Appendix F: Tier 2
Cultural Resources Appendix

SOUTH ATLANTIC COASTAL STUDY (SACS)

Appendix F: Tier 2 Cultural Resources Appendix

ENVIRONMENTAL TECHNICAL REPORT

AUGUST 2022

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Attachments

Attachment 1. South Atlantic Coastal Study Cultural Stakeholder and Tribal Nation Coordination

1 Introduction

1.1 Overview

A qualitative assessment of exposure, vulnerability, and risk to cultural resources from increased coastal storm damages as a result of sea level rise was conducted for the South Atlantic Coastal Study (SACS). The SACS definitions of exposure, vulnerability, and risk are provided below:

- *Exposure* is who and what may be harmed by a flood hazard. Exposure incorporates a description of where the flooding occurs at a given frequency and what exists in that area (U.S. Army Corps of Engineers [USACE] Engineering Regulation [ER] 1105-2-101).
- *Vulnerability* is the susceptibility of harm to human beings, property, and the environment when exposed to a hazard. Depth-damage functions, depth-mortality functions, and other similar relationships can be used to describe vulnerability (ER 1105-2-101). In the context of SACS, vulnerability is the sensitivity of populations, infrastructure, and environmental and cultural resources to coastal storm hazards, and adaptive capacity of the receptors or assets within the system to withstand and recover from the hazards. In the North Atlantic Coast Comprehensive Study (NACCS), probability of occurrence was used as the only measure of sensitivity to a coastal flood hazard, and adaptive capacity was not assessed. In SACS, vulnerability is assessed in state and territory appendices to refine potential risk areas identified in the Tier 1 Risk Assessment.
- *Risk* is broadly defined as a situation or event in which something of value is at stake and its gain or loss is not certain. Risk is typically expressed as a combination of the likelihood and consequence of an event. Consequences are measured in terms of harm to people, cost, time, environmental harm, property damage, and other metrics (ER 1105-2-101).

Consistent with the SACS objectives discussed in the main report, the SACS qualitatively assessed the vulnerability and potential risk of cultural resources within the coastal areas of the South Atlantic Division to increased hurricane and storm damages as a result of 3 feet of sea level rise over a 100-year planning horizon based on USACE intermediate sea level change estimates. Using the results of the analysis, the SACS cultural team and district project delivery teams identified planning reach-specific opportunities to manage the risk to at-risk cultural resources through a range of potential measures. These opportunities were used to formulate specific and detailed actions achievable by federal and/or non-federal stakeholders to address risk.

The USACE NACCS assessed the vulnerability of populations, infrastructure, and resources at risk throughout the North Atlantic Coastal region. The NACCS Tier 1 Risk Assessment evaluated exposure of environmental and cultural resources to coastal storm surge inundation and sea level rise. Similar to the NACCS, risk to environmental and cultural resources from coastal storm surge inundation and sea level rise was evaluated in the SACS Tier 1 Risk Assessment (refer to the SACS Main Report for an explanation of the Tier 1 Risk Assessment). Potential management strategies for exposed cultural resources are provided in the SACS state and territory appendices and Focus Area Action Strategies (located at the end of each state or territory

appendix). Any strategy would need to be in compliance with Section 106 of the National Historic Preservation Act (NHPA) before implementation.

1.2 Purpose of this Appendix

This appendix provides information on cultural resources in the SACS study area that are exposed to coastal storm hazards including storm surge inundation, erosion, and wave attack that increase as sea level rises. This appendix does not provide all or comprehensive information on exposure to cultural resources but contains select information that augments the information provided in the SACS state and territory appendices. This appendix does not include assessments of vulnerability or risk to cultural resources. Qualitative assessments of vulnerability and risk to cultural resources are included in the SACS state and territory appendices.

For the purpose of SACS, cultural resources include precontact and historic structures and buildings, archaeological sites, cemeteries, museums, shipwrecks, tribal sites, historic landmarks, monuments, historic United States Department of Defense (DoD) installations, historic districts, and traditional cultural places. Cultural resources are important to consider in this study because these resources are prevalent throughout the SACS study area and are threatened by increased coastal storm damages as a result of sea level rise. Cultural resources hold multiple and diverse values to local communities, visitors, and the general public. These resources are irreplaceable, and their meaning is often tied to their specific location (NC State University 2018). Archaeological sites are non-renewable resources and once a site has been lost, it cannot be replaced. Section 106 of the NHPA and its implementing regulations in 36 CFR Part 800 does not apply to the SACS because the SACS is will not result in an action.

This appendix does not include information on vulnerable environmental resources in the SACS study area. The SACS Environmental Technical Report, Tier 2 Environmental Resources Vulnerability and Risk Analysis/Priority Environmental Areas Identification (Environmental Technical Report) provides information on vulnerable and at-risk environmental resources and Priority Environmental Areas.

2 Cultural Resources Exposed to Coastal Storm Hazards

The Tier 1 Risk Assessment included regionally applicable and publicly available cultural-resources-related data and information. These data included historic properties listed on the National Park Service's (NPS) National Register of Historic Places (NRHP) to include specific points and polygons approximating boundaries (NPS 2020g). The NRHP data was used for the Tier 1 Risk Assessment because it is public data available for the entire SACS study area. Findings of exposure from storm surge inundation and sea level rise to cultural resources in the Tier 1 Risk Assessment are described in detail in the SACS state and territory appendices. This report does not discuss findings from the Tier 1 Risk Assessment.

The Tier 2 analysis allowed for additional input from local stakeholder agencies, on a per-state and territory basis, and for additional publicly available data inclusion. Each state and territory maintains an inventory of historic properties as required by the NHPA (NPS 2021). Sections 2.1 through 2.8 below identify the datasets used to assess exposure of cultural resources to coastal storm hazards in each state and territory.

Note, because of the size of the study area, this document does not provide all, or comprehensive, information on exposed cultural resources. This document contains select information that augments state and territory appendices.

2.1 North Carolina

2.1.1 Planning Reach NC_01

The North Carolina State Historic Preservation Office (NCSHPO) and the North Carolina Office of State Archaeology (NCOSA) were consulted regarding opportunities to enhance resiliency and manage risks to cultural resources related to increased hurricane and storm damages resulting from sea level rise in North Carolina. Both entities expressed concerns regarding vulnerabilities of historic structures, archaeological sites, cemeteries, museums, shipwrecks, and historic United States DoD installations that were not included in the Tier 1 Risk Assessment. Cultural resources in these categories that are listed on the NRHP were included in the Tier 1 analysis. Exposed DoD installations, specifically, have been included in the Tier 2 analyses, but are discussed elsewhere. Unless listed in the NRHP, archaeological site, cemetery, and shipwreck location data are not explicitly included in the Tier 2 analysis. In accordance with the policies of USACE, NCSHPO, and NCOSA, these locations are not made publicly available given their sensitive nature and concerns for damage to the resources. However, omission of specific location data does not ignore the vulnerabilities of coastal archaeological sites, cemeteries, and shipwrecks to storm damages and sea level rise.

Tribal nations (i.e., federal- and state-recognized tribes in North Carolina with an interest in the SACS study area) were also contacted and asked to collaborate regarding applicable at-risk resources. No feedback from North Carolina tribal nations was received to inform this study. Refer to Attachment 1 for a list of the tribal nations contacted.

Regarding shipwrecks, coastal North Carolina is host to a multitude of sunken vessels. Known as the Graveyard of the Atlantic, waters near North Carolina and its barrier islands have been infamously difficult to navigate and have contributed to many shipwrecks ranging from pleasure craft, to military craft, to pirate/privateer vessels (NPS 2018b). For example: the Huron, which was the last iron-built American naval vessel, rests near Milepost 11/12 at Nags Head and the Triangle Wrecks rest near Milepost 7 in Kill Devil Hills. Contrary to the suggestive name, the triangle wrecks are only two ships. The Kyzickes and the Carl Gerhard wrecked at the exact same location in the late 1920s (Outer Banks of North Carolina 2020).

The NCSHPO data more accurately defines polygons associated with NRHP properties as compared to NPS data (NCSHPO 2020; Figure 1). The NCSHPO data also depicts a broader range of resource categories as compared to the NPS data informing the Tier 1 Risk Assessment including properties and districts determined eligible for NRHP listing, study-listed properties, properties designated as local landmarks, and others. These expanded, North Carolina-specific data provide greater geographic context of resources that may be vulnerable to coastal storm damage and sea level rise.

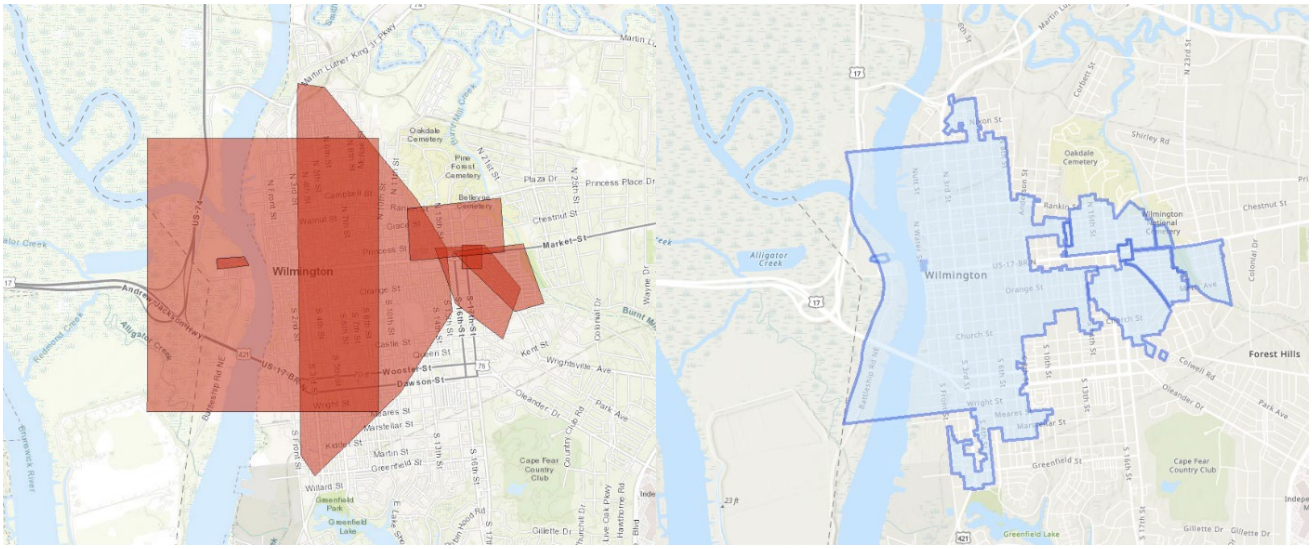

Figure 1: National Park Service National Register of Historic Places Data (red) versus North Carolina State Historic Preservation Office National Register of Historic Places (blue), Wilmington, North Carolina

Programs currently underway designed to protect specific vulnerable cultural resources in Planning Reach NC_01 include the NPS Cape Hatteras Group's efforts to address climate change options for cultural resources along the Cape Hatteras and Cape Lookout National Seashores, and continued efforts of organizations including:

- Outer Banks Conservationists (https://obcinc.org/)
- Ocracoke Preservation Society (https://www.ocracokepreservation.org/)
- Ocracoke Foundation (https://www.ocracokefoundation.org/)
- Whalehead Club (http://www.visitcurrituck.com/places/corolla/whalehead-in-historic-corolla/)

Additionally, efforts to provide aid to local governments' Historic Preservation Commissions to assist with physically raising elevations of historic resources and North Carolina flood Insurance assistance to affected owners of historic homes assist in protecting cultural resources and properties.

As effects of storm damage and sea level rise increase, such as erosion and gradual inundation, coastal cultural resources are increasingly vulnerable allowing for the potential loss of significant historic data. The NCSHPO has commented that the most effective long-term solution for protecting coastal cultural resources against the effects of storm damage and sea level rise is to alter practices that contribute to sea level rise. In the short term, data recovery mitigation excavations would allow for data associated with vulnerable coastal cultural resources to be retained; however, data recovery mitigation excavations may be prohibitively expensive to conduct.

2.1.2 Planning Reach NC_02

As stated in Section 2.1.1 above, coastal North Carolina is host to a multitude of sunken vessels. Edward Teach (Blackbeard)'s ship, the Queen Anne's Revenge, rests near Beaufort Inlet near Morehead City (North Carolina Department of Natural and Cultural Resources [NCDCR] 2021b) and waters off New Hanover County's barrier islands contain the Cape Fear Civil War Shipwreck District (NCDCR 2021a).

Planning Reach NC_02 in North Carolina also encompasses the northern-most portion of the Gullah Geechee Cultural Heritage Corridor, which stretches from Wilmington, North Carolina to Jacksonville, Florida (NPS 2017a). The Gullah Geechee people are the descendants of African slaves that labored on rice, indigo, and cotton plantations along the southern Atlantic coast, and are named for the unique creole language spoken by a portion of its members (Gullah Geechee Cultural Heritage Corridor Commission [GGCHCC] 2021). Gullah Geechee is the only distinctly African creole language in the United States, and Gullah Geechee expressions of food, art spirituality remain distinctive cultural characteristics.

Programs currently underway to protect specific vulnerable cultural resources in Planning Reach NC_02 include examples such as a partnership between the University of North Carolina at Wilmington and the U.S. Naval Academy for the construction and monitoring of wave attenuators at Brunswick Town/Fort Anderson in Brunswick County to slow the loss of a historic wharf to erosion. Additionally, efforts to provide aid to local governments' Historic Preservation Commissions to assist with physically raising the elevations of historic resources and North Carolina flood Insurance assistance to affected owners of historic homes assist in protecting cultural resources and properties.

2.2 South Carolina

2.2.1 Planning Reach SC_03

Using information and datasets from NPS, the South Carolina Institute of Archeology and Anthropology (SCIAA) and the South Carolina Department of Archives and History (SCDAH)'s ArchSite, and the United States Geological Survey (USGS), exposure of significant cultural resources to coastal storm hazards can be evaluated. Data gathered from these databases are current as of June 2021, and any cultural resources added after that point will not be represented in this analysis throughout the report.

- **NRHP**: The data was developed by NPS to protect historic and archaeological resources (NPS 2020g). The NRHP has a comprehensive inventory of cultural resources that are deemed worthy of preservation. The data provides spatial data of where historic points and historic places (polygons) occur relative to different types of hazards.
- **Geographic Names Information System (GNIS) Historical Features**: The data was developed by the U.S. Geological Survey (USGS) to maintain uniform feature name usage throughout the government (USGS 2021). The GNIS contains information about historical features and cultural resources. The data provides spatial data of where physical, cultural, political, and historical points occurs relative to different types of shorelines and hazards.
- **ArchSite**: Additional cultural resources data from ArchSite were used to refine hazards to cultural resources in the Tier 2 analysis. Information about archaeological and historic resources is contained in ArchSite, an online cultural resource information system for South Carolina (SCIAA and SCDAH 2017). ArchSite combines data from the state's archaeological and built environment (i.e., historic resources) to provide researchers with an online source for cultural resources information. This dataset identifies known historic properties (buildings, structures, sites, landscape features, and districts) that are eligible for listing, but not listed on the NRHP; resources that require additional evaluation for NRHP eligibility; and resources that are not eligible for listing on the NRHP that would be exposed to storm hazards. Archaeological sites that would be exposed to hazards are also identified using this dataset.

The 1-percent and 10-percent annual exceedance probability (AEP)[1] events with 3 feet of sea level rise was used to demonstrate the exposure from coastal storm inundation and sea level rise in the future condition. The coastal critical erosion areas layer was used to identify cultural resources exposed to coastal erosion. Wave attack was evaluated using the National Oceanic and Atmospheric Administration (NOAA) Environmental Sensitivity Index (ESI) shoreline layer for the continental United States (CONUS). Exposed shorelines have high and mixed wave energy while sheltered shorelines have low wave energy.

SACS Geoportal

The SACS combined hazard layer is located on the SACS geoportal at: https://www.sacs.usace.army.mil/SACS/

[1] AEP (measured as a percentage) is a term used to describe flood size. It is a means of describing how likely a flood is to occur in a given year.

Exposed shoreline types indicate exposure of cultural resources to wave attack within higher wave energy environments.

The outputs identified several areas in this planning reach that are exposed to storm surge inundation, erosion, and wave attack. Historic resources (e.g., buildings and structures) account for the most abundant resource type in Reach SC_03 (n=3,015). These resources include those that are eligible and noneligible for NRHP listing, and the information related to these resources is publicly available, including their location. The highest concentration of historic resources (n=874) is located in Horry County in the North Myrtle Beach and Myrtle Beach areas. The majority of these resources are residential buildings that date from the early 1900s to 1950s and are located near the shoreline in heavily developed and populated areas.

Archaeological sites are the second most abundant resource type in the planning reach (n=1,290). These sites are scattered throughout the planning reach but are concentrated in proximity to rivers, creeks, streams, and marshes. The highest concentration of archaeological sites is found in Georgetown County (n=615). High concentrations of sites are located near the Waccamaw River that date to both the prehistoric and historic periods.

There are 28 resources classified as historic areas in the planning reach. These resources are historic districts, boundary expansions, or multiple resource areas that are eligible for, but not listed on the NRHP, contribute to an existing historic district, or have been determined not eligible for listing. The area surrounding Georgetown contains numerous historic areas that are related to the rice culture in South Carolina.

The following cultural resources are highlighted as they illustrate the range of properties present and the potential impacts from flooding, erosion, storm surge, etc. This is not an all-inclusive list. Cultural resources within the areas were selected through both quantitative means, such as determining which cultural resources were located in areas of greater exposure, and qualitative means, such as stakeholder input. A selection of historic properties and districts are highlighted because of their National Register status, as well as stakeholder input. Stakeholders noted their historical significance and the concern for continued preservation because of their higher exposure rating. General information is also included regarding the presence of archaeological sites in areas of higher exposure.

Myrtle Beach and North Myrtle Beach, and Georgetown County (MPS-031)

South Carolina's first major agricultural staple was rice and during the Colonial period, South Carolina was the largest producer of rice in the colonies, with Georgetown County as the leading producer. The economy in the region was dominated by this product for nearly 200 years until the Civil War disrupted cultivation. There are still many standing structures associated with rice cultivation in Georgetown County, as well as archaeological evidence. The entirety of Georgetown County is a multiple property NRHP nomination for rice culture from 1750 to 1910 (NPS 1988a). The area contains at least 1,000 buildings that are age 50 years or older; 1,000 is the default maximum return for search results. Also, 904 are not eligible for the NRHP, 34 are individually eligible, and 62 contribute to an eligible historic district. Over half (602) are located in Myrtle Beach proper. There are four historic districts within the area, including (1) Myrtle Heights-Oak Park (Myrtle Beach), (2) Socastee Historic District, (3) Murrells Inlet Historic District, and (4) Downtown Myrtle Beach.

There are eight individually listed properties (five in Myrtle Beach, two in Murrels Inlet, and one in Georgetown). Significance of the resources is tied to development of the area as a coastal resort/tourist destination beginning in the early 1900s through mid-1950s. The low-lying districts could be prone to flooding, storm surges, and erosion. The aging infrastructure will struggle with light rainstorms, with nuisance flooding regularly closing streets in the historic districts.

Pee Dee River Rice Planter's Historic District (NRHP Ref. No. 88000532)

There are still many standing structures associated with rice cultivation in Georgetown County, as well as archaeological evidence and the rice fields themselves. One multiple property NRHP-listed resource is associated with rice plantations that flourished from the mid-1700s to the early 1900s. This multiple property nomination includes features from 12 rice plantations on the Pee Dee River and five plantations on the Waccamaw River. Additionally, there are individually listed NRHP resources in the vicinity of Georgetown that are associated with rice cultivation (NPS 1988b) (South Carolina Historic Properties Record n.d.). With any increase in the current rate of sea level rise combined with storm events, these resources will experience large changes and degradation due to erosion. Resource such as rice trunks and wharves that are constructed of wood that are located in the river or creek bank would be subjected to inundation and accelerated rates of deterioration.

Brookgreen Gardens (NRHP Ref. No. 78002510)

This resource is home to an expansive archaeological site associated with the use of the property as former rice plantations, as well as a historic sculpture garden and wildlife preserve, located south of Murrells Inlet, South Carolina. The 9,100-acre property features nature reserves of several different ecosystems, several gardens, a zoo, and various trails throughout the property (DOI 1978). Founded by Archer Milton Huntington and his wife Anna Hyatt Huntington, the purpose of the gardens was to feature sculptures by American sculptors, including Anna and her sister Harriet Randolph Hyatt Mayor. The gardens opened in 1932 after being built on four former rice plantations. The garden's name originates from the former Brookgreen Plantation, which had been the home of Joshua John Ward, who was the largest slaveholder in America at the time of his death in 1853 (NPS 1978). The park is located between the Waccamaw River and Huntington Beach State Park on the Atlantic Ocean, and because of the resource's low elevation, makes it susceptible to flooding and erosion from coastal storm surges which will worsen with sea level rise. Huntington's nearby residence, Atalaya, is now part of the Huntington Beach State Park and is listed on the NRHP.

Hobcaw Barony (NRHP Ref. No. 94001236)

Hobcaw Barony is a 16,000-acre research reserve and one of a few tracts on the Waccamaw Neck that remains undeveloped. The Hobcaw Barony site is associated with rice cultivation and illustrates changes in land use (post–Civil War) from a rice plantation to a winter hunting resort. The land became a colonial land grant (i.e., barony) in 1718 and was subdivided into plantations. Rice production continued in this area until the beginning of the twentieth century. The property was purchased in 1905 by Bernard M. Baruch, who was a Wall Street financier and also served as an adviser to several presidents. He used the house and lands as a winter hunting retreat. He eventually sold the land to his daughter Belle Baruch, who created a foundation

to manage the land in perpetuity. It now serves as an outdoor laboratory. The site includes 42 contributing buildings, 53 contributing sites, and 25 contributing structures. This area is home to expansive prehistoric shell middens and evidence of colonial land use (South Carolina Department of Archives and History 2021a; Hobcaw Barony n.d.). As a result of the configuration of the Waccamaw Neck and its proximity to Winyah Bay, as well as the Atlantic Ocean, all resources on the reserve may occasionally experience overwash and are more vulnerable to erosion.

2.2.2 Planning Reach SC_04

Several areas in this planning reach are exposed to storm surge inundation, erosion, and wave attack. Archaeological resources account for the most abundant cultural resource type in Planning Reach SC_04 (n=7,458). Resources found throughout the planning reach have the highest concentrations near rivers, the coast, and on barrier islands in Charleston and Beaufort Counties (n=5,777). These sites date from both the prehistoric and historic periods and several of these sites contain the archaeological remains of eighteenth and nineteenth century plantations.

Historic resources (e.g., buildings and structures) account for the second most abundant resource type in SC_04 (n=5,250), and they are found in all areas throughout the planning reach. The highest concentrations of historic resources are found in Charleston County (n=2769) and Beaufort County (n=1,158). These resources date primarily from the nineteenth to the mid-twentieth century.

There are 166 resources classified as historic areas in the planning reach. These resources are historic districts, boundary expansions, or multiple resource areas that are eligible for, but not listed on the NRHP, contribute to an existing historic district, have been determined not eligible for the NRHP or require additional evaluation. Concentrations of these resources are found in Charleston County (n=82) and Colleton County (n=31). Resources in Charleston County are located in Charleston on the peninsula and the barrier islands. Historic areas in Colleton County are located in the Ashepoo, Combahee, Edisto (ACE) Basin National Wildlife Refuge, along the Combahee River and in the vicinity of the Green Pond community. These resources are often associated with former rice plantations.

Civil War earthen works (n=209) are a unique resource type found only in Planning Reach SC_04. These resources consist of batteries, forts, revetments, and earthen fortifications constructed during the Civil War. The majority of these resources are located in the vicinity of James Island, south of the city of Charleston. These resources were placed near sounds, rivers, and creeks, which are prone to erosion from storm events and are highly vulnerable to storm surges, to protect against enemy invasion.

The following cultural resources are highlighted as they illustrate the range of properties that are exposed to storm surge inundation, erosion, and wave attack in Planning Reach SC_04. This is not an all-inclusive list. Cultural resources within the areas were selected through both quantitative means, such as determining which cultural resources were located in areas of greater exposure, and qualitative means, such as stakeholder input. A selection of historic properties and districts are highlighted because of their National Register status and stakeholder input. Stakeholders noted their historical significance and concern for

continued preservation because of their higher exposure rating. General information is also included regarding the presence of archaeological sites in areas of higher exposure.

Charleston (NRHP Ref. No.'s 66000964, 78002497, and 70000923)

Charleston was settled in 1670 and became one of the wealthiest cities in Colonial America due to rice, cotton, and other exports. The City of Charleston contains a large National Historic Landmark District (the area contains records for at least 1,000 structures that are 50 years or older), Charleston Historic District, as well as 44 individual National Historic Landmarks. These resources range from historic buildings and structures from the early 1700s, fortifications such as Fort Sumter and Fort Moultrie that played key roles in the Civil War, and nineteenth and twentieth century single family dwellings. The area contains at least 1,000 recorded archaeological sites, the maximum number of records that can be returned in the ArchSite database search. Many sites are located on Kiawah, Folly, and Seabrook Islands, and along the Wando and Cooper Rivers (South Carolina Department of Archives and History 2021b). With climate change these historic districts and resources will see an increase in sea level rise, dramatically extending the storm surge driven by hurricanes into their neighborhoods, increasing their chances of inundation. A rise of sea levels as low as a few feet, which is well within current projections, could permanently inundate portions of the city's historic districts. Meanwhile, storm surges and flooding could undermine the foundations of many historic buildings.

Fig Island Archaeological Site (NRHP Ref. No. 70000585)

At least 20 prehistoric shell rings are located along the central coast of South Carolina and Georgia, two of which are located on Fig Island. The Fig Island Shell Rings are believed to date around 1000 to 2000 BC. These resources contain some of the earliest pottery found in North America. While the function remains unknown as to the reason for the ring shape, the rings appear to be carefully planned. The rings are thought to be one of the earliest examples of sedentary life by inhabitants who survived through foraging the local environment for resources (South Carolina Department of Archives and History 2021c). The Fig Island Site (Number 2) consists of three prehistoric shell middens situated in a marsh. The other shell midden site on Fig Island (Number 3) is severely eroded and the entire resource is vulnerable to tidal erosion in the future as sea level continues to rise and is currently subject to storm surge and related episodic erosion.

Willtown Bluff (NRHP Ref. No. 74001830)

This resource, which was founded in 1704, was also known as Wilton and New London. It served as a historic settlement located on the South Edisto River in proximity to Adams Run. After Charleston was relocated in 1682, attention turned to Willtown Bluff and it became the second planned town to be established in this area. The town served as a local governmental and regional commercial center. The historic property includes three early-nineteenth-century buildings. The Parsonage dates to circa 1836, the Willtown Plantation House dates to circa 1820, and the remains of the Episcopal church that dates to circa 1836. The resource also includes the vast archaeological complex of the unexposed remains of a colonial village, which is believed to have been comprised of 80 houses (NPS 1974). Changes in shoreline topography due to erosion or migration would likely not affect these cultural resources as most are located in the interior of the island. However, storm surge from hurricanes and associated winds would inundate the resources while flooding could undermine the foundations of historic buildings.

Santa Elena, San Felipe, San Marcos, Ribaut Monument (NRHP Ref. No. 74001822)

Deemed to be one of the most important historical sites in South Carolina, the site consists of three fort sites and two town sites. Two of the forts are Spanish, dating to 1566 and 1577, and one is French, dating to 1562. One of the town sites was in existence for approximately a decade and was considerable in size for that time period and area. It represents the first European occupation in the area, as well as the only French and Spanish occupations in South Carolina. The Spanish fort built in 1566 was named San Felipe and was occupied until 1576 when a North American uprising forced the Spanish out. The Spanish relocated in 1577 to a nearby fort near the location of the original San Felipe location (South Carolina Department of Archives and History 2021d). The resource is also designated a National Historic Landmark and has experienced varying levels of damage from recent hurricanes. Storm surge from hurricanes and associated winds would inundate these resources while flooding could undermine the foundations of historic buildings.

Grove Plantation (NRHP Ref. No. 78002495)

Grove Plantation is a late federal-style building that was built by George Washington Morris circa 1828. After Morris' death circa 1857, the plantation transferred ownership after the death of Morris to John Berkeley Grimball. Grimball was a planter and member of the South Carolina Senate. Grove Plantation serves as an example of a low country house built during the end of the Federal Period (1790–1830). The main house, which is a raised cottage configuration, has a distinctive design that features polygonal rooms with symmetrical polygonal bays that project out (South Carolina Department of Archives and History 2021e). Several outbuildings are situated to the east. Storm surge could undermine the foundations of many of the island's historic buildings.

Daufuskie, St. Helena, and Hilton Head (NRHP Ref. No. 82003831)

These communities and cultural resources are associated with descendants of Africans who were enslaved on the rice, indigo and cotton plantations, many of whom came from West Africa. Their locations on remote or isolated plantations created a unique culture that is represented in language, arts, crafts, music, and foodways. Daufuskie Island Historic District encompasses the entire island and consists of 18 individual structures, 52 contributing buildings or structures, and 167 contributing properties, mainly wooded tracts (South Carolina Department of Archives and History 2021f). The resources collectively illustrate a 300-year long history of the island (1700 to1930) that has evolved in relative isolation. The Penn Center Historic District, located on St. Helena Island, was founded in 1862 as a school for freed slaves. For over a century, the school promoted education, welfare, and heritage of the local black community (South Carolina Department of Archives and History 2021g). The school served various functions aside from educational purposes. It also serves as a health clinic, farm bureau, and preservation institution for the island's Gullah Geechee heritage. A group of northern missionaries and abolitionists founded the school. They arrived on the island after the Union took over during the Civil War. The school closed in 1948, but a spirit of community service and historical preservation has continued in this community. Fort Howell, located on Hilton Head, is a Civil War earthwork fortification (South Carolina Department of Archives and History 2021f). Built in 1864, it is integral to the military history of that area. It played an important role in the federal occupation and defense of Hilton Head Island. The fort is associated with the United States Colored Troops, who aided with

the fort's construction, and demonstrates the role they played in the occupation and defense of the island. The fort also has a connection to Mitchelville (established between 1862 and1863), which was a freedmen's village for which the fort was built to defend. Another important note is that the fort is a rare example of a semi-permanent field fortification that was relatively large and still mostly intact. Structures and earthworks associated with these resources may be invulnerable to tidal waters today, but they will be vulnerable to tidal erosion in the future as sea level continues to rise, plus many are currently subject to storm surge and related episodic erosion.

2.3 Georgia (Planning Reach GA_05)

Exposed cultural resources were broadly defined as being within the 1-percent and 10-percent AEP flood hazard extent, because of the potential impacts of repeated and frequent inundation. Geographic Information System (GIS) analysis using several datasets discussed in this section was performed to determine which cultural resources were exposed to storm surge, erosion, and wave attack. Exposed cultural resource areas identified are not meant to be all-inclusive. Publicly available data for historic resources are discussed below and in the Georgia Appendix. Specific archaeological site data are not publicly reportable but were analyzed quantitatively to determine the volume of sites exposed to coastal storm hazards.

By using information and datasets from the NPS, USGS, and Georgia's Natural, Archaeological and Historic Resources GIS (GNAHRGIS), exposure of significant cultural resources to coastal storm hazards was evaluated. Data gathered from these databases are current as of June 2021, and any cultural resources added after that point will not be represented in this analysis throughout the report.

- **NRHP**: The data were developed by the NPS to protect historic and archaeological resources (NPS 2020g). The NRHP has a comprehensive inventory of cultural resources that are deemed worthy of preservation. The data is available in GNAHRGIS and can provide spatial data of where historic points and historic places (polygons) occur relative to different types of hazards.

- **GNIS Historical Features**: The data were developed by USGS to maintain uniform feature name usage throughout the government. The GNIS contains information about historical features and cultural resources (USGS 2021). The data are available in Georgia's Natural, Archaeological and Historic Resources Geographic Information System (detailed below) and provide spatial data of where physical, cultural, political, and historical points occur relative to different types of shorelines and hazards.

  GNAHRGIS: Additional cultural resources data from GNAHRGIS was used to refine exposure for cultural resources as part of the Tier 2 analysis. GNAHRGIS consists of two databases, including (1) Georgia Archaeological Site File Data and (2) Georgia Historic Preservation Division Historic Resources Survey Data (Georgia Archaeological Site File at the University of Georgia and the Georgia Department of Natural Resources n.d.). GNAHRGIS combines data from Georgia's archaeological and built environment (i.e., historic resources) to provide researchers with an online source for cultural resources information. This dataset identifies known historic resources (buildings, structures, sites, landscape features and districts) that are eligible for listing, but not listed on the National Register;

resources that require additional evaluation for NRHP eligibility; and resources that are not eligible for listing on the National Register that would be exposed as a result of hazards. Archaeological sites that would be exposed because of hazards are also identified using this dataset.

The 1-percent and 10-percent AEP hazard plus 3 feet of sea level rise layer was used to demonstrate exposure to cultural resources from coastal storm inundation and sea level rise in the future condition (Tables 1 and 2). Cultural resources located within these hazard areas are categorized as being at a higher exposure than resources located outside of these defined boundaries.

SACS Geoportal

The SACS combined hazard layer is located on the SACS geoportal at: https://www.sacs.usace.army.mil/SACS/

Table 1: Archaeological Sites in Georgia Exposed to the 1-Percent and 10-Percent Annual Exceedance Probability Flood Hazard

Archaeological Sites (Confidential Locational Data)						
County	Existing Exposure			Future Exposure (+3 feet Sea Level Rise)		
	Number of Sites			Number of Sites		
	1% Annual Exceedance Probability (AEP) (0.01)	10% AEP (0.1)	1% & 10% TOTALS (per county)	1% AEP (0.01)	10% AEP (0.1)	1% & 10% TOTALS (per county)
Bryan	88	114	202	114	153	267
Camden	157	76	233	61	208	269
Chatham	340	573	913	187	761	948
Glynn	210	90	300	165	143	308
Liberty	86	131	217	84	152	236
McIntosh	98	122	220	51	191	242
TOTALS	**979**	**1,106**	**2,085**	**683**	**1,608**	**2,291**

Table 2: Historic Resources Sites in Georgia Exposed to the 1-Percent and 10-Percent Annual Exceedance Probability Flood Hazard

Historic Resources Sites (Publicly Available Data)						
County	Existing Exposure			Future Exposure (+3 feet Sea Level Rise)		
	Number of Sites			Number of Sites		
	1% Annual Exceedance Probability (AEP) (0.01)	10% AEP (0.1)	1% & 10% TOTALS (per county)	1% AEP (0.01)	10% AEP (0.1)	1% & 10% TOTALS (per county)
Bryan	32	4	16	20	16	36
Camden	92	22	114	23	119	142
Chatham	461	157	618	281	353	634
Glynn	2,523	285	2,808	2,292	591	2,883
Liberty	12	0	12	12	6	18
McIntosh	8	13	21	7	14	21
TOTALS	**3,128**	**481**	**3,609**	**2,635**	**1,099**	**3,734**

In the current conditions, 2,085 archaeological sites were identified within the 1-percent and 10-percent AEP flood hazard extent (Table 1). With the addition of 3 feet sea level rise, an additional 206 archaeological sites are potentially exposed within the future condition for a total of 2,291 archaeological sites. In the current conditions, 3,609 historic resources were identified within the 1-percent and 10-percent AEP flood hazard extent (Table 2). With the addition of 3 feet of sea level rise, an additional 125 resources are potentially exposed within the future conditions to the 1-percent and 10-percent AEP flood hazard extent for a total of 3,734 historic resources. Figure 2 shows that the future condition leads to a higher exposure of historic resource compared to the existing conditions, and it contains locational information for publicly available data (i.e., no archaeological site locational information).

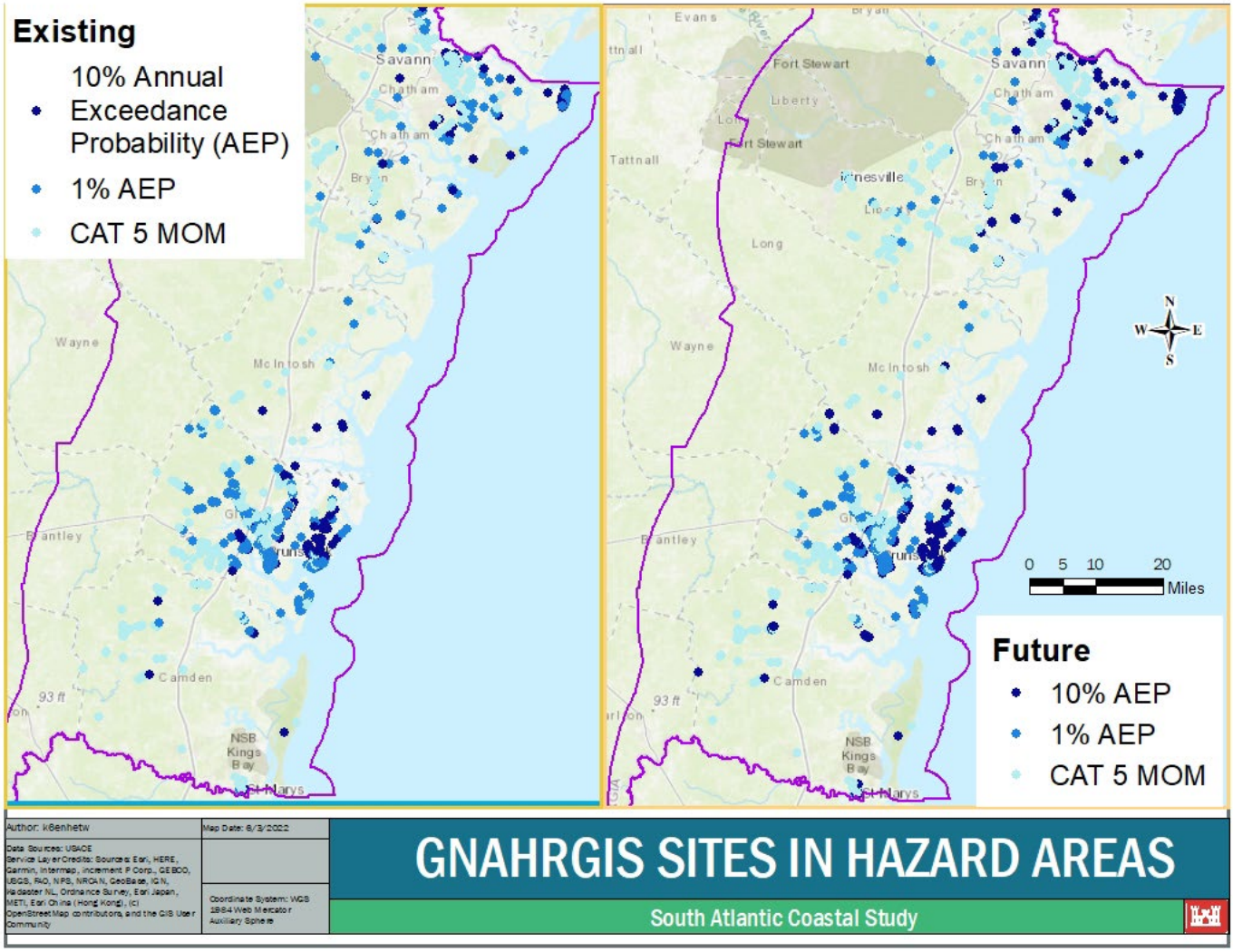

Figure 2: Historic Resources Recorded in Georgia's Natural, Archaeological and Historic Resources Geographic Information System Located in Existing and Future Conditions 1-Percent and 10-Percent Flood Events (with 3 Feet of Sea Level Rise)

Exposure of archaeological and other historic resources to coastal storm hazards for all coastal counties are discussed in greater detail below, as these counties are deemed to have higher exposure because of their proximity to the coast and coastal storm surge. Specific cultural resource areas are categorized by county in Table 3. Cultural resources within the areas were selected through both quantitative means, such as determining which cultural resources were located in areas of greater exposure, and qualitative means, such as stakeholder input. The table below is not all-inclusive and is meant to communicate the types of cultural resources that may be found in these areas. A selection of historic properties and districts are highlighted because of their National Register status and stakeholder input. Stakeholders noted their historical significance and concern for continued preservation because of their higher exposure rating. General information is also included regarding the presence of archaeological sites in areas of higher exposure.

Table 3: Exposed Cultural Resources Areas in Georgia by County

County	Location	Exposed Cultural Resource Area
Bryan	Richmond Hill	Fort McAllister
Camden	Cumberland Island	Cumberland Island, Dungeness Historic District, Little Cumberland Island, Duck House, and prehistoric and historic archaeological sites subject to erosion (Crooked River State Park)
Chatham	Moon River District	Pin Point Gullah Geechee Community
Chatham	Cockspur Island	Fort Pulaski National Monument, Cockspur Island Lighthouse, and prehistoric and historic archaeological sites subject to erosion
Chatham	Tybee Island	Back River Historic District, Tybee Island Strand Cottages Historic District, Fort Screven Historic District, and prehistoric and historic archaeological sites subject to erosion; includes Little Tybee
Chatham	Ossabaw Island	Prehistoric and historic archaeological sites subject to erosion
Chatham	Savannah	Savannah Historic District (River Street)
Chatham	Isle of Hope	Wormsloe Plantation, Isle of Hope Historic District, Gullah Geechee sites, and prehistoric and historic archaeological sites subject to erosion
Glynn	St. Simons	Fort Frederica National Monument, St. Simons Lighthouse and Lighthouse Keepers' Building, U.S. Coast Guard Station at St. Simons Island, Hamilton Plantation slave cabins, and prehistoric and historic archaeological sites subject to erosion
Glynn	Brunswick	Brunswick Old Town Historic District, Hofwyl-Broadfield Plantation
Glynn	Jekyll Island	Jekyll Island Historic District and National Historic Landmark, Jekyll Island Club, Indian Mound Cottage (Rockefeller Cottage), Faith Chapel, and prehistoric and historic archaeological sites subject to erosion
Liberty	Midway	Fort Morris
Liberty	St. Catherines Island	National Historic Landmark and prehistoric archaeological sites and historic sites subject to erosion
McIntosh	Darien	Ashantilly, Fort King George
McIntosh	Sapelo Island	Sapelo Island Lighthouse, Hog Hammock, and prehistoric and historic archaeological sites subject to erosion
McIntosh	Blackbeard Island	Prehistoric and historic archaeological sites subject to erosion

Bryan County

A query of GNAHRGIS revealed that 1,591 archaeological sites and 210 historic resources are located in Bryan County, with high concentrations of the resources located northwest of Fort Stewart and along the Canoochee River. Of these resources, 238 are located in the existing condition 1-percent and 10-percent AEP flood hazard extent and 303 are located within the future condition of 3 feet sea level rise, therefore at higher exposure. Of the 303 resources, 267 are archaeological sites and 32 are historic resources. One historic

resource of note is Fort McAllister, which is a restored Civil War earthworks fort situated on the Ogeechee River (NPS 1970). Built in 1861, the fort has undergone several restoration projects and is now a Georgia State Park.

Camden County

A query of GNAHRGIS revealed that 576 archaeological sites and 343 historic resources are located in Camden County, with high concentrations of the resources located on Cumberland Island. Of these resources, 347 are located in the existing condition 1-percent and 10-percent AEP flood hazard extents and 411 are located within the future condition of 3 feet sea level rise, therefore at higher exposure. Of the 411 resources, 269 are archaeological sites and 142 are historic resources. Cumberland Island is a barrier island that is also a designated national seashore and managed by the NPS. One of the highest concentrations of historic buildings is a historic district on the northern end, which includes 21 buildings. This resource is owned and managed by the NPS. Another historic district is located the southern end of the island that contains 10 buildings and structures. Prehistoric and historic archaeological resources include the Duck House, which was a historic dwelling site, and the Crooked River Site, which is a prehistoric shell midden site that is bordered by a salt marsh, Crooked River, and a shallow tidal creek (NPS 2020h). Little Cumberland Island, a barrier island to the north of Cumberland Island, is where the Little Cumberland Island Lighthouse is located. Both Cumberland and Little Cumberland Islands contain archaeological sites subject to erosion, as documented by the Georgia Department of Natural Resources Historic Preservation Division.

Chatham County

A query of GNAHRGIS revealed that 1,512 archaeological and 6,220 historic resources are located in Chatham County, with high concentrations of the resources located in downtown Savannah, the outskirts of Savannah on Isle of Hope and on Tybee Island. Of these resources, 1,531 are located in the existing condition 1-percent and 10-percent AEP flood hazard extent and 1,582 are located within the future condition of 3 feet sea level rise, therefore at higher exposure. Of the 1,582 resources, 948 are archaeological sites and 634 are historic resources. The highest concentrations of historic structures in Savannah are related to the initial settlement (late 1700s) and nineteenth century construction periods. The city of Savannah contains a large National Historic Landmark District with numerous architecturally significant resources that abut the Savannah River. These resources were built on some of the highest elevations in the city and are not inundated during major storm events. Tybee Island contains over 900 buildings and structures that are 50 years old or older (NPS 2020i). These resources are located behind the existing dunes and flood protections that are in place and are protected from inundation except during major storm events and storm surges. The Bonaventure Cemetery is listed on the NRHP and is located between the Wilmington River and Placentia Canal (NPS 2000b).

Tybee, Cockspur, Ossabaw, and Isle of Hope, contain several significant cultural and historic resources that are threatened by storm surge inundation, wave attack, and erosion. Tybee Island contains over 900 structures that are 50 years old or older, including the Back River Historic District, Tybee Island Strand Cottages Historic District (NPS 2020i), and Ft. Screven Historic District, which could all serve as the focus of

additional studies to protect these important sites from current erosional threats and future sea level rise (City of Tybee n.d.). Cockspur Island is in the eastern portion of the county north of Tybee Island. This island, which has experienced several episodes of significant storm damage, is home to the Ft. Pulaski National Monument (NPS 2003). The fort is subject to erosion and inundation, and the lighthouse has been destroyed several times due to storm surges. Ossabaw Island is a barrier island located in the southern portion of the county. The island is a historic district that covers approximately 39 square miles. Ossabaw Island contains multiple archaeological sites subject to erosion, as documented by the Georgia Department of Natural Resources - Historic Preservation Division (GADNR-HPD) (NPS 1996b) Isle of Hope is home to the Wormsloe Plantation, the Isle of Hope Historic District, and numerous sites that are important to the Gullah Geechee community (NPS 2005). The island is surrounded by a tidal salt marsh on all sides and transitions from a peninsula to island at high tide. Flooding and erosion are the main hazards associated with sea level rise in that area. Additional areas identified through stakeholder input include the Savannah Historic District at River Street (NPS 1977) and the historic Gullah Geechee community of Pin Point located adjacent to Shipyard Creek, both of which were impacted from storm surge during previous named storm events. Many of these resources in the Chatham County area are located behind the existing dunes and flood protections that are in place and are protected from inundation except during major storm events and storm surges.

Glynn County

A query of GNAHRGIS revealed that 443 archaeological and 3,390 historic resources are located in Glynn County. Of these resources, 3,108 are located in the existing condition 1-percent and 10-percent AEP flood hazard extent and 3,191 are located within the future condition of 3 feet of sea level rise, therefore at a higher exposure level. Of the 3,191 resources, 308 are archaeological sites and 2,883 are historic resources. These resources are located primarily near the coast of St. Simons and Jekyll Islands and near Brunswick. Over 400 historic resources are located on St. Simons Island that range in construction from the 1700s through the 1960s. More than 300 of the resources were constructed during the twentieth century and most are residential dwellings. Fourteen of the historic resources on St. Simons are classified as sites and three are affiliated with battles or fortifications that helped the British prevent the Spanish expanding their interests into Georgia in the mid - 1700s (NPS 2020j). St. Simons Island contains significant historical resources such as Ft. Frederica National Monument, the St. Simons Lighthouse and Lighthouse Keepers' Building, the U.S. Coast Guard Station on St. Simons Island, and the Hamilton Plantation slave cabins. (NPS n.d.-o, NPS 1972). Ft. Frederica, which abuts the Mackay River, contains remnants of a fort and town built by James Oglethorpe between 1736 and 1748 (NPS n.d.-f, NPS n.d.-g). Resources that are located along the perimeter and southern end of the island are subjected to flooding during coastal storm surges. A historic district on Jekyll Island includes the Jekyll Island Club (which is a designated National Historic Landmark), Indian Mound Cottage (Rockefeller Cottage), and Faith Chapel (NPS n.d.-k). Hofwyl-Broadfield Plantation, which is located in the city of Brunswick, is a nineteenth century plantation site that is listed on the NRHP and is also a Georgia State Historic Site (NPS n.d.-j). The site is located along the Altamaha River and includes 1,268 acres of land and 696 acres of marsh. Two historic districts are also located in Brunswick along the Brunswick peninsula, which is bordered by multiple rivers such as the East, Turtle, Mackay, and Brunswick Rivers (NPS n.d.-a). One

historic district encompasses 289 acres and contains numerous structures and buildings related to the establishment of Colonial Brunswick in the 1700s. Additional areas identified through stakeholder feedback include the Brunswick Historic District, which was impacted from storm surge during previous named storm events.

Liberty County

A query of GNAHRGIS revealed that 2,115 archaeological sites and 591 historic resources are located in Liberty County. Of these resources, 229 are located in the existing condition 1-percent and 10-percent AEP flood hazard extent and 254 are located within the future condition of 3 feet of sea level rise, therefore at higher exposure. Of the 254 resources, 236 are archaeological sites and 18 are historic resources. The majority of the resources are concentrated in inland near populated areas such as Hinesville and Flemington (NPS 2020k). St. Catherine's Island, a privately owned barrier island located in this area, is listed as a historic district, and covers approximately 35 square miles. St. Catherine's Island contains multiple archaeological sites subject to erosion, as documented by the GADNR-HPD (NPS n.d.-n). Another vulnerable area is a 93.6-acre historic plantation site developed by Button Gwinnet, which is listed on the NRHP (NPS n.d.-n). Ft. Morris, which is in the city of Midway on a bend in the Medway River, is an earthen works fort that was important in the Revolutionary, French and Indian, and Civil Wars (NPS n.d.-i). Fort Defiance/Fort Morris, which is located along the Medway River, and would be exposed to flood hazards under multiple inundation scenarios.

McIntosh County

A query of GNAHRGIS revealed that 581 archaeological sites and 1,495 historic resources are located in McIntosh County. Of these resources, 241 are located in the existing condition 1-percent and 10-percent AEP flood hazard extent and 263 are located within the future condition of 3 feet of sea level rise, therefore at a higher exposure level. Of the 263 resources, 242 are archaeological sites and 21 are historic resources. A large concentration of historic buildings and structures is found on Sapelo Island that were constructed as early as the early 1800s through the 1950s and many are the remains of plantations. Sapelo Island, a barrier island, contains many significant cultural and historical resources that are threatened by erosion and future sea level rise. The island is home to the Sapelo Island Lighthouse (NPS 1997) and Hog Hammock, which is a 427-acre historic district associated with a post–Civil War African American settlement affiliated with the Gullah Geechee culture, the importance of which was stressed by stakeholder input (NPS 1996a, NPS 1996b). Current residents are descended from antebellum slaves of Sapelo Island's plantations (NPS 1996b). This community is Georgia's only remaining community where the Geechee culture has been preserved. The community's low elevation makes it susceptible to flooding from coastal storm surges, which will worsen with sea level rise (NPS 1996a). The island contains multiple archaeological sites subject to erosion, as documented by the GADNR-HPD. Additional areas identified through stakeholder input include the NRHP-listed Ft. King George Historic Site, which is subject to erosion (NPS n.d.-h). This site is the oldest English fortification in Georgia and is located on the east side of Darien, along the Darien River. The site is part of the Georgia State Parks and Historic Sites system and is listed on the NRHP. Ashantilly, located north of Ft. King

George along Black Island Creek, is another historic resource located in Darien (NPS 2015). Further inland in the city of Darien are two historic districts that consist primarily of standing structures (Advisory Council on Historic Preservation [ACHP] n.d.). Blackbeard Island contains multiple archaeological sites subject to erosion, as documented by GADNR-HPD (U.S. Fish and Wildlife Service [USFWS] 2015b).

Exposure to wave attack was evaluated by looking at the SACS NOAA ESI CONUS Shoreline layer, which include exposed and unexposed shoreline classifications. Typically, exposed shorelines are located in more dynamic environments and are subject to high and mixed wave energy, while sheltered shorelines have lower wave energy owing to a variety of natural protective measures. Within the coastal counties, during storm conditions, the elevated water levels generated by storm surge allow waves to penetrate much closer to the shoreline, exposing coastal structures to direct wave impacts, known as wave attack. Cultural resources located along and adjacent to exposed shoreline types such as the coastline of Georgia's barrier islands, are more exposed to direct wave attack, exacerbating erosion and threatening structural integrity. Conversely, cultural resources located along the numerous tidal inlets, streams, and creeks within Planning Reach GA_05 are most susceptible to exposure from inundation due to coastal storm surge and compound flooding, and to a lesser degree, erosion.

Previous studies by the GADNR-HPD and Skidaway Institute of Oceanography have documented archaeological sites that are in danger of, or are currently, being lost to erosion within Georgia's barrier islands (Skidaway Institute of Oceanography 2011). Sites identified by the GADNR-HPD included prehistoric Native American shell middens, artifact and shell scatters, and burial sites, among other archaeological sites exposed to erosion.

2.4 Florida

Florida contains a rich cultural history, including some of the oldest cities in America. Many of Florida's cultural resources are exposed to coastal hazards. With sea level rise, these cultural resources will experience a heightened likelihood for flood inundation, potential damage from coastal erosion, and increased wave action during major storms. The data (noted below) were used in the Tier 2 Risk Assessment to identify nationally registered cultural resources that could be exposed to coastal storm hazards under existing and future conditions. This data was used in conjunction with stakeholder input to assess exposure based on the Tier 1 10-percent AEP hazard plus 3 feet of sea level rise.

- **NRHP**
- **Florida Master Site File (FMSF):** Additional cultural resources data from the FMSF was used to refine exposure for cultural resources in Tier 2 (Florida Division of Historical Resources [FL DHR] 2021).

2.4.1 Planning Reach FL_06, Northeast Florida

Fernandina Beach Historic District and Fort Clinch are threatened by inundation and erosion in Nassau County. The Timucuan Ecological and Historical Preserve is threatened by erosion. This preserve contains archaeological sites representing over 6,000-year human history, including the Kingsley Plantation, the oldest

surviving example of an extant plantation in the United States. Additional threatened areas in Duval County include Fort George Island Cultural State Park, Fort Caroline, and historic places associated with the development of Jacksonville are exposed to inundation along the St. Johns River and tributaries. One of the most significant resources in the region, the Fort Caroline National Memorial commemorates the French Colony of la Caroline. This is located on the St. Johns River, and features a scaled exhibit of the fort in a location threatened by subsidence and shoreline erosion along St. Johns Bluff. In St. Johns County, there are currently 61 recorded archaeological sites within the boundary of the Guana Tolomato Matanzas National Estuarine Research Reserve. Known sites include a burial mound, numerous shell middens, a Spanish mission, and homestead sites from the British, Second Spanish and Territorial time periods. Shoreline change threatens to erode a Minorcan well and other archaeological resources into the Tolomato River. St. Augustine Historic District in St. Johns County is the nations' oldest city and has numerous cultural resources that are exposed to the coastal hazards of inundation, erosion, and wave attack. Fort Matanzas in Flagler County, built by the Spanish in 1742, is a U.S. National Monument threatened by storm surge inundation and sea level rise. Archaeological sites, historic structures, and historic resources groups near Daytona Beach and New Smyrna Beach in Volusia County, and historic places in Palatka on the west side of the St. Johns River are exposed to coastal hazards that threaten these significant cultural resources.

2.4.2 Planning Reach FL_07, East Central Florida

Archaeological sites, historic structures, and historic resource groups are present along the coast and barrier islands in Planning Reach FL_07. This planning reach includes unique historic properties, ranging from the best-studied archaic mortuary pond to resources related to the space age. As with other areas, many of the resources are located along the coastlines and waterways. The Merritt Island National Wildlife Refuge is a well-studied area within this region with resources ranging from precontact archaeological sites to buildings related to the operations of Kennedy Space Center (USFWS 2008). The archaeological sites include precontact shell middens, burial mounds, historic cemeteries, a fort, canal, saltworks, homestead/grove, and sugar mill ruins (USFWS 2019). The island also includes a variety of National Aeronautics and Space Administration facilities at Kennedy Space Center that are historically significant and listed in the NRHP. The island has experienced significant erosion and is projected to be further exposed to sea level rise and coastal storm damage.

Portions of Rockledge and Titusville in Brevard County and historic places around Sebastian and Vero Beach in Indian River County also have significant cultural resources exposed to coastal hazards. Significant resources here include precontact middens and mounds, resources related to the development of Florida, and historic districts from the settlement of towns. The Pelican Island National Wildlife Refuge is listed in the NRHP as the first U.S. Fish and Wildlife Service national wildlife refuge in the United States.

2.4.3 Planning Reach FL_08, Southeast Florida

Archaeological sites, historic structures, and historic resource groups are present in Jupiter, the Town of Palm Beach, West Palm Beach, and Lake Worth Beach spanning both sides of the Lake Worth Lagoon in Palm Beach County. The Jupiter Inlet Lighthouse is a notable resource and is key to the development of the region, combining both precontact and historic archaeological deposits. Now a museum and protected land as an

Outstanding Natural Area, this resource has lost acres of land to erosion in recent decades. The site of the historic trading post between the Seminole Indians and settlers, located in downtown Ft. Lauderdale in Broward County, is now the Historic Stranahan House Museum. The historic building and archaeological site are located along the Tarpon River, in an area now prone to nuisance flooding and flooding from major storm events. A few cultural resources along the Atlantic Ocean-facing shorelines of this planning reach may be threatened by erosion and wave attack, particularly in the Town of Palm Beach and Miami Beach. Some of the hotels associated with the development of the twentieth-century tourism industry are located directly on the beachfront on top of the historical dune locations, leaving the resources exposed to coastal hazards.

Miami and Miami Beach also contain several archaeological sites, historic structures, and historic resource groups surrounding Biscayne Bay. As in other planning reaches, there are archaeological sites located along the shorelines and waterways in areas mapped as a threatened by sea level rise and coastal storms. Of particular interest in this planning reach are the NRHP-listed historic districts associated with the development of Miami. There are multiple districts recorded that document the architectural character of this region. Some of the historic properties in this area were created to directly interact with the water, such as the Miami Marine Stadium and Pan American Sea Plane Base and Terminal. The direct association between these resources and the water means they are inherently threatened by coastal storm damages and sea level rise. A notable threatened archaeological resource here is the Miami Circle, located directly at the mouth of the Miami River.

2.4.4 Planning Reach FL_09, Southern Florida

As shown in the Tier 1 Risk Assessment, the limited terrestrial area of the Florida Keys is dense with recorded cultural resources. Nearly all of these resources are located within the 10-percent AEP hazard plus 3 feet of sea level rise hazard footprint. Portions of some NRHP-listed properties may not be threatened, such as the higher portions of Lignumvitae Key Archaeological and Historical District or the Fort Jefferson National Monument, but portions of these resources are threatened by inundation and erosion.

The entirety of Key West is located within the 10-percent AEP hazard plus 3 feet of sea level rise hazard footprint, with only one of the 21 properties recorded in the NRHP unaffected. These include the properties associated with Harry Truman, military construction over the last 150 years, and the African Cemetery at Higgs Beach.

The John Pennekamp Coral Reef State Park is a historic property encompassing much of the southern and eastern portions of Key Largo including submerged environments. The longest island of the Keys chain, and the closest to mainland Florida, Key Largo is home to more than 20 archaeological sites, and 57 historic structures including the Rock Mound site, Carysfort Lighthouse, historic pineapple plantations and key lime groves as well as two state parks, a national park and a section of the Florida Keys National Marine Sanctuary. As previously noted, portions of the Overseas Highway (U.S. Route 1) are also designated under the NRHP.

2.4.5 Planning Reach FL_10, Southwest Florida

Archaeological sites, historic structures, and historic resource groups are present along the coast of Collier County near Naples and Marco Island, and sensitive cultural resources are located along the water in areas subject to coastal storm damages and erosion. The coastal areas in this region include some of the most intriguing precontact development in the Americas, one of the few places thought to support political complexity without agriculture. Most famously present at Pine Island, this region is home to archaeological sites associated with water courts, canals, and other features which interact with water. The rich environment drew European exploration and conquest, though with sparse population consisting of fishing camps until the twentieth century. The twentieth century development, including extensive coastal development, resulted in historic resources that are now in the threatened areas.

Manatee County contains archaeological sites, historic structures, and historic resource groups along the Manatee River with the development of Bradenton and Palmetto directly on the banks of the river, with more than one NRHP-listed historic district. In addition to the historic districts, there are precontact mound complexes in Manatee County adjacent to the water in both coastal and riverine settings. This pattern continues in Sarasota County to the south, where threatened historic resources include the planned community of Venice, downtown Sarasota and the associated terraforms of the barrier islands in Sarasota Bay, and the architecturally significant Caples' and Ringling's' Estates Historic District along the bayfront.

Notable cultural resources in Charlotte County occur in the Punta Gorda vicinity of the south bank of the Peace River, where the historic residential district is listed on the NRHP. Similarly, in Lee County there are significant cultural resources along the south bank of the Caloosahatchee River near Fort Myers and on the barrier islands. Into Collier County, the historic development has largely focused on the coast, and the NRHP-listed historic properties in the area reflect this pattern. Significant archaeological sites are found along the coast as well, with well over one hundred archaeological sites mapped in the Ten Thousand Isles area.

As noted above, the association of cultural resources with environmental resources results in shared exposure. The erosion to the J.N. "Ding" Darling National Wildlife Refuge and its associated satellite refuges threatens both the coastal environmental resources and the archaeological sites found in the same setting. Both precontact and historic settlement in this region was centered along the water and in coastal areas, with generally low landforms. This pattern results in conditions where damage from coastal storms and sea level rise encroaches on both the precontact and historic sites.

2.4.6 Planning Reach FL_11, West Central Florida

Archaeological sites, historic structures, and historic resource groups are present in Pinellas County along the south bank of the Anclote River in Tarpon Springs and Clearwater along the intracoastal waterway including Caladesi State Park, in the St. Petersburg vicinity along Tampa Bay, the Bay Pines National Cemetery, and along the southern portion of Long Key. The precontact and historic settlement of this region took advantage of the waterways and productive coastal environments. Locations like Caladesi Island capture much of the history and development of Florida. This includes precontact middens, a burial mound, a nineteenth century homestead, a twentieth century resort, and a mid-century military testing facility. As a result of the

configuration of Caladesi as a drumstick barrier island, all cultural resources in the park are occasionally overwashed and threatened from erosion.

Archaeological sites, historic structures, and historic resource groups in Hillsborough County consist of Egmont Key and several areas located near downtown Tampa including cultural resources on Davis Island and historic places along Bayshore Boulevard. Named for the English Earl of Egmont, Egmont Key is a focal point of Florida history and is mentioned in Spanish documents as early as 1757 (Stafford, 1980). Later surveyed by the British and potentially fortified, it was eventually conveyed to the United States with the remainder of Florida in 1821. Hosting a lighthouse and later a military installation, it is a key location in the path of the removal of the Seminoles from Florida during the Seminole Wars. The island was later held by Confederate then Union forces during the Civil War. Fort Dade was constructed following the Spanish American War and Egmont Key was eventually designated as a state park. The critical erosion at Egmont Key has been well-documented and has already impacted the cultural resources on the island. Other coastal islands with cultural resources exhibit similar exposure, such as Anclote Key, Homosassa, Crystal River, and Cedar Key that are exposed to coastal hazards.

2.4.7 Planning Reach FL_12, Florida Big Bend

The San Marco de Apalache Historic State Park is located immediately south of St. Marks and has been designated as a National Historic Landmark. The Garden Patch Site is a historic property in Dixie County in a threatened area and is one of the many coastal islands across this region hosting archaeological sites including mound complexes, burials, and middens. Some of these are being expressly studied to examine how erosion and sea level rise are impacting archaeological sites (Sassaman et al. 2017). Additional cultural resources are present along the St. Marks Wilderness Gulf coastline and the north bank of the St. Marks River.

2.4.8 Planning Reach FL_13, Florida Panhandle

Cultural resources along the Florida Panhandle consist of archaeological sites, historic structures, historic resource groups, and precontact sites. Among the precontact sites, common resource types include shell middens, artifact scatters and campsites, and a few mounds. Precontact sites in this part of Florida date from the PaleoIndian through Mississippian periods to European and Euro-American contact, spanning approximately 13,000 years. Historic sites include house foundations, mill sites, historic scatters, and resources such as standing houses, buildings (schools, churches, government buildings), military structures, and shipwrecks.

There are over 14,700 known archaeological sites and aboveground resources in the 1-percent and 10-percent AEP hazard footprints. Of these, 8895 are aboveground resources, with the remainder consisting of precontact and historic archaeological sites. Approximately one-third of the archaeological sites are historic or multi-component sites, consisting of both precontact and historic sites. These include 275 building remains, 230 homesteads, 61 shipwrecks, 20 naval stores, and 25 historic forts. The majority of the archaeological sites are precontact and consist of 1416 precontact campsites, 282 shell midden/mounds, and over 500 artifact and lithic scatters and quarries. The aboveground resources mostly consist of historic houses, buildings, forts, lighthouses, schools, churches, and other government buildings. In addition, there

are 171 resource groups, including five archaeological districts, 16 historic landscapes, 31 historic districts, and one rural historic landscape. Important or well-known resources include St. Andrew's State Park, the Eglin Field Historic District, and Fort Pickens.

Many of the exposed precontact sites, such as the large number of shell middens, are located in the lowlands, deltas, and wetlands surrounding the rivers and bays. These areas are subject to increased erosion and submergence during times of storm surges and to side effects from sea level rise. Many of the aboveground resources, such as the historic buildings and structures located on or near barrier islands like Santa Rosa Island, including many historic forts and military districts, are subject to damage from storm surge inundation, with increased impacts likely with the addition of sea level rise, as are many of the historic districts and sites located within the coastal towns of Pensacola, Fort Walton-Destin, Panama City, and others. Many of these resources are considered eligible for the NRHP.

The following cultural resources are examples of the types of historic properties within Planning Reach FL_13. These resources are highlighted as they illustrate the range of properties present and the potential impacts from coastal hazards such as storm surge, erosion, wave attack, etc. This is not an all-inclusive list.

St. Andrews State Park

Now more than 1,200 acres in size, St. Andrews State Park originally comprised only a mere 302.87 acres along the Gulf Shore in 1947. This portion was purchased from the U.S. Government at a bargain price of $2.50 per acre. Over the next 40 years, additional land was infrequently acquired. The park first opened to the public in 1951, after repairs to the nearby Grand Lagoon Bridge made access to the park feasible. Shell Island was created with the construction of the Gulf-Bay Pass in the 1930s. The park is home to two historic structures and four archaeological sites ranging from large precontact shell middens, historic eighteenth, and twentieth century Spanish tabby structures as well as World War II remains reflecting the utilization of the area as a military reservation. Because of its location at the mouth of St. Andrews Bay, Grand Lagoon and the Gulf of Mexico, St. Andrews State Park is critically endangered by severe erosion, overwashing and rising sea levels.

Fort Pickens (NRHP Ref. No. 72000096)

In 1816, the United States began constructing Third System forts along its coastline to protect important waterways and seaports. Five years later, the federal government began fortifying areas along Florida's 3,500-mile seaboard. Pensacola Bay was one such area. Fort Pickens is one of four military forts designed to protect Pensacola in the 1800s. Located on Pensacola Beach on the Gulf Islands National Seashore, Fort Pickens was originally designed and constructed to defend Pensacola Bay and the Pensacola Navy Yard and Depot from foreign attacks. Its purpose would reach beyond the physical boundaries of the Gulf frontier. The historic archaeological sites at the park as well as the aboveground resources, such as the historic buildings and structures located on the barrier island, are subject to damage from storm surge inundation, with increased impacts likely with the addition of sea level rise, as the resource is located at the mouth of Pensacola Bay.

2.5 Alabama (Planning Reach AL_14)

The Alabama State Archaeological Site Files from the Office of Archaeological Research were used to refine exposure for cultural resources as a result of coastal flood hazards in the 1-percent and 10-percent AEP hazard extent in the current and future conditions with 3 feet of sea level rise. This dataset identifies historic resources (buildings, structures, sites, landscape features and districts) that are eligible for listing, but not listed on the NRHP; resources that require additional evaluation for NRHP eligibility; and resources that are not eligible for listing. Archaeological sites that would be exposed to hazards (eligible, NRHP-listed, need more evaluation, not eligible for listing) are also identified within this dataset.

These analyses show that the following geographic areas are exposed to inundation and inundation plus sea level rise from west to east: Grand Bay Swamp, Bayou La Batre, Mona Island, Dauphin Island, Fowl River, Dog River, Mobile Bay, and shoreline, the eastern third of the city of Mobile, the Mobile-Tensaw Delta, Weeks Bay and surrounding wetlands, Fish River, Magnolia River, Bon Secour River and adjacent wetlands, Fort Morgan Peninsula, Wolf Bay, and Perdido Bay.

Cultural resources in this area consist of prehistoric sites, historic sites, and historic aboveground resources. Among the prehistoric sites, common resource types include shell middens, artifact scatters and campsites, and a few mounds. Prehistoric sites in this part of Alabama date the from PaleoIndian through Mississippian period to European and Euro-American contact, spanning approximately 13,000 years. Historic sites include house foundations, mill sites, historic scatters, and aboveground resources such as standing houses, buildings (schools, churches, government buildings), military structures, and shipwrecks.

There are 550 known archaeological sites and aboveground resources exposed to inundation and an additional 13 in the added area of the inundation plus sea level rise zone. Of these, 68 are standing structures, with the remainder consisting of prehistoric and historic archaeological sites. Approximately one-third of the archaeological sites are historic or multi-component sites, consisting of both prehistoric and historic sites. These include over 60 historic artifact scatters, two buried forts, six shipwrecks, and three military earthworks. The majority of the archaeological sites are prehistoric and consist of 157 shell middens, 33 midden/mounds, and 114 prehistoric artifact scatters.

Most aboveground resources are historic dwellings in downtown Mobile, but also include several forts. Fort Gaines and Fort Morgan are two historic forts at the entrance to Mobile Bay. The Bottle Creek Mound complex is a major Mississippian mound complex in the Mobile-Tensaw Delta that was the center of a major Mississippian chiefdom. Mobile Bay and the Mobile-Tensaw Delta also contains multiple famous shipwrecks, including the Clotilda, Ivanhoe, and Seminole.

Specific resources discussed below are examples of the types of historic properties exposed to coastal storm hazards in this planning reach. These resources are highlighted as they illustrate the range of properties present and the potential impacts from flooding, erosion, and wave attack. This is not an all-inclusive list.

Baldwin County

Blakely State Park (NRHP Ref. No. 74000397): The park is home to a sprawling prehistoric Native American (Late Woodland) shell midden along the lower delta as well as evidence of a historic Native American Apalachee village and mission from 1733 to 1763. It was also the site of Fort Blakely, where the last major battle of the Civil War was fought. The Historic Blakeley State Park was created by an act of the state Legislature in 1975. The park is located along the Tensaw River and is threatened by subsidence and shoreline erosion.

Bottle Creek Indian Mounds (NRHP Ref. No. 74000398): This fundamental resource of value is a prehistoric Native American archaeological site and mound complex and is the largest site of the Mississippian culture on the central Gulf Coast. It is important to understanding the history and culture of the Mobile-Tensaw Delta in late prehistoric times and was designated as a National Historic Landmark in 1995, making it one of only two such sites in Alabama (alongside Moundville Archaeological Park). The park is located along the Mobile River, and as a result of the resource's low elevation in an urban area, makes it susceptible to flooding from coastal storm surges which will worsen with sea level rise.

Mobile Bay - Fort Morgan (NRHP Ref. No. 66000146): Located at the entrance to Mobile Bay, Fort Morgan played a significant role in the 1864 Civil War battle of Mobile Bay. It was built on the site of the earlier

Mobile Bay - Fort Bowyer (NRHP Ref. No. 66000146): An earthen and stockade type fortification involved in the final land battles of the War of 1812. The National Historic Landmark was constructed between 1819 and 1834 as a masonry pentagonal bastion fort at the mouth of Mobile Bay to be used for coastal defense. Fort Morgan is well maintained, yet it faces varying levels of threat from coastal storms and associated storm surges and flooding which could undermine the foundations of many of the island's historic buildings.

Mobile County

Indian Mound Park (NRHP Ref. No. 73000360): Located on the northern shore of Dauphin Island. Indian Shell Mound Park is historically significant because of the presence of expansive prehistoric Native American shell middens, and mounds dating to between 900 and 1500 BC. The park was added to the NRHP in 1973. These shell middens are particularly susceptible to coastal erosion from hurricane waves and storm surge.

The Clotilda: A schooner carrying 103 enslaved West Africans that was scuttled in 1860 in the Mobile River to prevent being prosecuted under the Act Prohibiting Importation of Slaves. It was the last slave ship to enter the United States via the Atlantic slave trade. After the Emancipation Proclamation and the Thirteenth Amendment, many of the descendants of the Clotilda would establish the neighborhood of Africatown in Mobile. The wreck is located in the riverine zone and is highly susceptible to instability within the landscape. Sand movement, extreme storms, shoreline change (e.g., accretion and/or erosion), and the physical effects of climate change (e.g., sea level rise) may present both challenges and advantages to protecting the scuttled wreck resource.

Mobile-Tensaw Rivers Delta (MTRD): The pre-European human history of the National Natural Landmark MTRD is still relatively under researched, however archaeological evidence exists of settlements and land use that go back at least 6,000 years before the present. This unique and culturally significant MTRD landscape is rapidly disappearing due to the ongoing erosion of coastal wetlands, subsidence, sea level rise, storm surges, and more than a century of anthropogenic alterations to coastal landforms and hydrology which will only increase as time moves forward.

These exposed cultural resources could benefit from additional studies to determine what management strategy would be appropriate to protect them from irreparable loss. More localized examples are included in the Alabama Focus Area Action Strategy.

2.6 Mississippi (Planning Reach MS_15)

Planning Reach MS_15 is composed of three counties – Hancock, Harrison, and Jackson, from west to east. The Tier 2 analysis shows that, from west to east, the following geographic areas are threatened by inundation and inundation plus sea level rise: the lower Pearl River, Jourdan River, Bay St. Louis, St. Louis Bay and back bay area, Pass Christian-Long Beach-Gulfport-Biloxi area, Wolf River, Cat Island, Ship Island, Big Lake, Bernard Bayou, Biloxi River, Tchoutacabouffa River, Back Bay of Biloxi, D'Iberville, Gulf Hills, Ocean Springs, Deer Island, Horn Island, Old Fort Bayou, Mississippi Sandhill Crane National Wildlife Refuge, Pascagoula River and delta, Pascagoula-Moss Point, and Escatawpa River.

Cultural resources in this area consist of prehistoric and historic sites, and historic buildings, structures, and districts. Among the prehistoric sites, common resource types include shell middens, artifact scatters and campsites, and a few mounds. Prehistoric sites in this part of Mississippi date from the PaleoIndian through Mississippian periods to European and Euro-American contact, spanning approximately 13,000 years. Historic sites include house foundations, mill sites, historic scatters, and aboveground resources such as standing houses, buildings (schools, churches, government buildings), military structures, and shipwrecks.

There are 1,518 known archaeological sites and 130 historic buildings, structures, and districts, according to the Mississippi Department of Archives and History website. Approximately one-third of the known sites are historic sites, with the remainder consisting of a variety of prehistoric sites. Included within these are a few well-known sites, such as a variety of site on Ship Island, such as Fort Massachusetts and the Ship Island Lighthouse, the Oleander shipwreck, and the series of Graveline prehistoric mounds near the Pascagoula area.

Many of the prehistoric sites that are exposed to coastal storm hazards, such as the large number of shell middens, are located in the lowlands, deltas, and wetlands surrounding the rivers and bayous. These areas are subject to increased erosion and submergence during times of storm surges and to side effects from sea level rise. Many of the aboveground resources, such as the historic buildings and districts located in the communities of Pascagoula, Biloxi, and Gulfport are subject to damage from storm surge inundation and associated erosion, with increased impacts likely with the addition of sea level rise.

2.7 Puerto Rico

Puerto Rico has a rich cultural history dating back thousands of years. From indigenous settlements of the Taíno to the Spanish colonization and the eventual United States Commonwealth status, each era in history left its mark on the land and culture (Library of Congress n.d.; Poole 2011). Many of Puerto Rico's cultural resources are in vulnerable locations. With sea level rise, these cultural resources will experience a heightened likelihood for flood inundation, potential damage from coastal erosion, and increased wave action during major storms.

2.7.1 Planning Reach PR_1

The following is a summary and brief history of the cultural resources located within Planning Reach PR_1. Based on the NRHP and Puerto Rico SHPO datasets, there are approximately 46 cultural resources within Planning Reach PR_1. Many additional unidentified or unlisted resources are likely present within the reach. This assessment highlights a few that are potentially exposed to Tier 2 hazards, including the U.S. Custom House in Mayagüez, the Rincón Lighthouse, and the Boiling Nuclear Superheater (BONUS) Reactor Facility. This is not an all-inclusive list.

U.S. Custom House (NRHP Ref. No. 88000077)

The U.S. Custom House is located in Mayagüez is within Puerto Rico's Planning Reach PR_1. The Puerto Rico Historic Buildings Drawings Society reports that, "The present Customhouse replaced a . . . Spanish-period Customhouse on the same site that was damaged beyond repair in 1918." The current United States Custom House was designed in 1924 by Puerto Rican architect Rafael Carmoega (Puerto Rico Historic Buildings Drawings Society 2014).

As documented by the U.S. Department of the Interior – NPS – NRHP Inventory Nomination Form, the U.S. Custom House building "is significant architecturally and historically for the role it played in the first, transitional phase of the American customs service in Puerto Rico, from 1898 through 1930. This period is bracketed at one end by the cession, on December 10, 1898, of the island of Puerto Rico to the United States by Spain as a condition of the Treaty of Paris ending the Spanish American War, and on the other by the completion in 1930 of the major building and rehabilitation program undertaken by the U.S. Customs Service following World War I" (1987). The building was listed on the NRHP in 1988 and was restored completely in 1996 (NPS 1988c; Puerto Rico Historic Buildings Drawings Society 2014).

Currently, the building is exposed to one foot of inundation during a Category 5 Hurricane maximum of maximum (Category 5 MOM) storm. Nearby areas are experiencing coastal erosion of approximately 1.3 feet per year (Luijendijk et al. 2018), which may exacerbate flood and wave hazards in the area. According to the USACE Coastal Hazards System (CHS) data (USACE 2020), wave heights in the area are expected to increase during the 1-percent AEP event by over 3 feet with 6.95 feet of sea level rise (6.95 feet corresponds with the USACE High Scenario for 2120). The U.S. Custom House is in an area of low to medium exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Rincón Lighthouse (NRHP Ref. No. 81000560)

The Rincón Lighthouse, also known as Faro de Punta Higuero, was built in 1892, but was severely damaged by an earthquake in 1918. According to the website Lighthousefriends.com, "two serious cracks in the tower . . . extended clear through the brickwork . . . Other cracks were found in the arches above the windows and doors in the exterior walls, and a great deal of plaster had fallen from the walls." In 1919, the U.S. Congress (Congress) appropriated funds to rebuild. In 1920, additional earthquakes further damaged the lighthouse—breaking the mantles and damaging the vaporizer and connecting tubes. The lighthouse was rebuilt and commissioned in 1922.

Located along the coast on top of steep slopes and bluffs, the lighthouse is not subject to inundation from a flood event. However, the sandy beach just to the south of the park is showing signs of shoreline retreat at a rate of 1.6 feet per year (Luijendijk et al. 2018). While the shoreline directly adjacent to the lighthouse may be stable, the erosion of the nearby beach could present accessibility issues as a result of road damages. With 6.95 feet of sea level rise, the lighthouse may also be exposed to wave attack owing to wave height increases of over 3 feet, as modeled by USACE's CHS. The lighthouse is in an area of low to medium exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Boiling Nuclear Superheater (BONUS) Reactor Facility (NRHP Ref. No. 7001194)

The BONUS Reactor Facility is a decommissioned small-scale nuclear reactor located on the coast of Rincón. Built in 1960, it was designed to test concepts without the high costs of larger plants. It was decommissioned in 1968 and all nuclear material was transported to the CONUS. Contaminated surfaces were cleaned or protected (U.S. Department of Energy 2018). It was listed as a historic district in the NRHP in 2007.

The reactor is in an area of low to medium exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. The reactor is not subject to inundation from a Category 5 MOM hurricane but is located approximately 300 feet (91 meters) from the shoreline, which is currently eroding at a rate of 1.6 feet per year (Luijendijk et al. 2018). This will likely increase the reactor's potential for flooding or damage from erosion. Wave heights are likely to increase by more than 3 feet based on 6.95 feet of sea level rise within the next 50 to 100 years, according the USACE's CHS.

San Carlos Borromeo Church (NRHP Ref. No. 84003124)

The historic San Carlos Borromeo Church is located in the center of Aguadilla, approximately 750 feet from the shoreline. The structure was built in 1780 and devoted to San Carlos Borromeo and Santa Maria de la Victoria (Grupo Editorial EPRL 2014a). The church is listed with the NRHP and considered architecturally significant because it is Puerto Rico's only church with a groin vault ceiling in its apse, instead of a cupola or barrel vault. Additionally, three wooden sculptures (of Jesus, the Virgin Mary, and Saint Joseph) dating back to 1850 are preserved in the vestry (NPS 1984b).

The church is in an area of low exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. While the church is not currently exposed to inundation from a Category 5 MOM hurricane, the nearby shoreline is retreating at a rate of up to 2 feet per year (Luijendijk et al. 2018). With 6.95 feet of sea level rise, wave heights are also expected to increase by up to 4 feet during the 1-percent AEP storm.

District Courthouse of Aguadilla (NRHP Ref. No. 85000041)

The District Courthouse was built in 1925. By the 1970s, the building was dated and inadequate for the workload and needs of the courthouse. A new judiciary center was built, and the original building was rehabilitated and converted into the Aguadilla Art Museum (Museo de Arte de Aguadilla), which houses works by significant artists such as Carmen Arroyo Gely, Susana Marrero, Rafael Motta, Cajiga, Rafael Tufiño, Hernandez Cruz, Sadotnski, Eliseo Echevarría, and López del Campo. The building is listed with the NRHP (NPS 1984a). The courthouse is in an area of low exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. The courthouse is located approximately 200 feet from the shoreline. Though it is not subject to inundation from a Category 5 MOM hurricane, and a man-made structure along the nearby shoreline provides some protection from coastal erosion, the area has seen shoreline erosion rates of approximately 2 feet per year (Luijendijk et al. 2018). With 6.95 feet of sea level rise, wave heights are also expected to increase by up to 4 feet during the 1-percent AEP event.

Figure 3 shows the location of all cultural resources in Planning Reach PR_1.

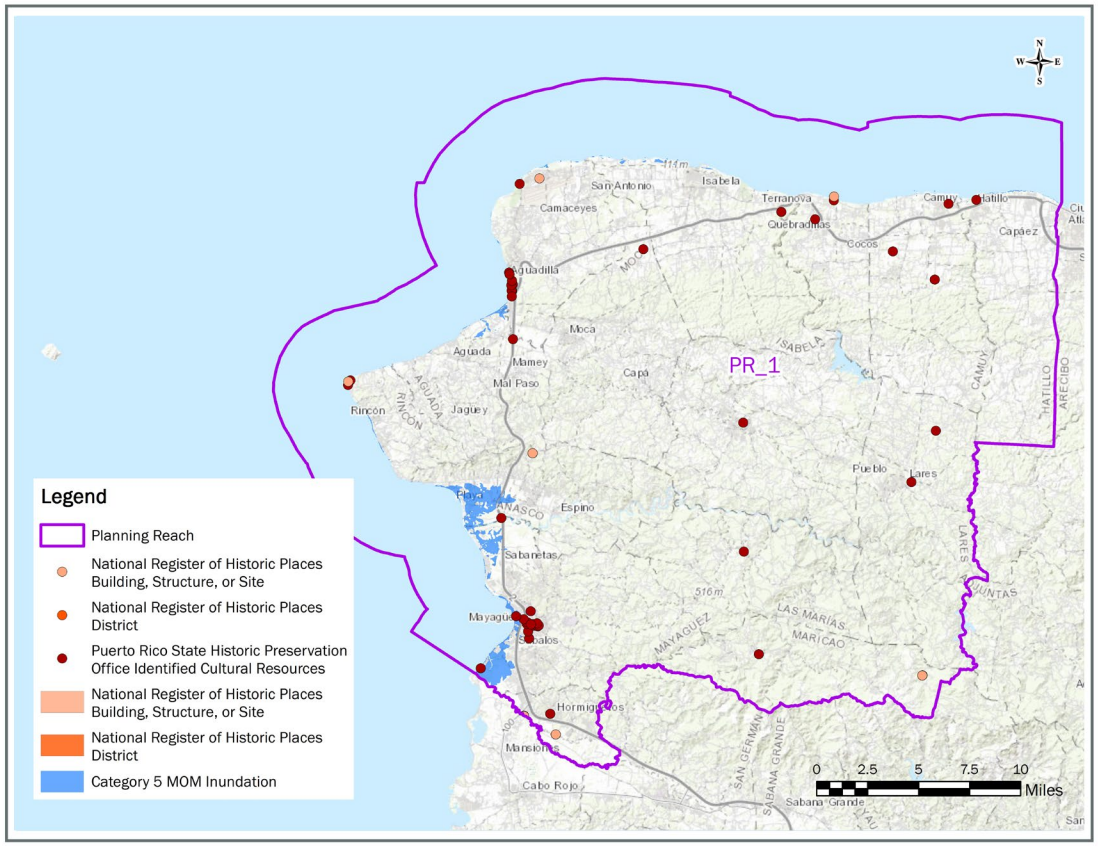

Figure 3: Cultural Resources in Planning Reach PR_1 (NPS 2014)

2.7.2 Planning Reach PR_2

This planning reach has significant cultural resources located in areas of potential flood hazard. Based on the NRHP and Puerto Rico SHPO datasets, there are approximately 41 cultural resources within Planning Reach PR_2, including Hacienda Azucarera la Esperanza and several within the municipality of Arecibo. Many additional unidentified or unlisted resources are likely present within the reach. This assessment highlights a few that are potentially exposed to Tier 2 hazards. The two locations with the highest densities of cultural sites are Arecibo and Vega Baja. These sites include historic buildings, such as the Corregimiento Plaza Theater, Casa Alcaldia de Arecido, Casa Cordova, and the Church Santa Maria del Rosario of Vega Baja. Along the coast of Manati, there is a NRHP Cultural Resources District called Hacienda Azucarera la Esperanza. There are also many archaeological sites along the oceanfront zone immediately inland from the beaches. This is not an all-inclusive list.

Arecibo

Settled in 1556, Arecibo is one of the oldest municipalities and home to Puerto Rico's largest rum distilleries (Britannica 2012). The municipality features significant sites that include La Cueva del Indio (The Cave of the Indian); Paseo Victor Rojas, a historic promenade built in 1881 over ruins of a fort destroyed during a British attack (NPS 1986); Casa Ulanga, built in 1850, which has functioned as a hospital, City Hall, jail, and District Court (NPS 1982); and the Arecibo Lighthouse and Historical Park (Discover Puerto Rico 2022).

The Arecibo municipality is ranked as low to medium exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Paseo Victor Rojas, a historic promenade built in 1881 over ruins of a fort destroyed during a British attack (NPS 1986), and Casa Ulanga, built in 1850, which has functioned as a hospital, City Hall, jail, and District Court (NPS 1982) are within 400 feet of the coast. While a seawall and riprap line the coast near the town center and the area are not modeled to be subject to inundation from a Category 5 MOM hurricane, shoreline erosion rates of up to 16 feet per year have been recorded (Luijendijk et al. 2018). With 6.95 feet of sea level rise, this coastal community may also see wave height increases from the 1-percent AEP event of over 3 feet. La Cueva del Indio is located along the coast to the east of the town center and is subject to inundation, erosion, and wave attack.

Hacienda Azucarera la Experanza (NRHP Ref. No. 76002190)

Hacienda Azucarera la Esperanza was one of the most advanced sugar plantations of the nineteenth century and its ruins are now protected by the Puerto Rico Conservation Trust. According to the Enciclopidia de Puerto Rico website, "Excavations uncovered indigenous sites that date to 510 AD, among which is a ceremonial park, four plazas, petroglyphs, and a cemetery. Currently, the machinery and structures associated with the historical complex of the plantation are being restored."

The site is also home to more than 10 different ecosystems, including important estuaries, wetlands, and forests (Grupo Editorial EPRL 2014b). Portions of the plantation are ranked as medium exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Significant portions of the plantation are subject to flooding from the 1-percent AEP event. With sea level rise, these areas also become exposed to the 10-percent AEP event. Changes in flooding patterns and saltwater inundation may cause damage to both the

ruins and the natural ecosystems. Because of its distance from the coast, this site is not likely subject to wave action or coastal erosion.

Figure 4 shows the location of all cultural resources in Planning Reach PR_2.

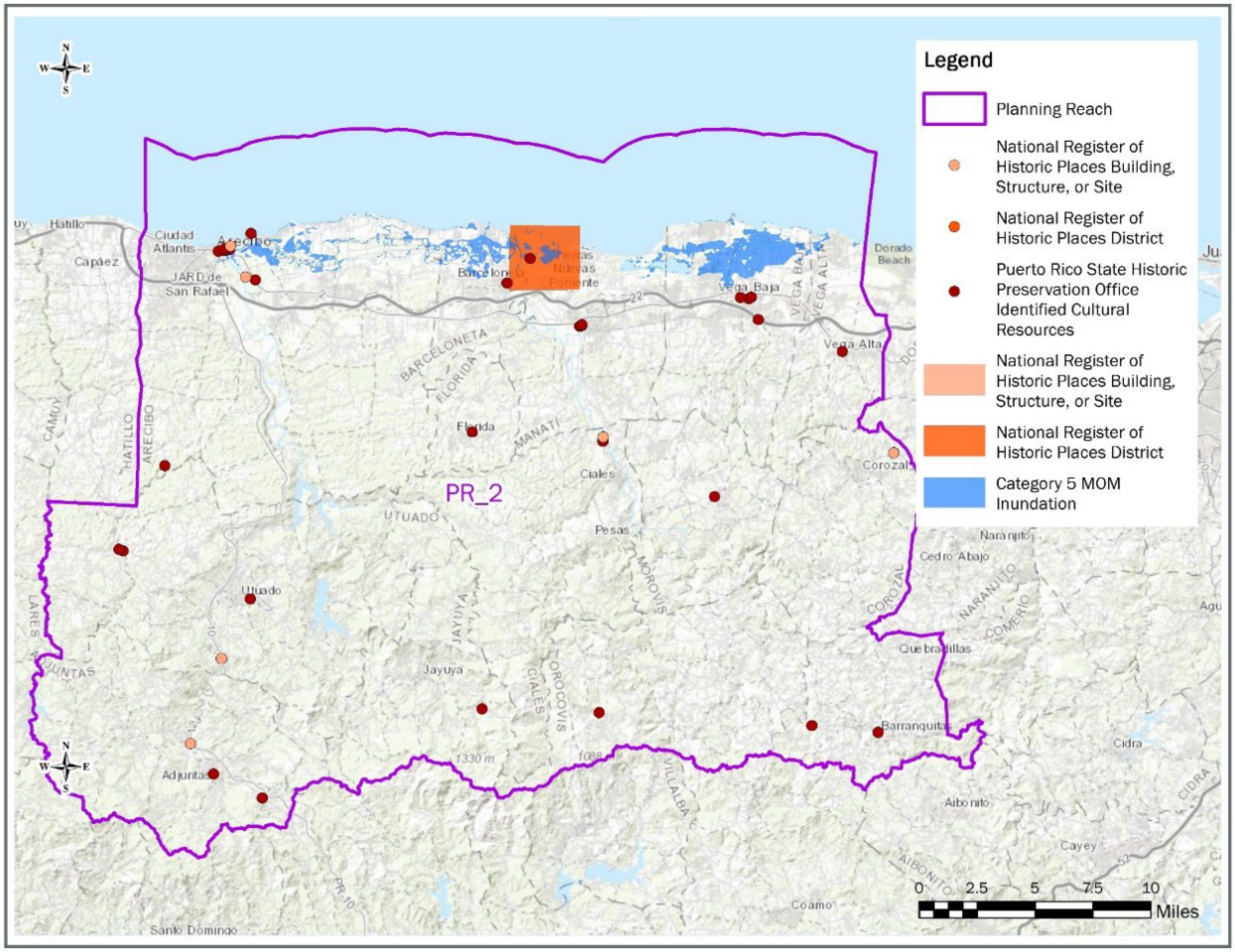

Figure 4: Cultural Resources in Planning Reach PR_2

2.7.3 Planning Reach PR_3

The following is a summary and brief history of the cultural resources located within PR_3. Based on the NRHP and Puerto Rico SHPO datasets, there are approximately 93 identified cultural resources within Planning Reach PR_3. Many additional unidentified or unlisted resources are likely present within the reach. This assessment highlights a few that are potentially exposed to Tier 2 hazards including architectural sites within Ponce, the Cabo Rojo National Wildlife Refuge, Punta Ostiones, and Punta de las Figuras Lighthouse. This is not an all-inclusive list.

Ponce

Ponce, a municipality on Puerto Rico's southern coast, was developed in the late seventeenth century by Spanish settlers and the Spanish influence can still be seen today in preserved historic buildings and sites. Important architectural sites within the municipality include Iglesia Metodista, one of the first non-Roman Catholic churches in Puerto Rico (Grupo Editorial EPRL 2014c), and Edificios Empresas Ferre, a building featuring two murals depicting Puerto Rican life in the early twentieth century (NPS 2013).

The topography of Ponce is relatively flat compared to other areas of Puerto Rico, resulting in significant potential for flooding. Coastal portions of Ponce ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index, while inland areas ranked as low exposure. Several historic buildings are subject to inundation depths of up to 8 feet during a Category 5 MOM hurricane. With 3 feet of sea level rise, these resources will also be subject to inundation from the 10-percent AEP event. Though man-made structures protect the shoreline of Ponce near these historic buildings, shoreline change rates have demonstrated shoreline retreat of 1 foot per year (Luijendijk et al. 2018). Coastal Hazards System modeling indicates wave height increases of 4.6 feet in this area with 6.95 feet of sea level rise.

Cabo Rojo National Wildlife Refuge

Once home to a station for the U.S. Foreign Broadcast Information Service (a partition of the Central Intelligence Agency), the Cabo Rojo National Wildlife Refuge 1,836acre (743 square kilometers) site is a critical habitat for wildlife; 245 plant species and 145 bird species have been identified within the refuge (USFWS 2015a). Reportedly, the entire refuge is part of the BirdLife International Important Bird Area. The Cabo Rojo Salt Flats are an Important Critical Wildlife Area, and the refuge is the first place in the Caribbean to be designated a site in the Western Hemisphere Shorebird Reserve Network (Discover Puerto Rico 2020).

The refuge is ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. The Cabo Rojo National Wildlife Refuge is subject to flooding from the 1-percent AEP event. With sea level rise, the area is expected to experience increased inundation and wave heights. Shoreline change rates show a retreat of approximately 6.6 feet per year (Luijendijk et al. 2018). With sandy beaches and mangroves lining the shoreline, the Cabo Rojo Wildlife Refuge is expected to experience significant future coastal erosion.

Punta Ostiones (NRHP Ref. No. 4000908)

Located within Cabo Rojo, Punta Ostiones contains an archaeological site believed to be connected to the Ostionoid people. According to the Enciclopedia de Puerto Rico website, the site "reflected a decisive social change that occurred around 600 AD" This new cultural group showed different behavior from the previous Agroceramic group. The archaeology showed that they lived in coastal villages near coral reefs, mangroves, and potable water" (Grupo Editorial EPRL n.d.).

The site is on a small peninsula with mangroves to the north and sandy beaches to the south. It is ranked as medium to high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Shoreline change data demonstrates erosion of approximately 0.7 feet per year (Luijendijk et al. 2018). The area is

subject to inundation from the 1-percent AEP event and has experienced shoreline erosion. Sea level rise is expected to increase wave heights, exacerbating these hazards.

Punta de las Figuras Lighthouse (NRHP Ref. No. 81000687)

Punta de las Figuras Lighthouse, also known as Faro de Punta de las Figuras, was built in 1893 for maritime commerce in Arroyo and Patillas. According to the Enciclopedia de Puerto Rico, the lighthouse is "built of stone and brick in neo-classical style. It has a frieze or decorative horizontal border made up of alternating circles and squares that surrounds the structure and ends in a simple cornice and parapet, an ornamental detail does not present in the island's other lighthouses" (Grupo Editorial EPRL 2014d).

The lighthouse is ranked as low exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Sandy beaches, mangroves and wetlands surround the light house, providing limited protection from wave attack or coastal erosion. The area has experienced shoreline erosion rates of approximately 1 foot per year (Luijendijk et al. 2018). With 6.95 feet (2.12 meters) of sea level rise, wave heights are expected to increase by up to 5 feet during the 1-percent AEP event.

Figure 5 shows the location of all cultural resources in Planning Reach PR_3.

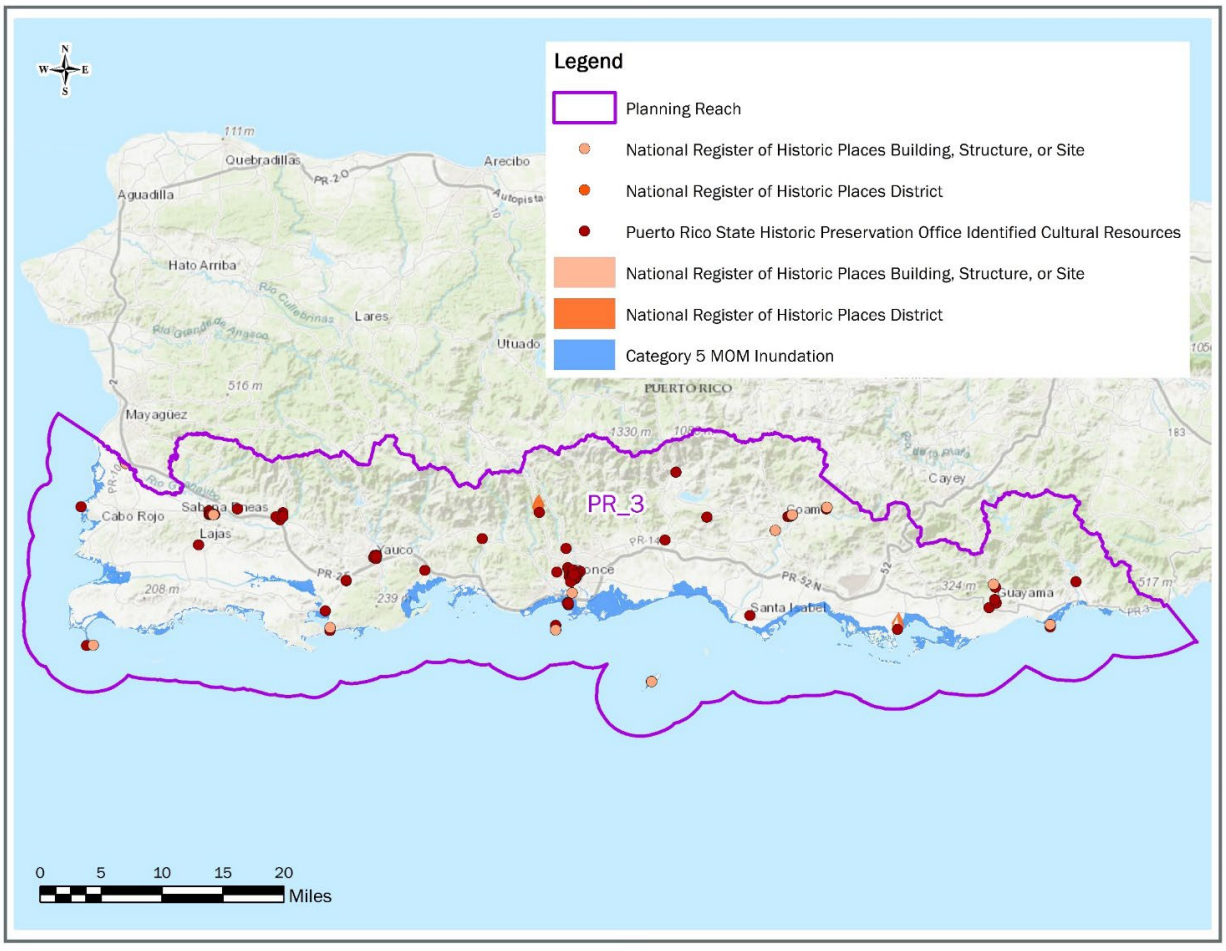

Figure 5: Cultural Resources in Planning Reach PR_3

2.7.4 Planning Reach PR_4

The following is a summary and brief history of the cultural resources located within Planning Reach PR_4. Based on the NRHP and Puerto Rico SHPO datasets, there are approximately 163 cultural resources within Planning Reach PR_4. Many additional unidentified or unlisted resources are likely present within the reach. This assessment highlights a few that are potentially exposed to Tier 2 hazards, including the Old San Juan Historic District and Parroquia del Esporitu Santo y San Patricio. This is not an all-inclusive list.

Old San Juan (NRHP Ref. No.'s 72001553 and 12000465)

Founded in 1519 as the capital of Puerto Rico, San Juan is one of the oldest cities in the Western Hemisphere. The Old San Juan Historic District contains many of the oldest buildings in the United States (NPS n.d.-l). According to the NPS, "Old San Juan's historic architecture reflects four centuries of development that shaped the historic urban landscape. Today, it is the nation's most complete Spanish urban center with its Gothic, Renaissance, and Baroque architecture" (NPS n.d.-l).

The Old San Juan Historic District includes La Fortaleza/San Juan National Historic Site, a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Site, built between the sixteenth and twentieth centuries. The site comprises a network of defensive fortifications, including La Fortaleza, Fort San Juan de le Cruz, Castillo San Felipe del Morro, Castillo de San Cristóbal and a large portion of the city wall (UNESCO n.d.).

Portions of Old San Juan ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index, but the majority ranked as low exposure. Cultural resources within the city are subject to coastal hazards, including up to 7 feet of inundation from a Category 5 MOM hurricane. With sea level rise, many of San Juan's historic buildings become subject to inundation from the 10-percent AEP event. The city's shoreline is a combination of man-made structures, rocky shores, mangroves, and sandy beaches. Locations within Old San Juan are experiencing shoreline retreat of up to 38.4 feet per year (Luijendijk et al. 2018). The highest rates of erosion (38.4 feet/year) are occurring along Playa Puerta De Tierra. Other locations experiencing erosion include Garita del Diablo (8.9 feet/year) and Parque Pasivo Viejo San Juan (1.6 feet/year). With 6.95 feet of sea level rise, locations within the city may experience increased wave heights of up to 9.8 feet during the 1-percent AEP event based on USACE CHS data (USACE 2020).

Parroquia del Esporitu Santo y San Patricio (NRHP Ref. No. 76002251)

Built in 1645, Parroquia del Esporitu Santo y San Patricio is one of Puerto Rico's oldest churches. According to the NPS, the church represents a "distinct community characterized by a rich Afro-Hispanic cultural and folk craft tradition" (NPS n.d.-m). The church has served as a shelter during past floods and hurricanes but is subject to inundation from a Category 5 MOM hurricane and the 1-percent AEP event. With sea level rise, surrounding roads and nearby areas may become subject to inundation from the 10-percent AEP event, limiting access to the church. Set back from the coastline, the church is not likely to be exposed to coastal erosion or wave attack. The church ranked as low exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Figure 6 shows the location of all cultural resources in Planning Reach PR_4.

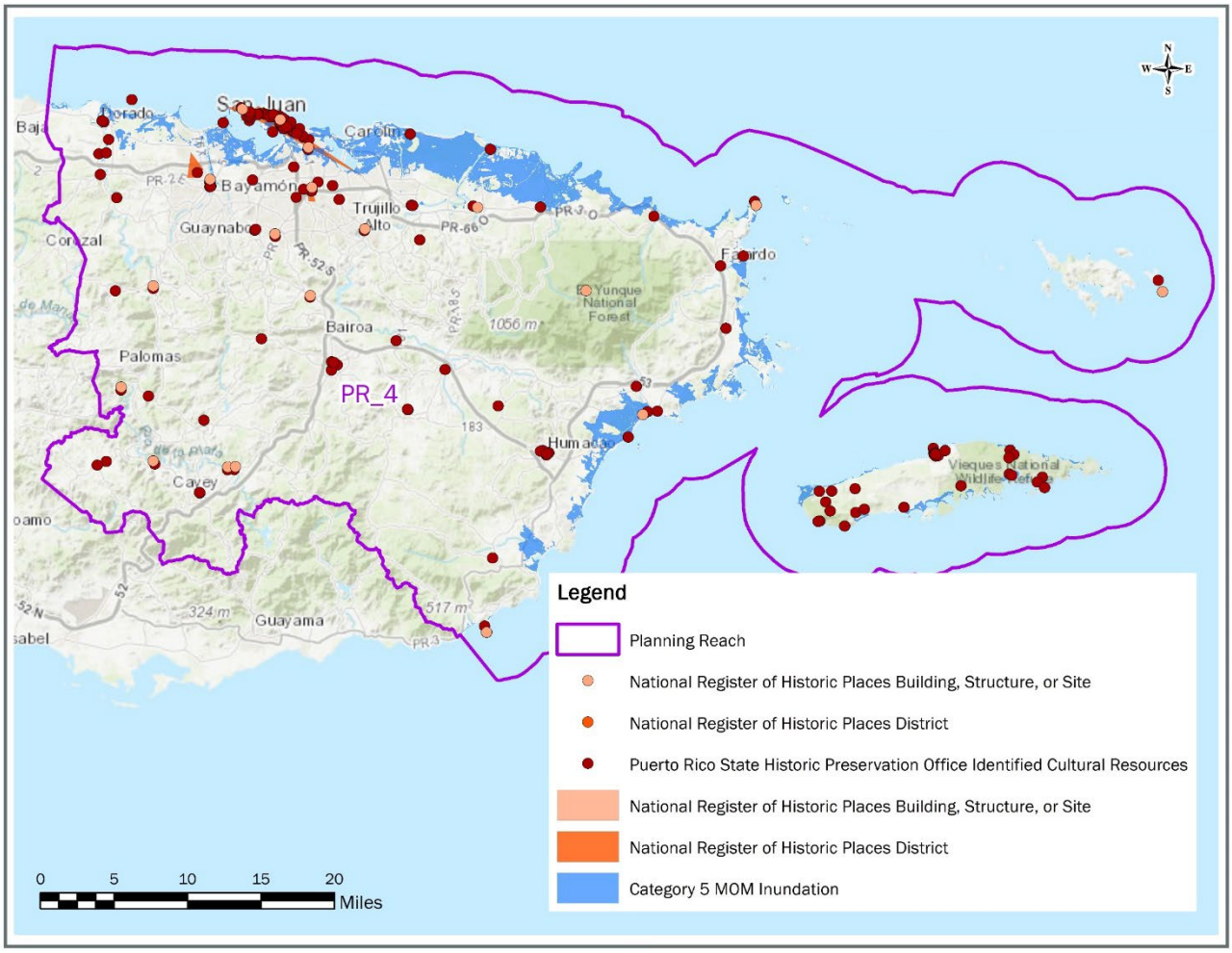

Figure 6: Cultural Resources in Planning Reach PR_4

2.8 U.S. Virgin Islands

The U.S. Virgin Islands have a rich cultural history. The early residents of the islands included the Ciboney, Caribs, and Arawaks. The Spanish first visited the islands in 1493. Over the next few hundred years, England, Holland, Spain, and France all tried to gain control over the islands. In 1733, the Danish West Indian Company first joined the three islands together as one entity to create the Danish West Indies. After years under Danish control, the islands became U.S. territories in 1917 (VInow n.d.). Owing to its location within the Caribbean, the U.S. Virgin Islands are subject to coastal hazards and many of its cultural resources are in vulnerable locations. With sea level rise, these cultural resources will experience a heightened likelihood for flood inundation, potential damage from coastal erosion, and increased wave action during major storms. Sections 2.8.1 to 2.8.3 highlight selected cultural resources in each planning reach and summarize their exposure to coastal hazards.

Within the territory, cultural resources comprise conservation preserves, archaeological sites, and historic buildings. The vulnerability of these resources to coastal hazards depends on the resource type, age, and level of existing protection and/or maintenance.

2.8.1 Planning Reach VI_1, St. Croix

There are approximately 30 NRHP-listed cultural resources within Planning Reach VI_1. Many additional unidentified or unlisted resources are likely also present within the reach. This document highlights a few resources identified within the NRHP or through literature review that are potentially exposed to Tier 2 hazards including Sandy Point National Wildlife Refuge, Salt River Bay National Historical Park and Ecological Preserve, Christiansted National Historic District, and Frederiksted Historic District. This is not an all-inclusive list.

Sandy Point National Wildlife Refuge

Located on the southwestern corner of St. Croix, this refuge preserves vital habitat for endangered and threatened species. In particular, this land is nesting ground for the endangered leatherback sea turtle (USFWS 2017b). The Sandy Point National Wildlife Refuge also comprises the Aklis Archaeological Site—14 acres of what is believed to be a former settlement or village (high-artifact density) and a public area or residential section (low-artifact density). Dated at approximately 400 CE, the site has yielded artifacts of pre-Columbian life, such as pottery, human remains, midden, and fragments of tools (USFWS 2010) and provides insight about the people who once lived there.

The refuge is in an area of medium to high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Coastal storms, storm surge events, hurricanes, and heavy precipitation are eroding the Sandy Point National Wildlife Refuge shoreline (O'Brian 2015), which encompasses sandy beaches, wetlands, mangroves, and areas of rocky shores along the northwestern side. Historical shoreline change data indicate erosion of up to 2.3 feet per year (Luijendijk et al. 2018). According to the USACE's CHS data, 2.33 feet of sea level rise is predicted to cause a 1.3-feet increase in wave height above existing conditions and 6.95 feet of sea level rise is predicted to cause a 3.6-feet increase in wave height above existing conditions within 100 years. Furthermore, areas of the Sandy Point National Wildlife Refuge are subject to flood hazards based on Category 5 MOM modeling.

Salt River Bay National Historical Park and Ecological Preserve (NRHP Ref. No. 1000280)

Congress added the Salt River Bay National Historical Park and Ecological Preserve to the National Park System in 1992 "to preserve, protect, and tell the story of its rich contributions to the nation's natural and cultural heritage" (NPS 2017b). The 1,015-acre park contains prehistoric and colonial era ruins and archaeological sites, including remains of South American Indian culture and evidence of Columbus' arrival in 1493 (NPS 2018c).

In addition to its historical significance, the preserve protects the Salt River watershed, mangrove forests, estuaries, and other marine environments and offshore coral reef ecosystems (Kendall et al. 2005). The shoreline consists mainly of mangroves and sandy beaches.

The preserve is within an area ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Shoreline Change data (Luijendijk et al. 2018) shows shoreline accretion; yet 6.95 feet of sea level rise within 50 to 100 years is predicted to cause an increase in corresponding wave heights from the 1-percent AEP event. Based on Category 5 MOM modeling, the preserve is also subject to coastal flood inundation.

Christiansted National Historic District (NRHP Ref. No. 76002266)

The district was developed on a former French settlement by Frederick Moth, who would later become the first Danish governor of St. Croix. The district includes Fort Christiansvaern, shown in Figure 7, the Old Danish Customs House, and many historic buildings along the waterfront (NPS n.d.-b and n.d.-c).

The district is ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index and is within the Christiansted focus area. Because of its low elevation and proximity to the shoreline, areas of the district could potentially experience 1–5 feet of inundation during a Category 5 MOM hurricane.

Within the next 50 to 100 years, the waterfront could experience a 3-feet increase in wave height above existing conditions (based on 6.95 feet of sea level rise). While the district's shoreline in this area is protected by man-made structures, which are (presumably) limiting the rate of coastal erosion, the waterfront is exposed to wave attack, which will worsen with sea level rise.

Figure 7: Fort Christiansvaern on the Christiansted Waterfront (Photo Source: NPS 2020c)

Frederiksted Historic District and Fort Frederik (NRHP Ref. No. 76001853)

Frederiksted Historic District and Fort Frederik are located on the western side of St. Croix. The Town of Frederiksted and fort were built between 1752 and 1760, during the Danish Colonial era. According to the NPS, Fort Frederik "has been the focal point of several significant historical events including the earliest reported salute by a foreign government to a United States ship (October 25, 1776), the Emancipation Revolt of 1848, the 1878 Labor Riot and Fireburn, and one of the 1917 ceremonies transferring the Virgin Islands to the United States" (NPS 2018a, NPS 2020d).

The district is in an area ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. The coastal portion of the district is protected by a man-made structure but is still exposed to future potential flooding from a future 1-percent AEP event with 3 feet of sea level rise as well as increased future wave heights. Strand Street and the Frederiksted Pier are particularly exposed to these hazards. The shoreline just to the south of the district is experiencing shoreline retreat at a rate of approximately 0.2 feet per year, but a seawall along Strand Street may be preventing significant shoreline retreat within Frederiksted (Luijendijk et al. 2018).

Figure 8 shows the location of the assets described above and additional cultural resources relative to the modeled Category 5 MOM inundation extent in Planning Reach VI_1.

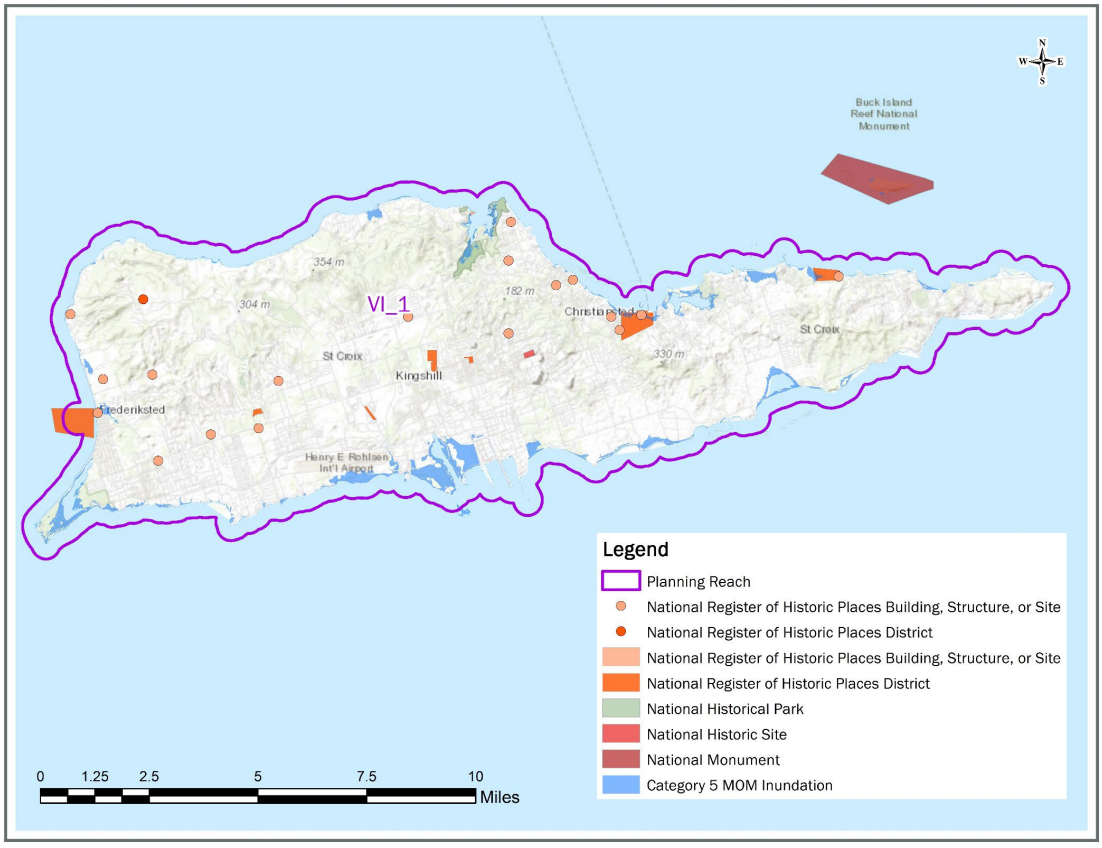

Figure 8: Cultural Resources in Planning Reach VI_1 (NPS 2014)

2.8.2 Planning Reach VI_2, St. Thomas

The Tier 1 Assessment identified areas of high cultural resources exposure in the U.S. Virgin Islands. There are approximately 17 NRHP-listed cultural resources within Planning Reach VI_2. Many additional unidentified or unlisted resources are likely also present within the reach. This assessment highlights a few resources identified within the NRHP or through literature review that are potentially exposed to Tier 2 hazards, including the Charlotte Amalie Historic District, Hassel Island Historic District, historic sugar plantations, and Magens Bay Archeological District. This is not an all-inclusive list.

Charlotte Amalie Historic District/Fort Christian (NRHP Ref. No. 76001860)

Charlotte Amalie was the first European settlement on St. Thomas and is now the capital and largest town of the U.S. Virgin Islands. In 1691, the city was named after Queen Charlotte Amalie of Hesse-Kassel. The city's architecture is known for its Danish colonial influence. Ft. Christian is also located within the historic district and is the oldest remaining structure in the U.S. Virgin Islands, built between 1672 and 1680. The fort was used to defend the island against a French attack in 1678 (NPS 2020a).

The Charlotte Amalie Historic District is ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index and is within the Charlotte Amalie focus area. Portions of the Charlotte Amalie Historic District, including Fort Christian, are currently within the 1-percent AEP event and the Category 5 MOM inundation extent (modeled to experience up to 5 feet of inundation during the Category 5 MOM). With 3 feet of sea level rise, these areas will also be exposed to the 10-percent AEP event. A combination of seawalls and riprap line the coast of the district, which may have prevented substantial shoreline retreat (Luijendijk et al. 2018).

Hassel Island Historic District (NRHP Ref. No.'s 76001862 and 78003093)

Hassell Island is a small island just south of the harbor of Charlotte Amalie. The island was created from a peninsula in 1860. It was originally known as Orkanhullet or Hurricane Hole. The island contains ruins of English fortifications from the early and mid-1800s, during the British occupation of St. Thomas. A section of Hassel Island is designated as part of the Virgin Islands National Park (NPS 2020e).

The Hassel Island Historic District is ranked as high in the Tier 1 Environmental and Cultural Resources Exposure Index and is within the Charlotte Amalie focus area. Low-lying portions of the island are subject to up to four feet of inundation from a Category 5 MOM hurricane. Though rocky shores and man-made structures have likely prevented significant coastal erosion, the island may experience an increase in wave height above existing conditions over the next 50 to 100 years.

Historic Sugar Plantations

St. Thomas contains the ruins of historic sugar plantations, many of which are subject to coastal hazards. The ruins of Estate Brewers Bay (NRHP Ref. No. 78002727) are particularly exposed because of their proximity to the shoreline. Estate Brewer's Bay consists of a former animal mill and factory complex (Hillary and Wright 1977). The factory complex is just south of Brewer's Bay Road and within 200 feet of the shoreline. Some

portions of the site fall within the Category 5 MOM inundation extent. With sea level rise, this portion of the coast may experience an increase in inundation and wave heights that may also accelerate possible damage to the ruins. The Estate Brewer's Bay ruins are within an area ranked as medium to high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Magens Bay (NRHP Ref. No. 76001865)

Magens Bay is located on the northern side of the island and is a popular tourist attraction known for its three-quarter-mile white sandy beach. The property includes a coconut grove, a mangrove, and an arboretum. Magens Bay has some of the most important archaeological resources on the island, but because of its popularity for recreational use, many of these sites have been damaged or destroyed. The Magens Bay Archaeological District contains a prehistoric village site dating to approximately 700 Common Era (The Cultural Resource Group et al. 1988). The bay and archaeological district are subject to inundation hazards and portions of the area could experience up to six feet of inundation from a Category 5 MOM hurricane. While Magens Bay Park beach has not seen significant historical shoreline change, the beaches along the northern portion of the bay have experienced shoreline retreat rates of up to 2.0 feet per year (Luijendijk et al. 2018). Magens Bay is ranked medium to high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Figure 9 shows the location of cultural resources in Planning Reach VI_2.

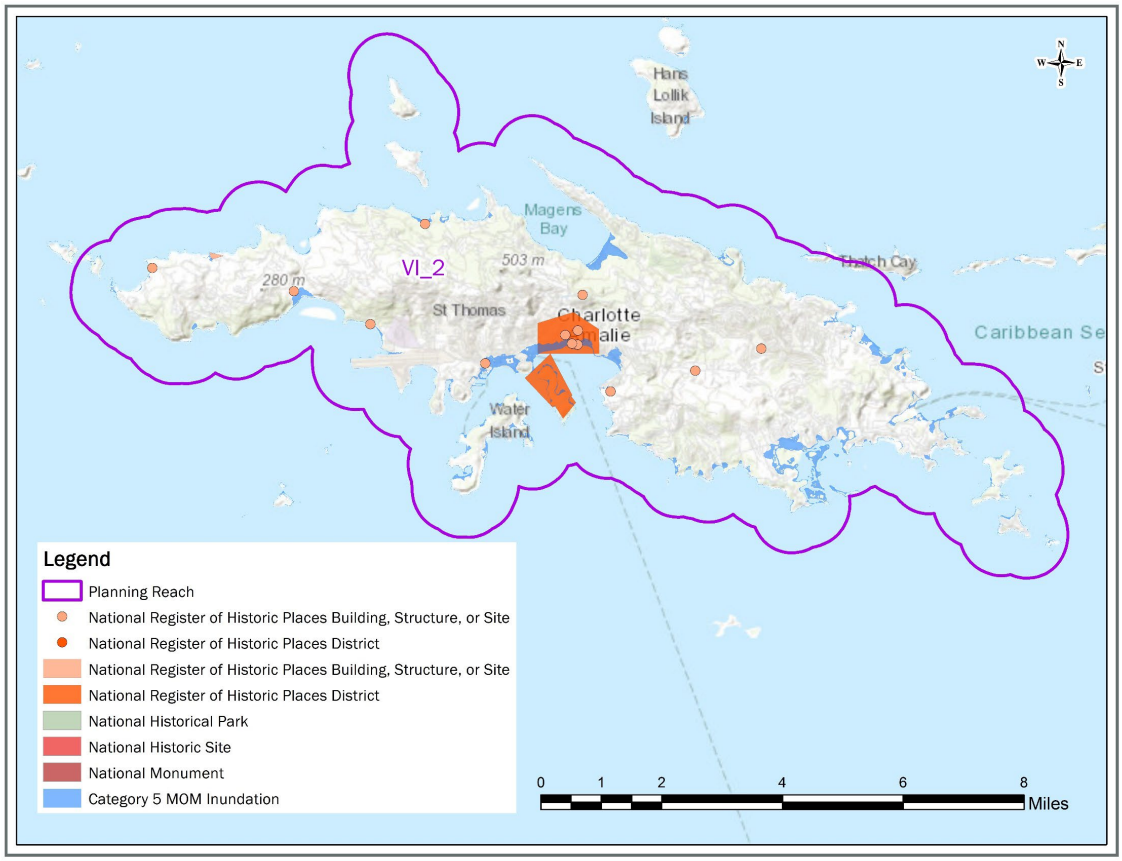

Figure 9: Cultural Resources in Planning Reach VI_2 (NPS 2014)

2.8.3 Planning Reach VI_3, St. John

The Tier 1 Assessment identified areas of high cultural resources exposure in the U.S. Virgin Islands. There are approximately 22 NRHP-listed cultural resources within Planning Reach VI_3. Many additional unidentified or unlisted resources are likely also present within the reach. This assessment highlights a few resources identified within the NRHP or through literature review that are potentially exposed to Tier 2 hazards, including Virgin Islands National Park, Dennis Bay Historic District, Reef Bay Great House Historic District, Cinnamon Bay Plantation, Cruz Bay Historic District, and Lameshur Plantation. This is not an all-inclusive list.

Virgin Islands National Park (NRHP Ref. No. 64000886)

Covering the majority of St. John, this national park contains an abundance of archaeological sites from past civilizations that inhabited the island over 2,500 years ago, including ancient petroglyphs carved by the Taino Indians (NPS 2018d). Many of these sites are located along sandy beaches within the park and are subject to inundation from storm surge or potential damage from wave attack. In more recent history, several historic districts, farms, and plantations from the era of Danish rule, were placed on the NRHP. Many of these sites were a part of the island's sugar production industry, including Dennis Bay Historic District, Cinnamon Bay Plantation, Mary Point Estate, and Reef Bay Great House Historic District. The Cinnamon Bay Plantation, Dennis Bay Historic District, and Reef Bay Great House Historic District are all ranked as high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index.

Dennis Bay Historic District, which was added to the NRHP in 1981, is particularly exposed to coastal hazards and is located within the Category 5 MOM inundation extent. With 6.95 feet of sea level rise, the district could experience increased wave heights of up to 2.6 feet above existing conditions.

Cinnamon Bay Plantation, one of the oldest sugar plantations on the island, was established in 1717. The plantation consists of a factory building, several houses, slave quarters, a warehouse, and a cemetery (NPS 2020b). While the main ruins of the plantation are not subject to inundation hazards, portions of the historically designated area are located within the 10-percent AEP event inundation extent. Additionally, the nearby Cinnamon Bay Beach is exposed to potential future wave height increases of up to 2.3 feet based on 6.95 feet of sea level rise.

Reef Bay Great House Historic District is "one of the most important architectural monuments in the park. The existing buildings dates to the early nineteenth century, but the stone foundation of an earlier wood building remains within its walls" (NPS 2020l). Portions of the site are subject to inundation from the 10-percent AEP event. With sea level rise, the Reef Bay Great House Historic District may experience an increase in inundation and wave heights.

Lameshur Plantation (NRHP Ref. No. 78000271)

Within the Virgin Island National Park, Lameshur Plantation consists of ruins along the shoreline of Little Lameshur Bay and along the nearby hillside (Figure 10 and Figure 11). The plantation was originally built for sugar production (NPS 2020f). The ruins closer to the shore are subject to inundation from a Category 5 MOM

hurricane. Exposure to coastal hazards is expected to increase with sea level rise. In fact, with 6.95 feet of sea level rise within the next 50 to 100 years, wave heights could increase above existing conditions by approximately 3.3 feet. The Lameshur Plantation is ranked as high in the Tier 1 Environmental and Cultural Resources Exposure Index.

Figure 10: Little Lameshur Plantation (Photo Source: NPS 2020f)

Figure 11: Ruins of the Little Lameshur Plantation (Photo Source: NPS 2020f)

Cruz Bay Historic District (NRHP Ref. No. 16000699)

Cruz Bay is the location of the main port and area of commerce on the island of Saint John. The Cruz Bay Historic District was listed on the NRHP in 2016. The Town of Cruz Bay was originally designed in traditional European style in 1766. The town sits on a flat plain surrounded by steep hills. Several other historic places are registered within the town of Cruz Bay, such as the ruins of an old sugar plantation (U.S. Department of the Interior 2016). The creation of the Virgin Islands National Park caused a dramatic transition for Cruz Bay from a small town to a major tourist attraction.

Cruz Bay ranked as medium to medium-high exposure in the Tier 1 Environmental and Cultural Resources Exposure Index. Portions of the district are subject to inundation of up to 4 feet during the Category 5 MOM hurricane. With sea level rise, portions of the town also become subject to inundation from the 10-percent AEP event. The shoreline within the district consists of a combination of rocky shores, sandy beaches, and man-made structures. A significant portion of the district is protected from damaging wave hazards because of the sheltered nature of the bay. However, modeling shows some areas will experience wave height increases of approximately 1.6 feet based on 6.95 feet of sea level rise.

Figure 12 shows the location of the assets described above and additional cultural resources relative to the modeled Category 5 MOM inundation extent in Planning Reach VI_3.

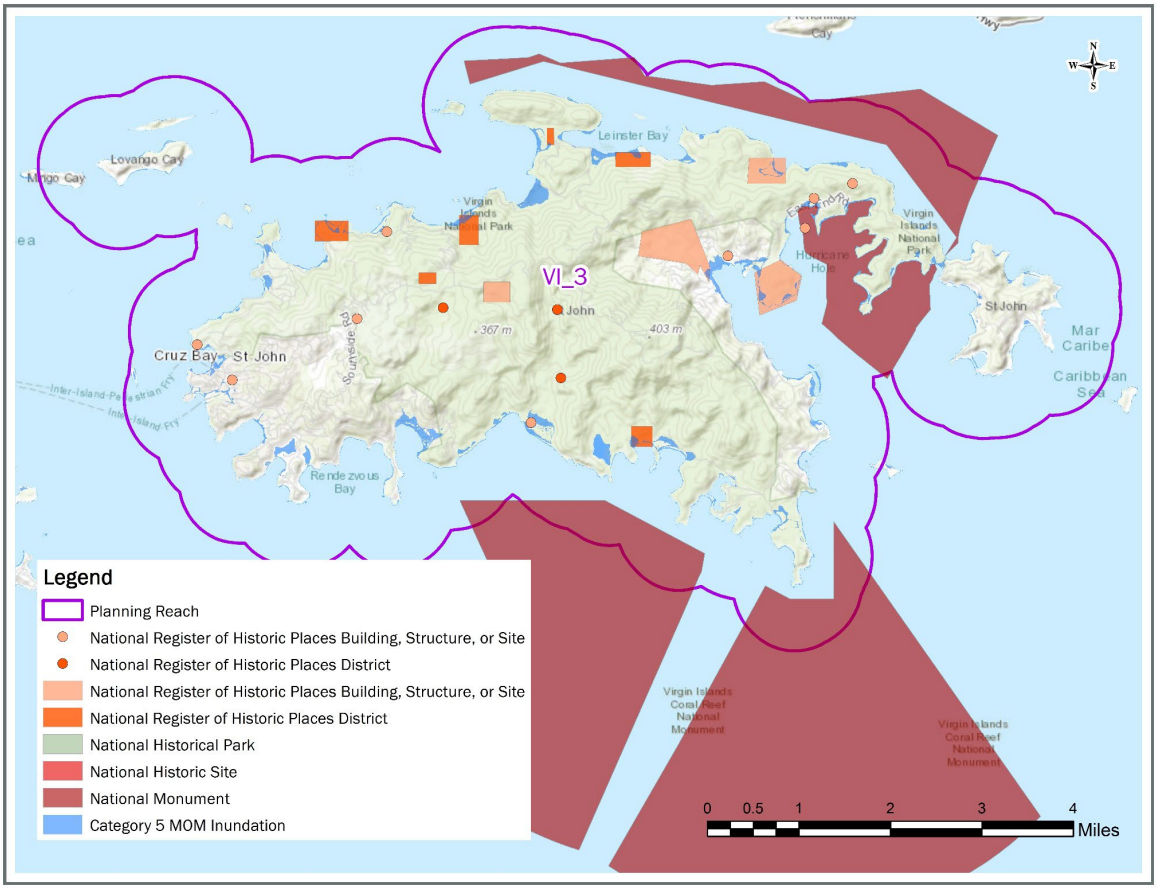

Figure 12: Cultural Resources in Planning Reach VI_3 (NPS 2014)

3 Cultural Stakeholder and Tribal Nation Coordination

Feedback from cultural stakeholders was essential in identification of cultural resources exposed to coastal storm damages and sea level rise in the SACS study area. Cultural stakeholders included federal agencies such as NPS, USFWS and ACHP; state agencies including state historic preservation offices and state archaeology offices; local governments; non-governmental organizations (NGOs) such as the Florida Public Archeology Network; historical societies; and academic institutions. The SACS Cultural Stakeholder and Tribal Nation List in Attachment 1 lists all of the SACS cultural stakeholders.

Feedback from federal and state-recognized tribes was also important to address exposure to Native American resources located within the SACS study area. The SACS Cultural Stakeholder and Tribal Nation List in Attachment 1 lists the 24 federally recognized tribes and the two state-recognized tribes that USACE determined may have had an interest in the study. Attachment 1 also includes a map that shows the federally recognized tribes with land area in the SACS study area.

Feedback from cultural stakeholders and tribal nations was obtained during and following SACS tribal and cultural webinars held throughout the study, and through coordination done by District project development teams (PDTs) and the SACS cultural team members with stakeholders and tribal nations in their state or territory. Information on the tribal and cultural stakeholder webinars and a summary of comments received during and following the webinars are provided below.

3.1 Coordination with Tribal Nations in 2019

A series of visioning meetings were held in 2019 to introduce the SACS to stakeholders. Refer to the SACS Outreach Appendix for details on the visioning meetings. To engage tribal nations that may have had an interest in the study, letters were sent by the District PDTs in July of 2019 to the federally recognized tribes. The letters provided a brief introduction to the study and provided dates for the two vision meetings specifically for tribal nations. Vision meetings for

tribal nations were held on July 23 and July 31, 2019. The purpose of these webinars was to introduce the draft Tier 1 Risk Assessment and draft shared vision statements for feedback and input from the tribal nations. Slides from this webinar are located in Attachment 1.

3.2 Cultural Stakeholder Webinar on August 4, 2020

A virtual workshop was held on August 4, 2020, for cultural stakeholders and tribal nations. The purpose of this workshop was for the SACS cultural team to present the cultural and archaeological resources exposed to increased coastal storm damages and sea level rise and to obtain feedback from stakeholders and tribal nations on the exposed resources.

To ensure that the workshop invitation included stakeholders and federally recognized tribes that may have had interest in the study, a stakeholder and tribal liaison list was developed in coordination with the SACS cultural team and the South Atlantic Division. The SACS cultural team is familiar and works regularly with the cultural stakeholders and the tribal liaisons in their state or territory. Each cultural team member developed a list of their federal, state, and local cultural stakeholders and tribal liaisons. The list of tribal liaisons was developed in coordination with the South Atlantic Division.

The SACS Cultural Stakeholder and Tribal Nations List (located in Attachment 1) includes the list of stakeholders and tribal nations points of contact that were invited to the workshop. The workshop was announced on the SACS Quarterly Stakeholder Workshop on June 29, 2020, and the official workshop invite was emailed to stakeholders on July 20, 2020. The workshop was virtually attended by a total of 77 stakeholders. Unfortunately, because of technical difficulties with the Webex, a list of all webinar participants is not available. For information on what specific information was presented during the workshop, please refer to the SACS Cultural Workshop Summary and the presentation slides located in Attachment 1.

Stakeholders provided feedback during and following the workshop. During the presentation, stakeholders submitted comments and questions through the Webex chat function. There were also opportunities for stakeholder comments and questions at the end of each state and territory presentation. All of the questions received during the workshop were addressed during the workshop. There was not one main theme of questions or comments during the workshop. Questions included whether submerged cultural resources were considered, how Native American resources will be accounted for, if a comprehensive list of cultural resources in the SACS study area was developed, and questions on the exposure indices in the Tier 1 Risk Assessment. Most of the coordination on cultural resources following the webinar was done by the District cultural team members.

On August 26, 2020, a follow-up email was sent to stakeholders and tribal nations that included the workshop meeting summary and a request for feedback on the qualitative write-ups for the exposed cultural resources in each state and territory.

To ensure that Native American resources would be accounted for in the study, letters were sent to each federally recognized tribe and two state-recognized tribes on September 18, 2020 (identified in the SACS Cultural Stakeholder and Tribal Nations List in Attachment 1) asking if there were any tribal resources or lands (e.g., sacred sites, places of cultural or religious importance) in the SACS study area that the tribal nation would like the SACS cultural team to consider in the study. The letter noted that the SACS products would ultimately be made publicly available. The letters asked for feedback or an indication of no input by October 16, 2020. No responses were received. An example letter sent to the federally and state-recognized tribes is located in Attachment 1.

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Attachment 1:
South Atlantic Coastal Study Cultural Stakeholder and Tribal Nation Coordination

SACS Cultural Stakeholder and Tribal Nation Contact List

SACS Cultural Stakeholder and Tribal Nation List

Organization	Points of Contact
TRIBAL NATIONS (FEDERAL)	
Alabama-Coushatta Tribe of TX	Mr. Bryant Celestine, Ms. Joan Battise, Mr. Carlos Bullock
Alabama-Quassarte Tribal Town	Ms. Samantha Robinson, Nelson Scott Harjo
Catawba Indian Nation	Dr. Weinonah Haire, Mr. William Harris
Cherokee Nation (of Oklahoma)	Ms. Elizabeth Toombs & Mr. Bill John Baker
Chickasaw Nation	Ms. Karen Brunso
Chitimacha Tribe, Louisiana	Melissa Darden
Choctaw Nation of OK	Gary Batton
Coushatta Tribe of Lousiana	Dr. Linda Langley & Mr. David Sickey
Delaware Tribe of Indians	Dr. Brice Obermeyer
Eastern Band of Cherokee	Mr. Russell Townsend, Mr. Richard Sneed, Mr. Stephen Yerka
Eastern Shawnee Tribe of Oklahoma	Mr. Brett Barnes, Ms. Glenna Wallace, Ms. Robin DuShane
Jena Band of Choctaw indians, Louisiana	Cheryl Smith
Kialegee Tribal Town, OK	Mr. David Cook & Mr. Jeremiah Hobia
Miccosukee Tribe of Indians of Florida	Billie Cypress, Hope Lovemore
Mississippi Band of Chocktaw Indians	Beasley Denson
Muscogee (Creek) Nation	Ms. Corain Lowe-Zepeda & Mr. James Floyd
Poarch Band of Creek Indians	Ms. Carolyn White, Ms. Stephanie Bryan, Mr. Robert Thrower
Seminole Nation of Oklahoma	Mr. Theodore Isham & Mr. Gregory Paul Chilcoat
Seminole Tribe of Florida	Dr. Paul Backhouse & Mr. Marcellus Osceola, Jr.
The Shawnee Tribe (of Oklahoma)	Ms. Edwina Butler-Wolfe, Mr. Joseph Blanchard, Mr. Devon Frasiser, Ms. Devon Frasier, Ms. Tonya Tipton, Mr. Ron Sparkman, Ms. Rebecca Hawkins, Mr. Nick Smith
Thlopthlocco Tribal Town	Mr. Terry Clouthier & Mr. Ryan Morrow
Tunica-Biloxi Indian Tribe of Louisiana	Earl Barbry
Tuscarora Nation (of New York)	Mr. Bryan Printup, Leo Henry
United Keetowah Band of Cherokee	Ms. Shiela Bird & Mr. Joe Bunch
TRIBAL NATIONS (STATE)	
Meherrin Indian Tribe	Wayne Brown
Waccamaw Siouan Tribe	Brenda Moore
FEDERAL AGENCIES	
Advisory Council on Historic Preservation	Reid Nelson
National Park Service	Kelly Irick, Ellen Rankin
U.S. Fish and Wildlife Service	Paul Niecase, Rick Kanaski
STATE AND TERRITORY AGENCIES	
NC State Historic Preservation Office	Ramona Bartos, Renee Gledhill-Earley
North Carolina Office of State Archaeology	John Mintz, Lindsay Flood Ferrante, Chris Southerly
North Carolina Archives and History Office	Kristi Brantley
North Carolina Department of Public Safety, Emergency Management	John (Chris) Crew, Steve McGugan
Mississippi Department of Archives and History	Kate Blount
Alabama Historical Commission	Lisa Jones
SC State Historic Preservation Office	Eric Emerson, Elizabeth Johnson
SC State Underwater Archaeologist	Jim Spirek, Nate Fulmer, Steve Smith
SC Office of State Archeologist	Jonathan Leader
SC DNR Heritage Trust Program	Karen Smith
GA State Historic Preservation Office	bryan.tucker@dnr.ga.gov
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PR State Historic Preservation Office	carubio@prshpo.pr.gov
PR State Historic Preservation Office	gmortiz@prshpo.pr.gov
USVI State Historic Preservation Office	sean.krigger@dpnr.vi.gov
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Northwest Florida Water Management District	erica.bundrick@nwfwater.com
Suwanee River Water Management District	kevin.flavin@srwmd.org
State of Florida	jbrewer@sjcfl.us
State of Florida	madeleinep@jupiter.fl.us
State of Florida	russell.morgan@fl.usda.gov
State of Florida	tbagley2@aol.com
LOCAL GOVERNMENTS	
Wilmington Historic Preservation Commission	Dawn Snotherly
Beaufort Historic Preservation Commission	Kyle Garner
New Bern Historic Preservation Commission	Matt Schelly
Washington Historic District Commission	Emily Rebert
Edenton Historic District Commission	Elizabeth Bryant
Elizabeth City Historic Preservation Commission	Kellen Long
Hancock County	Maureen Anderson
Harrison County	Marlin Ladner
Jackson County	Ken Taylor
Gulfport, MS	Ella Holmes-Hines
Pascagoula, MS	Jaci Turner
Harrison County	Kent Jones
City of Moss Point	Andrew Beamon
Mobile County	Connie Hudson
Baldwin County	jeb.ball@baldwincountyal.gov
City of Charleston	Dennis Dowd
Horry County	Mary Catherine Hyman
Town of McClellanville CLG	mcclellanville2@tds.net
Town of Mount Pleasant	rrutherford@tompsc.com
Town of Sullivan's Island	rrobinson@sullivansisland-sc.con
Town of Summerville	mhdetsch@summervillesc.gov
Georgetown Historic Commission	rmartin@cogsc.org
Conway Historic Commission	aemrick@cityofconway.com
Chatham County - Savannah Metropolitan Planning Commission	wilsonm@thempc.org
Director of Historic Preservation Savannah Metropolitan Planning Commiss.	wilsonm@thempc.org
Chatham Historic Preservation Commission	harrise@thempc.org
City of Tybee Island	harrise@thempc.org
City of St. Marys	mgranger@stmarysga.gov
City of Darien	citymanager@darientel.net
McIntosh County	patrick.zoucks@mcintoshcounty-ga.gov
City of Brunswick	jhunter@cityofbrunswick-ga.gov
City of Richmond Hill	astyer@richmondhill-ga.gov
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City of Miami	jbrewer@sjcfl.us
City of Miami	rweinreb@miamigov.com
City of Sarasota	alexandrea.davisshaw@sarasotagov.com
City of Jacksonville	ggoldsberry@coj.net

Town of Palm Beach	pbrazil@townofpalmbeach.com
City of Jacksonville	thomasf@coj.net
Charlotte County	claire.jubb@charlottecountyfl.gov
NON-GOVERNMENTAL ORGANIZATIONS	
North Carolina Archaeological Council	January Costa
North Carolina Archaeological Society	Shane Petersen
South Carolina State Historical Society	Faye Jensen
Institute of Puerto Rican Culture	info@icp.pr.gov
Central Florida Regional Planning Council	callison@cfrpc.org
South Carolina Council of Professional Archaeologists	martint@scdot.org
Georgia Historical Society	lgculler@georgiahistory.com
West Coast Inland Navigation District	justin@wcind.net
Charlotte Harbor National Estuary Program	lbeever@chnep.org
St. Johns Riverkeeper	shannon@stjohnsriverkeeper.org
The Nature Conservancy	sonia.succar@tnc.org
The Nature Conservancy	lgeselbracht@tnc.org
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Florida Public Archaeology Network	barbaraaclark@uwf.edu
Florida Public Archaeology Network	semiller@flagler.edu
Florida Public Archaeology Network	jmoates@usf.edu
ACADEMIA	
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University of Florida	nicolepinson@ufl.edu
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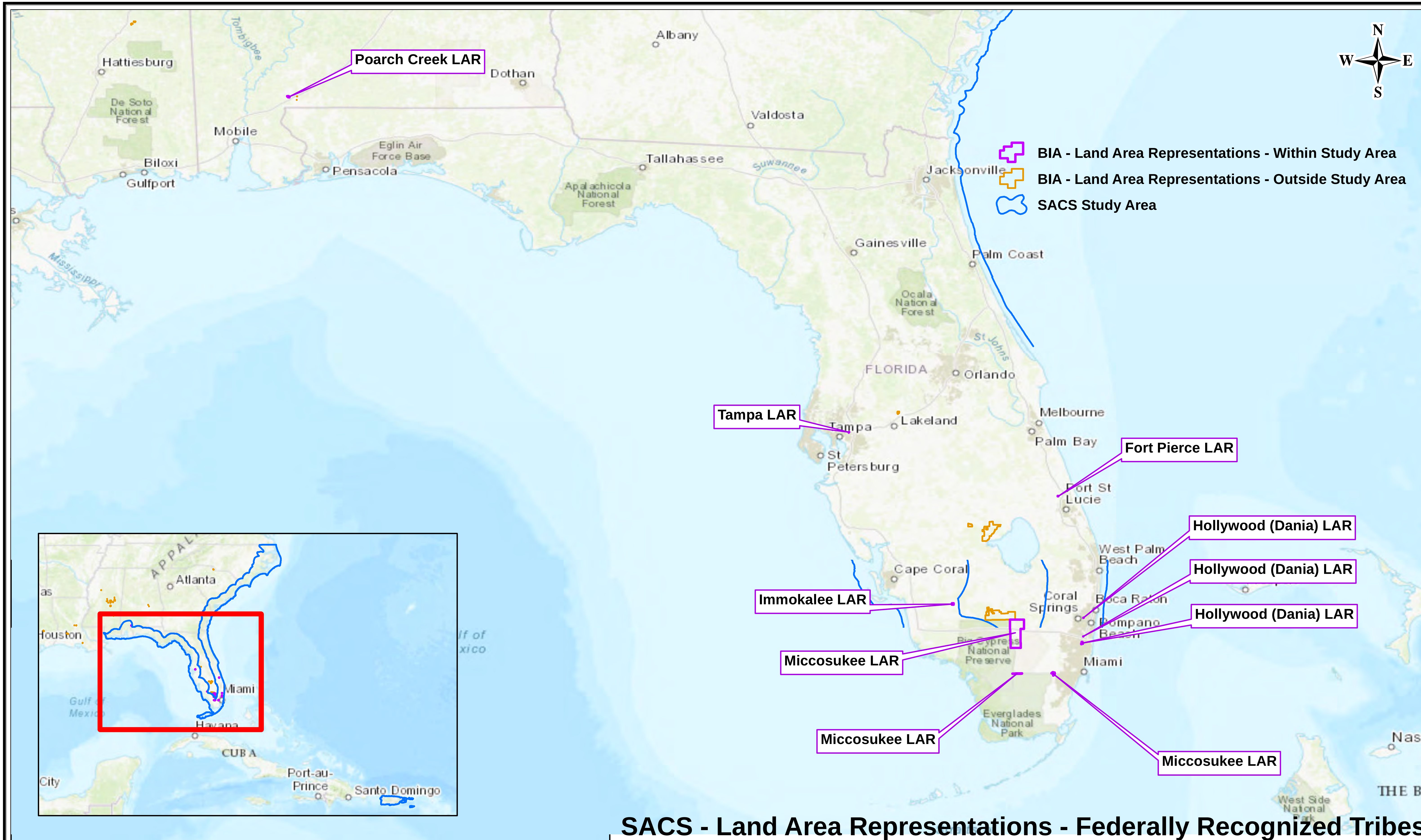
Florida International University	jobeysek@fiu.edu
Florida Gulf Coast University	msavares@fgcu.edu

Federally-Recognized Tribal Nations
Land Area Representations in the SACS study area


Poarch Creek LAR
Tampa LAR
Fort Pierce LAR
Hollywood (Dania) LAR
Hollywood (Dania) LAR
Hollywood (Dania) LAR
Immokalee LAR
Miccosukee LAR
Miccosukee LAR
Miccosukee LAR
BIA - Land Area Representations - Within Study Area
BIA - Land Area Representations - Outside Study Area
SACS Study Area
N
S
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Hattiesburg
De Soto National Forest
Mobile
Biloxi
Gulfport
Pensacola
Eglin Air Force Base
Dothan
Albany
Valdosta
Tallahassee
Apalachicola National Forest
Jacksonville
Gainesville
Palm Coast
Ocala National Forest
FLORIDA
Orlando
Lakeland
Tampa
St Petersburg
Melbourne
Palm Bay
Port St Lucie
West Palm Beach
Cape Coral
Coral Springs
Boca Raton
Pompano Beach
Miami
Big Cypress National Preserve
Everglades National Park
Nassau
THE B
West Side National Park
Mississippi
Tombigbee
Suwannee
St Johns
APPAL
Atlanta
Houston
Miami
Gulf of Mexico
Havana
CUBA
Port-au-Prince
Santo Domingo
City
0
50
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200
Miles

SACS - Land Area Representations - Federally Recognized Tribes

Data Sources:
BIA
USACE

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

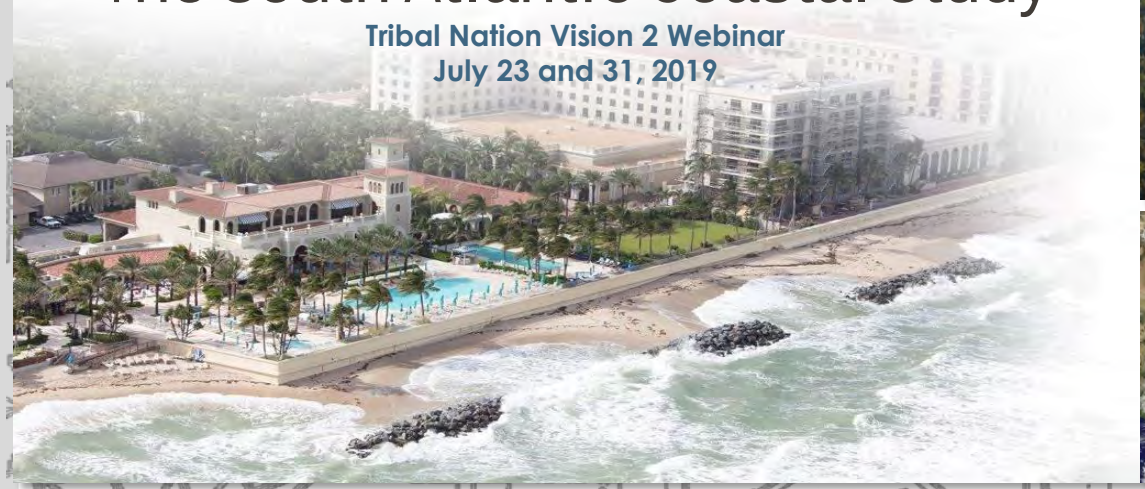
South Atlantic Coastal Study

Map Date: 7/22/2019

July 23 and 31, 2019
SACS Vision Meeting 2 for Tribal Nations
Presentation Slides

The South Atlantic Coastal Study

Tribal Nation Vision 2 Webinar
July 23 and 31, 2019



US Army Corps of Engineers ®

RSM RCX

AGENDA

- Introductions of USACE Team & Identification of Participants
- Brief Study Overview
- Meeting Purpose
- Roll Out the Tier 1 Risk Assessment
  - What is the Tier 1 Risk Assessment?
  - How will the Tier 1 Risk Assessment be used?
- Tier 1 Risk Assessment Discussion
- Draft Shared Vision Statements
- Next Steps

SOUTH ATLANTIC COASTAL STUDY

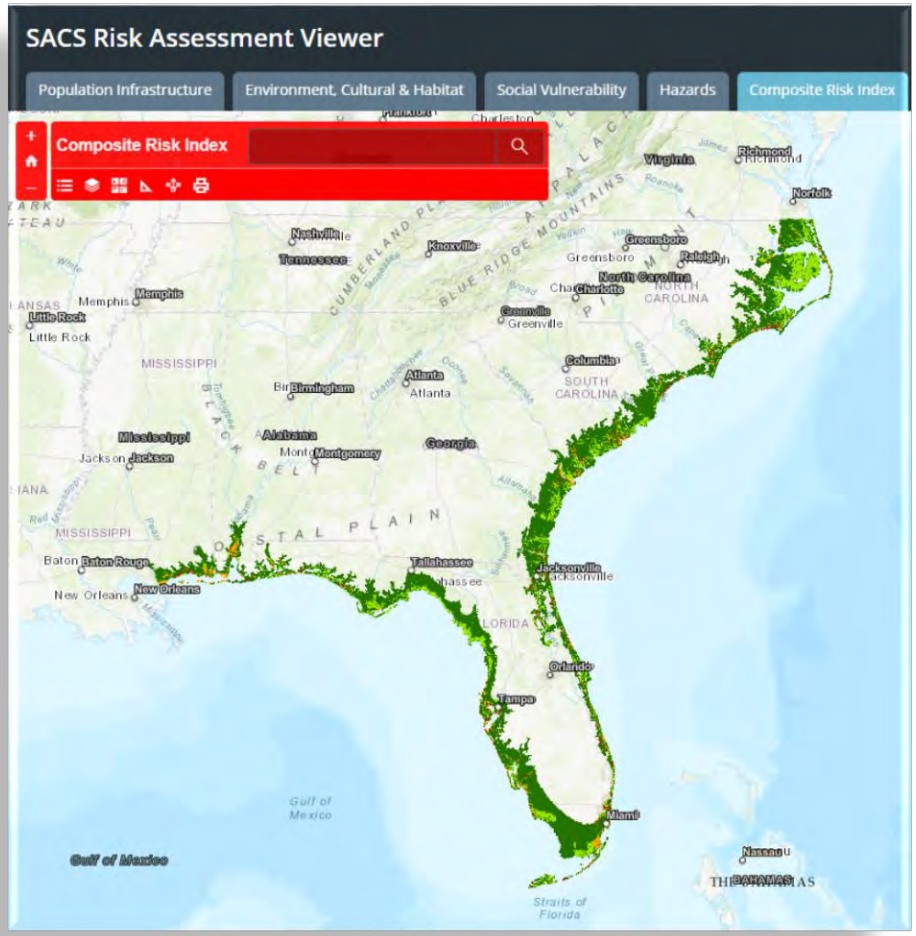
Over 65,000 miles of tidally influenced coastline affected by sea level rise where hurricane and storm damages are occurring, or are forecast to occur.

BUILDING STRONG®

MEETING PURPOSE

- Discuss Tier 1 Risk Assessment
- Gain feedback on the Tier 1 Risk Assessment in moving forward to Tier 2
- Present Draft Shared Vision Statements

WHAT IS THE TIER 1 RISK ASSESSMENT?



- Its purpose is to identify potential risk areas
- Generally follows the NACCS methodology
- Regional screening level analysis for identifying tidally-influenced areas potentially at risk
- Does NOT identify exposure vulnerability
- Utilizes National Level Datasets

RISK ASSESSMENT

In general terms, risk includes two dimensions

- **Consequences**
- **Likelihood of Hazard**

Risk = Consequence x Likelihood

A Risk assessment at its most basic level involves the calculation of the magnitude of potential consequences (levels of impacts) and the likelihood (levels of probability) of these consequences to occur.

CONSEQUENCES AND EXPOSURE

Consequence is described as a **Weighted Exposure.**

Risk = Consequence x Likelihood

Risk = (Exposure $_{Weight}$) x (Probability of Hazard)

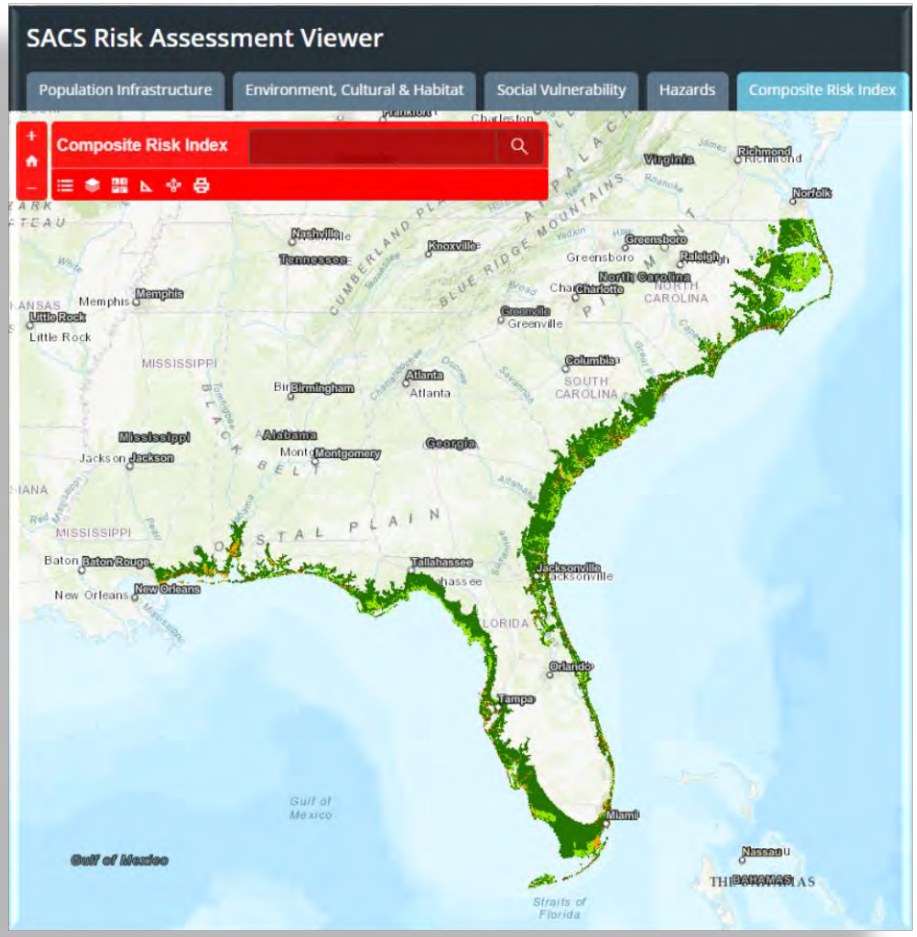
TIER 1: Calculates Risk in terms of Consequence and Hazard . . .

Risk = Consequence x Likelihood

Risk = (Exposure $_{\text{Magnitude}}$) x (Probability of Hazard)

- The **Exposure** Elements were an enumeration of Population, Infrastructure, Environmental, Cultural and Social Vulnerability
- The **Magnitude** for individual Exposure elements were decided upon through Outreach meetings – Separate weighting values were given to each Exposure element.
- The **Probability of Hazard** was reported as the Percent Annual Chance Occurrence of a Flood.

TIER 1 RISK ASSESSMENT



Exposure: Number of assets, people, sensitive environment and cultural resources within the hazard footprint.

Three Exposure Indices

1. Infrastructure and Population
2. Environmental and Cultural Resources
3. Social Vulnerability

Hazard: Footprint of the hazard and probability of the hazard (Large footprint / Low Probability; Small Footprint / High Probability).

Three Extreme Water Level Events*

1. Category 5 Hurricane Maximum of Maximums
2. 1% Annual Chance Flood (100 yr storm)
3. 10% Annual Chance Flood (10 yr storm)

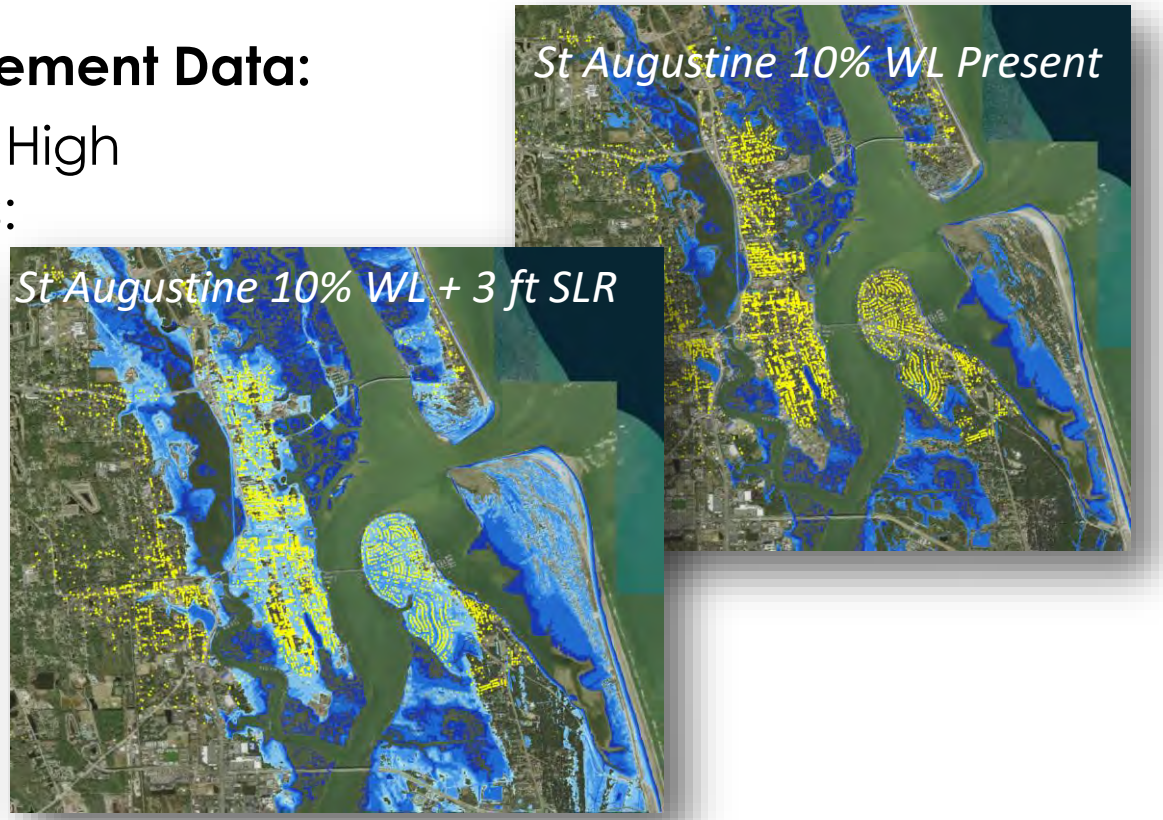
*Sea level rise is included by adding 3 feet to the 1% and 10% events

Risk = Composite Exposure Index **x** $\mathcal{P}$ (Hazard)

TIER 2 HIGH RESOLUTION EXPOSURE

Revision of Exposure Element Data:

- Regional and Local High Resolution Data sets:
  - Infrastructure
  - Cultural
  - Environmental



*Risk = (Vulnerability ***Exposure$_{Weight}$**)x (Probability of Hazard)*

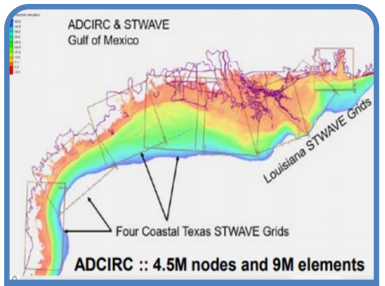
TIER 2 HIGH RESOLUTION HAZARD

https://chs.erdc.dren.mil/default.aspx

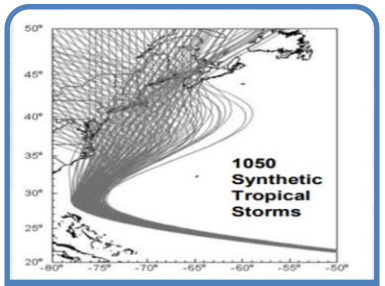
Through the USACE Coastal Hazards System website, users can download model results related to:

- Meteorological conditions
- Wave climate
  - (wave height, wave period)
- Storm Surge elevations
  - (10yr, 100yr, 1000yr)
- Storm Tracks
  - (pressure center, translational speed)
- NDBC and NOAA wave climate and water levels
- Statistics related to storm probabilities

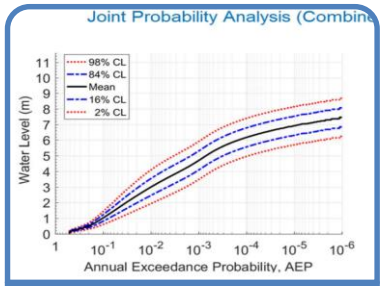
Coastal Hazards System



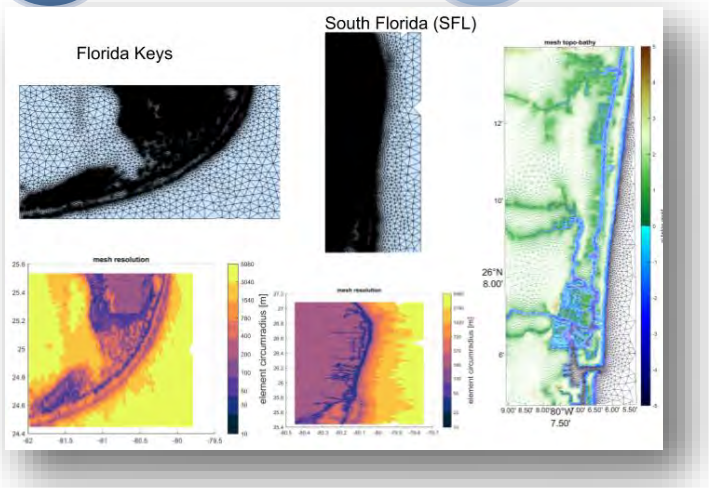
ADCIRC and STWAVE



CSTORM Coupler



Joint Probability



*Risk = (Vulnerability *Exposure$_{Weight}$)x (**Probability of Hazard**)*

TIER 2 VULNERABILITY AND RESILIENCE

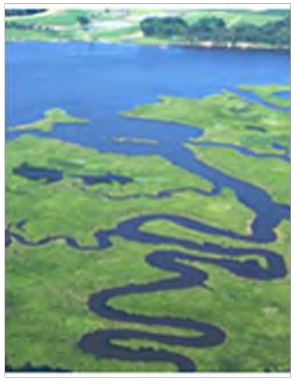
Inclusion of Vulnerability Reduction Measures and Increase of Coastal Resilience

- Engineering Measures
- Environmental Conservation and Restoration
- Natural & Nature-Based Features
- Development of Resilient Communities
- Reduce Institutional Barriers
- Foster Collaboration Among Agencies

Artificial Reefs

Living Shorelines

Wetlands

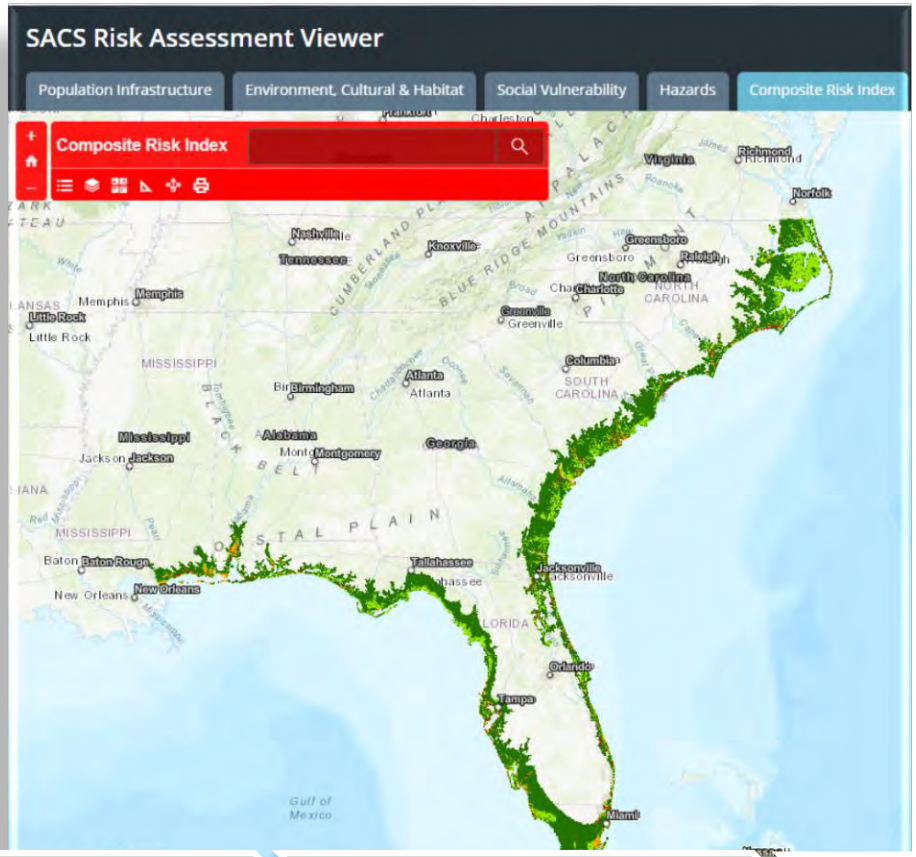


Oyster Reefs

Beaches/Dunes

*Risk = (**Vulnerability** *Exposure$_{Weight}$)x (Probability of Hazard)*

LOOKING AHEAD TO TIER 2



- Tier 2 to go into further detail – can use local/regional datasets
- Tier 2 incorporates vulnerability and identifies risk reduction measures
- Focus area action strategies

RELEASE TIER 1 JUNE 2019 → **FIELD WORKSHOPS** JULY 2019 → **FINALIZE TIER 1** AUGUST 2019 → **TIER 2 ANALYSIS**

TIER 2: Reducing Risk through the inclusion of Vulnerability . . . A buffer for Exposure

Add a term to this risk equation . . .

*Risk = (**Vulnerability** *Exposure$_{Magnitude}$)x (Probability of Hazard)*

Vulnerability is a means to reduce extent of exposure.

Hazards cannot be controlled but **Vulnerability** can be reduced to lessen risk.

VULNERABILITY

*Risk = (**Vulnerability** *Exposure $_{Magnitude}$)x (Probability of Hazard)*

Vulnerability is can be reduced through. . .

- **Degree of Exposure** – we can reduce the degree of exposure through:
  - Engineering Design
  - Environmental Conservation and Restoration
  - Policy Implementation and Reduction of Institutional Barriers
- **Degree of Resilience** – adaptive capacity
  - Implementation of Resilience measures:
    - Environmental Buffers
    - Adaptive Strategies
    - Community Practices

DRIVE THRU GEOPORTAL

TIER 1 DISCUSSION

State/Territory Appendices

- State/territory-specific conditions and info relevant to comprehensive coastal storm risk management strategies.
- Key Components
  - Environmental, cultural, and social data.
  - Refine Tier 1 risk based on vulnerability and local/regional knowledge.
  - Focus Area identification.
  - Focus Area Action Strategies:
    - Multi-disciplinary/multi-agency teams
    - Measures for actionable solutions
  - Performance of existing Federal CSRM projects and recommendations to improve.
  - Stakeholder studies/plans to address risk and how SACS can support.

State/Territory Points of Contact

- **Mobile District** (Alabama, Florida panhandle):
  Tom Smith thomas.e.smith@usace.army.mil
- **Jacksonville District** (Peninsular Florida, U.S. Virgin Islands, Puerto Rico):
  Ashleigh Fountain ashleigh.h.fountain@usace.army.mil
- **Wilmington District** (North Carolina):
  Brennan Dooley brennan.j.dooley@usace.army.mil
- **Charleston District** (South Carolina):
  Diane Perkins diane.perkins@usace.army.mil
- **Savannah District** (Georgia):
  April Patterson april.n.patterson@usace.army.mil

SHARED VISION MILESTONE (AUGUST 2019)

Purpose: To define the overall shared vision for the study and to present the associated activities and stakeholder roles supporting the vision.

Key Activities to Support the Milestone:

- Assemble a team that includes participation with **partners and stakeholders**.
- Define the study area with **partners and stakeholders** to capture impacts and influences of **broadly identified problems and opportunities**.
- Work with partners and stakeholders to develop a **concise shared vision statement**.
- Develop **broad study goals and objectives**.
- Document **partner and stakeholder support**.
- Identifying the **roles and responsibilities of USACE and its partners**, with associated tasks that will advance the shared vision.
- Describe how these tasks incrementally contribute to the shared vision.
- Consider how **various agency authorities** may be combined to align and prioritize actions.

DRAFT SHARED VISION STATEMENTS

1. The vision of the SACS is to equip vulnerable South Atlantic Coastal communities with a comprehensive risk assessment and suitable risk reduction strategies to efficiently implement resilient solutions.

2. The SACS vision is to facilitate coastal storm risk reduction within the South Atlantic Division Area of Responsibility.

3. A resilient future for the coastal communities of the Southeastern US, Puerto Rico, and the US Virgin Islands.

5. Reducing risk and developing solutions for a more resilient future.

4. The SAC's vision is to provide a common understanding of vulnerabilities to coastal storms and SLR in order to provide for and support resilient communities along the South Atlantic shoreline, including the territories of PR and the USVI. The product of this multiagency effort is intended to be used as an instrument for stakeholders to leverage each other's efforts and implement resilient, cohesive CSRM strategies.

6. The SACS envisions resilient coastal communities and habitats able to adapt to the increased effects of coastal storms resulting from sea level rise. Achieving this vision is a shared responsibility requiring a collaborative, cooperative effort to which South Atlantic coastal stakeholders are committed.

LATE SUMMER 2019 – Collaborative workshops in each state/territory
RE: Tier 1 Risk assessment an Focus Area Identification

Please email sacs@usace.army.mil to receive invitations to face to face workshops.

SEP 2019- SEP 2021: Stakeholder/Partner Progress Briefs via webinar

OCT 2021: Draft Report available for review

JAN 2022-AUG 2022: Stakeholder/Partner Progress Briefs via webinar

THANK YOU!

SACS@usace.army.mil

August 4, 2020
SACS Tribal Nation and Cultural Stakeholder Webinar Meeting Notes

South Atlantic Coastal Study
Cultural Webinar Summary

As a part of the South Atlantic Coastal Study (SACS), a qualitative cultural analysis was conducted by the SACS cultural team to identify cultural resources at risk to increased coastal storm damages as a result of sea level rise. Information from the SACS qualitative cultural analysis will be used as input to the SACS focus area action strategies, where at-risk cultural and tribal resources are located inside the focus area boundaries. For other planning reaches, acknowledgment of at-risk cultural resources will serve to inform overall recommendations for follow-up studies or strategies.

A cultural webinar was conducted on August 4, 2020, for federal and state agencies including state historic preservation offices, non-governmental organizations (NGOs), historical societies, tribal nations and academia. The purpose of the webinar was for the SACS cultural team to present the cultural resources at risk to increased coastal storm damages from sea level rise, and to obtain feedback from stakeholders and tribal nations on the at-risk resources. The webinar accomplished the following:

- Provided a background on SACS including a description of the Tier 1 Risk Assessment, Tier 2 analysis, and several SACS key products.
- Cultural resources at risk to increased coastal storm damages as a result of sea level rise were presented for each state and territory in the SACS study area.
- Obtained feedback from stakeholders and tribal nations on the at-risk cultural resources.
- Communicated next steps and how stakeholders and tribal nations can provide additional feedback.

Facilitators/Presenters

Name	Affiliation	Email Address
Kristina May	USACE Baltimore District – SACS Environmental and Cultural Lead – presented Puerto Rico and U.S. Virgin Islands*	Kristina.K.May@usace.army.mil
Justin Bashaw	USACE Wilmington District – North Carolina Appendix	Justin.P.Bashaw@usace.army.mil
Ryan Clark	USACE Jacksonville District – South Carolina, Georgia, Florida, Alabama and Mississippi Appendices	Ryan.N.Clark@usace.army.mil
Lisa Clark	USACE Jacksonville District – SACS Outreach Lead	Lisa.M.Clark@usace.army.mil

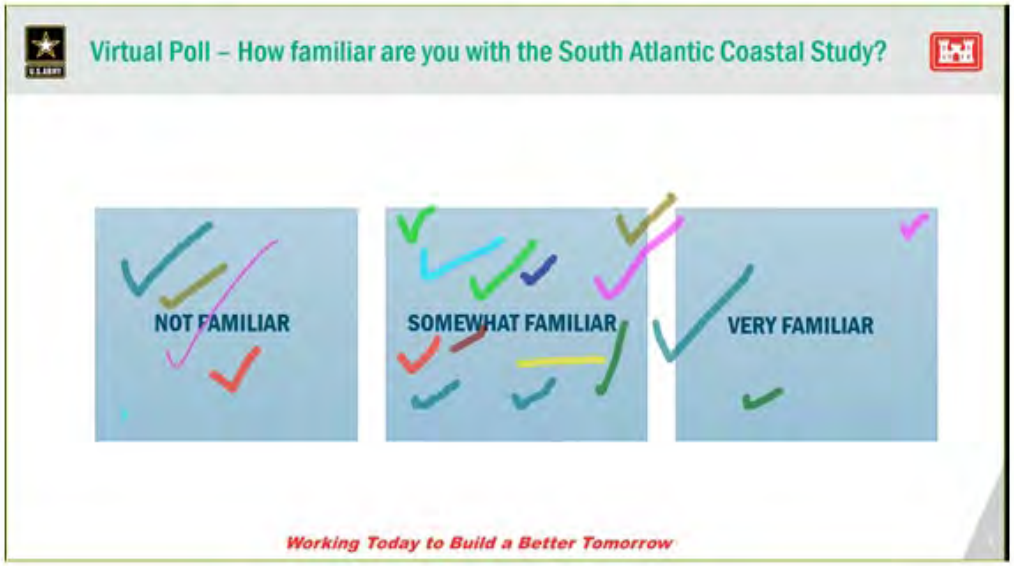
*CDM Smith is drafting the SACS territory appendices for Puerto Rico and the U.S. Virgin Islands

The cultural webinar was attended by a total of 77 participants from federal and state agencies, NGOs, tribal nations and academia. Unfortunately, due to technical difficulties with the Webex, a list of all webinar participants is not available.

Meeting Notes

- Lisa Clark / Kristina May opened the meeting by having attendees indicate (annotation tool) what type of organization they represented and which state they were from/represented.
    - Most participants represented federal or state agencies, with a few participants from NGOs, academia and "other".
    - It was pointed out in the chat box that a box for tribal nations was not included. Kristina May addressed the comment and apologized for not including a box for tribal nations.
- Lisa Clark introduced housekeeping.
    - Encouraged questions being asked in the "chat" function
    - Let participants know that there would be a Q&A opportunity at the end of the presentation
- Kristina May opened the meeting and thanked stakeholders for virtually attending the webinar. Kristina reviewed the agenda for the webinar, which included a SACS overview, a description of the at-risk cultural resources by state and territory, next steps and a Q&A at the end of the presentation.
- Kristina May reviewed the purpose of the webinar:
    - Present the cultural resources at risk to increased coastal storm damages as a result of sea level rise in each state and territory in the SACS study area.
    - Obtain feedback from our stakeholders during and following this webinar on our identification of at-risk cultural resources.
    - Explain how this information will be used in the study and the next steps.
- The cultural team introduced themselves, beginning with Kristina.
    - Each team member shared which USACE district they represent and which SACS state/territory appendix they are working on.
- Kristina May asked that participants indicate their familiarity with the SACS:
    - "not familiar", "somewhat familiar", "very familiar"
    - Most participants indicated that they were somewhat familiar with SACS and there were a few marks in the "not familiar" and "very familiar" boxes
    - Kristina stated that the next set of slides provides a brief background on SACS. If stakeholders are

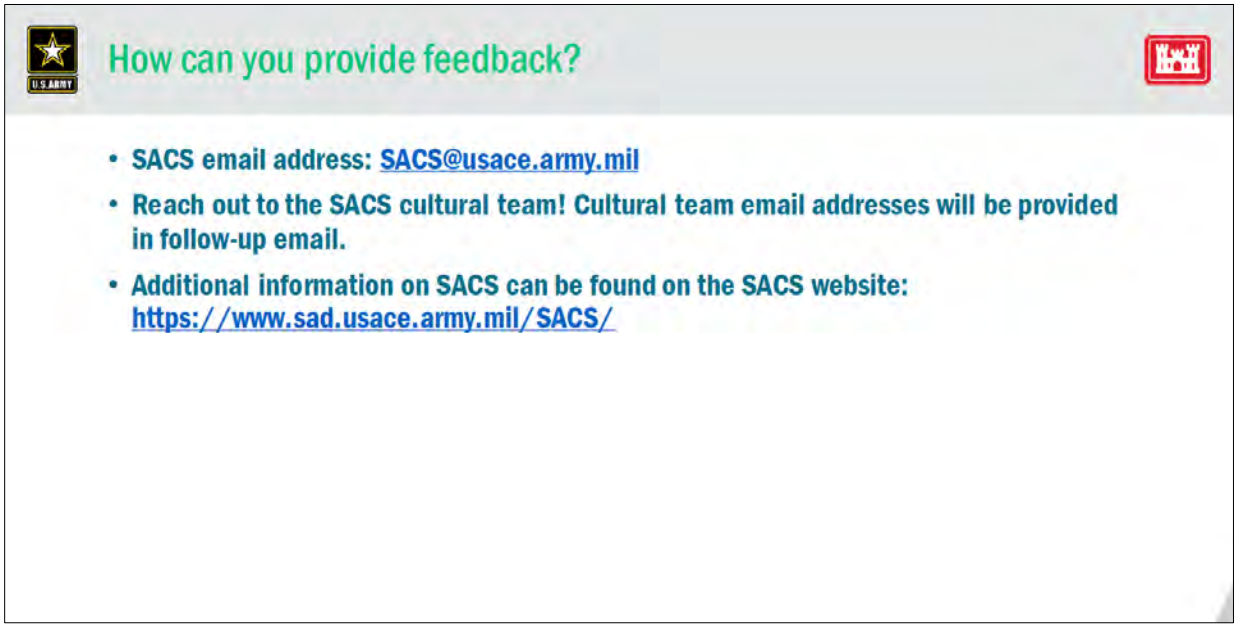
interested in learning more about SACS, please visit the SACS website at: https://www.sad.usace.army.mil/SACS/



- Kristina May provided background on the SACS Tier 1 Risk Assessment, and the environmental, cultural and habitat exposure index used in the Tier 1 Risk Assessment. Kristina explained how the Tier I analysis was conducted and the methodology used to arrive at risk. Kristina also described the Tier 2 analysis and showed a slide that explained how the incorporation of Tier 2 data provides a more refined look at the risk of storm surge inundation and sea level rise in the St. Augustine area.
- Kristina May showed a map of the 21 focus areas that were identified from the Tier 1 Risk Assessment. These areas were further refined in the Tier 2 analysis. Kristina explained that the cultural team would present the at-risk cultural resources within and outside the focus areas.
- Kristina May introduced the SACS key products (SACS placemat)
    - The Tier 1 Risk Assessment, measures and costs library, state and territory appendices and the focus area action strategies were highlighted
- The next set of slides presented the cultural resources at risk by each state and territory
    - To set the stage and to show how at-risk cultural resources would be presented for each state and territory, Justin Bashaw provided a background on how the SACS planning reaches and focus areas were developed.
    - Justin also presented the cultural resources at risk in North Carolina.
    - Ryan Clark presented the cultural resources at risk in South Carolina, Georgia, Florida, Alabama and Mississippi.
    - Kristina May presented the cultural resources at risk in Puerto Rico and the U.S. Virgin Islands.
- Kristina May discussed how the information from the cultural analysis will be used in the SACS
    - Cultural information will be used in the focus area action strategies.
    - A description of the at-risk cultural resources will be provided by planning reach in each SACS state and territory appendix
    - For other planning reaches, at-risk cultural resources will be used to inform recommendations for follow-up studies or strategies
- Kristina discussed next steps
    - The webinar notes and the draft cultural qualitative analysis write-ups for each state and territory in the SACS study area will be provided to stakeholders in a follow-up email
    - The webinar slides and webinar notes will be posted to the SACS website

- The cultural analysis will be used in the upcoming SACS focus area action strategy meetings in August and September
- SACS draft report anticipated to be available for public review in October 2021

- Kristina indicated how to provide feedback
  - Links below will be sent out in a follow-up email.



Questions*

- There was no box included for tribal nations during introductions on the first slide.
  Response: We apologize for not including a box for tribal nations. We will ensure that this does not happen in future presentations.
- What are climatic factors associated with submerged resources?
  Response: SACS is primarily analyzing terrestrial resources at risk from Sea Level Rise and associated coastal storms. However, several of the focus area discussions within the state appendices, do discuss submerged resources within a qualitative framework in order to aid in further analysis among stakeholders. The construction of the large SACS linked data, set is essential to aid in the development of procedures among other federal, state and local agencies when their studies focus on the sampling, triage, and mitigation of these impacts to submerged resources.
- How have/will Native American Indian resources be accounted for?
  Response: A SACS tribal liaison has been appointed that will be reaching out for a consultation with each tribal nation with interest in the study area. The tribal liaison will reach out to each tribal nation via a phone call to discuss the study and ask if there are any important sites that we are not aware of and should consider in our study.
- Is the intent of SACS to compile a comprehensive library of cultural resources in the study area? If so, how will this be accomplished/maintained and can it be shared?
  Response: SACS is attempting to compile as comprehensive of a data set as possible from both nationally available and state/local databases. Due to the sensitive nature of the data and agreements among providers of said state/local data, only the nationally available data may be provided to stakeholders.
- How were the exposure indices scored/ranked?

Response: The exposure indices in the SACS Tier 1 Risk Assessment are weighted 60% population/infrastructure, 30% environmental, cultural and habitat, and 10% social vulnerability. The North Atlantic Comprehensive Coastal Study (NACCS) exposure indices were weighted 80/10/10, respectively. The SACS team used the NACCS weighting as a starting point and revised to give more weight to the environmental, cultural and habitat index due to the amount and importance of sensitive environmental resources present in the SACS study area.

- Tribal nations are not considered stakeholders.
  Response: Acknowledged. Thank you for the comment.

*Unfortunately, due to technical difficulties with the Webex, questions asked in the chat box were lost.

- Kristina thanked all participants for their attendance and contributions, and provided the below reference and contact info.
- Lisa Clark also thanked everyone for attending the webinar and apologized for not including a tribal nation's box on the first slide of the presentation.

Example Letter sent to Tribal Nations in September 2020

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

September 18, 2020

Mr. Brett Barnes
Tribal Historic Preservation Officer
Eastern Shawnee Tribe of Oklahoma
bbarnes@estoo.net

Dear Mr. Barnes,

As part of the South Atlantic Coastal Study (SACS), the U.S. Army Corps of Engineers (Corps) hosted a webinar to specifically address cultural resources-related matters on August 4, 2020. Invitees/attendees included federal agencies, tribal governments, state agencies, non-governmental organizations, and academia. During the webinar, the Corps' SACS team presented the cultural resources presently identified as at-risk to increased coastal storm damages as a result of sea level rise in each state and territory in the SACS area. The team received valuable feedback from tribal governments and our stakeholders regarding the team's identification of the at-risk cultural resources.

A webinar summary, webinar slides, and draft qualitative reports of the at-risk cultural resources by state and territory were sent to tribal governments and stakeholders by e-mail on August 26, 2020. The webinar summary and webinar slides, as well as background information on the study are located on the SACS website: https://www.sad.usace.army.mil/SACS/

We are reaching out to tribal governments that may have interest in the SACS as we believe your feedback will assist the Corps' team with our analysis and inform its products.

Our goal is to collaboratively develop a common understanding of cultural resources at risk from increased coastal storm damages as a result of sea level rise. At-risk cultural resources will be taken into consideration in the development of measures and actions to reduce risk to these resources. In support of this goal, we respectfully request your feedback on the following:

- Are there tribal resources or lands (e.g., sacred sites, places of cultural or religious importance) in the SACS study area that you would like the SACS cultural team to consider in our study? Please note that the SACS' products will ultimately be made publicly available, which may influence the specificity of information you wish to contribute.

We also welcome any additional comments that you may have on our draft qualitative cultural resources reports. We respectfully request for responses to be provided by Friday, October 16, 2020.

Please provide your feedback (or a quick indication of no input) to Ryan Clark, archeologist in the USACE Jacksonville District office, at Ryan.N.Clark@usace.army.mil. If you have questions or would like to discuss the study in more detail, please contact Ryan Clark at (904) 232-3634 or by email. We look forward to your response to this request.

Sincerely,

Kristina May
Environmental and Cultural Lead
South Atlantic Coastal Study
Baltimore District
U.S. Army Corps of Engineers