EVIDENCE FOR LARGE-SCALE RAPID CONSTRUCTION IN A BELLE GLADE MONUMENT: BIG MOUND CITY REVISITED

Nathan R. Lawres [1] *and Matthew H. Colvin* [2]

[1] *Department of Anthropology, University of West Georgia, Carrollton, GA 30118, nlawres@westga.edu*
[2] *Department of Anthropology, University of Georgia, Athens, GA 30602, mhcolvin@uga.edu*

Introduction

In this article, we focus on the question of how monumental architecture of the Belle Glade culture was built. To do so, we focus on the Big Mound City site (8PB48) in Palm Beach County. In contrast to Fort Center (8GL13), Belle Glade (8PB40/8PB41), and other sites in the region, Big Mound City provides detailed evidence for large-scale, rapid construction events of architectural features of monumental proportions. To demonstrate this, we focus on a single architectural feature of the site: the midden-mound (Mound 4). Drawing on results of recent excavations, we present stratigraphic, pedogenic, and chronometric lines of evidence to support an argument for rapid construction.

Background

The Kissimmee-Okeechobee-Everglades (KOE) watershed has long been considered an understudied region in Florida archaeology (Griffin 2002:140; Johnson 1991:1-3; Lawres and Colvin 2017; Milanich 1994:281; Milanich and Fairbanks 1980:181). Archaeologist John Griffin (2002:140) wrote that it is "the least known of the South Florida areas." Yet, the region offers a distinctive landscape in North America (Schwadron 2010:114; Widmer 2002:374) that warrants more attention than it has received in the past. Its environment is a vast freshwater landscape stretching north-south approximately 400 km (250 mi) across peninsular Florida (McPherson and Halley 1996), with water flowing from north to south most of the year. Throughout this watershed, the dominant ecosystems have long hydroperiods, and upland ecosystems are restricted to small topographic rises called tree island hammocks.

The people who inhabited this watershed, known to archaeologists as the Belle Glade archaeological culture, practiced a way of life that provides a stark contrast to contemporaneous groups throughout the interior Southeast (Schwadron 2010; Widmer 2002), and this way of life was entangled with the environmental characteristics of the watershed. Instead of an agricultural focus supplemented by hunting, fishing, and gathering, they focused heavily on fishing supplemented with gathering and hunting (Hale 1984, 1989; Johnson 1990, 1991; Milanich 1994:279-298; Thompson et al. 2013; Thompson and Pluckhahn 2014; Widmer 1988, 2002). With the exception of the Lake Wales Ridge, they placed many settlements on tree island hammocks dotting the landscape because these provided the only naturally occurring dry ground.

Belle Glade people almost exclusively manufactured plain pottery rather than decorated wares (Porter 1951; Sears 1982). While they did inter deceased individuals in mortuary mounds, they also practiced subaqueous burial (Davenport et al. 2011:484, 518-519; Hale 1989:161), a practice shared by the Early and Middle Archaic peoples of peninsular Florida (e.g., Windover Pond, Republic Groves, Bay West, and Little Salt Spring). Further, though they did not practice agriculture (Johnson 1991; Hale 1989; Thompson et al. 2013), they reached a level of cultural complexity often overlooked.

Goggin and Sturtevant (1964:196) emphasized the tremendous size of earthworks, such as Big Mound City, and wrote: "These large construction efforts suggest the necessity for organized leadership for planning and execution, as well as many workers to carry out the tasks and to be fed while they did so." Milanich and Fairbanks (1980:181) noted: "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."

While the KOE region is less understood than most other areas of Florida, this is beginning to change. Previously, most of our knowledge about Belle Glade archaeology stemmed from Stirling's work at the culture's type site (Stirling 1935; Willey 1949) and Sears and colleagues' work at Fort Center (Sears 1982), with several articles, theses, and dissertations providing the basis for a more regional perspective (Austin 1996, 1997; Carr 1985; Carr et al. 1995; Hale 1984, 1989; Johnson 1990, 1991, 1994, 1996; Mitchell 1996). However, over the past decade there has been a renewed concern with Belle Glade archaeology, resulting in an increase in research. Thompson, Pluckhahn, and colleagues (Pluckhahn and Thompson 2012; Thompson et al. 2013; Thompson and Pluckhahn 2012, 2014; Thompson 2015), along with Austin (2015) and Colvin (2015, 2016), have reinvestigated Fort Center. Locascio and Colvin (2017, 2018) have initiated long-term research on Late Archaic to Early Woodland sites southeast of Lake Okeechobee, such as Wedgworth site, while Davenport and colleagues have concentrated on sites east of Lake Okeechobee and organized conference symposia on the region (Davenport 2016; Green and Smith 2018).

In 2015, the authors initiated the Kissimmee-Okeechobee Regional Earthwork Survey (KORES) project to gather data related to Belle Glade monumentality. This project is aimed specifically at taking a regional perspective on the practices surrounding monumental construction in the KOE watershed and includes several overarching research questions: "How do the monumental architectural constructions of the region relate to each other temporally? Do they conform to the temporal patterns exhibited at Fort Center? Are there any temporal disjunctures in the construction of multifaceted monumental architectural features… or were they constructed as a singular event?" (Lawres and Colvin 2017:63). This article focuses on the latter question by addressing how Belle Glade monumental architecture was built.

Despite many studies of Belle Glade monumental architecture (e.g., Carr 1985, 2016; Carr and Steele 1992, 1994; Carr et al. 1995; Carr et al. 1996; Colvin 2014, 2015, 2016; Hale 1984, 1989; Johnson 1990, 1991, 1994, 1996; Lawres 2015, 2016a, 2016b, 2017; Lawres and Colvin 2016, 2017; Sears 1982; Thompson 2015; Thompson and Pluckhahn 2012, 2014), there has been minimal discussion of construction sequences or processes (Lawres et al. 2018). This is something to address as the question ties to broader anthropological concerns of complexity among fisher-gatherer-hunter and hunter-gatherer societies (*sensu* Marquardt 1985).

Belle Glade Monumental Construction

Much of our knowledge of Belle Glade architectural construction stems from Stirling's work at the Belle Glade site (Willey 1949) and Sears's (1982) work at Fort Center. However, this knowledge is limited. Stirling's investigations at Belle Glade included excavations in the midden-mound and burial mound. The only publications from the research were a preliminary report by Stirling (1935) and a summary by Willey (1949).

The investigation of the Belle Glade midden-mound gave the impression of gradual accumulation rather than intentional construction. Willey (1949:19) noted that while stratification in the mound was visible, it did not correlate to "any structural features or changes in cultural material." He stated that Stirling only discussed two lines of evidence for intentional construction:

> A great number of house posts were uncovered during the excavation. The position of these in the ground gave little information about the house plans beyond showing a rectilinear type of construction…. On the south part of the mound (habitation mound) there is a slight elevation about 2 feet higher than the general level of the mound that may represent a platform upon which a structure was built. [Stirling 1935, in Willey 1949:19]

Stirling did not conduct excavations in this elevated portion of the mound. Further, he did not discuss stratification in the mound, except to note that none was visible. The only stratification that Willey (1949) discussed was the vertical positions of ceramics as a means to delineate the culture-historical sequence.

In contrast, investigation of the burial mound provided a view of multiple construction events and occupation levels throughout its history. Willey (1949:20-22) described an initial ground surface that was occupied, and upon this surface a burial mound was built of muck soils. On top of this mound, a series of limestone slabs created a pavement of sorts. A sand mound built on top of this appears to have been washed by a flood. The remnants of this mound then became an occupational area for an unknown time before a third mound was built over what was likely the center of the second mound. While this work provides a good, broad picture of the construction sequence and history of use for the burial mound, the lack of radiocarbon dating at the time of Stirling's excavations limits our temporal understanding of the sequence.

Sears's (1982) work at Fort Center in the 1960s and 1970s provides a broader picture of Belle Glade monumental construction practices because of the long-term, intensive excavations he conducted. His investigation included excavation of 18 architectural features, which he called "artificial structures" (mostly mounds and linear earthworks or "causeways"). However, Sears does not delve into details of construction except for brief hints. For example, in a discussion of Mound 1 and its associated linear earthworks, he states:

> Essentially, the picture is one of a low sand mound built by throwing soil to the inside of a circular ditch. It was built to approximately its present height to support a single structure… [that] probably had a floor level close to the height

> of the present mound surface. Some debris, in aiding humus development, probably added a few inches to mound height. [Sears 1982:132]

His descriptions of other architectural features provide a much different view that involves alternating sequences of occupation and small-scale construction. This form of construction resulted in anthropogenic midden strata separated by thin lenses of sand devoid of cultural materials.

The most detailed account of construction activities that Sears provides is related to the Mound-Pond Complex, where he discusses the entire complex based on stratigraphic ties between sediment sources and architectural features. However, there is no discussion of temporality, simply a description of the movement of sediments from one area to another to build an architectural feature. He discusses different occupation levels and activities that led to discolorations or stains in these levels, but he did not focus on the construction sequence of architectural features. Thus, we are not able to discern construction events or to determine if they were rapid or long-term and repetitive.

With the exception of his brief description of the construction of Mound 1, Sears (1982) gives an overall impression of long-term construction activities at Fort Center. Thompson and Pluckhahn (2012, 2014) build upon that view. They specifically state that at Fort Center "many earthworks demonstrate an extended history of construction and use" (Thompson and Pluckhahn 2012:62).

Big Mound City

Environment

Big Mound City is in the J. W. Corbett Wildlife Management Area, managed by the Florida Fish and Wildlife Conservation Commission (FWC), in Palm Beach County (Figure 1). It is 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; Wheeler et al. 2019). 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 very low

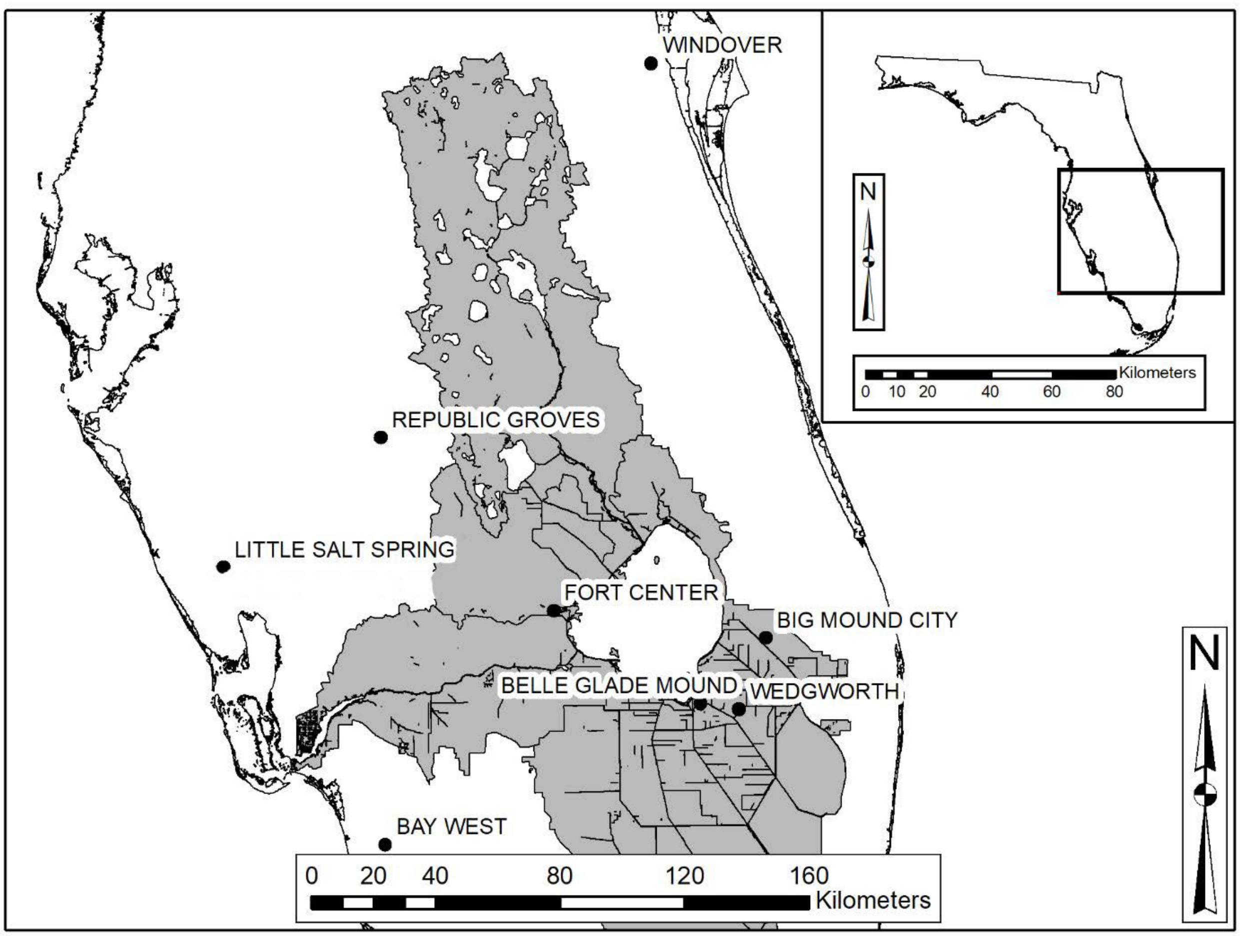

Figure 1. Florida Sites Mentioned in the Text.

topographic relief, with an average elevation above mean sea level of 7.6 to 9.1 m (25 to 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).

Big Mound City is characteristic of what Johnson (1991, 1996) labels Type B circular-linear earthworks. It contains a large oblong midden-mound partially enclosed by a large semi-circular embankment, from which multiple linear embankments project outward (Figure 2). In total, there are 39 known architectural features at Big Mound City (Rochelo et al. 2015). They consist of 28 mounds, the semi-circular embankment, and 10 linear embankments. Of the linear embankments, seven are attached to the semi-circle, while three are detached. With an architectural footprint of 81,884 m^2, Big Mound City is the largest of the Belle Glade monumental earthworks (Lawres and Colvin 2017:64).

The entirety of Big Mound City is comprised of earthen architecture. Every elevated landform is architecture in the confines of several flowing-water ecosystems. They include cypress sloughs, the Allapattah Slough or Allapattah Flats (Davis 1943; White 1970), and cypress swamps. For approximately nine months of the year, these ecosystems are inundated by water that is in many places over 1 m (3 ft) deep (McVoy et al. 2011). In some places, the water depth reaches nearly 2 m (6 ft).

Early Work

Matthew Stirling, as part of the Federal Emergency Relief program, conducted the first excavations at Big Mound City in 1933 and 1934 (Stirling 1935). This project involved excavations in 11 mounds and the survey and detailed topographic mapping of the site, but otherwise produced limited information. Stirling (1935) published only a brief description of the project in his report to the Smithsonian Institution.

It was not until Willey (1949) published *Excavations in Southeast Florida* that any substantive information about the site was put in print. Even this is limited because very few collections remained from the excavations. The only part of the collections available to Willey for analysis was a handful of sherds from Mound 9. Willey stated:

> 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

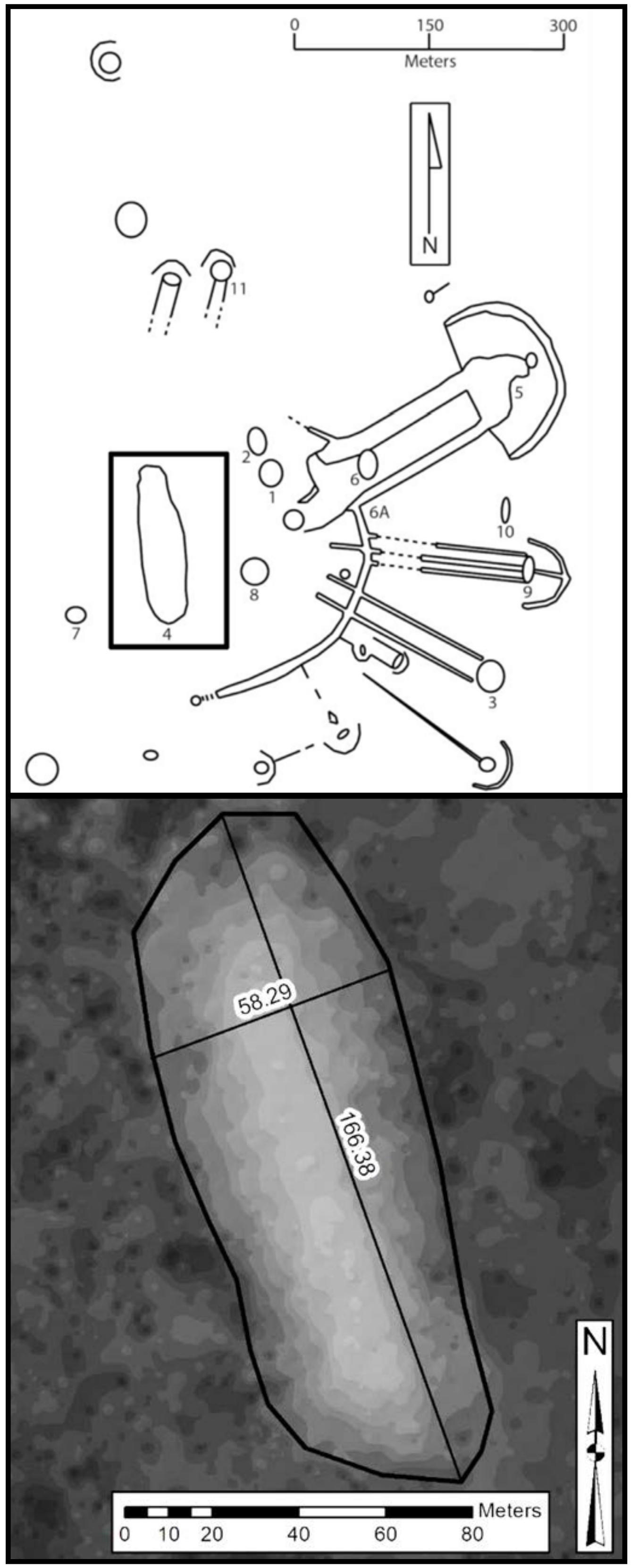

Figure 2. Plan of Big Mound City. Top: Stirling's 1933-1934 map rotated to correct for magnetic north with box around Mound 4. Bottom: LiDAR image of Mound 4 showing maximum length and width.

Table 1. Basic Information about Stirling's Excavations at Big Mound City.

Mound	Diameter	Height	Location	#Trenches	Results
1	10.6 m	2.4 m	Interior of Semi-Circle	3	Small amount of pottery
2	9.1 m	1.5 m	Interior of Semi-Circle	2	Pottery, human bone
3	18.2 m	3.6 m	End of Embankment 3	2	Small amount of charcoal
4	91x10 m	n/a	Midden-Mound	3	Numerous artifacts
5	30 m	7.6 m	End of Embankment 1	1	Sterile
6	n/a	n/a	Between Embnkmt. 1 Pair	1	Sterile
6a	n/a	2.7 m	Embankment 1 (South)	1	Sterile
7	6x12 m	0.7 m	West of Midden-Mound	1	Pottery
8	6 m	1.5 m	Interior of Semi-Circle	2	Pottery, 3 human skulls
9	6 m	0.7 m	End of Embankment 2	1	Small amount of pottery
10	6 m	0.7 m	Between Mounds 5 & 9	1	Sterile
11	n/a	n/a	North of Type B Complex	1	3 human skeletons, no skulls

> by Mr. M. W. Stirling and some comments and photographs published by Mr. John K. Small. [Willey 1949:73]

Even so, Willey provides an important glimpse into Big Mound City in his five-page description of the excavation results and interpretation. He provides brief descriptions of the architecture that include 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 1 provides these results.

A salient aspect of the results of these excavations is that most of the core Type B architecture (Semi-Circle and radiating linear embankments) is devoid of cultural material. With the exception of the midden-mound (Mound 4), there is no evidence of intensive occupation on the core architectural features. Willey notes this:

> 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]

After Stirling, no further 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; Wheeler and Newman 1997). However, it was not until 2015 that subsurface archaeology resumed (see Lawres and Colvin 2017).

KORES at Big Mound City

Our investigations represent the first component of the long-term KORES project mentioned above. The goal of our initial work at Big Mound City was to collect carbonized wood samples for accelerator mass spectrometry (AMS) dating from architectural features using minimally invasive methods, including sediment cores and shovel tests. We extracted cores using a JMC PN425 Environmentalist’s Sub-Soil Probe PLUS. This mechanism was a manually operated slide-hammer percussion core with a 1.2-inch diameter core tube and a core extraction tool. Extracted sediments were collected in a 3-foot polyethylene terephthalate glycol (PETG) copolyester core liner. Core extensions allowed for extraction of additional sediments from lower depths.

We extracted six cores to obtain sediments spanning the top of the architecture to its base. The cores originated from three different contexts: the midden-mound (Mound 4), Mound 8, and the open space inside the Semi-Circle. Two cores came from the midden-mound, one from the summit and one from the foot slope. Three cores were taken from Mound 8 and include the summit, shoulder slope, and toe slope of the architecture. A single core originated from the interior of the Semi-Circle (Lawres and Colvin 2017).

In addition, we excavated four shovel tests adjacent to the core extraction locations. These shovel tests had two primary goals: (1) to provide a means to verify the stratification in the sediment cores and to aid in laboratory analysis; and (2) to provide the means to collect carbonized wood samples from contexts with stronger vertical control than could be provided by a percussion core (Lawres and Colvin 2017). All shovel tests were 50 x 50 cm squares that were excavated in 10 cm arbitrary levels in natural strata, and all the sediments were sieved through 1/8 in (3.18 mm) hardware cloth.

Six AMS dates resulted from these initial investigations, providing the first chronometric dates for Big Mound City. All the dates were based on carbonized wood samples recovered from the shovel test and sediment core extracted from the summit of the midden-mound (Mound 4). Figure 3 shows the sample origins, and Table 2 and Figure 4 provide the results of the AMS analyses.

The resulting dates suggested an occupational range of cal 355 B.C. to A.D. 675 (originally published as cal 356 B.C. to A.D. 674). Further, they demonstrated a tight chronological grouping for three discrete stratigraphic layers from 45 to 95 cmbs (centimeters below surface) in the shovel test: Stratum II (25 to 50 cmbs), Stratum III (50 to 75 cmbs), and Stratum IV (75 to 95 cmbs). However, a date of cal A.D. 614 to 674 from Stratum III was much younger than the cal A.D. 86 to 235 date from Stratum II and the two dates, cal A.D. 70 to 215 and cal A.D. 82 to 227, from Stratum IV, raising the possibility of bioturbation or the use of midden materials for construction fill (Lawres and Colvin 2017:65-66). The dates from the sediment core were obtained from materials toward the base of the mound in order to provide the earliest time (*terminus post quem*) for occupation and construction. However, they also produced inverted results, with the sample from the deeper context producing a younger date.

While the dates provided new insight into Belle Glade monumentality and allowed us to begin evaluating Johnson's (1991, 1996) chronology, they also raised additional questions. The two most pressing questions concerned the inverted dates in the vertical sequence and the temporal relationship of the midden-mound to other architectural features at the site: (1) were they a result of bioturbation or did they reflect Belle Glade

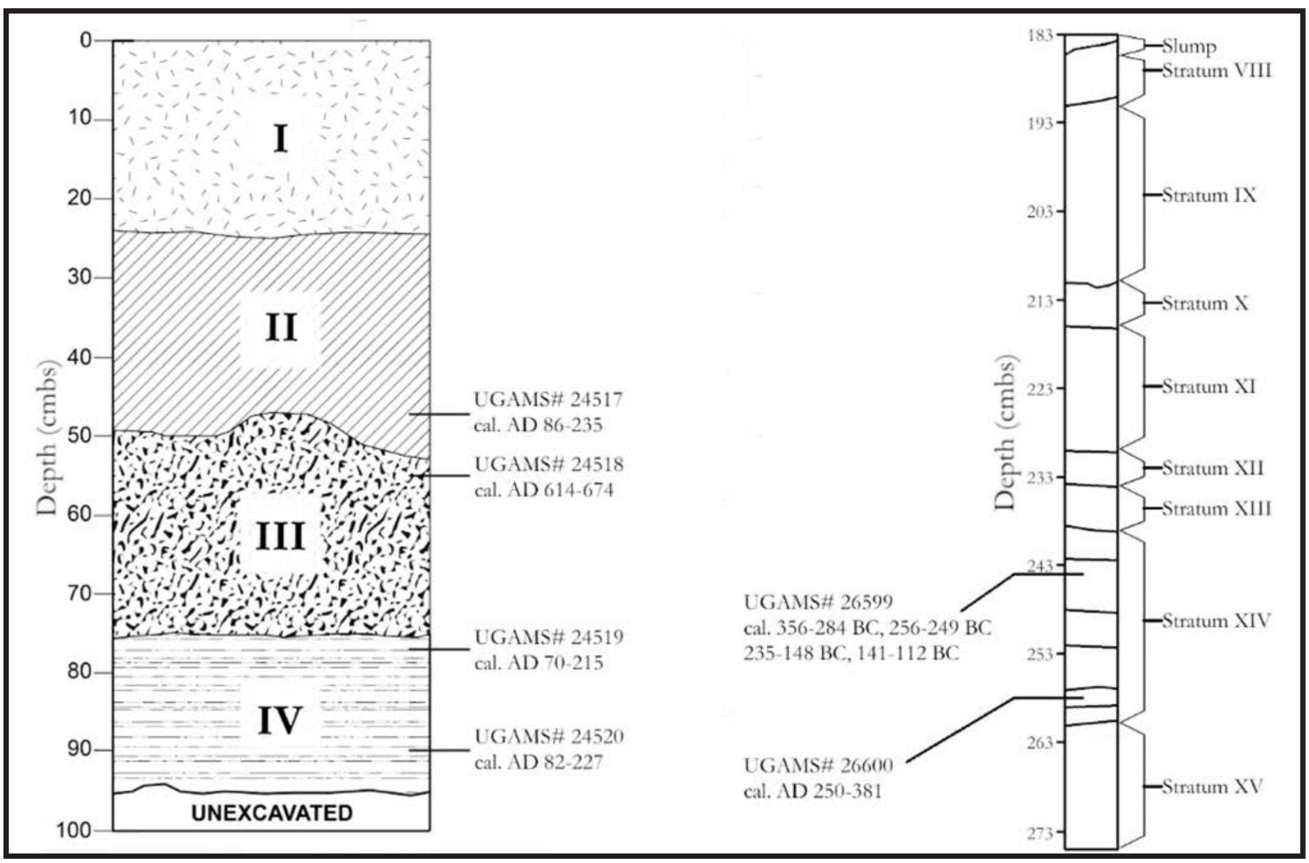

Figure 3. Carbonized Wood Sample Locations from 2015 KORES Project. Left: Shovel test. Right: Sediment core.

Table 2. AMS Dates from 2015 KORES Project at Big Mound City. Adapted from Lawres and Colvin (2017:Table 2).

Sample ID	Material	Provenience	Stratum	^{14}C Age*	σ ^{13}C, ‰	1 Sigma Calibration**	2 Sigma Calibration**
UGAMS# 24517	charcoal	ST3 Lvl 6, 45-50 cmbs	II	1850 ± 25	-26.2	AD 129-214	AD 86-235
UGAMS# 24518	charcoal	ST3 Lvl 7, 50-60 cmbs	III	1380 ± 25	-26.3	AD 641-665	AD 614-674
UGAMS# 24519	charcoal	ST3 Lvl 10, 75-85 cmbs	IV	1880 ± 25	-25.6	AD 75-139, AD 199-206	AD 70-215
UGAMS# 24520	charcoal	ST3 Lvl 11, 85-95 cmbs	IV	1860 ± 25	-25.6	AD 90-100, AD 123-180, AD 186-214	AD 82-227
UGAMS# 26599	charcoal	Core 1, Section 3, 245 cmbs	XIV	2160 ± 25	-24.8	350-310 BC, 209-170 BC	356-284 BC, 256-249 BC, 235-148 BC, 141-112 BC
UGAMS# 26600	charcoal	Core 1, Section 3, 259 cmbs	XIV	1730 ± 20	-26.9	AD 255-301, AD 316-344	AD 250-381

* These ages are corrected for Delta-13 (σ^{13}) and expressed at 1 Sigma. **All dates calibrated using INTCAL13 (Reimer et al. 2013).

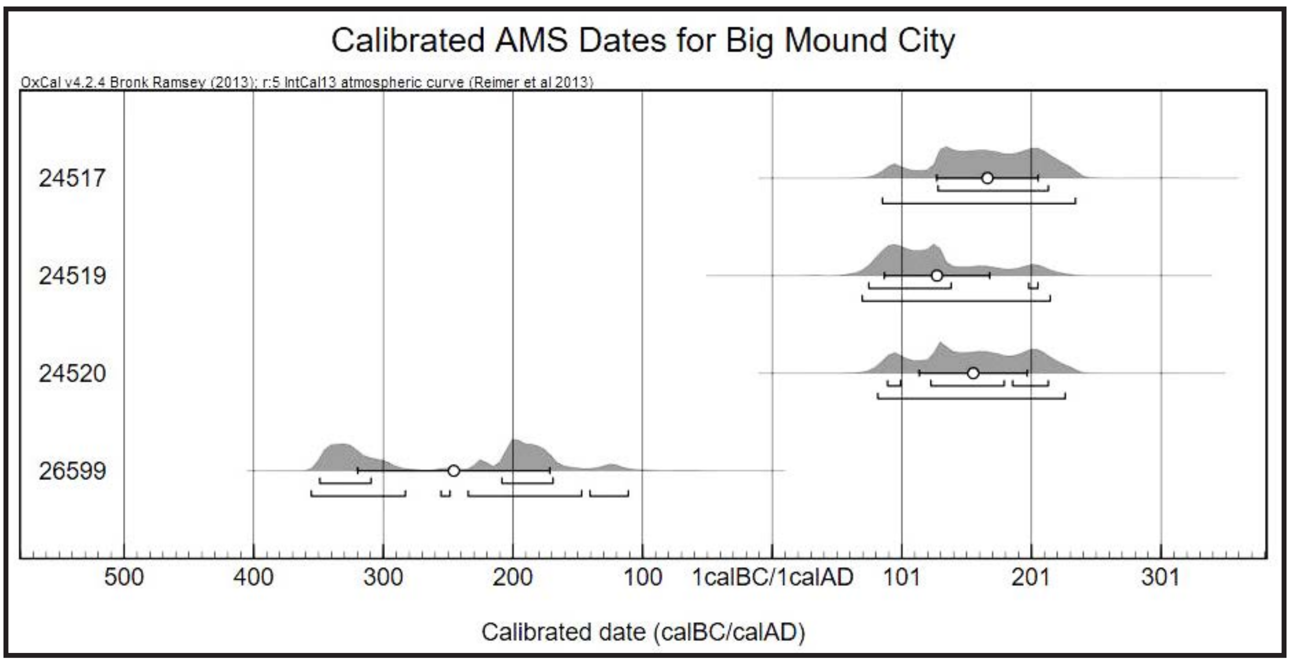

Figure 4. Calibrated AMS Dates from 2015 KORES Project (problematic dates removed).

monumental practices? and (2) how do these dates relate to architectural features outside the midden-mound? To address this, the senior author expanded the KORES project at Big Mound City in 2017. He focused on the core Type B architectural elements: the midden-mound, Semi-Circle, and radiating linear embankments. This involved a more in-depth evaluation of the midden-mound and an assessment of the radiating linear embankments. This article focuses on the midden-mound construction sequence.

Methods

To evaluate the midden-mound in 2017, 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 long axis of the mound. The 2017 transect was chosen based on the location of the 2015 investigations. It was placed near the 2015 transect, running down the opposite, western slope of the mound (Figure 5).

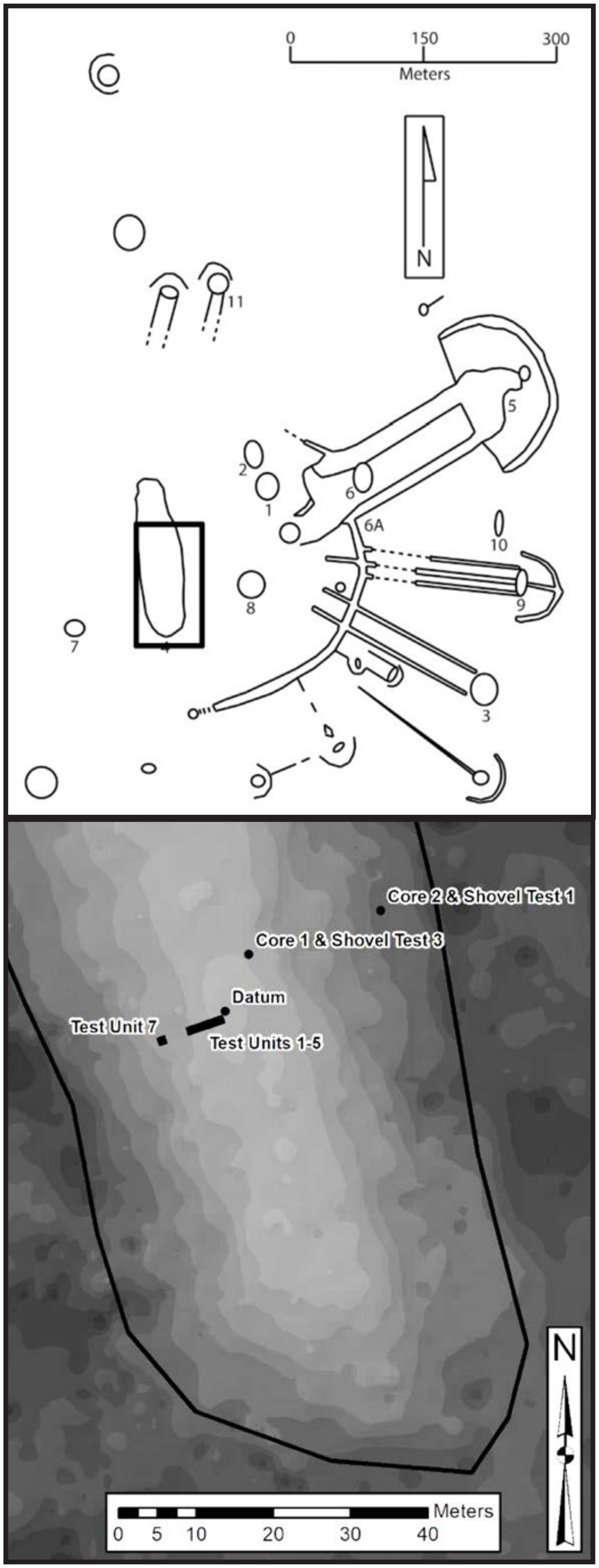

Figure 5. Mound 4 and Plan of Excavations.

The first five units are best described as a trench, while the sixth was located 3 m farther down slope. The reason for the offset of the sixth unit was the presence of a very large live oak (*Quercus virginianus*) tree. The offset also provided an additional stratigraphic view of the mound. This view provided a broader horizontal picture of stratification, showing the continuation of contiguous strata.

All test units utilized a single datum placed at the summit of the mound near the southeast corner of Test Unit 1. The datum was 15 cm above the ground surface. We excavated units in a stepped fashion, with the intent to excavate the first two units to 100 cmbd (centimeters below datum), the second two units to 200 cmbd, and the fifth unit to 300 cmbd. We excavated in 10-cm arbitrary levels in natural strata, with all sediments sieved through 1/8-inch (3.18 mm) hardware mesh. The University of Florida's Department of Anthropology African Archaeology Laboratory is housing the recovered materials until completion of the project. Additional analyses of ceramics were conducted at Florida Atlantic University's Department of Anthropology. Upon completion of the project, all materials will be transferred to the Florida Bureau of Archaeological Research for curation.

The goal of these excavations was to reach the base of the mound to expose the full stratigraphic sequence to assess mound construction. However, we terminated Test Unit 1 early due to an extremely dense root ball of a sabal palm (*Sabal palmetto*) adjacent to the unit. Further, due to almost daily heavy rains, and encountering numerous sedimentary stains that we treated as features, the depth goals were not met. We excavated Test Units 3, 4, and 5 to a depth of 180 cmbd. To overcome this and reach the base of the mound (which we estimated to be at 280 cmbd based on the observed vertical difference between the summit of the mound and the off-mound ground surface), 50 x 50 cm shovel test windows were excavated in Test Units 3 and 5. The Test Unit 5 shovel test accomplished this task, which exposed a stratum of underlying peat at 280 cmbd. Because dating the construction was a primary concern of this project, we made an effort to collect *in situ* carbon samples throughout the excavations. We submitted the samples to the University of Georgia's Center for Applied Isotope Studies for AMS dating.

Results

Our excavations in Big Mound City's midden-mound (Mound 4) confirmed some previous work while revealing a new picture of the mound's structure. As noted by earlier investigators, the midden is vertically restricted to the uppermost portion of the mound (Willey 1949). In fact, in his report of Stirling's investigations, Willey (1949:75) states a lack of artifacts below 61 cmbs (24 inches below surface). Our excavations confirmed this, with roughly 98% of all artifacts and ecofacts originating from 0 to 60 cmbs. The remaining materials were scattered throughout the sediments below but not in any concentration. Thus, the midden of this "midden-mound" is in the top portion of the mound.

Soil Profile

The stratigraphic sequence of Mound 4 presents a complicated picture unlike anything reported previously for Belle Glade monumental architecture. Figures 6 and 7 present the full stratigraphic sequence. In these figures, each test unit is contiguously placed in horizontal fashion as measured from the site datum. Thus, along the transect, Test Unit 1 is 0 to 100 cm, Test Unit 2 is 100 to 200 cm, Test Unit 3 is 200 to 300 cm, Test Unit 4 is 300 to 400 cm, and Test Unit 5 is 400 to 500 cm. The one exception is Test Unit 7, which is at 800 to 900 cm from the site datum. Test Unit 6 (500 to 600 cm) was planned, but was not excavated.

The contiguous, anthropogenic midden soils (Strata I, II, and III) are restricted to the upper portion of the mound, where the vast majority of cultural materials were recovered. Stratum I is characterized by poorly sorted fine sand with a Munsell classification of 10YR3/1 (very dark gray) mottled with 10YR6/1 (gray). Stratum II consists of poorly sorted fine sand of 10YR3/2 (very dark grayish brown). Stratum III is well sorted fine sand of 10YR5/1 (gray). The south sides of Test Units 1 and 2 contain a large root ball of a sabal palm (*Sabal palmetto*) tree with fine sand of 10YR3/1 (very dark gray) that interrupts Strata II and III in these units. Further, Stratum III is not continuous through all test units, exhibiting a break in Test Unit 3.

Beneath these strata, the picture becomes much more complicated. The underlying strata are relatively devoid of cultural materials. Directly underlying Stratum III is Stratum IV. This stratum of well sorted very fine sand

Table 3. Sedimentary Lenses Encountered During Excavations and Their Associated Stratum and Munsell Designation.

Lens	Stratum	Munsell
L1	V	10YR3/1 (very dark gray)
L2	V	10YR7/1 (light gray)
L3	IV	10YR5/1 (gray)
L4	V	10YR7/1 (light gray)
L5	V	10YR7/1 (light gray)
L6	V	10YR7/1 (light gray)
L7	V	10YR6/1 (gray)
L8	VI	10YR3/1 (very dark gray) mottled with 10YR6/1 (gray)
L9	VI	10YR3/1 (very dark dray)
L10	VI	10YR2/1 (black)
L11	VI	10YR2/1 (black)
L12	VI	10YR6/1 (gray) mottled with 10YR3/1 (very dark gray)
L13	VI	10YR7/1 (light gray)
L14	VI	10YR5/1 (gray)
L15	VI	10YR6/1 (gray)
L16	VI	10YR5/1 (gray)
L17	VI	10YR6/1 (gray)
L18	VI	10YR5/2 (grayish brown)
L19	IV	10YR5/2 (grayish brown)
L20	VI	10YR6/1 (gray)
L21	VI	10YR6/1 (gray)

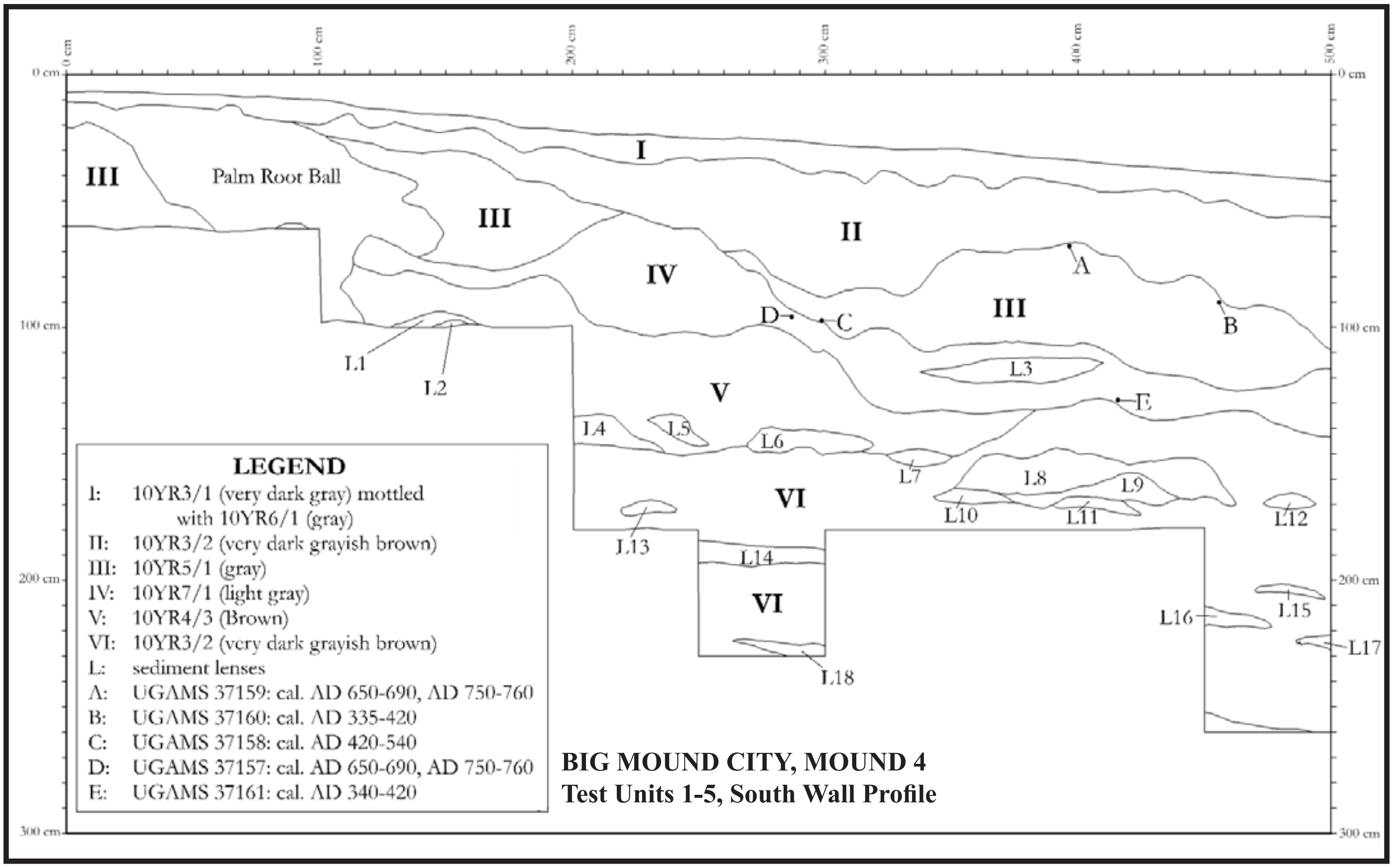

Figure 6. South Wall Profile in Test Units 1 through 5. Note *in situ* carbonized wood samples (A through E).

of 10YR7/1 (light gray) is continuous through Test Units 2 through 5 and Test Unit 7, but it arcs upward to obscure Stratum III throughout most of Test Unit 3. This suggests that when Stratum III was placed on Stratum IV, it filled depressions adjacent to the upward arc of Stratum IV visible in the profile. Further, in Test Unit 4 and the southernmost portion of Test Unit 5 is a large, oblong pocket (L3 in Figure 6) of well sorted fine sand that matches Stratum III (10YR5/1, gray).

Underlying Stratum IV is Stratum V, which consists of well sorted very fine sand of 10YR4/3 (brown) on top of Stratum VI. Stratum V, however, is not continuous throughout the trench. It is restricted to Test Units 2 through 4. Further, at the base of Stratum V are four oblong lenses of sediment. Three of these match the Munsell classification of Stratum IV (10YR7/1, light gray), and the fourth has a classification of 10YR6/1 (gray). All these lenses consist of well sorted very fine sand.

Stratum VI, comprised of well sorted very fine sand of 10YR3/2 (very dark grayish brown), underlies Stratum V in Test Units 3 and 4. However, in Test Units 5 and 7, this Stratum VI underlies Stratum IV. Throughout all these test units, Stratum VI exhibits multiple smaller, roughly oblong pockets of sediments of various Munsell classifications (Table 3). These lenses are labeled L1 through L21 in Figure 6, Figure 7, and Table 3.

Pockets or Lenses

We encountered these pockets of sediments throughout the excavations. They appeared to be circular stains because we typically identified them at their apical point. We noted them as features and pedestaled them as we excavated the surrounding matrix. This quickly revealed the stains spreading and then dissipating relatively shallowly. There were some, however, that were large enough to appear as thin lenses in the larger matrices.

These pockets appear to be evidence of basket loading. We interpret them as evidence that native people did not construct this mound in distinct stages, with each stage associated with a distinct sedimentary

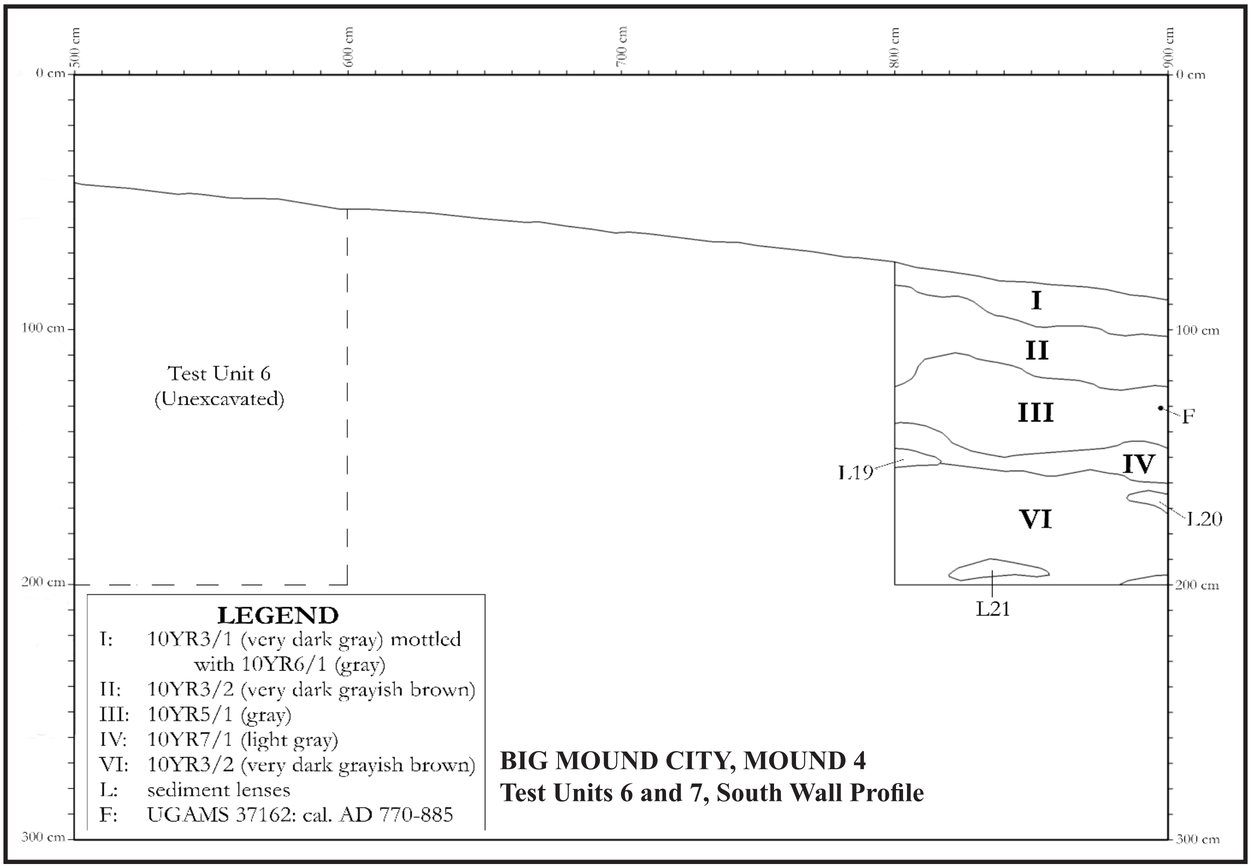

Figure 7. South Wall Profile in Test Unit 7. Note *in situ* carbonized wood sample (F). This is a westward downhill continuation of the profile shown in Figure 6.

source. Rather, the evidence suggests that people built the mound in rapid fashion using multiple sources of sediments or, at the very least, sediments from the same source but at different depths (i.e., A Horizon, E Horizon, Bh Horizon, etc.). The latter is more likely given that shifts in soil horizons occur at shallow depths in this region because of the aqueous nature of the landscape (inundated for 9 to 10 months of the year).

As Sherwood and Kidder (2011:72) note, basket loading is a term referring to "sedimentological structures composed of individual 'loads' or separate deposits that are typically distinguishable by distinct lithostratigraphic boundaries that can result in a variegated appearance in profile." Often, construction is comprised of loaded fills, which do not undergo homogenization before deposition (Sherwood and Kidder 2011:77). In such cases, the result is a profile exhibiting a hodgepodge of discrete soil types and colors. However, in some cases, even when loaded fills are used, individual basket loads contain sediments of similar enough coloration and texture that when they are deposited atop one another, they accumulate into a larger mass where individual loading boundaries are no longer visible.

In the case of our profile in Mound 4, the stratigraphic sequence suggests loaded fills. Individual basket loads are visible in plan view as "lens-shaped blob[s] of dirt" (Peacock 2005:78). In profile, when encountered near their midsection, they appear as crescent-like shapes, and when they are encountered closer to their edges, they appear in shapes that are amorphous. The boundaries of these basket-loads are easily distinguished from the larger matrix because of differences in color and texture (see Table 3).

The individual loads include L1 through L7, L9 through L13, L15, and L21 in Figures 6 and 7. L16 through L20 may represent individual loads, but because of their locations adjacent to east or west walls, their extent is unknown. Larger mantles of accumulated basket loads include L8 and L14, which may extend to include L16. Stratum V also represents a large mantle where individual loading boundaries are not visible because of the similarity in coloration and texture of individual loads. Strata IV and VI are massive loaded fills (Sherwood and Kidder 2011:77-78) as well. Not only do they contain the same materials just mentioned, they also exhibit individual basket loads of sediments with different coloration and/or textures in their larger matrices.

Further, the distribution of individual loading boundaries of L4 through L12 and the arcing shape of this distribution are suggestive. This arc mirrors the slope of the mound surface. This suggests deposition of these lenses on a sloping surface as individual basket loads. If these lenses were part of a homogenized mantle of soil, or even a mantle of loaded fill of the same coloration and texture (i.e., a massive loaded fill), they would not appear as individual features in the profile. Instead, each lens has a boundary to it, and these individual boundaries are likely indicative of individual baskets, or other containers, that builders of Big Mound City used in the process of making Mound 4. Similar patterns are visible in the profiles of Hedgepeth Mounds (Saunders and Allen 1994). In Hedgepeth profiles, individual loading boundaries are visible in larger matrices, and individual loads follow slopes on which they were deposited (see Saunders and Allen 1994:Figure 4).

In addition, this arcing distribution of lenses undermines arguments that these could represent animal burrows. The most likely candidate for making burrows of the shapes and sizes of these lenses is the gopher tortoise (*Gopherus polyphemus*). However, this tortoise is typically associated with pine forests (Jones and Dorr 2004; McRae et al. 1981), an ecosystem not correlated with the wooded swamp of Big Mound City. It is also unlikely that they would mimic the slope of the surface as gopher tortoise burrows are typically a single long, winding tunnel running up to 3 m (10 ft) beneath the ground surface (Jones and Dorr 2004).

Soil Composition

Additional evidence for construction speed can be found in pedogenic processes (Kidder et al. 2009; Ortmann and Kidder 2013). Except for biotic activity and weathering in the upper 40 cm of the stratigraphic sequence, evidence for pedogenic development in the mound is lacking. If pauses in construction occurred and lasted more than a few weeks, we would expect the development of features such as surface crusts (Valentin and Bresson 1992) and thus evidence for lithologic discontinuities (Schaetzl 1998; Schaetzl and Anderson 2005).

When a surface is exposed to weathering, several types of soil crusts can form, including structural crusts, erosional crusts, and depositional crusts (Valentin 1991; Valentin and Bresson 1992). There are further subtypes of crusts, and their formation is time-dependent. Over time, one crust will develop into another if surface exposure is continuous (Bresson and Boiffin 1990; Valentin and Bresson 1992; Valentin 1991). Further, the spatial distribution of crusts is dependent on topography. In sandy soil, the initial crust formed will be a structural sieving crust due to exposure to water drop impact. However, if crust forms on a flat surface, long-term exposure to rain will cause formation of a crater, and in 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).

The structural crust is of interest because architecture creates topographic relief that provides the opportunity to test contexts considered upslope (i.e., the summit). The structural crust that forms upslope (resulting from rainfall water drop impacts) is a direct form of surface weathering. The impacts of water drops creates micro-craters that vertically sort particles in a mechanical sieving process resulting in finer particles forced into a deeper depositional context (Valentin and Bresson 1992:231). There are several types of structural crusts dependent on a number of conditions, such as sediment type, climatic conditions, and the rate of formation.

Of 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 relatively 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.

Particle size distribution analyses show these are lacking in the matrices of Mound 4 (Figure 8). What these distributions show is the areas with larger proportions of fine particles (clay-sized particles

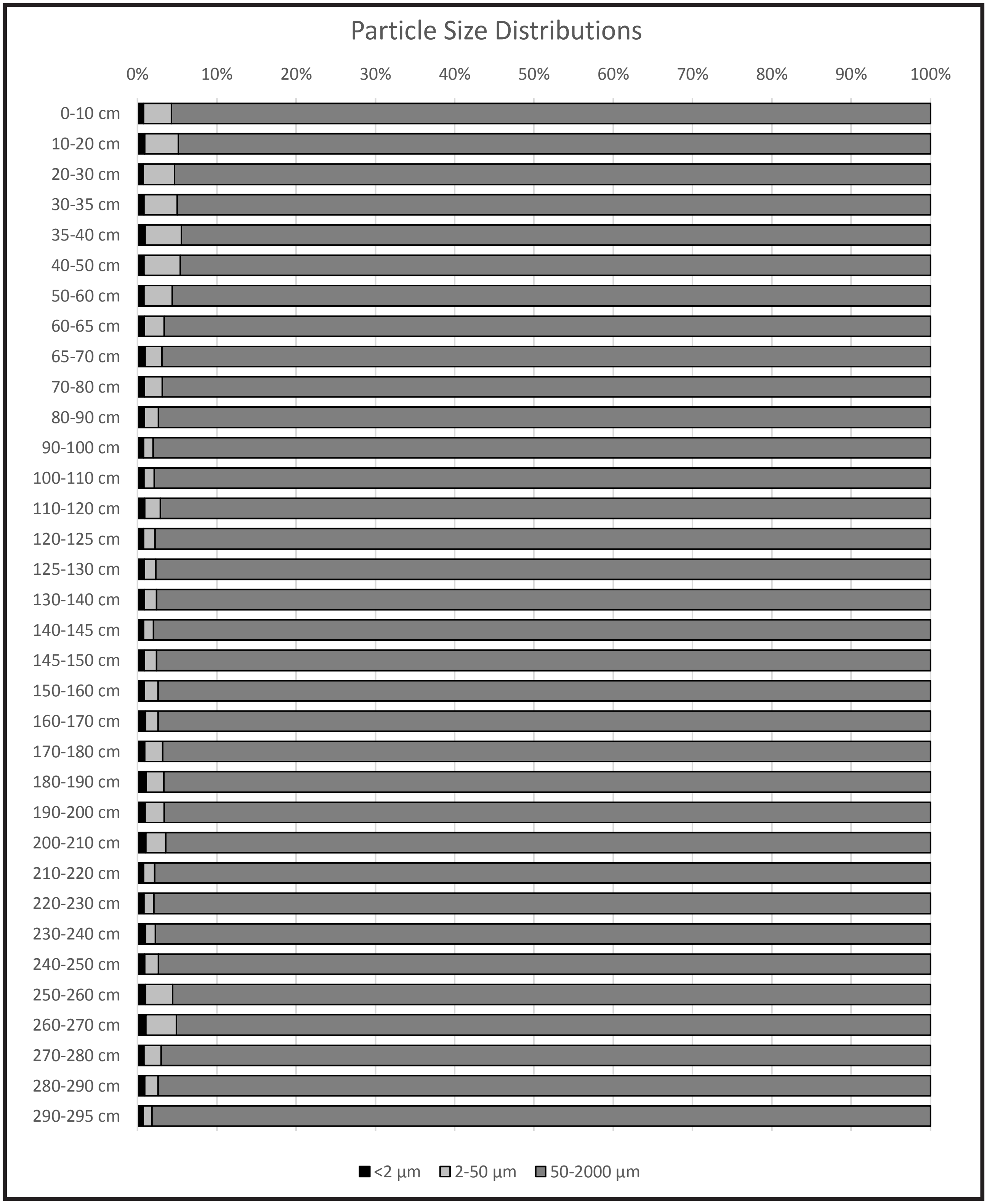

Figure 8. Particle Size Distribution in Mound 4 Test Units. Bars show percent volume of clay-sized (< 2 µm), silt-sized (2 to 50 µm), and sand-sized (50 to 2000 µm) particles. Note that larger grains overwhelm the finer particles.

of < 2 μm, and silt-sized particles of 2 to 50 μm) are associated primarily with the midden in the upper 60 cmbd of the profile and with the base of the mound (260 to 280 cmbd). The former association is expected given that it correlates with the midden strata and its chemical and physical weathering of pottery, faunal remains, and other anthropogenic materials. The latter association correlates with the process of lessivage, or clay translocation (Schaetzl and Anderson 2005), which is the process in which fine particles and minerals go into suspension as water percolates downward through the solum (Duchaufour 1998).

If weathering processes were at play deeper in the sequence, we would expect the edges of basket loads to exhibit evidence of weathering processes, such as oxidation along their edges (see Kidder et al. 2009 for an example) or the leaching of coloration due to eluviation and illuviation (Duchaufour 1998; Schaetzl and Anderson 2005). The latter processes, along with pedoturbation, would obliterate the boundaries of individual basket loads. As Figures 6, 7, 9 and 10 demonstrate, this is not the case for Mound 4. The loading boundaries are clearly visible for L1 through L21. In addition, the boundaries of the massive loaded fills of Strata IV, V, and VI are clearly visible, suggesting that even the deposition and burial of the larger mantles of loaded fill was fast.

It should be noted that the coloration of Strata V and VI (10YR4/3 and 10YR3/2, respectively) are similar to that of a Bh Horizon. However, their structure suggests differences. While both contain multiple lenticular deposits in their matrices, their overall structure would be described as loose, nonplastic, massive, and structureless. They are both comprised of well sorted, very fine sand, with minimal clay- and silt-sized particles. Stratum V exhibits an average percentage of 0.8% clay-sized particles, 1.5% silt-sized particles, and

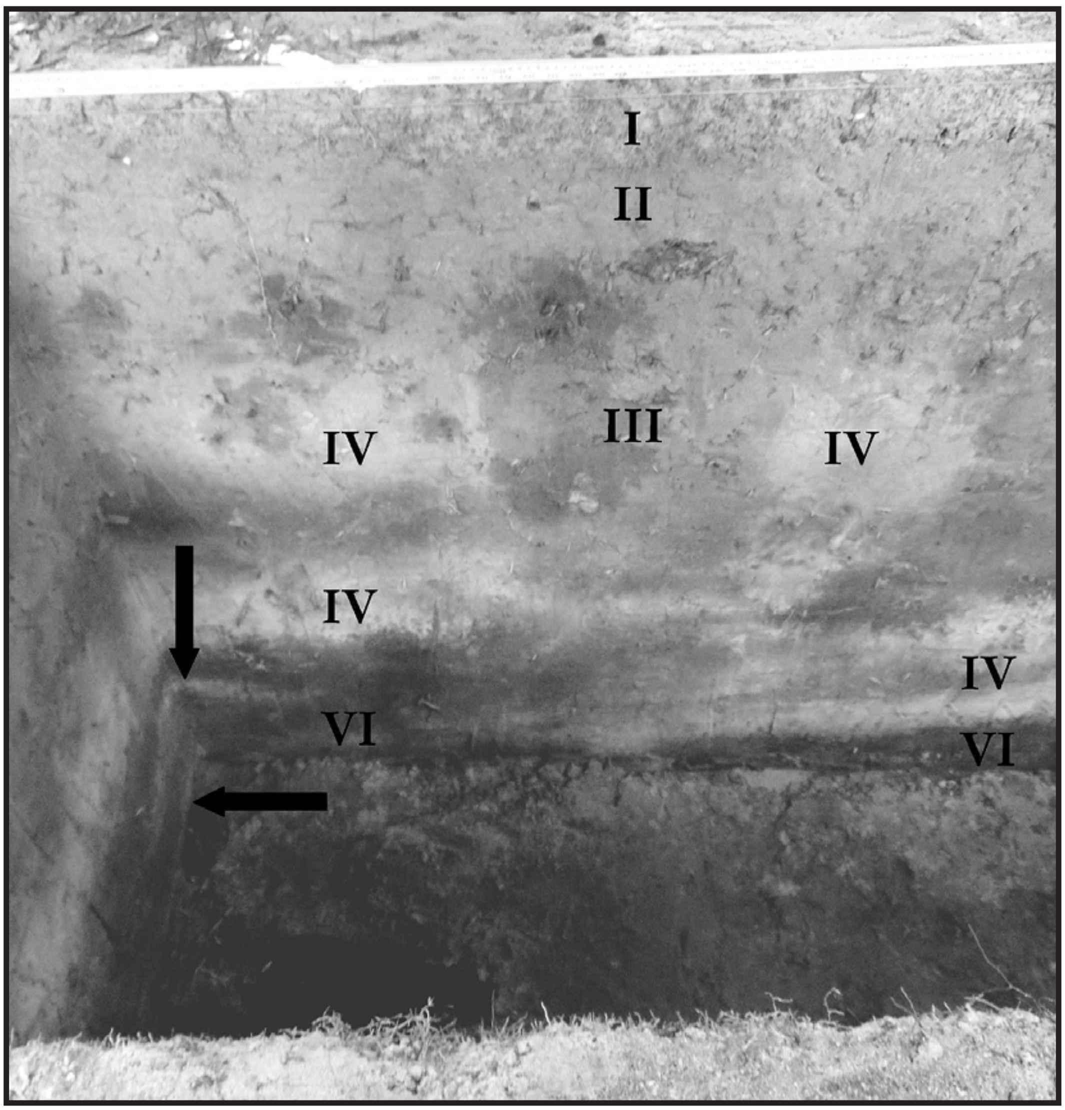

Figure 9. Test Unit 5 North Wall Profile. Arrows point to individual loading boundaries.

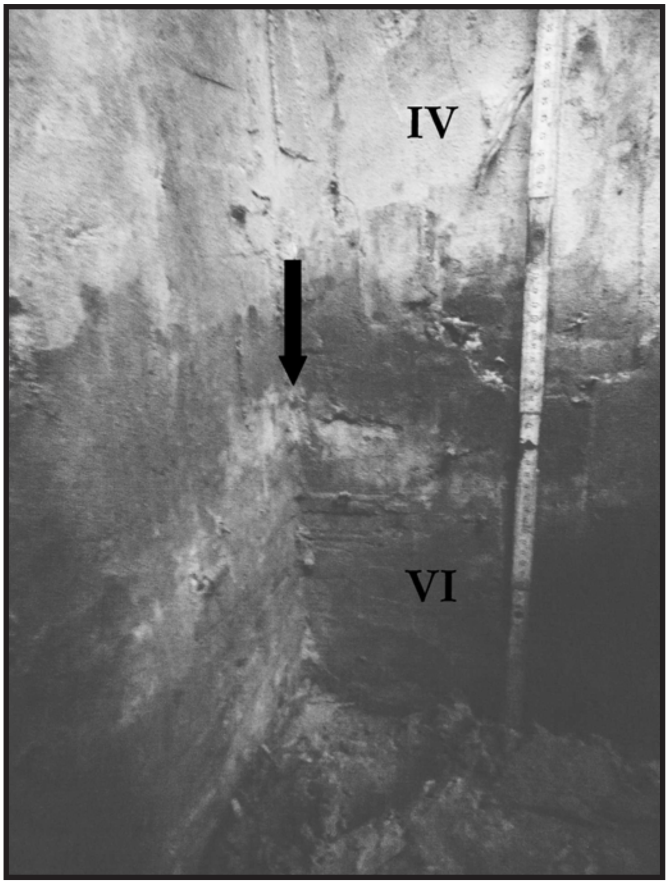

Figure 10. Northeast Corner in Test Unit 3. Arrow points to individual loading boundary.

97.7% sand-sized particles. Stratum VI, when removing samples from the bottom 30 cm to account for lessivage, exhibits an average of 0.9% clay-sized particles, 1.8% silt-sized particles, and 97.2% sand-sized particles. In the bottom 30 cm of Stratum VI, the clay-sized particles remain the same, but silt-sized particles increase to an average of 2.5% and sand-sized particles decrease to 96.6%.

These particulate percentages (clay and silt) are quite telling about the nature of these strata as they have a significantly smaller percentage of silt-sized particles than the strata above them, which average 0.8% clay-sized particles, 2.6% silt-sized particles, and 96.6% sand-sized particles. This suggests that illuviation did not play a role in the formation of these strata because if it did, they should have a higher percentage of both clay- and silt-sized particles (Duchaufour 1998; Schaetzl and Anderson 2005). Further, if illuviation were the formative process behind these strata, we would expect a structure to form into either angular or subangular blocky pedons, but instead these strata are unconsolidated and structureless.

Radiocarbon Dating

While individual strata represent individual episodes of deposition, the stratigraphic and sedimentary evidence suggest these episodes are part of a single mound-building event. This is further corroborated by radiocarbon data. Our excavations in the midden-mound (Mound 4) of Big Mound City resulted in the collection of 17 *in situ* samples of charred botanical materials. These samples ranged in depth from 68 cmbd to 165 cmbd. An additional 4,525 small fragments (539.10 g) of charred botanicals were recovered during sieving. Six of the *in situ* samples (UGAMS# 37157, 37158, 37159, 37160, 37161, and 37162) were selected for AMS analysis (see Figure 6).

These samples were selected because of their stratigraphic context at either the top or base of a stratum. None of them was selected from the midden due to evidence of disturbance near the surface (e.g., tree falls, hog rooting, etc.). We chose these samples because of their relatively large size, the smallest was approximately 2 cm in diameter and the largest approximately 5 cm. While AMS techniques can produce dates from much smaller amounts of carbonaceous material, size became a factor in our selection of samples because of the stratigraphic evidence that suggested rapid construction. Size is affected by turbation in matrices, thus we selected specimens in a size range with limited potential for vertical migration in the sediments. Further, the presence of clearly demarcated loading boundaries, both individual and massive, provides further support for the *in situ* deposition of these larger fragments of charred wood rather than their vertical migration through the matrices. Four additional samples (UGAMS# 37153, 37154, 37155, and 37156) were selected from the 2015 sediment core for AMS analysis to provide dates for depths between the *in situ* samples and the basal samples from the 2015 research (UGAMS# 26599 and 26600) (Figure 11).

Radiocarbon ages were calibrated with OxCal v4.3 software (OxCal 2019; Bronk Ramsey 2001) using the IntCal13 calibration curve (Reimer et al. 2013). All dates in this discussion represent 2-sigma results. The results of the 10 new AMS analyses show a date range of cal A.D. 135 to 255 through cal A.D. 1025 to 1155 (Table 4). Six of these dates, however, cluster between cal A.D. 300 and A.D. 560. Another three dates cluster between cal A.D. 650 and A.D. 885. The tenth date, which does not cluster with any of the others, is cal A.D. 1025 to 1155. While at first glance this seems like an outlier, on review of the stratigraphic evidence it provides a new "earliest possible time" (*terminus post quem*) for the construction of Mound 4.

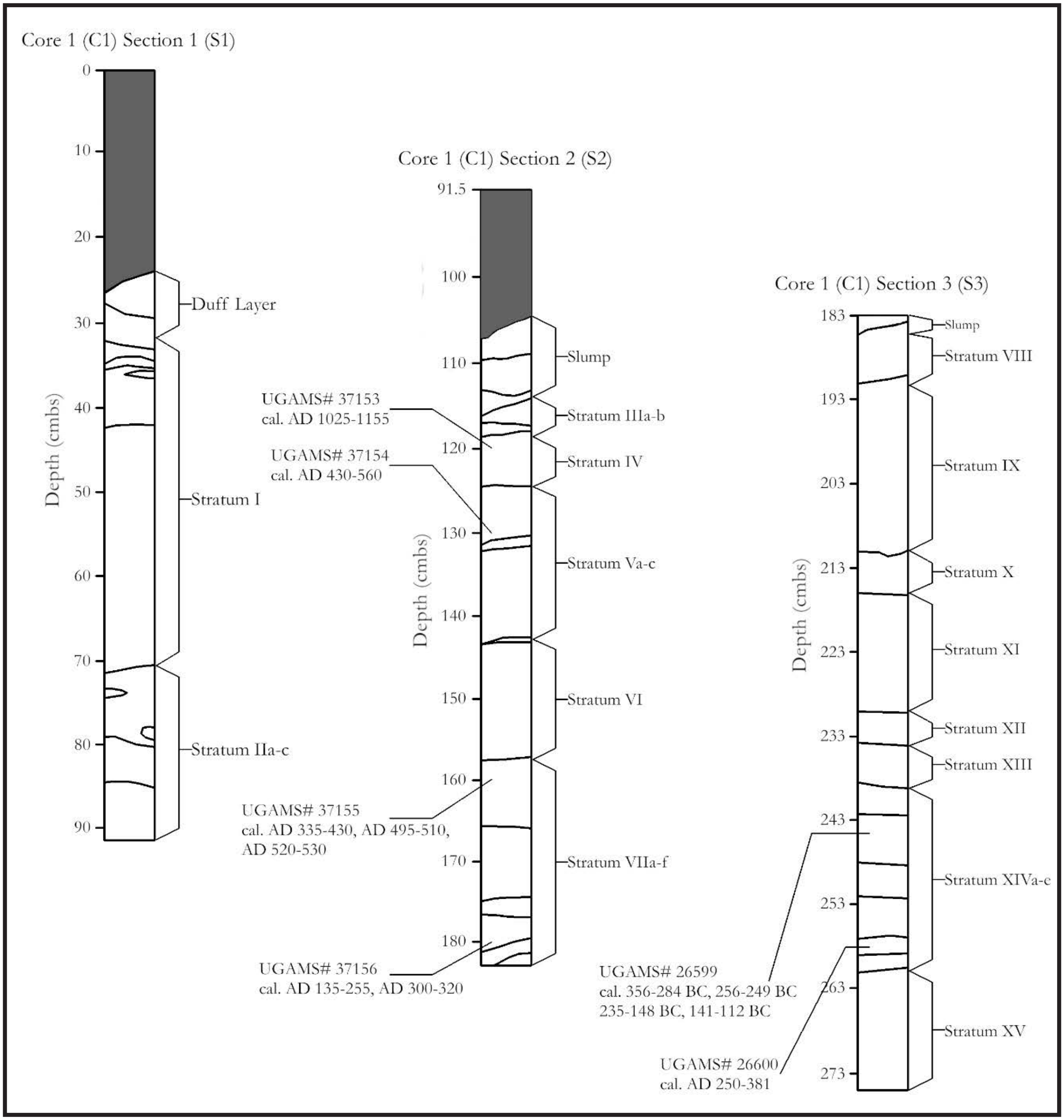

Figure 11. Sediment Core with Sample Locations. Shading shows sections with no recovery.

Table 4. AMS Dates from 2017 KORES Project at Mound 4, Big Mound City.

Sample ID	Material	Provenience	Stratum	^{14}C Age*	σ ^{13}C, ‰	1 Sigma Calibration**	2 Sigma Calibration**
UGAMS# 37159	charcoal (*in situ*)	TU4 Lvl 7, 68 cmbd (37 cmbs)	III	1340 ± 20	-25.85	AD 655-675	AD 650-690, AD 750-760
UGAMS# 37160	charcoal (*in situ*)	TU5 Lvl 10 90 cmbd (51 cmbs)	III	1670 ± 20	-25.58	AD 350-370, AD 380-405	AD 335-420
UGAMS# 37162	charcoal (*in situ*)	TU7 Lvl 14, 131 cmbd (56 cmbs)	III	1200 ± 20	-25.15	AD 775-780, AD 790-830, AD 835-870	AD 770-885
UGAMS# 37158	charcoal (*in situ*)	TU3 Lvl 11, 105 cmbd (79 cmbs)	III	1580 ± 20	-27.33	AD 425-435, AD 450-470, AD 485-535	AD 420-540
UGAMS# 37157	charcoal (*in situ*)	TU3 Lvl 11, 100 cmbd (74 cmbs)	IV	1340 ± 20	-26.33	AD 655-675	AD 650-690, AD 750-760
UGAMS# 37161	charcoal (*in situ*)	TU5 Lvl 13, 128 cmbd (93 cmbs)	IV	1660 ± 20	-25.88	AD 355-365, AD 380-415	AD 340-420
UGAMS# 37153	charcoal	Core 1, Section 2, 120 cmbs	IV	950 ± 30	-26.13	AD 1030-1050, AD 1085-1125, AD 1135-1150	AD 1025-1155
UGAMS# 37154	charcoal	Core 1, Section 2, 130 cmbs	V	1550 ± 20	-28.06	AD 430-490, AD 530-550	AD 430-560
UGAMS# 37155	charcoal	Core 1, Section 2, 160 cmbs	VII	1650 ± 25	-26.82	AD 360-365, AD 380-425	AD 335-430, AD 495-510, AD 520-530
UGAMS# 37156	charcoal	Core 1, Section 2, 180 cmbs	VII	1800 ± 20	-26.15	AD 145-155, AD 170-195, AD 210-250	AD 135-255, AD 300-320

* These ages are corrected for Delta-13 (σ13) and expressed at 1 Sigma. **All dates calibrated using INTCAL13 (Reimer et al. 2013).

When we group these dates by stratum, and by depth in individual strata (rather than looking at clusters of dates), a picture begins to emerge that supports the stratigraphic evidence discussed previously. In Stratum III are four samples that date broadly between cal A.D. 335 and 885. However, when considering depth, the dates do not suggest a gradual development for Stratum III. Rather than exhibiting a trend of younger ages as depth decreases, as would be expected for a gradually developed stratum, the dates have no order. The three dates from Stratum IV also demonstrate this pattern. While the dates are broadly between cal A.D. 340 and cal A.D. 1155, they are not ordered chronologically by depth in Stratum IV. In fact, the youngest date, cal A.D. 1025 to 1155, originated near the base of that stratum. While Stratum V only has a single date, cal A.D. 430 to 560, this date is younger than the oldest date for Stratum IV above it. Stratum VII is the only one where dates are ordered chronologically when sorted by depth.

When we combine these new dates with the six from 2015, the possibility of gradual development starts to fade. As shown in Figure 12, the total sequence of 16 dates paints a picture of date reversals both between and within strata. Stratum II exhibits a date older than any date from Stratum III or Stratum V, and the Stratum II date is close to the same ranges of two dates from Stratum IV and one date from Stratum VII.

Date reversals within individual strata are also apparent, with reversals in Strata III, IV, and XIV (Figure 12). When the five dates for Stratum III are sorted by depth, the three deepest dates point to gradual development because they show a trend of decreasing age with decreasing depth, but one of the dates above them is older than all of them and another date is older than the youngest of the three that are in sequence. Stratum IV also has five dates, and when sorted by depth, the dates are disorderly. In addition, the cal A.D. 1025 to 1155 date of a sample toward the base of Stratum IV is the youngest in the entire sequence of dates, providing a new *terminus post quem*. The two dates from Stratum XIV, which is associated with the base of Mound 4, also exhibit a reversal when the dates are sorted by depth.

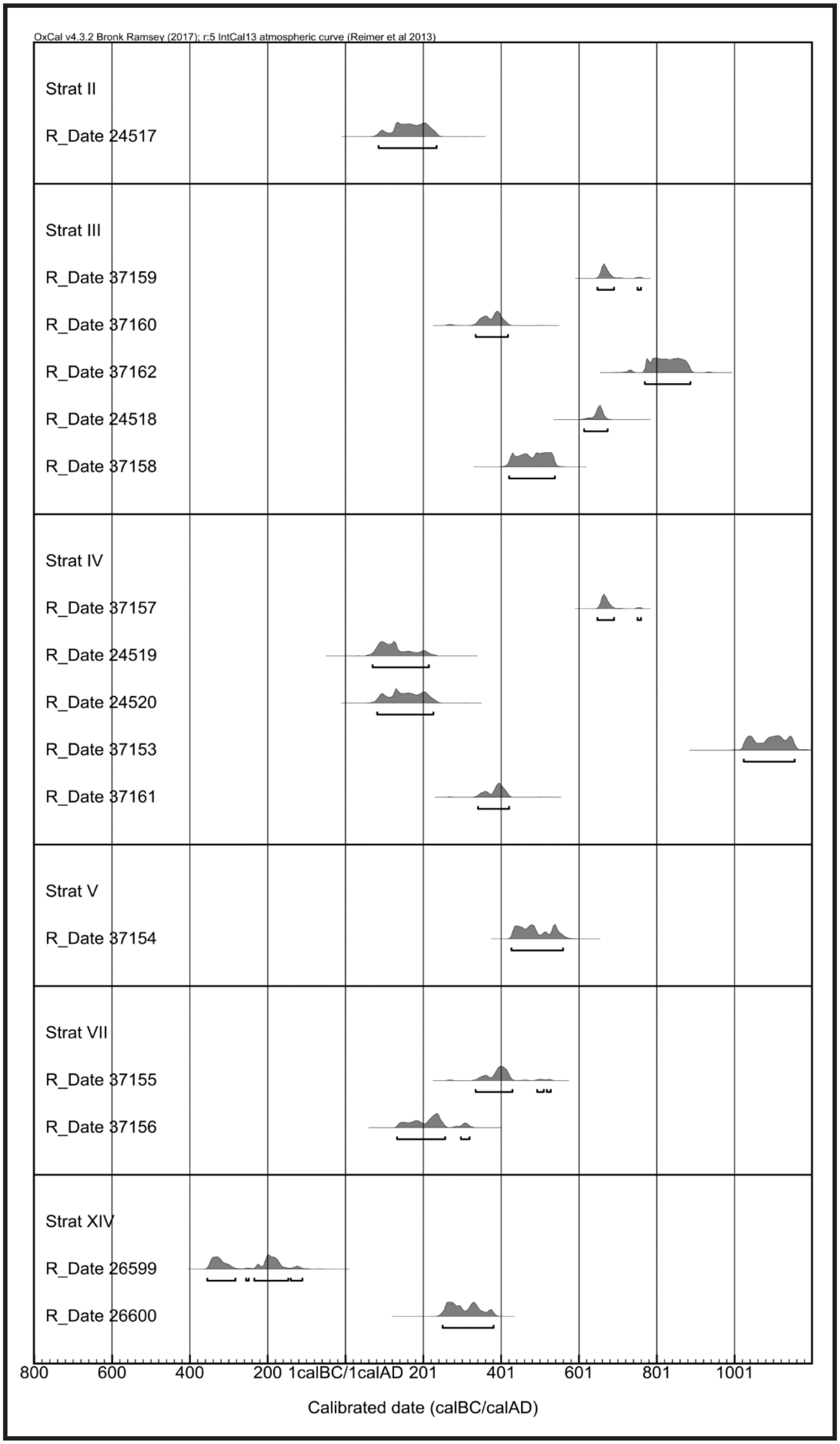

Figure 12. All AMS Calibrated 2-Sigma Radiocarbon Dates from Big Mound City's Mound 4 Sorted by Stratum and Depth Within Stratum. Time is on horizontal axis, depth is on vertical axis.

The deepest of the dates for Stratum XIV, which is also the deepest of all dates for Mound 4, has a much older date above it, which happens to be the oldest for the mound.

These data substantiate the view presented by the stratification and soils. Rather than a gradually developed midden-mound, we are looking at an intentionally, rapidly constructed mound that is capped by a midden. Not only do the data preclude evidence for gradual development, the similarity in dates between strata suggests an event rather than a protracted process. For instance, four dates (from Strata II, IV, and VII) cluster between cal A.D. 70 and 255; three dates (from Strata III, IV, and VII) cluster between cal A.D. 335 and 420; two dates (from Strata III and V) cluster from cal A.D. 420 to 560; and three dates (from Strata III and IV) cluster between cal A.D. 615 and 690. This clustering of dates between strata is indicative of using deposits of similar age for construction. In other words, these clustered ages do not represent occupational spans or specific construction episodes, but instead date the past landscape deposits mined for construction materials. The differences in the ages of the clusters suggest that sediments might have been mined from different depths and that multiple past landscape surfaces may be represented in the loaded fills of Big Mound City's Mound 4.

Finally, based on data currently at hand, we suggest that the earliest possible date range for construction is cal A.D. 1025 to 1155, placing construction in the early portion of the Belle Glade III period, which Johnson (1991, 1996) argues was when all Type B circular-linear earthworks were built. This date is from a sample from the base of Stratum IV. Because all the other dates are older, this particular date provides us with the earliest possible time for construction.

Discussion

Our excavations provide a new view of Belle Glade monumentality and allow an evaluation of the construction sequence in a portion of Mound 4. Previous research at other Type B earthworks describes the midden-mounds of these sites as comprised of three 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 a midden stratum (Carr and Steele 1994; Carr et al. 1995). This is similar to the Belle Glade burial mound, which Willey (1949:20-23) describes as comprised of three distinct mounds superimposed on top of an old midden.

Mound 4 at Big Mound City, however, provides us with a different view. Rather than having three stratigraphic layers, Mound 4 exhibits evidence of large-scale construction using multiple sediment sources and a midden on top of the constructed feature. While Willey (1949:75) describes Mound 4 as a "refuse or habitation mound," he also notes that the midden deposit is vertically restricted to the mound's uppermost portion and that "no artifacts were found below the 24-inch level." He singles out Mound 4 as the only one at Big Mound City with evidence of intensive occupation and that "the excavations showed that the [other] mounds were intentionally built of sand and were not refuse accumulations" (Willey 1949:76).

As discussed above, our 2017 excavations support Willey's assertion of a vertically restricted midden, with more than 98% of all artifacts and ecofacts found in the upper 60 cm of the test units. The remaining 2% were scattered through the lower sediments and had no evidence of concentrations. Most were recovered individually in the screen. Like Willey's (1949) explanation for the small amounts of artifacts recovered in the site's other mounds, these were likely incidental inclusions in construction materials.

Evaluating the strata and soils exposed by our excavations provides a view of the construction sequence of this massive architectural feature. The midden-mound (see Figures 6 and 7) exhibits intentional construction and evidence of multiple sediment sources. The AMS dates support this view. There are now 16 AMS dates from Big Mound City's midden-mound. Table 5 and Figure 12 show the calibrated results of all the AMS dates grouped by stratum and sorted by depth within strata. If this mound were the result of gradual accumulation of refuse, we would expect the AMS plot to exhibit temporal continuity in reference to depth. However, an evaluation of these dates shows temporal nonconformity within stratigraphic sequences that substantiates the view of this architectural feature as comprised of multiple sediment sources.

These new data undermine the previous view we (Lawres and Colvin 2017) put forth for an occupational range of cal 355 B.C. to A.D. 675 for the site. Rather, the combination of the stratigraphic and AMS data suggest that Big Mound City's Mound 4 was constructed rapidly in at least one construction event comprised of several individual depositional episodes. Based on the date from sample UGAMS# 37153, the earliest possible time (*terminus post quem*) for this event is cal A.D. 1025 to 1155, placing construction of this portion of the mound in the early Belle Glade III period. However, no dates have been obtained from the midden in the uppermost

Table 5. All AMS Dates from Big Mound City's Mound 4 Sorted by Stratum and Depth Within Stratum. Adapted from Lawres (2019:Table 9-4).

Sample ID	Material	Provenience	Stra-tum	^{14}C Age*	σ ^{13}C, ‰	1 Sigma Calibration**	2 Sigma Calibration**
UGAMS# 24517	charcoal	ST3 Lvl 6, 45-50 cmbs	II	1850 ± 25	-26.2	AD 130-215	AD 85-235
UGAMS# 37159	charcoal (*in situ*)	TU4 Lvl 7, 68 cmbd (37 cmbs)	III	1340 ± 20	-25.85	AD 655-675	AD 650-690, AD 750-760
UGAMS# 37160	charcoal (*in situ*)	TU5 Lvl 10, 90 cmbd (51 cmbs)	III	1670 ± 20	-25.58	AD 350-370, AD 380-405	AD 335-420
UGAMS# 24518	charcoal	ST3 Lvl 7, 50-60 cmbs	III	1380 ± 25	-26.3	AD 640-665	AD 615-675
UGAMS# 37162	charcoal (*in situ*)	TU7 Lvl 14, 131 cmbd (56 cmbs)	III	1200 ± 20	-25.15	AD 775-780, AD 790-830, AD 835-870	AD 770-885
UGAMS# 37158	charcoal (*in situ*)	TU3 Lvl 11, 105 cmbd (79 cmbs)	III	1580 ± 20	-27.33	AD 425-435, AD 450-470, AD 485-535	AD 420-540
UGAMS# 37157	charcoal (*in situ*)	TU3 Lvl 11, 100 cmbd (74 cmbs)	IV	1340 ± 20	-26.33	AD 655-675	AD 650-690, AD 750-760
UGAMS# 24519	charcoal	ST3 Lvl 10, 75-85 cmbs	IV	1880 ± 25	-25.6	AD 75-140, AD 200-205	AD 70-215
UGAMS# 24520	charcoal	ST3 Lvl 11, 85-95 cmbs	IV	1860 ± 25	-25.6	AD 90-100, AD 125-180, AD 185-215	AD 80-225
UGAMS# 37161	charcoal (*in situ*)	TU5 Lvl 13, 128 cmbd (93 cmbs)	IV	1660 ± 20	-25.88	AD 355-365, AD 380-415	AD 340-420
UGAMS# 37153	charcoal	Core 1, Section 2, 120 cmbs	IV	950 ± 30	-26.13	AD 1030-1050, AD 1085-1125, AD 1135-1150	AD 1025-1155
UGAMS# 37154	charcoal	Core 1, Section 2, 130 cmbs	V	1550 ± 20	-28.06	AD 430-490, AD 530-550	AD 430-560
UGAMS# 37155	charcoal	Core 1, Section 2, 160 cmbs	VII	1650 ± 25	-26.82	AD 360-365, AD 380-425	AD 335-430, AD 495-510, AD 520-530
UGAMS# 37156	charcoal	Core 1, Section 2, 180 cmbs	VII	1800 ± 20	-26.15	AD 145-155, AD 170-195, AD 210-250	AD 135-255, AD 300-320
UGAMS# 26599	charcoal	Core 1, Section 3, 245 cmbs	XIV	2160 ± 25	-24.8	350-310 BC, 210-170 BC	355-285 BC, 255-250 BC, 235-150 BC, 140-110 BC
UGAMS# 26600	charcoal	Core 1, Section 3, 259 cmbs	XIV	1730 ± 20	-26.9	AD 255-300, AD 315-345	AD 250-380

* These ages are corrected for Delta-13 (σ13) and expressed at 1 Sigma. **All dates calibrated using INTCAL13 (Reimer et al. 2013).

36 cmbs (with modern and historic disturbances), so it is possible that the earliest construction date could be later than provided by the UGAMS# 37153 sample.

These data address some questions posed about the temporality of Belle Glade monumental construction in our previous publication. As discussed above, our previous work identified a tight chronological grouping for three distinct strata. This raised questions of the temporality of construction, such as:

> When were the midden-mounds first constructed and were they constructed intentionally, as the unintentional result of the residues of daily activities, or the result of many large feasting events? If the midden-mounds were intentional constructions, do they represent a single construction event or is there evidence suggestive of multiple construction events over a longer span of time? [Lawres and Colvin 2017:68]

The stratigraphic sequence clearly exhibits evidence for intentional construction in creating the mound underlying the midden. The clear evidence of basket loading throughout the sequence demonstrates this beyond doubt.

This also leads us to another important point: this is not a midden-mound as traditionally conceived: "accretional formations, the result of midden deposits accumulating over many generations" (Altschul 1983:9). Rather, Willey's (1949:75) description of this architectural feature as a "habitation mound" is more appropriate. While both terms indicate occupation of the mound, subtracting the term "midden" removes loaded terminology and the connotation that Mound 4 was an accretional accumulation. The term "habitation mound" allows intentional construction of a mound that was then occupied. It is likely that the midden on top of this mound developed *in situ* following construction of the underlying mound rather than the builders adding midden materials to the top as a capping event. This, however, remains to be tested. To address this, future excavations should focus on an area of the mound where fewer disturbances have occurred to maximize control over samples.

These new data also allow us to reject the hypothesis we proposed in our previous work. 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 our data at the time and of Johnson's (1991, 1996) proposed chronology that placed Type A earthworks in the A.D. 200 to 1000 construction range and the Type B earthworks in the A.D. 1000 to 1500 range. Based on our previous data, we argued that people began to build Mound 4 much earlier than the A.D. 200 to 1000 range of Johnson. The earliest possible time (*terminus post quem*) of cal A.D. 1025 to 1155 for the Big Mound City construction event conflicts with this argument and aligns with Johnson's Type B circular-linear earthwork range of A.D. 1000 to 1500. In addition to undermining our hypothesis, these data do not support Johnson's (1991, 1996) argument that the Type B circular-linear earthworks were construction elaborations of already existing Type A circular-linear earthworks, at least at Big Mound City. To reject this, however, we need to obtain dates for the construction of the semi-circle and radiating linear embankments.

These data also show that the dates we considered outliers based on our previous analysis should be reconsidered. We identified those outliers because they appeared to be flipped in the stratigraphic sequence. One outlier (UGAMS# 24518) presented a range of cal A.D. 615 to 675 for a stratum between two other strata that clustered between cal A.D. 70 to 235. Another outlier (UGAMS# 26600) originated from the deepest context and produced a range of cal A.D. 250 to 380. However, the sample from the context directly above it (UGAMS# 26599) produced a much older range of cal 355 to 110 B.C. Given the limited, minimally invasive methods we used in 2015, considering these as outliers (resulting from bioturbation or vertical forcing from sediment coring) was a plausible reason for removing the dates from the occupational sequence. However, given the information obtained from the larger scale 2017 excavations that revealed the complexity of the stratigraphic sequence, we now know that those dates were not outliers but instead reflect rapid construction using multiple sediment sources.

Further Discussion

To place rapid construction in a broader context, as well as to provide a scalar context for Big Mound City, we consider the size of mounds at well-known sites in the broader region. Table 6 provides a list of mound volumes from selected sites. The data for Cahokia and Moundville are from Lacquement (2010), who recalculated the volumes of all the architectural features of Moundville and a few of Cahokia using a gridding method that provides a more accurate portrayal of the geometry of irregularly shaped mounds than previous methods. Lacquement's volumetric assessments are more conservative compared to those proposed by earlier researchers.

Table 6. Mound Volumes at Selected Sites.

Site	Mound	Volume (m^3)
Big Mound City, Florida	4	13,101
	5	8,812
Crystal River, Florida	A	9,002*
	C	557
	F	1,490
	G	602
	H	3,461
	J	1,932
	K	1,606
Moundville, Alabama (Lacquement 2010:348, Table 2)	A	30,150
	B	49,530
	C	5,080
	D	3,880
	E	10,820
	F	2,790
	G	6,790
	I	2,690
	J	2,570
	K	1,855
	L	4,420
	P	15,880
	Q	3,210
	R	21,820
	V	22,460
Cahokia, Illinois (Lacquement 2010:352, Table 3)	48	42,230
	60	36,460
	42	34,620

*From Pluckhahn and Thompson 2018:162.

We calculated the volumetric estimates for Crystal River and Big Mound City using ESRI's ArcGIS LAS toolkit. The one exception to this is Crystal River's Mound A. The volume of this mound was taken from Pluckhahn and Thompson (2018:162) because the available LiDAR data do not provide complete coverage of Mound A. The LiDAR data for Big Mound City do not provide complete coverage due to processing by FDEM personnel (Pluckhahn and Thompson 2012; Lawres 2017, 2019). Thus, we were able only to calculate volumes for Mounds 4 and 5.

These volumes show that Big Mound City is an architectural site of scale similar to some of the famous sites in the broader Southeast. Mound 4 at Big Mound City is larger than any architectural feature at Crystal River. While only two mound volumes were calculated for Big Mound City (Mounds 4 and 5), their combined volume is greater than all of Crystal River. Big Mound City's Mound 4 is larger than most of Moundville's architectural features aside from several of the largest mounds. Big Mound City is dwarfed when compared to the massive architecture at Cahokia.

While Moundville as a whole is much larger than Big Mound City, evidence suggests that Moundville's architecture was built in several stages, both as individual features and as a whole (Blitz 2008; Knight 2010), rather than the rapid building event we have presented for Mound 4 at Big Mound City. The same is true for Crystal River, which was built in four broad phases (Pluckhahn and Thompson 2018; Pluckhahn et al. 2015). This provides insight on labor involved in construction. Because the mounded architecture of Crystal River and Moundville was built over protracted temporal spans involving several stages of construction, the labor pool requirements were much smaller than if they had been built in single construction events.

In contrast, our data support Belle Glade people building Big Mound City's Mound 4 (or at least a sizeable portion of it) in a single construction event, which implies a different labor requirement. It suggests that a large number of people were mobilized to build this mound quickly. Building it in multiple stages, over a protracted period of time, would require a smaller number of people.

Knowing the temporality of construction and the number of construction episodes provides essential information to calculate architectural energetics. While this type of analysis cannot provide direct information about the size of the labor force, such an assessment can estimate the amount of labor hours to build architectural features. 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) and that expenditure is typically presented as person-hours. The basis of architectural energetics lies in volumetric measurements of architecture and experimental and ethnographic data related to extracting and transporting resources (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; Lacquement 2009).

An early historic account of the Lake Okeechobee area described individual settlements of 30 to 40 people (Goggin and Sturtevant 1964:186, 210; True 1944:13; Worth 2014:201), providing a baseline to evaluate rapid construction. To calculate the number of person-hours involved in construction, we use Erasmus' (1965:284-285) experimental sediment excavation rate of 0.52 m^3 per person-hour (2.6 m^3 in a 5-hour day) and his sediment transport rate for a distance of 50 m of 0.634 m^3 per person-hour (3.17 m^3 in a 5-hour day). As noted above, Mound 4 has a volume of 13,101 m^3. Using Erasmus' (1965) rates, excavating the sediments would require 25,194.23 person-hours, and transporting those sediments an assumed 50 m distance would require an additional 20,664.04 person-hours. Thus, a conservative number of person-hours for construction is 45,858.27 person-hours or 9,171.65 person-days, assuming a 5-hour work day. It should be noted that this number is conservative because it does not account for tamping and shaping the mound.

If Big Mound City's labor pool was only 20 people, it would take 459 days to construct Mound 4. If the labor pool were 40 people, it would take 229 days. However, given the lack of evidence for development of surface crusts or other pedogenic processes in the mound, we estimate construction to have been on the order of only a few months, and probably less. To construct the mound in 90 days, it would require 102 laborers working five hour days; for 60 days it would require 153 laborers; for 30 days it would require 306. To reiterate, these are conservative estimates because they do not include additional labor-time for tamping sediments and shaping them into final form.

The point is that Big Mound City's Mound 4, with a volume of 13,101 m^3 of sediments and no evidence of protracted construction stages, would have required a large number of people to build in a rapid fashion. This is especially intriguing given the small population estimates. Big Mound City's Mound 5 may have similar evidence of rapid construction, but this is yet to be tested. Willey (1949) notes that Stirling's early excavations in this mound encountered only white sand that was sterile of cultural materials, thus it is possible that people also rapidly built this earthwork.

It is important to note that our data are from limited testing in Mound 4, so the history of this particular mound may be more complex than we suggest. In other words, given the large size of the mound, people might have built other portions at other times. However, Stirling's two large trench excavations in the mound's northern portion suggest patterns similar to ours. Those excavations were prior to the invention of radiocarbon dating and were devoid of cultural materials below the 24-inch level (Willey 1949). Thus, as discussed above, Stirling's excavations, which covered an even larger portion of Mound 4 than ours, suggest a midden capping a mound constructed of fill sediments (likely loaded fills like those we encountered). Unfortunately, the remainder of Stirling's documentation does not include stratigraphic notes, so we do not know if he encountered individual basket-loads, although we do know that he did not encounter midden strata beneath the capping midden (Willey 1949). To us, this suggests that people constructed most, if not all, of Mound 4 rapidly, but more testing is needed to be sure.

Concluding Remarks

We are closer to a better understanding of Belle Glade monumentality by documenting variability in construction methods used to build habitation mounds in Type A and B circular-linear earthworks. Our excavations provide data necessary to evaluate the construction of Mound 4, the habitation mound at Big Mound City. We are now in a position to say that people of the Belle Glade culture, in some cases such as Mound 4, participated in *large-scale* construction *events* leading to the building of large architectural features, rather than only small-scale capping episodes that produced periodic enlargements of architecture, such as implied for the habitation mounds at Tony's Mound (Carr and Steele 1994) or some of the mounds at Fort Center (Sears 1982). At Big Mound City, a single radiocarbon date suggests that one of these *events* occurred between cal AD 1025 to 1155 and resulted in the construction of all or a sizeable part of Mound 4. This mound is comprised of 13,101 m^3 of sediments, which makes it one of the largest mounds in Florida and is on a similar scale to many of the large mounds in the greater Southeast.

However, Mound 4 is only one of many architectural features at Big Mound City. Future research should focus on developing an understanding of how other features, such as the semi-circle and radiating linear embankments, relate to Mound 4 temporally. Research aimed at understanding their construction sequences is already underway (Lawres 2019; Lawres et al. 2018). Once we understand the temporality of these features, it will be possible to conduct a site-wide architectural energetics assessment, which will allow us to address broader questions of labor (i.e., number of person-hours for construction, scale of the labor force, etc.) and fisher-hunter-gatherer complexity.

Since inception in 2015, the KORES project has made great strides toward our goal of understanding Belle Glade monumentality. We have surveyed several monumental earthworks, produced the first chronometric dates of monumental architecture outside Fort Center and the first chronometric dates of massive Big Mound City, and we here present compelling evidence for rapid, large-scale construction events. However, we still have a long way to go to understand Belle Glade monumentality from a regional perspective. While gaining data to refine our view of architectural construction at Big Mound City and working to develop a new method to refine this view, we are also obtaining the first chronometric dates at another Belle Glade monumental architectural site (Colvin et al., in prep.). It is our aim to contribute to the discipline of anthropological archaeology by furthering our knowledge of sociocultural complexity and monumentality in non-agricultural societies.

Acknowledgments

Our gratitude is due to many people who helped make this research possible. Our thanks go to Christian Davenport (Palm Beach County Archaeologist), Jeff Ransom (Miami-Dade County Archaeologist), Andrew Schneider, Katie Higgins, Jessica Baker, Jennifer Green, Tasia Renee Scott, Sara Ayers-Rigsby (FPAN), Andres Garzon, Julio Pachon, Rachael Kangas (FPAN), Mallory Fenn (FPAN), Stephanie Escoto, Danielle Ashley Simon, Victoria Ternullo, Carrie Black, Scott Ciliento, Victoria Lincoln (FPAN), and many other volunteers in fieldwork.

We are extremely grateful to the Florida Fish and Wildlife Conservation Commission (FWC) J. W. Corbett office and staff for assistance in the field and for providing swamp buggies in the wet season. Without assistance of so many wonderful, dedicated people, this research would not have been possible. We would like to thank Timothy Murtha, Madeline Brown, Nathania Martinez, Breana Ross, and Luwei Wang for comments on an earlier draft of this article.

Funding for fieldwork was provided by the University of Florida (UF) Graduate School Fellowship and the UF Department of Anthropology's Jamie C. Waggoner, Jr. Grant-in-Aid. AMS analyses were funded by the UF Department of Anthropology's Charles Fairbanks Award, the Florida Museum of Natural History's Ripley P. Bullen Award, the John S. and James L. Knight Endowment for South Florida Archaeology, and Laurencine Mazzoli. We express our gratitude to TeraFlex Suspension Systems for providing Jeep suspension and lift components to reach the site when swamp buggies were not available. Excavations were conducted under State of Florida 1A-32 Archaeological Research Permit No. 1516.053 and Florida Fish and Wildlife Conservation Commission Special Use Access Permit No. SUO-51405.

References Cited

Abrams, Elliot M.
1989 Architecture and Energy: An Evolutionary Perspective. In *Archaeological Method and Theory, Volume 1*, edited by Michael B. Schiffer, pp. 47-88. University of Arizona Press, Tucson.

1994 *How the Maya Built Their World: Energetics and Ancient Architecture*. University of Texas Press, Austin.

Abrams, Elliot M., and Thomas W. Bolland
1999 Architectural Energetics, Ancient Monuments, and Operations Management. *Journal of Archaeological Method and Theory* 6(4):263-291.

Arnold, Jeanne E., and Anabel Ford
1980 A Statistical Examination of Settlement Patterns at Tikal, Guatemala. *American Antiquity* 45(4):713-726.

Austin, Robert J.
1996 Ceramic Seriation, Radiocarbon Dates, and Subsistence Data from the Kissimmee River Valley: Archaeological Evidence for Belle Glade Occupation. *The Florida Anthropologist* 49(2):65-87.

1997 *The Economics of Lithic-Resource Use in South-Central Florida*. Ph.D. dissertation, Department of Anthropology, University of Florida, Gainesville.

2015 The Ritual Uses of Lithic Raw Materials during the Woodland Period, Fort Center, Southern Florida. *Journal of Field Archaeology* 40(4):413-427.

Bernardini, Wesley
2004 Hopewell Geometric Earthworks: A Case Study in the Referential and Experiential Meaning of Monuments. *Journal of Anthropological Archaeology* 23(3):331-356.

Blitz, John H.
2008 *Moundville*. The University of Alabama Press, Tuscaloosa.

Bresson, L.-M., and J. Boiffin
1990 Morphological Characterization of Soil Crust Development Stages on an Experimental Field. *Geoderma* 47:301–325.

Bronk Ramsey, Christopher
2001 Development of the Radiocarbon Calibration Program OxCal. *Radiocarbon* 43:355-363.

Carmean, Kelli
1991 Architectural Labor Investment and Social Stratification at Sayil, Yucatan, Mexico. *Latin American Antiquity* 2:151-165.

Carr, Robert S.
1985 Prehistoric Circular Earthworks in South Florida. *The Florida Anthropologist* 38(4):288-301.

2016 Belle Glade Circular Earthworks: A New Interpretation. Invited paper presentation (Symposium: The Belle Glade Culture Revisited), Society for American Archaeology, 81st Annual Meeting, April 6-10, Orlando, Florida.

Carr, Robert S., David Dickel, and Marylin Masson
1995 Archaeological Investigation at the Ortona Earthworks and Mounds. *The Florida Anthropologist* 48(4):227-263.

Carr, Robert S., Anne McCudden, and Willard S. Steele
1996 *An Archaeological Survey and Assessment of the Terry Jackman Ranch, Hendry County, Florida*. Report prepared for Jackman Cane & Cattle Co. by Archaeological and Historical Conservancy, Miami. AHC Technical Report #152.

Carr, Robert S., and Willard S. Steele
1992 *An Archaeological Assessment of the South Lake Mounds, 8HN33, Hendry County, Florida*. Report prepared for U.S. Sugar Corporation by Archaeological and Historical Conservancy, Davie. AHC Technical Report #60.

1994 *An Archaeological Assessment of Tony's Mound and the Hilliard Brothers Site, Hendry County, Florida.* Report prepared for Hilliard Brothers, Inc. and U.S. Sugar Corporation by the Archaeological and Historical Conservancy, Inc.,

Colvin, Matthew H.
2014 Assessing Monumentality in the Okeechobee Basin, Florida and the Scope of LiDAR Imaging. Poster presented at Southeastern Archaeological Conference 71st Annual Meeting, November 12-15, Greenville, South Carolina.

2015 Emergence of Place: The Great Circle of Fort Center, Glades County, Florida. Paper presented at Society for American Archaeology 80th Annual Meeting, April 15-19, San Francisco.

2016 New Perspectives for Engaging Temporality of Sand Earthworks at Fort Center (8GL13), Florida. Paper presentation, Southeastern Archaeological Conference, 73rd Annual Meeting, October 26-29, Athens, Georgia.

Colvin, Matthew H., Nathan R. Lawres, and Christian Davenport
in prep. Presenting the First Chronometric Dates from Big Gopher Mound, Florida. Ms on file with the authors.

Craig, Douglas B., James P. Holmlund, and Jeffery J. Clark
1998 Labor Investment and Organization in Platform Mound Construction: A Case Study from the Tonto Basin of Central Arizona. *Journal of Field Archaeology* 25(3):245-259.

Davenport, Christian (organizer)
2016 The Belle Glade Culture Revisited. Symposium held at the Society for American Archaeology, 81st Annual Meeting, April 6-10, Orlando, Florida.

Davenport, Christian, Gregory Mount, and George Boyer, Jr.
2011 *The Boyer Survey: An Archaeological Investigation of Lake Okeechobee*. Report prepared for 1A-32 State Research Permit Number 0607.67. On file, Florida Division of Historic Resources, Tallahassee.

Davis, John H., Jr.
1943 *The Natural Features of Southern Florida*. Geological Bulletin No. 25. Florida Geological Survey, Tallahassee.

Duchaufour, Ph.
1998 *Handbook of Pedology: Soils, Vegetation, Environment*, translated by V.A.K. Sarm. A.A. Balkema, Brookfield.

Erasmus, Charles J.
1965 Monument Building: Some Field Experiments. *Southwestern Journal of Anthropology* 21(4):277-301.

Hammerstedt, Scott William
2005 *Mississippian Construction, Labor, and Social Organization in Western Kentucky*. Ph.D. dissertation, Department of Anthropology, Pennsylvania State University, Union Park.

Goggin, John M. and William C. Sturtevant
1964 The Calusa: A Stratified Nonagricultural Society (With Notes on Sibling Marriage). In *Explorations in Cultural Anthropology: Essays in Honor of George Peter Murdock*, edited by Ward H. Goodenough, pp. 179-219. McGraw-Hill, New York.

Green, Jennifer, and Catherine Smith (organizers)
2018 Finding Middle Ground: Emerging Ideas About Interior Wetlands Florida. Symposium at the Southeastern Archaeological Conference, 75th Annual Meeting, November 14-17, Augusta, Georgia.

Griffin, John W.
2002 *Archaeology of the Everglades*. University Press of Florida, Gainesville.

Hale, H. Stephen
1984 Prehistoric Environmental Exploitation Around Lake Okeechobee. *Southeastern Archaeology* 3:173-187.

1989 *Prehistoric Subsistence Strategies and Settlement Patterns in the Lake Okeechobee Basin of the South Florida Peninsula*. Ph.D. dissertation, Department of Anthropology, University of Florida, Gainesville.

Johnson, William G.
1990 The Role of Maize in South Florida Aboriginal Societies: An Overview. *The Florida Anthropologist* 43(3):209-214.

1991 *Remote Sensing and Soil Science Applications to Understanding Belle Glade Cultural Adaptations in the Okeechobee Basin*. PhD. dissertation, Department of Anthropology, University of Florida, Gainesville.

1994 Early Aerial Photography: A Remote Sensing Technique used to Detect Prehistoric Earthworks in the Kissimmee River Basin. *The Florida Anthropologist* 47(3):269-279.

1996 A Belle Glade Earthwork Typology and Chronology. *The Florida Anthropologist* 49(4):249-260.

Jones, Jeanne C., and Brian Dorr
2004 Habitat Associations of Gopher Tortoise Burrows on Industrial Timberlands. *Wildlife Society Bulletin* 32(2):456-464.

Kidder, Tristram R., Lee J. Arco, Anthony L. Ortmann, Timothy Schilling, Caroline Boeke, Rachel Bielitz, and Katherine A. Adelsberger
2009 *Poverty Point Mound A: Final Report of the 2005 and 2006 Field Seasons*. Report to Louisiana Archaeological Survey and Antiquities Commission. On file, Louisiana Archaeological Survey and Antiquities Commission, Baton Rouge.

Knight, Vernon J., Jr.
2010 *Mound Excavations at Moundville: Architecture, Elites, and Social Order*. University of Alabama Press, Tuscaloosa.

Kolb, Michael J.
1994 Monumentality and the Rise of Religious Authority in Precontact Hawai'i. *Current Anthropology* 35:521-547.

Lacquement, Cameron H.
2009 *Landscape Modification at Moundville: An Energetics Assessment of a Mississippian Polity*. Ph.D. dissertation, Department of Anthropology, University of Alabama, Tuscaloosa.

2010 Recalculating Mound Volume at Moundville. *Southeastern Archaeology* 29(2):341-354.

Lawres, Nathan R.
2015 Monumentality of the Belle Glade Landscape: Pathways of Citation. Paper presentation, Florida Anthropological Society, 67th Annual Meeting, May 28-31, Sarasota, Florida.

2016a Bridging Earth, Sky, and Water with Place: Materializing Ontology in a Monumental Landscape. Paper presentation (Symposium: Ancient Water Worlds of the Southeast: The Role of Dwelling and Traveling in the Formation of the Southeastern Archaeological Record), Southeastern Archaeological Conference, 73rd Annual Meeting, October 26-29, Athens, Georgia.

2016b Engaging the Ontological in the Okeechobee Basin: Materializing Ontology in Monumental Form. Paper presented at Florida Anthropological Society, 68th Annual Meeting, May 19-22, Jupiter, Florida.

2017 Materializing Ontology in Monumental Form: Engaging the Ontological in the Okeechobee Basin, Florida. *Journal of Anthropological Research* 73(4):647-694.

2019 *Engaging the Monumental Through the Ontological: The Belle Glade Monumental Landscape of South Florida*. Ph.D. dissertation, Department of Anthropology, University of Florida, Gainesville.

Lawres, Nathan R., Allan Bacon, and Julio Pachon
2018 A Dirty Conundrum: Identifying Construction Sequences Without Visible Stratification. Paper presented at Southeastern Archaeological Conference, 75th Annual Meeting, November 14-17, Augusta, Georgia.

Lawres, Nathan R., and Matthew H. Colvin
2016 Gathering Relations in an Aqueous World: Ontology, Monumentality, and the Belle Glade Landscape. Invited paper presentation (Symposium: The Belle Glade Culture Revisited), Society for American Archaeology, 81st Annual Meeting, April 6-10, Orlando, Florida.

2017 Presenting the First Chronometric Dates from Big Mound City, Florida. *The Florida Anthropologist* 70:59-69.

Lichtler, William F.
1960 Geology and Ground-Water Resources of Martin County, Florida. Report of Investigations No. 23. Florida Geological Survey, Tallahassee.

Locascio, William, and Matthew H. Colvin
2017 Prehistoric Tree Island Use in the Northern Everglades: New Evidence from the Late Archaic. Paper presented at Society for American Archaeology, 82nd Annual Meeting, March 29-April 2, Vancouver, BC, Canada.

2018 Middens in the Muck: Evidence of Late Archaic Tree Island Occupation in the Northern Everglades. Paper presented at Southeastern Archaeological Conference, 75th Annual Meeting, November 14-17, Augusta, Georgia.

Marquardt, William H.
1985 Complexity and Scale in the Study of Fisher-Hunter-Gatherers: An Example from the Eastern United States. In *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*, edited by T. Douglas Price and James A. Brown, pp. 59-98. Academic Press, Orlando.

McPherson, Benjamin F., and Robert Halley
1996 *The South Florida Environment – A Region Under Stress*. U.S. Geological Survey Circular 1134. United States Government Printing Office, Washington, D.C.

McRae, W. Alan, J. Larry Landers, and James A. Garner
1981 Movement Patterns and Home Range of the Gopher Tortoise. *The American Midland Naturalist* 106(1):165-179.

McVoy, Christopher W., Winifred Park Said, Jayantha Obeysekera, Joel A. VanArman, and Thomas W. Dreschel
2011 *Landscapes and Hydrology of the Predrainage Everglades*. University Press of Florida, Gainesville.

Milanich, Jerald T.
1994 *Archaeology of Precolumbian Florida*. University Press of Florida, Gainesville.

Milanich, Jerald T., and Charles H. Fairbanks
1980 *Florida Archaeology*. Academic Press, New York.

Mitchell, Scott E.
1996 *The Importance of Aquatic Resources at Five Archaeological Sites in the Okeechobee Region of South Florida*. M.A. thesis, Department of Anthropology, University of South Florida, Tampa.

Ortmann, Anthony, and Tristram R. Kidder
2013 Building Mound A at Poverty Point, Louisiana: Monumental Public Architecture, Ritual Practice, and Implications for Hunter-Gatherer Complexity. *Geoarchaeology: An International Journal* 28:66-86.

OxCal
2019 Radiocarbon Calibration Online Program. Electronic document, http://c14.arch.ox.ac.uk/oxcal.html, accessed November 24, 2019.

Peacock, Evan
2005 *Mississippi Archaeology Q&A*. University Press of Mississippi, Jackson.

Pluckhahn, Thomas J., and Victor D. Thompson
2012 Integrating LiDAR Data and Conventional Mapping of the Fort Center Site in South-Central Florida: A Comparative Approach. *Journal of Field Archaeology* 37(4):289-301.

2018 *New Histories of Village Life at Crystal River*. University Press of Florida, Gainesville.

Pluckhahn, Thomas J., Victor D. Thompson, and Alexander Cherkinsky
2015 The Temporality of Shell-Bearing Landscapes at Crystal River, Florida. *Journal of Anthropological Archaeology* 37:19-36.

Porter, Rita K.
1951 Analysis of Belle Glade Plain Rim Sherds from Two Fish Eating Creek Sites. *The Florida Anthropologist* 4(3-4):67-75.

Reimer, P.J., E. Bard, A. Bayliss, J.W. Beck, P.G. Blackwell, C. Bronk Ramsey, P.M. Grootes, T.P. Guilderson, H. Haflidason, I. Hajdas, C. Hatt, T.J. Heaton, D.L. Hoffman, A.G. Hogg, K.A. Hughen, K.F. Kaiser, B. Kromer, S.W. Manning, M. Niu, R.E. Reimer, D.A. Richards, E.M. Scott, J.R. Southon, R.A. Staff, C.S.M Turney, and J. van der Plicht.
2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon* 55(4):1869-1887.

Rochelo, Mark J., Christian Davenport, and Donna Selch
2015 Revealing Pre-historic Native American Belle Glade Earthworks in the Northern Everglades Utilizing Airborne LiDAR. *Journal of Archaeological Science: Reports* 2:624-643.

Saunders, Joe W., and Thurman Allen
1994 Hedgepeth Mounds, an Archaic Mound Complex in North-Central Louisiana. *American Antiquity* 59(3):471-489.

Schaetzl, Randall J.
1998 Lithologic Discontinuities in Some Soils on Drumlins: Theory, Detection, and Application. *Soil Science* 163:570–590.

Schaetzl, Randall, and Sharon Anderson
2005 *Soils: Genesis and Geomorphology*. Cambridge University Press, New York.

Schwadron, Margo
2010 Prehistoric Landscapes of Complexity: Archaic and Woodland Period Shell Works, Shell Rings, and Tree Islands of the Everglades, South Florida. In *Trend, Tradition, and Turmoil: What Happened to the Southeastern Archaic?,* edited by David H. Thomas and Matthew C. Sanger, pp. 113-146. Anthropological Papers of the American Museum of Natural History, New York.

Sears, William H.
1982 *Fort Center: An Archaeological Site in the Lake Okeechobee Basin*. University Press of Florida, Gainesville.

Sherwood, Sarah C., and Tristam R. Kidder
2011 The DaVincis of Dirt: Geoarchaeological Perspectives on Native American Mound Building in the Mississippi River Basin. *Journal of Anthropological Archaeology* 30:69-87.

Stirling, Matthew W.
1935 *Smithsonian Archaeological Projects Conducted Under the Federal Emergency Relief Administration, 1933-1934*, Annual Report for 1934. Smithsonian Institution, Washington, D.C.

Thompson, Victor D.
2015 Finding Resilience in Ritual and History in the Lake Okeechobee Basin. In *Beyond Collapse: Archaeological Perspectives on Resilience, Revitalization, and Transformation in Complex Societies*, edited by Ronald K. Faulseit, pp. 313-341. Center for Archaeological Investigations, Occasional Paper No. 42. Southern Illinois University Press, Carbondale.

Thompson, Victor D., Kristen Gremillion, and Thomas J. Pluckhahn
2013 Challenging the Evidence for Prehistoric Wetland Maize Agriculture at Fort Center, Florida. *American Antiquity* 78:181-193.

Thompson, Victor D., and Thomas J. Pluckhahn
2012 Monumentalization and Ritual Landscapes at Fort Center in the Lake Okeechobee Basin of South Florida. *Journal of Anthropological Archaeology* 31:49-65.

2014 The Modification and Manipulation of Landscape at Fort Center. In *New Histories of Precolumbian Florida*, edited by Neill J. Wallis and Asa R. Randall, pp. 163-182. University Press of Florida, Gainesville.

True, David O. (editor)
1944 *Memoir of Do. d'Escalente Fontaneda Respecting Florida, Written in Spain, about the Year 1575*. Glade House, Coral Gables, Florida.

Valentin, C.
1991 Surface Crusting in Two Alluvial Soils of Northern Niger. *Geoderma* 48:201–222.

Valentin, C., and L.-M. Bresson
1992 Morphology, Genesis and Classification of Surface Crusts in Loamy and Sandy Soils. *Geoderma* 55:225-245.

Wheeler, Ryan J., and Christine L. Newman
1997 Summary of Site Components and Management Recommendations for Big Mound City (8PB48), J. W. Corbett Wildlife Management Area, Palm Beach County. Conservation and Recreation Lands (CARL) Archaeological Survey. On file, Florida Master Site File, Tallahassee.

Wheeler, Ryan J., Donna Ruhl, Arlene Fradkin, and Fredrick J. Rich
2019 The Archaeology of the Whitebelt 1 Circle-Ditch (8PB220), Palm Beach County, Florida. *The Florida Anthropologist* 72(2):68-126.

White, William A.
1970 *The Geomorphology of the Florida Peninsula.* Bulletin 51. Florida Geological Survey, Tallahassee.

Widmer, Randolph J.
1988 *The Evolution of the Calusa: A Nonagricultural Chiefdom on the Southwest Florida Coast*. University of Alabama Press, Tuscaloosa.

2002 The Woodland Archaeology of South Florida. In *The Woodland Southeast*, edited by David G. Anderson and Robert C. Mainfort, Jr., pp. 373-397. University of Alabama Press, Tuscaloosa.

Willey, Gordon R.
1949 *Excavations in Southeast Florida.* Yale University Publications in Anthropology 42, New Haven.

Worth, John E.
2014 The Captivity of Hernando de Escalante Fontaneda. In *Discovering Florida: First-Contact Narratives from Spanish Expeditions along the Lower Gulf Coast*, pp. 190-221. University Press of Florida, Gainesville.

ABOUT THE AUTHORS

Dorothy Block earned M.A. and B.A. degrees in Anthropology and a B.A. degree in English and American Literature from Florida Atlantic University. She is the founder of the Palm Beach County Anthropological Society and the former Director of the Lawrence E. Will Museum of the Glades, in Belle Glade. Dorothy has taught archaeology and general anthropology at Broward College and Palm Beach State. She has worked for over a decade in Cultural Resource Management. She is a proud mother and mentor of young anthropologists in her region.

Bianca Maltese Book is a bioarchaeologist with interests in European and Native American prehistory. She was graduated Suma Cum Laude from Florida State University with a B.S. and M.S. in Anthropology and a minor in Psychology.

Matthew Colvin currently works at the Center for Applied Isotope Studies at the University of Georgia, where he prepares materials for accelerator mass spectrometry (AMS) dating and isotopic analyses. His primary research interest examines the complex histories of long-lived spaces, specifically those of fisher-hunter-gatherers in south-central Florida.

Christian Davenport holds a B.A. (Franklin Pierce College, New Hampshire) and an M.A. (University of Tennessee, Knoxville) in Anthropology focusing on zooarchaeology. He is currently working on is Ph.D. in geosciences (Florida Atlantic University). Chris was awarded the Ripley Bullen Award by FAS in 2018 for furthering good relations among professional and avocational archaeologists. He is the Historic Preservation Officer/Archaeologist for Palm Beach County, Florida.

George R. Ferguson published an article in *The Florida Anthropologist* in 1976 about the Weekiwachee Site in Hernando County. In 1977, he co-authored an article with Wilfred Neill about the age of Santa Fe projectile points. In 1977 or 1978, he reported a Deptford tripodal ceramic vessel from Pasco County in the *FAS Newsletter*. He donated the vessel to the West Pasco Historical Society in New Port Richey, Florida.

Nathan R. Lawres is an Assistant Professor of Anthropology and Director of the Antonio Waring, Jr. Archaeological Laboratory at the University of West Georgia. He teaches courses in archaeological methods, experimental archaeology, laboratory analyses, and cultural resource management. His research has focused on monumentality, ontologies, human-environment relations, materiality, trade networks, human migration and mobility, issues in curation and museology, and cultural resource management. Nathan's primary focus is the southeastern United States, where he has practiced CRM and academic archaeology for 15 years. He holds B.A. and M.A. degrees in Anthropology from the University of Central Florida and a Ph.D. in Anthropology from the University of Florida.

George M. Luer is a former FAS President and recipient of the Lazarus and Bullen Awards. He has helped preserve significant archaeological sites and natural areas, while furthering their research and understanding through scientific publications. George has worked as an archaeologist in CRM and for the State of Florida in various capacities, including for the Florida Park Service. He holds M.A. and Ph.D. degrees in Anthropology from the University of Florida, with studies in coastal geomorphology. He has studied Botany and participated in plant expeditions to various parts of the world. George also has studied Latin America, history, and Florida folk culture.

Gregory J. Mount is an associate professor of hydrogeophysics at the Indiana University of Pennsylvania. He works primarily in the geophysics realm, focusing on electromagnetic and electrical techniques applied to critical zone and near-surface research. As part of ongoing collaborations with south Florida archaeologists, he still maintains an active presence in archaeology and geoarchaeology. The research presented here is part of his 2009 thesis, undertaken with archaeologists Arlene Fradkin, Clifford Brown, and Christian Davenport at Florida Atlantic University.

Wilfred T. Neill, Jr., a herpetologist and native of Augusta, Georgia, was a long-time resident of Florida and member of FAS. He served two terms as FAS President in 1954 and 1955 and contributed many articles to *The Florida Anthropologist*. He authored scholarly books, including *Archaeology and A Science of Man* (1978). An obituary of Neill appears in Volume 56, Number 4, of *The Florida Anthropologist* (December 2003).