An Unthinkable Loss: A Consideration of Climate Change and Archaeology in the Southeastern United States

Taylor Bethell[1], B.A., Eric Bezemek[1], B.A., Bianca Book[1], M.S., Caleb Brady[1], B.S., Alison Bruin[1], M.S., Makenna Chandler[1], B.S., Caitlin Delmas[1], M.S., Michelle Gray[1], B.A., Analise Hollingshead[1], M.S., Daniel Hougland[1], B.A., Ariana Kline[1], B.A., Tara Skipton[1], B.A., Benjamin Stewart[1], M.S., Nicholas Yarbrough[1], B.S., Heather Young[1], M.S., and Jayur Madhusudan Mehta,[1] Ph.D.

[1]*Florida State University, Department of Anthropology*

Abstract

Hudson et al. (2012) provided five ways in which archaeology can contribute to developing responses to the global climate crisis. By using these five broader themes as a framework, we evaluate the role of Southeastern archaeology in the discussion of climate change but also highlight the reality for 15 archaeological and historical sites in terms of their struggle with the effects of climate change and the associated risk of losing physical remains of past human activity. To better visualize the effects of climate change on these 15 archaeological and historic sites, we created a triage system by placing each site into categories based on its current and near-future preservation condition.

Keywords: *Climate Change, Cultural Preservation, Southeastern Archaeology*

Introduction

Scholars and scientists have long discussed the topic of climate change, but politicians and the public have increasingly debated plans on how to address it and mitigate its effects.[1] Effects of climate change can include rising temperatures and sea levels, more frequent and intense storms, erratic weather patterns, large-scale wildfires, floods, droughts, and more. These changes have devastating implications for our cultural resources as well as our economy, infrastructure, and wildlife. While archaeology can do little to reverse the current global climate crisis, it can be helpful in determining how our global society handles the consequences of climate change.

The National Research Council (NRC) stated that 18 of the last 19 warmest years have occurred since 2001 (NRC, 2010; NRC, 2012; National Aeronautics and Space Administration [NASA], 2019). The warmest year ever recorded occurred in 2016 (NASA 2019; National Oceanic and Atmospheric Administration [NOAA], 2017), and, if this trend continues, we will see an increase in glacial melting, a subsequent rise in sea level, and other global consequences. NOAA projects the global mean sea level will rise 0.2 m (0.6 ft.) to 2.0 m (6.6 ft.) by 2100 (NOAA, 2012; Lindsey, 2018). Just in the Southeast region of the United States[2], rising sea level will displace approximately 6.9 million people living within 0 to 2 mAMSL (meters above

[1] Within the scope of this paper, climate change refers to the current climatic shifts that human activities have caused. This is not to be confused with the natural processes that occur over long periods of time on Earth, as humans are in fact accelerating these natural processes.

[2] Coastal Southeast region includes Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia, and Maryland (Anderson et al. 2017).

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mean sea level),[3] which encompasses about 60,000 square kilometers (~23,000 square miles) (Anderson et al., 2017). In other words, the climate change effect of sea level rise would inevitably cause people to become displaced, losing their homes and communities.

Not only is the United States population at risk of displacement, but our cultural heritage, identity, and resources are also at risk. Under the NOAA maximum projection of 2.0 m (6.6 ft) of sea level rise by 2100, Anderson et al. (2017) found that about 23,000 archaeological sites and about 1,700 National Register of Historic Places (NRHP) located within 200 km (~124.3 miles) of the coast will be lost. Although they will be submerged by 2100, these archaeological sites and those located more inland will, in the meantime, become damaged due to increasing storm activity and intensity. The impact of recent hurricanes can be seen through the 2018 Hurricane Michael, which wreaked havoc across the Southeast. Intense winds, flooding, and storm surges in 2018 caused an estimated $25 billion in damages to infrastructure, properties, and natural resources, and caused damage to innumerable archaeological and historic sites, like Fort Gadsden/Prospect Bluff, a Weeden Island site in Wakulla Spring State Park, and an early 20th-century school house in Bay County, to name a few (Lazo et al., 2018; Sullivan & Chiglinsky, 2018).

While climate change today is affecting the preservation of these archaeological sites, archaeological interpretations about the people who lived at these sites also have the potential to aid in today's current climate crisis. More specifically, Hudson et al. (2012) introduced five ways in which archaeological studies can contribute to the mitigation and preventative efforts against climate change: *societal collapse and resilience, an archaeology of the nature/culture divide, public archaeology, social inequality and climate justice, and transdisciplinary studies for an intercultural understanding*. By using these five broader themes as a framework, we evaluate the role of Southeastern archaeology in the discussion of climate change but also highlight the reality for 15 archaeological and historical sites in terms of their struggle with the effects of climate change and the associated risk of losing physical remains of past human activity. The preservation status of the 15 sites are evaluated within a triage system and include: Fort Raleigh National Historic Site (31DR0067), Turtle Mound (8VO109), Sapelo Island (9MC23), The Deering Estate (8DA2101, 8DA7, 8DA8, 8DA5198, 8DA6518, 8DA02815B 8DA02815A, 8DA02815C, 8DA2815D, 8DA16447, 8DA16448, 8DA16449, 8DA16450, 8DA16451, 8DA5202), the National Mall, Shipwreck Trail, Arthur G. Dozier School for Boys (8JA1460), Jamestown, Charlesfort-Santa Elena (38BU51), Garden Patch (8DI4), Castillo de San Marcos (8SJ9), Pillsbury Temple Mound (8MA30), Adams Bay (16PL8), Grand Caillou (16TR38), and Topper (38AL23, 38AL43) (**Figure 1**).

[3] Population displacement in the southeastern United States due to sea level rise based on population data from 2013 estimation as part of ongoing research conducted by LandScan undertaken by the Oak Ridge National Laboratory (Anderson et al. 2017).

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Figure 1: Southeastern sites to be evaluated. Credit: Michelle Gray

Defining Climate Change

Forces of Change

Climate is the long-term environmental consistencies of a region's temperatures, precipitation, and atmospheric pressure. Fluctuations in a region's climate can have effects on local weather patterns and environmental conditions (Armstrong et al., 2018). For example, the Southeast has seen an increase in hurricanes, flooding, thunderstorms, and droughts, as the ocean's temperature begins to rise (Keim, 1999).

While regional climate naturally shifts over time, anthropogenic processes have increased this rate of change. Most powerfully, the Industrial Revolution served as the accelerant for the ongoing, large-scale, anthropogenic process of climate change that we are in today. With the influx of burning coal and other fossil fuels to operate machinery and factories, the Industrial Revolution introduced mass amounts of carbon dioxide into the atmosphere in the 18th and 19th centuries. Incited by these industrial events, the average global surface temperature has risen 1.1°C (2.0°F) (Armstrong et al., 2018, p. 12) and environmental researchers are calling for immediate mitigative

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action in order to keep this net difference below 2°C (3.6°F) by around 2050 (Peters et al., 2013; IPCC, 2014). While these temperature changes may seem minute, they will nevertheless cause disastrous effects on our environment.

Impacts of Global Warming

While the effects of climate change are felt globally, this article aims to discuss the climatic impacts on ecosystems and archaeological resources within the Southeast, USA. The effects of climate change today have dramatically impacted the Southeast and have altered inland, coastal, riparian (river), littoral (lake), and marine environments. More specifically, these long-term temperature increases have spurred a myriad of related environmental issues, such as rising sea levels, intensified flooding and rainfall, and more frequent and severe storm episodes (Peart et al., 1995). In addition to affecting modern populations and archaeological and historical resources, these climate change events have also affected past populations of the Southeast, as shown through archaeological and geological studies. The ways in which past populations responded to these comparable events can help shape modern responses to climate change.

As global temperatures rise, glaciers within the Arctic regions of the world continually melt, which ultimately increases global sea levels. This rise in sea level has caused an increase in flooding events in both marine and riparian environments, which is detrimental for both coastal and inland territories. As mentioned earlier, the Intergovernmental Panel on Climate Change (IPCC) (2018) predicts at most 2 m (6.6 ft) of global sea level rise by 2100. However, these global estimates do not consider how sea level rise is distributed differently depending on the region. For example, in Louisiana, coastal regions will experience about a 1 m (3.2 ft) increase in sea level by 2060, but coastal regions in most of Florida will experience about a 0.5 m (1.6 ft) increase by 2060 (Skipton et al., 2019).

Just as current coastal populations are making plans to address sea level rise, past coastal settlements within the Southeast have experienced and subsequently responded to rising sea levels. More specifically, the Lower Suwannee Archaeological Survey (LSAS) found that, even though sea levels became relatively stable beginning around 6,000 years ago, small-scale climate events nevertheless caused fluctuating sea levels (Sassaman et al., 2017). In response, the indigenous people of the northern Gulf Coast of Florida continually abandoned and relocated their settlements. While this seems to be a major disruption for these coastal societies, LSAS also concluded that their reliance on estuarine resources, like oysters and fish, remained stable throughout this time (Sassaman et al., 2017). This archaeological example calls into question how sea level rise specifically will cause modern populations to adapt their subsistence and production patterns.

Rising sea levels have also led to an increase in rainfall since there are more available water sources feeding into the evaporation process (Keim, 1999). This increase in yearly rainfall contributes to the recent intensification of flooding within the Southeast and is a significant cause of inland ecosystem disruption. This shift in rainfall, a vital natural water source for inland plants and crops,

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is harmful to yields and to the vegetative growth within the Southeast. More specifically, the amplification of rain within one region and the decrease of rainfall in others can cause sporadic mass droughts (Peart et al., 1995, p. 635).

Similarly, past populations along the Mississippi River had to address its dynamic ecology, as it is susceptible to minute changes in temperature and weather. The topography of the Mississippi River basin is largely dependent on the River's overall water flow and intensity. The modern-day subdeltas of the Mississippi River started forming around 6,000 years ago as they meandered through new land and repositioned sediment. In one instance, between 3,000 and 2,600 B.P., there was an increase in the frequency and magnitude of flooding events in northeastern Louisiana due to changes in precipitation and temperature around the Mississippi River basin (Rodning & Mehta, 2015). Presumably, people living in these areas had to address their fluctuating environments through relocation or through some other mitigating efforts until the subdeltas reached their present states around 500 years ago (Rodning & Mehta, 2015). Discovering those responses and adopting similar tactics or uncovering the effects of such tactics can aid in developing responses to our current global climate crisis.

Finally, the warming of the atmosphere and the marine and littoral ecosystems have triggered an increase in storm activity since the heating and cooling of water vapor and air altered of convection currents (Longstreth, 1999). This convective instability has resulted in an increase in frequency and severity of storms within the Southeast (Longstreth, 1999, p. 173). Keim (1999) noted this upsurge of storm magnitude and occurrence as 22 of the 27 U.S. Historical Climatology Network Daily Temperature and Precipitation stations have shown a yearly increase in rainfall associated with temperature rise. The escalation of storm regularity and scale is disadvantageous for all environments and archaeological sites because of its disruptive effects.

However, in terms of people, powerful storms have always affected populations of the Southeast. In fact, Braun et al. (2017) found sedimental and foraminiferal evidence, extending as far back as 3,000 BP, for at least seven intense hurricanes that made landfall on St. Catherines Island, Georgia and significantly changed its environment. While this does not seem significant, in that there was, on average, one extreme event every 471 years (Braun et al., 2017), determining how the people who lived in this area responded to such catastrophic and unprecedented events can help modern populations in planning for future disasters.

Although the scale and rate of modern-day anthropogenic climate change events is historically unparalleled, the people of the Southeast have nevertheless experienced comparable climate change events, like rising sea levels, increased flooding and precipitation, and powerful storm events. However, it is through their reactions and through an understanding of the adaptive nature of humans that contemporary populations can better deliberate ways to address climate change.

Broader Themes and Global Studies in Climate Science and Archaeology

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As discussed in the previous section, the Southeast is unique as its rich archaeological record includes many instances in which inhabitants responded to climate change events. However, archaeological sites that may contain information regarding responses to climate change are ironically at risk due to contemporary climate change events. If climate change negatively impacts this rich assemblage, not only are we at risk of losing irreplaceable historical information, but we also risk losing information that can help us respond to our current climate change crisis.

Hudson et al. (2012) argued that archaeologists can contribute to the global discussion on climate change through the study how people of the past responded to climate change and through several archaeological methods and perspectives. Specifically, Hudson et al. (2012) offered five different themes from which these contributions stem: *societal collapse and resilience, an archaeology of the nature/culture divide, public archaeology, social inequality and climate justice, and transdisciplinary studies for an intercultural understanding*. Together, these five contributions can bring archaeology to the forefront of the global discussion on climate change. Additionally, the Southeast in particular provides numerous opportunities to address these themes.

Resilience Theory

Resilience theory examines how people or ecosystems respond to dynamic changes through the concept of the adaptive cycle. The adaptive cycle is separated into four phases: colonization and exploitation, conservation, release, and reorganization (Holling, 2001; Redman, 2005; Holling & Gunderson, 2002; Rodning & Mehta, 2016; Faulseit, 2016). Hudson et al. (2012) offered this theoretical view as a way to help archaeologists understand past disasters, or 'collapse,' and what conditions were present for these disasters to occur; however, this theory has much more to contribute than just examining collapse. Rather, it provides a model for archaeologists to combine material culture with the surrounding environment to understand its collective influence on past human groups.

For example, Rodning and Mehta (2016) and Thompson and Pluckhahn (2012) offered unique insights on Southeastern archaeological sites through resilience theory. Using a multidisciplinary approach, Rodning and Mehta (2016) examined how Native American groups in Southeastern Louisiana, from the Archaic through Contact period, remained resilient and/or responded to the ever-changing Mississippi River Delta. This location experienced and continues to experience short-term and long-term environmental changes in sea level rise, shifting deltaic lobes, hurricanes, or flooding (Rodning & Mehta, 2016). In response to this dynamic environment, Rodning and Mehta (2016) argued that mounds in this area were active symbols of permanence. Similarly, Thompson and Pluckhahn (2012) examined human-environment interactions in South Florida and how mounds were persistent monumental places to the people occupying Fort Center in the Middle Woodland through the Contact period. Its strategic location, multiple construction events, and differing use of the mounds over time suggest the complex witnessed stages of social

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reorganization (Thompson & Pluckhahn, 2012).

By examining these sites through a perspective centered on resilience, archaeologists can demonstrate that ecological change is closely linked with cultural change. In other words, archaeologists can stress that the changes we experience in our environments today will necessitate cultural change. Additionally, resilience studies emphasize a long-term perspective of human activity, which helps contemporary populations consider the consequences of our collective actions today.

Archaeology of the Nature/Culture Divide

In this section, Hudson et al. (2012) considered how cultures and nature have always interacted with each other, even if modern modes of production hide this kind of interaction today. By emphasizing that people have always interacted with their environments and dispelling the "modern conceit of separation between nature and culture" (p. 321), archaeology can bring to light our current relationship with the environment in terms of modern production and discard.

Accentuating the power that human activity has on the environment, Thieme (2005) showed how Archaic shell middens and/or mounds left an ecological impact that can be seen today. Due to anthropogenically fertile soils, plants are currently growing out of these middens. By showing how inadvertent human activity, especially from older times like the Archaic period, can affect environments in the long-term, archaeologists can better work to emphasize that cultures intrinsically interact with the environment. Additionally, considering the scale of past examples such as these mounds and middens, it is easier for contemporary populations to understand the drastic effects that current modes of production and discard have on our global environment.

Public Archaeology and Climate Change

After noting that public archaeology has worked towards goals of tourism, education, and site preservation, Hudson et al. (2012) called for the use of archaeology in environmental education. Specifically, they discussed how to incorporate the public into environmental monitoring and preservation efforts of archaeological sites and the importance of teaching the public about climate change and its disastrous effects on the Earth (Hudson et al., 2012).

The Florida Public Archaeology Network (FPAN) is dedicated to combining public outreach with saving our cultural heritage sites and has actively taken on a role in teaching the public about the dangers of climate change on archeological sites. They provide courses for the public, teaching them how to monitor sites and report their findings to state archaeology departments. Additionally, public outreach initiatives associated with archaeological research, like the Adams Bay Project and their documentary, help emphasize the importance of saving specific sites through stimulating and emotionally provoking imagery (Finch, 2020).

In these ways, archaeology can work to bridge the gap between academic and public knowledge while also drawing attention to climate change effects on cultural resources. By incorporating the public in archaeological endea-

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vors to a greater degree, archaeologists can urge public action on climate change via a different perspective based on saving cultural heritage.

Social Inequality and Climate Justice

Hudson et al. (2012) argued that archaeology can function as a bridge between the past and present through a common focus on non-elite communities and social inequalities. More specifically, archaeology's focus on non-elite communities can help in identifying modern social inequalities that will intrinsically become more disparate in the face of crises since "social inequalities from the past affect the ability of groups to adapt to climate change in the future" (p. 322). By utilizing the social relevance of archaeology in this way, archaeologists can also better identify factional and intersectional interests based on social identities within responses to climate change.

While archaeology attempts to uncover the lived experience of everyday people of the past, this can be challenging as elites are more often historically documented and leave behind more pervasive material culture. However, it is not impossible. As Kassabaum (2019) argued, there is a general lack of understanding of daily lifestyles of people living around mound sites in the Southeast and their relationship to the earthen monuments. As a solution, she suggests that archaeological studies focus on "plazas and other 'empty' places" instead of mound summits (Kassabaum, 2019, p. 230). Similarly, archaeologists can offer this perspective for the modern world as the populations most vulnerable to climate change are less visible and less vociferous than those that are more privileged.

Additionally, the Dozier School for Boys, in Northwest Florida, is a historical site that has identified unreported atrocities and injustices committed by school administrators against young boys of varying ethnicities. Here, archaeological investigations supported incriminating documents published by the federal and state justice offices of repeated abuse occurring within the walls of this school (Kimmerle et al., 2012; Kimmerle, 2014). This site illuminated social injustices committed against boys seen as criminals in their society, and the inherent problems with the juvenile criminal justice system in Florida during the 20th-century. Requiring an understanding of power dynamics, archaeological research like this demonstrates that archaeologists are equipped to recognize and address contemporary processes of inequality.

Both Kassabaum's (2019) regional Southeastern critique and the Dozier School research show how archaeologists are prepared to not only identify subdued and marginalized communities that will disproportionately undergo hardships due to climate change, but they are also able to discern the current power dynamics that caused those inequalities in the first place.

Transdisciplinary Studies for Intercultural Understanding

Finally, in this section, Hudson et al. (2012) called for a "transdisciplinary synthesis" as a better way for subdisciplines in archaeology to address a more global relevance to their archaeological studies. Since "global climate change affects all aspects of life in ways not necessarily anticipated by existing academic subdivisions," (p. 323) transdisciplinary perspectives are necessary for a holistic

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understanding of the effects of climate change. Additionally, this idea can extend to encouraging collaboration between people of all societies and cultures.

As an example of such behavior, Thompson (2014) combined the views of both political and historical ecology in order to construct a more inclusive perspective of the past. In particular, using these different approaches can better emphasize the intrinsic role of the environment within human and cultural interactions, such as the consequences of human action on the environment, the inseparability of humans and nature, and more complex relationships within cultures. Additionally, transdisciplinary studies like these can highlight how climate change is affecting archeological sites in the Southeast and the modern populace. By using this multidisciplinary approach, Thompson (2014) was able to obtain a clearer picture of the detrimental effects of climate change.

Hudson et al. (2012) provided five ways in which archaeology can contribute to the global discourse on climate change, and the archaeological record and archaeological resources of the Southeast has demonstrated the potential to fulfill these themes. However, there exists numerous sites within the Southeast capable of making one or more of these five contributions, but the integrity of these sites is currently threatened by modern climate change events.

Triage: Climate Impacts at Southeastern Sites

At first glance, the individual sites that were chosen for this study might appear to be a random assemblage of archaeological sites that span multiple periods of Southeastern history. However, as this article seeks to demonstrate, these sites are integral in expressing a combined cultural narrative in North America that tie past and present populations together and have the potential to contribute to plans for responding to climate change today. The archaeology, history, and heritage represented at each of these sites is relevant not only in explanations of our past but also as we look toward broader issues that are affecting our future, such as human-induced climate change.

To better visualize the effects of climate change on these 15 archaeological and historic sites, we created a triage system by placing each site into categories based on its current and near-future preservation condition in regard to the effects of climate change. It is our hope that this triage can help prioritize the needs for each of the sites discussed. The classifications are shown in **Table 1**.

These rankings have provided us with discrete categories that allow comparison and discussion of these diverse sites. **Table 2** shows the sites and the triage categories into which they fall. Sites within the green classification primarily face threats in relation to sea level rise and submersion, but these threats are eventual and not immediate. In particular, Turtle Mound, the Deering Estate, and Charlesfort-Santa Elena are all at risk of flooding. The anomaly in the threats to this ranking classification is the Arthur G. Dozier School for Boys, which is located further from the coast, but is still at risk of encroaching infrastructure and urban planning as populations increasingly move inland due to sea level rise on the coast.

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While not expressly defined in the original triage classifications, some sites fall into intermediate categories. Sites like Jamestown, Garden Patch, Shipwreck Trail, and Topper straddle between the green and yellow triage categories. At these sites, different components of the landscape will be affected in different ways. For example, a small portion of the fort at Jamestown is currently underwater, but the entire site is subject to significant flooding and damage in the event of hurricanes. Additionally, in the case of Garden Patch, more coastal components of the site are threatened by rising sea levels. This will cause foliage on different parts of the sites to die off, leaving the mounds further exposed to encroaching seas and erosion. Topper features a more immediate risk of flooding due to the Savannah River. During these flooding episodes, water levels can stay above the flood stage for several days, which compromises the soil structure (Ponnamperuma, 1984). Although Shipwreck Trail comprises multiple underwater sites, it is not immune to the threatening effects of climate change, as components of these shipwrecks are at different depths. While the deeper components are mostly safe from storms and hurricanes, the shallower components are in danger.

Sites at triage level yellow must be observed closely and assessed frequently. All four sites are mostly at risk of flooding and submersion due to their coastal locations. Part of the Pillsbury Temple Mound has already been lost due to erosion from sea level encroachment, while Grand Caillou, along with other coastal Louisiana sites, experience subsidence, erosion, and sea level rise altogether. Because of its location right on the water, Castillo de San Marcos is at risk of flooding and eventual inundation. It is one of only two forts in the world constructed from coquina, but rising sea levels put this site, and the entire historic district of St. Augustine, Florida at risk. Additionally, the National Mall, located along the Potomac River, is at risk of flooding, due to severe weather and rising sea levels.

The Fort Raleigh National Historic Site falls between the yellow and red triage categories, as it is at risk of natural erosion from rising tides, as well as erosion from boat wakes. While Sapelo Island faces similar threats to Fort Raleigh, it is classified under the red triage level, as there have been relatively little mitigation efforts in comparison with the Fort Raleigh National Historic Site (Fort Raleigh National Historic Site, 2018; Cochran, 2019).

Finally, Adams Bay falls under the black classification level as mitigation to preserve the site is futile. As Louisiana's coastline undergoes processes of sea level rise, erosion, and subsidence, stabilizing vegetation surrounding the site has since died off. Previously consisting of three distinct mounds, Adams Bay only features half of one mound as waves lap at its foundation and continue to dissolve what is left (Hale, 2017).

The range of triage levels among these sites demonstrates the complexity of the impact of climate change and human influence. Overwhelmingly, the greatest threat to the sites discussed are the environmental effects stemming from rapid climate change such as rising sea levels and destruction caused by increased hurricanes. The geographic diversity represented in these sites demonstrates how the effects of climate change

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Table 1: Triage Categories

Triage Level	Definition
Green Future impacts, but threats not immediate	• More than 80% of the site is stable • Some portions will need attention, but threats are more long-term or much slower • Preservation is needed eventually • Funds could be better allocated
Yellow Observe and assess	• Site conditions are mostly stable, with less than 50% of the site experiencing threats • In a non-emergent setting, site would be mitigated anyways, especially if funding were available
Red Immediate	• More than 50% of the site are threatened • Need for preservation is significant due to significance of site and scale of destruction
Black Mitigation futile	• No hope for immediate mitigation • More than 80% of the site is already lost • Any funds directed toward preservation will only result in data salvage, not toward maintaining site integrity

Table 2: Selected Southeastern Sites and Triage Categories

Triage Level	Site Names
Green Future impacts, but threats not immediate	Turtle Mound (FL) The Deering Estate (FL) The Arthur G. Dozier School for Boys (FL) Charlesfort-Santa Elena (SC)
Green to **Yellow**	Garden Patch (FL) Topper Site (SC) Shipwreck Trail (FL) Jamestown (VA)
Yellow Observe and assess	National Mall (D.C.) Castillo de San Marcos (FL) Pillsbury Burial Mound (FL) Grand Caillou (LA)
Yellow to **Red**	Fort Raleigh National Historic Site (NC)
Red Immediate	Sapelo Island (GA)
Black Mitigation futile	Adams Bay (LA)

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are extensive. While concern for preservation might be placed on coastal sites, this article expresses interest in sites from a variety of locations.

Discussion with a View Forward

By moving beyond simply stating the existence of climate change, we wish to demonstrate its devastating effects both in the immediate and long-term and strive to bridge the gap between what climate change means politically or environmentally to what it means within the contribution of archaeology. As the consequences of climate change continue to affect archaeological resources, archaeology's potential to contribute pertinent information about the past toward discussions on climate change dwindle.

Additionally, it is important to acknowledge that losing these sites has an effect on the identity of contemporary populations. The ways in which personal identity are defined are broad and highly variable. Identity can include the clothes we wear, the food we cook, and what language we speak, but these characteristics were taught, acquired, and learned. Our desire to assert our identity is thus rooted in the events, places, and people of our past. As our present becomes our past, we continue to build, reshape, and share our internal habitus as outward expressions of identity. Therefore, when we ask what it means to lose these sites, we also ask what it means to lose a part of our identity as a result of human-induced climate change.

The sites included in this report detail numerous millennia of Southeastern history. The monumental shell mounds of the Northeast coast of Florida, or the embodiment of American patriotism at the National Mall, or even the painful past of the Dozier School for Boys, represent triumphs and struggles throughout Southeastern history.

While limited in number, the fifteen sites discussed in this paper uniquely contribute to our multi-volume epic that is our American past. However, nature does not dutifully wait for histories to be written, and, as our study demonstrates, the rapid encroachment of intensified climate events, combined with a bureaucratic delay in investigating these sites, will inevitably result in their loss.

Currently, we stand to lose almost 20,000 archaeological and cultural sites within the Southeast by just one meter of sea level rise (Anderson et al., 2017). While daunting, the task of regaining control of our past must first be approached by organizing site priority and recognizing the effectiveness of current mitigation measures. Within this paper, we discussed five contributions that archaeology can make toward the struggle against climate change, provided by Hudson et al. (2012), and several of these 15 sites have the potential to fulfill these themes.

Sapelo Island can be viewed through a perspective on resilience. As part of a chain of barrier islands, the seaward coastline of Sapelo Island has always been in flux, eroding and aggregating due to the tidal and wave processes of the Atlantic Ocean. Although this site was home or useful to numerous populations in the past, including a Late Archaic community, the Guale, Spanish missionaries, the Creek, and several European and American landowners and plantation

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owners (Thompson et al., 2004; Sullivan, 1991; Jefferies & Moore, 2008; Crook, 2007, 2008), changes in the local ecology either caused each population to adapt by relocating or to be forcibly removed from the land. Today, descendants of the Gullah-Geechee slaves brought to Sapelo Island 200 years ago occupy a portion of Sapelo Island, known as Hog Hammock (Roberts & Holladay, 2019). However, just like previous inhabitants, the Hog Hammock community is currently facing pressures to adapt to their changing environment — this time due to human-induced climate change. Although Sapelo Island is not the typical example of resilience in archaeology, its history nevertheless encourages people to consider the deep-rooted bond that exists between ecological change and cultural change in the present and in the long-term.

In assessing our current production of "everyday life pollution" (Hudson et al., 2012; Hasegawa, 2004) and the ways in which our current modes of production affect the environment, we can best look at the interaction of culture and nature in our archaeological past. Within the dynamic delta of the Mississippi River, the creation and maintenance of mounds appears to "mimic natural process of land formation" (Mehta & Chamberlain, 2018, p. 3). The Grand Caillou site is located on a natural levee, at the intersection of Bayou Grand Caillou and a smaller crevasse channel (Mehta & Chamberlain, 2018). The purposefully selected location of the mounds provided abundant resources and transportation along the primary distributary, a protected channel for storing canoes and access to the backswamp, and greater protection from flooding on an elevated landscape along the natural levee and crevasse splay (Mehta & Chamberlain, 2018, p. 16). Therefore, the construction of the Grand Caillou site is a representation of how pre-contact peoples consistently considered the tumultuous natural behavior of the Mississippi Delta and how the environment plays a large role in cultural development. As the relationship between our current modes of production and the environment are hidden behind multiple levels of production and distribution, archaeology can highlight examples like Grand Calliou, in which culture deeply depends on the environment, to remind the public that our culture and society is not unique. Just like past populations, we are using environmental resources to fulfill our needs but on a much larger scale.

The Southeast also features instances in which public archaeology is involved in environmental education and mitigation methods, like site recording and management, as a means of filling the gap between cultural resource needs and government funding. For example, the Shipwreck Trail provides the state of Florida a means of assessing site integrity with limited allocation of funding while engaging the local community with the purpose to preserve sites and understand their vulnerability to climate events. The National Marine Sanctuary has put together a course for snorkelers and scuba divers to monitor underwater site conditions (Hester, 2018). In this way, public archaeology provides a tangible means of expressing the severity of climate change to the general public that is far more engaging than another news article about rapid flooding in a distant land.

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Human-induced climate change is often felt the hardest by those who contribute the least to its existence. Many of the sites included in this report have already experienced the strongest storm systems that ravage our coastlines. However, disparities in social justice often occur during post-storm recovery. For example, the Deering Estate complex has suffered devastating damage due to storm events. In 1992, Hurricane Andrew's 16.6-foot storm surge destroyed one of the historical buildings on the property and flooded the first story of the main home. The late nineteenth- and early twentieth-century structures were still used to host cultural and social events and were therefore the first to be repaired and rebuilt. However, on the periphery of the estate, Cutler Mound, a Woodland period burial mound, was left victim to the impacts of passing storms. In particular, a large oak lies on top of the mound and threatens to expose the burials underneath. The neighboring Cutler Midden, a shell midden that is unique to Miami's urbanized coastline, continues to slip underneath rising sea levels with little mitigation other than rebar placed in the 1980s to measure the rate of tide encroachment.

By taking a broader perspective of this situation, this example demonstrates archaeologists' capability of discerning how past inequalities are compounded in present disparities. As mainstream media has and continues to homogenize Native American identity (Leavitt et al., 2015), social inequalities have existed within this frame of reference regardless of lineage. In other words, the active ignorance of the preservation of Indigenous archaeological sites like Cutler Mound is an active ignorance of the ancestors of Native Americans today. Additionally, the mixed preservation efforts of the Deering Estate is symbolic of past power dynamics regarding white settlers and Native Americans, as, even though settlers encroached and built upon significant Indigenous places like burial mounds, these sites are still deprioritized in favor of historic sites of Euro-American significance. By showing how this disparity is a result of deeply entrenched power dynamics of the past, archaeologists exhibit the ability to analyze complex and institutional relationships in the past and in the present.

Finally, the power of interdisciplinary studies within climate change-driven investigations is best understood within the framework of Turtle Mound, whose archaeological significance is matched by its ecological uniqueness. The mound is unique as it is home to over eight species of subtropical plants in a northern location (Norman, 1976). The significance of Turtle Mound as both an archaeological and botanical landmark has resulted in the collaboration of the University of Central Florida and the National Park Service to create "living seawalls" to hinder further erosion (Holtz et al., 2014, p. 35). The cross-disciplinary study of the site has demonstrated that the mound represents multiple meanings and consequently has multiple impacts if lost due to drastic climatic events. The interdisciplinary approach at the site has resulted in mitigation efforts that not only protect the site from erosional wave energy but also supports a healthy ecosystem through the establishment of an active oyster bed.

Undoubtedly, the Southeast has much to offer in terms of addressing and contributing to the global discussion of

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climate change. However, while many of these sites are not considered to be under immediate threat of destruction, they are still located in areas that will be irreversibly damaged by climate change within the next few decades. Currently, some of the responses to climate change effects on these Southeastern archaeological resources can be characterized as experimentative, inactive, and salvage. However, by recognizing the impacts caused by climate change today and subsequently acknowledging successful mitigation efforts like that of Turtle Mound, we can help establish mitigation plans to help curb the damage caused by rising sea level and hurricanes for other sites within the Southeast.

The Castillo de San Marcos has been a national monument since 1924, but just because the site is protected does not mean that it is immune to the impacts of climate change (Arana, 1986). Locals have recognized this site's cultural and economic significance within the community and have been making efforts to preserve it since 1832 (Arana, 1986). In 2011, the National Park Service (NPS) built a living seawall made of coquina, in hopes that marine life and vegetation would establish themselves on it and create a natural habitat in order to protect the historic seawall from further erosion (Holtz et al., 2014).

Alternatively, Pillsbury Temple Mound has not seen as much attention. Pillsbury Temple Mound is one of the last known sites in Manatee County that is associated with the Safety Harbor culture that dominated this part of Florida from the Late Woodland to the Contact period (Taylor, 2009). The site was excavated in the 1960s and, as of today, only 50% of the mound remains. During the excavation, 147 bodies were exhumed, and evidence of cremation was found (Taylor, 2009). In 2009, the State of Florida purchased the mound from the South Florida Museum to save it from developers. Unfortunately, the only way to gain access to the site today is to go through private property and the only barrier that protects this ancient ceremonial site is a wire fence that wraps around its entirety. The site sits only 60 meters away from the shoreline and the only barrier in between the two is a privately-owned house (Staller et al., 2016).

While all of these sites are simply "at risk" due to sea level rise or the increased severity of storm surges, one site included in our discussion, Adams Bay, represents the ultimate result of human-induced climate change as it is completely compromised. Rising sea levels and wave energy along the Louisiana coast severely eroded and continues to erode the multi-mound Plaquemine site (ca. 700 B.P.), resulting in the loss of over 80% of the site. In addition to the rising tides, the encroachment of the Gulf of Mexico's saltwater has caused the marshy grasslands that stabilized the site to die off. Although researchers discussed several energy abatement methods, the potential for stabilization and successful mitigation is low (Ostahowski et al., 2019). Therefore, with an understanding that complete loss was rapidly imminent, archaeologists from the Louisiana Archaeological Society, Florida State University, and New Orleans Center for the Creative Arts, conducted soil probe tests and test excavations in order to "salvage" the geological formation and cultural affiliation of the site. In other words, as there is no hope in saving the

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site and preventing further damage, archaeologists have attempted to gain as much information as possible from the site before the remaining 20% is washed away. This method of salvage archaeology represents the most immediate actions that we must pursue for those sites identified as black and red on the triage scale.

While some land management groups have made significant efforts to combat the damaging effects of climate change, there is still more to be done to protect other sites equally important to our cultural heritage. A way of quickly assessing site information and condition is through community-based archaeology. One such program offered to community members in the state of Florida is called the Heritage Monitoring Scouts. These volunteers visit local historical/archaeological sites and report any significant changes to the corresponding departments (Miller & Murray, 2018). Capacity-building programs assist with handling the vast needs of site management and instill a sense of duty within communities to preserve their local history. This method, therefore, pursues our recommendation to rapidly assess sites within at-risk areas, as well as informs the general public about climate change in a tangible way.

Overall, numerous sites within the Southeast have demonstrated or have the potential to demonstrate their contributions to a global discussion on climate change. However, if climate change negatively impacts these sites today, we risk not only losing irreplaceable cultural information and potential sources of guidance regarding how contemporary populations cope with climate change events. Mitigation efforts are therefore necessary to preserve these sites.

Conclusion

In this paper, we demonstrated how climate change is impacting or threatening modern populations and paralleled this process with examples of past events in the Southeast. Additionally, we emphasized that Southeastern archaeology, within the framework of Hudson et al.'s (2012) five contributions of archaeology, can help in determining our next steps regarding our response to climate change. However, key sites that are integral in this process are currently threatened by modern climate change events like sea level rise and increased storm activity, and, without future mitigation, the potential for these sites to not only provide us information about the past but also aid in developing our future dwindles.

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