits) but also against maligned magic (or bad medicine as the Seminoles refer to it). In the case of the circular ditches he makes special note of Fort Center in this regard because the circular ditch would have held water but also because of the adjacent subaqueous ossuary (i.e., the mound-pond complex in Sears’ terminology). To Hall, this suggests a more spiritual use of the ditch architecture than Sears’ (1994) interpretations allow for.
Thompson and Pluckhahn (2012:63) claim that the construction and use of Fort Center’s Great Circle involved communal rituals that referenced the “contextual landscape.” Specifically, they argue the reference is to the oxbow lakes found along Fisheating Creek that provided the vast majority of sustenance for the people living there (Thompson and Pluckhahn 2012:63, 2014:177; see Hale 1984, 1989, 1995 for detailed descriptions of zooarchaeological analyses of Fort Center and other sites in the area). Further, they theorize that the construction of the Great Circle marked a watershed event that would have structured concurrent social relations as well as how future residents of the site would have viewed the past in that particular place. More recently (Thompson and Pluckhahn 2014:176–177) they have amended their argument to view these constructions as multifunctional, not only providing a locus for ceremonial activity but also acting as a source of food (e.g., Carr’s 2012a, 2012b, 2016 fish impoundment hypothesis) during times of flooding.

However, much like with Carr’s (2012a, 2012b, 2016) argument, when our scale is increased Thompson and Pluckhahn’s (2012, 2014) argument of oxbow lake referencing becomes questionable based on spatial distributions (see Figure 4-3). There are only two waterways in the KOE that produce oxbow lakes: Fisheating Creek and the Kissimmee River. Only four of the known circular ditches are located near these waterways. Rather, and as previously mentioned, the majority of them are located amid wet prairies and are nowhere near the oxbow-producing waterways. When the overall regional distribution of these features is examined it is pertinent to note that they are emplaced more broadly around the periphery of Lake Okeechobee itself. This is important to note because this lake is more productive and conducive to large-scale fish
harvesting than are the smaller oxbow lakes along Fisheating Creek and the Kissimmee River. Further, Lake Okeechobee is more accessible to the populations of the entire region than are the confined areas of oxbows. This is an exceptionally important point because Thompson and Pluckhahn (2012) argue that this oxbow lake reference held true for all of the circular ditch constructions of the region. If this were the case we would expect to see more of the ditches centered around areas containing the oxbows, but in actuality what we see is a distribution situated around Lake Okeechobee. Thus, rather than arguing for a reference to oxbow lakes it seems more plausible to argue for a reference to Lake Okeechobee. Not only is this more reflective of the spatial distribution, but the lake would have been more accessible to the regional population, it is more productive in the long-term and more resilient to mass fishing, and its sheer size would have made it a major landmark on the landscape. Furthermore, it is not possible to distinguish the source of the aquatic species that the inhabitants of Fort Center were consuming. Hale’s (1984, 1989, 1995) zooarchaeological analyses demonstrate that aquatic species were the predominant focus of subsistence at this site, as well as others (Hale 1995; Mitchell 1996), but these species would have been available in Fisheating Creek in general as well as in the sheetflow surrounding the site and in the numerous depression marshes dotting the surrounding landscape.

Colvin (2015) takes a similar view to Thompson and Pluckhahn (2012) in that the construction of the Great Circle created a ceremonial context tied to the contextual landscape, but he takes his argument a step further and claims that it is tied to the broader landscape and the cyclicality of seasonal hydrologic change. More broadly, the circular ditches throughout the region are indicative of the entanglements between
people and their environment and they create and maintain persistent aqueous contexts even during the dry season, when sheet flow would have lessened drastically. Moreover, for Colvin the circular ditches are not just a reference to the environment but to past practices as well. Subaqueous burials are a form of mortuary practice geographically restricted to peninsular Florida and, other than the Belle Glade examples, are temporally restricted to the Early and Middle Archaic periods (Milanich 1994:81–82; Sassaman 2010:67–68; Sassaman and Randall 2012:67–68). Colvin (2015) argues that creating this negative space in the surficial landscape to maintain persistent aqueous contexts is a reference to these past practices, and thus the circular ditches were likely viewed as sacred ancestral spaces.

All of these circular earthworks are located in areas that would have been subject to inundation during periods of time that hydrologic patterns were tied to higher levels of sheetflow across the KOE (i.e., spring and summer months). While Colvin doesn’t discuss the relevance of paleohydrological or paleoenvironmental data to his interpretation, the location of the circular ditches—with the exception of Fort Center’s, which was built in a tree island hammock ecosystem—is especially significant for his interpretation when coupled with the paleoenvironmental data discussed above. Because the appearance of the circular ditches coincides with the hydrological shift to seasonal drying of the landscape, their location in the midst of wet prairies subject to seasonal inundation strengthens Colvin’s interpretation. Prior to this period the ditches would not have been feasible to build, nor would they have acted to drain water. However, with the seasonal landscape drying that the shifting climate offered they would have retained water during the dry season. This increases the likelihood that his
interpretation is correct. The shift from a completely aquatic landscape to one that is seasonally aquatic would have been cognized as an important element of the Belle Glade landscape that at first may have brought about fear among the inhabitants of the KOE. Indeed, it would be a frightening thing indeed if the place your family had lived for generations was suddenly beginning to dry out on a yearly basis, which would have caused significant shifts in the distributions of the aquatic species being targeted for subsistence (see Chapter 3). Because of this it is possible to take Colvin’s argument a step further, as he and I have done elsewhere (Lawres and Colvin 2016), to claim that the building of these features may have been an attempt at restoring balance to the Belle Glade cosmos. While it isn’t possible to test this claim, the prevalence of the theme of balance in Native American thought and religious traditions and practices (Buckley 2000; Chaudhuri and Chaudhuri 2001; Deloria 2003; Fixico 2003; Griffin-Pearce 2000; Martin 1991, 2000; Salmon 2000; Sullivan 2000; Waters 2004a; Wildcat 2005) makes this a likely scenario (see also Chapter 5).

Thompson (2015) also argues for a ceremonial function for the circular ditches, but he takes a different approach to the ceremonialism itself. Specifically, he argues that there are strong interdependencies between ceremonialism and cooperative subsistence practices in the Okeechobee, and that these interdependencies are reflected in the circular ditch constructions. What Thompson means by this is that the circular ditches were multifunctional in that, like Carr (2012a, 2012b, 2016) posits, they acted as fish impoundments while also acting as a medium for ceremonialism surrounding cooperative food procurement, or in this case food production. Furthermore, because these features were built for the purpose of food procurement
and ceremonial space, over the longer term they became both sunk-cost labor—the labor input of previous years or even generations influenced the decisions made to keep returning to, maintaining, and using these features (Janssen et al. 2002)—and landesque capital—structures requiring continued labor input for maintenance and use (Brookfield 1984). While Thompson’s argument is more nuanced than Carr’s regarding the fish impoundment function—Thompson is careful to state that the features would have been used in this manner only after flooding events—it is still problematic to argue for this particular function for those features not located adjacent to actively flowing waterways in the region such as Fisheating Creek, the Kissimmee River, or the Caloosahatchee River.

However, Thompson also argues that the communal and integrative aspects of the labor involved in the construction, maintenance, and use of the circular ditches paved the way for future monumental constructions in the region. In other words, the sunk-cost labor effects of these architectural features impacted the monumental practices of Belle Glade peoples for numerous subsequent generations. This part of his argument is worth belaboring because of the ramifications of the idea. Further, it is something that has been noted in other areas of the world (see Barrett 1999; Bradley 1998; Wallis 2008). I agree with Thompson in this assessment because there is continuity in the monumental forms, what Thompson and Pluckhahn (2012:63) refer to as a “recursiveness of form,” visible in subsequent monumental architectural forms. Thus, as Barrett (1999) has noted for some areas of Europe, the Belle Glade peoples encountered these monuments throughout the course of their daily lives and would have interpreted them according to their own cultural milieu, and those interpretations
would affect their future decisions regarding where and what type of monument to build. While the Belle Glade peoples did not continue building circular ditches, the ditches themselves did inform subsequent monumental construction practices in three primary ways. First, they continued to practice building monumental architecture. Second, they continued building this architecture in the midst of flowing water ecosystems. And third, the circular form of the ditches continued to inform later monumental forms of architecture. This latter point is significant because the ditches appear in two forms: enclosed and open-faced. It is the open-faced form that is replicated in subsequent architectural forms, and this is what Thompson and Pluckhahn (2012:63) refer to when they discuss a “recursiveness of form.”

**Belle Glade II–III Architecture**

Beginning around cal. AD 200 there was a fundamental shift in the structure of monumental building practices in the region, as well as shifts in other aspects of the material culture production in the region (Johnson 1991, 1996; Milanich 1994; Sears 1994; Thompson and Pluckhahn 2012, 2014). This change correlates with the onset of what has been referred to as the Belle Glade II period that spanned cal. AD 200–1000 (Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014; see also Sears 1994 for the original designation of cal. AD 200–600 or 800). This initial shift to the Belle Glade II period occurred approximately 300–400 years after a regional shift in environmental conditions. As discussed above, the onset of the Belle Glade I period is associated with a drastic shift to more arid conditions that transformed the landscape from being perennially aquatic to being subject to seasonal drying. Palynological data suggest that between 200–100 BC there was a shift back to long hydroperiod ecosystems throughout the watershed associated with the Roman Warm Period (Bernhardt and
Willard 2009; Lamertsma et al. 2015; Willard and Bernhardt 2011). This suggests that there was a greater amount of water flowing throughout the KOE than during the majority of the Belle Glade I period. Along with this shift came the elimination of the seasonal drying of the landscape that had become a key characteristic of the preceding period, a characteristic that has been argued to have played an integral role in the development of key ecosystems in the Everglades Trough (Bernhardt and Willard 2009; Lamertsma et al. 2015). Additionally, towards the end of the Belle Glade II period there was a decrease in the amount of water in the region. Palynological data suggest that during the period from cal. AD 700–1300, moderate hydroperiod ecosystems were dominant throughout the watershed (Willard and Bernhardt 2011).

During this temporal span the monument forms from the preceding period continued to be used, with mounds and mound groups continuing to be constructed (Johnson 1991, 1996; Sears 1994; Thompson and Pluckhahn 2012, 2014). However, it appears that the circular ditches were no longer constructed (although the evidence at Fort Center suggests the Great Circle Complex was still in use). One of the major fundamental shifts that occurred involved mortuary practices. It was during this time that the renewal of subaqueous burial practices appeared at Fort Center in the form of the construction of the mound-pond complex, the location of Fort Center’s subaqueous ossuary. Radiocarbon assays suggest that this ossuary was constructed and in use by cal. AD 180–340 (2-sigma) (Thompson and Pluckhahn 2012:59). This feature is roughly circular, has a 30 m diameter, and is encircled by mounded architecture, giving it a similar appearance to the much larger Great Circle Complex (Sears 1994; Thompson and Pluckhahn 2012, 2014). This is likely a citation (sensu Butler 1993; Jones 2001) to
the past mortuary practices involving Early and Middle Archaic charnel ponds, and coupled with the morphology of the mound-pond complex, this provides additional credence to Colvin’s (2015) and my (Lawres and Colvin 2016) argument regarding the circular ditches.

An additional shift in the monumental practice during this temporal span involved the initiation of circular-linear earthworks (Johnson 1991, 1996; Sears 1994; Thompson and Pluckhahn 2012, 2014). Johnson (1991:166–168, 1996:253) divides these into Type A (Figure 4-4a) and Type B (Figure 4-4b) forms, with the Type A form being chronologically associated with the Belle Glade II period. The Type A form is defined as:

a semi-circular embankment (although some may be ditches) with a linear embankment attached. The linear embankment terminates in a habitation mound. Another mound, usually a dense midden mound that is oblong in

Figure 4-4. Circular-linear earthworks. A) Type A circular-linear earthwork, Lakeport Earthworks (USDA 1948d); B) Type B circular-linear earthwork, Tony’s Mound (USDA 1957b).
shape, is located opposite the semi-circular embankment... [the] linear embankment... usually appears at a break in the semi-circle (Johnson 1991:166–168)

Additionally, most of the linear embankments are comprised of two distinct parallel ridges (although there are cases exhibiting only a single embankment), and many of the terminal mounds of the linear embankments have additional semi-circular embankments, and in some cases ditches, surrounding them. This contrasts with Sears’ (1994:132) statements claiming that the Type A earthwork, along with its Type B components (see below), consists of a single, wide embankment instead of two distinct parallel ridges. He states:

Using a tractor, I cut trenches across all linear earthworks on the site, long enough to include the flanking ditches, and profiled one side of each trench. The data gained from these cuts demonstrated that this linear earthwork [associated with Mound 1] and the others were indeed each a single structure and not two parallel ones. This linear mound is not and never was attached to, nor did it touch, Mound 1 at its eastern end. Nor are the cow paths forming a vague arc at the western end, perceptible on the aerial photograph, prehistoric structures at all. They are traces of paths reflecting the presence of an unusually wet spot, a fence, and bovine psychology (Sears 1994:132).

Essentially, Sears is arguing that the parallel embankments are actually single embankments, and that the parallel lines visible on historic aerial photographs are cow paths. Further, he discounts the semi-circular feature they are attached to.

These statements also conflict with a report written by John M. Longyear III of Colgate University. While Sears only pays brief homage to the work of his collaborators at Fort Center, who included Longyear and his students from Colgate University as well as Charles H. Fairbanks of the University of Florida and his students, their work was integral to data recovery at this site, even if Sears largely ignores their findings when they contradicted his own views. Longyear’s (n.d.) report of the 1966–1967 excavations
of Mound 1 and its associated linear embankments is pertinent because he explicitly discusses two embankments (which he refers to as causeways). He states:

The two parallel “causeways” associated with Mound 1 extend away from the mound, in a direction 65 degrees west of magnetic north, until they meet the semi-circular ridge mentioned earlier, some 500 feet from the mound. The “causeways” consist of clean white sand, formed into a ridge, not over 12 inches high at the present time, and 25 feet wide. On either side of the ridge are shallow borrow trenches, now filled with black sand. The distance between the two “causeways” is 125 feet, which means that the eastern ends of the ridges terminate well outside the limits of Mound 1… We were not able to determine how the “causeways” were attached to Mound 1 or if, indeed, they were attached at all (Longyear n.d.:2).

As Longyear’s statement demonstrates, he explicitly notes the presence of two distinct parallel embankments, which directly contrasts with Sears’ statements above. Goggin (1952) also notes the presence of two distinct parallel embankments at the Lakeport Earthworks site, a Type A circular-linear earthwork located several hundred meters to the northeast of Fort Center on the opposite side of Fisheating Creek. Longyear also briefly discusses the semi-circular embankment that the parallel linear embankments attach to, which also contrasts with Sears’ notion of a bovine origin for the feature. Thompson and Pluckhahn (2012:61) also note the presence of this semi-circular embankment, which they state is approximately 300 m in length, although in their map of the site (Thompson and Pluckhahn 2012:Figure 3) they label this semi-circle as a ditch rather than a raised embankment. Goggin (1952) also notes the presence of a semi-circular embankment, approximately 122 m in diameter, at the Lakeport Earthworks.

In addition to the data gleaned from Longyear’s (n.d.) and Goggin’s (1952) reports, Light Detection and Ranging (LiDAR) data from the Florida Division of Emergency Management’s (FDEM) Herbert Hoover Dyke Project (FDEM 2009)
provides additional insight into the question of whether these were single or parallel features. If Sears' (1994) assessment is correct, and the parallel appearance on historic aerial photography is a result of cattle paths, then we should not expect LiDAR data to detect the features as elevated over the adjacent ground surface. However, even given the limited height of the features discussed by Longyear (n.d.), LiDAR data clearly depicts the presence of parallel embankments (Figure 4-5).

Figure 4-5. LiDAR-derived DEM of Fort Center's Type A and B circular-linear earthwork. Note that the parallel embankments are clearly visible as two distinct rises in elevation.

This discussion shows that there are indeed several examples of Type A circular-linear earthworks exhibiting two distinct parallel embankments extending from a semi-circular embankment, even if Sears does not agree. However, there are also examples throughout the region where there is only a single embankment terminating in a conical mound (Figure 4-6). These, however, are fewer in number and they tend to be much
smaller in size. Examples include the Nicodemus Earthworks (Ambrosino et al. 2013; Carr 1975), Whitebelt #2 Earthwork Complex (Wheeler 1997), and Summer Earthworks (Carr 1976). Additionally, the midden mounds at many of these single-embankment Type A earthworks do not adhere to the oblong, ovular shape seen in the double-embankment Type A earthworks. Rather, their midden mounds tend to incorporate the semi-circular embankment into the overall midden shape, leading to a shape that resembles a chevron instead of a semi-circle. This suggests that there is an even greater amount of variability in Belle Glade monumental constructions than previously recognized, especially when Big Gopher Mound is considered because it does not fit within the Type A or B classification (see Marshall’s 1984 map in Rochelo et al. 2015:Figure 4) and provides us with yet another anomalous form of monumental architecture in the region. This variability in Type A circular-linear earthworks is not only exhibited in the presence of either single or parallel embankments but is also present in the variable lengths, widths, and heights of the embankments, as well as the basal architectural footprints of the entire earthwork complexes (Table 4-2).

These monumental constructions have been documented throughout the KOE, the majority of which are located around Lake Okeechobee; only two are documented to the north along the Kissimmee River (see Figure 4-1c). Those along this river, however, are separated from those in the Okeechobee Basin by a vast geographic distance as well as the presence of another form of monumental construction: squared and rectangular earthworks (Johnson 1991, 1994, 1996). However, the contiguity of the squared/rectangular earthworks and the Type A circular-linear earthworks is poorly understood due to a lack of field investigation. Further, the lack of investigations at
these sites precludes any definitive statements as to their temporality and to whether they are related to other Belle Glade sites at all, because their morphology is distinct from all other sites in the region. Type A earthworks are associated with Belle Glade Plain wares as well as smaller proportions of Glades decorated wares and other sand-tempered wares (Johnson 1991; Sears 1994; Thompson and Pluckhahn 2012).

Table 4-2. Known Type A circular-linear earthworks in the KOE watershed.

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<th>Name</th>
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<td>Single</td>
<td>27284.2</td>
<td>Cypress Slough</td>
</tr>
<tr>
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<td>Parallel</td>
<td>12381.18</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Candler Earthworks</td>
<td>8OS1761</td>
<td>Parallel</td>
<td>4554.32</td>
<td>Wet Prairie</td>
</tr>
<tr>
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<td>8GL9</td>
<td>Single</td>
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<td>Parallel</td>
<td>24418</td>
<td>Scrub Oak Hammock</td>
</tr>
</tbody>
</table>

Johnson (1991:173) further argues that these monumental features provided the basis for expansion into the Type B circular-linear earthworks, which began being constructed by cal. AD 1000 based on associations with St. Johns Check-Stamped and Pinellas Plain ceramics (Sears 1994:133, 136). Johnson (1991:168) defines the Type B constructions as additional linear embankments, which radiate in spoke-like form from the semi-circular embankment, added to what were originally Type A constructions (see Figure 4-4b). He further notes that the additions are distinguishable from the original Type A linear embankment because they are shorter and narrower. Unlike the strictly

² This site is unparalleled in that it consists of an oblong circular ditch (rather than a raised semi-circular embankment) with embankments on both sides of the ditch and a pair of parallel embankments, extending from the ditch, that terminate in a conical mound.
Type A form, Type B earthworks are geographically restricted to the Okeechobee Basin and the northern portion of the Everglades Trough (i.e., the sawgrass plains) (see Figure 4-6). Variants of Type A circular-linear earthworks exhibiting a single embankment rather than dual parallel embankments. A) Nicodemus Earthworks (USDA 1948b); B) Summer Earthworks (USDA 1974).

Table 4-3. Known Type B circular-linear earthworks in the KOE watershed.

<table>
<thead>
<tr>
<th>Name</th>
<th>FMSF</th>
<th>No. Embankments</th>
<th>Footprint (m²)</th>
<th>Environ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Mound City</td>
<td>8PB48</td>
<td>10</td>
<td>81884</td>
<td>Cypress Slough</td>
</tr>
<tr>
<td>Tony's Mound</td>
<td>8HN3</td>
<td>10</td>
<td>51038</td>
<td>Sawgrass Marsh</td>
</tr>
<tr>
<td>Fort Center</td>
<td>8GL13</td>
<td>5</td>
<td>54650</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>South Lake Mounds</td>
<td>8HN33</td>
<td>2</td>
<td>19324</td>
<td>Sawgrass Marsh</td>
</tr>
<tr>
<td>Hendry Earthworks</td>
<td>8HN25</td>
<td>3</td>
<td>15181</td>
<td>Sawgrass Marsh</td>
</tr>
<tr>
<td>Kissimmee Circle Earthworks</td>
<td>8GL39</td>
<td>3</td>
<td>5241</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Maple Mounds</td>
<td>8HN5</td>
<td>2</td>
<td>15321</td>
<td>Sawgrass Marsh</td>
</tr>
</tbody>
</table>

Figure 4-1d) and are typically associated with ecotonal environments between long and moderate hydroperiod environments, which are further correlated to geologic formations (Hale 1984, 1989). Much like the Type A forms that preceded them, there is a great
amount of variability in the Type B circular-linear earthworks. This variability is exhibited in slightly different ways, however. In the Type B form the greatest variability is in the overall size of the earthwork complexes (i.e., their basal architectural footprint), which is related to the number of embankments that are present and the length and width of those embankments (Table 4-3).

The shift to constructing Type B Circular-Linear earthworks occurred during the Belle Glade III period spanning cal. AD 1000–1513 (Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014; see also Sears 1994 for the original designation of cal. AD 600 or 800–1200 or 1400), which is further tied to other shifts in material culture (Milanich 1994; Sears 1994). The initiation of the Belle Glade II period is also correlated with another drastic shift in the regional environmental characteristics. Following the cal. AD 700–1000 maximum wet conditions discussed above, there was shift back to more arid conditions (Willard and Bernhardt 2011). This shift is tied to the Medieval Climate Optimum (Bernhardt and Willard 2009; Willard and Bernhardt 2011), which in the KOE watershed led to considerable changes in ecosystem composition and distribution. Palynological data suggest that these changes included a regional shift towards ecosystems with a moderate hydroperiod being dominant, and the reinstatement of a hydraulic regime characterized by seasonal drying of the landscape (Bernhardt and Willard 2009; Willard and Bernhardt 2011). This shift likely played a large role in the development of many of the tree island hammocks of the watershed, as well as increasing the extent of sawgrass marsh and sawgrass ridges in the Everglades Trough (Willard and Bernhardt 2011).
Theoretical arguments for the function of both Type A and Type B earthworks are typically discussed together due to similarities in form as well as their shared history (e.g., Type B earthworks are elaborated Type A). Much like the interpretations of the circular ditch architecture, the interpretations of the Type A and Type B circular-linear earthworks are largely functional in nature, but there are some instances of ceremonial interpretations. The earliest interpretation of the circular-linear earthworks comes from Willey (1949), who reported on the Big Mound City excavations of Matthew Stirling. While his interpretation is very limited, due to the fact that the majority of the collections recovered by Stirling in 1933–1934 have been misplaced, he notes that “This unusual site was undoubtedly of considerable ceremonial importance. The size, arrangement, and nature of the earthworks all imply that the embankments and mounds were built for ceremonial purposes and not for defense” (Willey 1949:76). He does go on, however, to note that there is a possible functionality to the architecture as well due to the hydraulic characteristics of the watershed. His interpretation does not go beyond this, however.

In contrast to Willey’s claim for a ceremonial purpose of the Type A and B earthworks, Sears (Sears 1994:137) claims that the linear embankments of these constructions acted as elongated and elevated agricultural fields, and the mounds at the terminal ends were used for habitation (Sears 1994:132–133, 137; see also Johnson 1991:168–173, 1996:253, 258; Widmer 2002:383 for agreement). Given the more recent evidence (Hale 1989; Johnson 1990, 1991; Thompson et al. 2013) disputing Sears’ agricultural claims (see above), however, this is highly unlikely. Further, there is a temporal disparity between the occupation of the terminal mounds and the proposed construction period for both the Type A and Type B circular-linear earthworks, at least at
Fort Center. Sears’ (1994:130–133) data from the excavations of terminal mounds at Fort Center (e.g., Mounds 1, 2, and 5) suggest occupations during the 16th and 17th centuries.

This brings Johnson’s (1991, 1996) chronology into question. Johnson argues that the Type A circular-linear earthworks were built between cal. AD 200–1000, and the Type B additions were made between cal. AD 1000–1513 to accommodate growing populations. This argument relies on the assumption, extrapolated from a misreading of Sears’ original data, that the terminal mounds of these embankments were inhabited during the Belle Glade III period. If that were the case, we would expect to see occupation of the Type A terminal mounds during the cal. AD 200–1000 span and the Type B terminal mounds occupied during the cal. AD 1000–1513 span. We do not see either. Rather, as just mentioned, the data suggest occupation of these features occurred post-AD 1513.

Furthermore, recent fieldwork at Fort Center, Big Mound City, and Big Gopher Mound have failed to reveal any occupational evidence from these features. This is something that other researchers have noted regarding the linear embankments and terminal mounds at several sites. Willey (1949:74–76), in his report of Stirling’s 1933-1934 excavations at Big Mound City, notes that four mounds (Mounds 3, 5, 6, and 9; Figure 4–7) associated with embankments were excavated, and of these mounds only one contained ceramic sherds (n=30). Even Mound 5, with a height of approximately 7 m and a diameter of 30 m (Willey 1949:75), is noted as being completely devoid of cultural materials. Stirling also excavated a trench into one of the embankments associated with Mound 5 (location 6a in Figure 4-7). The embankments associated with
this mound are the largest known in the watershed, with an average height of 2.75 m, and the trench, “carried down to the water level, yielded nothing” (Willey 1949:75). Willey also notes the use of different colored sediments for construction. Of the four mounds associated with linear embankments he notes that Mound 3 was built of yellow sandy sediments and Mound 9 was built of white sandy sediments; he does not mention the color of Mounds 5 and 6.

Figure 4-7. Adaptation of Stirling’s map of Big Mound City. From Lawres, Nathan R. and Matthew H. Colvin. 2017. Presenting the First Chronometric Dates from Big Mound City, Florida. *The Florida Anthropologist* 70:59-69 (Page 64, Figure 3).
Sears and Longyear also note the sterility of the embankments of Fort Center’s Type A and B earthworks, which is one of the few concordant ideas they shared. Sears states:

The trenches cut by Colgate University and my tractor provided some information on the linear earthwork abutting Mound 1 on the west side… There were no associated artifacts in or on any part of the structure. Its original height was probably 2–3 feet, judging by the quantities of wash into the ditches. It was definitely built by excavating dirt from boundary ditches and moving it toward what would be the midline of the completed structure. Ditches appear to have gone down about 2 feet from the present surface and were 20 to 30 feet wide, with their bases solidly on the yellow-brown humite that underlies the savannah… The linear earthwork [associated with Mound 2] was bisected near its midpoint by a tractor-cut trench, with one profile hand cleaned. Information acquired was about the same as that for the linear mound adjacent to Mound 1, but this mound is longer and narrower (Sears 1994:133)… The abutting linear mound [of Mound 5] was tested in two places. Colgate University ran one cut from the edge of the Mound 1 borrow ditch right across the edge of the linear earthwork. I later bisected the structure at its midpoint with one tractor cut. Except for length, the earthwork seems identical in construction, probably in original height, and in ditch width and depth to the linear earthworks related to Mounds 1 and 2. Like them, it contained no artifacts either in the areas excavated, a reasonable sample, or in surface areas exposed in various ways (Sears 1994:137).

Longyear’s (n.d.) report on the excavations of the linear embankments sheds additional light on these features and their construction as well as provides the only excavation profile for these features (Figure 4-8):

The southern parallel “causeway” of Mound 1 is a ridge of clean white sand, in no place exceeding 12 inches in height, although at one time it was probably considerably higher, before having been eroded down to ground level. The ridge tapers off abruptly at the edges, and measures 25 feet in width. Along each edge runs a shallow trench, the southern one a little deeper than that to the north, from which the sand for the ridge was probably obtained. At present, these trenches are filled with black sand and humus… The surface upon which the ridge was built appears to have been scraped clean before construction, since no humus line separates the ridge sand from the natural sand beneath. Perhaps because of this, or more probably because of the presence of the ridge itself, leaching of the sub-soil has proceeded in a differential manner, with that under the ridge being much lighter in color than that to either side… The southern parallel
“causeway of Mound 5 resembles its counterpart of Mound 1 in every way except for its width, which is only 14.5 feet. Both ridges... appear to have been built on prepared surfaces, and differential leaching has taken place under them... No artifacts were found in any of the excavations connected with the “causeways” (Longyear n.d.:5–6).

The Hendry Earthworks site is the only other site where test excavations have been placed in the linear embankments. Carr and colleagues (Carr et al. 1996) note that only one of the linear embankments (Linear Earthwork A) attached to the semi-circular embankment contained cultural materials. Three pottery sherds were recovered between two shovel tests (Carr et al. 1996:9). In contrast, Linear Earthworks B, D, and F were devoid of cultural materials. However, one of the linear embankments not attached to the semi-circle, likely associated with the Belle Glade IV period (see below), did contain 30 pottery sherds, and its associated terminal mound revealed six additional sherds (Carr et al. 1996:10). Given the paucity of cultural materials in Linear Earthwork A and the sterility of Linear Earthworks B, D, and F, it is likely that the few sherds recovered from Linear Earthwork A were incidental inclusions.

Figure 4-8. Longyear's west wall profile of excavation unit from southern parallel embankment associated with Mound 1 at Fort Center circa 1966–1967. From Longyear, John M., III. Unpublished Mound 1, Fort Center, Florida: A Preliminary Descriptive Report, Covering the Excavations by Colgate
University During the Seasons of 1966 and 1967 (Page 5, Figure 5). Courtesy Florida Museum of Natural History, used by permission.

Three other Type B circular-linear earthworks have been subject to excavations targeting their terminal mounds, and all have demonstrated that these were not used for habitation. At South Lake Mounds, Carr and Steele (1992) note that Mounds 2 and 4 were devoid of cultural materials, and that Mound 3 produced a minimal amount of pottery (n=8) (Carr and Steele 1992:7). The Ortona Earthworks site’s Type A terminal mound has also been noted to be sterile (Carr et al. 1995). Likewise, the terminal mound of Tony’s Mound’s Type A portion, referred to as Mound B in Carr and Steele’s (1994:9, Figure 3) site report, is noted to be sterile. Most of Carr and Steele’s testing was limited to the midden-mound, but they did test Mound B and conducted a surface survey of the remainder of the earthwork complex. They note that “broken pottery sherds and a flint flake were observed on the surface” of Mound C, which is located in the semi-circular embankment, and they note the presence of human remains eroding out of Mound D, which is located to the northwest of the Type B earthwork (Carr and Steele 1994:9).

This brief discussion of the paucity of evidence for habitation of the terminal mounds and linear embankments of the Type A and B circular-linear earthworks shows that, with the exception of the 16th–17th century occupation of Mound 1 at Fort Center, these architectural features were not built as living spaces as Johnson (1991, 1996), and subsequent researchers (see below) argue. Rather, habitation was limited to the midden-mounds within the confines of the semi-circular embankment. The sterility of the embankments and terminal mounds also informs many of the methods described and used in a subsequent analysis, so it is a discussion I will return to in Chapter 9.
Hale (1984:180–183, 1989:71–73) offers quite a different interpretation than Sears (1994) or Johnson (1991, 1996). He argues that the linear embankments of these constructions were purposefully aligned with the prevailing direction of water flow in order to minimize erosion and to redirect it away from the settlement area (e.g., the midden-mound). The former suggests that all of the embankments should be oriented to parallel the prevailing water flow direction while the latter suggests that the orientation of the semi-circle should be oriented so that the opening should face away from the primary flow direction. This is a logical argument given the amount of water that flowed across the landscape during the wet season. However, the variation in orientations for both Type A and Type circular-linear earthworks precludes such a generalization for the former aspect of his argument. In many cases the primary embankments of the earthworks (i.e., the Type A portion of the Type B earthworks) are oriented in such a manner, but at others they are not. Further, the smaller or secondary embankments of the Type B earthworks do not align in such a way. This is related to the overall design of the earthworks: the embankments are attached to the semi-circular embankment and thus must follow the arc of the semi-circle. Because of this design these smaller embankments cannot be aligned in the same manner as the primary, or Type A, embankment. Additionally, there are many cases where the semi-circular embankments are oriented so that the opening is directly facing the water flow direction (Figure 4-9). However, hydrological modeling suggests that his redirection argument is incorrect. Rather than redirecting water away from the midden-mound it does the opposite: it redirects it and draws it inwards into the semi-circle and thus towards the living areas.
This will be discussed in more detail in Chapters 7, 8, and 11 as this modeling was conducted to test my arguments regarding the earthworks.

Hale (1989:187–191) also provides a secondary argument regarding food production, claiming that the locations of these constructions in ecotonal zones, which coincide with the edges of geological formations bordering the persistently wet conditions of slough environments and the seasonally inundated conditions of wet

![Figure 4-9](image)

Figure 4-9. Sample of circular-linear earthwork orientations relative to primary direction of sheet flow. The red arrows denote the primary directions of water flow. A) Kissimmee Circle Earthworks (USDA 1957c); B) Tony's Mound (USDA 1957b); C) Big Mound City (USDA 1949b); D) Fort Center (bottom) and Lakeport Earthworks (top) (USDA 1948c).
prairies and sawgrass marshes, provided ideal locations for the collection of root tubers from endemic plants, such as cattails, coontie, and groundnut (Hale 1989:187–191). Given the environmental locales of these architectural features this is a very plausible argument, especially in light of the ethnohistoric data that discusses the use of root tubers for making bread around Lake Okeechobee (see Chapter 3). He also poses the possibility that the embankments were used for cultivation of tuberous plants specifically for the production of the bread discussed in historic accounts. This, however, remains an untested proposition. It should be noted that this hypothesis does have much merit and should be tested in the future, as Hale (1984:183) notes.

In contrast, Thompson and Pluckhahn (2012:63; 2014:176) claim that the Type A and Type B circular-linear earthworks are tied to changes in social relations. More specifically, they view the construction of the embankments as an act of delineating space and of separating groups of people across that delineated space. The semi-circular embankments at the base of the linear features and surrounding the terminal mounds they see as a continued citation of past practices, a “recursiveness of form” (Thompson and Pluckhahn 2012:63). In their more recent claim (2014:176) they incorporate a multifunctional view of these monuments. While refuting the agricultural interpretations, they note that the embankments acted in part to redirect water flow (cf. Hale 1984, 1989), some of the terminal mounds supported living structures (cf. Johnson 1991, 1996; Sears 1994; Widmer 2002), and the combination of the two delineated space and separated people within the community.

Their argument for the recursiveness of form is powerful. They are correct in that the circular form is recursive and continually appears in the monumental constructions.
over the course of more than two millennia. This suggests that the construction of the circular ditches informed how subsequent generations of people inhabiting the KOE watershed constructed monumental architecture as well as structured how they would have interpreted those circular ditches when they encountered them centuries after their construction (sensu Barrett 1999, Wallis 2008). This becomes an even more important point when taking paleoenvironmental data into account. As discussed above, a few hundred years prior to the initiation of the Type A circular-linear earthworks there was a shift away from the more arid conditions of the Belle Glade I period towards much wetter conditions that eliminated the seasonal drying of the landscape (Bernhardt and Willard 2009; Lamertsma et al. 2015; Willard and Bernhardt 2011). The perennial inundation of the landscape would have prevented the ability to successfully continue building the circular ditches. Yet the Belle Glade peoples wanted to continue building circular architectural features so they shifted the form of their constructions from one of creating negative space in the ground surface (i.e., digging into the ground surface) (sensu Colvin 2015) to one of creating elevated circular forms that would have risen above the regional water levels, even if only slightly. Thus, the shifting environmental conditions also helped to direct monumental practices in the region. The power of the circular form continued to inform monumental practices even after the environment shifted back to more arid conditions that brought about the return of the seasonal drying of the landscape after AD 1000 (Bernhardt and Willard 2009; Willard and Bernhardt 2011).

However, their argument regarding the separation of people and the delineation of space is problematic because there is no evidence in the Okeechobee Basin that
suggests social distinctions existed prior to the historic period. This was something noted by Sears (1994:197), who says “[a]ll of the inhabitants of Fort Center during the time of this ceremonial center episode constituted a single social class that had sacred status.” This particular argument is based on shifts in exotic goods deposition and habitation locales at the Fort Center site, where, during the Belle Glade II period that is associated with the Type A earthworks, habitation shifts away from the midden along Fisheating Creek to the ceremonial area centered on the mound-pond complex that is rife with mortuary ceremonialism. Prior to this period there is no differentiation in the deposition of exotic goods between habitation areas and this depositional pattern follows suit with the shift in residential area to the mound-pond complex. In other words, exotic goods were equally accessible to all residents of the site and are found in all residential areas. Thus, Thompson and Pluckhahn’s (2012, 2014) argument regarding separating people across space based on social distinctions does not hold up well when compared to direct evidence that might speak to social distinction in the first place.

In a more recent paper, Thompson (2015) backtracks on his position regarding the separation of people across space. Instead, he argues that the earthworks were a medium for social integration at both the community and regional scales. He claims this began with the initiation of circular ditch construction during the Belle Glade I period, but it became increasingly important through time, eventually becoming a staple integrative ritual practice of earthwork construction. His argument, like the one above for circular ditches, stems from the ideas of sunk-cost labor effects and landesque capital, which formed the basis for the continual input of labor in building and maintaining these architectural features. This communal labor reinforced social cohesion at the community
level while at the regional scale he argues that the “extensive canal networks” (Thompson 2015:328) acted to integrate the multiple communities distributed throughout the watershed.

In contrast to this statement there are only two known canals in the KOE, and they are both located at the Ortona Earthworks site. All of the other known prehistoric canals in South Florida are located in the Calusa area along the Southwest Florida Gulf Coast. Furthermore, because of the hydrologic characteristics of the KOE watershed, canals would not have been needed for canoe travel for 9–10 months of the year because of the interconnectivity of waterflow across the landscape. Thus, the canals would have helped to integrate the inhabitants of the Ortona site into the broader watershed because of its dissimilar environmental context (an upland scrub oak hammock, Carr et al. 1995) that separated it from the regional water flow. In contrast to Thompson (2015), I would argue that the similarity in shape and form of the architecture, along with the data presented in Chapter 8, helped to integrate the many communities dwelling within the Okeechobee Basin instead of the canals. Further, the extensive canal systems that Thompson (2015) seems to be referring to are associated with the Calusa. These would have aided travel into the interior and thus facilitating interactions between the Calusa and Belle Glade peoples while also integrating households at the community level among Calusa populations (Carr et al. 1995; Luer 1989a, 1989b, 1998; Luer and Wheeler 1997; Marquardt 2014; Thompson et al. 2014; Wheeler 1995). Thus, the canal systems he refers to would have aided interregional integration rather than just at the scale of the KOE watershed.
Overall, Thompson provides an explanation for how monumental practices were beneficial—Thompson’s overall argument is that it aided in long-term resilience of the regional population against environmental perturbations—but it fails to go beyond this. It focuses entirely on the ritual practice, albeit an important one, of construction and not delving in to why the monuments took forms different than most in North America or why they were emplaced in the locations they were. In other words, it fails to elucidate the underlying structures that inform monumentality.

The final interpretation of the circular-linear earthworks is from Carr and colleagues (Carr et al. 1995), who offer a much different possibility for the Type A and Type B earthworks. They argue that the circular-linear earthworks were likely multifunctional and were incorporated into both ritual and domestic activities. However, in a very brief musing, Carr and colleagues (Carr et al. 1995:258) suggest the possibility that these earthworks might be shown to align with celestial bodies. While they did not pursue this avenue, they note the linear embankments of Ortona’s Type B earthwork component extend along a general east-west axis. This would accord well with the equinoctial azimuth of solar rise/set. As will be shown below this is more than just a possibility; celestial alignments are present at the majority of the Type B circular-linear earthworks.

**Belle Glade IV Architecture**

The Belle Glade IV period, which spanned cal. AD 1513–1763 (Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014; see also Sears 1994 for the original designation of AD 1200/1400–1763) is associated with dramatic changes, both environmental and sociocultural, in the region. Climatically, this period is associated with the middle portion of the Little Ice Age, which spans AD 1200/1300–1850 and is
associated with cooler temperatures and lowered sea levels globally, and more specifically with a colder sub-episode that spanned 1500–1650 (Haeberli and Holzhauser 2003; Walker 2013). However, the Little Ice Age is better characterized as a period of annual temperature variability than strictly as a period of cooling. As Mann (2002:1) notes: “The Little Ice Age may have been more significant in terms of increased variability of the climate, rather than changes in the average climate itself.” Furthermore, this variability isn’t related to just temperatures, but to regions and timing as well (Mann 2002; Mann et al. 2009). While the effects of this cooling vary from region to region, the paleoenvironmental data from the KOE watershed suggest a shift back to wetter conditions along with associated ecosystem shifts towards longer hydroperiods by approximately AD 1300 (Bernhardt and Willard 2009; Willard and Bernhardt 2011). Along with this shift towards a regional ecosystem with greater hydroperiod lengths there was a proportional increase in pollen indicative of moderate hydroperiod taxa as well as an increase in taxa associated with tree island hammocks (Willard and Bernhardt 2011:73). This suggests that the regional palynological data support the notion of the Little Ice Age being characterized more by annual variability than as a period of cooling (Lammertsma et al. 2015).

Alongside these environmental shifts there were several drastic social events that forever changed the region during this period. The first was the arrival of the Spanish with Juan Ponce de Leon’s entrada in 1513 (Davis 1935), which heralded the influx of a string of subsequent military entradas into Florida and the Southeast. It is likely the arrival of the Spanish and their military power had effects on local geopolitics, such as the increase of Calusa sociopolitical complexity and the associated expansion
of their political power and control into the interior which would have had dramatic effects on the Belle Glade peoples and their way of life (Marquardt 2014).

A second drastic event involved the microbiota introduced by the Europeans. It has long been known that epidemics of smallpox, yellow fever, and the like caused untold decimation throughout the Americas. The toll on South Florida’s populations is unknown, but given the small population of the KOE watershed (see Chapter 3), it is possible that any of these epidemics would have devastated the already small communities of the region. However, Kelton (2002, 2007) has convincingly argued that the true epidemics did not occur until much later than previously thought, possibly not until the beginning of the 18th century. The third, and most drastic, of the social events was brought about by the Indian Slave Trade of the 17th and early 18th centuries. In South Florida the Indian Slave Trade took its greatest toll following the destruction of the Apalachee mission system in 1704–1706 (Worth 2009, 2013). The fall of the mission system literally opened the doors to waves of British-aided Creek and Yamassee bands of warriors with the sole intent to enslave as many Native peoples as possible for sale in Charleston. The decimation of the South Florida populations—including Calusa, Mayaimi, Tequesta, and more—was brutal and swift, forcing bands of refugees to flee to Cuba in 1711 (Worth 2009, 2013). It is likely that remnant populations of Belle Glade peoples still inhabited the watershed afterwards and were incorporated into Seminole communities during the 19th century (Lawres 2014).

However, prior to this depopulation of the KOE watershed there were shifts in Belle Glade culture, many of which are related to the presence of the Spanish in peninsular Florida. In terms of monumental architecture, linear embankments
terminating in mounds, and not associated with semi-circular embankments, were constructed (Johnson 1991, 1996; Sears 1994; Thompson and Pluckhahn 2012, 2014). Several cases of this form of embankment have been documented without the presence of a terminal mound (e.g. Highlands Linear Ridges), but these are typically further north in the Kissimmee River Basin, much like the squared and rectangular earthworks (Johnson 1991, 1994, 1996). Sears (Sears 1994:137) includes these features in his interpretation of raised field agriculture. No other interpretations have been put forth thus far. These monuments, along with others still in use during this period, are associated with Belle Glade plain wares as well as artifacts manufactured from Spanish metals such as gold, iron, smelted copper, and silver (Johnson 1991, 1996; Sears 1994:144).

Many of these artifacts represent foreign sources reworked into forms that denote the cosmology of the KOE peoples, the most well-known being the South Florida ceremonial tablets (see Allerton et al. 1984). Further, these historic exotic goods provide the first definitive evidence for social distinction in the KOE. An overwhelming majority of the currently known ceremonial tablets were recovered from mortuary contexts and were definitively associated with single interments within mortuary populations (Allerton et al. 1984; Austin and Mitchell 1998; Lee 1998; Luer 1985, 1994, 2000, 2010; Sears 1994:66–67, 190, 200; Willey 1949:22, 113–114). This stands in direct contrast to the mortuary data associated with earlier temporal periods (see Chapter 3). What this all suggests is that there were drastic transformations in Belle Glade culture during the Belle Glade IV period.
Summary

This review shows that there is a long history of monumentality in the KOE, spanning from cal. 800 BC (possibly earlier) through at least the early 18th century (Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014). It also highlights the variability in the materializations of monumental practice in the region while also emphasizing the variability in archaeological thought that has been applied to Belle Glade monumentality. When examining this variability through time it is evident that the transformations in monumental practice involve both environmental and cultural drivers, but it is also evident that there is a strong persistence in certain characteristics of Belle Glade monumentality, such as the circular form that appears consistently over the course of more than two millennia.

As demonstrated in this brief review, many of the previous interpretations have focused narrowly on functional economic explanations for the architecture, and these have failed to stand the test of time and additional archaeological investigation. Further, all of the previous interpretations have relied almost exclusively on data from Sears’ (1994) excavations at Fort Center, or in the case of Thompson (2015) and Thompson and Pluckhahn (2012, 2014) on a combination of Sears’ data and that recovered during excavations led by Thompson and his colleagues in 2010 (Thompson et al. 2012). This is problematic because extrapolating these data to the entire region masks intersite variability at the regional scale. Further, none of these interpretations have touched on the true complexity of the monumental architecture of the region. This is because monumental practices are informed by underlying structures, and the theoretical perspectives applied to these previous interpretations do not elucidate, nor do they attempt to do so, these underlying structures. A close attempt comes from Thompson
(2015) when he argues that these practices of ritual monumental construction build off the structures of practice from previous generations. As discussed above, however, this focuses simply on the practice of constructing monuments rather than explicating the underlying structure that informs the practice itself. A much closer attempt is from Thompson and Pluckhahn (2012) in their argument for a recursiveness of form. As discussed above this suggests the power of the circular form has persistence through time in that it continued to inform the structure of monumental practices in the region for more than two millennia until circular forms all but disappear in the Belle Glade IV period. I argue that a more robust framework for elucidating the reasons for such a persistence, as well as the underlying structures that inform monumentality, stems from the ontological turn, which I discuss in Chapter 5.
As Chapter 4 shows, traditional archaeological perspectives have not been successful in explaining Belle Glade monumentality. Many of these interpretations have focused narrowly on functional and economic explanations of Belle Glade architecture, with several ritual or ceremonial interpretations as well. However, there are flaws in each of the interpretations. Several of these flaws, such as those found in Johnson (1991, 1996) and Thompson and Pluckhahn (2012, 2014), have their basis in misreadings of earlier datasets, while other flaws are due to the extrapolation of data from a single site to an entire region (see Carr 2012a, 2012b, 2016; Johnson 1991, 1996; Thompson and Pluckhahn 2012, 2014) or from outdated datasets (see Hale 1984, 1989) and more rigorous testing and new data (see Sears 1994 for original interpretation, see Hale 1989; Johnson 1990, 1991; Thompson et al. 2013 for critiques and new analyses).

Here I provide an alternative framework from which to view the Belle Glade monumental architecture that is more conducive to understanding why the architecture exhibits such dissimilarity in comparison to the majority of the Native North American architecture. I begin by presenting a basic outline of the ontological turn, which provides the alternative framework. Following this, I present and engage with the major criticisms of the ontological turn in order to establish a guiding framework to circumvent the pitfalls identified by the critics of the ontological turn. With this framework in mind, I discuss the core aspects of Native American ontologies to establish a foundation for the Belle Glade ontology.
The Ontological Turn in Anthropology

Over the past two and a half decades the discipline of anthropology, along with the other social sciences, has borne witness to what is now referred to as “the ontological turn” (Alberti 2016; Alberti and Bray 2009; Alberti et al. 2011; Charbonnier et al. 2017; Graeber 2015; Holbraad and Pederson 2017; Kelly 2014; Kohn 2015; Palaček and Risjord 2012; Sivado 2015; Swenson 2015; Vigh and Sausdal 2014). This dramatic turn has been a call to arms to shift the mode inquiry of anthropological research from strictly observable behaviors to an entirely different mode focused more on cross-cultural metaphysical understandings of reality (Charbonnier et al. 2017). The origins of the ontological turn are closely associated with the work of Bruno Latour (1993), Eduardo Viveiros de Castro (1998), and Philippe Descola (2013[2005]), all of whom argue that a shift in anthropological thought is necessary because of its inherent ties to the modernist substance ontology of Cartesian thought: the understanding of mind versus matter (Alberti 2016; Charbonnier et al. 2016; Kohn 2015). This has led to the dissolution of Cartesian dichotomies that underlie Western thought, such as Nature/Culture, Primitive/Modern, Subject/Object, Mind/Matter, Humans/Animals, and many others within this new line of research. However, as Kohn (2015) notes, this turn towards ontologies is part of a broader movement and is not just associated with the work of Latour, Viveiros de Castro, and Descola, but it is rather a reaction to the global ecological crisis and the inability of anthropology’s conceptual tools to address such a problem. Essentially, the many scholars that have participated in this shift realize that there is a need to reconfigure how we conceptualize “the relations humans have to that which is other than human” (Kohn 2015:312).
The ontological turn has been primarily methodological in that it has shifted the kinds of questions being asked, but it also has a theoretical aspect in that the questions that are being asked are ontological in nature (Holbraad and Pederson 2017:5). Henare and colleagues (Henare et al. 2007), in a seminal volume in the ontological turn, claim that it is also a shift in how material things are treated in analysis. Rather than encountering things in the field and then analyzing them in a traditional laboratory setting using traditional techniques, the aim is to encounter things and engage them as they are presented. “[T]he aim of this method is to take ‘things’ encountered in the field as they present themselves, rather than immediately assuming that they signify, represent, or stand for something else” (Henare et al. 2007:2). Doing this requires shifting our mode of inquiry to ask questions rooted in ontological inquiry, which requires jettisoning our preconceived notions of what things are and shifting our questions towards those regarding what exists, what might exist, and how (Holdbraad and Pederson 2017). For instance, shifting our questions to include such things as ‘what is a person?’ and ‘what constitutes personhood’ is a way to cast aside our presuppositions about what it is to be human and consider the concepts that other cultural groups hold to be constitutive of a reality.

Asking such questions brings a whole new light to anthropological research because it allows us to consider the actual concepts used by non-Western groups. This is a major concern of the ontological turn: using theoretical frameworks, philosophies, and methodologies that allow for alternative ontologies to come to the fore in the interpretive process (Alberti and Bray 2009; Alberti et al. 2011; Carrithers et al. 2010; Harrison-Buck 2012; Kelly 2014; Palaček and Risjord 2012; Sivado 2015; Vigh and
One of the major aspects of this new line of research has been focused on dissolving the Cartesian dichotomies that prevail in the Western scientific worldview. The point of dissolving such dichotomies has been to emphasize the fact that people associated with cultural groups outside of Western society do not view the world in terms of dichotomous divides, or more accurately, they do not understand the world in such terms.

This latter point is especially salient because the primary focus of this new line of research has been on the ontologies themselves. Ontologies are defined as the understandings of a reality or lived world and how that world or reality exists (Graeber 2015:15). More specifically, ontology refers to

a discourse (*logos*) about the nature of being (or alternately, about its essence, or about being as such, or in itself, or about the basic building blocks of reality... the only really important word at this initial juncture is “about”) (Graeber 2015:15, emphasis original).

This discourse about reality includes not only human constructed worlds but also other worlds (Kohn 2015:312). At first glance this may seem like a new way to discuss worldviews, but it is something distinctive. According to Henare and colleagues (Henare et al. 2007:10–12), worldviews are representations. Moreover, they are anthropological renderings of how others represent their beliefs about how to live in a world. This means that they are interpretations of those beliefs through our lens of reality.

In contrast, ontologies are the actual cognized understandings of the world, and it is imperative for us to acknowledge that there is not a single understanding of the world but rather a great variability in understandings. There is not even a single world, but an endless possibility of multiple worlds existing side-by-side and comingling with one another (Hanks and Severi 2014), because every cultural group has the potential to
understand a reality or cognized world that exists as something fundamentally different from the realities understood by others (Marquardt 1992b:109; Marquardt and Crumley 1987:6). This is variability in cognized realities, and the existence of these multiple realities, is known as ontological pluralism (Charbonnier et al. 2017; Descola 2017).

Being that ontological anthropology deals with subject matter that is largely mental—that is, it deals with concepts (Kohn 2015)—the origin of the turn is found in cultural anthropology and its ethnographic methodology. However, the ontological turn has found purchase in archaeological studies as well. Much like their ethnographer counterparts, the archaeologists employing ontological frameworks in their studies have diverged into several broad categories of approaches: metaphysical, archaeology of social ontologies, and critical ontology (Alberti 2016; see also Kohn 2015 for the metaphysical vs. ontological approaches in cultural anthropology).

The metaphysical approach to the archaeology of ontologies draws influence from the work of Latour (1993, 2005, 2013) but also has antecedents in Heidegerrian or phenomenological archaeology (Alberti 2016). This approach has the dual concern of expanding the content of what is included in definitions of “the social” and questioning the nature of matter in a manner aimed at reformulating the discipline of archaeology (Alberti 2016:165). With these concerns there is a strong opposition to the Cartesian substance ontology (i.e., the Cartesian dualism) that predicates Western science, and Western society more generally. In eschewing this substance ontology there is a focus on alternative ways of understanding reality. This results in an emphasis on relationality or a relational metaphysic, which is found in Latour’s (2005) ANT Network, Ingold’s (2006:13, 2007:80, 2011:69–71; 2013a:132–133, 2013b, 2015:82) Meshwork, and
Barad’s (2007) entanglement (which is distinct from Hodder’s 2011, 2012, 2014 concept of entanglement). Within this framework, the various categories of being or existence become contingent upon their relations, not just with humans but with other things in the world as well.

The archaeology of social ontologies approach is a contrast to the metaphysical approach. Rather than attempting to overhaul the discipline of archaeology on a metaphysical level, this approach uses an ontological framework in the interpretive process (Alberti 2016). This can involve interpreting or reinterpreting a site or assemblage in terms of alternative ontologies or it can involve reconstructing past ontologies (i.e., ontography). Alberti (2016:169) describes this approach as being:

characterized by an extension of the meaning of the social; reconstruction of past ontologies; and the use of anthropological case material as an analogical tool or relational ally. Such work is additive rather than reconstructive, including ontology as a new interpretive tool, and as such can be seen as a continuation of social archaeology.

One of the key features of this approach is the use of ethnographic and ethnohistoric literature as ethnographic analogy upon which to base interpretations. It is in this branch of approaches that the “new animism”—anthropological studies that have brought the animism concept back, allowing for the animacy and agency of other-than-human persons—is found (Alberti 2016).

The critical ontology approach is a blending of the two discussed above. Like the metaphysical approach, it attempts to overhaul the discipline on a metaphysical and ontological level, but it attempts to do so by using indigenous theory (Alberti 2016:164). However, while the social ontologists use indigenous concepts as the basis for ethnographic analogies, critical ontologists use these concepts as the source for new
theories (Alberti 2016:171). A prime example is found in the work of Fowles (2013). In a complex study of Tewa peoples, Fowles uses ethnographic information (both pre-existing and new data he collected) to develop and outline the concept of “doings.” He argues that the concept of religion does not fit with Native American concepts of the cosmos. Drawing on the philosophical literature of Vine Deloria, he claims the focus should instead be on the doings, the actions that are used to maintain the cosmos in various ways. He argues that this should be applied in other areas of North America so that our approach to the practices that are traditionally conceptualized as religious within Western society are understood in terms closer to that of Native American communities.

While Alberti (2016) discusses the existence of these three overarching branches of the archaeology of ontologies, the predominant concept in the archaeological and anthropological literature is that of relational ontologies (see, for example, Abram and Lien 2011; Angelo 2014; Bird-David 1999, 2006; Cooper 2011; Descola 2013; Harrison-Buck 2012; Herva et al. 2010; Hornborg 2006; Ingold 2000, 2006, 2011, 2015; Lepri 2006; Pauketat 2013; Watts, ed., 2013), most of which falls within the social ontology approach. Relational ontologies are described as adhering to a process metaphysic that views the world itself as perpetually in a state of becoming (Ingold 2006:10, 2011:68), with existence brought about through a field of mutually constitutive relations (Bird-David 2006; Harrison-Buck 2012; Ingold 2000, 2006, 2011; Skousen and Buchanan 2015; Watts 2013). This field of relations is the result of the pathways of life that all entities take (Ingold 2006, 2011). These pathways connote movement, which is central to life. Indeed, the world itself is in constant motion, always in a state of fluidity, with
entities constantly moving within and through the world along their pathways, which intersect and weave around the pathways of other entities, ultimately creating relations. The sum of these relations is known as the meshworks (Ingold 2006:13, 2007:80, 2011:69–71; 2013a:132–133, 2013b, 2015:82), bundles of relations (Ingold 2013b:248; Pauketat 2013), or “networks of interactive agencies” (Harrison-Buck 2012:73) that constitute existence. As I describe below, however, there are issues with this being the dominant concept.

Engaging the Criticisms of the Ontological Turn

As I have discussed elsewhere (Lawres 2017), it is important to note that the ontological approach in anthropology has been criticized in recent years for several reasons (Bessire and Bond 2014; Descola 2014; Fischer 2014; Graeber 2015; Leclud 2014; Ramos 2012; Swenson 2015; van Oyen 2016). It is imperative that we engage with these critiques to find ways to bring this approach forward rather than ignoring them (Bessire and Bond 2014). In this section I summarize some of the major critiques and offer rebuttals.

The most cogent of the critiques of the ontological turn argues that the focus on alternative ontologies and the associated dissolution of Cartesian dichotomies (i.e., Nature vs. Culture) has the effect of shifting the focus of political agendas in order to redefine who and what is worthy of protecting from modernization and eradication (Bessire and Bond 2014:442; see also Graeber 2015:31–34). In other words, the claim is that this is a political move on the part of anthropologists to save what they deem worthy of saving, whether that be people, plants, animals, land, or something else entirely. Bessire and Bond (2014) and Graeber (2015) argue this is a dangerous move on the part of anthropologists, and I wholeheartedly agree. However, Bessire and Bond
(2014:442–445; see also Ramos 2012) claim that this has a secondary effect of reifying the dichotomy of modern-nonmodern peoples based on the worlds they inhabit.

However, this is a critique that stems from the abandonment of colonialist frameworks of early anthropologists such as E.B. Tylor (1871) that viewed animism as a primitive retention from earlier times (Harrison-Buck 2012; VanPool and Newsome 2012). Rather than viewing alternative ontologies in general as a trademark of primitiveness, as Bessire and Bond (2014) are suggesting is the case, we should simply view them from the standpoint of difference and alterity. After all, alterity forms the core of the anthropological project. Being that this is at anthropological core, their argument can be construed to be one claiming anthropology should not be done at all, since it is a discipline focused on documenting and comparing similarity and difference. From this standpoint then, all of anthropology reifies the modern-nonmodern dichotomy, especially when viewed in light of the fact that the majority of anthropologists are part of the Western Academy studying people who are already marginalized.

Further, the non-Western ontologies are not primitive in the least, but rather are based on highly astute observations of a lived world or reality. Even though these observations and understandings do not stem from the epistemology of Western Science, many of them have been coming to light in various scientific disciplines for several decades now. For instance, the relationality inherent in the relational ontologies discussed in a vast amount of the literature is (see, for example, Abram and Lien 2011; Angelo 2014; Bird-David 1999, 2006; Cooper 2011; Descola 2013; Harrison-Buck 2012; Herva et al. 2010; Hornborg 2006; Ingold 2000, 2006, 2011; Lepri 2006; Pauketat 2013; Watts 2013), for the most part, replicated in the relational order theories of physics,
chaos theory, and ecology (to name but a few examples). If the complexity of these understandings of Indigenous peoples is seen as primitive, then why would such principles be found in the arguments and understandings of multiple disciplines of Western Science?

What is at issue here, according to the logic of Bessire and Bond, is not the alternative ontologies themselves, but rather the methods used in gaining the knowledge they are based on (i.e., the scientific method is not used). In other words, this is something that stems from Western-centric worldview, where the ways of Western Science are seen as the only way to properly study the world around us. This, in itself, is rooted in the Cartesian dualism the Ontological Turn seeks to dissolve. This is an inherent issue in anthropology. Many anthropologists have relegated what should be ontological questions regarding the cultural groups they are studying into epistemological questions, thus making “other peoples’ ontological commitments appear trivial or wrong” (Alberti 2016:165).

What I mean by this is that when anthropologists are told by Natives that an object is something, such as power or spirit or something else intangible or otherwise spiritual, those explanations are not taken seriously (Graeber 2015; Henare et al. 2007). In a discussion of this issue, Henare and colleagues discuss ache:

a particular kind of powder Cuban diviners use during their séances. This powder, the diviners say, constitutes their divinatory power. Now, if one were to take this powder as a ‘thing’ in the analytic sense, the ethnographer would have to devise a connection between two distinct entities (powder and power), only one of which appears as ‘obviously’ thing-like, according to their preconceived notion of ‘things’. The task then becomes one of interpretation—explaining to those who have not encountered such a ‘thing’ before how it can be considered powerful (given that the ‘things’ we know do not exercise power in and of themselves) and how power itself may be considered a (powdery) thing—
a strategy which not only presumes the reader’s familiarity with the concepts being deployed, but insists upon their authority as an accurate account of reality. ‘They’ believe the powder is power, ‘we’ know that this belief derives from a peculiar cultural logic in which powerful powder makes sense. What remains undeveloped (or even precluded) in this scheme are the theoretical possibilities afford by powerful powder itself (Henare et al. 2007:5)

Essentially, what they are describing here is the problem of using interpretation rather than taking what cultural consultants say seriously. This is a problem because it inherently says that their understanding of reality is not true, it needs to be interpreted through the lens of Western Science. This acts to trivialize alternative ontologies simply because they are not formed through the same “prestigious” epistemology of Western Science. The fact that more anthropologists do not recognize the inherent dilemma in this is problematic. It highlights the colonial roots of our discipline, and as anthropologists we need to recognize this and work towards not eschewing not only other forms of knowledge but the multitude of different ways of going about studying the worlds we dwell within. A first step towards this would be to recognize the validity of the non-Western sciences.

However, in order to avoid trivializing such alternative ontologies, and their related epistemologies, we do need to take great care in not painting a picture of primitivity out of difference. We need to move past this criticism by acknowledging the complexity inherent in such alternative ways of understanding a reality as well as the ways of studying and learning about those realities. After all, anthropology has always been a strong promoter of cultural relativism, and learning in all its forms is a part of culture, is it not?
Another criticism is found in the work of Van Oyen (2016), who points out that the recent spate of archaeological literature on relationality and adhering to relational frameworks, much of which stems from the ontological turn, has become so prevalent that it borders on the brink of triviality. While this may be true in some respects, I argue there is still a great utility in evaluating the archaeological record in terms of relationality and alternative ontologies, more broadly.

By examining the ontological understandings of a world, the effects those understandings have on cultural practices can be brought to the foreground. Indeed, an ontological perspective is an important component of garnering a fundamental understanding of not only how and why certain cultural practices are performed, but how culture and its myriad associated practices are constituted because ontology, culture, and practice/performance are in mutually constitutive relations. This is because ontologies provide a cognized understanding of a world while culture feeds off that understanding to provide the norms, rules, sociohistorical structures, and socially accepted practices for interacting with and within that cognized world (Feibleman 1951). In other words, culture can be recognized as a form of applied ontology (Feibleman 1951) or a translation of ontology (Hanks and Severi 2014) wherein those appropriate ways of interacting with and within that reality are drawn from the knowledge and understanding of how that reality exists. Yet, culture itself reinforces ontological understandings through the translation of ontology into cosmologies that bridge understandings to beliefs and their actualization (Halbmeyer 2012), by providing those rules for appropriate interaction with and within that world, and by providing the
meanings associated with components of that world (Hanks 2014; Hanks and Severi 2014).

The concept of translation is especially pertinent because it is central to culture. As Hanks and Severi (2014:8) note: “Words are translated into images, music into words, and gestures into objects.” Yet, even as these various aspects of culture are translated, the actuation of these translations through the performativity of practices continually recreates and structures (sensu Giddens 1986) how the world within which they are performed is understood and cognized. This is because practices are expressions not only of culture, but of the ontologies that provide the framework for culture (Abram and Lien 2011; Angelo 2014; Cooper 2011; Zedeño 2013). Thus, there is a mutually constitutive relationship between ontology, culture, practice, and performance. As such, studying ontologies can be an important component of anthropological discourse because it can aid in our understandings of the underlying structures that affect culture and its associated practices.

For this reason, understanding ontologies and the ways they are materialized is pertinent to understanding behaviors and practices, especially when they are related to cosmologies, religions, and symbolism (VanPool and Newsome 2012:259), and in cases where those practices might seem out of place otherwise. Yet, in the case of relational ontologies, we have to heed van Oyen’s (2016) warning and be careful not to see relations just because we are looking for them. Instead, we should be evaluating how those relations, and their associated ontologies, affect historical practices.

Another major criticism of the ontological approach has been leveled at the ability of anthropologists—because of their own ontologies—to actually understand alternative
ontologies (Bessire and Bond 2014; Graeber 2015; Ramos 2012). This is an apt
criticism that is most cogently brought forth by Graeber (2015), who notes (correctly)
that it is impossible for any one person to fully comprehend a reality. Rather, each
person will have a grasp of some portion of it. This is why there are so many different
scientific disciplines, each one devoted to understanding a portion of the reality of our
contemporary world, and each one having a range of specialists devoted to furthering
our understanding of a single component of that world. Cultural knowledge is similarly
fragmented and distributed, which leads to different specialists within a cultural group
(i.e., a religious specialist, a political authority, a hunter, etc.). It is the combined
knowledge of multiple group members that bring one closer to a comprehensive
understanding, whether it be a culture or an ontology. Thus, I agree that it is impossible
for an anthropologist to fully understand an ontology alternative to their own. However,
as discussed above, because of the relationship between ontology, culture, and practice
it is a fruitful endeavor to attempt garnering an understanding of whatever bits and
pieces of an ontology we can so that we can have a better understanding of how those
ontological fragments may have affected the practices and behaviors that are
materialized in the archaeological record.

The fact that a person cannot fully comprehend her/his own ontology, let alone
an alternative ontology, has also led to the neglect of ontological variability within
regions and, ultimately, to over-generalizations of ontologies (Alberti et al. 2011; Bessire
and Bond 2014; Graeber 2015; Harrison-Buck 2012; Ramos 2012; Swenson 2015).
This is highly problematic because each cultural group has the potential to understand
their reality as fundamentally different from the realities of others (Marquardt 1992b:109;
Marquardt and Crumley 1987:6). By heedlessly attributing a particular form of ontology, or a generalized ontological form (i.e., relational ontology), to an entire region can mask the presence of any variability that could very well be the key to answering important questions (Graeber 2015; Hanks and Severi 2014).

The last major critique I will address comes from the work of Swenson (2015), whose critique is sobering because while he is a critic of the ontological turn, he is also a strong supporter of it. He cautions readers that there is often a divorcing from contexts—historical, social, and political—in ontological studies and argues that ontologies are historically specific products of negotiation whose interpretation should be bridged with multiple pertinent contexts (Swenson 2015:679).

The second major aspect of Swenson’s critique is that he cautions against the danger of jumping straight to an ontological explanation for material phenomena in the archaeological record. Instead, he makes the claim that ontological studies should be used as supplements to more traditional archaeological inquiries. There are many aspects of being human, and consequently of the archaeological record, that don’t equate directly to ontologies, so it is necessary to explore these other inquiries to explicate the nature of being human in a dynamic world.

I agree with both of Swenson’s major critiques. There is a strong need to ensure that the ontologies in question are properly contextualized, and more than that, we need to analyze the contexts themselves to even begin identifying a past ontology. Further, ontological explanations should be used in conjunction with other archaeological studies.
Developing an Ontological Framework

All of these issues make it necessary to develop a theoretical framework and methodology that circumvents the pitfalls identified by critics of the ontological turn (Lawres 2017). This framework must do several things. First, it must emphasize the complexity of the ontology in question. As Bessire and Bond’s (2014) critique shows, there is an inherent—and problematic—association between alterity and primitivity, which can be extended to include the association between primitivity and simplicity.

Second, and closely related, the framework must avoid attributing a generalized ontological form to a cultural group. Overly generalized concepts like that of relational ontologies have a strong tendency to mask variation because they are applied wholesale to large regions. This has the same effect as applying a singular cultural attribution to an entire region. Further, such overgeneralized concepts mask complexity by focusing on only one variable of the ontology. By drawing on existing evidence, it is possible to elucidate further aspects of the ontology in question. In other words, I am arguing that there is more to relational ontologies than simply relationality, and it is up to us to identify other aspects of them to unmask variability and to emphasize the complexity of ontologies.

Third, we must acknowledge that it is impossible for us to comprehend the totality of the ontology in question. Rather, we need to remember that we will only understand fragments of it. As discussed above, it is impossible for us to fully comprehend our own ontology, so we should not expect to understand the totality of another ontology, no matter how much we study it and analyze it. Yet, through study and analysis we can expound multiple fragments of it. These fragments are what will form the basis of showing the variability between the ontologies of multiple cultural groups.
Fourth, we must concede that identifying and/or classifying the ontology of a group is not enough. Rather, we must examine the effects an ontology has on the historical practices that are materialized in the archaeological record. This, however, must be done cautiously. As Swenson (2015) warns, neither the ontology nor the historical practices should be divorced from their proper contexts. Further, as I note above, alternative explanations for those historical practices need to be explored before applying an ontological framework to ensure that it is the best fit.

Many other studies of this nature incorporate ethnographic data from descendant populations to identify and establish an ontological type, which is almost unanimously considered a “relational ontology” in the literature. However, in the study area for this research there is a lack of descendant populations to work with, and thus a dearth of ethnohistoric and ethnographic data to draw from in order to establish foundational aspects of a Belle Glade ontology.

In the absence of such data, I draw on the philosophical literature of numerous contemporary Native American groups in order to identify themes and concepts that cross-cut cultural boundaries and are pervasive in Native thought. While there is not a singular Native American ontology, the presence of persistent themes suggests that some aspects of the ontology of the source populations from south-central or Southeastern Siberia (Pitblado 2011) survived the many generations of cultural transmission and the effects of European colonization (Sanger 2015:57). This is important because this study is an attempt at evaluating the ontology of a cultural group without a known, living descendant population. Thus, drawing from the persistent and consistent themes from the ontologies of multiple cultural groups, all with common
ancestral roots in a source population, increases the likelihood of reconstructing part of the Belle Glade ontology. For all intents and purposes, the product of this study is only a partial reconstruction, but it still provides a great amount of insight into a previously unrecognized ontology as well as insight into how ontologies can be materialized as monumental architecture. Finally, the use of contemporary Native philosophical themes is pertinent because it takes Native concepts seriously and gives them voice in archaeological interpretation, which Graeber (2015), for all his criticism, claims is the greatest strength of the ontological turn.

There is a long-standing divide between Native Americans and archaeologists, and anthropologists, for that matter. In the past few decades, many archaeologists have taken up the mantle of trying to bridge this divide by working collaboratively with Native cultural groups, which has helped to close this gap and bring Native Americans and archaeologists together (Dongoske et al. 2000; Ferguson 1996; Pruecel and Cipolla 2008; Watkins 2005; Yellowhorn 2002). Much of this divide can be found in the hesitancy of archaeologists to actually incorporate Native concepts into the interpretive process. Deloria (1988, 1997, 1999) has famously remarked on this issue in several publications, and he has rightfully done so with much venom. The ontological turn is an important step in further collapsing this divide, and this very aspect was commented on in a seminal volume in the turn:

If we are to take others seriously, instead of reducing their articulations to mere “cultural perspectives” or “beliefs” (i.e., “worldviews”), we can conceive them as enunciations of different “worlds” or “natures,” without having to concede that this is just shorthand for “worldviews.” (Henare et al. 2007:10)
Core Ontological Principles

The persistent themes I refer to above are what Norton-Smith (2010) refers to as world-ordering principles because they order the sensory experiences that form the core of how a world comes to be understood. In my review of the Native American philosophical literature I have noted three persistent themes or principles that cross-cut cultural boundaries. They are the principles of relatedness, circularity, and principle of place-centeredness. In this section, I describe each of these principles in turn and provide examples of how they are manifested historically and ethnographically among different cultural groups throughout North America.

The Principle of Relatedness

The first of these themes is the “principle of relatedness” (Burkhart 2004:16). In the context of Native American thought, this principle refers to an understanding that everything in a world is related and interconnected with everything else within that world (Burkhart 2004; Cajete 2000, 2004; Chaudhuri and Chaudhuri 2001; Cordova 2004b, 2007; Deloria 1999, 2003, 2004; Fixico 2003; Norton-Smith 2010; Plerotti and Wildcat 2000; Salmon 2000; Verney 2004; Waters 2004a, 2004b; Wildcat 2005). Underlying this principle is a conception of personhood that extends beyond humans to include animals, plants, water, stones, celestial bodies, geological formations, things, and places (Cajete 2000, 2004; Chaudhuri and Chaudhuri 2001; Cordova 2004b, 2007; Deloria 2003; Martinez 2004; Norton-Smith 2010; Salmon 2000; Plerotti and Wildcat 2000; Wildcat 2005).

The basis of this extended personhood lies in the animate nature of the world. Norton-Smith (2010:82–93) explains this in terms of a manitou, or inner energy, that all entities possess. In the Muscogee Creek tradition this is referred to as Boea fickcha
(puyvfekcv), or inner spirit, which every entity possesses and is connected to Ibofanga (Epohfvnkv) (Chaudhuri and Chaudhuri 2001:123–126). This is what Descola (2013:129–135) refers to in his discussion of interiority. He explains that the basis of animism lies in the conception of all entities as having similar interiorities but different physicalities.

While the basis of relatedness lies in the animate nature of all entities, relatedness itself is not given or inherent; it is more than just the similarity of interiorities that Descola (2013) describes. Rather, the interconnectedness of various entities is performance-based. This means that relations are created and maintained on a continual and reciprocal basis. Indeed, Norton-Smith (2010:86) explains that one of the three conditions of personhood in Native American traditions is that “an entity is a person by virtue of its membership and participation in a network of social and moral relationships and practices with other persons” (emphasis added). Among humans, this may take the form of any number of cultural practices involving interactions between two or more people. Among other entities, it may take the form of rains bringing forth new vegetation, cooperative hunting among species, or any number of other observable relations among other-than-human entities.

Further, because other-than-human entities are characterized as persons, there is a moral obligation among Native cultural groups to treat these entities with respect and dignity, which are oftentimes considered to be members of the same community as human persons (Burkhart 2004; Cajete 2000; Cordova 2004b, 2007; Deloria 1999, 2003; Plerotti and Wildcat 2000). As Cajete explains:

Native community is about living a “symbiotic” life in the context of a “symbolic” culture, which includes the natural world as a vital participant
and co-creator of community. That is to say, the life of the Indigenous community is interdependent with the living communities in the surrounding natural environment. (Cajete 2000:94)

Because of such moral obligations, it is necessary to maintain balance in the relations among humans and between human and other-than-human persons, which is a key theme in many Native religious traditions and practices (Buckley 2000; Chaudhuri and Chaudhuri 2001; Deloria 1999, 2003; Fixico 2003; Griffin-Pearce 2000; Martin 1991, 2000; Salmon 2000; Sullivan 2000; Waters 2004a; Wildcat 2005). Waters discusses the importance of balance in terms of sickness for both persons and the universe:

For many Indigenous people, the importance of order and balance, as a proper (moral) behavior, are part of our cosmological understanding of our universe. If one is out of balance with metaphysical forces, or out of balance within oneself, sickness will appear and remain, until the universe, and the person in that universe, is again balanced, or ordered. The structures of the cosmos are like the structures of the mind, in that everything must be balanced and nurtured properly in order for the universe, and us, to survive. (Waters 2004a:35)

This balance is renewed through ritualized practices, many of which involve dances. In some cases, the dances are aimed at world renewal, such as the Jump Dance of the Yurok (Buckley 2000; see also Kroeber and Gifford 1949). However, there are also many dances aimed at maintaining the balance with non-human persons, including various animal and plant species as well as with the earth itself (Buckley 2000; Chaudhuri and Chaudhuri 2001; Hudson 1976; Martin 2000; Deloria 1999).

Other practices aimed at maintaining balance in relatedness are varied, with some involving ritualized practices such as dances and songs while others involve adornment of specialized talismans. An excellent example is found among the Mandan, whose Okipa ritual aims to renew animals on an annual basis (Harrod 2000:107–110).
This four-day ritual involves a series of performative dances enacted by human persons donning metamorphic regalia. According to Descola (2013:133–138), the donning of regalia made from the physical parts of nonhuman persons allows a metamorphic transformation to occur. This is because all entities share a similar interiority, it is the outward physical appearance, or physicality, that differs between different forms of persons. So, by donning this regalia, human persons can effectively become a nonhuman person. This is what happens in the Okipa ritual. Three primary characters are assumed by participants—Lone Man, Hoita, and Trickster-Clown—while other participants assume the identities of many other animals (Harrod 2000). On the third day of the ritual, a dance is performed to release all of the various animals withheld by Hoita so that they are renewed and available to the Mandan. On the following evening, there is a special rite for the buffalo involving men transformed into buffalo bulls:

On the evening of the last night of the Okipa ritual, the women who had defeated the Trickster-Clown, along with a number of young accomplices, gathered in the Okipa lodge along with the buffalo bulls. After a feast was held, the women began to dance before the buffalo bulls. In the course of dancing the women were transformed into female buffalo, then each of the buffalo women chose one of the bulls to have intercourse with. The fertilization and renewal of the buffalo continued until late in the evening… The sexual relationships between buffalo women and the buffalo bulls assured that the people would have plenty to eat during the coming year. When this ritual had ended, the major participants in the Okipa entered a sweat lodge; when they emerged there was a sense that one of the basic sources of the people’s lives, the animals, had been renewed. (Harrod 2000:109–110)

In contrast to this highly performative ritual, Ingold (2000:126–127) discusses the use of realistic animal carvings to ensure balance is maintained in the relationship between hunter and prey. Some of these are worn as tokens while some are carved into the handles of hunting equipment. These adornments, whether they are worn as tokens
or adorn hunting equipment, are used to focus the mind of the hunter on the animals in their world so that they can politely request the gift of an animal’s life rather than forcefully take it and endanger the relationship between human and animal.

During the annual posketv, or Green Corn Ceremony, Muscogee Creek practices within the square ground and the italwa at large are aimed at the renewal of the community, the Creek world, the ties between the Middle World and Upper World, and the relationship between humans and corn. The community is renewed through both spiritual and material cleansing. This is done spiritually through fasting and dance, while materially it is achieved through ceremonially cleaning the homes of the community and burning old items. William Bartram describes the practice as follows:

When a town celebrates the busk, having previously provided themselves with new clothes, new pots, pans and other household utensils and furniture, they collect all their worn out clothes and other despicable things, sweep and cleanse their houses, squares, and the whole town, of their filth, which with all the remaining grain and other old provisions, they cast together in one common heap, and consume it with fire; after having taken the medicine, and fasted for three days, all the fire in the town is extinguished. (Waselkov and Braund 1995:125–126)

The extinguishing of the fire that Bartram describes is one of the climactic parts of the posketv because along with the extinguishing of the fires comes the renewal of the sacred fire in the square ground, which is then used to rekindle the hearths in each household (Bartram in Waselkov and Braund 1995). Igniting individual hearths with the same source fire serves to tie the community as a whole to the square ground and its sacred fire. This cohesion is further reinforced through the structure of households, or micro-italwas as I have referred to them elsewhere (Lawres 2014:550–552), which mimic the square ground structure. However, the rekindling of the sacred fire itself purifies and renews the community’s relationship with the Upper World, which serves to
strengthen the ties between the Middle World itself and the Upper World (Grantham 2002; Hudson 1976; Martin 1991, 2000).

The posketv also involves first rites practices with the rekindling of the sacred fire. These rites are aimed at balancing the relationship with the sacred fire itself—along with Ibofanga (Epohfvnkv) who the fire directly communicates with—as well as the relationships with maize and deer, two of the primary constituents of the Muscogee Creek diet. The posketv is held in tune with the ripening of the maize, typically in June or July (Chaudhuri and Chaudhuri 2001; Hudson 1976; Martin 1991, 2000). The first ears of maize are always fed to the sacred fire, an act that not only consecrates both the fire and the harvest, but also reconstitutes the special relationship held with that particular plant because it was a gift from Corn Mother (Chaudhuri and Chaudhuri 2001:103–104; Martin 2000:97). The use of four logs, each pointing to a cardinal direction, for the sacred fire symbolizes and reaffirms the relationship with and sacrifice of plants more generally (Chaudhuri and Chaudhuri 2001:54). Additionally, a deer tongue (a cow tongue is common today) is fed to the newly kindled fire as well, to reaffirm the relationship with the nonhuman persons of the Creek World and sanctify the sacrifice these persons bear for the larger community (Chaudhuri and Chaudhuri 2001:54).

There are also ritualized practices used to maintain and negotiate relationships among humans. The most famous of these is the calumet ceremony found throughout the majority of the Southeast (Brown 2006; Galloway 2006; Hall 1997; although see Brown 2006 for a discussion of a lack of evidence for this ceremony in Florida). This ceremony, involving parties smoking tobacco from a calumet pipe, was a major medium
of intertribal diplomacy (Galloway 2006). It often involved the ritual adoption of fictive kin (Galloway 2006; Hall 1997). This is the most obvious aspect of the calumet creating and maintaining relations between two groups of human persons. Once the adoption was complete, a person was named as a protector or diplomat to ensure peace and balance between families. Hall (1997) notes that there are different types of calumet pipes, and each had its own role and function in different ceremonial practices. Some of these pertained to mourning, while others were used for greeting and war medicine. However, each of the different roles and functions of the varied calumet pipes all stem from the primary aim of creating and maintaining some sort of balance between groups of human persons.

**The Principle of Circularity**

The second theme is the principle of circularity, which refers to how Native Americans conceptualize time and space as circular or cyclical manifestations (Chaudhuri and Chaudhuri 2001; Deloria 1999, 2003; Fixico 2003; Jojola 2004; Norton-Smith 2010; Plerotti and Wildcat 2000; Wildcat 2005). Time, for Native cultural groups, is conceived as being cyclical, and with cycles that do not necessarily end, but begin anew over and over again. Cordova eloquently describes it as thus:

> [I]magine a spinning top, a child’s toy. In this case, however, it is a top spinning in perpetual motion. One cannot go back to a previous spin—it no longer exists. One cannot go into a future spin—it has not yet come into existence. Now imagine tops among tops, vortices, if you will—so that there is no space between the spinning tops. And imagine also that all of the things on the top, in the top, have an effect on the spinning.

(2007:174)

In this passage, note that Cordova is not describing a single cycle, but a never-ending series of cycles that are nested within one another. She describes this as a vortex, but it can also be described in terms of a spiral expanded along a vertical dimension (sensu
Jojola 2004, see below), which is significant because the spiral is a symbol common in iconography throughout Native North America. Also note in this passage that she touches on the future that has not yet come into existence and the effects things can have on the spinning of time, which is a point I will return to below.

This view of time is related, in part, to how Native cultural groups have related to and observed their environments for so many millennia. Native Americans relied on astute observations of their landscapes—such as animal movements and behaviors, vegetational florescence and ripening, seasonal cycles, and celestial patterns—in order to adjust their land-use patterns (Fixico 2003; Norton-Smith 2010). This means that their primary frame of reference for the passage of time were seasonal cycles and the associated celestial movements. Hence, time became a circular phenomenon because of the cyclicality of the patterns they observed and relied on, of which the solstitial and equinoctial events would have played significant roles. In fact, the movement of the sun is seen as circular because of the arc it follows through the sky (Chaudhuri and Chaudhuri 2001). However, it is more than just observing these phenomena that brings time a cyclical quality. These are all phenomena that can be experienced. This is a key point because sensory experiences are how the world is ordered from the Native perspective (Norton-Smith 2010). Thus, actually experiencing the changing weather patterns as the sun reaches its northern and southern maximums along the horizon, and seeing with your own eyes how animals behave and move across different parts of the landscape during these changes year after year, can cause the cognization of cyclical patterns related to specific times of the year.
This temporal circularity perspective is also related to a spatial component of circularity. The sun’s path is an obvious case because of its movement across the sky on a daily cycle, but also the movement north and south along the horizon during its yearly cycle. The sun’s movement is also experiential to humans. We see it move across the sky on a daily basis, and along the horizon on a yearly basis. There is a human spatial component to the seasonal cycles as well. Native cultural groups timed their movements across the landscape and their daily tasks according to these seasonal cycles (Fixico 2003; Jojola 2004; Norton-Smith 2010). Hunters moved to certain places on the landscape according to the seasonal availability of animals, certain vegetal resources would be available for collection at certain places during specific seasons, agricultural fields had to harvested at certain points of the annual cycle. The point is that Native peoples, like many other people across the globe, timed their spatial movements and tasks according the cycles of their worlds. These temporalized movements are also experiential. Each place visited provides a different experience, bringing one into interactions with different entities inhabiting the various areas.

However, the relatedness of time and space, which are experienced together, create a coherence for Native conceptions of the importance of circularity. Deloria (1999:361) states that Native Americans “maintain the unity of space-time” and focus instead on understanding reality through experiences. He further explains that space is given some priority over time because time itself transpires within the confines of space (Deloria 1999:362). Indeed, there is a strong tendency among Native groups to conceive of history in terms of space and place rather than through chronologies of events. Plerotti and Wildcat (2000:1334) state that “history cannot be separated from
the entire geography, biology, and environment.” Tribal histories are encoded in the places they have lived, the conditions—for better or worse—those places provided for living, and where sacred objects and places were revealed by spiritual entities (Deloria 1999:290–304).

This suggests that time and space are interconnected in a fundamental way, and that history is conveyed through stories of movements across landscapes and encounters with sacred places and beings. In such stories, whether they are about migrations or creations or sacred encounters, descriptions of time are vague compared to those of space or place. It is relegated to an acknowledgement of a before or after relative to another event or place (Deloria 1999:295). Instead, space and place are brought to the forefront into what Jojola (2004) refers to as a transformative model of communities that describes a community’s identity through three dimensions: time, space, and place. Essentially, this is a way of reckoning a history of how a community got to be where it is through an experiential journey.

This model, according to Jojola (2004), is best depicted in terms of a spiral for three reasons. First, because it depicts the cyclical nature of time in the Native perspective. In contrast to a circle, a spiral never closes, but rather each whorl represents a new cycle, much like the vortices analogy of Cordova (2007, see above). Second, it shows an origin point in its center, which is the community in its original manifestation. During the experiential journey the community moves outward from its origin point over many cycles, growing and expanding through experience with the world until the spiral, and its depicted cycles, ends, which represents the current community and its growth to that point. Third, the spiral is a symbol that can be
extended along a primary vertical axis to represent that growth and transcendence. The apposition of the spiral to that axis “indicates that the clan has not simply completed a cycle, but in the process of its experiential journey, its collective mind has been elevated or transformed to a higher ideological level of consciousness” (Jojola 2004:92). Deloria (2003:66) notes that this type of transformation not only occurs with experience, but with religious revelation, which “was seen as a continuous process of adjustment to the natural surroundings and not as a specific message for all times and places” (Deloria 2003:66). These religious revelations occur as spiritual entities reveal themselves and significant information to human persons throughout the course of experiencing the world (Deloria 1999:329–330).

Another way that circularity is conceptualized in Native American understandings of their realities is in the relationship between nature and culture, which is exemplified in way the structure of the cosmos is understood (Cajete 2000; 2004; Chaudhuri and Chaudhuri 2001; Cordova 2007; Waters 2004a, 2004b). While many anthropologists have described the structural descriptions of the cosmos of many Native cultural groups (see, for example, Duncan 2011; Hudson 1976; Lankford 2007a, 2007b; Sullivan, ed., 2000), none of them delve into how energy is exchanged between the different realms of the various cosmos.

Chaudhuri and Chaudhuri (2001:96–98) eloquently describe this energy flow and its circular conception from the Muscogee Creek perspective. The cosmos is conceptualized as being comprised of a sphere connected by both horizontal and vertical circles. The vertical circles are the natural communities while the horizontal circles are the human communities, and they are deeply interconnected through energy
flow and cultural practices. This energy flow is found in the articulation of water, fire, air, and wind. The tree that connects the earthly circle to that of the heavens, or Upper World (Hudson 1976; Lankford 2007a, 2007b), draws water with its roots and air from the heavenly sphere, while air and the fire of the sun bring about evaporative energy to move water into the upper sphere. It is here that the energies of the water and the sun fuse to bring the renewing rains. This process is symbolically enacted in the square ground with the sacred fire. The earthen area surrounding the fire is ritually cleaned, purified, and sprinkled with water, the wind and the air feed the fire, which brings vapor and smoke into the upper sphere (Chaudhuri and Chaudhuri 2001:54). The four logs of the fire, which point to the cardinal directions, symbolize the tree (Chaudhuri and Chaudhuri 2001:96), and all of the directions of the cosmos are contained within the sacred fire itself.

From the transformation of mist, rain, and snow the earth is renewed by rain, and what emerges from this vertical circle into the chogo biloxi or natural community returns to the horizontal circle of the human community, the chogofa. The chogo biloxi—or community circle—plays a vital guardianship role in the exchange of energy. If humans do not understand the proper [h]enosis of fire, air, water, and wind, imbalances occur in the environment and the horizontal circle of the human community. The vertical circle of nature is thus adversely affected and new destructive forces, as in bad marriages, are created. Hence, humans in the chogofa must connect their behavior with the natural order of things, which not only gives life but points to the appropriate values for sustaining life. The good life is at the sacred circular center where the horizontal cycles of culture and the vertical water/sun cycles meet. Thus, life is in a giant sphere where there are seven directions, spokes, or pathways (the center, up, down, north, south, east, and west); different circles connect all of them at the center, at the four logs of the ceremonial grounds where the four major elements are symbolically blended in the sacred fire. (Chaudhuri and Chaudhuri 2001:98).

The principle of circularity manifests in several ways in both performative practices and materially. Given the inseparability of time and space in Native
understandings of reality, we can observe many different examples of how time and space are materially interwoven in Native cultural groups. However, one of the most dramatic examples is the Skidi Pawnee earth lodge.

These earth lodges are structured and oriented in a way to track numerous astronomical observations so that they could be used as a cyclical calendrical system for both ceremonial and daily life. Von Del Chamberlain (1982:163–183) has documented the astronomical orientations of the Skidi Pawnee earth lodge in magnificent detail. The first observation he notes is the orientation towards the east and the rising sun. The doorway faces this way so that when the sun rises close to and during the equinoxes, the rays shine on a bison skull atop an altar on the west wall of the lodge. During the times of the year when sunlight did not shine on the skull (summer solstice through fall equinox), the Skidi Pawnee were living in tipis hunting buffalo on the Plains. The doorway, along with the smoke hole in the roof, were used to observe other cyclical celestial events and objects as well. One example is the view of Polaris through the smoke hole, which is visible “15 ft. south of the center of the lodge,” exactly where the North Star bundle is placed during ceremonies (Chamberlain 1982:178). Additionally, the way light arrayed itself on the interior of the lodge through the smoke hole was also used for observations. For example, “At the winter solstice… sunlight would only come part of the way down the wall. By mid-February… sunlight would reach the base of the north wall at midday” (Chamberlain (1982:172). This would be used to mark the beginning of the new ceremonial year for the Skidi Pawnee.

In contrast to the material manifestations of circularity, an example of how circularity is manifested in performative practices is visible in the ritual calendars
adhered to by Native cultural groups. These calendars are based on seasonal cycles, celestial events such as the solstices and equinoxes, and lunar patterns. Swanton (1911:109–110) describes the Natchez as adhering to a ceremonial calendar based on new moons. The calendar begins in March and consists of thirteen lunar cycles. Each new moon is celebrated with a ceremonial feast, and each feast revolves around a particular food item. For example, the first moon is associated with deer, the fifth moon with peaches, the eighth with turkey, and so on.

A particularly interesting example of circularity is found in several Native American maps drawn in the early 18th century. While there are only a handful of maps still in existence that were drawn by Native Americans during Colonial times, there are two distinct varieties (Waselkov 2006). There are those aimed at portraying landscape information in an accurate spatial sense, and there are those designed to depict sociopolitical relations. It is the latter that is of interest to this discussion. These maps, all originally painted on deerskin, include one from the Catawbas (circa 1721), one from a Chickasaw leader (circa 1723), and two from an Alabama leader (both circa 1737) depicting Chickasaw villages (Waselkov 2006:439–440). These maps depict a number of villages and their relationships to one another through a series of connections between villages. The pertinent part of these maps to this discussion of circularity is how the villages themselves were portrayed. Each village was represented by a circle, and the creator of each map placed their own village in the center and of larger size than the others (Waselkov 2006:444–445). In contrast, the English settlements (Charlestown and Virginia) were represented by squared and rectangular shapes.
Waselkov (2006:445) argues that the use of circles to represent Native villages on these maps is likely symbolic of group social cohesion and common village plans of the time. However, given the persistence of circularity in Native understandings of reality, I argue that these circles may be representative of the *chogofa* concept that Chaudhuri and Chaudhuri (2001:96–98) discuss. It is probable that these circles represent the horizontal circles of the various cosmos of the communities depicted. As discussed in the following section, the center point of a community’s reality lies in the heart of a community, and in these maps, the communities are shown as circles, or possibly even the circular disks that comprise the Earth Disk (Lankford 2007b).

**The Principle of Place-Centeredness**

The third, and final, pervasive theme is the principle of place-centeredness, which refers to the centrality of places in how Native American cultural groups understand their worlds (Cajete 2000, 2004; Cordova 2007; Deloria 2003; Jojola 2004; Martinez 2004; Norton-Smith 2010; Plerotti and Wildcat 2000; Verney 2004; Waters 2004b; Wildcat 2005). Deloria (2003:65–66) explains that spatial context is essential in Native understandings of reality. He states:

> Thousands of years of occupancy on their lands taught tribal peoples the sacred landscapes for which they were responsible and gradually the structure of ceremonial reality became clear… [They] have a sacred center at a particular place, be it a river, a mountain, a plateau, valley, or other natural feature. This center enables the people to look out along the four dimensions and locate their lands, to relate all historical events within the confines of this particular land, and to accept responsibility for it. (Deloria 2003:66)

Cajete (2000:157) refers to this as “natural orientation.” He explains that “Natural orientation began with a symbolic center and radiated out of that center to include the
entire cosmos, all plants and animals, the mountains, rivers, streams, lakes, and all of those natural entities comprising the reality of a community” (Cajete 2000:157).

How places come to hold such a centrality in Native thought is tied to the principles of relatedness and circularity. As Native peoples move through a landscape according to temporal cycles, they come to the same places year after year. Over time this leads to relationships being developed with the place itself and then important meanings being attributed to them. However, the sanctity of places can be attained in a number of different ways in addition to recurrent, cyclical use.

Deloria (1999:327–334) describes four categories of sacred places based on the reasons they are attributed sanctity. The first, most common, category includes places where an event of historical importance happens. They are “places to which we attribute sanctity because the location is a site where, within our own history, something of great importance has taken place” (Deloria 1999:327). These are places, he explains, that promote social cohesion in a group because of a shared sense of the history that brought them to their present state. The second category includes places where a religious revelation is experienced through intervention of the divine. Deloria (1999:329–330) explains that this often involves places where spiritual relationships with non-human persons are first initiated. These places then become the focus of ceremonial practices aimed at maintaining the prosperity of those relationships (Deloria 1999:330).

The third category comprises places where powerful spiritual entities reside and have revealed themselves to human persons. These are places where people go to communicate with those spiritual entities. Further, people visit them “to perform ceremonies at these holy places so that the earth and all its forms of life might survive
and prosper… they must perform certain ceremonies at specific times and places in order that the sun may continue to shine, the earth prosper, and the stars remain in the heavens” (Deloria 1999:331). It is important to note that many of the places in this category are natural landscape features. Deloria cites Bear Butte and Blue Lake as examples of sacred landscape features, but many of the landscape features discussed by Basso (1996), which have been part of the process of interanimation and are part of the storied landscape, could also be included here.

The fourth category are lands that have not yet been deemed sacred because revelatory experiences are yet to be had on them. As Deloria (1999:333) explains, the fact that spiritual entities are alive and able to communicate with human persons, Native Americans are constantly alert to the possibility of new revelations in new places. The experiences and revelations that happen in these places are significant and become remembered so that other Native peoples can return to the place to attempt communication with spiritual entities through ceremonial practices (Deloria 2003:65–66). The practices will not only build and maintain relationships between the people and spirits, but also between the people and the place itself. This accords with both the principle of relatedness, with the associated moral obligations to maintain relationships, and the principle of circularity, with its cyclical nature.

Sacred places also play a central role, along with the practices and experiences that happen within them, in Native American identity and religious traditions at multiple scales (Cajete 2000, 2004; Deloria 2003; Martin Waters 2004b). The Muscogee Creek peoples provide an excellent example of the multiscalar nature of person-place relations. Upon meeting a Muscogee Creek person they will identify themselves with
their name, titles, and the name of their *italwa* or square ground (Martin 1991:11). This does not mean they actually live within the confines of that specific *italwa*, but that they participate in ceremonies at this particular place, which thus constitutes part of their identity. More broadly, Muscogee Creek peoples consider themselves “people of one fire” (Hahn 2004:20; Micco 1995:4), which refers to the sacred fire that lies in the center of the square ground of each *italwa* throughout the Creek world, and thus a network of related, meaningful places constituted by practices enacted within the square ground.

These square grounds play a role as the center point of the Muscogee Creek cosmos as well. The Creek cosmos is divided into different layers: the Above World, the Middle World, and the Beneath World (Hudson 1976; Lankford 2007b). These layers are anchored to one another by an axis mundus, which for the Creeks is the sacred fire that lies at the center of the square ground (Howard 1968; Hudson 1976; Lankford 2007b). Thus, the square ground, with its sacred fire, is the center point of the Creek cosmos. According to Lankford (2007b:20–29), the cross-in-circle motif of the Mississippian Ideological Interaction Sphere (formerly referred to as the Southeastern Ceremonial Complex) is part of a plan view of the Middle World, or Earth Disc. The central point of the cross represents the sacred fire, while the lines pointing to the cardinal directions are the four logs of the sacred fire. This is famously depicted as the central part of the Cox style gorgets (Lankford 2007b) found throughout the Southeast, but it is also found at Belle Glade sites on the upper portion of the metal tablets found throughout the Kissimmee-Okeechobee-Everglades watershed and other areas of South Florida. While there is variation in the other motifs on these tablets, the cross-in-circle is nearly identical on every recorded specimen (Allerton et al. 1984).
Another excellent example of the central role of place and place-centered practices, and one that shows the wide geographic spread of this principle, is found among the Tewa peoples of the Southwest. Fowles (2009, 2013) and Snead (2008) describe the Tewa cosmos as comprised of a nested series of spheres that are organized in terms of the cardinal directions. At the center of this cosmos lies the village. Yet, the village itself is a nested space. The center of the village is a circular sacred shrine considered to be the mother earth navel, and this is surrounded by four plazas, where all public ceremonial practices occur, representing the cardinal directions (Fowles 2009:451–452). Outside of the village itself, there are three other spheres (Fowles 2009:450–452). The first is demarcated by constructed rock shrines, many of which are large, elongate stones stood upright or piles of stones. The second sphere is marked by four hills with flat tops and caves that are inhabited by spiritual entities and provide ingress/egress to the underworld. The third sphere is the most distant and is outlined by four holy mountains with earth navels at their peaks. These navels are the homes to important spiritual entities.

**The Interdependence of the Principles: A Moral Universe**

As this discussion of the three core principles shows, there is overlap between them. This overlap, however, is what allows the different principles to function together to increase the effectiveness of cognizing a lived world or reality. Without it, these principles would be disparate understandings of how a lived world works and is maintained. The overlap also decreases the difficulty of translation from such an understanding of reality into the cosmologies that cultures use to bridge ontology to culture (*sensu* Halbmeyer 2012), or, in the case of cultural histories, the historical stories that explain the relatedness of entities in the world. For instance, without the
relatedness of time and space, there would be a distinction between space, place, and history, which would, in turn, be reflected in a much different tradition of oral history among Native cultural groups. Rather than focusing on the stories encoded in a landscape, the focus might turn to chronology, much like Western histories.

What bridges the core principles together, however, is the concept of relatedness. As discussed above, relatedness is a concept that ties all entities in the universe into relation with one another. This includes humans, animals, plants, places, things, the sun, the moon, and the stars. Everything is related on a fundamental scale of interiority (sensu Descola 2013). Time and space are also in inextricable relation with one another. They are experienced in such a relationship because time occurs within space, and, as such, time is experienced in places (Deloria 1999). This is one of the reasons that tribal histories are focused on movements to places rather than a chronology of events. Further, time and place are in relation with one another because places are what encode histories.

This relatedness brings with it moral obligations, not only the moral obligations to treat all entities with reciprocal respect, but also obligations to the universe, which itself is sometimes referred to as a “moral universe.” As Deloria explains:

> there is a proper way to live in the universe: There is a content to every action, behavior, and belief. The sum total of our life experiences has a reality. There is a distinction to the universe, empirically exemplified in the physical growth cycles of childhood, youth, and old age, with the corresponding responsibility of every entity to enjoy life, fulfill itself, and increase in wisdom and the spiritual development of personality. Nothing has incidental meaning and there are no coincidences. (Deloria 1999:46)

This is further echoed by Cordova (2007:123), who notes that for Native Americans, the universe is a concept of harmony (see also Waters 2004b:103 on balance and the
universe). This is why balance is such a strong, recurrent theme in Native American ceremonial practices. They understand the universe to be alive, and that all actions, even events, have the essence of moral content (Deloria 1999:52). Yet, human persons are not understood to be the only moral participants in this living universe. Other-than-human persons are also participants, and this means that “responsibility for maintaining the harmony of life falls equally on all creatures” (Deloria 1999:52).

Maintenance of the moral universe is not the only responsibility of the entities dwelling within it. The universe is constantly in a state of becoming, of constant creation. It is the moral actions, whether good or bad, the behaviors and practices of every entity, that co-create the universe. Every action of every entity shapes the present and future. As Cordova states:

> Time and the Universe have everything to do with expectations of what it is to be a human being. I AM RESPONSIBLE. My actions in the world are not meaningless; they may be no more than a drop of water in an ocean, but at some point that drop triggers a deluge, or a weather pattern, or myriads of other “relative motions.” The future does not exist. “I” have not yet made it, contributed to it. My present actions are making it. Present actions are like layers of snow added to a snowball—the shape of the present outer layer determines the future shape of the whole. (Cordova 2007:175)

As this quote shows, this moral universe is something always in the making. Every action contributes to it, whether that be the action of a human person or an other-than-human person. Every entity contributes to the moral content of the universe. However, when the moral balance tips to one side or the other, it is necessary to undertake ceremonial practices to rebalance the universe.

**The Belle Glade Ontology**

As discussed above, these are the primary, or core, principles that form the basis of Native American ontologies throughout most of North America. There are differences
in each cultural group’s ontology, but these three principles cross-cut cultural boundaries. The differences are found in other aspects of ontological understandings of their realities. However, the fact that these core principles are present among so many culturally and geographically diverse groups suggests that the principles themselves were present in the source populations that founded the Native American groups that have inhabited the Americas for so many millennia.

I argue that these three principles—relatedness, circularity, and place-centeredness—also form the core of the Belle Glade ontology. More specifically, I argue these principles are materialized as monumental architecture throughout the region. In other words, the monuments themselves are literally a materialized form of the ontology. Thus, we should see evidence for these three principles in the architecture itself, something that I discuss in Chapters 7 and 8. However, these principles form only the core of the Belle Glade ontology. As discussed above, it is impossible for any of us to comprehend the totality of it, especially given that there are no longer Belle Glade, or Mayaimi or Serrope, descendants to collaborate with.

This type of study would be considered by Alberti (2016) as a blending of the social ontology and critical ontology approaches. In part, I am reconstructing the core part of the Belle Glade ontology. Thus, it partially aligns with the social ontologies approach. However, this is also an attempt to develop a theory of ontological materialization based on indigenous theory. These concepts and principles regarding how Native Americans understand their realities should be incorporated into archaeological theory and practices. They are concepts that should be taken seriously (sensu Graeber 2015; Henare et al. 2007). Taking these concepts seriously not only
accords with the American Anthropological Association’s code of ethics, specifically Principle No. 1 (http://ethics.americananthro.org/ethics-statement-1-do-no-harm/), it helps to close the gap between Native Americans and anthropologists and archaeologists, something that is much needed.

This ethical principle—to do no harm—ties into closing that gap. The principle states:

A primary ethical obligation shared by anthropologists is to do no harm. It is imperative that, before any anthropological work be undertaken — in communities, with non-human primates or other animals, at archaeological and paleoanthropological sites — each researcher think through the possible ways that the research might cause harm. Among the most serious harms that anthropologists should seek to avoid are harm to dignity, and to bodily and material well-being, especially when research is conducted among vulnerable populations. (American Anthropological Association 2012, http://ethics.americananthro.org/ethics-statement-1-do-no-harm/)

This clause specifically states that harm to a person’s dignity should be avoided because it is considered one of the most serious forms of harm that can be done.

When archaeologists, especially those of us working in the Americas, ignore the concepts and understandings of descendent populations, which are by definition vulnerable populations (as are the material remains of their ancestors), we are harming their dignity by undermining the legitimacy of their own ontologies and epistemologies. Thus, we should be taking these concepts seriously. By doing so, we are not only avoiding harming the dignity of a large group of stakeholders, we are also increasing our own understanding of the archaeological record. Evaluating the material record in terms of how the populations that made the record we are examining will bring us closer to understanding why they did the things they did rather than in abstract scientific terms looking for an ultimate truth. The latter is something that does not do the archaeological
record any justice, nor does it avoid harming the dignity and understandings that Native Americans have of their own histories and cultural heritage.

Summary

The ontological turn provides a powerful framework for evaluating the archaeological record in ways that have hitherto gone unexplored. To summarize, the ontological turn has shifted the focus of anthropological inquiry towards the ways people understand their reality to exist. However, this does not just include the cultural groups being studied. It also includes the discipline of archaeology, along with anthropology more generally, and how the practitioners of archaeology understand and interpret the reality of the material record. The ontological turn has come under critical fire over the past several years. Because of this we need to engage with these criticisms to ensure the continued growth of not only this lens of evaluating what it is to be human, but the continued growth of our discipline as a whole.

In engaging these criticisms, I have set forth a framework that enables us to incorporate the major criticisms into ontological studies (Lawres 2017). This framework (1) emphasizes the ontological complexity, (2) accentuates the affects that ontology has on the practices encoded in the material record after examining the efficacy of other interpretive frameworks, (3) acknowledges that the totality of the ontology cannot be comprehended, and (4) does not attribute a generalized ontological form but instead uses existing evidence to reveal aspects of that ontology. By following the suggestions of this framework, we are able effectively to circumvent the pitfalls of the ontological turn identified by its critics.

Unlike the study areas for many other archaeological studies of ontologies, the Belle Glade archaeological culture does not have an extant descendent population to
collaborate with (although it is possible that the Seminoles incorporated remnant populations of Mayaimi during their coalescence and southward migration during the Second Seminole War [see Lawres 2014]). Due to the lack of descendants to work with and establish the foundations of a Belle Glade ontology, I have drawn on the philosophical literature of numerous Native American cultural groups to identify persistent themes or principles that cross-cut cultural boundaries. The three persistent themes identified are the principles of relatedness, circularity, and place-centeredness.

Drawing on the framework outlined in this chapter, I argue that the Belle Glade monumental constructions are the materialization of the three major principles exhibited in Native American ontologies—relatedness, circularity, and place-centeredness—and that these principles are literally embodied in the architecture itself. However, before I present the data that suggest these architectural features are just such a materialization, it is necessary to gather independent lines of data to show that these principles are exhibited in other aspects of Belle Glade material culture. In Chapter 6 I present these data.
Chapter 6
EVIDENCE FOR A BELLE GLADE ONTOLOGY

Up to this point I have painted a picture of the Belle Glade world, at least in broad brush strokes. Chapter 2 describes the physical structures and characteristics of the landscape that existed prior to the late 19th and early 20th drainage projects. This description shows that the Kissimmee-Okeechobee-Everglades watershed was much different than it is now. It was an aqueous landscape, a watery world, that the Belle Glade peoples, known historically as the Mayaimi and Serrope, dwelled within. As shown in Chapter 3, the Belle Glade peoples performed practices that emphasized dwelling within that aqueous landscape. They primarily ate fish and other aquatic animals, they emplaced settlements on tree islands that were adjacent to perennial water sources so that they could continue to focus on aquatic resources and have fresh water during the dry (or damp) season, they buried many of their dead in water, and they built monumental architecture in the middle of flowing water.

However, it was also shown that the majority of Belle Glade material culture lacks the artistic flare exhibited by other archaeological cultures throughout Florida and the Greater Southeast. Instead, Belle Glade pottery was manufactured without surface treatments containing iconographic elements, and lithic tools were rare and typically lacked the aesthetics of similar tools elsewhere. The most elaborate parts of Belle Glade material culture are the wooden carvings and monumental architectural features (described in Chapter 4) throughout the region. This changes with the onset of the historic period, when the flare of monumental architecture dies down and artistic depictions find a new medium in the Spanish metals being traded through the region.
Given the characteristics of Belle Glade material culture, and the seemingly palpable lack of symbolism in the region outside of monumental architecture and woodworking, you might ask: is there any other evidence independent of the architecture that can speak to ontologies?

These are important questions to ask, and similar questions have been voiced in regard to the ontological turn more generally, especially in the archaeological research associated with it. Specifically, there is always a concern with the possibility that a specific ontological attribution is being applied without verification (Harrison-Buck 2012:65; Swenson 2015). Because of this concern it is necessary to evaluate ontological evidence on a case-by-case basis to ensure against ascribing an unsound ontological attribution to an archaeological culture as well as guarding against creating a sense of a universalizing ontological understanding over entire geographic regions (Harrison-Buck 2012:65). It is always imperative to remember that variation in ontological understandings of a world will always be present, even within a single community. This is because it is impossible for a single person to understand the entirety of a reality or world, be it the one they are inhabiting or that inhabited by other people (Descola 2014; Graeber 2015; Lenclud 2014). Garnering an understanding of reality or realities—the formation or cognizing of an ontology—requires acts of translation (sensu Hanks and Severi 2014) involving numerous peoples so that more aspects of that reality are understood. However, no matter how many people are involved in these translations and cognizations, the reality in question will never be fully understood (Descola 2014; Graeber 2015). Even so, it is important for us to identify and elucidate those ontologies visible in the archaeological record because they will
ultimately help us to understand how understandings of a reality can affect the cultural practices that are materialized in the archaeological record.

Here I present evidence that is suggestive of the presence of the three ontological principles—relatedness, circularity, and place-centeredness—in the Kissimmee-Okeechobee-Everglades watershed, and more specifically in the Okeechobee Basin of that watershed. The evidence I present in this chapter is independent of the monumental architecture and thus provides supporting evidence that the architecture may be the materialization of these principles. This fulfills the need to contextualize and verify the ontological attribution, as suggested by Swenson (2015). In addition to presenting this evidence I provide explanations of how the evidence is suggestive of the principles by drawing on other archaeological and ethnographic studies of ontologies. I argue that there are five primary lines or types of supporting material cultural evidence in the Okeechobee Basin: ceremonial regalia, effigy carvings, cosmological depictions, columella pendants, and mortuary practices.

Ceremonial Regalia

The first line of evidence was recovered from the Belle Glade site. Specifically, it comes from the habitation mound portion of the site rather than the burial mound. This evidence comes in the form of what have been described as deer antler headdresses (Stirling 1935:374; Willey 1949:44). Two of these headdresses were recovered. One is a triangular portion of the parietal region of the animal’s skull with both antlers present (SNMNH Catalog Number: A384071-0; Figure 6-1). Additional modifications to the parietal bone include the grinding of the edges, both lateral and posterior, to create smoothed sides. Willey (1949:44) considers this modification to be one aimed at assisting wearing the piece. The antlers were also modified. They were both split and
hollowed, and the striations associated with the hollowing process suggest this was conducted with shark teeth tools (Willey 1949:44). This hollowing suggests that the antlers may have acted as mortises for other objects, with adjoining tenons, to be inserted and displayed. It is notable that excavations recovered two other hollowed antler sections (Willey 1949:45). The second headdress (SNMNH Catalog Number: A384072-0) did not display the same modifications as the first. Instead, the parietal region was cut in a circular fashion. Willey (1949:44) does not discuss edge modifications or antler modifications to the second headdress.

Figure 6-1. Deer antler headdress from Belle Glade Mound. Adapted from Willey, Gordon R. 1949. *Excavations in Southeast Florida* (Plate 9). Yale University Press, New Haven.

In addition to the two headdresses recovered from Belle Glade, excavations at Fort Center recovered a pair of carved wooden deer antlers from the mortuary pond (Sears 1994:55). These were likely used as ornamentation for a deer antler headdress like those from Belle Glade. Similar objects are also found in Hopewell sites in the Ohio area (Wheeler 1996:94). Although a count is not provided, Sears (1994:55) notes that
the presence of deer antler carvings are somewhat enigmatic because “there were
great numbers of real deer antlers available, many having been found in deposits in the
pond.” It is possible that the actual antlers recovered from the mortuary pond context
were parts of headdresses.

This is a strong line of evidence for the principle of relatedness because of the
common interiority or inner essence that underpins relatedness among all entities. A
common feature in this form of ontological understanding is the capability of both human
and other-than-human entities to undergo metamorphosis (Descola 2013:133–138;
Ingold 2000:123–126). This is because the inner essence provides animic qualities to
2010). As Descola (2013:114–116) notes, the basis of this ontological understanding
lies in how people classify the entities of their world or worlds, and this classification can
be broken down into the interiority and physicality of an entity. Among peoples with
animic understandings of entities, all entities are considered to have a common person-
like or anthropomorphic interiority and the primary differentiation between humans and
nonhumans comes from differences in their physicality—their outward appearance—
and in their behaviors (Descola 2013:129–130, 143; Ingold 2000:123–126). The
common interiority of these entities is what allows successful metamorphosis because
the physicality can either be shed or a secondary one donned. While the shedding of
skin is exhibited in artistic depictions, metamorphosis requires ornamenting one’s body
with the body parts of a nonhuman entity or by bearing a mask.

Because of the famous Key Marco site, where 15 wooden masks were recovered
(Cushing 1896:388–394), the use of masks in South Florida has been a topic of
discussion for quite some time (see Clark 1995, 2013; Colvin and Thompson 2017; Cushing 1896; Gilliland 1989; Wheeler 1996). In contrast, other forms of ceremonial regalia have not been subject to much discussion. This is especially true in regards to regalia that includes the body parts of nonhuman animals. The deer antler headdresses, as parts of the physicality of nonhuman entities, could have been donned as an aid in the metamorphic process. The result of this metamorphosis is the signaling of an equality of entities that have a similar interiority and personhood because the differences in their outward appearance (i.e., their physicality) are mediated by creating similarity through the wearing of body parts (Descola 2013:133; Ingold 2000:129; Strathern and Strathern 1971:176–177). As Descola (2013:133) notes:

The wearing of feathers, teeth, skins, and masks with beaks, fangs, and tufts of bristles makes it possible, by using the very attributes that signal the discontinuity between the species, to differentiate, not men from animals, but different kinds of human species that resemble one another.

Further, the ultimate goal of metamorphosis is to aid in maintaining the relations between human and nonhuman persons (Descola 2013:137–138). By undergoing the metamorphic process and creating a perceivable equality, a more effective means of communication is achieved, which thus allows positive relations to be maintained. Conneller (2004) describes this process as less of an actual metamorphosis and more of a transformative process, a “corporeal transformation,” that involves donning assemblages of other bodies to take on the characteristics and behaviors of that other body. When appropriating the characteristics of a nonhuman person, it is possible to engage in life as that being would, which she claims is a goal of the process. Further, this is an argument she makes for the antler frontlets recovered from the Star Carr site
in England; these frontlets were very similar to those recovered from Belle Glade, the main difference being the holes drilled into the parietal bone in the Star Carr specimens.

It should also be noted that there is variation among different cultural groups in who may undergo metamorphosis. In some cultures, anyone may participate, while in others it is restricted to religious practitioners with certain powers (Descola 2013:136). Thus, these headdresses may have been associated with religious practitioners residing at the Belle Glade site. Furthermore, the use of deer antler headdresses has been documented historically among the neighboring Calusa. Fontaneda describes the ceremonial use of horns by Calusa religious practitioners as being seasonal:

after the summer, there come some shamans in the figure of the devil, with some horns on their heads, and they come howling like wolves, and many other different idols that shout like animals of the woods, and these idols are there four months, during which they never rest, night or day, running with great fury. (Worth 2014:217)

While the description is rather vague, it is notable that white-tailed deer are the only animals with either antlers or horns in Florida. Thus, it is likely that they were wearing deer antlers or carvings of deer antlers like those recovered at Belle Glade and Fort Center.

**Columella Pendants**

The presence of columella pendants provides another line of ontological evidence for the region. The function of these artifacts has been questioned since the 19th century, with archaeologists variously classifying them as plummets, sinkers, net weights, or pendants (Gilliland 1975; Henshaw 1885; Marquardt 1992c; Pennypacker 1938; Reiger 1990, 1999). The exact function of these artifacts is still elusive, with some evidence pointing to their use as fishing equipment—as sinkers in hook-and-line fishing, as net weights, or as fish gouges coated in animal fats and oils (Pennypacker 1938)—
while other evidence points to their use as pendants for ornamentation and for use in ceremony (Henshaw 1885; Reiger 1990, 1999). It is possible that the variation in the evidence is due to variation in their actual use. Ethnographic data suggests just such variation.

In California, Native American groups use the stone version of these artifacts as medicine stones or charm stones. Henshaw (1885:110) reports the Santa Barbara Indians using them in the following manner:

The moment the stones were shown to these Indians, and without leading questions from me, I was told that they were “medicine or sorcery stones” used by the medicine-men in making rain, in curing the sick, and in various ceremonies. The sorcerer arranged twenty of the stones, the proper number, in a circle, pushed them violently together, sprinkled water over the whole, when smoke issued from them.

He further reports that the San Buenaventura Indians used them in the same way, but the proper number was 12 rather than 20. When questioned about their use as sinkers among the Santa Barbara, they quizzically responded with “why should we make stones like that when the beach supplies sinkers in abundance; our sinkers were beach stones, and when one was lost we picked up another” (Henshaw 1885:112).

In contrast, the use of plummetts among more northerly cultural groups, such as the Penobscot and Ojibwe, is for fishing. Charles Willoughby (in Pennypacker 1938:143) reports that among the Ojibwe “the pendants were covered with lard and held near the lake bottom for catching pickerel and pike.” The Penobscot use them in a similar manner. Frank Speck (in Pennypacker 1938:143) recounts:

Another ancient device that I was told of was that of plummet shaped stones covered with tallow and attached to a line as a gorge-bait for large fish. The fish, would swallow the stone and could be pulled in before disgorging it. I only mention this at the suggestion of those older Indians…
who informed me of it in explanation of the pear- or plummet-shaped stones so common on prehistoric sites of this area.

Archaeological evidence supports both ethnographically-recorded uses, which opens up the possibility of their use as pendants as well. In looking at the overall distributions of these artifacts, their use as fishing equipment may be supported because they are most commonly found at sites near bodies of water (Henshaw 1885; Reiger 1990). Further, they are often found in midden contexts (Reiger 1999). However, there are also numerous sites where these artifacts—including all material versions (shell, stone, copper, hematite)—are recovered from mortuary contexts (Blankenship 2013; Bullen 1952; Moore 1900, 1903, 1907; Reiger 1990, 1999; Thompson et al. 2017). Those recovered from mortuary contexts typically point to their use as pendants suspended from the neck or waist. During his work at the Jones Mound in Hillsborough County, Bullen (1952:49) encountered 179 interments, 20 of which had pendants associated with them. In regards to their locations relative to the skeletal remains, Bullen (1952:49) states they “were located at necks or chests and so, presumably, were suspended from the neck in life." Excavations at Crystal River also produced similar information regarding the context of these pendants. C. B. Moore (1903:397–408) notes the recovery of numerous pendants from a burial mound at this site, noting various bodily associations for them, ranging from the waist to the arms to the chest and the neck. Bullen's investigations at the site met with similar results, only finding three of the plummet-shaped artifacts outside of mortuary contexts (Bullen 1953).

Because of the variation in the evidence of use for plummet-shaped artifacts throughout North America it is necessary to evaluate the contextual evidence related to these artifacts before jumping to conclusions regarding their use. In the KOE watershed,
the evidence seems to point to their use as pendants. Further, the majority of the plummet recovered in the region are made from columella, giving them a special significance in regards to ontological evidence (see below). There are numerous sites throughout the KOE where columella pendants have been recovered, but the sites with the best evidence supporting their use as pendants are Kreamer Island, Belle Glade Mound, and Fort Center.

The Belle Glade site produced the greatest number of columella pendants. Willey (1949:50–51) notes that 31 complete specimens were recovered from this burial site (Figure 6-2). Additionally, five fragmentary specimens were recovered. These fragments could represent five individual pendants or be fragments of a single pendant; Willey does not specify. The pendants were recovered from both the midden-mound and burial mound of the site (Willey 1949:69). It is unknown how many were recovered from the burial mound versus the midden-mound.

Figure 6-2. Columella pendants from Belle Glade Mound. Adapted from Willey, Gordon R. 1949. *Excavations in Southeast Florida* (Plate 12). Yale University Press, New Haven.
Excavations at Fort Center resulted in the recovery of eight shell plummets. All of these plummets were recovered from mortuary contexts of the site. Seven were recovered from Mound A (Sears 1994:83). This mound was not a burial mound but is part of what Sears considers the mortuary complex. This mound—with its midden strata, evidence for structures, and ceremonial artifacts—is interpreted by Sears to have been the residence of “religious functionaries, probably the equivalent of the Choctaw Buzzard Men, and their families, who cleaned the bones from decomposed human bodies” (Sears 1994:175). In this context, it is likely that the pendants could have been used in ritual practice, similar to that among the Santa Barbara community but in mortuary-related ritual rather than rain-making. The one other shell plummet recovered from Fort Center was found in the charnel pond, where numerous burials were encountered (see below). In this context, the plummet most likely served the role of a pendant associated with one of the bodies interred within the waters of the pond.

At Kreamer Island a total of 40 shell pendants were recovered, 23 of which were made from columella (Davenport et al. 2011:451). All of these pendants were recovered from beyond the north shoreline of the island, when Lake Okeechobee’s waters were at an extreme low (see Davenport et al. 2011). This location is extremely important to note because this is also the location where numerous bodies were interred (Davenport et al. 2011:483–484; Hale 1984, 1989:161–162; Will 2002:105–107). It should be noted that none of the pendants were recovered in exact association with skeletal remains, but the skeletal remains that were encountered were not articulated and seemed to have been subjected to the erosional forces of wave action (Davenport et al. 2011:483). Thus, it is likely the pendants were associated with bodies at the time of interment. This is further
supported by the spatial distribution of the pendants. Pendants made from *Cassis* spp. lip fragments were recovered from only a small area to the western side of the site while the pendants made from columella were located to the east. If these were worn as pendants and interred with the bodies they adorned, this distribution could reflect the placement of bodies of people of different lineages if the pendants were reflective of some form of identity marker (Davenport et al. 2011). The presence of the dead in this area makes it unlikely that the inhabitants of the site would have used the same area as a fishing ground. This unlikeliness further extends to the use of these plummet-shaped artifacts as sinkers because of this mortuary context.

While the columella has long been recognized as an important artifact type in the Southeast, and in Southeastern iconography, recent research suggests that the significance of this artifact lies in the spiral of the columella. According to Marquardt and Kozuch (2016; Kozuch 2013), the spiral, specifically the clockwise spiral, is associated with several aspects of Southeastern Native American cosmology, such as the sun, death, fire, and purification. These cosmological aspects are signified by the spiral in the columella of the left-handed whelk that is prevalent in many archaeological assemblages throughout the Southeast. The spiral is also apparent in the ethnographic and ethnohistoric records. Ceremonial dances are an excellent iteration of the spiral. As Marquardt and Kozuch (2016:11–13, 21) note, the clockwise spiraling movements of many ceremonial dances in the Southeast symbolically replicate the movement of the sun, a movement which is associated with death—it “is born in the east and dies in the west each day” (Marquardt and Kozuch 2016:9). This is best exemplified by the Natchez mortuary ceremony revolving around the death of the chief known as Tattooed
Serpent. In this ceremony, Tattooed Serpent was carried on a litter in a spiraling path to a mortuary facility (Hudson 1976:328–334; Marquardt and Kozuch 2016:9–10). It is also important to note that many of these clockwise dances are named after animals associated with death and that they are performed by males. In contrast, many of the counter-clockwise dances are performed by females and are associated with curative properties and rituals. In other words, they are associated with life.

This spiral is also present in Southeastern iconography, where it signifies cosmological principles. Lankford (2007b; 2011; see also Marquardt and Kozuch 2016) argues that the spiral plays a primary role as a conduit between the Upper and Middle Worlds. Specifically, he argues this conduit is opened through the medium of fire. Fire is considered to be an earthly representative of the sun, and because of this, many Southeastern groups maintained a sacred a fire in their settlements. One of the common characteristics of fires is that they emit a column of smoke. This column, rising directly from the fire and into the Upper World, is the medium that Lankford refers to, and for some groups it is what allowed communication between people and the deities inhabiting the Upper World (Grantham 2002). Lankford (2007b) claims this column is depicted in the shell gorgets of the Southeast, as the center point of the cross-in-circle motif (Cox style gorgets) and as the spiral-pole of Hixon gorgets. Marquardt and Kozuch (2016) argue that there are further connotations of these spiral elements. Specifically, they argue that it is tied to beliefs regarding the Great Serpent of mythology, who is associated by some groups with the Scorpio constellation (Lankford 2007a, 2007c). Because the Great Serpent is associated with Scorpio, it is seen to travel between the Upper and Middle worlds in its annual cycle. For Marquardt and Kozuch (2016) this
provides evidence that links it to the spirals visible in rattlesnake depictions in the iconography, and these spirals provide a link to the Cox and Hixon spirals. In other words, they argue that the spiral of Southeastern iconography represents an *axis mundi* that bridges the Lower, Middle, and Upper worlds symbolically.

They further argue that the columella of the left-handed whelk signifies this *axis mundi*. This is signified through the spiral that is clearly visible in the columella's morphology, but it is further signified through the medium of the shell itself (Lankford 2007b; Marquardt and Kozuch 2016). As a mollusk, the whelk inhabits a watery world, and water is often associated with the Lower World of Southeastern cosmology (Hudson 1976; Lankford 2007b). However, the animals are killed, eaten, and their shells made into columella pendants and worn in the Middle World. Thus, they signify the Lower World in their medium, they are worn in the Middle World, and they signify the *axis mundi* that spirals towards the Upper World—as well as the sun’s spiraling path through the cosmos—in their morphology. In other words, the spiral of the columella is a signification of the relations between the three worlds and how they are bound together through communicative mediums. As discussed above, one of the primary ways of maintaining positive relations is through communication (Descola 2013:137–138), thus the columella may signify the importance of maintaining those communications between the worlds. As such, the columnella provides evidence for the presence of the principle of relatedness.

The circularity inherent in the spiral also provides evidence of the principle of circularity. As discussed in Chapter 5, circularity is an integral component of Native American philosophies. Indeed, it is a world-ordering principle, and it is through this
principle that time and space are collapsed into one notion (Norton-Smith 2010). I argue that the same is true of the columella pendants: time and space are encapsulated in these artifacts. As Marquardt and Kozuch (2016) have noted, the spiral is often associated with the movement of the sun, which is a cyclical movement. These cycles happen on a daily basis, but they also occur in the annual cycles exhibited in solstitial and equinoctial events as well as the 18.6 year cycles of the lunar standstills. Thus, the columella encapsulates the circularity of these temporal cycles.

Yet it also signifies the spatial aspects of these cycles. These seasonal cycles are also tied to seasonal movements of people through landscapes, especially those adhering to a hunter-gatherer lifestyle—or a fisher-hunter-gatherer lifestyle in the case of this study (Norton-Smith 2010:125–126). Each time the cycle reaches summer, there is a certain place on the landscape where people need to move to in order to gather a specific resource. The same is true for fall, winter, and spring. People following this way of life know the landscape intimately and know where specific things are located in that landscape and when they will be available. Because of this, people will move to these same places each year, and the pattern of movement across landscapes becomes cyclical. Thus, the circularity of the spiral encapsulates this spatial aspect as well.

Marquardt and Kozuch (2016:19) make note of this and argue that the columella pendant “show[s] that the person wearing it is on a death path, or at least is in a liminal state, capable of moving between the Middle World of humans and other animals and the celestial realm of the Upper World.”

I argue that there is likely more to this assessment. Jojola (2004) notes that the spiral is an important symbol of migrations and movements among the Pueblo groups of
the Southwest. They are also important markers of identity and community. Yet, they are more than that. They signify the transformations that communities undergo as they migrate further and further from their starting point, or center place. These transformations are due to the knowledge that is gained when people travel into areas unknown. Movements such as this are learning processes, which can have drastic effects on both people and communities. I argue that the columnellas signify just such a transformative migration, but for the bearer of the artifact rather than the community. The people bearing these objects were likely those that underwent the spiritual trials and tribulations of learning medicinal practices, those that underwent the spirit journeys required to practice powerful medicine. Rather than seeing these bearers as being on the death path or having the ability to move between worlds, as Marquardt and Kozuch do, I see them as having undergone the proper training and journeys to become the mediators of the three worlds. They were likely the ones responsible for communicating with the entities in the Upper and Lower worlds to maintain positive relations to keep the cosmos in balance. Thus, wearing these columnella objects links the bearer to both relatedness and circularity.

**Effigy Carvings**

Another line of evidence is effigy carvings. Some of these effigies are zoomorphic, others are anthropomorphic, and still others represent other things that relationships are developed with. Within the Kissimmee-Okeechobee-Everglades watershed proper, these come in the form of the large, carved wooden effigies of Fort Center and Belle Glade, but there are also smaller specimens of bone, stone, and wood that have been recovered. These latter specimens typically have either a perforation, a tenon, or a groove for suspension suggesting their use as personal ornamentation, an
attribute that is common for effigy carvings in South Florida more generally (Wheeler 1996).

These carvings provide evidence for the principle of relatedness in three primary ways. First is the act of carving itself. In a review of modes of artistic depiction among hunter-gatherers, Ingold (2000:111–131) notes that carving is the artistic technique most associated with people that have animic understandings, which is associated with the principle of relatedness. The act of carving is relational in three ways: (1) it involves a give and take process between artist and medium; (2) it brings forth a depiction from the interior of the medium; and (3) it requires keeping both the material and entity being brought forth in the mind of the artist, which maintains relations throughout the carving process. Ingold (2000:126) likens this process to hunting and how it creates and maintains relations between human and nonhuman entities:

there is a… parallel between carving and hunting. Yet the similarity hides a contrast, for in the experience of the carver, hunting is not so much a movement through the terrain as a mode of relating to animals. The important thing in hunting is never to impose one’s will upon animals, to force them against their inclinations. When it is ready, but not before, the animal reveals itself to the hunter, who can then gracefully receive its gift of bodily substance. In just the same way, carving is not the willful imposition of preconceived form on brute matter, but a process in which the carver is continually responsive to the intrinsic qualities of the material, to how it wants to be.

This point about the “intrinsic qualities” (Ingold 2000:126) of a material, about how the material itself wants to be something, is exhibited in Belle Glade wooden effigy carvings. Both Sears (1994) and Willey (1949) note that Belle Glade carver incorporated naturally occurring knots and twists in the wood into their carvings.

Further, carving is a performance, it requires a person to perform certain actions to manipulate the wooden medium. Performance is an integral aspect of bringing
relations into material form and of maintaining those relations (Norton-Smith 2010:95–97). In the case of effigy carvings, it is the performance of the relatedness between the carver, the wood, and entity being brought forth from the wood.

A second way these carvings connote a relatedness is in the realism they display. This realism foments relations between human and nonhuman entities because it helps to keep the depicted entities in the mind of the person interacting with the carving. Ingold (2000:127) notes that hunters often use realistic carvings—either as figurines, talismans, or as decorations on hunting equipment—as stand-ins for the animals they are hunting, which allows them to converse with the animal’s spirit to properly request permission for taking its life. It is important to remember that this communication does not necessarily have to take place in the context of the hunt because nonhuman entities are important in other realms of life as well. Indeed, they play an integral role in the chain of life that provides a model for the operationalization of relatedness, which is visible in the ways inner energy or interiority is envisioned and how it is viewed as relational in itself (Cajete 2000:73; Descola 2013:134).

Third, the context of use can also provide clues to ontological understandings. For instance, the difference between personal- and communal-use contexts can point to the importance of relationships between the material object, what is being depicted, and who those relationships are important to. For instance, carvings for use in communal settings, such as the carved wooden effigies of Fort Center (discussed below), point to the importance of these relations for the community as a whole. This is something that is stressed in the philosophy of many Native American groups because of the principle of relatedness (Burkhardt 2004; Cajete 2000:94; Norton-Smith 2010:57–59). However,
relations between a single person and something else may be just as important, maybe even more so. This is something that tends to be reflected in material culture in the form of small, carved objects used for ornamentation. As Ingold (2000:127) notes for Inuit hunters wearing small zoomorphic carvings, these effigies act “like memories, they are held close to the person—generally fastened to the clothing—and carried around with that person wherever he or she goes.” This is done in order to help keep the animals being depicted, typically those targeted as prey, in mind so that the hunter can maintain positive relations with that animal by interacting with its spirit.

Figure 6-3. Duckhead effigy from the Blueberry site. Courtesy Florida Museum of Natural History, used by permission.

In general, effigy carvings in the Kissimmee-Okeechobee-Everglades watershed are relatively rare, but they do provide a substantial amount of evidence for the presence of the principle of relatedness in the region. There are several examples of the personal zoomorphic effigies like the Inuit example discussed by Ingold (2000:127). One of these is a duckhead effigy from the Blueberry site (Figure 6-3). This small specimen exhibits a realistic style and has a perforation in the head for suspension, suggesting its intended use is ornamentation. There is another specimen from the
Blueberry site that depicts a duckbill. This specimen only features the bill of a duck rather than the whole head, similar to those recovered from Jones Mound in Hillsborough County (Bullen 1952:Figure 16). Instead of a perforation, it has a grooved tenon for suspension. Fort Center has a similar specimen that exhibits the entire head of a duck (Figure 6-4). Like the duckbill plummet from Blueberry, the Fort Center specimen exhibits a grooved tenon rather than a perforation. These zoomorphic carvings point to the importance of relations with ducks. This contrasts with the Inuit example discussed by Ingold (2000:127) because the focus of the depictions was on prey animals, but in the Kissimmee-Okeechobee-Everglades watershed ducks are very small components of the zooarchaeological assemblages (Allgood 2008; Fradkin 2012; Hale 1984, 1989, 1995; Mitchell 1996). What is interesting, however, is that they show up in other forms of effigy carvings (see below). They also happen to be avian species with strong relations to both sky and water, which, as discussed in Chapter 2, are both in strong, visible relation with each other in this region.

![Duckhead effigy from Fort Center. Adapted from Sears, William H. 1994. *Fort Center: An Archaeological Site in the Lake Okeechobee Basin* (Page 71, Figure 6.1). University Press of Florida, Gainesville.](image)

The Belle Glade site also produced personal carved ornaments that are effigies of a sort. However, they are not effigies of animals, but are rather carvings of canoe paddles. These carvings, eight in total, are all small (i.e., less than 10 cm long) and carved from bone (Willey 1949:43). Three of them have perforations for suspension,
while two do not (Figure 6-5). The remaining three are broken, with the missing area being the handle where the perforations would be. These carvings suggest the importance of relations between people and things. Specifically, the relations signified are between people and things that are specifically in relation to water and movement through water. However, there is also the possibility they are stylized depictions of fish (Marquardt, personal communication, 2018). If this is the case, they still suggest the importance of relations, but rather than between humans and things, they would suggest the relatedness between humans and fish, or human persons and nonhuman persons.

Figure 6-5. Paddle effigies from Belle Glade Mound. Adapted from Willey, Gordon R. 1949. *Excavations in Southeast Florida* (Plate 8). Yale University Press, New Haven.

Several examples of human effigies have been recovered from sites throughout the KOE as well. The majority of these are wooden carvings, but a ceramic effigy head
from the Blueberry site is also pertinent to this discussion. This specimen (Figure 6-5), made from fired clay, likely depicts a specific person (Reynolds 2000). The level of detail provides a sense of realism that makes this specimen different from other ceramic effigy heads found throughout Florida and the Southeast more generally. Unlike the examples discussed above, this specimen does not exhibit a tenon or a perforation and thus was not likely used in a suspended fashion but was rather it has a hole in the base of the head that could have been used for attachment to something underneath it (Reynolds 2000:52). The Platt site near Fort Center also produced fragments of ceramic human effigies (Goggin 1951:64).

Figure 6-6. Ceramic effigy head from the Blueberry site. From Reynolds, Anne. 2000. A Ceramic Effigy Head from Highlands County, Florida (Figure 1). The Florida Anthropologist 54:50–54.
In contrast to the ceramic effigies, several examples of human effigies carved from wood were also recovered from sites in the region. Two specimens were recovered from the Belle Glade site, one being complete and the other deposited prior to completion. Willey (1949:57) describes the more complete specimen (Figure 6-6) as a standing person with easily identifiable “head, nose, folded arms over stomach, legs, knees, feet, buttocks, calves, and a large hair-knot on the back of the head.” This is significant because it places humans and animals within the context of the same medium while also placing humans, animals, and trees in a specific relationship.


A wooden effigy of a kneeling person was recovered from a site near Pahokee along the southeastern shore of Lake Okeechobee and approximately 15 km from the Belle Glade site (Purdy 1991:243–244; Wheeler 2011). This specimen is fragmentary because it was discovered during the plowing of a field and thus bears the damage associated with the plow. Nevertheless, this effigy depicts a human kneeling down with
hands placed on the knees and long hair extending down the back of the figure. Wheeler (2011:143) notes that a projection on one side of the head may be related to a headdress feature, but this is uncertain. A very similar effigy was recovered from the base of a mound in Lakeport on the western shore of Lake Okeechobee near Fort Center (Figure 6-8; SNMNH Accession Number A316254-0). The Lakeport effigy has the same manner of hairstyle, with the hair reaching down the back of the figure and the hands are placed on the knees. However, rather than kneeling, the person is seated. Willey (1949:78) also notes the similarities of this effigy to those recovered from Belle Glade.

The most notable carved human effigy from the region, and the most pertinent to this discussion, is the Padgett figurine from the Palm Hammock site (Figure 6-9). This carving also depicts a kneeling person, but the hands are placed on the platform the
The figure is kneeling on rather than on the knees. The figure also exhibits highly detailed facial features, including eyebrows, a nose, eyes, lips, a chin, and ears. What makes this effigy pertinent to this discussion is that it exhibits a headdress exhibiting feline characteristics (Wheeler 2011:143–144). It is likely that this depicts a feline skin being used as the headdress, and it is possible, as Wheeler (2011) claims, that this headdress may be related to panther symbolism because of the similarities in posture and position to the Key Marco anthropomorphic kneeling cat effigy. However, regardless of the species being worn and/or depicted, the depiction of using a headdress with animal characteristics bears relevance to this discussion because of the role it would have played in metamorphosis. As discussed above, donning such regalia would have played an important role in maintaining relations between human and nonhuman persons.

Figure 6-9. Padgett figurine from Palm Hammock site. Courtesy Florida Museum of Natural History, photo by Kristen Grace.
Marquardt (2019) discusses the Padgett Figurine, along with other wooden figurines recovered from sites throughout South Florida, in terms of the role it may have played in transformative ritual. He notes that through transformative rituals, which often involve donning masks similar to the feline headdress or even mask depicted in the Padgett Figurine, a metamorphosis takes place that allows the wearer to experience the behaviors, characteristics, and wisdom of the entity being transformed into. As discussed above, donning such regalia and the experiences that go along with the associated metamorphosis would have played an important role in maintaining relations between human and nonhuman persons.

Figure 6-10. Zoomorphic effigy carvings from Belle Glade Mound. Adapted from Willey, Gordon R. 1949. *Excavations in Southeast Florida* (Page 55, Figure 6). Yale University Press, New Haven.

The human effigies recovered from sites in the Kissimmee-Okeechobee-Everglades watershed add an important dimension to the evidence for the principle of
relatedness in the region. Because they are carvings they provide evidence of the importance of relations between the carver, the medium, and that being depicted (Ingold 2000:111–131). In contrast to many studies on relational ontologies, which emphasize the importance of relations between humans, animals, and things, these carvings suggest the importance of relations among people, a point often neglected in ontological research (Halbmeyer 2012).

Figure 6-11. Zoomorphic effigy carving from Belle Glade Mound. From Willey, Gordon R. 1949. *Excavations in Southeast Florida* (Page 56, Figure 7). Yale University Press, New Haven.

Thus far, this discussion of effigy carvings has focused on the small, personal carvings. I now turn attention towards the larger carvings found in contexts considered more communal. These are the carved zoomorphic effigies recovered from Fort Center (Sears 1994:38–55) and the Belle Glade site (Willey 1949:53–59). At Fort Center these carvings were recovered from the mortuary pond context. Thus, the effigies were in direct association with the remains of ancestral persons. This points to the importance of the relations between people and animals, but, given the context of a communal mortuary facility, it also points to this importance transcending the scale of a single person to suggest the importance of these relations to the community as a whole. It also suggests this importance transcends temporal boundaries and continues into the afterlife. The same is true for the effigies recovered from the Belle Glade Mound. This
was a communal mortuary facility with people and effigies deposited into a mound constructed of wet muck soils.

Excavations at the Belle Glade Mound produced several zoomorphic effigies. There are five fragments of avian species represented, four of which are heads and the remaining an extended wing (Figures 6-10 and 6-11). Exact species for these carvings have not been identified, but one is definitively a form of crested duck and one is a raptor. The latter Willey (1949:57) claims might be an eagle, while Wheeler (1996:188) claims it is a vulture (see Figure 6-11). Willey remarks that the duck head is the most remarkable specimen from Belle Glade, partly because the person that carved it made use of a natural twist and curve of the wood to create the neck, which demonstrates the give and take process between artist and medium discussed above.

Willey (1949:56) further identifies one of the other heads to also be that of a raptor. However, given the curve of the beak overall, and the bulge on the bottom portion of the beak, it is more likely that this is a water bird such as an ibis or stork. Finally, Willey (1949:56) identifies the fourth head as “a woodpecker, an eared grebe, or a bird with a long, straight, pointed bill.” Conversely, Wheeler (1996:188) identifies this specimen simply as “a shorebird.” Interestingly, this specimen has two projections on the posterior side of the head, which Willey thinks might be associated with crests. If they are crests, the fact that they have been hollowed suggests that those crests might have been removable and part of a mortise and tenon system.

A much greater number of zoomorphic effigies were recovered from Fort Center, where Sears (1994) recovered between 100 and 150 wooden carvings from the mortuary pond, many of which are characterized by zoomorphic depictions. He
interprets these wooden carvings as part of a D-shaped wooden platform structure used for mortuary purposes that rose approximately three meters above the water of the pond (Sears 1994:38), which he claims eventually caught fire and collapsed into the pond. He does caution that this interpretation is not definitive (Sears 1994:165), and others have argued against it, claiming that the effigies were likely attached to free-standing wooden poles and the bodies being intentionally placed within the pond rather than accidentally being deposited with the collapse of a platform (Wheeler 1996:95–97). I subscribe to the latter interpretation because of the lack of definitive evidence for an actual platform (e.g., there are no planks or logs, and not enough wood in general).

Figure 6-12. Sample of zoomorphic effigies from Fort Center depicting mammals. Adapted from Sears, William H. 1994. *Fort Center: An Archaeological Site in the Lake Okeechobee Basin* (Page 49, Figure 4.5). University Press of Florida, Gainesville.

In contrast to the assemblage recovered from the Belle Glade Mound, there are numerous species represented in the Fort Center assemblage. These fall into the
categories of mammals and birds, the latter of which are much more numerous. In this discussion I follow the species identifications of Wheeler (1996:88–93) rather than Sears’ identifications because Wheeler’s identifications fit better with visual comparisons. The mammals depicted in this assemblage include several specimens of bears, two felines of which one is likely a panther and the other a bobcat (based on size and depicted behavior), the head of a feline, and two specimens depicting foxes (Figure 6-12). Birds are much more numerous and variable. They include three examples of vultures (Wheeler 1996:89; Sears claims these were turkeys), two full owls and the head of a third owl, three eagles and the head of a fourth, an osprey, a hawk or kestrel, an unidentified raptor, two egrets or herons and the head of a third, two coots or gallinules, a small unidentified water bird, a stilt head, an avocet head, and two spoonbill heads (Figure 6-13). There were also many other unidentifiable wooden carvings recovered.

Sears (1994:42–52) makes an interesting division between styles of carvings that he ties into function. He divides the carvings into a large style, a two-legged style, and a tenoned style. He argues that the former two styles “functioned in an engineering sense as parts of the platform structure” (Sears 1994:42). He bases this on two lines of evidence. First, the large style specimens are all located on the eastern edge of what he identifies as the platform, and the two-legged style specimens are all located on the western edge. Second, the specimens of both styles were either attached to or part of large posts. Thus, he claims these were the structural posts of the platform with the effigies rising above the bodies on the platform. In contrast, the tenoned style effigies were all unattached and the tenons would function to attach the carvings into mortise
features carved into posts. This suggests that the tenoned style carvings were removable and replaceable. Wheeler (1996:91–93) makes a fascinating observation regarding the categories established by Sears. He notes that the specimens comprising the large style and two-legged style all depict non-migratory animals that are predatorial or carrion-feeders. In contrast, the tenoned style specimens are all birds and many of

![Figure 6-13. Sample of zoomorphic effigies from Fort Center depicting birds. From Sears, William H. 1994. *Fort Center: An Archaeological Site in the Lake Okeechobee Basin* (Page 54, Figure 4.9). University Press of Florida, Gainesville.](image)

them depict migratory species. The implication that Wheeler suggests is that the large and two-legged specimens are permanent residents of the region, which is signified in the affixed, permanent characteristic of the carvings themselves, and that the migratory characteristic of the species depicted in the tenoned specimens is signified in the removable characteristic of the tenoned carvings. He further notes the possibility that this latter signification might be actuated in the “ceremonial movement of the carvings at
a particular time of the year in concert with the arrivals and/or departures of these birds” (Wheeler 1996:93).

Like the small, personal effigy carvings discussed above, the large zoomorphic effigies of Fort Center and Belle Glade were made in a style of realism that aligns with descriptions of artistic depictions made by people that adhere to ontologies with relational, animic principles at their core (Ingold 2000; Bird-David 2006; Borić 2013). In addition to the realism in these carvings, many of them depict motion and movement that signify the continual unfolding of the world. This latter point is in contrast to the smaller, personal carvings. However, the smaller carvings typically have a tenon or perforation for suspension, thus the carvings themselves would be in motion in tandem with the person wearing them.

The movement depicted by the large zoomorphic effigies provide important evidence for the presence of the principle of relatedness. The movements being depicted are characteristic behaviors of the animal species being depicted, which is something that matches the characteristics discussed by Ingold (2000:121–122), who states that these behaviors are part of the process that reveals the animals in their medium (see above). There are numerous examples in Fort Center’s effigy assemblage that depict characteristic movements and behaviors. Prime examples include the panther, otters, eagle, and vultures (Figure 6-14). The panther exhibits the movement of running, perhaps chasing down its prey, while the otters depict their characteristic undulating swimming style. In contrast, the eagles display their characteristic perch. In one case the eagle’s wings are spread, with feathers depicted as lines of white pigment,
perhaps about to lift off in flight. In the other case, the eagle’s wings are only partially opened, perhaps on the verge of closing after landing.

![Sample of zoomorphic effigy carvings from Fort Center depicting movement. Adapted from Sears, William H. 1994. *Fort Center: An Archaeological Site in the Lake Okeechobee Basin* (Page 56, Figure 4.10). University Press of Florida, Gainesville.]

Of particular interest, however, are the vultures, all of which lined the eastern side of the pond, and if Sears (1994) is correct, the eastern edge of the mortuary platform. They all exhibit open wings. As Wheeler (1996:89) notes, this is a pose and a motion that vultures display when they are fighting over the flesh of a carcass. This is of particular interest because of the context they are found in: a charnel pond. Such a context and the behavior being depicted reflect the characteristic behaviors of vultures in similar contexts involving carcasses. It is also interesting that among a grouping of Calusa, Boca Raton, and Keys peoples, who were occupying the Tequesta village site to the south, Spanish missionaries documented the presence of a carved bird effigy,
likely vultures because they are described as hideous and as being the deity of a burial ground (Hann 2003:47, 191).

Additionally, the association that Wheeler (1996) notes between the presence/absence of tenons and the migratory nature of the depicted species is suggestive of the principle of circularity. Nonhuman animal migrations are notably cyclical/circular in their occurrence. In the Kissimmee-Okeechobee-Everglades watershed, bird migrations are highly visible phenomena, with thousands upon thousands of different birds of many different species entering and exiting the region annually. This same association is also suggestive of the principle of relatedness in the fact that human persons are part of the process of placing and removing the effigies from their posts at the proper time.

**Cosmological Depictions**

Another carving is deserving of attention. This carving, however, is distinct in its medium, form, and depictions than those previously discussed. This specimen, from the Blueberry site on the western edge of the KOE watershed, is carved from an egg-shaped nodule of sandstone with a hematite cortex. This cortex has been carved away to reveal the inner core of sandstone. In the sandstone medium are several depictions on multiple sides (Figure 6-15) of the nodule and what appears to be a dividing line splitting the nodule in two.

On one side of the dividing line is a depiction of a snake’s head that appears to have an animal in its maw, thus displaying a characteristic behavior of a snake. Butler (2014) notes the presence of a third animal encircling the snake and its prey. He interprets it as a possible otter, but I do not think it is distinguishable enough to make such an interpretation. On the other side of the dividing line are three depictions: a sun,
a lightning bolt, and a sprouting seed. The sun is a circle with radiating lines extending from it, suggesting that the carver intended to depict not only the sun itself, but its characteristic behavior of projecting sunlight outwards through its rays. The lightning bolt is directly adjacent to the sun, suggesting its location in the sky alongside the sun. Further, a bolt of lightning is inherently both movement and a characteristic behavior of rain clouds and thunder, both of which are common occurrences in South Florida. The sprouting seed is on the same side of the dividing line as the sun and lightning, but the nodule must be rotated away from the weather symbols for the seed to be visible. This is suggestive of the seed’s location being away from the weather, possibly below it. This is further suggested by the directionality of the lightning bolt and seed, both of which align vertically. Furthermore, movement is captured in the depiction of the seed through the depiction of the sprout emerging from its top. Thus, all of the depictions on this carving depict movement and characteristic behaviors of the entities being depicted. This characteristic brings this carving into alignment with the characteristics outlined by Ingold (2000), as discussed above for zoomorphic effigy carvings.

Figure 6-15. Carved sandstone nodule from the Blueberry site. Photographs courtesy of David S. B. Butler.
There may be cosmological significance to this carving as well (Butler 2014). The line that bisects the nodule may signify the separation of the Lower World and Upper World of Southeastern Native American cosmology (Hudson 1976:122). This is further suggested by the depictions on either side of the dividing line. The snake to one side, the weather elements to the other. The snake is a figure that is central to numerous myths among Native Americans, in the Southeast and beyond. In Southeastern mythology, the snake often appears as the Great Serpent or the Horned Serpent (Lankford 2007a:240–256), which also shows up often in the iconography recovered from Woodland and Mississippian sites throughout the Southeast (Lankford 2007b).

This character is notably associated with the Lower World, and in stories is often featured in watery contexts that act as portals to the Lower World (Hudson 1976:130). In contrast, the sun and lightning are typically associated with the Upper World in Southeastern cosmology. Specifically, the sun is typically regarded as the most important deity while lightning, and associated thunder, are just behind the sun in importance. They are also often associated with myths revolving around characters known as the Thunderers or Thunder Boys (Hudson 1976:127). The Middle World, the world of persons, both human and nonhuman, may be represented by the single sprouting seed. Butler (2014) interprets the dividing line as representing the Middle World, which he bases on the presence of three groupings: the animals discussed above as the Lower World, a grouping of geometric shapes centered around the dividing line, and the sun, lightning, and seed as the third grouping.

All of this also connotes the principles of relatedness and circularity. As discussed above, the depiction of characteristic behaviors of animals is common among
peoples with animic understandings of entities. The snake swallowing an animal fits this
description perfectly. The sun, lightning, and sprouting seed also have relational
implications. Specifically, they are indicative of knowledge regarding the relational and
emergent characteristics of the landscape. The sprouting of a seed, indeed the growth
of vegetation in general, requires sunlight. It also requires rain, which is represented by
lightning. Further, it also implies knowledge of the cyclical properties of the Belle Glade
world, and thus the principle of circularity, because the cosmos and weather are
intimately related to the emergence and maintenance of visible aspects of that world,
such as vegetation.

The metal tablets of the First Spanish Colonial Period (AD 1513–1763)/Belle
Glade IV Period discussed in Chapter 3 also provide evidence of one of the core
ontological principles. Specifically, they are indicative of the principle of place-
centeredness (see Chapter 5). The indication of this principle is tied to a specific
iconographic element that is present on each and every one of these tablets: the cross
in circle motif.

As discussed in Chapter 5, Lankford (2007b) explains that this motif, which is
found throughout the Mississippian Southeast (associated with the Mississippian
Ideological Interaction Sphere), is a plan view of the Middle World found in the
cosmologies of many Southeastern cultural groups. The center point of the cross is the
sacred fire, and the four arms of the cross are the symbolically placed logs of the fire
that reach to the four cardinal directions. The sacred fire is the center point of Muscogee
Creek towns, to name but one example. It is located at the center point of the square
ground, which is the heart of community life, ceremonial life, and political life, and it
represents a core component of their multi-scalar identities. They identify themselves as being a part of the *italwa* that bears the sacred fire they participate in ceremonies with, and they identify as the “people of one fire” because of the central role the sacred fire plays in the various aspects of Muscogee Creek lives (Hahn 2004:20; Micco 1995:4). Further, while it is not pictured in this plan view, there is a column of smoke rising from the sacred fire (pictured in other motifs throughout the southeast), and this serves as an *axis mundus* connecting the Middle World to the Upper World (Lankford 2007b).

The presence of this motif at Belle Glade sites throughout the Kissimmee-Okeechobee-Everglades watershed, as well as other sites in South Florida more generally, is suggestive of the presence of the principle of place-centeredness. For the majority of cultural groups throughout the Southeast, the sacred fire plays a core role in ceremonial practices and is perpetually kept burning in the center of towns, whether in a square ground or council house; it is only extinguished during annual renewal ceremonies (Hudson 1976). It is likely the Belle Glade peoples followed similar protocols regarding fire. There is some evidence for this at the Blueberry site, where two of the metal tablets were recovered.

At this site there is a large mound in the central portion of the arcing sheet midden that is suggestive of a large, long-burning fire (Lawres in prep). Excavations in this area reveal a plethora of heavily burned objects. This includes ceramic sherds with heavy sooting on both the interior and exterior surfaces, ochre, lithics (both debitage and finished forms), faunal remains, and even one of the metal tablets, of which the top half was partially melted, obscuring a portion of the cross in circle motif. Of particular interest here is the sooting patterns on the ceramics. Under normal circumstances of
use (i.e., food preparation), sooting typically occurs on the exterior of the vessel. However, in the ceramic assemblages recovered from excavations on this mound, interior sooting occurs on nearly half of the sherds.

This suggests one of two things. Either many of these vessels were inverted over a fire, or broken vessels were discarded into a fire. I think the latter is more likely, especially when accounting for the condition of many of the ceremonial artifacts types that were recovered from excavations on the mound: they were heavily charred. The same is true of the more mundane artifacts and ecofacts. Further, charcoal was recovered in a much higher frequency in these excavation units than any others on the site.

This evidence is suggestive of what may have been a long-burning, annually renewed sacred fire like those discussed in the ethnohistoric and ethnographic literature from the broader Southeast (Adair 1775; Foster 2003; Hudson 1976; Waselkov and Braund 1995). The midden stratum in this unit was darker, more compact, and even had a greasier texture to it when compared to the midden stratum in every other excavated area. This greasy texture, along with the burned artifacts and high density of charred wood, leads me to suggest that there is a very strong possibility that the depositional signature on the mound summit is the material signature of a Belle Glade variant of Green Corn Ceremonialism. Now, I say a variant of it because there was a lack of maize agriculture in the region, but this does not mean that similar practices were not occurring in regard to celebrating seasonal change and world renewal; the importance of both cross-cuts cultural boundaries of Native groups.
Ethnohistoric accounts describe most Southeastern groups as practicing the Green Corn Ceremony in order to renew their communities and their worlds (Hudson 1976). Crimes and grievances were forgiven, social ties were renewed, and towns and their individual homes were cleansed. This was all done in preparation of the extinguishing and rekindling of the sacred fire that connected the community with the entities of the Upper World. Essentially, it was all aimed at ritual purity so that there was no chance of the newly kindled fire becoming tainted by lingering impurities in the community (Hudson 1976). Most of the accounts don't provide much detail on the community-wide cleansing in a material sense, but they do almost unanimously describe a practice of feeding the fire, a first fruits offering of ripening corn and medicinal plants.

However, there are some accounts that describe a further act of feeding the fire that involves burning material objects. William Bartram describes the practice as involving the removal old utensils, clothing, furniture, and stored vegetables and grains to be burned in a communal fire (Waselkov and Braund 1995:125–126).

James Adair also describes this in several ways and in several places in his manuscript The History of the American Indians. There are two parts of his description that are particularly apt. First, he describes several of the activities revolving around cleansing the town, one of which is cleaning out the temple, “clearing it of every supposed polluting thing, and carrying out the ashes from the hearth… Several towns join together to make the annual sacrifice” (Adair 1775:144–145). He goes on to say that: “Before noon, the temple is so cleared of every thing the women brought to the square, that the festival after that period, resembles a magical entertainment that had
no reality in it” (Adair 1775:148). A practice such as this could have produced a similar assemblage of items as were recovered from the mound. The second pertinent part of Adair’s description discusses the first fruits offering:

He then takes a little of each sort of new harvest, which the old woman had brought to the extremity of the supposed holy ground, rubs some bear’s oil over it, and offers it up together with some flesh, to the bountiful holy Spirit of fire, as a first-fruit offering. (Adair 1775:150)

Coating such offerings in oil would have the effect of creating a greasy sediment matrix if done year after year in the same location.

These examples provide an analog for the evidence at the Blueberry site to suggest that similar world renewal practices revolving around a sacred fire are present in the Belle Glade culture. Thus, the presence of a sacred fire and its role in world renewal further suggest that the cross in circle motif on the metal tablets follows the patterns identified by Lankford (2007b). This, in turn, is indicative of the presence of place-centeredness being materialized in Belle Glade material culture.

**Mortuary Contexts and Practices**

Mortuary practices and mortuary contexts can also provide important evidence for the presence of the principle of relatedness. Research in other areas of the world shows that mortuary deposits can reveal relational understandings of the world. Specifically, they can inform on ideas of personhood being distributed beyond the realm of humans to include animals as other-than-human persons (Losey et al. 2013). Because of the context of deposition, or interment in this case, these deposits can also elucidate ontological understandings of the transmigration of souls given the availability of ethnographic studies. Such ethnographic data can be an exceptionally powerful tool because it provides strong analogical data. The range of ethnographic data regarding
the relationships between the living and the dead, and among dead persons—both human and nonhuman—is quite varied, but in many cases it has revealed the importance of living human persons maintaining positive relations with human and nonhuman spirits in order to continue to be productive hunters and to not provoke grievances with spiritual entities (Ingold 2000; Losey et al. 2013; McNiven 2013).

However, there is a lack of ethnographic or ethnohistoric data specifically tied to the Belle Glade archaeological culture. This is because the Mayaimi peoples—the historically-known cultural group around Lake Okeechobee—are only referred to in a single historic account given by Fontaneda, who was captive among the neighboring Calusa and thus gave limited details of the Mayaimi. This led to a lack of direct accounts of Belle Glade cultural practices. Yet, there are accounts of Calusa and Tequesta practices from multiple Spanish narratives, and some of these practices are related to mortuary contexts. Because the archaeological record suggests strong relations between these groups and the Mayaimi peoples of the Okeechobee Basin, the accounts of these practices may be informative of Belle Glade mortuary practices.

In Belle Glade mortuary contexts, such as at Fort Center and the Belle Glade site, both the skeletal remains of animals and zoomorphic effigies have been recovered (Hale 1989:127–131; Sears 1994:38; Willey 1949:20–23). The presence of the zoomorphic effigies is undoubtedly intentional, as many were affixed to large posts at both Fort Center and Belle Glade. However, it is unknown whether the animal remains were intentionally deposited in the Fort Center charnel pond or not. It is interesting to note that the Tequesta to the south did participate in the practice of intentionally placing
animal remains in association with the remains of persons deemed to play important roles in their society. Fontaneda provides an account of this practice:

> When a cacique or noble dies, they cut him up and remove the large bones of the body, and they bury the small bones with the body, and in the house of the cacique they place a large chest, and in this chest they enclose the large bones. And all the town comes there to worship these bones, which they have as their gods.

> And in the winter, all the canoes go to the sea, and among all these Indians there comes forth one Indian who is sent with three stakes at his waist, and he throws a lasso around the neck of a whale, and while it is coming up, he places a stake in one of the air holes, and thus since it is tied up he does not lose it because he goes on top of it. And upon killing it as they do, they run it aground on the sand, and the first thing that they do is to open up the head and remove two bones that it has in the skull, and they place these bones in this box where they place their dead, and they worship this. (Worth 2014:217)

This passage suggests two practices that are pertinent to this discussion. First, the placement of whale bones with the cacique's remains shows that it was an intentional practice among the Tequesta to associate humans and animals in mortuary contexts, which suggests the importance of relations between human and nonhuman persons. Of particular note is the use of an aquatic mammal for this purpose. The Tequesta resided in the southernmost portion of the Kissimmee-Okeechobee-Everglades watershed and thus lived in an aqueous world like the Mayaimi (i.e., Belle Glade) peoples of the Okeechobee Basin. They also lived along the southern coast of the peninsula, giving them a much broader aquatic world to dwell within. This inherently points to the importance of water to the Tequesta peoples, who would have created and maintained strong, positive relations with water because of its importance. The use of an aquatic animal for mortuary associations with their deceased leader, or cacique, further suggests the importance of water, but the fact that whales are aquatic mammals
also suggests the importance of animals that maintain relations not with just an aquatic world but to the world above by emerging from the water to breathe air. Furthermore, the use of bones associated with the head or skull of the whale may also be significant. In other areas of the world, the skull is often considered to be the location of the soul of both humans (see below in regards to the Calusa) and animals, and because of this is often given special treatment and used in ceremonial practices (Losey et al. 2013; McNiven 2013). In some cases, the skull is required to maintain communication, and thus relations, with the deceased animals (McNiven 2013:98).

The second practice suggested by the passage is visiting mortuary facilities for communion with the dead. Jesuit priests noted the continuation of this practice nearly two centuries later, but they discussed it in the context of communal burial grounds rather than the burial chests of caciques. They stated that the Tequesta feared the dead, and because of this fear they did not speak the names of the deceased, locating their burial grounds away from living areas (Hann 2003:191). These burial grounds were guarded by warriors, and they were visited on a daily basis to ensure the dead were given offerings of food and other items. This demonstrates that relations were maintained with the ancestors of the community. More so, it shows that the Tequesta went to great lengths to continually maintain these relations. They travelled some distance from the village to visit these places, which were continually guarded, and they brought offerings with them. Thus, maintenance of relations required performance.

The Calusa of the Southwest Gulf Coast also held similar practices of visitation and communion. There are more detailed accounts regarding Calusa religious beliefs, so it is possible to tie these practices with specific beliefs about human interiority, or the
human soul. A Jesuit priest among them, named Friar Juan Rogel, reported that the Calusa believe:

that each man has three souls. One is the little pupil (*niñeta*) of the eye; another is the shadow that each one casts; and the last is the image of oneself that each one sees in a mirror or in a calm pool of water. And that when a man dies, they say that two of the souls leave the body and that the third one, which is the pupil of the eye, remains in the body always. And thus they go to the burial place (*enteramiento*) to speak with the deceased ones and to ask their advice about the things they have to do as if they were alive… from what they [the deceased] say to them there, they learn about many things that happen in other regions or that come to pass later on. (Hann 1991:237–238)

What this passage suggests is that because the pupil soul remains with the body after death, the Calusa are able to visit mortuary facilities to commune with their ancestors. Further, it suggests that they frequently converse with their ancestors about current and future events in both local and distant contexts.

It is likely the Belle Glade peoples (i.e., the Mayaimi) performed similar practices of visitation and communion with the ancestors. The Fort Center and Belle Glade Mound sites would be likely candidates for such visitations, and it is likely that the zoomorphic effigy carvings at these places played a large role in these visitations. Just as Ingold (2000:126–127) notes in regards to the zoomorphic carvings among the Inuit, the realism of the carvings at both Fort Center and Belle Glade Mound would have been an important factor in these visitations and communions because they would have acted as stand-ins for the real animals. In other words, their likenesses would have fostered increased communication, and thus positive relations, between people and the animals or animal spirits the carvings depicted. Furthermore, because of their association, and thus relations, with ancestral humans they likely would have fostered increased communication with ancestral spirits as well.
The mortuary contexts themselves are also indicators of the principle of relatedness. As briefly discussed in Chapter 3, there is a dichotomy in terms of mortuary contexts in the KOE watershed. There are numerous sites where people were buried in conical earthen mounds. In fact, at Big Mound City there are two such mounds. In one of the mounds there were postcranial remains of several individuals, while in the other were several crania (Willey 1949:75–76).¹ As other researchers have noted, burial mounds provide a medium for bundling relations (Pauketat 2013; Wallis and Blessing 2015). The mounds act as containers for things to be placed within, and once placed within, relations between these things are made, similar to the way medicine bundles use the bundling of disparate objects to create a powerful unison through the relations created within the bundle itself (Zedeño 2008, 2009, 2013). These relations can also extend to the people that made them, if they are manufactured material objects, as well as to the social contexts they originate from (sensu Jones 2001). This also extends to animal remains or animal depictions that are deposited within the mound, in that the relations extend back to the social world those animals originate from (sensu Descola 2013 and Viveiros de Castro 1998). Further, these relations also extend to the earthen form and earthen medium they are deposited within, which also places them in relation to the sky since the mounds reach towards the heavens (sensu Ingold 2013).

The other half of the Belle Glade mortuary dichotomy is a much different context. As briefly discussed in Chapter 3, there are several known sites in the Okeechobee Basin that exhibit subaqueous mortuary contexts, what I refer to as subaqueous

¹ It is uncertain as to whether the crania and postcranial elements belong to the same people or not. These remains, along with the majority of the materials recovered from Big Mound City, were lost at some point, likely during transport from the field to the Smithsonian Institution (Willey 1949:76).
ossuaries. Fort Center is, by far, the most famous of these sites, but it also stands out from the rest because its subaqueous ossuary was constructed (Sears 1994:165). Sears only excavated a portion of the pond, but at least 150 skeletons were encountered (Sears 1994:164). Other sites with subaqueous ossuaries in the Okeechobee Basin include several island sites in Lake Okeechobee. These are Ritta Island, Kreamer Island, and Observation Island (Davenport et al. 2011:483–484, 518–519; Hale 1984, 1989:161–162; Will 2002:105–107). In contrast to Fort Center, the subaqueous ossuaries at these sites were not constructed but were contained within the waters of Lake Okeechobee itself. Specifically, people were interred off the north shores of Ritta and Kreamer Islands, and between the shoreline of Lake Okeechobee and Observation Island (Will 2002:105). Some of the burials were close to the shorelines while others were much further away, up to just shy of an estimated 1,400 meters (Will 2002:106).

The subaqueous ossuaries also create contexts of bundled relations, but they do so in a context that reflects the importance of water in the Belle Glade ontology. As shown in Chapter 2, this was an aqueous world that the Belle Glade peoples dwelled within, and thus water would be an extremely important part of their world. Because of this they would want to create and maintain as many positive relations they could with water. These subaqueous ossuaries did just that, they created and maintained relations between humans and water, and they did so in a fashion that maintained those relations beyond one life and into the next. Thus, deceased humans continued to maintain those relations beyond death, and when living humans visited these places to commune with their ancestors—possibly bringing offerings—they were aiding in continuing those
relations among the living by relating with the dead associated with water. It is also pertinent to revisit the description of Calusa beliefs about the human soul here because, as discussed above, one of the souls remains with the body after death, which in turn allows the communion with the dead. It is also important to remember that one of the souls is the reflection visible in pools of water. It is possible that the Belle Glade peoples held a similar belief and the burial in water may be a reflection of that belief. Furthermore, if a person is visiting the subaqueously buried dead and they are looking into the water, they will see their reflection in the water with the dead. If they adhered to the same belief of the tripartite soul as the Calusa, this would place one of their souls in the water with the pupil souls of the deceased, creating an immediate relationship between the souls of the living and the dead.

Yet, the dead in these subaqueous ossuaries were in bundled relations with more than just water. In the context of Fort Center, they were also in relation with the zoomorphic effigy carvings. However, in the context of the Okeechobee Islands—Ritta Island, Kreamer Island, Observation Island, and Grassy Island—they were also in relation to living subaqueous entities, the same entities that comprised the majority of their diet. The burial of the dead among these entities may have helped to maintain positive relations with them much as Ingold (2000:126–127) notes for the Inuit hunters that attempt to do so with their prey animals through zoomorphic carvings.

In addition to the aqueous animals, the dead in these special ossuaries were also in relation with a specific form of earth: muck. As discussed in Chapter 2, this muck is an essential part of the hydraulic regime of the KOE watershed because it retains water during the dry, or damp, season. The Belle Glade peoples may have realized the
importance of this organic sediment specifically because of this water-retaining quality. This muck sediment lined the bottom of Fort Center’s subaqueous ossuary, and it lines the bottom of Lake Okeechobee where the bodies were interred off Ritta, Kreamer, Observation, and Grassy islands. I would argue the knowledge of the importance of this sediment and its water-retaining characteristic is reflected in its use as a burial medium in the Belle Glade site’s mound (Willey 1949:20–22). It was with this organic sediment that the mound was originally constructed (it was later capped by a layer of limestone pavement and a conical sand mound), and it was in this medium that numerous burials were encountered, along with wooden zoomorphic effigies. The use of muck in this context might have also played a citational role (sensu Butler 1993) in signifying the relationship to the subaqueous ossuaries of the region.

Summary

As this discussion shows, there are several lines of evidence that support the presence of relatedness, circularity, and place-centeredness in the Okeechobee Basin: ceremonial regalia, columella pendants, effigy carvings, cosmological depictions, and mortuary practices. The ceremonial regalia, deer antler headdresses recovered from the Belle Glade site, is suggestive of relatedness through the presence of animic understandings in which personhood extends beyond humans because of the similarity of interiority in all entities (Descola 2013:129–130; Ingold 2000:123–126). This understanding of a common interiority underlies the ability to undergo metamorphosis through the donning of the body parts of other entities, which has been documented among numerous groups adhering to a relational ontology (Descola 2013:133–138). The shell pendants or plummets recovered from sites throughout the Basin are suggestive of circularity through not only their morphology but their signification of the
communicative medium that keeps the three worlds of the cosmos in balance: the spiraling column of smoke.

The effigy carvings—anthropomorphic, zoomorphic, and thing-oriented—are indicative of relatedness in three ways: (1) the act or performance of carving—a performance (itself an integral aspect of relationality) that brings forth emergent relations between carver, medium, and depicted entity; (2) the realism depicted in the carvings allows the carvings to act as substitutes for the spirits of the animals, thus aiding in maintaining relations through communication; and (3) the context of use is pertinent to revealing the type of relations signified in the carving (i.e., personal or communal).

The cosmological depictions depict relatedness and place-centeredness. The carved sandstone nodule from the Blueberry site signifies relational understandings of the three worlds of the cosmos described among many Southeastern Native American groups (Hudson 1976:122) while the cross in circle motif on the metal tablets is indicative of place-centeredness because of the depiction of the sacred fire. Finally, mortuary practices are suggestive of the relations among things, humans, and animals deposited within mortuary facilities. All of this evidence provides a strong supporting base for the arguments I put forth in Chapters 7, 8, and 11.
In Chapter 6, I presented evidence from the Belle Glade material record that is indicative of the presence of the ontological principles I outlined in Chapter 5. To reiterate, these principles include relatedness, circularity, and place-centeredness, all of which are drawn from contemporary Native American philosophies and all of which are reflected in multiple types of artifacts and their depositional contexts at Belle Glade sites. This evidence provides the groundwork necessary to begin reconstructing the ontology of the Belle Glade peoples, but it also provides a strong supporting base for the arguments I set forth here and in Chapters 8 and 11. More importantly, however, is that this evidence provides the initial basis for reconstructing an ontology with more details than the overgeneralized concepts, such as the relational ontology concept, that have become dominant in ontological research in archaeology.

In this chapter I lay the foundation for testing whether the ontological principles outlined in Chapter 5 are present in the Belle Glade monuments. I begin by reviewing the literature on ontological studies of monuments as a way to identify and develop a set of expectations that, if met, provide indications of the ontological principles outlined in Chapter 5: relatedness, circularity, and place-centeredness. These expectations are discussed in the following section. Using these expectations as a basis, I then explain the methods used to test the applicability of the ontological principles to the Belle Glade monuments. In other words, the methods discussed here are used as a way to test for the presence of the ontological principles in the Belle Glade monuments. The results of the analyses that incorporate these methods are reported in Chapter 8, which focuses on the evaluation of the presence of the principles.
Ontologies and Monumentality: Developing Expectations

Few archaeologists involved in the ontological turn have focused their research on how ontologies can be materialized as monumental architecture. Rather, the majority of ontological archaeological studies have focused on how ontologies are manifested and visible in the archaeological record as specific forms of artifacts and specialized depositional contexts. Some have sought to reveal these materialized ontologies through the identification of index objects and the relations they are intended to signify (Conneller 2004; Zedeño 2008, 2009, 2013), the relationships found between ritualized practices and their associated depositional patterns (Brown and Emery 2008; Mills and Ferguson 2008; Murray and Mills 2013; Wallis and Blessing 2015), or the relations signified in the deposition of other-than-human persons, including nonhuman species as well as animate objects, in mortuary contexts (Hofmann 2013; Losey et al. 2013; McNiven 2013:111–112). The few archaeologists that have investigated the relationship between ontologies and monuments have focused on several aspects that are pertinent components of projects of monumentality. These studies fall under three categories: (1) artistic depictions in stone monuments; (2) construction materials and their relations; and (3) bundled deposits of relations.

Two studies fall within the realm of the first category—artistic depictions in stone monuments. In an excellent study of Gòbekli Tepe’s architecture, Borić (2013) engaged with the visual depictions found throughout this very early monumental architectural site. In this study, Borić sought to reveal the meanings underlying the depictions in terms of a regional symbolic ecology by evaluating the contextual landscape through the zooarchaeological assemblages at the site, comparing species frequencies to the frequencies of species depictions. He notes that the frequencies do not match between
the two datasets, with gazelle and aurochs dominating the faunal assemblage and predators dominating the depictions. To help reveal the ontology underlying these patterns he turns to Descola’s (2013) typology of ontologies and Ingold’s (2000) work on characterizing the art associated with different ontological schema. He notes that these depictions accord well with Ingold’s descriptions of animic depictions. Rather than the X-ray style and inanimate scenes depicted in totemic ontologies, the imagery of Göbekli Tepe focuses on the bared teeth and movements that characterize animic depictions. The bared teeth are significant not only because they emphasize the dangers that predators can pose, but they also signify the danger of the interiority or inner being of the predators, an inner being shared with human persons (sensu Descola 2013). Borić explains that the imagery of Göbekli Tepe suggests the site acted as a theatre where the viewer is removed from the realm of the ordinary and the everyday to be immersed in the parallel world of animic inner beings. Thus, the intended audience may have been shamans, whose lives are characterized by the dangers of entering this other world. Further, the presence of projectile point styles from areas in the broader region suggests that people of different communities coalesced in this area, which in turn suggests that multiple communities within the region adhered to the same or very similar ontological systems.

Weismantel (2013) takes a different approach to evaluating the artistic depictions of Chavin de Huantar. She approaches these depictions from the frameworks of phenomenology and materiality. From this vantage, she focuses on visual and bodily perception as human persons encountered and engaged with the monoliths of the site and, in turn, how those monoliths might have acted towards the people engaging with
them. She notes that such objects “are constructed to engage our senses and our bodies in culturally sanctioned ways” (Weismantel 2013:24), and the key to understanding how that works is “by analyzing the way that artifacts constrain, prevent, or enable specific forms of interaction and perception” (Weismantel 2013:24–25). In the context of Chavín art, the three-dimensionality and large size of the monoliths—often twice the size as the human encountering them—combined with the minute details carved in a much smaller scale requires the viewer to actively engage with the depictions. They have to move closer to view the details of multiple images contained within each other, but then have to move back out and around the monoliths to view other details as they seamlessly flow around all sides of the features. Weismantel notes that this form of art requires an active engagement to truly see it, a mode of “active seeing” that requires multiple perspectives (Weismantel 2013:28). This, she claims, is a form of experience similar to getting to know another person or entity.

She ties this in with Viveiros de Castro’s (1998) concept of perspectivism. As one moves through the plazas into the temple and its subterranean corridors, there is a shift in perception and perspectives. This shift is from one doing the seeing to one being seen, since the primary focus of all the depictions on the monoliths are three-dimensional eyes set against a backdrop of what amount to be two-dimensional reliefs. Yet it is also a shift from visual perception to audial perception. As one moves into the subterranean corridors, visual capabilities are lost to the darkness and audial perception is enhanced, yet altered, by tiny passages that allow the movement of air and cause the manipulation of sounds. Weismantel notes that these perspectival shifts accord well
with the ontological perspectivism found among many Amazonian cultural groups that are likely descendants of the builders of Chavín de Huantar.

Eleanor Harrison-Buck’s (2012) study of Maya circular shrines is the only study that falls within the second category—construction materials and their relations—of studies on the relationship between architecture and ontologies. In this case study, Harrison-Buck examines circular shrines among the Sibun Maya and evaluates them in terms of their animistic and relational qualities that transform along with the landscape around them. To do so she draws on Gell’s (1998) concept of distributed personhood and Bird-David’s (1999) theory of relatedness. In the Sibun Valley she identified three circular structure types. Type 1 structures represent the earliest and are “simple circular platforms that may or may not have a staircase leading to the top… [with] a cobble surface and does not show signs of a formally prepared plaster floor… [and they] sometimes have an overhanging cornice” (Harrison-Buck 2012:69). Type 2 structures are comprised of a superstructure that has low walls underlain by a plinth resembling “a molding or low step circling the exterior… that does not extend under the entire building, only under the superstructure walls” (Harrison-Buck 2012:69). There is a single doorway into the structure. Type 3 structures are in-filled Type 2 structures with a second superstructure built on top.

Two significant aspects of these constructions are the use of marine shell and speleothems as architectural elements. In the case of the marine shells they are found in higher concentrations with these structures than in any other context in the Sibun Valley. Researchers in other subareas of the Maya region have documented their use as roofing elements and that they act as trumpets every time the wind blows. These...
shells were transported from the Caribbean Sea. Speleothems were found in association primarily with the doorways of these structures, and in one case large stalactites were carved and used as doorjambs. Harrison-Buck argues that these materials:

served as portals of animacy, stimulated by an ongoing engagement with other conditions in the world that they inhabited—namely, the seasonal rounds that brought wind, rains, and agricultural fertility to the Sibun Valley on an annual basis. I suggest that this complex network of interactive agency involved ongoing negotiation between human and other-than-human agents, namely Ehecatl Quetzalcoatl and his divine attributes of air, water, and creation (Harrison-Buck 2012:73).

The shrines, with their shell trumpet adornments, would have acted as signals of the coming rains and shifting winds, and the speleothems acted as references to caves associated with Ehecatl Quetzalcoatl and thus the summoning of the winds and rains. However, Harrison-Buck stresses the fact that marine shells and speleothems are only found in association with circular shrine contexts in the Sibun Valley. To her this suggests the possibility of local ontological variation and further emphasizes the need to examine the situated context before applying a relational ontological approach to analysis and interpretation.

Within the third category—bundled deposits of relations—sits Timothy Pauketat’s (2013) An Archaeology of the Cosmos: Rethinking Agency and Religion in North America. In this study, Pauketat focuses on Cahokia and its hinterlands and the many examples of monumental architecture, specialized deposits, and mortuary contexts found in the region to reveal how different relations are brought together to transfer agentive powers through the medium of religious practice. To understand this process, he uses the metaphor of a bundle, defined as “a set of otherwise distinct things, substances, or qualities… [that] form nodes in a larger field or web of relationships
where material and metaphorical relations and associations articulate with one another” (Pauketat 2013:27). The affordant properties of the bundled contents, all teeming with their own animate qualities of life and personhood, gain additional agentive powers because of their position within the relation field created by the process of bundling. In other words, on their own the various contents of a bundle may be animate but not have much agentive power, but when they are bundled together, the agentive powers of each of the contents are transferred to the web of relations created by the bundle itself, magnifying its power in a way similar to Aristotle’s famous phrase “the whole is greater than the sum of its parts.” However, bundles do more than just create or magnify agentive power. They mediate relationships by transferring and translating various powers (Pauketat 2013:34–42).

For Pauketat, the architecture of Cahokia (both monumental and nonmonumental)—along with the people who built it, participated in the practices surrounding it, and creating the deposits within it—is, in itself, a bundling of monumental proportions. Many of the massive site’s architectural features are aligned with celestial events, especially the annual solar events (i.e., solstices and equinoxes) and the generational lunar events (i.e., lunar minima and maxima), thus bundling earth with sky. There is also substantial evidence suggesting that Cahokia was the target destination of pilgrimages from throughout the Southeast, thus bundling the individual agentive powers of those moving to, from, and within the site. Further, there are many deposits within Cahokian architecture that include the dead as well as the living in the form of animate objects. Essentially, a multitude of different relations, or more appropriately relational fields, were bundled together at Cahokia, within its monumental architecture.
This monumental bundling, Pauketat argues, was part of an ancient, and massive, religious tradition that relied on the agentive powers of people, places, things, the earth, and the cosmos. As Pauketat notes:

the religions of ancient America were based on relational ontologies that lacked rigid distinctions between animate and inanimate powers or human and nonhuman agencies. Rather, such powers and agencies came into being through the affordant and animate properties of bundles of the most elemental practices of people and a universe in motion. These properties enabled repeated couplings, convergences, synchronicities, transubstantiations, or intimate parallelisms. In so doing, they embodied and emplaced agency by articulating the connective threads brought together in such sensory-rich engagements (Pauketat 2013:181)

The work of William Romain (2015a, 2015b), focused on Hopewell monumental architecture, also falls within this category. From a relational perspective, Romain examines the connections between moving people, the cosmos, landscape features (Sugarloaf Mountain in this case), the Great Hopewell Road, and the Adena-Hopewell monumental architecture. More specifically, he uses archaeoastronomical methods to evaluate the Adena-Hopewell earthworks, and he reports (as do Hively and Horn 1982, 1984, 2006, 2010, 2013) that there are numerous solar and lunar alignments present within the earthworks. He also notes that from numerous Hopewell sites, solstices, equinoxes, lunar minima, and lunar maxima (which celestial event depends on the site it is being viewed from) would be seen to occur as either rising from or setting into Sugarloaf Mountain, and he thus argues the mountain may have been an axis mundi for the Hopewell world.

He also notes that the Great Hopewell Road aligns with the rise and set of the Milky Way, which in the legends and beliefs among many Native American groups acts as the Path of Souls (see Lankford 2007a, 2007b). Further, when the trajectory of the road is projected further outwards, it aligns with Sugarloaf Mountain. To add to this
complex string of arguments, he also finds that from Sugarloaf Mountain, the
constellation known as Scorpius lies along the same azimuth angle as the Serpent
Mound, a large Adena-Hopewell effigy mound. This is significant because the Great
Serpent of Native American legend and belief is said to guard the Realm of the Dead
that the Milky Way Path of Souls leads to. From the relational perspective, Romain
takes these observations to suggest that the Adena-Hopewell earthworks, the Great
Hopewell Road, Sugarloaf Mountain, and the Serpent Mound comprised a
“transdimensional relational network” where “each site “did” something in the sense of
enabling, facilitating, guiding, constraining, or otherwise affecting the movements and
experiences of people, living and dead” (Romain 2015a:54)

While all of the topics just discussed are pertinent to discussions of
monumentality because they are part of the broader projects of monumental
construction process, they are not always relevant for every case study because not all
monumental architecture consists of stone elements conducive to artistic depictions, nor
is all monumental architecture constructed of multiple materials, nor does all
monumental architecture contain internal deposits conducive to evaluating specialized
deposits, or bundles if you will, for the presence of index objects.

The Belle Glade monuments are a case in point. They are made entirely of earth,
and several researchers have noted the sterility of the embankments and the very
minimal deposits (i.e., less than 30 sherds) in only some of the terminal conical mounds
associated with the embankments (Carr et al. 1996:9–11; Carr and Steele 1994: 8–10;
Sears 1994:130–133, 136-137; Willey 1949:74–76). The only mounds at these
monumental sites with dense deposits are the midden-mounds located inside the semi-
circles—which contain the refuse of daily activity and not specialized deposits—and the burial mounds that are not attached to the Type A or Type B monuments. Even so, these monuments hold the potential to enlighten our view of how ontologies can be materialized as monuments. However, I argue that we need to look to the form of the monuments themselves to reveal how this is so.

Even so, there are several expectations to be gained from the brief review of ontological research on monumental architecture. The alignments to celestial phenomena, such as those described by Pauketat (2013) and Romain (2015a, 2015b), provide an excellent starting point to develop some expectations as to what we should look for to reveal such a materialization of ontologies. As Pauketat and Romain both note, the act of aligning to celestial phenomena such as solstices, equinoxes, and lunistices (i.e., lunar minima and lunar maxima) can be indicators of relational webs or bundles. More so, however, we can extend this line of reasoning to accord with the principles of relatedness and circularity outlined in Chapter 5.

As discussed previously, for Native Americans the principle of relatedness conceptualizes all things as being animate, having personhood (and thus agency), and as being related to everything else in a world because of this common animacy and personhood. Thus, the stars in the sky, the moon that looms over us each night, and the sun that vaults the sky each day are all active social agents and are thus related to everything on the earth below them. They are a part of the landscape in a way that is manifested in the seasonal changes that are visible on the ground, in the winds, in the leaves of the trees, and in the waters that fall from the skies. In other words, earth and sky are related in myriad ways that are highly visible to the naked human eye.
Furthermore, they all tie into the principle of circularity because of the cyclical patterns that they follow. The sun has a cyclical daily path as it rises and sets each day, but it also has an annual cycle as it moves north and south of the equator along the horizon to rise and set in its pathways. The moon has its cycle along the horizon as well, but rather than the annual cycle followed by the sun, it moves at a much different scale that is measurable in generational time (Pauketat 2013). The lunar maxima occur once every 18.6 years, a period of time referred to as the lunar standstill cycle, and the minima occur halfway through (9.3 years) this cycle (Kelley and Milone 2011:29–36). Thus, celestial alignments can be expected to indicate both the principles of relatedness and circularity.

The significance of this extends beyond just developing these expectations for what to look for in the Belle Glade monuments. There is a steadily growing database of such celestial alignments in eastern North America. Extensive research on the Adena-Hopewell monuments has demonstrated the presence of such alignments in the geometric earthworks of the Midwest (Hively and Horn 1982, 1984, 2006, 2010, 2013; Romain 2000, 2009, 2015a, 2015b). They have also been demonstrated in the layouts of numerous major Mississippian mound centers (Benchley 1974, 2000) as well as among the architecture of Cahokia and its hinterlands (Pauketat 2013; Skousen 2015) and many of the monumental sites of the Archaic Southeast (Sassaman 2016). Contemporary Muscogee Creeks still refer to the Mississippian and Woodland mound centers throughout the Southeast as being celestial observatories and containing ancestral knowledge of the movement of the sun and stars (Chaudhuri and Chaudhuri 2001). Such celestial alignments are also not limited to this area of North America. They
are also found among the Puebloan architecture of Chaco Canyon (Sofaer, ed. 2008; Van Dyke 2003) and elsewhere in the Southwest (Fowles 2004, 2013), and they have been shown to play a large role in Native American legends and oral histories (Lankford 2007a, 2007b; Miller 1997) and in the timing of their ceremonial practices (Chamberlain 1982; Hudson 1976). Thus, this holds the implication that these examples may also be indications of the principle of circularity among these other cultural groups.

Yet, as discussed in Chapter 5, the principle of circularity also has a spatial component to it. According to Fixico (2003), Native Americans conceptualize both time and space as circular phenomena. While time is moving in a cyclical fashion, with the sun moving along its daily and annual patterns—the seasons following suit—Native American peoples timed their movements across the landscape in accordance with these patterns. Thus, their movements to attend to particular tasks, such as gathering a resource at point A during the Fall and then moving to point B to collect another resource during the Winter, were made in a similar cyclical pattern. Additionally, because of the nature of our visual perceptions being tethered to our corporeal bodies, our field of view is limited to a wide circle. As you stand in a single location, you can perceive the world within a circular frame of view as you spin your head to the left or right, or turn your body in similar fashion, to shift your peripheral vision to your central vision. For these reasons, and more (as discussed in Chapter 5), space and spatial movement are conceptualized as circular, and thus circles figure prominently in Native American iconography such as the cross-in-circle motif that depicts a central point that radiates outwards into the cardinal directions within a circular field of view (Lankford 2007c).
As such, we can expect the circle to hold a vast significance in the morphology of monuments, and to indicate the spatial aspect of the principle of circularity. In fact, Fixico (2003:41–42) specifically points out that the conical mounds of the Woodland period Southeast (cal. 1200 BC–AD 1000; Anderson and Sassaman 2012) are manifestations of this principle. These mounds are, in essence, a series of nested circles that rise towards the sky; they are circular at their base, and that circle rises upwards with a diminishing diameter until it reaches the peak of the mound. This shape can also be thought of as a compacted and condensed spiral, a shape which happens to be found in the form of ramps winding their way around many of the conical mounds in the Southeast (Marquardt and Kozuch 2016).

Norton-Smith (2010:129–132) offers a similar insight for the Hopewell earthworks of the Midwest. He notes that the entirety of the monuments are the embodiments of this principle in both its spatial and temporal aspects. Many of these earthworks incorporate circular shapes into their overall form, indicating the spatial aspect of the principle, but as Romain (2000, 2009, 2015a, 2015b) and others (Hively and Horn 1982, 1984, 2006, 2010, 2013) have shown, the presence of many celestial alignments within the monuments also indicate the temporal aspect of circularity. Thus, alongside the expectation that we should see celestial alignments present in the Belle Glade monuments to indicate the temporal aspect of the principle of circularity, we should also expect to see circles figure prominently in the overall form of the monuments as well. This would indicate the spatial aspect of the principle of circularity.

For indications of the principle of place-centeredness I argue that we should have two expectations. First, we can expect place-centeredness to be exhibited in the actual
construction materials in two primary ways. As noted above, the Belle Glade monuments are built entirely of earthen materials. They are not shell mounds like those along the coasts of South Florida or along the coasts and major riverways of the Greater Southeast, and they do not include stone architectural elements like those in Meso- or South America or other areas of the world. They are built only of sediments that were excavated, moved, piled, arranged, and likely tamped into their final orientations. Because of this we cannot look to multiple materials and their attendant relations and significations as Harrison-Buck (2012) has done for the Maya circular shrines. Rather, we can look to the sediments for evidence of long-term use and construction sequences (see also Chapter 9) to indicate place-centeredness.

The long-term use of mounded architecture would provide evidence suggestive of multi-generational occupation of the architecture. In this sense, the presence of midden-mounds would indicate such long-term usage. This type of architecture is formed through the gradual accumulation of generations of debris from everyday life, and thus it is not intentionally constructed architecture (Marquardt 2010a, 2010b). Over generations of unintentionally building these features through discard, they can become quite large, and people may take it upon themselves to shape them into culturally sanctioned forms. This becomes especially salient if people are living on the summits of the features. However, for the purposes of this discussion, this type of feature provides the evidence for long-term, habitual use of a specific location in space. That is, they are persistent places (*sensu* Schlanger 1992) on the landscape that people either repeatedly return to use over and over again, or they are places continually inhabited
over long temporal spans. Thus, midden-mounds provide evidence for place-centeredness.

The other way the construction materials can be expected to provide evidence for place-centeredness is in construction sequences. This relies on the assumption and acknowledgement that the actual process of monumentalizing a place on the landscape signifies the importance of that particular place. Thus, in this sense it is already possible to say that the principle of place-centeredness is indicated by the presence of Belle Glade monuments, as well as that it is present among numerous cultural groups worldwide. However, I do not think the presence of monumental architecture alone provides sufficient evidence to justify claiming the presence of this principle. We should expect the construction sequences to tell us one of two things. Either the place was considered of such significance from the beginnings of occupation that all of the architectural features were built together over a long period time and involving multiple construction stages—something evidenced by many of the Mississippian Period (cal. AD 1000–1540) platform mounds that were built in multiple construction episodes (Knight 2006; Lindauer and Blitz 1997; Pauketat 2000)—or place gained its significance over the course of generations of occupation before being monumentalized in rapid fashion. In the context of this study, the latter evidence is exceptionally significant because it implies that the principle of circularity is involved in the process of developing a sense of place-centeredness, which accords well with the arguments of the philosophers Fixico (2003), Norton-Smith (2010), and Deloria (1999, 2003) in regards to how places become important in Native American thought. This is something, however,
that is the subject of Chapter 9, and the tests for these expectations are reported therein.

The second expectation for the principle of place-centeredness also draws on the principle of relatedness. What I mean by this is that we can expect the principle of place-centeredness to involve evidence of the relatedness of places. One way we can expect the relatedness of places to be indicated is through the deposition of objects manufactured in distant places to be emplaced or deposited in specialized contexts within the monuments. However, this is not possible with the Belle Glade monuments because they lack specialized deposits that might contain the data for this line of evidence. The only architecture of the Type A and Type B monuments that contains significant deposits of any kind are the midden-mounds within the confines of the semi-circular embankments and the burial mounds that are considered separate entities from the monuments themselves.

However, there is a second way that we can expect the relatedness of places to be indicated in the Belle Glade monuments. More specifically, I expect alignments between and within places to figure prominently. Other researchers in North America have found alignments between places on a landscape to be both present and expressive of the relationships between the aligned places. Chaco Canyon provides one such example. Here there are several important regional centers—Chaco, Aztec, and Paquimé—located on a meridian alignment (Lekson 1999). Lekson (1999) argues that these centers represent a chain of regional capitals, where the elites of Chaco abandoned their home and moved more than 80 km north along the meridian to
establish Aztec as a new capital, and then after a time abandoned Aztec to move over 600 km south along the meridian to establish Paquimé as a new capital.

A similar meridian alignment is found at Poverty Point (Clark 2004; Sassaman 2005a, 2010). Poverty Point’s alignment, however, is a bit different than that of Chaco’s. Rather than multiple regional centers being aligned along a meridian, Poverty Point exhibits three large earthen mounds (Mounds B, A, and E) aligned along a meridian that when projected further to the south aligns with Lower Jackson Mound, which predates Poverty Point by more than a millennium. This may be considered a reference to the relatedness of not only the places but of the builders of those places, through either genetic or cultural ancestry.

A third example of alignments that indicate a relatedness of places is found in the Archaic solstitial and meridian alignments of major Archaic architectural centers throughout the Southeast (Sassaman 2016). Sassaman (2016) argues that a grid of equilateral triangles established along meridians creates the same azimuths as the solstices, and that these triangles were used in siting the locations of new mound centers, cemeteries, and caches relative to older ones. This grid of triangulated mound centers structured the movements of people, things, and the dead in what Sassaman refers to as a futurescape that aided in coping with sea level rise. In other words, these places were related with one other on the basis of the people moving between them.

These other researchers have shown that meridian alignments between sites may be a pertinent avenue to explore when evaluating the relatedness of places. However, a cursory look at the Belle Glade monument distributions shows that meridian alignments do not seem to be much of a factor in the region, and among the Type A and
Type B monuments there are very few embankments that are near a north-south orientation. However, the form of the Type A and Type B monuments can guide our expectations. To reiterate, these monument types consist of semi-circular earthen embankments with linear embankments that project outwards from the semi-circles. In the case of the Type A monuments there is only a single linear embankment or a pair of dual, parallel embankments extending outwards, while the Type B monuments exhibit multiple linear embankments radiating outwards from the semi-circle in multiple directions. I expect that these embankments provide the basis for creating alignments between places on the landscape and provide the indication of the relatedness of places. Thus, if they align with other places, they can indicate the presence of both the principles of relatedness and place-centeredness.

**Methods: Testing for the Ontological Principles**

As a starting point I began with historic aerial photographs that depict these monumental features. Johnson (1991, 1994, 1996) has repeatedly noted that the use of historic aerials in studying the monumental architecture of the region is highly productive. These constructions are typically located in flowing-water ecosystems, such as wet prairies, sawgrass marshes, and sloughs. Because of the environmental locations of the monuments there is minimal canopy cover, rendering them visible from an aerial point of view. Furthermore, they are always constructed of white, sandy sediments, which further increases their visibility. Because of their locations in flowing-water ecosystems, the surrounding environs appear as having a darker gray coloration than the monuments themselves. Thus, the combination of aquatic environments and white sand constructions offer a very stark contrast in the black-and-white historic aerials.
Additionally, the USDA has collected aerial imagery of the region on a nearly annual basis since 1938. Because of this, each of the monuments is visible on aerial photographs over multiple years, as well as from various angles—resulting from different flight paths—and various altitudes. This essentially provides a time-series database of aerial imagery to work with, affording a temporal view of changes to the monuments. However, it also provides the different viewing angles necessary to see each component of the monuments. Because of the different angles and the time of day the flight path passed over the monuments—the angle of sun affects the shadows cast by the monuments and thus the visibility of some features—each of the aerial photographs provides a different level of visibility of the monuments to work with. Thus, it is necessary to work with multiple aerial photographs of the same monuments to achieve the highest level of analytical results.

However, these aerial photographs are not initially tied in to any geospatial frame of reference, which hampers the ability to analyze them at the landscape scale and test for the possibility of alignments between sites. To rectify this issue, I georeferenced each of the historic aerial photographs in ESRI’s ArcGIS v10.5. To establish the highest accuracy possible in the georeferencing process, a minimum of 20 anchor points for each aerial was established. The anchor points selected were those features visible on both the historic aerials as well as on the 2014 USGS digital orthoquad aerial photographs. These features included canals, ponds, vegetative features (i.e., tree island hammocks), roads, and, in a few cases, houses.

While Light Detection and Ranging (LiDAR) data are available for the region under study, collected as part of Florida Division of Emergency Management’s Herbert
Hoover Dyke project, there are notable limitations with the data. In these data large sections are missing. The reasons for these missing data include variability in flight coverage and the presence of dense, low-lying vegetation, such as sawgrass and sugar cane, which is unable to be distinguished from the ground surface during classification. Pluckhahn and Thompson (2012) discuss these issues as being present in this dataset for the area of the Fort Center site. Additionally, they note that other sections of data, associated with mounded architectural features that are not associated with such dense vegetation, are missing and likely having been removed during post-processing by FDEM personnel not familiar with the archaeology of the region (Pluckhahn and Thompson 2012:295–296). Rochelo and colleagues (Rochelo et al. 2015) note the same issues in these data for the area containing Big Mound City.

In evaluating this issue, it is abundantly clear that many of the features of Big Mound City were removed, which is clearly visible in the multi-point cloud generated from the LAS data of the LiDAR survey. Figure 7-1 provides a comparison of a historic aerial of Big Mound City, the point cloud generated from the LAS data file, and the resulting digital elevation model (DEM) of the point cloud. This comparison clearly demonstrates that all the architectural features except the midden-mound, primary set of embankments (what Johnson [1991, 1996] would refer to as the Type A component), the terminal mound of those embankments, and the semi-circular embankment surrounding the terminal mound were removed. In fact, when looking at the point cloud (Figure 7-1b), the areas of the removed features are clearly visible as blank white space amidst the cloud of data points, none of which appear in the resulting IDW surface interpolation (Figure 7-1c).
Rochelo and colleagues (Rochelo et al. 2015) do attempt to circumvent these issues by employing a method of surface interpolation that does not rely on point classifications. They attempt this because their argument is not that the features were removed during post-processing, but rather the problem lies with dense canopy vegetation. Instead of ESRI’s ArcGIS platform, they use a ground-filtering algorithm in the FUSION GIS software. However, this method is unsuccessful in revealing further features, even though they argue it is, and I am not the only one to disagree with them (Victor Thompson, personal communication January 2017).

Figure 7-1. Figures showing the removal point cloud data associated with architectural features at Big Mound City. A) Aerial photograph showing Big Mound City (USDA 1949b); B) Point cloud based on LiDAR data of Big Mound City; C) LiDAR-based digital elevation model (DEM) of Big Mound City.

Even with these issues in mind, the LiDAR data are not conducive for many of the analyses that follow. This is because the majority of the Belle Glade monuments were destroyed well before the LiDAR surveys took place in 2007, and even before the advent of LiDAR technology. The destruction of these monuments occurred during the land conversion processes as the area surrounding Lake Okeechobee was transformed.
from vast wetland ecosystems into lands conducive for large-scale agricultural practices. These lands were highly sought after for sugar cane production, and to a lesser extent for other agricultural products, because of the highly fertile peat soils surrounding the massive lake and in the northern extent of the Everglades Trough (Grunwald 2006; McCally 1999). The monument destruction is particularly evident in the Everglades Agricultural Area, which was formerly the sawgrass plains. Because of the database of historic aerial photography available for study over a large temporal range, it is possible to see the process of destruction to individual monuments through time, providing the ability to narrow down a range of years during which it occurred. Sometimes the destruction was swift and complete, completely obliterating a monument in one fell swoop, while other times a monument was disassembled one feature at a time over the course of many years (see Figure 7-2 for an example of the former).

However, the LiDAR data still does serve a purpose to this study. It provides a means for evaluating and assessing the accuracy of georeferencing the historic aerials. Once the LiDAR data are processed through a surface interpolation, they provide a highly accurate portrayal of the same landscape features used as anchor points used in the georeferencing process. These features include modern canals, ponds, roads, and in some cases houses or other structures. While these features are visible in the 2014 USGS digital orthoquad aerials, the presence of shadows can mask the actual edge of many features, and these edges are critical for the selection of anchor points. In the historic aerials, the edges are easily distinguished from shadows because of the grayscale coloration of the photographs, but in the color orthoquads the shadows serve to blend the colors of adjacent features, which makes distinguishing the edges more
difficult. Furthermore, some landscape features that can be suitable for anchor points, such as tree island hammocks and cypress domes, have expanded or contracted over time due to landscape drainage. The LiDAR data circumvents these issues because the

![Figure 7-2](image)

Figure 7-2. Figure showing two aerials of the location of Hendry Earthworks, one of the sites destroyed by land conversion. Top: USDA (1957a); Bottom: USDA (1963b).

surface interpolations are devoid of shadows and reveal the actual ground surface with all vegetation removed. Thus, LiDAR provided one of the best means to verify the
accuracy of the georeferenced historic aerials to ensure their suitability for the following analyses aimed at testing for the presence of the principles of circularity, relatedness, and place-centeredness.

Evaluating the monuments for the principle of circularity required two tests, one involving morphological analysis and the other utilizing spatial analysis techniques. The morphological analysis consisted of a simple method of looking for patterns in the form of the monuments that might indicate the presence of the spatial aspect of the principle of circularity. Based on the observations of the Native American philosophers Donald Fixico (2003) and Thomas Norton-Smith (2010), the principle of circularity can be manifest in earthen architecture with circular elements. As discussed above, Fixico (2003:41–42) notes that the circular base of conical mounds is such an indication, just as Norton-Smith (2010:129–132) explains that the circular forms incorporated into the Hopewell geometric earthworks embody this principle as well. The work of these Native philosophers provides the grounding of the morphological analysis of the Belle Glade monuments.

The second test for the principle of circularity involved spatial analyses within the rubric of archaeoastronomy. Essentially, this test was aimed at identifying alignments to cyclical celestial phenomena that might indicate the temporal aspect of the principle of circularity. Using the georeferenced historic aerials, the azimuth of each linear embankment of the Type A and Type B monuments was measured using a line projection method in ESRI’s ArcGIS v10.5. This method involves projecting a line along the central axis of each embankment using two vertices. Because the circular ditches lack such embankments, the distribution of the circular ditches across the landscape
was used to calculate azimuths (i.e., the azimuth line connecting two of the ditches). Once the beginning and ending vertices are placed, the GIS software allows the measurement of azimuth angle and distance.

By default, the software measures the azimuth from polar angles, which places 0° at East, 90° at North, 180° at West, and 270° at South. To avoid having to convert these azimuth measurements to a standard north azimuth system, it is possible to edit the properties of both the data frame within the software as well as the editing tools used to take the measurements. This is most easily done in the Editing Options dialog box, which allows you to select from the default polar system, a north azimuth system, a south azimuth system, or a quadrant bearing system. For the purposes of this analysis, I used the north azimuth system to avoid unnecessary calculations and unit conversions.

Once the azimuths for each of the embankments in the Type A and Type B monuments, along with the distributional azimuths of the circular ditches, were calculated and recorded in an MS Excel 2016 database, they were compared to the rise and set azimuths of celestial features to test whether the embankments and distributions were oriented in respect to the cosmos. This type of orientation was initially suggested by Carr and colleagues (Carr et al. 1995:258) based on their work at the Ortona Earthworks site, but they never pursued the possibility that the other Belle Glade monuments might similarly be oriented. Because of Carr and colleagues’ (Carr et al. 1995) initial suggestion of a possible equinoctial alignment and the vastly growing database demonstrating the importance of and alignment to solar and lunar events in the prehistoric architecture of the Eastern Woodlands (Benchley 1974, 2000; Hively and

The solar events commonly known as the solstices and equinoxes are highly predictable events, and people have known about their predictability for many millennia, which is evidenced in astronomical alignments to these phenomena at archaeological sites across the globe (Kelley and Milone 2011). The reason that they are so predictable is tied to the mechanics, or physics, of the earth’s orbit around the sun. Contrary to popular belief, the earth does not spin on an axis that is parallel to its orbital plane, or plane of the ecliptic. Rather, the earth spins on an axis that is tilted at an angle of roughly 23.44°, an angle known as the obliquity of ecliptic or an axial tilt (Kelley and Milone 2011). This tilt is what causes the northern and southern hemispheres to have opposite seasons: it causes one half of the earth to be closer to the sun than the other half, and then as the earth’s orbit passes the halfway mark of the yearly orbital migration, the hemispheres’ solar proximities switch. The tilt, in combination with the daily rotation along the axis and the orbital path of the earth, causes the sun to rise and set in positions along the horizon each day, essentially having a different declination—the angular distance north or south of the equator—each day. Within the span of its annual orbit the sun’s rise and set positions fall within a declination range of 23.44° N and 23.44° S, or the Tropic of Cancer and Tropic of Capricorn, respectively. These northern and southern declination extremes are known as the solstices, or solar standstills. In contrast, the equinoxes are the two days in the earth’s orbit where the sun’s declination is at 0° or parallel to the celestial equator. So essentially, the azimuth
of the sun rise and set on the solstices and equinoxes is location dependent. The sun will rise above the Tropic of Cancer or Capricorn or the Equator, but the exact direction (e.g., azimuth) you have to face to align with that azimuth depends on where you are standing at the moment of the rise or set. In other words, the azimuth of the summer solstice sunrise in South Florida is different from the azimuth in Central Alabama, which is different than the azimuth in New York.

People have known about this range of the sun’s horizon path for a long time, and they know how predictable it is. However, it is notable that the exact rise and set azimuths of the solstice and equinox do change through time, but it is a very slow rate of change caused by shifts in the axial tilt resulting from gravitational pull (Aveni 1972; Kelley and Milone 2011). The rate of change, however, is quite slow. It is on the order of 0.05° per 500 years, and it occurs as a cycle that resets along with the obliquity cycle (Aveni 1972). Thus, the celestial azimuths of the solstices and equinoxes are dependent on both location and time. Additionally, elevation affects the visibility of the azimuths, but because Florida is so close to sea level, this is not an issue, nor is the presence of mountainous terrain an obstacle restricting horizon visibility.

The lunar standstills (also known as the lunistics or lunar minima and maxima), on the other hand, are much more complex phenomena and much more difficult to predict. This is partly because they occur on an 18.6 year cycle, known as the lunar standstill cycle, but also because the moon follows a quicker and more erratic orbital cycle because it follows a much smaller orbital plane around the earth. This orbital plane is close to the ecliptic plane but does not mirror it (Kelley and Milone 2011). Essentially, the yearly pattern that the sun follows—moving its declination north and
south of the equator—is mimicked on a monthly basis by the moon. However, after 9.3 years the moon reaches a point known as the lunar minimum standstill, where the declination range is much smaller than normal: +18.5 N through -18.5 S (Kelley and Milone 2011). Approximately 9.3 years after the lunar minimum standstill the lunar maximum occurs, where the declination range is much greater: +28.5 N through -28.5 S (Kelley and Milone 2011). So, in essence, the lunar standstill cycle is 18.6 years long, with the shift to lunar minima and maxima occurring every 9.3 years—the halfway point of the full standstill cycle. At the times in between these shifts, the lunar declination range mimics the 23.5° N through 23.5° S range of the sun, with the full lunar phase cycle occurring on a monthly basis (Kelley and Milone 2011).

Table 7-1. Table of rise/set azimuths for solstices and equinoxes. Azimuths obtained from the coordinates of the Big Mound City midden-mound.

<table>
<thead>
<tr>
<th>Year</th>
<th>Vernal Equinox</th>
<th>Estival Solstice</th>
<th>Autumnal Equinox</th>
<th>Hibernal Solstice</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD 200</td>
<td>90.3/ 269.11</td>
<td>63.0/ 297.06</td>
<td>89.88/ 270.83</td>
<td>116.93/ 243.05</td>
</tr>
<tr>
<td>AD 1000</td>
<td>87.51/ 272.58</td>
<td>63.21/ 296.53</td>
<td>92.33/ 267.95</td>
<td>116.36/ 243.31</td>
</tr>
</tbody>
</table>

Table 7-2. Table of rise/set azimuths for lunar maxima and minima. Azimuths obtained from the coordinates of the Big Mound City midden-mound.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lunar South Max</th>
<th>Lunar North Max</th>
<th>Lunar South Min</th>
<th>Lunar North Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD 201</td>
<td>108.6/ 245.5</td>
<td>72.3/ 286.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 210</td>
<td>120.1/ 240.17</td>
<td>60.8/ 298.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 1001</td>
<td></td>
<td>111.6333/ 248.55</td>
<td>69.35/ 289.9</td>
<td></td>
</tr>
<tr>
<td>AD 1010</td>
<td>123.25/ 236.85</td>
<td>57.97/ 301.73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The azimuths of the solstices, equinoxes, and lunar standstills were obtained from the Starry Night Pro Plus v.7 software. This program allows the movement of the cosmos to be projected backwards through time to ensure accuracy of the azimuth measurements for the time in question. This is a necessary step because these azimuths change slightly through time (Aveni 1972). Further, in addition to calculating
obliquity based on time, this program calculates azimuths based on geographic position and altitude and corrects for both refraction and equinoctial precession (Benfer 2012). Because Johnson (1991, 1996) places the Type A monuments in the AD 200–1000 range and the Type B monuments during the AD 1000–1513 range, the azimuths were measured for both AD 200 and AD 1000 to align with the initial construction of these features. Table 7-1 provides the rise and set azimuths for vernal and autumnal equinoxes and the estival and hibernal solstices at AD 200 and AD 1000. Table 7-2 provides the rise and set azimuths for the lunar minima in AD 201 and AD 1001 and the lunar maxima in AD 210 and AD 1010 since the maxima and minima do not fall on the AD 200 or AD 1000 years.

As discussed above, the expectations for the principle of relatedness take several different forms guided by other researchers focused on monuments. However, the Belle Glade monuments do not take a form found in the iconography of Belle Glade material culture, nor do they take the form of iconographic elements found throughout Florida or the Greater Southeast. In other words, at first glance the Belle Glade monuments do not seem to be effigies of any sort. They also do not seem to be mimetic references of landscape features, as Thompson and Pluckhahn (2012) argue. Yet the form of the monuments is distinct, and I used this form to guide the tests for the principle of relatedness.

This test also relied on a line projection method, but the projected lines were extended across the landscape to test for alignments to other sites. In other words, the test was aimed at revealing whether the linear, radiating embankments were literally pointing the way towards other sites, with the implication that this also acted as a test
for the principle of place-centeredness. These landscape-scale projections relied on the initial azimuth measurements and the original vertices used to calculate them. Using these initial vertices to maintain the central axis of the embankments, the lines were projected along the same azimuths to a set distance of 250 km. This distance allows the lines to cross the entire width of the Florida peninsula.

This test also required the use of data from the Florida Master Site File (FMSF) to populate the base maps in ArcGIS with point data for site locations. There are two aspects of this test: one to evaluate the Type A monuments for such alignments and the second to assess the Type B monuments for alignments. For the Type A test, sites post-dating AD 1000 were excluded because they would not have been present on the landscape when the Type A monuments were constructed. For the Type B test, sites post-dating AD 1513 were excluded with the same reasoning. When the projected lines were seen to pass close to a site location, LiDAR data, georeferenced historic aerials, and site maps were inserted into the base maps to check for exact alignments. All of the FMSF point data were coded on a site-by-site basis as being non-monumental, monumental, or Belle Glade monument based on the presence or absence of monumental architecture and whether that architecture took the form of one of the Belle Glade monument types.

Because South Florida has a large number of prehistoric sites (n=5,796 south of Tampa Bay) that are distributed in all directions around the Belle Glade monuments, one might say you can draw a line in any direction from one of the monuments and create an alignment. Thus, it is necessary to account for the intention of the Belle Glade monument builders to include site alignments in their architecture. This was done in
several ways. First, identified alignments were considered intentional when there was a known affiliation between the site of origin and the site of alignment. Known affiliations included cultural affiliation, such as when both sites were classified as Belle Glade and thus a strong cultural affiliation could be assumed, or when there were strong indications of interaction between the origin and alignment sites, such as evidence of materials being traded back and forth between the two areas. Second, the presence of multiple alignments converging on a single locale but originating from different monuments was used as an indicator of intentionality. The presence of convergent alignments on single locales increases the likelihood of intention as well as secures the significance of the aligned place to the builders of the monuments, which in this case signals that the significance transcends a single community.

To add further credibility to the likelihood of intentionality, as well as to evaluate the possibility of incidental or chance alignments, probability statistics were computed. These were calculated for the probability of aligning with (1) a non-monumental site (i.e., a site that lacks any earthen architectural features of monumental scale), (2) a monumental site (i.e., a site containing architectural features of monumental scale), and (3) a Belle Glade monument, whether that be a circular ditch, a Type A monument, a Type B monument, or a Belle Glade conical mound. Because the distribution of sites is non-continuous, the shape of Florida's peninsula is irregular, and the geological and ecological features contained within are not continuously distributed, and the Belle Glade monuments are widely distributed and thus have different geospatial relations to other sites, it was necessary to calculate the probabilities on a site-by-site basis.
Furthermore, the directional nature of the data made it necessary to calculate the probabilities within 10° azimuth ranges (e.g., 1°–10°, 11°–20°, 21°–30°, etc.) from each of the sites. This was achieved by creating a compass rose diagram with 10° intervals in ArcGIS. The diagram’s center point was placed directly over the midden mound of each
Type A and Type B monument being tested (see Figure 7-3 for an example). Each of the sections of the diagram were selected individually using the select by polygon feature, which in turn selects all the point data within that section. Because the point data were already coded as non-monumental, monumental, or Belle Glade monument, it made tabulation of the data into Excel spreadsheets a simple process of documenting the total number of non-monumental, monumental, and Belle Glade monument sites, along with the total number of sites, within each of the 10° azimuth ranges for each monument being tested. These data were used to calculate the probabilities using three standard probability formulas:

\[
(1) \text{Probability} = \frac{\text{number of non - monumental sites}}{\text{total number of sites}}
\]

\[
(2) \text{Probability} = \frac{\text{number of monumental sites}}{\text{total number of sites}}
\]

\[
(3) \text{Probability} = \frac{\text{number of Belle Glade monuments}}{\text{total number of sites}}
\]

In addition to evaluating the embankments for the presence of these principles, there is still the question of why the monuments were built amidst flowing water and how their emplacement in these locations ties into the principles. To reiterate from earlier discussions, I argue that the intentional building and emplacement of the monuments within flowing water acts to create and maintain relations with the water and entities moving within it, and that the water itself helps define the importance of place to the Belle Glade peoples. This argument, however, needs to be tested with data, especially because it runs counter to some of Hale’s (1984, 1989) arguments regarding the Belle Glade monuments. As discussed in Chapter 4, Hale argues that the Type A and Type B monuments were built and oriented in a manner that would redirect water.
flow away from the living areas or midden-mounds while simultaneously minimizing erosion to the earthen architecture itself. However, Hale relied on hydrological data and models that are now out of date. The recent paleohydrological modeling of McVoy and colleagues (McVoy et al. 2011), drawing on a plethora of sources ranging from historic descriptions to long-term data monitoring of ecologists to paleoenvironmental reconstructions, has shown that the water depth, rate of flow, and direction of flow are much different than earlier models and estimates claim. Because of this, Hale’s arguments need to be tested utilizing these new data.

To test both my and Hale’s arguments, I conducted hydrological modeling that would enable me to assess whether there is any significance to the locational choice of the monuments. I restricted the modeling to the Type A and Type B circular-linear monuments for two reasons. First, the circular ditch architecture that temporally preceded them obviously would have drawn water into them as water flowed across the landscape. As the water levels receded and the landscape dried, the features undoubtedly would have held some amount of water—as shown in Carr’s (1985) study of them where he provided a photographic example of one retaining water in 1985—but they would not have figured into the movement of water during the dry season (Figure 7-4). Thus, this architectural form was excluded from this analysis. Second, this analysis has the secondary goal to test Hale’s (1984) argument that the Type A and Type B monuments were built and oriented to redirect water.

Testing Hale’s arguments, as well as my own, requires hydrological analysis and modeling. This was done using ESRI’s ArcGIS v10.5 along with the ArcHydro v2 framework. ArcHydro is a customizable GIS geodatabase model that incorporates
spatial and temporal coverage of water resources for hydrologic analysis (Maidment 2002). Essentially, what Arc Hydro allows a user to do is combine spatial data and temporal data related to surface water resources to create a hydrologic information system around a relational network of multiple data inputs (Macrae and Iannone 2016; Maidment 2002; Olivera et al. 2002). It should be noted that there are other hydrologic modeling tools available, such as the one in use by the Southwest Florida Water Management District’s Regional Simulation Model (Min et al. 2010), but Arc Hydro has proven successful in reconstructing historic hydrologic regimes in several archaeological studies (Berking et al. 2010; Harrower 2010; Harrower et al. 2012; Macrae and Iannone 2016).

![Figure 7-4](image)

Figure 7-4. Glades Circle circa 1985. View of the circular ditch from the interior looking South. From Carr, Robert S. Prehistoric Circular Earthworks in South Florida (Page 293, Figure 5). *The Florida Anthropologist* 38:288–301.

Reconstruction of the historic water flow for hydrologic analysis takes several steps. It begins with the creation of a digital elevation model (DEM) or bare earth model (BEM) that illustrates the morphology of the ground surface with vegetation removed.
These DEMs typically contain depressions known as sinks or pits that can hinder hydrologic analysis by causing the software to render these as areas where water will accumulate (Connolly and Lake 2006; Doctor and Young 2013; Jenson and Domingue 1988; Wang and Liu 2006). These depressions may be the result of imperfections in the DEM, naturally occurring topographic features, or may be the result of anthropic activities and thus need to be evaluated manually (Wang and Liu 2006:195). These depressions can be especially significant in a flat, homogenous topographical landscape such as South Florida, where water flows over such a slight gradient. Further, in this region there are numerous canals that were constructed since the late nineteenth century that have significantly altered the hydrology of the region (Grunwald 2006; McCally 1999). ArcHydro provides a suite of tools (sink evaluation, sink selection, and sink fill) for evaluating and removing depressions that previously relied on manual code implementation (e.g., Jenson and Domingue 1988; Wang and Liu 2006). However, because of the size and extent of the canals, it is often necessary to fill these features manually rather than using the ArcHydro tools. Once the depressions are filled, the DEM is conducive to hydrologic analysis.

The next step is drainage analysis, which evaluates the pathways of water drainage—“the flow process of water direction as it moves from its origin point in the landscape to its final resting location” (Macrae and Iannone 2016:376). Importantly, drainage is primarily affected by topography, elevation, and slope gradients. In the context of South Florida this is especially significant because the gradient of the peninsula slopes southward at an average rate of 0.30 m for every eleven kilometers (Davis 1943), and there is a relative lack of topographic rises that could affect the
course of water flow. The primary form of topographic rises that could affect water flow and drainage are the tree island hammocks. However, these are not large enough in geographic extent to have significant effects except for immediately surrounding them. Conversely, there are also topographic depressions in the landscape, but these would also have negligible effects on water flow and drainage. Of course, the latter would play a role in defining water catchments and thus affect the catchment analysis aspect of hydrological modeling, which is discussed below.

This first part of drainage analysis involves the identification of Flow Direction (FDR). This calculates the direction water will flow from cell to cell based on the elevation of each cell in the DEM (Connolly and Lake 2006:257; Jenson and Domingue 1988:1594; O’Callaghan and Mark 1984:326). Within the ArcGIS software, this is calculated on the basis of slope angles and gradients of each cell in the DEM. The software uses a pour point model that measures the amount of elevational change in eight directions from each cell, and the direction of steepest descent is determined as directing the flow of water (Macrae and Iannone 2016:376). This is calculated for each individual cell in the DEM to create an integer raster (Figure 7-5).

The flow direction analysis provides the basis for modeling Flow Accumulation (FAC). This model assigns a code to each cell based on how many surrounding cells are sources of water flowing into it (Connolly and Lake 2006:258; Jensen and Domingue 1988:1594, 1596; Macrae and Iannone 2016:377; O’Callaghan and Mark 1984:326). The software uses these data to compute a raster image where each cell in the DEM is assigned an accumulated value based on all cells that flow into it (Macrae and Iannone 2016:377). What this does is show the primary pathways that water takes
as it flows across a landscape (Figure 7-6). These pathways, or flow accumulations, are the areas calculated to be paths of steepest descent across the landscape and are thus areas water will flow through in the greatest amounts. This is perhaps the most important part of the hydrological modeling for the purposes of testing both my and Hale’s (1984, 1989) arguments because it has the capability of showing if and how the monuments would have affected water flow. However, it is possible to take the analysis further and follow additional steps.

Figure 7-5. Flow Direction (FDR) model of Big Mound City.
The next step would be Catchment Analysis (CA), which delineates the areas where water flow terminates and accumulates (Olivera et al. 2002:60). This analysis employs the data from both the FDR and FAC analyses to construct what is known as Figure 7-6. Flow Accumulation (FAC) model of Big Mound City. Stream Definition and Stream Segmentation that lay the foundation for creating stream networks that “supersede a threshold of accumulation as streams” (Macrae and Iannone 2016:377). The software divides the networks into segments that are separated by junctions and coded numerically based on their location within the stream network.
Once this is complete, the software computes drainage divides or catchment boundaries that are defined on the basis of pour points—“the locus where all the accumulated water drains from a specific catchment” (Macrae and Iannone 2016:377). To delineate the boundaries of the catchment, the software again relies on the FDR analysis and assigns each cell in the DEM that flows towards a specified pour point as part of the catchment associated with that pour point.

The ArcHydro v2 framework provides an exceptionally powerful tool for evaluating if and how the monuments would have affected water flow. However, as discussed above, the LiDAR data for the region are neither perfect nor were they collected when the majority of the monuments were still in existence. Because of the issues inherent within the LiDAR data, it was necessary to edit the raw data to run the hydrological analyses. Essentially, this involved manually inputting many of the now destroyed monuments into the data itself. There are some monuments already present in the data, but, as discussed above, many of their architectural features have been removed by FDEM personnel during post-processing. For these monuments, it was necessary to input the lost features manually.

This required obtaining the LiDAR data in ASCII format rather than the more widely used LAS format. The reason for this is that LAS data are not as easily modifiable whereas ASCII data provides editable XYZ coordinates for each point return obtained during the LiDAR survey. The ASCII data were then input into the ArcGIS data frame with the georeferenced historic aerials overlaid on top of them. The georeferenced aerials provided a clear view of the monuments so that they could be manually traced in the software to create polygons. With these polygons in hand it was
possible to select all of the ASCII points within the confines of the polygons. With the points selected and editing mode enabled, it was possible to open the attribute table of the ASCII layer and edit the selected points. The X and Y coordinates were not edited, but the Z, or elevation, coordinates were manually changed to build models of the monuments within the LiDAR data.

Fortunately, some of the monuments were not destroyed before archaeologists were able to inspect them and record basic information about the architectural features. For these particular monuments, the site reports provided invaluable information regarding the vertical extent of specific features, which then allowed me to build models of the monuments within the LiDAR data based on known elevations. However, for many of the other monuments I did not have this information to work with. For those monuments lacking this information, I built the models with estimated heights of various features based on averages of the sites with known measurements. It is important to note, however, that vertical accuracy of the models is not necessary for the hydrological models. Because of the shallow gradient of the landscape and the relative lack of topographic features, any elevation of the monument models will show the same effect on water flow.

Summary

In this chapter, I set out to develop some expectations for what we should see archaeologically in the Belle Glade monuments if the ontological principles outlined in Chapter 5 are materialized within the form of the monuments. These expectations were developed by drawing on the few archaeological studies focused on the relationships between monuments and ontologies, the work of Native American philosophers, and other archaeological insights into monumentality. For the principle of circularity, we
should expect the spatial aspect to be indicated by the presence of circular shapes in the monuments (*sensu* Fixico 2003; Norton-Smith 2010) and the temporal aspect to be demonstrated by the presence of alignments to cyclical celestial events (*sensu* Pauketat 2013; Romain 2015a, 2015b). The latter is also tied to the expectations for the principle of relatedness because of the relationship between the earth and sky in Native philosophy. For the principles of relatedness and place-centeredness, which are combined here because of the relationships found in Native philosophies, we should expect to see alignments between places on the landscape. For place-centeredness, this is only one aspect of the expectations; the other portion is the subject of Chapter 9.

Using these expectations as a basis, I then provided a discussion of the methods that were used to test for the presence of the ontological principles in the Belle Glade monuments. These methods are all non-invasive and relied on both microscale (i.e., site-level) and landscape scale spatial analyses conducted with historic aerial photography, LiDAR, line projections, ESRI's ArcGIS v10.5, and Starry Night Pro Plus v.7. The tests for the principle of circularity involved morphological analysis and archaeoastronomical methods aimed at identifying evidence for celestial alignments indicative of an understanding of circular or cyclical time and space. The tests for the principle of relatedness, which in part drew on the archaeoastronomical method, also crossed into the tests for the principle of place-centeredness. This involved projecting the embankment azimuths of the Type A and B monuments across the landscape to test for site alignments. To ensure the intentionality of any identified alignments, I calculated probability statistics for the possibility of incidental alignments occurring as well as took into account cultural affiliations and relationships (i.e., economic and
political) between communities and the convergence of multiple alignments originating
from different source monuments. In Chapter 8 I provide the results of these tests,
which provide the basis for much of the discussion in Chapter 11.
Chapter 8
TESTING FOR ONTOLOGICAL PRINCIPLES IN BELLE GLADE MONUMENTS

In Chapter 7, I described and discussed the different expectations to be tested for the presence of the principles of circularity, relationality, and place-centeredness. To review, these expectations were developed by drawing on archaeological studies focused on the relationships between monumental architecture and ontologies, the work of Native American philosophers, and other archaeological studies of monumentality. For the principle of circularity, we should expect the spatial aspect to be indicated by the presence of circular shapes in the monuments and the temporal aspect to be demonstrated by the presence of alignments to cyclical celestial events. The latter is also tied to the expectations for the principle of relatedness because of the relationship between the earth and sky in Native philosophy. For the principles of relatedness and place-centeredness, which are combined here because of the relationships found in Native philosophies, we should expect to see alignments between places on the landscape. I refer to this combination as the relatedness of places. However, for the principles of place-centeredness, this is only one aspect of the expectations; the other portion is the subject of Chapters 9 and 10.

In this chapter I report the results of the analyses that employed the methods described in Chapter 7. This chapter is divided into three primary sections, with each section devoted to the results of the analyses of a single monument type. Further, they are organized chronologically so that the circular ditch analysis results are presented first, and the Type B circular-linear earthwork analysis results are presented last.
Results: Circular Ditches

There is a total of 14 known circular ditches (Table 8-1). Twelve of the 14 are located within the confines of the KOE watershed. The remaining two are located in areas associated with neighboring archaeological cultures. The Pine Island circle, located on Pine Island in Lee County along the Southwest Gulf Coast, is in the immediate vicinity of the Pineland site and is associated with the Caloosahatchee culture. The Miami Circle Ditch, located in Miami-Dade County along the Southeast Atlantic Coast, is associated with the Glades culture. All of the others are associated with the Belle Glade culture.

Table 8-1. Known circular ditches, morphological form, and environmental context.

<table>
<thead>
<tr>
<th>Name</th>
<th>Open-Faced/Enclosed</th>
<th>Environmental Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Center</td>
<td>Open-Faced</td>
<td>Hammock/River</td>
</tr>
<tr>
<td>Lakeport Circle</td>
<td>Unknown¹</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Glades Circle</td>
<td>Enclosed</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Caloosahatchee Circle</td>
<td>Open-Faced</td>
<td>Wet Prairie/River</td>
</tr>
<tr>
<td>West Okeechobee Circles</td>
<td>Enclosed &amp; Nested</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Hendry Circle</td>
<td>Enclosed</td>
<td>Wet Prairie/Swamp</td>
</tr>
<tr>
<td>Miami Circle Ditch</td>
<td>Enclosed</td>
<td>Upland</td>
</tr>
<tr>
<td>Pine Island Circle</td>
<td>Unknown¹</td>
<td>Upland</td>
</tr>
<tr>
<td>North Fisheating Creek Circle</td>
<td>Open-faced</td>
<td>Broad-leaf Marsh/River</td>
</tr>
<tr>
<td>Martin Circle Ditch</td>
<td>Unknown¹</td>
<td>Wet Prairie</td>
</tr>
<tr>
<td>Lake Kissimmee Circle</td>
<td>Open-faced</td>
<td>Wet Prairie/Lake</td>
</tr>
<tr>
<td>Whitebelt #1/L-8 Canal Circle</td>
<td>Enclosed</td>
<td>Upland Marsh</td>
</tr>
<tr>
<td>Davenport Circle</td>
<td>Enclosed</td>
<td>Sawgrass Plains</td>
</tr>
<tr>
<td>Martine Crescent Earthworks</td>
<td>Unknown¹</td>
<td>Wet Prairie</td>
</tr>
</tbody>
</table>

Because of the morphology of the circular ditches, it is not possible to conduct the same exact analyses as the Type A and Type B circular-linear earthworks.

¹ These circular ditches were partially destroyed in the earliest available aerial photographs.
discussed below. As discussed in Chapter 7, the lack of linear embankments prevents the ability to conduct the archaeoastronomical analysis in the same manner. Rather than relying on the embankment azimuths to test for the temporal aspect of circularity and for the relatedness of places (a combination of the principles of relatedness and place-centeredness), the archaeoastronomical analysis of the circular ditches relies on the geographic distribution of the architecture and how the emplacement of the ditches at certain locations on the landscape can inform us of circularity, relatedness, and place-centeredness.

Further, because the spatial aspect of circularity is expected to be present in the form of circular architectural shapes, a full morphological analysis is not necessary. All of the circular ditches, as the name of the architectural type implies, are circular in structure. Thus, spatial circularity is present in each of them.

There is, however, variation in this structure. As Colvin (2014) notes, there are two primary variations in this structure. First, there is an open-faced form, where the circle is not complete and creates a shape Colvin (2014) refers to as similar to a torc. These forms always exist in locations where the open end is connected to a river system. This allows water to flow freely into and out of the ditch as the water levels of the rivers rise. The one exception is the Lake Kissimmee Circle, which is located adjacent to a large lake rather than a river. Four (28.57%) of the known circular ditches fit this category. Second, there is an enclosed form, where the circle is complete. These are typically located in environs of slow-moving water, such as wet prairies and marshes. As discussed in Chapter 4, these environments do not allow for the movement of water in and out of the ditch on a tidal cycle like a river does. Six (42.85%) circular
ditches fit this category. Furthermore, there are four (28.57%) examples of circular ditches where it is unknown whether they are enclosed or open-faced because they were partially destroyed prior to the earliest aerial photographs of the region.

Figure 8-1. Distribution of circular ditches showing emplacement along celestial azimuths.

The archaeoastronomical analysis of the circular ditches identified remarkable patterning in the locational emplacements of the ditch architecture across the landscape. The patterning suggests that the entire monumental landscape during the Belle Glade I period was structured in accordance with cyclical celestial events. What I
mean by this is that the location of each of the ditches was chosen relative to other ditches on the basis of azimuths associated with cyclical celestial events, effectively creating celestial pairings (Figure 8-1). The only outlier to this pattern is the Lake Kissimmee Circle, which is the circular ditch located furthest to the north.

Figure 8-2. Circular ditches emplaced along equinoctial azimuths.

Eight of the ditches are paired into five sets along equinoctial azimuths within ±1.52° (Figure 8-2). These include: Martin Crescent Earthworks, West Okeechobee Circles, Martin Circle Ditch, Whitebelt I, Glades Circle, Davenport Circle, Hendry Circle, and Pine Island Circle. The northernmost pairings are comprised of Martin Crescent Earthworks—West Okeechobee Circles and West Okeechobee Circles—Martin Circle Ditch. In both pairings, the architecture is separated by the waters of Lake Okeechobee.
The next pairing to the south, which is also separated by Lake Okeechobee, is Glades Circle—Whitebelt I. The final two pairings are both south of the lake and include Davenport Circle—Pine Island Circle and Pine Island Circle—Hendry Circle. These two pairings are separated by Matlacha Pass and the Caloosahatchee River. All of the pairings focused to the east (i.e., the equinoctial sunrise) show remarkable consistency in azimuth orientation, all of which are within less than 0.5° of one another and are all within 0.4° of the equinox azimuth (92.33°).

Figure 8-3. Circular ditches emplaced along solstitial azimuths.

Six of the circular ditches are paired along solstitial azimuths within ± 1.91° (Figure 8-3). Two of the pairs are confined to the Okeechobee Basin. The northernmost of the Okeechobee pairs is Caloosahatchee Circle—Martin Circle Ditch, which is set
along an azimuth that is -0.2885° from the solstice azimuth. The southern Okeechobee pair is Hendry Circle—Whitebelt I, which is set along an azimuth that is 1.91° greater than the solstice azimuth. While this is a larger error range it is still within reasonable limits given that the azimuth of the sun changes 2° within 30 minutes of emerging above the horizon. The third solstitial pair is completely outside the KOE watershed and involves the two circular ditches not associated with the Belle Glade archaeological culture: Pine Island Circle and Miami Circle Ditch. This pairing is set along an azimuth that is -1.13° from the solstice azimuth.

![Circular ditches emplaced along lunar azimuths.](image)

Figure 8-4. Circular ditches emplaced along lunar azimuths.

Ten of the circular ditches are paired along lunar azimuths that include both the lunar maxima and lunar minima (Figure 8-4). All of the lunar pairings are confined to the
Okeechobee Basin, and they form an interesting distinction. The pairings in the north half of Lake Okeechobee are all along lunar northern minimum azimuths, while those in the south half of the lake are all along lunar northern maximum azimuths.

The lunar minimum pairs include Fort Center (Great Circle)—Martin Crescent Earthworks, Lakeport Circle—Martin Crescent Earthworks, North Fisheating Creek Circle—Martin Crescent Earthworks, Glades Circle—Martin Circle Ditch, and Whitebelt I—West Okeechobee Circles. All of these pairings are set along lines within 0.92° of the lunar northern minimum azimuth.

The lunar maximum pairs include Davenport Circle—Whitebelt I, Davenport Circle—Glades Circle, and Hendry Circle—Caloosahatchee Circle. The latter pairing is the only lunar pairing to not be separated by the waters of Lake Okeechobee. All of the lunar maximum pairings are set along lines within 2.9° of the lunar northern maximum azimuth. While there is a greater degree of error, they are still within a reasonable and acceptable range of error given both the variability in lunar rise/set patterns (i.e., it is much more difficult to predict than solar patterns), the longer cycle involved (e.g., it is an 18.6-year cycle), and the amount of change in lunar azimuth once it emerges above the horizon (i.e., tall vegetation growth, such as cypress, can force a viewer’s eye to see the celestial object only when it is well above the horizon line).

In addition to the equinoctial, solstitial, and lunar minima and maxima pairings of circular ditches, the archaeoastronomical analysis also identified two meridian alignments among the ditch architecture (Figure 8-5). The two meridian pairs include Martin Crescent Earthworks—Martin Circle Ditch, which is within 0.324° of a true meridian, and North Fisheating Creek Circle—Lakeport Circle, which is within 0.038° of
a true meridian. These two pairs are also the pairs that include the ditches that are the closest to one another.

Figure 8-5. Circular ditches emplaced along meridians.

These analyses demonstrate that the expectations for the principles of relatedness, place-centeredness, and circularity are met by the circular ditch architecture. Spatial circularity is inherent in the design of the circular ditches while temporal circularity is exhibited in the specific locations chosen for ditch construction. Relatedness and place-centeredness are further reflected in the emplacement choices because they show relations between places in terms of their relations to the cosmos.
Results: Type A Monuments

There is a total of nine positively identified Type A circular-linear earthworks within the KOE watershed (Figure 8-6). Both Hale (1989) and Johnson (1991) list other examples of this earthwork type in their dissertations in addition to those listed here. However, Hale (1989) did not always use the same names in the Florida Master Site File, so many of those he listed are covered in this analysis but under the official state-listed site names. Further, some of those included in Hale’s analysis were unable to be positively identified as Type A earthworks in aerial photographs and thus were not included here. Some of the additional sites included in Johnson’s (1991) list also could not be confirmed to be Type A earthworks and were not included here.

Much like the circular ditches that preceded them, all of the Type A circular-linear earthworks exhibit spatial circularity. It is inherent in their design. It is present in the semi-circular embankments and the conical mounds at the terminal ends of the linear embankments. In the case of Ortona’s Type A earthwork, there is a second semi-circle surrounding the terminal conical mound, increasing the amount of circularity exhibited at the site. Further, the midden-mounds at these sites, when they are present, also exhibit circularity, but to a lesser extent. The amount of circularity present in the midden-mounds, however, varies from site to site. For example, Summer Earthworks’ midden-mound is nearly circular while Candler Mounds & Earthwork is very elongated with rounded ends. Even so, the spatial aspect of the principle of circularity is met by each of these architectural sites.

As such, the individual site sections in this portion of the chapter do not discuss the results of the morphological analysis of the spatial aspect of circularity. Instead, each section focuses on reporting the results of the tests for the temporal aspect of
Figure 8-6. The nine Type A circular-linear earthworks included in this analysis. A) Drasdo Earthworks (USDA 1941a); B) Kissimmee Circle (USDA 1944); C) Barley Barber I (USDA 1971); D) Whitebelt II Earthworks (USDA 1938); E) Seummer Earthworks (USDA 1974); F) Ortona Earthworks (USDA 1949c); G) Lakeport Earthworks (USDA 1948d); H) Nicodemus Earthworks (USDA 1948b); I) Candler Mound & Earthworks (USDA 1941b).
circularity and for the relatedness of places, which is a combination of the principle of relatedness and place-centeredness. Additionally, where LiDAR data are available the individual sections report the results of the hydrological modeling used to test Hale’s (1984) argument, which also further tests the principle of relatedness through the relations developed with water. However, because of the geographic distribution of the Type A circular-linear earthworks, LiDAR was not available for every site.

**Drasdo Earthworks**

The Drasdo Earthworks site is the second largest of the Type A circular-linear earthworks, with an architectural footprint of 12,381.18 m² (Figure 8-7). It is also located further north than all but one of the Type A earthworks. It is distinct from the other Type A earthworks in four ways. First, it is the only example of a Type A earthwork where the semi-circle is a ditch rather than a raised embankment. Second, it is the only example to exhibit a nearly fully closed circle rather than a third- or half-circle. Third, it is the only Type A earthwork to have a second embankment and mound associated with, but not attached to, it. Fourth, there is no identifiable midden-mound within the semi-circle.

Additionally, there is no conical mound visible at the terminal end of the embankments like at other Type A earthworks. However, this is due to the construction of the berm surrounding the wetland and lake to the east of the architecture. The berm runs directly through the space where the conical mound should be located.

As the above description implies, the spatial aspect of the principle of circularity is present in this earthwork. The semi-circular ditch nearly forms a whole circle. Further, the presence of a ditch rather than a raised embankment provides a tie to the circular ditch architecture that precedes the Type A circular-linear form. It is possible that the
dual parallel embankment that projects from the semi-circle was added to an existing circular ditch, but this cannot be confirmed at present.

Figure 8-7. Aerial photograph showing Drasdo Earthworks in 1941 (USDA 1941a).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied solely on the embankment azimuths due to the nearly closed semi-circle. The dual parallel embankment pair, which projects outwards from the semi-circle, has an azimuth of 112.76°, which places it within ±3° of the lunar southern minimum (109.90°) (Figure 8-8). The second embankment, which is not attached to the rest of the
architecture, has an azimuth of 332.58°, which is nearly the exact same azimuth exhibited by Summer Earthworks (332.52°). This azimuth is not associated with any cyclical celestial events. Neither of the azimuths are associated with any site alignments, and due to the lack of LiDAR data for this area, hydrological modeling is not possible for Drasdo Earthworks. Further, given that it is composed of a semi-circular ditch rather than a raised embankment, it is not necessary because a ditch will not redirect the flow of water at such slow speeds. These analyses suggest that Drasdo Earthworks meets the expectations for the principles of circularity and relatedness, with the latter being reflected in the relations developed with water. However, the expectations for the relatedness of places and place-centeredness are not met.

Figure 8-8. Celestial alignment exhibited by Drasdo Earthworks (USDA 1941a).
Kissimmee Circle

The Kissimmee Circle architectural site is located north of Lake Okeechobee in the floodplain of the southernmost extent of the Kissimmee River (Figure 8-9). This site is not to be confused with the Kissimmee Circle Earthworks, a Type B circular-linear earthwork discussed below. The architectural footprint of this site encompasses 7884.07 m², making it the fourth largest Type A earthwork in this analysis. However, much of the architecture was destroyed during the construction of U.S. Highway 98. This happened prior to the earliest aerial photographs of the site, which hinders our ability to gain a true measure of the full architectural footprint of the site. Even so, it is unlikely that the footprint exceeds that of the third largest Type A earthwork.

Figure 8-9. Aerial photograph showing Kissimmee Circle in 1944 (USDA 1944).
The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The embankment of Kissimmee Circle projects at an azimuth of 25.12° and thus does not align with any of the expected cyclical celestial events. The azimuth of the line connecting the two ends of the semi-circle is 154.5615° and does not align with any celestial events. However, a line perpendicular to this, 244.5615° (154.5615 + 90), is within ±1° of the hibernal solstice sunset, which at A.D. 200 had an azimuth of 243.05° (Figure 8-10). This demonstrates that the semi-circle is open to the solstice sunset.

![Legend](image)

Figure 8-10. Azimuths present in Kissimmee Circle (USDA 1944).

The test for the relatedness of places identified a single alignment. Projecting the embankment line across the landscape does not form any alignments with other sites of contemporaneous or older age. However, when projecting the line connecting the ends
of the semi-circle across the landscape, there is an alignment to the Belle Glade Mound in Palm Beach County (Figure 8-11). This is the multi-phase mortuary architectural component of the Belle Glade type site.

Probability statistics for the azimuth range of the alignment (151–160°) show that aligning with Belle Glade monuments and subaqueous ossuaries have a very low probability of occurring by chance (0.012), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.123) and with a non-monumental site is very high (0.876) (Table 8-2). The validity of this alignment is further substantiated by the presence of other alignments to this site originating from several different earthworks (see below).

The location of the Kissimmee Circle is just outside the boundaries (by approximately one hundred meters) of the FDEM LiDAR survey. Because of this no

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Figure 8-11. Alignment exhibited by Kissimmee Circle. A) Close-up of Kissimmee Circle showing alignment origin (USDA 1944).
hydrological modeling is possible. However, given its orientation and location adjacent to the Kissimmee River it is likely that Hale’s (1984) argument is not supported by Kissimmee Circle. Rather, when the Kissimmee River overspills its banks, filling the floodplain, the semi-circle will be filled with this water. Altogether, these analyses suggest that Kissimmee Circle meets the expectations for the principles of circularity, relatedness, and place-centeredness.

Table 8-2. Alignment probabilities and site distributions by azimuth range from Kissimmee Circle.

<table>
<thead>
<tr>
<th>Kissimmee Circle Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kissimmee Circle Azimuth Range</td>
</tr>
<tr>
<td>P(Monument)</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
</tr>
<tr>
<td>No. Total Sites</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
</tr>
</tbody>
</table>

**Barley Barber I**

The Barley Barber I site is located on the eastern edge of the Okeechobee Basin in the Barley Barber swamp in Martin County. It has an architectural footprint of 6829.1 m², making it one of the smaller Type A circular-linear earthworks (Figure 8-12). Like Drasdo Earthworks discussed above, there is no identifiable midden-mound on historic aerials of this site. However, there has been considerable land alteration just west of the semi-circle associated with the construction of the Florida East Coast Railway that was built in 1895 (Grunwald 2006). It is possible that the midden-mound was destroyed during construction. Additional landscape alterations have also taken place since the
construction of the railway. There is now a park, with restrooms and boardwalks, dedicated to the site. Further, these alterations are so extensive that accurate hydrological modeling is not possible for Barley Barber I.

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (relatedness and place-centeredness) relied on a combination of embankment azimuths and the semi-circle opening. The dual parallel embankments of Barley Barber I have an azimuth of 91.44°, placing them in ±1° of the A.D. 200 vernal equinox (90.3°) (Figure 8-13). A line connecting the two ends of the semi-circle exhibits an azimuth of 176.37°. This is within ±4° of a true meridian, which means the semi-circle is open to the setting sun on an equinox.

Figure 8-12. Aerial photograph showing Barley Barber I in 1971 (USDA 1971).
When projected across the landscape, the meridian line of the semi-circle does not produce any alignments to other sites, either to the north or the south. The projected embankment line, when followed to the east, also does not exhibit any site alignments. However, when using that same line as a back sight (271.44°), there is an alignment to the Little Salt Springs site (Figure 8-14). This is an Archaic period subaqueous ossuary site where an estimated >1,000 people were interred in extended positions into graves dug into the muck soils of a slough (Milanich 1994:80).

![Figure 8-13. Celestial alignments exhibited by Barley Barber I (USDA 1971).](image)

Probability statistics for the azimuth range of the alignment (271–280°) show that alignment with Belle Glade monuments and subaqueous ossuaries have a very low probability of occurring by chance (0.038), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.136) and with a non-monumental site is very high (0.863) (Table 8-3). However, this alignment is to a Middle Archaic
Figure 8-14. Site alignment exhibited by Barley Barber I. A) Close-up of Barley Barber I showing alignment origin (USDA 1971).

Table 8-3. Alignment probabilities and site distributions by azimuth range from Barley Barber I.

<table>
<thead>
<tr>
<th>Barley Barber I</th>
<th>Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>271–280</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.136</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.863</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.038</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
<td>317</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
<td>50</td>
</tr>
<tr>
<td>No. Total Sites</td>
<td>367</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
<td>271.4366</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
<td>14</td>
</tr>
</tbody>
</table>

subaqueous burial site. Two such sites (Warm Mineral Springs and Little Salt Springs) are within the azimuth range in question for Barley Barber I. The probability for incidental alignment with either of these sites is extremely low (0.005). This is further
substantiated by the fact that outside of the Archaic Period practice of subaqueous burial, no other Florida archaeological culture is known to have performed such practices except for the Belle Glade culture. These analyses suggest Barley Barber I meets the expectations for circularity, relatedness, and place-centeredness.

**Whitebelt II Earthwork Complex**

The Whitebelt II Earthwork Complex is a Type A circular-linear earthwork located on the DuPuis Management Area (South Florida Water Management District) in Palm Beach County. At 27,284.2 m², it has the largest architectural footprint of all the Type A earthworks. However, much of that footprint is related to the peculiar characteristic of this particular earthwork. Rather than having a semi-circular earthen embankment, it has a semi-circular midden-mound the dual parallel embankments project directly out of (Figure 8-15). This is the only Type A earthwork that is structured in this manner. The size of the midden-mound accounts for the large architectural footprint of the site.

![Aerial photograph showing Whitebelt II Earthworks Complex in 1938 (USDA 1938).](image)

Figure 8-15. Aerial photograph showing Whitebelt II Earthworks Complex in 1938 (USDA 1938).
The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The dual parallel embankments have an azimuth of 359.88°, which is ±0.12° of a true meridian alignment (Figure 8-16). Further, a line connecting the two ends of the semi-circle/midden-mound has an azimuth of 96.37°, which places it ±6° of the A.D. 200 vernal equinox (90.3°) and ±4° of the A.D. 1000 autumnal equinox (92.33°). While we don’t have dates for this site, it is likely it was built closer to A.D. 1000.

Figure 8-16. Celestial alignments exhibited by Whitebelt II Earthworks Complex (USDA 1938).

When projected across the landscape, the embankment meridian line does not create any alignments to other sites either to the north or the south. However, the semi-circle/midden-mound equinox line does. Projecting this line to the west along the
276.37° (96.37°+180°) azimuth exhibits an alignment to the Lakeport Circle (Figure 8-17). This is a circular ditch site located on the west side of Lake Okeechobee near the banks of Fisheating Creek. Further, it is located near the Fort Center, Lakeport Earthworks, and North Fisheating Creek Circle sites, all of which are Belle Glade monumental architectural sites. Probability statistics for the azimuth range of the alignment (271°–280°) show that aligning with Belle Glade monuments and subaqueous ossuaries have a very low probability of occurring by chance (0.025), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.198) and with a non-monumental site is very high (0.801) (Table 8-4).

![Map of site alignment](image)

**Figure 8-17.** Site alignment exhibited by Whitebelt II Earthworks Complex. A) Closeup showing alignment origin (USDA 1938).

Hydrological modeling of the Whitebelt II Earthworks Complex and its immediate vicinity shows significant patterning in how water flows around the site (Figure 8-18).
This patterning demonstrates variability in water flow across the landscape in this area due to the presence of numerous topographic depressions that take the form of cypress dome swamps. The hydrologic model shows these depressions drawing the flow.

Table 8-4. Alignment probabilities and site distributions by azimuth range from Whitebelt II Earthworks Complex.

<table>
<thead>
<tr>
<th>Azimuth Range</th>
<th>Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>271–280</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.198</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.801</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.025</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
<td>218</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
<td>54</td>
</tr>
<tr>
<td>No. Total Sites</td>
<td>272</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
<td>276.37</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
<td>7</td>
</tr>
</tbody>
</table>

Figure 8-18. Hydrological model of the Whitebelt II Earthworks Complex showing primary flow accumulations. The NW-SE flow accumulations in the SW corner of the map are due to the presence of a large modern canal unable to be removed during processing (USDA 1938).
Summer Earthworks

Summer Earthworks, located south of Lake Okeechobee in the Everglades Agricultural Area (EAA) of Hendry County, is the third smallest of the Type A circular-linear earthworks (Figure 8-19). It has an architectural footprint of 5898.53 m². Unlike the other Type A earthworks discussed above, Summer Earthworks has only a single embankment projecting from the semi-circle rather than a dual set of parallel embankments. It is one of only two known earthworks of this type that is structured in this manner. Due to the extent of the landscape alterations in the immediate vicinity of the site, hydrological modeling was not possible for Summer Earthworks.

Figure 8-19. Aerial photograph showing Summer Earthworks in 1974 (USDA 1974).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The embankment has an azimuth of 332.52°, which does not align with any
celestial events (Figure 8-20). Additionally, a line connecting the ends of the two ends of
the semi-circle has an azimuth of 54.59°, which is ±3° of the A.D. 201 lunar northern
maximum (57.96°).

Figure 8-20. Celestial alignments exhibited by Summer Earthworks.

The test for the relatedness of places identified two alignments in Summer
Earthworks. When the embankment line is projected across the landscape, it aligns with
the conical mound at Lakeport Earthworks' dual embankments (Figure 8-21). The
Lakeport Earthworks site, discussed below, is another Type A circular-linear earthwork.
Additionally, the line connecting the two ends of the semi-circle intersects with Joseph
Reed Shell Ring, a Late Archaic site. Probability statistics for the azimuth range of the
alignment (51–60°) with Joseph Reed Shell Ring show that alignment with Belle Glade
monuments and subaqueous ossuaries have a very low probability of occurring by
chance (0.088), while the probability of aligning with a non-Belle Glade monument by
chance is higher (0.176) and with a non-monumental site is very high (0.823) (Table 8-5).
However, Joseph Reed is a Late Archaic Shell Ring site, and it is the only site of this type within the azimuth range in question. Thus, the probability for incidental alignment with this site 0.029. The likelihood of a purposeful alignment to this site is substantiated by two lines of evidence: (1) there is a strong morphological similarity between this particular shell ring and the semi-circles of Belle Glade earthworks; (2) there are multiple alignments to this site originating from separate earthworks (see below).

Figure 8-21. Site alignments exhibited by Summer Earthworks. A) Close-up of Summer Earthworks (USDA 1974) showing alignment origin. B) Close-up of Lakeport Earthworks showing alignment to conical mound (USDA 1948d); C) LiDAR image of Joseph Reed Shell Ring showing alignment.

Probability statistics for the azimuth range of the Lakeport Earthworks alignment (331–340°) show that alignment with Belle Glade monuments and subaqueous ossuaries have a very low probability of occurring by chance (0.015), while the
probability of aligning with a non-Belle Glade monument by chance is higher (0.099) and with a non-monumental site is very high (0.90). Altogether, these analyses suggest that Summer Earthworks meets the expectations for circularity, relatedness, and place-centeredness. While hydrological modeling is not possible for this site due to extreme landscape alteration, the orientation of the earthwork, with the semi-circle open to the south/southeast, suggests that in the case of Summer Earthworks, Hale’s (1984) argument cannot be rejected.

Table 8-5. Alignment probabilities and site distributions by azimuth range from Summer Earthworks.

<table>
<thead>
<tr>
<th>Summer Earthworks</th>
<th>Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>51–60 331–340</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.176 0.099</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.823 0.90</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.088 0.015</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
<td>28 471</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
<td>6 52</td>
</tr>
<tr>
<td>No. Total Sites</td>
<td>34 523</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
<td>54.59 332.52</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
<td>3 8</td>
</tr>
</tbody>
</table>

**Ortona Earthworks**

The Ortona Earthworks site is located in Glades County, well outside the range of available LiDAR, which hinders any ability for hydrological modeling. It is a distinctive site in terms of Belle Glade monumental architecture. While it boasts a Type A circular-linear earthwork, it is also home to many other types of earthen architectural constructions, including conical mounds, elongated mounds, a possible serpent effigy, and two U-shaped enclosures (Carr et al. 1995). The Type A earthwork at the site has an architectural footprint of 12,359 m², making it the third largest of the Type A circular-linear earthworks. It is also distinct in that it is the only example of a Type A earthwork.
with a secondary semi-circle surrounding the conical mound at the terminal end of its dual embankments, which is common among the later Type B earthworks (Figure 8-22).

Figure 8-22. Aerial photograph showing Ortona Earthworks’ Type A architecture in 1949 (USDA 1949c).

In my previous work (Lawres 2017), I classified this particular earthwork as a Type B circular-linear earthwork because of Carr and colleagues’ (1995) assertion that much of this portion of the site was destroyed by landscape alterations involving the construction of a cemetery, which is visible to the west of the architecture in the 1940 aerial photograph, and a combination of land alteration and use by model airplane hobbyists and skeet shooting enthusiasts. However, further investigations involving inspection of multiple aerial photographs and ground truthing did not reveal any
evidence for additional architectural features in this area. Thus, for this study I have reclassified it as a Type A circular-linear earthwork.

Figure 8-23. Celestial alignments exhibited by Ortona Earthworks Type A architecture (USDA 1949c).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The archaeoastronomical analysis of Ortona Earthworks identified three significant azimuths in the architecture. The dual embankments have an azimuth of 96.08°, which is significant in two ways (Figure 8-23). First, it is within ±6° of alignment with the A.D. 200 vernal equinox (90.3°), and ±4° of the A.D. 1000 autumnal equinox (92.33°). While we don’t have dates for this architectural feature, it was likely built
towards the end of the Belle Glade II period (A.D. 1000). Second, it is almost the exact same azimuth exhibited by the line connecting the ends of the semi-circle/midden-mound at the Whitebelt II Earthwork Complex (96.37°). There are also two meridians present in Ortona’s Type A earthwork. These are both associated with the semi-circles at the site. The larger semi-circle has an azimuth of 179.53°, which is ±0.47° from a true meridian, and the smaller semi-circle has an azimuth of 182.71°, which is ±2° from a true meridian alignment. The orientation of these semi-circles is open to the equinoctial sunsets.

Table 8-6. Alignment probabilities and site distributions by azimuth range from Ortona Earthworks. Modified from Lawres (2017:Table 9).

<table>
<thead>
<tr>
<th>Azimuth Range</th>
<th>Ortona Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>91–100</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.23</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.77</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.033</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
<td>23</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
<td>7</td>
</tr>
<tr>
<td>No. Total Sites</td>
<td>30</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
<td>96.08</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
<td>1</td>
</tr>
</tbody>
</table>

The test for the relatedness of places identified a single alignment. When Ortona’s embankment line is projected across the landscape, it intersects with the northern part of the Kreamer Island site (Figure 8-24). Not only is this the densest portion of Kreamer’s occupation area, it is also off the north shore that people were interred within the waters of Lake Okeechobee. Probability statistics for the azimuth range of the alignment (91–100°) show that alignment with Belle Glade monuments and subaqueous ossuaries have a low probability of occurring by chance (0.033), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.23) and
with a non-monumental site is extremely high (0.77) (Table 8-6). This alignment is further substantiated by the presence of multiple other alignments to the same site, all of which originate from other monuments in both the Type A and Type B categories (see below). These analyses suggest that Ortona Earthworks meets the expectations for the principles of circularity, relatedness, and place-centeredness.

Figure 8-24. Site alignment exhibited by Ortona Earthworks Type A architecture. A) Close-up of Ortona Earthworks Type A architecture showing alignment origin (USDA 1949c).

Lakeport Earthworks

Lakeport Earthworks is located in Glades County in close vicinity to Fort Center. In fact, it is less than 1,500 m northeast of Fort Center’s Type B circular-linear earthwork, just to north of Fisheating Creek. It has an architectural footprint of 7542.8 m², making it the median size rank of the Type A earthworks (Figure 8-25).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and
relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The archaeoastronomical analysis of Lakeport Earthworks identified one significant azimuth in the architecture (Figure 8-26). The dual parallel embankments have an azimuth of 281.96°, which does not align with any cyclical celestial phenomena. A line connecting the ends of the semi-circle do, however. This line has an azimuth of 116.42°, which is ±0.06° of the A.D. 200 hernal solstice.

Figure 8-25. Aerial photograph showing Lakeport Earthworks in 1948 (USDA 1948d).

The test for the relatedness of places also identified a single alignment. This alignment stems from the line connecting the ends of the semi-circle. When it is projected across the landscape intersects with the same location at Kreamer Island as the alignment from Ortona: the northern portion of the densest occupation, adjacent to the north shore subaqueous ossuary (Figure 8-27).
Figure 8-26. Celestial alignment present in Lakeport Earthworks (USDA 1948d).

Figure 8-27. Site alignment exhibited by Lakeport Earthworks. A) Close-up of Lakeport Earthworks showing alignment origin (USDA 1949d).
Probability statistics for the azimuth range of the alignment (111–120°) show that alignment with Belle Glade monuments and subaqueous ossuaries have a low probability of occurring by chance (0.125), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.312) and with a non-monumental site is very high (0.687) (Table 8-7). As discussed above, there are other alignments to this site, such as the one originating from Ortona Earthworks. This further substantiates the alignment from Lakeport Earthworks.

Table 8-7. Alignment probabilities and site distributions by azimuth range from Lakeport Earthworks.

<table>
<thead>
<tr>
<th>Lakeport Earthworks</th>
<th>Azimuth Range (Decimal Degrees) and Site Distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>111–120</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.312</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.687</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.125</td>
</tr>
<tr>
<td>No. Non-Monumental Sites</td>
<td>11</td>
</tr>
<tr>
<td>No. Monumental Sites</td>
<td>5</td>
</tr>
<tr>
<td>No. Total Sites</td>
<td>16</td>
</tr>
<tr>
<td>Possible Alignment Azimuths</td>
<td>116.42</td>
</tr>
<tr>
<td>No. Belle Glade Monuments in Range</td>
<td>2</td>
</tr>
</tbody>
</table>

Hydrological modeling of Lakeport Earthworks and its immediate surroundings shows significant patterning that is contrary to Hale’s (1984) argument (Figure 8-28). The model shows the primary flow of water to be bidirectional, flowing southward until being pulled to the east by Fisheating Creek. The architecture also affects this flow. However, rather than redirecting flow away from the midden-mound of the site, the semi-circle directs primary flow accumulations around the southern end of the midden-mound and along the embankments. This is in direct contradiction to Hale’s argument. In total, these analyses suggest that Lakeport Earthworks meets the expectations for relatedness, circularity, and place-centeredness.
Candler Mound and Earthworks

The Candler Mound and Earthworks site is located on the border of Polk and Osceola counties in the northern portion of the Kissimmee River Basin. Given its location this far north, it is well outside the range of available LiDAR data. Thus, hydrological modeling is not possible for this site. It is the furthest north of all Type A circular-linear earthworks. With an architectural footprint of 4833.65 m², it is the second smallest of all Type A earthworks (Figure 8-29).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The archaeoastronomical analysis did not identify any alignments to cyclical celestial phenomena. The dual embankment pair has an azimuth of 188.6234° while a
line connecting the two ends of the semi-circle has an azimuth of 226.8609°. Neither of these has any correlation to the expected celestial events.

Figure 8-29. Aerial photograph showing Candler Mound & Earthworks in 1941 (USDA 1941b).

The test for the relatedness places identified a single alignment based on the embankment azimuth. This alignment is to the famous Key Marco site in Southwest Florida (Figure 8-30). Probability statistics for the azimuth range of the alignment (181–190°) show that alignments with Belle Glade monuments and subaqueous ossuaries have a very low probability of occurring by chance (0.006), while the probability of
alignment with a non-Belle Glade monument by chance is higher (0.168) and with a non-monumental site is very high (0.831) (Table 8-8). However, this alignment is to a large Caloosahatchee culture site with massive shellworks comprising the monumental

Table 8-8. Alignment probabilities and site distributions by azimuth range from Lakeport Earthworks.

| Candler Mound & Earthworks Azimuth Range (Decimal Degrees) and Site Distributions |
|---------------------------------|-----------------|
| Azimuth Range                   | 181–190         |
| P(Monument)                     | 0.168           |
| P(Non-Monument)                 | 0.831           |
| P(Belle Glade Monument)         | 0.006           |
| No. Non-Monumental Sites        | 276             |
| No. Monumental Sites            | 56              |
| No. Total Sites                 | 332             |
| Possible Alignment Azimuths     | 188.62          |
| No. Belle Glade Monuments in Range | 2               |
architecture. Eight sites of similar morphology fall within this azimuth range, which means the probability of an incidental alignment with a site such as this is very low (0.024). Together these analyses suggest that the Candler Mound & Earthworks site meets the expectations for relatedness and place-centeredness, along with the spatial aspect of circularity, but not the temporal aspect of circularity.

**Nicodemus Earthworks**

Nicodemus Earthworks is located in Glades County, exactly 5.5 km directly south of Fort Center’s Great Circle Complex. With an architectural footprint of 3844.69 m², it is the smallest of the Type A Earthworks (Figure 8-31). It is possible that the footprint is larger than this. Carr (1975) suggests the presence of an effigy earthwork (possibly human) adjacent to the Type A feature. However, this is not visible on the aerial photographs, and a more recent archaeological survey of the site (Ambrosino 2013) failed to locate the feature. Similar to Hendry Earthworks, a Type B earthwork discussed below, Nicodemus Earthworks does not have a singular midden-mound within the semi-circle, but instead it has several smaller conical mounds in lieu of the larger oval-shaped or elongated midden-mounds more typical of this architectural type.

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied on a combination of embankment azimuths and the semi-circle opening. The archaeoastronomical analysis identified a single significant azimuth (Figure 8-32). The embankment of Nicodemus Earthworks has an azimuth of 251.0795°. This is ±6° of the A.D. 201 lunar southern minimum, and it is ±3° of the A.D. 993 and A.D. 1010 lunar southern minima, which are 248.01° and 248.55°, respectively. It is likely this site was built close to the end of the Belle Glade II period (A.D. 1000).
Figure 8-31. Aerial photograph showing Nicodemus Earthworks in 1948 (USDA 1948b).

Figure 8-32. Lunar southern maximum alignment present at Nicodemus Earthworks (USDA 1948b).
The test for the relatedness of places did not identify any alignments to sites of contemporary age in either the embankment azimuth or a line connecting the ends of the semi-circle. However, hydrological modeling shows patterning in flow accumulations that rejects Hale’s (1984) argument. The model shows primary flow accumulations.
moving generally south over the landscape (Figure 8-33). Nicodemus Earthworks is oriented in a manner where the semi-circle is relatively open to this water flow. This is shown by the flow accumulations moving directly into the semi-circle. Further, this is in direct contrast to Hale’s argument since water is not being redirected away from the mounds within the semi-circle. Together these analyses suggest that Nicodemus earthworks meets the expectations for circularity and relatedness with water but not for the relatedness of places.

**Results: Type B Monuments**

There are seven positively identified Type B circular-linear earthworks within the KOE watershed (Figure 8-34). Just as with the Type A earthworks, both Hale (1989) and Johnson (1991) list other examples of this earthwork type in their dissertations in addition to those listed here. However, Hale (1989) used alternate names from the Florida Master Site File whereas I use the official state-listed names. Additionally, some of the earthworks listed in both Hale’s (1989) and Johnson’s (1991) lists could not be positively identified as Type B circular-linear earthworks based on Johnson’s official definition and criteria. Those not able to be positively identified as Type B circular-linear earthworks were not included in this analysis.

The analyses of the Type B monuments show that some of the same trends identified among the Type A monuments are present in the Type B monuments. However, they are amplified greatly when compared to the frequencies exhibited by their Type A counterparts. In this section I report the results of the analyses of the Type B monuments and discuss whether the expectations for the principles of relatedness, circularity, and place-centeredness are met by the results of the analysis. Additionally, whereas the circular ditches and Type A circular-linear earthworks were not subjected
Figure 8-34. All known Type B circular-linear earthworks. A) Tony’s Mound (USDA 1957b); B) Big Mound City (USDA 1949b); C) Fort Center (1948c); D) Kissimmee Circle Earthworks (USDA 1957c); E) Maple Mound (USDA 1963a); F) Hendry Earthworks (USDA 1957a); G) South Lake Mounds (USDA 1957d).
to full morphological analysis, the Type B circular-linear earthworks provide structural complexities that allow for additional analysis of morphology for testing the extent of the spatial aspect of circularity.

**Tony’s Mound**

Tony’s Mound is comprised of ten linear embankments radiating from its semi-circle, which partially encloses its midden-mound (Figure 8-35). Of the ten embankments, there are three with dual, parallel embankments, one of which would be classified by Johnson (1991, 1996) as its primary or Type A embankment. All of the embankments at this site terminate in conical mounds, and four of these terminal mounds are partially enclosed by smaller semi-circular embankments. Three of these embankments exhibit additional conical mounds within the embankments, something not present in other Type B monuments. Additionally, there is a conical mound within the large semi-circular embankment, which is also not exhibited at other Type B monuments. This is also a feature of a second semi-circular embankment located to the northwest of Mound 6 and Mound 8. However, Carr and Steele (1994:9) note that the mound, which they label Mound D, within the secondary semi-circle is a mortuary mound. This contrasts with the one in the primary semi-circle (Carr and Steele’s Mound C), which exhibited a very small surface scatter of ceramics and lithics but was otherwise sterile. In total, Tony’s Mound contains 21 conical mounds, seven semi-circular embankments, one ovate midden-mound, ten linear embankments, and one elongated mound. This shows that the circle is the primary feature of the site. Further, if the terminal conical mounds are connected with a line, the linear embankments form two additional semi-circles, and, when completed, a set of three nested circles (Figure
8-36). This demonstrates that the expectations for the spatial aspect of the principle of circularity are met for this site.

Figure 8-35. Aerial photograph of Tony’s Mound in 1957 showing numbered embankments (USDA 1957b).

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness, as discussed above) relied solely on the embankment azimuths and the azimuths of mound-to-mound or mound-to-causeway sitings. The conical mound within the semi-circular embankment provided the basis for the mound-to-causeway siting.
Outside of the embankment azimuths and the mound-to-causeway siting azimuth, the only other alignment found at this site was based on a mound-to-mound siting with the mounds at the ends of Embankment 6 and Embankment 8 (see Figure 8-35). Both of these mounds are partially enclosed by semi-circles that are connected to each other, and their embankments are close to parallel. This siting involves a projected line that intersects the westernmost edge of Mound 6’s semi-circle, the center of Mound 6, the connecting point of both semi-circles, the center of Mound 8, and the easternmost edge of Mound 8’s semi-circle.

Table 8-9. Azimuths, celestial alignments, and site alignments exhibited by Tony’s Mound.

<table>
<thead>
<tr>
<th>Tony’s Mound</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>139.63</td>
<td>Miami Circle Ditch</td>
<td>Glades</td>
<td></td>
</tr>
<tr>
<td>Embankment 2</td>
<td>183.18</td>
<td>Meridian (180.00)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 3</td>
<td>241.95</td>
<td>W Solstice (243.31)</td>
<td>Naples Canal</td>
<td>Calusa</td>
</tr>
<tr>
<td>Embankment 4</td>
<td>261.18</td>
<td>Mound Key</td>
<td>Calusa</td>
<td></td>
</tr>
<tr>
<td>Embankment 5</td>
<td>275.93</td>
<td>S Equinox (272.58)</td>
<td>Pineland</td>
<td>Calusa</td>
</tr>
<tr>
<td>Embankment 6</td>
<td>314.49</td>
<td>N/A</td>
<td>Calusa</td>
<td></td>
</tr>
<tr>
<td>Embankment 7</td>
<td>309.51</td>
<td>Ortona</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Embankment 8</td>
<td>319.57</td>
<td>N/A</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Embankment 9</td>
<td>305.88</td>
<td>Lunar Northern Max (301.73)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 10</td>
<td>334.11</td>
<td>Fort Center</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Mound to Causeway</td>
<td>51.39</td>
<td>Joseph Reed</td>
<td>Archaic</td>
<td></td>
</tr>
<tr>
<td>Mound to Mound</td>
<td>52.42</td>
<td>Big Mound City</td>
<td>Belle Glade</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-9 presents the azimuths of each linear embankment at Tony’s Mound, along with the mound-to-causeway and mound-to-mound sitings, any alignments to celestial events or other sites across throughout the landscape, and the cultural affiliation of any sites aligned with. The archaeoastronomical analysis of Tony’s Mound demonstrates the presence of three celestial alignments (Figure 8-37). One alignment is to the hibernal solstice, one to the vernal equinox, and one to the
lunar northern maximum. Additionally, two of the alignments are within ±2° of error while the third is within ±4° of error. All of these alignments are found in the linear embankments (Embankments 3, 5, and 9), and thus 30.0% of the embankments of the embankments exhibit celestial alignments. Further, the primary or Type A embankment is within 3° of a meridian azimuth. These results meet the expectations of the temporal aspect of the principle of circularity and the principle of relatedness—in this case indicative of the knowledge of the relatedness between earth and sky—for this site.

Figure 8-36. Spatial circularity exhibited by Tony’s Mound (USDA 1957b). Modified from Lawres (2017:Figure 6.)
Eight site alignments were identified (Figures 8-38 and 8-39). Three of these are to sites within the Okeechobee Basin, and these are all Belle Glade monuments. The remaining five site alignments are to sites outside of the KOE watershed. Two of these, Joseph Reed Shell Ring and Miami Circle Ditch, are located on the Atlantic Coast and three along the Gulf Coast. Additionally, every single one of these site alignments is to a site with monumental architecture, and more specifically the projected lines align with specific architectural features at these sites. All of these alignments are within 0.01° of error. These results meet the expectations for the principles of relatedness and place-centeredness because they are indicative of the relatedness of places.
Figure 8-38. Site alignments exhibited by Tony’s Mound (1 of 2). A) Tony’s Mound (USDA 1957b); B) Naples Canal (USGS 1991); C) Mound Key (FDEM 2014); D) Pineland (FDEM 2014); E) Ortona Earthworks (USDA 1949c). Adapted from Lawres, Nathan R. 2017. Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida (Page 671, Figure 8). *Journal of Anthropological Research* 73:647–694
Figure 8-39. Site alignments exhibited by Tony’s Mound (2 of 2). A) Tony’s Mound (USDA 1957b); F) Fort Center (USDA 1948c); G) Joseph Reed Shell Ring (FDEM 2014); H) Big Mound City (1949b). Adapted from Lawres, Nathan R. 2017. Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida (Page 672, Figure 9). Journal of Anthropological Research 73:647–694.
Probability statistics show the probability for aligning with a Belle Glade monument ranges from 0–0.073; the probability for aligning with non-Belle Glade monument ranges from 0.07–0.35; and the probability for aligning with a non-monumental site ranges from 0.65–0.93) (Table 8-10). This shows that the probability of a chance alignment to Belle Glade monument is extremely low. However, it is notable that only three of the site alignments originating from Tony’s Mound are to Belle Glade monuments: Big Mound City, Fort Center, and Ortona. Rather, the majority of the alignments are to sites outside of the KOE watershed. Yet, they are still to monumental architecture at these sites. This increases the probability of an alignment occurring by chance, but the probability still remains relatively low when compared to the probabilities of aligning with non-monumental sites. Because of the increased probability of chance alignments occurring, it is necessary to take a closer look at the

<table>
<thead>
<tr>
<th>Tony’s Mound</th>
<th>Azimuth Range and Site Distributions for Alignments</th>
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</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>60</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.17</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.83</td>
</tr>
<tr>
<td>P(BG Monument)</td>
<td>0.073</td>
</tr>
<tr>
<td>#Non-Monumental Sites</td>
<td>34</td>
</tr>
<tr>
<td>#Monumental Sites</td>
<td>7</td>
</tr>
<tr>
<td>#Total Sites</td>
<td>41</td>
</tr>
<tr>
<td>#BG Monuments</td>
<td>3</td>
</tr>
</tbody>
</table>
azimuth ranges in question as well as the sites being aligned with and the alignments identified from the other Type B monuments.

Looking first to the alignments to sites along the Atlantic Coast we are interested in the azimuth ranges 51–60° and 131–140°. Within the 51–60° range there are three Belle Glade monuments, but there are also two alignment lines that pass through this range. One aligns with Big Mound City, the other with the Joseph Reed Shell Ring. The latter is the alignment of concern here, because Joseph Reed Shell Ring predates the Type B monuments by millennia and is not definitively associated with the ancestral population of the Belle Glade peoples. Looking at the azimuth range more broadly there is a total of 41 sites distributed throughout the range, and only seven of them exhibit monumental architecture. Thus, there is 0.17 probability of randomly aligning with a monument. While this probability is much higher than those associated with aligning with a Belle Glade monument, we can account for the intentionality of the alignment by looking to other identified alignments originating from Type B monuments. When we do this, there are a total of three alignments—originating from three different Type B monuments—converging on this site. The details of the other two alignments to this site are discussed below and in Chapter 11.

The 131–140° azimuth range presents a slightly different picture, with a total of 144 sites distributed throughout the range and only 16 of them exhibiting monumental architecture. Thus, the probability of a chance alignment occurring to non-Belle Glade monumental site calculates as 0.1. This alignment is to the location of the Miami Circle Ditch, a circular ditch architectural feature documented by an 1845 U.S. government surveyor (Carr 1985:298). This surveyor was the only person to document it
professionally before it ended up beneath the pavement of modern-day Miami. At first thought this seems problematic, but two lines of evidence provide credence to the alignment. First, circular ditch architecture is a common monument form among the Belle Glade peoples (see above). Even though this particular circular ditch lies outside of the KOE watershed and within the area historically inhabited by the Tequesta, the similarity in form suggests a strong connection with the Belle Glade peoples. Second, when taking into account the alignments from other Type B monuments, there are three originating from different Type B monuments that converge on this site, much like the case of Joseph Reed (see below).

Turning now to the three alignments to sites on the Gulf Coast, three azimuth ranges require similar attention: 241–250°, 261–270°, and 271–280°. Within the 241–250° range there is a total of 61 sites distributed throughout, with 11 of them exhibiting monumental architecture. This calculates as a 0.16 probability of a chance alignment, which is much greater than the 0.015 probability of aligning with the single Belle Glade monument within the range. However, the identified alignment is to the western edge/entrance to the Naples Canal, a Prehispanic canal built by the Calusa (Luer 1998). The association with the Calusa adds credence to this alignment because of the historically and archaeologically documented relationships between them and the Belle Glade/Mayaimi peoples (Hahn 1991, 2003; Marquardt 1992a, 2014; Marquardt and Walker 2013; Milanich 1995; Worth 2013, 2014).

The site alignments within the 261–270° and 271–280° ranges are provided similar credence because of the association with the Calusa. However, it is important to note that the probability of chance alignments with monumental architecture within both
of these ranges is much higher—0.35 and 0.34, respectively—because of the higher density of monumental architecture within the Calusa heartland. Within these ranges, however, sites—both monumental and not—tend to be clustered along the waterways such as the Caloosahatchee River and Estero River. Thus, it is easy to avoid aligning with the majority of the sites in these ranges.

There are two lines of evidence that add further credibility to the alignments in these ranges. First, the alignments are to Mound Key (261–270° range) and Pineland (271–280° range), the two largest Calusa sites (Marquardt and Walker 2012:47). Further, Mound Key, historically known as Calos, was the capital of the Calusa paramount chiefdom during the sixteenth century (Marquardt 1992a, 2014; Marquardt and Walker 2012:47–49; Thompson et al. 2014; Thompson et al. 2016; Worth 2014). Pineland, historically known as Tampa, is the second largest known Calusa site (Marquardt and Walker 2012, 2013; Marquardt 2014; Worth 2013). The fact that these two centers of power are the subject of alignment provides some of the credibility to the alignments because the Belle Glade peoples would likely have known these sites well. Further, archaeological evidence demonstrates that the Calusa had relationships with the Belle Glade peoples well before the Spanish documented Calusa political control of the interior in the sixteenth century (Cordell 1992, 2013; Marquardt and Walker 2013; Marquardt 2014; Widmer 1988, 2002). The social and political implications of these relationships are discussed in detail in Chapter 11.

Second, if we account for the alignments identified at other Type B monuments we see there are multiple alignments originating from different Type B monuments converging on these sites, much like with Miami Circle Ditch and Joseph Reed Shell.
Ring. In the case of Mound Key, two alignments converge on the site while Pineland has three alignments converging on it. The fact that multiple Type B monuments are aligned with these two sites provides strong evidence that the alignments were not mere coincidence but were intentional.

Tony’s Mound could not be accurately tested with hydrological modeling because of its immediate surrounding environment. This site is located in the midst of sugarcane fields, which hindered the LiDAR survey for the area. Some forms of low-lying, dense vegetation do not allow the LiDAR laser to reach the ground surface. This is because the density and shortened height keep the stalks close together and the leafy vegetation densely compact, which prevents the laser from reaching the ground surface from the oblique angles of the machinery aboard the aircraft flying the survey (FDEM 2007). Sugar cane falls within this category of vegetation. While the site itself was clear of sugar cane when the survey took place, the surrounding environment contained fields of full growth. Thus, the resulting bare earth model shows the sugar cane as the ground surface surrounding the site. While ArcHydro provides useful tools for filling sinks or depressions, and canals can be manually filled, it is not possible to remove the cane and obtain an accurate portrayal of the actual ground surface. Thus, it is not possible to test Hale’s hypothesis with Tony’s Mound using ArcHydro. However, given the orientation of the semi-circle and the generally southward flow of water over the landscape, water likely would have entered directly into the semi-circle.

**Big Mound City**

Big Mound City is comprised of seven linear embankments radiating from its semi-circle, which partially encloses its large midden-mound (Figure 8-40). Of the seven embankments, there is one with three parallel embankments, three with dual parallel
embankments—one of these (Embankment 1) would be considered its primary/Type A embankment (*sensu* Johnson 1991, 1996)—and three single embankments. All of the embankments terminate in conical mounds, and five of these terminal mounds are partially enclosed by semi-circular embankments. The terminal mound of Embankment 1, labeled Mound 5 in Willey’s (1949:74–75) report on Stirling’s excavations, is one of the largest in the Kissimmee-Okeechobee-Everglades watershed, measuring approximately 7.5 meters tall when Stirling documented the site in 1933–34.

![Aerial photograph of Big Mound City in 1949 showing numbered embankments (USDA 1949b).](image)

Figure 8–40. Aerial photograph of Big Mound City in 1949 showing numbered embankments (USDA 1949b).

Furthermore, the embankments attached to this mound are the largest embankments, in vertical terms, present at any of the Type A or Type B monuments. Willey (1949:73) notes that these embankments averaged slightly less than 3 meters in height during 1933–34. It is notable that Embankment 7 does not follow the typical
pattern of radiating embankments because it does not connect to the large semi-circular embankment, but rather projects outwards from the small semi-circular embankment surrounding the terminal mound of Embankment 6 (see Figure 8-40).

Table 8-11. Azimuths, celestial alignments, and site alignments exhibited by Big Mound City.

<table>
<thead>
<tr>
<th>Big Mound City</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>240.81</td>
<td>W Solstice (243.31)</td>
<td>Hendry Earthworks</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 2</td>
<td>276.98</td>
<td>S Equinox (272.58)</td>
<td>Fort Center</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 3</td>
<td>298.46</td>
<td>S Solstice (297.06)</td>
<td>Whitebelt Circle</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 4</td>
<td>297.72</td>
<td>S Solstice (297.06)</td>
<td>Blueberry</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 5</td>
<td>305.10</td>
<td>Lunar North Max (301.73)</td>
<td>Kissimmee Circle Earthworks</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 6</td>
<td>325.98</td>
<td>W Solstice (243.31)</td>
<td>Maple Mounds</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 7</td>
<td>245.7</td>
<td>W Solstice (243.31)</td>
<td>Maple Mounds</td>
<td>Belle Glade</td>
</tr>
</tbody>
</table>

In total, Big Mound City contains 25 conical mounds, nine semi-circular embankments, one ovate midden-mound, seven linear embankments attached to the large-semi-circle, and three linear embankments located to the north/northwest of the Type B monument. This shows that the circle is the primary feature of the site. Further, if the terminal conical mounds are connected with a line, the linear embankments form two additional semi-circles, and, when completed, a set of three nested circles (Figure 8-41). These results demonstrate that the expectations for the spatial aspect of the principle of circularity are met for this site.

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places relied solely on embankment azimuths. There are no mound-to-mound sitings at Big Mound City. Table 8-11 provides the azimuths of each linear embankment associated with the large semi-circular embankment at Big Mound City, along with any alignments to celestial events or other sites associated with those azimuths, and the cultural affiliation of the aligned sites.
The archaeoastronomical analysis of Big Mound City demonstrates a strong association with celestial phenomena at this site. Six of the seven (85.71%) embankments are aligned with celestial events. This includes four solstice alignments, one equinoctial alignment, and one alignment to the lunar northern maximum (Figure 8-42). The solstitial alignments are all within ±2° of error while the equinoctial and lunar maximum alignments are within ±4° of error. These results show that the expectations for the temporal aspect of the principles of circularity and relatedness are met. In addition to the large number of celestial alignments at Big Mound City, this Type B monument also exhibits a large number of site alignments (Figures 8-43 and 8-44). In fact, all of the embankments align with Belle Glade sites, and with the exception of one of these sites (Blueberry), they are all Belle Glade monuments. One of the monuments is a circular ditch, one is a Type A monument, and the remaining four are Type B monuments. It is notable, however, that while the Blueberry site may not exhibit the
same forms of monumental construction as the other sites aligned with, there was a significant amount of terraforming that occurred there that resulted in the construction of at least four conical mounds (Butler 2008; Butler and Lawres 2014; Lawres 2017). Further, this site represents a significant site of interregional interaction (Butler and Lawres 2014; Lawres 2017). This contrasts with Tony’s Mound, where the majority of the site alignments are to places outside of the Okeechobee Basin.

Figure 8-42. Celestial alignments exhibited by Big Mound City (USDA 1949b).

Because all of Big Mound City’s alignments are to other Belle Glade sites, and most of them monuments, the question of the intentionality behind the alignments is lessened in comparison with Tony’s Mound. Even so, the probability statistics do provide further validity for the intentionality (Table 8-12). As with the other Type B monuments discussed in this section, there is variability in the probability ranges for chance alignments with Belle Glade monuments (0.002–0.03), non-Belle Glade
Figure 8-43. Site alignments exhibited by Big Mound City (1 of 2). A) Big Mound City (USDA 1949b); B) Hendry Earthworks (USDA 1957a); C) Maple Mound (USDA 1963a); D) Fort Center (USDA 1948c); E) Blueberry (USGS 2014).
Figure 8-44. Site alignments exhibited by Big Mound City (2 of 2). A) Big Mound City (USDA 1949b); F) Kissimmee Circle Earthworks (USDA 1957c); G) Barley Barber I (USDA 1971); H) Whitebelt I (USDA 1938).
monumental architecture (0.05–0.25), and non-monumental sites more generally (0.75–0.95). These ranges show the probability for chance alignments with non-monumental sites is quite high in each of the azimuth ranges. In contrast, the probability of chance alignments occurring with monumental architecture are comparatively low, while the probability for chance alignments with Belle Glade monuments is extremely low. The fact that all of the Big Mound City alignments fall within the latter category exponentially increases the likelihood of the alignments being intentional. This is increased even further when considering that the majority of these alignments include Type B monuments and a Type A monument because these monuments share a strong similarity in form and locational placement with Big Mound City.

Table 8-12. Alignment probabilities and site distributions by azimuth range from Tony’s Mound. Adapted from Lawres, Nathan R. 2017. Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida (Page 676, Table 4). *Journal of Anthropological Research* 73:647–694

<table>
<thead>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P(Monument)</td>
<td>0.14</td>
<td>0.25</td>
<td>0.21</td>
<td>0.09</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.86</td>
<td>0.75</td>
<td>0.79</td>
<td>0.91</td>
<td>0.95</td>
<td>0.92</td>
</tr>
<tr>
<td>P(BG Monument)</td>
<td>0.03</td>
<td>0.026</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.002</td>
</tr>
<tr>
<td># Non-Monumental Sites</td>
<td>114</td>
<td>113</td>
<td>221</td>
<td>493</td>
<td>278</td>
<td>408</td>
</tr>
<tr>
<td># Monumental Sites</td>
<td>18</td>
<td>37</td>
<td>58</td>
<td>51</td>
<td>15</td>
<td>36</td>
</tr>
<tr>
<td># Total Sites</td>
<td>132</td>
<td>150</td>
<td>279</td>
<td>544</td>
<td>293</td>
<td>444</td>
</tr>
<tr>
<td># BG Monuments</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Hydrological modeling of Big Mound City and its immediate vicinity show significant patterning in flow accumulations (Figure 8-45). The areas of primary flow are demonstrated to be affected by the architecture. Specifically, water is shown to flow within the confines of the semi-circle, with a primary flow accumulation following the direction of the semi-circle. The flow accumulation directions are also manipulated by
the radiating linear embankments. Embankment 1 provides an interesting case because the flow accumulations cut through a damaged location in the northern embankment of the pair. Prior to this damage, the flow accumulation would have flowed parallel to the entire embankment before entering the semi-circle. The main takeaway from this is that the data suggest that while the architecture does redirect water, it does not do so in the manner suggested by Hale (1984). Rather, it redirects it into the semi-circle and towards the midden-mound instead of away from it.

Figure 8-45. Hydrological modeling for Big Mound City showing flow accumulations (USDA 1949b).
Hendry Earthworks

Hendry Earthworks is comprised of four linear embankments radiating out of its semi-circle (Figure 8-46). Rather than enclosing a single large midden-mound, there are several conical mounds, and possibly a crescent shaped mound as well, within the confines of the semi-circle (Carr et al. 1996). Of the embankments radiating from the semi-circle, three are dual embankments terminating in conical mounds and one is a single embankment terminating in a conical mound partially surrounded by a smaller semi-circle. Additionally, Embankment 1 is structured in a slightly different manner than the others. Rather than the dual embankments terminating directly into the conical mound, they arc around it to form a semi-circle connected to both embankments, essentially forming one long singular embankment that encircles a conical mound at one end. The only other Type B monument with this embankment form is Kissimmee Circle Earthworks (see below). In addition to the four embankments attached to the large semi-circle, there is a large dual embankment located to the south/southeast of the Type B monument. This dual embankment terminates in conical mounds at both ends. Carr and colleagues (1996) note the presence of yet another detached linear embankment in the vicinity of this one, but it is not discernible on historic aerial photographs, so it is not included in this analysis.

In total, Hendry Earthworks exhibits three semi-circles (one of which is incorporated into a dual embankment configuration, as discussed above), five embankments (not including the additional one noted by Robert Carr and his colleagues), and at least nine conical mounds. Much like the other Type B monuments, if a line is projected to connect the terminal mounds of the radiating embankments, a set of nested circles is formed. However, because of its specific configuration, only two
circles are formed at this site (Figure 8-47). Even so, these results show that the expectations for the spatial aspect of the principle of circularity are met.

![Aerial photograph of Hendry Earthworks in 1957 showing numbered embankments (USDA 1957a).](image)

The tests for the temporal aspect of the principle of circularity, the principle of relatedness, and the relatedness of places (principles of place-centeredness and relatedness) relied solely on embankment azimuths. No mound-to-mound sitings were identified for Hendry Earthworks. Table 20 presents the embankments azimuths, associated celestial alignments, site alignments, and cultural affiliations of the alignments.

The archaeoastronomical analysis shows that Hendry Earthworks exhibits two celestial alignments and one meridian alignment (Figure 83). All of these alignments are
within 1° of error. One of the celestial alignments is to the lunar northern maximum, and the other is to an equinox. While meridian lines are not necessarily celestial alignments,

Figure 8-47. Spatial circularity exhibited by Hendry Earthworks (USDA 1957a).

Figure 8-48. Celestial alignments exhibited by Hendry Earthworks (USDA 1957a).
they factor in to concepts of space and place because allow persons to orient
themselves towards a cardinal direction. This would make orienting oneself towards a
rising or setting position of the sun, moon, or stars an easy task. Additionally, cardinal
directions play large roles in Native American cosmology, mythology, philosophy, and

In addition to the celestial alignments, Hendry Earthworks exhibits five
alignments originating from four of the radiating embankments (Figure 8-49). Three of
these are to other Belle Glade monuments, two are to Type B monuments and one to a
Type A monument. One of the remaining alignments is to the Miami Circle Ditch along
the Atlantic Coast while the other is to the Pineland site along the Gulf Coast. Further,
one of the embankments (Embankment 2) has two alignments associated with it,
something that is not exhibited at any of the other sites. What I mean by this is that the
embankment azimuth projected towards the southeast (141.47°) aligns with the Miami
Circle Ditch, but if projected towards the converse direction (321.47°) the alignment is to
the South Lake Mounds site.

Probability statistics show that alignment with Belle Glade monuments have a
low probability of occurring by chance (0–0.007), while the probability of aligning with a
non-Belle Glade monument by chance is higher (0.06–0.29) and with a non-

Table 8-13. Azimuths, celestial alignments, and site alignments exhibited by Hendry
Earthworks.

<table>
<thead>
<tr>
<th>Hendry Earthworks</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>301.71</td>
<td>Lunar North Max (301.73)</td>
<td>Ortona</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 2 (a)</td>
<td>141.47</td>
<td>Miami Circle Ditch</td>
<td>Glades</td>
<td></td>
</tr>
<tr>
<td>Embankment 2 (b)</td>
<td>321.47</td>
<td>South Lake Mounds</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Embankment 3</td>
<td>164.30</td>
<td>Tony's Mound</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Embankment 4</td>
<td>179.26</td>
<td>Meridian (180.0)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 5</td>
<td>271.80</td>
<td>S Equinox (272.58)</td>
<td>Pineland</td>
<td>Calusa</td>
</tr>
</tbody>
</table>
monumental site is extremely high (0.71–0.94) (Table 8-14). This shows that the three alignments to Belle Glade monuments have a very low probability of being incidental, but the alignments to the Miami Circle Ditch and Pineland require further examination.

The 141–150° azimuth range has a probability of 0.12 for incidental alignment to monumental architecture (non-Belle Glade) and 0.88 for non-monumental sites more generally. The alignment in this range is to the Miami Circle Ditch, which is a monumental architectural feature associated with the Glades archaeological culture. However, as discussed above, there is a strong similarity in form between this circular ditch and the others produced within the Kissimmee-Okeechobee-Everglades watershed by the Belle Glade peoples. Additionally, there are three total alignments to the location of this circular ditch. These two lines of data provide support for the intentionality of the alignment.

The 271–280° range has a much higher probability for chance alignment with monumental architecture (0.29) but a lower probability for incidental alignment with non-monumental sites (0.71). However, the alignment associated with this azimuth range is to Pineland. As we saw earlier there are three alignments to this site, and this site is associated with the Calusa, with whom the Belle Glade peoples had longstanding relationships. Further, this large, significant site would likely have been well-known by the Belle Glade peoples. Thus, it is unlikely that this alignment occurred by mere chance.

Hydrological modeling of Hendry Earthworks and its immediate vicinity show similar results as Big Mound City (Figure 85). However, there is a significant difference
Figure 8-49. Site alignments exhibited by Hendry Earthworks. A) Hendry Earthworks (USDA 1957a); B) Pineland (FDEM 2014); C) Ortona Earthworks (USDA 1949c); D) South Lake Mounds (USDA 1957d); E) Tony’s Mound (USDA 1957b). Adapted from Lawres, Nathan R. 2017. Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida (Page 673, Figure 10). *Journal of Anthropological Research* 73:647–694

<table>
<thead>
<tr>
<th>Hendry Earthworks</th>
<th>Azimuth Range and Site Distributions for Alignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(Monument)</td>
<td>0.12</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.88</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.007</td>
</tr>
<tr>
<td># Non-Monumental Sites</td>
<td>124</td>
</tr>
<tr>
<td># Monumental Sites</td>
<td>17</td>
</tr>
<tr>
<td># Total Sites</td>
<td>141</td>
</tr>
<tr>
<td># BG Monuments in Range</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 8-50. Hydrological modeling of Hendry Earthworks showing flow accumulations (USDA 1957a).
between the two sites and their relationship to water. Whereas Big Mound City is oriented so that the semi-circle opens away from the primary direction of water flow, Hendry Earthworks is oriented in the opposite manner. Thus, the water flows directly into the semi-circle with no redirection necessary. Thus, Hale’s (1984) argument does not hold water with this site. However, the radiating linear embankments of Hendry Earthworks do redirect water flow. As seen in Figure 8-50, Embankment 1 and Embankment 2 funnel water between them towards the semi-circle, and where flow accumulations follow the topography of the western portion of the semi-circle, Embankment 3 redirects the flow southwards, back to its original flow direction.

**Maple Mounds**

Maple Mounds is comprised of two linear embankments, one of which projects outwards from the site’s semi-circular embankment that partially encloses the midden-mound (Figure 8-51). Additionally, the semi-circle’s western terminus connects to a conical mound. The embankment projecting from the semi-circle is a single embankment terminating in a conical mound that is, in turn, partially surrounded by a smaller semi-circular embankment. The other linear embankment is located to the north of the semi-circle and is detached from the main complex of architecture. This embankment is unparalleled among the Type B monuments because it extends directly out of the northern side of a pond rather than from a semi-circle. This linear embankment is comprised of dual embankments terminating in a conical mound.

In total, Maple Mounds contains three conical mounds, an ovate midden-mound, and two embankments. This demonstrates that the circle is the primary feature of the site, and that the expectations for the spatial aspect of the principle of circularity are met. However, unlike the other Type B monuments, the presence of only two linear
embankments prevents the identification of additional, nested circles such as those exhibited at the Type B monuments discussed thus far (Figure 8-52).

Table 8-15. Azimuths, celestial alignments, and site alignments for Maple Mound.

<table>
<thead>
<tr>
<th>Maple Mounds</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>12.08</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 2</td>
<td>286.77</td>
<td>Lunar North Minimum (289.9)</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Figure 8-51. Aerial photograph of Maple Mound in 1963 showing numbered embankments (USDA 1963a).

The archaeoastronomical analysis shows that a single celestial alignment is present in the embankments of Maple Mounds. This alignment is to the lunar northern minimum, and it is within 3° of error (Figure 8-53; Table 8-15). The presence of this celestial alignment suggests that the expectations for the temporal aspect of the principles of circularity and relatedness are met. In contrast, no alignments to other sites were identified. This is the only Type B monument in which the principles of relatedness
and place-centeredness (i.e., the relatedness of places) are not exhibited. Yet, one of the alignments from Big Mound City intersects the midden-mound of this site, drawing

Figure 8-52. Spatial circularity exhibited by Maple Mound (USDA 1963a).

Figure 8-53. Celestial alignments exhibited by Maple Mound (USDA 1963a).
the site and its inhabitants into the network of related places. It is possible that there were once alignments originating from this site, but the places being aligned with have since been destroyed. This is a very likely scenario given the amount of land that has been converted to agricultural purposes in South Florida as well as the rate of urban development and expansion. As discussed above, the majority of the Belle Glade monuments were destroyed in the process of converting so much of the region to agricultural pursuits during the late nineteenth and early twentieth centuries. It is very possible, indeed probable, that if there was originally an alignment originating from Maple Mounds that the subject of that alignment has since been destroyed.

Figure 8-54. Hydrological modeling of Maple Mound showing flow accumulations (USDA 1963a).
Hydrological modeling of Maple Mound and its immediate vicinity show results similar to Hendry Earthworks, with the semi-circle allowing open flow into its confines due to the orientation of the opening facing the primary water flow (Figure 8-54). Further, Embankment 1, which is the detached embankment with an azimuth of 12.08°, acts to split a flow accumulation into two that flow roughly parallel to it to either side. The effects of Embankment 2 are harder to decipher because of the presence of ditches and canals on the western side of the site. These modern features have altered the landscape so significantly that they were unable to be removed in the DEM preparation phase of the hydrological modeling for this site. Even so, given the orientation of its semi-circle and the evidence from Embankment 1, Maple Mound does not follow Hale’s argument for redirecting water away from the midden-mound but rather draws water in.

**South Lake Mounds**

South Lake Mounds is the most difficult Type B monument to assess because of the level of unmitigated destruction it was subject to in the late nineteenth century that has continued into the 1990’s (Carr and Steele 1992; Johnson 1990). Aerial photographs of the site obtained in 1949 show that the drainage canals were in place within 100 meters to the north and south of the architecture. These canals are associated with the repurposing of the wetlands for agricultural production and cattle range. Even at this early date many of the architectural features had been destroyed and thus not visible on the aerial photographs. However, Carr’s (1975; see also Carr and Steele 1992) work, using both aerial photography and field survey, was able to produce a generalized reconstruction of the site. Unfortunately, it is not a reconstruction that is usable in this analysis because it is not verifiable and there are not enough surrounding features in the map to use in georeferencing it accurately enough.
Carr and Steele (1992:6) note that South Lake Mounds was comprised of at least “8 possible mound and earthwork components.” Based on the number of architectural features included in Carr’s reconstruction, this number likely involved grouping multiple features together into what they refer to as “components.” Using aerials spanning from 1949–1963, I identified five conical mounds, two semi-circular embankments, and the midden-mound, which aligns with the southern shore of a depression marsh (Figure 8-55). I was unable to locate the three linear embankments that Carr’s 1975 survey identified. One of the semi-circular embankments is the large one that partially encloses the midden-mound. The other semi-circle has a conical mound in the center of it, much
like the one that acted as a mortuary facility at Tony’s Mound (see above). If Carr’s reconstruction is correct, then a third semi-circle would have surrounded a conical mound at the terminus of one of the embankments. The presence of this many circular features suggests that the expectations of the spatial aspect of the principle of circularity are met at this site. However, the lack of a reliable reconstruction that can be georeferenced prevents further assessment for the nested circles that are exhibited at the other Type B monuments discussed thus far.

Table 8-16. Azimuths, celestial alignments, and site alignments for South Lake Mounds.

<table>
<thead>
<tr>
<th>South Lake Mounds</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mound 2–Mound 1</td>
<td>244.77</td>
<td>W Solstice (243.31)</td>
<td>Mound Key</td>
<td>Calusa</td>
</tr>
<tr>
<td>Mound 1–Mound 2–Mound 5</td>
<td>66.33</td>
<td>S Solstice (63.21)</td>
<td>Joseph Reed</td>
<td>Archaic</td>
</tr>
<tr>
<td>Mound 3–Mound 4</td>
<td>96.96</td>
<td></td>
<td>Ritta Island</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Mound 2 Semi-circle</td>
<td>149.46</td>
<td></td>
<td>Tony's Mound</td>
<td>Belle Glade</td>
</tr>
</tbody>
</table>

The lack of visible linear embankments to use in the tests for the temporal aspect of the principle of circularity and the principles of relatedness and place-centeredness required a different approach. I had to rely solely on mound-to-mound sitings for these analyses. Mound-to-mound sitings were assessed during the analyses of the other Type B monuments as well, but South Lake Mounds had the highest frequency of them.

Table 8-16 presents the azimuths for each identified mound-to-mound siting, associated azimuths of celestial events, alignments to sites, and cultural affiliations of those sites.

The archaeoastronomical analysis identified two celestial alignments (Figure 8-56). Both alignments are to solstice events and are the converse of one another (i.e., estival solstice sunrise and hibernal solstice sunset). Both of these alignments are within 3° of error. If Carr’s reconstruction of South Lake Mounds is correct, then there are other possible celestial alignments as well. Based on a rudimentary examination of
his reconstruction, the westernmost linear embankment has an azimuth roughly close to
the equinox, and the easternmost embankment has an azimuth that is a few degrees
south of the lunar southern maximum. However, as discussed above it is not possible to

Figure 8-56. Celestial alignments exhibited by South Lake Mounds (USDA 1957d).

In addition to the two identified celestial alignments, four site alignments were
documented in the mound-to-mound sitings (Figure 8-57). Two of these sitings are to
Belle Glade sites. One of these sites is a Type B monument: Tony’s Mound. The other
is Ritta Island, a site located in Lake Okeechobee that exhibits a large area off the
northern shore of the island with hundreds of burials in the waters of the lake itself
2002:105–107; see also Chapter 3, Chapter 6, and Chapter 11).
The remaining two alignments are to sites outside of the Kissimmee-
Okeechobee-Everglades watershed. One is to the Joseph Reed shell ring on the
Atlantic Coast, and the other is to Mound Key, the sixteenth through eighteenth century
Calusa capital, on the Gulf Coast. Similar to the embankment at Hendry Earthworks
(see above) that exhibit two alignments, the latter two alignments originate from a
similar circumstance. The alignment to Mound Key projects from the center of Mound 2
to pass through the center of Mound 1. Conversely, the alignment to Joseph Reed Shell
Ring projects from the center of Mound 1 to pass through the centers of Mound 2 and
Mound 5. While the azimuths of these two alignments are not exactly true converses—
they are 0.44° off from being true converses—they are very close to being so.

<table>
<thead>
<tr>
<th>South Lake Mounds</th>
<th>Azimuth Range and Site Distributions for Alignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>61–70</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.29</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.71</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.032</td>
</tr>
<tr>
<td># Non-Monumental Sites</td>
<td>22</td>
</tr>
<tr>
<td># Monumental Sites</td>
<td>9</td>
</tr>
<tr>
<td># Total Sites</td>
<td>31</td>
</tr>
<tr>
<td># BG Monuments in Range</td>
<td>1</td>
</tr>
</tbody>
</table>

Probability statistics show that the probability for incidental alignment with Belle
Glade monuments ranges from 0.019–0.04, while the probability of chance alignments
with non-Belle Glade monuments ranges from 0.13–0.3 and with non-monumental sites
0.7–0.87 (Table 8-17). This suggests that the alignments with the Belle Glade sites
have a very high likelihood of being intentional (i.e., a low probability of incidental
Figure 8-57. Site alignments exhibited by South Lake Mounds. A) South Lake Mounds (USDA 1957d); B) Mound Key (FDEM 2014); C) Tony’s Mound (USDA 1957b); D) Joseph Reed Shell Ring (FDEM 2014).
occurrence). The fact that they are also to sites that have multiple alignments converging on them also increases the likelihood of intentionality.

The probabilities associated with the non-Belle Glade sites requires further examination, however. The alignment to Joseph Reed Shell Ring is associated with the 61–70° azimuth range. Within this range the probability of coincidental alignment with a non-monumental site is 0.71 while the probability of chance alignment with a non-Belle Glade monument is 0.29. While these probabilities are high, if we account for the alignments identified at other Type B monuments we see that Joseph Reed has three separate alignments converging on it from multiple Type B monuments. This increases the likelihood of intentionality behind the alignment. A nearly identical situation is presented by the 241–250° associated with the Mound Key alignment, where the probability of chance alignments with non-monumental sites is 0.3 and non-Belle Glade monuments is 0.7. Like Joseph Reed, there are multiple alignments originating from different Type B monuments converging on Mound Key. However, there are only two convergent alignments in this case. Even so, this aids in increasing the likelihood of intentionality behind the alignment from South Lake Mounds.

Because of the inability to fully reconstruct this site, along with the inability to verify and georeference Carr’s reconstruction, it was not possible to test South Lake Mounds within the ArcHydro framework. Further confounding this test is the extreme landscape modification in the area directly surrounding the site. Much like Tony’s Mound, the surrounding area has been ditched and drained to such an extent that it is not possible to accurately fill the vast number of canals to even see exactly how the
water would have flowed towards the exact location of South Lake Mounds. Thus, it is not possible to test Hale’s hypothesis with South Lake Mounds.

**Kissimmee Circle Earthworks**

Kissimmee Circle Earthworks is comprised of three linear embankments radiating outwards from a semi-circular embankment that partially encloses an ovate midden-mound (Figure 8-58). The semi-circular embankment has conical mounds at both of its terminal ends. Two of the linear embankments are single embankments terminating in a conical mound. The third linear embankment (Embankment 3 in Figure 8-58) is a dual embankment very similar in form to one exhibited at Hendry Earthworks. It consists of a single embankment that wraps around a conical mound to proceed back towards the
semi-circle, running parallel to itself. In total, Kissimmee Circle Earthworks contains five conical mounds, one ovate midden-mound, and three linear embankments. Further, a line connecting the terminal mounds of the embankments creates a second semi-circle. Similar to many of the other Type B monuments discussed thus far, if this semi-circle and the semi-circular embankment are completed they form a set of nested circles (Figure 8-59).

Like the other Type B monuments, with the exception of South Lake Mounds, the tests for the temporal aspect of the principle of circularity and the tests for the principles of relatedness and place-centeredness relied on the linear embankments radiating out of the semi-circular embankment. One mound-to-mound siting was identified as well. Table 8-18 presents the azimuths of the embankments and mound-to-mound siting, associated celestial events, identified site alignments, and the cultural affiliations of the sites being aligned to.

Table 8-18. Azimuths, celestial alignments, and site alignments exhibited by Kissimmee Circle Earthworks.

<table>
<thead>
<tr>
<th>Kissimmee Circle Earthworks</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>119.72</td>
<td>W Solstice (116.36)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 2</td>
<td>138.81</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Embankment 3</td>
<td>163.75</td>
<td>Ritta Island</td>
<td>Belle Glade</td>
<td></td>
</tr>
<tr>
<td>Mound to Mound</td>
<td>244.82</td>
<td>W Solstice (243.31)</td>
<td>Pineland</td>
<td>Calusa</td>
</tr>
</tbody>
</table>

The archaeoastronomical analysis identified two celestial alignments (Figure 8-60). One of the alignments is associated with an embankment while the other is in the form of the mound-to-mound siting. Both of the alignments are solstitial. The embankment alignment is within 3° of error while the mound-to-mound siting is within 1° of error. This shows that the expectations for the temporal aspect of the principle of
Figure 8-59. Spatial circularity exhibited by Kissimmee Circle Earthworks (USDA 1957c).

Figure 8-60. Celestial alignments exhibited by Kissimmee Circle Earthworks (USDA 1957c).
Figure 8-61. Site alignments exhibited by Kissimmee Circle Earthworks. A) Kissimmee Circle Earthworks (USDA 1957c); B) Pineland (FDEM 2014).
circularity, and the associated principle of relatedness as it involves the earth and sky, are met at Kissimmee Circle Earthworks.

Additionally, two site alignments were identified in the analysis of this site’s architectural features (Figure 8-61). One of the alignments is to the Belle Glade site, Ritta Island. As discussed above (see also Chapter 6 and Chapter 11), this is a site with a large subaqueous ossuary. The other alignment is to the Pineland site on the Gulf Coast. As discussed above (see also Chapter 11), this is the second largest known Calusa site and likely played an important role in the administration of Calusa political power throughout South Florida.

Probability statistics show that within the two azimuth ranges associated with these alignments, the probability for incidental alignments with Belle Glade monuments ranges from 0.007–0.015, while the possibility of such coincidences with non-Belle Glade monuments ranges 0.05–0.18 and for non-monumental sites more generally the range is 0.82–0.95 (Table 8-19). This suggests that the likelihood of intentional alignment with Ritta Island is very high (probability of chance alignment is 0.015), especially when coupled with the convergence of multiple alignments from different monuments converging on the site and the presence of such a significant mortuary component off the north shore of the island. In contrast, the 241–250° range associated with the Pineland alignment exhibits probabilities of incidental alignment with non-Belle Glade monuments at 0.18 and with non-monumental sites at 0.82. However, as discussed above, when we account for the alignments identified at other Type B monuments we see that three total alignments converge on Pineland. This, coupled with
the archaeologically and historically documented relationships between the Belle Glade and Calusa peoples, increases the likelihood of the alignment being intentional.

Table 8-19. Alignment probabilities and site distributions by azimuth range from South Lake Mounds. Adapted from Lawres, Nathan R. 2017. Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida (Page 679, Table 7). *Journal of Anthropological Research* 73:647–694

<table>
<thead>
<tr>
<th>Kissimmee Circle Earthworks</th>
<th>Azimuth Range and Site Distributions for Alignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth Range</td>
<td>111–120</td>
</tr>
<tr>
<td>P(Monument)</td>
<td>0.28</td>
</tr>
<tr>
<td>P(Non-Monument)</td>
<td>0.72</td>
</tr>
<tr>
<td>P(Belle Glade Monument)</td>
<td>0.031</td>
</tr>
<tr>
<td># Non-Monumental Sites</td>
<td>23</td>
</tr>
<tr>
<td># Monumental Sites</td>
<td>9</td>
</tr>
<tr>
<td># Total Sites</td>
<td>32</td>
</tr>
<tr>
<td># BG Monuments in Range</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 8-62. Hydrological modeling of Kissimmee Circle Earthworks showing flow accumulations.
Hydrological modeling of Kissimmee Circle Earthworks and its immediate vicinity shows the same results as Maple Mound and Hendry Earthworks: the semi-circle opening faces the primary water flow allowing unimpeded flow into the semi-circle (Figure 8-62). Further, Embankment 1 and Embankment 2 funnel water towards the semi-circle, similar that seen with Hendry Earthworks. These data suggest that Hale’s argument does not work for this site because water is not being redirected away from the midden-mound.

**Fort Center**

Fort Center is an anomaly among the Belle Glade monumental sites. It is the only one that exhibits the entire range of primary Belle Glade monument types (this excludes the squared/rectangular earthworks of the Kissimmee River Basin and the effigy barrows). The morphological analysis reported here focuses on the Type B monument at the site because the circular ditch (known as the Great Circle Complex) is discussed above. Fort Center’s Type B monument is comprised of three linear embankments terminating in conical mounds and a large semi-circular embankment (Figure 8-63). Unlike the other Type B monuments, Fort Center’s semi-circle does not enclose a midden-mound. Instead there are several midden-mounds throughout the site and a large midden along the southern banks of Fisheating Creek. The three linear embankments are all dual, parallel embankments that terminate in horizontally large conical mounds. In terms of verticality, these mounds are less than one meter tall. Additionally, Sears (1994) and Longyear (n.d.) report that at least two of these terminal conical mounds are partially surrounded by small semi-circular embankments and ditches. These, however, are not discernible on aerial photographs, and they were not
visible during a field inspection in May 2015 because they have since been obliterated by a combination of erosion and cattle activity (the property is currently leased to cattle ranchers).

Figure 8-63. Aerial photograph of Fort Center in 1948 showing numbered embankments (USDA 1948c).

In total, Fort Center’s Type B monument consists of three conical mounds, three linear embankments, one large semi-circular embankment, and at least two smaller semi-circles. Further, throughout the rest of the site there are three circular ditches within the Great Circle complex, a roughly circular subaqueous ossuary, and numerous conical mounds that are sometimes surrounded by small semi-circular embankments. This shows that the expectations for the spatial aspect of circularity are met for this site.
Further, because of the antiquity of many of the circular features here (see Sears 1994; Thompson and Pluckhahn 2012, 2014), this principle was in effect over a long duration of time at this location. However, similar to Maple Mounds, the configuration of the Type B monument at Fort Center precludes the identification of nested circles within the monument (Figure 8-64).

Table 8-20. Azimuths, celestial alignments, and site alignments exhibited by Fort Center.

<table>
<thead>
<tr>
<th>Fort Center</th>
<th>Azimuth</th>
<th>Celestial Event</th>
<th>Site Intersection</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment 1</td>
<td>122.32</td>
<td>Lunar South Max (122.35)</td>
<td>Belle Glade Mound</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 2</td>
<td>115.59</td>
<td>W Solstice (116.36)</td>
<td>Kreamer Island</td>
<td>Belle Glade</td>
</tr>
<tr>
<td>Embankment 3</td>
<td>132.52</td>
<td></td>
<td>New River Earthworks</td>
<td>Glades</td>
</tr>
<tr>
<td>Great Circle 1</td>
<td>79.55</td>
<td></td>
<td>Joseph Reed Shell Ring</td>
<td>Archaic</td>
</tr>
<tr>
<td>Great Circle 2</td>
<td>143.79</td>
<td></td>
<td>Miami Circle Ditch</td>
<td>Glades</td>
</tr>
</tbody>
</table>

Figure 8-64. Spatial circularity exhibited by Fort Center (USDA 1948c).
Figure 8-65. Celestial alignments exhibited by Fort Center (USDA 1948c).

The tests for the temporal aspect of the principle of circularity and the principles of relatedness and place-centeredness (i.e., the relatedness of places) relied on the linear embankments of the Type B monument, but the Great Circle was brought into this analysis as well because it presents an opportunity to examine the temporal depth of the principles. This architectural feature exhibits a conical mound at its geometric center as well as two causeways that allow ingress and egress from the interior confines of the circle. Lines projected from the mound in the center of the circle through the causeways were assessed for the principles. No mound-to-mound sitings were identified for Fort Center. Table 8-20 presents the azimuths of the embankments and the Great Circle lines of sight, associated celestial events, identified site alignments, and cultural affiliations for aligned sites.
Figure 8-66. Site alignments exhibited by Fort Center. A) Fort Center’s Great Circle Complex (FDEM 2014); B) Fort Center’s Type B earthwork (USDA 1948c); C) Joseph Reed Shell Ring (FDEM 2014).
The archaeoastronomical analysis resulted in the identification of two celestial alignments in the Type B monument (Figure 8-65). The alignments are to the lunar southern maximum and a solstice. The solstice alignment is within less than 1° of error. These alignments show that the expectations for the temporal aspect of the principle of circularity, and the associated principle of relatedness regarding the relations between earth and sky, are met for this site.

In addition to the celestial alignments, Fort Center also exhibits five site alignments (Figure 8-66). However, much like the pattern of long-term construction history at Fort Center that involved multiple Belle Glade monument types, the pattern of alignment at this site is also distinct. Three of the alignments originate from the Type B monument, projecting outwards from the embankments of the monument itself. Two of these are to Belle Glade sites. One is to the Belle Glade mortuary mound, a component of the type site for the Belle Glade archaeological culture. The other is to Kreamer Island, another island site on Lake Okeechobee that contains a subaqueous ossuary component off its north shore, much like Ritta Island discussed above (Hale 1989:161–162; Will 2002:105–107). The third of the embankment alignments intersects the New River Earthworks site, which is associated with the Glades archaeological culture historically correlated with the Tequesta. Much like the Miami Circle Ditch, this site is now underneath modern development, but it was visited and documented by archaeologists in the early twentieth century. Interestingly, M.R. Harrington’s (in Boas et al. 1909:139–142) description of the site makes it sound very reminiscent of some of the Belle Glade monuments in terms of the presence of embankments. However, there is no mention of the semi-circular embankments that are
prevalent in the Type A and Type B monuments, so it is likely something related to the Glades culture:

at a distance of perhaps three hundred yards from the river, lay a group of mounds, six in number, forming a row nearly parallel to the course of the stream. The largest approximates some eight feet in height, with a diameter of fifty feet; the smallest, about two feet in height and eight feet in diameter. Low embankments were noticed extending from some of the larger mounds toward the river. There were also a number of small tumuli scattered about through the scrub palmetto (Harrington 1909:139)

In contrast to these three alignments, there are two additional ones that have a different origin point. They originate from the conical mound in the geometric center of the Great Circle Complex. A line extending from the center of this conical mound through the center of one of the two causeways in the circular ditch results in an alignment. This true of both causeways. The northern causeway creates an alignment with Joseph Reed Shell Ring while the southern causeway creates an alignment with the Miami Circle Ditch. Due to the lack of LiDAR for the majority of the other circular ditches, and the lack of higher resolution for the few that do have associated LiDAR data, this was not noted at any other circular ditch site.

Probability statistics show that aligning with Belle Glade monuments have a low probability of occurring by chance (0.004–0.054), while the probability of aligning with a non-Belle Glade monument by chance is higher (0.14–0.31) and with a non-monumental site is extremely high (0.69–0.86) (Table 8-21). This shows that the two alignments to Belle Glade monuments have a very low probability of being incidental, but the alignments to the Miami Circle Ditch, New River Earthworks, and Joseph Reed Shell Ring require further examination.

The 71–80° azimuth range has a probability of 0.20 for incidental alignment to monumental architecture (non-Belle Glade) and 0.80 for non-monumental sites more
generally. The alignment in this range is to the Joseph Reed Shell Ring, which was built during the Late Archaic Period (Russo 2006; Russo and Heide 2000, 2002). While the Type B portion of Fort Center was built much, much later than this, the alignment originates from the Great Circle Complex. This origin point is significant because the Great Circle Complex was built by cal. 800 BC (Thompson and Pluckhahn, 2012, 2014). While occupational overlap is not apparent (Joseph Reed: latest C14 assay is 2850±130 [Russo 2006]; Fort Center: earliest C14 assay associated with Great Circle 2430±40 BP [Thompson and Pluckhahn 2012:Table 1]), this places the gap to a minimum of 10 generations. Thus, it is likely that the people that constructed the Great Circle of Fort Center would have been aware of, and likely visited, such a prominent monumental site on the landscape. Further, the semi-circular portion of the Type B earthwork appears to be a near exact replica, in both size and shape, of the Joseph Reed shell ring, but in inverted orientation (Joseph Reed opens to the east, Fort Center to the west). Additionally, there is a total of three alignments to this Archaic architectural
feature, and they all originate from different Type B monuments. These three lines of data provide support for the intentionality of the alignment.

The 131–140° and 141–150° ranges both exhibit the same statistical probabilities for incidental alignments. The probability of an incidental alignment to non-Belle Glade monumental architecture is 0.14, which is lower than the 71–80° range, but the probability of incidental alignment to non-monumental sites is higher (0.86). These alignments are to the New River Earthworks and Miami Circle Ditch, respectively.

The Miami Circle Ditch, associated with the Glades archaeological culture, is a large circular ditch architectural feature of the same type found in the Belle Glade archaeological culture during the Belle Glade I period. Further, the alignment originates from the Great Circle Complex of Fort Center. Given the morphological similarity between the two, as well as the temporal relationship of the circular ditch style architecture, it is unlikely this alignment was unintentional.

The New River Earthworks, described above, also exhibits strong similarities to Belle Glade architectural forms. Harrington (1909:139) notes the presence of embankments extending from the larger mounds at the site, which is a characteristic of the Type A and Type B circular-linear earthworks. The alignment to this site originates from the Type B architecture at Fort Center. Given this information, along with the prevalence and accuracy of all the other alignments presented in this analysis, it is unlikely that this alignment is incidental.

Hydrological modeling of Fort Center and its immediate vicinity shows similar results to Maple Mound, Hendry Earthworks, and Kissimmee Circle Earthworks, with the semi-circle opening facing the prominent water flow direction (Figure 8-67). However,
the direction of primary flow at Fort Center is different than at other locations. Rather than a general north-south trajectory, there is a dual trajectory of west-east and north-south. This is because the location of the site adjacent to Fisheating Creek. The flow of the meandering creek pulls water to the east while water is also following the north-south gradient of the landscape. It should also be noted that the radiating linear embankments also affect the flow accumulations across this landscape. All three of the parallel embankment pairs are seen to redirect water flow. Together, the results of these analyses suggest that Fort Center meets the expectations for the principles of circularity, relatedness, and place-centeredness.

Figure 8-67. Hydrological modeling of Fort Center showing primary flow accumulations (USDA 1948c).
Summary

This chapter presented the results from the analyses associated with the methods presented in Chapter 7. These methods all revolved around different forms of spatial analyses using ESRI’s ArcGIS. Specifically, these methods included morphological analysis, archaeoastronomical analysis, geographic distribution analysis, hydrological modeling, and a novel site alignment analysis.

The results show that with the exception of an individual monument in both the Type A and Type B categories, the expectations for the ontological principles are met by the architecture. The spatial aspect of circularity is present in the morphology of the monuments, while temporal circularity is exhibited in the locational emplacement of circular ditches across the landscape and in the celestial alignments in the Type A and Type B circular-linear earthworks. The principle of relatedness is also exhibited in these alignments, in the alignments to other sites, and in the relations developed with water by building and orienting the architecture in certain ways within flowing-water ecosystems. The principle of place-centeredness is also exhibited in the alignments to other sites across the landscape, but this principle is also addressed using other lines of evidence that are developed and presented in Chapters 9 and 10. Further, the results of the hydrological modeling demonstrate that, with the exception of a couple of Type A circular-linear earthworks, Hale’s (1984) argument is not supported by new data.

In Chapters 9 and 10 I address the second major research question of this study: How were the Belle Glade monuments built? This question is directly related to the principle of place-centeredness. In Chapter 9 I discuss the issues surrounding addressing this question, and the associated ontological principle, in the context of studying Belle Glade monumental architecture. In doing so, I discuss the development
of a new method and what we should expect from the data in terms of whether the monuments were built rapidly or over longer periods of time.
Chapter 9
DEVELOPING EXPECTATIONS AND METHODS FOR TESTING FOR THE PERFORMANCE OF PLACE-CENTEREDNESS

In Chapters 7 and 8, I laid out the groundwork and evidence supporting the argument that the Belle Glade monumental architecture is a materialization of the core principles: relatedness, place-centeredness, and circularity. However, as discussed in Chapter 5, performance is an integral part of these principles. Thus, the question now becomes: how do we approach the performance of such principles in the case of monumental architecture?

This seems like a relatively straightforward exercise because the act of building monumental architecture with the features discussed in Chapter 8 is a performance of such principles. Yet, this is also where this study gets even more complex, and for several different reasons. Alongside the initial question here of approaching the performance, we also have to consider such aspects as the labor force involved in construction and the population it was derived from, the timing of construction events, the number of building episodes involved, the source of sediments used in construction, and more. While many of these aspects will have to be left for a future phase of this research, some aspects are addressed here. Additionally, the second research question for this study is: How were the Belle Glade monuments built?

In this chapter I delve into the necessary approach for addressing this. The approach necessitates a case study, and I have chosen the Big Mound City site for this purpose as it is the largest and most intact of the Type B monuments left. This site provides us with the best opportunity to test for the principle of place-centeredness as well as for investigating the how the monuments were built, which involves evaluating the construction sequences of the site. While construction sequences often provide
relatively straightforward evidence for the different building episodes, Belle Glade architecture does not present much evidence for these actual sequences. As discussed previously, the Type A and Type B circular-linear earthworks exhibit evidence only for a single architectural feature associated with habitation: a midden-mound within the semi-circular embankment. The rest of the features are devoid of cultural materials and visible stratification.

Thus, Belle Glade architecture presents a conundrum for those of us wishing to evaluate construction sequences. In this chapter I delve into this conundrum. I begin by presenting information on Big Mound City, including its characteristics and a history of research on the site. This is followed by a presentation of the evidence gathered from excavations in 2017 for the midden-mound’s construction sequence. However, because the other architectural features present a much different context for the study of such sequences, I follow the midden-mound evidence with a discussion revolving around developing the expectations and methods required for evaluating construction sequences in the rest of the architecture at the site. The results of those analyses are presented in Chapter 10.

**Big Mound City as a Case Study**

Big Mound City (8PB00048) is located on the J.W. Corbett Wildlife Management Area, managed by the Florida Fish and Wildlife Conservation Commission (FWC), in Palm Beach County. This places its location in the southern end of the Eastern Flatlands (Davis 1943) or Eastern Valley (White 1970) physiographic region of Florida and along the edge of the Loxahatchee Scarp (Hale 1989; Rochelo et al. 2015). Willey
(1949:73) describes it as “a lonely and uninhabited area where the edge of the Everglades meets the higher land of the pinewoods.”

The Eastern Flatlands/Eastern Valley has a very low amount of topographic relief, with an average elevation above mean sea level of 25–30 ft (Lichtler 1960; White 1970). White (1970:110) describes it as having a degree of flatness “second only to the Everglades.” Further, he characterizes it as being a transitional zone between a northern area of more topographic relief and the “reliefless plains of the southern end of the peninsula” (White 1970:110).

The post-Miocene geomorphic history of the Eastern Flatlands/Eastern Valley consists of the Pliocene Caloosahatchee marl, the Early Pleistocene Bermont formation, the Late Pleistocene Fort Thompson formation, and Pamlico sands (Scott 2001). This is bound to the east by the Anastasia formation. Informally, the combination of the Caloosahatchee, Bermont, and Fort Thompson formations is referred to as the Okeechobee formation or Tertiary-Quaternary shell units (TQsu) in the Florida Geologic Survey maps (Scott 2001) (Figure 9-1). This latter name is a reference to the mollusk-bearing fossiliferous sediments of the region. According to Scott (2001:21), these formations are biostratigraphic units that are not well defined.

The Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) shows several soil types found in the immediate vicinity of Big Mound City (Figure 9-2). These include: Basinger fine sand, 0 to 2 percent slopes; Basinger and Myakka sands, depressional; Immokalee fine sands, 0 to 2 percent slope; and Okeelanta Muck, drained, frequently ponded, 0 to 1 percent slopes (USDA NRCS 2018). The site itself is built almost entirely on an Immokalee sand deposit, but there is overlap with Basinger
and Myakka depressional sands as well. Table 9-1 provides the distribution of these soils around the site.

![Map of Florida geologic formations showing location of Big Mound City.](image)

Figure 9-1. Florida geologic formations showing location of Big Mound City.

Big Mound City is characteristic of what Johnson (1991, 1996) labels Type B circular-linear earthworks. It contains a large ovular midden-mound partially enclosed by a large semi-circular embankment, from which there are multiple linear embankments projecting outwards (Figure 9-3). There are 39 total known architectural features at Big Mound City (Rochelo et al. 2015). These features include 28 earthen mounds, the semi-circular earthen embankment, and 10 linear earthen embankments. Of the linear embankments, seven are attached to the semi-circle, while three are detached. With an architectural footprint of 81,884 m², Big Mound City is the largest of the Belle Glade monumental earthworks (Lawres and Colvin 2017:64).
Figure 9-2. USDA NRCS Web Soil Survey map of the Big Mound City site location. Numerical code legend: 6: Basinger fine sand, 0 to 2 percent slopes; 8: Basinger and Myakka sands, depressional; 18: Immokalee fine sands, 0 to 2 percent slopes; and 24: Okeelanta muck, drained, frequently ponded, 0 to 1 percent slopes.
Table 9-1. USDA NRCS Web Soil Survey data for Big Mound City site location. The map unit symbols and names correspond to Figure 2.

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Basinger fine sand, 0 to 2 percent slopes</td>
<td>7.8</td>
<td>2.4%</td>
</tr>
<tr>
<td>8</td>
<td>Basinger and Myakka sands, depressional</td>
<td>198.7</td>
<td>60.5%</td>
</tr>
<tr>
<td>18</td>
<td>Immokalee fine sands, 0 to 2 percent slopes</td>
<td>121.9</td>
<td>37.1%</td>
</tr>
<tr>
<td>24</td>
<td>Okeelanta muck, drained, frequently ponded, 0 to 1 percent slopes</td>
<td>0.2</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

 Totals for Area of Interest | 328.5 | 100.0% |

Every part of the site is comprised of architecture (there are no middens on or under the ground surface), and this architecture is emplaced within the confines of several flowing-water ecosystems, including cypress sloughs—the Allapattah Slough or Allapattah Flats (Davis 1943; White 1970)—and cypress swamps (see Chapter 2). The cypress swamps are inundated for approximately nine months of the year by water that is in many places over a meter deep while the sloughs are inundated year-round. In some places, the water depth reaches nearly two meters. This makes access to the site very difficult, which is one of the reasons it has remained intact while nearly all of the other Belle Glade earthworks have been destroyed.

The first excavations at Big Mound City were conducted by Matthew Stirling as part of the Federal Emergency Relief program in 1933–1934 (Stirling 1935). This project involved targeted excavations of eleven mounds and the surveying and mapping of the site. While this was a large-scale project, there is only a limited amount of information that resulted from it. Stirling himself only published a brief description of the project in his report to the Smithsonian Institution (see Stirling 1935). It was not until Willey (1949)
published his *Excavations in Southeast Florida* manuscript that any substantive information about the site was put in print. Even this is limited, however, because very little of the collections resulting from the excavations remain. Willey states:

The descriptions of field operations are based upon Mr. Garner's notes. Other than these field records, the only sources of information on Big Mound City are a description in a manuscript prepared by Mr. M.W. Stirling and some comments and photographs published by Mr. John K. Small (Willey 1949:73)

The only part of the collections available to Willey for analysis was a handful of pottery sherds from the Mound 9 excavations.

Figure 9-3. Adaptation of Stirling's map of Big Mound City. From Lawres, Nathan R. and Matthew H. Colvin. 2017. Presenting the First Chronometric Dates from Big Mound City, Florida. *The Florida Anthropologist* 70:59–69 (Page 64, Figure 3).
Even so, Willey provides an important glimpse into Big Mound City in his short, five-page description of the excavation results and brief interpretation. He provides brief descriptions of the architecture that includes the dimensions of many features, the dimensions and depths of the excavation units, basic soil coloration, and a general description of the results of each excavation unit. Table 9-2 provides a breakdown of these results.

Table 9-2. Breakdown of basic information about Stirling’s excavations at Big Mound City.

<table>
<thead>
<tr>
<th>Mound</th>
<th>Diameter</th>
<th>Height</th>
<th>Location</th>
<th>#Trenches</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.6 m</td>
<td>2.4 m</td>
<td>Interior of Semi-Circle</td>
<td>3</td>
<td>Small amount of pottery</td>
</tr>
<tr>
<td>2</td>
<td>9.1 m</td>
<td>1.5 m</td>
<td>Interior of Semi-Circle</td>
<td>2</td>
<td>Pottery, human bone</td>
</tr>
<tr>
<td>3</td>
<td>18.2 m</td>
<td>3.6 m</td>
<td>End of Embankment 3</td>
<td>2</td>
<td>Small amount of charcoal</td>
</tr>
<tr>
<td>4</td>
<td>91x10 m</td>
<td>n/a</td>
<td>Midden-Mound</td>
<td>3</td>
<td>Numerous artifacts</td>
</tr>
<tr>
<td>5</td>
<td>30 m</td>
<td>7.6 m</td>
<td>End of Embankment 1</td>
<td>1</td>
<td>Sterile</td>
</tr>
<tr>
<td>6</td>
<td>n/a</td>
<td>n/a</td>
<td>Between Embnkmt. 1 Pair</td>
<td>1</td>
<td>Sterile</td>
</tr>
<tr>
<td>6a</td>
<td>n/a</td>
<td>2.7 m</td>
<td>Embankment 1 (South)</td>
<td>1</td>
<td>Sterile</td>
</tr>
<tr>
<td>7</td>
<td>6x12 m</td>
<td>0.7 m</td>
<td>West of Midden-Mound</td>
<td>1</td>
<td>Pottery</td>
</tr>
<tr>
<td>8</td>
<td>6 m</td>
<td>1.5 m</td>
<td>Interior of Semi-Circle</td>
<td>2</td>
<td>Pottery, 3 human skulls</td>
</tr>
<tr>
<td>9</td>
<td>6 m</td>
<td>0.7 m</td>
<td>End of Embankment 2</td>
<td>1</td>
<td>Small amount of pottery</td>
</tr>
<tr>
<td>10</td>
<td>6 m</td>
<td>0.7 m</td>
<td>Between Mounds 5 &amp; 9</td>
<td>1</td>
<td>Sterile</td>
</tr>
<tr>
<td>11</td>
<td>n/a</td>
<td>n/a</td>
<td>North of Type B Complex</td>
<td>1</td>
<td>3 human skeletons, no skulls</td>
</tr>
</tbody>
</table>

A salient aspect of these excavation results is that the majority of the core Type B architecture—the Semi-Circle and radiating linear embankments—is devoid of cultural materials. With the exception of the midden-mound (Mound 4), there is no evidence of intensive occupation on the core architectural features. Willey notes this as well:
Only Mound 4 was a place of intensive occupation. While potsherds were scattered throughout the body of several of the other mounds, the excavations showed that the mounds were intentionally built of sand and were not refuse accumulations. The potsherds found in the sand mounds can be accounted for in one of two ways. Either the sherds were incidentally included in the fill used in construction, or they were dropped by Indians who occupied the mound tops for brief periods after their construction. The occupation area called Mound 4 is proof that village detritus was available close at hand and could have been mixed with sand in the building of the mounds… There is no information, unfortunately, as to whether there were post molds or other evidences of permanent or semi-permanent structures on the mounds (Willey 1949:76).

Following Stirling’s work, no other archaeological excavations were conducted at Big Mound City for 81 years. There were surface surveys and a mapping project during that time (Rochelo et al. 2015), but it wasn’t until 2015 that subsurface archaeological investigations resumed. These investigations were part of a collaborative project I initiated with Matthew Colvin of University of Georgia called the Kissimmee-Okeechobee Regional Earthwork Survey (KORES), which is aimed at collecting chronometric data from Belle Glade earthwork sites on a regional scale (Lawres and Colvin 2017).

The goal of our work at Big Mound City was to collect carbonized wood samples for AMS dating from architectural features using minimally invasive methods. These methods included a combination of extracting sediment cores and conducting shovel tests. The cores were extracted using a JMC PN425 Environmentalist’s Sub-Soil Probe PLUS. This mechanism is a manually-operated slide hammer percussion core with a 1.2" diameter core tube and a core extraction tool. The sediments are extracted into a 3 ft. polyethylene terephthalate glycol (PETG) copolyester core liner. To extract additional sediments from lower depths, core extensions are added.
A total of six cores were extracted to obtain sediments spanning from the top of the architecture to its base. The cores were extracted from three different contexts: the midden-mound (Mound 4), Mound 8, and the open space inside the Semi-Circle. Two cores were collected from the midden-mound, one from the summit and one from the foot slope. Three cores were removed from Mound 8 and included the summit, shoulder slope, and toe slope of the architecture. A single core was collected from the interior of the Semi-Circle (Lawres and Colvin 2017).

In addition, four shovel tests were excavated adjacent to the core extraction locations. These shovel tests had two primary goals: (1) to provide a means to verify the stratification exhibited in the sediment cores to aid in laboratory analysis; and (2) to provide the means for collecting carbonized wood samples from contexts with stronger vertical control than could be provided by a percussion core (Lawres and Colvin 2017). All of the shovel tests were 50-x-50-cm squares excavated in 10 cm arbitrary levels within natural strata, and all of the sediments were sieved through 1/8” (3.18 mm) hardware cloth.

The shovel test exhibited four distinct strata. Stratum I (10–24 cmbs) comprised a poorly sorted silt loam with a Munsell rating of 10YR5/1 (gray) mottled with 10YR2/2 (very dark brown). This stratum contained a high density of artifacts along with charcoal flecking. Stratum II (24–50 cmbs) consisted of a poorly sorted very fine-grained sand with a Munsell rating of 10YR5/1 (gray). This stratum contained a higher density of artifacts than Stratum I, with a higher concentration of charred wood as well. Stratum III (50–74 cmbs) comprised a well sorted very fine sand with a Munsell rating of 10YR6/1 (gray). This stratum contained very few artifacts, but charcoal flecking was present.
Stratum IV (74–95 cmbs) consisted of a well sorted very fine sand with a Munsell rating of 7.5YR3/1 (very dark gray). Like Stratum III, this stratum contained very few artifacts, but charcoal flecking was present.

Sediment Core 1 consisted of three 1-m-length core tubes. Dates were selected from the Section 3, which exhibited eight strata, some with several microstrata contained within stratigraphic boundaries. C1 S3 Stratum I (183–190 cmbs) consisted of a well sorted very fine sand with a Munsell rating of 10YR3/1. C1 S3 Stratum II (190–211 cmbs) was comprised of a well sorted very fine sand with a Munsell rating of 10YR5/1 (gray). C1 S3 Stratum III (211–216 cmbs) was a well sorted very fine sand with a Munsell rating of 10YR4/2 (brown). C1 S3 Stratum IV (216–228 cmbs) was composed of a well sorted very fine sand with a Munsell rating of 10YR6/1 (gray). C1 S3 Stratum V (228–234 cmbs) was a well sorted very fine sand with a Munsell rating of 10YR3/1 (very dark gray). Stratum VI (234–239 cmbs) comprised a well sorted very fine sand with a Munsell rating of 10YR8/1 (white). Stratum VII (239–262 cmbs) contained five microstrata within its boundaries, each with slight variations in coloration that ranged from 10YR2/1 (black) to 10YR3/1 (very dark gray). Stratum IX (262–274.5 cmbs) was a well sorted very fine sand with a Munsell rating of 10YR8/1 (white).

A total of six AMS dates resulted from this project, providing the first chronometric dates for Big Mound City. All of the dates were produced from carbonized wood samples recovered from the shovel test and sediment core extracted from the summit of the midden-mound (Mound 4). Figure 9-4 shows the locations from which the samples were collected, and Table 9-3 provides the results from the AMS analyses.
The resulting dates suggest an occupational range of cal. 356 BC–AD 674. Further, they demonstrate a tight chronological grouping for three discrete stratigraphic layers from 45 to 95 cmbs of the shovel test. However, a date from a stratum between two of the stata was much younger, raising the possibility of bioturbation or the use of midden materials from other sites for construction (Lawres and Colvin 2017:65–66). The dates from the sediment core were produced from materials at the base of the mound. These materials were selected in order to provide a *terminus post quem* for occupation and construction, but they also produced inverted results, with the sample from the deeper context producing a younger date.

Table 9-3. AMS dates from the 2015 KORES Project at Big Mound City. Modified from Lawres and Colvin (2017:Table 2).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Material</th>
<th>Provenience</th>
<th>$^{14}$C Age</th>
<th>$\sigma$ $^{13}$C, ‰</th>
<th>Cal. Method</th>
<th>1 Sigma Cal.</th>
<th>2 Sigma Cal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UGAMS #24517 charcoal ST3 Lvl 6, 45–50 cmbs</td>
<td>1850 ± 25</td>
<td>-26.2</td>
<td>INTCAL13*</td>
<td>AD 129–214</td>
<td>AD 86–235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGAMS #24518 charcoal ST3 Lvl 7, 50–60 cmbs</td>
<td>1380 ± 25</td>
<td>-26.3</td>
<td>INTCAL13*</td>
<td>AD 641–665</td>
<td>AD 614–674</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGAMS #24519 charcoal ST3 Lvl 10, 75–85 cmbs</td>
<td>1880 ± 25</td>
<td>-25.6</td>
<td>INTCAL13*</td>
<td>AD 199–206</td>
<td>AD 70–215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGAMS #24520 charcoal ST3 Lvl 11, 85–95 cmbs</td>
<td>1860 ± 25</td>
<td>-25.6</td>
<td>INTCAL13*</td>
<td>AD 123–180, AD 186–214</td>
<td>AD 82–227</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGAMS #26599 charcoal Core 1, Section 3 (top)</td>
<td>2160 ± 25</td>
<td>-24.8</td>
<td>INTCAL13*</td>
<td>350–310 BC, 256–249 BC, 235–148 BC, 141–112 BC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGAMS #26600 charcoal Core 1, Section 3 (middle)</td>
<td>1730 ± 20</td>
<td>-26.9</td>
<td>INTCAL13*</td>
<td>AD 255–301, AD 316–344</td>
<td>AD 250–381</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*INTCAL13 was developed by Reimer et al. (2013).

While the dates produced from this project provided new insight into Belle Glade monumentality and allowed us to begin evaluating Johnson’s (1991, 1996) chronology, they also brought up additional questions. The two most pressing of these questions, however, revolves around the inverted dates in the vertical sequence and the temporal relationship of the midden-mound to other architectural features at the site: (1) Were these the result of bioturbation or are they reflective of Belle Glade monumental practices? and (2) How do these dates relate to architectural features outside of the midden-mound?

To address this, the KORES project at Big Mound City was expanded in 2017. This expansion focused on the core Type B architectural elements: the midden-mound,
Semi-Circle, and radiating linear embankments. Specifically, it involved a more in-depth evaluation of the midden-mound and an assessment of the radiating linear embankments.

To evaluate the midden-mound, a series of six 1-x-1-m test units were excavated along the summit and shoulder slopes of the mound. These units were placed along a transect running W/SW at 251°, approximately 10° S of perpendicular to the N/S axis of the site. The transect location was chosen based on the location of the 2015 investigations; it was placed in alignment with the 2015 transect, running down the opposite slope.

The first five of the units were connected into a trench, while the sixth was located 3 m further downslope. The reason for the offset of the sixth unit was the presence of a very large live oak (*Quercus virginiana*) tree. However, the offset also provided an additional stratigraphic view of the mound.

All test units utilized a single datum placed at the summit of the mound near the southeast corner of Test Unit 1. It measured 15 cm above ground surface. The unit excavations were conducted in a stepped fashion, with the intent to excavate the first two units to 100 cmbd, the second two units to 200 cmbd, and the fifth unit to 300 cmbd. The goal of these excavations was to reach the base of the mound to expose the full range of stratigraphy and assess the construction sequence. However, Test Unit 1 was terminated early due to an extremely dense root ball associated with a sabal palm (*Sabal palmetto*) adjacent to the unit. Further, due to unforeseen climatic circumstances (e.g., heavy rains almost daily), and encountering numerous sedimentary stains that were treated as features, the depth goals were not met. Test Units 3-5 were excavated
to a depth of 180 cmbd. To overcome this and reach the base of the mound, which was
estimated to be at 280 cmbd, 50-x-50-cm shovel test windows were excavated in Test
Unit 3 and Test Unit 5. This was accomplished in the Test Unit 5 shovel test, which
exposed a stratum of underlying peat.

The excavations provide us with a new view of Belle Glade monumentality and
allow an evaluation of the construction sequence of this architectural feature. Previous
research at other Type B earthworks describes the midden-mounds of these sites as
being comprised of three stratigraphic layers. At the base is either a midden or a
stratum of muck or peat, which is overlain by a constructed stratum of light sand, which
in turn is covered by another midden stratum (Carr and Steele 1994; Carr et al. 1995).
This is a similar structure as the Belle Glade burial mound described by Willey (1949).
Willey (1949:20–23) describes this mortuary facility as comprised of three distinct
mounds superimposed on top of an old midden. The base is a burial mound
constructed of muck or peat soils. Overlying this is a limestone pavement capped with a
sand burial mound that covers a wider area than the underlying “Old Muck Mound”
(Willey 1949:21). Located on top of this, and roughly in its center, is a third burial
mound; this one also built from sand.

The midden-mound at Big Mound City, however, provides a different view of
midden-mound construction. Rather than having the three stratigraphic layers described
at other Type B earthworks, Big Mound City’s midden-mound exhibits evidence of large-
scale construction using multiple sediment sources with a midden stratum capping the
top of the constructed feature. While Willey (1949:75) describes this mound (Mound 4)
as a “refuse or habitation mound,” he also notes that the midden deposit is vertically
restricted to the uppermost portion of the architecture. He states, “No artifacts were found below the 24-inch level.” He also singles this mound out as the only one on site with evidence for intensive occupation and that “the excavations showed that the [other] mounds were intentionally built of sand and were not refuse accumulations” (Willey 1949:76).

The 2017 excavations support Willey’s assertion of a vertically restricted midden, with more than 98% of all artifacts and ecofacts being found in the upper 60 cm of the test units. The remaining 2% were found scattered throughout the lower sediments and were not concentrated in any way (i.e., most were recovered individually in the screen). Much like Willey’s (1949) explanation for the small amounts of artifacts recovered in the other architectural features, these were likely incidental inclusions in the construction materials.

Evaluating the stratigraphy exposed during excavations provides a view of the construction sequence of this massive architectural feature. The stratigraphy of the midden-mound (Figure 9-5) exhibits evidence of intentional construction using multiple sediment sources. Much of this evidence appears to be indicative of basket loading, with small arcs of sedimentary lenses appearing throughout the profiles of Test Units 2–5 and 7. These small lenses were encountered during excavations and were nearly always initially thought to be post mold features (and were initially treated as such). When the center, apical point of these features was encountered they appeared to be circular in shape with a diameter of approximately 20 cm. However, as they were exposed, they quickly expanded across the test unit, often covering the majority of 1 m²
unit floor. Each one disappeared quickly, though, and had a vertical expanse averaging between 6 cm and 10 cm.

The AMS dates produced from these excavations support this view of building the midden-mound using sediments from multiple sources. The excavations resulted in the collection of 17 in situ charcoal samples, six of which were selected for AMS analyses (see Figure 9-5). These specific samples were selected because of their spatial context relative to the base and top of strata. Further, four of the samples (UGAMS# 37158, UGAMS# 37159, UGAMS# 37160, and UGAMS# 37162) were specifically selected because of their association with the stratum that produced the cal. AD 614–674 date. As discussed above, this date was produced from a sample located in a stratum in between two strata that produced dates several hundred years earlier. Additional dates were produced as part of this study using materials associated with the midden-mound summit sediment core from the 2015 KORES investigations.

There is now a total of 16 AMS dates from Big Mound City’s midden-mound. Table 9-4 and Figure 9-6 show the calibrated results of all the AMS dates sorted by depth. To align the depths of the samples from the test unit excavations with the depths from the shovel test and core, I converted the depths below datum to depths below surface with the aid of detailed field notes and the stratigraphic profiles.

An evaluation of these dates shows a vertical zig-zag pattern that substantiates the view of this architectural feature being built using multiple sediment sources. If this mound was the result of the gradual accumulation of refuse, the AMS plot would be expected to exhibit a positive slope over time. However, the zig-zagging pattern exhibited by the AMS plot suggests otherwise.
Figure 9-5. Stratigraphic profile of the south wall of Test Units 1–5 & 7 showing locations of in situ carbonized wood samples.
Figure 9-6. All AMS dates from Big Mound City sorted by depth.

These new data undermine the previous view Colvin and I (Lawres and Colvin 2017) put forth in terms of an occupational range of cal. 356 BC–AD 674 for the site. Rather, the combination of the stratigraphic and AMS data suggest that Big Mound City’s midden-mound was constructed rapidly in a single construction episode. Based on the date from sample UGAMS# 37153, the terminus post quem for this episode occurred by at least cal. AD 1024–1155. However, no dates have been produced from materials in the uppermost 36 cmbs (due to modern disturbance), so it is possible that the earliest construction date could be later than that provided by the UGAMS# 37153 sample.

These data also reject the hypothesis that Colvin and I put forth based on our 2015 investigations. Specifically, we argued that:
At this juncture in our research the possibility remains open that the beginnings of construction may be much earlier than expected. In fact, we hypothesize this is the case. Specifically, we posit that the midden-mounds themselves predate the construction of the rest of the architectural features, and that they represent important, persistent places on the landscape (sensu Schlanger 1992) that were inhabited for generations prior to major construction events leading to the Type A and B earthworks (Lawres and Colvin 2017:66–67).

This argument was made in light of Johnson’s (1991, 1996) proposed chronology that placed Type A earthworks in the AD 200–1000 construction range and the Type B earthworks in the AD 1000–1500 range. Based on our previous data, we were arguing that the midden-mound began being constructed much earlier than the AD 200–1000 range of Johnson.

The cal. AD 1024–1155 date range for the Big Mound City construction event rejects this argument and aligns with Johnson’s Type B earthwork range of AD 1000–1500. In addition to undermining our hypothesis, these data also reject Johnson’s (1991, 1996) argument that the Type B circular-linear earthworks were construction elaborations of already existing Type A circular-linear earthworks, and thus provide an important contribution to our knowledge of the Belle Glade culture. While these excavations provided the data necessary to evaluate the construction of the midden-mound, they do not contribute to our knowledge of the other core Type B architectural elements: the Semi-Circle and radiating linear embankments. Assessing the construction sequences of these features requires a different set of methods.

Previous researchers at Type B earthworks have all noted a lack of stratification in the embankments and they all note the sterility of the architecture in terms of cultural materials. There is some mention of carbonaceous materials, in small amounts, in one of the terminal mounds (Mound 3) at Big Mound City (Willey 1949), but given the lack of
Table 9-4. All AMS dates from Big Mound City sorted by depth.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Material</th>
<th>Provenience</th>
<th>$^{14}$C Age</th>
<th>$^{13}$C,‰</th>
<th>Cal. Method</th>
<th>1 Sigma Cal.</th>
<th>2 Sigma Cal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UGAMS#37159</td>
<td>in situ charcoal</td>
<td>TU4 Lvl 7, 68 cmbd (37 cmbs)</td>
<td>1340 ± 20</td>
<td>-25.85</td>
<td>INTCAL13*</td>
<td>AD 656–677</td>
<td>AD 648–691, 751–760</td>
</tr>
<tr>
<td>UGAMS#24517</td>
<td>charcoal</td>
<td>ST3 Lvl 6, 45–50 cmbs</td>
<td>1850 ± 25</td>
<td>-26.2</td>
<td>INTCAL13*</td>
<td>AD 129–214</td>
<td>AD 86–235</td>
</tr>
<tr>
<td>UGAMS#37160</td>
<td>in situ charcoal</td>
<td>TU5 Lvl 10 90 cmbd (51 cmbs)</td>
<td>1670 ± 20</td>
<td>-25.58</td>
<td>INTCAL13*</td>
<td>AD 348–370, AD 378–405</td>
<td>AD 335–418</td>
</tr>
<tr>
<td>UGAMS#24518</td>
<td>charcoal</td>
<td>ST3 Lvl 7, 50–60 cmbs</td>
<td>1380 ± 25</td>
<td>-26.3</td>
<td>INTCAL13*</td>
<td>AD 641–665</td>
<td>AD 614–674</td>
</tr>
<tr>
<td>UGAMS#37162</td>
<td>in situ charcoal</td>
<td>TU7 Lvl 14, 131 cmbd (56 cmbs)</td>
<td>1200 ± 20</td>
<td>-25.15</td>
<td>INTCAL13*</td>
<td>AD 775–777, AD 789–830, AD 837–868</td>
<td>AD 770–887</td>
</tr>
<tr>
<td>UGAMS#37157</td>
<td>in situ charcoal</td>
<td>TU3 Lvl 11, 100 cmbd (74 cmbs)</td>
<td>1340 ± 20</td>
<td>-26.33</td>
<td>INTCAL13*</td>
<td>AD 656–677</td>
<td>AD 648–691, 751–760</td>
</tr>
<tr>
<td>UGAMS#24519</td>
<td>charcoal</td>
<td>ST3 Lvl 10, 75–85 cmbs</td>
<td>1880 ± 25</td>
<td>-25.6</td>
<td>INTCAL13*</td>
<td>AD 75–139, AD 199–206</td>
<td>AD 70–215</td>
</tr>
<tr>
<td>UGAMS#37158</td>
<td>in situ charcoal</td>
<td>TU3 Lvl 11, 105 cmbd (79 cmbs)</td>
<td>1580 ± 20</td>
<td>-27.33</td>
<td>INTCAL13*</td>
<td>AD 427–435, AD 448–472, AD 487–534</td>
<td>AD 421–539</td>
</tr>
<tr>
<td>UGAMS#24520</td>
<td>charcoal</td>
<td>ST3 Lvl 11, 85–95 cmbs</td>
<td>1860 ± 25</td>
<td>-25.6</td>
<td>INTCAL13*</td>
<td>AD 90–100, AD 123–180, AD 186–214</td>
<td>AD 82–227</td>
</tr>
<tr>
<td>UGAMS#</td>
<td>Sample</td>
<td>Material</td>
<td>Provenience</td>
<td>¹⁴C Age</td>
<td>σ ¹³C, ‰</td>
<td>Cal. Method</td>
<td>1 Sigma Cal.</td>
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</tr>
<tr>
<td>37161</td>
<td>in situ charcoal</td>
<td>TU5 Lvl 13, 128 cmbd (93 cmbs)</td>
<td>1660 ± 20</td>
<td>-25.88</td>
<td>INTCAL13*</td>
<td>AD 356–365, AD 381–415</td>
<td>AD 341–421</td>
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<tr>
<td>37153</td>
<td>charcoal</td>
<td>Core 1, Section 2, 120 cmbs</td>
<td>950 ± 30</td>
<td>-26.13</td>
<td>INTCAL13*</td>
<td>AD 1029–1050, AD 1083–1126, AD 1136–1151</td>
<td>AD 1024–1155</td>
</tr>
<tr>
<td>37154</td>
<td>charcoal</td>
<td>Core 1, Section 2, 130 cmbs</td>
<td>1550 ± 20</td>
<td>-28.06</td>
<td>INTCAL13*</td>
<td>AD 432–490, AD 532–546</td>
<td>AD 427–560</td>
</tr>
<tr>
<td>37156</td>
<td>charcoal</td>
<td>Core 1, Section 2, 180 cmbs</td>
<td>1800 ± 20</td>
<td>-26.15</td>
<td>INTCAL13*</td>
<td>AD 143–155, AD 168–195, AD 210–251</td>
<td>AD 133–257, AD 297–320</td>
</tr>
<tr>
<td>26600</td>
<td>charcoal</td>
<td>Core 1, Section 3 (middle)</td>
<td>1730 ± 20</td>
<td>-26.9</td>
<td>INTCAL13*</td>
<td>AD 255–301, AD 316–344</td>
<td>AD 250–381</td>
</tr>
</tbody>
</table>

*INTCAL13 was developed by Reimer et al. (2013).
stratification and cultural materials there is no way to positively correlate any carbon-bearing materials to the actual construction event for the architecture. This means that optically stimulated luminescence dating becomes the best option for dating the construction of any architecture outside of the midden-mound. However, the sediment cores from the 2015 investigations did not identify any visible buried surfaces. Thus, the use of optically stimulated luminescence dating is undermined until such surfaces can be identified. The question now becomes: How can such surfaces be identified? The answer to this lies in pedogenic processes and how they affect exposed surfaces. Further, addressing this question also provides the ability to evaluate the construction sequence for evidence of multiple building episodes in architectural features that lack visible stratification.

**Developing Expectations: Pedogenic Processes on Exposed Surfaces**

The characteristics of the architectural features at Big Mound City make evaluating the construction sequence very difficult. These characteristics are not limited to Big Mound City. In a survey of Tony’s Mound in Hendry County, FL, Carr and Steele (1994:9) note the stratigraphic profile of the architecture as being comprised of “sterile white sand.” Carr, McCudden, and Steele (1996:9–11) note the same for similar architectural features at Hendry Earthworks; Carr and Steele (1992:7) note that these features at the South Lake Mounds site were “composed of white sand”; Carr and colleagues (Carr et al. 1995:255) also note the same for similar features at Ortona Mounds, which are built of “homogenous white sand.” Both Sears (1994) and Longyear (n.d.) note this for Fort Center’s Type B earthwork components as well: “The southern parallel ‘causeway’ of Mound 1 is a ridge of clean white sand” (Longyear n.d.:5).
This characteristic of being comprised of a homogenous sedimentary profile limits our ability to evaluate the construction sequence of these features. On first glance it seems like a straightforward set of evidence to argue that these features were built in a single construction episode. However, this might not be the case. There could be evidence for multiple construction episodes contained within a single, homogenous stratum, but their boundaries might be blurred due to the use of sediment sources with the exact same characteristics, such as color and grain size. So, the question now becomes: how do we evaluate a sedimentary profile for construction sequences in the absence of visible stratification?

This question becomes problematic when approached from the common framework in archaeology that relies almost entirely on principles of stratification and sedimentation (Harris 1979; Phillips and Lorz 2008; Stein 1987). While the laws outlined by Harris (1979:112–113)—superposition, horizontality, original continuity, and stratigraphic succession—are at play in Big Mound City’s architecture, the lack of visible stratification limits the usefulness of viewing the stratigraphic profiles from this standpoint.

The answer to this issue lies in the concept of lithologic discontinuities, which are defined as “zones within the pedo-stratigraphic column representing a change in lithology, sediment type, or parent material” (Weindorf et al. 2015:1704). Lithologic discontinuities are classified into two types depending on how they are formed. The first type includes discontinuities that are geologically-sedimentologically formed and referred to here as geologic discontinuities (Schaetzl 1998; Schaetzl and Anderson 2005). These form as a result of either a shift in the sedimentation system, such as a
change from alluvial deposition to eolian deposition, or the formation of an erosional surface, which involves a pause in sedimentation altogether (Schaetzl and Anderson 2005:216). In the former case, the discontinuities are considered to be inherited from parent materials because the shift in sedimentation results in the deposition of sediments from different sources. In contrast, a pedologically formed discontinuity is the result of pedogenic processes that cause the physical sorting of sediments near the surface (Schaetzl and Anderson 2005:216). These form in situ and are not considered inherited.

It is important to be able to distinguish between these two types of discontinuities because they can affect the interpretations of data analyses (Schaetzl 1998; Schaetzl and Anderson 2005). Both types are visible in a vertical profile through shifts in depth function (e.g., data plotted by depth) because a stable landform should present a profile exhibiting horizons with relative uniformity in these functions (Schaetzl 1998). However, there are differences in how the two types of discontinuities are displayed in the data. Typically, geologic discontinuities show abrupt shifts in the data while pedogenic discontinuities exhibit gradual shifts over a distance in the profile (Schaetzl 1998). Yet, if a geologic discontinuity occurs near the surface and it is relatively subtle, pedogenic processes can blur the evidence for it (Schaetzl 1998; Schaetzl and Anderson 2005).

Few archaeologists have approached earthen architectural construction from the perspective of soil science and looked specifically at pedogenic development within architectural features that lack visible stratification. As such, methods for approaching construction sequences in this manner are relatively underdeveloped. However, there has been some work focused on identifying pedogenic processes within earthen
architecture that has been aimed primarily at understanding the time scale of these processes and the implications that can have for dating architectural features (Ammons et al. 1992; Parsons et al. 1962). These studies have contributed an important body of work to understanding both the time scale of pedogenesis and the dating and timing of construction events. They also set the basis for the methods used in more intensive studies of construction sequences, but their methods also have issues. Further, all of these studies were conducted in contexts with clearly visible stratification.

Parsons and colleagues (Parsons et al. 1962) employed a combination of exchangeable element distributions and micromorphological analysis. Rather than trying to determine the number of construction episodes, they focused their study on determining the origins of the construction materials, the preparation of the original surface, and the antiquity of the architecture based on soil development and the pedogenic processes at play within the structure of eight earthen mounds. While this study is not directly applicable to the study at hand, Parsons and colleagues’ work is the earliest example of a soil science approach to earthen architecture. Their use of micromorphology—“the study of undisturbed soil (or sediment) material in thin section” (Goldberg 1992:145)—was also the first in an earthen architectural context, which paved the way for future studies using this method in similar contexts.

In contrast, Ammons and colleagues (Ammons et al. 1992) used a combination of methods including particle size distribution, micromorphological, organic carbon, and dithonite-citrate iron analyses. This combination allowed for the identification of “a break in the construction of mound 2 that allowed some weathering of soil materials before construction resumed” (Ammons et al. 1992:44). However, their use of particle size
distribution data relied entirely on the very fine particle sizes (clay and fine silts) that are known for their mobility in soil profiles because of their solubility (see below). According to Schaetzl and Anderson (2005) this should be a secondary metric, and clay-free analyses should be sought because of a higher degree of reliability. Parsons’ (Parsons et al. 1992:493–494) note the depth-dependency of clay-sized particles in their study of earthen mounds and use the data to discuss pedogenic processes within the mound rather than a means of identifying previously exposed surfaces. Further, Ammons’ (Ammons et al. 1992) use of iron distributions should be read with caution due to iron’s susceptibility to pedogenic processes (Schaetzl 1998; Schaetzl and Anderson 2005).

Studies of construction sequences tend to rely more on micromorphology than any other method because of the fine-grained detail that can be achieved (Cremeens 1995, 2005; Kidder et al. 2009). However, it is typically coupled with other methods that provide broader interpretive power, such as particle size distribution analysis and stratigraphic analysis. Ortmann’s work at Poverty Point (Kidder et al. 2009; Ortmann and Kidder 2013) is one the best examples of a study aimed specifically at identifying pauses in construction sequences. He used a combination of stratigraphic analysis, particle size distributions, loss on ignition and micromorphology to evaluate Poverty Point’s famous Mound A architectural feature. While the broader methods provided strong interpretive power because of the well-preserved stratigraphic sequence, which was further highlighted by pedogenic processes causing oxidation around the edges of individual basket loads (see Kidder et al. 2009:88–89 for examples), the micromorphology allowed for verification of the interpretations through detailed analysis. The micromorphological analysis was specifically “focused on identifying evidence of
surficial weathering and/or pedogenic development at contacts between basket loads of mound fill deposits” (Kidder et al. 2009:54)

Ortmann’s focus on weathering and pedogenesis is the strongest approach to identifying the presence of pauses in a construction sequence. This is directly related to the lithologic discontinuities discussed above. However, a pause in a construction sequence is slightly different than the two aforementioned types of discontinuities for two reasons. First, it is an anthropogenic discontinuity and thus represents a distinct type of discontinuity formed solely through the actions of human social agents. Second, it meets the characteristics of both geologic and pedogenic discontinuities. By stopping or pausing construction of earthen architecture there is a shift in the sedimentation system. That is, it shifts from a consistent and rapid deposition of sediments to no sedimentation at all, which in turn may creates an erosional surface if exposed for sufficient time. This meets the criteria of a geologic discontinuity. Further, by creating an erosional surface, the sediments near that surface are now subject to surface weathering and pedogenic development, meeting the criteria of a pedogenic discontinuity.

This brings up the question of how these anthropogenic discontinuities can be detected. As discussed earlier, geologic and pedogenic discontinuities have different signatures in terms of depth functions. Geologic discontinuities are visible as abrupt shifts in the data while pedogenic discontinuities display gradual changes over the length of the profile. This question becomes even more pertinent in the absence of visible stratification. Micromorphology studies, such as Ortmann’s (Kidder et al. 2009) and Cremeen’s (1995, 2005), obtain their samples for analysis from the contacts or
interfaces between stratigraphic layers or between basket load features. Outside of Big Mound City’s midden-mound this is not possible due to a complete lack of stratification. Thus, micromorphology becomes an infeasible method because it would require the analysis of an entire soil profile via thin section since no contacts could be identified.

However, Ortmann’s approach provides a starting point for developing these expectations. When a surface is exposed to weathering processes, several types of soil crusts can form, including structural crusts, erosional crusts, and depositional crusts (Valentin 1991; Valentin and Bresson 1992). These different crust types are further divided into subtypes. The formation of crusts is time-dependent, and over time one crust will develop into another if surface exposure is continuous (Bresson and Boiffin 1990; Valentin 1991; Valentin and Bresson 1992). Further, the spatial distribution of crusts is dependent on topography. For example, in sandy soils the initial crust formed will be a structural sieving crust due to exposure to water drop impact. However, if the crust is formed on a flat surface, long-term exposure to rain will cause the formation of a crater, and within that crater a depositional crust will form. In contexts with topographic relief, there is a space-dependent sequence of crust development: “structural crusts upslope, erosion crusts, and possibly coarse pavement crusts midslope, and depositional crusts downslope” (Valentin and Bresson 1992:238).

Of interest here is the structural crust because the architecture creates topographic relief that provides the opportunity to specifically test in contexts considered upslope (i.e., the summit). This crust type forms specifically from water drop impact resulting from rainfall, and thus is a direct form of surface weathering. The impact from water drops creates micro-craters that vertically sort particles in a mechanical sieving
process resulting in finer particles being forced into a deeper depositional context (Valentin and Bresson 1992:231). Structural crusts are classified into several types that are dependent on a number of conditions, such as sediment type, climatic conditions, and the rate of formation. Of particular interest to the architectural context of this study is the structural sieving crust, which is comprised “of a layer of loose skeleton grains overlaying a plasmic layer” (Valentin and Bresson 1992:230). These skeleton grains are the coarse fraction, or sand-sized particles, of a soil’s structure while the plasma is the fine particles and organic matter that are soluble and mobile in vertical profiles (Schaetzl and Anderson 2005:776). Because sand-sized particles are immobile in soils, their vertical continuity through soil profiles is a well-established metric for identifying discontinuities (Schaetzl 1998; Schaetzl and Anderson 2005:218–225), and the presence of a sieving crust, which is characterized by a higher concentration of sand-sized particles above a concentration of fine particles due to the sorting process, is just such a discontinuity.

The process of crust formation is part of the pedogenic processes of eluviation and illuviation. Eluviation refers to the loss of materials by a soil horizon through either the solution or suspension of those materials—which leads to leucinization and the formation of E Horizons—while illuviation refers to the gain or accumulation of new materials and results in the formation of B Horizons (Schaetzl and Anderson 2005:353). Specifically, the formation of a structural sieving crust involves lessivage, or clay translocation (Schaetzl and Anderson 2005), which is the:

process of mechanical entrainment by gravitational water of dispersed fine particles… from the upper horizons (eluvial: impoverished and partly decolorized) to the lower horizons (illuvial: enriched and therefore darker-coloured) (Duchaufour 1998:136).
When the water droplets strike the surface, creating the micro-craters, it is possible for clay-sized particles and minerals to go into suspension, even if briefly as the water disperses and percolates downward through the profile. Percolating water is the transport medium for clay particles, and the faster the percolation the more significant the translocation (Schaetzl and Anderson 2005:366). However, the soils in the immediate vicinity of Big Mound City—Basinger fine sand, Basinger and Myakka sands (depressional), Immokalee fine sand, and Okeelanta muck—are all classified as poorly to very poorly drained, meaning percolation does not occur very quickly (USDA NRCS 2018). Further, the sediments in the architecture have been compacted, likely during the construction process, which fills voids in the skeleton, leading to reduced capillary action for water percolation.

In addition to clay translocation, lessivage can also lead to the movement of chemical elements, in the form of the minerals they are bonded to, downward through a profile. However, there are elements that are considered “difficultly weathered” (Schaetzl and Anderson 2005:222) because of their resistance to weathering and low solubility rate that are of interest to this study (Brimhall et al. 1991; Du et al. 2012; Ma et al. 2011; Ma et al. 2007; Nesbitt and Wilson 1992; Stockmann et al. 2016; Taboada et al. 2006). Titanium (Ti) and Zirconium (Zr) are two such elements that are considered to be high field strength elements and have conservative behavior in the face of weathering and pedogenic processes (Bern et al. 2011). This conservative behavior in Zr is due to the element being hosted in materials highly resistant to weathering while Ti is resistant because it bonds with secondary materials and those materials tend to remain in the soil profile during weathering (Ma et al. 2007). Because these elements
and their host materials are resistant to weathering, they are immobile in soils, and their proportions increase in surfaces exposed to weathering processes (Stockmann et al. 2016), especially in comparison to other elements that are essentially washed away or percolated downwards.

Mass balance studies have quantitatively demonstrated the conservative behavior of these elements and used them for comparisons with non-conservative elements (Bern et al. 2011; Bern et al. 2015; Brimhall et al. 1991; Chadwick et al. 1990; Schaetzl and Anderson 2005). Mass balance studies, also known as pedogenic mass balance analyses, use chemical elements as a means to track the vertical movement of material in a soil profile during weathering and pedogenesis (Schaetzl and Anderson 2005). This is done by quantifying the amount of loss and gains of elements and minerals in different parts of a uniform profile. Quantification is achieved using chemical dissolution and multi-elemental analysis (Bern et al. 2015; Chadwick et al. 1990) or a combination of multi-elemental analysis and petrographic methods (Bern et al. 2011; Brimhall et al. 1991). The result is an effective means of tracing elemental and mineral mobility in soil profiles based on principles of conservation of mass, and these studies have effectively substantiated the conservative behavior of Ti, Zr, and several other elements.

Based on this discussion, testing for the presence of these specific discontinuities in the architecture should involve identifying the characteristics of structural sieving crusts and surface weathering. These two processes have data correlates in soil separates, or particle sizes, and chemical elements. As such, identifying structural sieving crusts and surface weathering will involve looking for
characteristic shifts in depth functions of a soil profile. Given the characteristics of a structural sieving crust, the data should show a concentration in coarse particles above a concentration of fine particles. Given the behaviors of mobile and immobile elements, it is expected that any surfaces exposed during a pause in construction would exhibit increased concentrations of Ti and Zr relative to samples directly above or below in the profile. This would reflect the presence of weathering processes. It is expected that these will be exhibited in the form of sharp shifts in depth function data within a profile, similar to a geologic discontinuity. However, these shifts are expected to occur within a single soil horizon rather than just at the contacts between any visible horizons.

To evaluate whether the data are reflecting a lithologic discontinuity associated with differences in parent material, the uniformity value (UV) index, developed by Cremeens and Mokma (1986), can be calculated. The UV value is calculated by creating ratios in samples. These ratios are total “silt plus very fine sand to total sand minus very fine sand” (Cremeens and Mokma 1986:1003). The ratios of vertically adjacent samples are then divided, and the result minus 1.0 provides the UV index. “The greater the deviation of the uniformity value from zero, the greater the possibility of originally nonuniform parent materials” (Cremeens and Mokma 1986:1003). With this index, the 0.60 value is cut-off for uniformity, anything greater is considered to have nonuniform origins. Asady and Whiteside (1982) use a similar index using the ratio of silt to sand. In their estimation, ratios ranging from -1.0 to 0.37 are considered to have “developed in uniform parent material” (Asady and Whiteside 1982:1044). All values greater than 0.37 are considered to have developed in separate parent materials.
Subsequent studies have demonstrated that 0.60 is a better fit for identifying discontinuities (Schaetzl 1998; Tsai and Chen 2000).

As such, this study follows suit. If any samples suggest discontinuities, they will be subjected to the UV index test to determine whether the discontinuity is the result of differences in parent material or of depositional episodes. If the UV index has a value of greater than 0.60, a depositional episode is rejected. However, it should be noted that even if the index suggests differences in parent material there are still implications for Belle Glade construction practices. If such instances are identified, it means that multiple soil sources are being used for construction.

This test for the presence of pauses in the construction also aligns with the test for the principle of place-centeredness. As discussed in Chapter 7, given the characteristics that result in the sacredness of a place, testing for place-centeredness involves testing whether the place itself was accorded great significance from the beginning of occupation so that all of the architectural features were built together over a long period of time involving multiple construction stages—similar to the Mississippian platform mounds with multiple construction stages (Knight 2006; Lindauer and Blitz 1997; Pauketat 2000)—or if the place gained its significance over the course of generations of occupation before being monumentalized in rapid fashion.

**Methods**

As discussed above, other studies of earthen constructions have relied on micromorphological analyses of vertical sequences to elucidate the presence of breaks in construction sequences. However, such studies are both timely and costly, especially when there is a lack of visible stratification limiting a researcher's ability to efficiently
identify the best samples for analysis. This means that the entirety of each vertical sequence would have to be analyzed, greatly increasing the cost and time of the analysis. To circumvent this, I initiated a collaboration with Allan Bacon, a soil scientist specializing in pedogenesis and anthropogenic effects on pedogenic processes. This collaboration led to the development of the methods used in this study to identify lithological discontinuities in the architecture of Big Mound City. While these methods are commonly used in the soil sciences, this is the first application of the combination of multi-elemental analysis and particle size distribution analysis to earthen architecture to determine the presence of weathering processes and structural crust development within the middle of soil horizons.

**Sample Collection**

Vertical sequences of soil samples were collected from intact architectural features at Big Mound City using a modified version of the Dutch Auger method, which is commonly used in the Soil Sciences. This method relies on the use of a Dutch Auger, which is a form of open-faced auger system with broad, sharpened blades designed specifically for extracting hard soils, wet soils, and soils with heavy root concentrations. The broad blades also aid in maintaining an intact sample within the auger head once the sample is extracted. Each extraction results in 20–25 cm of compacted sediment in the auger head.

The open-faced design allows the removal of intact sediments into a secondary container for analysis. Prior to moving the sample into the secondary container, it is necessary to clean the face of the sediment core to remove the excess sediments. It is also necessary to clean the top of the intact sediment core to remove the fall in/wall fall related to re-penetration of the auger hole and the twisting motion that causes
sediments from higher in the vertical sequence to fall into the hole. If this is not done for each extraction, there is a loss of vertical control in the samples and results in contaminated samples.

The secondary containers used in this study consisted of a series of polyvinyl chloride (PVC) rain gutters. Each gutter has 10-cm increments measured and marked with small cuts along one side. Each extracted sample is placed sequentially, in order of extraction, within the gutters to maintain vertical control of the samples. Further control is established by measuring the depth reached with the auger handle and comparing to the 10-cm incremental marks on the gutters. Using these control methods, control is maintained to within <1 cm. This process of extracting, cleaning, and transferring samples to the gutters is repeated until the water table is reached. To reach depths below 1 m, extension handles are attached to the Dutch Auger.

In many soil science studies, the resulting samples are bagged sequentially by horizon. However, for this study the goal was to maintain tighter vertical control. Further, because the aim is to detect the development of structural sieving crusts, which can be very thin if surficial exposure to weathering events is minimal (Valentin and Ruiz Figueroa 1987), the samples must be collected in a manner that would allow for the identification of crusts. Further, Schaetzl and Anderson (2005:218) state that “[e]xamination and sampling of the soil from the surface downward, at numerous, closely spaced intervals, is the first step in detecting lithologic breaks.” Following this, samples were bagged in 10-cm increments unless a horizon change was noted. In these cases, samples were bagged in 5-cm increments. That is, the full 10-cm or 5-cm
length of soil was bagged. The logic here is that if the pause in construction was more than a year, the resulting crust that developed would be relatively thick (at least 5 cm).

The vertical sequences used in this study were collected from multiple architectural features at Big Mound City. The primary focus, however, was the radiating linear embankments, so the majority of the samples were collected from these features. The conical mounds at the terminal ends of the embankments were not sampled for several reasons. First, Stirling conducted excavations on the majority of these mounds, and the locations of his excavation units are unknown because his notes were lost (Willey 1949). In order to avoid collecting disturbed vertical sequences these mounds were avoided. Second, there is additional modern disturbance on several of these mounds, including two modern graves on Mound 9. There are also fence posts, along with barbed wire, on several of them. Third, the vegetation on these mounds is in significantly greater concentrations and includes large oak trees. Thus, the vertical sequences are subject to a greater amount of bioturbation.

Vertical sequences associated with radiating linear embankments were extracted from Embankment 1 (Augers 1–4), Embankment 2 (Auger 14), Embankment 3 (Auger 12), Embankment 5 (Auger 15), and Embankment 6 (Auger 20) (Figure 9-7). No samples were collected from Embankment 4 or Embankment 7 because of modern disturbance in the form of hog rooting. The disturbance on these embankments was extensive enough that there were no areas large enough left fully intact to sample with enough confidence to assume no disturbance was present.

With the exception of Embankment 1, the vertical sequences were extracted from the summit of the architecture. Embankment 1 was sampled along a transect
perpendicular to the embankment itself to evaluate the stratigraphy for any horizontal differentiation. However, only one sequence, from the shoulder slope (Auger 4), was analyzed using the methods discussed below. Additionally, off-architecture sequences were also collected. These were collected as control samples to show the differences between the naturally occurring horizons, along with the pedogenic evidence associated with them, and that exhibited in the architecture itself.

Figure 9-7. Locations of analyzed auger tests from Big Mound City (USDA 1949b).
Vertical sequences were also collected from other architectural features. These include the large, semi-circular earthen embankment, Mound 6, and the midden-mound (Mound 4 in Willey 1949). The semi-circular embankment involved extracting two vertical sequences. The first extraction resulted in a highly disturbed soil profile due to heavy root concentrations and burrowing insects. Because of the disturbance, this sample was discarded. The second extraction (Auger 21) was located further south near Embankment 3. No off-architecture sequence was collected for the semi-circle due to the number of control samples already collected. Mound 6 was sampled in the same manner as Embankment 1: a transect of four augers was placed across the mound, and an off-architecture control sample was collected. The midden-mound (Mound 4) sequence was extracted directly adjacent to the trench excavations so that the sequences could be compared.

Each vertical sequence was separated into individual samples based on depth. As discussed above, these were either 10-cm or 5-cm sample sizes. Each sample was assigned a field specimen (FS) number as an identifier. Each sample was subjected to two separate analyses: particle size distribution analysis and multi-elemental analysis using X-Ray fluorescence.

**Particle Size Distribution Analysis**

Particle size distribution refers to the physical proportions of clastic mineral particles in the fine earth fraction of a soil’s skeleton (Shaetzl and Anderson 2005). The fine earth fraction is comprised of all particles less than 2 mm in size (Duchaufour 1998; Schaetzl and Anderson 2005), and the particles making up this fraction are divided by size classes referred to as sand, silt, and clay (Birkeland 1984; Duchaufour 1998; Schaetzl and Anderson 2005). These are also referred to as soil separates (Shaetzl
The sand class has a range of 2.0–0.05 mm, while the silt class is 0.05–0.002 mm and clay is anything less than 0.002 mm (Birkeland 1984:13; Schaetzl and Anderson 2005:11). The U.S.D.A. further divides silts into the subclasses of fine (0.002–0.02 mm) and coarse (0.02–0.05 mm) and sands into subclasses of very fine (0.05–0.1 mm), fine (0.1–0.25 mm), medium (0.25–0.50 mm), coarse (0.50–1.0 mm), and very coarse (1.0–2.0 mm) (Schaetzl and Anderson 2005:10).

The specific proportions of the particle sizes, typically reported as the “percentage of the total dry weight of soil occupied by a given size fraction” (Di Stefano et al. 2010:205), comprise the texture of a soil (Birkeland 1984; Duchaufour 1998; Schaetzl and Anderson 2005), which is an important characteristic of soil to analyze when addressing aspects of weathering processes (Duchaufour 1998:7). This partly due to the texture playing a major role in determining the hydraulic conductivity of the soil (Ryżak and Biegganowski 2011), and thus whether water will move through or be retained. In soils with a greater proportion of coarse particles (i.e., a coarse texture, such as sands), there is a greater amount of space—or pores—between particles and smaller amount of surface area for water to attach to, which allows water to move more freely (Schaetzl and Anderson 2005). In contrast, soils with a fine texture, like clays and peats, have fewer pores in the skeleton and an increased “surface area per unit volume” (Birkeland 1984:15), which limits hydraulic conductivity and leads to water retention. Water retention, in turn, leads to greater amounts of weathering (Birkeland 1984; Ryżak and Biegganowski 2011).

The analysis of particle size distributions (PSDs) is an important first step in characterizing the weathering processes at play in a soil (Duchaufour 1998). There are
several different methods for analyzing PSDs. Traditionally, the coarser fractions (e.g., sand: 0.05–2.0 mm) are separated from the finer fractions through sieving while the finer fractions (e.g., silt and clay) are determined by sedimentation velocity (Beuselinck et al. 1998; Di Stefano et al. 2011; Duchaufour 1998; Eshel et al. 2004). These sedimentation methods are further divided into the pipette method and hydrometer method (Beuselinck et al. 1998; Di Stefano et al. 2011; Eshel et al. 2004), and the combination of sieving and hydrometer methods has become the international standard for PSD analysis (Di Stefano et al. 2011).

More recently, however, the laser diffraction method has started becoming popular for PSD analysis. This method is based on the principle that clastic mineral particles of certain sizes refract light at certain angles, and those angles are inversely proportional to the clastic mineral particle size (i.e., the angle increases as the particle size decreases) (Beuselinck et al. 1998; Di Stefano et al. 2011; Eshel et al. 2004). This method provides an alternative that counters many of the disadvantages of traditional methods, such as the time-consuming nature of sedimentation procedures, the large requisite sample sizes—more than 10 g for pipette and more than 40 g for hydrometer (Eshel et al. 2004)—and the inaccuracies created by the Brownian effect on extremely small particles (Beuselinck et al. 1998; Eshel et al. 2004). However, the laser diffraction method has come into question because of discrepancies in the quantification of clay-sized particles between this method and traditional ones, with laser diffraction underestimating clay-sized fractions compared to the traditional methods (Beuselinck et al. 1998; Di Stefano et al. 2011; Eshel et al. 2004). Because of this, it should be kept in
mind that the clay-sized particles reported below are likely underrepresented, but not to an extent that the data should be seen as flawed (Di Stefano 2011).

The PSD analysis was conducted using a Beckman Coulter LS 13 320 multi-wave particle sizing analyzer that is fitted with an aqueous liquid module and connected to a deionized water system. This model is capable of measuring particles ranging from 0.017 µm to 2 mm and thus required sieving all samples through 2-mm geologic sieves to remove the coarse fraction (>2 mm). Once sieved, the samples were mixed to ensure homogeneity and subsampled. The subsamples ranged in weight from 0.400 to 3.100 g, with the weight being dependent on the amount required to reach obscuration levels of 7–13%. The required amount was determined by evaluating standard reference materials of similar textural character. In general, coarser samples require greater mass to reach the optimal obscuration levels than finer samples do.

The subsamples were placed in 50 mL polypropylene conical-bottomed centrifuge tubes. Once in the tubes, 5 mL of 5% sodium hexametaphosphate solution was added to each tube as an alkaline dispersing agent. The centrifuge tubes were then vortexed for 10 seconds to suspend all solids in the solution. To remove any solids that adhered to the tube walls while being vortexed, another 5 mL of 5% sodium hexametaphosphate solution was added to rinse any solids off the walls and back into solution. The samples were left in solution overnight to maximize the dispersing agent before introducing the samples into the aqueous liquid module for PSD.

Following the methodology set forth by Pachon and colleagues (Pachon et al. in review), all samples were run for 60 seconds at a pump speed of 7.2 L per minute. The
refractive index for deionized water at all wavelengths (\(\lambda = 450, 600, 750, \text{ and } 900 \text{ nm}\)) was set to 1.332 + 0.00i. The refractive index for all samples was set to 1.53 + 0.20i.

**Multi-Elemental Analysis: X-Ray Fluorescence**

X-ray fluorescence is a common method for analysis of trace elements in an object. It is based on the principle that when an atom is under excitation by an energy source, such as an x-ray beam, it emits radiation of a characteristic energy that is mathematically related to the number of protons contained in the atom (Bambynek et al. 1982). This characteristic energy is known as a fluorescent x-ray and is the result of the atoms undergoing the process of de-excitation (Jenkins 1988). By measuring and quantifying this released energy it is possible to document what elements are present—because of the mathematical relationship between the number of protons and the energy release—in an object and to quantify the amount of that element (Jenkins 1988).

This method can provide evidence of deposition by focusing on elements that display conservative behaviors in the face of weathering (Ma et al. 2011; Ma et al. 2007; Stockmann et al. 2015; Taboada et al. 2006). The ratio of Ti to Zr is especially significant in these regards (Brimhall et al. 1991; Chadwick et al. 1990; Schaetzl 1998; Schaetzl and Anderson 2005; Stockmann et al. 2015). As such, more weight is placed on this ratio than other conservative elements for detecting depositional processes. However, the behavior of other conservative elements, such as Ca and Si, is to be considered as secondary lines of evidence.

X-ray fluorescence analysis was performed using a Shimadzu EDX-7000 energy-dispersive x-ray fluorescence spectrometer. This mode is equipped with a silicon drift detector (SDD) that increases sensitivity and lowers the limit of detection (the minimal
amount fluorescent x-rays required for the machine to detect the presence of an element). Further, it is equipped with a 12-sample turret and fitted with a helium atmosphere for increased precision.

All soil samples were sieved through 2-mm geologic sieves to remove organic matter. Once sieved, the samples were subsampled for this analysis. All subsamples were manually pulverized using an agate mortar and pestle to create homogeneity in the sample for a more accurate reading by the machine. The pulverized subsamples were loaded into polypropylene sample cups with mylar film bases. This sample preparation step is essential to avoiding any matrix effects and contaminating the samples through unbalanced readings by the spectrometer (Hunt and Speakman 2015). Further, for accurate calibration curve generation, the samples must be prepared and treated in the exact manner standard reference materials are prepared and treated (Hunt and Speakman 2015).

The x-ray fluorescence analysis estimated the concentrations of silicon (Si), calcium (Ca), phosphorous (P), iron (Fe), copper (Cu), titanium (Ti), and zirconium (Zr). The x-ray voltage used in the analysis is dependent upon the elements being measured. For Si, Ca, and P, the x-ray voltage was set to 15kV at 1.740 (SiKa), 3.691 (CaKa), and 2.013 (PKa) keV, respectively. For Ti, Fe, Cu, and Zr, voltage setting was changed to 50kV at 4.509 (TiKa), 6.400 (FeKa), 8.042 (CuKa), and 15.748 (Zrka) keV, respectively.

The initial measurements document the net intensities of the elements. To convert these intensities into elemental concentrations it is necessary to develop calibration curves. These curves were developed by analyzing four standard reference
materials (USGS AGV-2, USGS SGR-1b, USGS W-2a, and NIST 2781) with known elemental concentrations. Further, the standards were matrix matched (i.e., specific standards were selected because of similarity to the unknown samples). These standards were prepared in the same manner as the samples—pulverized with an agate mortar and pestle and loaded into polypropylene sample cups—and were measured 14 times each alongside the current samples (the unknowns) to create the curves. The coefficient of determination of these calibration regressions was 0.979, 0.999, 0.996, 0.990, 0.990, 0.993, and 1.000 for Si, Ca, P, Fe, Cu, Ti, and Zr, respectively.

**Summary**

In this chapter, I focused in on the Big Mound City site as case study in testing for the principle of place-centeredness as well as answering the second research question of this study: how were the Belle Glade monuments built? As such, I began by presenting information about the site and its location context along with a history of research conducted there. The excavations associated with this research were the first large-scale investigations of the site since Stirling’s work in 1933–1934, and they had the explicit goal of evaluating the construction sequences of the site.

The midden-mound excavations, which consisted of a series of five 1-x-1-m test units aligned in a trench and a sixth unit offset by three meters, were conducted with the goal of exposing and investigating the entire vertical stratigraphic profile of the architectural feature. This profile exhibits a much different construction sequence than that described for other Type B earthworks. It consists of a midden stratum that caps the mound, and all of the sediments beneath show clear evidence of basket loading and
are suggestive of a rapid construction event. This idea is substantiated by radiocarbon (AMS) data that show a zig-zagging pattern of dates instead of a gradual positive slope. Together, these data suggest that the midden-mound at Big Mound City was constructed in a single event by at least cal. AD 1024–1155.

However, this only addressed one architectural feature of the many at Big Mound City. The other features require a different approach because they exhibit different characteristics. Specifically, they lack visible stratification and thus limit our ability to identify construction sequences using traditional methods. Because of this, the remaining part of this chapter was devoted to developing the expectations and methods for testing for construction episodes in the absence of visible stratification. These expectations were developed by drawing on the literature of the soil sciences, with a focus on pedogenesis, and on other archaeological studies devoted to identifying and assessing construction sequences in earthen architecture.

To test for the presence of construction episodes in earthen architecture lacking visible stratification I argue it is necessary to look for evidence of the development of structural sieving crusts. Specifically, there should be evidence of an increased concentration of coarse (sand-sized) particles above a concentration of fine (silt and clay) particles along with an increase in the ratio of Ti to Zr. The methods for detecting these involves a combination of particle size distributions and multi-element analysis at 5–10 cm resolution. The results of these analyses are presented in Chapter 10.
In Chapter 9 I outlined an approach to testing for the performance of the principles through monumental construction practices associated with the Belle Glade monuments. This approach is centered on evaluating the construction sequences of the earthen architecture because they can provide information on the population involved in construction projects, the timing of construction, and the number of actual building episodes. Further, this test is also a test for the principle of place-centeredness. Specifically, it is a test to evaluate whether monumentalization occurred from the start of the occupation of a site and involved long-term construction of all architectural features through multiple building episodes or whether the site was occupied for a long period of time prior to monumentalization. Additionally, this addresses the second major research question of this study: How were the Belle Glade monuments built?

Using the Big Mound City site, the largest of the Belle Glade Type B circular-linear earthworks, as a case study I have already shown that the midden-mound was constructed in a single event. However, due to a lack of visible stratification, the other architectural features require a different approach that involves the methods of the soil sciences. Using a combination of particle size distribution analysis and multi-elemental analysis, the goal is to identify evidence for the development of structural sieving crusts and evidence for surficial weathering processes. It is expected that if a sieving crust formed, particle size distributions will show an increased concentration in coarse particles overlying a concentration of fine particles. Further, surficial weathering processes will increase the concentration of conservative or immobile elements. This chapter presents the results of these analyses.
Results

The combination of the two analyses—multi-elemental analysis and particle size distribution analysis—provides a powerful new tool for evaluating construction sequences in contexts where visible stratification is lacking. As discussed above, the stratigraphic profiles of Big Mound City’s architecture, along with the profiles in other Belle Glade architectural features, do not provide much in terms of evidence for construction sequences and the number of actual construction episodes it took to build the various features of the site. The exception to this, of course, is the midden-mound, where the evidence suggests a midden formed on top of a constructed mound (see below). This is similar to the evidence presented by Carr and Steele (1994) for Tony’s Mound, the second largest Belle Glade Type B circular-linear earthwork, but it also differs significantly in key ways.

In this section I report the results of the multi-elemental analysis and particle size distribution analysis. Alongside these results I present cross-sectional diagrams of the architectural features. In these diagrams, the placement and profile of the auger tests are shown. This is done to demonstrate the differences in stratigraphy between the architectural profiles and the off-architecture control samples. These cross-sections were produced through in-field measurements using a datum line strung between trees adjacent to the architecture and fitted with line levels. These datum lines were run as close to perpendicular to the architectural features as possible, but they were not always exact because of the hindrance of other trees. Measurements were taken at 50-cm intervals from the ground surface to the datum line to produce cross-sections that display the height and slope of the architecture.
Embankment 1

Embankment 1 consists of a pair of parallel embankments that are the northernmost of the radiating linear embankments. These terminate in the largest conical mound at Big Mound City, which is labeled Mound 5 by Willey (1949). Four auger tests were performed on the northern embankment of this pair, and one auger test was performed adjacent to the architecture as a control sample (Figure 10-1). Multi-elemental analysis and particle size distribution analysis was conducted on two vertical sequences: Auger #4 on the southern shoulder slope of the embankment and Auger #2, which is the off-architecture control sample.

Auger 4

Auger #4 resulted in the extraction of a 210-cm soil profile and 21 individual 10-cm samples. The stratigraphy demonstrates the presence of three soil horizons. An A Horizon (10 YR 4/1 mottled with 10 YR 7/1) comprises the first 10 cm (0–10 cmbs) of the profile. An E horizon (10 YR 7/1) underlies the A, spanning 10–130 cmbs, and there is an E2 Horizon (10 YR 7/2) beneath that from 130–210 cmbs. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 85–90 cm below the top of the auger profile, placing the estimated original ground surface the feature at this depth.

The Auger 4 data exhibits evidence for three soil populations: 10–80 cm, 80–130 cm, and 130–210 cm (Figure 10-2). As expected, the beginning of the 10–80 cm population coincides with the beginning of the E Horizon, and the interface of the 80–130 cm and 130–210 cm populations accord with the beginning of the Ew Horizon. However, the shift from the 10–80 cm to 80–130 cm populations occurs within the E Horizon, which is unexpected and marks a discontinuity. However, this discontinuity
aligns with the estimated original ground surface. Thus, the 10–80 cm population is specifically associated with the architecture.

Evaluating this population further, the data suggest an increased rate of deposition, suggested by the Ti:Zr ratio, relative to the underlying population, which is expected. There is an increase in the fine:coarse sand ratio from 40–70 cm that may be related to differences in construction activities. At 40 cm there is a decrease in in Ti:Zr, and thus deposition, that may indicate a pause in construction. If this is the case, then Embankment 1 was built in two events, the first resulting in a 40 cm tall embankment and the second increasing its height an additional 30–40 cm.

Auger 2

Auger #2, the off-architecture control for Embankment 1, resulted in the extraction of a soil profile more than 40 cm deep and four individual samples (Figure 10-1). Three of the samples were 10 cm while the fourth was saturated to the point that it bled over 30 cm in the gutter. The stratigraphy of the profile exhibits two soil horizons: an O Horizon (10 YR 2/1) from 0–30 cmbs and a Bh Horizon (10 YR 3/3) beginning at 30 cmbs.

The Auger 2 data exhibit evidence for two soil populations: 0–20 cm and 20–40 cm (Figure 10-2). These populations are not coterminous with the soil horizons exhibited in the profile, but their interface is within 10 cm of the interface between the O Horizon and Bh Horizon. Further, the uppermost sample exhibits a higher Ti:Zr ratio than other samples, but given the location of this auger test in a depositional environment (it is adjacent to a slope) this is expected.
Figure 10-1. Cross-section of Embankment 1 showing location of auger tests and the stratigraphy of analyzed profiles.
Figure 10-2. Elemental and particle size distribution data for Embankment 1.
Embankment 2

Embankment 2 consists of a triplet of parallel embankments that are located south of Embankment 1. This triplet terminates in an oblong earthen mound labeled as Mound 9 by Willey (1949). This is the only known example of triple parallel embankments in Belle Glade earthworks. One auger test was performed on the summit of the middle embankment of the triplet (Auger 14), and one auger test was performed adjacent to this feature as a control sample (Auger 19) (Figure 10-3).

Auger 14

Auger #14 resulted in the extraction of a 155-cm soil profile and 17 individual samples. Three of these samples were only 5-cm while the remainder were 10-cm. The stratigraphy of the profile exhibits four soil horizons: an O Horizon (7.5 YR 4/4) from 0–10 cmbs, an O/A Horizon (7.5 YR 4/4 mottled with 10 YR 5/1) from 10–15 cmbs, an E Horizon (10 YR 7/1) from 15–120 cmbs, and a Bh Horizon (10 YR 2/2) from 120–155 cmbs. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 60–70 cm below the top of the auger profile, which places the estimated original ground surface the feature was built on at this same depth.

The Auger 14 data exhibits evidence for three soil populations: 10–40 cm, 40–120 cm, and 120–155 cm (Figure 10-4). The interface of the latter two populations coincides with a soil horizon change visible in the profile. The interface of the former two populations occurs within the confines of the E Horizon, which is not expected under nonanthropogenic circumstances.

A closer evaluation of these populations reveals patterns of interest to this study. There are two particular points of interest within the profile. As stated above, the
estimated original ground surface is 60–70 cm below the top of the auger test. At this depth there is a spike in the Ti:Zr ratio, indicating greatly increased rates of deposition. This is expected for earthen construction. Additionally, this depth overlies an increase in the fine:coarse sand ratio. The increase in Ti:Zr ratio continues upwards to 40 cm, which is where the upper soil population terminates. Above this depth the Ti:Zr ratio decreases. Together, this suggests a pause in construction, and thus two building events: one to 30 cm tall, the other adding 20 cm. However, it is possible that this discontinuity is associated with a change in soil sources being used in construction. There is an increase in the UV index that coincides with the decrease in Ti:Zr ratios.

**Auger 19**

Auger #19 is the control sample for Embankment 2. It was extracted approximately 10 m south of the middle embankment of the triplet. This auger resulted in the extraction of an 80-cm soil profile and eight individual samples that were all 10 cm (Figure 10-3). The stratigraphy of the profile exhibits four soil horizons: an E Horizon (10 YR 7/1) from 0–10 cmbs, a Bh Horizon (10 YR 2/2) from 10–25 cmbs, an E’ Horizon from 25–55 cmbs, and 2Bh Horizon (10 YR 2/2) from 55–80 cmbs.

The Auger 19 data exhibit evidence for three soil populations: 0–20 cm, 20–60 cm, and 60–80 cm (Figure 10-4). These three populations accord relatively well with the soil horizons visible in the profile. The interface between the 0–20 cm and 20–60 cm populations is within 5 cm of the beginning of a soil horizon visible in the profile. The interface between the 20–60 cm and 60–80 cm populations is also within 5 cm of a shift in soil horizons in the profile. Within these three populations, the particle size distributions and elemental concentrations remain relatively stable. The greatest amount of fluctuation is exhibited in the Ti:Zr ratios, which exhibit a depth dependent trend.
Figure 10-3. Cross-section of Embankment 2 showing location of auger tests and the stratigraphy of analyzed profiles.
Figure 10-4. Elemental and particle size distribution data for Embankment 2.
Embankment 3

Embankment 3 is comprised of a pair of parallel embankments located south of Embankment 2. The pair terminates in a large conical mound that Willey (1949) refers to as Mound 3. This is the only terminal conical mound at Big Mound City that is not surrounded by a semi-circular earthen embankment. One auger test (Auger #12) was conducted on the summit of the northern embankment of the pair. An off-architecture auger test (Auger 13) was performed approximately 10 m north of the northern embankment.

Auger 12

Auger #12 resulted in the extraction of a 120 cm soil profile and 12 individual 10–cm samples (Figure 10-5). The stratigraphy of the profile exhibits four soil horizons: an A1 Horizon (10 YR 4/1 mottled with 10 YR 7/1) from 0–10 cmbs, an A2 Horizon (10 YR 4/2) from 10–40 cmbs, an E Horizon (10 YR 7/1) from 40–90 cmbs, and a Bh Horizon (10 YR 4/3) from 90–120 cmbs. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 40–50 cm below the top of the auger profile, which places the estimated original ground surface the feature was built on at this same depth.

The Auger 12 data exhibit evidence for four soil populations: 0–20 cm, 20–60 cm, 60–100 cm, and 100–120 cm (Figure 10-6). None of these populations are coterminous with the horizons visible in the soil profile. However, they are all within 10 cm of the horizon changes. Additionally, the interface between the 20–60 cm and 60–100 cm populations is within 10 cm of the estimated original ground surface. This shows that these two populations are associated with the architecture itself.
A closer evaluation of these two populations shows relative stability throughout their distribution. The 20–60 cm population does exhibit a decrease in the Ti:Zr ratio from 20–40 cm that indicates a decrease in deposition, but this rate is still greater than that exhibited in the underlying population. Additionally, the data suggest that these two populations are distinct, and that the 0–20 cm population is likely a post-construction development. This is indicated by an increase in Ti:Zr ratios and the UV index, which suggests non-conformity in parent materials. However, given that the 20–60 cm population exhibits stability, it is likely this was built in a single construction event.

**Auger 13**

Auger #13 resulted in the extraction of a 90 cm soil profile. This profile has 10 individual samples (Figure 10-6). Two of the samples are 5-cm while the remainder are 10-cm samples. The stratigraphy of the profile exhibits five distinct soil horizons: an O Horizon (10 YR 2/1) from 0–5 cmbs, an A1 Horizon (10 YR 6/1) from 5–10 cmbs, an A2 Horizon (10 YR 4/2) from 10–35 cmbs, an E Horizon (10 YR 6/1) from 35–60 cmbs, and a Bh Horizon from 60–90 cmbs.

The Auger 13 data exhibit evidence for three soil populations: 0–30 cm, 30–60 cm, and 60–90 cm. The latter two populations coincide well with the soil horizons visible in the profile. However, the 0–30 cm population encompasses three stratigraphically distinct horizons (O Horizon, A1 Horizon, and A2 Horizon). A closer examination of this population shows that there is some evidence that distinguishes the A1 Horizon from the A2 Horizon. This evidence is found specifically in the fine:coarse sand ratio and coarse sand:coarse silt ratio. The former provides stronger evidence by showing strong distinctions between 0–10 cm and 10–30 cm. The data, however, do not strongly distinguish between the O Horizon and A1 Horizon.
Figure 10-5. Cross-section of Embankment 3 showing location of auger tests and the stratigraphy of analyzed profiles.
Figure 10-6. Elemental and particle size distribution data for Embankment 3.
Embankment 5

Embankment 5 consists of a single embankment located to the south of Embankment 4. It terminates in a conical mound that was not numbered by Willey (1949). A single auger test (Auger #15) was conducted on the summit of the embankment, and a single off-architecture control sample (Auger #16) was extracted approximately 15 m south of the embankment.

Auger 15

Auger #15 resulted in the extraction of a 115-cm soil profile and 14 individual samples (Figure 10-7). Six of the samples were 5-cm while the remaining eight were 10-cm samples. The stratigraphy of the profiles exhibits six soil horizons: an A Horizon (10 YR 3/1 mottled with 10 YR 7/1) from 0–5 cmbs, an A/E Horizon (10 YR 7/1 mottled with 10 YR 3/1) from 5–10 cmbs, an E1 Horizon (10 YR 6/1) from 10–35 cmbs, a Bw Horizon (10 YR 4/2) from 35–45 cmbs, an E2 Horizon (10 YR 6/2) from 45–95 cmbs, and a Bh Horizon (10 YR 2/2) from 95–115 cmbs. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 45–50 cm below the top of the auger profile, placing the estimated original ground surface at this same depth.

The Auger 15 data exhibit evidence for four general soil populations: 0–20 cm, 20–45 cm, 45–95 cm, and 100–110 cm (Figure 10-8). The latter two populations are coterminous with the soil horizons exhibited in the profile. Further, the beginning of the 45–95 cm population is correlated to the estimated original ground surface. Thus, the 0–20 cm 20–45 cm are associated with the architecture itself.

Closer examination of these two populations shows some patterning in the data that may reflect construction activities. The Ti:Zr ratio exhibits a decrease at the
interface of the two populations, suggesting decreased deposition, which is overlain by two samples (0–5 cm and 5–10 cm) with increased Ti:Zr and thus deposition. This is expected, given that these two samples are associated with the A and A/E Horizons, respectively, and should be expected to exhibit characteristics of horizon development. What is not expected is the differences exhibited between the first two samples associated with the E Horizon (10–20 and 20–30). The UV index is informative because it exhibits an increase, suggesting the use of two different parent materials for construction. In sum, it appears that this embankment was constructed in a single building event but using two soil sources.

**Auger 16**

Auger #16 resulted in the extraction of a 115-cm soil profile and 13 individual samples (Figure 10-7). Three of the samples were 5-cm while the remaining ten were 10-cm samples. The stratigraphy of the profile exhibits six soil horizons: an O Horizon (10 YR 4/4) from 0–10 cmbs, an E Horizon (10 YR 6/1) from 10–20 cmbs, a Bh Horizon (10 YR 2/2) from 20–40 cmbs, an E` Horizon (10 YR 4/2) from 40–80 cmbs, a Bt/Bh Horizon (10 YR 2/1) from 80–95 cmbs, and a 2Bh Horizon from 95–115 cmbs.

The Auger 16 data exhibit evidence for five general soil populations: 0–10 cm, 10–40 cm, 40–70 cm, 70–80 cm, and 80–115 cm (Figure 10-8). While some of these populations are coterminous with the soil horizons illustrated in the profile, not all of them are. The 80–90 cm sample that begins the deepest population is correlated with the beginning of a horizon, while the 70–80 cm sample that comprises an entire population is associated with the basal 10 cm of a horizon. The beginning of the 40–70 cm population starts at a horizon boundary, and the 0–10 cm population comprises an entire horizon.
Figure 10-7. Cross-section of Embankment 5 showing location of auger tests and the stratigraphy of analyzed profiles.
Figure 10-8. Elemental and particle size distribution data for Embankment 5.
Embankment 6

Embankment 6 consists of a single embankment that terminates in a small conical mound that was unnumbered by Willey (1949). It is located to the west/southwest of Embankment 5 and Embankment 4. A single auger test (Auger #20) was conducted on the summit of this embankment. No off-architecture control sample was collected for this embankment because of standing water to both the east and west of the feature. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 45–50 cm below the top of the auger profile, which places the estimated original ground surface the feature was built on at this same depth.

Auger 20

Auger #20 resulted in the extraction of a 130-cm soil profile and 130 individual 10-cm samples (Figure 10-9). The stratigraphy of the profile exhibits five soil horizons: an O Horizon (5 YR 4/4) from 0–10 cmbs, an A/E Horizon (10 YR 3/1 mottled with 10 YR 6/1) from 10–20 cmbs, an E Horizon (10 YR 6/1) from 20–50 cmbs, an E2 Horizon (10 YR 5/2) from 50–120 cmbs, and a Bh Horizon (7.5 YR 2.5/1) from 120–130 cmbs.

The Auger 20 data exhibits four general soil populations: 0–20 cm, 20–60 cm, 60–120 cm, and 120–130 cm (Figure 10-10). Some of these populations are coterminous with the soil horizons visible in the profile. The interface of the 0–20 cm and 20–60 cm populations is a horizon boundary, as is the interface of the 60–120 cm and 120–130 cm populations.

The 0–20 cm and 20–60 cm populations are associated with the architecture itself, but the 0–20 cm population is associated with modern soil development (O Horizon and A/E Horizon). Within the 20–60 cm population there is evidence for
changes in the rate of deposition in the Ti:Zr ratio and possibly differences in parent source materials, as evidenced in the UV index. In general, the evidence is suggestive of a single construction episode but using two different soil sources.

Figure 10-9. Cross-section of Embankment 6 showing location of auger tests and the stratigraphy of analyzed profiles.

Figure 10-10. Elemental and particle size distribution data for Embankment 6.
Semi-Circle

The Semi-Circle is a large earthen architectural feature that partially encloses the midden-mound (Mound 4), and it is the feature that the radiating linear embankments project outwards from. Two auger tests (Auger #11 and Auger #21) were conducted on this feature. However, Auger #11 was discarded due to a high level of disturbance. This auger test was located near the juncture of the Semi-Circle and the southern embankment of the Embankment 1 pair. Auger # 21 was placed near the juncture of Embankment 3 and the Semi-Circle. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 50–60 cm below the top of the auger profile, which places the estimated original ground surface at this same depth.

Auger 21

Auger #21 resulted in the extraction of a 120-cm soil profile and 12 individual samples, all of which were 10-cm samples (Figure 10-11). The stratigraphy of the profile exhibits five soil horizons: an A Horizon (10 YR 3/1) from 0–10 cmbs, an A/E Horizon (10 YR 3/1 mottled with 10 YR 7/1) from 10–20 cmbs, an E1 Horizon (10 YR 7/1) from 20–70 cmbs, an E2 Horizon (2.5 Y 7/1) from 70–110 cmbs, and a Bh Horizon (2.5 Y 7/1) from 110–120 cmbs.

The Auger 21 data exhibits evidence for four general soil populations: 0–20 cm, 20–60 cm, 60–110 cm, and 110–120 cm (Figure 10-12). In only two cases is there agreement between the visible horizons in the profile and these data. The interface of the 0–20 cm and 20–60 cm population correlates with a horizon change, and the 110–120 cm population comprises a soil horizon. The interface of the 20–60 cm and 60–110
cm populations occurs within the boundaries of a horizon. However, this interface correlates with the estimated original ground surface.

Within the 0–20 cm and 20–60 cm populations, which are associated with the architecture, the data show relative stability within the respective populations. There are shifts in the fine:coarse sand ratio and Ti:Zr ratio in the 20–60 cm population, the latter of which documents decreases in deposition from 30–50 cm. The increase in the fine:coarse sand ratio at the top of this population is likely related to translocation from the overlying A and A/E Horizons. In general, the data suggests stability within this population and thus a single construction episode.

Figure 10-11. Cross-section of the Semi-Circle showing location of auger tests and the stratigraphy of analyzed profiles.
Mound 6

Mound 6 is a large conical mound located between the Embankment 1 pair of parallel embankments on the western end of them. This position places Mound 6 opposite Mound 5 relative to the embankment pair, and is located “near the opening into the semicircle” as Willey (1949:75) describes it. Four auger tests were performed on the mound along a transect parallel with the adjacent embankments, and one auger test was performed adjacent to the mound as a control sample.

Multi-elemental analysis and particle size distribution analysis were conducted on two vertical sequences: Auger #10 on the western shoulder slope of the mound and Auger #6, which is the off-architecture control sample. Evaluating the vertical extent of the profile and comparing it to the cross-section of the embankment shows that the off-architecture ground surface is approximately 85–90 cm below the top of the auger profile, which places the estimated original ground surface at this same depth.
Figure 10-13. Cross-section of Mound 6 showing location of auger tests and the stratigraphy of analyzed profiles.

Auger 10

Auger #10 resulted in the extraction of a 270-cm soil profile and 27 individual samples, all of which were 10-cm in size (Figure 10-13). The stratigraphy exhibits four distinct soil horizons: an A/E Horizon (10 YR 3/1 mottled with 10 YR 7/1) from 0–10 cmbs, an E1 Horizon (10 YR 7/1) from 10–200 cmbs, an E2 Horizon (10 YR 5/2) from 200–220 cmbs, and a Bh Horizon (10 YR 3/3) from 220–270 cmbs.
The Auger 10 data exhibits evidence of three primary soil populations: 0–10 cm, 10–210 cm, and 210–270 cm. None of the changes in soil populations are correlated with the soil horizons visible in the profile. While the particle size data suggest relative stability within the soil populations, there is strong variation in the Ti:Zr ratio at certain depths. Of particular interest is the spike in Ti:Zr ratios from 70–90 cm. This correlates with the estimated original ground surface, so it is expected to see increases in Ti:Zr above this surface that indicate deposition. Within the subpopulation of 10–90 cm there is some variability in the fine:coarse sand ratio at 50–60 cm, and this coincides with an increase in the UV index. This suggests a possible second soil source used in construction, but it does not appear to be indicative of distinct construction episodes.

**Auger 6**

Auger #6 resulted in the extraction of a 40-cm soil profile and four individual 10-cm samples (Figure 10-13). The stratigraphy exhibits the presence of two soil horizons. From 0–10 cmbs there is an O Horizon (10 YR 2/1), and from 10–40 cmbs there is a Bh Horizon (10 YR 3/3). The Auger 6 data exhibit evidence for a single soil population from 0–40 cm (Figure 10-14). As expected there is a greater Ti:Zr ratio at the top of this profile since it is located in a depositional environment adjacent to the slope of Mound 6.

**Midden-Mound (Mound 4)**

The midden-mound, referred to as Mound 4 by Willey (1949), is a large ovoid mound located on the western side of the open space within the Semi-Circle. Volumetrically, it is the largest architectural feature at Big Mound City. It is also the only feature with definitive evidence for occupation (Willey 1949).

A single auger test (Auger #25) was conducted on the shoulder slope of the mound. It was placed adjacent to the test unit excavations in order to compare the
Figure 10-14. Particle size distribution and elemental data for Mound 6.
stratigraphy. The exact placement of the test was 1 m North and 0.5 m West of the northeast corner of Test Unit 5. The original ground surface for this architectural feature is estimated to be 250 cmbs from the top of the auger test.

**Auger 25**

Auger #25 resulted in the extraction of a 295-cm soil profile and 34 individual samples (Figure 10-15). Nine of the samples were 5 cm in size while the remaining 25 were 10-cm samples. The stratigraphy exhibits 21 distinct strata, and based on the estimated original ground surface, 18 of these strata are related to construction. The three lowest strata represent the initial ground upon which the mound was built. Within these strata there are three occurrences of 10 YR 2/1 (black), a single occurrence of 10 YR 2/2 (Very Dark Brown), three occurrences of 10 YR 3/1 (Very Dark Gray), two occurrences of 10 YR 3/2 (Very Dark Grayish Brown), two occurrences of 10 YR 4/1 (Dark Gray), two occurrences of 10 YR 4/2 (Dark Grayish Brown), three occurrences of 10 YR 5/1 (Gray), three occurrences of 10 YR 6/1 (Gray), and three occurrences of 10 YR 7/1 (Light Gray).

Comparing the soil profile of Auger #25 to the profiles of the test unit excavations reveals additional variability in the stratigraphic profile of the midden-mound. As stated above, Auger #25 was conducted 1 m North and 0.5 m West of the northeast corner of Test Unit 5. Yet, the profile of the auger test exhibits a different stratigraphic sequence than the test unit it was placed next to. This substantiates the evidence of basket loading presented in Chapter 9. Further, it provides additional evidence suggesting that a variety of materials were used in construction (i.e., different areas were mined for sediments). However, data presented below suggest that these materials were different
primarily in their coloration and not in the actual parent material of the source sediments.

Figure 10-15. Cross-section of midden-mound (Mound 4) showing location of auger tests and the stratigraphy of the analyzed profile.

The elemental data for this profile are highly variable (Figure 10-16). However, there is a general trend in the Ti:Zr ratios. With few exceptions, the ratios exhibit either increases or decreases in every sample associated with a change in stratigraphy. This is suggestive of differential weathering in the source materials used in construction, but may also be related to differences in parent materials. The Ti:Zr ratio also exhibits a
large spike in the 250–260 cmbs sample, which is associated with the estimated original ground surface.

This trend in stratigraphic alignment is also reflected in other elemental data. It is visible in the concentrations of Cu (ppm). The shifts in these data are not as stark as those exhibited in the Ti:Zr ratios, though. To lesser extent, this trend is also visible in the Si (%) data. While the concentrations of this element tend to remain more stable throughout the profile there are minor shifts that coincide with the majority of the stratigraphic boundaries.

A second trend is also visible in the elemental data. In the strata associated with the midden, there is depth-dependent trend of elemental enrichment. This is visible in the Ti:Zr ratios, Cu (ppm), Ca (%), and P (%). This makes sense given the density of artifacts and ecofacts in the midden. These materials are undergoing taphonomic processes and are thus releasing nutrients into the surrounding matrix. Further, the depth function of this enrichment correlates to the increasing and decreasing densities of cultural materials.

The particle size distribution data for the midden-mound show evidence for four soil populations: 0–60 cm, 60–190 cm, 190–250 cm, and 250–295 cm (Figure 10-16). The primary differentiating characteristic in these populations is silt-sized particles, which are concentrated in the greatest amounts in the 0–60 cm and 250–295 cm populations. The former is interesting because this is the same depth range of midden development, suggesting that within this population, silt-sized particles may be associated with the decay and degradation of midden materials.
Figure 10-16. Elemental and particle size distribution data for the midden-mound (Mound 4).
This may also be related to the midden stratum capping the top. The density of artifacts and ecofacts, along with the orientations of these materials, may be preventing large-scale percolation of water, thus hindering the translocation of fine particles. Further, the midden stratum was described in the field as having a loamy texture, which is reflected in the higher proportion of silt-sized particles in the upper matrices. Finer particles have increased surface areas that act to bond with and retain water more effectively than coarse particles, and when a matrix has a high percentage of fine particles, the increased surface areas and tighter packing of the particles leaves less matrix voids for water to travel through (Schaetzl and Anderson 2005).

Summary

This chapter presented the results from the analyses associated with the methods presented in Chapter 9. These methods involved a combination of geochemical and geophysical techniques aimed at describing the micromorphological properties of the soils used in the construction of Big Mound City. The geochemical technique employed was a multi-elemental analysis using x-ray fluorescence spectrometry. The geophysical technique used was laser diffraction particle size distribution analysis.

These methods were aimed at identifying depositional discontinuities in the soil profiles of architectural features at Big Mound City. Given the processes for the formation of such discontinuities, along with the expected stability of depth functions within a single soil horizon, it is not expected for a discontinuity to exist within the confines of a single horizon unless there is a shift in sedimentation systems or differences in parent materials. Additionally, to aid in distinguishing between the use of different parent materials in construction, which can cause the data to suggest a
discontinuity, and an actual break in the construction sequence, the uniformity value (UV) index test was applied to each sample.

The results of the analyses show that there are areas within many of the architectural features that point to the presence of discontinuities in unexpected places (i.e., within the confines of a soil horizon). However, the UV index test suggests that some of these discontinuities can be explained in terms of using different sediment sources in construction.

In Chapter 11 I present an interpretation of these results. Along with the interpretations of the construction sequence results, I also provide an interpretation of the results presented in Chapter 8. The implications of these interpretations in regard to my primary argument—that the Belle Glade monumental architecture is a materialization of the core principles of the Belle Glade ontology—is also discussed.
In Chapters 7, 8, 9, and 10 I presented the expectations, analytical methods, and results for evaluating the Belle Glade monuments for the presence of the core principles of the Belle Glade ontology: relatedness, circularity, and place-centeredness. Chapter 7 presented details on the expectations that should be met for each of the core ontological principles as well as a discussion of the methods that were used to test for those expectations while Chapter 8 presented the results of those analyses. Chapter 9 provided a discussion of a single ontological principle—place-centeredness—and the need to test for it in an additional manner. Chapter 9 also discussed the expectations that should be met as well as the methods used to test for those expectations. Chapter 10 then presented the results of the tests for place-centeredness using data gathered from Big Mound City, the largest of the Type B monuments, as a case study. This chapter is the culmination of this research and ties it all together.

In this chapter, I discuss how the results of those analyses accord with the core ontological principles and is divided into sections based on the principles. The first two sections discuss the principle of circularity, with one section devoted to the spatial aspect of it and the other to the temporal aspect. Following this, there are two sections devoted to the principle of relatedness. In the first, I specifically discuss the relatedness of the monuments and water. The second is devoted to a discussion of the relatedness of places, which is a combination of the principles of relatedness and place-centeredness. The final section is devoted to place-centeredness itself and the evidence garnered from the case study on Big Mound City.
Spatial Aspect of Circularity

The morphological assessment of the Belle Glade monuments demonstrates that the circle is, indeed, at the heart of the form of the Type B monuments and the circular ditches and Type A monuments that preceded them. The Type A and B forms of monument exhibit conical mounds, semi-circular embankments, linear embankments, and oblong midden-mounds. With the exception of the linear embankments, the circle is the underlying structural form of the different architectural features. The conical mounds are circular at their base and maintain a circular shape as they rise upwards, essentially forming a rising set of nested circles or a compacted spiral. Fixico (2003), a Native American philosopher, identifies such conical mounds as being the manifestation of the principle of circularity in Native American architecture, and these are indeed present in significant numbers at all of the Type B monuments. They are present in all of the Type A monuments as well, but in much smaller numbers.

The large semi-circular embankments that partially enclose the midden-mounds also have the circle as their underlying structural form, although it is in an incomplete form. This latter aspect, however, plays a significant role in other respects, as discussed below. Semi-circular embankments are also present in smaller forms surrounding some of the conical mounds at the terminal ends of the linear embankments, again emphasizing the importance of the circle in structuring monumental construction yet also highlighting the significance of the open-ended circle. These secondary semi-circles are absent from all but one of the Type A monuments (Ortona Earthworks).

Thus, there seems to be a temporal trend suggesting the increasing significance of the semi-circle through time. In the circular ditches, the open-faced form is the minority to the fully enclosed form, but the Type A monuments that succeeded them
always exhibit a semi-circular embankment, or in the case of Whitebelt II Earthwork Complex, a semi-circular midden-mound. With the Type B monuments, however, secondary semi-circles surrounding the conical mounds become a prominent feature. Ortona Earthworks’ Type A monument is the only example of the Type A form with a secondary semi-circle. Ortona is also an anomalous site because it exhibits many different forms of architecture (see Chapter 8). While we don’t have chronometric data for the construction of this architectural feature, it is possible that Ortona’s Type A monument was built during a transitional period between the Belle Glade II and Belle Glade III periods and may have started a trend with the secondary semi-circle.

Additionally, as I have argued elsewhere (Lawres 2017), the fact that the spatial aspect of the principle of circularity is manifest not as full circles, but as semi-circles, is suggestive of the role water plays in linking the principle of circularity to the principle of relatedness. This linkage hinges on the opening in the semi-circle, which “allows enduring relations between the inhabitants of the midden-mounds, water, and aqueous entities moving into the confines of the circle” (Lawres 2017:665). Fully enclosed circles would not allow for an openness to the formation and maintenance of these relations because water would not be able to flow into the confines of the circle. Thus, the use of a semi-circle in the structure of these monuments is suggestive of a connection between these two principles in the context of the Belle Glade ontology.

This is not to say that the enclosed circular ditches do not display this same openness to water relations. On the contrary, they do, but in a different manner. They are built as ditches that fill with water. The semi-circles of the Type A and Type B monuments, on the other hand, are built as raised earthen embankments. Because the
Type A and Type B semi-circles are raised, an opening in the circle is necessary to allow water to flow into the interior. Further, they were built in a time when the landscape was inundated with sheet flow throughout the majority of the year (see Willard and Bernhardt 2011). In contrast, the circular ditches were built during a much more arid period when the landscape was dry for the majority of the year (see Glaser et al. 2013), and they are structured in a way that captures and retains water (see Carr 1985). Further, because they are not raised embankments they would not impede sheet flow. Rather, it would fill and pass over the ditches to enter the interior of the circle without hindrance. Thus, the circular ditches are also suggestive of water’s link between relatedness and circularity.

The oblong midden-mounds of the Type B monuments also present a roughly circular structure, although to a lesser extent than the conical mounds. This differs from the midden-mounds in many of the Type A monuments. As discussed in Chapter 4, the Type A monuments exhibit two variants, one with the semi-circular embankment partially enclosing a midden-mound and the other with a crescent shaped embankment that in some cases is also a midden-mound. Both variants of the Type A monuments exhibit variation in the morphology of the midden-mounds. Summer Earthworks, Kissimmee Circle, and Lakeport Earthworks all exhibit midden-mounds that are ovate in shape similar to those of the Type B monuments. Nicodemus Earthworks has multiple conical mounds in lieu of a single midden-mound. Candler Mound & Earthworks’ midden-mound is long and linear with rounded ends, similar to the mound in the second semi-circular structure of Tony’s Mound (see Chapter 8). Carr and colleagues (Carr et al. 1995) also describe Ortona Earthworks’ Type A architecture as having a similar
rounded rectangular mound at the western end of the linear embankment pair. However, this could neither be verified on historical aerial imagery nor in ground truthing. In contrast, the midden-mounds of the Type B monuments are always ovate and thus offer hints of circularity but in an elongated form. In other words, they resemble horizontally stretched conical mounds.

While the linear embankments of the Type A monuments do not exhibit the spatial circularity, those of the Type B monuments do. To reiterate, these embankments radiate outwards from multiple points along the semi-circle of the sites. While these radiating embankments do not overtly exhibit the characteristics of the principle of circularity, it is present within their layout and orientation. As demonstrated in Chapter 8, if the terminal conical mounds of the embankments are connected with a line they form another semi-circle. In some of the Type B monuments it is possible to create multiple semi-circles, depending on the number of embankments and their orientations, while in others it is possible to form only one. If these semi-circles are completed, they form sets of nested circles. As Fowles (2009, 2013) and Snead (2008) discuss of the Tewa peoples of the Southwest, there is a cognization of the cosmos as being comprised of sets of nested circles, with the innermost circle enclosing the sacred shrine in center of the Pueblo itself and the outermost circle being demarcated by the four holy mountains. This all contrasts with the Type A monuments. Because of the presence of only a single embankment, or single set of parallel embankments, it is not possible to form additional semi-circles, let alone nested circles. This further attests to the temporal trend suggesting the increasing significance of the circle.
These morphological characteristics show that the expectations for the spatial aspect of the principle of circularity are met, and thus this principle is embodied within the monuments of the Belle Glade culture. As this discussion has shown, the morphology of all the Belle Glade monument forms display this characteristic. However, the Type B monuments display a greater amount of spatial circularity than do the circular ditches and Type A monuments. Thus, there seems to be an increase in the importance and significance of this principle through time.

**Temporal Aspect of Circularity**

The archaeoastronomical analyses of the Belle Glade monuments demonstrate the presence of the temporal aspect of the principle of circularity in the structure of the Type A and Type B monuments and in the locational emplacement across the landscape for the circular ditches. The circular ditches are arrayed across the landscape along celestial azimuths, with each one of the ditches connected to another by either a solstitial, equinoctial, lunisstitial, or meridian azimuth. All but one of the Type A monuments exhibits the presence of one or more celestial alignments in either its embankment or semi-circle, and all but one of the Type B monuments exhibit one or more celestial alignments in their embankments, semi-circles, or in mound-to-mound sitings. The presence of so many celestial alignments suggests an intricate knowledge of the patterning in the movement of celestial bodies and how it relates to time (Lawres 2017). Further, the presence of celestial alignments in all of the Belle Glade monument types demonstrates the antiquity of the knowledge of celestial patterns as well as the antiquity of the importance of this knowledge to Belle Glade ontology.

This is significant in that this celestial patterning is cyclical. The solstitial and equinoctial events occur on annual cycles, and these cycles are tied to changes in
seasons, hence the names of the solstices and equinoxes: vernal (spring) equinox, estival (summer) solstice, autumnal (fall) equinox, and hibernal (winter) solstice. Cope (1919) notes that the use of solar observations, especially solstices, is a common method of tracking both time and seasonal change among groups throughout North America. However, there is variation in the number of seasons among groups, which varies from two to eight seasons. She further notes that “where more than four are recognized the main seasons are subdivided naturally” (Cope 1919:133).

Among some Native American cultural groups, celestial observations played a role in determining the planting cycle for agricultural crops, such as with the Skidi Pawnee (Chamberlain 1982:135). However, celestial observation seems to have played a larger role in calendrics and determining the ceremonial calendar (Chamberlain 1982; Cope 1919; Hudson et al. 1979). Further, solar observations seem to occur in greater frequencies among hunter-gatherer groups than among agriculturalists, and of the solar observations the solstices play a more prominent role in calendric systems than equinoxes (Cope 1919). The method of observation varies among hunter-gatherers, but direct observation is more typical than indirect methods (Cope 1919; Hudson et al. 1979). However, there is a growing body of literature demonstrating that agricultural groups in Southeastern North America also used solar observations, and they did so through indirect methods, such as creating alignments with earthen architecture (Benchley 1974, 2000; Pauketat 2013; Romain 2000, 2009, 2015a, 2015b, 2015c). The Belle Glade use of architecture to make solar observations adds to this growing body of literature for the Southeast but adds a fisher-hunter-gatherer twist to it.
However, the celestial observations made by the Belle Glade people involved more than just aligning to solar patterns, and they did so through a combination of direct and indirect methods. As discussed in Chapter 8, the celestial alignments observed in Belle Glade monuments included not only the solstices and equinoxes but also the lunar minima and maxima. While the solar events provide a means of tracking annual cyclical time and seasonal change, the lunar cycle is 18.6 years (Kelly and Milone 2011; Pauketat 2013). Thus, observations such as these would be tracking generational-scale lunar patterns, what Pauketat (2013:77) refers to as “trans-generational tracking.” The Belle Glade peoples are not unique in making such generational-scale observations. The Hopewell Earthworks primarily exhibit lunar cycle alignments (Hively and Horn 1982, 1984, 2006, 2010, 2013; Romain 2000, 2009, 2015a, 2015b), and Cahokia also exhibits such alignments (Pauketat 2013).

Among the Belle Glade monuments, the Type A and Type B monuments exhibit only indirect observation methods for both solar and lunar observations. This is because the architecture itself provides the method of observation. However, the circular ditches provide an example of a direct observation method because the horizon or horizon markers must still be used to define the solstitial, equinoctial, or lunisititial events (Hudson et al. 1979). How such observations were actually made eludes us due to the lack of ethnographic literature and descendant populations. Yet, it was likely a method similar to that reported for the Nootka:

The Nootka call observing the solstices ho·'palnk⁶n “to look after the sun.” The observer places a stick in front of himself, while another man places a second stick in line with the first and the point of the rising of the sun. The observation continues for several days. The period when the sun remains quiet (literally: “sits down”) for four or five days before beginning its return journey, is called the solstice. The observation of the solstice is of great
economic importance. If one wishes to be successful in the hunting season, he must perform certain magical rites when the days are getting longer and the moon is waxing (Cope 1919:122).

The circular ditches, however, provide a distinct form of direct observation. They don’t just rely on observations of sunrise and sunset relative to the horizon. They also rely on the location of other circular ditches. The initial siting of ditch construction locations, however, would have likely relied on a combination of direct observations and travel along those observational azimuths. The construction of the Type A and Type B monuments were likely similar but may have also involved the use of indirect methods, such as creating a line of posts along an observational azimuth. This is something that I intend to test in future research, as discussed in Chapter 12.

While there is a functional aspect to understanding the cyclical nature of time and seasonal change (see below), as mentioned above celestial observation plays a larger role in determining the ceremonial calendar for many Native American groups (Chamberlain 1982; Cope 1919; Hudson et al. 1979). Further, as discussed in Chapter 5, one of the primary themes of Native American religious and ceremonial practices is balance (Buckley 2000; Chaudhuri and Chaudhuri 2001; Deloria 1999, 2003; Fixico 2003; Griffin-Pearce 2000; Martin 1991, 2000; Salmon 2000; Sullivan 2000; Waters 2004a; Wildcat 2005). As Native philosopher Anne Waters (2004a:35) notes, balance is an integral component of Native American cosmological understandings (i.e., ontologies or understandings of a lived world), and it is understood that balance in the universe must be maintained for the universe to continue functioning properly. Among Native American groups in California, solstitial observations played an important role in that maintenance (Hudson et al. 1979). Because they understood the relations between
patterns of solar movement and seasonal change, they monitored the movement of the sun to help ensure that it continued to maintain its pattern of north-south movement along the horizon. If there was deviation from this pattern, they understood there would be dire consequences for the world. As Hudson and colleagues (Hudson et al. 1979:40) state, “The critical times for man or earth were the solstices, the two solar extremes of Sun’s travels; should Sun decide not to take up his journey, it meant cosmic imbalance and death for all.” To help ensure that this did not happen, solstitial ceremonies were conducted by many Californian groups. Further, Benchley (2000) notes the importance of the equinox for the Choctaw, whom divided their year into two periods based on the equinoxes and whom celebrated the Green Corn Ceremony during the autumnal equinox.

The Belle Glade monuments, with their alignments to celestial events, suggest a similar knowledge of the relationship between the heavens and the earth, and it is likely that monitoring solar movements was similarly aimed at ensuring the continued balance of the universe. However, given the Belle Glade knowledge of the relations between earth and sky (discussed in more detail below) and the principle of relatedness, it is likely that the act of building the monuments with such alignments was aimed at creating an enduring form of ceremonial relationship with the sun to ensure its continued journey north and south along the horizon. This, in turn, would have maintained the necessary balance to ensure continued seasonal change. The characteristics of the principle of relatedness is important here. As discussed in Chapter 5, a conception of personhood that extends beyond humans underlies relatedness, and the basis of this extended personhood is found in an animate understanding of the
world and all of the entities within it, including things that are made or built (Cajete 2000, 2004; Chaudhuri and Chaudhuri 2001; Cordova 2004, 2007; Deloria 2003; Martinez 2004; Norton-Smith 2010; Salmon 2000; Plerotti and Wildcat 2000; Wildcat 2005). Because built things, such as monuments, are animate they are understood to be sentient persons with agential power. Thus, the monuments themselves would have the power to create and maintain enduring and balanced relationships with the celestial bodies they are aligned to.

The moon also played an important role in the calendrics of Native groups throughout North America (Benchley 2000; Cope 1919; Hudson 1976). Indeed, many Native Southeastern groups had a ceremonial calendar based on the cycle of new moons throughout the year (Hudson 1976). However, the lunar alignments in the Belle Glade monuments are to the 18.6-year lunar cycle and are thus related to generational time. To my knowledge there are no known ethnographic accounts detailing the importance of lunisititial events. Pauketat (2013:160), however, argues that the moon, and specifically the lunisititial alignments exhibited in the Cahokia heartland, was a “locomotive force” that all people experience every night. He argues that the people of this region likely associated the moon with the dead or ancestors because of the presence of such alignments in mortuary facilities.

It is possible that the Belle Glade people held similar associations, but it is also likely that similar relationships to that of the sun were required for maintaining proper balance in the universe. As Hudson (1976:126) notes, for many Southeastern groups the moon was often “associated with rain and menstruation, and with fertility generally.” For peoples living in an aqueous landscape like the KOE watershed, a celestial body
associated with rain would have been extremely important because the rains are the primary source of the water that comprises their landscape. Thus, aligning the monuments with lunisititial events would likely have created and maintained enduring and balanced relationships with the moon to ensure the continued balance in the relations between celestial bodies and water.

It is important to note that the Belle Glade culture is not unique in building celestial alignments into their monumental architecture. Benchley (1974, 2000) found solstice alignments in the majority of Mississippian mound centers she surveyed, and Pauketat (2013) notes the prevalence of both solar and lunar alignments throughout Cahokia and its hinterlands (see also Romain 2015c). However, the Adena and Hopewell earthworks of the Midwest deserve special consideration here due to the high prevalence of celestial alignments in their architecture as well as the similarities present in the form of the architecture itself.

The Early Woodland Adena culture (500 B.C.—A.D. 100) built a number of circular ditch enclosures, or sacred circles, throughout the Midwest that closely resemble the Belle Glade circular ditches in both form and temporal span (Romain 2015a). The Adena circular ditches are described as having circular embankments that surround a ditch, with a singular opening through both the ditch and embankment to allow entrance into the enclosure that most often contains a mound (Jefferies et al. 2013). There are 198 such circles distributed across the landscape, and they exhibit variability in their size, ranging 0.01–1.35 ha in size (Jefferies et al. 2013:103). Romain (2015b) notes that among Adena earthworks celestial alignments—originating from the openings—are known but not that common. Further, while some lunar alignments are
known among this architecture, the alignments that do occur are focused primarily on
the estival and hibernal equinoxes.

While the Belle Glade circular ditches exhibit very strong similarities in form to
the Adena sacred circles, they are much larger. In fact, the largest Adena circles are
approximately 75 m in diameter (Jefferies et al. 2013:103), which places the largest of
them on the low end of the Belle Glade circular ditch range: 60–366 m. Additionally, as
demonstrated in Chapter 8, celestial alignments are present in every Belle Glade
circular ditch. However, these alignments do not originate in the openings to the ditches,
like the Adena sacred circles, but are found in their placement across the landscape
relative to one another. Further, rather than a focus on either solar or lunar alignments,
the arrayment of Belle Glade circular ditches across the landscape is focused on an
equal mix of solar and lunar azimuths. There are eight of each: five equinoctial
azimuths, three solstitial azimuths, and eight lunar azimuths.

The Middle Woodland Hopewell culture (100 B.C.–A.D. 400) is associated with a
large number of earthworks throughout the Midwest and northern limits of the Southeast
(Case and Carr 2008; Romain 2015a, 2015b). In contrast to their Adena predecessors,
these earthworks incorporate multiple geometric shapes—squares, circles, octagons,
and straight lines—into their form and can be quite large, “up to 5.2m (17 ft) tall and
more than 300 m (1000 ft) in diameter” (Bernardini 2004:331). There is variation among
the earthworks as to which shapes are incorporated into their design, whether the
design includes one or more shapes, and the overall size and layout of the earthworks
(Romain 2015a).
There are 52 known Hopewell geometric earthworks (Case and Carr 2008; Romain 2015b). As several scholars have shown (Hively and Horn 1982, 1984, 2006, 2010, 2013; Romain 2000, 2009, 2015a, 2015b), the majority of these earthworks exhibit celestial alignments, and these alignments have been shown to be accurate within 0.01–0.06° (Hively and Horn 2013). Much like the Adena alignments before them, the majority of the Hopewell alignments are focused on solar events (Romain 2015b:244), but there are also many lunar alignments observed that involve both the lunar minima and lunar maxima. Additionally, the location of the Hopewell earthworks accounts for the celestial azimuths relative to specific landscape features and other sites (Hively and Horn 2013; Romain 2015a, 2015b:245).

There are some similarities between the forms of Hopewell earthworks and the Belle Glade Type A and Type B earthworks. Both exhibit circular elements, although the Belle Glade earthworks are semi-circles rather than full circles. Both also include linear embankments, although many of the Hopewell examples curve at some points.

There are also some differences between them. The Hopewell earthworks incorporate squares and octagons into many of their designs, while the Belle Glade earthworks strictly incorporate circular elements. It is important to note that there are squared earthworks in the KOE watershed, it is not certain they are associated with Belle Glade culture because they were destroyed before any investigations could take place (Johnson 1991, 1994, 1996). It is possible these are associated with the fortifications the U.S. Army constructed during the Second Seminole War. Another notable difference between the Hopewell and Belle Glade earthworks is that in all of the Hopewell examples, full enclosures are formed by the constructions. This is not the
case with the Belle Glade examples. These all incorporate semi-circles into their form, leaving large openings.

What bridges these differences, however, is the focus on bridging the earthly and celestial landscapes. As Hively and Horn (1982, 1984, 2006, 2010, 2013) and Romain (2000, 2009, 2015a, 2015b) have shown, the Hopewell monumental landscape was focused on creating relations between the earth and the sky, and this was certainly the case with the Belle Glade monumental landscape. Both of these cultures exhibit strong evidence for knowledge of the relationships between earth and sky, and as Norton-Smith (2010) notes (for the Hopewell earthworks), strong evidence for the principle of circularity being materialized in the architecture itself.

**Relatedness to Water**

One of the salient aspects of the Belle Glade monuments is that, with the exception of Ortona Earthworks’ Type A architecture, they are always built within flowing-water ecosystems. This suggests that the Belle Glade peoples that built them had a special relationship with water and understood it to be an integral aspect of their lived world in that it played an important role in continuously creating that world. Indeed, the KOE watershed was an aqueous world prior to the drainage of the Florida peninsula (see Chapter 2). As I have argued elsewhere (Lawres 2017), the Belle Glade monumental architecture was partly built as a means of creating and maintaining enduring relations with the water that flowed across the landscape. More specifically, the emplacement of the monuments within such ecosystems creates “an enduring performance of the principle of relatedness… it forms and maintains enduring relations between the monuments and water” (Lawres 2017:663).
Hale (1984) also noticed a relationship between the monuments and water. However, Hale claimed that the monuments were not built to create and maintain relationships with water, but rather were built and oriented in a manner suited to redirecting water away from the living area (e.g., midden-mounds) at these sites so that the people dwelling there could maintain a dry living area.

The hydrological modeling presented in Chapter 8 shows a trend among the Type B circular-linear earthworks. As I have noted elsewhere (Lawres 2017), contrary to Hale’s (1984) suggestion, this monumental architecture was not oriented in a manner aimed at redirecting water flow away from the living areas, or midden-mounds. Rather, the architecture is oriented in a manner conducive to creating water flow within the interior of the semi-circles. As the results of the hydrological modeling of the different Type B monuments show, once the water entered the semi-circle, the flow accumulations have a tendency to follow the topographic barrier created by the semi-circular embankments. Thus, a circular flow of water is created, and this circular flow would have moved, at least partially, around the midden-mounds of these sites. Further, only one of the Type B monuments, Big Mound City, is oriented in a manner where the opening of the semi-circle is not facing the primary direction of water flow. Thus, the orientation of this architectural type alone refutes Hale’s (1984) argument.

However, this is not always the case with the Type A monuments. While the majority (n=5; 55.55%) of the occurrences of this architectural form exhibit similar hydrologic patterns to the Type B monuments, where water flows either directly into the semi-circle through its orientation of the opening to primary flow accumulations or where water is redirected via the linear embankments into the semi-circle, there are three
examples of this architecture that suggest Hale (1984) is correct. These include Barley Barber I, Candler Mound & Earthworks, and Summer Earthworks. While these monuments could not be tested with hydrological modeling due to either a lack of LiDAR data (Candler Mound & Earthworks) or LiDAR data that cannot be accurately processed due to drastic land alterations, their orientations relative to primary water flow are suggestive.

Barley Barber I is oriented on an east-west axis with its semi-circle open to the west, and water flow in the area would have been in a general southward direction. Thus, water would not have entered the semi-circle directly or through redirection. Candler Mound & Earthworks’ orientation is similarly suggestive. While it is possible that water could have entered directly into its semi-circle given the orientation of its opening to the northwest, the semi-circle is closed to the large wetland and lacustrine ecosystems to its east. These ecosystems would have flooded during the six-month wet season in the Kissimmee River Valley, and the semi-circle would have likely deterred water movement into the confines of the semi-circle.

Summer Earthworks, however, is also oriented in exactly the manner suggested by Hale (1984). It is oriented so that the semi-circle opens opposite of the primary flow direction of the region, and its linear embankment points directly into that flow. It is likely that the primary flow accumulations would have split into two directions around the linear embankment, much like the model shows for Whitebelt II Earthworks. The semi-circle would have then continued to redirect water flow away from the midden-mound. Whitebelt II Earthworks also would support Hale’s argument if the semi-circle were not
also the midden-mound at this site. Because the midden-mound is the semi-circle it cannot be said to redirect water away from the living area.

Yet, it should be noted that all of these monuments were built in aqueous environments. So, even if the architecture redirected the flow of water away from the midden-mounds, the area within the semi-circles would still be saturated with water. This is best exhibited by the aerial photographs of Candler Mound & Earthworks (see Figure 8-29 in Chapter 8). In this image, the midden-mound is clearly surrounded by water, whereas immediately east of the semi-circle and linear embankment is higher, drier ground in the form of a tree island hammock. Thus, even though the architecture may be redirecting water, the monuments themselves, including the living areas/midden-mounds, are in a continuous relationship with water.

Hale (1989) also made similar arguments regarding the circular ditches, which he maintained were built to drain the interior areas to create artificial islands. However, as noted in Chapter 4, the circular ditches were built during an arid period when the landscape was dry. Thus, the ditches would have likely been built as a means of retaining water, not draining it. Further, as my colleague and I (Colvin 2015; Lawres 2015; Lawres and Colvin 2016) have argued, retaining water in this manner was likely to create a ceremonial space involving a relationship with water and was likely a citation to the past practices of subaqueous burial seen among Archaic populations at sites such as Windover, Bay West, Republic Groves, Little Salt Springs, and Warm Mineral Springs. As discussed in Chapter 3, subaqueous burial was practiced solely by the Belle Glade peoples after the Archaic period.
As Hall (1976) notes, circular enclosures and water create protective barriers against vengeful spirits while also creating important ceremonial spaces. Further, water is seen by many Southeastern Native American peoples as a portal to the Lower World and is often associated with creatures of supernatural origin (Hudson 1976; Lankford 1987, 2007a, 2007b). The Belle Glade peoples would have known of the relations between protection, supernatural power, ancestral spirits, and water and likely built the circular ditches because of their knowledge of these relations. Furthermore, by creating spaces that made citations to ancient traditions they would have created and maintained relationships with those ancestral spirits. These ideas are further substantiated by the discovery of burials within the interior of Glades Circle (Ambrosino 2013). Surrounding the dead with water is still practiced by Native Americans in South Florida today. The cemeteries on both the Big Cypress and Brighton Seminole Indian Reservations are both surrounded by canals that hold water. It is also notable that the Smith Mound at the Pineland site, which is the largest of the Calusa burial mounds, is encircled by water (Marquardt 2013; Torrence 2013).

Because of the hydrological characteristics of the KOE watershed, with its dominating hydraulic cycle, it would have been necessary for the Belle Glade peoples to form and maintain enduring relations with the water that surrounded them. As discussed in Chapter 2 and elsewhere (Lawres 2017), water was the primary characteristic of the landscape the Belle Glade peoples dwelled within, and as such these peoples would have lived their lives in sync with the rise and fall of the water levels in their lived world. “They fished from it, drank of it, traveled through it, and their settlements were surrounded by it… their lives were tied to the shifting depths of water” (Lawres
There was a spiritual significance to water as well. As discussed above and in Chapters 3 and 6, water was also a repository for the ancestors. The waters of Lake Okeechobee provided the resting place for the ancestors off the northern shores of Kreamer, Ritta, and Grassy Islands and the western shoreline of Observation Island (Davenport et al. 2011:483–484, 518–519; Hale 1984, 1989:54–55, 161–162; Will 2002:105–107), and at Fort Center, a constructed charnel pond provided a similarly watery resting place (Sears 1994).

Because water was such an important characteristic of the KOE watershed it would have held a significant place in the Belle Glade ontology. Specifically, the hydraulic cycle, the rise and fall of water, would bring the emergent properties of the landscape to the forefront of visibility, and this would make the relations between water and the cyclical emergence of life visible to the Belle Glade peoples. I argue that understanding these relations would have been significant to how these peoples understood their world to exist and operate on a fundamental level because they provide visible examples of both the principle of relatedness and the principle of circularity.

During the spring months they would witness the hydration of the landscape as the water levels began to rise. This is a time where the vegetation would effloresce, with the leaves of the trees greening, the grasses and sedges beginning to repopulate the prairies and marshes, the increase in mammalian activity and the associated propagation of those species, and the flocks of migratory birds leaving the region to return north.
The summer months bring the water levels to their maximum depths with heavy rains that occur almost daily. During this time, the Belle Glade peoples would be able to witness many shifts in animal behaviors and biogeographies. They would be able to see the deer in the KOE watershed shift towards rutting behaviors, which in this region is timed so that the young are born during the driest portion of the year (Richter and Labisky 1985). They would also experience the massive influx of fish and turtles throughout the entirety of the watershed because maximum water depth means maximum ability to move across the landscape. There would also be an auditory component to this shift in animal behavior as the many alligators of the region move into their mating and begin their distinctive mating sounds, which are often audible from a great distance.

The fall and winter months present a much different, but equally visible, picture of the relations between water and the life of the landscape. It is during this time that the landscape begins to dry out. This drying, in turn, causes several drastic changes to the landscape. Most visibly, the vegetation begins to wither and brown, or red in the case of the red maple trees common in the southern portion of the KOE watershed. This also is a time where the Belle Glade peoples would witness the ingress of droves of migratory birds that flock to the Everglades Trough to wait out the cold of winter each year. The drying of the landscape also changes the distribution of water so that the deeper catchment areas, such as small ephemeral ponds and depression marshes, retain the last of the water through the winter. This, in turn, changes the distribution of fish populations. Because the water becomes restricted to smaller catchment areas, fish

Emergent properties such as these would have provided the Belle Glade peoples with highly visible illustrations of the principle of relatedness, showcasing the relationships between water and the many aspects of life that are part of the landscape. Further, because of the seasonal cycles of the rise and fall of water levels, this also would have provided visible portrayals of the principle of circularity. Thus, the Belle Glade peoples would have understood the significance of water to both principles.

I argue that building the monuments within flowing water ecosystems was an intentional act to create a performance of the principle of relatedness. Further, this performance would be both enduring and emergent, and once built, the monuments themselves would create and maintain the relationships between monument and water. Each year as the water levels rise and water comes into contact with the monuments, a relationship is created and maintained. Thus, the relationship is also tied to the principle of circularity because it is cyclically formed and reformed.

**Relatedness of Earth, Sky, and Water**

The alignments to the annual solstitial and equinoctial events further substantiate the importance of the relatedness of water to the life of the Belle Glade landscape and suggest the importance of the relatedness of the cosmos to seasonality to the Belle Glade ontology (Lawres 2017). In the KOE watershed, where water levels are such a visible characteristic of the landscape itself, this is significant because the seasonal hydraulic cycles are important to understand for people dwelling in this landscape.

The water levels themselves play a significant role in the behaviors, distributions, and breeding seasons for animals in the region, and these have a strong tendency to
differ within the watershed because of the water. For example, terrestrial reptiles such as snakes have much different seasonal movement patterns in the Everglades Trough than in other regions, and this is due to the snakes timing their movements and feeding behaviors in accordance with the rise and fall of water (Dalrymple et al. 1991). Long-legged wading birds nesting is also dependent on wetland productivity, and during the dry season of the fall and winter months, fish populations become exceedingly concentrated in small catchments that provide the biomass necessary for large numbers of birds to nest in the area (Bancroft et al. 2002; Frederick and Ogden 2001; Johnson et al. 2007). The breeding season of white-tailed deer also differs in this region because it is intricately tied to water levels (Richter and Labisky 1985).

The water levels of the KOE watershed are inextricably tied to precipitation patterns, and these precipitation patterns, in turn, are correlated to cyclical solar events. Specifically, the vernal equinox and estival solstice are tied to the rise of water levels. The former marks the beginning of the rainy season while the latter signals the peak of the heaviest rains, which in this region typically come in the form of daily thunderstorms. Conversely, the autumnal equinox and hibernal solstice are tied to the fall of regional water levels. The former signals the termination of the heaviest rains while the latter is associated with the drying of the landscape.

The alignments with these events provide additional evidence that the Belle Glade peoples knew about the relatedness between the cosmos and water levels (Lawres 2017). By building the monuments within flowing-water ecosystems, a relationship between the monuments and water was established and maintained through enduring cycles of the rise and fall of water. Further, Belle Glade subsistence
patterns, which are classified as fisher-hunter-gatherer patterns (see Chapter 3), would have relied heavily on knowledge of the distributions and behaviors of local fauna, which in this case are tied to the water levels of the KOE watershed. For example, during the winter months, when the landscape dries and water is restricted to small, deeper catchment areas, the fish populations, along with amphibians and aquatic reptiles, migrate into these catchments and become concentrated there (Ewel 1990; Gaff et al. 2000, 2004; Kushlan 1974, 1976, 1980, 1990). Deer behavior also shifts to post-rut patterns, where home range size increases but diurnal activity decreases significantly (during the rut period, females restrict their mobility so that tending bonds with males can be formed) (Beier and McCullough 1990; Hölzenbein and Schwede 1989). The ability to predict such shifts in distribution and behavior would be integral to subsistence, and the alignments to the solar events associated with the water levels tied to these shifts would have aided in predicting when land-use patterns should be adjusted. Thus, knowledge of the relatedness between earth, sky, and water and the circularity inherent in those relations would be an essential component of the Belle Glade ontology.

It is likely that there is also a sacred aspect to the celestial events that the monuments are aligned to. Similar arguments have been made by Native American philosophers (Norton-Smith 2010:129–132) and archaeologists (Hively and Horn 1982, 1984, 2006, 2010, 2013; Romain 2000, 2009, 2015a, 2015b) for the celestial alignments exhibited by the Hopewell Earthworks. As I have noted elsewhere (Lawres 2017; also discussed above), this sacred component could have been reflected in the timing of ceremonial activities or possibly by the assembly of groups of people at the monuments.
themselves during the celestial events. The solstices and equinoxes mark important ceremonial days for many Native American groups throughout the Southeast and elsewhere in North America (Chamberlain 1982; Hudson 1976; Lankford 2007b; Miller 1997; Pauketat 2013), and these days may have been similarly significant to the Belle Glade peoples. However, these sites have yet to produce evidence of such ritual usage because cultural materials are largely restricted to the midden-mounds. This does not mean that ritual activities not involving the use of material culture did not occur here. Indeed, there is evidence for ceremonial regalia at Belle Glade sites, like the deer antler headdresses discussed in Chapter 6, and such regalia could have been used in dances and other ceremonies.

The cyclical celestial events being aligned with are significant because the relations between them and the emergent properties of the landscape would be highly visible to the Belle Glade peoples. As such, the relatedness between earth, sky, and water would be cognized as an emergent property of the world, with the cyclical movement of the cosmos bringing different aspects of the landscape into emergence. As Norton-Smith (2010:132) argues for the Hopewell Earthworks, the alignments to such cyclical celestial events in the Belle Glade monuments suggests these temporal events are “incorporated into the very structure of the site[s].” Further, the alignment to these events is reflective of both the principle of circularity, because of the cyclical nature of the events themselves, and the relatedness between the cosmic cycle, the emergent landscape, and the water that ties it all together.

**Relatedness of Places**

The site alignments exhibited in the Belle Glade monuments suggest that the principles of relatedness and place-centeredness are materialized in the morphology of
the monuments as well as in their emplacement across the landscape. The circular ditches exhibit this relatedness of places (the combination of the principles of relatedness and place-centeredness) through their locational emplacement throughout the KOE watershed. The locations of the ditches place each one along a celestial azimuth line relative to another ditch, showing not only a relationship between these monumental architectural features, but a relationship between the ditches and the cosmos.

The Type A monuments also exhibit alignments between places on the landscape. Seven of the nine examples of this monument type exhibit one or more alignment through either its linear embankment or through alignments created by the ends of the semi-circle. The only exceptions to this are Drasdo Earthworks and Nicodemus Earthworks. However, given the pattern of alignment and the accuracy of the alignments, it is possible that these two sites are aligned to sites that have either been destroyed or are as yet undiscovered.

The majority (62.50%) of the alignments exhibited by the Type A monuments are to other Belle Glade sites. Of these alignments, five (83.33%) are to monumental architectural features and one (16.67%) is to a subaqueous ossuary (Kreamer Island). Further, one of the alignments (Ortona Earthworks to Kreamer Island Mound) is to a monumental feature at the same site as the ossuary.

The three alignments to non-Belle Glade sites are to significant sites outside the KOE watershed. One is to the Key Marco site, an important site related to the Calusa, whom the Belle Glade peoples had a relationship with during the Historic Period (Marquardt and Walker 2012, 2013; Marquardt 2014; Worth 2014). Further,
archaeological data suggest that this relationship, while it likely changed in its nature through time (Marquardt 2014), was established by at least cal. AD 500 based on the presence of Belle Glade pottery at Calusa sites (Cordell 2013; Marquardt and Walker 2013). This alignment is further substantiated by the presence of other alignments to important Calusa sites by multiple Type B monuments (see below).

The remaining two non-Belle Glade alignments are to Joseph Reed Shell Ring and Little Salt Springs. Joseph Reed Shell Ring is a Late Archaic shell ring site that exhibits a morphology that is very similar to the semi-circles of the Type A and Type B monuments. Further, there are multiple other alignments to this in the Type B monuments. Little Salt Springs, on the other hand, is a Middle Archaic subaqueous ossuary. At this site people were interred in the peat bottom of a slough and large sinkhole, and researchers estimate that more than 1,000 burials are held within the 6,000 m² subaqueous ossuary (Clausen et al. 1979:612). This is the same mortuary practice exhibited by the Belle Glade peoples several thousand years later. Additionally, a wooden tablet with the partial profile of a bird was recovered that "resembles the typically tenoned wooden tablets or slats with carved or painted animals or geometric figures recovered in the late 1890’s from the Key Marco site" (Clausen et al. 1979:612). Similar plaques were also recovered from the Belle Glade Mound (Willey 1949), suggesting ancient connections to both the Caloosahatchee and Belle Glade archaeological cultures. (Clausen et al. 1979:613).

The Type B monuments also exhibit alignments with other places across the landscape but to a greater degree than the Type A monuments. This increase in the occurrence of site alignments, however, is due to the greater number of embankments
present among the Type B monuments. However, the greater number of embankments may be related to the desire to create more alignments. A comparison of the number of observed alignments (n=31) with the number of possible alignments (n=37), suggests that these alignments do not occur by chance, as 83.78% of the embankments and mound-to-mound sitings are aligned with other sites. As with the Type A monuments, given the pattern of alignment and the accuracy of the alignments, it is possible that the six embankments without documented alignments are actually aligned to sites that have either been destroyed or are as yet undiscovered.

The majority of the alignments are to monumental sites and sites with known subaqueous ossuaries within the KOE watershed. Twenty-three (74.19%) of the observed alignments are to Belle Glade sites, with eleven (47.82%) of them being to Type B monuments. Three of these monuments have two alignments from separate sites converging on them. Similarly converging alignments are also visible to two Calusa sites (Mound Key and Pineland), two subaqueous ossuaries (Kreamer Island and Ritta Island), and a Late Archaic shell ring (Joseph Reed Shell Ring).

These alignments suggest that these were all places imbued with meaning to the Belle Glade peoples, and that these were places that did not exist in isolation but rather were interconnected with one another. They “were part of an integrated landscape with people moving within and between them with enough regularity that sufficiently strong relations were formed and maintained to warrant their citations being monumentalized” (Lawres 2017:674). Further, because of the principle of relatedness and its underlying understanding of extended personhood and animacy, it is likely that the monuments
themselves continually formed and maintained these relations between the places on the landscape through their enduring alignments.

The agential power of these monuments is likely due to their status as sacred centers. As Deloria (2003:65–66) notes, for Native Americans, sacred landscapes have a sacred center at a particular place deemed to be especially significant. However, while Deloria describes such sacred centers as being natural features, elsewhere (Deloria 1999:327–334) he explains that sacred places gain their sanctity through different means, whether it be through a shared sense of history, religious revelation, of the residence of powerful spiritual entities. The fact that there are multiple Belle Glade monuments of similar form associated with the same material culture suggests that a shared history is exhibited in the building of monuments. Further, sacred places where religious revelations occur and where spiritual entities reside are the focus of ceremonial practices for Native Americans (Deloria 1999:329–331). The process of monumentalizing these places may have been ceremonial, especially given the circularity, both temporal and spatial, incorporated into the structure of the monuments.

Deloria states that people visit them:

> to perform ceremonies at these holy places so that the earth and all its forms of life might survive and prosper… they must perform certain ceremonies at specific times and places in order that the sun may continue to shine, the earth prosper, and the stars remain in the heavens (Deloria 1999:331, emphasis added)

This suggests similarities to the understanding of a need to maintain balance in the universe discussed above, and the presence of solar and lunar alignments suggests that the maintenance of solar and lunar journeys was a key component of both the monuments and balance. As discussed above, the Belle Glade peoples had a cognized
understanding of the relatedness between the earth, sky, and water, and this understanding, and the balance between the three, is manifest in the monuments.

As sacred centers, these monuments may have been the symbolic centers necessary for what Cajete (2000) refers to as natural orientation. This form of orientation begins with the center and then “radiate[s] out of that center to include the entire cosmos, all plants and animals, the mountains, rivers, streams, lakes, and all of those natural entities comprising the reality of a community” (Cajete 2000:157). This is also similar to the transformative model of Jojola (2004) in which the experiential journey of a community begins with a center point and radiates outward in a spiraling form over many cycles of experience and religious revelation, which according to Deloria (2003:66) is not a specific spiritual message but “a continuous process of adjustment to the natural surroundings.”

The Type B monuments encapsulate this view of “radiating outwards” through their many embankments that radiate from the semi-circles. These radiating embankments are of various sizes and lengths, further giving the appearance of them radiating. Additionally, the alignments exhibited by both the Type A and Type B monuments radiate across the landscape to create connections between places while also creating alignments with celestial bodies. Thus, the Belle Glade monuments were likely tied to the natural orientation described by Cajete (2000) because they not only include the places they are aligned to but also the celestial bodies of the sun and moon as well as everything in between the places being aligned: the water, plants, animals, spirits, and earth.
While Deloria (2003) and Cajete (2000) describe sacred centers of landscapes in the singular (i.e., a single center for a single landscape), there is a multiscalar aspect to sacred places. Ethnohistoric accounts describe the existence of multi-sited sacred places in the sacred landscape of the Muscogee Creeks. For these peoples, italwas, the Creek towns with square grounds at their center, are sacred places. It is in these square grounds that ceremonial practices are performed around the sacred fire to maintain balance in the universe (Martin 1991, 2000). There are multiple italwas throughout the Muscogee Creek world. Thus, the sacred landscape of the Muscogee Creeks is comprised of multiple sacred places.

However, their role as a sacred center is dependent on the scale at which one views the landscape. As Marquardt and Crumley (1987:8) note, when viewed from the perspective of the individual something may be a center, but when viewed from the scale of an entire group that same thing may be at the periphery. Thus, the possibility of multiple sacred centers is likely. Indeed, among the Tewa there are multiple sacred centers to the Tewa cosmos because there are multiple Tewa cosmoses (Fowles 2009, 2013; Snead 2008). The sacred centers are located in the sacred shrines in the centers of the individual Pueblos. The nested circles discussed above are defined relative to each Pueblo.

It is likely that the Belle Glade landscape was structured in a similar manner, where each monument acted as a sacred center, with each possibly doing different work. However, in the Belle Glade landscape, the sacred centers are integrated by the alignments between places. This ties to Julian Thomas’ (2001, 2014) descriptions of the relationship between place and landscape. Thomas conceives of a landscape as being:
a network of related places, which have gradually been revealed through people’s habitual activities and interactions, through the closeness and affinity that they have developed for some locations, and through important events, festivals, calamities, and surprises which have drawn other spots to their attention, causing them to be remembered or incorporated into stories (2001:173)

The alignments between the Belle Glade monuments effectively create a network of meaningful places, along with the people living in them, thus demarcating a monumental landscape of sacred places.

These sacred places do not just include the monuments themselves. While they comprise the majority of identified alignments, there are also several convergent alignments, each originating from different monuments, to sites containing subaqueous ossuaries. This suggests not only the importance of these places, but the importance of the ancestors contained within them (Lawres 2017). In addition to suggesting the presence and importance of the principles of relatedness and place-centeredness, these alignments also suggest that the principle of relatedness encompasses the relations between the living and the dead. Further, the use of the same subaqueous ossuaries over the course of generations—the dates from Fort Center demonstrate a span of use from cal. AD 180–340 to cal. AD 540–650 (Thompson and Pluckhahn 2012:59)—further substantiates the presence of the principle of place-centeredness because the dead were recurrently emplaced in the same ossuary over many generations.

Given that the principle of relatedness is performance-based, it is likely that the Belle Glade peoples visited these places to converse with the ancestors interred within the waters. While there is a dearth of ethnohistoric documents discussing the importance of ancestors to the Mayaimi and Serrope (Belle Glade), there are
documents that discuss neighboring groups—Calusa and Tequesta—and practices associated with the dead. To these two groups, the ancestors played an important role. The Tequesta are reported to have regularly visited and communed with the dead, whose remains were bundled with whale bones and placed in boxes (Worth 2014), much as Belle Glade remains were bundled with aquatic creatures and effigy carvings in water. Spanish missionaries reported that the Calusa made daily visits to cemeteries, bringing offerings and conversing with their ancestors about current and future events (Hann 2003:191, 197). There is also documentation of the Calusa belief in three souls, one of which remains in the pupil of the eye after death and another that is the reflection one sees in the water. If the peoples of the Belle Glade culture held similar beliefs and followed similar practices, then when visiting a subaqueous ossuary the visitors spirit would enter the waters where ancestral spirits resided because they remained in the pupil. While we can’t make any definitive statements about whether the Belle Glade peoples practiced the same behaviors of ancestor visitation, given the relationships between the two groups (see below) it is likely they performed similar practices.

There is also a significant number of alignments to sites outside the KOE watershed. Three of these alignments are to the Miami Circle Ditch. While it is located outside the watershed, the morphology of this circular monument suggests a strong connection with the Belle Glade peoples (Carr 1985). Further, this ditch is on a celestial azimuth relative to the Pine Island Circle, which is another circular ditch located outside the KOE watershed. This is significant because both of these ditches were built outside of the Belle Glade range, yet they both show morphological connections with the Belle
Glade monuments as well as a relationship with each other through the celestial alignment to one another.

There are also four alignments originating from multiple monuments that converge on the Joseph Reed Shell Ring. This is significant because this is a site that predates the Type A and Type B earthworks by millennia (Russo 2006; Russo and Heide 2000, 2002). However, one of the alignments originates from the mound in the geometric center of Fort Center’s Great Circle Complex and passes through the eastern causeway. This origin point is significant because the Great Circle Complex was built by cal. 800 BC (Thompson and Pluckhahn 2012, 2014). This places the Joseph Reed connection much closer in time since Fort Center bridges the temporal divide. While occupational overlap is not apparent (Joseph Reed: latest C\textsuperscript{14} assay is 2850±130 [Russo, 2006]; Fort Center: earliest C\textsuperscript{14} assay associated with Great Circle 2430±40 BP [Thompson and Pluckhahn 2012:Table 1]), this places the gap to a minimum of 10 generations. This may represent a citation to a place considered to be of ancestral significance, especially when considered alongside the alignments to subaqueous ossuaries. This further suggests the importance of ancestral relations to the Belle Glade ontology, and specifically the principles of relatedness and place-centeredness.

The alignments to Pineland, Mound Key, Key Marco, and the Naples Canal on the Gulf Coast are also significant because of their association with the Calusa. During the 16\textsuperscript{th} century, the Calusa held political dominance over the Mayaimi, exacting tribute from them (Marquardt 2014; Marquardt and Walker 2012, 2013; Worth 2014). There are seven alignments to Calusa sites, and two of the sites have multiple alignments converging on them. Further, the sites with convergent alignments are the two largest
sites associated with the Calusa. Mound Key, historically known as Calos, was the Calusa capital during the 16th through 18th centuries, and Pineland, historically known as Tampa, was the second largest Calusa village (Marquardt 1992a, 2014; Marquardt and Walker 2012; Worth 2013). However, relations with the Calusa are documented archaeologically as early as cal. AD 500 in the form of Belle Glade Plain pottery being present at Calusa sites (Cordell 2013; Marquardt 2014; Marquardt and Walker 2013). While at first this pottery was present in small frequencies relative to locally produced pottery, over time Belle Glade Plain became a prominent ceramic type at many Calusa sites. In fact, at the Pineland site Belle Glade Plain was the dominant pottery type during the Caloosahatchee IIB and III periods (Cordell 2013:Tables 7 and 8).

Thus, the alignments to Calusa sites signify important relations with political connotations as well as longstanding relations that likely shifted over time. Further, the presence of celestial alignments between the Pine Island Circle and two Belle Glade circular ditches (Davenport Circle and Hendry Circle) suggests that these relations may have begun even earlier than previously thought. While the construction dates for Davenport Circle and Hendry Circle are unknown, the chronometric data from Fort Center suggest that circular ditches were being built as early as cal. 800 BC. These alignments open up the possibility of Belle Glade-Caloosahatchee relations beginning at this time rather than cal. AD 500. Further, if Clausen and colleagues (1979) are correct, it is possible these relations are based in common kinship that dates at least to the Middle Archaic.

However, while the Mayaimi were the subjects of Calusa political control during the 16th century, this was likely not always the case. Marquardt (2014; Marquardt and
Walker 2013) argues that heterarchical political relations—“the relation of elements to one another when they are unranked or when they possess the potential for being ranked in a number of different ways” (Crumley 1995:3)—structured the political landscape of South Florida. The archaeological evidence suggests that reciprocal relations among the Caloosahatchee culture and cultural groups of the interior, including Belle Glade, emerged between cal. AD 500–800 (Marquardt 2014:13–16). During this time of lowered water tables in the Gulf of Mexico, there was a continual amplification of trade relations between coastal and interior groups as evidenced at Calusa sites by the ever-increasing amounts of Belle Glade pottery and at Belle Glade sites by the presence of shark tooth tools, lightning whelk shells, and other objects that can be found only in coastal areas. As discussed in Chapter 3, the evidence suggests that these materials were more likely to have been imported from the Gulf Coast than the Atlantic.

Thus, the initial basis for these reciprocal relationships was due to the needs of both the Caloosahatchee and Belle Glade peoples. Their economy was fueled by the typically productive but shallow waters of the estuarine environments along Southwest Florida Gulf Coast (Marquardt 2014; Marquardt and Walker 2013). However, the period cal. AD 500–800 was one of lowered sea levels and thus a time of unpredictability for the Caloosahatchee peoples that culminated in the short-term abandonment of some sites (Marquardt and Walker 2013:836). Marquardt further argues that the Belle Glade peoples would have had similar unpredictable subsistence resources during this time. This is substantiated by paleoenvironmental data showing a shift from long to moderate hydroperiods in the Everglades Trough (Willard and Bernhardt 2011). However, in the
KOE watershed, these lowered water levels and shorter hydroperiods lasted until after cal. AD 1200 (Willard and Bernhardt 2011:Figure 5).

Marquardt (2014:15) argues that a shift in these relations occurred during the Caloosahatchee IIB period (cal. AD 800–1200) due to Mississippian influences and competition with chiefdoms to the north. This shift involved the imposition of a patron-client system with the Calusa in a position of coercive power over the Belle Glade peoples. This would have been a drastic shift in political and economic relations for the Belle Glade peoples.

This shift in political relations also affected the Glades peoples to the south. Griffin (2002:158) notes that during the Glades IIc period, decorated pottery all but ceases to exist in the region. He questions the reason for this, pointing to possible explanations in environmental changes, such as sea level rise that occurred during this time, or the possibility of Calusa political expansion. It is likely the combination of the two. The rising sea levels would have disrupted the ability to acquire certain resources, possibly even forcing the relocation of settlements and cemeteries, while the Calusa expansion would have disrupted political leadership, ideology, etc.

The construction of the Type B monuments at approximately cal. AD 1000 is likely related to this shift in relations. As discussed above, the maintenance of balance in relations throughout the universe is a key theme in Native American ritual, and as noted in Chapter 5 balance is an integral core of the principle of relatedness. I have already argued that the construction of the monuments played a role in maintaining the balance in the movement of the solar and lunar celestial bodies, and thus in seasonal change and water levels throughout the KOE watershed.
Relations between and among people is an important component of a lived world, and the relationships with the Caloosahatchee peoples would have been significant because they were longstanding, and, prior to the Caloosahatchee IIB period, reciprocal (i.e., balanced). The multiple alignments to both Mound Key and Pineland, the hearts of Caloosahatchee political and economic power, were likely aimed at rebalancing the relationships between the Caloosahatchee and Belle Glade peoples. A return to these earlier relations would create balance between the Caloosahatchee and Belle Glade worlds.

This is further substantiated by the fact that the largest of the Type B monuments, Big Mound City, is located the farthest east from these sites. The size and location of this site may have been aimed at reaffirming or reinvigorating the power of the Belle Glade peoples, which is corroborated by the fact that all of the alignments exhibited by Big Mound City are to other Belle Glade monumental earthworks. Of these alignments, four are to other Type B monuments (Fort Center, Hendry Earthworks, Kissimmee Circle Earthworks, and Maple Mound), one is to a Type A monument (Barley Barber I), one is to a circular ditch (Whitebelt Circle), and one is to a large mound at the Blueberry site. Thus, these alignments encompass the full range of Belle Glade monumentality and include both contemporary and ancestral places throughout the Belle Glade landscape. Thus, building the Type B monuments was likely both a means of rebalancing the relations with the Caloosahatchee peoples as well as a means of rebalancing the relations between earth, sky, and water during a time of lowered water levels in the KOE watershed. The shift from the Type A to Type B monuments is likely related to this as well. The increasing numbers of embankments allowed for an increase
in alignments to both celestial bodies and places throughout the landscape, thus
maximizing the rebalancing of relations.

It is also notable that this a period of broad-scale changes throughout the Greater
Southeast. It is at this time, circa A.D. 1050, that the “Big Bang” of Cahokia occurred
wherein there was a rapid consolidation of power in the American Bottom (Pauketat
1997:31–32). This Big Bang was a drastic event that had broad implications. As
Pauketat (1997:32) notes:

The event brought about the abrupt and large-scale transformation of
community order, the physical landscape of Cahokia, and the entire
northern expanse of American Bottom floodplain. Large plazas were
leveled... buildings were reconstructed entirely using new (wall-trench)
techniques, domestic and community space was reordered, populations
became nucleated, and, judging by refuse assemblages, domestic
activities were altered.

It is with the Big Bang that Cahokia transformed from one of many large villages in the
American Bottom to the political, economic, social, and religious center that it is known
for (Anderson and Sassaman 2012; Pauketat 2004:9–10; Pauketat and Emerson 1997).
Cahokia became epicenter of Mississippianism, and it was from here that
Mississippianism spread throughout the Greater Southeast.

This did not happen all at once, though. Cahokia rose to its prominence very
quickly during the Lohmann Phase (cal. A.D. 1050–1100), during which its population
grew between five and ten times its previous size (Pauketat and Emerson 1997:5). This
prominence continued only until approximately cal. A.D. 1200 (the end of the Stirling
Phase, A.D. 1100–1200), and thereafter the site began to decline (Pauketat 2004:11–13).
By A.D. 1100, other Mississippian polities were beginning to coalesce, drawing on
the ideas originating from Cahokia (Anderson 1997). By A.D. 1200, as Cahokia was
beginning to decline, these other regional centers—including Moundville, Lake Jackson,
Etowah, and many others—had consolidated their power, much like the Big Bang of Cahokia, and transformed their surrounding landscapes (Blitz 2008; Knight and Steponaitis 1998; Marrinan 2012; Pauketat 2004; Smith 2000; Walthall 1980). What this suggests is that the time period of A.D. 1000–1200 was one of drastic social changes throughout the Greater Southeast, and South Florida was no exception. However, the Calusa were attempting to extend their power and consolidate the South Florida political landscape slightly earlier than places between them and Cahokia. Pauketat (1997:32–35) notes that while the types, or even the degree, of resistance to Cahokia’s power consolidation are unknown, the ramifications of that resistance are seen in the pit burials of people, many of whom were decapitated or beheaded. As discussed above, the building of Big Mound City may be seen as a form of resistance to Calusa power consolidation, a way to reconfigure the relations between Mayaimi and Calusa back towards the ancestral state. While we can not definitively affirm this, it is possible that the burials at Big Mound City were the result of a reprisal against that resistance. As discussed in Chapter 3, these burials were encountered in two separate mounds, with one mound containing just the skulls of three individuals and the other mound containing only the postcranial remains of three individuals. It is probable that these individuals were decapitated, and, given the shifting dynamics of Belle Glade-Caloosahatchee relations at this time, it is probable these decapitations were at the hands of the Calusa.

**Place-Centeredness**

While the site alignments among and between the Belle Glade monuments provide some evidence that place-centeredness formed a core principle of the Belle Glade ontology, and that this principle is materialized in the monuments, there is
another expectation for this principle. As discussed in Chapters 7 and 9, it is necessary to evaluate the monuments in terms of construction sequences to gain an understanding of whether or not the principle of circularity is tied directly to the principle of place-centeredness. While it can be said that the presence of both celestial and site alignments provides evidence that this is so, what I am referring to here is the cyclical, recurrent use of the place itself. Essentially, it is important to know whether these monuments were built over the course of many generations or whether the place itself gained its importance over the course of generations before being monumentalized in rapid fashion. This, in turn, may provide insight into how the places where the monuments were built became sacred (*sensu* Deloria 1999).

The initial data from my 2015 investigations of Big Mound City suggested the former. To reiterate, these dates were produced from carbonized wood recovered from a sediment core and a shovel test excavated directly adjacent to the core on the summit of the midden-mound. The resulting dates were intended to provide a total occupational range, which was cal. 356 BC–AD 674.

However, larger-scale excavations, in the form of a 1-x-5-m trench and a 1-x-1-m test unit placed 3 m off that trench provided evidence that did not support this occupational range. As discussed in Chapter 9, the stratigraphic profiles from these excavations, along with the materials recovered during them, show evidence that demonstrates the midden stratum is restricted to the uppermost portion of the mound, and everything beneath the midden appears to have been basket loaded in rapid fashion. This is substantiated by the AMS dates produced from carbonized wood recovered during the excavations. When sorted by depth, the 16 AMS dates produce a
zig-zagging pattern that does not meet the positive slope expected for a gradually accumulating mound. Rather, the zig-zag patterning is reflective of rapid construction of the mound, with the charred wood that provided AMS samples being associated with the sediments that were mined for construction rather than with occupational activities or even the actual construction event. Further, no cultural materials were recovered from the base of the mound. Instead, a sterile layer of muck underlies it.

These data alone suggest that Big Mound City was not built over the course of many generations. However, the lack of midden development beneath the mound prevents the view that the place itself gained its importance over the course of generations prior to monumentalization. Yet, this is only one architectural feature of the massive site.

The results of the analyses on the sediments (Chapter 10) of the embankments, semi-circle, and Mound 6 provide pertinent information for addressing this, and this information provides a view that both contrasts with and is similar to that presented by the midden-mound construction. Embankment 1 and Embankment 2 show evidence of two construction episodes. The initial episodes resulted in small (vertically) architectural features ranging from 30 to 40 cm in height. These episodes were overlain by sediments from a second building episode that increased the height of these features. Embankment 1 was raised approximately 30 to 40 cm higher, while Embankment 2 raised 20 to 30 cm higher.

In contrast, the data suggest that Embankments 3, 5, and 6, along with Mound 6 and the Semi-Circle, were all built in single construction episodes. The construction episode for these embankments resulted in architectural features that were all 40–50
cm in height. Thus, embankment construction episodes were relatively consistent in the resulting heights. Further, the data for Embankment 5 and Embankment 6 suggest that multiple parent sources were used in construction. Mound 6, however, involved a single construction episode resulting in a feature 85–90 cm in height that involved the use of multiple sediment sources.

Thus, the construction of the embankments suggests a combination of both recurrent construction (and long-term since there was a period of no construction after the initial building event) and rapid construction. Even within the embankments that were built in two events, they were just that: events. The lack of pedogenic development in the soil horizons outside of the depositional discontinuities demonstrates the rapid nature of the construction episodes.

The multiple construction episodes in these features, however, suggest that Big Mound City could fit within two of Deloria’s (1999) categories of sacred places. Big Mound City could be a place where religious revelation was experienced, which often is associated with places where spiritual relationships with non-human persons are initiated. As Deloria (1999:330) explains, these places become the focus of ceremonial practices that are aimed specifically at maintaining those relationships. This site could also be a place where a powerful spiritual entity resides and has revealed itself to human persons. Deloria (1999:331) notes that places such as this are visited by people for the purpose of communicating with those powerful entities. During these visits people “perform ceremonies at these holy places so that the earth and all its forms of life might survive and prosper… they must perform certain ceremonies at specific times and places in order that the sun may continue to shine, the earth prosper, and the stars
remain in the heavens” (Deloria 1999:331). Given the celestial aspects of Big Mound City and the other Belle Glade monuments, it is more likely that the monuments are sacred places where spiritual entities reside.

The multiple building episodes in some of the embankments also suggest that there is some amount of circularity involved. However, the duration of circularity is not yet understood for this massive site. It is still unknown whether all of the embankments were constructed simultaneously or whether the semi-circle, Embankment 1, and Embankment 2 were constructed first and then the others constructed when these features were enlarged. Further, it is not known if the embankments were built at the same time as the midden-mound. These temporal issues need to be addressed, and, as discussed in Chapter 12, this is something I intend to do in my long-term research in the region.

**Summary**

In this chapter I provided a discussion of how the data presented Chapters 8 and 10 tie to the theoretical framework outlined in Chapter 5. I showed that the spatial aspect of the principle of circularity is present in the morphology of the monuments. The circle is at the heart of the form of each monument type, and the circle gains additional significance through time, culminating in the Type B monument form that exhibits a series of nested circles in its overall design.

I also showed that the temporal aspect of circularity is materialized in the form of the Type A and B monuments as well as the locational emplacement of the circular ditches across the landscape. This circularity is evident in the celestial alignments exhibited by the monuments and their locations. Further, these alignments suggest an intricate knowledge of time, seasonality, and the patterned movement of celestial
bodies. This knowledge is cognized in the Belle Glade ontology and played an important role in dwelling within the KOE watershed because of the relatedness between the earth, sky, and water, all of which exhibit highly visible relationships in this region. The celestial alignments in the monuments are likely related to maintaining balance in those relationships.

The principles of relatedness and place-centeredness were shown to be present in alignments between and among the monuments throughout the landscape, as well as alignments to important places outside of the KOE watershed. The alignments suggest the relatedness of places throughout the landscape as well as the people that lived in these places. These alignments were also likely associated with maintaining balance in the relations between people, or possibly rebalancing relationships that had drastically shifted. Place-centeredness was also shown to be present in the construction of the monuments, and that place-centeredness is likely based on the monuments’ status as sacred places.

This all shows that the core principles of the Belle Glade ontology—relatedness, circularity, and place-centeredness—are all materialized in the Belle Glade monuments. In Chapter 12, I provide some concluding remarks and a discussion of future research trajectories.
Chapter 12
CONCLUSIONS AND FUTURE RESEARCH

Throughout the pages of this dissertation I have explored numerous aspects of the Belle Glade archaeological landscape. I began by looking at the environmental context within which this culture was situated. This involved exploring the Kissimmee-Okeechobee-Everglades (KOE) watershed by elucidating the hydrological characteristics of this region as well as detailing the specific types of ecosystems present within the watershed. With this context established, I then delved into various aspects of the Belle Glade culture by describing some of the main features of the culture, including subsistence and settlement patterns, social organization, mortuary practices, various technologies used by the Belle Glade peoples, and the monumental architecture they built.

This monumental architecture was the primary focus of this work, and thus I then provided detailed descriptions of the primary types of architecture built by the Belle Glade peoples. In doing so, I reviewed the ways previous researchers have interpreted the different types of architecture, elucidating the issues with those interpretations before providing a new argument regarding the role of the architecture in Belle Glade culture, and, more specifically, why it was built in such a distinctive fashion and in unexpected environs.

My argument regarding these distinctive monumental forms was that they are materializations of three ontological principles—relatedness, circularity, and place-centeredness—and that they materialized these principles in very specific ways that are tied to the specificity of the Belle Glade lived world. However, defining the ontology of a cultural group that no longer exists is no easy task, especially when ethnohistoric
documentation is extremely limited and no ethnographic accounts exist. Further, it is not possible for anyone to have a full comprehension of an entire ontology.

However, surveying the philosophical literature of Native American groups throughout North America for information regarding how they understand their realities to exist and operate provides the opportunity to define core ontological principles that crosscut cultural boundaries. Further, by identifying such cross-cultural principles among numerous groups that share an ancestral population adds the necessary time-depth to the principles. This research identified three core principles that are found among Native American groups throughout the North American continent: the principle of relatedness, the principle of circularity, and the principle of place-centeredness.

I argued that these three principles are materialized in the Belle Glade monumental architecture. However, because of the lack of ethnohistoric and ethnographic documentation of the Belle Glade peoples and their ontology, it was necessary to evaluate their material culture and practices for additional lines of evidence for the existence of these principles in the archaeological record associated with these people. Further, because very few researchers have evaluated monumental architecture in terms of ontologies before, and because of the contexts provided by the Belle Glade architecture, it was necessary to develop some expectations and the methods to test for them. The results of these analyses identified the presence of all three principles in all three of the major types of Belle Glade monumental architecture.

The principle of circularity is exhibited in two forms: spatial and temporal. The spatial aspect of circularity is exhibited in the morphology of the monuments. The circle is at the heart of all three monument types, and the circle seems to gain increased
significance through time, culminating in the Type B circular-linear earthworks incorporating a series of nested circles into their form. The temporal aspect of circularity is exhibited by alignments to celestial events—solstices, equinoxes, and lunistices—in the Type A and Type B earthworks' linear embankments and semi-circles, as well as in the locational emplacement of circular ditches across the landscape, all of which are aligned with one another along azimuths associated with the same celestial events.

The principle of relatedness is exhibited in two ways. First, it is demonstrated by the form of the monuments and their locational emplacement within flowing-water ecosystems. This choice of location creates and maintains enduring relations with the waters of the KOE watershed. The specific form and orientation of the monuments allows water to enter the large semi-circular embankments of the Type A and Type B earthworks to flow around the midden-mounds where people were living. Further, the form of the circular ditches created and maintained relations with water by drawing water into the ditches and retaining it during an arid period.

The second way the principle of relatedness is demonstrated is through alignments to other sites, which also provides evidence for the principle of place-centeredness. As mentioned above, the circular ditches are emplaced across the landscape in a manner so that they are located relative to one another along azimuths associated with celestial events. The Type A and Type B circular-linear earthworks, on the other hand, provide a more direct means of creating alignments. The linear embankments of these architectural features literally point at other sites in many cases, whereas in other cases a line connecting the two ends of the semi-circles creates an alignment. The majority of these alignments are to other Belle Glade monumental
architectural sites or Belle Glade subaqueous ossuaries. However, there are also examples of longer distance alignments to sites along the Atlantic Coast that exhibit similar morphologies and to sites along the Gulf Coast associated with the Calusa, with whom the Belle Glade, or Mayaimi, peoples, had longstanding relationships.

Place-centeredness is also exhibited in the ways that the monuments were built. Using Big Mound City, the largest of the Type B circular-linear earthworks, as a case study, I evaluated the construction sequence to test whether the architecture was constructed over the course of multiple generations and involving many construction episodes or whether it was constructed rapidly. The implications for such an evaluation relate to how Native Americans conceive of the ways places become sacred and thus act as sacred centers of a landscape. In the case of Big Mound City, the evidence shows rapid construction using multiple building episodes, which, given the many other lines of evidence regarding this monument type, suggests it may have become sacred due to its being the residence of a powerful spiritual entity.

This research set out to address two questions: (1) What underlying structures informed Belle Glade monumentality and why did it result in such distinctive monumental forms? and (2) How were the Belle Glade monuments built? The first question was successfully addressed. The evidence garnered from the morphological, archaeoastronomical, locational, and alignment analyses all points to the presence of the three core ontological principles being materialized within the Belle Glade monumental architecture. Thus, the answer to this is that the core ontological principles of the Belle Glade peoples were the primary informing structure of their monumental practices. The Belle Glade peoples lived in a world composed of an aqueous
landscape, and this landscape provided highly visible portrayals of the principles of relatedness and circularity as well as the interrelationships between the two. Based on their lived experience and daily observations over the course of their lifetimes, as well as through cultural transmission, the Belle Glade peoples understood how their lived world existed and operated. Further, people and the places they lived played an important role in that lived world. They created and maintained relations with people throughout the landscape, and those relations played a large role in the existence and maintenance of the Belle Glade world. Non-human persons also held an important status, and the development of positive, enduring relations with them was also an essential component of the Belle Glade world. Thus, places where these relationships were formed and maintained helped to form the basis of place-centeredness. These three principles informed the structure of the monuments and resulted in a distinct monumental form.

These ontological principles would also have been socially significant (Lawres 2017). Because they would have acted as organizing principles for how the Belle Glade peoples understood their world to exist and operate, it is likely that the majority of the Belle Glade population would have held them in common. In turn, this would have provided some common ground between people within and between communities. As organizing principles, they also would have contributed to cultural transmission as young community members were taught about their world, its operation, and its maintenance.

As enduring features of the landscape that materialized these principles, the monuments may have also served as a medium of cultural transmission. Because they
were enduring features of the landscape it was possible for multiple generations to view them and visit them. As the role of the monuments was described to new visitors they would also be learning about the ways in which their world worked. The materialization of these principles in such monumental forms is a testament to the importance of the principles themselves. Indeed, the knowledge of the relatedness between the earth, sky, and water, and circularity of the seasonal changes that affect the amount of water on the landscape and thus the behaviors and distributions of animals across that landscape would be an essential component of daily life as a fisher-hunter-gatherer in the KOE watershed. Additionally, knowing which communities have positive or negative relationships with your own community would be important not only socially, but politically and culturally as well. During times of stress, knowing which communities have positive relationships with your own can be the difference between starvation and survival.

The second research question—How were the Belle Glade monuments built?—was only partially addressed. The evaluation of the construction sequence at Big Mound City was aimed at providing a case study for addressing this question. This project was initially designed around obtaining the necessary data to estimate the labor force involved in construction, but the characteristics of the architecture, such as the lack of visible stratification in the stratigraphic profiles and the inability to identify a buried A Horizon beneath the architecture, prevented obtaining the necessary data through traditional means. Thus, the project was redesigned in collaboration with soil scientists to find alternative means of identifying breaks in the construction sequence, which also lead to identifying the initial ground surface the architecture was built on. The methods
used in this research were successful in identifying breaks in the construction sequence of several architectural features at Big Mound City, as well as the use of multiple source materials for construction in two features. This is the first study that was able to successfully do so, and thus contributes to our understanding of how the Belle Glade monuments were actually constructed and the labor force involved in that construction.

**Future Research.** There is still a large amount of work to be done in regard to gaining a more holistic understanding of Belle Glade monumentality and the Belle Glade ontology. While this research has identified three of the core principles of the Belle Glade ontology through the study of monumental architecture and how those principles are materialized in the architecture itself. However, these are only a core portion of the ontology. Future research into the Belle Glade archaeological culture will seek to identify additional evidence that substantiates these core principles as well as to identify other principles not found in the architecture itself.

Further, this is one of the few attempts to relate ontologies to monumentality, and as I have shown, approaching monumental architecture from an ontological framework can be useful. As I have noted elsewhere (Lawres 2017), this approach is also useful in bringing us towards a more meaningful understanding of monumental architecture because it uses Native concepts, which brings us closer to how the people who actually built the monuments would have understood them. This approach should be used in other regions as well because of the structural relationship between ontologies and cultural practices, including those surrounding monumental construction. However, the specific morphology of the Belle Glade monuments required a specific analytical approach that may not transfer easily to other regions. Even so, the combination of the
approach presented here with those of other researchers in the ontological turn may prove to be a useful framework.

Any future research into ontologies needs to heed the criticisms of the ontological turn and take them to heart. As I argued in Chapter 5, these criticisms bring up important points for us to consider, and we need to incorporate new critical approaches to ontologies to bring this framework forward. I have offered a first step towards this, but additional work in this regard needs to be done to truly move the ontological turn forward in anthropological research.

There is further work to be done to understand the practices surrounding the actual construction process as well. The method developed for identifying pauses in the construction sequence of Big Mound City’s architecture is an effective starting point in understanding Belle Glade construction practices as a whole. This method identified two construction stages in many of the architectural features at this site as well as lithologic discontinuities that can be attributed to the use of multiple parent materials (i.e., different sediment sources) used in construction. However, the ultimate goal I have for understanding the construction process is to understand the labor force involved in building such grandiose architecture.

While the actual size of the labor force cannot be determined, an architectural energetics assessment can provide a strong estimate of the amount labor hours put into building the different architectural features and for the site as a whole. Architectural energetics “involves the quantification of the cost of construction of architecture into a common unit of comparison—energy in the form of labor-time expenditure” (Abrams 1994:1–2). The labor-time expenditure is typically presented as person-hours. The basis

However, traditional methods of volumetric calculations are known to produce exaggerated volumes (Lacquement 2009, 2010; Magnani and Schroder 2015). This is because solid geometry formulas rely on shapes that are generally similar to the architecture, a practice that fails to account for asymmetries, subtle architectural elaborations, and shapes that are too complex to rely on a single formula. The latter is a specific concern in the case of the Type A and Type B monuments. A gridding method, which divides the architectural form into equal cubic sections, is the most accurate for use in such cases (Lacquement 2009, 2010). This method, which accounts for complexities and asymmetries, will be used to calculate volumetrics using Agisoft’s Photoscan Pro software.

Estimates for the excavation and transportation of sediment will be drawn from experimental data (Erasmus 1965) and United Nations data (ECAFE 1957). Erasmus’ (1965) data is drawn from experiments with contemporary Maya laborers for the excavation (0.52 m$^3$ per hour) and transport of sediment (0.63 m$^3$ per hour at a 50-m distance). His excavation rate is used in the majority of architectural energetics studies (Abrams 1989, 1994; Abrams and Bolland 1999; Arnold and Ford 1980; Bernardini 2004; Carmean 1991; Craig et al. 1998; Erasmus 1965; Hammerstedt 2005; Kolb 1994). Following Bernardini (2004), I will use an average of Erasmus’ (1965) 50 m
transport data (1.6 person-hours/m³) with the UN’s 50 m data (1.4 person-hours/m³); this average (1.5 person-hours/m³) is divided by 5 to break it down to 10 m of transport for a rate of 0.32 person-hours/m³ for every 10 m of transport.

This shows that several lines of data are needed to complete an architectural energetics assessment. First, volumetric measurements of the architecture are required. Currently, the LiDAR data for Big Mound City are insufficient for this, but Palm Beach County just completed a new LiDAR survey that is of higher resolution (10 points per m²) than what is currently available and was conducted in consultation with the County Archaeologist, Christian Davenport, who is familiar with the archaeology of the region and is preventing the same post-processing issues found in the current FDEM data (personal communication, Davenport, 2018). These data are currently in the processing phase and should be available soon. With the high resolution of these data, it should be accurate enough to provide volumetric measurements of the architecture.

Second, the transport distance of the source sediments needs to be known. Longyear (n.d.) noted the presence of ditches along the sides of the embankments of Fort Center’s Type B monument. This may be the case at Big Mound City as well. Addressing this will involve conducting trench excavations on the embankments. These trenches will be placed perpendicular to the embankments and extended far enough beyond the edges of the embankment itself to identify the characteristic dip and rise of ditches. If such evidence is found, calculating the transport distance of the sediments will be easy. If it is not found, then a large-scale soil survey will be required. This survey would focus on the J.W. Corbett Wildlife Management Area (WMA) and would require a continued collaboration with the University of Florida Environmental Pedology and Land
Use Laboratory. The survey would utilize the same methods of micromorphological characterization used in identifying the pauses in the construction sequence in this study. However, the goal would be to identify soil families based on these characteristics similar to the fabric families used in provenance studies of pottery and lithics. The survey itself would sample numerous areas on the WMA to create a database of these soil families for comparison to the characteristics of the architectural sediments to try to identify potential source areas.

Third, the process of construction likely involved more than just piling sediment in straight lines. As mentioned in Chapter 11, it is possible that constructing the architecture along celestial azimuths involved using a combination of direct and indirect observation methods. One possibility is that a series of posts could have been emplaced on the initial ground surface prior to actual construction. Testing this possibility would require long excavation trenches into the summit of the embankments. In contrast to the trenches discussed above, these would have to be parallel to the embankments. The excavations would be brought down to the original ground surface. The identification of such posts would be easy because of the coloration of the sediments used in construction, which are very light in color. Post molds would provide a stark contrast to this coloration.

Fourth, there is a lack of knowledge regarding the temporality of construction at Big Mound City. While we know the earliest possible construction of the midden-mound, there have been no dates produced from the other architectural features. Because we are not able to directly associate any carbonized materials found in the embankments or other architectural features to construction (i.e., it could very easily be associated with
random natural events because the sediments are mined), optically stimulated luminescence (OSL) dating is the best available method.

I intend to obtain sediment samples for optically stimulated luminescence (OSL) dating of the interface between the original ground surface and the initial deposition of the earthen structure, as well as the interface of the first and second construction episodes, to address this. Luminescence is the emission of light from crystalline materials, such as quartz or feldspar, after stimulation by heat or sunshine (Duller 2008; Feathers 2003; Liritzis et al. 2013). The light stems from the release of a trapped charge in crystalline defects that has accumulated from the absorption of natural radioactivity. Its intensity is proportional to the amount of absorbed dose and can be related to time by measuring the dose rate, which in most cases is fairly constant through time. The amount of absorbed dose is calibrated as an equivalent dose, and dividing that by the dose rate yields the time elapsed since the material was last emptied of trapped charge by heat or light (Bush and Feathers 2003; Duller 2008; Liritzis et al. 2013; Roberts 1997). Thus sediments can be dated to the time of burial if they were exposed to sufficient sunlight during their deposition and have not been exposed since then.

OSL has been applied to dating surfaces under mounds in Louisiana and Florida (Bush 2008; Bush and Feathers 2003; Feathers 1997; Pluckhahn et al. 2015). The rationale here is that if the surface has been exposed for sufficient time, then some grains in the top stratum, through bioturbation or water disturbance, will find their way to the surface and be exposed to light (even to some degree if the surface has been inundated by water) (Bush and Feathers 2003). This process ends with the deposition of sediments during construction. Therefore, some grains in this top stratum will have
been “zeroed” before construction began, providing a direct age for construction. Isolating these well-exposed grains requires single-grain dating (see Feathers et al. 2015 for an application of this method to dating rock features).

Prior to this study, this method would not have been possible. There are no buried A Horizons directly beneath the architecture. Rather, the original ground surface is contained within the same horizons visible in the architecture. Further, due to the lack of visible stratification additional construction episodes were unable to be defined prior to this study. Armed with the knowledge of vertical locations of the original ground surface and the second construction episodes relative to the overall profile, I plan to obtain sediment samples for OSL dating. These samples can be collected in either the perpendicular or parallel trenches discussed above.

Additionally, the question arises as to whether the inhabitants of Big Mound City were the only people involved in construction or not. Hernando de Escalante Fontaneda’s historic account states the inhabitants around Lake Okeechobee lived in villages of between 20 to 40 inhabitants (Worth 2014:201). Based on this account and the number of Belle Glade sites in the Okeechobee Basin, archaeologists have estimated the region to contain a total population of between 1,500 (Widmer 1988:275) and 2,500 (Hale 1984:184). Widmer (2002:384) is the only one to attempt refining the population estimates using archaeological data. Because of the presence of numerous postmolds and an outline of a structure at the Belle Glade site, he used Naroll’s (1962) formula, assuming 10 m² of roofed area per person, to estimate a population of 62–125 inhabitants. However, he does not describe how he came to this specific figure, which is problematic because it assumes a continuous distribution of structures across the
midden-mound, and this contrasts with the published description of postmold distributions (see Willey 1949:19). For Fort Center he used a different approach. He assumes that all of the conical mounds provided foundations for a single living structure, and that each of these structures was inhabited by a family of five. Based on these assumptions he notes that “Fort Center would have a population of around sixty-five if all the mounds were contemporaneous” (Widmer 2002:384). However, as Widmer notes, the mounds were not contemporaneous at this site. Thus, the estimate of 65 is a maximum number of inhabitants and since the mounds were not contemporaneous, this should be considered an overestimate.

Additional excavations on the midden-mound can aid in assessing the population of Big Mound City. These excavations will be designed as area excavations, covering larger horizontal extents with the goal of identifying evidence of structures. They will also be shallow. The midden stratum of this site is vertically restricted, and since the goal is to identify evidence of structures there is no need to excavate far below the midden as I did in the previous excavations. The post molds are expected to descend out of the midden stratum and should thus be easily identifiable if the excavations only reach to 100 cm below the ground surface. Two 10-x-10-m blocks or four 5-x-5-m blocks, divided into 1-x-1-m units, on the summit of the midden-mound should suffice for this.

Following excavations at Big Mound City, I plan to expand my work to include other sites on the J.W. Corbett WMA. This WMA is more than 60,000 acres in size, and the Florida Master Site File (FMSF) records more than 50 sites on the property. The majority of these sites are either small Belle Glade settlements or resource extraction
camps, but there are several other sites with monumental architecture as well. However, archaeological investigations of these sites have been restricted to surface surveys. Additionally, there are numerous sites on the DuPuis Management Area (South Florida Water Management District) that is located directly adjacent (west side) to the J.W. Corbett WMA. Like J.W. Corbett, the sites on this property vary from small extraction camps to settlements to monumental earthworks.

My long-term goal is to conduct subsurface surveys on these sites along with targeted block excavations on select sites to address five interrelated research questions: (1) What are the population dynamics and interrelationships between monumental and non-monumental sites? (2) Do Belle Glade settlement patterns differ on the east side of Lake Okeechobee in comparison to the West and North sides of the lake? (3) Did the people in this area develop different relationships with their environment than their counterparts in other areas of the Belle Glade region (4) How do sites east of Lake Okeechobee articulate with the regional and interregional networks of interaction and power relations? and (5) Are there visible temporal changes in environmental relationships, land-use patterns, population sizes, and networks in this area of the Belle Glade region?

These are all questions pertinent to our understanding of the Belle Glade archaeological culture. As discussed in Chapter 1, the Belle Glade culture is one of the least understood archaeological cultures in Florida, and our current knowledge base of the culture is biased because of the focus on the Fort Center data. The Tribal Archaeology Section of the Seminole Tribe of Florida’s Tribal Historic Preservation Office has begun to rectify this issue with their studies of the many Belle Glade sites on
the Brighton Seminole Indian Reservation on the northwest side of Lake Okeechobee.

The work of Bill Locascio and his program at FGCU, along with colleagues Matthew Colvin and Christian Davenport, has begun to tackle similar questions for the area south and southeast of Lake Okeechobee. My work with Matthew Colvin on the KORES project has also begun to address the issue of temporal variation in monumental architecture across the region.

However, the Belle Glade area on the east side of Lake Okeechobee has seen minimal work outside of the surface surveys of Palm Beach County’s County Archaeologist, Christian Davenport. My collaboration with Davenport will be extended to address the questions posed above for the eastern portion of the Belle Glade archaeological region. This long-term research program will go a long way in creating a much more holistic understanding of the Belle Glade culture and how it relates to the neighboring Glades and Caloosahatchee cultures, the regional network of power relations and the rise of Calusa political dominance, and how South Florida as a whole fits within the broader framework of Southeastern archaeology and fisher-hunter-gatherer complexity.
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BIOGRAPHICAL SKETCH

Dr. Nathan R. Lawres began his anthropological career at the University of Central Florida in Orlando, where he received a Bachelor of Arts in anthropology with honors in the major. His honors thesis, *Native and African Cultures and Their Resistance to Oppression in Florida Prior to 1850*, focused on the patterns of combat behaviors employed by Native Americans and their African compatriots in resisting European and American subjugation, with particular attention paid to the Seminole Wars in Florida.

Dr. Lawres continued his education at University of Central Florida, obtaining a Master of Arts in anthropology from the institution. His thesis, “*You Have Guns and So Have We*”: An Ethnohistoric Analysis of Creek and Seminole Combat Behaviors, built upon the foundation laid by his honors thesis. It focused specifically on the combat behaviors and battlefield practices employed by the Seminole Indians of Florida, Muscogee Creeks, and Apalachee Indians. Using a classificatory model that focused on the specific battlefield practices, their specific contexts, and the environments in which battles were waged, he was able to document the evolution of the specific tactics used by the Seminoles that resulted in the longest and most costly war the U.S. had fought: the Second Seminole War. While pursuing his M.A. degree, Dr. Lawres worked for the Seminole Tribe of Florida’s Tribal Historic Preservation Office (THPO), holding several positions within his tenure there ranging from archaeological field technician to a BIA-sponsored joint position in both the THPO and Forestry Offices to a management position in the THPO’s Tribal Archaeology Section.

Dr. Lawres joined the University of Florida Department of Anthropology’s doctoral program in fall 2013. His dissertation work focused on garnering a more thorough
understanding of the Belle Glade monumental architecture of South Florida by incorporating Native ontological concepts to their interpretation. During his time at University of Florida, Dr. Lawres worked as a research assistant, teaching assistant, and teaching associate/instructor of record, instructing students in World Archaeology, Language and Culture, Rhetoric in Academic Writing, and Professional Writing in the Disciplines, and aiding in archaeological field investigations in South Florida and Ethiopia. He also worked as a curatorial assistant in the Florida Museum of Natural History, working in the South Florida Archaeology Collections and the Florida Ethnographic Collections. Additionally, he worked as a research assistant on a collaborative project with researchers in the College of Design, Construction, and Planning evaluating the statewide GIS databases of archaeological and historic resources.

Dr. Lawres received his Ph.D. from the University of Florida in the spring of 2019. His dissertation, Engaging the Monumental Through the Ontological: The Belle Glade Monumental Landscape of South Florida, was supervised by Dr. William H. Marquardt.