Hidden in Plain Sight: Digital Documentation of Cockroach Key (8HI2), a First Millennium Native American Mound Complex on the Western Coast of Florida, USA

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We present digital documentation of the Cockroach Key archaeological site in Tampa Bay on the western coast of Florida, USA. The site consists of a mound and midden complex constructed by Native Americans between around 100 and 900 CE. Although well known to antiquarians of the 1800s and archaeologists of the early 1900s, the site has slowly become "hidden in plain sight" to both archaeologists (owing to the lack of contemporary investigations) and the public [owing to the density of vegetation). We use LiDAR-based mapping and ground-penetrating radar to document the site's surface and subsurface features.

Keywords:
Airborne LiDAR, Ground-penetrating radar, archaeo-geophysics, Woodland period, Southeast USA

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1. INTRODUCTION

The trope of "discovery" of "lost" monuments and civilizations is foundational to the discipline of archaeology, beginning with its roots in nineteenth-century antiquarianism and continuing at least through scientific archaeology of the late twentieth century [Begley 2016:36-37; Effros and Lai 2018:xxi]. While the colonialist and imperialist histories of archaeology have been roundly critiqued over the past few decades [e.g., Díaz-Andreu 2007; Effros and Lai 2018; McNiven and Russell 2005;

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Meskell 1998; Trigger 1984], the cliche has found new life in popular press surrounding the proliferation of digital technologies—especially LiDAR—in archaeology [e.g., Jones 2013; Preston 2017]. Cohen and colleagues [2020:84-85], for example, have discussed the troubling implications of sensationalist media narratives associated with their use of LiDAR to map sites in Cambodia:

> Particularly troubling in the Cambodian context are the racist and colonialist implications of these "lost city" narratives, which ignore the fact that the temple-cities of the Angkor period have never been abandoned by the Khmer people who built them, and in fact, show evidence of continuous habitation from prehistory to the present day…These settlements were never "lost" or "abandoned" by Cambodians, and were thus never "discovered" by anyone, much less by teams led by foreign archaeologists. Nonetheless, the "lost city" trope is remarkably resilient in public discourse on lidar work in Cambodia and has overwhelmed alternative narratives of the past presented by archaeologists and local communities alike. It also speaks to a wider problem of public perception of our lidar work, which lies at the intersection of fantasies about exploration and discovery, and excitement about high-tech applications of lasers in the jungle. All of this is profoundly at odds with our desire to come to terms with legacies of colonialism in our discipline and suggests that we have a long and difficult road ahead in amplifying marginalized voices promoting alternatives to these kinds of narratives.

As these and other authors note, ancient monuments are rarely truly "lost," even if their form and location are unknown to archaeologists. Indeed, we argue that rather than "lost," it may be more accurate to describe such monuments are "hidden in plain sight" to draw attention to the fact that their visibility—like any other material phenomenon— is a function not only of strictly physical factors but also the attention of the viewer [Zerubavel 2015:2]. Attention, in turn, is "performed by members of particular communities with particular styles of attending, who focus their attention on particular slices of physical or mental reality while inattending others" [Zerubavel 2015:8].

Perhaps even more so than most sites, the Cockroach Key site—located in Tampa Bay on the western coast of the Florida Peninsula, USA (Figure 1)—was never really "lost." Constructed by Native Americans between around 100 and 900 CE, the site consists of an anthropogenic island of midden that includes two 10-m tall platform mounds (Mounds A and B) as well as a possible third, smaller platform mound (Mound C), a burial mound, and an extensive midden. As one of the highest points on the coastline of Tampa Bay, the mounds on the site were well known to Euro-American settlers of the area. The site attracted the attention of antiquarians in the later 1800s, and was excavated by WPA archaeologists in the 1930s. However, in the absence of any subsequent archaeology using modern methods, the site has gradually faded from memory. We review recent digital documentation of the site, including mapping of surface topography using publicly accessible airborne LiDAR and mapping of subsurface stratigraphy and features using ground-penetrating radar. First, however, we explain how the Cockroach Key site became "hidden in plain sight."

2. PREVIOUS INVESTIGATIONS AT COCKROACH KEY

As we noted above, the Cockroach Key site was well known to the earliest Euro-American settlers of Tampa Bay; the toponym "Indian Hill" appears on maps of Tampa Bay beginning as early as 1855, consistently applied to an island on the southeastern margin of the bay.

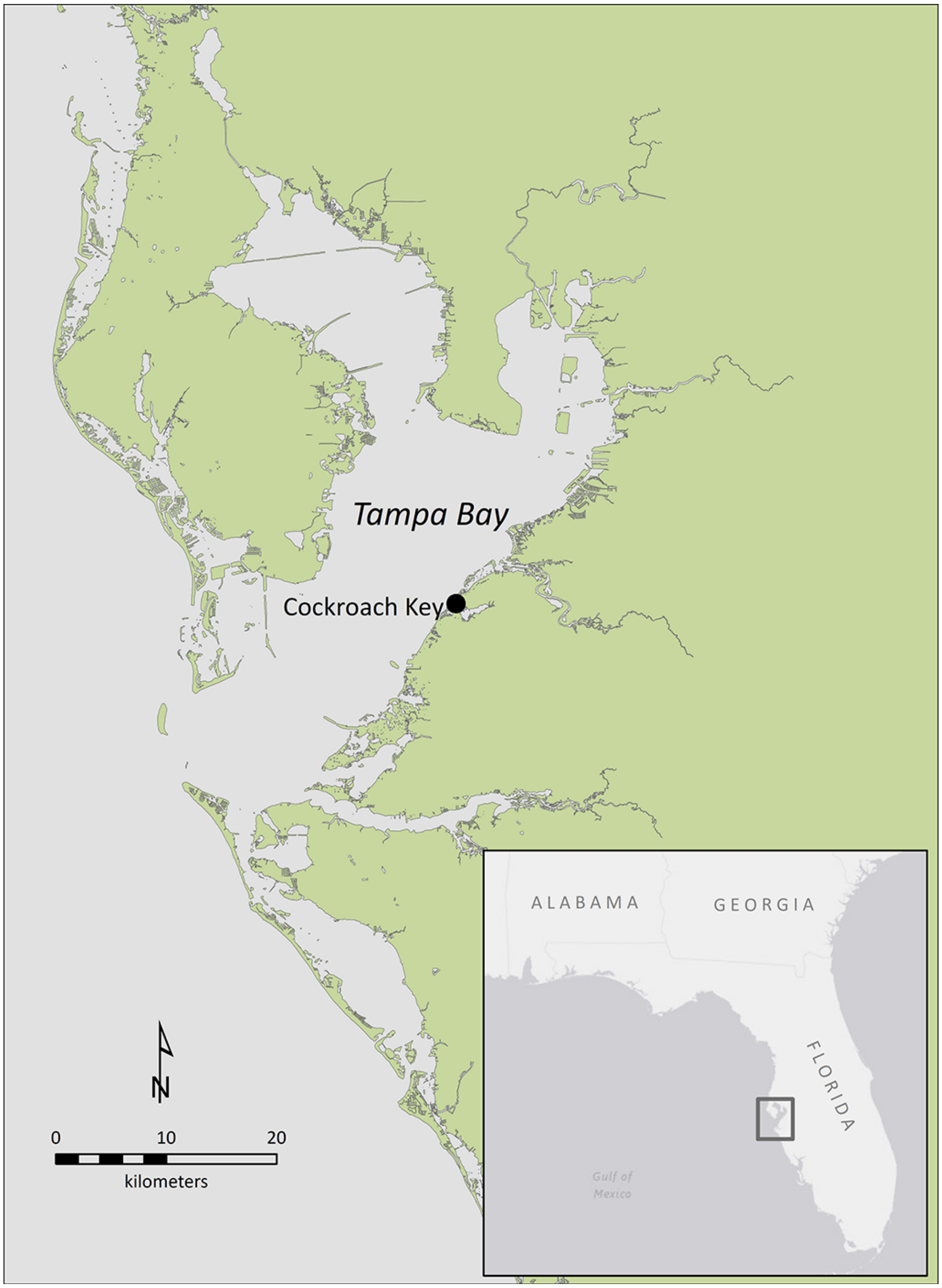

Figure 1. Location of the Cockroach Key site.

Although the use of this name continued, the location was coming to be known by an alternative name at least by the turn of the nineteenth century; an article in a local paper in 1898 noted that the fishing sharpie *Ruth* was en route to “Cockroach Mound” from Tampa Bay in search of catch [Tampa Weekly Tribune 1898]. The site and landform have since come to be more commonly referred to as

“Cockroach Key” in reference to Cockroach Bay, the small embayment leeward of the island. The name “Cockroach” reportedly derives from horseshoe crabs, which were “once so abundant along the shores of Florida’s west coast that early Spanish explorers called them cockroaches, believing them to be seagoing cousins of the insects” [Florida Department of Environmental Protection 2021].

Sylvanus T. Walker [1880:422]—antiquarian, naturalist, and newspaperman—appears to have been the first to describe the “shell-heap at Indian Hill” in print, briefly noting that “this mound, with the shell banks connected, is 700 or 800 feet [213 or 243 m] in length and from 20 to 30 feet [6 to 9 m] high.” Walker’s map of the site, while impressionistic and placing north to the left, documents the site’s major features: a comma-shaped island of shell (D), with three high mounds (A-C) on the southern end, and with a separate, lower mound (F) and an apparent circular depression (E) to the north and east. Walker [1880:422] observed that “the three highest pinnacles rise above the trees and may be seen four or five miles at sea.”

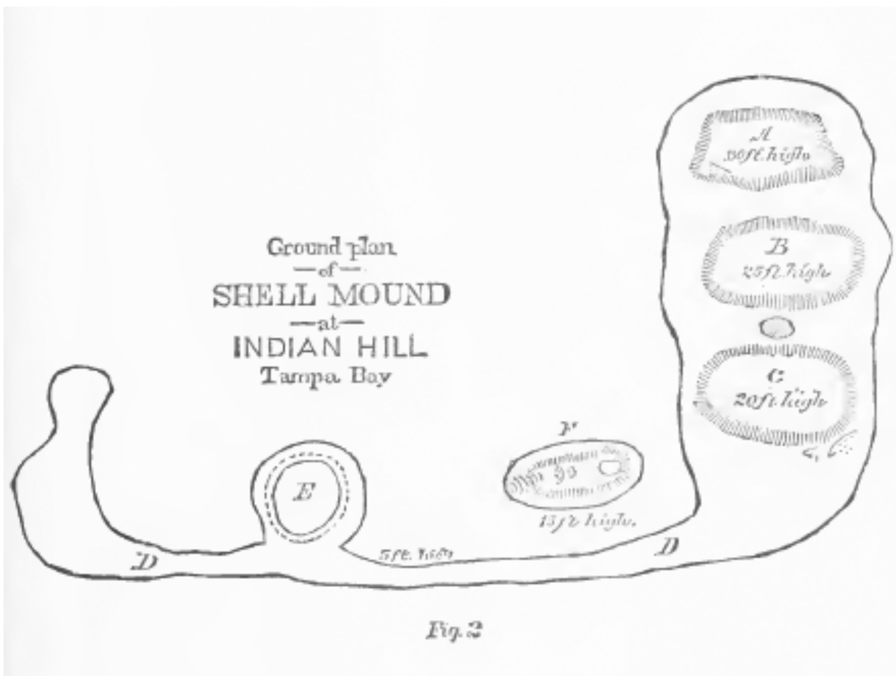

Figure 2. Walker’s [1886:421] map of the Indian Hill/Cockroach Key Mound site.

Another antiquarian, C.B. Moore [1900:359-360], visited “Indian Hill” in 1900, providing a more detailed description of the site and his explorations of the burial mound:

> About 3 miles [4.8 km] down Tampa Bay from the mouth of the Little Manatee river is an island known as Indian Hill, probably eight acres in extent, almost covered by an aboriginal deposit of shells…Part of the shell deposit is made of irregular mounds and ridges. At one extremity, however, the deposit rises steeply, forming a great heap seemingly composed of three mounds with depressions between. The circumference of base is 423 paces. The largest of these heaps has a height of 30 feet [9.1 m] above the surrounding shell deposit and 36 feet 7 inches [11.2 m]

> above water level. We believe, after personal inspection of the majority of Florida shell heaps and careful inquiry as to the rest, that the shell deposit at Indian Hill exceeds in height any in the State...Close to the great shell heap is another, also of shell, very symmetrical, with upward slope of 28 degrees, in places. This mound ...oblong with rounded corners, extends 76 feet [23.2 m] in a N. E. and S. W. direction. Its minor diameter is 55 feet [16.8 m]; its height above the general level of the surrounding shell is 12 feet 4 inches [3.8 m].

At the time of Moore's visit, the site was occupied by lighthouse keeper Fred Walker and his family. Walker reportedly killed himself "in his little cabin at Indian Hill" in 1900 [The Morning Tribune 1900]. He had been dead for 10 days before he was found, after residents of the surrounding area noted that the light had not been burning for several days.

Walker's heirs sold Cockroach Key to Lewis F. Symmes and L.L. Buchanan for the sum of one thousand dollars in 1908 [Haddleton 2021; Helgeson 2007]. The new owners apparently purchased the property with the aim of selling the shell midden as material to build roads, as was common at the time. Fortunately for the preservation of the site, their scheme failed; the small bridge they built to the island proved too small to move shell and washed away [Helgeson 2007]. In addition, asphalt soon replaced shell as the preferred material for road building; a road to Cockroach Bay was paved in 1932 [Tampa Daily Times 1932]. The island came to be used as a fishing retreat for the family [Helgeson 2007]. A passenger boat brought tourists from St. Petersburg to climb the shell mound at "Cucaracha Island" [Hegelston 2007].

Matthew Stirling [1930:183], Chief of the Bureau of American Ethnology, visited Cockroach Key in 1929, describing it as "the single example of one of the large shell mounds [that] remains undisturbed. Stirling overestimated the height of the largest mound at 50 feet (15.2 m), but accurately described the site as rising "in a succession of terraces." He presumed that each of these terraces was "formerly occupied by houses" with the flat summit of the highest mound "crowned by a temple."

During the Great Depression in the 1930s, the Works Progress Administration sponsored excavations at the Cockroach Key site. The work was completed under the overall direction of J. Clarence Simpson, of the Florida Geological Survey, with fieldwork supervised by Preston Holder, of the Smithsonian Institution [Bullen 1952:1-2]. Unfortunately, Simpson and Holder did not complete a report of their investigations. However, the excavations were later summarized by Gordon Willey [1949:158-172] and Ripley Bullen [1952:20-25]. Willey's account of the Cockroach Key work is by far the most detailed. Drawing from the WPA notes, he provided a more detailed map (Willey 1949:Map 12) (reproduced here as Figure 3) and description [Willey 1949:158-160] of the site's major features:

> All portions of the key that extend above the water line appear to be artificial in origin, consisting of the discarded shells of edible shellfish...it is composed of a series of terraces rising to two major mounds; the higher is 35 feet (roughly 10 meters) above the average high-water level, and the other is slightly less. There is also a smaller shell burial mound (indicated on the contour map as area A) which is about 15 feet above water level.

Willey describes WPA excavations in four parts of the site, as indicated on his map (one additional area (E) indicated on his map is not described, while another (F) is described but is located far enough away to be considered a separate site). The most intensive work appears to have been conducted in the burial mound (his Area A), half of which was excavated. These excavations recovered a total of

224 burials distributed across the upper two of three total mound stages [Willey 1949:163-164]. Two intersecting trenches were excavated in Area C, on “the flat section of the key lying to the northeast of the three great shell hills” [Willey 1949:169]; artifacts were common here and Willey [1949:169] reports that excavations continued to the water table but “at no place was the depth of cultural refuse exhausted.” Willey [1949:170] reports that “several random tests” were excavated in Area D, on the westernmost margin of the site. As elsewhere, artifacts were common and extended below the water table. In summarizing the artifact assemblage from the WPA work, Willey [1949:171] suggested that the pottery indicated affinities with the Glades culture of southern Florida. Bullen’s [1952:20-25] summary, intended as a supplement to Willey’s, associated the pottery assemblage with the Weeden Island II period, now understood to date to the Late Woodland (ca. 600 to 1050 CE) and Early Mississippian (ca. 1050-1150 CE) periods. However, Bullen also noted the possibility of an earlier Weeden Island I occupation, now understood to date to the Middle Woodland period (ca. 300 BC to AD 600). Recent radiocarbon dating validates Bullen’s assumptions, suggesting the main occupation at Cockroach Key took place between around 100 to 900 CE.

The Cockroach Key site was officially recorded by John Goggin of the University of Florida in 1952; however, Goggin appears not to have visited the site himself (documents on file at the Florida Master Site File, Tallahassee]. In 1974, the site was listed on the National Register of Historic Places. Lewis F. Symmes III, the third generation of his family to own the island, held on to the property even as Hillsborough County and the State of Florida acquired most of the surrounding land for the Cockroach Bay Aquatic Preserve [Hegelston 2007]. Hillsborough County acquired the land after Symmes died in 2014 [Tampa Bay Tribune 2014].

In the 80 years since the WPA crew completed its work, there have been no professional archaeological investigations at the Cockroach Key site. To some extent, the lack of contemporary work at the site is typical of the Tampa Bay area; academic archaeological research in the region has been limited and has tended to focus on a handful of the most prominent sites [Austin et al. 2014:95). We also suggest that the unusual size and nature of the site—as a 10-m tall anthropogenic island of shell—may have been a disincentive to archaeological research. But the paucity of work at Cockroach Key may also be explained by a more mundane reason: the difficulty of access to the site. First, it can only be accessed by boat. In addition, although once largely cleared of vegetation, the site is now covered by very dense vegetation (Figure 4), including a thick growth of red mangroves (Rhizophora mangle) along the site’s lower elevations and a mix of native scrub oaks (*Quercus*) and invasive Brazilian peppertree (*Schinus terebinthifolia*) in higher and better drained areas.

Whatever the reasons, as a result of the lack of modern excavations and the incomplete reporting of earlier work, the Cockroach Key site has faded from archaeological discourse. The site was omitted entirely from Milanich’s [1994] sweeping synthesis of the archaeology of Florida, as well as a seminal typology of platform mounds of the Tampa Bay area by Luer and Almy [1981]. Cockroach Key earned only a passing mention in Mitchem’s [1989] synthesis of the late prehistoric archaeology of Tampa Bay.

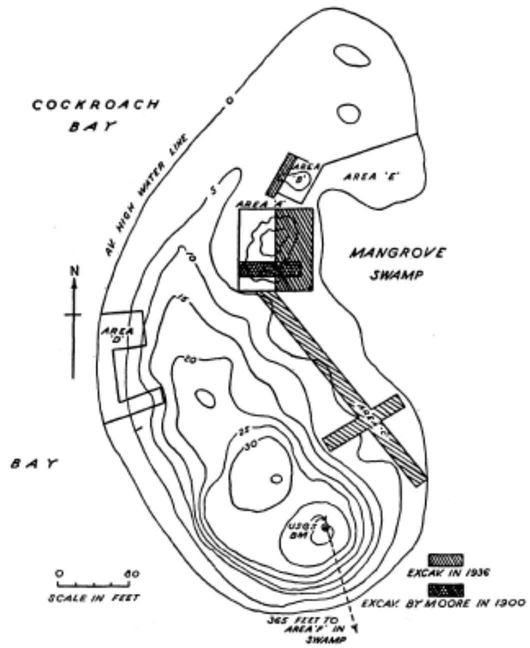

Figure 3. Willey's [1949:159] map of the Cockroach Key site.

Figure 4. View to the north of Cockroach Key and Tampa Bay. Courtesy of Eric Prendergast.

The site has also largely faded from public memory. Owing to the dense vegetation cover, the vast majority of the recreational kayakers, paddle-boarders, and fishers who frequent the adjacent salt flats and streams are probably unaware of the presence of two of the largest mounds on the Florida peninsula. However, the fact that site has never been completely forgotten is unfortunately evidenced by the presence of several pits resulting from illicit digging in the past decade.

3. DIGITAL DOCUMENTATION OF THE COCKROACH KEY SITE

3.1 Mapping

The density of vegetation on Cockroach Key would make mapping of the site nearly impossible with conventional techniques (e.g., total station), even if protections did not prohibit tree removal. Fortunately, the state of Florida Division of Emergency Management has been sponsoring airborne Light Detection and Ranging (LiDAR) survey for several decades as part of its Regional Hurricane Evacuation Studies. We began by locating, downloading, and digitally processing LiDAR data curated by the NOAA Office for Coastal Management [OCM Partners 2021]. The survey of the area encompassing Cockroach Key was conducted in 2007 for a coalition of GIS practitioners, including the Florida Division of Emergency Management (FDEM), Florida Water Management Districts, Florida Fish and Wildlife Conservation Commission, Florida Department of Environmental Protection, Army Corps of Engineers Jacksonville District, and other state and federal agencies. These data are referenced to the North American Vertical Datum of 1988 (NAVD88) and NAD83(2011). According to the accompanying metadata, minimum horizontal accuracy was tested to meet or exceed 115 cm accuracy at 95% confidence. Vertical accuracy was tested to meet 5.7 cm vertical root mean square error (RMSEz) in open terrain. The estimated point spacing is 1.2 m. The data were classified as: Unclassified, Ground, Low Point (noise), Water, and Overlap.

The LAZ tiles that cover the project area were downloaded and converted to LAS and text file formats. The text files were then imported into ArcMap (ESRI, Inc.) and clipped to a smaller area that encompassed the site. Selecting only ground and water further reduced the point cloud. We then used a natural neighbor interpolation to create the raster surface and elevation contours visible in the topographic maps presented below.

Our mapping indicates that the island of shell that comprises Cockroach Key measures around 215 m north-south with a maximum northeast-southwest width of around 91 m (Figure 5). The former measurement accords quite well with Walker's minimal estimation of 213 m, particularly considering the subjectivity of measuring a landform defined by sea levels that fluctuate across both short and long terms.

Our mapping indicates that Mound A, at the southern end of the island, has a maximum elevation of 10.75 m (Figure 6). As Moore [1900:359-360] noted, this mound slopes particularly steeply on its southern edge, from 0.15 m to 10.25 m in elevation across a distance of just 23 m (for a slope of around 44% or 24 degrees). Mound A has a relatively flat, sub-rectangular summit, measuring 18.5 m long (northeast-southwest) and 11.6 m wide (as defined by the 10.5 m contour line). An apparent looter pit is evident on the northwest corner of the summit.

Moving northwest on the main axis of the site from the summit of Mound A takes one down slope to a saddle with an elevation of around 9.46 m before climbing again to Mound B.

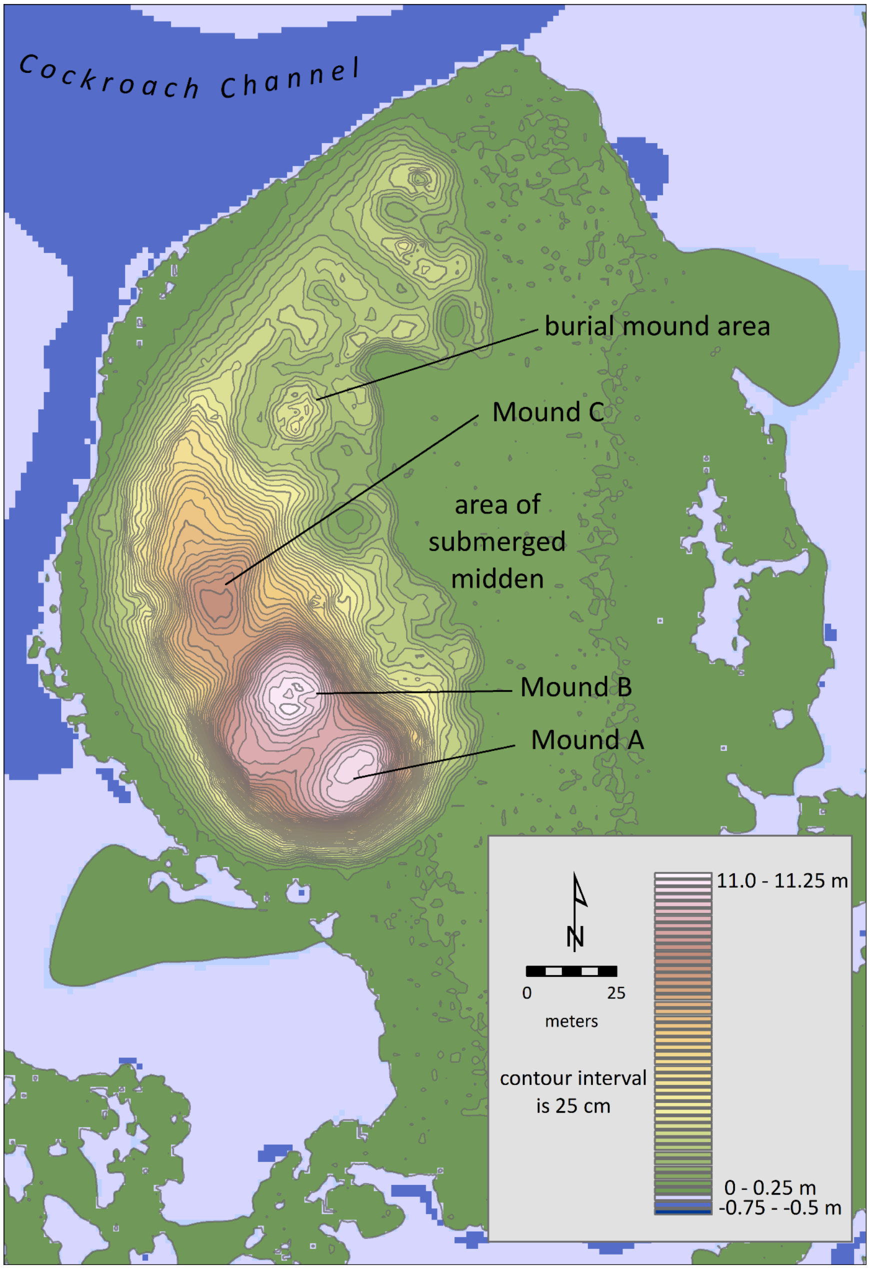

Figure 5. LiDAR-derived topographic map of the Cockroach Key site.

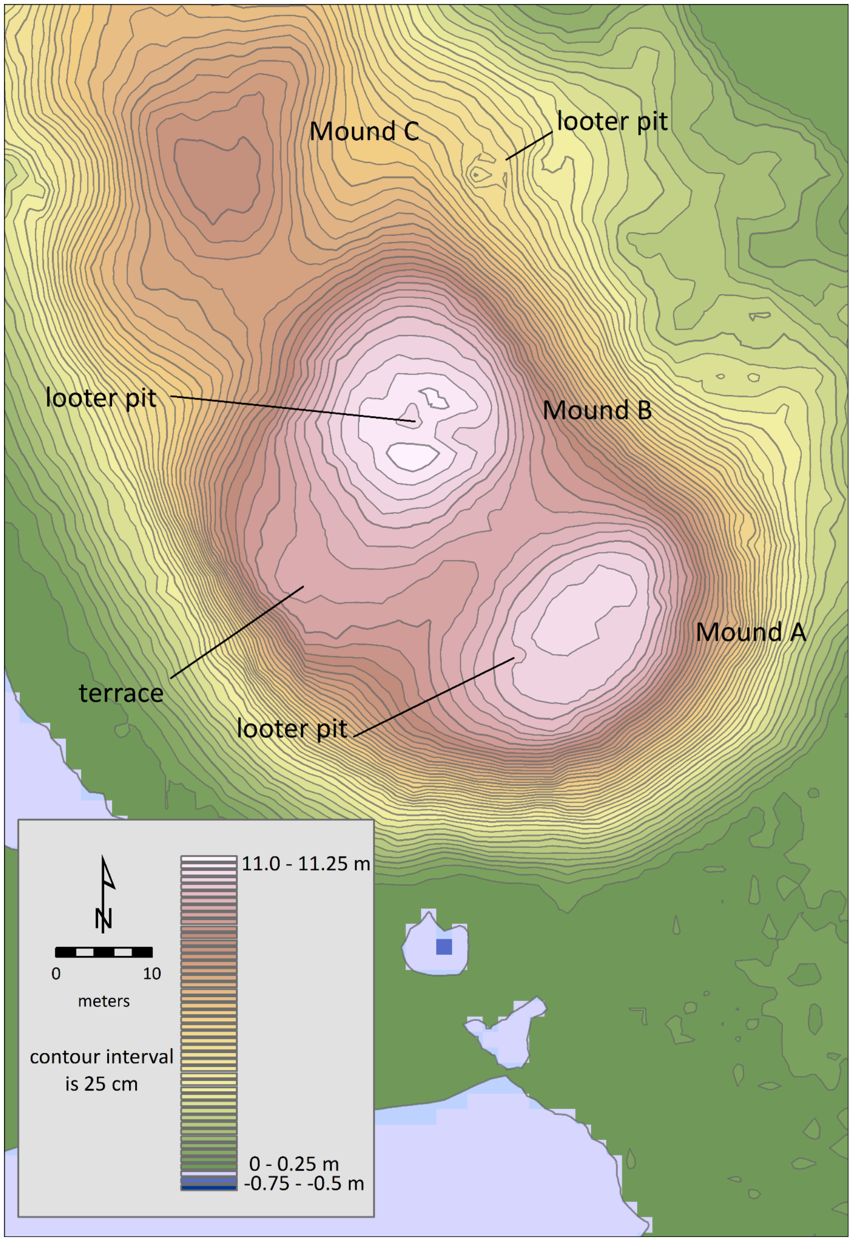

Figure 6. Map of the Mound A-C area.

LiDAR survey indicates that Mound B has maximum elevation of 11.24 m, remarkably consistent with Moore's [1900:359-360] estimate of 11.2 m. The summit of this mound is irregularly oval and around 11.6 m in diameter, but some of this irregularity may owe to the presence of several looting pits, one near the summit of the mound and another on the southeast corner. Mound B slopes steeply to the east and west; however, there is a break in elevation to the southwest, forming a relatively flat terrace about 10 m long and 6 m wide.

Continuing downslope northwest of Mound B, there is a second saddle at an elevation of 7.34 m before another rise to what appears to be a third platform mound. Mound C has a maximum elevation of 8.22 m. The summit of the mound is irregularly square, measuring approximately 8.5 m a side. From Mound C, the higher elevations of the Cockroach Key site slope more gradually to the north-northwest before turning northeast (Figure 7). The gradualness of the slope suggests that this may have been a purposefully constructed ramp; ramps are common to many of the platform mounds in Tampa Bay [Luer and Almy 1981].

East of the ramp, near its northern end, are the remnants of the burial mound. Owing apparently to the WPA excavations, as well as Moore's trenching, the surface here is very undulating. Figure 8 compares Moore's photograph of this mound to a 3D scene rendered from the LiDAR data in ArcScene, from approximately the same vantage. LiDAR data places the mound area's maximum elevation at 3.06 m, about 70 cm lower than Moore's estimate more than a century ago. The main area of higher elevations measures around 17.6 m in diameter, roughly consistent with Moore's description of the mound's "minor diameter" of 16.8 m. A circular area of low elevation separates the burial mound from adjacent higher areas; this suggests the burial mound may have surrounded by a purposefully constructed ditch and enclosure. Earthwork complexes with enclosed burial mounds have been identified at a number of sites on the Florida peninsula, with many dating to the same time period as Cockroach Key [Jackson et al. 2019; Pluckhahn and Thompson 2018; Wallis et al. 2014].

Southeast of the burial mound is a circular depression about 17 m in diameter. This is not noted in any of the earlier maps or descriptions. At northern end of site there are several additional depressions in the shell deposits, some oval and others more oval. One of the oval depressions may correspond with the area marked "E" on Walker's map. These depressions bear some resemblance to the "watercourts" common to sites in southwest Florida. Such features have been variously interpreted as fish ponds, water retention areas, or canoe basins [Cushing 1897; Marquardt 2010:561; Schwadron 2010:292; Thompson 2017]; although the examples at Cockroach Key seem to have been too high in elevation relative to sea level to have functioned in any such capacities. Linear ridges of shell, also common to sites in southwest Florida, have been interpreted as tidal fish weirs or the foundations of houses [Schwadron 2010:294]. The former interpretation again seems unlikely based on their elevation above sea level, but the possibility that these ridges were the foundations of houses seems plausible. However, we can't rule out the possibility that the ridges and depressions evident in the mapping data at the northern end of the site are not related to modern disturbances, perhaps especially the construction of the bridge by landowners in the early twentieth century.

On the eastern margin of the c-shaped island is a broad area of elevation that is today only slightly higher than sea level. This corresponds with Area C on Willey's map of the site, where the WPA excavations encountered extensive artifact deposits [Willey 1949:169]. Today, this area is frequently inundated at high tides and is covered by a dense growth of mangroves.

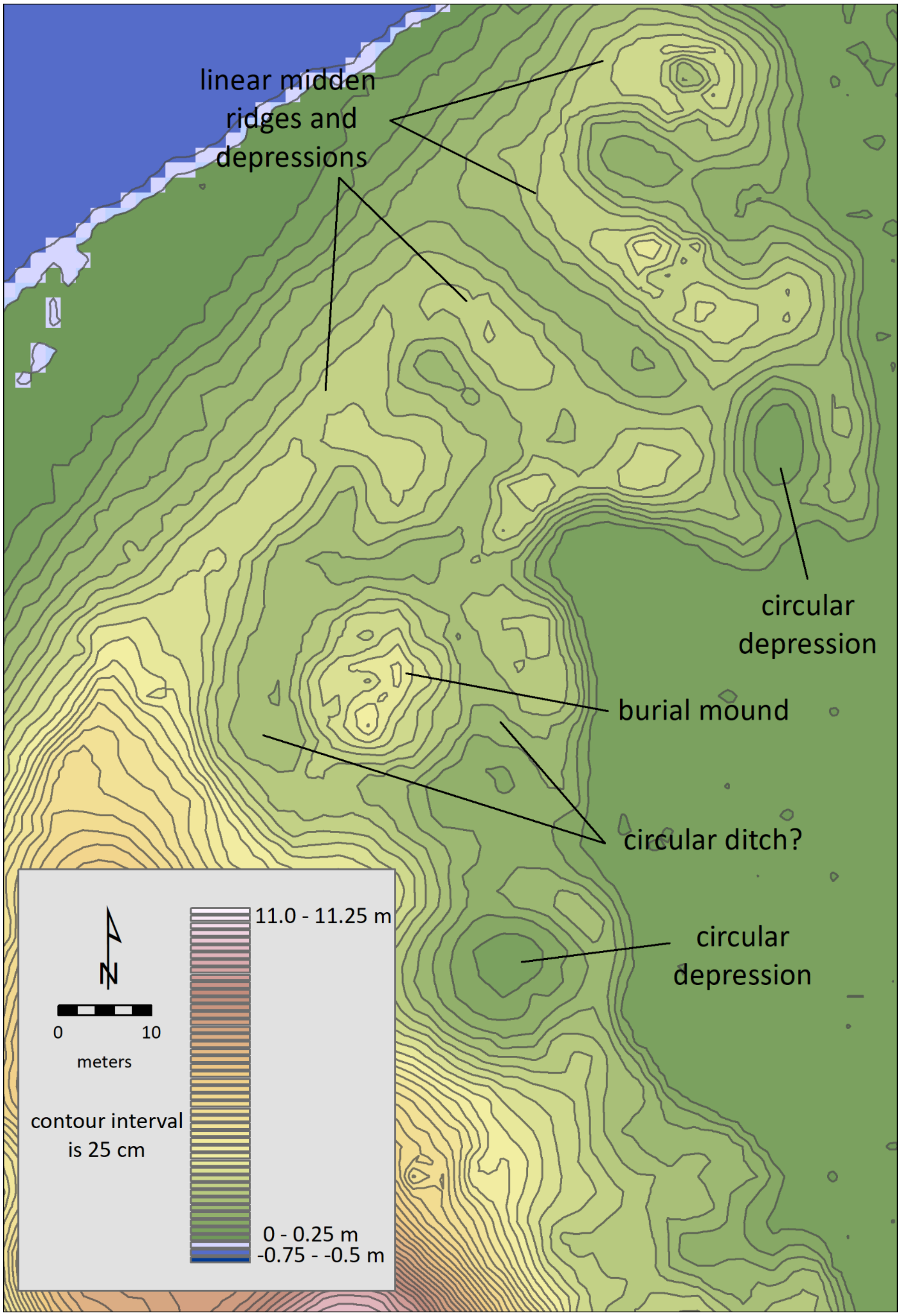

Figure 7. Map of the burial mound and other features at the northern end of the site.

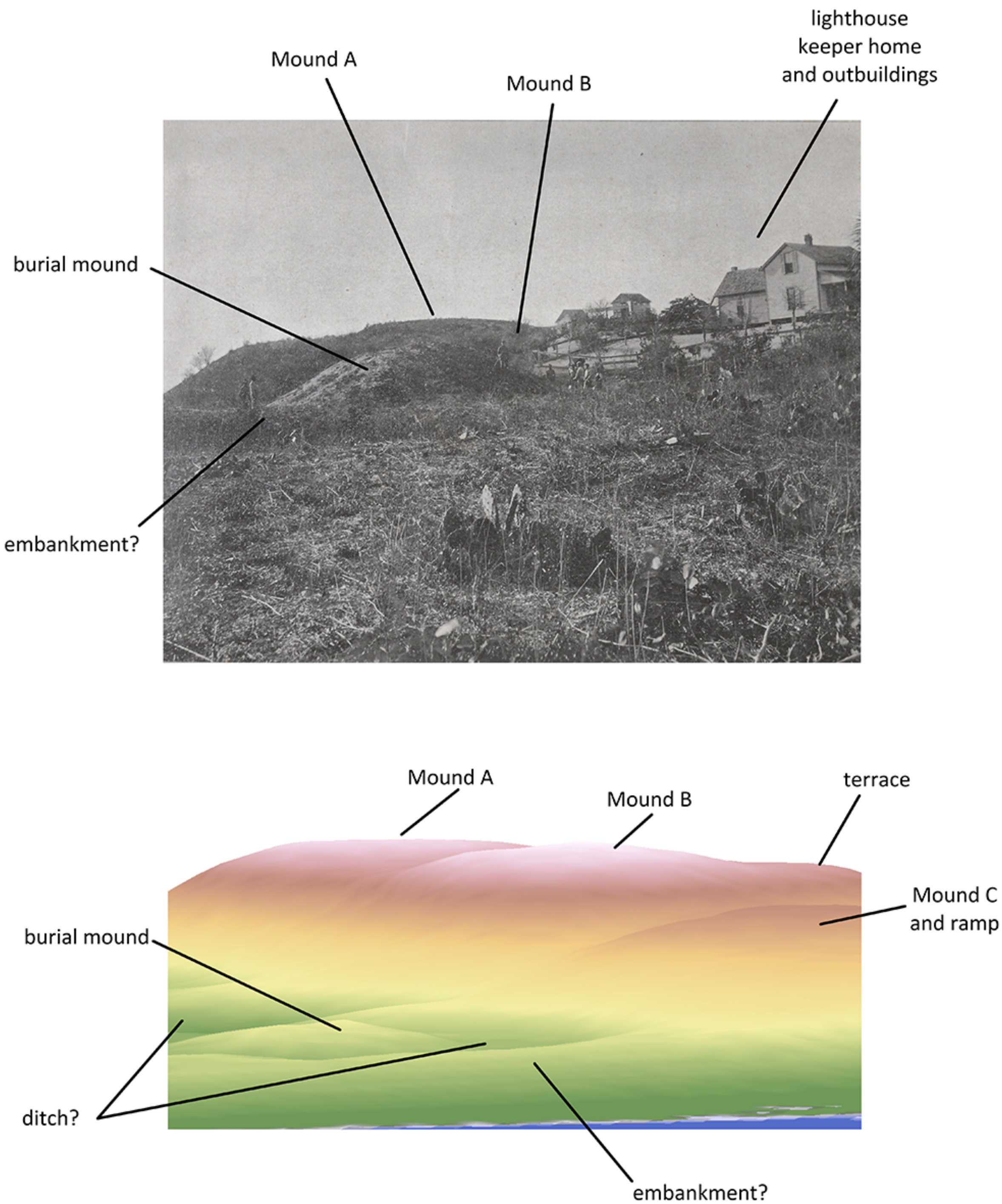

Figure 8. Comparison of Moore's [1900:Figure 4] photograph of the burial mound at Cockroach Key with modern topography as captured by LiDAR and rendered in ArcScene.

4. 2.2 GPR SURVEY

Airborne LiDAR documented the surficial topography of the Cockroach Key; we also conducted GPR survey to digitally document subsurface deposits. The scale of the GPR survey was limited by the density of vegetation and the restrictions on clearing required by the County. Our GPR survey included transects across the three platform mounds and grids on the summit of Mound A (Fig. 9).

The survey was conducted using a Geophysical Survey Systems, Inc. SIR 3000. The four transects were run with a 400Mhz antenna, with a 50-Ns window and using a vertical low pass filter of 800 Mhz and a vertical high pass filter of 200 Mhz. The summit of Mound A was surveyed using three antennae. The 200 Mhz antenna was employed on two transects spaced at 1-m intervals to form a 2-x-10-m grid at 1-m intervals; the range was set for 150 Ns, with a vertical low pass filter of 400 Mhz and a vertical high pass filter of 30 Mhz. The 400Mhz antenna covered a 4-x-10-m grid at 50 cm intervals using the same settings as the transects. Finally, the ran the 900 Mhz antenna on transects spaced at 25-cm intervals in a grid measuring 4 x 10 m, with a vertical low pass filter of 2500 Mhz and a vertical high pass filter of 225 Mhz. The resulting data were processed using band-pass and background filtering and corrected for topography in GPR-SLICE. In the interest of space and redundancy, we focus on the four survey transects and the 200 Mhz and 900 Mhz survey grids on Mound A.

GPR Transect 1 ran for approximately 34 m, beginning from the relatively flat area on the ramp north of Mound C and continuing south-southeast across the mound and downslope to the saddle that separates Mounds C and Mound B. At the left (northern) end of the radargram (Fig. 10), a series of reflections suggestive of shell layers slope downwards to the south, opposite of the modern ground surface. This may indicate the presence of a mounded layer of shell buried below the surface in the area north of Mound C. Moving upslope to Mound C, the radargram indicates what appears to be two major shell dense-layers (probably each comprised of lenses of shell) separated by a layer of lesser shell density that may represent a break in shell deposition and an associated buildup of soil. This same pattern is apparent on southern slope of Mound C, at the right (south) end of the radargram. At the summit of Mound C, near the center of the radargram, there are two breaks in the reflective layers that we interpret as shell-rich horizons. These could represent features comprised of fill with less shell, although they could just as easily reflect natural disturbances or anomalies introduced by obvious reflections of metal objects on or near the surface to the north and south.

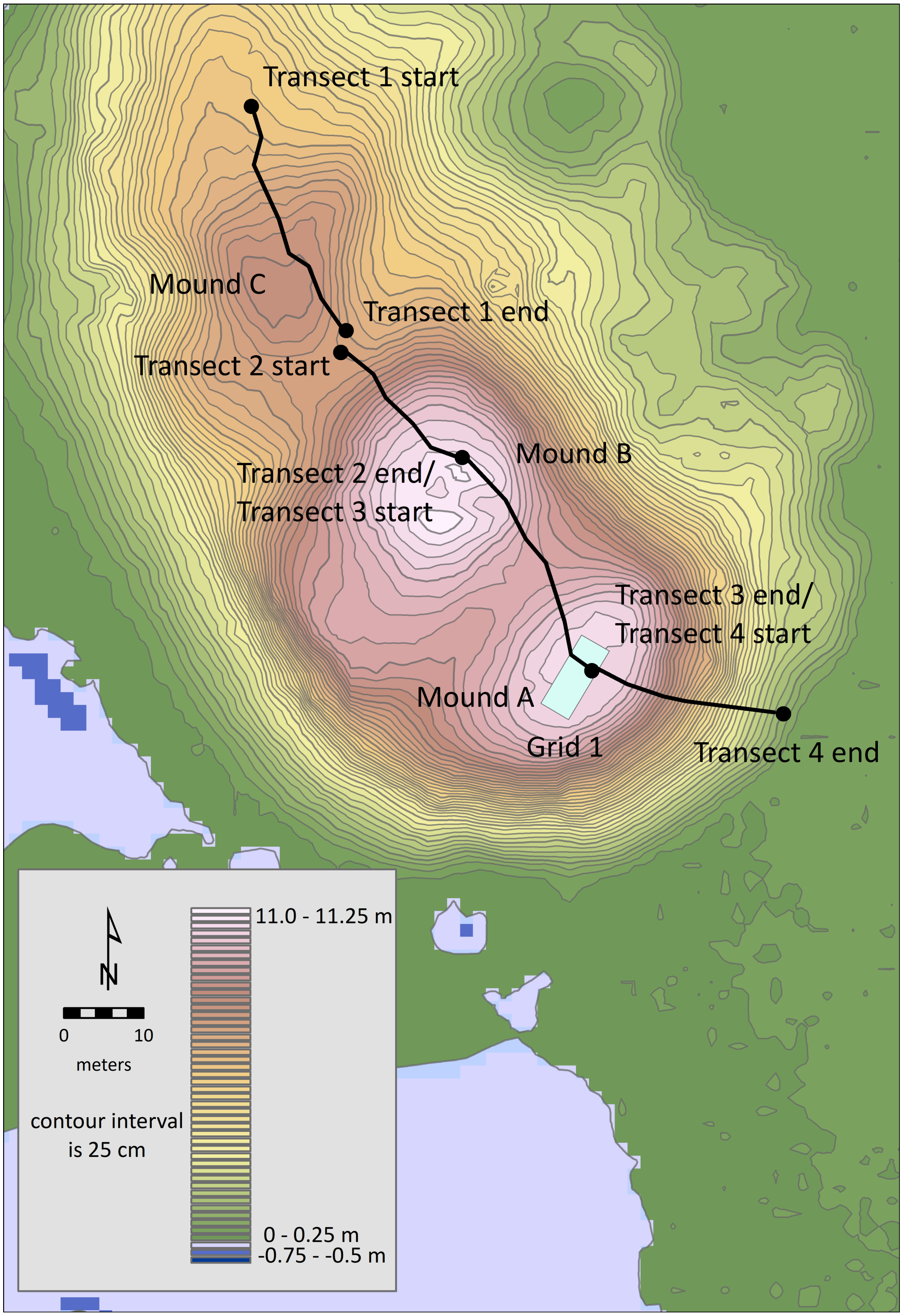

Figure 9. Locations of GPR survey transects and grid.

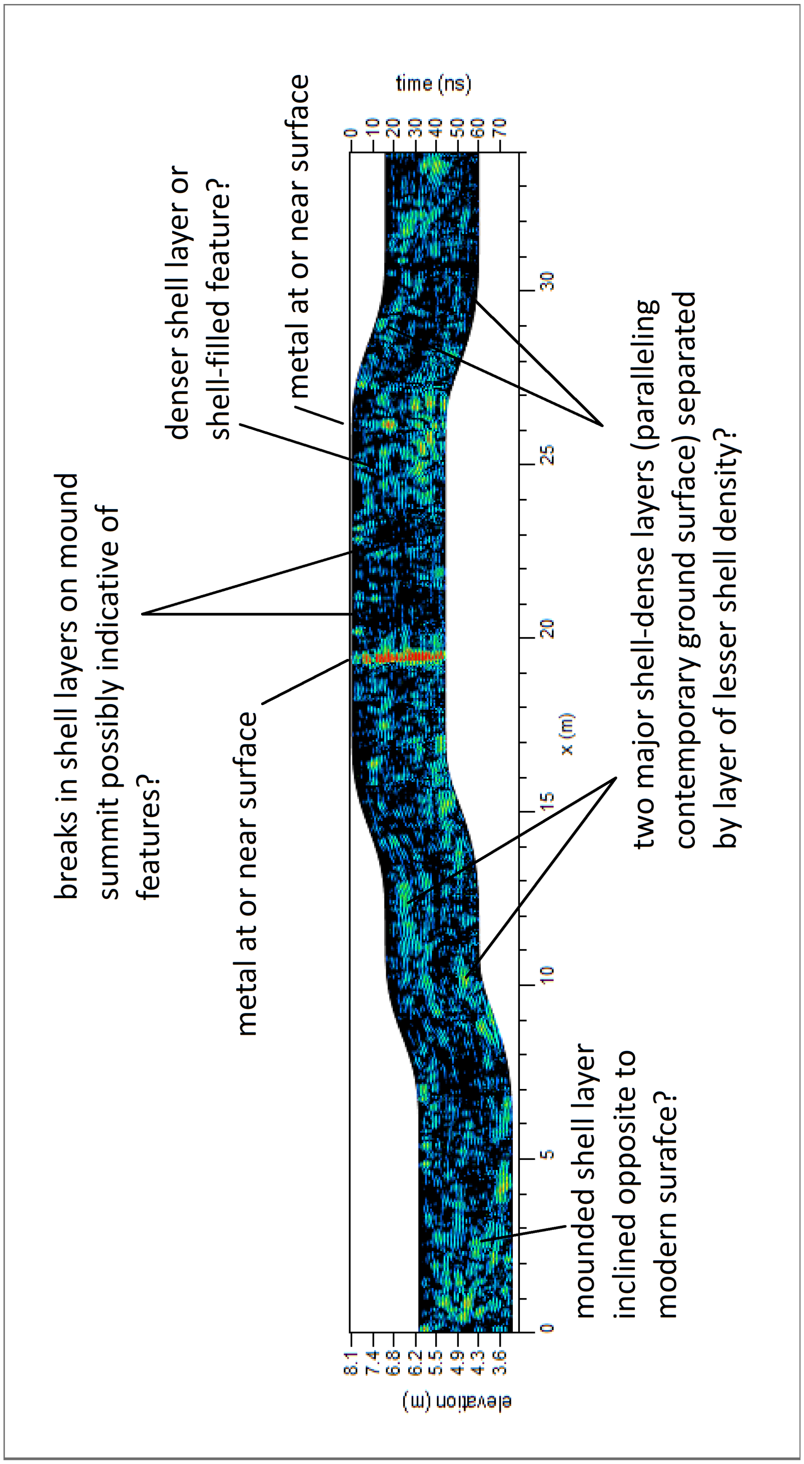

Figure 10. Topographically-corrected radargram profile of GPR Transect 1.

GPR Transect 2 picked up in the saddle between Mounds B and C and continued south-southeast up the northern slope of the former mound to its summit. As we described above for the opposite end of Mound C, the left (northern) side of this radargram profile (Figure 11) includes reflective layers that slope downwards to the south, suggesting possible mounding of shell. Otherwise, the radargram profile seems to consist of multiple, superimposed shell layers mainly paralleling the modern ground surface, with no major breaks apparent.

GPR Transect 3 continued south-southeast for 33 m, beginning at the top of Mound B and continuing down the south slope of the mound to a saddle, and then up the north slope of Mound A to its summit. This radargram profile (Figure 12) seems to indicate a layer of less-dense shell on top of a shell-dense horizon, with little or no break between these. Several strong reflections on the slope and summit of Mound B (near the center and right of the profile, respectively) may indicate areas with very high shell density, potentially marking lenses of shell-dense fill or features. A few near-surface anomalies possibly representing features are observable on the summit and south slope of Mound A (at the left and left center of the profile) although these reflections may only indicate more recent metal or bricks. One other reflection on the mound summit is obviously associated with a metal object at or near the surface.

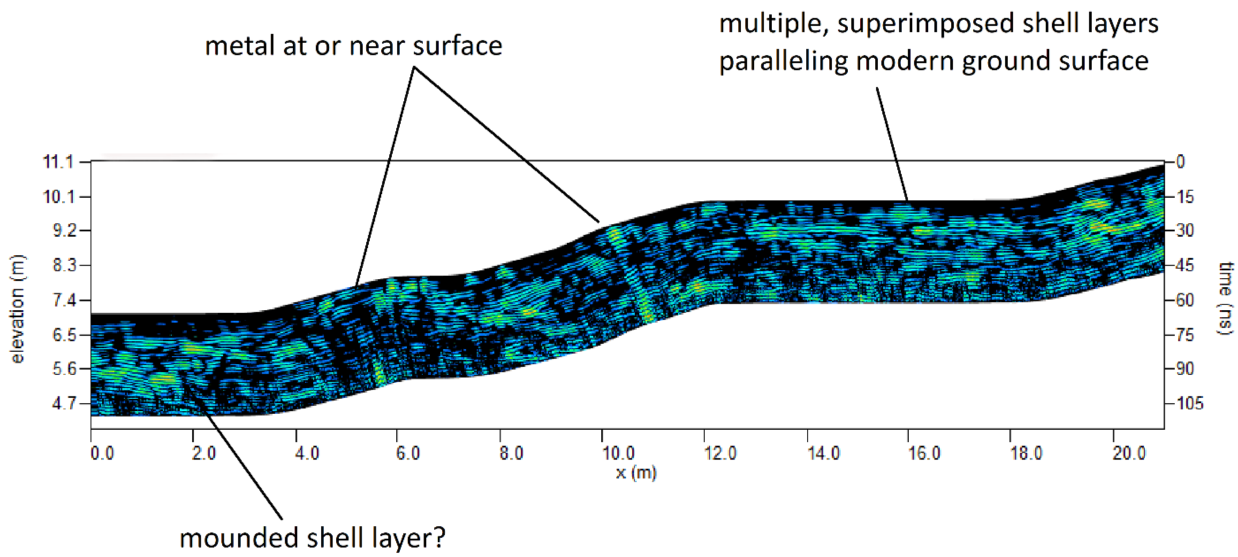

Figure 11. Topographically-corrected radargram profile of GPR Transect 2.

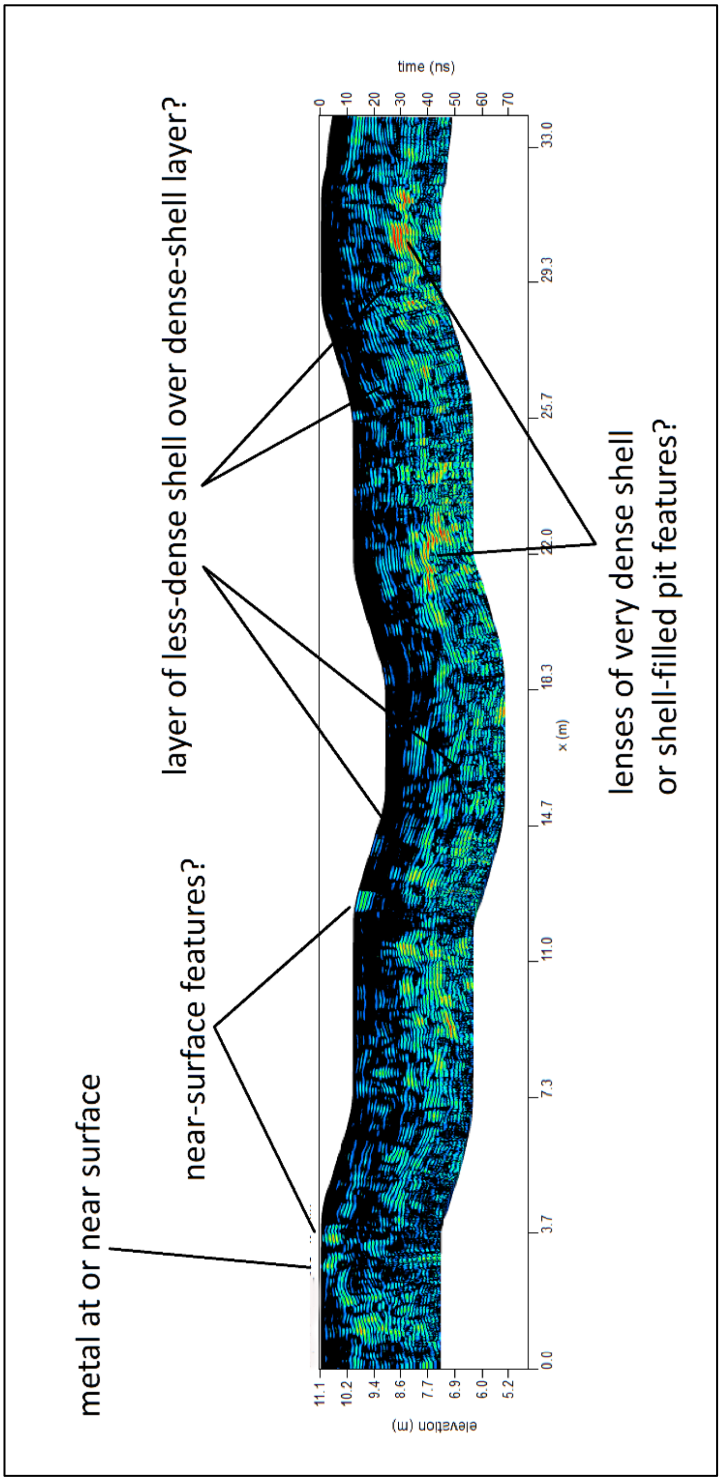

Figure 12. Topographically-corrected radargram profile of GPR Transect 3.

Finally, GPR Transect 4 ran 24 m east-southeast down the steep slope from the summit of Mound A to a point just above the marsh. The portion of the radargram (Figure 13) covering the slope of the mound seems to indicate two shell-dense layers paralleling the contemporary ground surface, separated by a layer with comparatively little shell--similar to what we observed in GPR Transect 1 at the north end of the mound complex. Near the base of the slope, horizontal shell midden layers appear to intersect with the inclined reflections associated with the lowermost of the two of the shell-dense mound strata.

GPR survey on the summit of Mound A provides additional insight into the construction and use of this feature. Figure 14 is radargram profile of one of the two transects we completed on GPR Grid 1 using the 200 Mhz antenna, which potentially allows deeper coverage of the mound than the 400 Mhz antenna (albeit also of lesser resolution). This profile seems to substantiate the presence of two shell-dense construction layers in Mound A, as suggested by Transect 4. One of these lies at a depth of around 1.25 m and continues to around 2.0 m. The other begins around 3.0 m and continues to about 3.75 m. These layers parallel the modern summit of Mound A, indicating the mound was expanded upward while maintaining the same general shape. Unfortunately, the signal became attenuated at a depth of around 4.5 m.

The 900 Mhz antenna provides a window on near-surface anomalies on the summit of Mound A. Given the greater survey coverage here, we used GPR SLICE to interpolate horizontal 3D surfaces from the radargrams; Figure 15 shows two interpolations, one near the surface at a depth of around 10 cm and the next at a depth of around 25 cm. These interpolations demonstrate roughly circular patterns of anomalies on the western end of the summit. The anomalies become better defined with depth, with most appearing as smaller circular anomalies in the lowermost interpolation, perhaps consistent with post features. Assuming this interpretation is correct, the final summit of Mound A might have served as a substructure for a circular structure 4-5 m in diameter. Structural patterns are rarely defined on the summits of platform mounds from the Woodland period, although they are common to those of the subsequent Mississippian period. Instead, Woodland-period platform mounds served primarily as stages for ceremonies rather than as substructure foundations [Kassabaum 2021:157; Knight 2001]; thus the potential identification of a structure on the highest mound at Cockroach Key may signal a significant change in mound-top practices.

5. CONCLUSION

Although well known to antiquarians of the 1800s and archaeologists of the early 1900s, the Cockroach Key site has slowly faded from the attention of both professionals (owing to the lack of contemporary investigations) and the public (owing to the density of vegetation). Airborne-LiDAR based mapping of the site reveals its surficial size and complexity, including three well-preserved platform mounds—two that are each over 10-m tall and another, slightly smaller. It also reveals the remnants of the burial mound excavated by archaeologists in the early twentieth century. Our mapping confirms many of the previous estimates of the size and shape of the site and its principal

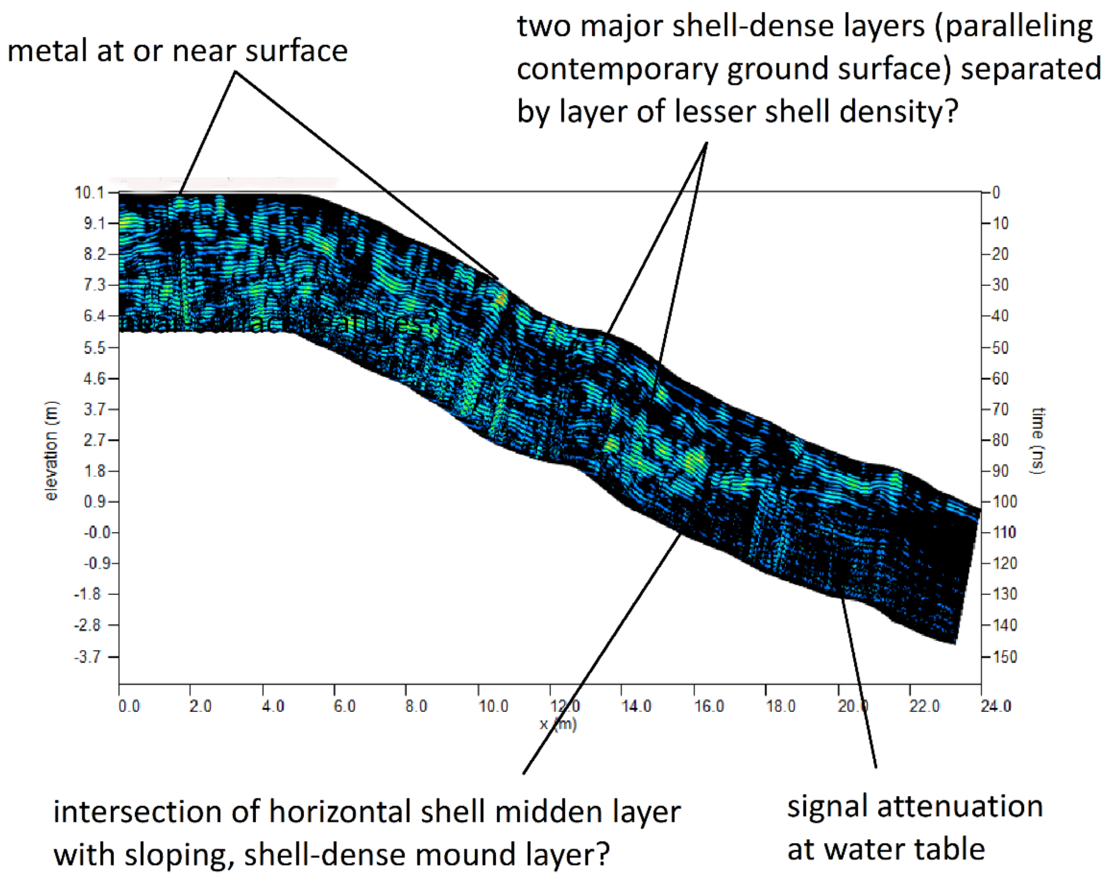

Figure 13. Topographically-corrected radargram profile of GPR Transect 4.

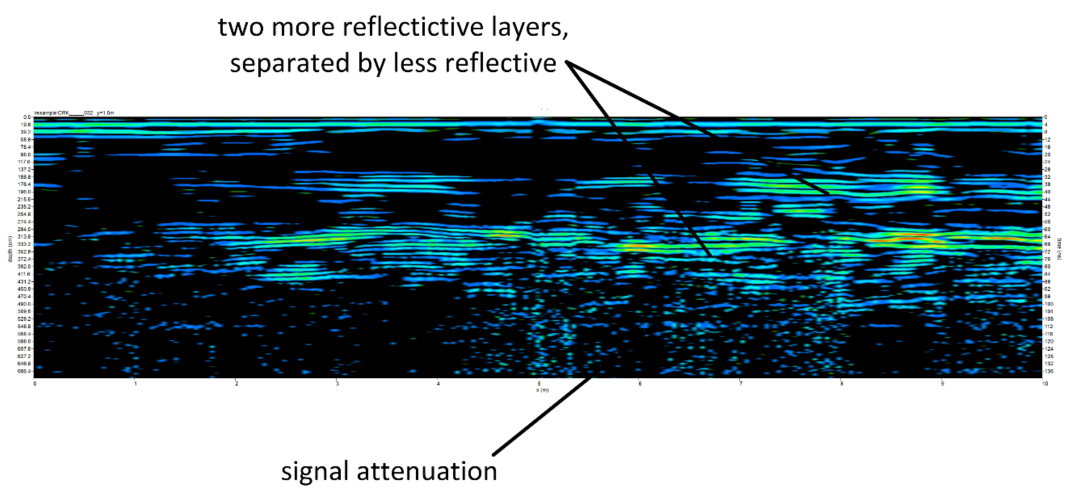

Figure 14. Radargram profile completed using a 900 Mhz antenna on the surface of Mound A.

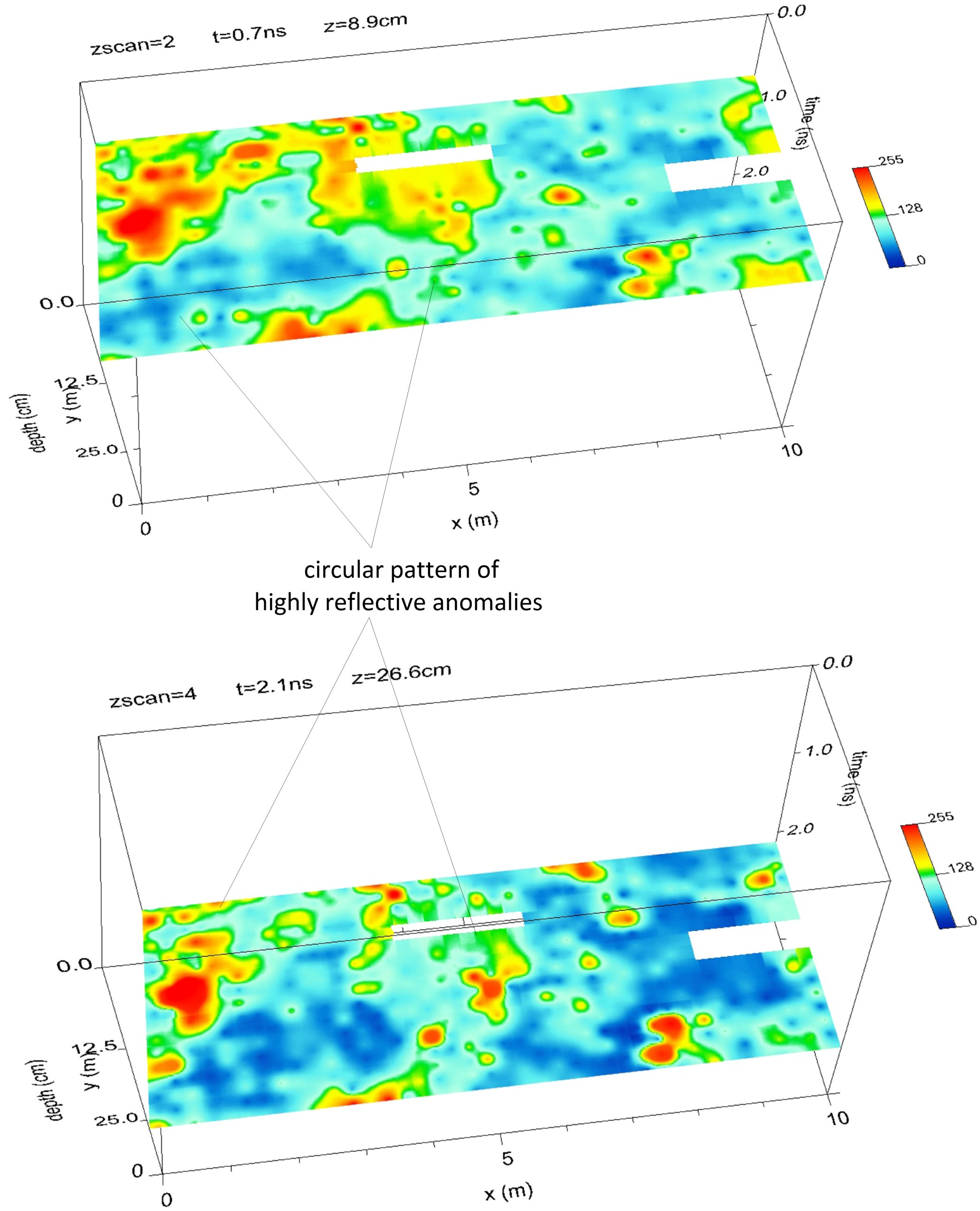

Figure 15. Horizontal slices at varying depths interpolated from GPR survey of the summit of Mound A using a 900 Mhz antenna.

features. However, it also reveals new information. First, our mapping suggests that the burial mound might have had a surrounding circular ditch and embankment, features not noted in previous descriptions. In addition, the mapping reveals anomalous depressions and ridges in the shell deposits at the northern end of the site, the latter possibly representing substructures for houses. Finally, the mapping documents several areas of illicit digging.

GPR survey was limited owing to the density of vegetation. Transects running across the three platform mounds suggest these were expanded several times, generally following the same form as the modern topography. Some of these expansions of the mounds appear to have consisted of dense shell deposits, as indicated by highly reflective anomalies in the radargrams, while others seem to have been constituted of sediments comparatively lacking in shell. The GPR transects also reveal buried deposits of denser shell that may represent features, including some cases the possible piling of shell in orientations that do not match later mound forms. GPR survey on the summit of Mound A suggests the possible presence of a small, circular structure on the latest mound surface.

Like many other archaeological sites in tropical and sub-tropical Florida, the Cockroach Key site has been "hiding in plain sight" While never truly "lost," it has been neglected by contemporary scholars, probably owing to the difficulties of using convention techniques to map the surface and sub-surface features of such a large and complex site with dense vegetative cover. In recent years, digital technologies such as the ones employed here have begun revealing the features of similarly neglected sites in finer detail [e.g., Barbour et al. 2019; Pluckhahn and Thompson 2012, 2017, 2018; Pluckhahn et al. 2015; Randall 2015]. Still, there are many more sites that await such attention. We cannot claim to have "discovered" the Cockroach Key site, but our employment of digital technologies reveals new information regarding its structure and another example of the utility of these techniques.

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