A COASTAL ARCHAEOLOGICAL SURVEY AND SHORELINE EROSION ASSESSMENT OF ACCOMACK AND NORTHAMPTON COUNTIES, VIRGINIA

By

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1. INTRODUCTION

On October 29th, 2012 at 12:36pm, the maximum storm surge associated with Hurricane Sandy impacted the coastline of Northampton and Accomack counties, which are situated along the lower end of the Delmarva Peninsula in Virginia. At the time, no one could thoroughly gauge the storm's impact to both populated and unpopulated areas.

In early 2014, the Virginia Department of Historic Resources announced that funds provided by the National Park Service would be made available to aide and evaluate historic properties impacted by Hurricane Sandy. On March 6th, 2014, the Chesapeake Watershed Archaeological Research Foundation; a 501(c)(3) organization, submitted a grant proposal to survey the coastlines of both Accomack and Northampton counties (see Figure 1.0) to assess the erosion at all of the 198 recorded archaeological sites situated on the coastline.

On July 25th2014, Dr. Michael Barber; the State archaeologist of Virginia, indicated that the grant to conduct the shoreline survey had been awarded. The contract to conduct the survey (Project No. 2014-1450 VA-02) was signed on January 29th, 2015. The fieldwork began in February, 2015, but was delayed for a short duration because of inclement and icy weather conditions. The fieldwork was essentially concluded on December 31st 2015. However, a few individual site locations were revisited in 2016 to better understand the coastal conditions unique to specific shoreline areas.

The fieldwork evaluated all 198 recorded archaeological site locations situated along the shorelines of both counties. Of these, it was determined that 35 archaeological sites on file with the Virginia Department of Historic Resources have been destroyed as a result of erosion. As such, 163 coastal archaeological sites in both Northampton and Accomack counties have survived the daily onslaught of erosion over the past several decades. However, the total number of surviving sites should eventually diminish as erosion continues. The current survey documented an additional 45 new and previously unrecorded sites and they are now included within the archaeological site database currently housed at the Virginia Department of Historic Resources in Richmond. All of the newly recorded sites were exposed as result of erosion over the past fifteen years since the completion of the earlier coastal surveys within both counties (see Lowery 2001 and 2003a). Nineteen archaeological features associated with several prehistoric sites were AMS-dated as a result of this investigation.

The following report outlines the results of the survey, highlights the complexity of shoreline erosion, and offers management recommendations to future and current cultural resource managers. The headings for the individual site descriptions presented in this report denote the official site number using the standard VCRIS (Virginia Cultural Resource Information System) designation (i.e., 44NH0003). However, throughout the text, tables, and illustrations depicted in this report individual site numbers were shortened (i.e., 44NH3) to reduce the size of the final report and offer comparable site designations analogous to adjacent states, which do not employ this system.

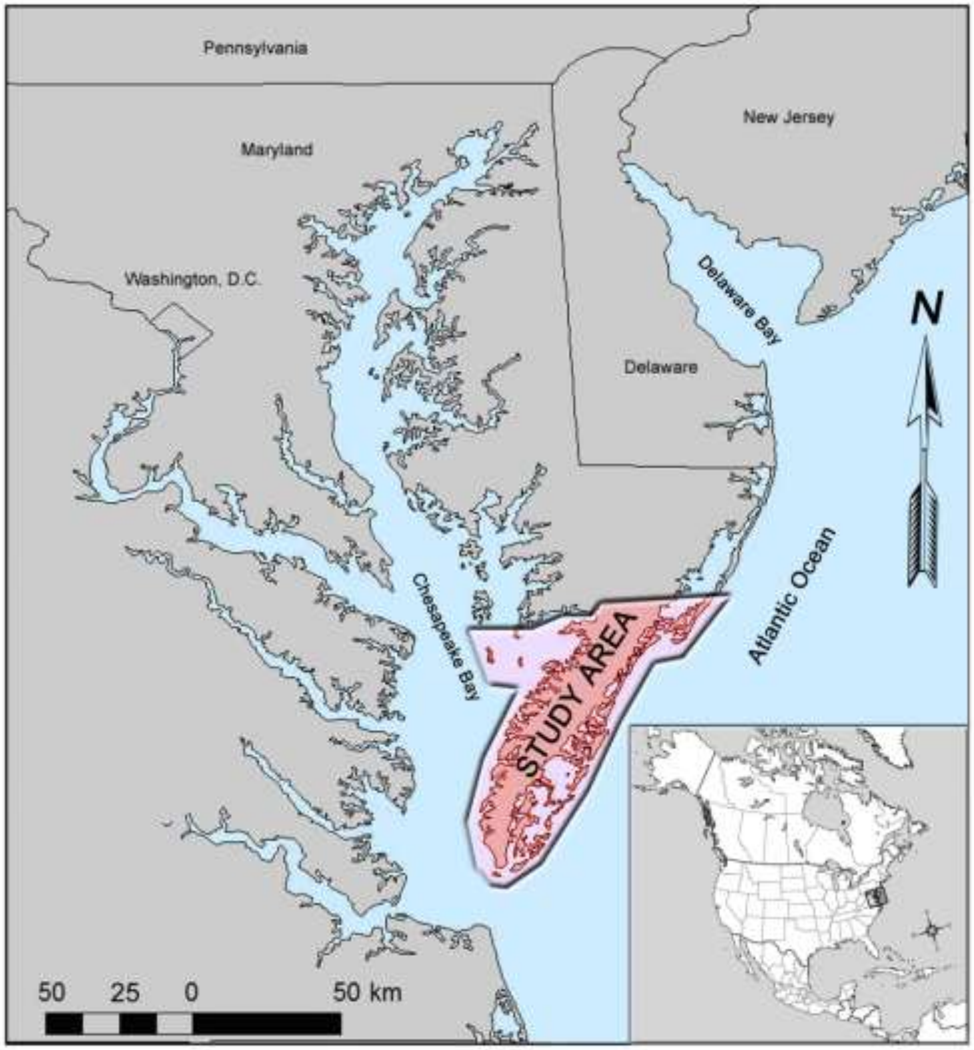

Figure 1.0. The map defines the coastal survey study area, which encompasses both Accomack County and Northampton County, Virginia.

2. BACKGROUND

The background portion of this report will highlight the region's geology, archaeology, and the methodology behind the recent shoreline survey.

GEOLOGIC SUMMARY:

The geologic history of the Virginia eastern shore is complicated (see Figure 2.0). The region formed as a result of multiple high sea level events intersected by low sea stands. During the early Pliocene when the Susquehanna River channel was situated underneath Salisbury, Maryland (Hansen 1966), the Susquehanna and an earlier paleochannel of the Potomac River were combined (Mixon 1985). The combined Susquehanna/Potomac paleochannels shifted progressively southward after each subsequent high sea stand event. Ultimately an early spit developed, which extended into the far northern fringe of Accomack County during a high sea stand episode. The episode occurred sometime >700,000 years ago and geological expression in far northern Accomack County is referred to as the Omar Formation. The Omar Formation consists of boulders-cobbles, gravel-sand, silt, clay, and peat at altitudes to 50 feet (see Virginia Division of Mineral Resources 1993). The Omar Formation represents an early Pleistocene-age formation that developed over a series of late Pliocene deltaic deposits.

A series of paleochannel deposits occur through north-central Accomack County, which may be associated with Marine Isotopic Stages 16 and 18 (a.k.a., MIS-16 and MIS-18). Boulder and cobble deposits associated with these two relic paleochannels can be found within Beasley Bay in northwestern Accomack County. The MIS-18 channel would date to approximately ~700,000 years old and the younger MIS-16 channel would date to approximately ~630,000 years old. These early river valleys drained towards the Washington Canyon. Multiple high-sea stand events between 400,000 and 600,000 years ago permitted the southward movement of the lower Delmarva Peninsula spit. The younger spit is referred to as the Accomack Spit. The high-sea events ultimately infilled the former MIS-18 and MIS-16 paleochannels and reworked much of the channel aggregate material.

A major low-sea stand event occurred circa ~360,000 years ago or MIS-10 and formed the Exmore paleochannel. During this low-sea stand event, the Susquehanna and Potomac River systems collectively drained towards the Norfolk Canyon. A marked marine transgression event occurred circa 340,000 years ago and infilled the Exmore paleochannel. However, the southward migration of this spit was limited, which may have been a byproduct of the short duration of the maximum high-sea stand connected with MIS-9.

A low-sea stand associated with MIS-8 at circa 275,000 years ago shifted the paleochannel further towards the south. This channel is referred to as the Belle Haven paleochannel. The process of channel infilling and reworking continued with yet another high-sea stand event, which occurred around ~200,000 years ago. The 200,000 year old spit is referred to as the Nassawadox Spit #1. The Eastville paleochannel formed circa 150,000 years ago when global sea levels dropped yet again. The Rappahannock was at this time united with the collective Susquehanna and Potomac systems. For the first time, the geologic record associated with the Rappahannock River system became incorporated into the fabric of Virginia's eastern shore as reworked secondary deposits.

The high-sea stand during the last interglacial infilled the Eastville paleochannel and continued the southward migration of the spit along the lower Delmarva Peninsula. Sea level was higher than present 125,000 years ago and resulted in the development of the Nassawadox Spit #2. The cycle continued again and global sea level dropped ~120 meters or ~400 feet circa 24,000 years ago, which formed the Cape Charles paleochannel. During this era, the York River system was united with the Susquehanna and the eroded geologic record within the York drainage became incorporated into the fabric of Virginia's eastern shore. The cyclical formation of the lower Delmarva Peninsula is described and illustrated in greater detail (see Oertel and Foyle, 1995; Kerhin et al. 1996; and Virginia Division of Mineral Resources 1993) than outlined in this brief synopsis.

Circa 24,000 years ago global sea levels began to rise. At this time, the Delmarva Peninsula was undergoing a period of isostatic uplift or forebulge as a result of the displacement weight of the Laurentide Ice Sheet, which was situated about ~300 kilometers or ~250 miles north of the study area. As a result, the Middle Atlantic relative sea level was ~15 meters or ~50 feet lower than the global sea level. Sea levels rose at varying rates throughout the late Pleistocene and Holocene. At least two major meltwater pulses (i.e., 1A, and 1B) or short period of rapid sea level rise impacted the region (see Figure 2.1). Throughout the late Pleistocene and Holocene, aeolian activity (see Lowery et al. 2010 and Lowery et al. 2012) reworked some of the previous high-sea stand fluvial-estuarine sediments, which resulted in areas capped by loess and encapsulated by dune fields. Over the past 2,000 years the rates of sea level rise have slowed markedly (see Figure 2.1). The Delmarva Peninsula spit continues to migrate southward and the circa 24,000 year old Cape Charles paleochannel has been infilled. The Cape Charles channel now lies about ~52 meters or ~170 feet beneath Fisherman's Island (Harrison et al. 1965: Figure 7). As a result of the present high sea stand, the James River channel has now joined the drainages of the combined tributaries associated with the Susquehanna-Chesapeake watershed.

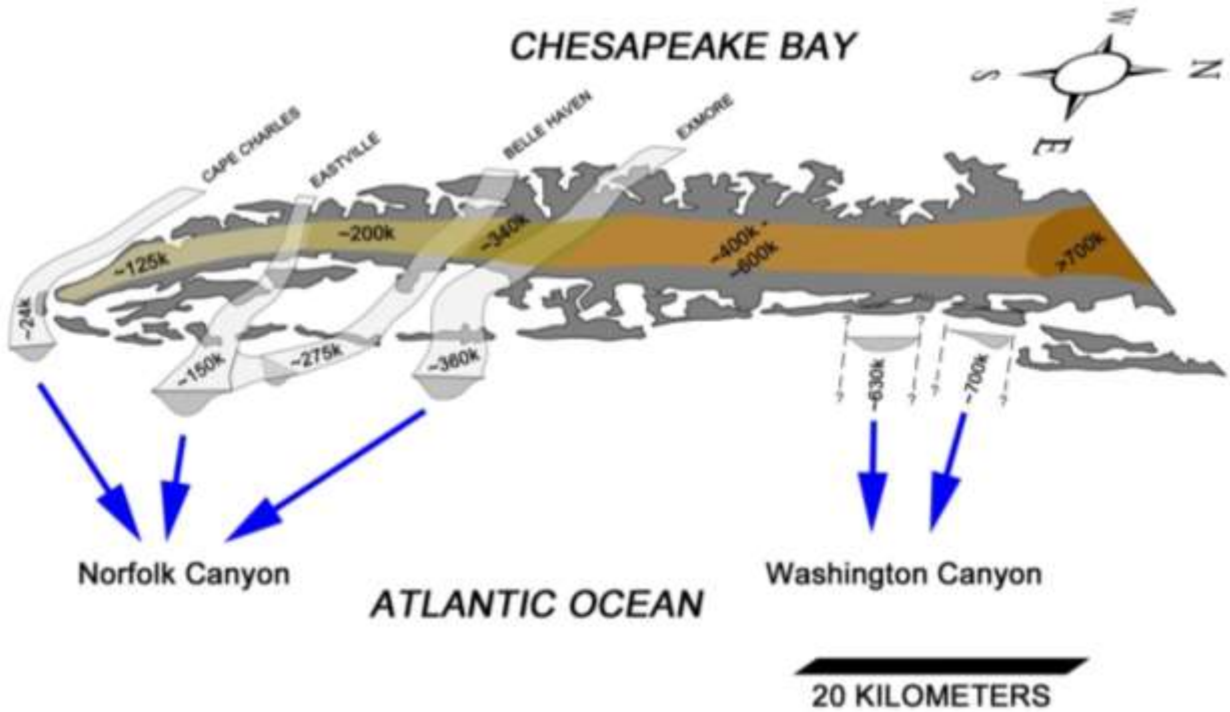

Figure 2.0. The map defines the geology and approximate age of the deposits (i.e., peolochannels and spit formations) associated with both Accomack and Northampton counties in Virginia.

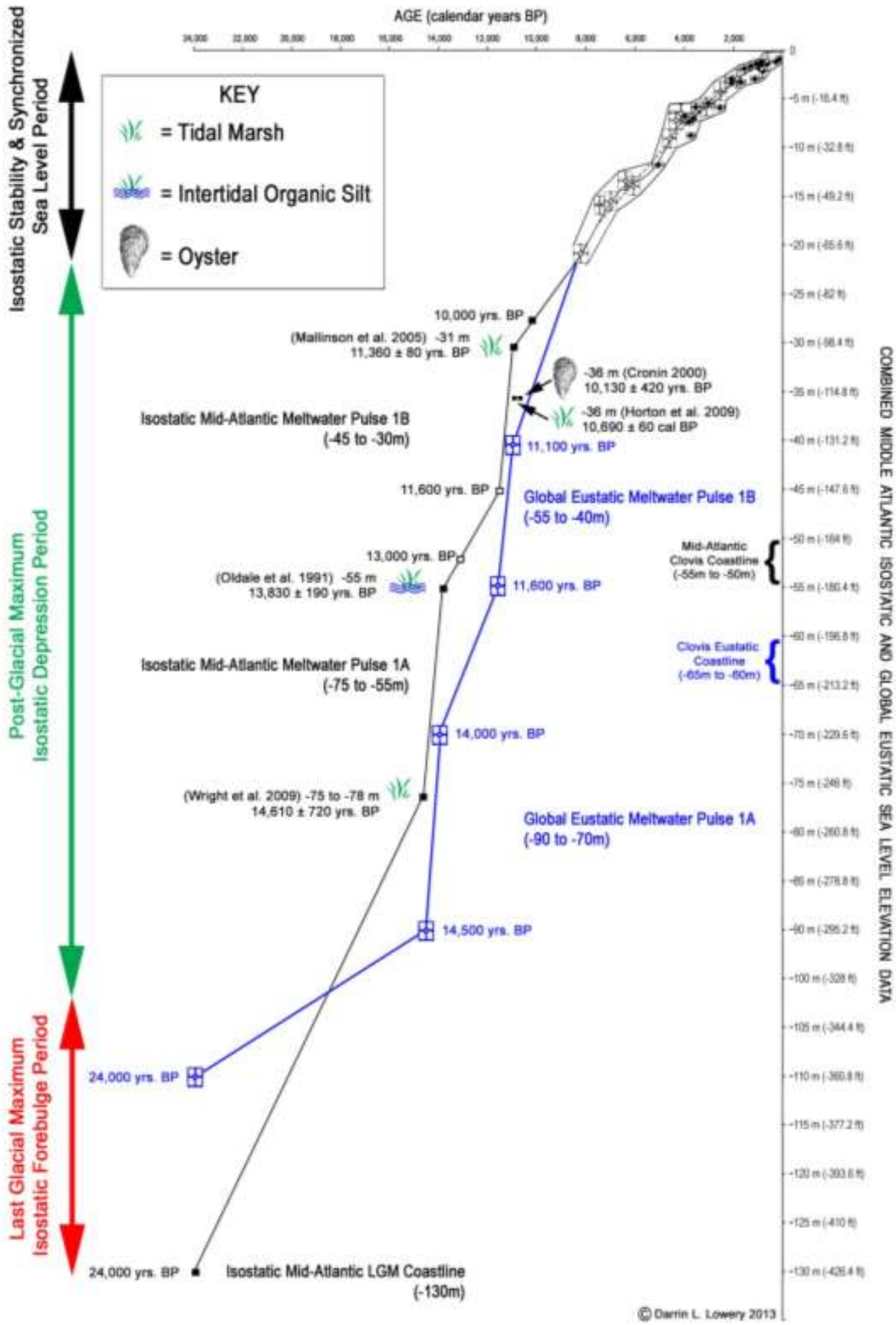

Figure 2.1. The graph defines the Middle Atlantic relative or isostatic sea level curve with respect to the global eustatic sea level changes over the past 24,000 years.

ARCHAEOLOGICAL AND CULTURAL SUMMARY:

The prehistoric cultural sequence of the Middle Atlantic region is generally understood (Custer 1984 and 1989, Dent 1995, and Kraft 2001) through archaeological survey and excavation. The dating scheme for this synthesis is presented in calibrated calendar years (Roberts 1998: 253) with respect to the radiometric-age equivalents generally associated with the recognized prehistoric cultural periods (Custer 1989, and Dent 1995). The sea level data (see Lowery 2009) were provided to better understand the magnitude of land loss within the region.

Paleo-American and Paleoindian Periods (19,000-11,600 Cal. Yr. BP)

Paleoindian occupations at the Paw Paw Cove site in Maryland, dating to approximately 13,200 years BP through 12,900 years BP, are presently the only well excavated evidence for early human occupation on the Delmarva Peninsula. Even so, numerous additional sites on the Delmarva Peninsula have been reported that have revealed Paleoindian archaeological remains.

The Paw Paw Cove site is located along the west side of the Delmarva Peninsula and it includes a series of individual localities that have produced numerous fluted Clovis points and fragments, a limited amount of debitage or stone tool manufacturing waste, and variety of formal flake tools in eroded shoreline and buried contexts. Presently, these localities are situated along the shoreline of the Chesapeake Bay. In the past these localities were situated within the upland interfluve areas and located around several springs and spring-fed wetlands. Given the Paleoindian artifact assemblage found at Paw Paw Cove, the site represents a series of reoccupied upland hunting-related base camps.

Additional Paleoindian sites have been found south along the main trunk of the modern Chesapeake Bay with settings identical to Paw Paw Cove. The Meekins Neck site is a drowned upland interfluve setting. Like Paw Paw Cove, the site has also revealed numerous Clovis points, formal flake tools, and only a few fragments of lithic waste or debitage. Like many of the Paleoindian sites on Delmarva, the Meekins Neck site also seems to represent a series of reoccupied upland hunting-related base camps.

It is likely, however, that people were here earlier than Clovis and that other intact Paleoindian era sites remain to be discovered. Evidence suggests that humans reached southern Virginia by at least 18,000 calendar years BP (McAvoy and McAvoy 1997). At the Cactus Hill site in Sussex County, Virginia, McAvoy and McAvoy (1997) have found a cultural stratum with unfluted lanceolate projectile points and quartzite blades, which has been dated to the terminal phase of the last glacial maximum. The pre-Clovis cultural stratum at Cactus Hill is also situated stratigraphically below a Clovis occupation surface. The early artifacts found at Cactus Hill seem to indicate an early human presence here in the Middle Atlantic region.

With respect to the lifeways of these ancient cultures, some people have argued that the first inhabitants were fairly dispersed and highly mobile, relying mostly on game resources and using open campsites for habitation (Custer 1989, and Dent 1995). Custer (1989) has emphasized that Paleoindians utilized cryptocrystalline lithic materials from primary quarries located at the northern extreme portion of the Delmarva Peninsula and only supplemented their need for stone tools with secondary cobble sources along the southern sections of the Chesapeake Bay. Custer and Stewart (1990) have developed a model for Paleoindian settlement within the Middle Atlantic region with hypothesized band territories. Lowery and Custer (1990) suggested a cyclical movement pattern for the Delmarva Peninsula. Current research (Lowery 2002) has challenged some of these earlier views. This new research has suggested fairly restricted movement patterns for Clovis-age peoples living on the Delmarva Peninsula, with stone tool technologies oriented around primary coastal plain lithic materials (i.e, orthoquartzite, petrified wood, silicified sediments) and a variety of secondary paleochannel cobble lithic materials.

There is geomorphological and paleoclimatic evidence that a major episode of loess deposition occurred after 12,900 years BP. The parent material for the loess seems to have been outwash in the ancestral Susquehanna River valley reworked by intense winds. The loess seems to have been deposited over a large section of the upland along the northwestern part of the Delmarva Peninsula (Lowery et al. 2010). An ancient landscape is buried beneath the loess that blanketed the region during the Younger Dryas cold period. Since humans were in the region 13,000 years ago, it is probable that most of the Paleoindian sites in the northwestern sections of Delmarva are buried beneath Younger Dryas era loess deposits (Ibid). In the interior sandy sections of the Delmarva Peninsula, eolian processes may have been reworking and depositing former marine and fluvial sands as late glacial dune landforms. Presently, Paleoindian era sites in the interior Delmarva drainage divide would be associated with a mixture of deflated landscapes and buried landscapes.

During the last glacial maximum, sea level was ~120 meters (~400 feet) lower than present. During the early period of human occupation at Cactus Hill, sea level in the Middle Atlantic should have risen, but would have ranged between 90 (296 feet) and 100 meters (328 feet) lower than present. During the initial Clovis occupation in the region, sea levels had continued to rise and global eustatic sea levels were 65 (213 feet) to 60 meters (196 feet) lower than present. However, by the end of the Paleoindian period eustatic sea level was around 55 (180 feet) lower than present. Because of isostatic conditions, the relative sea level for the Middle Atlantic region during the Clovis-era was slightly less and about 55 (180 feet) to 50 (164 feet) lower. As such, low salinity steep-sided Chesapeake Bay-like estuary would have been present at the end of the Delmarva Peninsula beneath Fisherman's Island.

Considering the degree of sea level rise, it is not surprising that virtually all of the known Paleoindian sites on the Delmarva Peninsula are in upland terrestrial areas situated near interfluves. While some of this distribution along watershed divides reflects real settlement preferences, particularly access to fresh-water, the Paleoindian settlement patterns along the coastal plain are highly biased by terminal Pleistocene and Holocene marine transgression. Currently we do not have substantive Paleoindian settlement data for the floodplain and river settings, the major river confluence points, and the coastal environments of the Delmarva coastal plain. With respect to coastal environments during the Paleoindian period, we do know that the types of shellfish resources attractive to later peoples were readily available to these Late Glacial cultures on the continental shelf east of the present coastline (Thieler et al. 2000).

Early Archaic Period (11,600-9,900 Cal. Yr. BP)

Early Archaic occupations at the Paw Paw Cove site (Lowery 2002) and the Crane Point site in Maryland (Lowery and Custer 1990), as well as the Hughes Complex in Delaware (Lowery 1999), presently provide some of the best published archaeological evidence for Early Archaic era human occupation on the Delmarva Peninsula. However, many additional Early Archaic sites are located throughout the Delmarva Peninsula remain unpublished or have been only marginally studied (Custer 1989; Lowery 1999).

The Crane Point site and the Hughes Complex sites include assemblages made up of large numbers of projectile points, knives, debitage, formal flake tools, specialized scraping tools, flaked stone adzes, gouges, or celts, bola stones, and some plant processing tools. Both of these sites or site complexes seem to represent repeatedly occupied hunting-related base camp locations. Like the earlier sites, the Early Archaic encampments seem to be focused around the drainage divide or interfluve areas.

The regional site data seem to indicate larger human populations during the early Holocene compared to the population levels observed for the late Pleistocene. Like the Paleoindian era, some researchers have argued that the Early Archaic inhabitants were highly mobile, relying on plant and animal resources and using open campsites for habitation (Custer 1989; and Dent 1995). McAvoy and McAvoy (1997) have suggested that the Early Archaic groups living in Virginia were far more mobile than their Paleoindian predecessors. Unlike the Paleoindian period, Early Archaic peoples heavily utilized cryptocrystalline lithic materials from the primary quarries located near the northern extreme portion of the Delmarva Peninsula (Lowery and Custer 1990). Other primary lithic quarry materials, such as silicified rhyolite and silicified tuff, have been found fairly regularly in Early Archaic assemblages here on the Delmarva Peninsula. These materials originated from either southern Virginia or North Carolina. Secondary cobble sources and primary lithic resources within the coastal plain seem to have only supplemented the Early Archaic stone tool kits found on the peninsula. During the Early Archaic period, exotic cryptocrystalline and exotic non-cryptocrystalline lithic materials seem to be the focal points for stone tool manufacture (Custer 1986). Long-distance cyclical movement patterns are indicated for the Early Archaic-era cultures living on the Delmarva Peninsula (Lowery and Custer 1990). Models for Early Archaic settlement patterns and demography have been proposed for portions of the Middle Atlantic region (Parker 1990).

Around 11,600 years BP on the Delmarva Peninsula, the vegetation changes, which can be linked to climatic warming, mark the beginning of the Holocene (Kellogg and Custer 1994; McWeeny and Kellogg 2001). In the coastal plain, there is again some evidence for eolian reworking and depositing sands along inland dunes (Ivester et al. 2001; Otvos and Price 2001). Some have suggested that the Holocene dune building and reworking activity was limited to the crests of some of the thick dunes (Ivester et al. 2001).

Based on the suggested eolian activity during this period, it is arguable that some of the Early Archaic sites in the interior sandy sections of Delmarva are buried beneath locally reworked sands. Lowery and Custer's (1990) work at the Crane Point site indicates that the Pleistocene-age loess sediments were reworked, a process which seems to have buried a hearth feature with diagnostic stone tools. Current evidence suggests Early Archaic era sites on the Delmarva Peninsula should include a mixture of deflated landscapes, as well as buried landscapes. It is suggested that deflation of the region's landscapes may have been associated with historic-era agricultural processes, which may have greatly impacted the observed overall patterning of Early Archaic era sites. For example, Custer's (1986: Figure 3) distribution of sites illustrates a dense accumulation of Early Archaic-era settlements in the interior drainage divide of the peninsula. These sites are associated with very sandy soils that are more easily susceptible to agriculturally induced erosion (Lowery 2001: 162-169). Like the regional Paleoindian site data, the Early Archaic era sites located in the silt-loam dominated areas near the Chesapeake Bay are commonly found as shallow buried or partially buried deposits due to localized reworking of the parent loess deposits (Lowery and Custer 1990; Lowery 2002).

During the early phase of the Early Archaic period circa 11,600 years BP, relative sea level in the Middle Atlantic region would have been approximately 45 meters (148 feet) lower than present. Over a short 500-year period associated with Meltwater Pulse 1B (i.e., MWP 1B), global sea levels rose ~15 meters (~50 feet). At approximately 11,000 years BP, Middle Atlantic sea levels were ~30 meters (100 feet) below present. At the terminus of the Early Archaic period around 9,900 years ago, eustatic sea levels were approximately 23 meters (75 feet) lower than present. Again, virtually all of the known terrestrial Early Archaic sites on the Delmarva Peninsula are in areas that were upland settings at the time of occupation. The settlement patterns that we understand for the coastal plain during this period are highly biased by marine transgression. We do not yet have substantive data for human use along the major estuaries and drowned river settings. We do know that shellfish resources were readily available to these early cultures within the developing Chesapeake Bay near the mouth of the Potomac River (Cronin 2000).

Middle Archaic Period (9,900-6,500 Cal. Yr. BP)

Middle Archaic occupations at 18DO279-east in Dorchester County, Maryland (Lowery 1999), as well as the Chance site in Somerset County, Maryland (Cresthull 1971 and 1972) currently provide some of the best archaeological evidence for Middle Archaic era human occupation on the Delmarva Peninsula. Numerous other sites from this period have been found along the eroded shorelines and in ploughed fields of the region (Lowery 1999 and Custer 1986). The large number of archaeological sites associated with the early-middle Holocene seems to indicate continued regional population growth.

Secondary cobble sources found locally were almost exclusively used to make stone tools. Even so, exotic non-local rhyolite has been found in Middle Archaic era assemblages (Custer 1986). Large numbers of Middle Archaic era Kirk stemmed points are manufactured from banded rhyolite. The presence of non-local lithic materials at Delmarva Middle Archaic sites may point towards the establishment of trade and exchange networks, while the heavy reliance on local lithic resources may indicate more localized Middle Archaic-era territories with restricted mobility patterns.

A typical early Middle Archaic tool kit would include small bifurcated projectile points, large bifurcated knives, as well as adzes, crude chopping tools, flake tools, and scrapers made from debitage detached from small bi-polar pebble cores. The latter portion of the Middle Archaic period is marked by the appearance of a stone tool kit that includes stemmed projectile points, large hafted knives, flaked ulu knives, utilized flakes, egg-shaped bola stones, and a complex ground stone tool assemblage, which includes adzes, full channel-grooved gouges, and crescent-shaped bannerstones or spearthrower weights.

The beginning of the Middle Archaic period is closely linked to the beginning of the "Hypsithermal" climatic event. Some researchers have referred to this era as the "Delmarva Desert" period (Millis et al. 2000). The warming episode associated with the beginning of the Holocene continued and may have created drought-like conditions on the Delmarva Peninsula (Kellogg and Custer 1994; McWeeny and Kellogg 2001). Dune building and sand reworking activity during the early-middle Holocene may have been limited to localized, dry, denuded landscapes susceptible to wind activity or in areas where large quantities of parent sand material were readily exposed to wind erosion.

Within the Delmarva area, there are large numbers of Middle Archaic sites found in agriculturally tilled fields regardless of the particle-size associated with the parent soil type. These observations may signify that few intact or buried Middle Archaic sites have survived the ravages of time. Even so, large areas along what was the developing Atlantic coastline during the Middle Archaic period may contain buried archaeological components. As sea levels rose along the Atlantic coast, onshore eolian processes combined with the droughts, may have stimulated the migration of dunes farther inland. This may signal that Middle Archaic-era human occupation sites along the Atlantic coast of Delmarva may be more deeply buried or stratified.

During the early portions of the Middle Archaic period, around 9,900 years BP, sea level was approximately 23 meters (75 feet) lower than present. Around 8,200 years ago, relative sea levels in the Middle Atlantic were approximately 15 meters (50 feet) below current levels. At the terminus of the Middle Archaic period around 6,500 years ago, relative sea levels were approximately 12.5 meters (41 feet) lower than present. Clearly, the Middle Archaic period was a time of relatively rapid sea level rise and ecological change in the Chesapeake Bay drainage.

Virtually all of the Middle Archaic sites on the Delmarva Peninsula are currently situated in terrestrial areas that were upland interior settings between 10,000 and 6,800 years ago. The settlement patterns and the types of focal points for human occupation within the Delmarva coastal plain over this period are again highly biased, as sea level rise has prevented us from gaining easy access to archaeological settings that, in the early-middle Holocene, were major floodplains, major river confluence points, and coastal environments. However, some late Middle Archaic-era cemeteries have been discovered in inundated contexts situated near drowned river confluence areas which provide us with rare glimpses into the life of these early cultures (Lowery and Martin 2009).

Models that have been proposed for Middle Archaic settlement patterns and demography in this area (Custer 1990; Parker 1990) also suffer from the limitations of sea level rise. As indicated earlier, we do know that shellfish resources were available to the Middle Archaic cultures living within the developing Chesapeake Bay (Cronin 2000), but we cannot be certain that people took advantage of them. The archaeological procurement settings for shellfish and marine resources are now for the most part inundated and difficult to access.

Late Archaic and Terminal Archaic Periods (6,500 – 3,000 Cal. Yr. BP)

Numerous Late Archaic era sites have been found in Delmarva (Custer 1989, Dent 1995, Reinhart and Hodges 1991), and models for settlement patterns and demography have been proposed for parts of the region (Reinhart and Hodges 1991). The large number of archaeological sites associated with this period signifies a large regional population.

Like the Middle Archaic period, stone tools and projectile points were generally made primarily from materials found in local, secondary deposits of cobble. In addition to ground and polished gouges, grooved axes and adzes occur during the Late Archaic period and were used to cut wood, fell trees, and craft dug-out canoes. Non-local materials, such as rhyolite and argillite, are also found at most Late Archaic-era sites (Custer 1989). More importantly, caches of large stemmed and unstemmed bifaces have been found at some Archaic-era sites. Caches of rhyolite bifaces are common on the western side of the Delmarva Peninsula, whereas, caches of argillite bifaces are far more common on the eastern side of the peninsula. The distribution of cached lithic materials may reflect the relative proximity of portions of the peninsula to the parent lithic quarries.

Other exotic lithic materials seem to have been traded into the peninsula during the Late Archaic period. Porphyry, a non-local hard igneous rock with large crystals of feldspar or quartz, was used to manufacture some notched crescent-winged bannerstones or spearthrower weights and a few grooved axes found at sites on the Delmarva Peninsula. Exotic banded slate and steatite were also used to manufacture some bannerstones. Steatite was also used to manufacture stone bowls during terminal phases of Delmarva's Late Archaic period. The presence of non-local lithic materials suggests that the local cultures had developed trade and exchange networks. The caches at specific sites would imply that these cultures periodically reused certain areas.

Probably the most unreported aspect of the Late Archaic period in this area is the cultural influence from peoples living outside the region. Contact, whether direct or indirect, from cultures occupying the eastern Great Lakes area are indicated by the presence of ground slate knives, ground slate points, and stone gouges. Long-distance trade and exchange with the Laurentian Archaic peoples also is suggested by the presence of a few exotic hammered copper points, crescent knives, adzes, and fishhooks found at a limited number of sites on the Delmarva Peninsula (Ibid). These utilitarian copper artifacts are identical to "Old Copper" culture tool types found in the western Great Lakes area. The types and styles of copper artifacts found in the region found with a burial near Still Pond, Maryland were probably manufacture by people associated with the western Great Lakes "Old Copper" culture and traded to the Laurentian Archaic cultures living in the eastern Great Lakes area. Based on the presence of "Old Copper" culture items within the Laurentian assemblages in the northeast, the few exotic copper artifacts found locally almost certainly reached the Delmarva area via the Late Archaic Laurentian cultures living in Quebec, Ontario, and New York (Chapdelaine et al. 2001:102-110). It seems clear that these exotic items are the result of long-distance trade and exchange with cultures far removed from the Delmarva area. The local scarcity of Late Archaic copper items indicates that a long-distance "down-the-line" trade pattern had been established at least by 5,000 years ago. The question arises as to what local Delmarva commodity was being traded outside the region and ultimately ending up with the cultures living in the western Great Lakes area? At the Oconto site, an "Old Copper" culture cemetery in Wisconsin, Ritzenthaler and Wittry (1952: 199-223) have reported two whelk shell fragments from a 5,000 year old grave. Maybe whelk shell was the commodity being traded from the Middle Atlantic region to cultures outside the region 5,000 years ago. The limited amount of marine shell found at a few of the western Great Lakes "Old Copper" culture sites would also suggest a long-distance "down-the-line" trade pattern had been established.

The Late Archaic period is marked by a series of climatic changes that suggests warm and wet conditions initially, changing to warm and dry conditions, and finally ending with wet and colder conditions (Kellogg and Custer 1994, McWeeny and Kellogg 2001, Fiedel 2001, and Custer and Watson 1987). Within the larger Delmarva area, there are large numbers of Late Archaic sites found in agriculturally disturbed fields, regardless of the parent soil type.

Marked sea level changes during the Archaic period that can be linked to continued Holocene warming. Relative sea level circa 6,500 years BP was approximately 12.5 meters (41 feet) lower than present. Around 4,000 years ago, sea level in the Chesapeake Bay was about ~6 meters (~20 feet) lower and by the end of the Late Archaic period circa 3,000 years BP, sea level had risen to approximately 3.6 meters (12 feet) lower than present.

Observations from agricultural fields indicate that only a limited number of intact or buried Late Archaic sites are present in the tilled interior upland areas of the modern Delmarva Peninsula. Given the sea level history, some Late Archaic era estuarine resource procurement sites may be inundated or buried beneath tidal marsh deposits. Current archaeological data indicates that the region's Late Archaic cultures were exploiting estuarine and marine resources. Along the Atlantic seaboard, transgressive barrier island processes may prove that some of the Atlantic coastal sites are offshore or buried below coastal dune formations.

Early Woodland Period (3,000 – 2,500 Cal. Yr. BP)

During the transition from the Archaic period to the Woodland period, regional cultures experimented with early ceramic technologies in tandem with the use of earlier stone bowls. Fishtailed knives and projectile points are diagnostic of this Terminal Archaic-era along with experimental ceramics with shapes similar to the earlier steatite bowls.

The Early Woodland period is marked by the complete adoption and use of ceramic technology and ceramic vessels as part of a daily lifestyle. Only a limited number of Early Woodland era sites have been found along the eroded shorelines and within the ploughed fields of Delmarva (Custer 1989; Dent 1995; Reinhart and Hodges 1991), and researchers (see Fiedel 2001) have tried to address the paucity of Early Woodland sites. Some researchers have suggested that the smaller number of sites is suggestive of a smaller regional population. Others have proposed that the lack of "good" diagnostic stone tools might explain the lower number of recognized sites. Whatever the reason, we know that local secondary cobble sources were still extensively used to make stone tools, but non-local materials such as rhyolite and argillite were also utilized (Custer 1989).

Aside from rhyolite and argillite, other non-local lithic materials were also entering the region. Completed artifacts made of varieties of exotic lithics originating from the Great Lakes region, western New York, and the Ohio Valley drainage are found at some Early Woodland sites on the Delmarva Peninsula. Usually, the exotic items are associated with Early Woodland mortuary features, but they are occasionally found at habitation sites. Styles of artifacts, such as birdstones, have been found on the Delmarva Peninsula. Outside of the region birdstones are usually associated with “Glacial Kame” and “Meadowood” cultures (Townsend 1959). A few “turkey-tail” blades have also been found on the Delmarva Peninsula made of Wyandotte Chert from Indiana. These “turkey-tail” points are linked to the “Red Ochre” culture (Ritzenthaler and Quimby 1962) of the Great Lakes and Ohio Valley region.

The “Glacial Kame” and “Red Ochre” style items found on the Delmarva Peninsula may have arrived here via the Meadowood culture trade network (Granger 1978). This network can be linked to the peoples living in western New York circa 2,500 to 3,000 years ago. The trade pattern linking the Delmarva area to the cultures living in western New York developed during the Late Archaic period and continued into the Early Woodland period. One of the hallmarks of the Meadowood culture is the style of projectile points and cache blades. Meadowood type points and cache blades made of Onondaga chert from New York and Ontario and burials dating to roughly 2,700 years BP have been found on the Delmarva Peninsula with caches of copper beads (Lowery et al. 2015).

During the latter portion of the Early Woodland period, items associated with the Ohio Valley Adena mound-building culture begin to appear in the archaeological record of the Chesapeake Bay area (Custer 1989; Dent 1995; Ford 1958, 1959, and 1976). The Meadowood-era trade seems to have been focused along the Susquehanna and Delaware River systems, whereas the Adena-era trade seems to have shifted towards movement along the Potomac River system. Based on the distribution of Meadowood items on the Delmarva Peninsula and the relatively “pure” nature of the associated site assemblages, Lowery et al. (2015) have argued that the Meadowood presence on the Delmarva Peninsula represents direct acquisition of items for trade and exchange. It is suggested that during the latter portion of the Early Woodland period direct acquisition breaks down and there is more focused exchange between cultures living in the Ohio Valley and contemporaneous cultures living on the Delmarva Peninsula. This assumption is based largely on comparing the observed Meadowood pattern at sites with characteristics seen at sites having later Adena artifacts mixed with “impure” local traits. Trade in Atlantic coast marine shell may explain the presence of exotic non-local items on the Delmarva Peninsula during the Early Woodland period (Ritchie 1969 and 1980).

The climate of the Early Woodland period is marked by wet and colder conditions (Kellogg and Custer 1994). Sea level circa 3,000 years BP was approximately 3.6 meters (12 feet) lower than present, and by the end of the Early Woodland period, circa 2,500 years BP, sea level had risen to approximately 2.5 meters (8 feet) lower than present. Since Early Woodland sites are predominantly found in disturbed agricultural field contexts, only a limited number of intact or buried Early Woodland sites may have survived within the interior upland areas of the modern Delmarva Peninsula due to the historic anthropogenic tilling. Given the sea level history, a large number of Early Woodland-era estuarine oriented prehistoric occupation sites may be buried below tidal marsh deposits or offshore in inundated upland settings. Along the Atlantic seaboard, transgressive barrier island processes may have buried some of the Atlantic coastal sites below coastal dune formations.

Middle Woodland Period (2,500 – 1,000 Cal. Yr. BP)

Numerous Middle Woodland era sites have been found on Delmarva (Custer 1989; Dent 1995; Reinhart and Hodges 1992), and the density of sites may indicate an increase in regional populations or an intensive focus of occupation in the coastal environments. In contrast, certain areas of the Middle Atlantic seem to be absent of a human presence or occupation. As such, the coastal areas may have been a focal point for human settlement between 2,000 and 1,000 years ago.

With respect to stone tool kits, secondary cobble sources found locally were only occasionally used to make stone tools during the Middle Woodland period. Non-local materials, such as rhyolite and argillite, are the most predominant lithic material present at most Middle Woodland-era sites (Custer 1989). Pennsylvania jasper, Normanskill chert, and Upper Mercer chert, which are also non-local lithic materials, are found at most large Middle Woodland-era Fox Creek sites. The most common Middle Woodland period diagnostic artifacts include the Fox Creek point, large Petalas blades, and shell-tempered Mockley ceramics; the latter being a pottery style that emerged during this period.

Along some watersheds draining into the Chesapeake (i.e., the Miles River, the Choptank River, and the Little Choptank River), numerous caches of large Petalas bifaces have been discovered (Custer 1987). Large, exotic stone artifacts from the Ohio Valley area are present in some early Delmarva Middle Woodland mortuary features, and these have traditionally been associated with the “Delmarva Adena Complex.” However, projectile point, copper breastplates, channel coal psuedo-bifaces, Hopewellian-style blades, copper celts, and other exotic artifacts have been found on the Delmarva Peninsula that would logically be more suggestive of “Hopewellian” contacts from the Ohio Valley than the traditionally accepted late Adena links (Lowery 2012).

Along the Atlantic seashore in Virginia, Lowery (2012) has recovered “Hopewellian” style points made of Ohio Valley cherts, rhyolite Fox Creek points, a copper celt, marine shell beads, and small stone drills in association with an organic midden deposit that contains fish remains, shell-tempered Mockley ceramics, and bone fishhooks. Interestingly, at the Frederica cemetery site in Delaware, exotic Hopewellian artifacts were found in association with local rhyolite Fox Creek points and blades (Lowery 2012). A radiometric date on the Frederica materials indicates a range of A.D. 391 to A.D. 531 (Custer et al. 1990), which would be too young for the Ohio Valley Adena culture, but would overlap with the last phases of the Hopewell culture. Trade in Atlantic coast marine shell and fossil shark teeth from geologic deposits along the shore of the Chesapeake Bay may explain the presence of exotic Hopewellian items on the Delmarva Peninsula during the early portion of the Middle Woodland period. The immense distances involved in this Middle Woodland-era trade network are clearly evident at the Frederica site. A large stemmed biface made of Knife River chalcedony, which outcrops in North Dakota, was found at this site.

During the latter portion of the Middle Woodland period, Kipp Island, Webb Phase, or Intrusive Mound-like materials appear in the archaeological record of the Delmarva Peninsula (Ibid). These outside influences originated from the eastern Great Lakes region, the New England area, and the Canadian maritime province. Large Kipp Island or Webb Phase cemetery sites and massive habitation sites have been found along parts of Delmarva's Atlantic coast and within the middle Chesapeake Bay section of Maryland's Eastern Shore.

The coastal habitation sites on Delmarva include assemblages of Jack Reef type projectile points, mica and sand tempered ceramics, along with a variety of bone tools. Interestingly, some of the lithic materials used to make a few of the Jack's Reef points found locally were quarried from outcrops in Ramah Bay, Labrador, which is over two thousand miles north of the Delmarva Peninsula near the Arctic circle. A truly massive Ramah chert pentagonal biface from the Labrador quarries was found at the Riverton site (Loring 2002: 180), along the Nanticoke River in Wicomico County, Maryland. The Ramah quartzite biface from Riverton was found in association with Jacks Reef corner-notched and un-notched points, as well as, numerous exotic stone platform pipes.

Delmarva's Kipp Island, Webb Phase, or Intrusive Mound-like sites suggest something more than simple trade and exchange. Custer et al. (1990) believe that the Kipp Island or Intrusive Mound-like materials found associated with Delmarva's Webb phase indicate an actual migration of people into the area. There may be some local data that lends credence to this idea. At contemporaneous sites in Maine, Bourque (2001:89-94) notes a marked increase in exotic materials from Ramah Bay associated with a corner-notch point type that is more commonly found at late prehistoric sites in Newfoundland and Labrador. The Ramah chert biface from the Riverton site would hint towards a northern intrusion into the area. Whether this intrusion was from the far northeast or from the direction of the Great Lakes is up for debate.

During the entire Middle Woodland period, there is evidence of intensive use of estuarine and marine resources. Large shell middens with oyster, soft-shell clam, razor clam, hard-shell clam, ribbed mussel, bay scallop, and whelk are found along the shorelines of the Delmarva. Some of the fish remains (i.e., bull shark and juvenile Great White shark) reported by Lowery (2013b) from the Upper Ridge site are associated with that site's Webb Phase component. Because of the stabilization of sea level during the Middle and Late Woodland periods, these circumstances may have provided a biased archaeological expression of intensive marine resource use by regional prehistoric peoples. The bias may simply be the result of the fact that more Middle and Late Woodland age terrestrial shoreline settings, which were used as fishing localities, have survived marine transgression.

The Middle Woodland period was marked by a climate with initially warm and wet conditions, changing to the warm and dry conditions associated with what some researchers have called the "Medieval Warm Period" (Cline et al. 2001; Millis et al. 2000). Within the larger Delmarva area, there are numerous Middle Woodland sites found in agriculturally disturbed tilled fields, appearing in all varieties of parent soil types (i.e., sand, silt, or loam). Sea level circa 2,000 years BP was approximately 2.3 meters (7.5 feet) lower than present. By the end of the Middle Woodland period circa 1,000 years BP, sea level had risen to approximately 1 meter (3.3 feet) lower than present. Given the sea level history, fewer Middle

Woodland-era estuarine and marine oriented prehistoric occupation sites would be buried below tidal marsh deposits in inundated upland settings than in previous periods. Also along the Atlantic seaboard, transgressive barrier island processes may have buried some Atlantic coastal sites below coastal dune formations.

Several archaeological sites in the region indicate aeolian dune formation and the subsequent burial of Middle Woodland and pre-Middle Woodland archaeological components along widely separated sections of coastline adjacent to the Chesapeake Bay (Cline et al. 2001; Lowery 2001). These natural site burial processes may be associated with the warm and dry conditions of the "Medieval Warm Period." In some areas, drought conditions, lower sea level, greater tidal amplitudes, and intense winds likely resulted in marked coastal dune building, which buried some archaeological sites.

Late Woodland Period (1000 - 400 Cal. Yr. BP)

Late Woodland era prehistoric settlements are, by far, the most common coastal sites on the Delmarva Peninsula (Custer 1989; Dent 1995; Reinhart and Hodges 1992). The increased density of sites over other time periods probably indicates an increase in regional populations, or perhaps an intensive focus of occupation in the coastal plain. One could also argue that the increased evidence of archaeological sites of this time period could also be a by-product of more stable coastlines with slower rates of sea level rise.

Late Woodland era stone tool kits are almost exclusively made from locally found cobbles that were collected from secondary geologic deposits. Stone triangular arrow points are made from cobbles of chert, jasper, quartz, and quartzite. Late Woodland assemblages also include highly decorated shell-tempered ceramics. The decorated ceramics may indicate a continued change in local ceramic technologies during this period. The lack of exotic or non-local lithic artifacts in Late Woodland assemblages suggests that the broad-based exchange networks of earlier periods were disrupted or severely attenuated. Trade in marine shell and soapstone pipes may have continued during the Late Woodland period. Aside from the triangular arrowheads and small utilized flakes commonly found at most Late Woodland sites, small ground stone celts or ungrooved axes are also present during the Late Woodland period. The meaning behind the transition from the larger wood working tools, common during the Late Archaic period through most of the Middle Woodland period, to the much smaller stone axe is not clear.

Many models for Late Woodland era settlement patterns and demography have been proposed for sections of the Middle Atlantic region (Reinhart and Hodges 1992). Late Woodland era sites vary in size depending on the setting and, like other Woodland era sites, produce obvious sub-surface features (Custer 1989). Late Woodland cultures on the Delmarva seem to have practiced a wide variety of subsistence strategies and seem to have had diverse patterns of social organization. There is virtually no evidence of agriculture on Maryland's eastern shore during this period. Research at the Holland Point site in coastal Dorchester County, Maryland (Walker 2003), for example, revealed no evidence for the use of cultigens. Meanwhile, the peoples living on the Virginia section of the Delmarva seem to have practiced an agricultural lifestyle (Rountree and Davidson 1997). Custer (1989) indicates only a limited use of cultigens for the Late Woodland peoples living in Delaware.

Based on the preserved remains from refuse features, hunted and gathered resources, such as deer, nuts, seeds, and berries, seem to have provided the bulk subsistence stores. For most of the Delmarva Peninsula during the Late Woodland period, there is evidence of intensive use of estuarine and marine resources. Large shell middens with oyster, soft-shell clam, razor clam, hard-shell clam, ribbed mussel, bay scallop, and whelk are found along the shorelines of the peninsula. The stabilization of sea level rise during the Late Woodland period may have resulted in a larger, more evident archaeological expression of regional marine resource use in modern terrestrial settings.

The Late Woodland period is marked by a climatic transition from the warm and dry conditions associated with the "Medieval Warm Period", circa 1,200 to 800 calendar years ago, to an era of colder winter temperatures associated with the "Little Ice Age", circa 600 to 150 calendar years ago (Cline et al. 2001; Kutzbach and Webb 2001; Millis et al. 2000). Periods of protracted droughts have also been reported for the latter portion of the Late Woodland period (Stahle et al. 1998). Brush (2001) has reported evidence of extensive fires and possible forest burning events during the Late Woodland period. These fires may have been the result of cultural burning episodes. Numerous burned and presently inundated upland forests have been observed beneath a mantel of tidal marsh deposits in Dorchester and Somerset counties, Maryland and in Accomack County, Virginia.

Sea level circa 1,000 years BP was approximately 1 meter (3.3 feet) lower than present. By the end of the Late Woodland period circa 500 years BP, sea level had risen to approximately 0.5 meters (1.6 feet) lower than present. Over the past 500 years, a limited amount of sea level rise combine with shoreline erosion has further sculpted the overall outline and shape of the bay. In areas subjected to drought conditions, impacted by intense winds, and associated with copious amounts of parent sand material, the aeolian dune development may have continued. Given the sea level history, some of the Late Woodland sites originally situated along coastlines would have been buried beneath tidal marsh peat. However, shoreline erosion may have played a major role in destroying many Late Woodland sites in coastal areas. From circa 2,000 years ago to present relatively stabilized sea levels in and around the Chesapeake Bay may have resulted in many bay front archaeological sites being lost to shoreline erosion. The relative scarcity of Late Woodland settlements situated along the modern Atlantic seaboard may imply that some of the Atlantic coastal sites were buried below coastal dune formations as a result of natural transgressive barrier island processes.

Contact Period (400 - 300 Cal. Yr. BP)

Only a few Contact era sites have been found in Delmarva (Custer 1989; Dent 1995; Reinhart and Hodges 1992; Rountree and Davidson 1997). The lack of sites may simply be an indication of the smaller unit of time associated with this era. Even so, records suggest that diseases introduced by the first European explorers may have decimated the Native population. Access to trade goods, along with the displacement of native groups, the establishment of the reservation system, as well as warfare and conflict characterized this period. On Maryland's Eastern Shore, a reliance on agricultural goods developed as a subsistence base for the first time. The reason for the late adoption of agriculture seems to have been the confinement of Native peoples to smaller tracts of land, which was a result of the reservation system. As during the Late Woodland period, local, secondary cobble sources were almost exclusively used to make stone tools during the early part of the Contact period. Stone triangular points and Townsend-style ceramic technologies continued during Contact period. However, Contact period assemblages are distinguished by the inclusion of European metal goods (i.e., guns, knives, and hoes), cut fragments of copper and brass, cut copper and brass triangular projectile points, clay smoking pipes, European ceramics, and glass trade beads.

The Contact period is marked climatically by colder winter temperatures associated with the "Little Ice Age", circa 600 to 150 calendar years ago (Cline et al. 2001; Kutzbach and Webb 2001; Millis et al. 2000). Sea levels had stabilized by this time and were essentially the same as today or only slightly lower, and the marine resources available in the Chesapeake Bay were obviously more abundant than today. Early accounts (Wharton 1973) indicate that large reefs of oysters, abundant fish species, sea turtles, and seals occupied portions of the Chesapeake ecosystem. Aside from deer, the terrestrial landscape included a variety of regionally extirpated species, including elk, puma, bobcats, wolves, and possibly bison. Species of trees that are no longer present in large numbers, such as the American chestnut and American elm, would have been part of Delmarva's forest ecosystem.

With respect to the Native cultures that once occupied the Delmarva Peninsula, their lifestyle dramatically changed. The 16th century John White paintings portray a proud people who had adapted to the region over a period that spanned many millennia.   With the colonization of the region by the English in the early 17th century, the prehistory of the Chesapeake Bay would end and the lifestyles of its native inhabitants would be dramatically altered. The coastal hunting and gathering lifestyle illustrated by John White in 1585 survives only in the archaeological record. Even today, clues about these ancient prehistoric cultures and their environment lie buried underfoot and exposed along eroded shorelines adjacent to the Chesapeake Bay and its tributaries. The features, objects, artifacts, and debris created, discarded, buried, and coveted by these early natives are the most tangible clues about the lifeways associated with the prehistoric cultures of the Delmarva Peninsula. Even though this type of research is largely ignored, these cultural objects and features can also provide very important data about environmental and ecological change.

Historic Period (400 - 0 Cal. Yr. BP)

With respect to the history of the Virginia eastern shore, the details are much more regionally specific. Many volumes have been published on this topic, which highlight various aspects of the local history (see Wise 1911; Whitelaw 1951; Turman 1964). Each one of these volumes covers various nuances about the history of the Virginia eastern shore. The reader is advised to seek out these references for more in-depth data relative to the subject. Given the large volume of data, rewriting the history of both Accomack and Northampton counties would not do justice to important individuals, significant places, and the key factors involved in shaping the historical landscape. The reader will also note that in the detailed historical volumes mentioned (see Wise 1911; Whitelaw 1951; Turman 1964) selective individual interpretations are evident. The authors of each of these volumes emphasized certain individual aspects of the past and de-emphasized other aspects. As a result, neither of the historical volumes represents a holistic all-encompassing view of the history associated with the Virginia eastern shore. Future researchers and archaeologists are advised to conduct an analysis of the primary historical resources of the region, when focusing on an individual property, residence, place, or archaeological site.

Virginia's eastern shore was initially surveyed and explored by John Smith in 1608. The first documented settlement or use of the region by Englishmen occurred in 1614 when the Virginia Company sent Lt. William Craddock to the eastern shore to purchase land from the Indians to provide salt and fish for the Jamestown settlement and 1616 "Dale's Gift" had been established south of Old Plantation Creek. The first permanent settlement appears to date to circa 1619, when Thomas Savage moved to what is now known as Savage's Neck near Eastville. In 1663, Virginia's eastern shore was divided into two counties. Throughout the history of the region, the northern boundary between Virginia's eastern shore and Maryland has episodically been contested. The historical economy of Virginia's eastern shore has largely been based on agricultural. However, seafood economy has also developed.

Over the past 400 years, the northern hemisphere climate has change. At the time of European arrival, initial exploration, colonization, and through the mid-19th century, the northern hemisphere (see Alley 2004) was experiencing colder conditions, which is referred to as the "Little Ice Age" (see Figure 2.2). Over the past four centuries, the amount of relative sea level change within the Middle Atlantic region is highly debated and different values have presented. For example, Boon (2012) modeled the amount of sea level change in the region based on tide records. Boon (ibid) calculated a >40-centimeter change in sea level at the mouth of the bay over the past century. He (Ibid) calculated a ~30-centimeter change in sea level near Baltimore harbor over the same time period. However, Boon's model failed to take into account changes in tidal amplitude within the bay as a result of sediment accumulation at the bay's mouth over the past 50 years (see Lowery 2015). Other researchers (Kemp et al. 2011) have indicated that sea level in the Middle Atlantic region was stable between 1400 calAD and 1880 calAD. For the Middle Atlantic area, these authors (Ibid) have also concluded that sea level has risen 2.1 mm per year beginning around 1880, which calculates to ~23-centimeters of rise over the past 130 years.

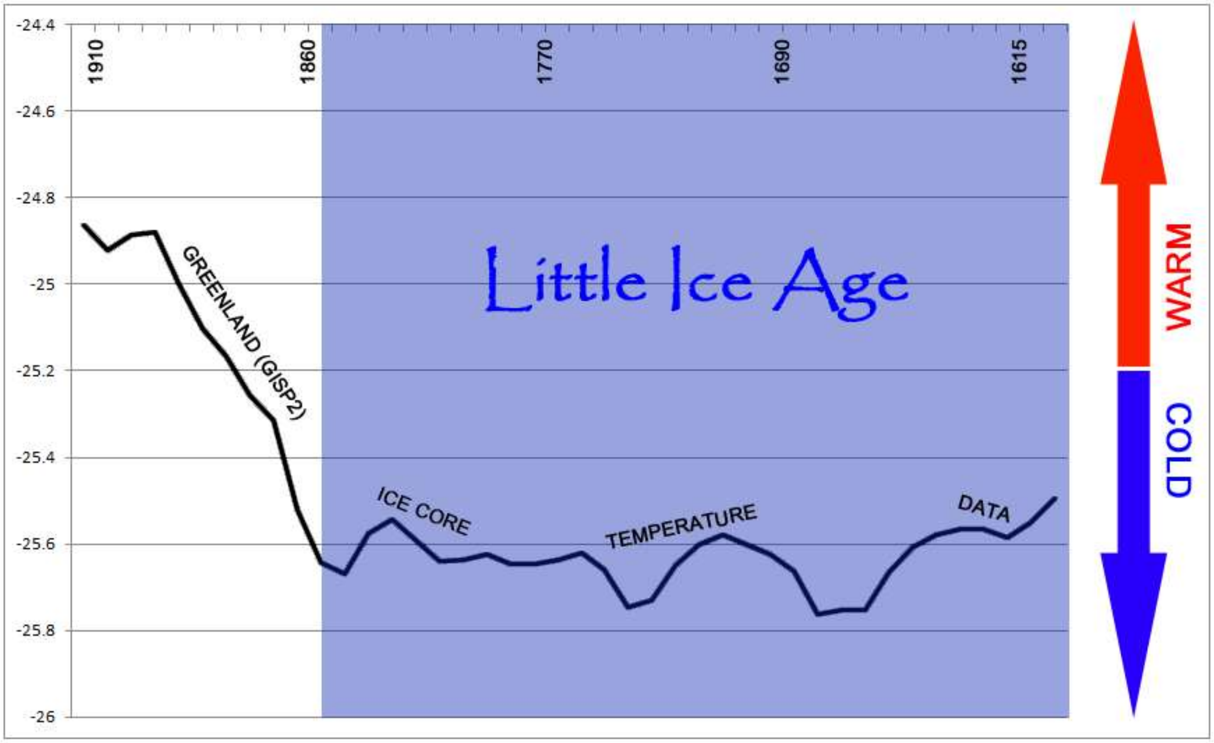

Figure 2.2. The graph illustration highlights the changes in the northern hemisphere climate as indicated by the Greenland (GISP2) ice core temperature data.

RESEARCH METHODOLOGY:

In doing similar shoreline surveys, Lowery (2001, 2003a, 2008, and 2015) has identified some of the unique aspects of archaeological site survey in coastal settings and the numerous variables that require consideration. Prior experience was important in shaping and defining the methodology employed in this project. The first objective of the project was to conduct a pedestrian survey of all coastlines within the survey area. The second goal was to identify evidence of previously documented or newly exposed archaeological sites or features impacted by erosion.

The approach would be to concentrate on examining all coastal edge profiles within the study area, assess the bank exposures for archaeological features, collect all associated and displaced artifacts within the inter-tidal zone at each locality or site, and photographically document the condition of each site. The drawback to this approach is that it is difficult, and largely impossible, to accurately gauge the inland extent of each site and the variety of possible features without extensive subsurface testing inland of the shoreline. As such, most of the sites found during this survey have only one dimension (i.e., length or width) accurately recorded. The assumption being that extensive archaeological remains associated with a given shoreline exposure implies that additional archaeological features extend inland from the shoreline.

Notwithstanding the drawbacks, a shoreline survey has several distinct advantages. First, exposed and eroded shorelines allow for the detection of sites without extensive subsurface testing. Sub-surface testing is time-consuming and consequently covers less ground during any given period. This is particularly true in many settings around the Chesapeake Bay, where layers of tidal marsh peat and waterlogged soils make excavation more time-consuming. Coring with an auger is also often impossible; as suction associated with these waterlogged settings usually makes it difficult to examine the soils associated with drowned archaeological sites.

The primary goal of the project was to gauge how archaeological sites are being impacted shoreline erosion and subsequent upland land loss. As such, shoreline archaeological surveys take advantage of coastal erosive processes to maximize the potential for site visibility. Furthermore, this type of approach also identifies the archaeological sites that are rapidly vanishing and subjected to the greatest loss due to erosion. In coastal areas around and adjacent to the Chesapeake Bay and along the Atlantic shore, natural shoreline erosion is the greatest threat to the region's archaeological heritage. To understand the long-term erosion threat, repeated and episodic shoreline surveys covering the same coastal area represent the best method to gauge archaeological site loss.

All shorelines within and adjacent to the study area were accessed by a boat. In offshore areas associated with potentially hazardous wave-weather conditions, a 15' Boston Whaler was used during the fieldwork. In shallow coastal bays subjected to extreme tidal ranges, a 17' Carolina Skiff was used to conduct the fieldwork. All shorelines were examined at maximum low tide. The tidal cycles for the study area were accessed online to coordinate the fieldwork during periods when the tide was low at or near mid-day. As such, the mid-day timing of low tide would provide the maximum daylight hours for fieldwork. The advantage of examining shorelines at low tide is clearly evident in Lowery's (2003a:

Figure 2.39 and 2.40) illustration showing the same archaeological site along the Atlantic coastline of Northampton County, Virginia at both high tide and at low tide. The tidal amplitude, which can be extremely variable within the Middle Atlantic region, can hinder or facilitate the discovery of archaeological sites along eroded shorelines. For example, the tidal amplitude (i.e., the daily range of high and low tide) within Back Bay, Virginia is <15 centimeters (< 6 inches) and the tidal amplitude for Magothy Bay, Virginia is >135 centimeters (>4.5 feet). Given these natural controls, eroding coastal archaeological sites are more readily identifiable and accessible in coastal regions with greater tidal amplitudes.

Prior to the fieldwork, soil maps associated with the study area were evaluated for potential soil types indicative of geological landscapes that might contain archaeological deposits. The approximate age of a particular landscape can be roughly estimated by the surface soil. The surface of a tidal marsh is a byproduct of sea level rise and would be geologically modern or recent in age. Most of the region's upland surface soils are late Pleistocene or Holocene in age. However, this rough approximation of age does not exclude the possibility of archaeological sites and features being situated on a drowned upland landscape beneath a geologically recent tidal marsh peat deposit. The actual fieldwork will help to assess the precision or the degree of flawed data presented by the published soils maps.

Historic aerial photographs and satellite images associated with the study area were assessed to better understand shoreline erosion and sediment accretion over the past 60 years (see Figure 2.3). Georeferenced satellite images for a 15-year interval were used to accurately gauge and measure the erosion and land loss in meters. These aerials photos and satellite images also provided important data relative to recent changes in land-use patterns. Historic coastal survey maps (see Figure 2.4) were also employed to gauge erosion, accretion, land surface modifications, and land-use changes over the past 160 years.

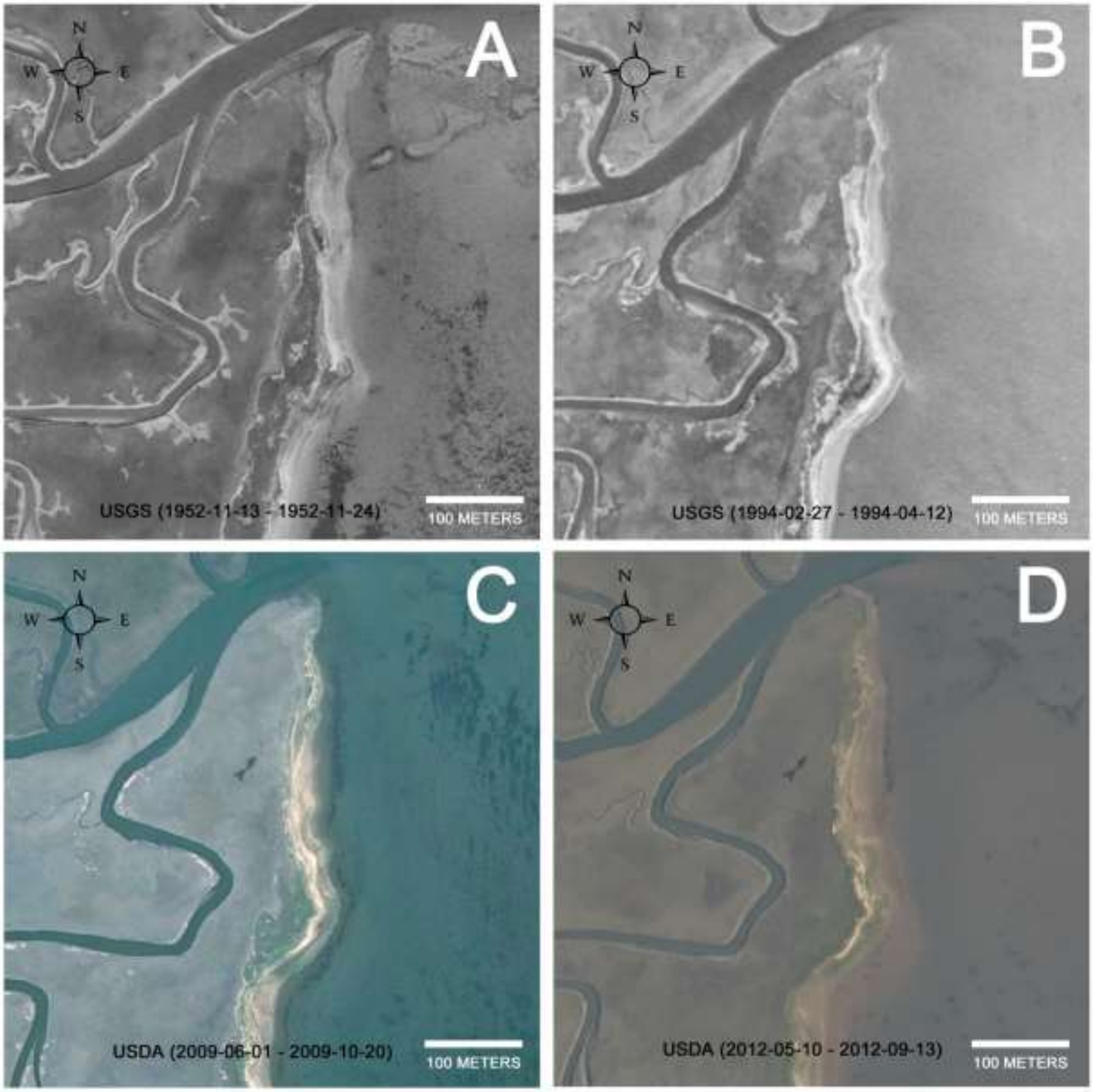

Figure 2.3. The series of aerial photographs and satellite images bracket the same area associated with both 44NH440 and 44NH441 in 1952 (A), 1994 (B), 2009 (C), and 2012 (D). Georeferenced versions of these and other images were incorporated into a GIS database to determine the degree of erosion at each archaeological site over a 15-year interval.

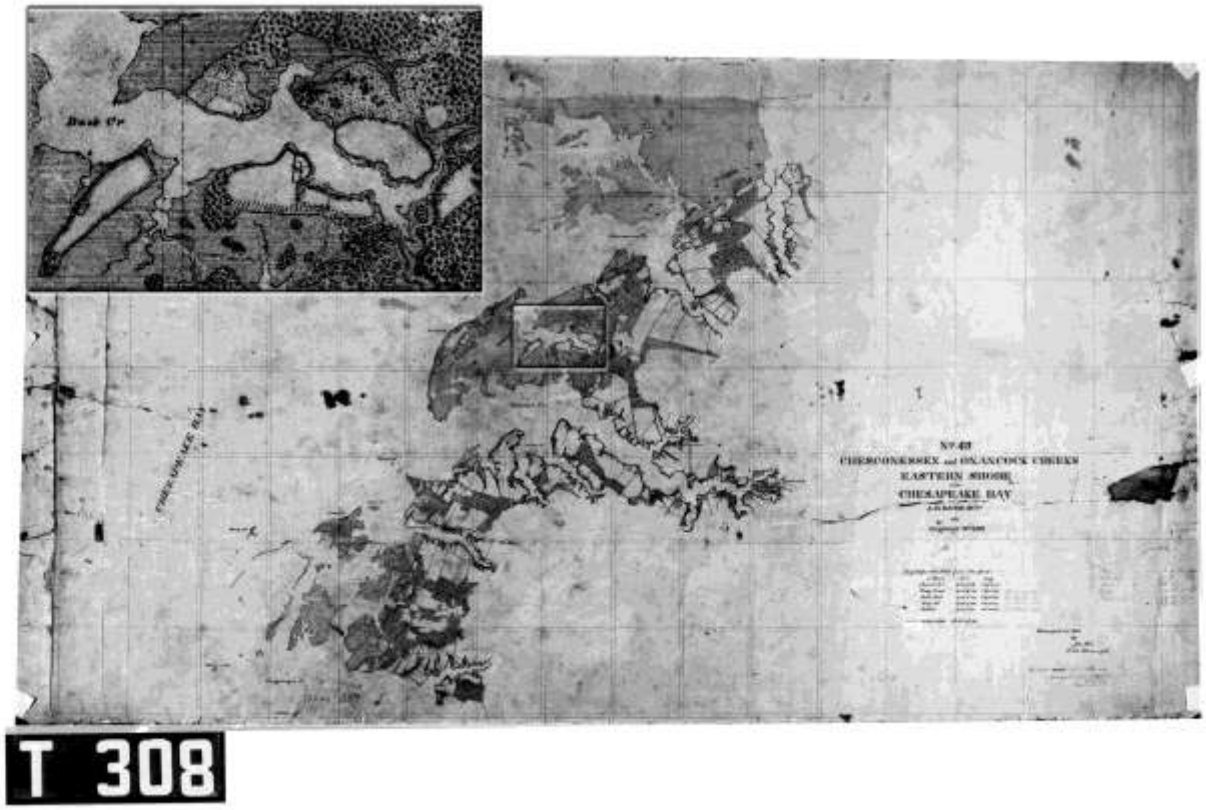

Figure 2.4. The image shows U.S. Coastal Survey Map (T-308). Map T-308 shows the boundary of the shoreline, the tidal marshs, the forested uplands, the tilled fields, the locations of houses, and other outbuildings during the mid-19th century. Georeferenced versions of these coastal survey maps were used to understand land surface changes and shoreline changes at each site location.

Obviously, weather impacted the timing of fieldwork within the study area. Even during weekly periods with ideal tidal conditions, wind direction and velocity greatly influenced if fieldwork could be performed. During the initial phase of the survey in February 2015, thick ice accumulations along the bay and the tidal creeks along the coast hampered the fieldwork. Each stretch of shoreline has its own unique fetch variables. The same wind and wave actions processes that are destroying many coastal archaeological sites also effect whether a boat can be safely used and securely anchored to conduct the fieldwork.

All of the sites examined and discovered during the fieldwork were photographed with a digital camera. A Pentax WG-III camera was used during the fieldwork. The camera has GPS and north-axis orientation capabilities. As such, the longitude, the latitude, and the orientation relative to true north were automatically recorded within the properties of each digital photograph. The precision of the GPS data and the orientation documented for each photo were tested against a georeferenced satellite imagery

GIS data layer. The all photographs were accurately relocated and plotted on the GIS satellite imagery layer.

The artifacts from each site location were bagged and labeled independently. Data relevant to each site (i.e., site name and the GPS coordinates) were noted on each artifact bag. The boundaries of each site were recorded on georeferenced satellite images rather than the standard U.S.G.S. 7.5’ minute quadrangles. Given the magnitude of erosion and the marked coastal margin changes over the past two decades, the dated U.S.G.S. quadrangles were found to be extremely inaccurate and should not serve as a measure to gauge archaeological site or shoreline erosion rates.

Archaeological site data were uploaded to VCRIS (Virginia Cultural Resource Information System). New site numbers were issued for previously undocumented sites. The artifact assemblages found during the survey were assessed based on recognized types for the region (see Lowery 1999). The quantity of artifacts and a description of the assemblages were noted for each site.   Photographs were also taken of current assemblages, as well as archived site collections associated with prior investigations. Finally, a summary report was completed outlining the results of the survey.

3. SURVEY RESULTS AND COASTAL ARCHAEOLOGICAL SITE SUMMARY

The following summaries describe all 243 sites located or formerly located along the coastlines of both Accomack and Northampton counties in Virginia. The primary goal was to provide individual histories about each site, a description of the cultural chronologies and archaeological features associated with each site, a narrative of each site's setting, and a measure of the observed loss of shoreline for each locality spanning a fifteen year period. The fifteen-year interval was chosen because the 1999 and 2001 coastal surveys (Lowery 2001 and 2003a) documented seventy-seven percent (152) of the known sites during these two years. As such, the land and archaeological feature loss associated with the greater part of the known sites could easily be quantified with comparative archival imagery.

As a result of the fieldwork, 1,289 linear miles of shoreline were examined. Of the 198 previously recorded coastal sites, 35 of the sites have been completely lost to erosion over the past 15 years. Some protected landforms (e.g. forested hummocks) once situated inland of the coastline in 1999 and 2001 are now actively eroding. Consequently, 45 previously unknown and undocumented archaeological sites were discovered and recorded as a result of this survey. Subtracting the 35 losses from the previous total, one could argue that there is a net gain in the number of identified archaeological sites for these two counties. A total of 243 archaeological sites are or were originally associated with the shorelines of both counties. Minus the 35 currently destroyed by erosion, only 208 remain.

The titles for each site denote the site's name and its official state site number. These titles are color coded. A "green" title indicates the site was discovered and documented as a result of the recent survey. A "black" title indicates the site was previously recorded and parts of the site still survive today along the coastline. A "red" title indicates that the site has been completely destroyed by erosion. The boundaries of each site were plotted on 2013 or 2014 satellite images for the corresponding coastal area within each county. The satellite images and site locations are included as figures for the associated site narratives. With a datum of WGS84, the longitude and latitude in degrees, minutes and seconds denote the center of each site as shown in each corresponding figure. Additional figures included with the narratives show unique aspects (e.g., the setting, comparative historical map overlays, site specific archaeological assemblages, in situ artifacts and features, and soil profile summaries) for selected sites.

Each site description or narrative has been numbered. By using the base map shown in Figure 3.0, each number provides an approximate location for the site along the coastlines of both Accomack and Northampton counties.

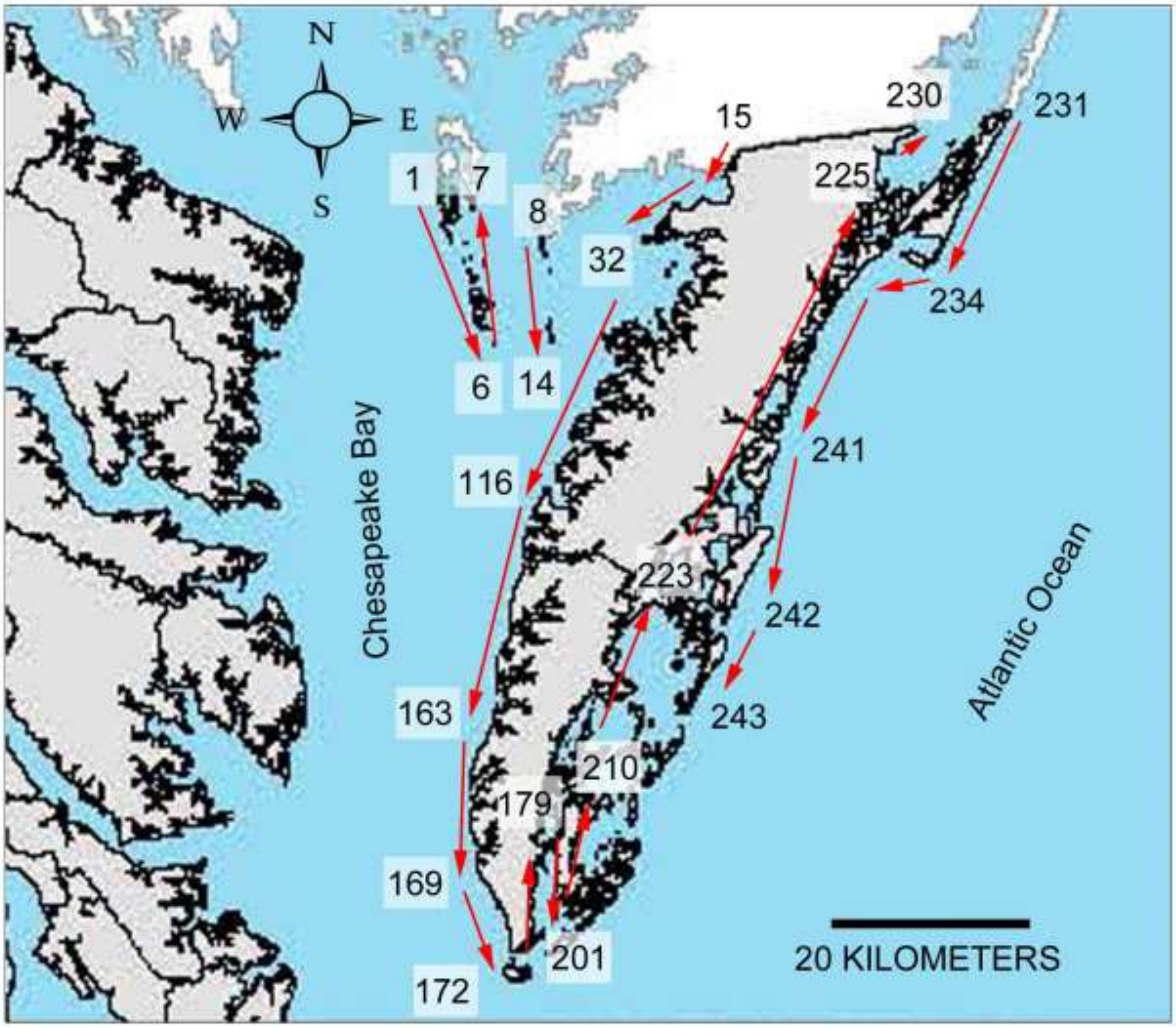

Figure 3.0. The map denotes the approximate locations of the numbered archaeological sites described in the following narratives.

1). **Hog Neck - 44AC0653**

The site was recorded based on information gleaned from Tim Marshall, a local resident of Smith Island. Over the past several decades, he has found a mixture of Paleoindian through Late Woodland-era projectile points at this location (see Figure 3.1). He has also noted the presence of 19th century domestic debris along the shoreline associated with a slightly elevated eroding hummock. The hummock represents the location of a former home site.

The site setting represents a dynamic shoreline with coastal beach dunes, tidal marsh, and drowned upland surfaces (see Figure 3.2). Tree stumps are occasionally observed eroding form the former upland surfaces. The seasonal movement of sand and the accumulation of organic detritus can greatly impact the visibility of the archaeological deposits.

When the area was examined, fire-cracked rock was noted. Historic debris was scattered along the shoreline. An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The shoreline at this location has eroded or receded ~146 meters (~480 feet) and ~282 meters (~926 feet) over the past decade and a half.

Figure 3.1. The image shows a representative sample of prehistoric artifacts found at 44AC653. Photos provided by Mr. Tim Marshall.

2). South Smith Island - 44AC0651

The site was recorded based on information gleaned from Tim Marshall, a local resident of Smith Island. Over the past several decades, he has found a mixture of Paleoindian through Late Woodland-era projectile points at this location. He has also noted the presence of 19th century domestic debris along the shoreline associated with slightly elevated eroding hummocks. The hummocks represent the location of former home sites.

The site setting represents a dynamic shoreline with coastal beach dunes, tidal marsh, and drowned upland surfaces (see Figure 3.2). Tree stumps are occasionally observed eroding form the former upland surfaces. The seasonal movement of sand and the accumulation of organic detritus can greatly impact the visibility of the archaeological deposits.

When the area was examined, fire-cracked rock was noted. Historic debris was scattered along the shoreline. An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The shoreline at this location has eroded or receded ~402 meters (~1319 feet) over the past decade and a half.

Figure 3.2. The satellite image shows the locations of 44AC653, 44AC651, and 44AC6.

3). Goose Harbor - 44AC0652

The site was recorded based on information gleaned from Tim Marshall, a local resident of Smith Island. Over the past several decades, he has found a mixture of Paleoindian through Late Woodland-era projectile points at this location. He has also noted the presence of 19th century domestic debris along the shoreline associated with a slightly elevated eroding hummock. The hummock represents the location of a former home site.

The site setting represents a dynamic shoreline with coastal beach dunes, tidal marsh, and drowned upland surfaces (see Figure 3.3). Tree stumps are occasionally observed eroding form the former upland surfaces. The seasonal movement of sand and the accumulation of organic detritus can greatly impact the visibility of the archaeological deposits.

When the area was examined, fire-cracked rock was noted. Historic debris was scattered along the shoreline. An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The shoreline at this location has eroded or receded ~66 meters (~216 feet) and ~24 meters (~78 feet) over the past decade and a half.

4). NW Tangier Island – 44AC0524

The site (see Figure 3.3) was recorded by Lowery (2001) as a prehistoric site with a Paleoindian through Late Woodland period occupation. At least three Clovis points have been found at this location over the past several decades. Later Archaic through Woodland period occupations have also been found at this site. One of the Clovis points found at this location was published in a 1986 article entitled "The Tangier Island Clovis Point", by Junius B. Bird and Viola Paucek in an issue of *The Chesopiean*, (24-2). The specimen currently resides in the collection of the American Museum of Natural History in New York.

In 2013, John Hayes of the Army Corps of Engineers visited the site with a local resident of the island and found a Late Archaic Savannah River point along the shoreline. However, like many of the sites in these coastal settings, the artifacts are deposited onto the modern tidal marsh as a result of storm-related wave overwash processes. Drowned upland surfaces with tree stumps occur at various locations along the shoreline. These are the submerged or partially submerged source areas for the displaced prehistoric artifacts.

An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The shoreline at this site has eroded or receded between ~143 meters (~471 feet) and ~43 meters (~144 feet) over the past decade and a half.

5). Tangier Uppers Cemetery – 44AC0571

The site (see Figure 3.3) was recorded by Mike Barber in 2012. It represents the location of a former 19th century through early 20th century cemetery that was eroding into the bay. The cemetery is associated with a linear ridge upland or hummock, which consists of late Pleistocene aeolian sediments. Excavations were conducted along the shoreline and the human remains were transported to Richmond for analysis. The cemetery was associated with a former residential area once located on the northern end of Tangier Island.

When the shoreline was surveyed in 1999, the cemetery was located far inland from the shoreline. An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The shoreline at this site has eroded or receded between ~108 meters (~356 feet) and ~135 meters (~445 feet) over the past decade and a half.

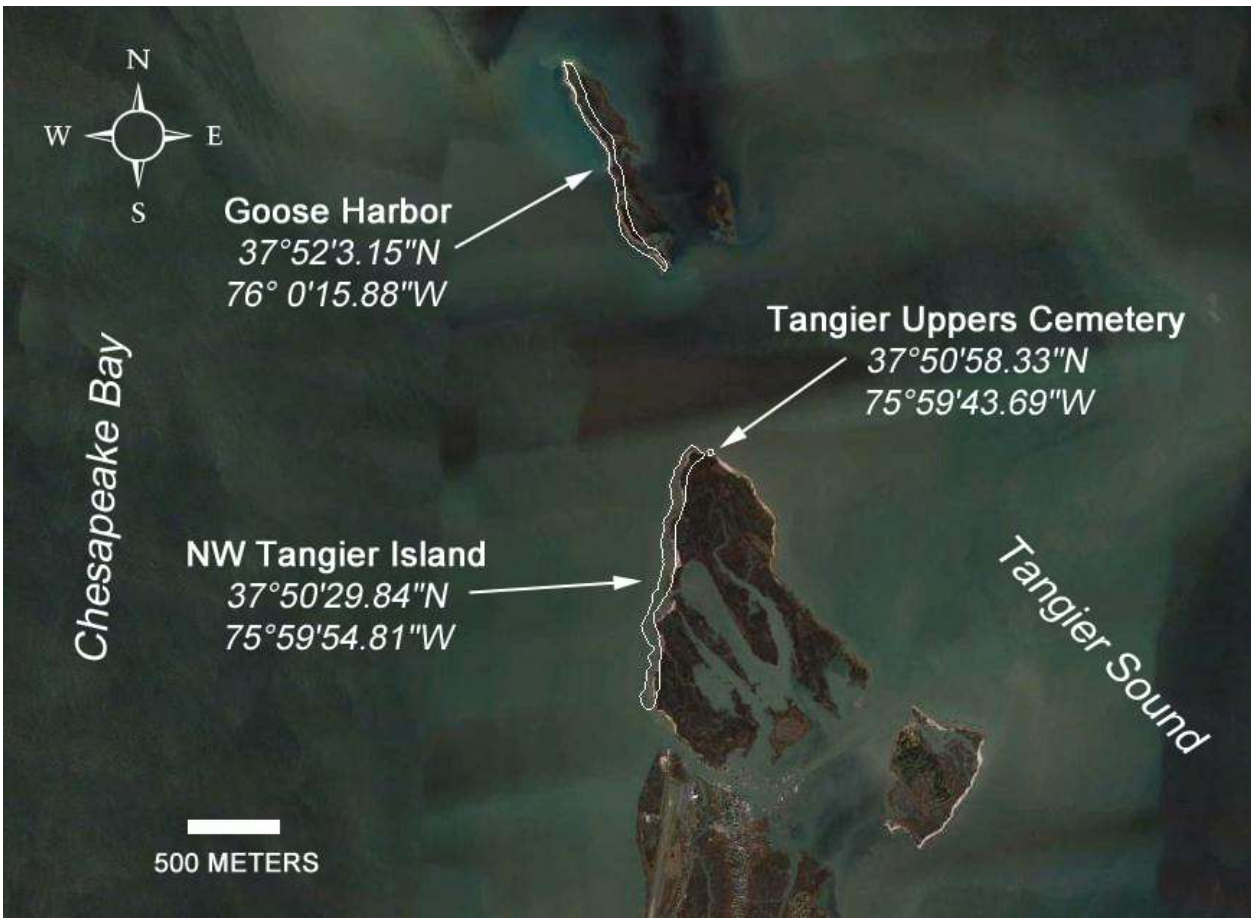

Figure 3.3. The satellite image shows the locations of 44AC652, 44AC524, and 44AC571.

6). Fort Albion – 44AC0574

The site was recorded by Gordon Watts in 2014. The 1846 US Coastal Survey map (see Figure 3.4) provided the exact location of this War of 1812 British fort. The fort was situated on a small hummock once located along the southern end of Tangier Island. The hummock was completely destroyed by erosion by the end of the 19th century. Using a georeferenced overlay of the historic coastal survey map and the modern satellite image, the original location of the hummock was situated ~770 meters (~2526 feet) south of the current southern end of Tangier Island. Given the dynamic nature of this coastal setting, the bay bottom area associated with the location of the fort should not contain in situ archaeological features or remains.

The southern end of Tangier Island consists of a sand spit, which comprises of recent redeposited sediments. The spit has shifted its location over the past several years. An overlay of satellite images provides a measure to determine the degree of land loss along the southern end of Tangier Island over the past decade and a half. The southern sand spit has shifted its location ~113 meters (~373 feet) to the north over the past 15 years.

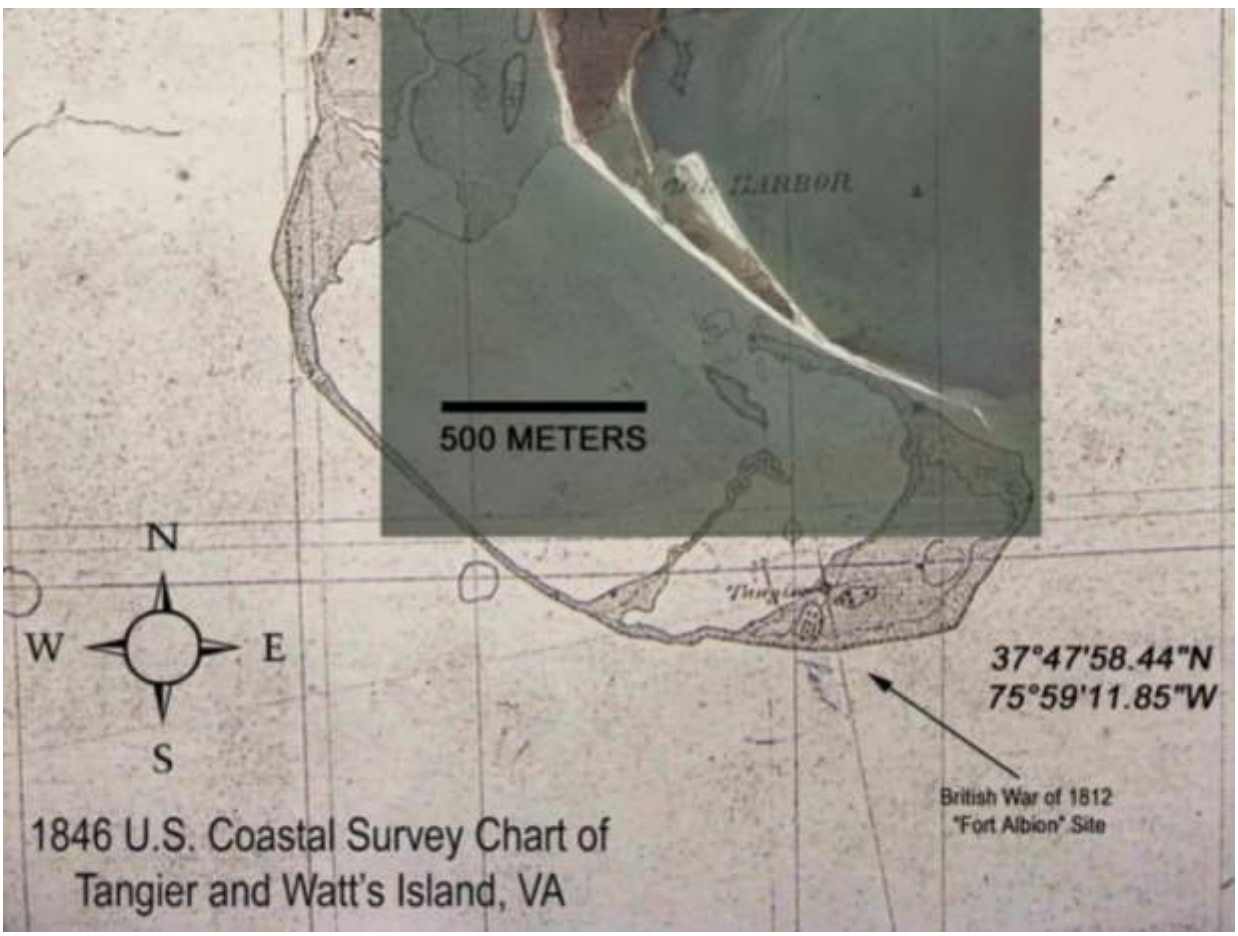

Figure 3.4. The overlay shows the modern dimensions of lower Tangier Island with respect to the 1846 U.S. Coastal Survey Map. The former location of Fort Albion (44AC574) is denoted by the arrow.

7). Horse Hammock – 44AC0006

The site(see Figure 3.2) was initially recorded by Howard MacCord in 1972 as a prehistoric site of unknown chronological affiliation. Subsequent data provided by the William and Mary Center for Archaeological Research in 1997 indicates that the site also represents an historic era colonial wharf situated over a prehistoric Archaic period site. The data were provided by an informant and reports indicate that the site consisted of materials strewn along eroded beach for a third of a mile. The descriptions would imply that the site may essentially consist of redeposited artifacts that have been overwashed onto the surface of the modern tidal marsh.

In 1999, the site location was examined and nothing was found. During this survey, the area was examined and shell was noted along the shoreline. No artifacts were discovered. The lack of diagnostic artifacts could mean that the site has been destroyed or lost to erosion.

An overlay of satellite images provides a measure to determine the degree of shoreline loss at this location over the past 15 years. The southern shoreline has eroded or receded ~139 meters (~457 feet). The northern section of the shoreline has eroded or receded ~73 meters (~240 feet).

8). Great Fox Island - 44AC0525

The site (see Figure 3.5) was initially recorded in 2000 based primarily based on data gleaned from avocational collectors. Since its initial documentation, other collectors have indicated that the site once produced numerous projectile points spanning the regions entire prehistory. Great Fox and neighboring Little Fox Island were once connected and the entire western coastlines of these conjoined islands were littered with prehistoric artifacts. Little Fox Island disappeared as a byproduct of shoreline erosion several decades ago. As of 2015, 44AC525 has been completely destroyed by erosion. An examination of the current shoreline located east of the documented site boundary on file at VDHR revealed no lithic artifacts, cultural features, or drowned upland landscape. As such, nothing remains of this archaeological site.

An overlay of satellite images provides a measure to determine the degree of land loss at this site over the past 15 years. The southern end of Great Fox Island has eroded or receded ~193 meters (~634 feet). The northern end of the island has eroded or receded ~125 meters (~411 feet).

Figure 3.5. The satellite image shows the former location of 44AC525 along the west side of Great Fox Island.

9). Watts Island 1 - 44AC0214

The site designated as 44AC214 (see Figure 3.17) was recorded by Mark Wittkofski in 1981. At the time, he noted that Daryl Hurley of Hopkins, Virginia is reported to have a collection from this location. In 1999, Lowery (2001) visited the location and found numerous lithic artifacts, which span the Early Archaic through Middle Woodland period. An incredible quantity of debitage was observed along the shoreline and in situ within the bank exposed profile. Clearly, this site was an area where stone bifaces and tools were resharpened and manufactured. Interestingly, virtually no fire-cracked rock was observed along the shoreline. The area was recognized for many years by local residents as a place to find artifacts.

Watts Island was undoubtedly part of the amalgamation of islands defined as the Russell's Isles on the 1612 *Map of Virginia*. The first patent for Watts Island (a.k.a. Gabriell's Island) was issued to Nicholas Waddelowe in 1652 for 400 acres of land (see Whitelaw 1951: 973-974). Today, Watts encompasses only ~29 acres of surviving upland and tidal marsh, which calculates to slightly more than one acre of erosion per year since the initial patent. In 1657, Waddelowe and his wife assigned their interest in the island to Robert Kinge, John Watts, Gilbert Henderson, and Robert Blake. Evidently, John Watts' name replaced the earlier title designation associated with the island. By 1662, Walter Taylor received a patent for the entire 400 acres of "Gabriell's or Watts Island". In 1672, Taylor left "Watts Island" to his son John. John Taylor patented an additional 34 acres of land at the lower end of the island called "Little Watts Island". It was this smaller island that became the location of the lighthouse in 1832. In 1672, Little Watts Island was bigger in acreage than the current main island is today. In 1847, the main island encapsulated slightly more than 150 acres of land. At that time, it contained three agriculturally-tilled upland ridges protected by a broad tidal marsh. Of these, the easternmost ridge included a residence, two associated outbuildings, and an orchard. The last vestige of eastern upland ridge washed away in 2009. The central ridge, which survives today, also contained an orchard in 1847. Three smaller forested hummocks were positioned southwest of the central ridge and adjacent to two creeks that extended through a broad marsh into the interior of the island. The remaining tilled ridge was located on the southern-end of Watts Island.

By 1702, Little Watts had been reduced in size to about 24 acres, which translates into a net loss of 10 acres over a thirty-year period or about one-third of an acre of erosion per year. In 1847 (see Figure 3.6), Little Watts Island consisted largely of tidal marsh surrounded by a man-made breakwater to protect the lighthouse and the keeper's house. A small pier or wharf was also located on the northeast side of the island. By 1923, Little Watts Island encompassed only 3 acres of land. By 1950, the land originally defined as Little Watts Island surrendered to erosion.

As of April 12th 2015, the site designated as 44AC214 has been completely destroyed as a result of shoreline erosion (see Figure 3.7). The former site location is shown in Figure located ~400 meters north of the northern-most end of the Watts Island. The bathymetry adjacent to the shoreline would suggest that the archaeological deposits and the underlying geology have been eroded and scoured away. Nothing remains to assess the cultural use of this site and/or the stratigraphy at this location. The site is essentially gone.

When the site existed, it produced an extensive array of debitage, stone tools, and other prehistoric artifacts. Prior to the island being acquired by the federal government, local residents collected artifacts from the shoreline area (see Figure 3.8). The diagnostic artifacts (see Figure A-M) within these surface collections and found at this location span the region's entire prehistory.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. The erosion observed at 44AC214 represents one of the most extreme rates of erosion noted along the entire coastline of Virginia. Since 1999, the northern end of Watts Island has retreated ~551 meters (~1808 feet) to the south or over one-third of a mile of erosion. The entire ~135 meter (~444 feet) breadth of island, which encompassed the complete distance across 44AC214, has also eroded away.

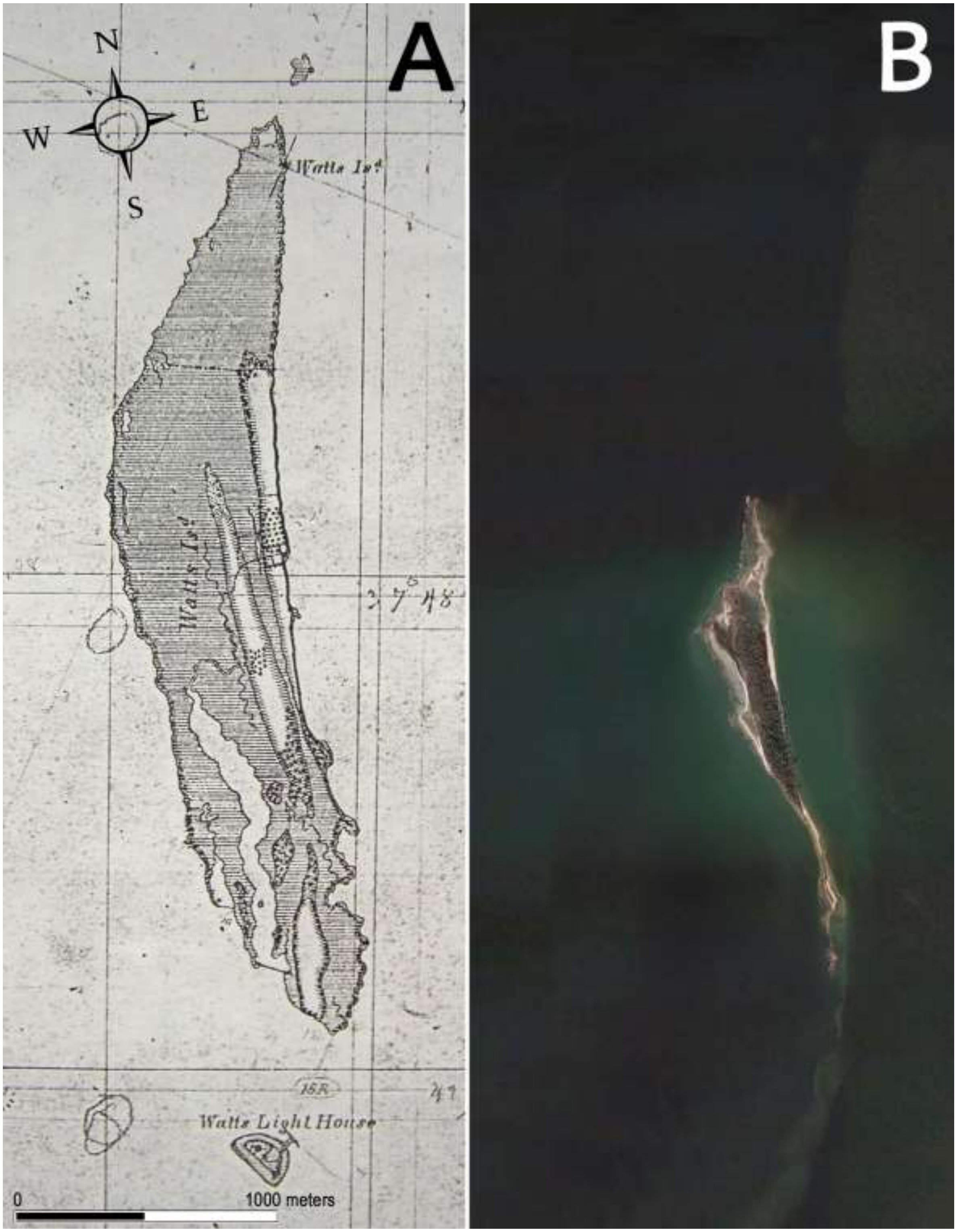

Figure 3.6. The georeferenced image provides a comparison between the dimensions of Watts Island in 1846 (left) and the current dimensions Watts Island (right) as noted on the 2013 satellite image.

Figure 3.7. The marked depth change observed off the northern end of Watts Island today provides proof that Watts Island 1 (44AC214) did not “sink” and the former archaeological site has been completely destroyed by wave-related erosion.

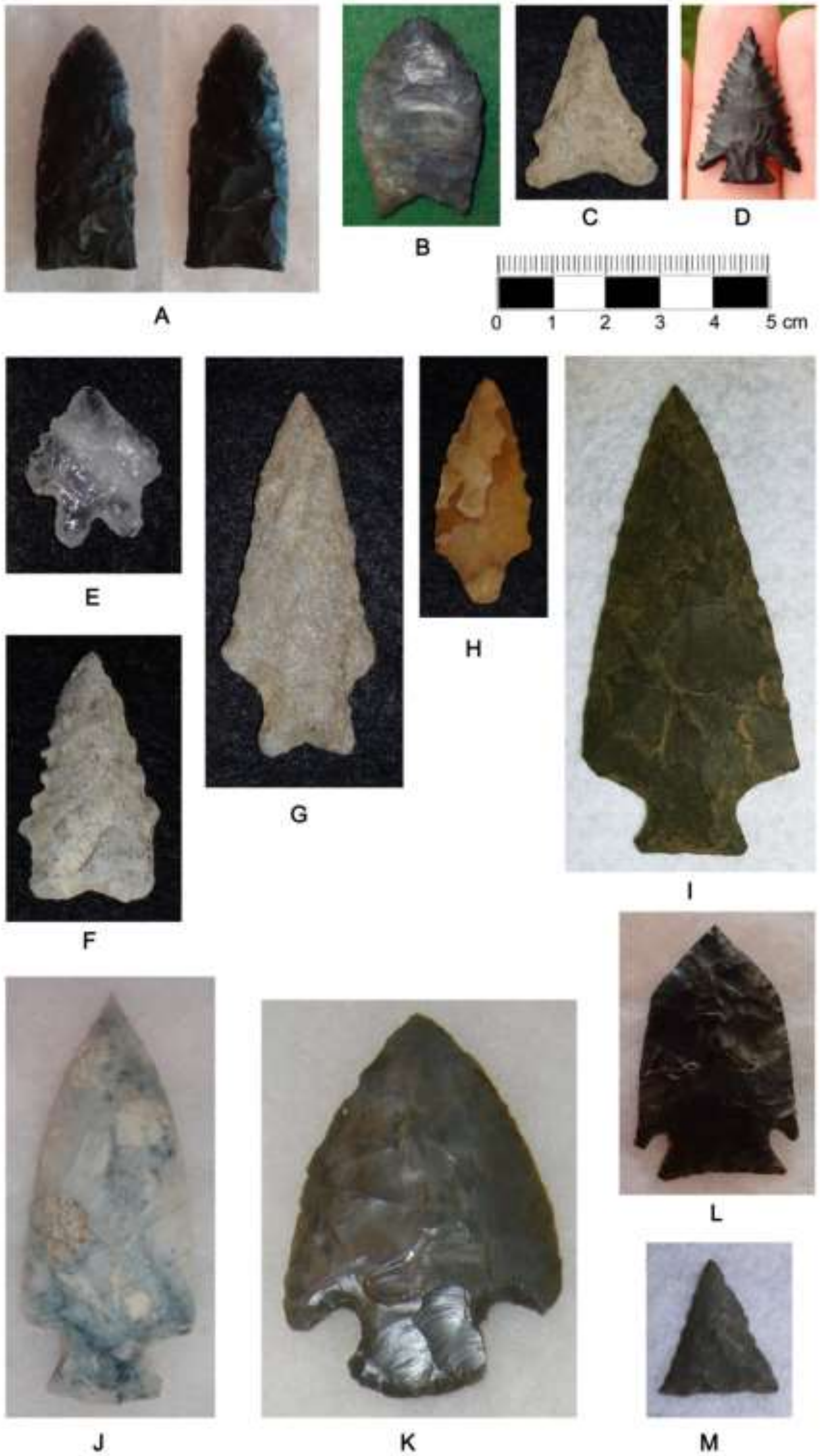

Figure 3.8. The image shows a representative sample of the artifacts found at 44AC214 by local residents many years ago. The diagnostic projectile points include distinctive Paleoindian (A-B), Archaic (C-I), and Woodland (J-M) period types.

10). North Central Watts Island - 44AC0520

The site (see Figure 3.17) was initially recorded in 1999 by Lowery (2001). As of April 12th 2015, the site designated as 44AC520 has been completely destroyed as a result of shoreline erosion. The former site location is shown in Figure located ~100 meters north of the northern-most end of the Watts Island. Like 44AC214 which was located immediately to the north, the bathymetry adjacent to the shoreline would suggest that the archaeological deposits and the underlying geology have been eroded and scoured away. Nothing remains to assess the cultural use of this site and/or the stratigraphy at this location. In 2009, a small remnant of the upland forested hummock associated with this site existed (see Figure 3.9). As of 2015, the former forested hummock has been completely eroded and the fallen trees have been scattered along the shoreline and the adjacent bottom (see Figure 3.10). The site is essentially gone. The only observable cultural feature at this location consists of three hand-hewn wooden beams embedded within the silt-loam matrix formerly encapsulated by tidal marsh peat (see Figure 3.11) . Given their location, these wooden features may have been associated with the residence denoted on the 1847 coastal survey map of Watts Island (see Figure 3.6). The easternmost ridge noted on this map included a residence, two associated outbuildings, and an orchard. One of these historic structures was positioned near the margins of the upland and the tidal marsh in 1847.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has retreated ~87 meters (~286 feet) along the northern section of the site. The southern portion of the site has retreated ~45 meters (~150 feet). The site is essentially gone.

Figure 3.9. The photograph, which was taken on 9-15-2009, shows a remnant portion of 44AC520 as it appeared seven years ago.

Figure 3.10. The photograph, which was taken on 4-12-2015, shows the northern end of Watts Island. As indicated by the fallen trees, the former forested hummock associated with 44AC520 has been destroyed as a result of wave-related erosion.

Figure 3.11. The photograph shows a series of hand-hewn wooden beams exposed along the shoreline at 44AC520.

11). Watts Island 2 - 44AC0522

The site (see Figure 3.17) was initially recorded in 1999 by Lowery (2001). As of April 12th 2015, archaeological features still exist at the site designated as 44AC522 along the northeastern side of Watt's Island (see Figure 3.12). An assemblage of material adjacent to this feature included several fragments of Westerwald stoneware, English brown salt-glazed stoneware, white salt-glazed stoneware, green wine bottle glass, brick, shell, and several corroded iron fragments. The assemblage and the associated feature would be 18th century in age. Stratigraphically, the 18th century feature is situated beneath a ~20 centimeter thick cover of tidal marsh peat and overlies a gleyed stratum, which represents a former tidal pond deposit. The tidal marsh peat formed as a byproduct of storm-related overwash detritus accretion and pond edge slope wash accumulation. Given the federal-ownership of this island, the artifacts were not collected.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has retreated ~29 meters (~97 feet) along the northern section of the site. The southern portion of the site has retreated ~24 meters (~78 feet).

Figure 3.12. The image shows a buried historic feature exposed along the shoreline at 44AC522.

12). Watts Island 3 - 44AC0523

The site (see Figure 3.17) was initially recorded in 1999 by Lowery (2001). As of April 12th 2015, the archaeological site designated as 44AC523 still exists (see Figure 3.13). The site is located along the southeast side of Watts Island and associated with an eroded upland hummock and tidal marsh. Artifacts along the shoreline consisted of some quartz and quartzite debitage, as well as fire-cracked rock. The area was clearly plowed, as indicated by the plowzone associated with the forested upland area and the historic 1847 coastal survey map. Importantly, the historic plowzone or Ap-soil horizon ends at the interface with the modern tidal marsh peat. An intact and untilled inundated A-horizon occurs beneath the tidal marsh peat layer. Aside from extreme erosion, there is very little geologic evidence to support any vertical change in sea level over the past 160 years. No diagnostic artifacts were found at this site during the shoreline examination. Given the federal-ownership of this island, the non-diagnostic artifacts were not collected.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has retreated ~54 meters (~179 feet) along the section of the site containing tidal marsh. The forested upland portion of the site has retreated ~68 meters (~225 feet).

Figure 3.13. The image shows the exposed bank profile at 44AC523 along the west side of Watts Island.

13). Watts Island 4 - 44AC0521

The site (see Figure 3.17) was initially recorded in 1999 by Lowery (2001). As of April 12th 2015, the archaeological site designated as 44AC521 still exists (see Figure 3.16). However, the site has lost most of its original land area over the past decade (see Figures 3.14 and 3.15). The site is located along the southern end of Watts Island and associated with tidal marsh, as well as a sand spit formation. A dense cluster of prehistoric lithic debris was noted along the southeast side of the site (see Figure 3.16). Artifacts along the shoreline consisted of a Late Archaic-age quartzite broadspear fragment, a quartzite biface, debitage, as well as fire-cracked rock. The site seems to be associated with a drowned upland landscape. An intact and untilled inundated A-horizon occurs beneath the tidal marsh peat layer. Over the next five years, the remnant portion of 44AC521 will succumb to shoreline erosion and ultimately be destroyed by shoreline erosion. Given the federal-ownership of this island, the artifacts were not collected.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has retreated ~67 meters (~219 feet) along the sites western side.

On the eastern side, the shoreline has retreated ~32 meters (~103 feet). The southern end of the site has retreated ~70 meters (~231 feet).

Figure 3.14. The image shows 44AC521 in 2009.

Figure 3.15. The image shows 44AC521 in 2015.

Figure 3.16. The image shows the eroded southern remnant of 44AC521 in 2015. Fire-cracked rock, debitage, and bifaces are scattered along the shoreline. In situ remains were also observed.

14). Southern Watts Island - 44AC0397

The site designated as 44AC397 (see Figure 3.17) was recorded by Mark Wittkofski in 1981. At the time, he noted that a collection of Early Woodland period points and other artifacts were found at the site. As of 2015, the site designated as 44AC397 has been completely destroyed as a result of shoreline erosion. The former site location is located ~300 meters (~986 feet) south of the southern-most end of the Watts Island. As such, nothing remains to assess the cultural use of this site and/or the stratigraphy at this location. The site has been essentially completely destroyed by erosion.

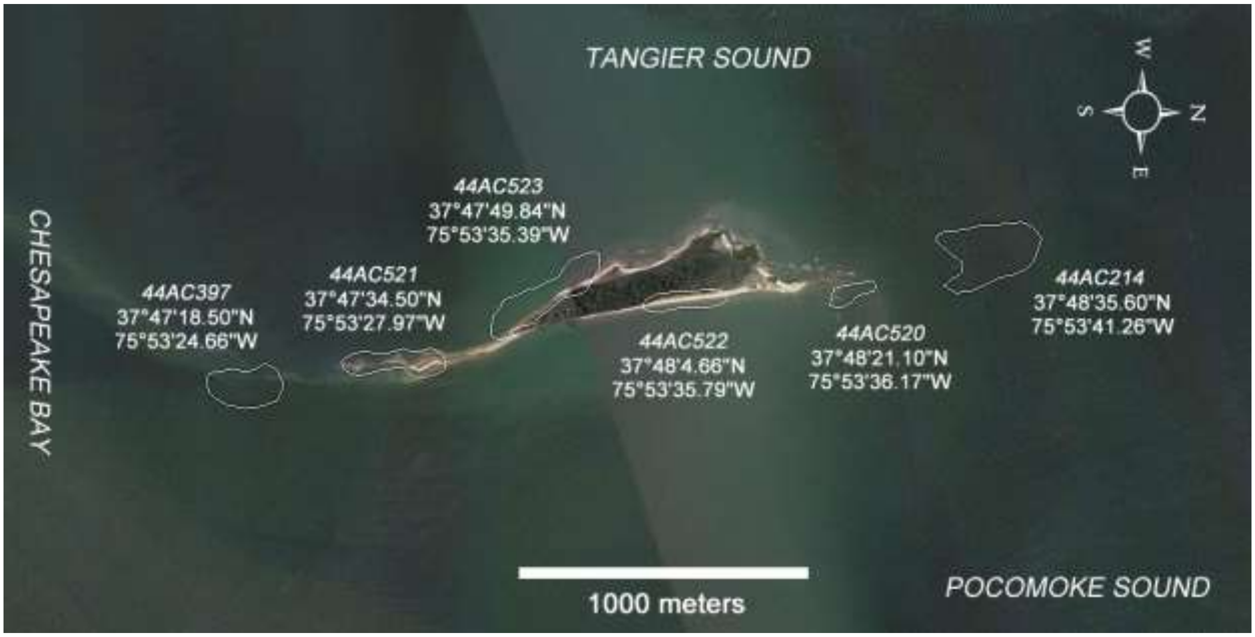

Figure 3.17. The satellite image shows the former locations of 44AC214, 44AC397, and 44AC520, as well as the current locations of 44AC521, 44AC522, and 44AC523 Watts Island.

15). Pitts Creek 8 - 44AC0626

The site (see Figure 3.18) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site encompasses an eroded shelf area adjacent to a well-drained forested upland (see Figure 3.19). Fire-cracked rock and debitage (see Figure 3.20) were discovered on the shelf area adjacent to the creek. Several small oyster shell features were noted within the bank profile associated with the intact upland. The upper portion of the bank profile includes a deposit of aeolian sand, which could be Holocene in age. The north edge of the hummock, adjacent to the creek, is markedly higher and slopes to the south. Given the stratigraphy, the site area consists of a dune formation. The dune may have formed during drier conditions over the past thousand years when sea level was lower and the tidal creek had markedly greater tidal amplitude. Similar late Holocene-age dune formations have been observed at sites in Maryland (i.e., Elliotts Island, Guinea Island, and Sandy Hill) and at sites in Northampton County, Virginia (i.e., Savage Neck, Butler's Bluff, and Latimer's Bluff). The late Holocene dune formation at this location may have buried any pre-Late Woodland archaeological components. As such, this location offers some promise for future geoarchaeological investigations.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.18. The satellite image defines the boundary and the longitude and latitude locational data for 44AC626 in Accomack County, Virginia.

Figure 3.19. The image shows the eroded bank profile at 44AC626.

Figure 3.20. The image shows the lithic artifacts found at 44AC626 during the recent survey.

16). Pitts Creek 7- 44AC0625

The site (see Figure 3.21) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of a series of hand hewn logs embedded within the tidal marsh peat and eroded upland bank (see Figure 3.22). The feature seems to be either a boat launch-way or a plank/log road structure. The ax marks suggest that the structure may be pre-20th century in age. No diagnostic artifacts were discovered.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

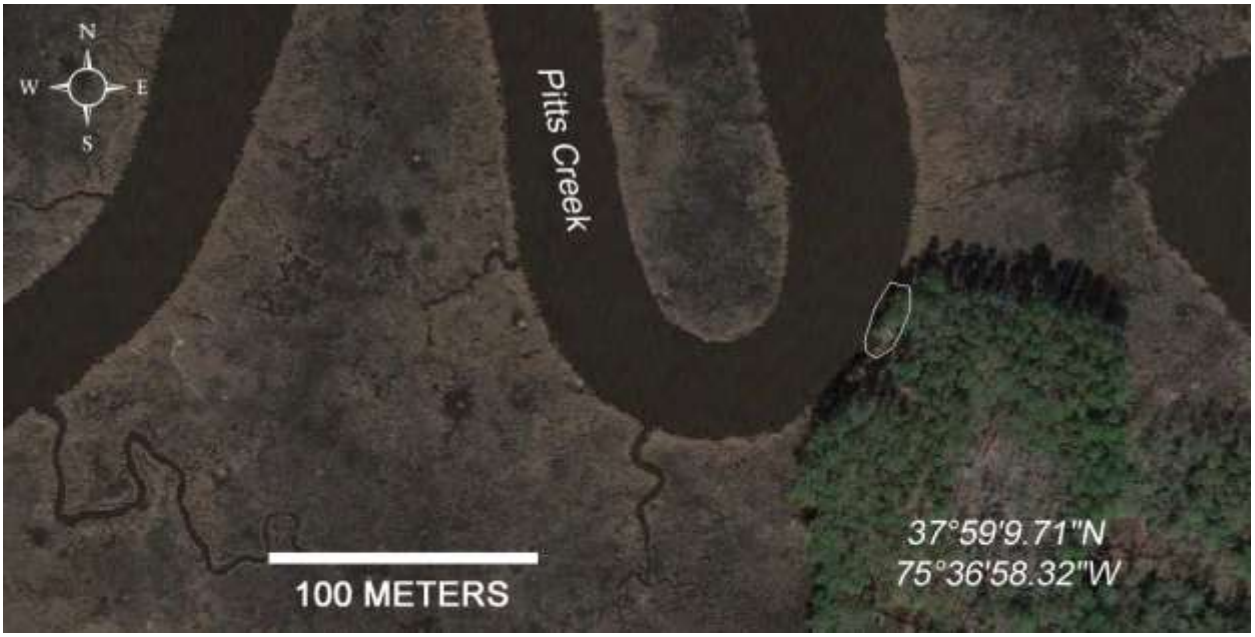

Figure 3.21. The satellite image defines the boundary and the longitude and latitude locational data for 44AC625 in Accomack County, Virginia.

Figure 3.22. The image shows the bank profile at 44AC625. Note the hand-hewn logs embedded within the tidal marsh bank profile.

17). Pitts Creek 6 - 44AC0624

The site (see Figure 3.23) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of a drowned upland landsurface, which is only visible during extreme low tide events (see Figure 3.24). The area was examined on 10-21-2015 and several pieces of fire-cracked rock were observed within the drowned A-horizon in the face of the bank profile. A single bifacial quartzite flake tool (see Figure 3.25) was also discovered embedded within the bank profile. The site seems to have an unknown prehistoric archaeological component. Given the steepness of the bank/creek edge, eroded artifacts would be deposited in the bottom of the creek channel.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.23. The satellite image defines the boundary and the longitude and latitude locational data for 44AC624 in Accomack County, Virginia.

Figure 3.24. The image shows the bank profile at 44AC624. A quartzite flake tool can be seen in situ along the edge of the exposed bank.

Figure 3.25. The image shows the quartzite flake tool found at 44AC624.

18). Pitts Creek 5 - 44AC0623

The site (see Figure 3.26) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of a shell midden feature with dense fire-cracked rock (see Figure 3.27). The assemblage found at the site includes 3 fragments of Townsend ceramics, multiple fragments of bone, 4 quartz flakes, and 1 hammerstone (see Figure 3.28). The archaeological features are located on a drowned upland beneath tidal marsh peat. At the time of occupation, sea level was lower. An AMS-date (D-AMS 0010275) was generated on an oyster shell from the midden feature at this site. The local reservoir corrected AMS-estimate for this midden feature calibrated to circa 1007 ± 14 calAD. As indicated by the ceramics, the resultant AMS-age would be indicative of the Late Woodland period.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

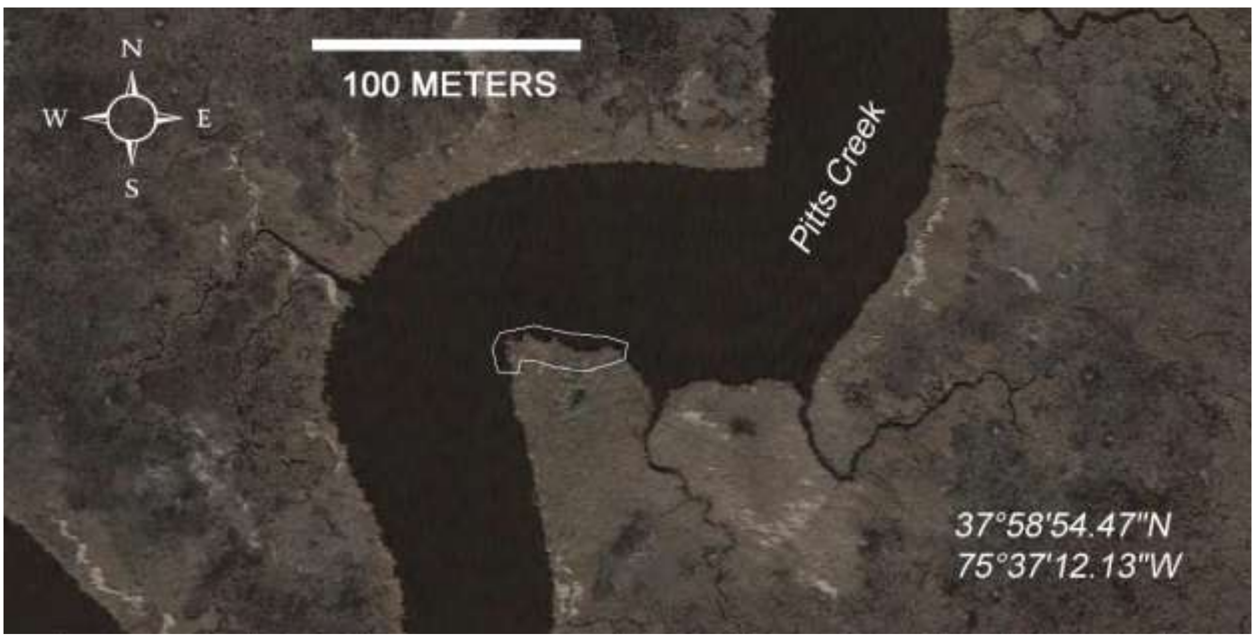

Figure 3.26. The satellite image defines the boundary and the longitude and latitude locational data for 44AC623 in Accomack County, Virginia.

Figure 3.27. The image shows the eroded bank profile at 44AC623. Note the shell refuse and the large mortar/anvil along the edge of the bank in the background.

Figure 3.28. The image shows three fragments of shell-tempered Townsend vessels and a pitted-hammerstone found at 44AC623 during the recent survey.

19). Pitts Creek 4 - 44AC0622

The site (see Figure 3.29) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of an extensive oyster shell midden located beneath a covering of tidal marsh peat (see Figure 3.30). Dense fire-cracked rock was noted along the edge of the bank at low tide. The assemblage found at the site (see Figure 3.31) included 5 fragments of Mockley ceramics, 22 fragments of deer bone, 1 quartz flake, 1 sturgeon scute, and 1 Great White shark tooth (w/use wear). The assemblage suggested a Middle Woodland era occupation of this drowned upland site area when sea levels in the bay were lower. An AMS-date (D-AMS 0010271) was generated on an oyster shell from the midden feature at this site. The local reservoir corrected AMS-estimate for this midden feature associated with Mockley ceramics calibrated to circa 644 ± 12 calAD. As indicated by the ceramics, the resultant AMS-age would be indicative of the Middle Woodland period.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.29. The satellite image defines the boundary and the longitude and latitude locational data for 44AC622 in Accomack County, Virginia.

Figure 3.30. The image shows the exposed midden along the eroded bank profile at 44AC622.

Figure 3.31. The image shows two fragments of shell-tempered Mockley ware and a fossilized (?) Great White shark tooth found at 44AC622.

20). **Pitts Creek 3 -44AC0621**

The site (see Figure 3.32) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of an eroded upland bank profile adjacent to Pitts Creek (see Figure 3.33). Fire-cracked rock was noted along the shoreline. Fragmented oyster shell was observed within the upper portion of the bank profile. A single fragment of Townsend ware (see Figure 3.34) was found along the shoreline indicating a Late Woodland occupation. The site does not overlap with the large area associated with 44AC54, which is located immediately to the north.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

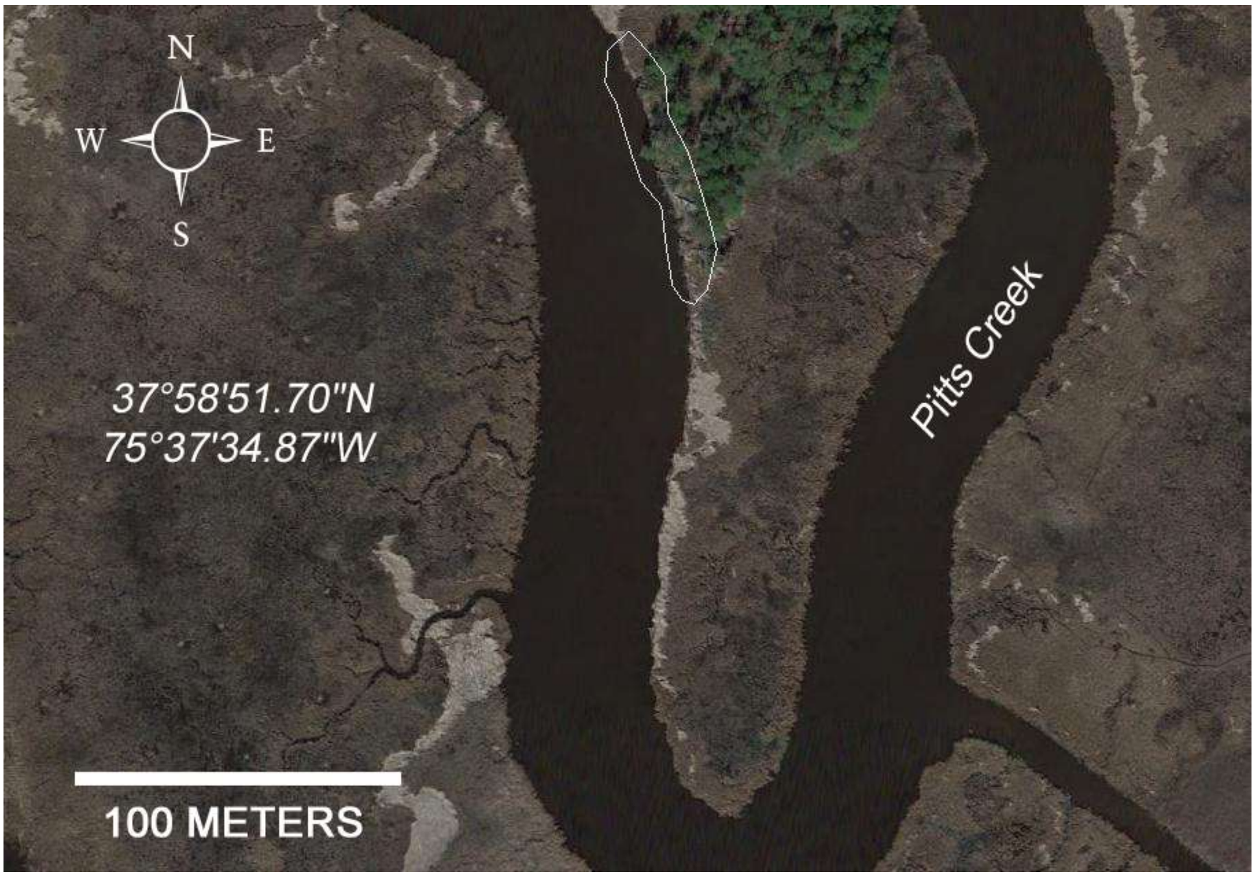

Figure 3.32. The satellite image defines the boundary and the longitude and latitude locational data for 44AC621 in Accomack County, Virginia.

Figure 3.33. The image shows the exposed bank profile at 44AC621.

Figure 3.34. The image shows a fragment of shell-tempered Townsend ceramics found at 44AC621.

21). Pitts Creek 2 - 44AC0054

The history of this site is rather vague. The location and boundary (see Figure 3.35) was initially documented in 1978 by Mr. Tyler Bastian; the Maryland State Archaeologist. Essentially nothing exists in this early file to substantiate the site designation. In 1997, the William and Mary Center for Archaeological Research noted only the presence of "*pottery and jasper flakes*". In 1999, the area was surveyed by Lowery (2001); however, the exposed bank was covered with silt and sediment. The recent survey indicates that the site consists of an eroded forested upland bank exposure associated with 44AC54 (see Figure 3.36). Fire-cracked rock was noted along the shoreline. A limited quantity of shell was noted within the upper portion of the bank profile. A single fragment of Townsend ware (see Figure 3.37) was found along the shoreline, which indicates a Late Woodland period occupation.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

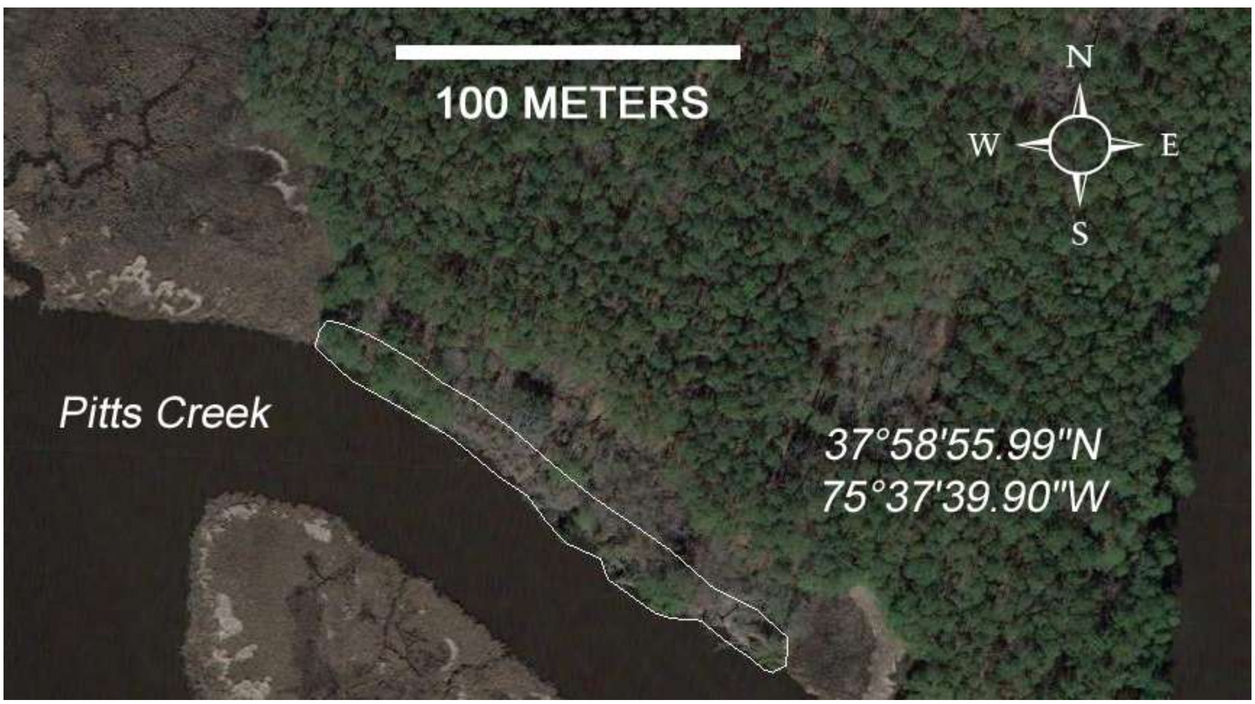

Figure 3.35. The satellite image defines the boundary and the longitude and latitude locational data for 44AC54 in Accomack County, Virginia.

Figure 3.36. The image shows the exposed bank profile at 44AC54. Note the presence of shell refuse near the surface (see inset).

Figure 3.37. The image shows a fragment of shell-tempered Townsend ceramics found at 44AC54.

22). Pitts Creek 1 - 44AC0620

The site (see Figure 3.38) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of a forested upland hummock located at the mouth of Pitt Creek and its juncture with the Pocomoke River (see Figure 3.39). Based on the 1850 coastal survey, the hummock was tilled and contained a residence 160 years ago. The eroded bank profile clearly indicates that the hummock was tilled. The survey of the hummock contains dense shell refuse. Most of the shell has been fragmented by the historic tilling. The assemblage found along the shoreline of the site on 3-24-2015 included 5 fragments of Townsend ware (2 fragments with geometric designs), 1 quartzite scraper, 1 chert flake, and 3 small shell beads. A reexamination of the shoreline on 10-21-2015 revealed two chert triangular points (see Figure 3.40). Dense fire-cracked rock and reworked shell were noted across the entire shoreline area. A sample of the shell from the eroded bank profile was submitted for AMS-dating. The results indicate that the shell on the surface of this hummock is late prehistoric. The refuse associated with the site may also include some historic oyster shell. An AMS-date (D-AMS 0010276) was generated on an oyster shell from the midden feature at this site. The corrected and calibrated age estimate for the oyster shell was 1427 ± 11 calAD, which would indicate a Late Woodland pre-contact era occupation of the hummock. The site is particularly interesting given its location along the Pocomoke River and the associated deep water depth. Given the written narratives, John Smith and his crew may have bedded down at this location during his initial exploration of the Chesapeake in June of 1608.

An overlay of satellite images spanning the past 15 years indicates that the shoreline within Pitts Creek is relatively stable and only eroded via diurnal tidal processes. The south and southwest margins of the hummock have eroded or receded ~5 meters (~16 feet) over the past 15 years.

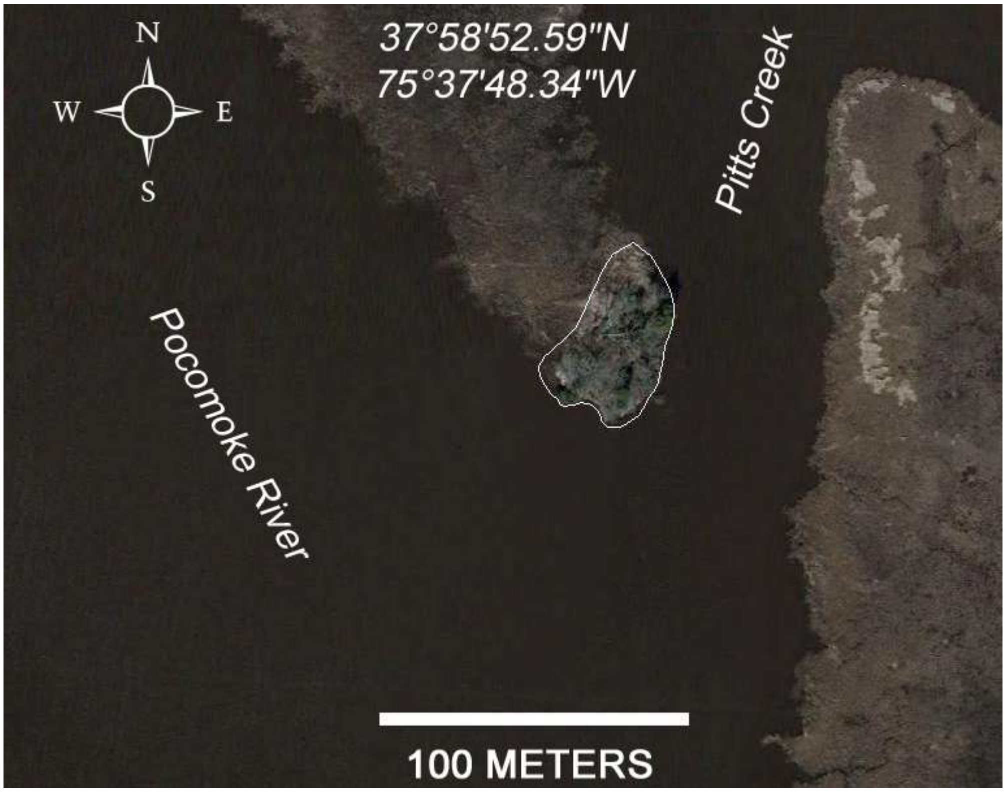

Figure 3.38. The satellite image defines the boundary and the longitude and latitude locational data for 44AC620 in Accomack County, Virginia.

Figure 3.39. The image shows the exposed bank profile at 44AC620. Note the presence of shell refuse near the surface (see inset).

Figure 3.40. The image shows the assemblage of Late Woodland period artifacts found at 44AC620.

23). Bullbeggar Creek 3 - 44AC0629

The site (see Figure 3.41) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consisted of a small tidal eroded upland hummock. Fire-cracked rock and some shell were noted along the shoreline during the initial 6-17-2015 survey. No diagnostic artifacts were found. The site was reexamined on 10-21-2015 and a shell-pit feature with some fire-cracked rock was observed within the eroded bank profile.

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.41. The satellite image defines the boundary and the longitude and latitude locational data for 44AC629 in Accomack County, Virginia.

24). Bullbeggar Creek 2 - 44AC0628

The site (see Figure 3.42) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of a tidal eroded upland hummock. Oyster shell and fire-cracked rock were noted along the shoreline. No diagnostic artifacts were found during the initial 6-17-2015 survey. The site was reexamined on 10-21-2015 and revealed one fragment of Late Woodland-era Townsend ware, two fragments of Hell Island ware, and one quartz flake (see Figure 3.43).

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.42. The satellite image defines the boundary and the longitude and latitude locational data for 44AC628 in Accomack County, Virginia.

Figure 3.43. The image illustrates the artifacts found at 44AC628 in Accomack County, Virginia.

25). Bullbeggar Creek 1 - 44AC0627

The site (see Figure 3.44) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with silt and sediment. The site consists of an eroded hummock with fire-cracked rock and oyster shell. No artifacts were found at the site on 6-17-2015. Preliminary data would suggest that the site encompasses a prehistoric occupation. The site was reexamined on 10-21-2015 and produced two fragments of Mockley ceramics (see Figure 3.45).

An overlay of satellite images spanning the past 15 years indicates that the shoreline is relatively stable and only eroded via diurnal tidal processes.

Figure 3.44. The satellite image defines the boundary and the longitude and latitude locational data for 44AC627 in Accomack County, Virginia.

Figure 3.45. The image shows fragments of shell-tempered Mockley ceramics found at 44AC627.

26). Bullbeggar Hummock - 44AC0630

The site (see Figure 3.46) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the upland hummock at that time was situated ~15 meters (~50 feet) inland from the shoreline. Since 1999, the shoreline has eroded or receded ~55 meters (~181 feet) at the center of the shoreline and ~22 meters (~73 feet) along both the northern and southern shoreline margins. As such, the 44AC630 was not recorded in 1999 because the hummock associated with the site was situated well inland of the shoreline.

The site consists of a sandy upland hummock with dense oyster shell, fire-cracked rock, and tested cobble material (see Figure 3.47). In situ fire-cracked rock and artifacts were observed along the eroded bank profile adjacent to the Pocomoke River. The assemblage found at the site on 3-24-2015 included seven fragments of shell-tempered (Mockley ?) ceramics, one fragment of quartz tempered ceramics (Wolfe Neck ?), two fragments of steatite tempered (Marcey Creek ?) ceramics, one rhyolite Orient Fishtail point, five quartzite flakes, one rhyolite flake, one chert flake, and one quartz flake (see Figure 3.49). The assemblage would indicate a Terminal Archaic through Middle Woodland-era occupation. The area was reexamined on 10-21-2015 and a plank-road feature was observed within the eroded tidal marsh bank profile (3.48). The data would indicate both prehistoric and historic-era components at the site location.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded between ~55 meters (~181 feet) and ~22 meters (~73 feet). The tidal marsh, which once protected the sandy hummock along the exposed western margin, has essentially disappeared as a result of erosion. Given the sandy geologic deposits associated with the hummock, the shoreline and the site should ultimately erode at an alarmingly high rate over the next decade.

Figure 3.46. The satellite image defines the boundary and the longitude and latitude locational data for 44AC630 in Accomack County, Virginia.

Figure 3.47. The image shows the exposed bank profile at 44AC630. Note the presence of shell refuse on the surface of the hummock (see inset, upper left) and in situ fire-cracked rock (see inset, lower left).

Figure 3.48. The image shows a plank road beneath a covering of tidal marsh peat at 44AC630.

Figure 3.49. The image an assemblage of prehistoric artifacts found at 44AC630.

27). West Holdens Creek - 44AC0631

The site (see Figure 3.50) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with coastal sand. The site encompasses an eroded upland area and consists of a scatter of fire-cracked rock along the beach (see Figure 3.51). A single chert flake was found during the initial 3-24-2015 survey of the area. At this location, the basal section of a fluted Clovis point (see Figure 3.52) has found at the site by a local resident. The fluted point is slightly tumbled by wave action and looks to be made of mottled green silificied rhyolite. If it is indeed silicified rhyolite, the lithic material used to make the point probably originated from the piedmont of Virginia/North Carolina. However, paleochannel cobble outcrops are located in the region and the Paleoindian point may also be made of a local secondary cobble, which resembles silicified rhyolite.

An overlay of satellite images spanning the past 15 years indicates that the entire shoreline has eroded or receded ~24 meters (~81 feet) since 2000.

Figure 3.50. The satellite image defines the boundary and the longitude and latitude locational data for 44AC631 in Accomack County, Virginia.

44AC631.

Figure 3.51. The image shows the shoreline at 44AC631.

Figure 3.52. The image shows both the obverse and the reverse faces of a Clovis point base found at 44AC631.

28). Pig Point - 44AC0530

The site (see Figure 3.53) was recorded by Lowery (2001) as a Late Archaic period prehistoric site. At that time, the site produced two jasper Susquehanna broadspears two jasper flakes. The shoreline associated with the site was reexamined on 10-21-2015. The area encompasses a drowned upland, as indicated by the tree stumps located offshore and beneath a tidal marsh (see Figure 3.54). At the time, a sand beach covered the bank profile and no artifacts were found during the 2015 survey. However, a few fragments of fire-cracked rock were noted. The original site may have been destroyed by erosion. The seasonal variation in sand distribution and movement along this shoreline may ultimately expose the bank profile. Follow-up investigations of the shoreline may provide more information about this site.

An overlay of satellite images spanning the past 15 years indicates that the entire shoreline has eroded or receded ~21 meters (~69 feet) since 2000.

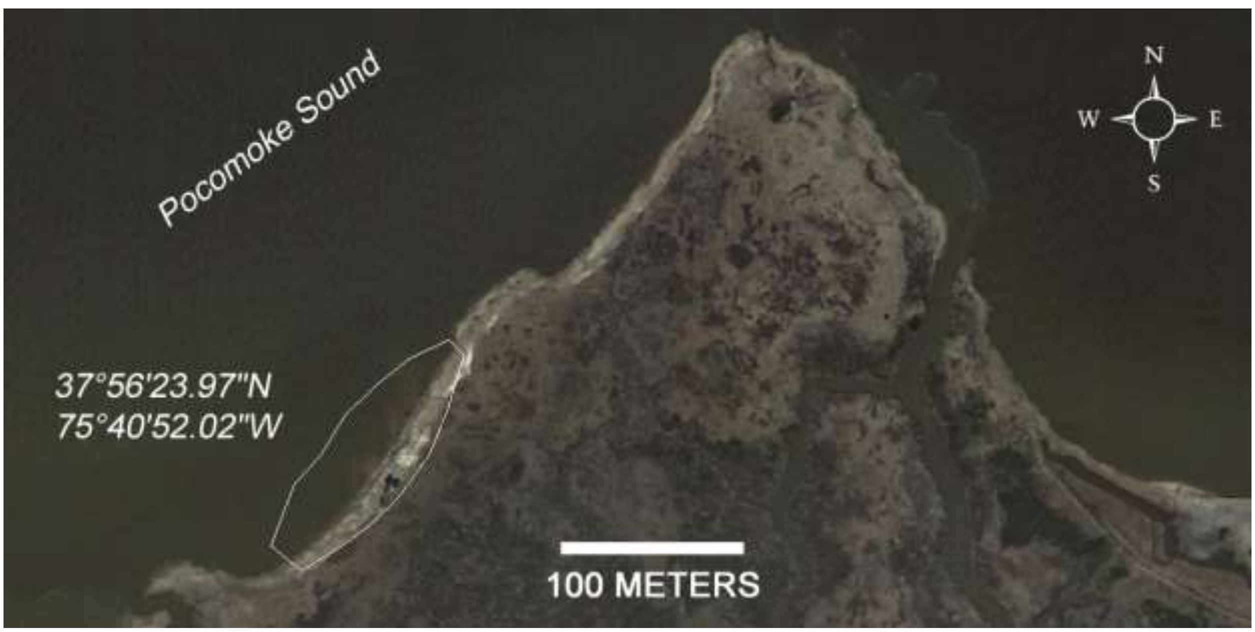

Figure 3.53. The satellite image defines the boundary and the longitude and latitude locational data for 44AC530 in Accomack County, Virginia.

Figure 3.54. The image shows the shoreline at 44AC530.

29). Pocomoke Sound 2 - 44AC0632

The site (see Figure 3.55) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the exposed bank was covered with coastal sand. The shoreline was reexamined on 10-21-2015. The site encompasses a drowned upland landsurface and a marginal elevated upland hummock (see Figure 3.56). The site includes historic brick scattered along the shoreline, as well as mid-late 19th century artifacts (glass, ceramics, and a gunflint). Fire-cracked rock and quartzite debitage along the shoreline would suggest a prehistoric occupation, as well. Further examination of the shoreline may provide additional information about this site.

An overlay of satellite images spanning the past 15 years indicates that the southern shoreline has eroded or receded ~20 meters (~66 feet) since 2000. The northern shoreline has eroded or receded ~13 meters (~43 feet).

Figure 3.55. The satellite image defines the boundary and the longitude and latitude locational data for 44AC632 in Accomack County, Virginia.

Figure 3.56. The image shows the shoreline at 44AC632.

30). Pocomoke Sound 1 - 44AC0014

Howard MacCord originally recorded the site (see Figure 3.57) in 1973. He indicated that a Woodland-era prehistoric shell midden was situated beneath about one-foot of tidal marsh peat. He also indicated that the site had produced prehistoric pottery and points, but did not define the types or styles of artifacts. The site was not relocated during the 1999 survey of the area. At the time the shoreline had a thick covering of sand and organic debris. The shoreline was examined on 10-21-2015 and no evidence of an archaeological site or midden feature could be located because of accumulated sand and debris. The shoreline area was again re-examined on 8-13- 2016 and the site and its associated features were clearly evident. As indicated, the seasonal shoreline conditions clearly impact site visibility.

The site area encompasses a drowned upland surface, which contains fire-cracked rock and shell refuse. Fire-cracked rock and other lithic debris were observed predominantly along the western portion of the shoreline. Burned tree stumps and a buried intact shell midden were observed along the eastern shoreline portion of the site. The midden is situated beneath ~90 centimeters of tidal marsh peat (see Figure 3.58). The shell refuse included both oyster and hard clam. However, oyster is the predominant species within the midden fill. Artifacts found at the site include five fragments of shell-tempered Mockley ware, two fragments of crushed quartz-tempered Wolfe Neck ware, four chert cobble flakes/spalls, three quartz flakes, and three quartzite flakes. The limited assemblage would suggest an Early to Middle Woodland period prehistoric occupation.

The original boundary of the site, as defined by Howard MacCord in 1973, encompasses a much smaller area than the current site boundary (see Figure 3.57). The MacCord site boundary was focused along the current site's western margin. The expanded site boundary may be a byproduct of 43 years of shoreline erosion and retreat.

An overlay of satellite images spanning the past 15 years indicates that the entire shoreline has eroded or receded ~15 meters (~50 feet) since 1999. Assuming the same erosion rate occurred during the prior decades, the coast examined by Howard MacCord in 1973 may have been located ~45 meters (150 feet) north of the present shoreline. As such, the shell midden he observed could have been situated along the western site margin of the site, as he originally defined. As such, the current midden may actually be a feature unseen when MacCord first examined the area.

Figure 3.57. The satellite image defines the boundary and the longitude and latitude locational data for 44AC14 in Accomack County, Virginia. The site boundary originally defined by MacCord in 1973 is also shown.

Figure 3.58. The image shows the bank profile at 44AC14. Note the in situ shell midden situated beneath ~90 centimeters of tidal marsh peat.

31). Starling Creek - 44AC0531

The site (see Figure 3.59) was recorded by Lowery (2001) as a prehistoric site of unknown cultural affiliation. At the time, the artifacts found at the site included the distal end of a jasper projectile point, a chert flake tool, and a jasper flake tool. Only a few fragments of fire-cracked rock were noted. The site location was reexamined on 4-12-2015 and revealed a dense accumulation of quartzite cobble debris. The upland hummock at this location consists largely of dredge spoil, which presumably originated from the nearby harbor on Saxis Island. A single quartzite cobble preform was found. Some brick was also noted along the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the entire shoreline has eroded or receded ~44 meters (~145 feet) since 1999.

Figure 3.59. The satellite image defines the boundary and the longitude and latitude locational data for 44AC531 in Accomack County, Virginia.

32). Fishing Creek - 44AC0526

The site (see Figure 3.60) was recorded by Lowery (2001) as a Late and Middle Woodland period prehistoric site. At the time, the artifacts found at the site included a chert triangular point, a jasper generalized side-notched point, a chert flake, a jasper cobble spall, and fire-cracked rock. The area was examined on 4-12-2015. Sand in the nearshore area impacted the visibility of the eroded shoreline profile. The site re-examined in 2016. At that time, a drowned upland surface with tree stumps was visible (see Figure 3.61). A fragment of fire-cracked rock was observed in situ within the drowned upland surface. The site is the western extension of a narrow Late Pleistocene-age aeolian ridge, which has been drowned by sea level rise. The prehistoric cultural material is concentrated at the area where the narrow upland ridge has been exposed by erosion. The assemblage found at the site included one quartzite biface distal fragment, two quartzite scrapers, one chert pebble scraper, one chalcedony flake, two quartz flakes, six quartzite flakes, and one small pitted stone anvil.

An overlay of satellite images spanning the past 15 years indicates that the entire shoreline has eroded or receded ~36 meters (~118 feet) since 1999.

Figure 3.60. The satellite image defines the boundary and the longitude and latitude locational data for 44AC531 in Accomack County, Virginia.

Figure 3.61. The image shows the bank profile at 44AC531. Note the in situ fire-cracked rock (see inset).

33). Northwest Messongo Creek - 44AC0633

The site (see Figure 3.62) was discovered as a result of the recent fieldwork. In 1999, the area was surveyed; however, the shoreline at that time was situated ~17 meters (~58 feet) further south into Messongo Creek. The site (see Figure3.63) was examined on 4-11-2015. The site consists of a drowned upland situated beneath a tidal marsh. Several shell lenses or midden features with Townsend ceramics and fire-cracked rock were noted along the eroded bank profile. Quartz and quartzite debitage were found, as well as triangular projectile point. A sample of oyster shell directly associated with a fragment of Townsend ceramics was collected for AMS dating. The local reservoir corrected AMS age-estimate for the midden feature the associated Townsend ceramics calibrated to circa 978 ± 24 calAD (D-AMS 0015331). As indicated by the ceramics, the resultant AMS-age would be indicative of the Late Woodland-era occupation.

An overlay of satellite images spanning the past 15 years indicates that the shoreline associated with 44AC633 has eroded or receded ~17 meters (~58 feet).

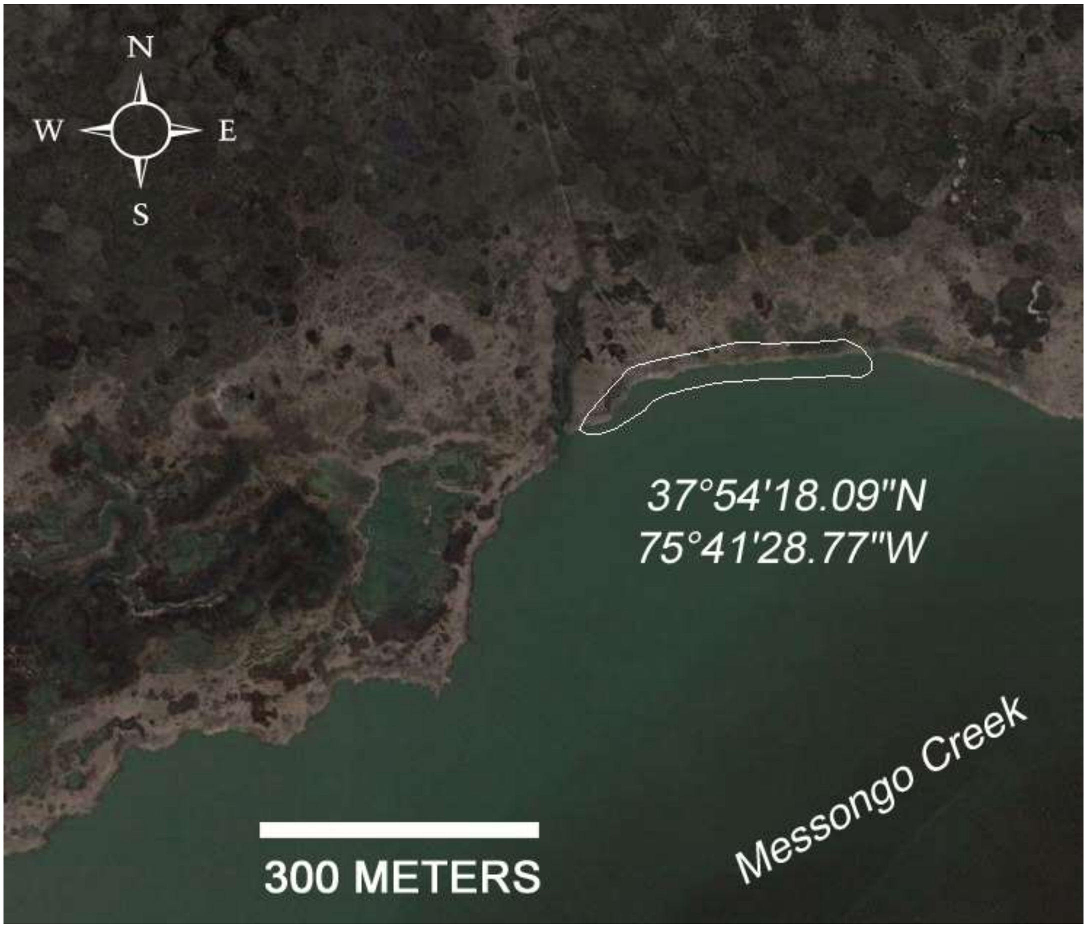

Figure 3.62. The satellite image defines the boundary and the longitude and latitude locational data for 44AC633 in Accomack County, Virginia.

Figure 3.63. The image shows the bank profile at 44AC633.

34). Messongo Creek #1 - 44AC0527

The site (see Figure 3.64) was recorded by Lowery (2001) as an Early, Middle, and Late Woodland period prehistoric site. The site setting encompasses a forested hummock with some drowned upland areas. In 1999, the artifacts found at the site included a fragment of Potomac Creek ware, five fragments of Townsend ware, two fragments of Mockley ware, one fragment of Popes Creek/Wolfe Neck ware, two chert triangular points, one copper nugget bead, twelve quartzite flakes, eighteen quartz flakes, six chert flakes, two jasper flakes, one rhyolite biface fragment, four fire-damaged chert/jasper cobbles, and one basalt flake. It was noted that oyster shell, hard clam shell, and whelk shell were associated with a refuse feature.

The area was reexamined on 4-11-2015. As a result of erosion, dense 18th to 20th century debris (i.e., brick, metal, glass, and ceramics) are now located along the shoreline. The site also includes a drowned upland surface beneath tidal marsh along the western margin of the site. Some fire-cracked rock and a jasper flake provide limited evidence of the previously recorded prehistoric occupation at this location.

An overlay of satellite images spanning the past 15 years indicates that the shoreline indicates that the shoreline has eroded or receded ~10 meters (~33 feet).

Figure 3.64. The satellite image defines the boundary and the longitude and latitude locational data for 44AC527 in Accomack County, Virginia.

35). Messongo Creek #2 - 44AC0528

The site (see Figure 3.65) was recorded by Lowery (2001) as an Early, Middle, and Late Woodland period prehistoric site. The site also contains a mixture of 19th to 20th century debris associated with a former landing area. There is also evidence that former fishing boats have been abandoned and subsequently decayed along this stretch of shoreline.

The area was reexamined on 4-11-2015. The site encompasses a drowned upland landsurface situated beneath tidal marsh (see Figure 3.66). The prehistoric archaeological components at this site have been corrupted by the presence of abandoned boat debris and other historic landing related debris. A small frame structure is also located inland from the shoreline. Fire-cracked rock, prehistoric ceramics, debitage, preforms, and a stemmed projectile point were found along the shoreline. A single drowned prehistoric shell midden feature was found along the western margin of the site. Middle Woodland Mockley ware and Late Woodland Townsend ware were both found along the shoreline.

A sample of oyster shell directly associated with a fragment of Townsend ceramics was collected for AMS dating. The local reservoir corrected AMS age-estimate for the refuse feature the associated Townsend ceramics calibrated to circa 1185 ± 20 calAD (D-AMS 0015332). As indicated by the ceramics, the resultant AMS-age would be indicative of the Late Woodland-era occupation.

An overlay of satellite images spanning the past 15 years indicates that the shoreline indicates that the shoreline has eroded or receded ~10 meters (~33 feet).

Figure 3.65. The satellite image defines the boundary and the longitude and latitude locational data for 44AC528 in Accomack County, Virginia.

Figure 3.66. The image shows the shoreline at 44AC528.

36). South Messongo Creek - 44AC0529

The site (see Figure 3.67) was recorded by Lowery (2001) as a prehistoric site with a Late Archaic and Woodland period occupation. Lowery (2007) conducted limited test excavations at the site in 2006. The testing indicated that the forested hummock had been historically tilled. Thus, the prehistoric shell midden had been incorporated into the plowzone and mixed with mid-18th through 19th century historic refuse. Interestingly, the plowed midden extended to the boundary of the current tidal marsh. Beneath the marsh the midden was intact, unplowed, and contained no historic debris (see Figure 3.68). The 1851 coastal survey suggests that the upland hummock was tilled 160 years ago (see Figure 3.69). The 18th century historic remains suggest that the hummock may have been tilled a century earlier or circa 1750. The deed records indicate that the first land patent for the region was issued to Colonel John Tilney for 1,600 acres of marsh between Cattail Creek and Messongo Creek (Whitelaw 1951: 1208). It is unclear whether the area was settled at the time. However, there are indications in the deed records that the region was settled between 1752 and 1772 (Ibid). Given the fact that this hummock is the only dry landform in the region and it is also adjacent to a navigable creek, we can assume that the site was settled, cleared, and plowed during the mid to late 18th century. Like many regionally-plowed hummocks, a man-made ditch in the adjacent tidal marsh surrounds the hummock. The creek situated immediately east of the hummock may have also been historical altered and channelized.

The area was examined on 4-11-2015. The eroded shoreline includes a mixture of both prehistoric and historic 18th and 19th century components. A drowned shell midden feature was found along the western margin of the site (see Figure 3.70). A fragment of Townsend ceramics was associated with the drowned midden feature. A sample of oyster shell from the drowned midden feature was collected for AMS dating. The local reservoir corrected AMS age-estimate for the refuse feature the associated Townsend ceramics calibrated to circa 1521 ± 68 calAD (D-AMS 0015333). As indicated by the Townsend vessel fragment, the resultant AMS-age would be indicative of the Late Woodland or pre-Contact occupation.

The historic map data, the aerial photographs, and the satellite imagery suggest that minimal sea level rise has impacted Messongo Creek. Given the associated soil data and the archaeological record observed at 44AC529 (see Figure3.71), the magnitude of sea level rise over the past 160 years has to be markedly <22 centimeters. If the magnitude of sea level rise were >22 centimeters, the dimensions of the upland hummock documented in 1851 (see Figure 3.69) would have been larger than present and the drowned prehistoric midden would have been contaminated or altered by the historic colonial residents that once occupied this landscape. As such, the South Messongo Creek (44AC529) site provides a high-resolution regional geoarchaeological benchmark with respect to the magnitude of relative sea level change over the past 160 years or more.

An overlay of satellite images spanning the past 15 years indicates that the shoreline indicates that the shoreline has eroded or receded ~4 meters (~14 feet).

Figure 3.67. The satellite image defines the boundary and the longitude and latitude locational data for 44AC529 in Accomack County, Virginia.

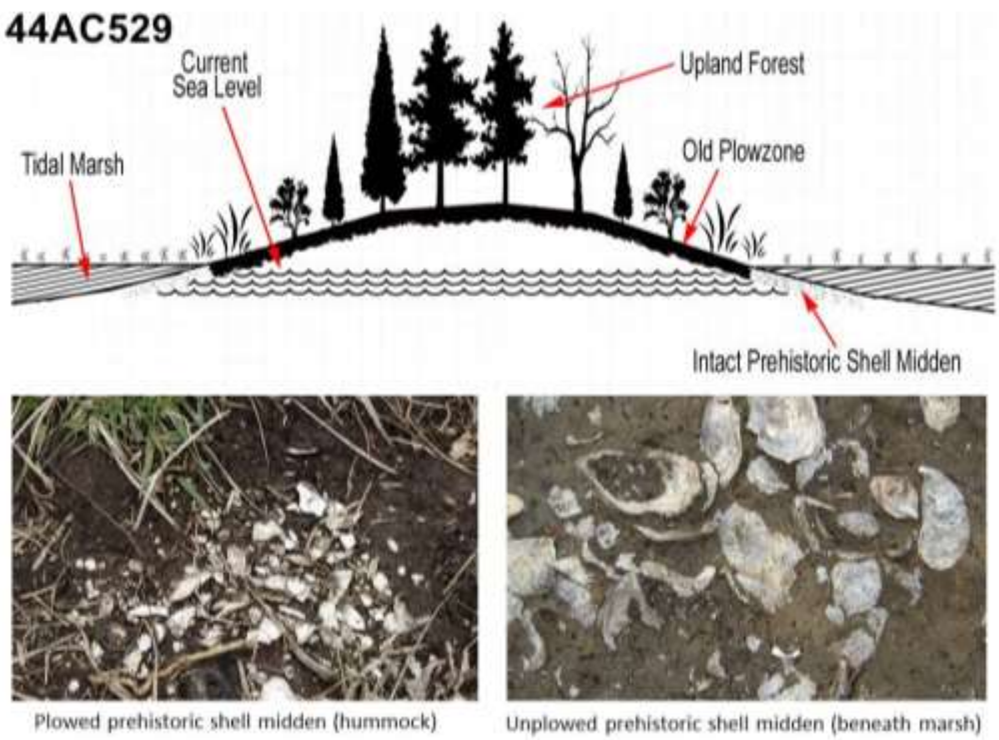

Figure 3.68. The image illustrates an idealized cross-section of the hummock at 44AC529 (top). The upland portion of the prehistoric midden has been tilled as indicated by the highly fragmented shell (lower left). The midden beneath the tidal marsh (lower right) was never tilled as indicated by the whole shell and the lack of a plowzone.

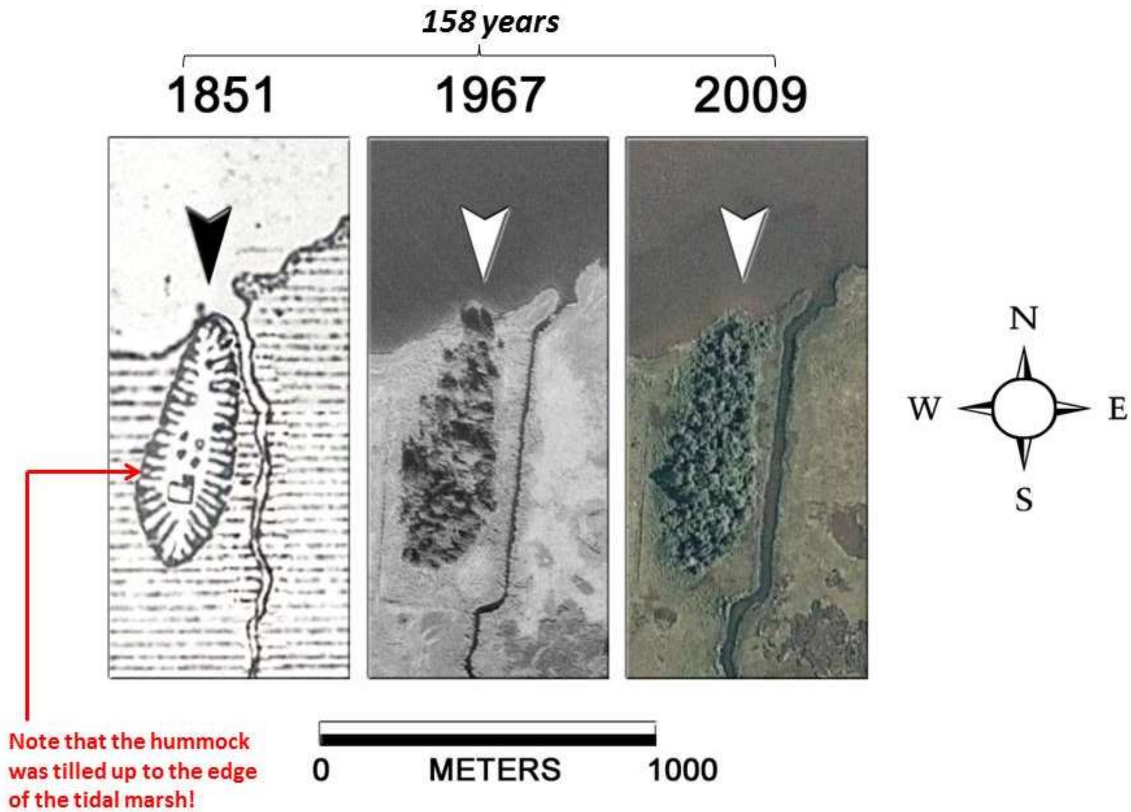

Figure 3.69. The 1851 coastal survey map indicates that the upland hummock was tilled (far left). Both the 1967 and 2009 aerials indicate thatupland dimensions of the hummock have not changed over the past 50 years. Aside from anthropogenic channelization in the marsh area east of the hummock, the upland dimensions of the hummock have not changed over the past 158 years.

Figure 3.70. The image shows the shoreline at 44AC529. Note the intact midden beneath tidal marsh along the western margins of the site.

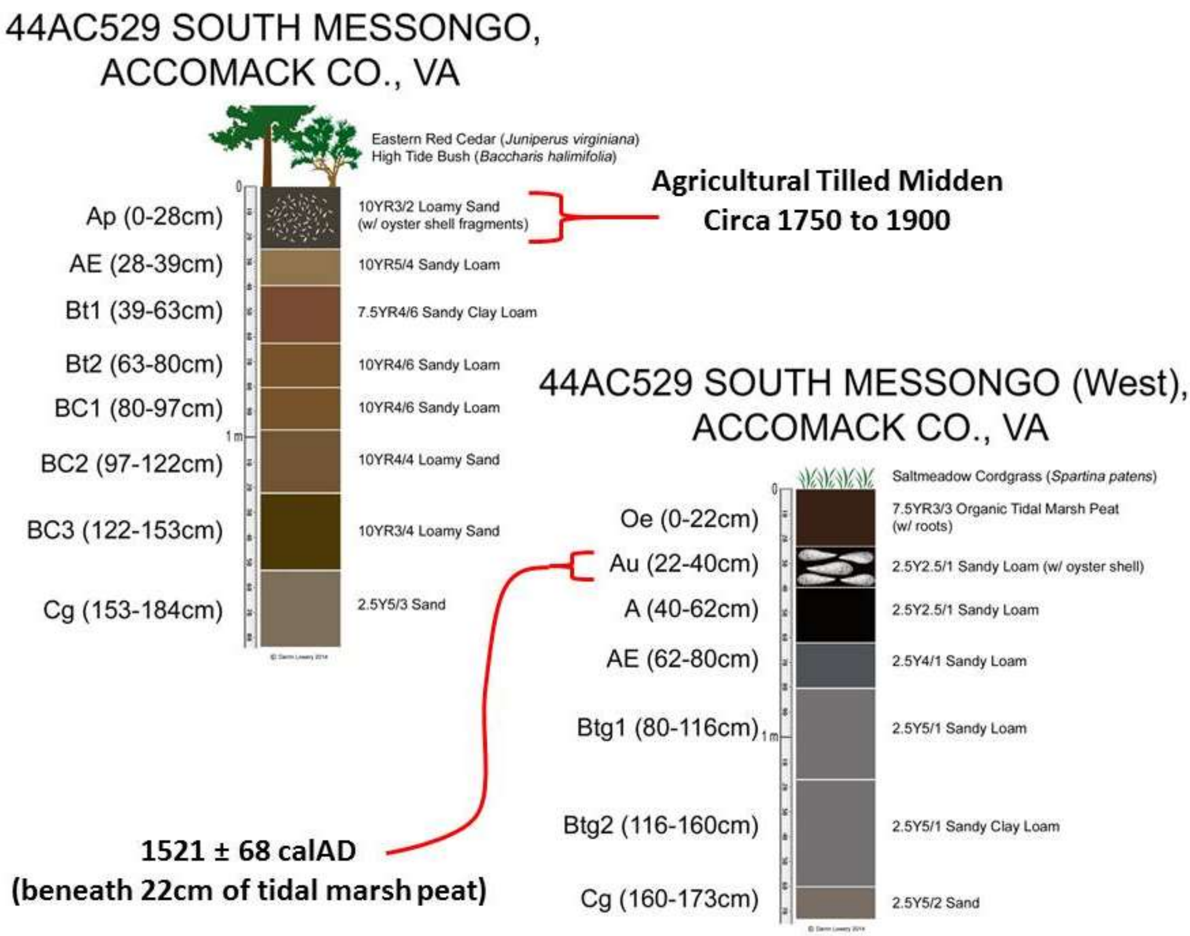

Figure 3.71. The image illustrates idealized soil profiles of the hummock (left) and beneath the tidal marsh at 44AC529. Note the AMS-date on the midden feature situated beneath 22-centimeters of tidal marsh peat.

37). Cattail Creek - 44AC0639

The site (see Figure 3.75) was recorded as a result of this survey. The site consists of a Pleistocene aeolian semi-circular ridge landform, which is surrounded by Holocene tidal marsh and estuarine tidal water (see Figure 3.72). The upland area was historically tilled, as indicated by the Ap-horizon and historic mid-19th century maps. Prior to historic-era tilling, the site encompassed an extensive late prehistoric shell midden feature. Parts of the midden are drowned and situated beneath a covering of tidal marsh peat. The drowned or inundated portions of the midden are intact. The upland portions of the midden have been tilled. Interestingly, the tilled sections end where the tidal marsh begins (see Figure 3.73). As such, the stratigraphy would suggest marginal relative sea level change over the past 160 years. Fire-cracked rock and shell are scattered along the shoreline. Diagnostic artifacts include late

Woodland-era ceramics (Townsend ceramics), an adze or celt, and one preform. It is assumed that the historic component is located inland of the shoreline within the upland forested ridge area.

Since 1999, the shoreline has retreated at variable rates ranging between ~35 meters (~114 feet) and ~3 meters (~10 feet) at various locations (see Figure 3.74). The slightly elevated hummock ridge and the associated midden area are the heaviest eroded portions of the site. The tidal marsh area on either side of the hummock is more resistant to wave energy and has eroded the least.

Figure 3.72. The image shows the shoreline at 44AC639.

Figure 3.73. The image defines the boundary between the plowed midden and unplowed midden feature at 44AC639. The upland tilled portion of the prehistoric midden is associated with a mixture of modern vegetation, which includes marsh elder, eastern red cedar, and saltmeadow cordgrass. The unplowed portion of the midden is situated beneath tidal marsh, which includes saltmeadow cordgrass and smooth cordgrass. Along the eroded bank (see inset), the plowed and unplowed landsurfaces are clearly indicated by the completeness or fragmentary condition of the midden shell.

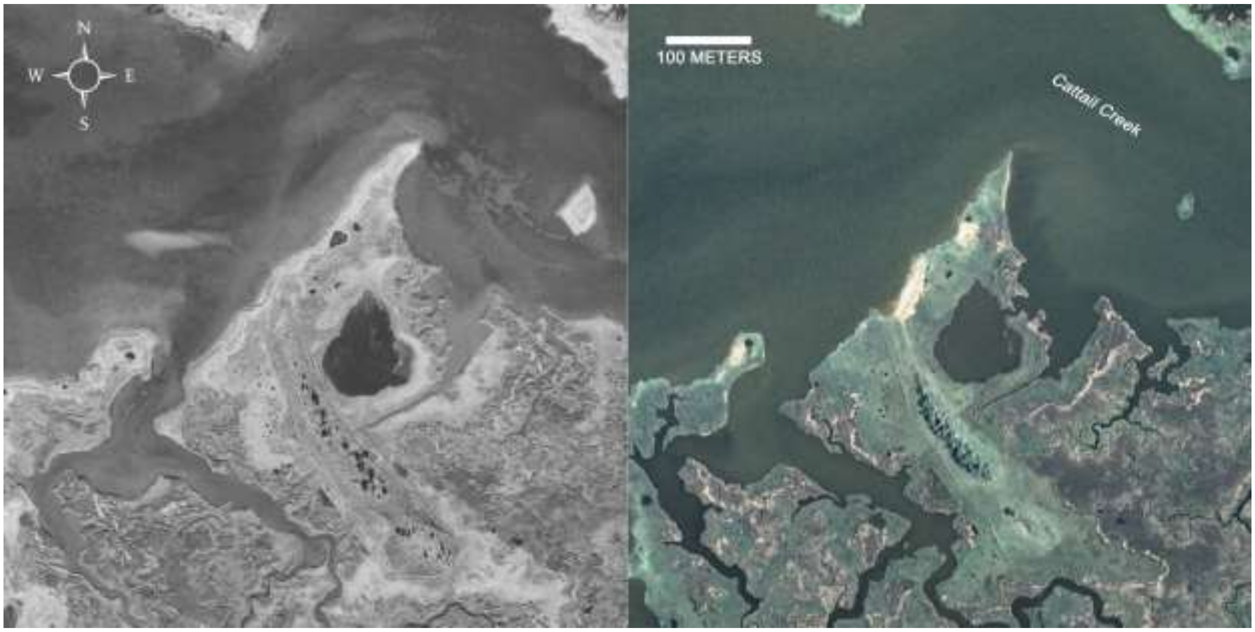

Figure 3.74. The 1999 shoreline dimensions at 44AC639 are shown on the left. The current shoreline dimensions are shown on the right.

Figure 3.75. The satellite image defines the boundary and the longitude and latitude locational data for 44AC639 in Accomack County, Virginia.

38). Old Tree Island - 44AC0136

The site (see Figure 3.77) was initially recorded by Mark Wittkofski in 1980 based on an assemblage of artifacts from this locality in a private collection. Lowery (2001) visited the site in 1999 and found evidence of stone tool manufacturing based on local cobble/boulder sources. The only diagnostic artifact found at that time was a quartz Guilford point. As such, the site clearly has a Middle to Late Archaic period occupation. In 2007, I was shown a basalt full-grooved ax that was dredged from the bottom immediately offshore from this site.

The survey included one shoreline examination on 7-22-2015. The geology of the region indicates that a former paleo-channel of the Potomac-Susquehanna river systems exists immediately beneath the surface. Earlier investigations by Lowery (2001) produced evidence that the cobble materials were being utilized at this location to manufacture flaked stone tools. The recent shoreline examination revealed tested cobbles and fire-cracked rock. A photo of the site area (see Figure 3.76) clearly shows cobbles and gravels located beneath the water surface and adjacent to the eroded shoreline.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has uniformly eroded or retreated ~22 meters (~75 feet) along the entire stretch.

Figure 3.76. The image shows the shoreline at 44AC136.

39). Island Field Cove - 44AC0503

The site (see Figure 3.77) was recorded in 1999 (Lowery 2001). At that time, the site produced several diagnostic projectile points, which suggested a Late Archaic and Early Woodland period occupation. Fire-cracked rock and debitage were also observed.

On 7-22-2015, this former site location was reexamined. Sand had accreted along the edge of the shoreline. The associated shoreline has now been partially armored to protect the residential structure, which is located on the edge of the hummock. The site recorded at this location in 1999 (Lowery 2001) may currently exist inland of the stabilized shoreline. No artifacts were found.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has eroded or retreated between ~6 meters (~20 feet) and ~2 meters (~7 feet).

Figure 3.77. The satellite image defines the boundary and the longitude and latitude locational data for 44AC136 and 44AC503 in Accomack County, Virginia.

40). Guilford Creek #1 - 44AC0498

The site (see Figure 3.78) was recorded in 1999 (Lowery 2001). At that time, the site revealed a quartz endscraper and a large chert flake. Fire-cracked rock was also observed along the shoreline. The site seemed to represent a prehistoric site of unknown cultural affiliation.

On 4-26-2015, this former site location was reexamined. Sand had accreted along the edge of the shoreline. All associated lithic artifacts or prehistoric remains were hidden from view as a result of the coastal beach dune formation. The site recorded at this location may still exist; however, conditions at the time of examination did not permit an inspection of any associated drowned upland deposits. No artifacts were found.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the southern shoreline associated with the site has eroded or retreated between ~35 meters (~116 feet). The northern shoreline associated with the site has eroded or retreated between ~8 meters (~26 feet).

41). Guilford Creek #2 - 44AC0499

The site (see Figure 3.78) was recorded in 1999 (Lowery 2001). A quartzite core, two flakes, and fire-cracked rock were found at that time. The site seemed to represent a prehistoric site of unknown cultural affiliation.

On 4-26-2015, this former site location was reexamined. Like 44AC498, sand had accreted along the edge of the shoreline. All associated lithic artifacts or prehistoric remains were hidden from view as a result of the coastal beach dune formation. The site recorded at this location may still exist; however, conditions at the time of examination did not permit an inspection of any associated drowned upland deposits. No artifacts were found.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the southern shoreline associated with the site has eroded or retreated between ~13 meters (~45 feet). The northern shoreline associated with the site has eroded or retreated between ~7 meters (~24 feet).

42). Cals Hammock - 44AC0492

The site (see Figure 3.78) was recorded in 1999 (Lowery 2001). In 1999, a shell feature was observed in the bank profile, which contained both oyster and hard clam. A quartzite stemmed point, five flakes, and fire-cracked rock were found at that time. The shell feature and the artifacts seemed to suggest both a Late Archaic and Woodland period occupation at 44AC492.

On 4-26-2015, this former site location was reexamined. Like both 44AC498 and 44AC499, sand had accreted along the edge of the shoreline. All associated lithic artifacts or prehistoric remains were hidden from view as a result of the coastal beach dune formation. The site and shell feature initially recorded at this location may still exist; however, conditions at the time of examination did not permit an inspection of any associated drowned upland deposits. No artifacts were found.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has uniformly eroded or retreated ~13 meters (~43 feet) along the entire stretch.

Figure 3.78. The satellite image defines the boundary and the longitude and latitude locational data for 44AC492, 44AC498 and 44AC499 in Accomack County, Virginia.

43). Jobes Island – 44AC0505

The site (see Figure 3.84) was recorded in 1999 (Lowery 2001). A quartzite scraper, three flakes, and fire-cracked rock were found at that time. The site seemed to include a prehistoric component of unknown cultural affiliation. The site also revealed several 18th and 19th century era ceramics and glass artifacts. Brick was also observed along the shoreline.

On 4-26-2015, this former site location was reexamined. The area encompasses a large section of exposed and eroded shoreline associated with a semi-circular shaped upland forested hummock (see Figure 3.79). The area was historically plowed, as indicated by the historic coastal survey maps and the evidence of an Ap-soil horizon within the eroded bank profile. Fire-cracked rock was scattered all along the shoreline, as well as 18th and 19th century historic debris. Fragmented shell was noted within the Ap-horizon suggesting that the site once contained shell refuse. Some intact shell-filled pit features were noted beneath the plowed deposits. The assemblage found at this site included a quartzite flake, three fragments of shell-tempered Townsend ceramics, and one damaged chert triangular projectile point. The low density of artifacts may suggest that the area is being heavily collected.

An overlay of satellite images provides a measure to determine the degree of land loss at this site location. Since 1999, the shoreline has retreated at variable rates ranging between ~5 meters (~16 feet) and ~30 meters (~99 feet) at various locations.

Figure 3.79. The image shows the shoreline at 44AC505.

44). Bundicks - 44AC0213

The survey included one shoreline examination if this site location on 4-26-2015. The site (see Figure 3.84), which was recorded by Mark Wittkofski in 1981, consists of a large area within the central depression area of a now-drowned bay basin feature associated with Cedar Island. He reported that projectile points had been found by collectors among the “rocks” in the shallow submerged bottom area. In 1999, Lowery (2001) examined the area and found no archaeological remains in this area. The recent examination also produced no evidence for an archaeological site.

Given the geologic setting, the site noted by Wittkofski may actually represent the depositional-accretion area. As such, eroded and redeposited cultural remains from the nearby site recorded as 44AC493 may have been transported by wave and current activity to this location. As the upland area associated with 44AC493 is eroded, the trending northwest winds and wave action will transport cultural and non-cultural remains within the tidal basin east of Cedar Island. In 1981, these redeposited remains may have been exposed. Since this time, continued erosion seems to have changed the coastal sediment dynamics, which may have resulted in the burial of these former scoured redeposited remains.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Since 1999, the tidal marsh shoreline has uniformly eroded or retreated ~18 meters (~60 feet) within the tidal basin area.

45). Cedar Island – 44AC0493

The site (see Figure 3.84) was recorded in 1999 (Lowery 2001). A chert stemmed projectile point, a chert flake, a gunflint, and fire-cracked rock were found at that time. Brick and shell were observed along the shoreline and within the bank profile.   The site seemed to have a Late Archaic prehistoric component, as well as historic 19th and 20th century occupation.

The survey included one shoreline examination of this site location on 4-26-2015. The area encompasses a section of exposed and eroded shoreline associated with the terminal eroded end of a semi-circular upland forested hummock (see Figures 3.80 and 3.81). The area was historically plowed, as indicated by the historic coastal survey maps and the evidence of an Ap-soil horizon within the eroded bank profile. Dense oyster shell and fire-cracked rock were noted along the shoreline and within the profile. Quartz and quartzite debitage were noted along the shoreline along with two fragments of shell-tempered Mockley ware.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Since 1999, the upland shoreline section of the site has retreated by about ~38 meters (~124 feet). The marsh section to the west of the upland ridge has only retreated by about ~9 meters (~29 feet), which is due to the fact that marsh is much more resistant to erosion that the exposed upland.

Figure 3.80. The image shows the shoreline at 44AC493 looking towards the southeast.

Figure 3.81. The image shows the shoreline at 44AC493 looking towards the northwest.

46). NE Halfmoon Basin – 44AC0506

The site (see Figure 3.84) was recorded in 1999 (Lowery 2001). A quartzite core, a chert flake, two quartzite flakes, a quartz flake, and fire-cracked rock were found at that time. A Late Archaic period diorite grooved axe was found in situ along the exposed bank profile in 1999 (see Figure 3.82).

The survey included one shoreline examination of this site location on 5-28-2015. The area encompasses a section of exposed and eroded shoreline associated with the terminal eroded end of a semi-circular upland forested hummock (see Figure 3.83). The area was historically plowed, as indicated by the historic coastal survey maps and the evidence of an Ap-soil horizon within the eroded bank profile. The shoreline area contains a mixture of historic and prehistoric debris (i.e., brick and fire-cracked rock). Only one quartz flake was found during this follow-up investigation of the site area.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Since 1999, the upland shoreline section of the site has retreated by about ~52 meters (~170 feet). The marsh south of the ridge has retreated about ~68 meters (~223 feet) and the marsh to the north has retreated about ~48 meters (~157 feet). As indicated by the magnitude of land loss, a good portion of the site has been destroyed and lost to erosion over the past 15 years.

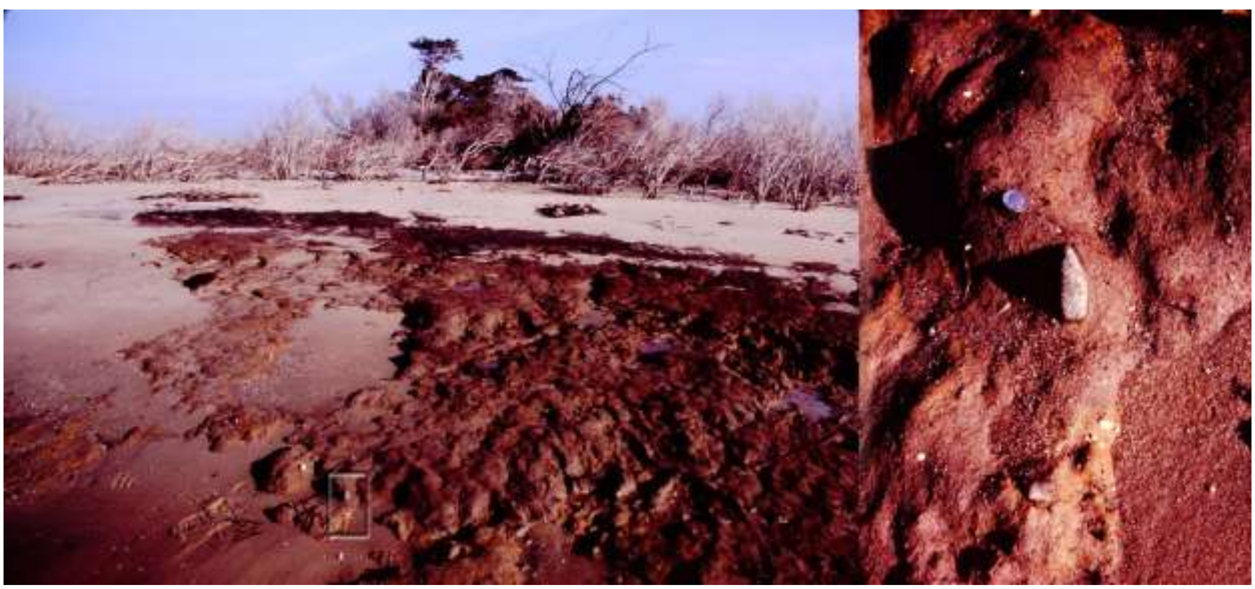

Figure 3.82. The image shows the shoreline at 44AC506 in 1999. Note the in situ grooved axe (see inset and right).

Figure 3.83. The image shows the shoreline at 44AC506 in 2015.

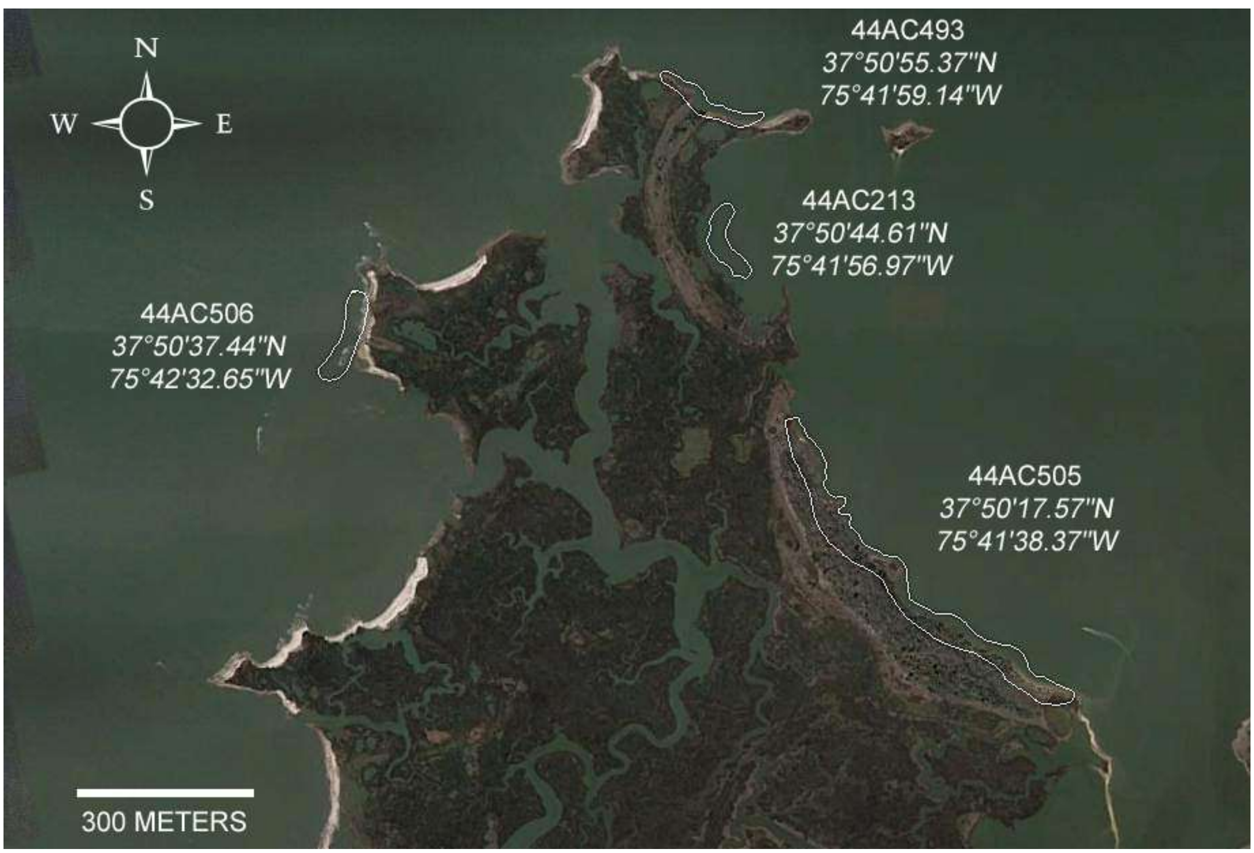

Figure 3.84. The satellite image defines the boundary and the longitude and latitude locational data for 44AC213, 44AC493, 44AC505, and 44AC506 in Accomack County, Virginia.

47). Bernard Islands – 44AC0491

The site (see Figure 3.88) was recorded in 1999 (Lowery 2001). The assemblage found at the site in 1999 included a mixture of armaments such as spent shell cases, bullets, and bomb fragments. The site was a WWII bombing site.

The survey included one shoreline examination of this site location on 7-22-2015. The Bernard Island encompasses a chain of two island landmasses, which include the lower Bernard and the upper Bernard islands (see Figure 3.88). The lower Bernard Island locality contains wooden pilings associated with WWII-era wooden bomb and machine gun targets (see Figure 3.85). Around the base of the targets and around the entire island numerous ordnance fragments and expended bullets were discovered (see Figure 3.86). The upper Bernard Island is essentially a thin narrow strip of tidal marsh (see Figure 3.87). Nothing was found at this site location during the reexamination of the shoreline on 7-22-2015.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. The north end of lower Bernard Island has eroded about ~48 meters (~157 feet) over the past 15 years. The south end of this island has eroded about ~60 meters (~196 feet) over the same duration of time. The northern end of upper Bernard Island has eroded about ~64 meters (~209 feet) over the past 15 years. The southern end of this island has eroded about ~118 meters (~387 feet) over the same duration. The width of upper Bernard Islands has also been reduced about ~10 meters (~32 feet) on both the west and east sides.

Figure 3.85. The image shows the shoreline at the lower Bernard Island site locality 44AC491. The wooden pilings are associated with a former WWII bomb target platform.

Figure 3.86. The image shows some of the expended ordnance found near the target platform feature at the lower Bernard Island site locality 44AC491.

Figure 3.87. The image shows the extant narrow island landmass associated with the upper Bernard Island site locality 44AC491.

Figure 3.88. The satellite image defines the boundary and the longitude and latitude locational data for 44AC491 in Accomack County, Virginia.

48). North Little Back Creek - 44AC0641

The site (see Figure 3.90) was recorded as a result of this survey on 5-24-2015. The site is located on the north side of Back Creek near is mouth. The area encompasses a narrow area with a drowned or inundated upland surface, which was never tilled (see Figure 3.89). The A-horizon is situated beneath a ~30-centimeter covering of tidal marsh peat. Remnant tree stumps are located offshore and indicate the presence of a former forested landscape that has been drowned as a result of sea level rise. Importantly, the 1851 coastal survey map of the region shows only tidal marsh in the entire region on this side of Back Creek. In sum, the amount of relative sea level rise at this location over the past 160 years has to be <30-centimeters. Given the lack of any observed scrub vegetation designated on the 1851 survey map, the maximum relative sea level change over this duration of time could not have exceeded ~15-centimeters in this region. A dense scatter of fire-cracked rock was observed along the shoreline. The assemblage found at the site included a quartzite biface, a quartzite flake, and a small fragment of Mockley ware. The diagnostic remains found at the site seem to be exclusively associated with the Early-Middle Woodland (circa 800BC to 400AD), the site may eventually provide evidence of an earlier occupation. Using satellite overlays, the shoreline associated with this site has eroded about ~20 meters (~65 feet) over the past 15 years.

Figure 3.89. The image shows the shoreline at 44AC641.

49). Little Back Creek Hummock - 44AC0640

The site (see Figure 3.90) was recorded as a result of this survey on 5-24-2015. The site encompasses a former upland hummock that is eroded only along the northeast side. The area encompasses a former tilled field area. The evidence of tilling is noted on the 1851 coastal survey map, as well as the presence of an Ap-soil horizon exposed along the eroded bank profile. The site contains a mixture of historic and prehistoric remains. A hand-made wooden cribbing or fence line was observed along the shoreline. Fire-cracked rock was observed along the shoreline and a fire-cracked rock filled pit feature was observed within the bank profile. The assemblage consisted of a mixture of rhyolite and quartzite debitage. A fragmentary quartzite biface was also discovered. Though no diagnostic archaeological remains were found, the assemblage seems to indicate both a 19th century component as well as a possible Middle Woodland (300BC to 400AD) occupation. Using satellite overlays, the shoreline associated with this site has eroded and receded about ~12 meters (~39 feet) over the past 15 years.

Figure 3.90. The satellite image defines the boundary and the longitude and latitude locational data for 44AC496, 44AC640, 44AC641 in Accomack County, Virginia.

50). East Halfmoon #1 – 44AC0496

The site (see Figure 3.90) was recorded in 1999 (Lowery 2001). In 1999, the site revealed three fragments of Accokeek ware, an argillite Fox Creek stemmed point, a chert triangular point, two quartz biface fragments, a chert biface fragment, a quartzite biface fragment, a rhyolite biface, seventy-eight flakes, two cores, and fire-cracked rock. A shell-filled pit feature with a mixture of oyster and hard clam was also observed along the shoreline in 1999. The assemblage suggested an Early through Late Woodland period occupation at 44AC496.

The examination of this site occurred on 5-24-2015. The site encompasses a former low upland hummock that is eroded along the entire west side (see Figure 3.91). The site was historically-tilled, as indicated by the Ap-soil horizon and the data noted on the 1850 coastal survey map. Like many of the agriculturally-tilled hummocks, a ditch was excavated around the entire hummock and wooden cribbing was installed. Given historic map data, these man-made historic structures were constructed during the 19th century. The hummock also contains a prehistoric occupation as indicated by the fire-cracked rock and debitage. Several rhyolite flakes were found as result of this recent re-examination of site location. In 1999 (Lowery 2001) documented a Middle Woodland-era Fox Creek occupation with meta-rhyolite and argillite use at this site location. The shell pit reported by Lowery (2001) in 1999 no longer exists.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has eroded about ~44 meters (~144 feet) along the western margin; as such the previously documented features have succumbed to erosion.

Figure 3.91. The image shows the shoreline at 44AC496. Note the wooden plank feature, which is associated with the man-made ditch that surrounds historically-plowed hummock landform.

51). East Halfmoon #2 – 44AC0497

The site (see Figure 3.94) was recorded in 1999 (Lowery 2001). An assemblage, which included projectile points, debitage, and historic ceramics, was found at this location. Fire-cracked rock, brick, and a barrel-well feature were observed along the shoreline in 1999 (see Figure 3.92). Archaic and Woodland period prehistoric components, as well as an historic 18th and 19th century occupation are associated with this site.

The reexamination of this site occurred on 5-24-2015. The site encompasses a forested upland hummock that is eroded along the entire west side. When the area was re-examined, sand had accumulated on the bank. As such, no artifacts were found because they were buried beneath the deposit of recent accumulated sand. No observable features were noted along this shoreline during the recent survey.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has eroded about ~35 meters (~114 feet) along the western margin. All of the features noted along the shoreline in 1999 have been lost to erosion.

Figure 3.92. The image shows the shoreline at 44AC497 in 1999. Note the wooden barrel well feature in the background and the hand-made bricks scattered along the shoreline.

52). Jacks Island – 44AC0504

The site (see Figure 3.94) was recorded in 1999 (Lowery 2001). The assemblage found at the site indicated a prehistoric occupation of unknown cultural affiliation.

The reexamination of this site occurred on 5-24-2015. The site encompasses a forested upland hummock that is eroded along the entire west side. When the area was reexamined, sand had accumulated on the bank. Only fire-cracked rock was noted along the shoreline. No observable features were noted along this shoreline.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has been relatively stable along its southern coastal margin. The northern margin has eroded about ~44 meters (~145 feet) along one isolated section.

53). Halfmoon Island – 44AC0500

The site (see Figure 3.94) was recorded in 1999 (Lowery 2001). An assemblage, which included debitage, fire-cracked rock, historic ceramics, and a kaolin pipe, was found at this location. The assemblage found at the site indicated a prehistoric occupation of unknown cultural affiliation, as well as an historic 19th century occupation.

The reexamination of this site occurred on 5-24-2015. The site encompasses the terminal end of a semi-circular upland hummock and is the only surviving remnant of large a bay basin ridge feature (see Figure 3.93). Most of the ridge feature has succumbed to erosion over the past century. However, 44AC500 represents the lone surviving portion. During the examination of the site, only fragments of fire-cracked rock and a large flaked quartzite cobble were noted. However, the area has been extensively collected by local artifact collectors. The area was being collected on the day the site was reexamined.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has eroded and receded about ~76 meters (~252 feet) along the southwestern margin. The most extreme shoreline erosion along the northwest margin is about ~45 meters (~148 feet). The southeast margin of the site has eroded or receded ~24 meters (~79 feet).

Figure 3.93. The image shows the shoreline at 44AC500.

Figure 3.94. The satellite image defines the boundary and the longitude and latitude locational data for 44AC497, 44AC500, 44AC504 in Accomack County, Virginia.

54). Dix Cove – 44AC0495

The site (see Figure 3.95) was recorded in 1999 (Lowery 2001). Lowery (2001) found two quartz terminal Archaic Susquehanna broadspears at this location, which provided some idea about the cultural chronological use of this location.

The reexamination of this site occurred on 5-24-2015. The site encompasses a tidal marsh associated with the drowned western margin of an upland hummock. Only fire-cracked rock was noted at this location when the area was re-examined. No observable features were noted along this shoreline.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has eroded about ~4 meters (~15 feet) or less along the northwestern margin. The southwest shoreline at this site is relatively stable.

55). Hunting Creek #1 – 44AC0501

The site (see Figure 3.95) was originally recorded in 1999 (Lowery 2001) as a 19th century refuse area associated with a residence. The area was re-examined on 5-24-2015 and the area was covered with a thick deposit of sand. No artifacts or features were observed during the most recent survey of the area. An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has eroded about ~8 meters (~26 feet) or less along the northeastern margins adjacent to Hunting Creek.

56). Hunting Creek #2 – 44AC0502

The site (see Figure 3.95) was originally recorded in 1999 (Lowery 2001) as an historic-era linear piles of rounded rocks adjacent to the shoreline. These piles represent an early attempt to curtail shoreline erosion. The area was re-examined on 5-24-2015. Like 44AC501, the area was covered with a thick deposit of sand. No artifacts or features were observed during the most recent survey of the area. An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site has only eroded about ~2 meters (~6.5 feet) or less along the northern margins adjacent to Hunting Creek.

Figure 3.95. The satellite image defines the boundary and the longitude and latitude locational data for 44AC495, 44AC501, 44AC502 in Accomack County, Virginia.

57). Deep Creek NW Harbor - 44AC0494

The site (see Figure 3.98) was originally recorded in 1999 (Lowery 2001) as a prehistoric-era site of unknown cultural affiliation. The area was re-examined on 5-24-2015. At this time, the shoreline was covered by a mixture of silt, sand, and organic detritus. No artifacts or features were observed during the most recent survey of the area. An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the site and the associated shoreline have been stable and unchanged.

58). Deep Creek #1 - 44AC0489

The site (see Figure 3.98) was recorded in 1999 (Lowery 2001). The assemblage found at the site indicated a prehistoric occupation of unknown cultural affiliation, as well as an historic 18th and 19th century occupation.

The area was re-examined on 5-24-2015 and revealed similar cultural chronological data as noted when the site was recorded in 1999 (Lowery 2001). The site encompasses a large upland hummock area with some adjacent inundated landsurfaces (see Figure 3.96). The site includes a mixture of both prehistoric and historic debris. The materials noted along the shoreline include 18th and 19th century ceramics, metal, and glass. Fire-cracked rock, quartz-quartzite debitage, and shell-tempered Townsend ceramics were also found at this location. So, the site has, for the first time, revealed a Late Woodland-era component. The site possibly also contains earlier prehistoric occupations.

An overlay of satellite images provides a measure to determine the degree of tidal marsh located west of this site location. Over the past 15 years, the shoreline has eroded about ~25 meters (~82 feet) in the area adjacent to the upland hummock. The heavily eroded section of shoreline is adjacent to Deep Creek and has an eastern exposure. The tidal marsh areas on either side of the hummock are stable.

Figure 3.96. The image shows the shoreline at 44AC489.

59). Deep Creek #2 - 44AC0490

The site (see Figure 3.98) was originally recorded in 1999 (Lowery 2001) as a Middle and Late Woodland-era site. The age determination was based on the presence of two fragments of Mockley ware and five fragments of Townsend ware. Debitage and fire-cracked rock were also observed at this location. In 1999, a residential structure was located inland from the shoreline. However, the shoreline had not been stabilized.

The area was re-examined on 5-24-2015 and the shoreline was covered with a thick deposit of sand. No artifacts or features were observed during the most recent survey of the area. Over the past 15 years, the shoreline area adjacent to the hummock has been stabilized by bulkhead (see Figure 3.97). An overlay of the satellite images suggests that the shoreline associated with the site has eroded about ~14 meters (~45 feet) along either side of the bulkhead. The shoreline east of the residential structure eroded or receded ~10 meters (~34 feet) before the bulkhead was installed.

Figure 3.97. The image shows the shoreline at 44AC490.

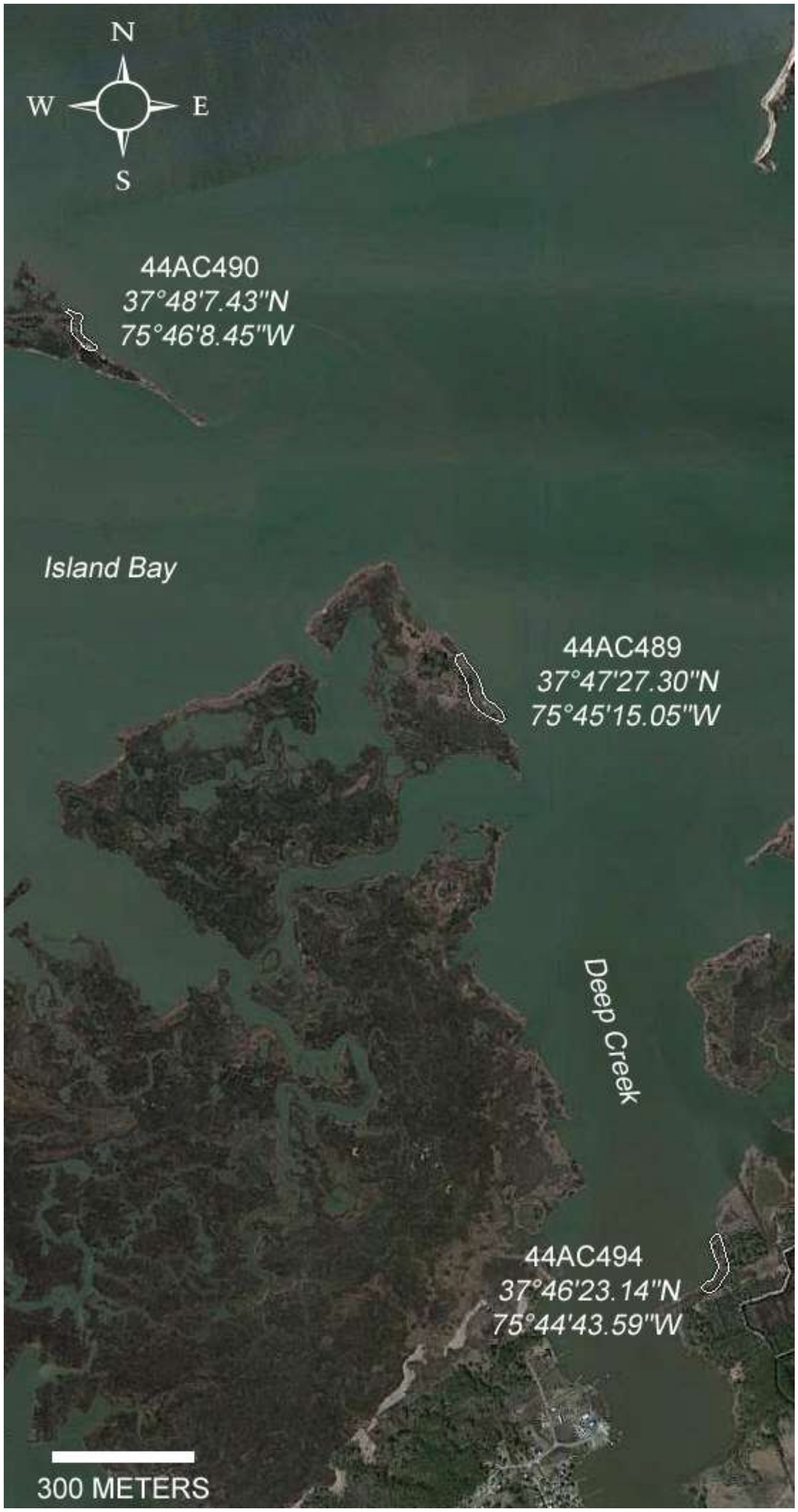

Figure 3.98. The satellite image defines the boundary and the longitude and latitude locational data for 44AC489, 44AC490, and 44AC494 in Accomack County, Virginia.

60). **Chesconessex Creek Hummock - 44AC0642**

The site (see Figure 3.102) encompasses a marsh area with high tide bush (see Figure 3.99). A small oyster and hard clam midden feature was observed within the bank profile along the west side of the hummock (see Figure 3.100). The midden is buried beneath ~35-centimeters of tidal marsh peat. Five fragments of shell-tempered and decorated Townsend ware were found along the shoreline. Three quartzite flakes and a dense cluster of fire-cracked rock were also observed along the shoreline. One of the quartzite flakes was found in situ within the upper portion of the Btg-soil horizon. Even though the diagnostic remains found at the site seem to be exclusively associated with the Late Woodland (circa 1000AD to 1600AD), the site may also contain an Archaic-era occupation. The 1850 coastal survey map shows only marsh at this location.

An overlay of the satellite images suggests that the shoreline has eroded or receded ~16 meters (~53 feet) over the past 15 years.

Figure 3.99. The image shows the shoreline at 44AC642.

Figure 3.100. The image shows the drowned shell midden feature at 44AC642.

61). South Chesconessex Marsh - 44AC0643

The site (see Figure 3.102) encompasses a tidal marsh area with an inundated upland landscape. A thin 25-centimeter tidal marsh peat encapsulates the upland landscape (see Figure 3.101). Fire-cracked rock was scattered along the shoreline. The assemblage found at the site includes quartzite debitage and a damaged quartzite Morrow Mountain type Middle Archaic-era point. The bulk of the cultural material is concentrated near the point, which extends into Chesconessex Creek. As indicated by the tree roots along the shoreline, the area once encompassed a loblolly pine forest. The 1850 coastal survey map shows a scrub forest with marsh at this location.

An overlay of the satellite images suggests that the shoreline has eroded or receded ~15 meters (~49 feet) over the past 15 years.

Figure 3.101. The image shows the shoreline at 44AC643.

Figure 3.102. The satellite image defines the boundary and the longitude and latitude locational data for 44AC642 and 44AC643 in Accomack County, Virginia.

62). Back Creek #1 - 44AC0460

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a site with an unknown prehistoric-era occupation. At the time, an eroding feature was observed along the shoreline, which contained two conjoining fragments of a single quartzite flake. Fire-cracked rock was also observed along the shoreline. The site setting encompasses a drowned upland surface beneath tidal marsh.

The recent survey produced no artifacts and did not reveal any features along this stretch of shoreline. An overlay of the satellite images suggests that the shoreline has eroded or receded ~18 meters (~61 feet) over the past 15 years.

63). Back Creek #2 - 44AC0461

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a site with an unknown prehistoric-era occupation and a late 19th to early 20th century historic presence. The prehistoric assemblage found in 1999 included fire-cracked rock and several flakes. Fragments of a stoneware whiskey jug and brick were also discovered at the site.

The recent survey of the shoreline (see Figure 3.103) documented several quartzite flakes, fire-cracked rock, and brick at 44AC461. The 1850 coastal survey map shows a structure immediately inland from the shoreline. As such, the brick may represent the eroded remnants of a 19th century building or foundation (see Figure 3.104). An overlay of the satellite images suggests that the most extreme shoreline loss at this site is ~12 meters (~39 feet) over the past 15 years. However, the bulk of the shoreline area has eroded or receded ~1.5 meters (~5 feet) over the same duration of time.

Figure 3.103. The image shows the shoreline at 44AC461. Note the hand-made brick scattered along the shoreline in the photo.

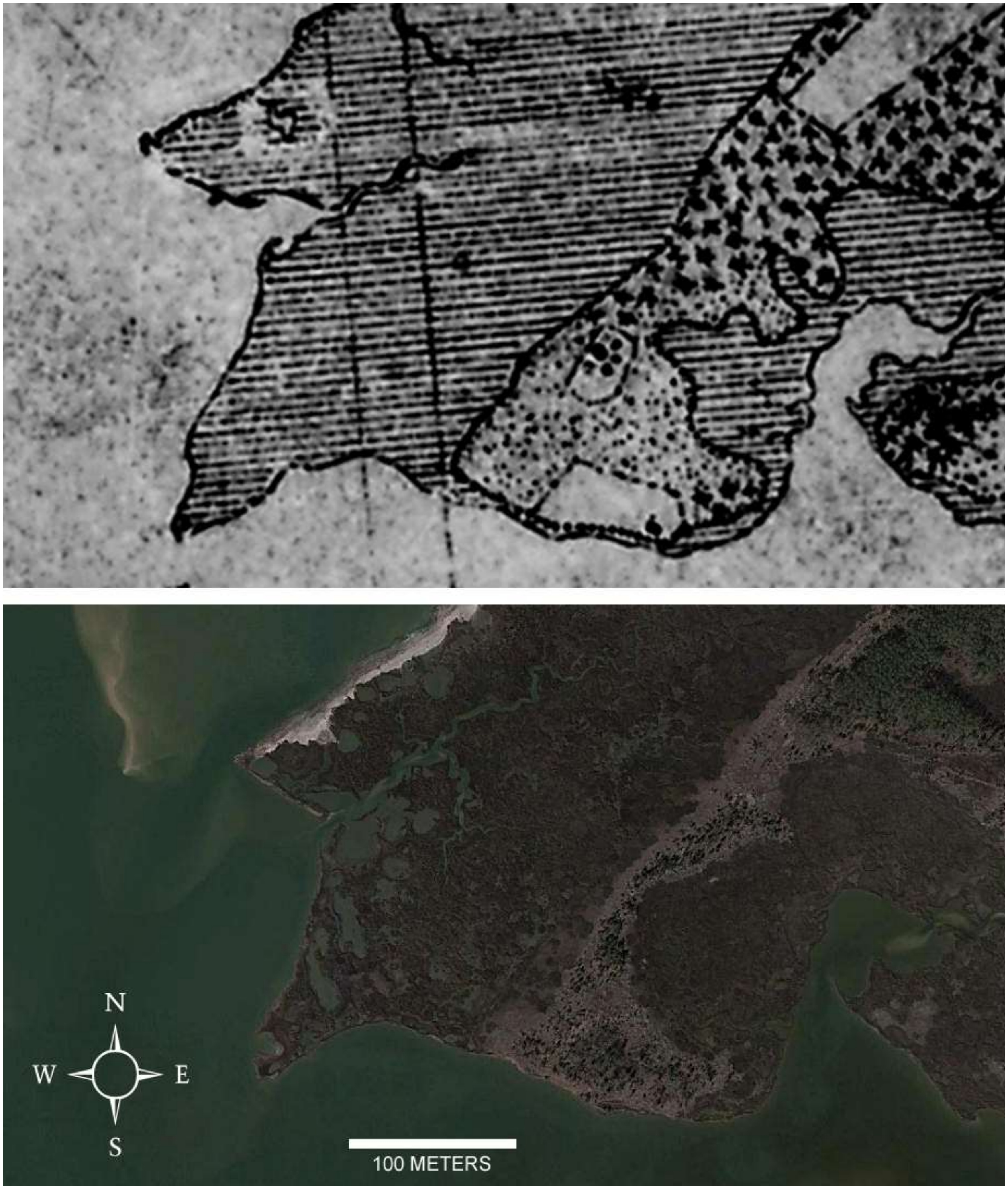

Figure 3.104. The image shows the Back Creek area associated with 44AC461 in 1850 (top) and in 2013 (bottom). The bricks noted along the shoreline at 44AC461 may be associated with the mid-19th century structure noted on the 1850 coastal survey map.

64). Back Creek #5 - 44AC0464

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a site with an unknown prehistoric-era occupation and a 19th century historic presence. The site area encompasses a low eroded forested hummock adjacent to tidal marsh. The prehistoric presence at this site is indicated by fire-cracked rock, a chert core, and a quartz 'bi-pointed' lanceolate. At the time, the chronological period associated with the 'bi-pointed' lanceolate was unknown. Based on recent work in the Chesapeake Bay region, the artifact may be old and thus associated with the Paleoindian or pre-Clovis era.

The recent survey documented only fire-cracked rock along the shoreline at 44AC464. The prior use of this landscape as a farm field is supported by the presence of a plowzone or Ap-soil horizon within the bank profile exposed along the eroded shoreline. The 1850 coastal survey map also indicates that this region was agriculturally tilled 160 years ago (see Figure 3.106). Like many of the former tilled hummocks, the entire hummock is surrounded by a series of man-made ditches. Today the area could not support agricultural crops. It is largely covered by saltmeadow cordgrass, high tide bush, and a few eastern red cedars. A combination of factors such as agricultural disturbance, sheet erosion, localized subsidence, and sea level rise could ultimately explain the transformation of this former agricultural field to a young tidal marsh setting.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~9 meters (~30 feet) over the past 15 years.

65). Back Creek #4 - 44AC0463

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a site with an unknown prehistoric-era occupation and an 18th century historic presence. The historic component would obviously be affiliated with the residence plotted on the 1850 coastal survey (see Figure 3.106). The site setting encompasses an upland and tidal marsh point, which extends into Back Creek. The area inland from the shoreline has a modern residence (see Figure 3.105) in the same relative location as the structure plotted on the 1850 coastal survey.

The recent survey documented only fire-cracked rock and brick along the shoreline at 44AC463. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded between ~11 meters (~38 feet) and ~4 meters (~14 feet) over the past 15 years. The northern shoreline associated with the site is relatively stable and unchanged.

Figure 3.105. The image shows the shoreline at 44AC463 and the modern residence situated inland from the shoreline.

66). Back Creek #3 - 44AC0462

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a prehistoric Late Archaic to Early Woodland period site based on the discovery of a quartzite broadspear and a quartz "teardrop" point. Fire-cracked rock was also noted at this location. The site setting consists of a young tidal marsh area with high tide bush and salt-meadow cordgrass.

The 1850 coastal survey map indicates that the area encompassed a farm field (see Figure 3.106). The prior use of this landscape as a farm field is supported by the presence of a plowzone or Ap-soil horizon within the bank profile exposed along the eroded shoreline. Like many of the former tilled hummocks, the entire hummock is surrounded by a series of man-made ditches. Presumably, these were an attempt to drain the field area. These ditches may have ultimately sterilized the landscape by the introducing high salinity water to the margins of the tilled field. In tandem with tilling, the marked gradient associated with the nearby man-made ditches may have accelerated the rates of field erosion via slope wash and/or sheet wash. As a result, the overall topographic elevation of the agricultural field would have been lowered over time; thus bringing the height of the field to sea level. Today the area could not support agricultural crops. A combination of factors such as agricultural disturbance, sheet erosion, localized subsidence, and sea level rise could ultimately explain the transformation of this former agricultural field to a young tidal marsh setting.

As indicated on the 1850 coastal survey map, the western margin of the hummock was forested 160 years ago. The untilled forested portion of the hummock presently encompasses a tidal marsh setting.

As such, localized subsidence and sea level rise would explain the net loss of forested upland over the past century and a half.

The recent survey documented only fire-cracked rock along the shoreline at 44AC462. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded between ~13 meters (~43 feet) and ~5 meters (~18 feet) over the past 15 years.

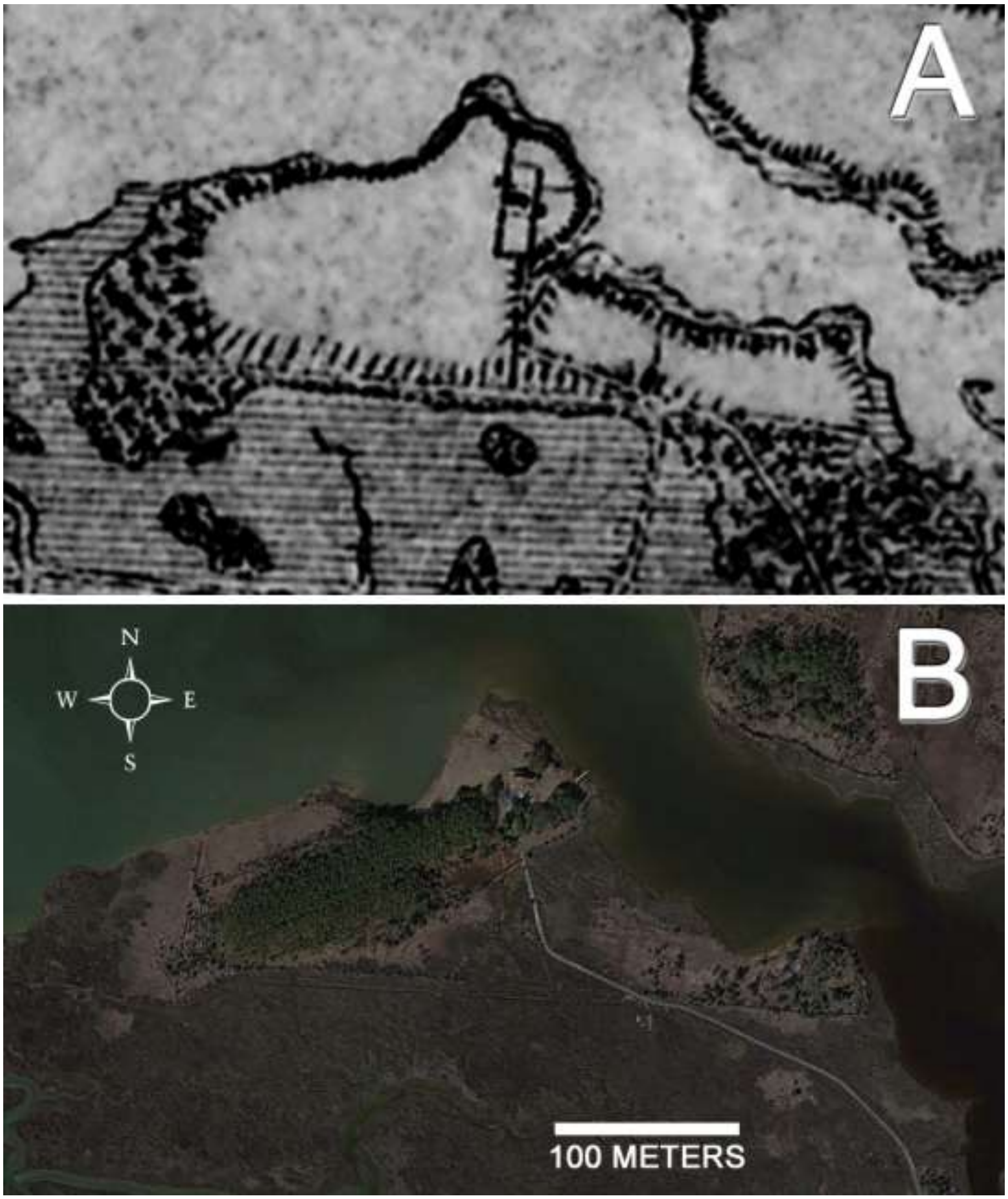

Figure 3.106. The image shows the Back Creek area associated with 44AC462, 44AC463, and 44AC464 in 1850 (top) and in 2013 (bottom). The amount of upland landscape has been greatly reduced and much of the tilled field and forested area documented in 1850 is now tidal marsh.

67). Back Creek #6 - 44AC0465

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a prehistoric Late Woodland period site based on the discovery of a fragment of Potomac Creek ware, debitage, and fire-cracked rock at this location. These artifacts were associated with a small shell pit feature noted along the shoreline. The shell refuse included a mixture of oyster and hard clam. As indicated by the presence of a plowzone or Ap-soil horizon, the area was historically tilled. The 1850 coastal survey map indicates that the hummock area inland of the shoreline encompassed a farm field and a residence (see Figure 3.107 A). The current satellite image shows a man-made ditch surrounding the formerly tilled hummock (see Figure 3.107 B). The hummock area is currently defined by high tide bush and salt-meadow cordgrass. Today the area could not support agricultural crops. A combination of factors such as agricultural disturbance, sheet erosion, localized subsidence, and sea level rise could explain the transformation of this former agricultural field to a young tidal marsh setting.

Since 1999, the shoreline has been impacted by minimal amounts of erosion. The shell feature observed in 1999 seems to have been lost to erosion (see Figure 3.108). The recent survey documented fire-cracked rock, a chert Adena-like point, two jasper flakes, and a jasper scraper along the shoreline. As such, the site may also contain an Early and Middle Woodland period occupation. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~13 meters (~43 feet) within the central portion of the site over the past 15 years. Both the north and south shoreline sections have eroded or receded ~5 meters (~18 feet) over the same period of time.

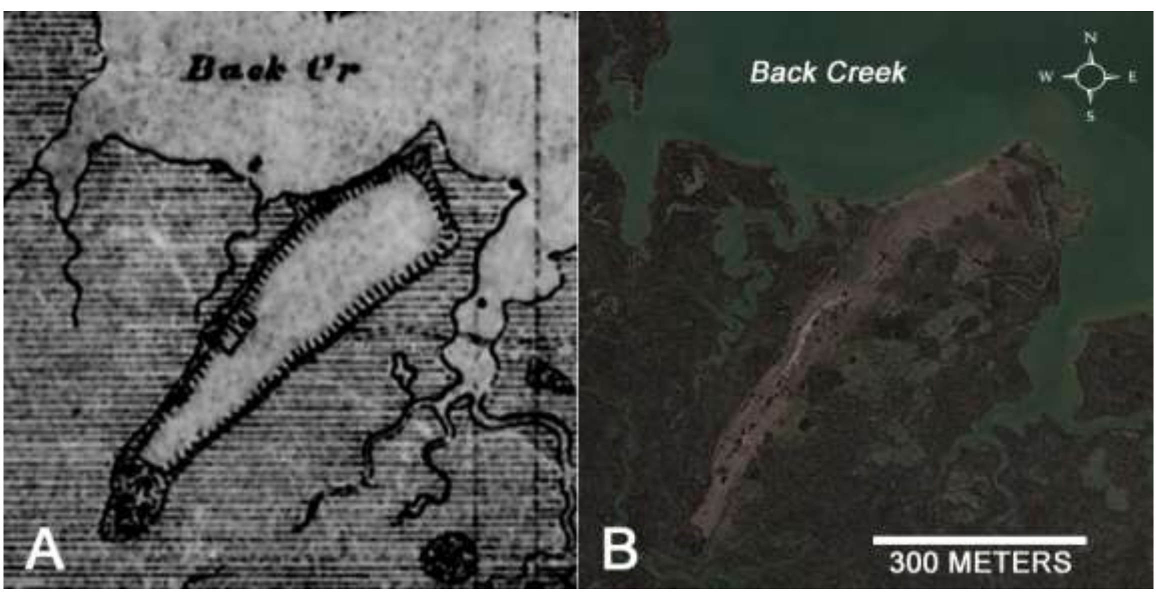

Figure 3.107. The image shows the Back Creek area associated with 44AC465 in 1850 (top) and in 2013 (bottom). The amount of upland landscape has been greatly reduced and much of the tilled field area documented in 1850 is now tidal marsh.

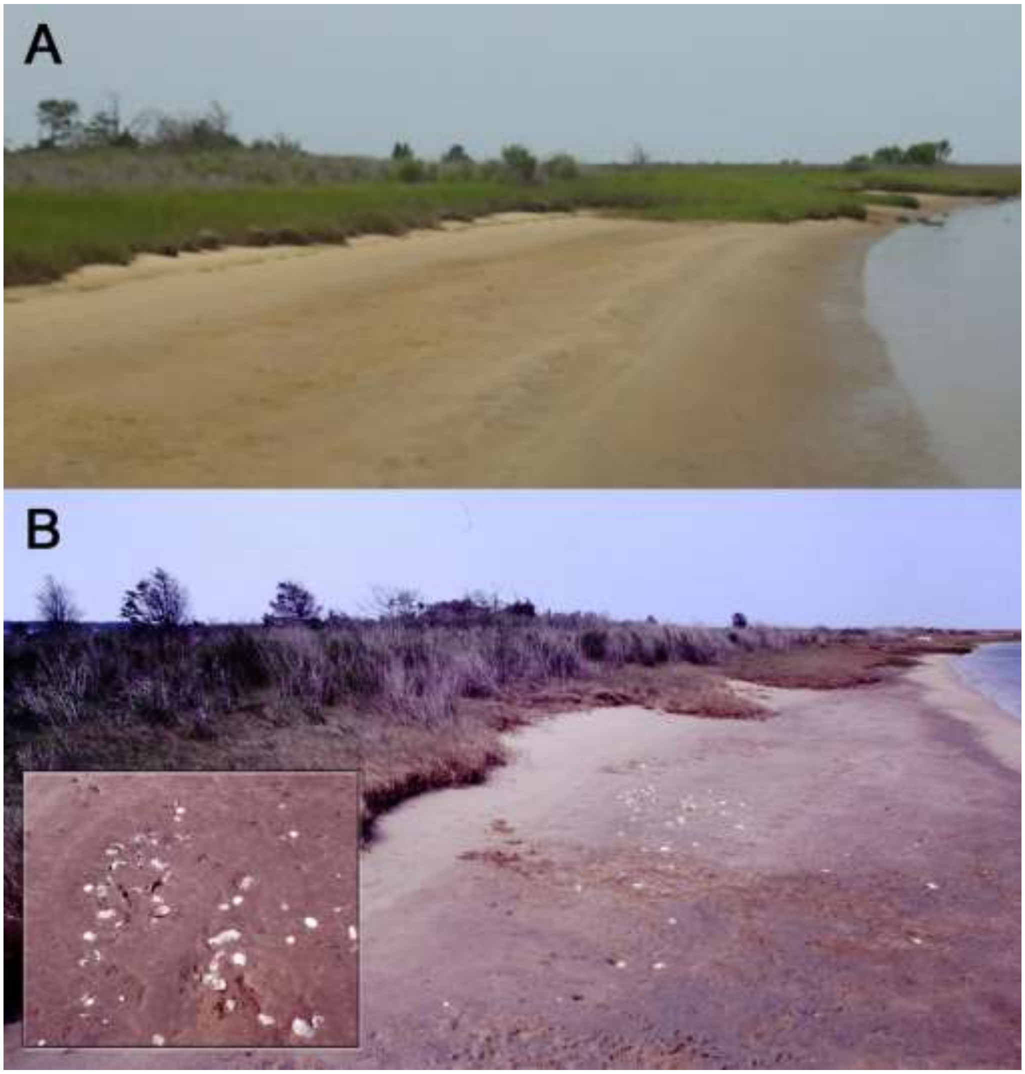

Figure 3.108. The image shows the shoreline at 44AC463 in 2015 (A) and 1999 (B). The shell-filled refuse feature observed in 1999 (B) can be seen (see inset).

68). Sound Beach #1 - 44AC0484

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a prehistoric Late Archaic period site based on the discovery of two Drybrook fishtail points, debitage, and fire-cracked rock at this location. The site in 1999 encompassed a drowned upland surface area located beneath tidal marsh peat.

Since 1999, the shoreline has been heavily impacted by erosion. The drowned upland surface has disappeared and the shoreline consists of geologically-young tidal marsh peat and overwash deposits. The site seems to have been destroyed by erosion. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~51 meters (~167 feet) over the past 15 years.

69). Sound Beach #2 – 44AC0485

The site (see Figure 3.110) was recorded in 1999 (Lowery 2001) as a prehistoric Early and Late Archaic period site. In 1999, he reported a quartz Kirk stemmed point and a quartz Late Archaic stemmed point from this location. Other less diagnostic artifacts included several scrapers, debitage, and fire-cracked rock. At the time, the site setting encompassed a drowned upland surface beneath tidal marsh peat. A few dead cedar trees were noted inland of the shoreline.

Since 1999, the shoreline has been heavily impacted by erosion. The drowned upland surface is still evident along the shoreline and many of the dead trees have been dislodged by erosion. Fire-cracked rock and one chert Late Archaic stemmed point were found during the recent survey of the area. Interestingly, a burial was reported and photographed along the shoreline on October 31, 2014 (see Figure 3.109 A-B). To evaluate the burial, the site was visited on December 11, 2014 by several archaeologists. However, over the short 42-day period the burial had been completely destroyed by shoreline erosion. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~142 meters (~466 feet) along the southern end of the site over the past 15 years. The shoreline associated with the central portion of the site has eroded or receded ~72 meters (~237 feet). The northern end of the site has eroded or receded ~30 meters (~99 feet). It is unclear how far the drowned upland surface associated with the site extends inland from the shoreline.

Figure 3.109. The image shows the shoreline at 44AC485 in 2014. The burial feature (A and B), which was photographed on October 31st 2014 was completely destroyed by erosion on December 11th, 2014.

Figure 3.110. The satellite image defines the boundary and the longitude and latitude locational data for 44AC460, 44AC461, 44AC462, 44AC463, 44AC464, 44AC465, 44AC484, and 44AC485 in Accomack County, Virginia.

70). Sound Beach #3 - 44AC0486

The site (see Figure 3.118) was recorded in 1999 (Lowery 2001) as a prehistoric Middle Woodland period site. In 1999, he reported a jasper and a chalcedony Jack's Reef corner-notched point, as well as a rhyolite Fox Creek point from this location. Other less diagnostic artifacts included a scraper, debitage, and fire-cracked rock. The setting encompassed a drowned hummock or upland surface situated beneath tidal marsh.

Since 1999, the shoreline has been heavily impacted by erosion. The drowned upland surface beneath the tidal marsh noted in 1999 has disappeared (see Figure 3.111). No artifacts were found at this location during the recent survey. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~72 meters (~239 feet) over the past 15 years. As such, 44AC486 may have been destroyed by erosion.

Figure 3.111. The image shows the shoreline at 44AC486.

71). Ware Point - 44AC0162

The site (see Figure 3.118) was initially recorded by J. Mark Wittkofski in 1980 based on information provided to him from a Mr. Bill Belote. The site data form states "*Mr. Belote has not visited this site but has been told of it by friends who have found thirty to forty points at low tide.*" In sum, the site data on file are a little sketchy. In 1999, Lowery (2001) did not record a site at this location. However, the 1999 survey was conducted during the summer months. The site area was examined during the winter months as a result of the recent survey. Numerous fragments of fire-cracked rock were observed on the surface of the modern marsh (see Figure 3.112). A few tree stumps noted offshore indicate the presence of a drowned upland. The collective data indicate that the offshore area does indeed contain a prehistoric archaeological site. Much of the eroded material is being displaced or over-washed onto the modern marsh via wave energy.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded between ~80 meters (~264 feet) and ~47 meters (~155 feet) over the past 15 years.

Figure 3.112. The image shows the shoreline at 44AC162. Displaced fire-cracked rock has been deposited on top of the modern marsh as a result of wave-related overwash processes (see inset).

72). Low Onancock Ridge - 44AC0644

The site (see Figure 3.118) was documented during the recent survey. The site consists of a low upland area (see Figure 3.113) containing a scatter of hand-made bricks, as well as 18th through 19th century ceramics, glass, and nails. Some small brick fragments were noted within the bank profile. The 1850 coastal survey map shows a tilled open field area at this location. Fire-cracked rock and quartzite debitage were also found at the site, which would indicate an unknown prehistoric-era occupation. The site area also encompasses a drowned upland area beneath a veneer of tidal marsh peat.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~14 meters (~46 feet) over the past 15 years.

Figure 3.113. The image shows the shoreline at 44AC644.

73). Onancock Creek Hummock #1 - 44AC0645

The site (see Figure 3.118) was documented during the recent survey. The site consists of a scattering of rhyolite debitage and small fragments of Mockley ware along the shoreline (see Figure 3.114). A thin oyster and hard clam shell midden is located along the western end of the hummock and situated beneath ~60-centimeters of tidal marsh peat (see Figure 3.115). Rhyolite debitage and a rhyolite Fox Creek point were found in situ within this feature and shell was collected and submitted for AMS dating. The AMS results on the midden feature directly associated with the Fox Creek point were 484 ± 40 calAD (D-AMS 0015329). The resultant age-estimate is consistent with the associated lithic projectile point. As such, the site and the dated feature indicate a Middle Woodland-era occupation.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~14 meters (~46 feet) over the past 15 years.

Figure 3.114. The image shows the shoreline at 44AC645. The shell feature has been demarcated along the exposed bank.

Figure 3.115. The image shows the drowned shell refuse feature at 44AC645. The soil profile is defined and the highlighted area denotes the location of the in situ Fox Creek point (see inset, A).

74). Onancock Creek Hummock #2 - 44AC0646

The site (see Figure 3.118) was documented during the recent survey. The site (see Figure 3.116) consists of a scattering of shell and 19^{th} and 20^{th} century historic artifacts (brick, iron, ceramics, and glass). The historic material is confined to the upland portion of the hummock and would indicate a small domestic residence was located on this hummock.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~13 meters (~43 feet) over the past 15 years.

Figure 3.116. The image shows the shoreline at 44AC646.

75). West Onancock Marsh - 44AC0647

The site (see Figure 3.118) was documented during the recent survey. The area encompasses a drowned upland landscape (see Figure 3.117) with fire-cracked rock and some quartzite debitage, which indicate an unknown prehistoric-era occupation. Large oyster shells along the shoreline suggest that a former midden or shell pit feature may have been associated with the site and recently eroded away. Some small fragments of shell were noted within the inundate upland A-horizon situated beneath ~80-centimeters of tidal marsh peat. The 1850 coastal survey map shows a residence that has now eroded away. The residence was located offshore of this location.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~13 meters (~43 feet) over the past 15 years.

Figure 3.117. The image shows the shoreline at 44AC647.

Figure 3.118. The satellite image defines the boundary and the longitude and latitude locational data for 44AC162, 44AC486, 44AC644, 44AC645, 44AC646, and 44AC647 in Accomack County, Virginia.

76). **North Thicket Point - 44AC0648**

The site (see Figure 3.121) was documented during the recent survey. The site (see Figure 3.119) consists of a dense accumulation of shell and 19th and 20th century historic artifacts (brick, iron, ceramics, and glass). The historic material is confined to the upland portion of the hummock and would indicate that a domestic residence was once located on this hummock. The area also seems to have been tilled, as indicated by the plowzone or Ap-soil horizon associated with the exposed upland portion of the site. The 1850 coastal survey map shows a residence and an orchard at this location.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~13 meters (~43 feet) over the past 15 years.

Figure 3.119. The image shows the shoreline at 44AC648. A mixture of shell, glass, and other historic debris are deposited on the surface of the modern marsh (see inset).

77). South Thicket Point - 44AC0487

The site (see Figure 3.121) was recorded in 1999 (Lowery 2001) as a prehistoric site with both a Late Archaic and an Early Woodland period occupation. In 1999, the site encompassed an upland forested linear ridge landform. The ridge is surrounded on both sides by tidal marsh, which encapsulates a drowned former upland surface. The ridge was tilled at one time as indicated by the plowzone or Ap-soil horizon in the bank profile. A man-made ditch surrounds the hummock area.

Since 1999, the upland portion of the shoreline has been heavily impacted by erosion. The tidal marsh on either side of the hummock seems to be more resistant to erosion. An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~28 meters (~91 feet) over the past 15 years. The recent survey documented an historic component associated with the site (see Figure 3.120). Brick fragments and historic 18th and 19th century ceramics, glass, kaolin pipes, and gunflint material were observed along the shoreline. Immediately offshore from the upland ridge, a brick-well (see Figure 3.120 A), a barrel-well (see Figure 3.120 B), and a box-well (see Figure 3.120 C) were observed beneath the water. Given the degree of erosion, these well features were situated in the interior and far inland from the shoreline in 1999. Four fragments of fire-cracked rock and one quartzite flake were discovered along the shoreline, which indicate the presence of the previously documented prehistoric occupation.

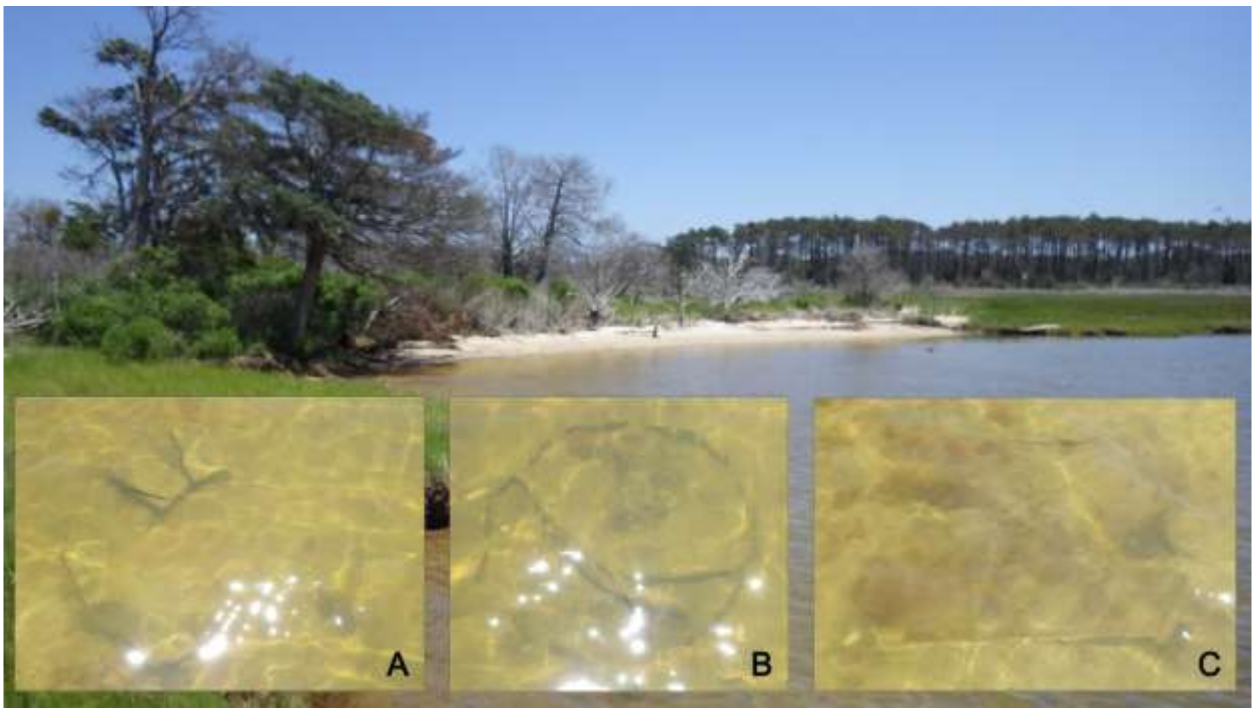

Figure 3.120. The image shows the shoreline at 44AC487. A brick well (A), a wooden barrel well (B), and a wooden box well (C) are situated in the shallows near the eroded hummock.

Figure 3.121. The satellite image defines the boundary and the longitude and latitude locational data for 44AC487 and 44AC648 in Accomack County, Virginia.

78). Pungoteague Creek #9 – 44AC0483

The site (see Figure 3.123) was recorded in 1999 (Lowery 2001). In 1999, the site encompassed a tidal marsh area associated with a drowned upland surface. Artifacts found at the site included fragments of steatite and chert, as well as quartzite debitage and fire-cracked rock. The limited assemblage indicated the presence of an unknown prehistoric component at this location. The steatite artifacts may indicate a Late Archaic or Terminal Archaic period occupation.

The recent shoreline survey found nothing at this location. Since the 1999 survey, a large wooden pier has been constructed across the site area. An overlay of the satellite images suggests that the shoreline has eroded or receded ~14 meters (~47 feet) over the past 15 years. It is possible that the site recorded in 1999 no longer exists.

79). Pungoteague Creek #8 – 44AC0161

The site (see Figure 3.123) designated as 44AC161 was initially recorded by J. Mark Wittkofski in 1980 based on information provided to him from a Mr. Bill Belote. The site was again rexamined and recorded in 1999 (Lowery 2001). Wittkofski's data indicated the presence of an unknown prehistoric component along with a possible contact-period presence. In 1999, Lowery found late 18th through 20th century era artifacts along this stretch of shoreline. Lowery also noted a brick feature eroding from the shoreline along with some historic shell refuse. These features are likely associated with the adjacent 19th century residence situated inland from the eroded bank (see Figure 3.122).

With the exception of a ~70 meter (~230 feet) section of shoreline immediately west of the 19th century residence, the remaining shoreline has been rip-rapped and bulk-headed. The recent survey documented brick, 19th and 20th century ceramics, and glass along the eroding section of the site.

An overlay of the satellite images suggests that the shoreline in the area west of the historic residential structure has eroded or receded ~8 meters (~28 feet) over the past 15 years.

Figure 3.122. The image shows the shoreline at 44AC161. The historic residence is situated near the eroded bank.

80). Belote – 44AC0160

The site (see Figure 3.123) designated as 44AC160 was initially recorded by J. Mark Wittkofski in 1980 based on information provided to him from a Mr. Bill Belote. Wittkofski never visited the site. Belote indicated his son has a collection of Archaic points, pottery, and an axe from this location. The survey conducted by Lowery in 1999 (see Lowery 2001) did not locate a prehistoric site at this location. The shoreline area is largely accreting sediment and stable. As the 1967 aerial photographs indicate, the shoreline, the adjacent road, and nearshore structures have remained largely unchanged over the past 50 years.

Given the long-term conditions, it is doubtful that prehistoric artifacts were found along the shoreline at this location. It is possible that a prehistoric archaeological site is situated inland from the shoreline. Like the 1999 survey, the recent shoreline survey did not locate a prehistoric site at this location.

Figure 3.123. The satellite image defines the boundary and the longitude and latitude locational data for 44AC160, 44AC161, and 44AC483 in Accomack County, Virginia.

81). Pungoteague Creek #1 – 44AC0477

The site (see Figure 3.124) was recorded in 1999 (Lowery 2001). In 1999, the site encompassed a tidal marsh peninsula situated near the mouth of a tidal creek drainage (see Figure 3.125). The site also encompasses a drowned upland land surface. The assemblage found at the site in 1999 include a Middle Archaic stemmed point, a scraper, debitage, and fire-cracked rock. The recent survey of the shoreline revealed only fire-cracked rock at this location. One fragment of fire-cracked rock was in situ within the exposed bank profile.

The original site boundary as defined in 1999 is currently located offshore. However, the presence of in situ fire-cracked rock would suggest that the original site extends inland beneath the tidal marsh. A small forested hummock situated ~20 meters (~68 feet) inland from the modern shoreline may ultimately turn out to be part of the site.

An overlay of the satellite images suggests that the shoreline associated with the site has eroded or receded ~21 meters (~69 feet) over the past 15 years.

Figure 3.124. The satellite image defines the boundary and the longitude and latitude locational data for 44AC477 in Accomack County, Virginia.

Figure 3.125. The image shows the shoreline at 44AC477.

82). Pungoteague Creek #2 – 44AC0478

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). In 1999, the site encompassed a low forested point fringed by tidal marsh (see Figure 3.126) at the mouth of a tidal creek. The lithic assemblage found in 1999 suggested a prehistoric occupation of unknown cultural affiliation. Notably, only three fragments of fire-cracked rock were found at the site during the recent survey.

An overlay of the satellite images suggests that the eastern portion of site, which is located near the creek mouth, has eroded or receded ~28 meters (~94 feet) over the past 15 years. The western section of the site has eroded ~18 meters (~58 feet). The central tidal marsh portion of the site is largely stable and unchanged.

Figure 3.126. The image shows the shoreline at 44AC478.

83). Pungoteague Creek #3 - 44AC0479

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). In 1999, the site encompassed a low forested area fringed by tidal marsh (see Figure3.127). The site is also situated near the mouth of a tidal creek drainage. A limited lithic assemblage, which included debitage and fire-cracked rock, suggested a prehistoric occupation of unknown cultural affiliation. Several fragments of fire-cracked rock were found during the recent survey of the shoreline.

An overlay of the satellite images suggests that the western shoreline at this site has eroded or receded ~22 meters (~74 feet) over the past 15 years. The eastern section of the site has eroded ~11 meters (~37 feet).

Figure 3.127. The image shows the shoreline at 44AC479.

84). Pungoteague Creek #4 - 44AC0480

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). In 1999, a hard clam and oyster shell pit feature was observed along the shoreline at this location. The site encompassed a low forested hummock fringed by tidal marsh. The artifacts found during the 1999 survey consisted of only undiagnostic debitage and fire-cracked rock. The feature and the limited assemblage suggested a prehistoric occupation of unknown cultural affiliation.

The shell-filled pit feature documented along the shoreline in 1999 has been lost to erosion. The original site boundary as defined in 1999 is currently located offshore. Nothing was found at the location situated inland from the 1999 site boundary. As such, 44AC480 may have been destroyed by erosion.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~17 meters (~57 feet) over the past 15 years.

85). Pungoteague Creek #5 - 44AC0481

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). The artifacts found during the 1999 survey suggested the site contained an historic 19th century presence, as well as an unknown prehistoric occupation. At the time a few brick fragments and other historic material noted along the shoreline suggested a possible landing/launching site. At the time, the site consisted of a tidal marsh situated about 40 meters north of a forested linear ridge. Since 1999, all of the marsh area has eroded and the forest is currently located along the shoreline (see Figure 3.128 A).

The current survey located evidence of a 19th century structure with a brick-pier foundation situated along the eroding shoreline (see Figure3.128 B). A wooden privy feature was also noted along the shoreline (see Figure 3.128 C). The area, which is currently forested, was clearly tilled, as indicated by a marked plowzone or Ap-soil horizon. Numerous fragments of 19th century ceramics and glass were observed. Pamplin pipe fragments and gunflint were also observed in the area. Three fragments of fire-cracked rock and one rhyolite flake suggest a prehistoric presence at this location.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~43 meters (~143 feet) over the past 15 years.

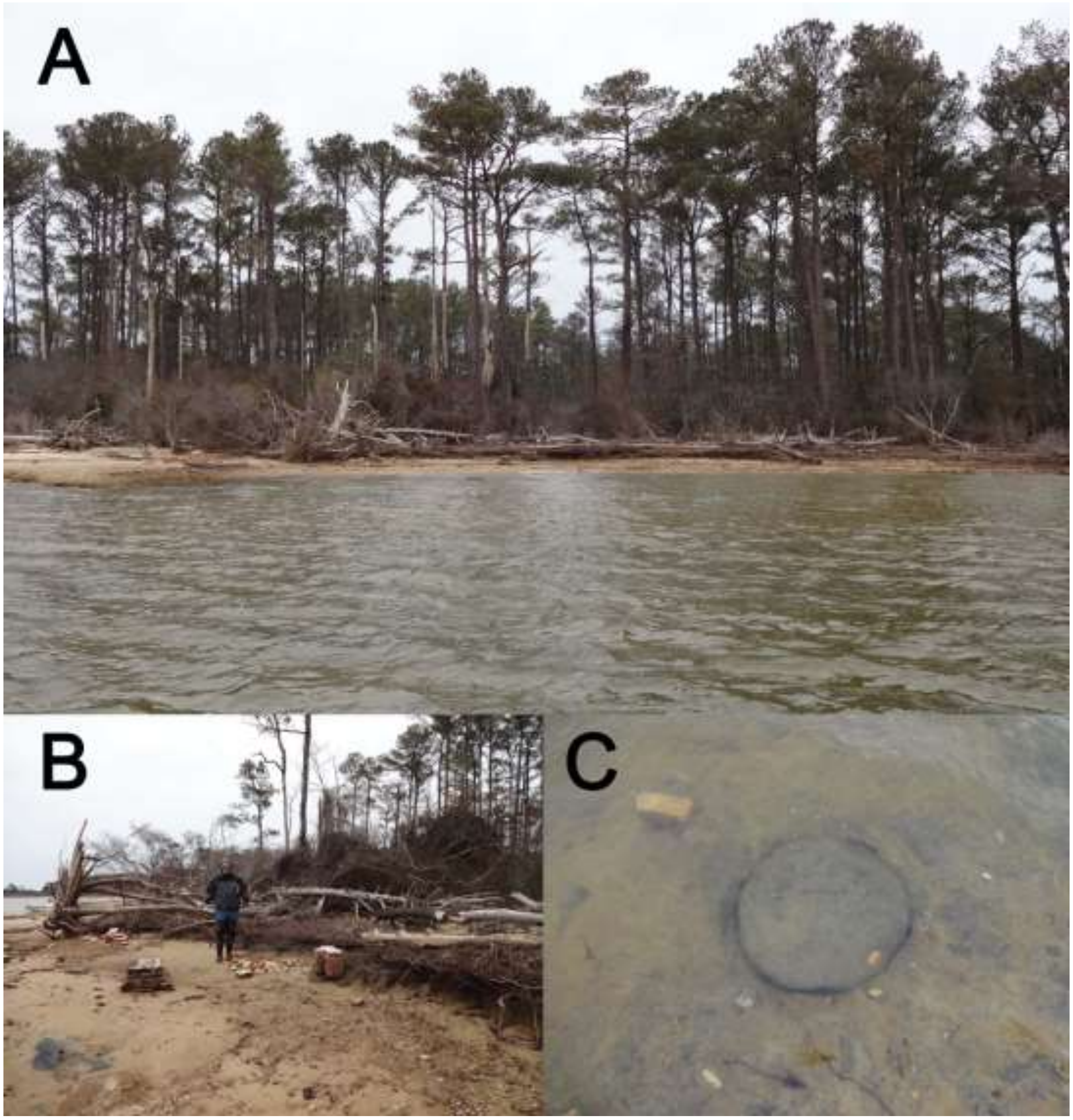

Figure 3.128. The image shows the shoreline at 44AC481 (A). An eroded brick-pier foundation (B) and a wooden barrel well feature (C) are exposed along the eroding shoreline.

86). Pungoteague Creek #6 - 44AC0482

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). In 1999, a hard clam and oyster shell midden feature was observed along the shoreline at this location. Both Mockley and Townsend ceramics were found, which indicated both a Middle and Late Woodland period occupation. One triangular point, debitage, hammerstones, and fire-cracked rock were also found along the shoreline. The area encompasses a slightly elevated linear ridge, which extends inland from the shoreline. The site and archaeological features are focused along the elevated area that has been exposed by erosion.

The midden feature documented along the shoreline in 1999 (see Figure 3.129 A) has been lost to erosion (see Figure 3.129 B). The original site boundary as defined in 1999 is currently located offshore.

The current shoreline area does contain a drowned upland surface and evidence that the region was once forested. Only two fragments of fire-cracked rock were found along the present shoreline. It is suspected that archaeological features do occur on the low ridge inland of the modern shoreline.

An overlay of the satellite images suggests that the shoreline at this site has eroded or receded ~43 meters (~143 feet) over the past 15 years.

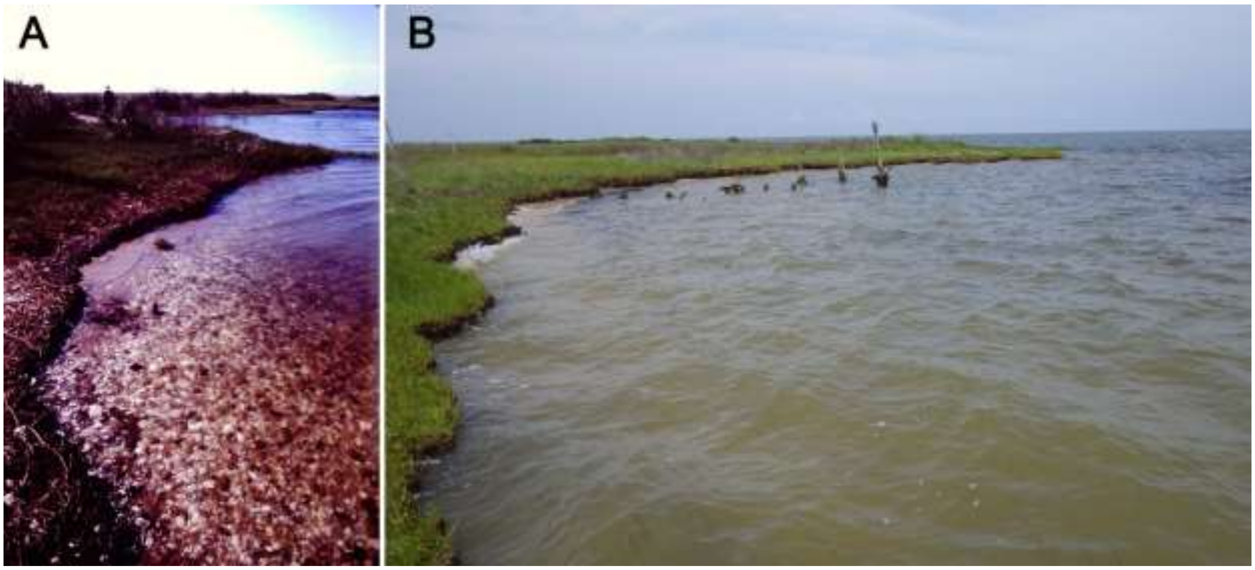

Figure 3.129. The image shows the shoreline at 44AC481 in 1999 (A) and in 2015 (B).

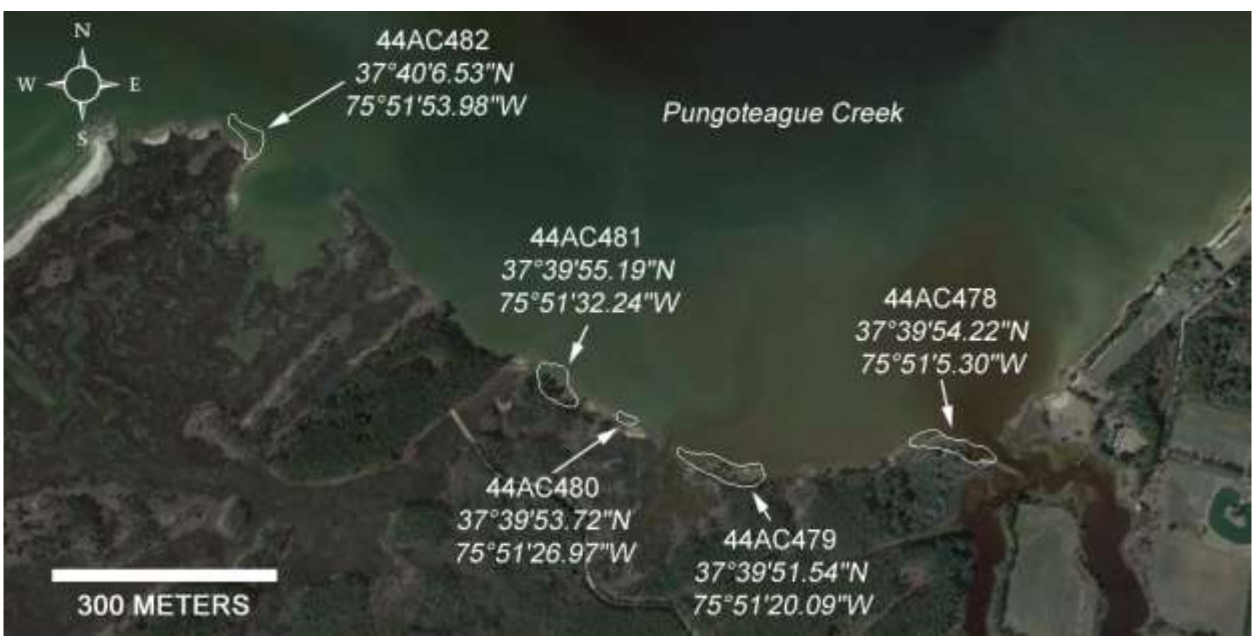

Figure 3.130. The satellite image defines the boundary and the longitude and latitude locational data for 44AC478, 44AC479, 44AC480, 44AC481, and 44AC482 in Accomack County, Virginia.

87). Pungoteague Creek #7 - 44AC0537

The site was recorded in 1999 (Lowery 2001). In 1999, a hard clam and oyster shell refuse feature was observed along the shoreline at this location. Associated artifacts included one fragment of a Hell Island type ceramic vessel, one quartz flake, and fire-cracked rock. The assemblage found at the site would suggest a late Middle Woodland-era occupation. The area encompasses a slightly elevated linear ridge, which is roughly parallel to the shoreline. The site and archaeological features are focused in the elevated area that has been exposed by erosion. The recent survey relocated a prehistoric refuse feature at this site location (see Figure 3.131).

An overlay of the satellite images suggests that the shoreline has eroded or receded ~32 meters (~108 feet) over the past 15 years. Even though the original site boundary as defined in 1999 is currently located offshore, the archaeological site clearly extends inland from the former shoreline. As such, erosion since 1999 has exposed new archaeological features eastward of the former shoreline. During the recent survey, only fire-cracked rock was found along the shoreline and within the midden feature.

Figure 3.131. The image shows the shoreline at 44AC537.

88). Butcher's Creek Marsh – 44AC0655

The site (see Figure 3.137) was discovered during the recent survey. The site is located on a low point of land within the northern-most tributary of Butcher Creek (see Figure 3.132). The point encompasses an area of tidal marsh vegetation with some salt tolerant eastern red cedars and pines. The trees within the interior have or are currently dying. An upland surface is evident along the eroded shoreline area. Fire-cracked rock, four quartzite flakes, and one quartz biface fragment were found along the shoreline. In situ fire-cracked rock was observed with the exposed sub-soil. The assemblage associated with the site suggests a prehistoric occupation of unknown cultural affiliation.

An overlay of the satellite images suggests that the shoreline has eroded or receded ~5 meters (~16 feet) over the past 15 years. As such, erosion since the 1999 survey has exposed the archaeological record associated with this landform.

Figure 3.132. The image shows the shoreline at 44NH504 (left), a close-up view of the shoreline (upper right), and a detail showing an in situ fragment of fire-cracked rock (lower right).

89). Butcher Creek #1 - 44AC0466

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is situated on a prominent forested point of land located along the western side of a tributary of Butcher Creek (see Figure 3.133). A tidal marsh defines the western site boundary and the tributary defines the eastern boundary. The area does not seem to have been agriculturally-tilled in the past. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation.

The recent survey located the basal section of a quartzite Guilford point, four fragments of fire-cracked rock, and two quartzite flakes at this location. As such, the site seems to have an initial Late Archaic period occupation. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the southern end of the site has eroded or receded ~22 meters (~72 feet). The remainder of the shoreline associated with the site has eroded or receded ~7 meters (~22 feet).

Figure 3.133. The image shows the shoreline at 44AC466.

90). Butcher Creek #2 – 44AC0467

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is situated on a prominent point of land between two tributaries of Butcher Creek (see Figure 3.134). The area is forested and fringed by tidal marsh. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation. The presence of an Ap-soil horizon within the eroded bank profile suggests that the area was once tilled.

The recent survey located twelve fragments of fire-cracked rock, seven quartzite flakes, and one quartz flake at this location. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the northwestern end of the site has eroded or receded ~20 meters (~65 feet). The western shoreline has eroded or receded ~8 meters (~26 feet). Meanwhile, the southern end of the site has eroded or receded ~5 meters (~16 feet).

Figure 3.134. The image shows the shoreline at 44AC467.

91). Butcher Creek #3 - 44AC0468

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated point of land within a small tributary situated on the northeastern side of Butcher Creek (see Figure 3.135).   The point encompasses a mixed forest and tidal marsh area. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation.

The recent survey located thirty-five fragments of fire-cracked rock and seven quartzite flakes at this location. The shoreline at this site has been variably impacted by erosion. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the northern end of the site has eroded or receded ~7 meters (~22 feet). The western shoreline has eroded or receded ~5 meters (~16 feet). Meanwhile, the southern end of the site seems to be stable and unchanged.

Figure 3.135. The image shows multiple views of the shoreline at 44AC468.

92). Butcher Creek #4 - 44AC0469

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated point of land within a small tributary situated on the northeastern side of Butcher Creek. The point encompasses a forested area, as well as tidal marsh vegetation. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation, as well as an historic 18^{th} through 19^{th} century presence.

The recent survey located three fragments of fire-cracked rock and one brick fragment at this location. The shoreline at this site seems to be stable. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the northern portion of the site has not changed. However, the southern shoreline has eroded or receded ~4 meters (~13 feet).

93). Butcher Creek #5 - 44AC0470

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated point of land along the eastern side of Butcher Creek. The point encompasses an area of tidal marsh vegetation over a submerged upland surface. A man-made ditch surrounds the slightly elevated area along the shoreline. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation, as well as an historic 17th century presence. At the time, an historic 17th century refuse feature was noted within the bank along the shoreline.

The recent survey located four fragments of fire-cracked rock and one green onion bottle neck fragment at this location. The 17th century feature observed in 1999 has been lost to erosion. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has uniformly eroded or receded ~5 meters (~16 feet).

94). Butcher Creek #6 - 44AC0471

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated point of land along the eastern side of Butcher Creek (see Figure 3.136). The point encompasses an area of tidal marsh vegetation with some salt tolerant eastern red cedars and pines. The northern boundary is defined by a natural tidal marsh drainage. A man-made ditch intersects the site along the southern shoreline area. The assemblage found along the shoreline in 1999 included a quartz unifacial graver tool, five green silicified rhyolite flakes, nine quartz flakes, twenty-five quartzite flakes, a chert spall, and fragments of fire-cracked rock. The assemblage suggested a prehistoric occupation of unknown cultural affiliation. However, the presence of green silicified rhyolite may indicate an Early Archaic occupation.

The recent survey located five quartzite flakes and fifteen fragments of fire-cracked rock at this location. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded between~14 meters (~46 feet) and ~4 meters (~13 feet).

Figure 3.136. The image shows a view of the shoreline at 44AC471 looking north (A) and looking south (B).

95). Butcher Creek #7 - 44AC0472

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated point of land within a small tributary situated on the southeastern side of Butcher Creek. The point encompasses an area of tidal marsh vegetation with some salt tolerant eastern red cedars and pines. The 1999 survey documented a single oyster shell-filled pit feature at this location with associated fire-cracked rock. The assemblage found along the shoreline in 1999 included seven quartzite flakes, a quartz core, and fire-cracked rock. The shell feature and the undiagnostic assemblage of lithic artifacts suggested a prehistoric occupation possibly affiliated with the Woodland period.

The recent survey located only one fragment of fire-cracked rock at this location. The shell-filled pit feature observed in 1999 has been destroyed by erosion. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded ~8 meters (~26 feet).

96). Butcher Creek #8 - 44AC0473

The site (see Figure 3.137) was recorded in 1999 (Lowery 2001). The site is located on a slightly elevated linear ridge, which is on the southern side of Butcher Creek. The low ridge encompasses tidal marsh vegetation with some salt tolerant eastern red cedars. The assemblage found at the site in 1999 included a quartz biface distal fragment, a quartz biface lateral edge fragment, and fire-cracked rock; which suggested a prehistoric occupation of unknown cultural affiliation.

Since 1999, a long wharf and pier have been constructed along the eastern margins of the site. The recent survey located only three fragments of fire-cracked rock. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded between ~13 meters (~43 feet) and ~3 meters (~10 feet).

97). South Butcher Creek – 44AC0152

The site (see Figure 3.137) designated as 44AC152 was initially recorded by J. Mark Wittkofski in 1980 based on information provided to him from a Mr. Lohr. The site data form also indicates a prehistoric Archaic-era cultural affiliation. However, no diagnostic artifacts are listed on the original form. The William and Mary Center for Archaeological Research suggested in 1997 that the site represented a submerged encampment.

The shoreline survey conducted in 1999 produced no artifacts at this site location. The recent survey reinforced the observations made in 1999. The site may have been destroyed by erosion prior to the 1999 survey. An overlay of the satellite images over the past 15 years indicates that the shoreline has eroded or receded ~36 meters (~120 feet). Given the observed erosion rates, the 1980 shoreline would easily be situated ~76 meters (~250 feet) westward of the current shoreline. As such, the site probably encompassed a nearshore tidal marsh setting when recorded by J. Mark Wittkofski in 1980.

Figure 3.137. The satellite image defines the boundary and the longitude and latitude locational data for 44AC152, 44AC466, 44AC467, 44AC468, 44AC469, 44AC470, 44AC471, 44AC472, 44AC473, 44AC537, and 44AC655 in Accomack County, Virginia.

98). Nandua Creek #4 – 44AC0535

The site (see Figure 3.140) was recorded in 1999 (Lowery 2001). The site setting encompasses a tidal marsh point or peninsula situated near the northern mouth of Back Creek where it enters Nandua Creek. The survey in 1999 documented a fire-cracked rock feature at this site embedded within a drowned upland surface located beneath tidal marsh. The assemblage found at the site in 1999 included a basalt hammerstone, chert debitage, and fire-cracked rock, which suggested a prehistoric occupation of unknown cultural affiliation.

Since 1999, the shoreline at this location has been heavily eroded. Most, if not all, of the site has been destroyed by erosion. The recent survey of the shoreline produced no artifacts. An overlay of the satellite images over the past 15 years indicates that the shoreline has eroded or receded ~26 meters (~86 feet).

99). Nandua Creek #1 - 44AC0532

The site (see Figure 3.140) was recorded in 1999 (Lowery 2001). The site setting encompasses a small forested point within Back Creek; a tributary of Nandua Creek (see Figure 3.138). The survey in 1999 documented a small shell feature at this location. The midden included a mixture of hard clam and oyster. The assemblage found at the site in 1999 included only fire-cracked rock, which suggested a prehistoric occupation of unknown cultural affiliation.

The recent survey located only two fragments of fire-cracked rock along the shoreline and the small shell midden feature observed in 1999 has completely disappeared as a result of erosion. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded between ~13 meters (~43 feet) and ~4 meters (~14 feet).

Figure 3.138. The image shows a view of the shoreline at 44AC532.

100). Nandua Creek #2 - 44AC0533

The site (see Figure 3.140) was recorded in 1999 (Lowery 2001). The site setting encompasses a small forested point within Back Creek; a tributary of Nandua Creek. The survey in 1999 documented a small shell feature at this location. The midden included a mixture of hard clam and oyster. The assemblage found at the site in 1999 included a shell-tempered Townsend ware vessel fragment, a quartzite flake, and fire-cracked rock, which suggested a Late Woodland-era occupation.

The recent survey of the site area indicates that the shoreline has been partially stabilized with some rip-rap. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded between ~10 meters (~32 feet) and ~3.5 meters (~11 feet). The recent survey located only fire-cracked rock along the shoreline and the small shell midden feature observed in 1999 has completely disappeared.

101). Nandua Creek #3 - 44AC0534

The site (see Figure 3.140) was recorded in 1999 (Lowery 2001). The site setting encompasses a tidal marsh point or peninsula situated near the southern mouth of Back Creek where it enters Nandua Creek (see Figure 3.139). Two man-made ditches cut through portions of the tidal marsh. Beneath the tidal marsh is a drowned upland surface. The assemblage found at the site in 1999 included two shell-tempered Townsend ware vessel fragments, cores, debitage, and fragments of fire-cracked rock, which suggested a Late Woodland-era occupation.

Since 1999, the shoreline at this location has been eroded. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded between ~13 meters (~43 feet) and ~2 meters (~7 feet). The recent survey located only fire-cracked rock along the shoreline associated with the site.

Figure 3.139. The image shows a view of the shoreline at 44AC534.

102). Nandua Creek #5 – 44AC0536

The site (see Figure 3.140) was recorded in 1999 (Lowery 2001). The site setting encompasses a low forested area with tidal marsh (see Figure), which is adjacent to Nandua Creek. A man-made ditch drainage is situated on the northern end of the site, as well as the southern end of the site. The assemblage found at the site in 1999 included a quartz stemmed point and fragments of fire-cracked rock, which suggested a Late Archaic-era occupation.

Since 1999, the shoreline at this location has been markedly eroded. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the site has eroded or receded ~26 meters (~85 feet). The recent survey located only fire-cracked rock along the shoreline. However, the area seems to be collected. While conducting the shoreline survey, a pitted sandstone mortar and a quartzite grinder were found perched on a tree stump (see Figure 3.141). The placement of these artifacts would imply someone found these items and therefore, this site and probably others in the region are being heavily collected by avocational residents.

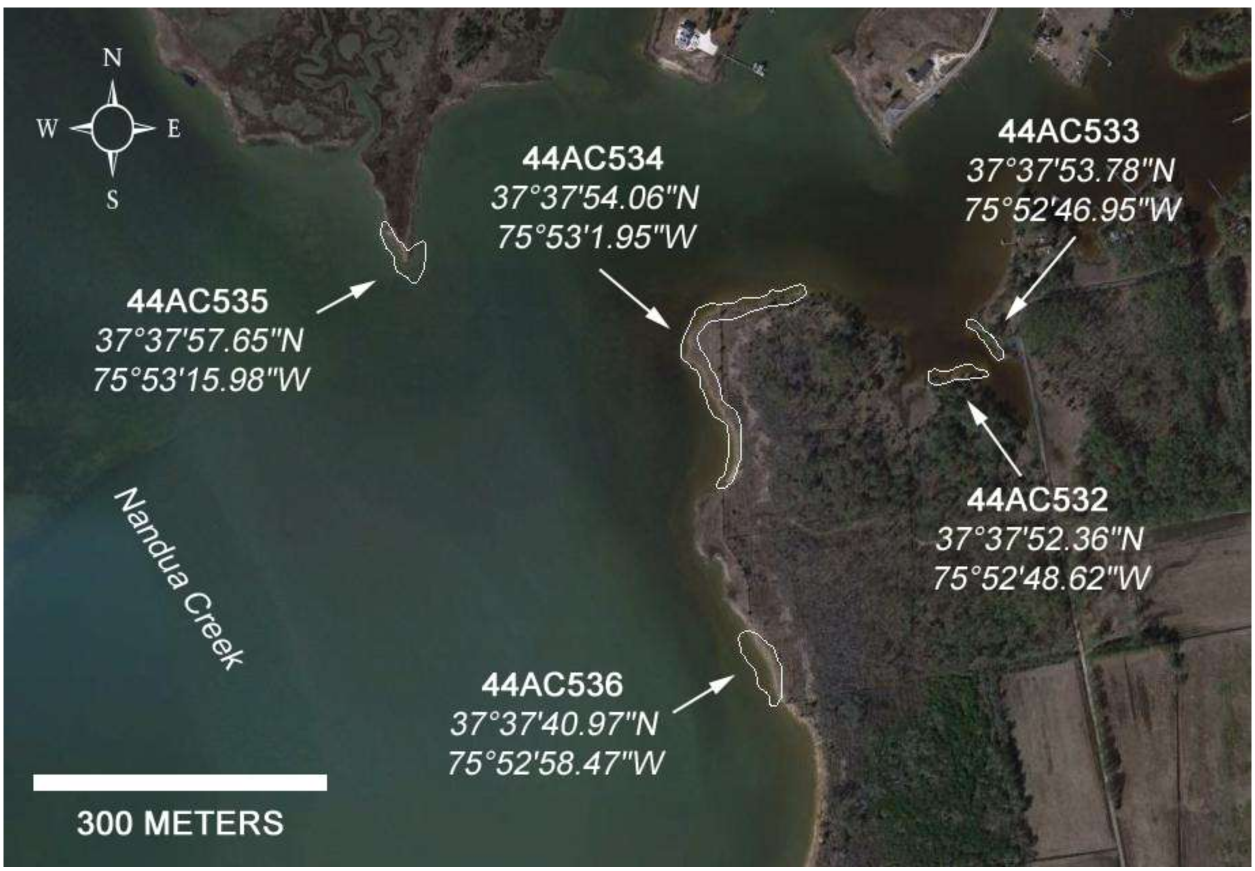

Figure 3.140. The satellite image defines the boundary and the longitude and latitude locational data for 44AC532, 44AC533, 44AC534, 44AC535, and 44AC536 in Accomack County, Virginia.

Figure 3.141. The image shows a view of the shoreline at 44AC536.

103). Nandua Creek #6 – 44AC0511

The site (see Figure 3.143) was recorded in 1999 (Lowery 2001). The site setting encompasses a tidal marsh point, which extends south into Nandua Creek. The tidal marsh encapsulated a drowned upland surface. Archaeological remains were associated with the former upland surface beneath the marsh. The assemblage found at the site included a large basalt full-grooved axe and fragments of fire-cracked rock, which suggested a Late Archaic-era occupation.

Since 1999, the shoreline at this location has been heavily eroded. Most, if not all, of the site has been destroyed by erosion. The recent survey of the shoreline inland of the former site area produced no artifacts. An overlay of the satellite images over the past 15 years indicates that the southern shoreline associated with the site has eroded or receded ~33 meters (~109 feet). The northern section of the site has eroded or receded ~28 meters (~95 feet). Given the magnitude of land loss and the lack of artifacts or observable features, 44AC511 seems to have succumbed to erosion.

104). Interior Nandua #1 – 44AC0474

The site (see Figure 3.143) was recorded in 1999 (Lowery 2001). The site setting encompasses a forested peninsula or point situated near the mouth of a small tidal creek drainage. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation. The assemblage included a hammerstone, a pitted anvil, debitage, and fire-cracked rock.

Since 1999, the shoreline at this location has been stabilized via rip-rap. A house has been constructed within the forested area and a dock has been constructed adjacent to the shoreline. As such, nothing was found during the recent re-examination of this site area. An overlay of the satellite images over the past 15 years indicates that the eastern shoreline associated with the site has eroded or receded ~19 meters (~62 feet). The western section of the site has eroded or receded ~5 meters (~16 feet).

105). Interior Nandua #2 - 44AC0475

The site (see Figure 3.143) was recorded in 1999 (Lowery 2001). The site setting encompasses a forested peninsula, which terminates into a tidal marsh point. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation, as well as an historic 19th century presence. The prehistoric assemblage consisted of a weathered rhyolite flake tool and three fragments of fire-cracked rock. The historic assemblage included 19^{th} century ceramics and glass along with a scattering of brick.

The recent survey of the site area revealed five fragments of fire-cracked rock, one fragment of shell-tempered Townsend ware, one chert flake, and six small pieces of brick. The current assemblage suggests a Late Woodland presence at this site location. Since 1999, a house has been constructed within the forest area near the shoreline. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the forested upland shoreline portion of the site has eroded or receded ~12 meters (~39 feet). The shoreline associated with the tidal marsh point has eroded or receded ~4 meters (~13 feet).

106). Interior Nandua #3 – 44AC0476

The site (see Figure 3.143) was recorded in 1999 (Lowery 2001). The site setting encompasses a forested peninsula adjacent to a tidal marsh spit, which wraps around a small tidal creek drainage. In 1999, the assemblage collected along the shoreline suggested a prehistoric presence of unknown cultural affiliation. The assemblage consisted of one quartzite scraper, debitage, and fire-cracked rock.

The recent survey of the site area revealed only three fragments of fire-cracked rock. An overlay of the satellite images over the past 15 years indicates that the shoreline associated with the forested upland shoreline portion of the site has eroded or receded ~7 meters (~22 feet). The shoreline associated with the tidal marsh has eroded or receded ~4 meters (~13 feet).

107). Interior Nandua #4 – 44AC0488

The site (see Figure 3.143) was recorded in 1999 (Lowery 2001). The site setting encompasses a topographically-low forested area with a fringe of tidal marsh peat. In 1999, the assemblage collected along the shoreline suggested a prehistoric Late Woodland/Contact Period occupation, as well as an historic 17th century presence.

The recent survey of the site area revealed some hand-made brick fragments and one fragment of 17th century-era North Devon gravel-tempered ware. An overlay of the satellite images indicates that the shoreline associated with the site is largely stable. Tidal marsh has developed along the northern shoreline section of the site. About ~2 meters (~7 feet) of erosion has occurred along the southern shoreline section of the site over the past 15 years. The changes are evident in the images of the shoreline (see Figure 3.142) taken in 1999 compared with current 2015 shoreline.

Figure 3.142. The image shows a view of the shoreline at 44AC488 as it appeared on August 2nd, 1999 and on August 10th 2015.

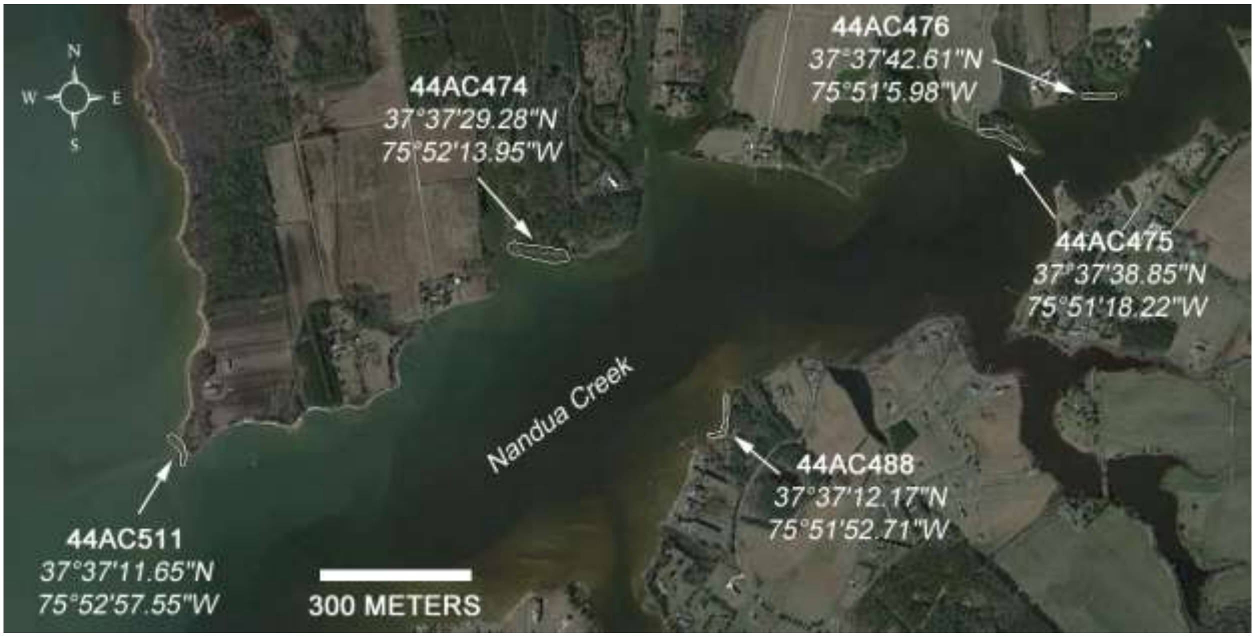

Figure 3.143. The satellite image defines the boundary and the longitude and latitude locational data for 44AC474, 44AC475, 44AC476, 44AC488, and 44AC511 in Accomack County, Virginia.

108). Nandua South #4 – 44AC0052

The site (see Figure 3.149) designated as 44AC52 was initially recorded by Nicholas Luccketti in 1978. Additional data about the site were provided by the William and Mary Center for Archaeological Research in 1997 and Lowery (Lowery 2001) during the 1999 shoreline survey. Luccketti noted a 19th century presence at the site along with a Middle Archaic prehistoric occupation. Lowery noted only brick and fire-cracked rock in 1999.

The shoreline at this location was stabilized via rip-rap in 2012. As a result, the recent survey of the site area revealed no artifacts. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded ~11 meters (~36 feet) over the past 15 years.

109). Nandua South #5 – 44AC0515

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a topographically-low marginally-forested area. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation, as well as an historic 19th century presence.

The recent survey of the site revealed no artifacts. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded ~12 meters (~39 feet) over the past 15 years.

110). Nandua South #6 – 44AC0516

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a topographically-low marginally-forested tidal marsh area. In 1999, the assemblage collected along the shoreline suggested an historic 19th century presence.

The recent survey of the site revealed only two brick fragments. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded ~27 meters (~89 feet) along the western and ~4 meters (~13 feet) along the eastern margins of the site over the past 15 years.

111). Nandua South #7 – 44AC0517

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a topographically-low marginally-forested tidal marsh area. In 1999, the assemblage collected along the shoreline suggested a prehistoric occupation of unknown cultural affiliation. The assemblage collected along the shoreline one chert cobble side scraper, one quartz core, one quartz hammerstone, twelve quartz flakes, one quartzite flake, and two fragments of fire-cracked rock.

The recent survey of the site revealed only two fragments of fire-cracked rock. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded between ~18 meters (~60 feet) and ~5 meters (~16 feet) over the past 15 years.

112). Nandua South #8 – 44AC0518

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a topographically-low marginally-forested tidal marsh (see Figure 3.144). The stratigraphy along the bank profile indicates that the area was tilled. In 1999, the assemblage collected along the shoreline suggested both an Early Woodland occupation and a historic 18th through 19th century presence. The diagnostic Early Woodland artifacts consisted of two fragments of Accokeek ware. The historic materials included mainly ceramics, pipes, and glass.

The recent survey of the site revealed only three fragments of fire-cracked rock and six fragmentary bricks. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded between ~18 meters (~60 feet) and ~8 meters (~26 feet) over the past 15 years.

Figure 3.144. The image shows a view of the shoreline at 44AC518. Note the presence of a plowzone or Ap-soil horizon. The 1850 coastal survey indicates that this area was tilled in the mid-19th century.

113). Nandua South #3 – 44AC0514

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a low forested peninsula with tidal marsh (see Figure 3.145). The assemblage found at the site in 1999 included 18th and 19th century ceramics, gunflints, white kaolin pipe fragments, brick, fire-cracked rock, and quartz flakes. The assemblage suggests both historic and prehistoric occupations.

The recent survey of the site revealed only one fragment of fire-cracked rock and one brick. An overlay of the satellite images indicates that the shoreline associated with the site has eroded or receded between ~20 meters (~65 feet) and ~5 meters (~16 feet) over the past 15 years.

Figure 3.145. The image shows a view of the shoreline at 44AC514.

114). Nandua South #2 – 44AC0513

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a drowned upland landscape situated on a narrow peninsula of land near the mouth of a small tidal creek. When initially discovered, a small shell midden feature, which contained hard clam, oyster, and bay scallop, was observed at this site. The assemblage found at the site included primarily argillite, rhyolite, quartz, and quartzite debitage. However, a single crushed quartz-tempered ceramic vessel fragment would be indicative of an Early to Middle Woodland period occupation.

A drowned upland surface can still be observed along the eroded shoreline and the area located in the interior contains a few tree stumps surrounded by tidal marsh (see Figure 3.146). As such, additional archaeological features may be located inland of the current shoreline.

The recent survey of the site only revealed six fragments of fire-cracked rock. The midden feature observed in 1999 has completely disappeared and eroded. However, the recent survey indicates that most of the site has eroded into Nandua Creek. An overlay of the satellite images indicates that the shoreline has eroded or receded ~12 meters (~39 feet) over the past 15 years.

Figure 3.146. The image shows a view of the shoreline at 44AC513. Note the tree stumps on the surface of the marsh. As the shoreline erodes, tidal marsh vegetation has colonized the exposed sub-soil (see inset).

115). Nandua South – 44AC0512

The site (see Figure 3.149) was recorded in 1999 (Lowery 2001). The site setting encompasses a drowned upland landscape situated on a narrow point of land near the mouth of a small tidal creek. The drowned surface contains a shell midden feature, which includes a mixture of hard clam, oyster, bay scallop, and periwinkle. At the time, the diagnostic artifacts found at the site included a combination of Terminal Archaic, Middle Woodland, and Late Woodland archaeological remains. In 2013, the site was revisited as a result of a VDHR funded sea level study (Lowery 2013a). An assemblage of Middle Woodland-era artifacts was discovered, which included Mockley ceramics and Fox Creek type bifaces made of rhyolite, chert, and argillite (see Figure 3.147). Several modified and unmodified fossil great white sharks teeth (*Carcharodon carcharias*) were also discovered. During this investigation, the shell midden feature associated with the site was radiometrically-dated and provided an age-estimate of 66 ± 32 calBC (D-AMS 003045).

The site (see Figure 3.148) still includes a remnant portion of a heavily eroded shell midden and associated fire-cracked rock. However, the recent survey indicates that most of the site has eroded into Nandua Creek. An overlay of the satellite images indicates that the northern shoreline associated with the site has eroded or receded between ~23 meters (~75 feet) and ~20 meters (~65 feet) over the past 15 years. 44AC512 should disappear completely within the next decade.

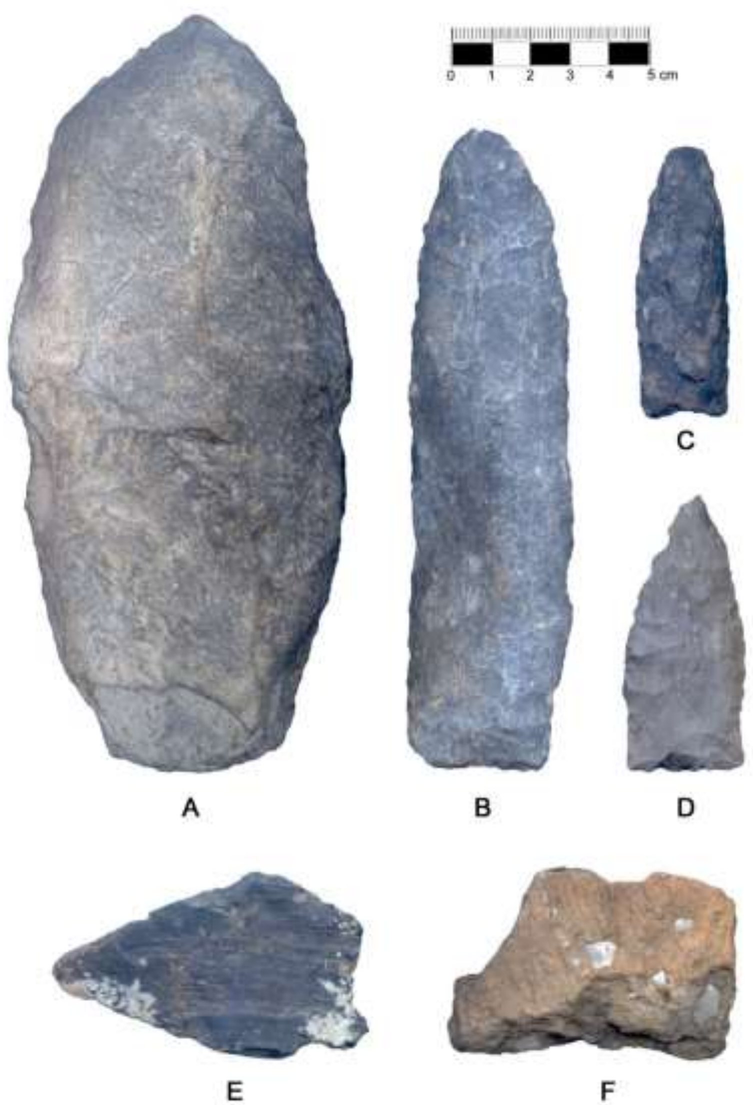

Figure 3.147. The image shows a representative assemblage of Middle Woodland period Fox Creek artifacts found at 44AC512. These were collected in 2013 and include a rhyolite Petalas knife (A), a rhyolite large Fox Creek lanceolate (B), a small rhyolite Fox Creek lanceolate (C), a chert Fox Creek stemmed point (D), a rhyolite utilized flake (E), and a fragment of shell-tempered Mockley ware.

Figure 3.148. The image shows a view of the eroding midden area at 44AC512 in 2013 (top) and in 2015 (bottom). Only a small portion of the original shell midden feature documented in 1999 survives.

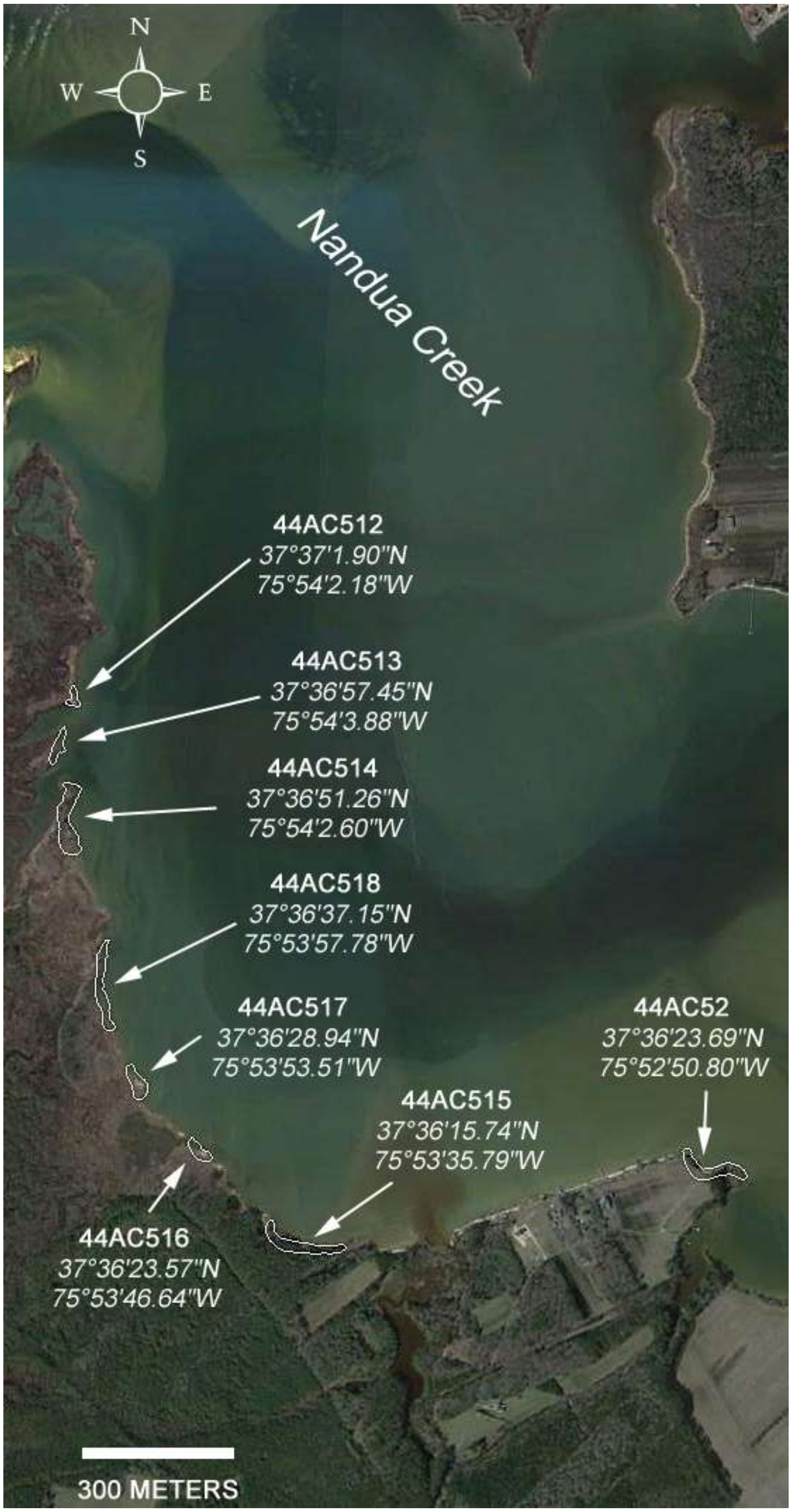

Figure 3.149. The satellite image defines the boundary and the longitude and latitude locational data for 44AC52, 44AC512, 44AC513, 44AC514, 44AC515, 44AC516, 44AC517, and 44AC518 in Accomack County, Virginia.

116). Hyslop Marsh – 44AC0510

The site (see Figure 3.130) was recorded in 1999 (Lowery 2001). The setting of the site consists of a low tidal marsh area encapsulated by a coastal dune formation. Tree stumps have been observed beneath the tidal marsh peat, which indicate a drowned upland landscape. At that time, he collected a small assemblage of Middle and Late Woodland-era artifacts from this shoreline. The assemblage found at the site in 1999 included a quartzite stemmed point, a quartz stemmed point basal fragment, a Flint Ridge chalcedony Adena point, a large chalcedony Jacks Reef pentagonal corner-notched point, a quartzite biface distal fragment, one quartzite flake, one quartzite hammerstone, and four fragments of fire-cracked rock. The assemblage suggested a Late Archaic, Early Woodland, and Middle Woodland period occupation at the site.

The recent survey failed to located or document additional diagnostic artifacts for this site location. However, fire-cracked rock was observed along the shoreline. An overlay of the satellite images indicates that the site has eroded or receded between ~10 meters (~32 feet) and ~20 meters (~65 feet) over the past 15 years.

Figure 3.150. The satellite image defines the boundary and the longitude and latitude locational data for 44AC510.

117). Craddock Creek #1 – 44AC0507

Craddock Creek #1 (see Figure 3.156) was initially recorded in 1999 (Lowery 2001) and re-examined as a result of the recent survey. The site encompasses a low partially forested tidal marsh point (see Figure 3.151). A drowned upland surface occurs beneath the marsh surface. A cluster of fire-cracked rock was noted along the shoreline with the limited artifacts collected. An accurate assessment of the sites cultural chronology cannot be made at this time, based on the limited artifacts assemblage. The site seems to have had only Late Woodland period components. The assemblage found at the site included a pitted hammerstone, three shell-tempered Townsend vessel fragments, one jasper flake, one chert flake, two quartzite flakes, one basalt flake, one fire-cracked chert pebble, and one additional piece of fire-cracked rock.

An overlay of the satellite images indicates that the site has eroded or receded ~10 meters (~32 feet) over the past 15 years. Given the conditions, the true size of the site could not be determined. Future archaeological testing in the area may help to resolve questions about the site's dimensions and cultural chronology.

Figure 3.151. The image shows a view of the shoreline at 44AC507.

118). Craddock Creek #2 – 44AC0508

Craddock Creek #2 (see Figure 3.156) was initially recorded in 1999 (Lowery 2001) and re-examined as a result of the recent survey. The site encompasses a low point of land which extends into a small creek (see Figure 3.152). A dense cluster of fire-cracked rock was noted along the shoreline with the limited artifacts collected. The assemblage noted at the site included one quartz flake, one basalt flake, and four fragments of fire-cracked rock. Given the undiagnostic nature of the assemblage, an accurate assessment of the sites cultural chronology cannot be made at this time. The site seems to have had only a prehistoric occupation. The tilled field behind the shoreline produced no cultural remains. The site may be buried beneath some aeolian deposits.

An overlay of the satellite images indicates that the site has eroded or receded ~23 meters (~75 feet) over the past 15 years. Given the conditions, the true size of the site could not be determined. Future archaeological testing in the field area may help to resolve questions about the site's dimensions and cultural chronology.

Figure 3.152. The image shows a view of the shoreline at 44AC508.

119). Craddock Creek #3 - 44AC0509

Craddock Creek #3 (see Figure 3.156) was initially recorded in 1999 (Lowery 2001) and re-examined as a result of the recent survey. The site encompasses a low tilled point of land adjacent to the shoreline, which extends into the creek (see Figure 3.153). A dense cluster of brick and shell were noted along the shoreline. Brick, shell, and a single fragment of brown-glazed redware were found within the freshly-tilled field along the western portion of the site area. With the limited artifacts collected, an accurate assessment of the sites cultural chronology cannot be made at this time. The site seems to have had only historic occupation components. The tilled field behind the shoreline produced no cultural remains aside from the brick and shell. The shoreline along the eastern portion of the site produced fire-cracked rock and one quartzite flake. The actual number of prehistoric time periods represented at the site cannot be assigned at this time.

An overlay of the satellite images indicates that the site has eroded or receded ~21 meters (~68 feet) over the past 15 years. Given the conditions, the true size of the site could not be determined. Future archaeological testing in the field area may help to resolve questions about the site's dimensions and cultural chronology.

Figure 3.153. The image shows a view of the shoreline at 44AC509 (right) and the adjacent plowed field (left).

120). Craddock Neck #4 - 44AC0051

The site (see Figure 3.156) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by Nicholas Luccketti in 1978. The assemblage found at the site included a Morrow Mountain point, Savannah River point, a chert triangular point, an axe, a ground stone cylinder or pestle, a point made of sheet copper, and a quartz biface. Given the assemblage, the site seems to have cultural occupations associated with the Middle Archaic, Late Archaic, Late Woodland, and Contact periods. During the 1999 survey of the area (Lowery 1999), nothing was found at this location. At that time, the site was blanketed by a dense covering of coastal and inter-tidal sand.

The recent survey failed to document eroded archaeological remains at this site location (see Figure 3.154). An overlay of the satellite images associated with this coastal area suggests that the shoreline along the southwestern margin of the site has been impacted by erosion. The southwestern shoreline portion of the site has eroded or receded ~10 meters (~32 feet) over the past 15 years. The entire northern and eastern sides of the site have accreted land and are encapsulated by recent coastal dune formations (see Figure 3.154). The inland portion of the site has also been partially developed and includes a large residence and yard area.

Figure 3.154. The image shows a view of the shoreline at 44AC51.

121). Craddock Neck #3 - 44AC0050

The site (see Figure 3.156) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by Nicholas Luccketti in 1978. The assemblage found at the site included a quartz Palmer, a celt fragment, a chert triangular point, a fragment of crushed quartz cord marked ceramics, and a fragment of shell-tempered fabric-impressed ceramics. Given the assemblage, the site seems to have cultural occupations associated with the Early Archaic, Middle Woodland, and Late Woodland periods. During the 1999 survey of the area (Lowery 1999), nothing was found at this location. At that time, the site boundary was already situated west of the modern shoreline and it may have been completely destroyed by erosion over the past 30 years.

The area inland of 44AC50 encompasses a large area of drowned upland situated beneath a veneer of tidal marsh peat and a recent coastal dune formation (see Figure 3.155). Exposed tree stumps provide evidence of a former forested landscape now drowned beneath the tidal marsh. The recent survey failed to document eroded archaeological remains at this site location. An overlay of the satellite images associated with this coastal area suggests that the shoreline has been marginally eroded (~8 meters or ~26 feet) along the south end and stable on the north end over the past 15 years.

Figure 3.155. The image shows a view of the shoreline at 44AC50.

Figure 3.156. The satellite image defines the boundary and the longitude and latitude locational data for 44AC50, 44AC51, 44AC507, 44AC508, and 44AC509.

122). Craddock Neck #2 - 44AC0049

The site(see Figure 3.161) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by Nicholas Luccketti in 1978. The assemblage found at the site included a chert Palmer point, a quartzite Morrow Mountain point, yellow jasper point fragment, a jasper triangular point, two quartzite Savannah River points, an argillite Morrow Mountain point, a fragment of shell-tempered Mockley ware, and a large fragment of crushed quartz Wolfe Neck ware. Given the assemblage, the site seems to have cultural occupations spanning the Early Archaic though the Late Woodland periods. During the 1999 survey of the area (Lowery 1999), nothing was found at this location. At that time, the site boundary was already situated west of the modern shoreline and it may have been completely destroyed by erosion over the past 30 years.

Along stretches of the extant modern shoreline, evidence of a former forested landscape appears beneath the tidal marsh. The recent survey failed to document eroded archaeological remains at this site location. An overlay of the satellite images associated with this coastal area suggests that the shoreline has eroded or receded ~6 meters (~20 feet) over the past 15 years.

123). Craddock Neck #1 - 44AC0048

The site (see Figure 3.161) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by Nicholas Luccketti in 1978. The assemblage found at the site included a jasper Palmer point, a jasper drill, a chert bifurcated point, and two unidentified specimens. Given the assemblage, the site seems to have cultural occupations spanning the Early Archaic though the Middle Archaic periods. During the 1999 survey of the area (Lowery 1999), nothing was found at this location.

At that time, the site location was already situated west of the modern shoreline and it may have been completely destroyed by erosion over the past 30 years.

Along stretches of the extant modern shoreline, evidence of a former forested landscape appears beneath the tidal marsh (see Figure 3.157). The recent survey failed to document eroded archaeological remains at this site location. An overlay of the satellite images associated with this coastal area suggests that the shoreline has eroded or receded ~25 meters (~82 feet) over the past 15 years.

Figure 3.157. The image shows a view of the shoreline at 44AC48.

124). Ortley - 44AC0355

The site (see Figure 3.161) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by William and Mary Center for Archaeological Research in 1997. The site was never visited and its location and documentary information are based solely on informant information. For this location, it was noted that “gorgets, points, and pottery have been found in the mud at low tide” by Sonny Kellam and Eugene Ortley. Given the data, the site would have an unknown Woodland period association.

During the 1999 survey of the area (Lowery 1999), nothing was found at this location. Given its location west of the modern shoreline, the site may have already succumbed to erosion. Notably, over the past 15 years, the shoreline at this site has receded ~8 meters (~26 feet). The coastal setting encompasses a large stretch of low tidal marsh shoreline beneath a coastal dune formation (see Figure 3.158). The recent survey failed to document eroded archaeological remains at this site location.

Figure 3.158. The image shows a view of the shoreline at 44AC355.

125). Occohannock Creek #3 - 44AC0356

The site (see Figure 3.161) was initially recorded by J. Mark Wittkofski in 1982 and additional data about the site were provided by William and Mary Center for Archaeological Research in 1997 and Lowery (Lowery 2001) during the 1999 shoreline survey. Lowery observed an eroding shell midden feature at this location in 1999. Artifacts associated with the midden area included a diverse mixture of lithic artifacts and prehistoric ceramics. The diagnostic artifacts within the assemblage included one quartzite Late Archaic stemmed point, a chert Jack's Reef corner-notched point, one fragment of Hell Island ware, and two fragments of Townsend ware.

The area currently encompasses a large coastal dune formation, which encapsulates a former tidal marsh surface (see Figure 3.159). Along portions of the shoreline, burned tree stumps are exposed beneath the tidal marsh surface. The recent survey failed to document eroded archaeological remains at this site location. The shell midden feature observed in 1999 could not be relocated. An overlay of the satellite images associated with this site suggests that the shoreline along the western margin has eroded or receded ~29 meters (~95 feet) over the past 15 years. As such, the midden feature seems to have been destroyed by erosion. The eastern side of the site is stable has not eroded or receded over the same time duration.

Figure 3.159. The image shows a view of the shoreline at 44AC356.

126). Kellam - 44AC0357

The site (see Figure 3.161) was recorded by J. Mark Wittkofski in 1982 based on information provided to him by Mr. Sonny Kellam and Mr. Eugene Ortley. Wittkofski, who did not visit the site, was told that projectile points have been found in the mud at low tide.

The shoreline survey conducted in 1999 (Lowery 2001) did not recognize an archaeological site at this location. The recent survey also failed to document eroded archaeological remains at this site location. The area consists of an eroded upland area that is partially fringed by tidal marsh (see Figure 3.160). An overlay of the satellite images associated with this site suggests that the shoreline along the western tidal marsh portion of the site is stable has not eroded or receded over the past 15 years. However, the shoreline associated with the forested hummock area near Johns Point has eroded and receded ~13 meters (~42 feet) over the same time duration.

Figure 3.160. The image shows a view of the shoreline at 44AC357.

Figure 3.161. The satellite image defines the boundary and the longitude and latitude locational data for 44AC48, 44AC49, 44AC355, 44AC356, and 44AC357.

127). Occohannock Creek #10 - 44AC0519

The site (see Figure 3.163) was recorded in 1999 (Lowery 2001). At that time, he collected a small assemblage of Middle and Late Woodland-era artifacts from this shoreline. The assemblage included one fragment of Townsend ware, one fragment of Mockley ware, one fragment of Potomac Creek ware, one quartz biface made from a rounded cobble, three flakes, and one jasper cobble core.

Like several areas on the lower end of the Delmarva Peninsula, the site encompasses a marked late Holocene aeolian dune deposit, which overlies a late Pleistocene aeolian loess formation. The late Holocene dune, which is ~2 meters (~6.5 feet) thick, is stable and covered by trees with some cactus. As such, the prehistoric remains at this location would be buried.

The shoreline has been stabilized by the installation of "living shoreline" features, which include a staked mess and planted marsh vegetation (see Figure 3.162). Given these erosion control measures, the recent shoreline survey did not uncover archaeological remains at this site location. An overlay of the satellite images associated with this site suggests that the shoreline is largely stable has not eroded or receded over the past 15 years.

Figure 3.162. The image shows a view of the shoreline at 44AC519.

128). Melson – 44AC0393

The site (see Figure 3.163) was recorded by J. Mark Wittkofski in 1982. Wittkofski indicated that a Mr. Melson has found many points on the mud flats at this location. Notably, the shoreline associated with the site is geologically young and represents an accretion area. As such, the site may actually represent an accumulation of eroded and redeposited archaeological remains. However, the recent shoreline survey and the survey conducted in 1999 (Lowery 2001) did not recognize any archaeological material at this site location.

An overlay of the satellite images associated with this site suggests that the shoreline is stable has not eroded or receded over the past 15 years. The lack of artifacts may indicate that earlier surface collections stripped the area of all or most of the redeposited archaeological materials.

Figure 3.163. The satellite image defines the boundary and the longitude and latitude locational data for 44AC393 and 44AC519.

129). Occohannock Midden - 44NH0194

The site (see Figure 3.164) was recorded by J. Mark Wittkofski in 1982. The shoreline survey conducted in 1999 (Lowery 2001) did not recognize any archaeological material along the shoreline at this site location. Wittkofski conducted a controlled field survey at this location and indicated the presence of dense shell within the tilled field. The assemblage collected in the field included a few flakes, unidentifiable ceramic fragments, fire-cracked rock, and a few late historic items.

No prehistoric or historic artifacts were discovered at this location as a result of the recent shoreline survey. An overlay of the satellite images associated with this site suggests that the shoreline is stable has not eroded or receded over the past 15 years. The lack of artifacts and observable features within the shoreline would seem to be the by-product of the fact that 44NH194 is stable and non-erosive.

Figure 3.164. The satellite image defines the boundary and the longitude and latitude locational data for 44NH194.

130). Occohannock Creek #1 - 44NH0192 and 44NH0044

The site (see Figure 3.165) was initially recorded by J. Mark Wittkofski in 1982 and supplemental data about the site were provided by Lowery (Lowery 2001) during the 1999 survey. The site designated as 44NH44, which essentially encompasses the western margin of the shoreline (see Figure 3.165) was recorded by Nicholas Luccketti in 1978. The demarcation between these two sites is completely arbitrary.

Luccketti designated a "shell-midden" at 44NH44, which included a "layer of mussell shells". The landform denoted as the "midden" area represents a tidal marsh spit formation on the eastern margin of a tidal creek. The spit formation is geologically young. Recently observations along this section of shoreline indicate that the supposed "midden" actually represents a former ribbed-mussel shellfish bed that has been buried as a byproduct of coastal sediment accretion. Both Wittkofski and Lowery recognized a mixture of both prehistoric and historic artifacts along the shoreline at 44NH192. The recent survey of the area reaffirmed the earlier observations. The assemblage noted along the shoreline at this location included a combination of brick, a mixture of quartz and meta-rhyolite debitage, and fire-cracked rock (see Figure 3.166).

The eroded bank profile at this location encompasses a late Holocene aeolian dune stratum, which overlies a late Pleistocene aeolian loess formation (see Figure 3.167). As such, much of the prehistoric archaeological record at this location may indeed be buried. An overlay of the satellite images associated with this site suggests that the shoreline has eroded ~8 meters (~26 feet) over the past 15 years.

Figure 3.165. The satellite image defines the boundary and the longitude and latitude locational data for 44NH44 and 44NH192.

Figure 3.166. The image shows a view of the shoreline at 44NH192. Debitage (see inset) was found along the shoreline.

Figure 3.167. The image shows the bank profile at 44NH192. The lighter sand immediately beneath the surface represents a regionally recognized late Holocene aeolian formation. The formation is more evident along the coast at Savage Neck, Butler's Bluff, and Latimer's Bluff.

131). Occohannock Creek #2 – 44NH0420

The site (see Figure 3.168) was recorded in 1999 (Lowery 2001). The site is situated within a low forested area immediately west of a small tidal marsh drainage. The assemblage found at this location included a limited quantity of fire-cracked rock and a large weathered meta-rhyolite Lehigh-Snook Kill style knife, which would indicate a Late Archaic-era occupation.

An overlay of the satellite images of this area suggests that the shoreline is stable and sediment has accreted along the western shoreline margin over the past 15 years. No prehistoric or historic artifacts were discovered at this location as a result of the recent survey and re-examination of the area. The lack of additional artifacts would seem to be the by-product of the fact that 44NH420 is stable and non-erosive.

Figure 3.168. The satellite image defines the boundary and the longitude and latitude locational data for 44NH420.

132). Occohannock Creek #9 - 44NH0423

The site (see Figure 3.172) was recorded in 1999 (Lowery 2001). The site is situated within a low forested area along a shoreline immediately east of a small tidal creek drainage. In 1999, the site revealed a basalt ground stone ax blade fragment, a mixture of eleven flakes, two cores, and fire-cracked rock. A small shell refuse feature was noted within the bank profile and a sample of oyster and hard clam shell were collected. At the time, the cultural chronology associated with the site was unclear.

During the recent survey, two fragments of fire-cracked rock and one quartz flake were discovered at this location. The satellite images of this area suggest that the western portion of the site has been impacted by the greatest degree of erosion over the past 15 years. The shoreline along the western margin has receded ~7 meters (~22 feet). The shoreline near the central portion of the site has receded ~4 meters (~13 feet). The far eastern shoreline has eroded ~2.5 meters (~8 feet). The area immediately east of the site location has also been stabilized via rip-rap since the 1999 survey.

133). Occohannock Creek #7 – 44NH0422

The site (see Figure 3.172) was recorded in 1999 (Lowery 2001). At the time, a decent assemblage of Early Archaic and Late Woodland-era diagnostic artifacts was found at this location. A corner-notched point and a graver were found, which indicated an Early Archaic occupation. Two triangular points found at the site also indicated a Late Woodland or Archaic-era occupation.

During the recent survey, three fragments of fire-cracked rock and one quartzite flake were found at this location. The satellite images of this area suggest that the southern portion of the site has been heavily eroded over the past 15 years. The shoreline has receded ~23 meters (~75 feet). The northern portion of the site has actually accreted sediment and the extent of new tidal marsh extends further into Occohannock Creek. In sum, the lack of additional diagnostic artifacts may be the result of the interplay between erosion (site loss) and accretion (site burial). Given the precarious location of 44NH422, the northern portion of the site may ultimately become erosive in the near future.

134). Occohannock Creek #8 – 44NH0043

The site(see Figure 3.172), which is located on the north side of Kilmon Cove, was initially recorded in 1978 by Nicholas Luccketti and supplemental data about the site were provided by Lowery (Lowery 2001) during the 1999 survey. The site produced a mixture of Late Archaic stemmed points, Middle Woodland-era shell-tempered Mockley type ceramics, bifaces, flakes, and fire-cracked rock. At the time, the site was associated with an elevated upland hummock situated on a narrow point of land.

As of 2015, the site has completely disappeared as a result of shoreline erosion. The satellite images of this area suggest that the shoreline has receded ~109 meters (~360 feet) over the past 15 years. Nothing was found during the recent survey and nothing remains of the original site area.

135). Occohannock Creek #6 – 44NH0421

The site(see Figure 3.172), which is located on the south side of Kilmon Cove, was recorded in 1999 (Lowery 2001). At the time, the eroded shoreline area produced a limited Middle Woodland prehistoric assemblage (i.e., a meta-rhyolite Fox Creek point) along with debitage and a cluster of fire-cracked rock. The most recent survey did not locate any additional prehistoric artifacts. However, the area was covered by a heavy veneer of recently accreted sand. As such, the ability to locate additional artifacts under these conditions was greatly hindered.

The satellite images of this area suggest that the shoreline has receded ~11 meters (~36 feet) over the past 15 years. Recently, sediment eroded from the Sparrow Point area to the west (i.e., 44NH3) has been transported eastward and is accumulating along the shoreline. As such, it would seem that 44NH421 is stable and non-erosive for the time being.

136). Occohannock Creek #4 – 44NH0003

The site (see Figure 3.172) encompasses a low forested peninsula, which is bounded by Kilmon Cove (a.k.a. Map's Creek) to the east and the Chesapeake Bay on the west. The area was surveyed and examined by multiple individuals over the past 50 years. In 1966, Howard MacCord noted that a mixture of Archaic period points, Woodland period points and pottery, glass beads, colonial relics have been found at this location. In 1978, Nicholas Luccketti reported a finely-flaked chert willow-leaf shaped blade, two chert Palmer points, a jasper Kirk corner-notched point, two quartzite Morrow Mountain points, a chert Morrow Mountain point, a quartzite Guilford point, two quartzite Savannah River points, an atlatl weight fragment, a lug handle from steatite bowl, a pipestone tubular pipe fragment, a jasper

Jack's Reef pentagonal corner-notched, a chert and a jasper triangular point, a quartzite ovate scraper, a quartzite pitted hammerstone, a drill, shell-tempered fabric impressed ceramic vessel fragments, shell-tempered incised ceramic vessel fragments, crushed quartz net-impressed ceramic vessel fragments, blue and gray Rhenish stoneware ceramic vessel fragments, brown Rhenish stoneware ceramic vessel fragments, several English and local pipe stem fragments, and an English gunflint. In 1985, Jay Custer visited the site and reportedly found Late Woodland Townsend ceramics and numerous roulette decorated pipe fragments. Finally in 1999, Lowery noted only a limited assemblage of flakes, cores, and fire-cracked rock from this location. The 2015 survey documented only four fragments of fire-cracked rock at this location. In sum, the collective prehistoric assemblages from the site suggest an Early Archaic through Late Woodland-Contact era occupation. The historic use of this site seems to encapsulate the 17th through the 19th centuries.

Based on the documented surface collections amassed since 1966, it would seem that there has been a marked decrease in the number of artifacts found at this location over the past 50 years. The decease may be associated with the fact that the "original" archaeological site may have been completely destroyed by erosion. In comparing the modern shoreline with historic coastal survey maps (see Figure 3.169), a marked topographic upland landform was once associated with the site, which has eroded away over the past 160 years. An overlay of the satellite images of this area suggests that the northern shoreline has receded ~55 meters (~180 feet) since 1999. The central portion has receded ~ 78 meters (~255 feet) since 1999 and the southern end of the site has receded ~56 meters (~183 feet) since 1999. If we assume a persistent rate of erosion back to 1966, the original shoreline examined by Howard MacCord may have been ~150 meters (~500 feet) offshore. When Luccketti uncovered the largest archaeological assemblage from this site in 1978, the shoreline may have been ~100 meters (~330 feet) offshore. These earlier researchers may have observed portions of the upland landform once associated with the site. As a result of the extreme erosion noted at 44NH3 (see Figure 3.169), the remaining archaeological residues and artifacts once associated with this grand site may be nothing more the sub-aqueous secondary deposits situated and scattered offshore.

Figure 3.169. The 1850 coastal survey and the current satellite image have been superimposed. The location of 44NH3 as recorded in 1966 is currently situated offshore.

137). Occohannock Creek #5 – 44NH0065

The site (see Figure 3.172) was initially recorded by J. Mark Wittkofski in 1980 and supplemental data about the site were provided by Lowery (Lowery 2001) during the 1999 survey. Given the limited assemblage data, the site was classified as a prehistoric site of indeterminate age. The site encompasses an eroded low forested area (see Figure 3.170).

The recent survey documented only six fragments of fire-cracked rock at this location. An overlay of the satellite images of this area suggests that the northern shoreline at this site has receded ~13 meters (~42 feet) since 1999. The southern end of the site has receded ~14 meters (~45 feet) since 1999.

Figure 3.170. The image shows a view of the shoreline at 44NH65.

138). Occohannock Neck #2 – 44NH0425

The site (see Figure 3.172) was recorded in 1999 (Lowery 2001). The assemblage found at the site suggested a Late Woodland occupation, as well as an historic 18^{th} to 19^{th} century occupation. The site area encompasses an eroded forested peninsula along the north flank of a closed-mouth tidal creek (see Figure3.171). The recent survey documented only four fragments of fire-cracked rock and one brick along the shoreline at this location. Notably, the distribution of modern sand along the shoreline may have hindered the ability to accurately assess the cultural chronology associated with the site.

An overlay of the satellite images of this area suggests that the northern shoreline at this site has receded ~8 meters (~26 feet) since 1999. The southern end of the site has receded ~10 meters (~32 feet) since 1999.

Figure 3.171. The image shows a view of the shoreline at 44NH425.

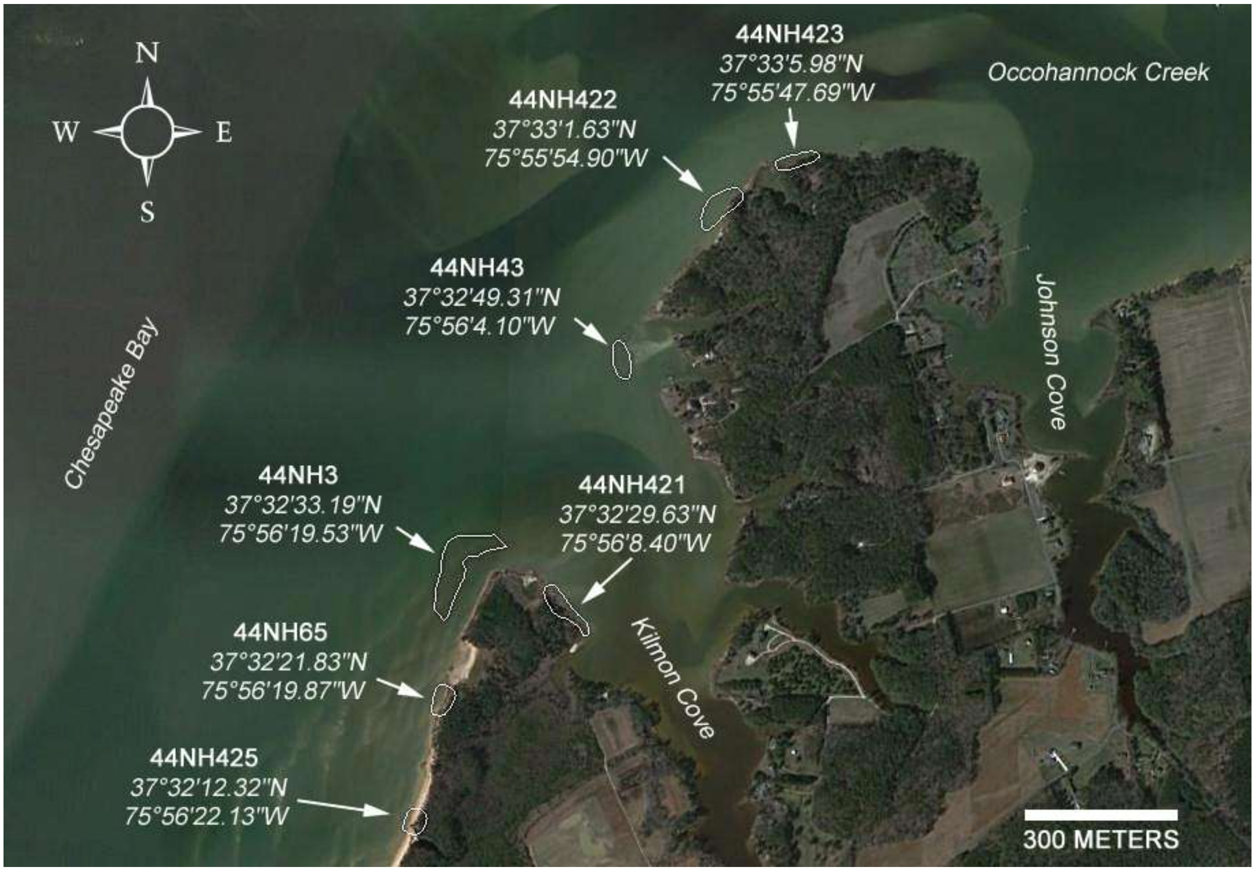

Figure 3.172. The satellite image defines the boundary and the longitude and latitude locational data for 44NH3, 44NH43, 44NH65, 44NH421, 44NH422, 44NH423, and 44NH425.

139). Sturgis Dwelling Area – 44NH0064

The site (see Figure 3.174) was recorded by J. Mark Wittkofski in 1982 as the location of a late 17th century dwelling location. It seems that the site was recorded based solely on historical references and not on physical evidence. Even though the area was examined at low tide in 1999 and during the recent survey, nothing was found to archaeologically document Wittkofski's dwelling site. However, the western boundary of the site is situated immediately inland of the modern coastline.

An overlay of the satellite images for this area suggests that the shoreline has been stable over the past 15 years. The area also encompasses a modern domestic residence with some shoreline erosion control measures installed.

140). Occohannock Neck #1 – 44NH0424

The site (see Figure 3.174) was recorded in 1999 (Lowery 2001). The assemblage found at the site included only one quartzite flake and several fragments of fire-cracked rock. The site area encompasses an eroded forested peninsula along the north flank of a closed-mouth tidal creek (see Figure 3.173). The recent survey documented seven quartz and quartzite flakes at this site location. Five fragments of fire-cracked rock were also noted along the shoreline.

An overlay of the satellite images of this area suggests that the northern shoreline at this site has receded ~26 meters (~85 feet) since 1999. The southern end of the site has receded ~30 meters (~98 feet) since 1999.

Figure 3.173. The image shows a view of the shoreline at 44NH424.

141). Hurricane Hotel - 44NH0181

The site (see Figure 3.174) was recorded by J. Mark Wittkofski in 1982 as the location of a former hotel that was destroyed during a hurricane in the early 20th century. In 1982, Wittkofski noted that some of the "wreckage" associated with the hotel can be observed at low tide.

In the late 1990's the shoreline inland of the submerged hotel area was stabilized by a series of jetties and bulk-heads. Between 1994 and 1999, the shoreline had receded between ~20 and ~30 meters (65 and 100 feet). Even though the area was examined at low tide, the recent survey failed to document the presence of the hotel location.

142). Peaceful Beach Campground – 44NH0179

The site (see Figure 3.174) was recorded by J. Mark Wittkofski in 1982 as the location of a submerged 17th century hogshead well feature located offshore and exposed at low tide.

Over the past 15 years, the shoreline has been stabilized as a result of residential bulk-heading. Even though the area was examined at low tide, the recent survey failed to document the presence of the 17th century well feature. By comparing satellite images of the region spanning the past 30 years, it would seem that the intertidal area associated with this site has been heavily impacted by vertical erosion associated with the combined impacts of bulk-heading and wave reflection. As a result, the area offshore of the bulk-head has been scoured and deepened. In sum, the 17th century well feature may have been destroyed.

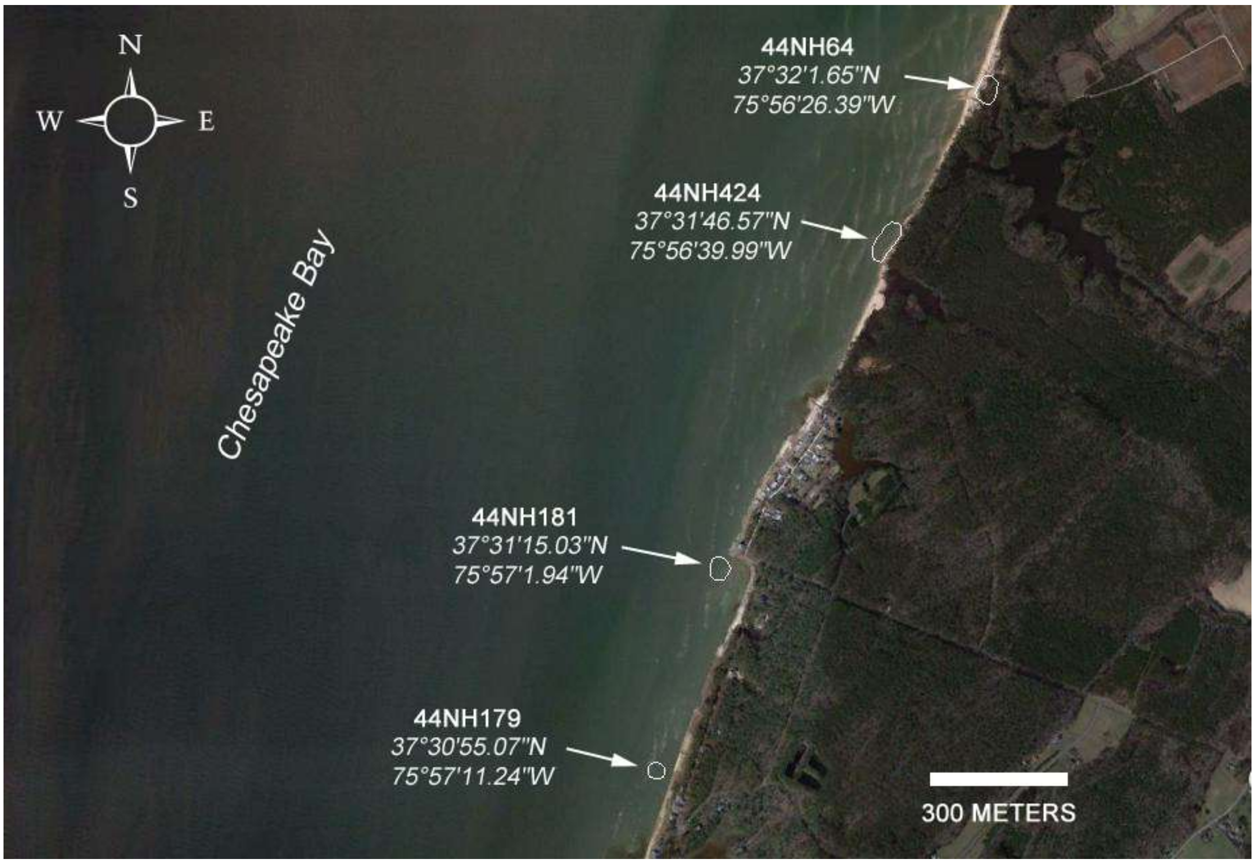

Figure 3.174. The satellite image defines the boundary and the longitude and latitude locational data for 44NH65, 44NH179, 44NH181, and 44NH424.

143). Silver Beach – 44NH0063

The site (see Figure 3.176) was recorded by J. Mark Wittkofski in 1980 as a submerged prehistoric site. Wittkofski noted that a Mr. Lohr has found points and other artifacts at this site during low tide.

Notably, Wittkofski did not inspect the site. Though no diagnostics are listed on the site data form, the archaeological components associated with the site supposedly span the Paleo-Indian through Middle Woodland periods. Recently two Paleoindian fluted points and a damaged Archaic stemmed point were observed in a local resident's collection from this general location (see Figure 3.175).

The site is associated with an eroded interfluve area. Interfluve settings were particularly preferred locations for early prehistoric occupation sites. Arguably, the site may also simply represent a natural post-erosion artifact accretion area.

The shoreline area is currently bulk-headed and rip-rapped. The areas inland of the shoreline are currently developed and have been for at least three decades. Over the past 15 years, the shoreline has been stabilized as a result of the combined effects of residential bulk-heading and rip-rapping. The recent survey failed to document any diagnostic artifacts for this site location.

Figure 3.175. The image shows three artifacts found along the shoreline by local residents at 44NH63. The assemblage includes two Paleoindian points and one damaged Archaic stemmed point. The photo was provided by Mr. Michael Clem.

144). Fincin – 44NH0167

The site (see Figure 3.176) was recorded by J. Mark Wittkofski in 1982 as a prehistoric shell midden. Wittkofsk indicated that the midden is about 18 inches thick and a Mr. Fincin has found artifacts associated with the midden. The assemblage found at the site included fabric-impressed and shell-tempered pottery sherds (Mockley ?), Morrow Mountain points, flakes, and a Savannah River point. The site data form indicates that the site was occupied from the Middle Archaic until Late Woodland periods. However, the assemblage listed on the site data form would imply both Middle and Late Archaic components, as well as an Early to Middle Woodland occupation.

Because the area is currently bulk-headed and rip-rapped, the recent survey failed to document any diagnostic artifacts for this site location. There have been several attempts to stabilize this shoreline over the past several decades. Based on a series of satellite overlays, the shoreline contained a series of jetties in the 1990's. These stabilization attempts seemed to have failed by 2005. In 2007, the area was bulk-headed and jetties were re-established along the shoreline. By 2013, a small portion of the bulk-headed area associated with the site area had failed and the shoreline was again partially eroded. Recently, granite rip-rap has been installed behind the failed bulk-head. The northern portion of the site has receded approximately ~23 meters (~75 feet) and the southern portion of the site has receded about ~18 meters (~60 feet) over the past 15 years.

Figure 3.176. The satellite image defines the boundary and the longitude and latitude locational data for 44NH63, 44NH167, and 44NH428.

145). Nassawadox Creek #6 - 44NH0432

The site (see Figure 3.178) was recorded in 1999 (Lowery 2001). The site encompasses a small ~1 acre forested island within Nassawadox Creek. In 1999, the site was recorded based on the presence of fire-cracked rock, one flake of chert, and a limited quantity of oyster shell observed near the surface within the eroding bank profile. At the time, the site was recorded as a prehistoric site with an unknown prehistoric archaeological component.

Recently, a series of surface collections found along the shoreline within Nassawadox Creek by local residents were examined and photographed. The assemblages included a mixture of Archaic and Woodland period items. Of particular interest are the few artifacts that can be directly linked to the Ohio Valley Adena culture (see Figure 3.177). A cache of four early Adena style tubular pipes was found in the region. Three of the Ohio pipestone tubular pipes were intentionally “killed”. Two of the “killed” pipes were reassembled and one is still missing the constricted mouth portion. The largest in the cache is complete and unbroken. A purple and green banded slate trapezoidal pendant was also found in the area. Another rectangular pendant made of black slate was also reportedly been found at the same location.

The recent survey at the site failed to document any diagnostic artifacts for this location. Five pieces of fire-cracked rock were also observed along the shoreline and some oyster shell was noted within the bank profile. Based on a series of satellite overlays, the island has eroded primarily along the western and southern margins. The western side of the island has receded approximately ~6 meters (~20 feet) and the southern side has receded about ~9 meters (~29 feet) over the past 15 years.

Figure 3.177. The image shows Ohio Valley Adena style artifacts found along the shoreline in the Nassawadox Creek area.

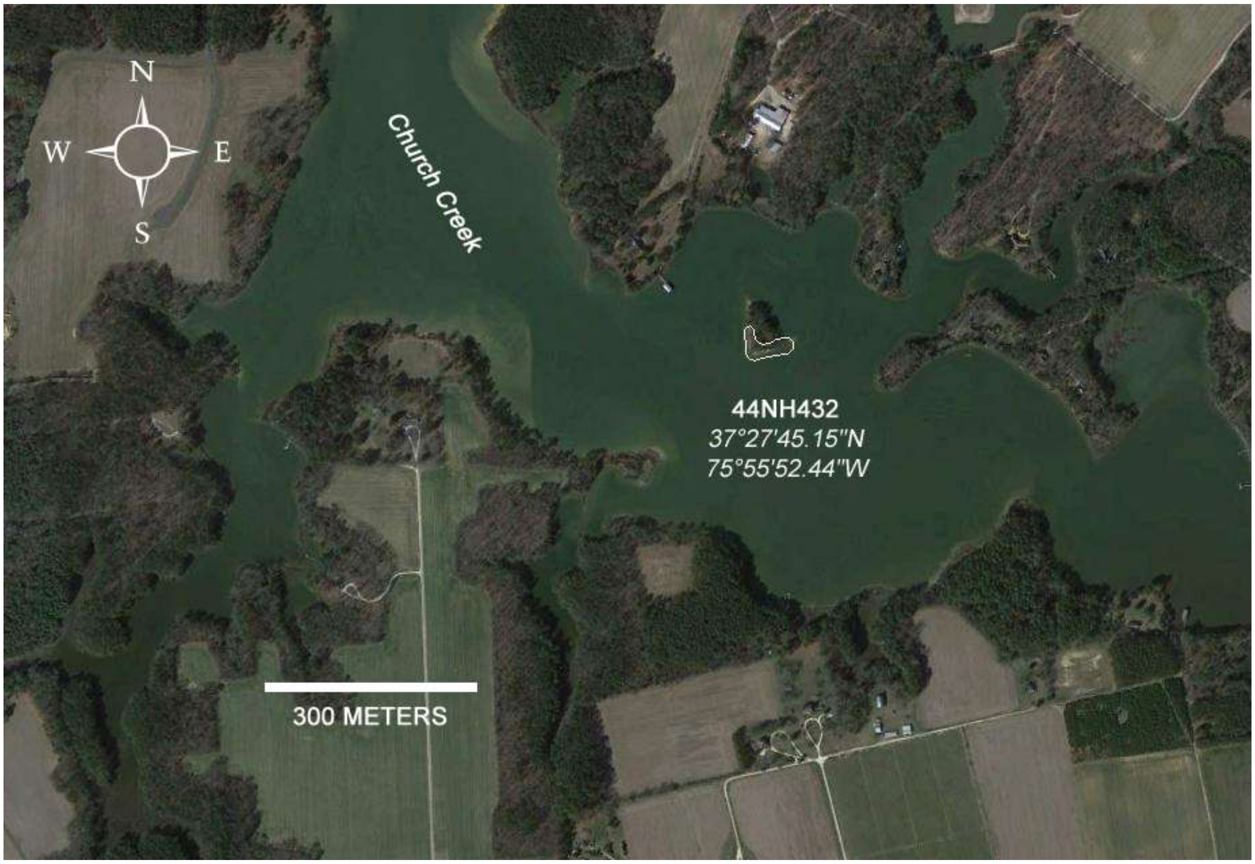

Figure 3.178. The satellite image defines the boundary and the longitude and latitude locational data for 44NH432.

146). Nassawadox Creek #1 – 44NH0428

The site (see Figure 3.176) was recorded in 1999 (Lowery 2001). The site was recorded based on the presence of undiagnostic prehistoric lithic artifacts (i.e. fire-cracked rock) and undiagnostic historic artifacts (i.e. brick and shell). The site encompasses a low forested peninsula adjacent to a small tidal cove along the south shore of Nassawadox Creek.

The recent survey also failed to document any diagnostic artifacts for this site location. Fragments of brick and shell were observed; but not collected. Two pieces of fire-cracked rock were also observed along the shoreline. Based on a series of satellite overlays, the shoreline at this location is stable and has not receded over the past 15 years.

147). Nassawadox Creek #2 – 44NH0429

The site (see Figure 3.186) was recorded in 1999 (Lowery 2001). The site was recorded based on the presence of a prehistoric shell midden along the low eroding shoreline (see Figure 3.179 A). The shell midden included a diverse mixture of shellfish species (i.e., hard clam, oyster, bay scallop, ribbed mussel, and whelk). Aside from a few quartz and quartzite flakes, Wolfe Neck and Mockley ceramic fragments were discovered at this location along with a single fragment of Townsend ware. The assemblage suggested an Early through Late Woodland period occupation.

The recent survey failed to document any diagnostic artifacts at this site location. Fire-cracked rock and remnants of the shell midden feature have survived the onslaught of shoreline erosion (see Figure 3.179 B). An overlay of the satellite images of this area suggests that the northern shoreline at this site has receded ~58 meters (~190 feet) since 1999. The southern end of the site has receded ~52 meters (~170 feet) since 1999. Over the next decade, this site will be destroyed by shoreline erosion.

Figure 3.179. The image shows a view of the shoreline at 44NH429 in 1999 (A) and in 2015 (B). A small portion of the original midden still survives (see inset, lower right).

148). Nassawadox Residence - 44NH0158

The site (see Figure 3.186) was recorded by J. Mark Wittkofski in 1982 as a derelict 19th century residence. The site boundary, as defined on the site data form places it close to the modern shoreline.

However, the recent survey of the bank profile (see Figure 3.180) associated with this site location did not locate evidence that the historic site is currently eroding into the Chesapeake Bay.

An overlay of the satellite images of this area suggests that the northern bank west of the site has receded ~30 meters (~98 feet) since 1999. The southern end of the site has receded ~21 meters (~69 feet) since 1999. Over the next decade, the site will be threatened by shoreline erosion.

Figure 3.180. The image shows the eroding bank profile at 44NH158.

149). Original Glebe – 44NH0042

In 1978, Nicholas Luccketti recorded this site (see Figure 3.186) as the location of a submerged church-related residence foundation. The site data form, however, notes only the presence of small yellow brick. The site boundary is situated directly offshore of a closed-mouth creek. The fill associated with this closed-mouth creek would be geologically-young and consist of a mixture of accreted silts, sand, and other debris. At some time in the past, the creek would have drained directly into the bay. Given the reported site location, it is suspected that the "foundation" may actually be redeposited brick rubble that naturally infilled the creek mouth. The brick foundation could also represent an early historic attempt to create a freshwater impoundment dam area. As such, the location feature offshore of the current creek mouth would simply be a byproduct of historic shoreline erosion.

The recent survey failed to document any artifacts or foundation features at this location. The shoreline at this location is stable and has not receded over the past 15 years. Considering the degree of exposure to the forces of the Chesapeake Bay, the shoreline associated with this site is not eroding.

150). Nassawadox Creek #3 – 44NH0430

The site (see Figure 3.186) was recorded in 1999 (Lowery 2001). The site was recorded based on the presence of fire-cracked rock, debitage, and prehistoric ceramics found along the shoreline. The data, at the time, suggested an Early through Late Woodland occupation of the site area.

The recent survey failed to document any artifacts or features at this location. The shoreline at this location (see Figure 3.181) is stable and has receded ~1 meter (3 feet) in isolated areas over the past 15 years. Considering the degree of exposure to the forces of the Chesapeake Bay, the shoreline associated with this site is not eroding.

Figure 3.181. The image shows the shoreline at 44NH430.

151). North Church Neck Wells – 44NH0060

The site (see Figure 3.186) was recorded by J. Mark Wittkofski in 1982. It was reported that a 17th century trash pit feature was eroding out of the shoreline. However, the site was never visited. The area was examined in 1999 (see Lowery 2001) and nothing was observed within the bank profile.

The recent survey failed to document any cultural features or artifacts at this location. The shoreline at this location is relatively stable and has receded ~1 meter (3 feet) over the past 15 years. Considering the degree of exposure to the forces of the Chesapeake Bay, the shoreline associated with this site is relatively stable.

152). Church Neck Wells – 44NH0008

The Church Neck Wells site (see Figure 3.186) was initially recorded in 1973 by Howard A. MacCord. At the time, the site included 17th and 18th century well features. The site was revisited by Mark Wittkofski in 1982. Testing at the site was conducted by Nicholas Luccketti, Beverly Straube, and Timothy Morgan in 1997. The survey conducted by Lowery in 1999 relocated two of the original eight historic well features.

The recent survey failed to relocate some of the wells noted in 1999 (see Figure 3.182). However, these features may currently be buried beneath a surface covering of sand and largely invisible. No artifacts were found during the recent survey. The shoreline at this location has receded ~1 to ~3 meters (3 to 10 feet) over the past 15 years. Considering the degree of exposure to the forces of the Chesapeake Bay, the shoreline associated with this site is relatively stable.

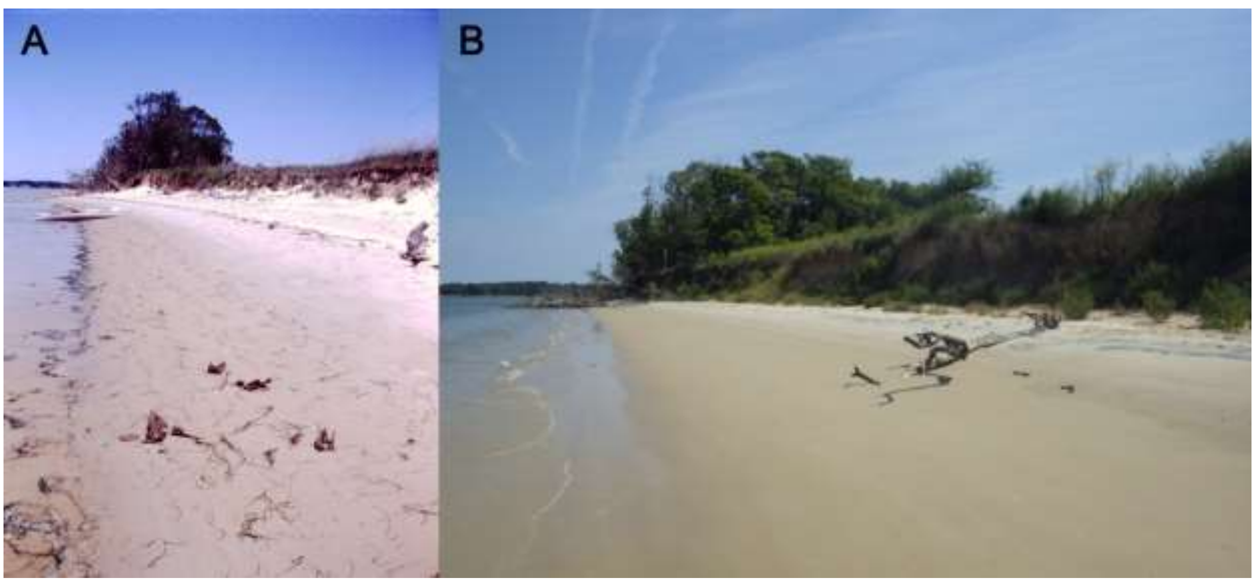

Figure 3.182. The image shows the shoreline at 44NH8 in 1999 (A) and in 2015 (B). Note the presence of a wooden well feature in the foreground (A).

153). Nassawadox Creek #4 – 44NH0431

The site (see Figure 3.186) was recorded in 1999 (Lowery 2001). At that time, a mixture of Late Archaic through Late Woodland-era artifacts were found along the shoreline. The site also encompassed an eroding unplowed prehistoric shell midden along the edge an elevated forested terrace. The refuse midden included a diverse assemblage of shellfish species (i.e., hard clam, oyster, and whelk). As indicated by the photos of the site taken in 1999, the site area shows extensive evidence of shoreline erosion (see Figure 3.183).

The recent survey of the shoreline suggests that the area encompasses an offshore sandbar and the bank is largely covered by a vegetated coastal beach formation (see Figure 3.184). These coastal landforms would imply that the shoreline is currently stable. However, an overlay of the satellite images of this area suggests that the northern bank associated with the site has receded ~7.5 meters (~24 feet) since 1999. The central portion of the site has receded ~17 meters (~55 feet) and the southern end of the site has receded ~18 meters (~59 feet) since 1999. Given of the series of aerial images, sediment began accumulating along the shoreline in early 2011. As such, the marked erosion noted at 44NH431 occurred over a shorter twelve-year period between 1999 and 2011.

A sample of oyster shell from the midden area (see Figure 3.184) produced an age estimate of 1953 ± 24 14C-age BP. The 14C-age was corrected using the local marine reservoir value and the resultant calibrated age estimate for the shell is 493 ± 44 calAD (D-AMS 0015334). The data would imply that a portion of the midden area was created during the late Middle Woodland period. Notably some of the artifacts (see Figure 3.185) found along the shoreline by local residents indicate a late Middle Woodland Jacks Reef occupation at the site.

Figure 3.183. The image shows the shoreline at 44NH431 in 1999. The unplowed midden feature can be seen near the surface in the eroded bank profile (see inset).

Figure 3.184. The image shows the shoreline at 44NH431 in 2015. The unplowed midden feature can be seen near the surface in the eroded bank profile (see inset).

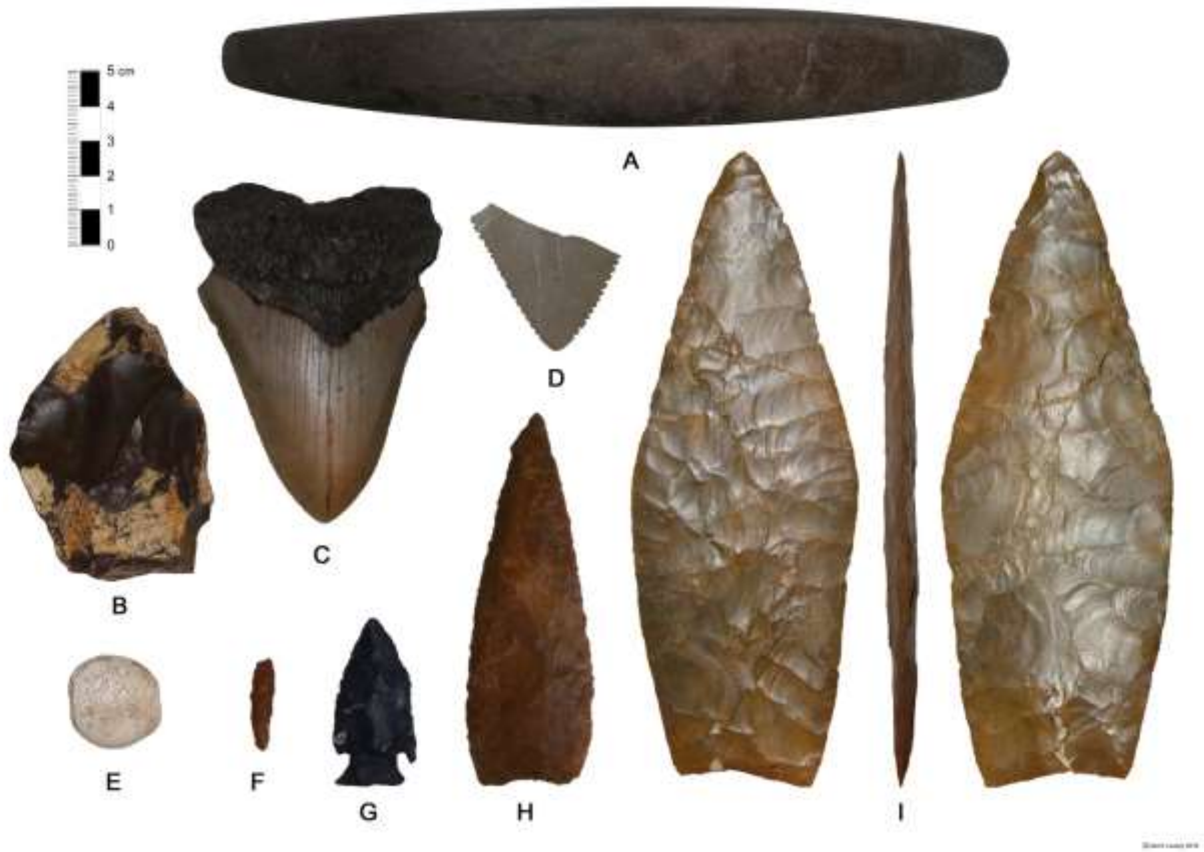

Figure 3.185. The image shows a representative sample of late Middle Woodland period Jacks Reef artifacts found at 44NH431 by local residents. The assemblage includes a basalt pick (A), a thick jasper flake core (B), a modified fossil extinct Great White shark tooth (C), a fragmentary slate shark tooth (?) effigy (D), a whelk shell bead (E), a jasper drill (F), a sulfidized jasper Jacks Reef corner-notched point (G), a jasper Jacks Reef knife (H), and a large jasper Jacks Reef pentagonal knife (I).

Figure 3.186. The satellite image defines the boundary and the longitude and latitude locational data for 44NH8, 44NH42, 44NH60, 44NH158, 44NH429, and 44NH431.

154). Williams - 44NH0166

The site (see Figure 3.188) was recorded by J. Mark Wittkofski in 1982. He reported that Mrs. Williams collected points, including Morrow Mountain, Savannah River, and others. She collected artifacts at low tide. However, when Wittkofski visited the site the tide was high. As such, the site has never been field inspected.

Most of the shoreline area inland of the defined site boundary has been bulk-headed. However, the northern shoreline has receded ~20 meters (~65 feet) over the past 15 years. The offshore area, which encompasses the site boundary defined by Wittkofski in 1982, is currently used for aquaculture beds. Nothing was found at this site during the recent survey.

155). Westerhouse Creek #1 - 44NH0479

The site (see Figure 3.188) was recorded by Mike Barber in 2013. The prehistoric assemblage found at this site included a Middle Archaic Morrow Mountain point and an Early Woodland Rossville projectile point. Historic artifacts included "Running Deer" motif Chesapeake pipe fragments, a case bottle, and a wine bottle fragment. A barrel-well was also noted along this shoreline.

The shoreline associated with the northern end of the site has receded ~ 20 meters (65 feet) and the shoreline associated with the southern end of the site has receded ~ 33 meters (108 feet) over the past 15 years. Discontinuous sections of the shoreline are currently rip-rapped. Nothing was found at this site during the recent survey.

156). Floyd – 44NH0116

The site (see Figure 3.188) was recorded by J. Mark Wittkofski in 1982. The site was recorded based on an assemblage collected by a Mrs. Floyd along the shoreline. Wittkofski noted that the assemblage included a mixture of Hardaway, Palmer, Kirk, Morrow Mountain, Savannah River, Rossville, Vernon, and Calvert points. A single sherd of sand tempered and cord-marked ceramics was also found at the site. He also noted both red and white kaolin pipe stems and bowls.

During the recent survey, a small collection of material found at this location by Mr. Kevin Kellam was examined (see Figure 3.187). The Kellam assemblage included one silicified rhyolite Cumberland-Barnes point distal fragment, one quartzite Kirk stemmed point, one quartzite Morrow Mountain point, one quartzite Savannah River point, three generic Late Archaic stemmed points, one quartz Rossville point, one exhausted jasper Fox Creek stemmed point, two Ohio Valley flint Hopewell points, and one jasper Jacks Reef notched point. The ground stone tools found at this site included one broken slate bannerstone, one basalt plummet, one basalt full-grooved axe, one basalt full-grooved adze, and one basalt full-channel gouge. The assemblage suggests a Middle Paleoindian through late Middle Woodland occupation. Some of the artifacts found at this site are expressive of the Maritime Archaic-era indicative of the coastal areas further to the north.

The southern shoreline associated with this site is largely stable and accreting sediment. The shoreline associated with the northern end of the site has receded ~ 8 meters (26 feet) over the past 15 years. Nothing was found at this site during the recent survey.

Figure 3.187. The image shows a representative sample of the artifacts found at 44NH116 by a local resident. The assemblage includes a mixture of Paleoindian and Woodland period projectile points. The photos were provided by Mr. Kevin Kellam.

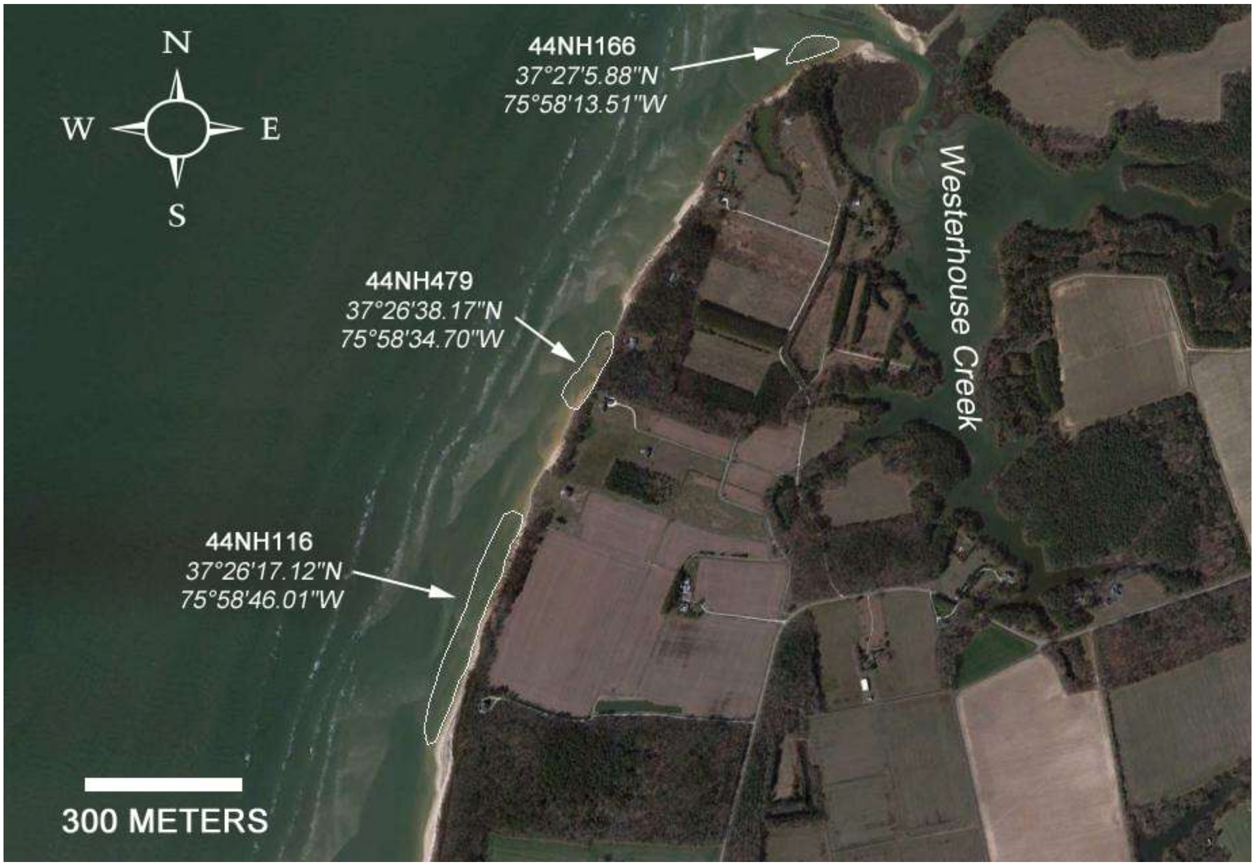

Figure 3.188. The satellite image defines the boundary and the longitude and latitude locational data for 44NH116, 44NH166, and 44NH479.

157). Lohr – 44NH0059

The site (see Figure 3.189) was recorded by J. Mark Wittkofski in 1980. The site was recorded based on a small assemblage of 17th century artifacts found along the shoreline. Wittkofski noted that a Mr. Lohr had found two bellarmine faces and one bellarmine medallion along the shoreline at this site. His summary provided no evidence of any associated 17th century features.

Since the site was initially recorded, the shoreline has been stable and accreting sediment. Nothing was found at this site location during the recent survey.

Figure 3.189. The satellite image defines the boundary and the longitude and latitude locational data for 44NH59, and 44NH426.

158). Mattawoman Creek #1 – 44NH0503

The site (see Figure 3.193) was recorded during the most recent survey. The area consists of a stable bank profile adjacent to a plowed field. The shoreline is covered with marsh vegetation and trees (see Figure 3.190). The site consists of a limited scatter of fire-cracked rock with two pieces of quartzite debitage. A single Middle Archaic Morrow Mountain type projectile point was found during the survey. It is suspected that the site boundary actually extends inland of the shoreline. The ability to assess the stratigraphy at the site is greatly hindered by the vegetation.

Over the past decade and a half, the shoreline at this site has been stable. As such, the limited number of artifacts found at this site may have accumulated during a time when small sections of the upland slumped off the edge of the bank.

Figure 3.190. The image shows the shoreline at 44NH503.

159). Mattawoman/Hungars Creek – 44NH0427

The site (see Figure 3.193) was recorded in 1999 (Lowery 2001). At the time, no diagnostic artifacts were found. However, a pit feature was observed along the shoreline, which contained charcoal and organic material. During the recent survey, the shoreline produced a mixture of 19th and 20th century glass, ceramics, and brick. Prehistoric refuse, which consisted of fire-cracked rock and one quartzite flake, was also scattered along the shoreline.

The site area is still eroding (see Figure 3.191). Given the pattern of artifacts along the shoreline, the actual boundary of the site can be extended ~200 meters south of the boundary originally defined by Lowery (2001). The boundary extension seems to be the result of continued shoreline erosion. The shoreline at 44NH227 has eroded eastward 1 to 5-meters (~3 to ~18 feet) since 1999. The greatest of which has occurred along the southern end of the site (see Figures 3.191 and 3.193).

Figure 3.191. The image shows the shoreline at 44NH427.

160). Hungars Creek Island – 44NH0426

The site (see Figure 3.189) was recorded in 1999 (Lowery 2001). At that time, the site incorporated an area of sand and tidal marsh containing pilings, iron plumbing pipes, glass fragments, and dense shell refuse. The site represented a 20th-century seafood processing area and/or a seafood landing location.

The recent survey failed to locate any evidence of this former site. The shoreline associated with the island has receded between ~ 114 meters (376 feet) and ~ 89 meters (295 feet) over the past 15 years. The area currently encompasses a shallow sand bar with no shell or historic debris on the surface (see Figure 3.192). The remnant tidal marsh island noted in 1999 has completely disappeared. As noted in 1999, "wind velocity and wave activity are the greatest threats to this site". As such, 44NH426 has been destroyed over the past 15 years.

Figure 3.192. The image shows the area once associated with 44NH426.

161). Hungar's Neck Trash Pit - 44NH0049

The site (see Figure 3.193) was first noted by Edward Heite in May 1968. Howard A. MacCord actually recorded the site in 1969 after he and a group of volunteers excavated a 17th-century trash pit at this location.

As noted during the 1999 survey, the area is currently developed and the shoreline is bulk headed. As such, the shoreline is stable and unchanged. The site is not eroding.

Figure 3.193. The satellite image defines the boundary and the longitude and latitude locational data for 44NH49, 44NH427, and 44NH503.

162). North Gulf Shore – 44NH0225

The site (see Figure 3.194) was recorded by J. Mark Wittkofski in 1982. The site was recorded based on an assemblage of artifacts amassed by the Bailey family, who regularly examined this location at low tide. The only artifact of note was a small full-grooved axe, which indicated an Archaic-era presence. In 1999, no artifacts were discovered at this location.

The recent survey produced no evidence of a prehistoric occupation at this site. However, the shoreline is stable and largely accreting sediment. Over the past 15 years, the shoreline has not changed. Therefore, the site may be intact, buried, and preserved in the nearshore or offshore area.

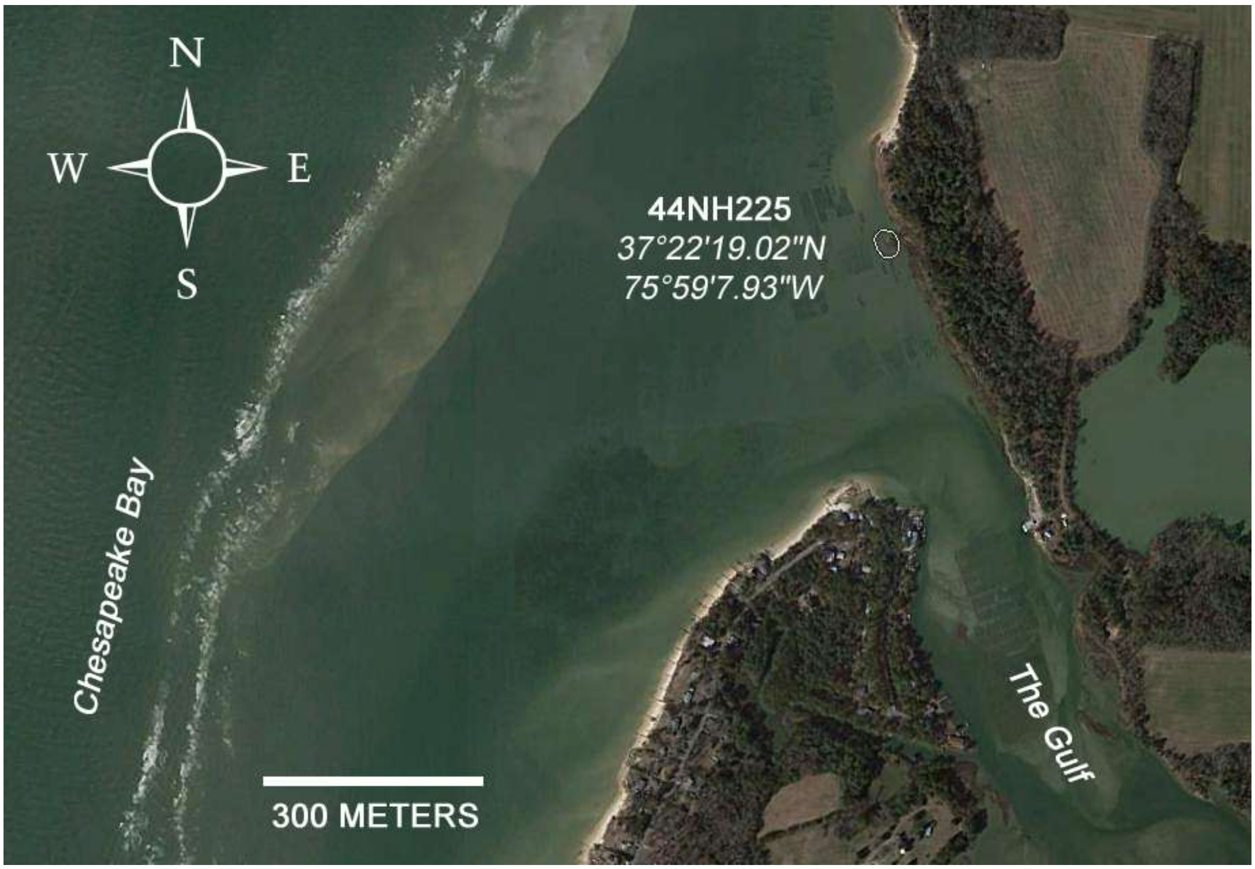

Figure 3.194. The satellite image defines the boundary and the longitude and latitude locational data for 44NH225.

163). Tankards Beach – 44NH0222

The site (see Figure 3.197) was recorded by J. Mark Wittkofski in 1982. The site was recorded based on an extensive collection amassed by a Mrs. Bailey, who regularly examined the shoreline area at low tide. The collection originated within the “mud” at low tide. The assemblage collected from the site included a variety of Savannah River stemmed points made of quartzite, a quartz ovoid biface, a quartzite side-notched point, and a grinding stone. The assemblage reportedly found at the site seems to be reflective of a Late Archaic occupation.

The site is located about 300 meters north of a former freshwater or tidal drain. A large aeolian sand dune has closed off the tidal drain and the basin eastward of the dune is now a freshwater pond. In 1999, no artifacts were discovered at this location. During the most recent survey, parts of the shoreline area have been covered by intertidal and aeolian sand (see Figure 3.195). The eroded bank profile at this location indicates that a historically-plowed field has been buried by covering of recent aeolian sand (see Figure 3.196). Interestingly, an earlier aeolian lens of sand situated beneath the buried plowzone or Apb-horizon along the shoreline encapsulates yet an earlier colonial plowed soil surface (see Figure 3.196). In summation, all prehistoric archaeological remains inland of the shoreline would be largely invisible on the surface of the modern plowed field. As in 1999, the current survey did not reveal any archaeological evidence. The shoreline at 44NH222 has eroded eastward approximately 40-meters or 131 feet since 1999. As such, most if not all of the site has disappeared. Given the contextual descriptions made by J. Mark Wittkofski, it is possible that the site he recorded included secondary eroded archaeological deposits in 1982.

Figure 3.195. The image shows the shoreline at 44NH222.

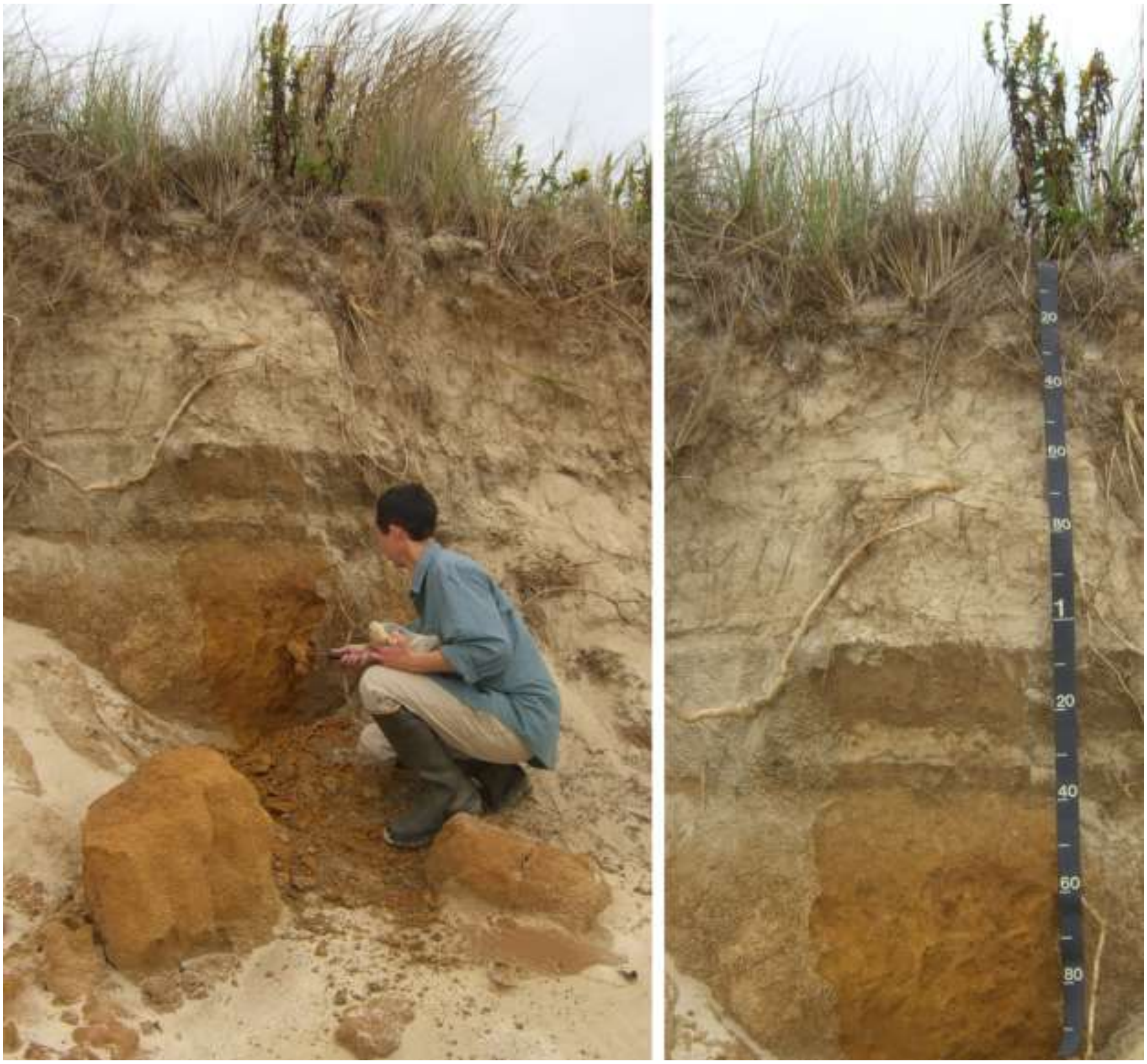

Figure 3.196. The image shows the bank profile at 44NH222. Note the buried Ap-soil horizons.

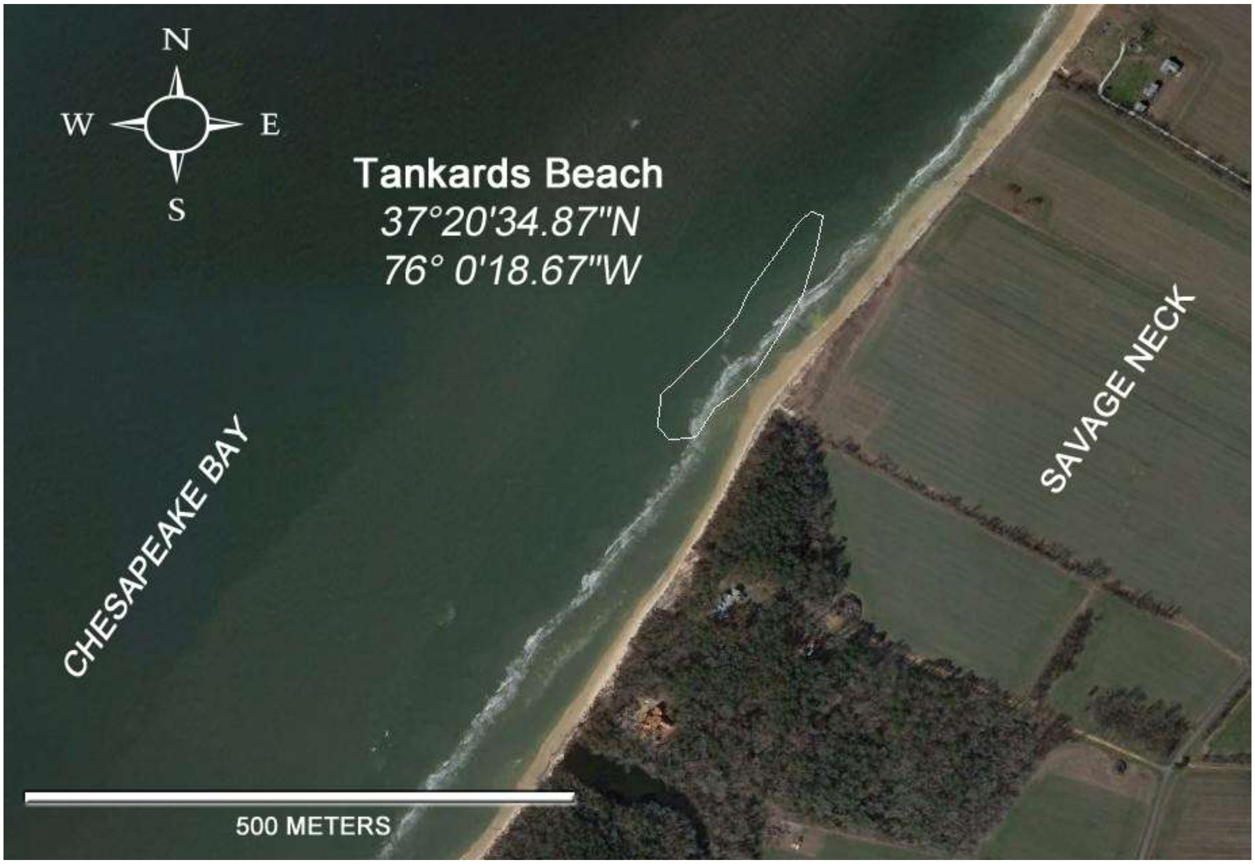

Figure 3.197. The satellite image defines the boundary and the longitude and latitude locational data for 44NH222.

164). Savage Neck North Midden – 44NH0435

The site (see Figure 3.204) was recorded in 1999 (Lowery 2001). At that time, the site consisted of a broad area of fire-cracked rock and shell adjacent to the shoreline. A single shell-filled pit feature and a shell lens area were observed within buried upland surface. The occupation surface has been encapsulated by a thick deposit (~3 to ~20 meters) of aeolian sand (see Figure 3.198). The limited surface collection made during the 1999 survey included one fragment of quartz-tempered Popes Creek ware, one quartz flake, and one quartzite flake. Lowery (1999) noted that “an accurate assessment of the site's cultural chronology cannot be made based on the limited artifact assemblage.”

After completing the 1999 survey, several surface collections from this site were located, examined, and documented. Cultural use of this locality spans most of the region’s prehistory. The site has produced seven Paleoindian points (see Figures 3.200 and 3.201). Photographs of another small quartz Clovis point from this location also exist and the point has been examined. There are unconfirmed reports of three additional fluted Paleoindian points from this location. Several Early Archaic notched-serrated points have also been found at this location. Numerous Middle Archaic Morrow Mountain type points, as well as Late Archaic stemmed point varieties have also been discovered. Terminal Archaic and Early Woodland types include Susquehanna, Orient, Piscataway, and Meadowood points. However, the Middle Woodland period represents the predominant component at this site (see Figure 3.202). The Middle Woodland presence is indicated by numerous Fox Creek type points made of exotic rhyolite, argillite, and black Upper Mercer chert. Cut and incised bone artifacts have also been found at this location. Several broken sandstone gorgets or pendants have also been found alone with over sixty fossil sharks teeth. The fossil teeth of the extant Great White (*Carcharodon carcharias*) dominate the assemblage. Recognizing that the lower portion of the Delmarva Peninsula consists of late Pleistocene and Holocene-age geologic deposits, the fossil shark teeth clearly did not originate from local sources. The shark teeth were clearly brought to the site from other areas. Nearby geologic outcrops containing these types of shark teeth would include the Yorktown formation along mainland Virginia and the Pungo River formation in coastal North Carolina. Paradoxically, the site has produced three Ohio Valley Adena-Hopewell biface forms. A large Upper Mercer chert Robbins stemmed and two Upper Mercer North blades have been found at this site. A Jack's Reef corner-notched point and three pentagonal points found at this site would indicate a late Middle Woodland presence. Eight triangular points and three incised shell-tempered ceramics provide evidence for a Late Woodland occupation.

In 2013, erosion along the shoreline at the site revealed a cluster of fragmented hard clam and oyster shell associated with several fragments of Potomac Creek cord-marked and grit-tempered ceramics (see Figure 3.199). The artifact cluster was associated with the upland surface buried beneath ~7 meters of aeolian sand. A sample of hard clam shell from this feature and within the paleosol produced an age estimate of 1368 ± 22 14C-age BP. The ^{14}C-age estimate was corrected using the local marine reservoir value and the resultant age estimate for the shell is 1007 ± 11 calAD (D-AMS 005955). Like both Butler's and Latimer's Bluff to the south, a post-1100 calAD aeolian dune formation has buried an extensive upland surface along the shoreline at Savage Neck.

44NH435 also contains a terminal Pleistocene aeolian formation, which can be correlated to the Younger Dryas climatic event (see Lowery et al. 2010). Beneath the circa 1000 calAD paleosol at 44NH435, a large Clovis style fluted point was found in situ and eroding from the exposed bank profile (see Figure 3.200). The in situ Clovis point was buried by a ~80 centimeter thick Younger Dryas-age loess deposit. Other in situ artifacts eroded from this level include a small endscraper, a quartzite sidescraper, and a utilized blade-like flake.

Since 1999, sections of the shoreline at 44NH435 have retreated and eroded ~38 meters. Most of this erosion occurred since 2010. Three massive stone revetments were constructed offshore in October 2010. These revetments protected the northern and central portions of the site. Along the southern margin, the interaction between the prevailing wind direction, wave energy, littoral processes and the revetment obstruction accelerated the rate of erosion and caused the observed ~38 meters of landward retreat. Most of the artifacts observed in private collections were found in the heavily eroded area between 2010 and 2015. The situation observed at 44NH435 clearly illustrates how erosion control measures (i.e. revetment construction) can actually encourage archaeological site erosion loss.

Figure 3.198. The image shows the shoreline and eroded bank profile at 44NH435.

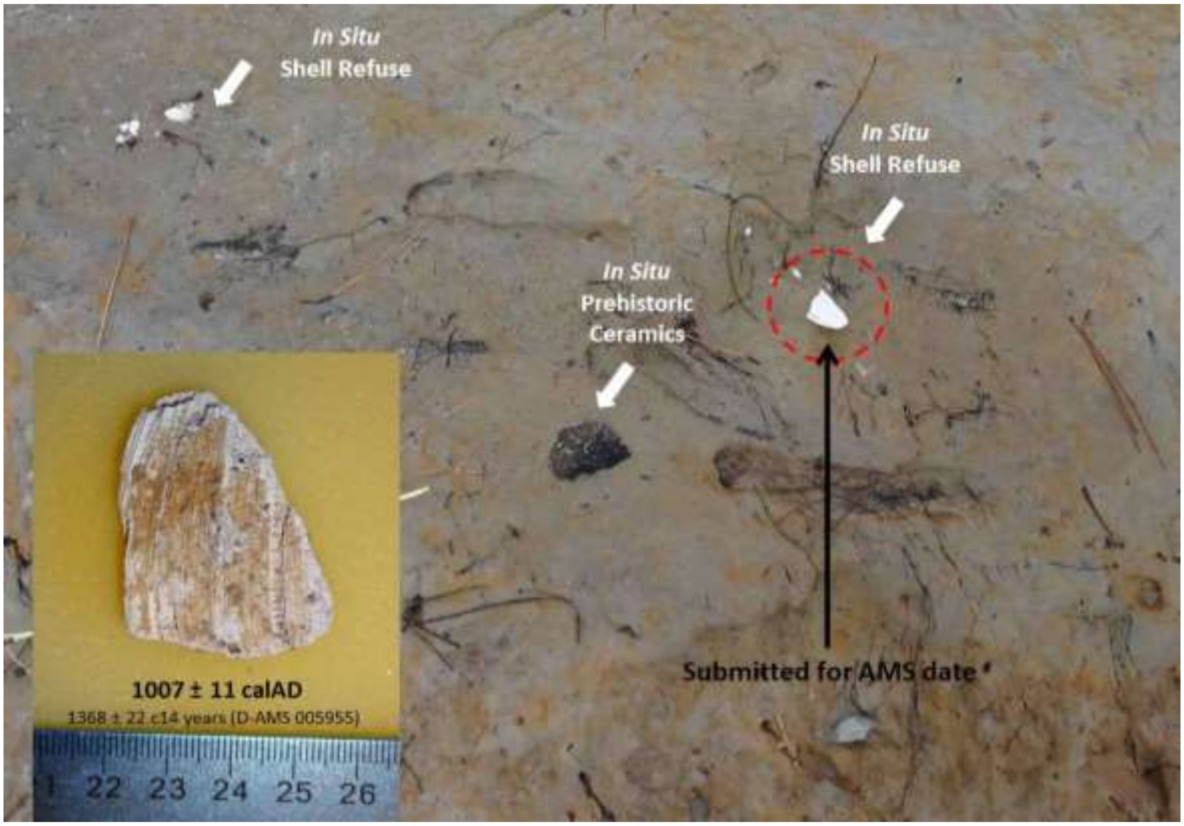

Figure 3.199. The image shows the buried surface at 44NH435 with in situ artifacts and shell refuse.

Figure 3.200. The image shows an in situ Clovis point exposed along the eroding bank profile at 44NH435. Note that the point is buried beneath loess.

Figure 3.201. The image shows six additional Paleoindian fluted points found by local residents at 44NH435.

Figure 3.202. The image shows Middle Woodland Fox Creek artifacts, Ohio Valley Hopewellian artifacts, fossil sharks teeth, and an incised bone awl found within the eroding midden area at 44NH435. These items were collected by local residents over past decade.

165). Humphrey Locality – 44NH0221

The site (see Figure 3.204) was recorded by J. Mark Wittkofski in 1982. The site was recorded based on an extensive collection amassed by a Mr. Humphrey, who regularly examined the shoreline area. The collection originated from an eroded bank and within the mud at low tide. The Humphrey's assemblage included a mixture of Archaic (serrated and stemmed points) and Woodland (triangular) projectile points, as well as shell, sand, and crushed quartz tempered vessel fragments.

The site is located along the south bank of a former freshwater or tidal drain. A large aeolian sand dune has closed off the drain and the basin eastward of the dune is now referred to as Custis Pond. In 1999 and during the recent survey, the site area has been completely covered by intertidal and aeolian sand (see Figure 3.203). Thus, the site is currently protected and non-erosive. However, Wittkofski's data would imply that the area was erosive or scoured in the early 1980's. Rapid shifts linked to erosive and non-erosive conditions frequently occur in coastal sand dominated areas; like those noted at 44NH221. As such, the coastal stability observed at 44NH221 during the recent survey could change.

Figure 3.203. The image shows the shoreline at 44NH221.

Figure 3.204. The satellite image defines the boundary and the longitude and latitude locational data for 44NH435 and 44NH221.

166). Savage Neck South Midden – 44NH0434 (a.k.a. 44NH0478)

The site (see Figure 3.210) was recorded in 1999 (Lowery 2001). The area encompassed a 274 meter section of the coastline adjacent to the Chesapeake Bay. The assemblage collected during the earlier survey included three shell-temper Mockley vessel fragments, a single thin-walled shell-tempered vessel fragment, a thin-walled grit-tempered vessel fragment, a mixed shell-grit tempered vessel fragment, a chert side-notched point, a jasper teardrop point, a chert biface fragment, a quartz bi-polar flake, a chert bi-polar flake, two quartzite flakes, a basalt flake, a quartz flake, and three pieces of fire-cracked rock.

In 2011, a follow-up survey of the Savage Neck coastline recognized a shell midden feature exposed along the shoreline (see Figure 3.207). Test excavations (see Figure 3.205) were conducted in the midden area (see Rick et al. 2015). The midden was given a separate site number (i.e., 44NH478) and located within the boundary of 44NH434. However, the 44NH478 designation has been removed. Diagnostic artifacts found associated with the midden included a mixture of exotic Meadowood style bifaces (see Figure 3.206) and a few local Piscataway/Teardrop points made of quartz/quartzite. Some of the ceramics found within the midden would be classified as Middle Woodland-era shell-tempered Mockley ware (see Figure 3.206 H). Bay scallop (*Argopecten irradians*) shell was used as tempering agent in the vessels. The testing and research at the site proved that shell tempered vessels are much older than the traditional accepted age range. Fourteen AMS-dates were generated on a gamut of materials, which included three samples of directly-dated shell temper. The resultant age fourteen age-estimates spanned a maximum time frame of 700 calBC to 1370 calBC (see Table 3.1). However, the mean of all fourteen age estimates is ~980 calBC .

Over the past 15 years, the shoreline at 44NH434 has remained relatively stable (see Figure 3.208). As the sand moves along the shoreline, the buried landscape beneath the dunes is periodically exposed and reburied (see Figures 3.207 and 3.208). The lack of erosion along this stretch of coastline is a byproduct of a series of shallow sand bars located offshore (see Figure 3.209). The bars are a natural breakwater and they dissipate the intense wave energy before the waves can strike the shoreline. The area was surveyed on January 31st 2015 and at this time; the site was largely buried beneath coastal sand. Nothing was found as a result of the most recent fieldwork.

Figure 3.205. The image shows the excavation being conducted at 44NH434 in 2012.

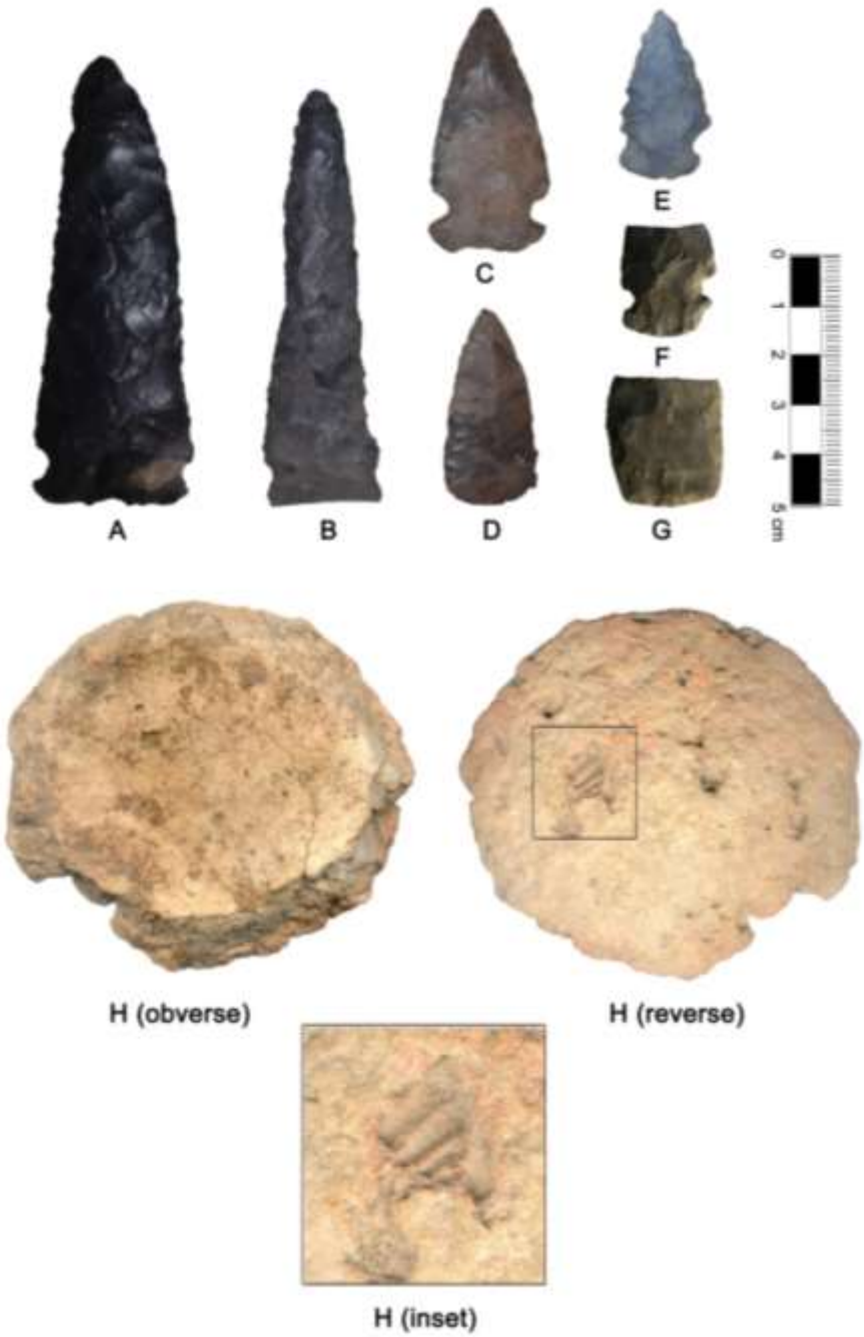

Figure 3.206. The image shows a representative sample of Early Woodland style artifacts found at 44NH434. Shown are two Onondaga chert Meadowood knives (A-B), two complete Onondaga chert Meadowood points (C, E), one broken Onondaga chert Meadowood point (F), a complete Onondaga chert Meadowood cache blade (D), a broken Onondaga chert Meadowood cache blade (G), and a fragment of early conoidal coiled shell-tempered Mockley ware (H). These were found as a result of the 2011 research.

Table 3.1. The AMS ages for the organic material found in the midden at 44NH434 (see Rick et al. 2015).

Sample #	Provenience	Material[1] (Pottery Type)	Lab #[2]	$d^{13}C$	Age	cal B.C. (2 sigma)
NH478a	Midden *in situ*, near Unit 1	Land Mammal Bone Collagen	B-322117	-22.4	2650 ± 30	900-790
NH478b	Unit 1, 20 cm	*M.m.*	B-312010	-1.2	2980 ± 30	950-700
NH478c	Unit 1, 20 cm	*C.v.*	B-312009	-1.2	3010 ± 30	970-740
NH478d	Field School units	*Shell temper (Mockley)*	B-349780	-1.0	3050 ± 30	1000-780
NH478e	Unit 1, 20 cm	*B.c.*	B-349881	-0.8	3060 ± 30	1020-770
NH478f	Unit 1, 10-20 cm	*C.v.*	OS-95244	0.3	3070 ± 40	1050-770
NH478g	Unit 1, 10-20 cm	*C.v.*	OS-95249	-0.4	3090 ± 25	1050-790
NH478h	Shell Midden near Unit 1	Charcoal	B-322118	-23.3	2810 ± 30	1050-900
NH478i	Unit 1, 20 cm	*M.m.*	B-349782	0.9	3150 ± 30	1150-830
NH478j	Unit 1, 20 cm	*A.i. temper* (Waterlilly)	B-315746	0.6	3200 ± 30	1210-900
NH478k	Field School units	*Shell temper (Mockley)*	B-349778	1.4	3250 ± 30	1280-950
NH478l	Unit 1, 20 cm	*A.i.*	B-312011	-2.2	3280 ± 30	1320-990
NH478m	Unit 1, 20 cm	*T.p.*	B-349783	-0.2	3280 ± 30	1320-990
NH478n	Field School units	*Shell temper (Mockley)*	B-349779	0.8	3310 ± 30	1370-1040

1. *C.v.= Crassostrea virginica. M.m.= Mercenaria mercenaria. A.i.=Argopecten irradians, TP=Tagelus plebius, B.c.=Busycon carica.*
2. OS=NOSAMS Lab, Woods Hole Oceanographic Institute. B= Beta Analytic, Inc.
3. dR= 2 ± 46 (Rick et al. 2012).

Figure 3.207. The image shows the shoreline at 44NH434 in 2010.

Figure 3.208. The image shows the shoreline at 44NH434 in 2015.

Figure 3.209. The shoreline at 44NH434 is largely stable because of natural sandbars situated offshore dissipate the wave energy.

167). South Cherrystone Creek - 44NH0433

The site (see Figure 3.210) was recorded in 1999 (Lowery 2001) and it is situated near the south entrance to Cherrystone Creek. During the earlier survey a rhyolite drill, a rhyolite flake tool, and two quartz flakes/spalls were discovered along with some fire-cracked rock.

Over the past 15 years, the shoreline at 44NH433 has retreated ~8 (27 feet) meters. The shoreline has recently been stabilized with rip-rap. As such, nothing was found as a result of the most recent fieldwork.

Figure 3.210. The satellite image defines the boundary and the longitude and latitude locational data for 44NH433 and 44NH434.

168). North Old Plantation Creek – 44NH0438

The site (see Figure 3.211) was recorded in 1999 (Lowery 2001) and it extended along a 950 meter (3,100 feet) section of Chesapeake Bay shoreline immediately north of Old Plantation Creek. A few years after the 1999 survey, the entire area was developed as a golf course community. Before the development, the shoreline at 44NH438 eroded or retreated between ~57 (187 feet) and ~32 (107 feet) meters. The entire site was graded and the shoreline has been rip-rapped. As such, we can assume that most, if not all, of the site was altered or destroyed as a result of the development. However, the shoreline is no longer eroding.

Figure 3.211. The satellite image defines the boundary and the longitude and latitude locational data for 44NH438.

169). Butler's Bluff - 44NH0436

The Butler's Bluff site (see Figure 3.220) was originally recorded by Lowery (2001). At the time, the area was noted to contain an undiagnostic prehistoric presence. At the time, the site produced one quartz triangular endscraper, two chert utilized "blade-like" flakes, and one chert bifacial thinning flake. The site is situated one kilometer east of the low sea stand Susquehanna-Chesapeake paleochannel. The site would have been located on a high elevated bluff overlooking the primordial Chesapeake Bay as it formed during the early Holocene. As such, the area may have been attractive to people for a long period of time. Lowery's (2001) research documented buried paleosols at this location (see Figure 3.212). Cline et al. (2001) dated the two paleosols within the eroded bank profile. Charcoal from a paleosol situated beneath ~2 meters of aeolian sand produced an age estimate of 1080 ± 40 ^{14}C-age BP or 842 ± 56 calAD (Beta-157935). Charcoal from a paleosol situated beneath ~7 meters of aeolian sand produced an age estimate of 33,090 ± 320 ^{14}C-age BP or 35,605 ± 720 calBC (Beta-156796).

The surface at Butler's Bluff (see Figure 3.213) is covered with a climax forest, which includes a mixture of loblolly pine (see Figure 3.215), eastern red cedar, live oak, American holly, sassafras, black cherry, and yaupon. As noted, the younger paleosol is situated beneath 2 to 4 meters of aeolian sand. The recent survey documented artifacts and other cultural remains within the younger paleosol (see Figure 3.214 A). Within the bank profile south of Devil's Ditch, several fragments of shell-tempered cord-marked Townsend ceramics (see Figure 3.214 B) were discovered associated with the remains of hard shell clam. A sample of hard shell clam within the paleosol produced an age estimate of 1282 ± 24 ^{14}C-age BP. The ^{14}C-age estimate was corrected using the local marine reservoir value and the resultant age estimate for the shell is 1071 ± 45 calAD (D-AMS 015335). The Devil's Ditch channel or drain is also covered by late Holocene aeolian sand. The aeolian sand encapsulates a basal peat associated with the former Devil's Ditch channel. A conifer cone extracted from the peat (see Cline et al. 2001) produced an age estimate of 880 ± 40 ^{14}C-years BP, which calibrates to 1131 ± 65 calAD. The results would imply that the dated archaeological remains from the young paleosol are contemporaneous with the buried peat located within the bottom of the Devil's Ditch channel. The late Holocene aeolian formation which extends from Butler's Bluff south towards Latimer's Bluff would post-date circa 1100 calAD.

Over the past 15 years, the shoreline at 44NH436 has retreated ~35 (114 feet) to 10 meters (32 feet). Since the initial survey in 1999, the area has also been developed and several houses have been built on top of the bluff. Initial attempts to stabilize the erosion along this developed shoreline included wooden bulkheads. These earlier attempts have failed. Beginning In 2006, stone revetments were placed offshore. These have successfully stabilized the eroding bank along a 650 meter (2130 feet) section of the shoreline. Along the northern end of the site near Devil's Ditch, the area continues to erode. The extensive erosion, slumping, and dynamic coastal conditions make it hard to locate in situ archaeological remains.

Figure 3.212. The image shows the shoreline at 44NH436 in 1999. Both the late Holocene (A) and the late Pleistocene (B) paleosols are delineated.

Figure 3.213. The image shows the shoreline at 44NH436 in 2015. Because of slumping only the late Holocene paleosol can be seen in the photo. The paleosol is situated ~2 meters or ~6.5 feet below the ground surface. Note that a climax forest occupies the modern surface.

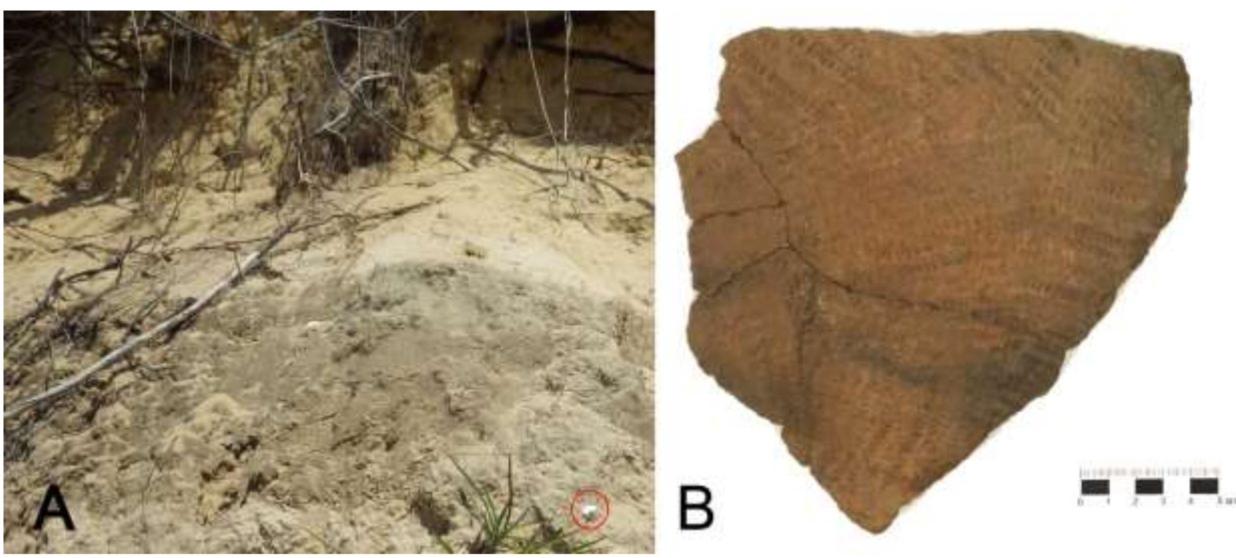

Figure 3.214. The photograph (A) shows a detailed view of the late Holocene paleosol. The red circle (lower right corner) denotes the hard clam shell that was dated. Conjoining fragments of Late Woodland ceramics was found within this paleosol.

Figure 3.215. The image shows the forested dune inland from the shoreline at 44NH436. Note that the forest floor rises markedly towards the east. Coring indicates that the late Holocene paleosol at the apex of the dune is buried beneath ~6 meters or ~20 feet of sand.

170). Latimer's Bluff - 44NH0437

The site (see Figure 3.220) was originally recorded by Lowery (2001). At the time, the area was noted to contain both a Paleoindian and an Early Archaic presence. The site produced a chert Clovis point fragment, a jasper Lost Lake-style notched point, and a few flakes. The site is situated one kilometer east of the low sea stand Susquehanna-Chesapeake paleochannel. As such, the site would have been located on a high elevated bluff overlooking the valley at the time of occupation. Given the current sea level data, a low salinity primordial Chesapeake Bay would have existed immediately west of the site at the time of Paleoindian and Early Archaic occupation. As such, the area may have been attractive as a result of estuarine resources located nearby.

The recent survey documented an additional Paleoindian artifact at this location. A single banded-chert Debert-style fluted point was found out of context along the beach (see Figure 3.216). Like many areas along the lower Chesapeake side of Northampton County, Virginia, the eroded bank-cut contains buried paleosol dated to circa 1000calAD. The age of the paleosol can be determined by the presence of the occasional fragment of late Middle Woodland and Late Woodland period ceramics (see Figure 3.217) found in situ and observed along the bank profile within the buried surface (see Figure 3.218). A sample of hard clam shell associated with a fragment of Townsend ware embedded within the paleosol was submitted for an age estimate. The presence of Townsend ware on this surface would imply that the site also has a buried Late Woodland occupation. When local reservoir corrected and calibrated, a resultant age estimate for the paleosol was 1272 ± 8 calAD (D-AMS 0015330). The late Holocene paleosol at Latimers Bluff is situated beneath 1 to 2.5 meters of aeolian sand. The surface is covered by a climax forest (see Figure 3.219), which includes a mixture of loblolly pine, eastern red cedar, live oak, American holly, sassafras, black cherry, and yaupon.

Over the past 15 years, the shoreline at 44NH437 has retreated ~15 (50 feet) to 10 meters (32 feet). The extensive erosion, slumping, and dynamic coastal conditions make it hard to locate in situ archaeological remains.

Figure 3.216. The image shows a displaced Paleoindian point found along the shoreline at 44NH437 during the recent survey.

Figure 3.217. The image shows two fragments of Late Woodland ceramics found embedded within the buried late Holocene paleosol at 44NH437.

Figure 3.218. The image shows the shoreline and bank profile at 44NH437. The late Holocene pasleosol is buried beneath ~1.5 meters of aeolian sand.

Figure 3.219. The image shows the forested dune inland from the shoreline at 44NH437.

Figure 3.220. The satellite image defines the boundary and the longitude and latitude locational data for 44NH436 and 44NH437.

171). Dale's Gift Well - 44NH502

A barrel well (see Figure 3.221) was observed at this site (see Figure 3.223) in the fall of 2015. Artifacts from the well include an early 17th-century stoneware Bellarmine jug fragment and a fragment of a late 16th-early 17th century Borderware vessel fragment (see Figure 3.222). The barrel well feature was photographed. The redistribution of sand along the shoreline plays a major role in the visibility of the well feature. Previous visits to this location did not reveal evidence of the barrel well. The well was covered with sand during two subsequent visits. As such, the visibility of the barrel-well largely depends on the nearshore sand conditions.

Over the past 15 years, the shoreline at 44NH502 has retreated ~6 meters (20 feet).

Figure 3.221. The image shows the shoreline at 44NH502. Note the in situ wooden barrel well feature (see inset).

Figure 3.222. The image shows two late 16th or early 17th century artifacts found within the exposed well feature at 44NH502.

Figure 3.223. The satellite image defines the boundary and the longitude and latitude locational data for 44NH502.

172). Fisherman's Island – 44NH0278

The site (see Figure 3.224) was recorded in 2001 by Lowery (2003a). Fisherman's Island is a geologically young landscape. The first deed for this landform was issued in the late 18th century for a shallow sandbar located in this area for use as a fishing ground. By 1953, the island encompassed about 350 acres of scrub forested upland, tidal marsh, and coastal dune landforms. After the construction of the Chesapeake Bay Bridge Tunnel in 1960, the island began to grow as a result of sediment accretion near the bridge pilings, which cross the island. The island currently encompasses 1,850 acres. As a result, the island has accreted approximately 1,500 acres of land over the past 55 years.

In 2001, the site was plotted on the west side of the island and its boundary can directly linked with the oldest geologic portion of the island. The ridge associated with site matches the ridge plotted on the 1852 coastal survey map. The site can be linked to a variety of activities. Between 1850 and 1890, the island contained fishing shacks. WWII coast defense structures are also located at the site. The area also served as a quarantine station. As such, there is a possibility of burials or cremations at this location linked to various epidemics.

The area was surveyed on 4-15-2015 and the island has continued to grow. The southern portion of the island extends an additional ~178 meters (~586 feet) further south than it did 15 years ago. The northwest side of the island extends an additional ~195 meters (~642 feet). The southwest side of the island extends an additional ~95 meters (~312 feet). There have been also small gains in land along the eastern side of the island. As such, 44NH278 has not eroded over the past decade and a half.

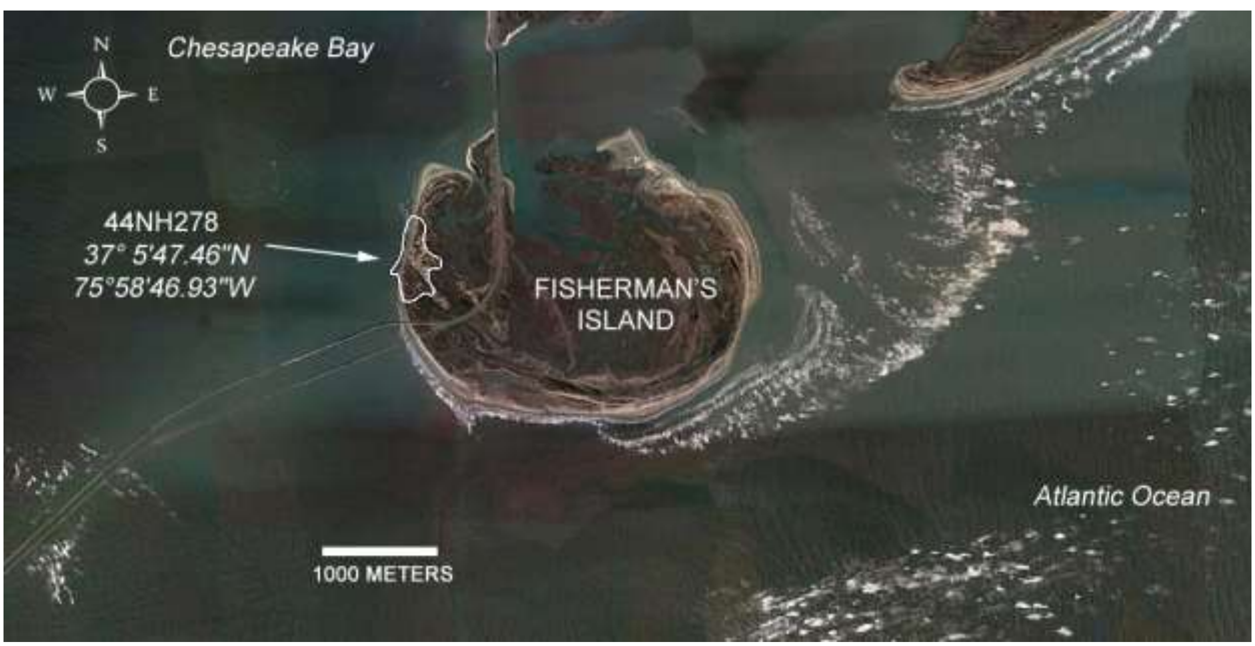

Figure 3.224. The satellite image defines the boundary and the longitude and latitude locational data for 44NH278.

173). **Skidmore Island – 44NH0458**

The site (see Figure 3.231) was recorded in 2001. In 2001, the site was associated with an eroded shoreline intact upland, coastal dune landforms, dredge spoil, and tidal marsh. The shoreline consists of dense sand, gravel, and cobble material. The coarse sediments (i.e., cobbles and gravel) are associated with the dredge material deposited across the island. The dredge material originated from the man-made channel cut for the Intracoastal Waterway situated immediately southwest of the site. Even though the cobbles are out of context, they provide a glimpse into the secondary lithic resources available to prehistoric cultures in the region when sea level was much lower. In 2001, the artifacts found at the site included Middle and Late Archaic diagnostic projectile points, undiagnostic bifaces and preforms, debitage, and one fragment of fire-cracked rock. The recent reexamination of the site in 2015 produced no additional lithic artifacts.

Over the past 15 years, the shoreline at 44NH458 has retreated ~62 (203 feet) to 25 meters (82 feet). The extensive erosion and the lack of cultural remains may indicate that the site has been destroyed by erosion.

174). **Southwest Magothy Bay #1 - 44NH0500**

The site (see Figure 3.231) includes a limited scattering of fire-cracked rock and quartz-quartzite debitage. A sulfidized jasper Susquehanna broadspear was found at this location and indicates a terminal Archaic (~3,200 to 3,800 years BP) occupation. The limited artifact assemblage was found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath a 90-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~20 meters (67 feet).

175). **Southwest Magothy Bay #2 - 44NH0501**

The site (see Figure 3.231) includes a limited scattering of fire-cracked rock and quartz-quartzite debitage. The limited artifact assemblage was found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath a 60-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~22 meters (75 feet).

176). Jones Cove – 44NH0462

The site (see Figure 3.231) was recorded in 2001. In 2001, the site was associated with an eroded tidal marsh. A drowned upland (see Figure 3.225) occurs beneath a 22 to 40 centimeter covering of tidal marsh peat. Given the geology, all of the cultural material should be confined to the A and AE soil horizons. In 2001, the artifacts found at the site included Late Archaic and Middle Woodland diagnostic projectile points, a ground stone adze fragment, a biface, debitage, and fire-cracked rock. In 2014, Lowery (2014) conducted test excavations, soil profile analysis, and a controlled shoreline analysis at this site. The site includes an extensive Middle and Late Archaic lithic assemblage (see Figure 3.226). Test excavations revealed some in situ Archaic-era diagnostic remains. The youngest archaeological materials found at the site included a single fragment of incised Rappahannock ware and a basalt triangular point (see Figures 3.227 and 3.228). Burned and charred tree stumps from beneath the tidal marsh were associated with the Late Woodland artifacts (see Figure 3.228) and AMS-dated to 868 ± 55 calAD (D-AMS 006452). Today the site area is a tidal marsh and the 1850 coastal survey map indicates that the region was a tidal marsh 160 years ago. Aside from fire-cracked rock, the recent reexamination of the site in 2015 produced no additional lithic artifacts.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated between ~17 (55 feet) and ~5 meters (16 feet).

Figure 3.225. The image shows the shoreline at 44NH462.

Figure 3.226. The image shows some of the Archaic period artifacts found at 44NH462 in 2013. The point on the far right is 3.2 centimeters in length.

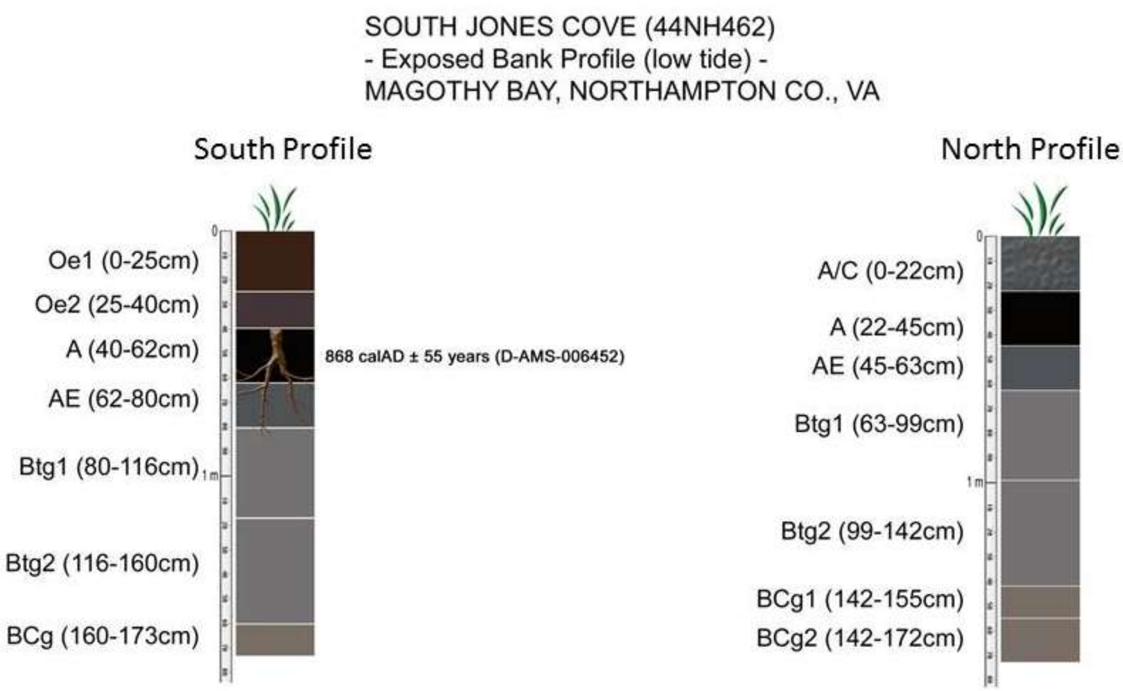

Figure 3.227. The image illustrates the idealized soil profiles associated with 44NH462.

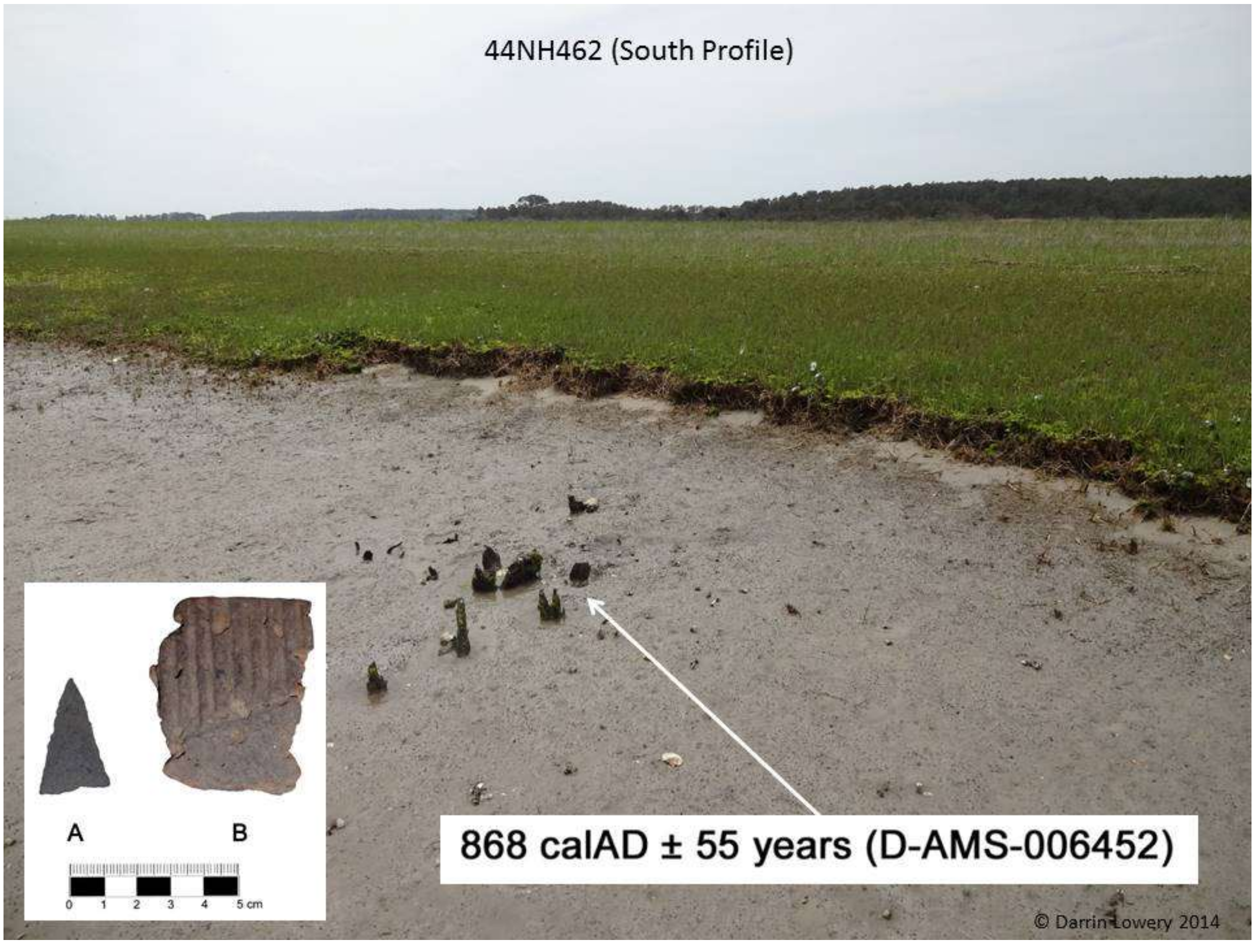

Figure 3.228. The image shows the southern shoreline associated with 44NH462. The last human occupation at this location is indicated by a Late Woodland period basalt triangular point and shell-tempered incised ceramic fragment. The associated AMS date for the burned tree stump shown in the photo has been defined.

177). South Cushman's Landing – 44NH0459

The site (see Figure 3.231) was recorded in 2001. In 2001, the site is associated with an eroded tidal marsh. A drowned upland occurs beneath a 20 centimeter-thick tidal marsh covering. The eroded bank profile is virtually identical to the profile recognized at 44NH462, which is located immediately to the south. Given the geology, all of the cultural material should be confined to the A and AE soil horizons. In 2001, the artifacts found at the site included a mixture of undiagnostic prehistoric lithic debris and some early 17th century artifacts. Aside from three fragments of fire-cracked rock, the recent reexamination of the site in 2015 produced a single fragment of a "Bellarmine style" stoneware vessel indicative of an early 17th century presence.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has retreated ~10 (32 feet) meters.

178). Landing Shore – 44NH0460

The site (see Figure 3.231) was recorded in 2001. In 2001, the site is associated with an eroded tidal marsh. A drowned upland occurs beneath a 40 centimeter-thick tidal marsh covering. The eroded bank profile is virtually identical to the profile recognized at 44NH461. Given the geology, all of the cultural material should be confined to the A and AE soil horizons. In 2001, the artifacts found at the site included Late Archaic diagnostic projectile points, some fragmentary bifaces, debitage, and a limited quantity of fire-cracked rock. Aside from three fragments of fire-cracked rock, the recent reexamination of the site in 2015 produced no additional lithic artifacts.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline has retreated ~11 (38 feet) meters.

179). Dunton Cove – 44NH0461

The site (see Figure 3.231) was recorded in 2001. In 2001, the site is associated with an eroded tidal marsh (see Figure 3.29). A drowned upland with some tree stumps occurs beneath a 40 centimeter-thick tidal marsh covering. Given the geology and soil profile data (see Figure 3.30), all of the cultural material should be confined to the A and AE soil horizons. In 2001, the artifacts found at the site included Early Archaic, Middle Archaic, Late Archaic, Terminal Archaic, and Middle Woodland diagnostic projectile points. The site also included some debitage and fire-cracked rock. Periodic reexamination of the site between 2003a and 2004, uncovered two fragmentary fluted Paleoindian Clovis points and additional Late Archaic stemmed points. A Middle Paleoindian Barnes style fluted point has also been found at this locality by a local individual. Aside from two fragments of fire-cracked rock, the recent reexamination of the site in 2015 produced no additional lithic artifacts.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has retreated ~12 (40 feet) meters.

Figure 3.229. The image shows the shoreline associated with 44NH461.

Figure 3.230. The image shows a generalized soil profile for 44NH461.

Figure 3.231. The satellite image defines the boundary and the longitude and latitude locational data for 44NH458, 44NH459, 44NH460, 44NH461, 44NH462, 44NH500, and 44NH501.

180). North Mockhorn Island - 44NH0457

The site (see Figure 3.233) was recorded in 2001. The site is associated with a drowned upland landsurface situated beneath a thick covering of tidal marsh peat. The low tide beach area adjacent to the site consists of coarse sand and gravel along with a thick deposit of intertidal silt. The site is also near a major bend in the Intracoastal Waterway immediately west of Mockhorn Island. The 2001 survey (see Lowery 2003a) noted a Paleoindian, Early Archaic, Middle Archaic, and Late Archaic presence at this site.

The site area was periodically examined over the past decade and no additional artifacts were discovered (see Figure 3.232). During the 2015 survey, no artifacts were discovered at 44NH457. As such, the site may have been lost to tidal channel erosion. Over the past 15 years, the Intracoastal Waterway channel has migrated towards the south and east. As such, the shoreline at this site has retreated ~16 to 21 (52 to 68 feet) meters.

Figure 3.232. The image shows the shoreline associated with 44NH457.

Figure 3.233. The satellite image defines the boundary and the longitude and latitude locational data for 44NH457.

181). North Stringer's Ditch – 44NH0443

The site (see Figure 3.238) was recorded in 2001. The site is associated with a partially drowned upland land surface with some tree remains situated beneath an incipient covering of tidal marsh peat (see Figure 3.234). The site is located immediately north of Stringer's Ditch, one of many tidal creeks that drains the center of Mockhorn Island. The 2001 survey (see Lowery 2003a) noted a Late Archaic through Middle Woodland presence at this site. The 2001 data indicate that the site also may also include a possible Late Woodland occupation; as indicated by triangular points.

The most recent survey documented only fire-cracked rock at this location. Over the past 15 years, the shoreline at this site has retreated ~8 (26 feet) meters.

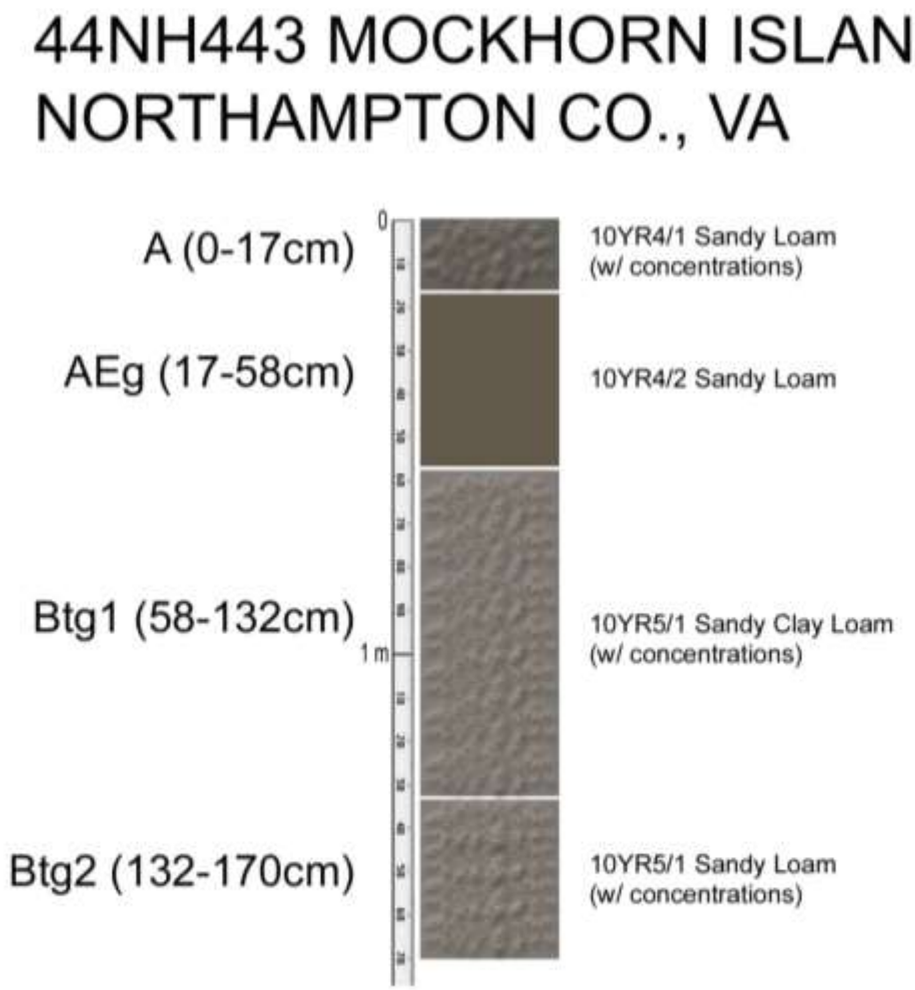

Figure 3.234. The image shows a generalized soil profile for 44NH443.

182). South Stringer's Ditch – 44NH0444

The site (see Figure 3.238) was recorded in 2001. The site is associated with a drowned upland landsurface with some tree stumps situated beneath a covering of tidal marsh peat. The site is located immediately south of Stringer's Ditch, one of many tidal creeks that drains the center of Mockhorn Island. The 2001 survey (see Lowery 2003a) noted a Middle Archaic, Late Archaic, Terminal Archaic, Early Woodland, and Middle Woodland presence at this site. The 2001 data indicate that the site also may also include a possible Late Woodland occupation; as indicated by two broken triangular points.

The most recent survey documented only fire-cracked rock at this location. Over the past 15 years, the shoreline at this site has retreated ~18 (59 feet) meters.

183). **Mockhorn West #2 - 44NH0499**

The site (see Figure 3.238) includes a limited scattering of fire-cracked rock and quartzite debitage. The distal end of a pink Flint Ridge chalcedony Hopewell-Adena point was found at this site in 2009 (see Figure 3.235). The limited artifact assemblage was found along the eroded shoreline and indicates a Middle Woodland-era (~2,000 years BP) occupation. At low tide, a drowned upland surface is situated beneath a 60-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed within the drowned upland surface at the base of the tidal marsh peat. The area represents an extension of the western late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

The most recent survey documented only fire-cracked rock at this location. Over the past 15 years, the shoreline at this site has retreated ~26 (85 feet) meters.

Figure 3.235. The image shows the distal end of a Flint Ridge biface found at 44NH499 in 2009. The specimen is 2.6 centimeters long.

184). **Mockhorn West #1 - 44NH0498**

The site (see Figure 3.238) includes a limited scattering of fire-cracked rock and quartz-quartzite debitage. The mid-section of a gray Flint Ridge chalcedony biface with a partial notch/stem section was found at the site in 2008 (see Figure 3.236). The basal end of a chert Debert-style fluted point (see Figure 3.237) and a chert LeCroy bifurcated point were found at this location in 2005. The limited artifact assemblage was found along the eroded shoreline and suggests a Paleoindian, a Middle Archaic, and a Middle Woodland-era occupation. At low tide, a drowned upland surface is situated beneath a 70-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed within the drowned upland surface at the base of the tidal marsh peat. The area represents an extension of the western late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

The most recent survey documented only fire-cracked rock at this location. Over the past 15 years, the shoreline at this site has retreated ~17 (55 feet) meters.

Figure 3.236. The image shows a “killed” Flint Ridge biface fragment found at 44NH498 in 2008.

Figure 3.237. The image shows the shoreline associated with 44NH498. The arrow denotes the location of a Debert-like Paleoindian point base (see inset) found at this site in 2005. The point fragment is 2.1 centimeters in length.

185). Mockhorn Island #14 – 44NH0456

The site (see Figure 3.238) designated as 44NH456 was recorded in 2001. The site is associated with a drowned upland landsurface with some tree stumps situated beneath a covering of tidal marsh peat. The 2001 survey (see Lowery 2003a) noted a Middle Woodland Fox Creek presence at this site. The 2001 data indicate that the site also includes an Archaic-era occupation and a possible Late Woodland occupation.

The most recent survey documented only fire-cracked rock at this location. Over the past 15 years, the shoreline at this site has retreated ~20 (65 feet) meters.

Figure 3.238. The satellite image defines the boundary and the longitude and latitude locational data for 44NH443, 44NH444, 44NH456, 44NH498, and 44NH499.

186). Mockhorn Island #7 – 44NH0234

The site designated as 44NH233 (see Figure 3.242) was recorded in 1983 by Keith Egloff. At the time, Egloff noted a shell feature along the northern margins of the site boundary area defined in VCRIS. In 2001 (see Lowery 2003a), a survey of the Atlantic coast relocated the remnant of this shell feature. Diagnostic terminal Archaic through Middle Woodland-era artifacts found near the small eroding feature included a steatite bowl fragment, one of shell-tempered Mockley vessel fragment, one chert Raccoon side-notched point, and one silicified mudstone "Tear Drop" point. Undiagnostic artifacts include debitage and fire-cracked rock.

Erosion has taken its toll on the upland hummock, the site, and the documented shell-filled feature. Over the past 15 years, the shoreline at this site has retreated ~28 (91 feet) meters. Aside from the accumulated lithic assemblage collected in 2001, very little cultural material remains along this section of shoreline. The site area was periodically examined over the past decade and no additional artifacts or features within the bank profile were discovered. During the 2015 survey, no artifacts were discovered at 44NH234. The site may have been lost to erosion.

187). Mockhorn Tower – 44NH0331

The site designated as 44NH331 (see Figure 3.242) was recorded in 1989 by Keith Egloff and recognized as the location of a 19^{th} century barrel well. Notably, Lowery and Stanford (2013) have extended the boundary of the Paleoindian occupation observed at 44NH233 northward into the site boundary defined for 44NH331. The area encompasses a broad exposure of upland hummock sub-soil. The forest on the hummock includes eastern red cedar and yaupon. Debitage, cores, and 19^{th} historic remains can occasionally be observed along the shoreline at low tide.

Because of the prior archaeological research conducted along this stretch of shoreline, no artifacts were discovered at 44NH331 during the 2015 survey. Over the past 15 years, sections of the site have retreated ~20 (65 feet) meters.

188). Mockhorn Island #8 – 44NH0233

The site (see Figure 3.242) designated as 44NH233 was recorded in 1983 by Keith Egloff, as an historic 17^{th} to 18^{th} century era site. He reported the presence of an unknown prehistoric occupation. In 2001, the site consisted of shoreline with numerous wedges/bipolar cores and debitage. Historic material (i.e., brick, glass, and ceramics) were also noted at this time. Without any diagnostic artifacts, it was assumed that the site encapsulated an Archaic-era occupation. The site area was reexamined multiple times in 2003 and 2004 (see Lowery 2003a and 2004) as a result of research being conducted on Mockhorn Island. Diagnostic artifacts found eroded out of context in 2003 to 2004 consisted of Paleoindian-era fluted projectile points. Several years later excavations were conducted at the site (see Lowery and Stanford 2013), which revealed buried in situ Paleoindian cultural material (see Figure 3.239). These investigations also mapped and plotted displaced artifacts along the shoreline to better understand how coastal processes are impacting this drowned archaeological site. The assemblage from this site included a diverse assemblage of artifacts (see Figure 3.240). Detailed analysis of the lithic assemblage from this site is currently being published (see Stanford et al. *In Press*).

Because of the prior activity conducted at 44NH233, no artifacts were found as a result of the 2015 survey. Over the past 15 years, shoreline sections of the site have retreated ~2 to 3 (7 to 10 feet) meters. Seasonally sand movement along the shoreline covers the exposed subsoil and acts like a natural erosive barrier.

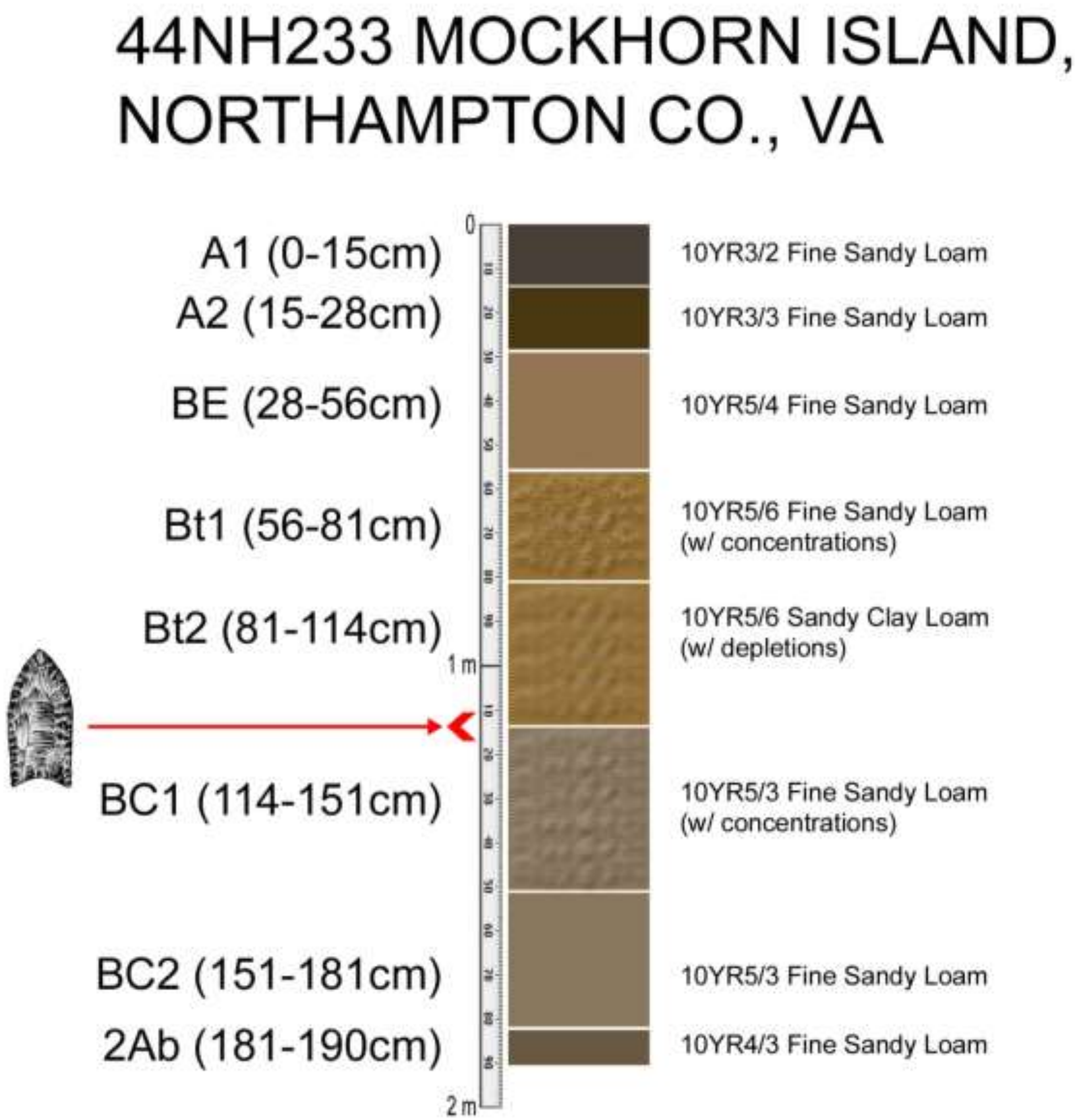

Figure 3.239. The image shows a generalized soil profile for 44NH233 with the location of the Paleoindian component plotted.

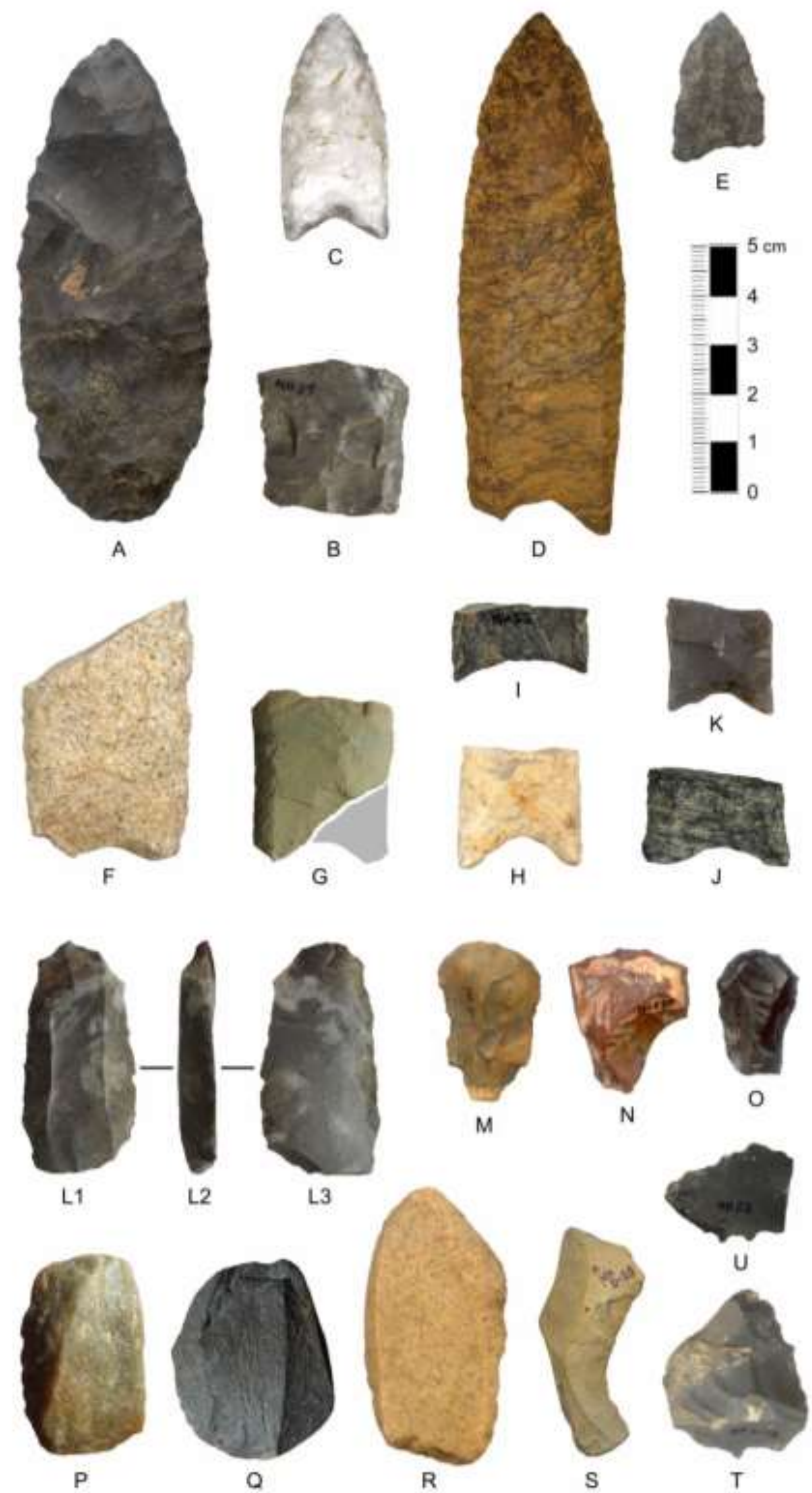

Figure 3.240. The image shows a representative assemblage of Paleoindian artifacts found at 44NH233 in 2003, 2004, and 2010. The assemblage includes bifaces (A-K), formal tools (L-O and S-U), and pieces esquilles or wedges (P-R).

189). Mockhorn Island #6 – 44NH0450

The site (see Figure 3.242) was recorded in 2001. In 2001, the site is associated with an eroded hummock that was partially stabilized by a weathered-concrete sea wall. Artifacts found at the site include both Late and Middle Archaic projectile points, some debitage, and a limited quantity of fire-cracked rock. Other diagnostic artifacts found at this site include two bifurcated base points, a broken bannerstone, a small full-grooved axe, a faceted adze, several flake tools, as well as a grooved sandstone shaft straightener. The assemblage suggests an Archaic period prehistoric occupation. The site also includes an historic-era 17th through 19th century occupation with barrel-well features. An early 20th century shoreline stabilization attempt is evident at the site by the presence of "rip-rap" situated ~10 meters (~32 feet) west of the existing bank (see Figure 3.241).

Because of the prior archaeological research conducted along this stretch of shoreline, no artifacts were discovered during the 2015 survey. Over the past 15 years, shoreline sections of the site have retreated <1 (3.28 feet) meter. Portions of the site have accreted sediment and are relatively stable.

Figure 3.241. The image shows the shoreline associated with 44NH450.

Figure 3.242. The satellite image defines the boundary and the longitude and latitude locational data for 44NH233, 44NH234, 44NH331, and 44NH450.

190). Mockhorn Island #11 – 44NH0453

The site (see Figure 3.251) was recorded in 2001. In 2001, the site is associated with an eroded hummock (see Figure 3.243). Artifacts found at the site include debitage and some fire-cracked rock. The diagnostic artifacts found at this site include one quartzite Early Archaic Kirk corner-notched point and one quartzite Morrow Mountain point. The small assemblage suggests a limited prehistoric occupation. The soil profile associated with the upland hummock suggests that the area was historically tilled (see Figure 3.244).

Over the past 15 years, sections of the site have retreated ~2 (7 feet) meters. The southern portion of the site has accreted sediment and is relatively stable.

Figure 3.243. The image shows the shoreline associated with 44NH453.

Figure 3.244. The image shows a generalized soil profile for 44NH453.

191). Mockhorn Island #10 – 44NH0452

The site (see Figure 3.251) was recorded in 2001. In 2001, the site is associated with an eroded hummock (see Figure 3.245). Artifacts found at the site include debitage and some fire-cracked rock. The diagnostic artifacts found at this site include one quartzite Early Archaic Fort Nottoway point and one quartzite Morrow Mountain point. The small assemblage suggests a limited prehistoric occupation.

Over the past 15 years, sections of the site have retreated ~2 (7 feet) meters. The southern portion of the site has accreted sediment and is relatively stable.

Figure 3.245. The image shows the shoreline associated with 44NH452.

192). Mockhorn Island #9 – 44NH0451

The site (see Figure 3.251) was recorded in 2001. The site is associated with a drowned upland area west of a low hummock (see Figure 3.246). Artifacts found at the site include debitage and fire-cracked rock. The diagnostic artifacts found at this site consist of a few Archaic stemmed projectile points.

Over the past 15 years, small sections of the site have retreated slightly or ≤ .25 meters (<1 foot). Other sections of the site have accreted sediment indicating that the setting is only mildly erosive.

Figure 3.246. The image shows the shoreline associated with 44NH451.

193). Mockhorn Island #5 – 44NH0449

The site (see Figure 3.251) was recorded in 2001. In 2001, the site is associated with an eroded hummock (see Figure 3.247). Artifacts found at the site include a dense accumulation of debitage and fire-cracked rock. The diagnostic artifacts found at this site are dominated by both Middle and Late Archaic projectile point styles.

Profile core data (see Figure 3.248) from 44NH449 indicates recent overwash sediments encapsulating an upland soil. The underlying strata represent late Pleistocene aeolian deposits, which overly MIS-5 (?) marine deposits. Over the past 15 years, small sections of the site have retreated slightly or ≤ .25 meters (<1 foot). Other sections of the site have accreted sediment indicating that the setting is only mildly erosive.

Figure 3.247. The image shows the shoreline associated with 44NH449.

Figure 3.248. The image shows a generalized soil profile for 44NH449.

194). Mockhorn Island #4 – 44NH0448

The site (see Figure 3.251) was recorded in 2001. In 2001, the site is associated with an eroded hummock (see Figure 3.249). Artifacts found at the site include a dense accumulation of debitage and fire-cracked rock. Both flaked and ground stone tools have been found at this site. The diagnostic artifacts found at this site are dominated by both Middle and Late Archaic projectile point styles. However, a few triangular points have also been found at this site. It is unclear whether these triangular points are Archaic or Woodland examples.

Over the past 15 years, sections of the site have retreated 8 (26 feet) to 12 (39 feet) meters. Other sections of the site have accreted sediment and are relatively stable.

Figure 3.249. The image shows the shoreline associated with 44NH448.

195). Mockhorn Island #3 – 44NH0447

The site (see Figure 3.251) was recorded in 2001. In 2001, the site is associated with an eroded hummock (see Figure 3.250). Artifacts found at the site include a mixture of debitage and fire-cracked rock. The limited number of diagnostic artifacts found at the site spans the entire region's prehistory. Since 2001, sediment accretion has provided the foundation for marsh vegetation. As such, the site has stabilized over the past 15 years and is no longer eroded. However, the stable non-erosive conditions could change in the future.

Figure 3.250. The image shows the shoreline associated with 44NH447.

196). Mockhorn Island #2 – 44NH0446

The site (see Figure 3.251), which was recorded in 2001, represents the northern exposed and eroded portion of the hummock associated with 44NH445. Early Archaic through Late Woodland-era cultural remains have been found along the shoreline at this location. Undiagnostic fire-cracked rock and lithic debitage can also be found along the shoreline at this location.

Over the past 15 years, small sections of the site have retreated slightly or ≤ .25 meters (<1 foot). Other sections of the site have accreted sediment indicating that the setting is only mildly erosive.

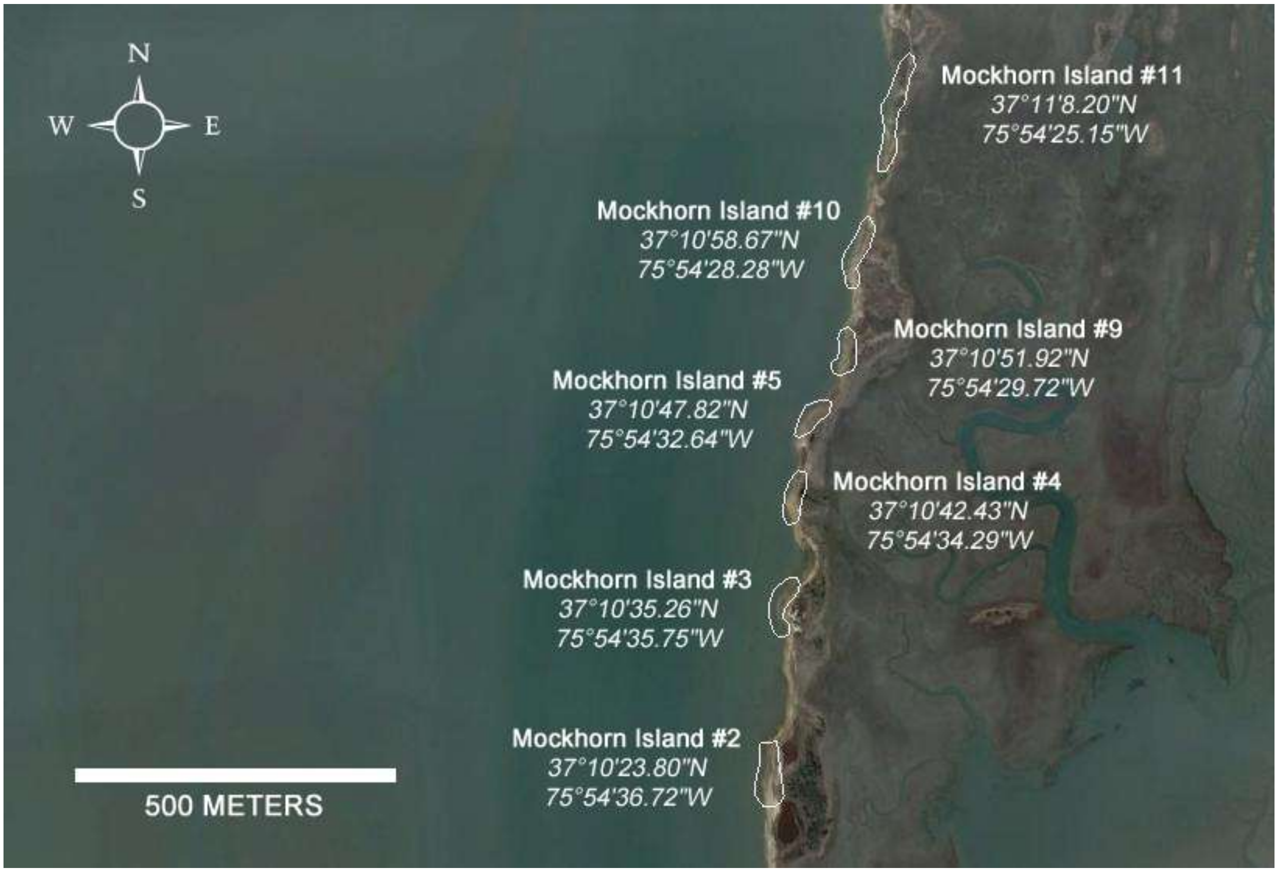

Figure 3.251. The satellite image defines the boundary and the longitude and latitude locational data for 44NH446, 44NH447, 44NH448, 44NH449, 44NH451, 44NH452, and 44NH453.

197). Mockhorn Island #1 – 44NH0445

The site (see Figure 3.267) encompasses the southern portion of a forested hummock along the west side of Mockhorn Island adjacent to Magothy Bay (see Figure 3.252). Displaced fire-cracked rock and lithic debitage occur within the intertidal zone along the shoreline. Diagnostic Paleoindian through Late Woodland-era cultural remains have been found along the shoreline at this location.

When the site was initially recorded in 2001, shell-filled features were noted on the exposed surface within the interior and along the margins of the hummock. In 2004, test excavations exposed two of the shell-filled midden features. These excavations uncovered a variety of Late Woodland-era diagnostic artifacts (see Figures 3.253 and 3.254) in association with a mixture of hard clam (*Mercenaria mercenaria*), American oyster (*Crassostrea virginica*) and Atlantic ribbed mussel (*Geukensia demissa*). The oysters and ribbed mussels from this feature show evidence of thermal damage indicative of open-pit roasting/steaming (see Figure 3.255). The hard clams showed similar thermal damage, however, fracturing observed on the shells indicate the use of a hammerstone, wedge, and anvil to aid in meat extraction. Samples (i.e., charcoal and shell) associated with the midden feature produced a calibrated AMS-age estimate of 914 ± 36 calAD (D-AMS 0010268) on the charcoal and a marine-reservoir corrected/calibrated AMS-age estimate of 872 ± 56 calAD (D-AMS 0010269) on oyster shell. The midden at 44NH445 is presently the youngest dated prehistoric occupational component found on Mockhorn Island.

Profile core data (see Figure 3.256) from 44NH445 indicates that the underlying strata represent late Pleistocene aeolian deposits that overly MIS-5 (?) marine deposits. Over the past 15 years, small sections of the site have retreated slightly or ≤ .25 meters (<1 foot). Other sections of the site have accreted sediment indicating that the setting is only mildly erosive.

Figure 3.252. The image shows the shoreline associated with 44NH445.

Figure 3.253. The image shows the excavation conducted at 44NH445 in 2004.

Figure 3.254. The image shows the assemblage of Late Woodland triangular projectile points (A-H) and shell-tempered pottery (I-P) excavated at 44NH445 in 2004.

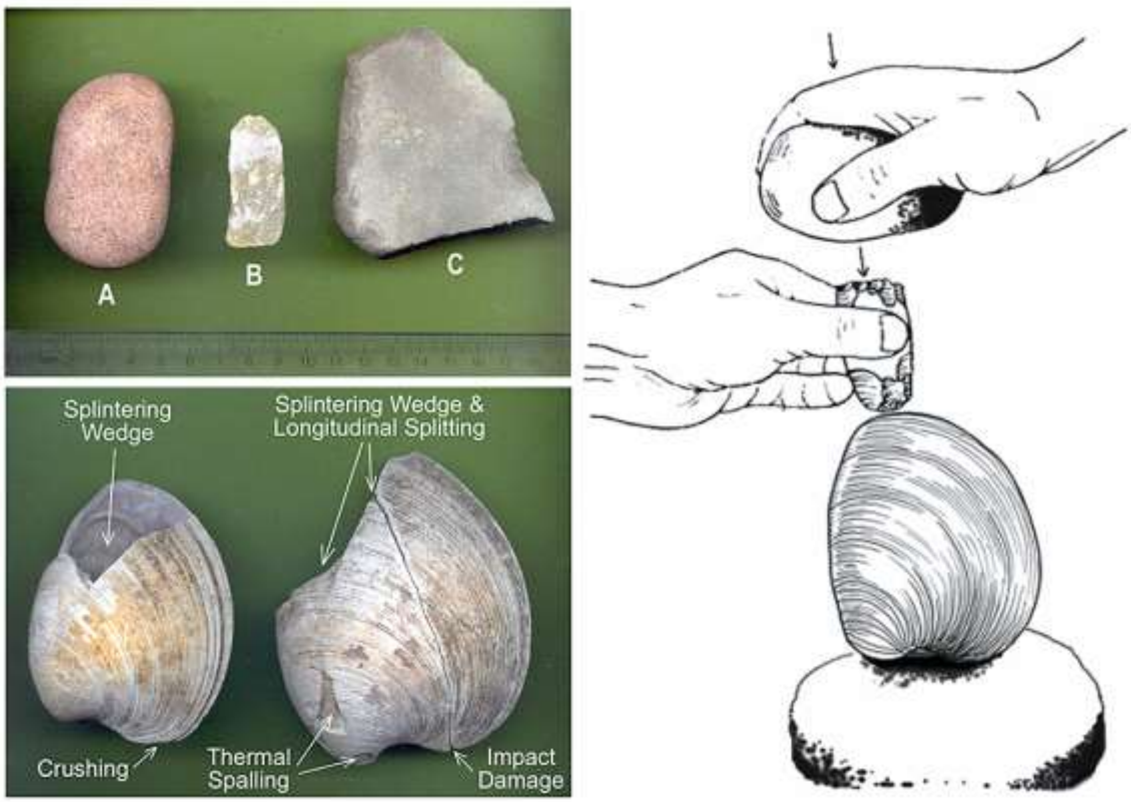

Figure 3.255. The image shows a hammerstone (A), wedge (B), and anvil (C) excavated at 44NH445. Based on the fracture patterns observed on the hard clam shells (lower left), these stone tools may have been used to extract the meat from the hard clams (right) at the site.

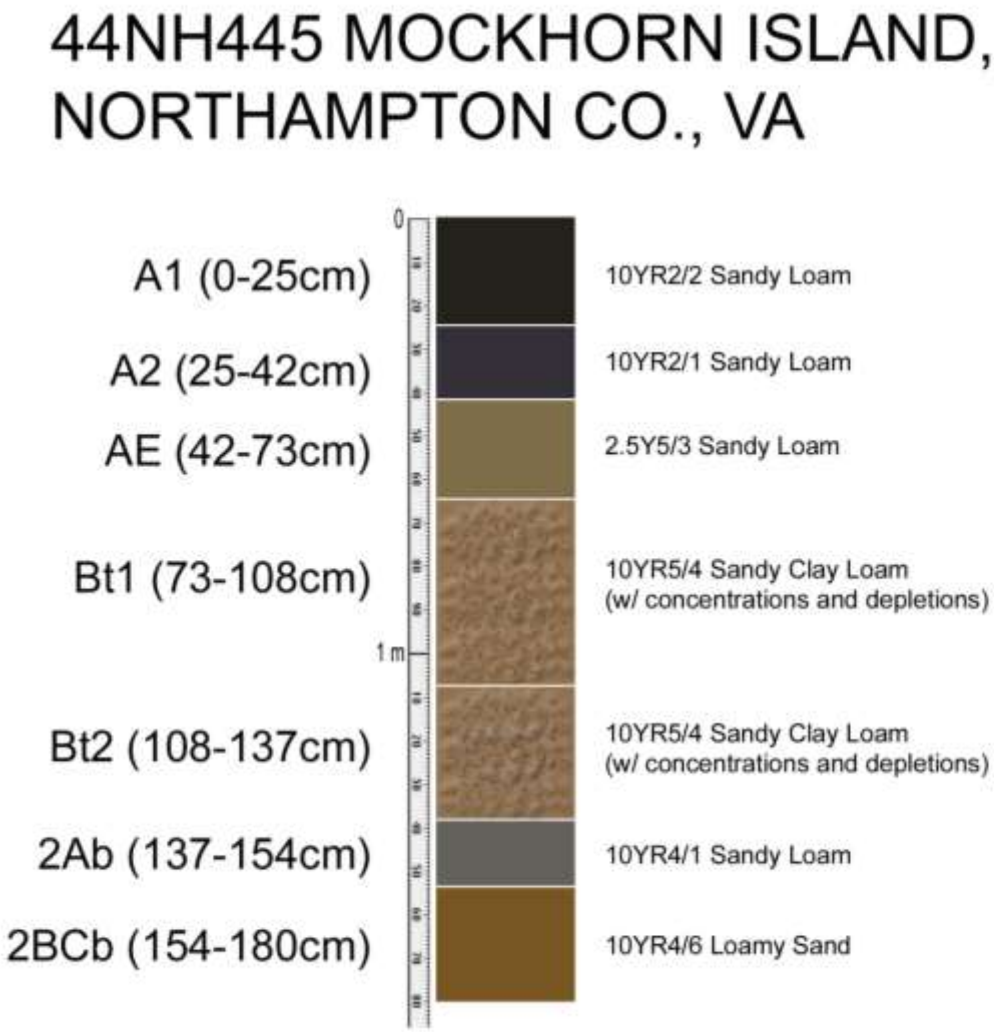

Figure 3.256. The image shows a generalized soil profile for 44NH445.

198). North Haulover Hummock - 44NH0496

The site (see Figure 3.267) encompasses a small eroded hummock area (see Figure 3.257) with fire-cracked rock, quartz and quartzite debitage, and one quartzite stemmed Morrow Mountain II point. The limited assemblage would suggest a Middle Archaic occupation. However, additional survey work may expand upon the cultural chronology associated with this site. At low tide, a drowned upland surface is situated beneath a 50-cenitmeter covering of tidal marsh peat. Evidence (i.e., roots) of former trees within the inundated A-horizon has been observed below the tidal marsh peat. The area represents an extension of the western late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

Over the past 15 years, the shoreline section of the site has retreated 4 meters (13 feet).

Figure 3.257. The image shows the shoreline associated with 44NH496.

199). Cushman Lodge Hummock - 44NH0497

The site (see Figure 3.267) encompasses a broad marginal upland hummock that was sculpted and altered by the various individual landowners. The site area is associated with a former mid-19th century through mid-20th century hunting lodge associated with Mockhorn Island (see 3.258). The hummock area encompasses the dilapidated remains of the lodge, cottage, and serval outbuildings. Concrete structures, ditches, and an elevated earthen berm are also located on this hummock. Ironically, most of these engineering features represent attempts to fend off coastal storm flooding. Importantly, several fragments of fire-cracked rock and some debitage may hint that the hummock also includes a prehistoric occupation. The area represents the largest upland extension of the western late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island.

In 1852, Nathan Cobb, Jr., constructed a small hunting lodge on this large hummock, which is situated on the southwestern side of Mockhorn Island. The hummock was used as a base of operations for hunting into the 20th century. In 1902, Larimer A. Cushman and his wife Caroline of New York acquired the whole island. The Cushman's made many improvements to Cobb's lodge and made alterations to the hummock landscape. The Cushman's built a new lodge, barns, cooling houses, and added many amenities. Livestock also were kept on the island. In an attempt to protect farmland and pasture from saltwater intrusion during storms, the Cushman's dug a moat-like ditch around the hummock associated with the lodge. They also constructed a series of elevated concrete walls with floodgates in an attempt to improve drainage and curb the impacts of coastal storm-surge. The moat-like ditch and berm still exist and many of the concrete sea-wall features still exist along the west side of the island. Larimer Cushman's attempts to preserve his coastal island lodge failed. The combined effects from both the August 23rd, 1933 Chesapeake Hurricane and the massive coastal storm of September 16th, 1933 proved the futility of Cushman's engineering attempts. These powerful storms did untold damage to the lodge, outbuildings, and the farmland. As a result, the Cushman lodge and Mockhorn Island were largely abandoned after the back-to-back 1933 storms. After Larimer Cushman's death, his wife Caroline sold the entire island to T. A. D. Jones in 1948. Jones was a successful businessman and military contractor. Like many of his predecessors, Jones thought that he could engineer the hummock and alleviate future impacts of coastal storms. He constructed a new hunting lodge, a new caretaker's house, and several outbuildings in the area of the former Cushman compound. Jones used the island as a hunting retreat to entertain many high-ranking military officials and politicians. In October 1954, Hurricane Hazel flooded the island and destroyed many of the buildings. The following year, Hurricane Connie in August 1955 flooded the island and destroyed Jones' lodge. When T. A. D. Jones died in 1959, Mockhorn Island and the former hunting lodge compound were purchased by the Commonwealth of Virginia.

Over the past 15 years, the shoreline section of the site has retreated ~11 meters (38 feet).

Figure 3.258. The image shows the shoreline associated with 44NH497. The lodge can be seen in the background.

200). Mockhorn Island #12 - 44NH0454

The site area (see Figure 3.267) includes a displaced scattering of fire-cracked rock and debitage, which are intermixed with modern coastal debris (i.e., shell and organic detritus). In situ archaeological remains are drowned at high tide and only exposed at low tide (see Figures 3.259 and 3.260). The archaeological remains found at the site are dominated by late Middle Woodland-era Jack's Reef culturally-affiliated artifacts. The Middle Woodland lithic points, flake tools, and debitage consist almost exclusively of black sulfidized jasper (see Figure 3.261). The few grit and mica-tempered ceramic fragments found at the site would be classified as Hell Island ware. Middle Woodland-era ground stone tools from 44NH454 include a nephrite celt, a dark schist "ceremonial pick" fragment, and a drilled slate pendant fragment. Virtually all of the broken Jack's Reef points at this site were damaged as a byproduct of torque stress associated with a knife-like function. Micro-drills and whelk columella beads hint that shell ornaments were being manufactured at this location. A few Late and Early Archaic projectile points have also been found at this location. However, the earlier projectile points are manufactured solely of quartzite.

Conditions in 2009 provided an opportunity to investigate some of the in situ archaeological remains exposed along the bank profile and located about 1 meter (3.28 feet) beneath the modern tidal marsh peat surface. Embedded within the drowned upland surface, carbonized cooking remains found on the interior of a Hell Island ceramic vessel produced a date of 490 calAD ± 48 years (Beta 326584). Wood charcoal associated with the drowned surface produced a date of 576 calAD ± 25 years (Beta 312660). Given the combined archaeologic and geologic data (see Figure 3.262), sea level had to be ≥ 1.5 meters lower than present circa 1,500 years ago for the drowned upland surface to be habitable.

An overlay comparing the 1850 coastal survey with the current satellite image shows that the area associated with 44NH454 encompassed a shallow intertidal bar setting 160 years ago. Within the bank profile at 44NH454, articulated oysters buried by a 50-centimeter covering of intertidal silt and tidal marsh peat supports this observation. The bank profile data suggests that 44NH454 represents an stable setting. Over the past 15 years, the western side of the peninsula associated with the site area has eroded or retreated ~10 meters (~32 feet). The erosive conditions exposed the in situ archaeological remains observed at the site.

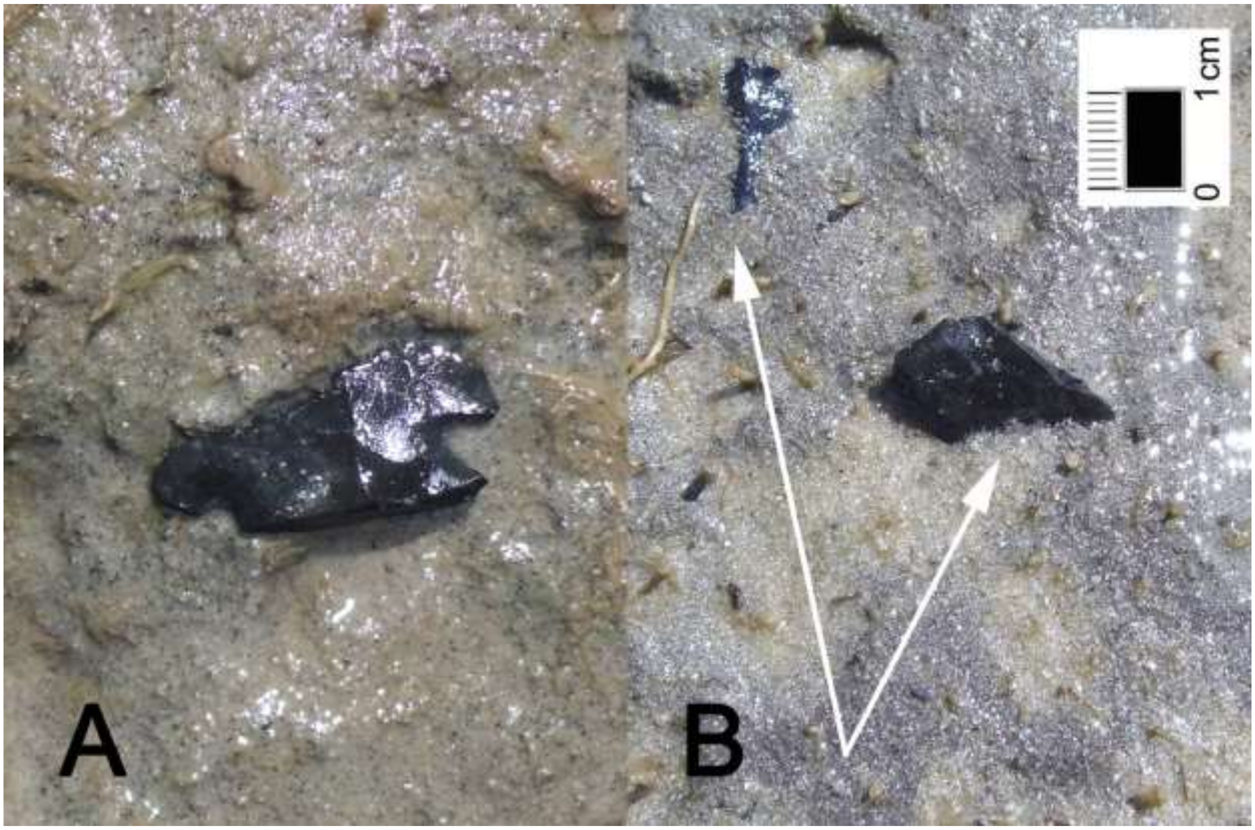

Figure 3.259. The image shows an in situ Jack's Reef corner-notched point (A) and debitage (B) associated with the inundated living surfaces at 44NH454. The artifacts are made of jasper, which has been sulfidized by the tidal marsh.

Figure 3.260. The image shows 44NH454 at high tide (top) and at low tide (bottom). The archaeological components at the site can only be accessed at low tide.

Figure 3.261. The image shows a representative sample of the extensive late Middle Woodland Jack's Reef material found at 44NH454 in 2009. Virtually all of the artifacts have been geochemically-altered by the tidal marsh.

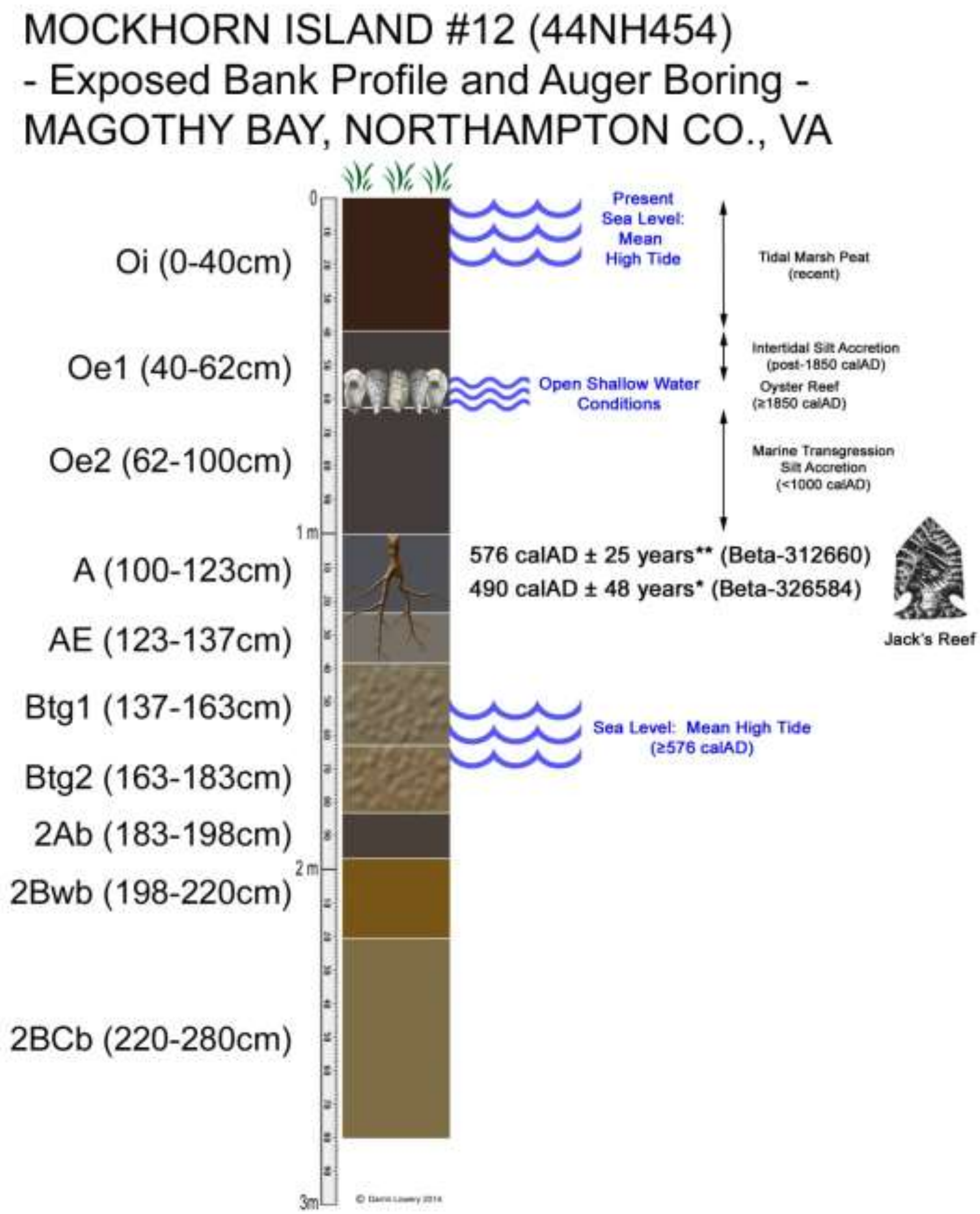

Figure 3.262. The image shows a generalized soil profile for 44NH454. The AMS-dates and the associated Jack's Reef archaeological remains are plotted.

201). Mockhorn Island #13 - 44NH0455

The site (see Figure 3.267) includes a displaced scattering of fire-cracked rock and debitage, which are intermixed with modern coastal debris (i.e., shell and organic detritus). The intact cultural levels are largely drowned and only exposed during periods of extreme low tide. As such, in situ archaeological remains are rarely evident at this site.

Conditions in 2009 provided an opportunity to investigate the in situ remains observed at the site. The in situ archaeological remains are situated within a drowned upland surface located about 1.5 meters (4.92 feet) beneath the modern tidal marsh peat surface. The limited testing revealed in situ Middle Woodland-era Fox Creek cultural remains (see Figure 3.264). Anthropogenic charcoal associated with these remains produced a date of 22 calAD ± 28 years (D-AMS 006453). The site has also revealed evidence of Late Archaic, Middle Archaic, Early Archaic, and Paleoindian occupations (see Figure 3.265). Two chert stemmed points, one rhyolite MacCorkle bifurcate, two jasper Decatur points, four quartzite Fort Nottoway points, and one chert Clovis point basal fragment were found at the site prior to 2009. A Late Archaic-era slate bannerstone fragment and a fragment of a schist pendant or gorget were also discovered at the site. Given the combined archaeologic and geologic data, sea level had to be ≥ 2 meters lower than present circa 2,000 years ago for the drowned upland surface to be habitable.

An overlay comparing the 1850 coastal survey with the current satellite image shows that the area associated with 44NH455 encompassed a shallow intertidal bar setting 160 years ago (see Figure 3.266). Within the bank profile at 44NH455, the presence of articulated oysters buried by an 80-centimeter thick deposit of intertidal silt and tidal marsh peat supports this observation. The bank profile data (see Figure 3.263) suggests that 44NH455 represents a stable shoreline setting. Over the past 15 years, the western side of the peninsula associated with the site has eroded or retreated ~18 meters (60 feet). The erosive conditions exposed the in situ archaeological remains observed at the site.

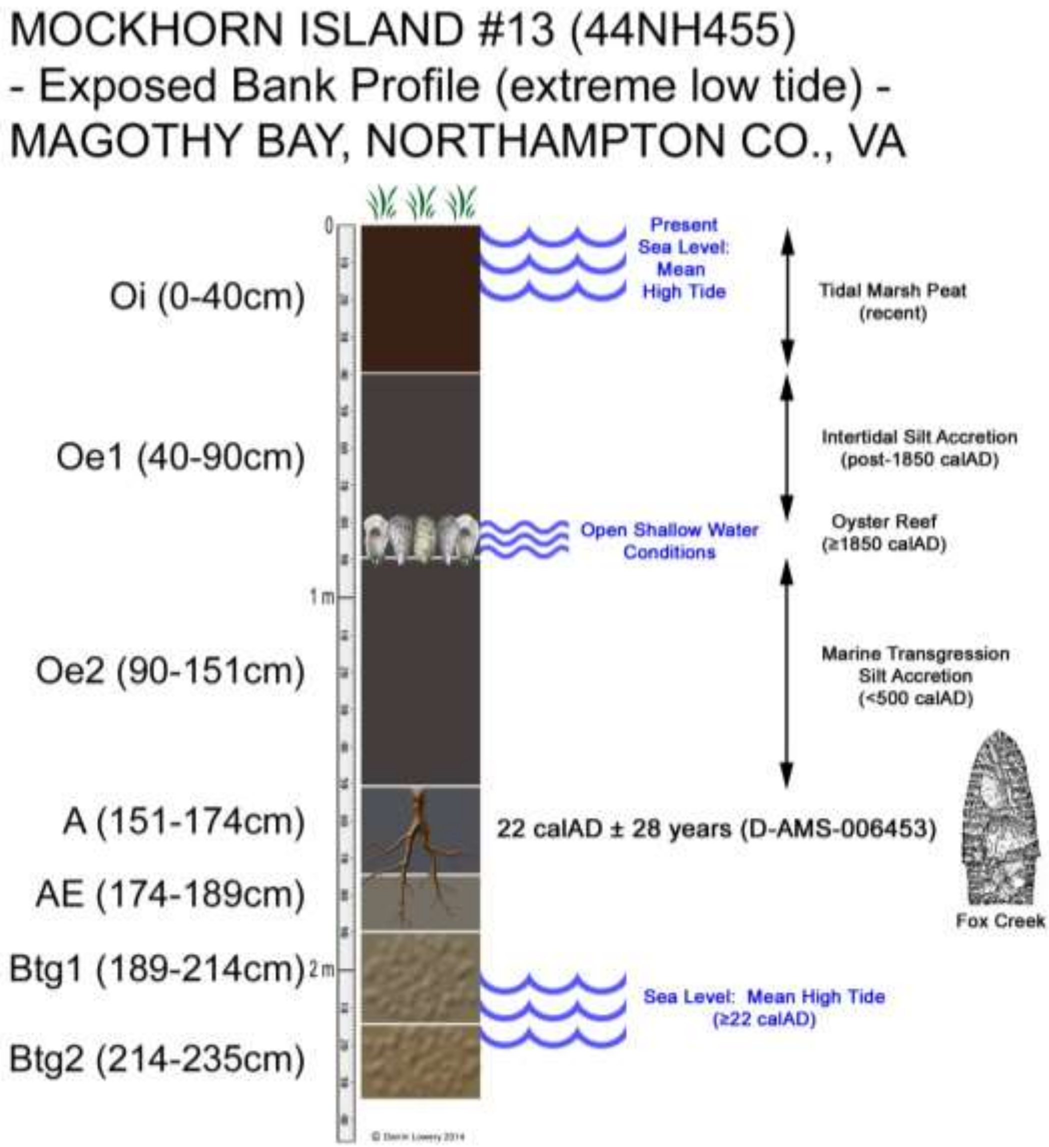

Figure 3.263. The image shows a generalized soil profile for 44NH455. The AMS-dates and the associated Fox Crrek archaeological remains are plotted.

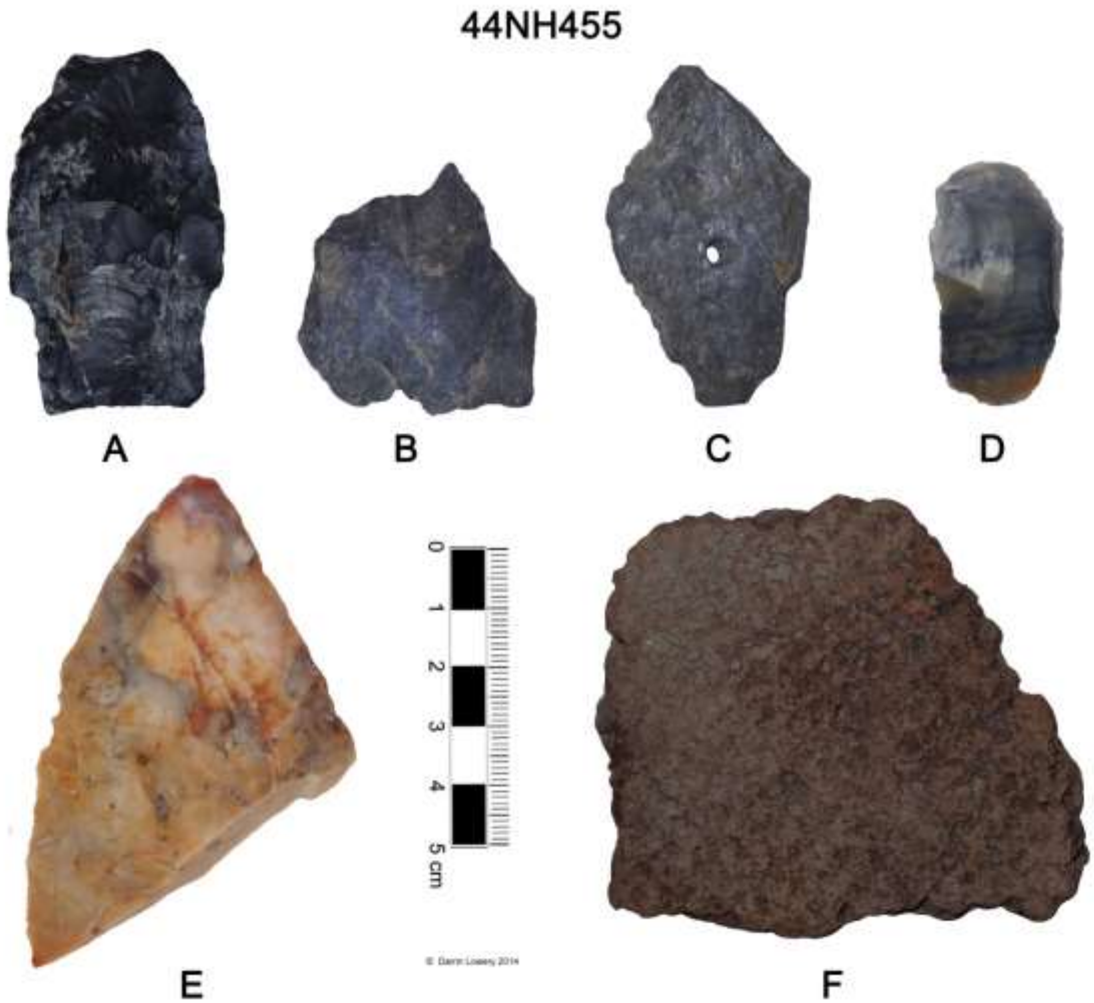

Figure 3.264. The image shows the youngest archaeological remains found at 44NH455. The assemblage includes a damage chert Fox Creek point (A), a rhyolite flake (B), a drilled phyllite gorget fragment (C), a Flint Ridge chalcedony flake (D), a “killed” distal fragment of a large Flint Ridge biface (E), and a large fragment of shell-tempered Mockley ware (F).

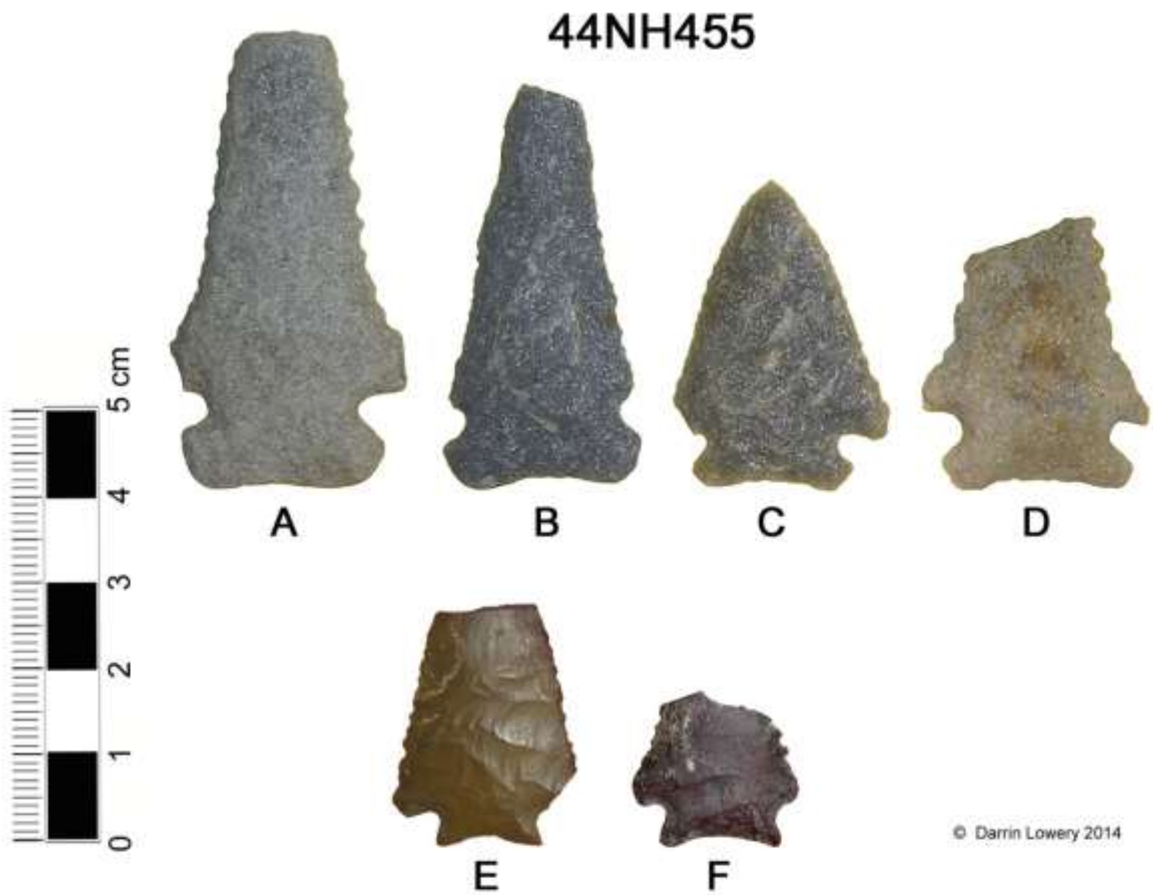

Figure 3.265. The image shows some of the earliest archaeological remains found at 44NH455. Early Archaic period Fort Nottoway (A-D) and Decatur (E-F) points have been found at the site.

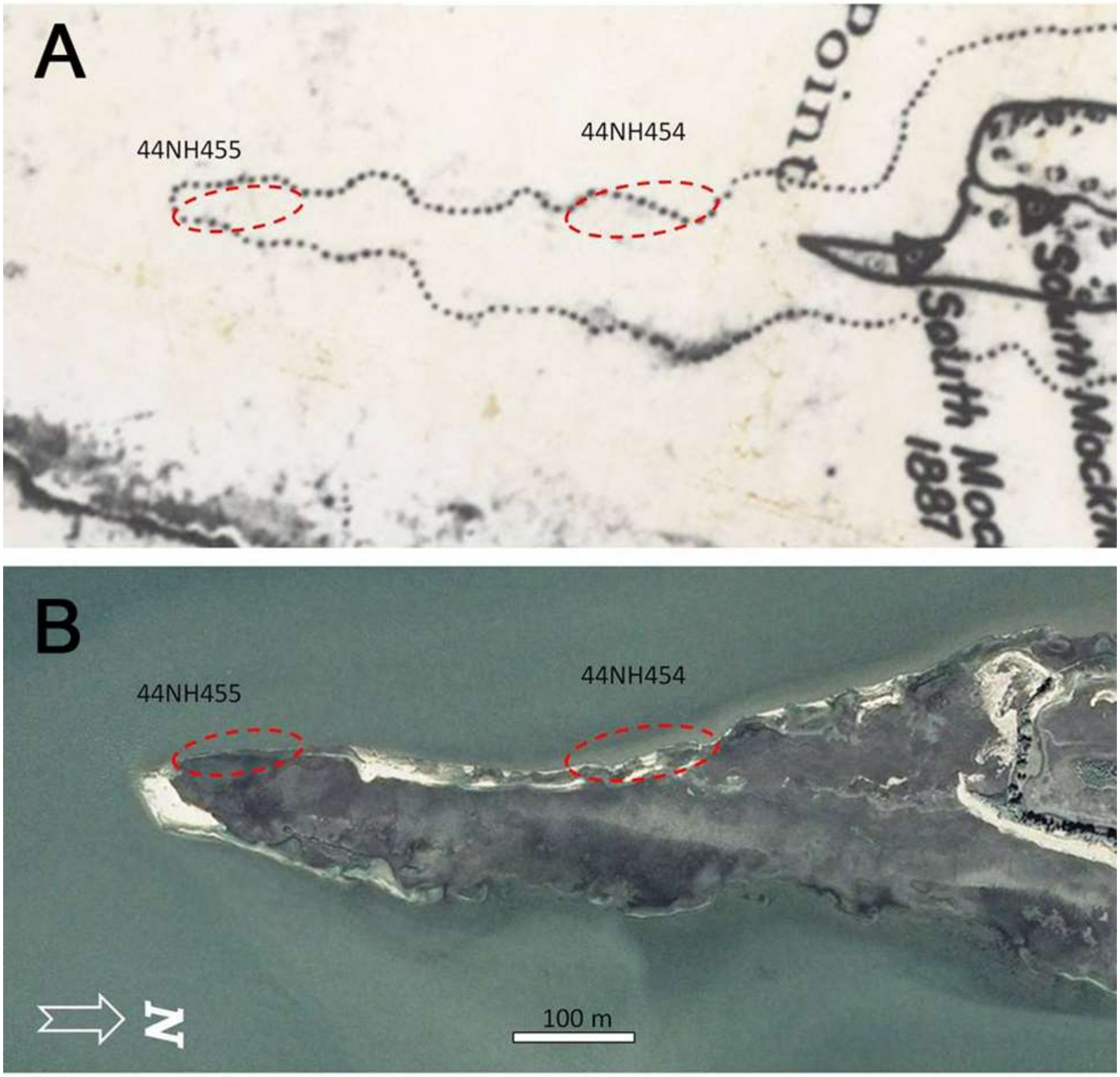

Figure 3.266. The 1850 coastal map indicates the both 44NH454 and 44NH455 encompassed an open shallow water mudflat or bar 160 years ago (A). The shallow water conditions are supported by the articulated oysters within soil profiles of both sites. Today (B), the area contains a broad tidal marsh.

Figure 3.267. The satellite image defines the boundary and the longitude and latitude locational data for 44NH445, 44NH454, 44NH455, 44NH496, and 44NH497.

202). Lower Ridge – 44NH0442

The Lower Ridge site (see Figure 3.280) was originally recorded by Lowery (2001), which conducting a shoreline survey of the Atlantic seacoast for the Commonwealth of Virginia. The site encompasses the southern eroded extension of a drowned late Pleistocene Aeolian ridge located along the eastern side of Mockhorn Island. The drowned upland surface (see Figure 3.268) is situated beneath 53-centimeters of tidal marsh peat. The assemblage found at the site in 2001 included several Paleoindian, Late Paleoindian, Early Archaic, Middle Archaic, and Late Archaic diagnostic projectile points. The assemblage of Late Paleoindian points included several complete and broken specimens analogous to Crowfield and/or Northumberland fluted point forms (see Figure 3.269). With respect to the regional settlement patterns, Middle Archaic bifurcated points are relatively rare on the Virginia eastern shore. However, 44NH442 produced two examples in 2001 (see Figure 3.269). As a byproduct of overwash processes, the displaced and eroded artifacts are frequently found on the surface of the tidal marsh. Some formal flake tools, debitage, bi-polar flaked pebbles, and fire-cracked rock are frequently found at this site. Based on a series of satellite overlays, the shoreline at 44NH442 has receded between 5 meters and 14 meters over the past 15 years.

Figure 3.268. The image shows the shoreline associated with 44NH442.

Figure 3.269. The image shows some of the late Paleoindian period artifacts (left) and the Middle Archaic period bifurcated points (right) found at 44NH442 in 2001.

203). Middle Ridge – 44NH0441

The Middle Ridge site (see Figure 3.280) was originally recorded by Lowery (2001), which conducting a shoreline survey of the Atlantic seacoast for the Commonwealth of Virginia. The site encompasses an eroded portion of a drowned (see Figure 3.270) late Pleistocene Aeolian ridge situated along the eastern side of Mockhorn Island. The drowned former upland surface is situated beneath 33-centimeters of tidal marsh peat (see Figure 3.272). The assemblage found at the site in 2001 included diagnostic projectile points, which span the Paleoindian through late Middle Woodland-era. However, the dominant archaeological element at this site is associated with Middle Woodland-era Fox Creek. Research at the site in 2009 (Lowery 2010) revealed an inundated prehistoric house pattern. Excavations revealed stemmed and notched points made of chert and meta-rhyolite (B-F), ceramics tempered with crushed bay-scallop shell (J-M), meta-rhyolite and argillite debitage (H-I), a Flint Ridge chalcedony leaf-blade (A), and a fragmentary pipestone tubular pipe (G) associated with the house pattern (see Figure 3.271). A fragment of deer bone refuse associated with the house pattern was submitted for a bone collagen AMS-age estimate. The resultant age-estimate on the deer bone was 465 ± 51 calBC or 2380 ± 35 $_{14}$C-years BP (OS-79762). Based on a series of satellite overlays, the shoreline at 44NH441 has receded between ~10 (32 feet) and ~39 (127 feet) meters over the past 15 years.

Figure 3.270. The image shows the shoreline associated with 44NH441.

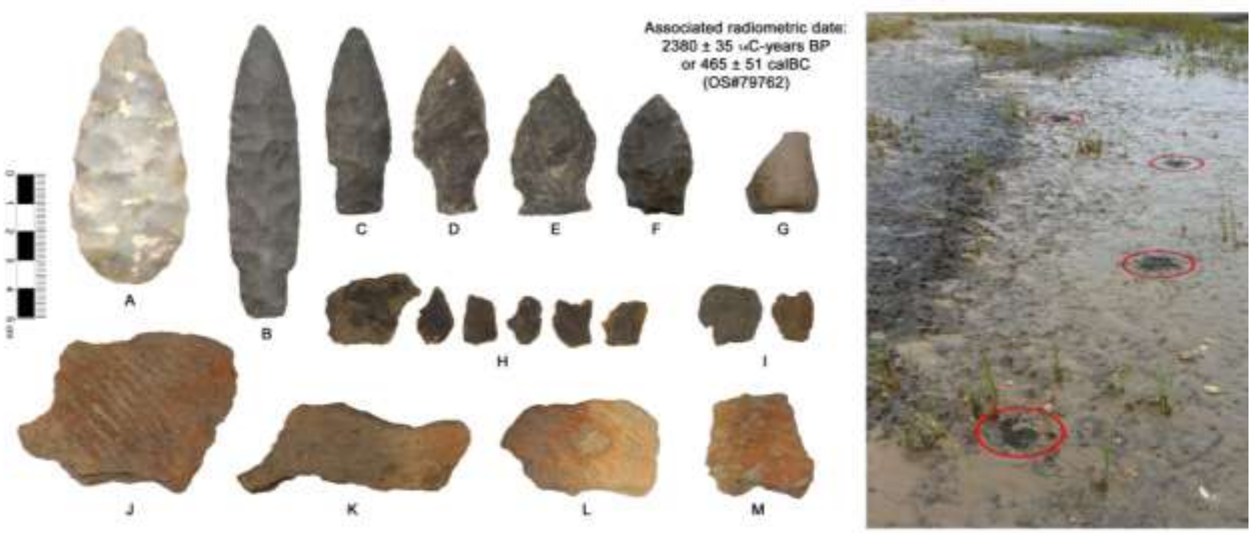

Figure 3.271. The image shows the Middle Woodland assemblage (left) excavated at 44NH441 in 2009. The assemblage was associated with a drowned prehistoric house structure (right). The bone associated with the assemblage was dated to 465 ± 51 calBC.

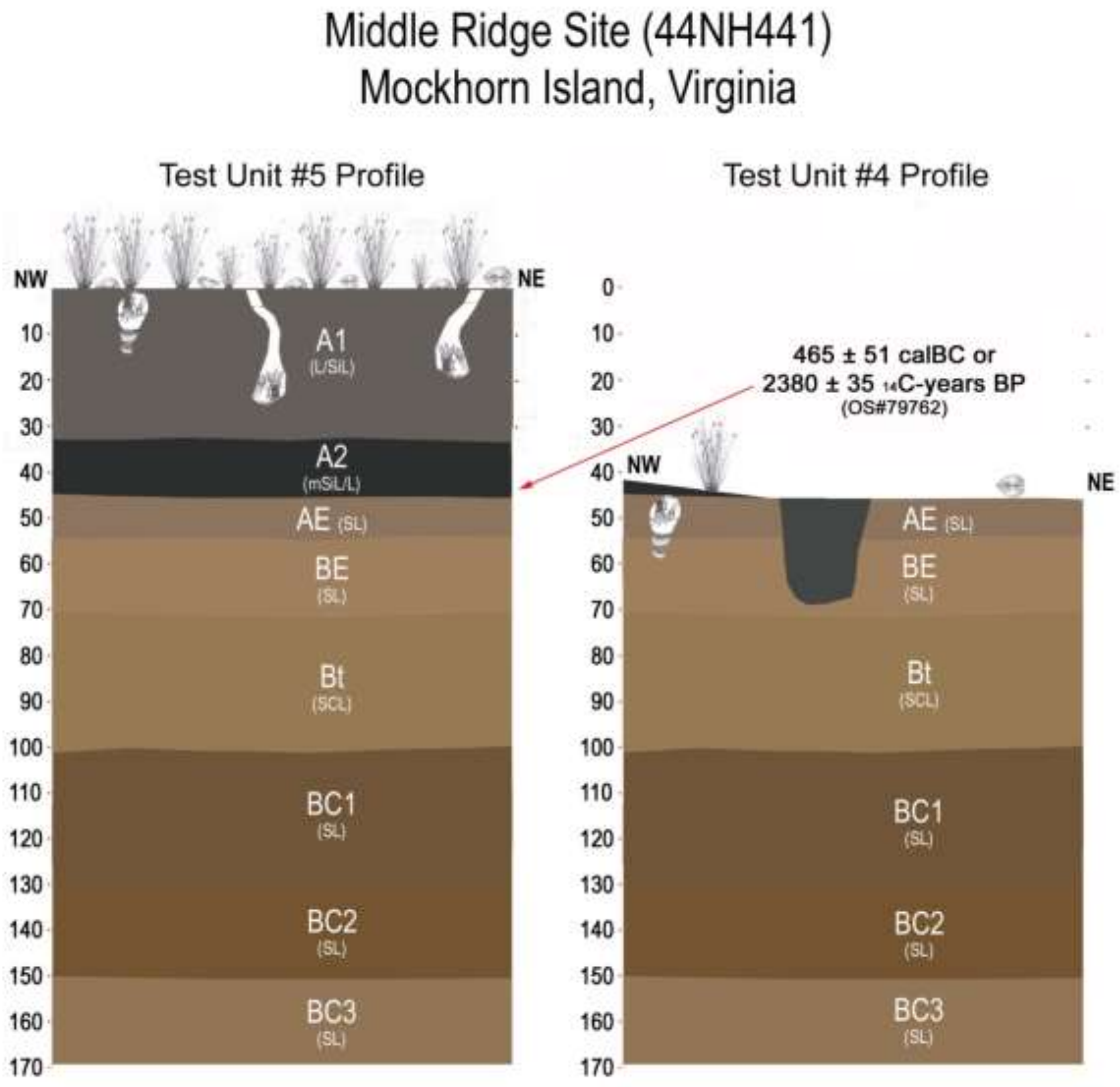

Figure 3.272. The image shows idealized soil profiles described at 44NH441. The intact profile (left) has a geologically young tidal marsh deposit over the former upland surface. The tidal marsh and most of the former upland surface had eroded (right) from the area associated with the post structure.

204). Upper Ridge – 44NH0440

The Upper Ridge site (see Figure 3.280) was originally recorded by Lowery (2001) and encompasses an eroded portion of the drowned late Pleistocene aeolian ridge situated along the eastern side of Mockhorn Island. Excavations (see Figure 3.274) conducted at the site (see Lowery 2003a, 2003b, 2004, and 2010) have revealed a drowned upland surface situated beneath 10 and 60-centimeters of tidal marsh peat (see Figure 3.273). Organic Middle Woodland-era cultural material associated with the drowned upland surface (see Lowery 2010 and Rick and Lowery 2013: Table 2) produced AMS age estimates of 488 ± 42 calAD (OS-80194)and 535 ± 125 calAD (OS-92580). Interestingly, the cultural chronological record associated with 44NH440 begins with the Paleoindian period and ends by the late

Middle Woodland period. The radiometric dates generated for the site are associated with the Jack's Reef-era occupation, which represents the most prevalent and the last human presence at this location (see Figure 3.275). In 2005, 44NH440 was nominated and added to the National Register of Historic Places. Over the past 15 years, satellite overlays suggest that the shoreline at 44NH440 has receded between ~8 (26 feet) and 15 (49 feet) meters.

Figure 3.273. The image shows the shoreline associated with 44NH440. In situ prehistoric ceramics (A) and bone (B) are located within the drowned upland surface at this site.

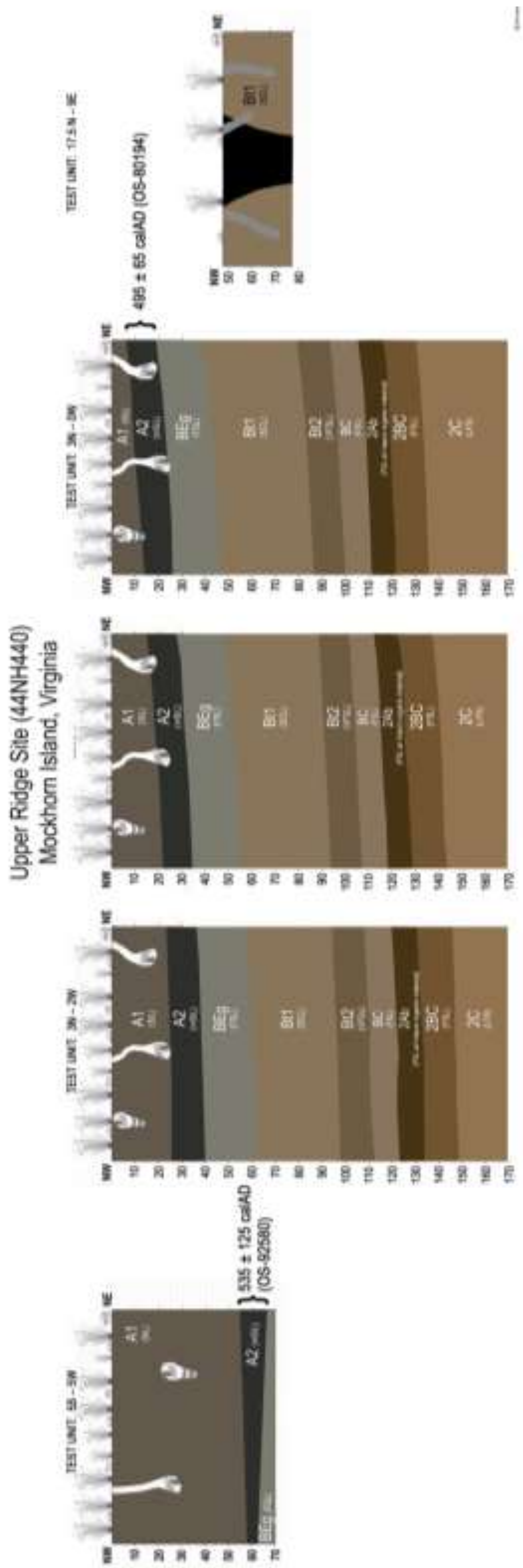

Figure 3.274. The image shows the idealized soil profile at 44NH440 along a west (bottom) to east (top) axis.

Figure 3.275. The image shows a representative sample of the extensive late Middle Woodland Jack's Reef material found at 44NH440 in 2001. The assemblage includes a flake core (A), a flake point preform (B), a preform (C), shark remains (D-F), Jack's Reef notched points (G-K), micro-drills (L and Y), a whelk shell bead (M), a drilled stone pendant (N), a projectile point reduction sequence (O-R), a large flake scraper (S), a bone fish hook (T), a bone harpoon (U), a wedge-shape micro-blade core (V), micro-blades (W-X), shell-tempered ceramics (Z), and three artifacts made of Ramah chert (AA-CC).

205). South Bay #1 - 44NH0490

The site (see Figure 3.280) includes a scattering of fire-cracked rock, quartzite debitage, and one Late Archaic chert stemmed point located along the eroded shoreline. At low tide, a drowned upland surface is situated beneath an 80-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late

Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~10.5 meters (34 feet).

206). South Bay #2 - 44NH0491

The site (see Figure 3.280) includes a scattering of fire-cracked rock, quartz debitage, quartzite debitage, chert debitage, three Early Woodland-era chert "tear drop" shaped points, two stemmed points (quartzite and chert), one chert triangular point, and one large fragment of “net-impressed” Early Woodland quartz-tempered Wolfe Neck type ceramics (see Figures 3.276 and 3.277). The artifacts were found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath a 70-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~23 meters (77 feet).

Figure 3.276. The image shows the projectile points found at 44NH491. The triangular point is 2.4 centimeters in length.

Figure 3.277. The image shows a large fragment of crushed-quartz and sand tempered “net-impressed” ceramic vessel fragmant found at 44NH491. The ceramic fragment is 15.1 centimeters in width.

207). South Bay #3 - 44NH0492

The site (see Figure 3.280) includes a limited scattering of fire-cracked rock and quartz, quartzite, chert debitage. The artifacts were found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath an 80-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~18 meters (60 feet).

208). South Bay #4 - 44NH0493

The site (see Figure 3.280) includes a limited scattering of fire-cracked rock and quartz debitage. The limited artifact assemblage was found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath a 90-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~19 meters (62 feet).

209). **South Bay #5 - 44NH0494**

The site (see Figure 3.280) includes a limited scattering of fire-cracked rock and one quartz stemmed point (see Figure 3.279). The limited assemblage was found on the surface of the tidal marsh adjacent to the eroded shoreline (see Figure 3.278). At low tide, a drowned upland surface is situated beneath a 30 to 40-cenitmeter covering of tidal marsh peat. Four centuries ago regional sea level was ~30 to ~40 centimeters lower than present. As such, the site would have encompassed a low hummock area with high-tide bush and some eastern red cedars. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~14 meters (46 feet).

Figure 3.278. The image shows the shoreline associated with 44NH494 being surveyed by Mr. Norman Brady and Mr. Ed Haile. The artifacts found at the site had been transported inland via overwash processes and distributed over the surface of the modern tidal marsh.

Figure 3.279. The image shows a quartz Archaic stemmed point also found at 44NH494.

210). South Bay #6 - 44NH0495

The site (see Figure 3.280) includes a limited scattering of fire-cracked rock and quartz debitage. The limited artifact assemblage was found along the eroded shoreline. At low tide, a drowned upland surface is situated beneath a 90-cenitmeter covering of tidal marsh peat. A few tree stumps have been observed at the bottom of tidal marsh peat. The area represents an extension of the eastern late Pleistocene-age aeolian ridge system within the confines of Mockhorn Island. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~21 meters (69 feet).

Figure 3.280. The satellite image defines the boundary and the longitude and latitude locational data for 44NH440, 44NH441, 44NH442, 44NH490, 44NH491, 44NH492, 44NH493, 44NH494, and 44NH495.

211). Fowling Point Ridge - 44NH0471

The site (see Figure 3.281) was recorded by Lowery (2001) as a Middle to Late Archaic prehistoric site. At that time, the site produced a fragment of a basalt full-channel gouge, one quartz stemmed point, and a quartzite hammerstone embedded within the eroded bank profile along a tidal drainage of the Ramshorn channel. The setting encompasses a slightly-elevated linear ridge, which is largely encapsulated by tidal marsh peat. The geology suggests that the ridges within the Ramshorn channel area represent high sea-stand (MIS-5 or 125,000 year-old) near shore sub-aqueous features. As such, the entire region's prehistoric archaeological record would be confined to the surface.

The archaeological sites associated with the Ramshorn channel area were examined on 3-17-2015. Since there is no beach or shelf area, the bank profile at the site was examined for exposed or in situ artifacts and only a single fragment of fire-cracked rock was located. The intact archaeological deposits are probably located inland of the exposed bank edge. The lack of associated diagnostics is the byproduct of the fact that dislodged artifacts would quickly fall to the bottom of the channel.

The diurnal tidal action is the dominant erosive process impacting the site. Channel meandering and scouring are the geologic variables influencing the sites archaeological integrity. An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or meandered ~9 meters (~29 feet) since 1999.

Figure 3.281. The satellite image defines the boundary and the longitude and latitude locational data for 44NH471.

212). South Bog Gut Ridge - 44NH0467

The site (see Figure 3.291) was recorded by Lowery (2001) as a Late Archaic prehistoric site. At that time, the site produced an argillite Lehigh/Snook Kill point fragment, four argillite point fragments, and a silicified sandstone biface fragment. Fire-cracked rock was also observed at the site. Some of the artifacts were found embedded within the eroded bank profile adjacent to the tidal drainage. A bench or shelf area also collected some of the artifacts within shallow depressions.

The archaeological sites associated with the Bog Gut and Ramshorn channel area were examined on 3-17-2015. The assemblage found at the site included three fragments of fire-cracked rock and one quartz flake. The site encompasses three tidally eroded linear ridge areas that were recently conjoined (see Figure 3.282).

The diurnal tidal action is the dominant erosive process impacting the site. Channel meandering and scouring are the geologic variables influencing the sites archaeological integrity. An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or meandered ~7 (~23 feet) to ~ 8 (~29 feet) meters since 1999.

Figure 3.282. The image shows the shoreline associated with 44NH467. Note that the site has been eroded into three pieces (see insets), as a result of tidal meandering and scouring.

213). Castle Ridge #2 - 44NH0469

The site (see Figure 3.291) was recorded by Lowery (2001) as a Late Woodland prehistoric site. At that time, the site revealed a jasper triangular point, two jasper unifacial endscrapers, and one chert unifacial stemmed endscraper. The Late Woodland cultural chronological association linked to the site was based solely on the presence of the triangular point. However, triangular points could indicate an Archaic-era occupation, as well.

The archaeological site was examined on 3-17-2015. Nothing was found at the site. The site encompasses a drowned linear ridge feature adjacent to a tidal creek. An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site is largely stable. However, the southern end of the site has eroded as result of the result of the meandering tidal channel ~3 (~10 feet) meters since 1999.

214). Bog Gut Ridge – 44NH0466

The site (see Figure 3.291) was recorded by Lowery (2001) as a prehistoric site of unknown chronological affiliation. The site encompasses a drowned linear ridge feature adjacent to a tidal creek. The assemblage found in 2001 included one quartz point distal fragment, one biface made from a chert cobble, four endscrapers, and cluster of fire-cracked rock. At that time, a dense cluster of fire-cracked rock was observed along an eroded shelf area (see Figure 3.283 A) adjacent to the tidal creek.

The archaeological site (see Figure 3.283 B) was examined on 3-17-2015. The only artifact found was the distal end of a serrated Early Archaic quartz point (see Figure 3.284). The point fragment was exposed within a secondary overwash deposit of tidal marsh. The context indicates that that the fragment had been eroded out of primary context at some time in the past, transgressed inland via storm-related overwash processes, and subsequently buried. Given the current data, the site clearly has an Early Archaic period chronological affiliation.

An overlay of satellite images spanning the past 15 years indicates that the bank edge has eroded as result of the result of the meandering tidal channel ~3 (~10 feet) to ~4 (~13 feet) meters since 1999 (see Figure 3.283 A and B).

Figure 3.283. The image shows the shoreline associated with 44NH466 in 2001 (A). Note the presence of fire-cracked rock on sub-soil “bench” near the tidal channel. The image also shows the shoreline associated with 44NH466 in 2015 (B). Note the loss of the sub-soil “bench” area and archaeological remains adjacent to the channel. The daily ebbing and flooding tides have resulted in channel meandering, which is eroding and scouring the site.

Figure 3.284. The image shows the only artifact (see inset) found at 44NH466. The position of the artifact within the exposed soil profile indicates that it is not in primary context.

215). Red Bank Creek - 44NH0465

The site (see Figure 3.291) was recorded by Lowery (2001) as an historic landing site or former wharf area. At the time, a few exposed wooden posts, rounded ballast rocks, and some brick rubble were noted along the exposed shoreline. No diagnostic artifacts were found in 2001.

The archaeological site (see Figure 3.285) was examined on 3-17-2015. Wooden posts, rounded ballast cobbles, and brick rubble were observed along the bank edge at low tide. Again, no diagnostic artifacts were found.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site is largely stable. However, the bank edges along the eastern and western ends of the site have eroded as result of the result of the meandering tidal channel ~4.5 (~14.5 feet) meters since 1999.

Figure 3.285. The image shows the shoreline associated with 44NH465.

216). South Hammock - 44NH0464

The site (see Figure 3.291) was recorded by Lowery (2001) as a prehistoric site of Late Archaic-era chronological affiliation. The affiliation was based on the presence of two stemmed projectile points found at this location. The site encompasses a linear ridge feature adjacent to a tidal creek. Like all of the ridges in the Ramshorn channel region, the geology suggests that the ridges represent high sea-stand (MIS-5 or 125,000 year-old) near shore sub-aqueous features. Coarse sand and gravel exposed along the bank edge (see Figure 3.286) are fused with an iron-oxide acid-sulfate geochemical “cement”.

The archaeological site was examined on 3-17-2015 and nothing was found at this location. An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site is largely stable and uneroded.

Figure 3.286. The image shows the shoreline associated with 44NH464. The coarse sediments (see inset) and highly weathered sub-soil indicate that the site is located on ancient high sea stand deposits.

217). The Hammocks #1 - 44NH0053

The site (see Figure 3.291) is actually situated inland from the shoreline. However, it was examined during the recent survey because it was easily accessible from the shoreline. The site was recorded by Mark Wittkofski in 1980 as a prehistoric site of Woodland-era chronological affiliation. He reported a shell midden at this location based on informant data and never actually visited the site.

A pedestrian walkover of the site occurred on 3-17-2015. Even though the area is not eroded, storm-surge activity has scoured the eastern margins of the hummock and exposed archaeological features (see Figure 3.287). A dense midden containing oyster shell, hard clam shell, and whelk shell was observed. Fire-cracked rock, a hammerstone, a jasper cobble flake, and a single fragment of shell-tempered Townsend ware was exposed on the surface (see Figure 3.287). The historic coastal survey map and the aerial photograph indicate that a portion of the hummock was tilled in the 19th and possibly 20th centuries. As such, the margins of the hummock may be the only portions of the site with an intact and unplowed midden feature.

An overlay of satellite images spanning the past 15 years indicates that the site has been impacted by storm surge activity and portions of the forest have been killed as a result of saltwater intrusion.

Figure 3.287. The image shows the shell midden and associated in situ artifacts (right) at 44NH53.

218). North Hammock - 44NH0054

The site (see Figure 3.291) was recorded by Mark Wittkofski in 1980 as a prehistoric site of unknown chronological affiliation. Lowery (2001) examined the site and found Late Archaic and Early Woodland projectile points, preforms, debitage, and fire-cracked rock at this location. The site encompasses a drowned linear ridge feature adjacent to a tidal creek.

The archaeological site was examined on 3-17-2015 and fire-cracked rock was found at this location (see Figure 3.288). An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded as result of the result of the meandering tidal channel ~10 (~33 feet) meters since 1999.

Figure 3.288. The image shows the shoreline associated with 44NH54.

219). Ramshorn Channel Lodge – 44NH505

The site (see Figure 3.291) is actually situated inland from the shoreline. However, it was examined during the recent survey because it was easily accessible from the shoreline. A pedestrian walkover of the site occurred on 3-17-2015. Even though the site is not eroded, storm-surge activity has scoured portions of the hummock and exposed historic archaeological features.

The site encompasses an historic structure (see Figure 3.289) as well as the former tilled field area associated with a 19th century hunting lodge/residence. The building is currently abandoned, but still standing. The former tilled field area is delineated by a ditch and berm feature, which can be seen on the satellite images of the site. The 1850 coastal survey shows a structure at this location, along with some outbuildings. The outbuildings no longer exist. The main structure is still standing, but in poor condition. An examination of the associated hummock indicates that the area contains some historic archaeological features.

An overlay of satellite images spanning the past 15 years indicates that the site has been impacted by storm surge activity and portions of the upland forest have been killed as a result of saltwater intrusion. The lodge-residence shows some structural damage along the eastern or coastal side.

Figure 3.289. The image shows the abandoned lodge structure associated with 44NH505.

220). Sandy Point - 44NH0463

The site (see Figure 3.291) was recorded by Lowery (2001) as a prehistoric site of Late Archaic through Late Woodland-era chronological affiliation. The affiliation was based on the presence of five diagnostic projectile points found at this location. The assemblage found at the site also included flake tools, preforms, and debitage. Fire-cracked rock was also observed along the shoreline.

The site encompasses two drowned linear ridge features adjacent to Hog Island Bay. The ridges are delineated by dead eastern red cedar trees situated inland from the shoreline (see Figure 3.290). The archaeological site was examined on 3-17-2015 and only fire-cracked rock was found at this location.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has been stable since 1999.

Figure 3.290. The image shows the former forested ridge inland from the shoreline at 44NH463.

Figure 3.291. The satellite image defines the boundary and the longitude and latitude locational data for 44NH53, 44NH54, 44NH463, 44NH464, 44NH465, 44NH466, 44NH467, and 44NH469.

221). Parting Creek Ridge - 44NH0472

The site (see Figure 3.293) was recorded by Lowery (2001) as a prehistoric site of unknown chronological affiliation. At that time, the site revealed three jasper endscrapers and an exposure of fire-cracked rock. The site encompasses a linear ridge feature adjacent to a tidal creek. Tide driven erosion is the dominant factor impacting the site.

The archaeological site was examined on 6-28-2015 and only fire-cracked rock was found at this location. The shoreline visibility was hindered by the accumulation of organic debris and silt (see Figure 3.292).

An overlay of satellite images spanning the past 15 years indicates that the shoreline has been stable since 1999. The far eastern section of the shoreline has actually accumulated tidal marsh of the past 15 years.

Figure 3.292. The image shows the shoreline associated with 44NH472.

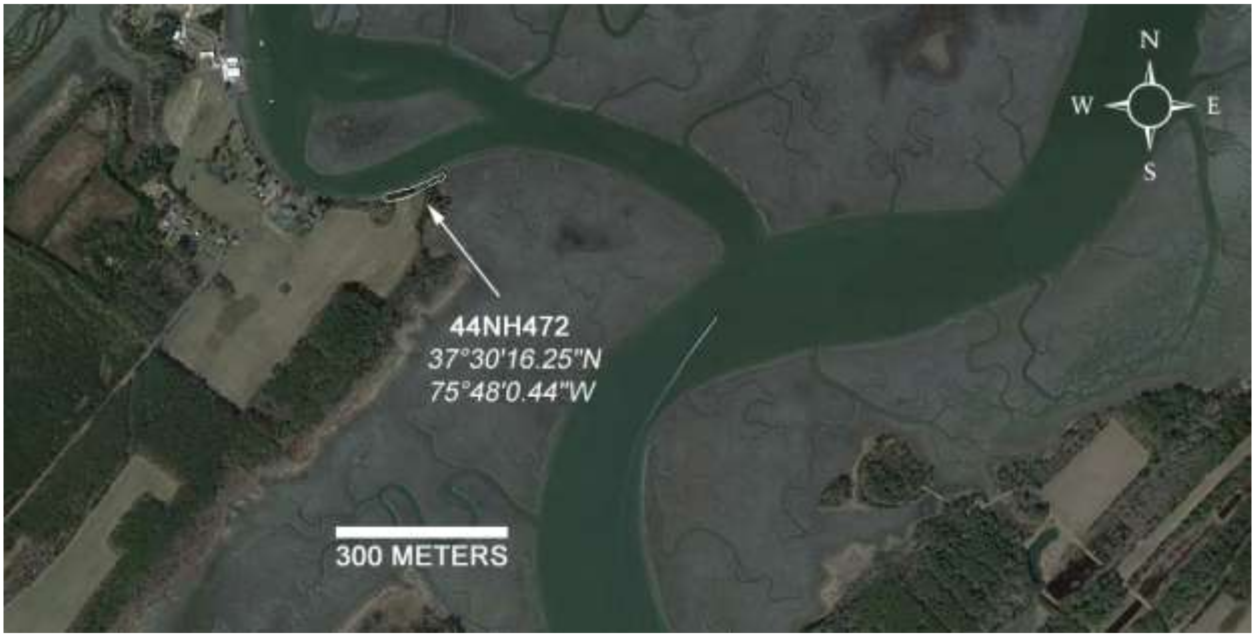

Figure 3.293. The satellite image defines the boundary and the longitude and latitude locational data for 44NH472.

222). Upshur Neck Terminus - 44AC0649

The site (see Figure 3.295) consists of a drowned upland landsurface beneath a ~60-centimeter covering of tidal marsh peat. Fire-cracked rock and two pieces of quartzite debitage were found at the site on 6-28-2015. The assemblage would suggest that an unknown-era prehistoric site is associated with the inundated landsurface. An old fish-weir structure occurs at the site (see Figure 3.294) and it extends from beneath the tidal marsh eastward towards the water. Given the fact that the wood does not show metal cut-marks, it is unclear whether the wooden feature is early historic or late prehistoric in age. Upshur Neck represents a 125,000 year-old (OIS-5) high-sea stand barrier island ridge system. Aside from pit-features, the entire prehistoric archaeological record would be confined towards the surface. A late-Pleistocene aeolian cap might exist beneath a veneer of tidal marsh peat. The archaeological site may extend inland of the shoreline.

An overlay of satellite images spanning the past 15 years indicates that the shoreline has changed. Over the past 15 years, the shoreline associated with the site has eroded or retreated ~20 meters (68 feet).

Figure 3.294. The image shows the shoreline associated with 44AC649. Note the fish-weir feature exposed along the shoreline.

Figure 3.295. The satellite image defines the boundary and the longitude and latitude locational data for 44AC649.

223). Upshur Bay Landing - 44AC0548

The site (see Figure 3.296) was recorded by Lowery (2001) as an historic landing site. At that time, the site included an exposed area with dense oyster and clam shells, small wooden pilings, and brick fragments. No diagnostic cultural artifacts were noted. Several lumps of heavily corroded iron in the same location suggested that the site may have been an individual wharf or landing location. The dense shell at the same location may indicate that the site is associated with the seafood industry.

The archaeological site was examined on 6-28-2015 and because of the high tide conditions the site could only be observed through the water. Since the site is a sub-aqueous archaeological feature and not situated along a shoreline, it has escaped the ravages of shoreline erosion.

An overlay of satellite images spanning the past 15 years indicates that the shoreline inland from the site has eroded or retreated ~12 meters (40 feet).

Figure 3.296. The satellite image defines the boundary and the longitude and latitude locational data for 44AC548.

224). Burton's Shore - 44AC0543

The site (see Figure 3.298) was recorded by Lowery (2001). At that time, it was observed that the shoreline revealed evidence for both a prehistoric and an historic presence. The prehistoric assemblage included a damaged quartz projectile point, two quartzite flakes, and fire-cracked rock. The historic remains included a mixture of brick and cement associated with an historic landing feature. The setting encompasses an upland tilled and forested area adjacent to Burton’s Bay.

The archaeological site was examined on 4-8-2015. The southern shoreline is raw and exposed (see Figure 3.297 A). The northern portion of the shoreline has been stabilized by the installation of a “living shoreline” (see Figure 3.297 B). As a result, the intertidal area has been staked off, partially filled with sand, and vegetation has been planted. The boat launch or landing feature is still present (see Figure 3.297 C). Fragments of fire-cracked rock and brick were observed along the shoreline. As indicated by the footprint pattern in the sand, the area also seems to be regularly checked for eroded and displaced artifacts. Along the southern shoreline section a barrel-well feature was discovered (see Figure 3.297 D). The feature is located along the shoreline immediately east of a foundation associated with a former structure or residence. The foundation is readily evident in the satellite images of the area.

An overlay of satellite images spanning the past 15 years indicates that the northern shoreline section of the site has eroded or retreated ~22 meters (73 feet). Over the same duration, the southern shoreline has eroded or retreated ~16 meters (53 feet).

Figure 3.297. The image shows the shoreline associated with 44AC543 (A). The northern part of the site has been stabilized (B). The shoreline area includes a dilapidated landing (C) and a barrel well (D).

Figure 3.298. The satellite image defines the boundary and the longitude and latitude locational data for 44AC543.

225). Mosquito Creek - 44AC0546

The site (see Figure 3.300) was recorded by Lowery (2001). At that time, the eroding shoreline revealed evidence of both a prehistoric and an historic presence. A shell feature with oyster, hard clam, and bone was noted within the bank profile. The feature also contained two in situ conjoining jasper flakes. Both of which were the byproduct of bi-polar reduction. Other flakes were also found at the site along with a cobble core, fire-cracked rock, and a small fragment of slate. Two pieces of redware were found inland from the shoreline, which indicated an historic 19th century occupation.

The archaeological site was examined on 7-15-2015 and a remnant shell feature with fire-cracked rock was observed in the bank profile at this location (see Figure 3.299). An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded as result of the result of the meandering tidal channel between ~9 (~29 feet) and ~4 (~13 feet) meters over the past decade and a half.

Figure 3.299. The image shows the shoreline associated with 44AC546. Note the shell feature exposed along the eroded bank edge (see inset).

Figure 3.300. The satellite image defines the boundary and the longitude and latitude locational data for 44AC546.

226). Red Hill - 44AC0044

The site (see Figure 3.308) was initially recorded by Wayne Clark in 1976. However, very little data about the site were provided at that time. Subsequently, the William and Mary Center for Archaeological Research reported on the site in 1997. Again, very little information was provided about the site. In 2001, Lowery (2003a) and he noted a refuse feature or midden with oyster and hard clam shell, some debitage, and fire-cracked rock. The site was classified as a prehistoric site with an unknown Woodland-era chronological affiliation.

The site is located at the top of a high sandy bluff which overlooks Chincoteague Bay. The area offshore from the site is relatively shallow. Archaeological remains are confined to the upper ~1 meter (3.28 feet) of the bank. The underlying geologic strata are associated with MIS-5 or older high-sea stand conditions.

In 2009, a small collection from this locality was examined. The assemblage collected from 44AC44 included several triangular points made of cobble chert and jasper. Fragments of decorated Townsend/Rappahannock ware were also present. A small green steatite elbow pipe was also found at this locality. The collective data suggested that the site included a Late Woodland period occupation.

The area was examined on 4-1-2015 (see Figure 3.301) and at that time, two shell-filled refuse features were observed in the bank profile (see Figure 3.302). Townsend ware fragments were found within the slump material along the bank associated with these two eroding features. Three samples were collected from these features. Shell pit #1, which was situated to the north, contained stratified fill layers (see Figure 3.303). The top of pit produced a calibrated and marine reservoir corrected AMS age of 1366 ± 41 calAD (D-AMS 0010272). The lower shell lens within pit #1 produced a calibrated and marine reservoir corrected AMS age of 1335 ± 40 calAD (D-AMS 0010273). Even though the lower level was slightly older, these two stratified layers are roughly contemporaneous. Shell pit #2, which is situated about ~30 meters south of pit #1, seemed to represent a single fill event (see Figure 3.304). Pit #2 produced a calibrated and marine reservoir corrected AMS age of 1358 ± 38 calAD (D-AMS 0010274). Given the limitations of radiometric dating, the resultant ages on these two features could represent a single short-term Late Woodland period occupation.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or receded ~14 meters (~48 feet) along the northern shore and ~10 meters (~32 feet) along the southern shore over the past decade and a half.

Figure 3.301. The image shows the shoreline and steep eroded bank associated with 44AC44.

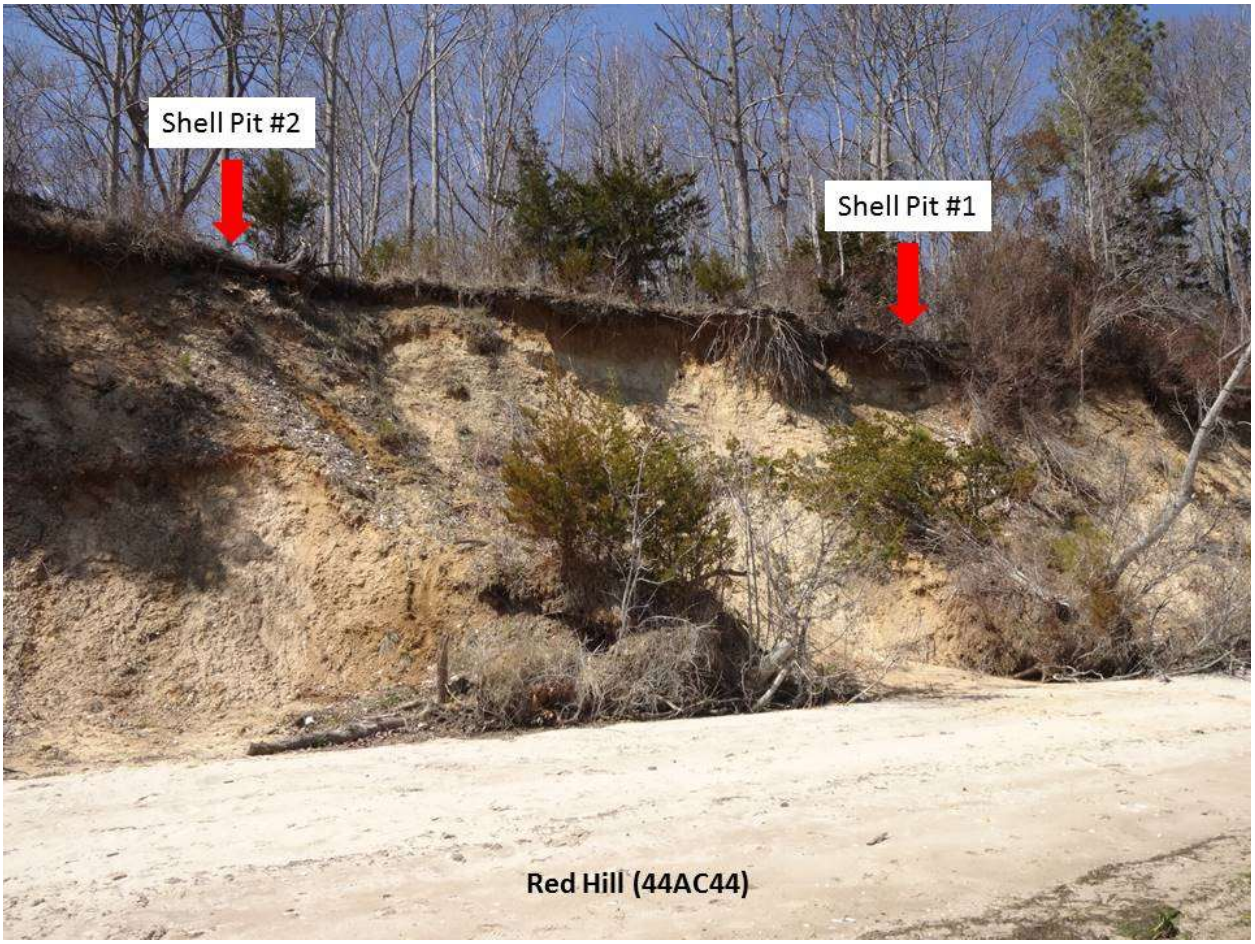

Figure 3.302. The image delineates two exposed shell-filled refuse pits along the eroded bank at 44AC44.

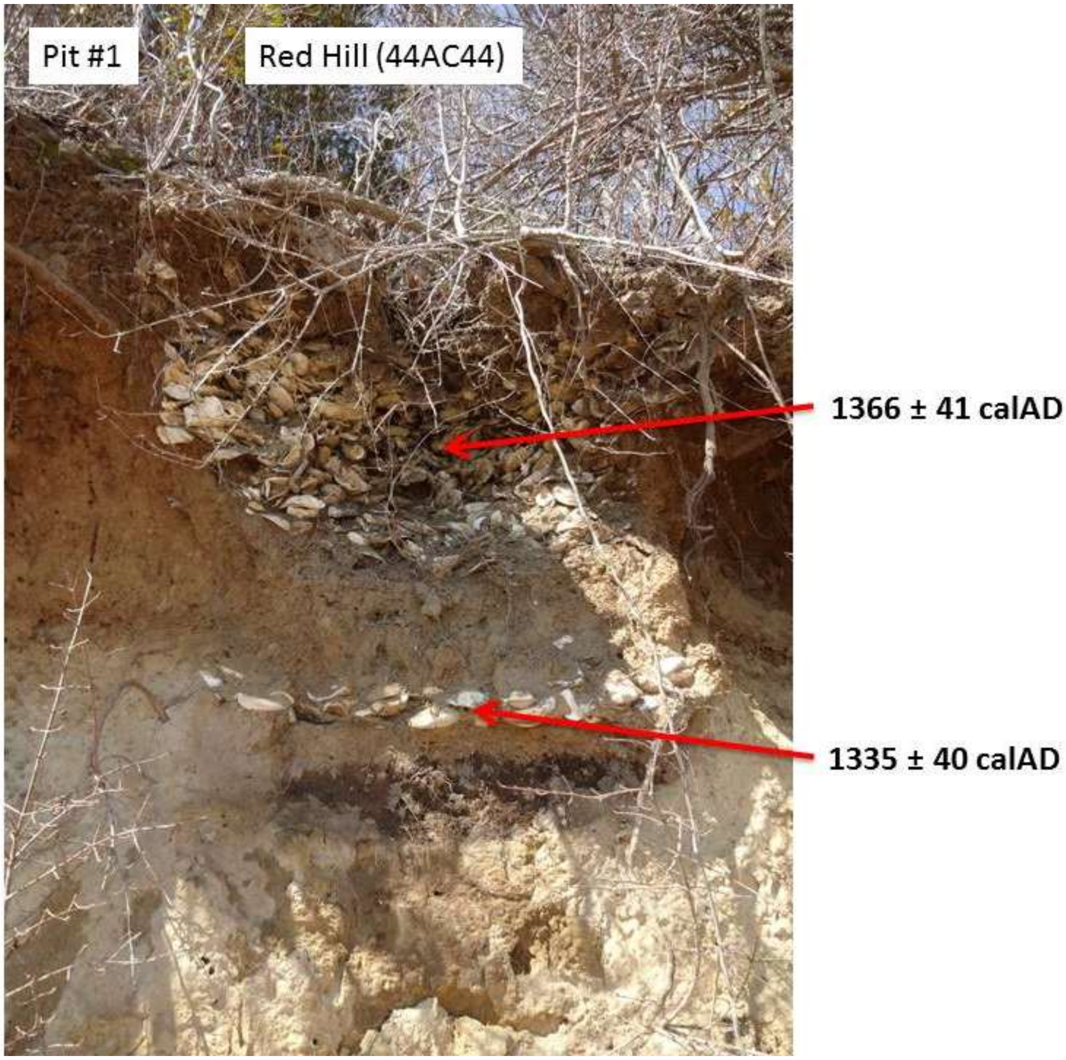

Figure 3.303. The image shows a close-up view of Pit#1 at 44AC44. The reservoir-corrected and calibrated AMS dates for the feature are shown.

Figure 3.304. The image shows a close-up view of Pit#2 at 44AC44. The reservoir-corrected and calibrated AMS date for the feature is shown.

227). Sinnickson – 44AC0008

The site (see Figure 3.308) was initially recorded by Howard MacCord in 1973. In 1976, Wayne Clark visited the site and reported shell refuse within upper portion of the bank profile. At that time, he found a single fragment of shell-tempered Rappahnnock ware, which would indicate a Late Woodland period occupation. In 2001, Lowery (2003a) visited the site and discovered a single fragment of Mockley ware, as well as fire-cracked rock. Collectively, the data would imply a Middle to Late Woodland period occupation.

Though topographically lower than the bluff to the south, 44AC8 is situated on a sandy bluff which overlooks Chincoteague Bay. The area offshore from the site is relatively shallow. Archaeological remains are confined to the upper ~1 meter (3.28 feet) of the bank. The underlying geologic strata are associated with MIS-5 or older high-sea stand conditions.

The area was examined on 4-1-2015 and at that time, shell fragments were observed within the slumping bank profile (see Figure 3.305). Fire-cracked rock and a single small jasper flake were found along the shoreline immediately adjacent to the slumping bank. No diagnostic artifacts were found.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or receded ~14 meters (~48 feet). As such, the midden features noted by Howard MacCord and Wayne Clark at this site may have been destroyed by erosion.

Figure 3.305. The image shows the shoreline associated with 44AC8. A limited quantity of shell can be seen in the eroded bank (right).

228). Sinnickson Landing - 44AC0654

The site (see Figure 3.308) was recorded as a result of the recent survey. The site is located on the south bank near the mouth of Swans Gut Creek. The setting encompasses a tidal marsh and a low forested bank. The area was clearly used as a landing or wharf area in the past. A plank road was exposed along the shoreline adjacent to the tidal marsh (see Figure 3.306). Two large parallel wooden log beams extend from the shoreline eastward into Chincoteague Bay (see Figure 3.307). The beams are hand-hewn and contain mortise and tenon features. The area is littered with shell and other mixed historic debris. The data would imply that the wharf or landing is 19th century or earlier in age.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or receded ~19 meters (~64 feet).

Figure 3.306. The image shows the exposed plank road along the shoreline at 44AC654.

Figure 3.307. The image shows one of the log beams along the shoreline at 44AC654.

Figure 3.308. The satellite image defines the boundary and the longitude and latitude locational data for 44AC8, 44AC44, and 44AC654. A detailed view of 44AC44 (left) shows the location of the two shell filled refuse pits.

229). Captains Cove #1 - 44AC0042

The site (see Figure 3.309) was initially recorded by Wayne Clark in 1976. At the time, he indicated the presence of shell in the upper portion of the bank profile. In 1978, Tyler Bastian indicated that "pottery was exposed by recent bulldozing". However, the pottery was not described by Bastian and its cultural affiliation was not indicated. In 1997, the William and Mary Center for Archaeological Research indicated that site produced projectile "points, pottery, a small mortar, steatite sherds, and lots of shell." The data would imply a Late Archaic through Woodland period occupation. In 2001, Lowery (2003a) examined only the shoreline and found nothing. At that time, the shoreline had receded as a result of erosion.

The area was examined on 4-1-2015 and at that time, nothing was found along the shoreline. However, the site boundary extends inland from the shoreline within a tilled field area. The inland portion of the site may indeed still contain archaeological deposits.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or receded ~29 meters (~96 feet). Importantly, the shell refuse observed in the bank profile and recorded by Clark in 1976 has been completely destroyed by erosion.

230). Chin B – 44AC0043

The site (see Figure 3.309) was recorded by Wayne Clark in 1976. At the time, Clark noted only shell at this location. No diagnostics were found or reported. The site was recorded as a domestic shell midden of unknown cultural affiliation. In 2001, Lowery (2003a) surveyed this portion of the coast and found nothing.

The area was examined on 4-1-2015 and at that time, nothing was found along the shoreline. However, the site boundary extends inland from the shoreline towards a forested hummock area. The inland portion of the site may indeed still contain archaeological deposits.

An overlay of satellite images spanning the past 15 years indicates that the bank edge associated with the site has eroded or receded ~22 meters (~73 feet). Importantly, the shell observed in the bank profile and recorded by Clark in 1976 has been completely destroyed by erosion.

Figure 3.309. The satellite image defines the boundary and the longitude and latitude locational data for 44AC42 and 44AC43.

231). Shipwreck #1 - 44AC0404

The site (see Figure 3.310) is situated along the Atlantic seacoast and was reported in 1988 as an 18th century fishing schooner. The shoreline at this location is relatively stable. Nothing was found during the recent survey. An overlay of satellite images spanning the past 15 years indicates that the shoreline has not eroded or receded. As such, the wreck may be buried beneath coastal barrier island sand.

Figure 3.310. The satellite image defines the boundary and the longitude and latitude locational data for 44AC404

232). Lifesaving Boathouse #1 – 44AC0409

The site (see Figure 3.311) is situated along the Atlantic seacoast and was reported in 1988 as an 18th century lifesaving boathouse. The shoreline at this location has changed. Nothing was found during the recent survey. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 76 meters (~250 feet). As such, the boathouse has been destroyed by erosion.

Figure 3.311. The satellite image defines the boundary and the longitude and latitude locational data for 44AC409.

233). Fish Oil & Guano Company - 44AC0414

The site (see Figure 3.312) represents the location of a former industrial complex of the early 20th century. The shoreline at this location has changed. The area has been transgressed by storm-related overwash processes. As such, nothing remains of this industrial complex. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 174 meters (~571 feet). As such, the site has been destroyed by erosion.

234). Fish Oil Plant – 44AC0415

The site (see Figure 3.312) represents the location of a former industrial complex of the early 20th century. The shoreline at this location has changed. The eastern portion of the site has been transgressed and scoured by storm-related overwash processes. The western shoreline has eroded and receded. As such, nothing remains of this industrial complex. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 17 meters (~58 feet) along the western margin. As such, the site has been destroyed by erosion.

235). Shipwreck #2 - 44AC0413

The site (see Figure 3.312) is situated along the Atlantic seacoast and was reported in 1988 as a 20th century shipwreck. The shoreline at this location has changed markedly. Nothing was found during the recent survey. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 34 meters (~112 feet). As such, the wreck may be situated offshore.

Figure 3.312. The satellite image defines the boundary and the longitude and latitude locational data for 44AC413, 44AC414, and 44AC415.

236). North Wallops Earthworks – 44AC0089

The site (see Figure 3.313) was recorded by Mark Wittkofski in 1980 as a Revolutionary War or Civil War earthworks. The shoreline at this location is stable. Nothing was found during the recent survey. An overlay of satellite images spanning the past 15 years indicates that the shoreline has not eroded or receded. As such, the earthworks are situated inland from the shoreline.

Figure 3.313. The satellite image defines the boundary and the longitude and latitude locational data for 44AC89.

237). South Wallops Shell Mound – 44AC0159

The site (see Figure 3.314) was recorded by Mark Wittkofski in 1980 as a one-meter high shell mound of unknown cultural affiliation. The area is now currently developed as a NASA facility. The inland portion has been graded and a rip-rap wall of stone has also been installed. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 69 meters (~227 feet). As such, the site has been destroyed by development and erosion.

238). North Assawoman Island - 44AC0544

The site (see Figure 3.314) was recorded in 2001 by Lowery (2003a). At the time, the site revealed two pitted quartzite hammerstones, one early stage quartzite biface, and two quartzite spalls. All of the artifacts were heavily tumbled and may have eroded from an offshore drowned site or represent the remnants of a site destroyed by erosion long ago. The shoreline at this location has been heavily impacted by storm-related overwash processes. Nothing was found at this site during the recent survey. An overlay of satellite images spanning the past 15 years indicates that the shoreline has eroded or receded ~ 65 meters (~215 feet). The lack of artifacts and the magnitude of erosion indicated that the site has been destroyed by erosion.

Figure 3.314. The satellite image defines the boundary and the longitude and latitude locational data for 44AC159 and 44AC544.

239). North Metompkin Island – 44AC0545

The site (see Figure 3.315) was recorded in 2001 by Lowery (2003a). At the time, the shoreline area produced a scattering of Dutch yellow bricks. The bricks indicated the presence of a 17th or 18th century residence or possibly even ballast from a wreck. Over the past decade, the shoreline at this location has changed markedly. The former barrier island site location is now part of Gargathy Inlet. The shoreline could not be examined during the recent survey because coastline no longer exists. As such, the site has been completely destroyed by erosion and the inlet formation. An overlay of satellite images spanning the past 15 years indicates that the northern shoreline associated with the former site location has eroded or receded ~ 453 meters (~1487 feet). The southern shoreline associated with the former site location has eroded or receded ~ 263 meters (~865 feet). The magnitude of erosion indicated that the site has been destroyed by erosion.

240). Metompkin Island – 44AC0138

The site (see Figure 3.315) was recorded by Mark Wittkofski in 1980 based on information provided to him from Barry Truitt and John Denues. It was reported that quartzite bifaces, grooved axes, and pitted grinding stones were found at this location. When the area was examined in 2001 by Lowery (2003a), he noted the presence of fire-cracked rock and some quartzite spalls at this location. Over the past decade, the shoreline at this location has changed markedly. The coastline has transgressed westward as a result of storm-related overwash processes and the former site location is situated well offshore. The shoreline could not be examined during the recent survey because coastline associated with the former site no longer exists. As such, the site has been completely destroyed by erosion. An overlay of satellite images spanning the past 15 years indicates that the shoreline associated with the former site location has eroded or receded ~ 167 meters (~548 feet).

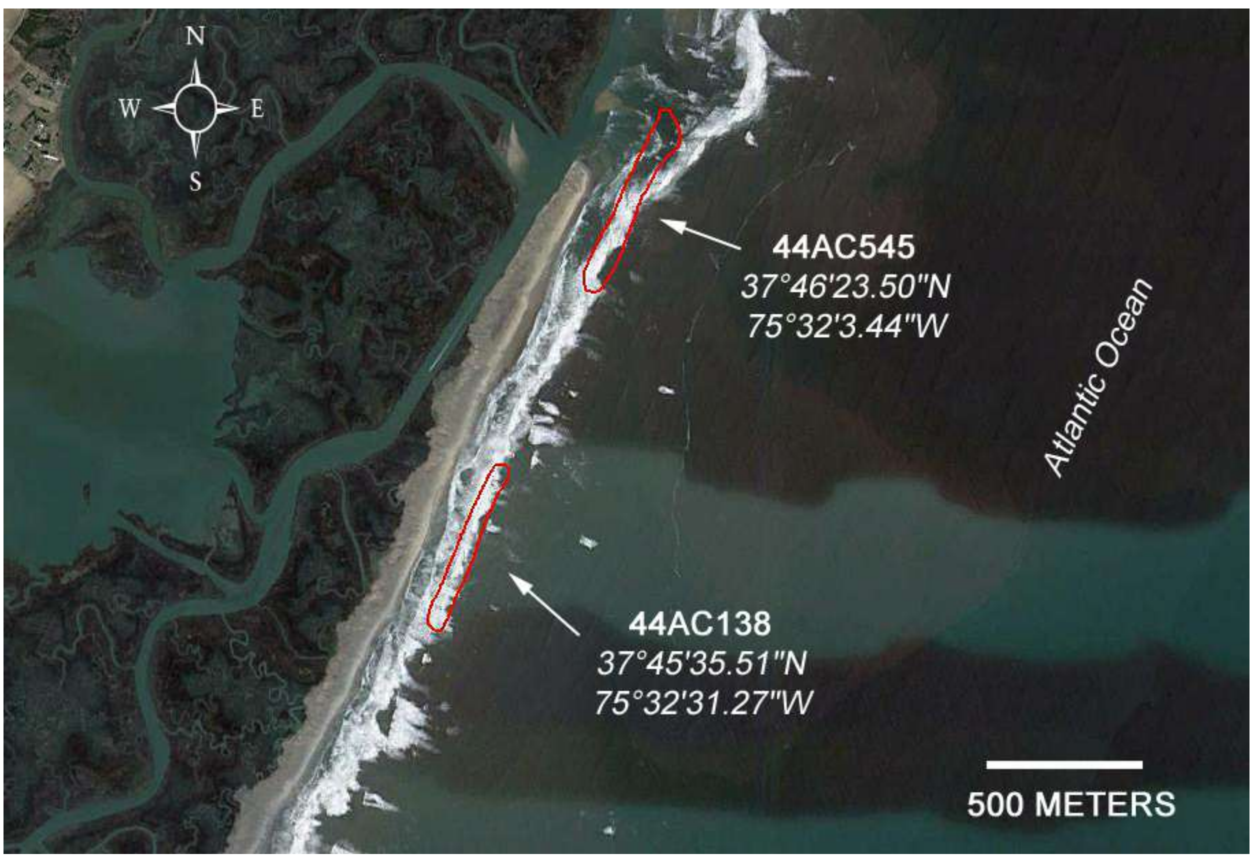

Figure 3.315. The satellite image defines the boundary and the longitude and latitude locational data for 44AC138 and 44AC545.

241). North Cedar Island – 44AC0547

The site (see Figure 3.319) was recorded in 2001 by Lowery (2003a). At the time he noted the presence of fire-cracked rock and lithic debris along the shoreline at this location. He also documented the presence of shell-tempered Townsend ware being eroded along the coast from an elevated ridge with eastern red cedar trees. A single basalt flake tool was found as well as an 18^{th} century wine bottle with a preserved wooden cork.

Between 2003 and 2006, the shoreline associated with 44AC547 was examined multiple times. The shoreline produced a large quartzite Morrow Mountain biface, a basalt three-quarter grooved axe, several additional fragments of shell-tempered Townsend ware vessels, and a Paleoindian lanceolate point basal fragment. The shoreline also revealed numerous Pleistocene vertebrate fossils (see Figure 3.316).

The coastline has transgressed westward as a result of storm-related overwash processes (see Figure 3.317) and the former site location is situated well offshore. As such, the site has been completely destroyed by erosion. An overlay of satellite images spanning the past 15 years indicates that the northern shoreline associated with the former site location has eroded or receded ~410 meters (~1347 feet). The southern shoreline has eroded or receded ~304 meters (~998 feet). In the near future, the Cedar Island lifesaving station (see Figure 3.318), which was located inland of 44AC547, will also be destroyed by erosion.

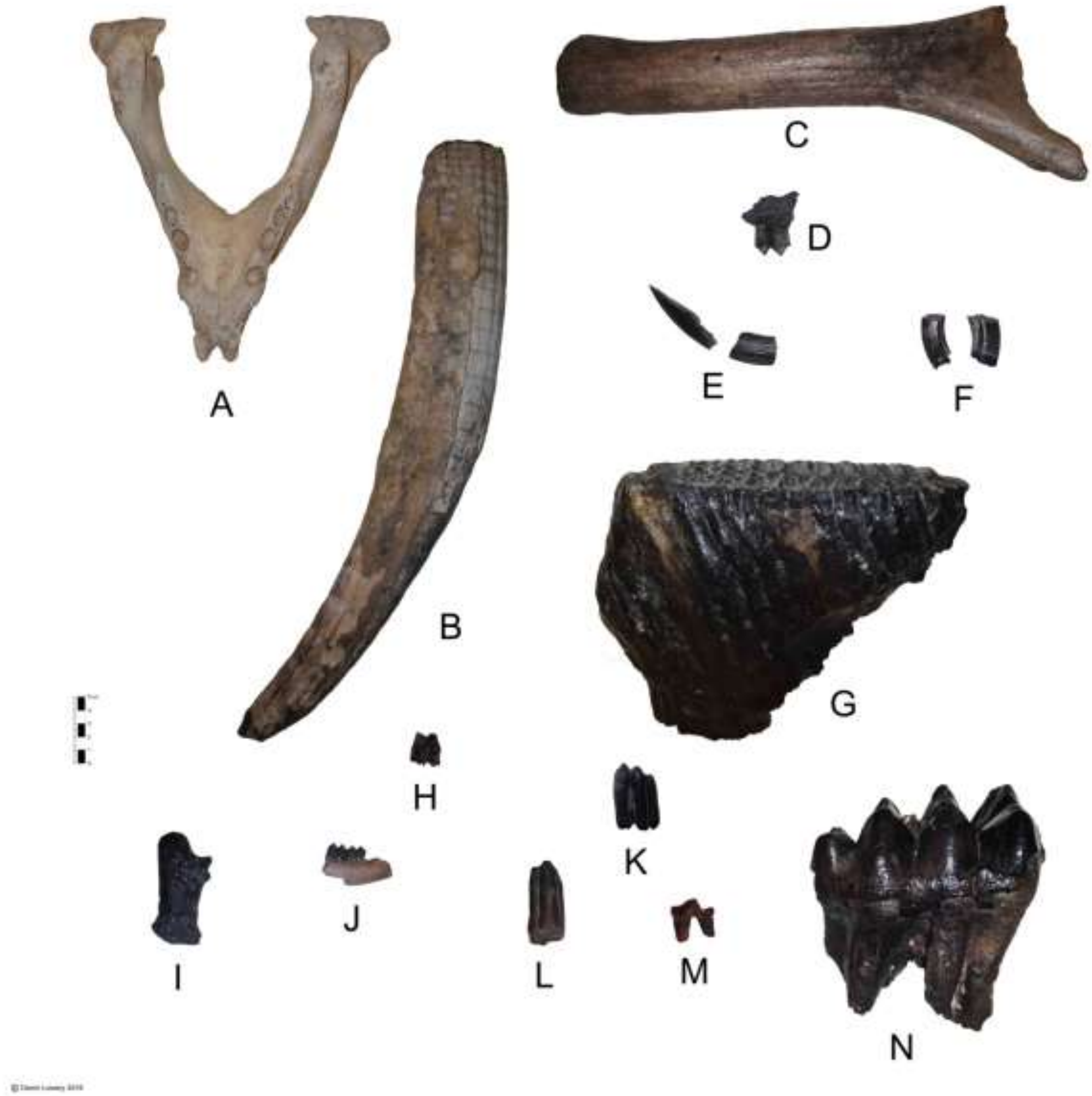

Figure 3.316. The image illustrates a sample of the Pleistocene vertebrate remains, which include an Atlantic Walrus (*Odobenus rosmarus rosmarus*) mandible (A) and tusk (B), a Stag-Moose (*Cervalces scotti*) antler pedicle-beam (C) and maxilla (D), a Giant Beaver (*Castoroides ohioensis*) incisor sections (E) and molars (F), a Columbian Mammoth (*Mammuthus columbi*) molar (G), a Woodland Muskox (*Bootherium bombifrons*) molar (H), a White-Tailed Deer (*Odocoileus virginianus*) antler pedicle-beam (I) and mandible (J), a Bison (*Bison* sp.) molar (K), a Horse (*Equus* sp.) molar (L), a Dire Wolf (*Canis dirus*) carnassial molar (M), and an American Mastodon (Mammut americanum) molar(N) found along the shoreline at 44AC547 between 2003 and 2006.

Figure 3.317. The image shows the shoreline at 44AC547. The former back-barrier island lagoon peat is now along the coastline as a result of storm-related transgression.

Figure 3.318. In 1999, the Cedar Island U.S. Coast Guard Lifesaving Station was located 718 meters (2355 feet) from the coastline. The station is currently situated only 265 meters (870 feet) from the Atlantic ocean shoreline. At this location, the westward transgression and erosion has resulted in a loss of 453 meters (1485 feet) of land over the past decade and a half. The station maybe lost to erosion within the next decade.

Figure 3.319. The satellite image defines the boundary and the longitude and latitude locational data for 44AC547.

242). Parramore Island Shipwreck – 44AC0139

The site (see Figure 3.322) was recorded by Mark Wittkofski in 1980 as the location of the vessel ESK. The vessel was built in 1886, sank in 1888, and washed up on the beach at Parramore Island about 1900. The coastal area of Parramore Island was examined in 1999 and the wreck was not located. As a result of the recent survey, the coastline of Parramore Island was examined on 6-14-2015 and the wreck could not be located (see Figure 3.320).

After a series of storms in the fall of 2015, the shoreline was scoured and the wreck was exposed. Dr. John Broadwater reported on 11-12-2015 that the wreck “is no longer buried and has broken into pieces”. A photograph of the wreck (see Figure 3.321) clearly shows the hull and ribs related as two fragments. More importantly, the comparison between the 6-14-2015 shoreline and the 11-12-2015 shoreline, illustrates the dynamic nature and the seasonal variation of the coastal barrier island systems relative to coastal archaeological resources. Archaeological features can be buried and exposed over a short period of time.

An overlay of satellite images spanning the past 15 years indicates that the shoreline associated with the wreck area has transgressed westward or receded ~210 meters (~689 feet).

Figure 3.320. The image shows the shoreline associated with 44AC139 on 6-14-2015.

Figure 3.321. The image shows the shoreline associated with 44AC139 on 11-12-2015. The photograph was provided by Dr. John Broadwater.

Figure 3.322. The satellite image defines the boundary and the longitude and latitude locational data for 44AC139.

243). Hog Island Shell Pile – 44NH0056

The site (see Figure 3.323) was recorded by Mark Wittkofski in 1980 as the location of a possible undisturbed prehistoric shell mound. However, Wittkofski did not visit the site. He recorded the site based on the fact that Barry Truitt has seen the piles of shell from an airplane at this location. The location is situated inland from the shoreline. However, the plotted site boundary correlates with a former overwash feature and a former inlet drain. As such, the shell at this location was deposited by a prior storm event or the result of previous short-term inlet characteristic of tide-dominated barrier island systems like Hog Island. As such, 44NH56 is not a cultural feature or archaeological site.

An overlay of satellite images spanning the past 15 years indicates that the shoreline situated east of the site has transgressed westward or receded ~53 meters (~174 feet).

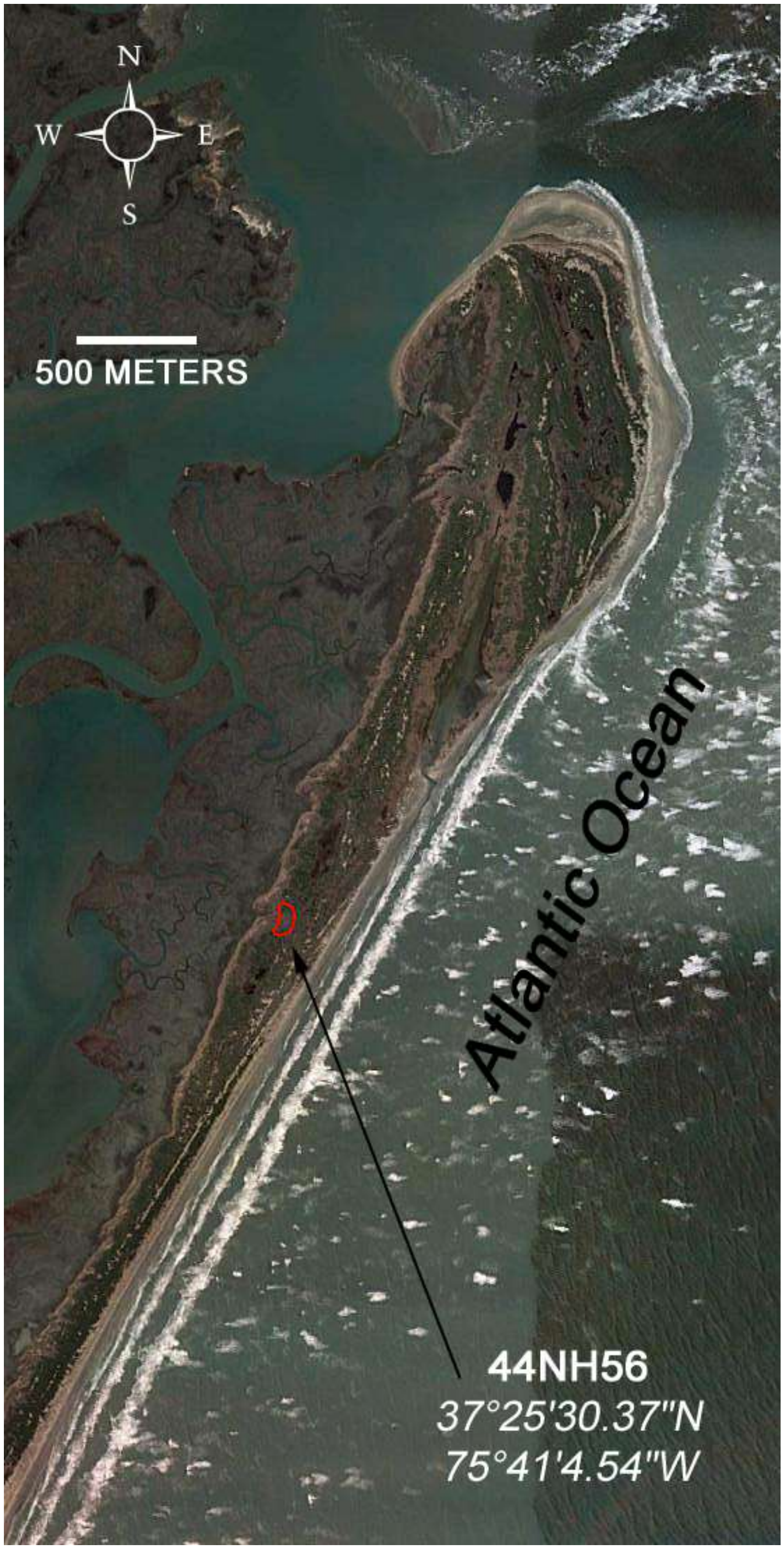

Figure 3.323. The satellite image defines the boundary and the longitude and latitude locational data for 44AC139.

4. SUMMARY AND CONCLUSIONS

Shoreline erosion is a complicated natural process. Erosion rates and the magnitude of land loss are impacted by a multitude of interrelated variables. One of the variables is fetch. Fetch is the distance that wind travels across water. One can assume that with a greater fetch the associated shoreline will erode at a higher rate; relative to those shorelines with smaller fetch distances. This is not always the case and can be illustrated by several archaeological sites assessed during the recent shoreline survey.

Both 44AC404 (see Figure 3.310) and 44AC547 (see Figure 3.319) are situated along Accomack County's Atlantic coastline. The fetch distances for both sites are essentially the same or >3,500 miles. If fetch is indeed the underlying driving force of erosion, one would assume that both sites have eroded at comparable rates over the past 15 years. The shoreline at 44AC404 is stable and unchanged over the past decade and a-half. Meanwhile, the shoreline at 44AC547 has eroded or transgressed westward between 304 and 410 meters or 998 to 1345 feet over the same duration of time. The observation at both sites would suggest that another underlying principle is influencing erosion rates at coastal archaeological sites.

Two distinct barrier island types occur along the Atlantic coastline of Virginia (see Oertel and Kraft 1994). Assateague Island; a wave-dominated barrier island, extends from the Maryland-Virginia border southward towards Tom's Cove at the southern end of the island. 44AC404 is associated with this wave-dominated barrier island. Wave-dominated barrier islands are a byproduct of excess sediment. As such, numerous inlets do not develop along a wave dominated barrier island and littoral sediment movement is the primary means of coastal sediment replenishment.

From Wallops Island south towards Fisherman's Island, the islands along Virginia's coast can be classified as a "tide-dominated" barrier island system. Unlike Assateague Island, these islands are largely deprived of regular inputs of littoral sediment and could be classified as being "sediment starved". As such, numerous inlets occur within tide-dominated barrier island chains and the diurnal movements of tides are the primary means of coastal sediment movement and relocation. 44AC547 is situated immediately south of an inlet along the coastline of Cedar Island; a tide-dominated barrier island.

With respect to the variable erosion rates observed at both 44AC404 and 44AC547, the geology of the island landform; not fetch, is the primary factor impacting shoreline erosion and associated land loss. Both 44AC404 and 44AC547 are associated with sand dominated landforms. With this in mind, other variables such as the parent sediment type and particle size can greatly impact or influence rates of shoreline erosion. The 551 meters or 1807 feet of land loss on the northern end of Watt's Island at 44AC214 (see Figure 3.17) is a perfect example. The linear upland ridge once associated with 44AC214 consisted of silt-loam (see Figure 3.6), which represents accumulated late Pleistocene-age loess (Lowery et. al. 2010). When in place, these weathered silt deposits are very resistant to wave and tidal activity. However, once the silt particles are dislodged from the parent formation, these small particles become emulsified and form a slurry. As a slurry, the silt, loam, and clay particles will become suspended within the water column and dispersed by tidal and wave actions. The movement of suspended silt particles by tidal action can easily be observed in the satellite images of Taylors and James Island along the central portion of the Chesapeake Bay in Maryland (see Figure 4.0).

The bathymetry and/or water depth adjacent to any given shoreline are influenced by the sizes of the associated shoreline particles. For example, eroded silt, loam, and clay are held in suspension and transported great distances away from the parent shoreline (see Figure 4.0). As a result, the sub-bottom areas adjacent to shorelines with silt-based geology are deeper than those areas with sand-based geology. The sub-aqueous regions adjacent to Taylors, James, and Watts islands are very deep (see Figure 3.7 and 4.0, bottom). The marked depth associated with these silt-based shorelines influence the overall power of wave and tide erosion. In areas with a greater nearshore depth, wave energy is not dissipated and the full-force of the wave is imparted onto the eroded bank face. As a result, the cohesive-bonds of these highly weathered silt particles are easily broken up and tidal actions can transport the silts away from the parent shoreline source area. Thus, shorelines with silt-based geology typically have greater nearshore bathymetry.

Shorelines with sand-based parent geology eroded markedly different. Unlike silt, sand contains no weatherable minerals. As a result, it takes a longer period of time to develop erosive resistant soil structure in geologically sandy areas. In sum, shorelines with sand-based geology eroded quickly. However, wave and tidal processes cannot hold eroded sand particles in suspension for any great duration of time. Therefore, eroded sand particles will not move great distances away from the parent shoreline. The resultant outcome can easily be seen at 44NH434 (see Figure 3.290). The sand collects offshore and forms sand bars. The sand bars act as natural breakwaters and dissipate wave energy before hitting the shoreline. Under these conditions, fetch-related erosive processes are largely alleviated.

To illustrate these processes in action, 44NH434 and 44AC214 represent excellent comparative examples. When the wind is out of the north-northwest, the fetch distance at 44NH434 is a staggering 112 miles. Under the same parameters, the fetch distance at 44AC214 on Watts Island was roughly 12 miles. If fetch were the primary driving force behind erosion, we would predict that the shoreline associated with 44NH434 would be more heavily eroded than the shoreline once associated with 44AC214. However, this is not the case. Over the past 160 years, the shoreline associated with 44NH434 is relatively stable. The same cannot be said for the Watts Island (see Figure 3.6). Out of context, the images (see Figure 3.207 and 3.208) showing the shoreline at 44NH434 are somewhat deceptive. The upland forest area on the sand dunes at 44NH434 can be impacted storm surge erosion and fall into bay. The archeological resources at 44NH434 are not within the sand dune they are beneath it. Analysis of the shoreline and the satellite imagery associated with 44NH434 suggests that it has been stable over the past 15 years. The images shown in Figure 4.1 prove the overall stability of the shoreline at 44NH434. In 2012, test excavations (see Figure 3.205) were conducted within the midden at 44NH434. The test units were situated along the midden/bank edge. After nearly 3 years, the slightly rounded edges of these units could still be seen (see Figure 4.1). In sum, the sand geology at 44NH434 stems the shoreline erosion, which stands in stark contrast to the situation witnessed at 44AC512.

Figure 4.0. The images illustrate the movement of silt-loam particles as a result of tidal action. The southward movement of silt particles at ebb tide can be seen in the 5-29-2010 dated image (upper right). The eastward movement silt particles at flood tide can easily be seen in the 10-19-2013 dated image (upper left). Even at ground level, the eastward movement of silt particles during flood tide can be observed (bottom).

Figure 4.1. The images illustrate the stability of the shoreline at 44NH434. The test units established along the shoreline in 2012 (top left) are still largely intact after nearly three years (bottom left and right).

Based on the discussions presented above, we can add the geologic landform, the geologic history, the bathymetry, and the parent geologic particle size to the list of interrelated variables, which influence shoreline erosion. Variability in the parent geology along a given shoreline can also influence rates of erosion and associated archeological site loss. Tidal marsh is much more resistant to erosion than exposed upland (see Hunter 1914). In areas where upland is surrounded by tidal marsh, the upland section of the shoreline is usually much more concave or recessed than the surrounding marsh. Under these conditions it is unfortunate because the upland portion frequently contains much of the archaeological record. Differential tidal marsh/upland erosion rates can be observed at 44AC493 (see Figure 4.2). By comparing the resultant dimensions and shape of the shoreline defined for 44AC493 (see Figure 4.2), another variable impacting erosion rates should be obvious (i.e., shoreline geometry).

The shoreline geometry at 44AC493 is fairly complex. Note that some areas associated with 44AC493 are accreting fine sediment, whereas other areas are being scoured. As the result of seasonal or even daily weather patterns, the erosion and accretion along any given shoreline is always in flux. Some shorelines accrete sediment during a portion of the year and become scoured when weather patterns and intensity change. The changing conditions observed along the shoreline at 44AC139 during the early summer (see Figure 3.320) relative to the winter (see Figure 3.321) represent an excellent example of this process. The shoreline geometry with respect to wave energy influences erosion and accretion along a shoreline. During any given storm or normal weather-related pressure system movement, the wind direction and intensity will change. During these weather events, the shoreline becomes the obstruction of trending wave activity and direction (see Figure 4.3 A). Even during the most intense storm, an archaeological site along a shoreline can be heavily eroded in one area and protected and accreting sediment along another stretch of shoreline.   Since the coastal plain consists of unconsolidated sediments, the caveat relates to the fact that the geometry of any given shoreline is always changing because of cyclical changes in erosion and accretion, as well as the geological variability of a given landscape (see Figure 4.3 B).

There are biological conditions that can impact shoreline erosion rates. For example, sub-aquatic vegetation can calm and dissipate wave energy (see Figure 4.4). Prior to the 1960's, sub-aquatic vegetation (i.e., SAV) occurred throughout the Chesapeake Bay watershed. Interestingly, as the SAV disappeared the rates of shoreline erosion increased along many tributaries of the bay. Several "old time" residents of Hooper Island in Dorchester County, Maryland stated that "*it wasn't until the SAV disappeared that we began to find prehistoric artifacts along the shorelines*". The interrelated variables mentioned above represent the most prevalent or dominant factors influencing rates of shoreline erosion. However, there are others and many of these have been described in detail by Lowery (2008) in previous publications.

There are three types of erosion defined in Table 4.1. These types include tide-related erosion, fetch-related erosion, and boat wake-related erosion. Tide-related erosion is most prevalent at archaeological sites adjacent to narrow and deep tidal channels. Because of the diurnal movements of tides, the channels can become scoured and meander over time. The impacts of long-term tide-related erosion can be easily seen at 44NH466 (see Figure 3.283). Fetch-related erosion has been thoroughly defined above and fetch seems to be the dominant erosive process impacting the bulk of the archaeological sites along Virginia's coastline. Boat wake-related erosion impacts those archaeological sites situated near marinas and navigational channels. The final erosive process, which can impact virtually every coastal archaeological site, largely depends on seasonal weather conditions. During the winter months, the shallow areas adjacent to the shoreline can freeze. The formation of ice along any given shoreline can greatly intensify the amount of erosion (see Figure 4.5). As such, ice-related erosion could be added to the list in Table 4.1; however, its impact on any given archaeological site depends largely on a salinity, temperature, and weather conditions.

Table 4.1 synthesizes the erosion rates observed at all 243 coastal sites in Accomack and Northampton counties over a fifteen-year interval. The table correlates with the archaeological sites described in section three of this monograph. Prior to the survey, 198 archaeological sites were situated on or adjacent to the Chesapeake Bay or Atlantic coastlines of Accomack and Northampton counties. The most recent survey added an additional 45 newly recorded sites for both counties; 30 in Accomack and 15 in Northampton. Of the newly recorded sites in Accomack County, 28 are situated along the Chesapeake Bay or west side of the peninsula and the remainder are located along the Atlantic or east side of the peninsula. Of the newly recorded sites in Northampton County, only 2 are situated along the Chesapeake Bay and the remaining 13 new sites are within the Atlantic watershed. Virtually all of the newly recorded sites were either situated inland from the shoreline or encapsulated by coastal sediment in 1999 and in 2001 during the earlier coastal surveys of the area (see Lowery 2001 and 2003a). In sum, the data clearly show that erosion is an ongoing process and does not stop after an archaeological shoreline survey has been completed.

Of the 198 coastal archaeological sites previously on file with the Virginia Department of Historic Resources, 35 have been completely destroyed by erosion over the past fifteen or more years. Many of the sites lost to erosion are on or within publically-held properties. Of the 35 archaeological sites destroyed by erosion, 24 are located in Accomack County and 6 are situated in Northampton County. Of the losses, 22 of the completely eroded sites are within the Chesapeake Bay watershed and 14 of these are within Accomack County.

Table 4.1 lists both a maximum and a minimum measure of land loss over a fifteen-year period for each coastal archaeological site. With these data, we can document that 24 (~10%) of the 243 coastal sites are essentially stable and non-erosive. Even with these stable or non-erosive sites include in the measured sample, the average annual erosion for all the coastal sites in both Accomack and Northampton counties is 1.92 meters or 6.3 feet per year.

The data presented in Table 4.1 can also help focus on those areas within both counties that have the highest rates of erosion and those areas with the least erosion. As a region, the archaeological sites situated in far northwest Accomack County, which are associated with Smith Island, Tangier Island, Great Fox Island, and Watts Island, show the highest annual erosion rates. Collectively, the 14 sites located in far northwestern Accomack County have a ~10-meters or ~32-feet annual erosion rate. The region with the least amount of erosion is associated with both Pitts and Bullbeggar Creeks in far northeastern Accomack County. The 11 sites documented along these two creeks have an annual erosion rate of ~4.5-centimeters or <2-inches per year.

The 103 archaeological sites located along the shorelines and tributaries of the Chesapeake Bay in Accomack County collectively have a ~1.2-meter or ~4-feet annual erosion rate. The 44 archaeological sites located along the shorelines and tributaries of the Chesapeake Bay in Northampton County have revealed a similar annual erosion rate. The Northampton sites have a ~1.1-meters or ~3.6-feet per year erosion rate.

The 71 archaeological sites along the Atlantic Ocean side of the peninsula are associated with two distinct regions. Not surprisingly, the coastal sites associated with the barrier island lagoons and lagoon tributaries show markedly different rates of erosion than those situated directly on the ocean. Only 13 archaeological sites are directly affiliated with the Atlantic Ocean and 12 of these are situated in Accomack County. The archaeological sites located on the Atlantic Ocean have an annual erosion rate of ~8.1-meters or ~26.5-feet per year. In contrast, the average annual erosion rate for all 58 coastal barrier island lagoon sites within both Accomack and Northampton counties is ~.78 meters or ~2.6 feet per year. At ~.72 meters or ~2.4 feet per year, the 49 Northampton lagoon-oriented sites show lower annual rates of erosion when compared with the 9 comparable sites in Accomack County. The fact that 6 (25%) of the 24 stable or non-erosive are located within the Northampton barrier island lagoon sector greatly reduced the perceived annual rates of erosion for this portion of the study area. The 9 lagoon-oriented sites in Accomack County have an erosion rate of ~1.13-meters or ~3.7-feet per year.

Given the numerical erosion rate data presented above and the site specific losses outlined in Table 4.1, the casual observer might think the information would help managers prioritize where to focus archaeological salvage efforts. One would surmise that archaeological sites located in those areas showing the greatest degree of erosion, such as northwest Accomack County and the Atlantic coast, should receive the most funding efforts. However, the sites in these two areas may not be the most significant. More importantly, one could easily argue that the most significant archaeological sites and features were destroyed decades or centuries ago in these two heavily eroded areas.

Counterintuitively, the most significant sites and features are generally found in those areas subjected to the least amount of erosion. For example, 44NH434 is currently associated with a stable and non-erosive coastline (see Figures 3.207 and 3.208). Given the steep bank profile edge and the condition of the exposed midden feature at 44NH434 (see Figure 3.205), we can conclude that the archaeological site was eroded at one time in the past or during various short-term intervals throughout the past. Given the data presented in Table 4.1, 44NH434 would seem to be a low priority site for targeted funding relative to threats from erosion. The site was reanalyzed and testing in 2011 and 2012. The outcome of this research indicated that 44NH434 has one of the earliest shell-filled refuse features within the entire Chesapeake Bay region (see Rick et al. 2015). The refuse provided a rare glimpse into coastal diets circa 2,800 to 3,000 years ago. Notably, the shell-tempered ceramic fragments found within the midden are the oldest shell-tempered wares in the New World (see Rick and Lowery 2013). As such, cultural resource managers should define whether priority funding strategies should focus on the most threatened coastal sites or the coastal sites with the most significant archaeological data.

As outlined above, the majority of the archaeological sites lost to erosion over the past fifteen years are within publically-held Federal and State properties. Over the past decade or more, the Virginia Department of Historic Resources has funded investigations at several coastal sites on properties managed by Upland Game and Fisheries. These projects have produced significant archaeological information about the prehistoric cultures of the region (see Lowery 2003a, 2004, and 2007, Lowery and Stanford 2013, and Stanford et al. *In Press*). Even though the funding has been limited, Virginia's Threatened Sites Program has initiated a process to investigate eroding archaeological sites under the management of the state.

A similar threatened site program has not been implemented or initiated by Federal agencies that have lands within the confines of Accomack and Northampton counties. The erosion that has (see Figure 3.17) and continues to occur (see Figures 3.14 and 3.15) at Watts Island represents a prime example of a Federal property containing neglected archaeological resources. Notably, signs are placed around the margins of Watts Island to deter public access as measure to protect biologically-significant shorebird nesting areas (see Figure 4.6 A). The refuge signs around Watts have to be replaced each year because the posts erode out of place and onto the shoreline (see Figure 4.6 B). Given the observed erosion rates for the sites at Watts Island (see Table 4.1 and Figure 3.17), the entire island should disappear over the next decade or by 2025. In sum, the biologically-significant shorebird nesting areas, as well as the archaeological sites located on Watts Island will both be destroyed by erosion. Unlike bird nesting areas, the archaeological sites at Watts Island are a non-renewable resource.

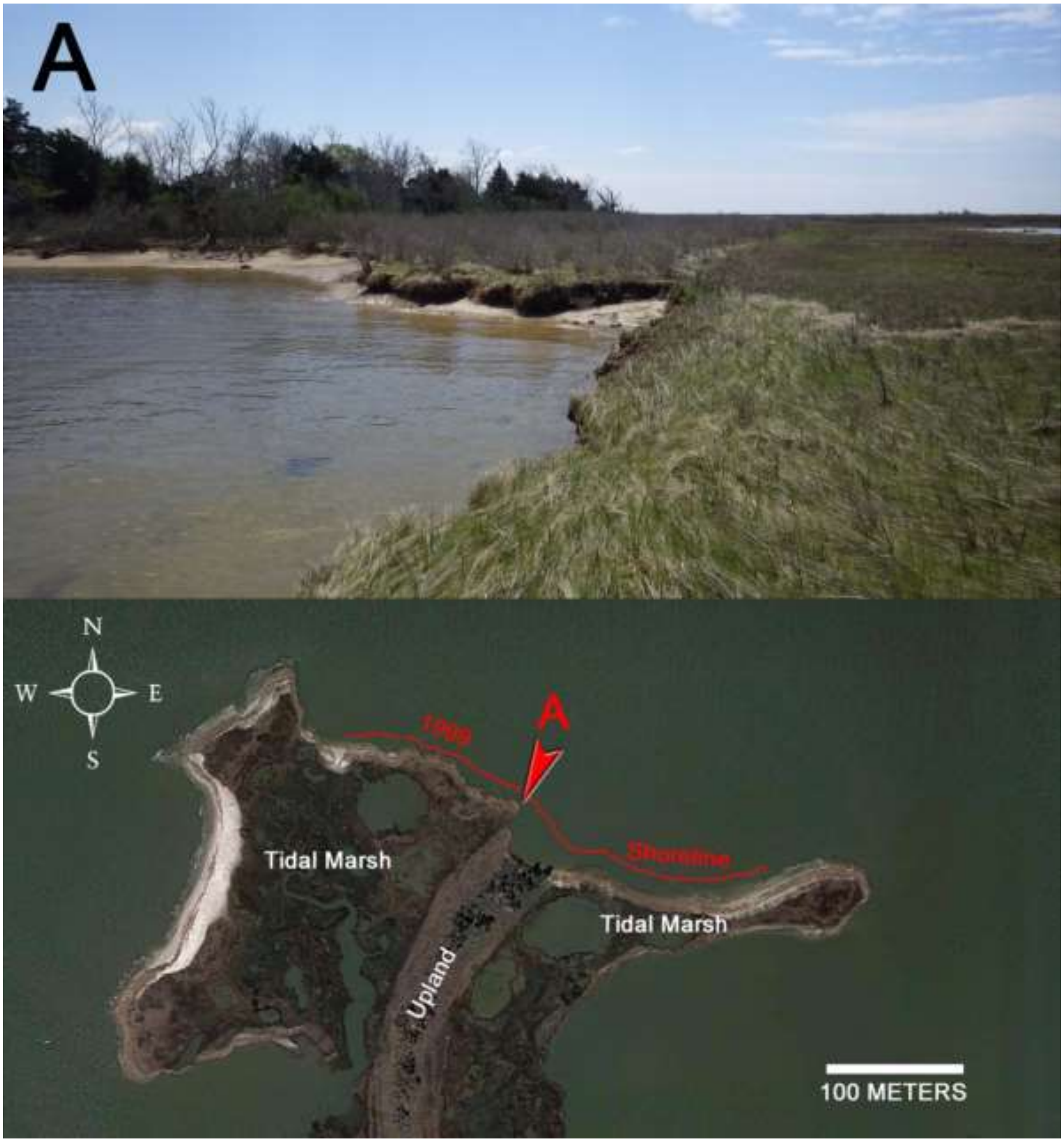

Figure 4.2. The images illustrate how the variability in parent geology at 44AC493 has influenced the rates of shoreline erosion. Over the past 15 years, the amount of erosion along this stretch of shoreline varies between ~38 meters (~124 feet) along the exposed upland portion of the site and ~9 meters (~29 feet) within the tidal marsh area along the western fringes of the site (bottom). Note that the upland portion of the site is more concave or recessed than the adjacent marsh (top).

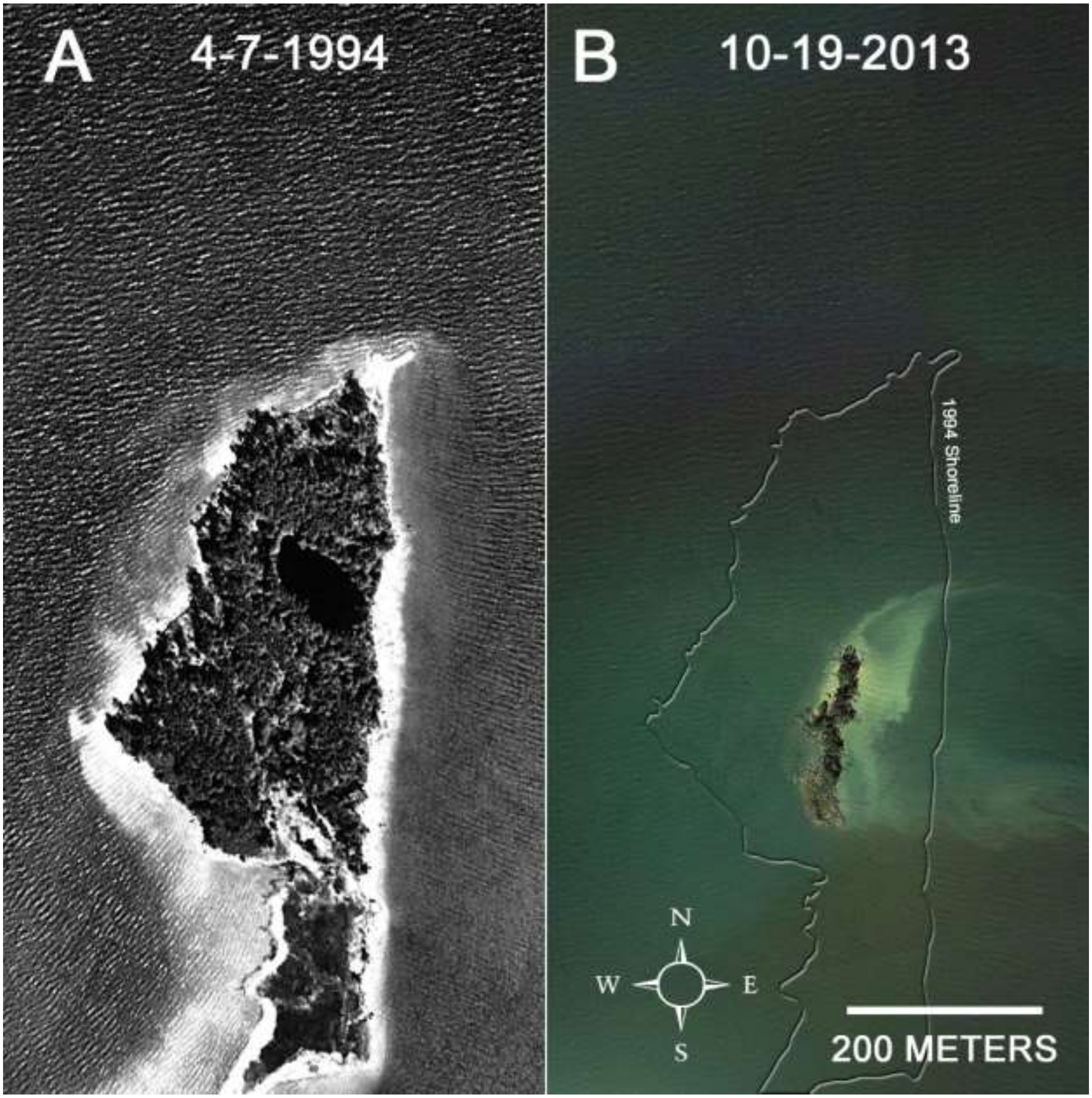

Figure 4.3. The aerial image (A) shows the northern end of James Island in Maryland during a period of northwesterly winds. Note that the wave crests impacting the northern end of the island are roughly parallel to the shoreline. Note along the west side of the island, how the axis of the wave crests are effected by the shape of the shoreline. Finally, note along the east side of the island how the axis of the wave crests change along the length of the island. With respect to the prevailing seasonal wind directions, the aerial image clearly shows how the shoreline geometry in tandem with wave energy can influence rates of shoreline erosion or recession. Nineteen years later (B), the positon of the remnant island landscape relative to the former 1994 shoreline is a byproduct of the prevailing seasonal wind directions, the parent geology, and the ever changing shoreline geometry.

Figure 4.4. The image shows a broad area within the Honga River watershed of Dorchester County, Maryland. Note that the flat or calm areas (arrow) within the small waves ripples. The calm or flat areas in the photo are associated with portions of the bottom containing sub-aquatic vegetation (inset).

#:	TABLE 4.1. SITE EROSION SYNTHESIS NAME and STATE NUMBER:	MAX. 15-Year EROSION:			MIN. 15-Year EROSION:			ERO. TYPE T	F	B
1	Hog Neck - 44AC653*	≤	282	m	≥	146	m		X	
2	South Smith Island - 44AC651*	~	402	m	~	402	m		X	
3	Goose Harbor - 44AC652*	≤	66	m	≥	24	m		X	
4	NW Tangier Island – 44AC524	≤	143	m	≥	43	m		X	
5	Tangier Uppers Cemetery – 44AC571	≤	135	m	≥	108	m		X	
6	Fort Albion – 44AC574**	~	113	m	~	113	m		X	
7	Horse Hammock – 44AC6**	≤	139	m	≥	73	m		X	
8	Great Fox Island - 44AC525**	≤	193	m	≥	125	m		X	
9	Watts Island 1 - 44AC214**	≤	551	m	≥	135	m		X	
10	North Central Watts Island - 44AC520**	≤	87	m	≥	45	m		X	
11	Watts Island 2 - 44AC522	≤	29	m	≥	24	m		X	
12	Watts Island 3 - 44AC523	≤	68	m	≥	54	m		X	
13	Watts Island 4 - 44AC521	≤	70	m	≥	32	m		X	
14	Southern Watts Island - 44AC397**	~	300	m	~	300	m		X	
15	Pitts Creek 8 - 44AC626*	≤	0.5	m	>	0	m	X		
16	Pitts Creek 7- 44AC625*	≤	0.5	m	>	0	m	X		
17	Pitts Creek 6 - 44AC624*	≤	0.5	m	>	0	m	X		
18	Pitts Creek 5 - 44AC623*	≤	0.5	m	>	0	m	X		
19	Pitts Creek 4 - 44AC622*	≤	0.5	m	>	0	m	X		
20	Pitts Creek 3 -44AC621*	≤	0.5	m	>	0	m	X		
21	Pitts Creek 2 - 44AC54	≤	0.5	m	>	0	m	X		
22	Pitts Creek 1 - 44AC620*	~	5	m	~	5	m	X	X	X
23	Bullbeggar Creek 3 - 44AC629*	≤	0.5	m	>	0	m	X		
24	Bullbeggar Creek 2 - 44AC628*	≤	0.5	m	>	0	m	X		
25	Bullbeggar Creek 1 - 44AC627*	≤	0.5	m	>	0	m	X		
26	Bullbeggar Hummock - 44AC630*	≤	55	m	≥	22	m		X	X
27	West Holdens Creek - 44AC631*	~	24	m	~	24	m		X	
28	Pig Point - 44AC530	~	21	m	~	21	m		X	
29	Pocomoke Sound 2 - 44AC632*	≤	20	m	≥	13	m		X	
30	Pocomoke Sound 1 - 44AC14	~	15	m	~	15	m		X	
31	Starling Creek - 44AC531	~	44	m	~	44	m		X	X
32	Fishing Creek - 44AC526	~	36	m	~	36	m		X	
33	Northwest Messongo Creek - 44AC633*	~	17	m	~	17	m		X	
34	Messongo Creek #1 - 44AC527	~	10	m	~	10	m		X	
35	Messongo Creek #2 - 44AC528	~	10	m	~	10	m		X	
36	South Messongo Creek - 44AC529	~	4	m	~	4	m		X	
37	Cattail Creek - 44AC639*	≤	35	m	≥	3	m		X	
38	Old Tree Island - 44AC136	~	22	m	~	22	m		X	
39	Island Field Cove - 44AC503	≤	6	m	≥	2	m		X	
40	Guilford Creek #1 - 44AC498	≤	35	m	≥	8	m		X	
41	Guilford Creek #2 - 44AC499	≤	13	m	≥	7	m		X	
42	Cals Hammock - 44AC492	~	13	m	~	13	m		X	
43	Jobes Island – 44AC505	≤	30	m	≥	5	m		X	
44	Bundicks - 44AC213	~	18	m	~	18	m		X	
45	Cedar Island – 44AC493	≤	38	m	≥	9	m		X	

TABLE 4.1. SITE EROSION SYNTHESIS (cont.)

#:	NAME and STATE NUMBER:	MAX. 15-Year EROSION:			MIN. 15-Year EROSION:			ERO. TYPE T	F	B
46	NE Halfmoon Basin – 44AC506	≤	68	m	≥	48	m		X	
47	Bernard Islands – 44AC491	≤	118	m	≥	20	m		X	
48	North Little Back Creek - 44AC641*	~	20	m	~	20	m		X	
49	Little Back Creek Hummock - 44AC640*	~	12	m	~	12	m		X	
50	East Halfmoon #1 – 44AC496	~	44	m	~	44	m		X	
51	East Halfmoon #2 – 44AC497	~	35	m	~	35	m		X	
52	Jacks Island – 44AC504	≤	44	m	≥	0	m		X	
53	Halfmoon Island – 44AC500	≤	76	m	≥	24	m		X	
54	Dix Cove – 44AC495	≤	4	m	≥	0	m		X	
55	Hunting Creek #1 – 44AC501	≤	8	m	≥	0	m		X	
56	Hunting Creek #2 – 44AC502	≤	2	m	≥	0	m		X	
57	Deep Creek NW Harbor - 44AC494	≤	0.1	m	~	0	m		X	X
58	Deep Creek #1 - 44AC489	~	25	m	~	25	m		X	
59	Deep Creek #2 - 44AC490	≤	14	m	≥	10	m		X	
60	Chesconessex Creek Hummock - 44AC642*	~	16	m	~	16	m		X	X
61	South Chesconessex Marsh - 44AC643*	~	15	m	~	15	m		X	X
62	Back Creek #1 - 44AC460	~	18	m	~	18	m		X	
63	Back Creek #2 - 44AC461	≤	12	m	≥	1.5	m		X	
64	Back Creek #5 - 44AC464	~	9	m	~	9	m		X	
65	Back Creek #4 - 44AC463	≤	11	m	≥	4	m		X	
66	Back Creek #3 - 44AC462	≤	13	m	≥	5	m		X	
67	Back Creek #6 - 44AC465	~	5	m	~	5	m		X	
68	Sound Beach #1 - 44AC484**	~	51	m	~	51	m		X	
69	Sound Beach #2 – 44AC485	≤	142	m	≥	30	m		X	
70	Sound Beach #3 - 44AC486**	~	72	m	~	72	m		X	
71	Ware Point - 44AC162	≤	80	m	≥	47	m		X	
72	Low Onancock Ridge - 44AC644*	~	14	m	~	14	m		X	
73	Onancock Creek Hummock #1 - 44AC645*	~	14	m	~	14	m		X	
74	Onancock Creek Hummock #2 - 44AC646*	~	13	m	~	13	m		X	
75	West Onancock Marsh - 44AC647*	~	13	m	~	13	m		X	
76	North Thicket Point - 44AC648*	~	13	m	~	13	m		X	
77	South Thicket Point - 44AC487	~	28	m	~	28	m		X	
78	Pungoteague Creek #9 – 44AC483	~	14	m	~	14	m		X	
79	Pungoteague Creek #8 – 44AC161	~	8	m	~	8	m		X	
80	Belote – 44AC160	≤	0.5	m	≥	0	m		X	
81	Pungoteague Creek #1 – 44AC477	~	21	m	~	21	m		X	
82	Pungoteague Creek #2 – 44AC478	≤	28	m	≥	18	m		X	
83	Pungoteague Creek #3 - 44AC479	≤	22	m	≥	11	m		X	
84	Pungoteague Creek #4 - 44AC480	~	21	m	~	21	m		X	
85	Pungoteague Creek #5 - 44AC481	~	43	m	~	43	m		X	
86	Pungoteague Creek #6 - 44AC482	~	43	m	~	43	m		X	
87	Pungoteague Creek #7 - 44AC537	~	32	m	~	32	m		X	
88	Butcher's Creek Marsh – 44AC655*	~	5	m	~	5	m		X	
89	Butcher Creek #1 - 44AC466	≤	22	m	≥	7	m		X	
90	Butcher Creek #2 – 44AC467	≤	20	m	≥	5	m		X	

TABLE 4.1. SITE EROSION SYNTHESIS (cont.)		MAX. 15-Year			MIN. 15-Year			ERO. TYPE		
#:	NAME and STATE NUMBER:	EROSION:			EROSION:			T	F	B
91	Butcher Creek #3 - 44AC468	≤	7	m	≥	0	m		X	
92	Butcher Creek #4 - 44AC469	~	4	m	~	4	m		X	
93	Butcher Creek #5 - 44AC470	~	5	m	~	5	m		X	
94	Butcher Creek #6 - 44AC471	≤	14	m	≥	4	m		X	
95	Butcher Creek #7 - 44AC472	~	8	m	~	8	m		X	
96	Butcher Creek #8 - 44AC473	≤	13	m	≥	3	m		X	
97	South Butcher Creek – 44AC152	~	36	m	~	36	m		X	
98	Nandua Creek #4 – 44AC535	~	26	m	~	26	m		X	
99	Nandua Creek #1 - 44AC532	≤	13	m	≥	4	m		X	
100	Nandua Creek #2 - 44AC533	≤	10	m	≥	3.5	m		X	
101	Nandua Creek #3 - 44AC534	≤	13	m	≥	2	m		X	
102	Nandua Creek #5 – 44AC536	~	26	m	~	26	m		X	
103	Nandua Creek #6 – 44AC511	≤	33	m	≥	28	m		X	
104	Interior Nandua #1 – 44AC474	≤	19	m	≥	5	m		X	
105	Interior Nandua #2 - 44AC475	≤	12	m	≥	4	m		X	
106	Interior Nandua #3 – 44AC476	≤	7	m	≥	4	m		X	
107	Interior Nandua #4 – 44AC488	≤	2	m	~	0	m		X	
108	Nandua South #4 – 44AC52	~	11	m	~	11	m		X	
109	Nandua South #5 – 44AC515	~	12	m	~	12	m		X	
110	Nandua South #6 – 44AC516	≤	27	m	≥	4	m		X	
111	Nandua South #7 – 44AC517	≤	18	m	≥	5	m		X	
112	Nandua South #8 – 44AC518	≤	18	m	≥	8	m		X	
113	Nandua South #3 – 44AC514	≤	20	m	≥	5	m		X	
114	Nandua South #2 – 44AC513	~	12	m	~	12	m		X	
115	Nandua South – 44AC512	≤	23	m	≥	20	m		X	
116	Hyslop Marsh – 44AC510	≤	20	m	≥	10	m		X	
117	Craddock Creek #1 – 44AC507	~	10	m	~	10	m		X	
118	Craddock Creek #2 – 44AC508	~	23	m	~	23	m		X	
119	Craddock Creek #3 - 44AC509	~	21	m	~	21	m		X	
120	Craddock Neck #4 - 44AC51	≤	10	m	~	0	m		X	
121	Craddock Neck #3 - 44AC50**	≤	8	m	~	0	m		X	
122	Craddock Neck #2 - 44AC49**	~	6	m	~	6	m		X	
123	Craddock Neck #1 - 44AC48**	~	25	m	~	25	m		X	
124	Ortley - 44AC355**	~	6	m	~	6	m		X	
125	Occohannock Creek #3 - 44AC356**	~	29	m	~	29	m		X	
126	Kellam - 44AC357**	≤	13	m	~	0	m		X	X
127	Occohannock Creek #10 - 44AC519	~	0	m	~	0	m		X	X
128	Melson – 44AC393	~	0	m	~	0	m		X	X
129	Occohannock Midden - 44NH194	~	0	m	~	0	m		X	X
130	Occohannock Creek #1 - 44NH192 / 44NH44	~	8	m	~	8	m		X	X
131	Occohannock Creek #2 – 44NH420	~	0	m	~	0	m		X	X
132	Occohannock Creek #9 - 44NH423	≤	7	m	≥	2.5	m		X	
133	Occohannock Creek #7 – 44NH422	≤	23	m	~	0	m		X	
134	Occohannock Creek #8 – 44NH43**	~	109	m	~	109	m		X	
135	Occohannock Creek #6 – 44NH421	~	11	m	~	11	m		X	

TABLE 4.1. SITE EROSION SYNTHESIS (cont.)

#:	NAME and STATE NUMBER:	MAX. 15-Year EROSION:			MIN. 15-Year EROSION:			ERO. TYPE T	F	B
136	Occohannock Creek #4 – 44NH3**	≤	78	m	≥	55	m		X	
137	Occohannock Creek #5 – 44NH65	≤	14	m	≥	13	m		X	
138	Occohannock Neck #2 – 44NH425	≤	10	m	≥	8	m		X	
139	Sturgis Dwelling Area – 44NH64	~	0	m	~	0	m		X	
140	Occohannock Neck #1 – 44NH424	≤	30	m	≥	26	m		X	
141	Hurricane Hotel - 44NH181**	≤	30	m	≥	20	m		X	
142	Peaceful Beach Campground – 44NH179**	~	0	m	~	0	m		X	
143	Silver Beach – 44NH63	~	0	m	~	0	m		X	
144	Fincin – 44NH167**	≤	23	m	≥	18	m		X	
145	Nassawadox Creek #6 - 44NH432	≤	9	m	≥	6	m		X	
146	Nassawadox Creek #1 – 44NH428	~	0	m	~	0	m		X	
147	Nassawadox Creek #2 – 44NH429	≤	58	m	≥	52	m		X	
148	Nassawadox Residence - 44NH158	≤	30	m	≥	21	m		X	
149	Original Glebe – 44NH42	~	0	m	~	0	m		X	
150	Nassawadox Creek #3 – 44NH430	~	1	m	~	1	m		X	
151	North Church Neck Wells – 44NH60	~	1	m	~	1	m		X	
152	Church Neck Wells – 44NH8	≤	3	m	≥	1	m		X	
153	Nassawadox Creek #4 – 44NH431	≤	18	m	≥	7.5	m		X	
154	Williams - 44NH166	~	20	m	~	20	m		X	
155	Westerhouse Creek #1 - 44NH479	≤	33	m	≥	20	m		X	
156	Floyd – 44NH116	≤	8	m	≥	0	m		X	
157	Lohr – 44NH59	~	0	m	~	0	m		X	
158	Mattawoman Creek #1 – 44NH503*	~	0	m	~	0	m		X	
159	Mattawoman/Hungars Creek – 44NH427	≤	5	m	≥	1	m		X	
160	Hungars Creek Island – 44NH426**	≤	114	m	≥	89	m		X	
161	Hungar's Neck Trash Pit - 44NH49	~	0	m	~	0	m		X	
162	North Gulf Shore – 44NH225	~	0	m	~	0	m		X	
163	Tankards Beach – 44NH222**	~	40	m	~	40	m		X	
164	Savage Neck North Midden – 44NH435	~	38	m	~	38	m		X	
165	Humphrey Locality – 44NH221	~	0	m	~	0	m		X	
166	Savage Nck S. Midden – 44NH434 (44NH478)	~	0	m	~	0	m		X	
167	South Cherrystone Creek - 44NH433	~	8	m	~	8	m		X	
168	North Old Plantation Creek – 44NH438**	≤	57	m	≥	32	m		X	
169	Butler's Bluff - 44NH436	≤	35	m	≥	10	m		X	
170	Latimer's Bluff - 44NH437	≤	15	m	≥	10	m		X	
171	Dale's Gift Well - 44NH502*	~	6	m	~	6	m		X	
172	Fisherman's Island – 44NH278	~	0	m	~	0	m	X	X	
173	Skidmore Island – 44NH458**	≤	62	m	≥	25	m	X	X	
174	Southwest Magothy Bay #1 - 44NH500*	~	20	m	~	20	m	X	X	
175	Southwest Magothy Bay #2 - 44NH501*	~	22	m	~	22	m	X	X	
176	Jones Cove – 44NH462	≤	17	m	≥	5	m	X	X	
177	South Cushman's Landing – 44NH4549	~	10	m	~	10	m	X	X	
178	Landing Shore – 44NH460	~	11	m	~	11	m	X	X	
179	Dunton Cove – 44NH461	~	12	m	~	12	m	X	X	
180	North Mockhorn Island - 44NH457**	≤	21	m	≥	16	m	X	X	

TABLE 4.1. SITE EROSION SYNTHESIS (cont.)		MAX. 15-Year EROSION:			MIN. 15-Year EROSION:			ERO. TYPE		
#:	NAME and STATE NUMBER:							T	F	B
181	North Stringer's Ditch – 44NH443	~	8	m	~	8	m	X	X	
182	South Stringer's Ditch – 44NH444	~	18	m	~	18	m	X	X	
183	Mockhorn West #2 - 44NH499*	~	26	m	~	26	m	X	X	
184	Mockhorn West #1 - 44NH498*	~	17	m	~	17	m	X	X	
185	Mockhorn Island #14 – 44NH456	~	20	m	~	20	m	X	X	
186	Mockhorn Island #7 – 44NH234**	~	28	m	~	28	m	X	X	
187	Mockhorn Tower – 44NH331	~	20	m	~	20	m	X	X	
188	Mockhorn Island #8 – 44NH233	≤	3	m	≥	2	m	X	X	
189	Mockhorn Island #6 – 44NH450	≤	1	m	>	0	m	X	X	
190	Mockhorn Island #11 – 44NH453	~	2	m	~	2	m	X	X	
191	Mockhorn Island #10 – 44NH452	≤	2	m	~	0	m	X	X	
192	Mockhorn Island #9 – 44NH451	≤	0.25	m	~	0	m	X	X	
193	Mockhorn Island #5 – 44NH449	≤	0.25	m	~	0	m	X	X	
194	Mockhorn Island #4 – 44NH448	≤	12	m	≥	8	m	X	X	
195	Mockhorn Island #3 – 44NH447	~	0	m	~	0	m	X	X	
196	Mockhorn Island #2 – 44NH446	≤	0.25	m	~	0	m	X	X	
197	Mockhorn Island #1 – 44NH445	≤	0.25	m	~	0	m	X	X	
198	North Haulover Hummock - 44NH496*	~	4	m	~	4	m	X	X	
199	Cushman Lodge Hummock - 44NH497*	~	11	m	~	11	m	X	X	
200	Mockhorn Island #12 - 44NH454	~	10	m	~	10	m	X	X	
201	Mockhorn Island #13 - 44NH455	~	18	m	~	18	m	X	X	
202	Lower Ridge – 44NH442	≤	14	m	≥	5	m	X	X	
203	Middle Ridge – 44NH441	≤	39	m	≥	10	m	X	X	
204	Upper Ridge – 44NH440	≤	15	m	≥	8	m	X	X	
205	South Bay #1 - 44NH490*	~	10.5	m	~	10.5	m	X	X	
206	South Bay #2 - 44NH491*	~	23	m	~	23	m	X	X	
207	South Bay #3 - 44NH492*	~	18	m	~	18	m	X	X	
208	South Bay #4 - 44NH493*	~	19	m	~	19	m	X	X	
209	South Bay #5 - 44NH494*	~	14	m	~	14	m	X	X	
210	South Bay #6 - 44NH495*	~	21	m	~	21	m	X	X	
211	Fowling Point Ridge - 44NH471	~	8	m	~	8	m	X		
212	South Bog Gut Ridge - 44NH467	≤	8	m	≥	7	m	X		
213	Castle Ridge #2 - 44NH469	~	3	m	~	3	m	X		
214	Bog Gut Ridge – 44NH466	≤	4	m	≥	3	m	X		
215	Red Bank Creek - 44NH465	~	4.5	m	~	4.5	m	X		
216	South Hammock - 44NH464	~	0	m	~	0	m	X		
217	The Hammocks #1 - 44NH53	~	0	m	~	0	m	X		
218	North Hammock - 44NH54	~	10	m	~	10	m	X		
219	Ramshorn Channel Lodge – 44NH505*	~	0	m	~	0	m	X		
220	Sandy Point - 44NH463	~	0	m	~	0	m	X	X	
221	Parting Creek Ridge - 44NH472	~	0	m	~	0	m	X		X
222	Upshur Neck Terminus - 44AC649*	~	20	m	~	20	m	X	X	
223	Upshur Bay Landing - 44AC548	~	12	m	~	12	m		X	
224	Burton's Shore - 44AC543	≤	22	m	≥	16	m		X	
225	Mosquito Creek - 44AC546	≤	9	m	≥	4	m	X		X

TABLE 4.1. SITE EROSION SYNTHESIS (cont.)		MAX. 15-Year			MIN. 15-Year			ERO. TYPE		
#:	NAME and STATE NUMBER:	EROSION:			EROSION:			T	F	B
226	Red Hill - 44AC44	≤	14	m	≥	10	m		X	
227	Sinnickson – 44AC8	~	14	m	~	14	m		X	
228	Sinnickson Landing - 44AC654*	~	19	m	~	19	m		X	
229	Captains Cove #1 - 44AC42**	~	29	m	~	29	m		X	
230	Chin B – 44AC43**	~	22	m	~	22	m		X	
231	Shipwreck #1 - 44AC404	~	0	m	~	0	m	X	X	
232	Lifesaving Boathouse #1 – 44AC409**	~	76	m	~	76	m	X	X	
233	Fish Oil & Guano Company - 44AC414**	~	174	m	~	174	m	X	X	
234	Fish Oil Plant – 44AC415**	~	17	m	~	17	m	X	X	
235	Shipwreck #2 - 44AC413	~	34	m	~	34	m	X	X	
236	North Wallops Earthworks – 44AC89	~	0	m	~	0	m	X	X	
237	South Wallops Shell Mound – 44AC159**	~	69	m	~	69	m	X	X	
238	North Assawoman Island - 44AC544**	~	65	m	~	65	m	X	X	
239	North Metompkin Island – 44AC545**	≤	453	m	≥	263	m	X	X	
240	Metompkin Island – 44AC138**	~	167	m	~	167	m	X	X	
241	North Cedar Island – 44AC547**	≤	410	m	≥	304	m	X	X	
242	Parramore Island Shipwreck – 44AC139	~	210	m	~	210	m	X	X	
243	Hog Island Shell Pile – 44NH56	~	53	m	~	53	m	X	X	

No Asterisk: Extant Archaeological Site	<	less than	T: Tide
	≤	less than or equal to	
* : Newly Recorded Archaeological Site	>	greater than	F: Fetch
	≥	greater than or equal to	
** : Site Destroyed by Erosion	~	about	B: Boat

Figure 4.5. The image shows ice-related impacts to coastal archaeological sites. Slabs of ice (top photo) have been stranded within the inter-tidal zone at low tide adjacent to an archaeological site. At high tide, the slabs of ice become floating rafts. Combined with wave action, the buoyant rafts of ice at as “battering rams” and can easily gouge and slice through large sections of the shoreline’s bank profile. Frozen spray (bottom photo) has coated the surface of an exposed shoreline containing a drowned archaeological. Freezing and thawing processes cause large blocks or fragments of the associated shoreline to become dislodged and break from the shoreline.

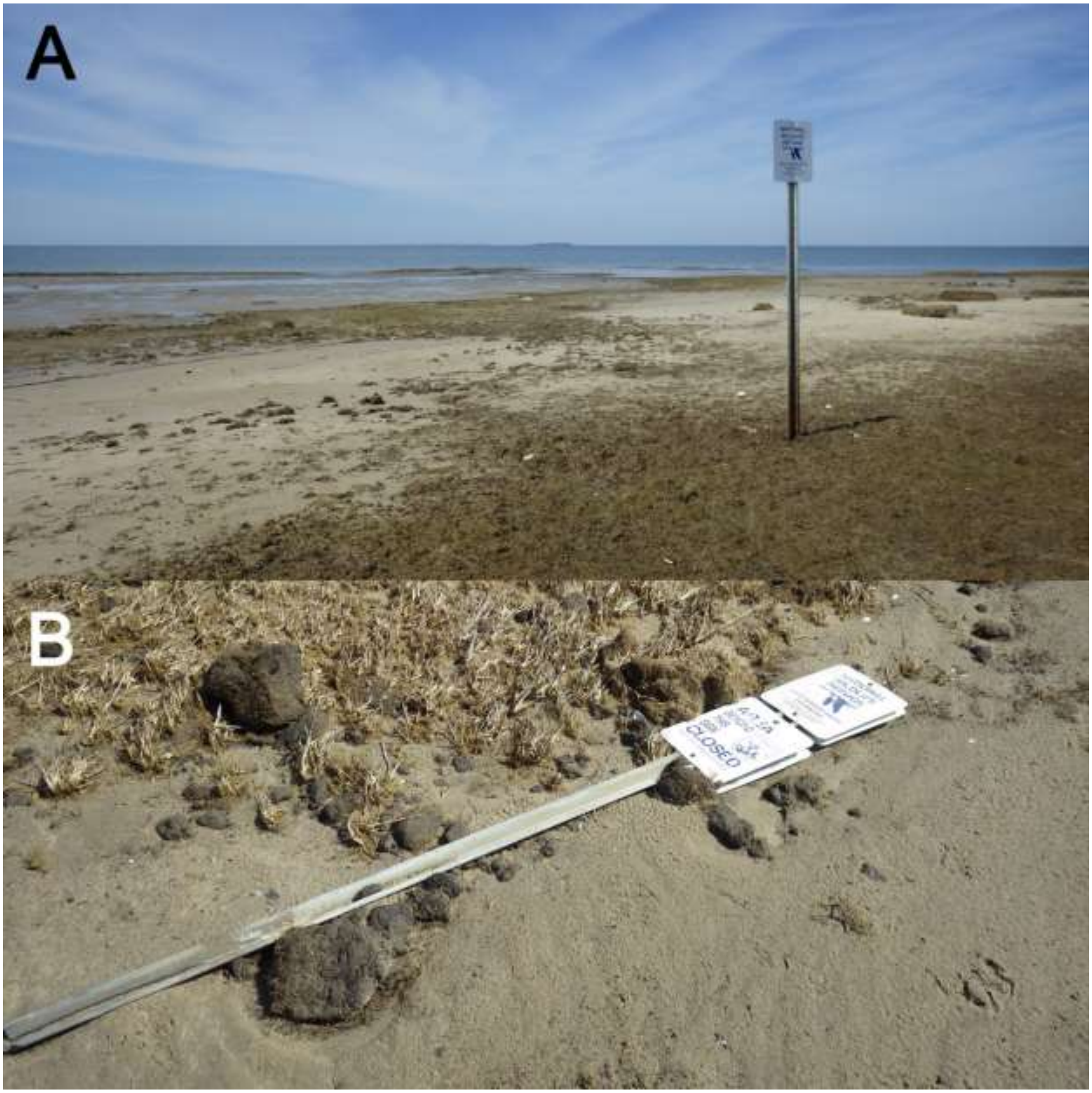

Figure 4.6. The image illustrates the rapidity of erosion at Watt's Island; a Federally-owned property. Each spring, signs are installed around the margins of the island to deter public-access (A). The area is closed because of the important biological resources and the island encompasses a significant shorebird nesting area. Like the archaeological resources at Watts Island, erosion ultimately dislodges and displaces the refuge signs (B).

SHORELINE EROSION, SEA LEVEL, AND CLIMATE:

It has been mistakenly asserted that shoreline erosion and sea level rise are directly linked. Each of these natural processes is independent of the other. Shoreline erosion can actually occur in regions where sea level is not a geologic variable (see Figures 4.7). Because wave energy is concentrated within the same narrow zone along any given shoreline (see Figures 4.7 and 4.8), erosion actually has its greatest impact when sea level is stable and unchanging. Erosion can greatly reduce the amount of upland landscape (see Figure 4.9). An adjustment in relative sea level produces a major biological-ecological habitat modification within low lying areas. Rising sea levels transform the overall dimensions of forested upland relative to the amount of tidal marsh (see Figures 4.10 and Figure 3.106).

During sea level rise episodes, inundation can overcome the negative impacts of erosion in protected coastal areas. As such, archaeological deposits can be preserved (see Figures 3.27, 3.30, 3.58, 3.70, and 3.115). Marked sea level rise events, such as Meltwater Pulse 1A, have occurred over the past 15,000 years. MWP-1A was an extreme marine transgression event, consisting of a circa 20 meter rise in global sea level over a short ~500-year period, beginning at either circa 14,600 calBP (Weaver et al. 2003) or around 14,100 calBP (Stanford et al. 2006). At these extreme rates of marine transgression or sea level rise, inundation will overcome erosion. During the duration of MWP-1A, the global oceans would have experienced ~40-centimeters or ~15-inches of sea level rise per decade. If these rates of sea level rise were to occur today, most of the coastal archaeological within both Accomack and Northampton counties would be inundated and perfectly preserved as drowned archaeological sites. Within the site summaries described in section three of this monograph, there are numerous examples of beautifully-preserved drowned archaeological sites and features. As such, extreme rates of sea level rise can be beneficial for archaeological site preservation.

A common inaccuracy is to directly link increased rates of erosion within climate change (a.k.a. global warming). As stated before, erosion depends on a multitude of interrelated variables and it is expressed on a localized geologic level. For example, the shoreline associated with 44AC404 (see Table 4.1 and Figure 3.310) has gone unchanged over the past 15 years. Meanwhile, 44AC547, which is situated along the same coastline, has lost an immense quantity of land (see Table 4.1 and Figure 3.319).

The erosion history of Sharps Island (see Figure 4.11), which was once situated at the mouth of the Choptank River in Maryland, indicates that climate change does not represent a key agent relative to shoreline erosion. In 1631, Sharps Island consisted of ~1500-acres of upland and tidal marsh. By 1672, the island had been reduced to 1,400-acres. In 1809, the island property was listed as having 700-acres of good tillable land. At the time, it was stated that "*great fields of wheat*" and "*flocks of grazing sheep*" could easily be seen on the island from the mainland. In 1846, the island had been reduced to 438-acres and a century later in 1946 the island consisted of only 5-acres of tidal marsh. In 1914, J. Fred Hunter (1914) predicted that Sharps Island would disappear as a result of erosion sometime between 1950 and 1955. In modeling his prediction, Hunter did not evoke sea level rise as a factor with respect to the rapid loss of land observed at Sharps. Sharps Island disappeared in 1954 as a result of erosion and it ceases to appear on navigation charts by 1956. If you superimpose the northern hemisphere climate record (see Alley 2004) with the erosion history of Sharps Island, the bulk of the island's landmass disappeared during the end of the "Little Ice Age" and not during the 20th century. However, the erosion slowed during the 20th century; a period of northern hemisphere warming. The reason the island eroded rapidly during the 17th through 19th centuries and slowed markedly during the 20th century relates to the island's geology. The western side of Sharps Island (see Figure 4.12) consisted of seven-foot high banks of exposed silt-loam (see Hunter 1914). The eastern flanks of Sharps consisted of tidal marsh (see Figure 4.12) and as Hunter (1914) noted "*the marshland"* of Sharps Island *"is withstanding the force of the waves much more effectively than the rest of the island and will doubtless be the last to disappear*."

The rapid erosion observed at Sharps Island (i.e., ~4-acres per year) since the mid-19th century stands in stark contrast with the erosion noted at Watts Island (i.e., ~.75 acres per year) in Accomack County, Virginia over the same period of time. The observed differences are a result of the geologic and topographic variation between both islands. In 1846, the main portion of Watts Island (see Figure 3.6) consisted of slightly more than 150 acres of land (see Whitelaw 1951: 973-974), which is 288 acres smaller than Sharps Island at the same time. Both Sharps and Watts had comparable fetch distances. However, Sharps Island disappeared in 1954 and a small 24-acre vestigial remnant of Watts Island still exists today. Watts Island encompassed much more tidal marsh area in 1846 (see Figure 3.6) compared to Sharps Island (see Figure 4.12). The variation in land loss exemplifies the fact that tidal marsh is indeed more resistant to erosion than exposed raw upland sub-soil. The dense interwoven roots and organic debris fabric within tidal marsh can be viewed as nature's "rebar". However, once a veneer of tidal marsh gets scoured away by erosion; like the current condition at Watts Island, the exposed upland sub-soil will erode at a much higher rate.

In sum, shoreline erosion is a very complicated natural process. The rates of land loss noted in Table 4.1 can serve an approximation of the amount of predicted future land loss. However, the stability of any of the archaeological sites listed can change over a very short period of time. For example, from 1994 to 2008, the shoreline at 44NH435 was largely stable and the archaeological features were protected by a thick deposit of coastal dune sand. In the Fall of 2009, landowners installed a series of granite rip-rap "breakwaters" along the shoreline (see Figure 4.13). These man-made features changed the dynamics of the sediment movement along the shoreline. The otherwise stable conditions that had persisted for almost 15 years ceased along the southern portion of 44NH435. Over the past seven years, the shoreline along the southern end of 44NH435 has receded ~38 meters or ~124 feet. The shoreline is now largely littered with displaced artifacts (see Figures 3.201 and 3.202) and exposed features (see Figures 3.199 and 3.200). The argument being, a site with a stable coastal setting can become an actively eroding shoreline over a very short period of time.

Figure 4.7. The image shows a steeply eroded bank profile; analogous to many areas around the Chesapeake Bay. Note that a house has eroded down the bank and into the water. The image clearly illustrates that erosion is not linked to sea level rise. The photograph was taken in 1973 along the shoreline of Lake Michigan. Lake Michigan is 175 meters or 577 feet above sea level. The photo illustrates that erosion can occur without any change in sea level.

Figure 4.8. The image shows an eroded shoreline near Blackwalnut Point on Tilghman Island in 1966. Note the dislodged trees and the rapidly disappearing forest shown in the photo. Images like the one shown above have been mistakenly attributed as evidence of recent or modern sea level change. The resultant outcome of the intact forested landscape in this aerial photo is exactly the same as the trees and the house shown along Lake Michigan (see Figure 4.7). Both photos illustrate that large open bodies of water can and do erode intact upland landscapes.

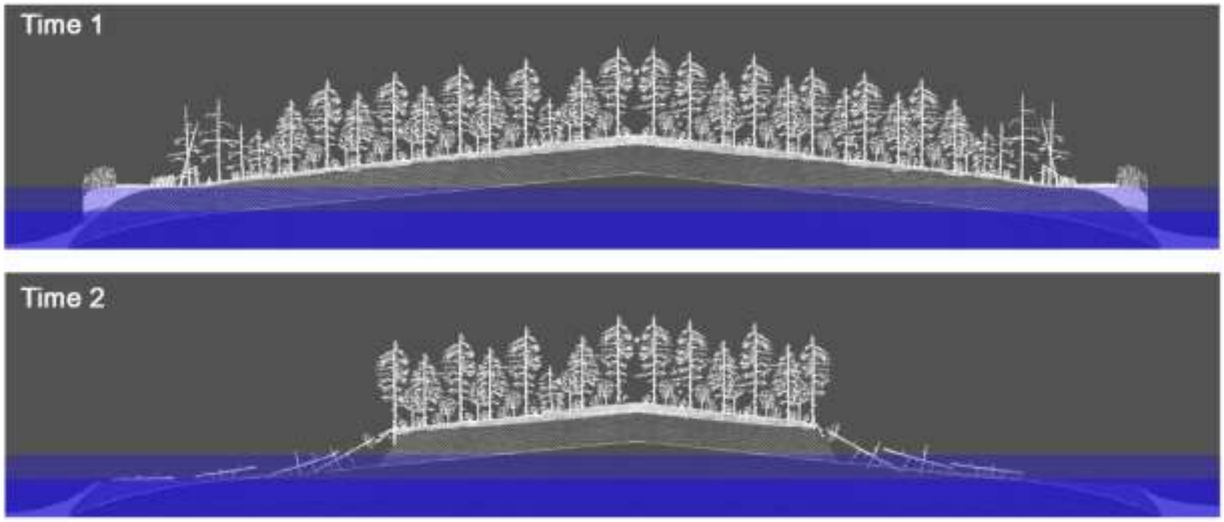

Figure 4.9. The image illustrates a hypothetical cross-section through an upland landscape surrounded by an estuarine body of water. The impact of erosion is shown over a duration of time (see Time 1 to Time 2). Note that the relative elevation of the estuarine body of water (i.e., sea level) did not change. The dimensions of the upland landscape were reduced as a result of wave-related erosion (see Figures Figure 4.8 and 4.9).

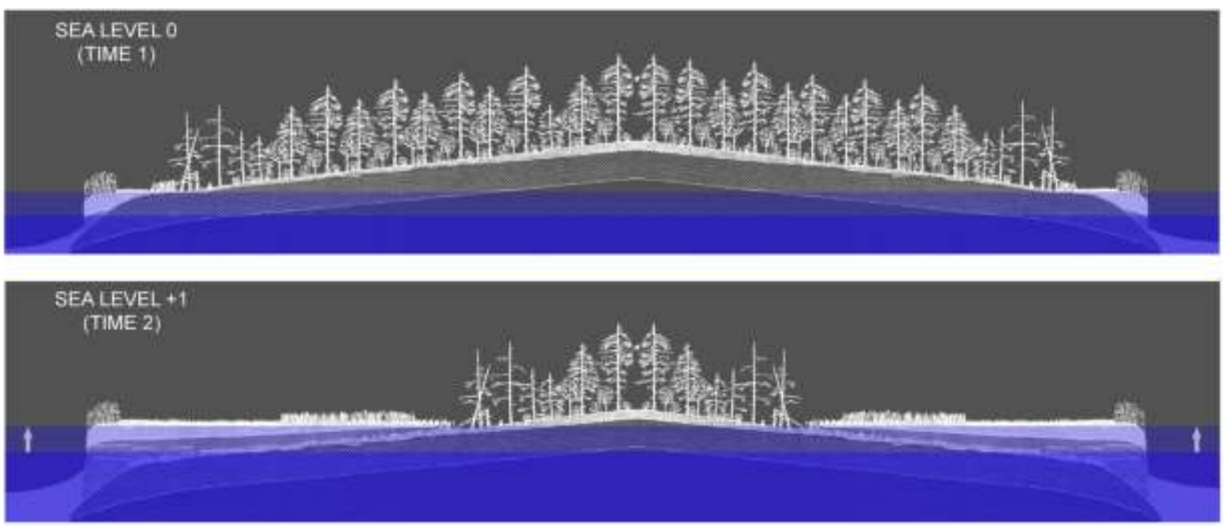

Figure 4.10. The image illustrates a hypothetical cross-section through an upland landscape surrounded by an estuarine body of water. The impact of relative sea level change is shown over a duration of time (see Time 1 to Time 2). Note that the relative elevation of the estuarine body of water (i.e., sea level) did change. Biologically, sea level rise results in a net gain in tidal marsh habitat and a net loss in forested upland habitat. In this hypothetical illustration, the adjustment in relative sea level transformed the dimensions of both the forested and the tidal marsh area but did not result in erosion. A similar real world situation has been observed at a few locations on the Virginia eastern shore (see Figure 3.106).

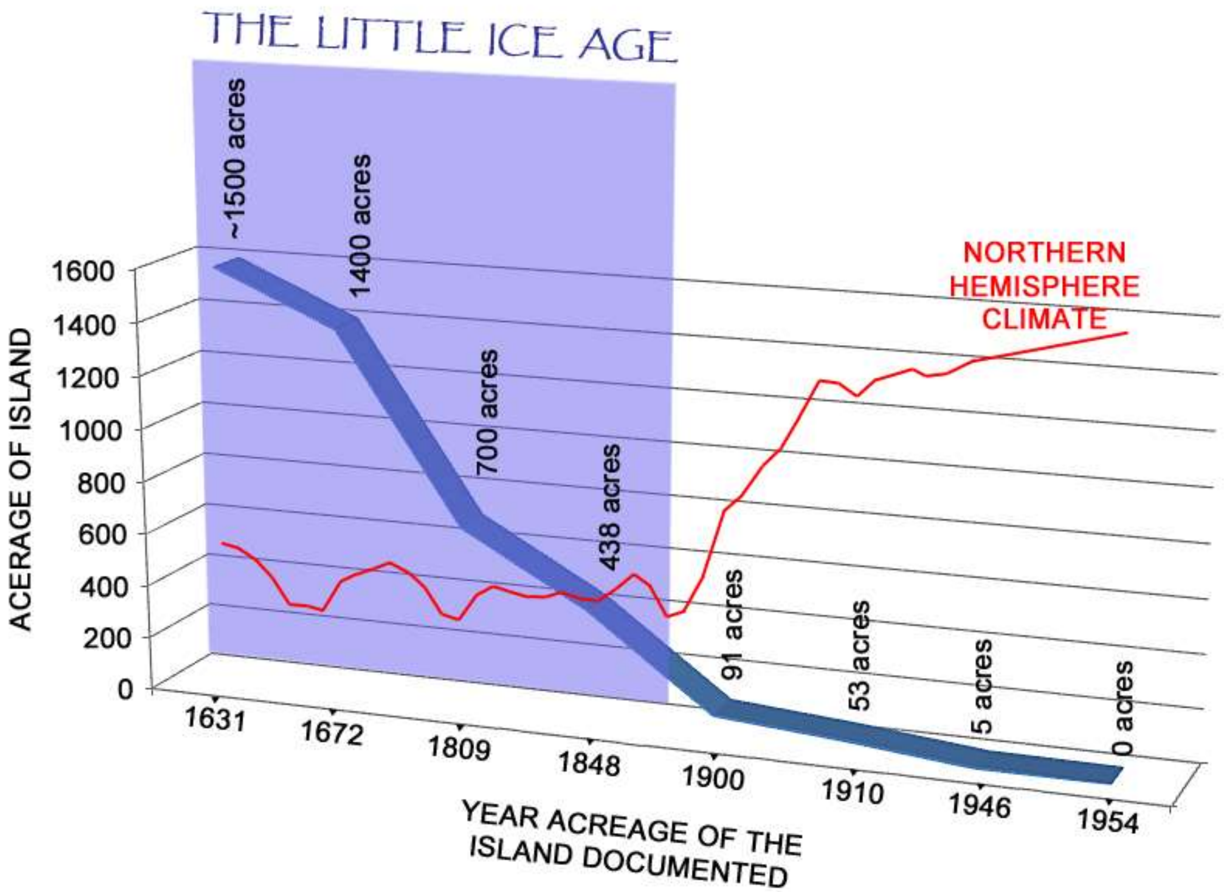

Figure 4.11. The graph illustrates the erosion rate at Sharps Island, Maryland between 1631 and 1954. The northern hemisphere climate record has been superimposed over the erosion history of Sharps Island. Taken out of context, it would seem that the erosion rate was much greater during "The Little Ice Age" than during the marked warming noted in the early 20th century. During the period between 1672 and 1848, Sharps Island was eroding at ~5.4-acres per year. In contrast, the rate of erosion slowed to ~1.7-acres per year between 1900 and 1954. However, the graph shown above and the marked reduction in rates of erosion do not take into account the geologic variation associated with Sharps Island. The marked decrease in erosion noted during the early 20th century is a byproduct of the fact that the last remnant portion of the Sharps Island consisted of tidal marsh, which is much more resistant to erosion.

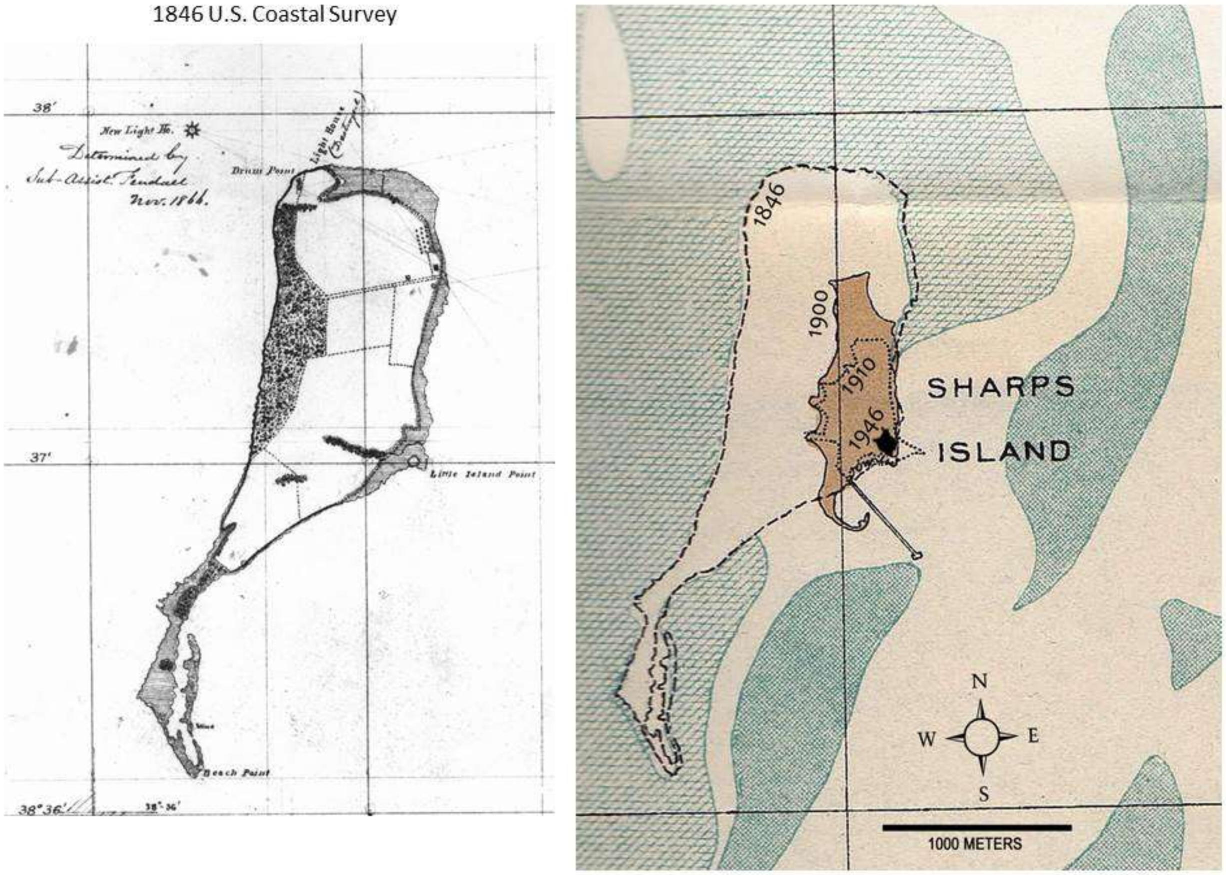

Figure 4.12. The U.S. Coastal Survey map (left) shows Sharps Island as it appeared in 1846. Note that fields and forest extend to the edge of the shoreline along the western side of the island. In 1846, the western side of Sharps Island probably resembled the shoreline shown in Figure 4.8. Note that a fringe of tidal marsh extends along the eastern side of the island in 1846. The dimensional changes to the island between 1846 and 1946 (right) suggest that the tidal marsh is much more resistant to erosion that the exposed silt loam soils.

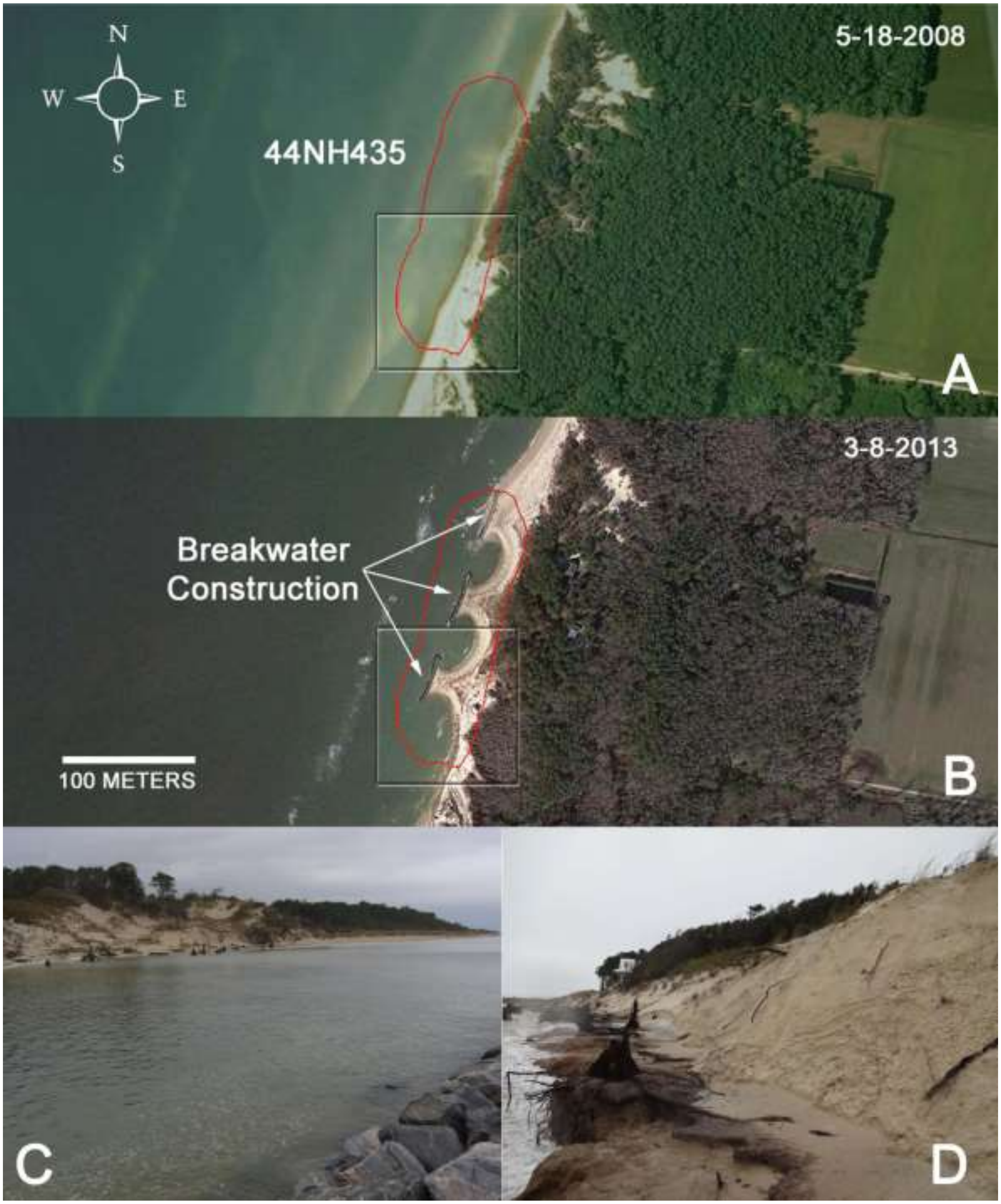

Figure 4.13. The satellite image (A) illustrates the dimensions of the shoreline at 44NH435 in 2008. After the construction of a series of "breakwaters" in 2009, the shoreline along the north end of 44NH35 began to accrete sand. Meanwhile, the protected sand along the southern end of the site was rapidly scoured away (B) exposing the formerly buried archaeological site (C and D). The southern end of the site has eroded ~38 meters or 124 feet since 2009. Many of the site's artifacts (see Figures 3.201 and 3.202) and features (see Figures 3.199 and 3.200) were exposed during this seven year period.

TIDES, RATES OF SEA LEVEL RISE, AND ARCHAEOLOGICAL LANDSCAPE PRESERVATION:

Wave-related shoreline erosion and tidal scouring processes occur on an hourly and daily time frame, whereas, sea level rise occurs on a century and millennial time scale. With these parameters in mind, the principal elements destroying coastal archaeological sites are the daily events associated with wave energy and tidal movement. However, the rate of sea level rise within a particular region does indeed influence the preservation of associated archaeological sites.

Two forms of sea level change are recognized. Eustatic sea level change involves an adjustment in the volume of water within the ocean basins. As terrestrial glaciers develop and expand in area and thickness, the volume of sea water within the ocean basins decrease and sea level falls, which results in what is termed a marine regression event. When terrestrial glaciers melt and disappear, the volume of sea water within the ocean basins increase and sea level rises causing a marine transgression event.

The second form of sea level change assumes that ocean water surface maintains a constant elevation and the elevation of the earth's crust fluctuates. Relative sea level change involves an actual adjustment in the elevation of a region's land surface relating to isostasy. A land surface can isostatically sink because of weight added to the earth's surface or because of underlying crustal or geologic actions resulting in ocean water invading nearby low-lying terrestrial regions. Land surfaces can also isostatically rise as a result of weight being removed from the earth's surface or because of geologic or tectonic actions resulting in the aerial exposure of previously drowned and adjacent sub-aqueous zones.

Within most coastal regions, the interplay between both eustatic and relative sea level are occurring at the same time (see Figure 2.1). If eustatic sea level rise is occurring in an area at the same time the earth's crust is sinking, the net result will be a rapid inundation of associated low-lying terrestrial regions. If eustatic sea level rise is occurring in an area when the earth's crust is rebounding or rising at or about the same rate, sea level will seem to be stable. If eustatic sea level is falling within a coastal region that is isostatically sinking at or about the same rate, sea level will also seem to be stable. When eustatic sea level is falling and the earth's crust in an area is rising, the overall result will be a rapid aerial exposure of nearby or adjacent sub-aqueous shelf zones. In sum, the rates of sea level rise along any given coastline fluctuate as a result of the relationship between both eustatic and relative sea level change.

In regard to archaeological features on or near the coastline, the rate of sea level change greatly influences the future longevity these cultural sites. The nearshore zone associated with active erosion can be roughly constrained by a region's high tide and the low-tide marks (i.e., swash and berm zone), which are regularly impacted by wave and wave-base energy. Obviously, the tidal amplitude along any given coastline will greatly influence or determine the degree and type of active erosion. With respect to Virginia eastern shore, the tidal amplitude is greatest (~4.5 to 5 feet) along the Atlantic coastline near the mouth of the Chesapeake Bay and markedly decreases northward towards the Virginia-Maryland line (~1.6 feet). Shorelines in areas with varied tidal amplitudes erode in markedly different patterns (see Figures 4.14, 4.15, and 4.16). With respect to coastal archaeological sites, researchers must take into account how tidal amplitude can influence the pattern of shoreline erosion in tandem with rates of sea level rise. Importantly, tidal amplitudes can change along a given stretch of coastline in a very short period of time (see Lowery 2015).

Historic tide records within the Chesapeake Bay region have been used to measure of sea level change (see Boon 2012). With these historical tidal datasets, researchers have erroneously equated mean tide (i.e., the average between mean high and mean low tide) as measure of sea level. As indicated above, the tidal amplitude (i.e., the variation between high and low tide) within the Chesapeake Bay varies from its mouth to its head. Therefore if Boon's (2012) assertion is correct, the mean tide sea level measure for the coastal areas near the Virginia-Maryland line would be markedly different than the mean tide sea level measure for coastal regions further south near the mouth of the bay.

In general, the tides within the Chesapeake Bay are a poor proxy for sea level. Theoretically, the earth's tides are a byproduct of the celestial (i.e., sun and moon) gravitation "pull" on the Earth's oceans. On the Earth, inertia acts as a counterbalance to gravity. As such there are two major tidal bulges on the Earth's ocean surface at any given moment in time. One tidal bulge is the result of the gravitational attraction of the moon and this bulge is situated on the side of the Earth that happens to be facing the moon. On the opposite side of the Earth, inertia exceeds the gravitational force of the moon and the water within an ocean basin tries to keep moving in a straight line away from the Earth producing a second tidal bulge. The tidal maximum-minimum along a given coast advances each day because of the rate at which the moon orbits around the Earth. However, the wind direction, the wind velocity, and the Chesapeake Bay's geometry pose many localized obstacles, which can either hinder or exacerbate the predicted diurnal tidal range and intensity at given locations along the bay.

The Chesapeake Bay is essentially an elongated-basin oriented along a north-south axis. The mouth of the Chesapeake Bay acts the ocean conduit, which drives diurnal tidal flow of saline water into and out of the bay. However, the orientation of the bay and the daily weather conditions can greatly impact the predicted celestial tidal patterns. For example, the tidal circumstance noted at Annapolis, Maryland between February 13th and February 16th, 2015 (see Figure 4.17) illustrates the influence that wind conditions can have relative to the predicted celestial tides. During this short period, the upper Chesapeake Bay experienced both the highest and lowest tides of the year. The NOAA data illustrated in Figure 4.17 shows both the predicted celestial tides (blue) and the verified weather-influenced tides (green) at Annapolis, Maryland (see Figure 4.17A). The NOAA wind velocity and direction data for this time frame was recorded a Bishop's Head, Maryland. The first verified low tide event (see Figure 4.17-1) noted in Annapolis, Maryland on February 13th, 2015 illustrates how the duration of a >20 knot northwesterly wind event exaggerated the predicted celestial low tide and hampered the predicted celestial high tide. During the early morning of February 14th, 2015, the regional wind direction shifted. Intense (~10 to ~25 knot) southwesterly winds persisted throughout the day and by 4:00pm (see Figure 4.17-2) the celestial high tide had been amplified ~1.5-feet above the predicted level. However, the regional wind direction and velocity changed immediately after midnight on February 15th, 2015. The region was subjected to intense northwesterly winds between 40 and 58 knots in velocity. At about 2:00pm (see Figure 4.17-3) on February 15th, 1015, Annapolis experienced a low tide that was ~2.5-feet below the predicted low tide level. The predicted celestial high tide was completely negated and the subsequent celestial low tide (see Figure 4.17-4) was again lower than predicted. In less than twenty-four hours, the upper Chesapeake Bay region, which has a predicted ~1.1-foot tidal range, experienced a wind driven tidal amplitude of ~5.1-feet.

The NOAA data shown in Figure 4.17 illustrate how wind and weather influence the actual daily tides within a narrow portion of the Chesapeake Bay. As noted throughout this report, the daily fluctuations in wind velocity and direction critically effect the erosion and subsequent loss of coastal archaeological sites. Like the conditions shown in Figure 4.17, the extreme daily tidal range can negate some of the short-term impacts of fetch-related erosion at some coastal archaeological sites. During periods of extreme low tide (see Figure 4.17-3 and 4), the intense fetch-related wave energy is shifted offshore away from many coastal archaeological sites and features positioned within the "normal" swash and berm tidal zone (for example, see Figures 3.114 and 3.115). However, other drowned or more inundated coastal archaeological sites and features that are situated offshore (for example, see Figures 3.259, 3.260, 3.263, and 3.266) could be negatively impacted by fetch-related erosion during these extreme low tide events. Because of the magnitude and duration of the marked high tide event on February 14th, 2015 (see Figure 4.17-2), you could argue that some coastal archaeological sites within the "normal" swash and berm zone (for example, see Figures 3.114 and 3.115) were spared from the effects of fetch-related erosion because rapid inundation transferred the wave energy inland and away from the drowned site. However, more upland coastal archaeological sites and features (for example, see Figures 3.301 and 3.302) would be negatively impacted by fetch-related erosion during these extreme high tide events. Depending on the site setting, extreme and rapid tidal shifts alter the degree of erosive impact to individual coastal sites. The "normal" tidal conditions present a greater erosion threat to many more coastal archaeological sites because wave-energy is concentrated within a more consistent and narrow inter-tidal zone.

Extreme tidal ranges can occur during periods when the moon is markedly closer to the Earth. During these times of the year, the tides are referred to as "king tides". The moon's orbit is closest to the earth between early and mid-October of each year. Extreme tides can also occur during cyclonic weather events; like hurricanes and tropical storms. The NOAA data shown in Figure 4.18 illustrate how cyclonic wind and weather events influence the predicted celestial tides within the entire Chesapeake Bay. In October 2016, a rare occasion occurred within the Chesapeake Bay region, which illustrates delicate interaction between the geometry of the bay, "king tides", and cyclonic weather. During the period between October 8th and October 11th, the moon's proximity to the Earth resulted in above normal predicted high and low tides for the Chesapeake Bay region (see blue lines shown in Figure 4.18 B-E). In tandem with the "king tides", Hurricane Matthew impacted the coast south of the region and resulted in ~18 to ~35 knot northerly winds within the Chesapeake Bay region (see Figure 4.18 A). In tandem with the geometry of the bay, the duration and intensity of the wind transferred much of the water out of the upper Chesapeake towards the lower bay; as recorded at various NOAA tide stations (see green lines shown in Figure 4.18 B-E). The verified tides in the upper bay (see Figure 4.18 B-C) for the period between October 9th and October 10th were markedly lower than the predicted "king tides". At the same time, the verified tides in the lower bay (see Figure 4.18 D-E) were markedly higher than the predicted "king tides". The October 2016 event provides a cautionary tale with respect to the linkage of tides and sea level. Contemporaneously, if we were using the mean averages of the tidal datasets shown in Figure 4.18 as a measure of sea level, the upper bay would reflect much lower sea levels than those coastal regions situated near the mouth of the Chesapeake Bay. If these conditions occurred a few times within a decade, the historic tidal-linked sea levels within the bay would be markedly skewed. Ironically, Boon's (2012) historic tidal record research signifies markedly higher rates of reported sea level rise at the mouth of the bay than in areas further to the north.

The data shown in both 4.17 and 4.18 illustrate that the daily tides within the Chesapeake Bay are greatly influenced by wind direction, wind velocity, as well as the bay's geometry. Because historic tidal records within the bay region are influenced by these collective variables, the records for any given station would be a poor proxy of relative sea level change. Because it is biologically and ecologically impossible to have tidal marsh form without the presence of saltwater (see Darmody and Foss 1979), the upland-tidal marsh interface (see Figures 3.68 and 3.69) provides the best proxy of mean sea level within the Chesapeake Bay region. In an attempt to understand rates of sea level change, any noticeable landward fluctuation of the upland-tidal marsh interface over a period of time offers conclusive evidence of relative sea level rise.

With respect to the negative impact of hourly and daily of tides and wind (see Figures 4.17 and 4.18), marine transgression or sea level rise, which occurs on a century or millennial level, represents a secondary factor in coastal archaeological site erosion. For example, the expression of sea level rise at Watts Island, Virginia is indicated by the presence of tidal marsh, which originally surrounded two upland linear hummocks (see Figure 3.6 A). Tidal marsh typically develops on a former upland surface as a consequence of long-term marine transgression (see Darmody and Foss 1979). Arguably, the formation of tidal marsh at Watts Island as a result of late Holocene sea level rise fended off the erosive effects of historic fetch-related wave energy and tidal scouring (see Figure 4.38). However, the minimal amount sea level change over the past 160 years has allowed the erosive actions of wave and tidal energy to remove the protective tidal marsh "armor" from around Watts Island (see Figure 3.6 B). The rate of sea level rise in a given coastal region can significantly influence the long-term integrity of coastal landforms and any associated archaeological sites.

Slow rates of sea level rise over the past century and a half have stripped the protective veneer of tidal marsh from around Watts Island. These same slow rates of sea level rise ultimately removed all evidence of the historic mid-19th century upland island landscape once associated with Sharps Island in Maryland (see Figure 4.19). Notably the geologic dimensions of Sharps Island and the historic archaeological features observed on the 1846 coastal survey map (see Figures 4.12 and 4.19B) are no longer evident in the modern high-resolution bathymetric survey of the area (see Figure 4.19 A). Like the situation noted at 44AC214 on the northern end of Watts Island (see Figure 3.7), the whole geologic footprint and archaeological record of Sharps Island have been scoured away by the hourly and daily wind and tidal erosion. The loss of Sharps Island is actually the result of the erosive actions of daily tidal and wind activity related to slow rates of sea level rise.

Greater rates of sea level rise have been observed at intervals over the past 24,000 years (see Figure 2.1). High rates of sea level rise essentially outpace the short-term erosive effects of wind and tide. Meltwater Pulse 1A, which occurred over a 500-year period between circa 14,500 and 14,000 years ago, resulted in ~20 meters (~65 feet) of global sea level rise. In contrast to the comparatively miniscule rate of sea level rise (i.e., ≤16.97 to ≥11.03 centimeters or ≤6.68 to ≥4.34 inches) reported over the past century (see Hay et al., 2015), global sea levels would have been rising at ~4 meters (i.e., ~13 feet) per century during Meltwater Pulse 1A. As a result, many coastal landforms would have been preserved.

Recent bathymetric data within the Pulley Ridge area located near the continental shelf margin of southwestern Florida show a perfectly preserved barrier island landform located -68 meters (-223 feet) beneath the surface of the Gulf of Mexico (see Figure 4.20). Given the depth, the drowned barrier island located near Pulley Ridge would have been inundated as a result of the rapid sea level rise associated with Meltwater Pulse 1A (see Figure 2.1). In stark contrast to the situation observed at Sharps Island (see Figure 4.19), coastal landscapes can be preserved if the rate of sea level rise surpasses the erosive actions of daily winds and tides. Archaeological sites and features; if they existed would be preserved largely intact on the now drowned Pulley Ridge barrier island landform. Therefore, rapid rates of sea level rise and quick inundation of coastal regions are not necessarily detrimental for the long-term preservation of former nearshore archaeological sites and features.

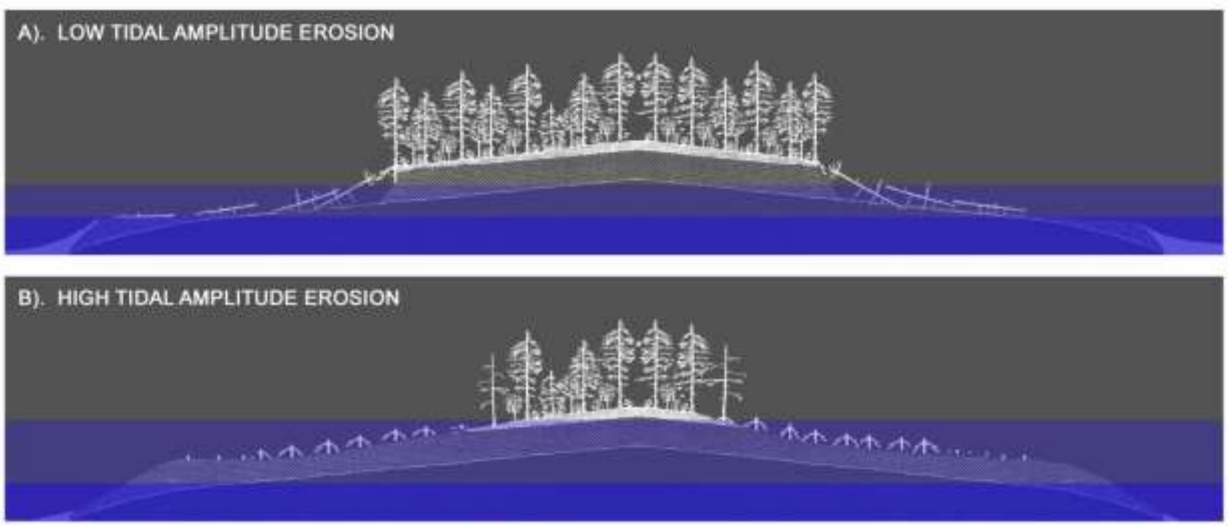

Figure 4.14. The image illustrates an idealized view showing how tidal amplitude can influence the geometry of shoreline erosion. In coastal areas with low tidal amplitudes (A), wave energy is concentrated at or near the same relative spot or location along a shoreline. As a result, a steep bank edge develops. In the hypothetical example shown above (A), trees have become undermined and the entire tree has fallen into the adjacent body of water. In coastal areas with high tidal amplitudes (B), wave energy is distributed along a broader topographic range. As such, the slope elevation of the adjacent landform becomes gradually reduced along a horizontal plane. The reduction in slope elevation is indicative of the wave energy diffusion along various water-land interface points within the extent of the daily tidal extremes. In the hypothetical example shown above (B), the tree root systems have been exposed but remain in their upright positions.

Figure 4.15. The photograph shows the eroded shoreline at 18DO371, a section of the middle Chesapeake Bay which has a ~1.3-foot tidal amplitude. The erosion at this location is expressive of the example illustrated in Figure 4.14A. The wave energy is concentrated within a narrow zone and has undermined the trees. The high energy environment does not foster the establishment of tidal marsh grasses along the soured substrata within the intertidal zone.

Figure 4.16. The photograph shows the eroded shoreline a 44NH448, an area near the mouth of the Chesapeake Bay that has a ~5-foot tidal amplitude. The erosion at this location is expressive of the example illustrated in Figure 4.14B. Note the elevated tree roots (inset) the surrounding tidal marsh grasses growing on the exposed substrata. In tandem with the marsh grass, the elevated tap roots suggest that the ground surface has been topographically deflated as a result of the extreme localized tidal amplitudes. Because of the extreme tidal amplitude, wave energy is diffused along a sloping horizontal plane. The low energy setting permits the establishment of tidal marsh grasses.

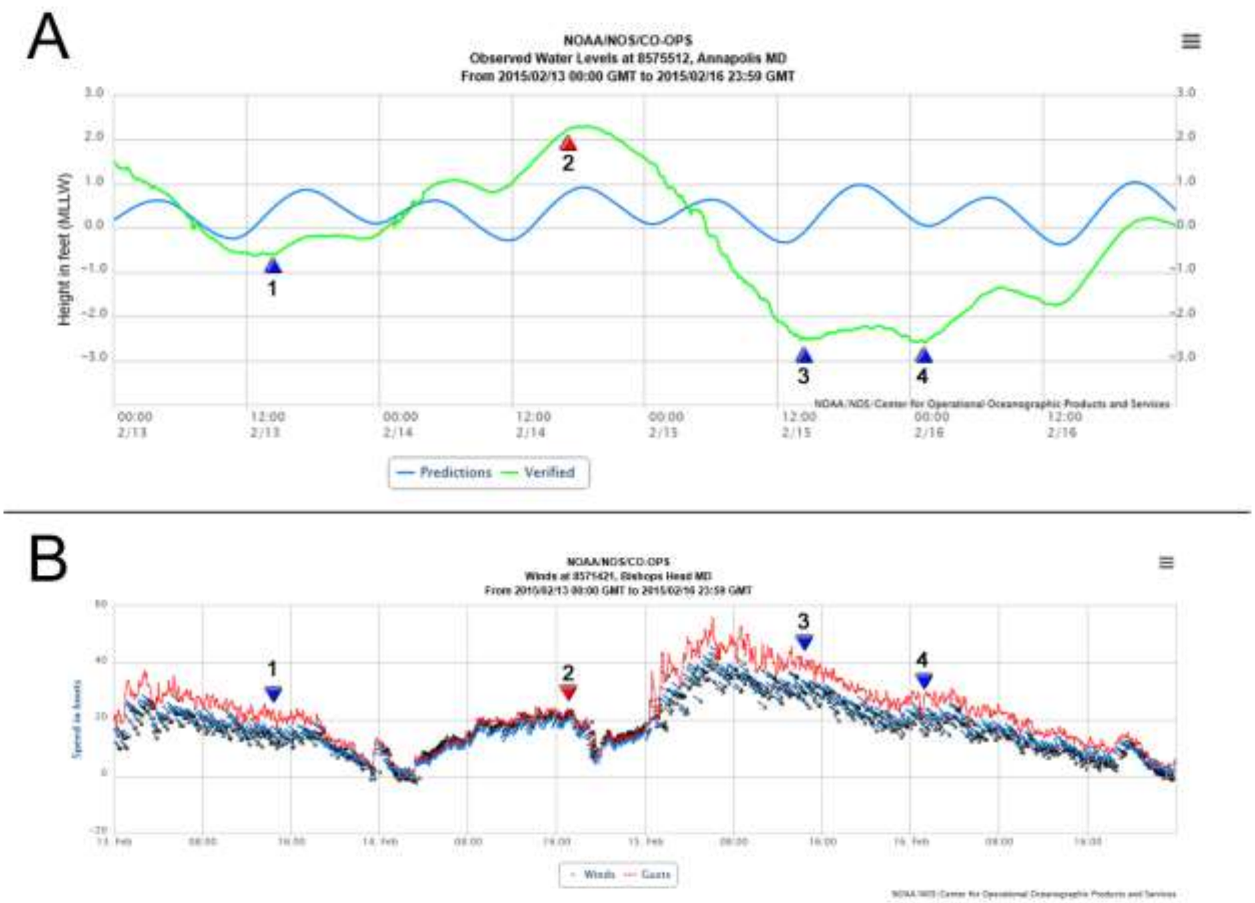

Figure 4.17. The combined NOAA data illustrate the extreme tidal conditions noted within the upper portion of the Chesapeake Bay between February 13th and February 16th, 2015. Within a twenty-four hour period, Annapolis (A) experienced both the highest tide (2) and the lowest tides (3 and 4) of the year. The extreme and rapid tidal shifts recorded during this short-period of time represent the combined influence of weather-driven wind direction, duration, and velocity (B). Note that the verified tides (A, green) only intersected the predicted celestial tides (A, blue) twice during the four-day period.

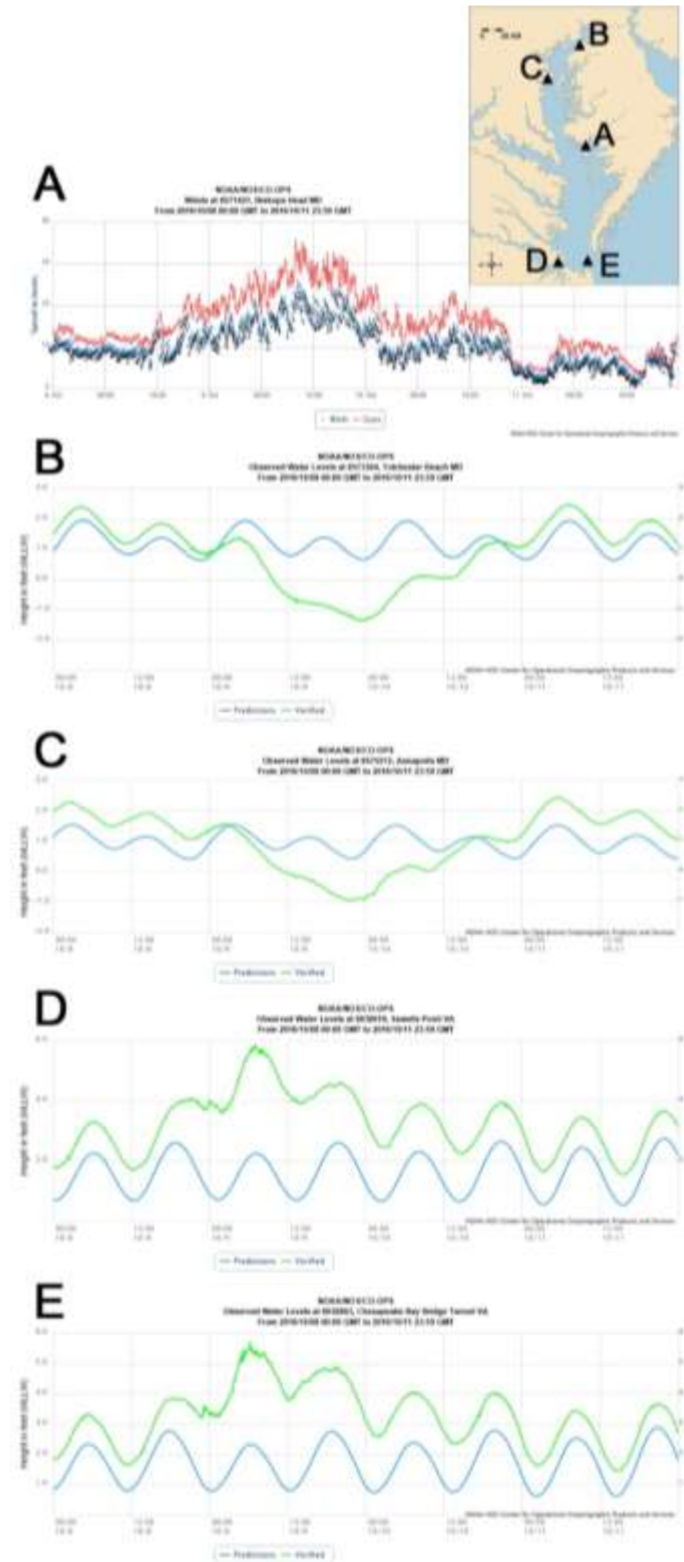

Figure 4.18. The combined NOAA data illustrate how regional wind velocity and duration associated with Hurricane Matthew (A) influenced the verified tides (B-E, green) within the Chesapeake Bay (inset) during a seasonal “king tide” episode.

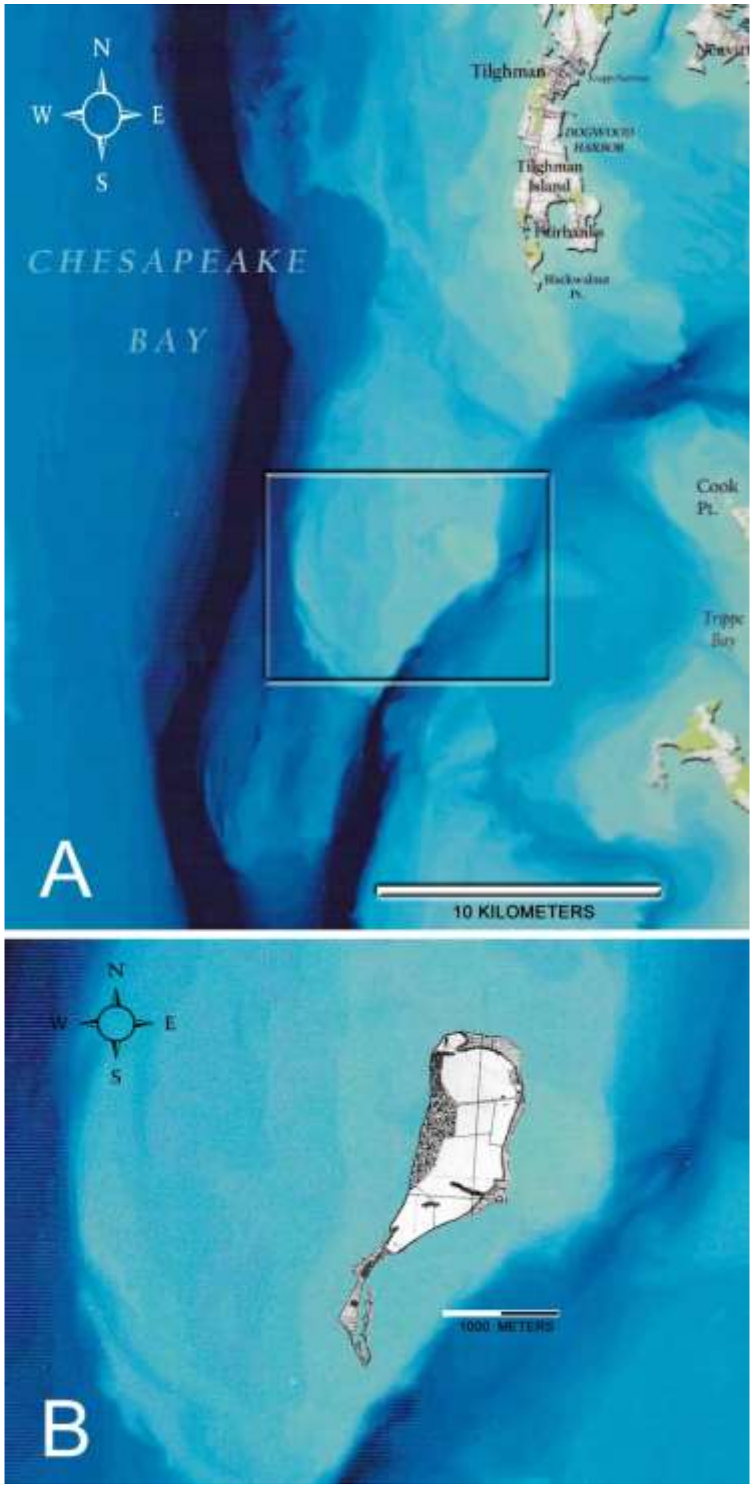

Figure 4.19. The image shows a portion of the modern Chesapeake Bay (A) associated with the former location of Sharps Island, Maryland. The topographic details of Sharps Island noted in 1846 (B) are not evident in the current high-resolution bathymetry data associated with the island's former location (A, inset). The lack of island details is the result of fetch-related erosion, which scoured away the island's landmass as a result of slow rates of sea level rise over the past century.

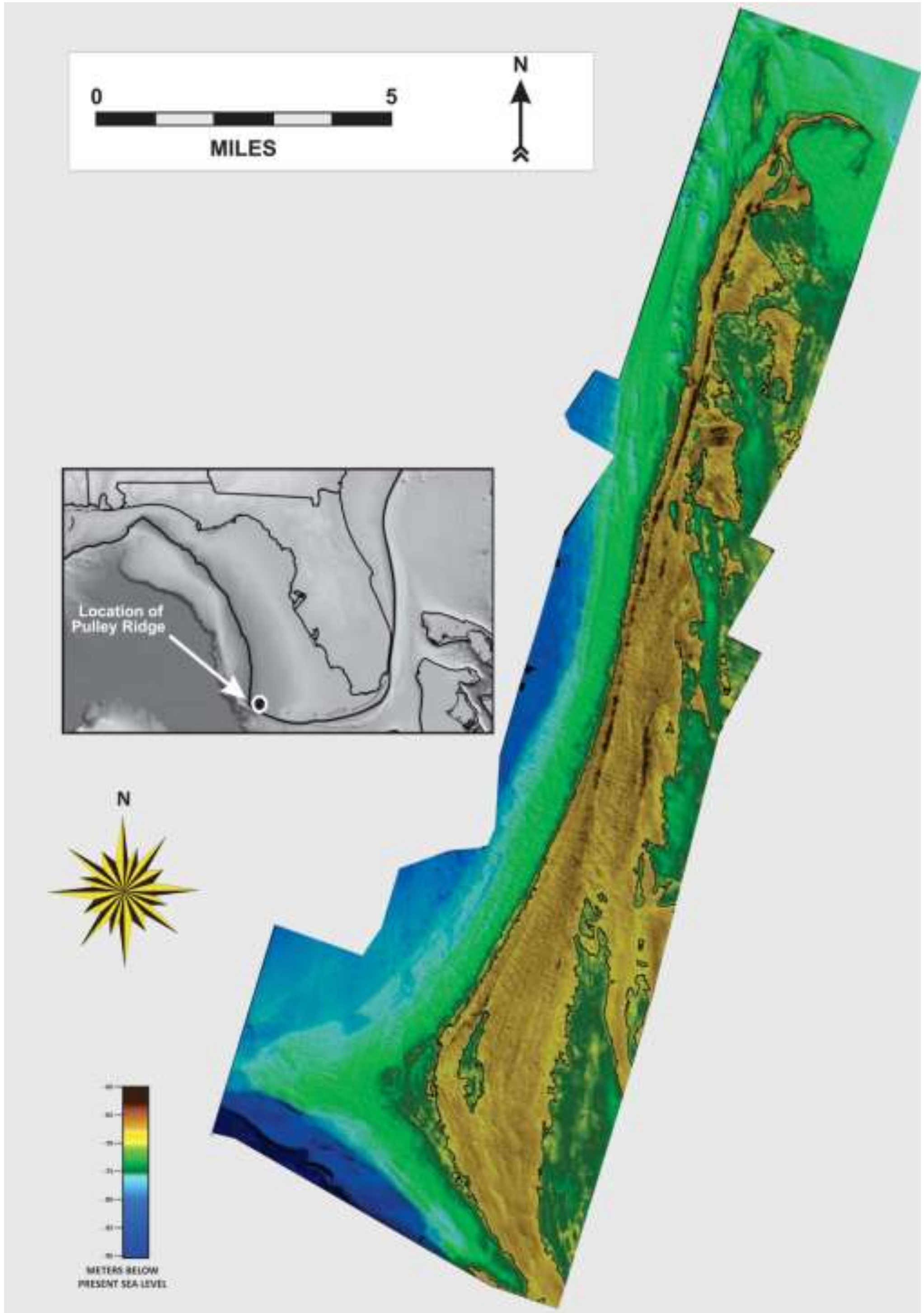

Figure 4.20. The image shows high-resolution bathymetric data for the Pulley Ridge area near the continental shelf margin off of southwestern Florida. The details indicate the presence a former coastal barrier island with dune landforms and an inlet at -68 meters (-223 feet) below the surface. Given the depth, this late Pleistocene barrier island was inundated as a result of the rapid sea level rise event (~4 meters per century) associated with Meltwater Pulse 1A. The image was provided by Dr. Jim Dunbar.

NEARSHORE COASTAL PROCESSES, OVERWASH, SEA LEVEL RISE, AND ARCHAEOLOGY:

There is a goal among archaeologists to make sense or build grand syntheses of the archaeological record. These goals can include changes in settlement patterns, subsistence pattern modifications, and adjustments in societal interactions within a broad region. Natural coastal processes, such as sea level rise and erosion, can greatly hinder our ability to thoroughly understand these cultural processes. Sea level rise has inundated much of the early prehistoric archaeological record. Erosion has destroyed much of the archaeological record. The following discussion will a common natural process associated with the archeological record at coastal sites in the region.

Overwash (see Donnelly et al. 2004) is defined as the flow of water and sediment over a low-profile shoreline or beach crest that does not directly return to the originating body of water. Overwash is traditionally associated with the geology of barrier island systems (Davis 1994). Overwash features, such as fan-shaped terraces or berms (see Morton and Sallenger 2003) are most evident after major storm events (Donnelly et al. 2004). During an overwash event, both offshore and nearshore sediment and associated debris can be transported inland and away from areas of original point of origin. Episodic overwash events followed by protracted periods of stability along a stretch of coastline can result in complex coastal geologic strata expressive of both stasis and change.

Archaeological sites and remains situated along the shorelines of the Delmarva Peninsula have been and are being impacted by marine transgression (Lowery 2013a), coastal erosion (Lowery et al. 2012), as well as coastal bio-geochemical processes (Lowery and Wagner 2012). On shorter time scales, experimentation at drowned coastal archaeological sites along the Chesapeake Bay (Walker 2003: 365-384) and along the Atlantic (Lowery 2003b: 72-80) demonstrates how eroded and displaced artifacts move along individual stretches of shoreline.

The following summary presents data from a few coastal Middle Atlantic archaeological sites, which demonstrate the marked effects of storm-related overwash. Located along the coastline of the Delmarva Peninsula within the Middle Atlantic region of North America, the collective data from 18DO369, 18SO192, and 44NH233 (see Figure 4.21) provide a rare opportunity to understand how overwash processes can influence archaeological interpretations, as well as impact coastal geologic reconstructions.

Site 18DO369 is located along the coastline of the Chesapeake Bay in Dorchester County, Maryland. The site encompasses a broad tidal marsh. The key archaeological feature at this locality is a drowned Late Woodland-era shellfish/refuse midden, which is encapsulated beneath a layer of tidal marsh peat (see Figures 4.22 and 4.23). Oyster shell directly associated with a triangular projectile point within the midden feature (see Figure 4.23) produced an uncorrected 14C-age of 1397 ± 23 years BP (D-AMS 003538). By rectifying the raw 14C-age with the local marine reservoir values (see Rick et al. 2012), the midden feature at 18DO369 dates to circa 945 calAD ± 38 years.

At mean high tide, the in situ shell midden feature at 18DO369 is situated about a-half-meter beneath the waters of the Chesapeake Bay. The fact that the midden is inundated is not surprising considering that Nikitina et al. (2000: Table 1) have indicated at least ~1.5 meters of sea level over the past 1000 years. When the site was occupied, the midden surface would have been at least a meter above sea level. The site's setting 1,100 years ago would have consisted of a dry upland landscape suitable for human habitation.

Figure 4.21. The map plots the archaeological sites discussed or mentioned in the text demonstrating evidence of coastal overwash.

Late Woodland-era lithic and ceramic artifacts (Figure 4.24 A-L) have been found associated with the drowned midden feature or A/Cu soil horizon (see Soil Survey Staff, 2014 for an explanation of soil horizon designations). Diagnostic Middle/Late Archaic-age artifacts (Figure 4.24 M-N) have also been found at the site. When found in situ, these earlier cultural components are confined to the upper portion of the underlying Btg and Au soil horizons. Erosion, displacement, and prolonged exposure to subaqueous environmental conditions have resulted in many of the artifacts being covered or partially covered with barnacles, bryozoans, and young oysters (Figure 4.24 M-O). Given the clear addition of young oysters to the nearshore flotsam assortment at 18DO369, we can conclude that erosion and redeposition at 18DO369 are mixing both prehistoric oyster shells with modern oyster shells.

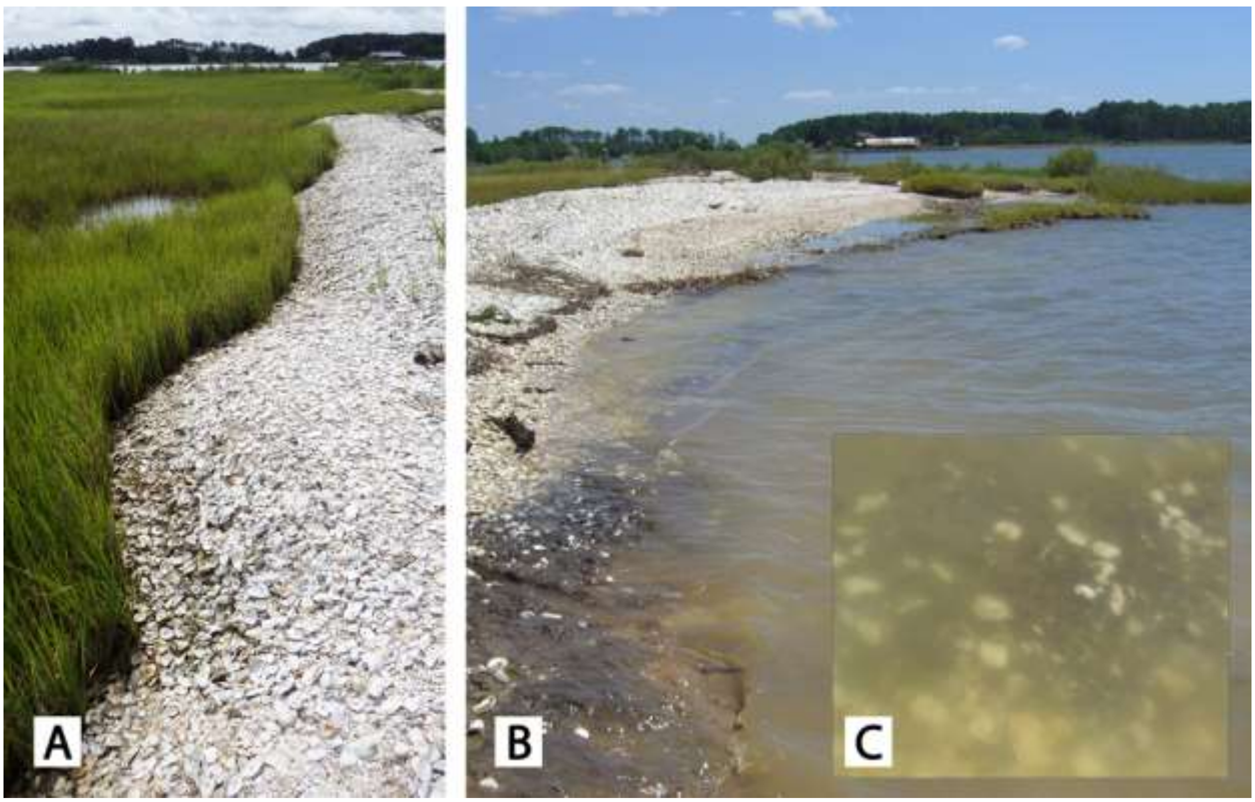

Figure 4.22. 18DO369 encompasses a drowned Late Woodland-era shell midden. A mixture of both prehistoric and modern oyster shell are being transported inland as a result of wave energy and storm surge overwash processes (A). Along the actively eroded shoreline (B), the drowned shell midden feature (C) is being scoured and dismantled. During abnormal high tide events, wave energy has transported a mixed assemblage of shell and artifacts about twenty-meters inland of the shoreline.

Figure 4.23. During extreme low tide, the intact midden at 18DO369 is exposed and diagnostic artifacts can be found in situ within midden feature.

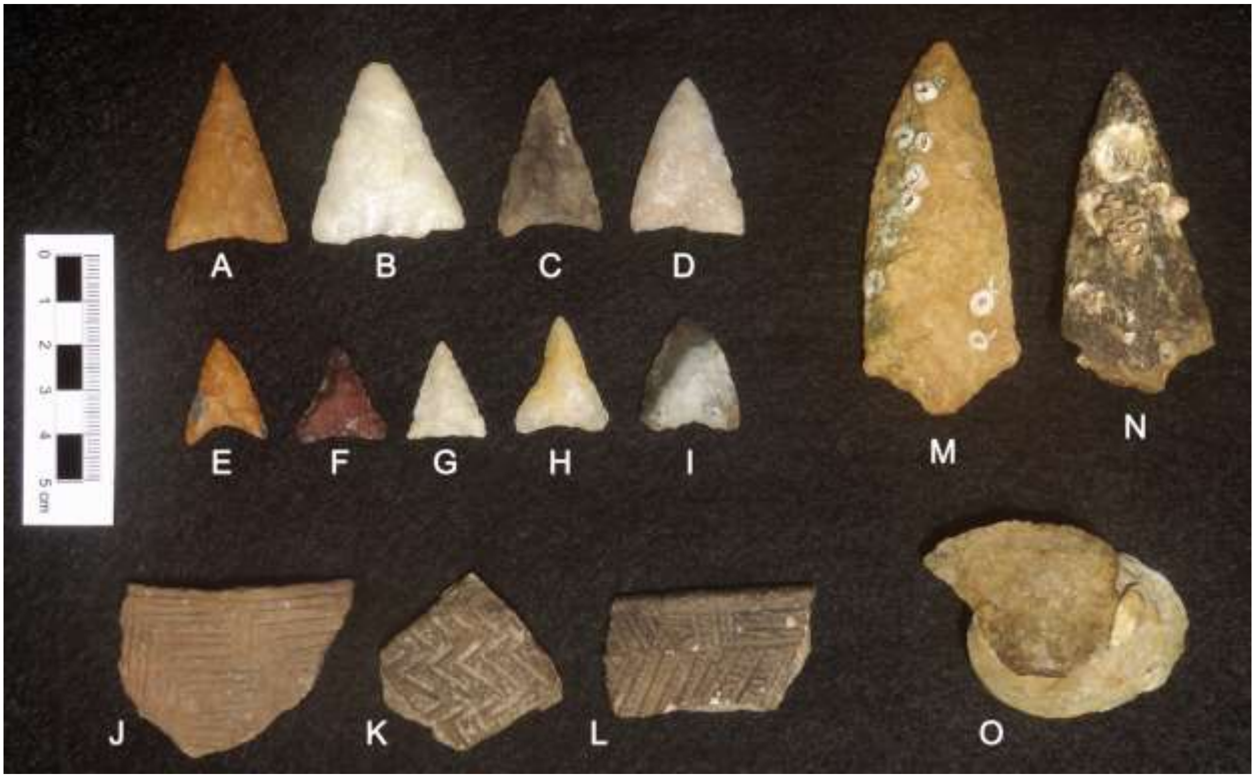

Figure 4.24. The assemblage found at 18DO369 includes a large number of triangular projectile points (A-I), as well as associated Late Woodland-era ceramic vessel fragments (J-L). Middle to Late Archaic-era bifaces (M-N) have also been found at the site. Shell attached to some artifacts (O) indicates that modern oysters are being mixed with older archaeological shell in the overwash deposits at the site.

The situation at 18DO369 is further complicated by overwash processes. As a result of storm-surge events and episodic extreme high tides, prehistoric midden debris and modern debris are being transported inland over the surface of the vegetated tidal marsh peat (see Figure 4.22 A). Over the past two decades the shoreline, which originally encompassed a much larger drowned midden feature, has retreated approximately 50 meters. The immense quantity of overwash shell noted at 18DO369 can be attributed to shoreline erosion, archaeological feature destruction, as well as the redeposition of any associated natural debris and cultural artifacts. Inland of the shoreline, the strata at 18DO369 indicate episodic periods of overwash followed by intermittent stability phases, which permitted tidal marsh formation (see Figure 4.25).

Along the actively eroding shoreline, the intact midden feature or A/Cu soil horizon can be observed beneath a layer of tidal marsh peat or Oe soil horizon (see Figures 4.25 A and 4.26). Several meters inland of the shoreline (see Figures 4.25 B, 4.25 C, and 4.26), tidal marsh peat (i.e., Oi soil horizon) has developed, which encompasses a mixture of both midden and modern shell debris (i.e., Oi/Cu soil horizon). The Oi/Cu soil horizon at 18DO369 is evidence of an earlier overwash event followed by a period of prolonged stasis. The active zone of overwash debris accumulation at 18DO369 is located 10 to 20 meters inland of the shoreline (see Figure 4.25 D and 4.25 E). Prehistoric artifacts, midden shell, and modern debris represent the mixture of reworked particles incorporated within this active overwash deposit. The distribution of the particles within this overwash feature is reflective of storm surge dynamics. The overwash deposit closest to the current shoreline includes hefty fragments of fire-cracked rock and whole oyster shells (see Figure 4.25 D). Further away from the shoreline, the overwash deposit incorporates a combination of small shell fragments, debitage, and pieces of prehistoric ceramic vessels (see Figure 4.25 E). The marked variation in particle size, weight, and mass noted within the active overwash zone at 18DO369 is a function of wave energy.

Figure 4.25. A linear transect (A-E) across the shoreline at 18DO369 reflects the complex nature of coastal overwash.

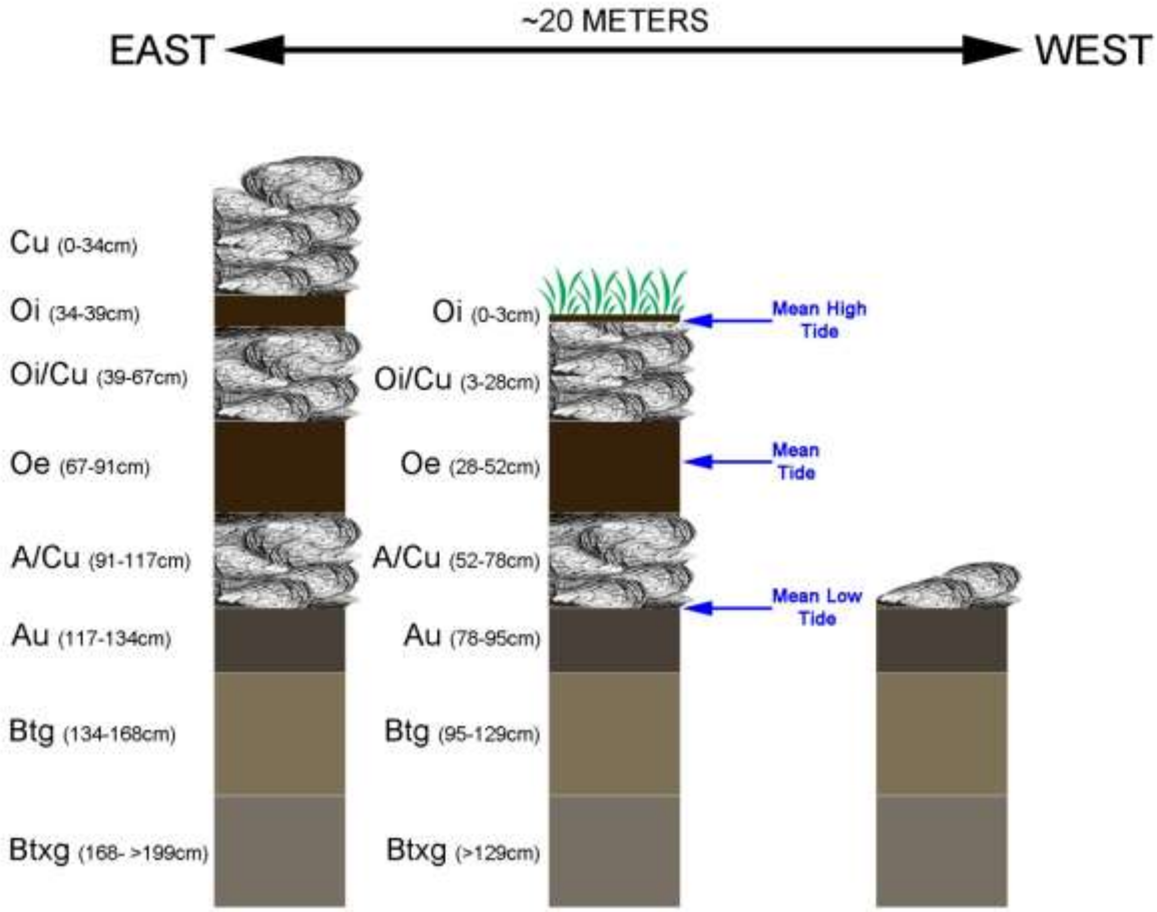

Figure 4.26. The graphic illustrates the complex stratigraphy at 18DO369.

To the researcher who is unfamiliar with the coastal dynamics of a nearshore setting, the stratigraphy and geoarchaeology at 18DO369 would seem perplexing and somewhat confusing. Even though artifacts and other cultural debris can be found within the various soil horizons at 18DO369, several of these soil horizons contain mixed cultural assemblages augmented with unassociated modern organic residues (see Figures 4.24, 4.25, and 4.26). If the strata noted at 18DO369 were encapsulated and preserved by a rapid pulse of sea level, one could easily misinterpret the alternating tidal marsh peat and shell strata as evidence of sporadic marine transgression events interrupted by intermittent regression episodes. Given the mixture of both prehistoric and modern debris, oyster shell from the various overwash strata should produce a gamut of radiometric ages (see Figures 4.26 and 4.27). Attempting to determine rates of sea level rise by dating organic carbon extracted from basal tidal marsh peat at 18DO369 would also be greatly impacted by bioturbation from intertidal organisms, such as burrowing fiddler crabs (see Figure 4.28 A, B, C, and D).

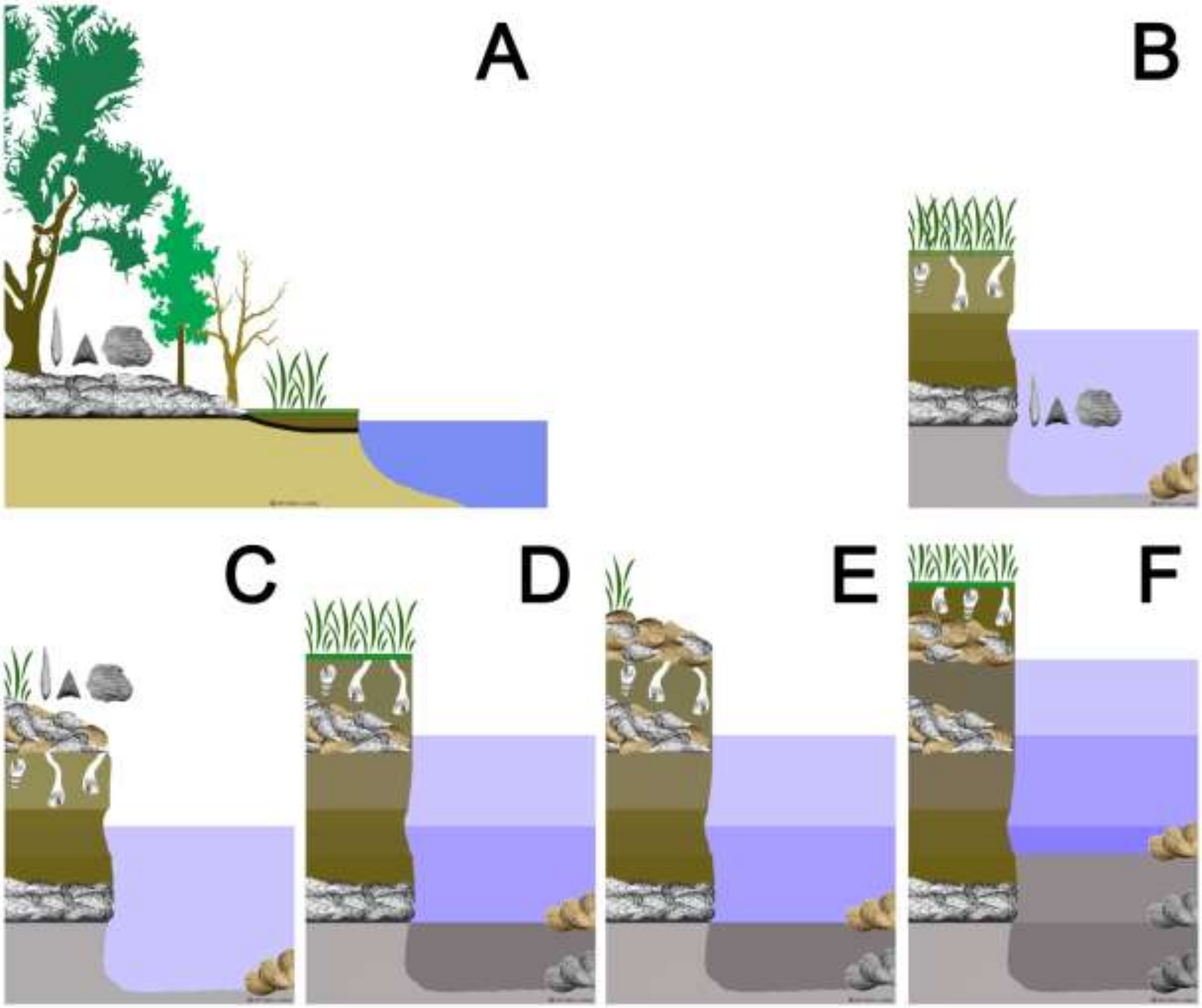

Figure 4.27. The graphic illustrates the compounding effects of slow rates of sea level rise and storm-related overwash at a hypothetical site like 18DO369. An upland refuse midden near a coastline is abandoned (A). Slow rates of sea level rise encapsulate the prehistoric midden beneath a covering of tidal marsh peat and living oysters have colonized the adjacent offshore area (B). Storm-surge and wave activity eventually erode a portion of the midden (C). Modern oyster shells, prehistoric oyster shell refuse, and artifacts are deposited by overwash processes on the surface of the young tidal marsh peat (C). The accumulation of detritus and slow rates of sea level rise permit the formation of another stratum of tidal marsh peat. The peat encapsulates the previous mixture of archaeological and natural overwash materials (D). Erosion and storm-surges deposit yet another assortment of dislodged archaeological and natural debris onto the surface of the tidal marsh (E). Sea levels continue to rise at a slow rate and another younger tidal marsh stratum encapsulates the previous amalgamation of archaeological and natural debris. Note that fiddler crab bioturbation occurs throughout the sequence

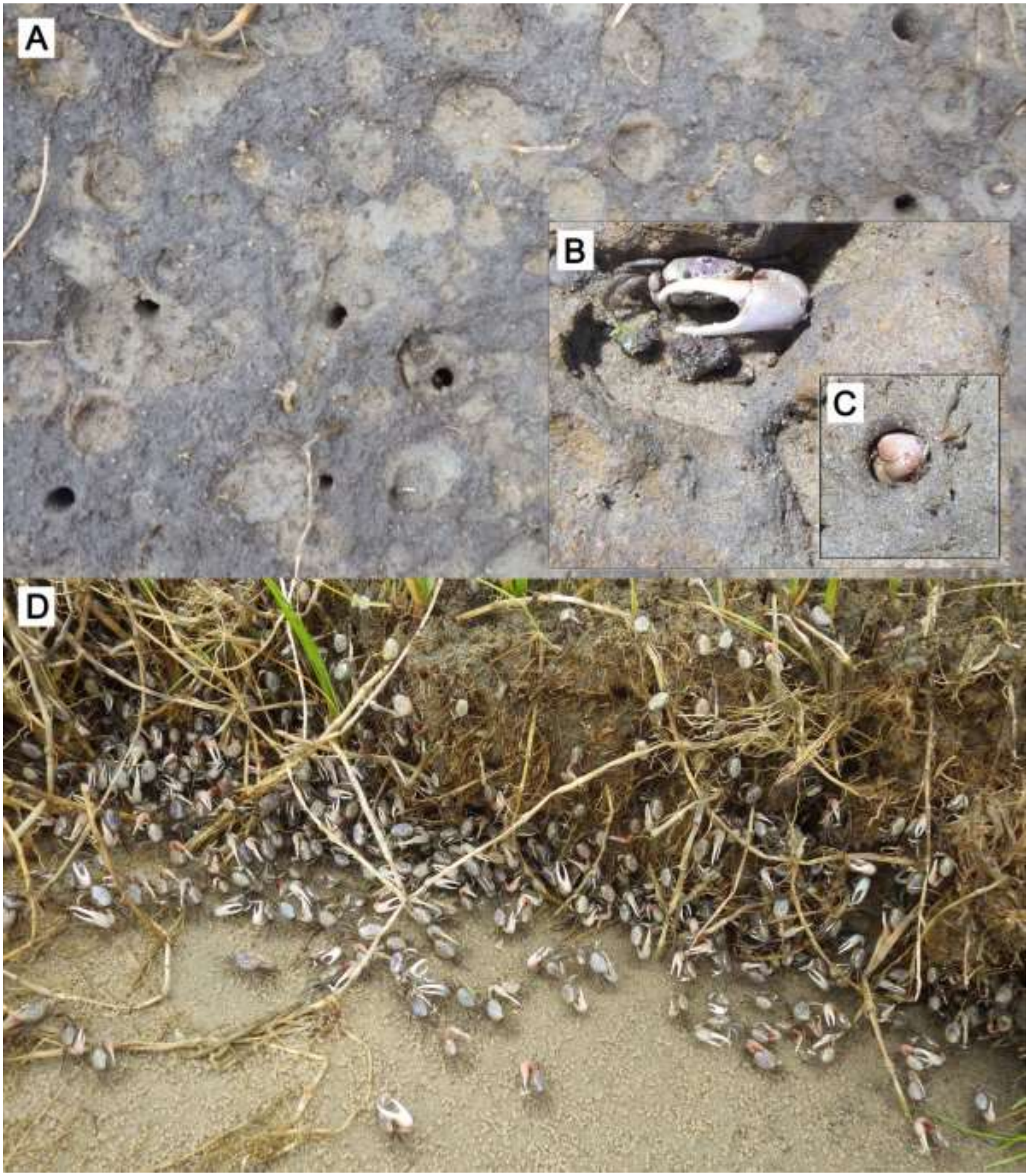

Figure 4.28. In nearshore coastal settings adjacent to the Delmarva Peninsula, archaeological deposits (A) can become churned as a result of fiddler crab (B) bioturbation (C). Each season, millions of fiddler crabs colonize the marshes of the Middle Atlantic region (D). At archaeological sites (A), active fiddler crab dens or burrows (C) introduce modern contaminants into the substrata. Abandoned dens or burrows become filled with coastal overwash sediment. The surfaces of excavated archaeological features (A) are scarred and pockmarked by active and abandoned fiddler crab dens or burrows. The exposed surfaces of Middle Atlantic coastal landscapes resemble partially infilled “Swiss Cheese”.

Site 44NH233 is located along the Atlantic coastline of Northampton County, Virginia (see Figure 4.21). The site encompasses a tidal marsh adjacent to a marginal upland forested ridge. Because of the ~1.5 meter daily tidal amplitude associated with the site area, a broad late Pleistocene-age aeolian sub-soil shelf is exposed twice each day (Lowery and Stanford 2013). Excavations conducted at the site have revealed an in situ Clovis-age (Figure 3.240) archaeological deposit (Lowery and Stanford 2013; Stanford et al. In Press). Along the shoreline of 44NH233, displaced Paleoindian-age lithic artifacts are concentrated at or near the mean high tide level. The displaced lithic assemblage, which has become focused within the swash and berm zone at 44NH233, provides a rare opportunity to understand the movement of artifacts in a nearshore coastal setting.

The in situ Clovis deposits at 44NH233 are drowned during most of any given twenty-four hour period. Excavating the in situ deposits at 44NH233 could only be conducted for a short time interval at or near the daily predicted low tide level. When conducting the fieldwork in 2012 and while waiting for low tide to occur, the displaced artifacts within the swash and berm zone were flagged (Figure 4.29 A), mapped (Figure 4.29 B), and collected.

At 44NH233, in situ Clovis archaeological remains are buried and occur from the base of the Bt2 horizon and the top of the BC soil horizon (Figure 4.30 A). When Clovis lithic artifacts are eroded out of context, they are transported inland away from their primary source. Plotting the artifacts (see Figure 4.29 A and 4.29 B) has shown that when dislodged from primary contexts lithic artifacts are displaced inland and concentrated at or slightly below the mean high tide level (Figure 4.30 B).

The excavations, mapping, and research at 44NH233 were conducted several months prior to and after Hurricane Sandy impacted the Middle Atlantic coast in the fall of 2012. The peak Hurricane Sandy storm surge at the mouth of the Chesapeake Bay occurred on Monday October 29th at 12:36pm. The surge was approximately 1.18 meters or 3.895 feet above normal high tide during this storm. Importantly, the tides near 44NH233 were higher than normal at least 48 hours prior to the peak storm surge (Figure 4.31). After the storm surge, the concentration of displaced Paleoindian artifacts normally located below the men high tidal level (see Figures 4.29 A, 4.30 B, and 4.32) had essentially disappeared. Paleoindian artifacts along with modern organic debris had been transported inland an additional 50 to 80 meters onto a Hurricane Sandy-related overwash berm feature (Figures 4.30 C and 4.32). The storm surge displaced artifacts exposed on the surface of the overwash berm feature were mapped (see Figure 4.32). Over the past four years, surface evidence of the overwash berm feature has all but disappeared and been recolonized by tidal marsh grasses, such as saltmarsh cordgrass (*Spartina alterniflora*) and American glasswort (*Salicornia virginica*).

During a single storm event, dislodged Paleoindian artifacts associated with 44NH233 were transported ≥ 100 meters east of the actual location along the shoreline containing in situ archaeological remains. The Paleoindian artifacts relocated by the storm surge were mixed with modern organic materials, such as shell and plant material. The mixture of modern organics and lithic artifacts are now encapsulated by the tidal marsh peat. Geochemical processes unique to tidal marshes (see Lowery and Wagner 2012) are actively impacting these artifacts. As the shoreline continues to erode, artifacts displaced inland as a result of Hurricane Sandy will again be exposed along the shoreface and reworked by coastal processes for yet a second time. Presumably, the sequence of events witnessed at 44NH233 will occur and re-occur numerous times as a result of shoreline erosion, coastal reworking, storm surge overwash, and short-term stabilization.

The data observed at both 18DO369 and 44NH233 have ramifications in the fields of archaeology, geoarchaeology, as well as coastal geology. Coastal overwash can result in mixed unaffiliated archaeological assemblages encapsulated within young organic-rich tidal marsh peat. To the neophyte archaeologist unfamiliar with coastal processes, these mixed assemblages could be misinterpreted as being archaeologically associated.

In areas impacted by slow rates of marine transgression, redeposited archaeological remains transported from inundated offshore sites can become concentrated within tidal marsh along actively eroding shorelines. When these circumstances occur, a systematic archaeological survey along a given stretch of shoreline (see Figure 4.33 A) can produced vast quantities of unassociated diagnostic archaeological remains (see Figure 4.33 B). Within geologically-young tidal marsh peat, a combination of wave-related overwash actions, offshore archaeological site erosion (see Figure 4.33 C), and slow rates of marine transgression (see Figure 4.33 D) can result in concentrated unassociated strata comprising of both mixed archaeological remains (see Figure 4.33 B) and natural debris (see Figure 4.24 O). Recorded archaeological sites; like 18SO152 (see Figure 4.33), which embrace no observable inundated upland archaeological landsurfaces, may be nothing more than the collective long-term accumulations of wave-related overwash deposits.

Under these conditions (see Figures 4.33 C and 4.33 D), archaeological remains would be subjected to a gamut of cyclical episodes of both sulfidization and sulfuricization (see Fanning et al. 2010 and Lowery and Wagner 2012). Given the ultra-acid pH and high amount of sulfate minerals reported in these types of settings (see Sánchez-Marañón 2015 and Soil Survey Staff 2014), archaeological remains would be subjected to intense sulfuric acid weathering during periods when aerobic conditions are restored. Overwash archaeological assemblages in settings subjected to cyclical acid sulfate conditions may display a preservation bias towards lithic artifacts (see Figure 4.33 B).

The overwash processes noted at 18DO369, 44NH233, and 18SO152 are not unique. To varying degrees, storm-related coastal overwash events have and will continue to impact virtually every archaeological site adjacent to the low lying shorelines of the Chesapeake Bay.

Figure 4.29. At the start of each work day, displaced Paleoindian artifacts along the shoreline at 44NH233 were flagged (A) and the locations of each artifact were mapped (B). The data provided an opportunity to access how artifacts eroded out of context are being moved and transported as a result of wind and wave processes.

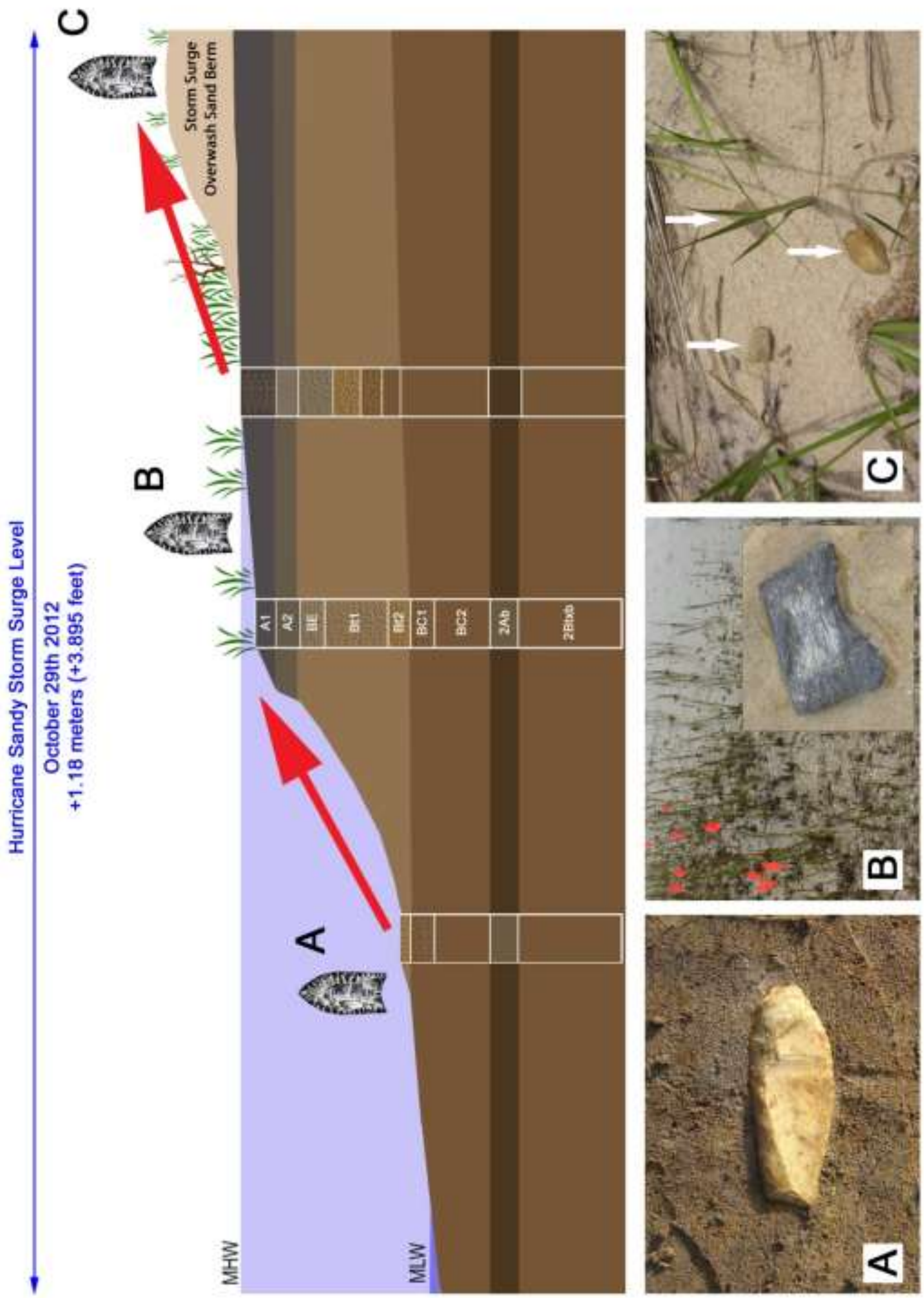

Figure 4.30. When in situ stone artifacts (A) are dislodged from the exposed strata along the shoreline, interplay between tidal and wave actions transports these artifacts inland towards the high-tide level (B). During storm events, artifacts and other nearshore sediments are redeposited further inland and form an overwash berm feature (C).

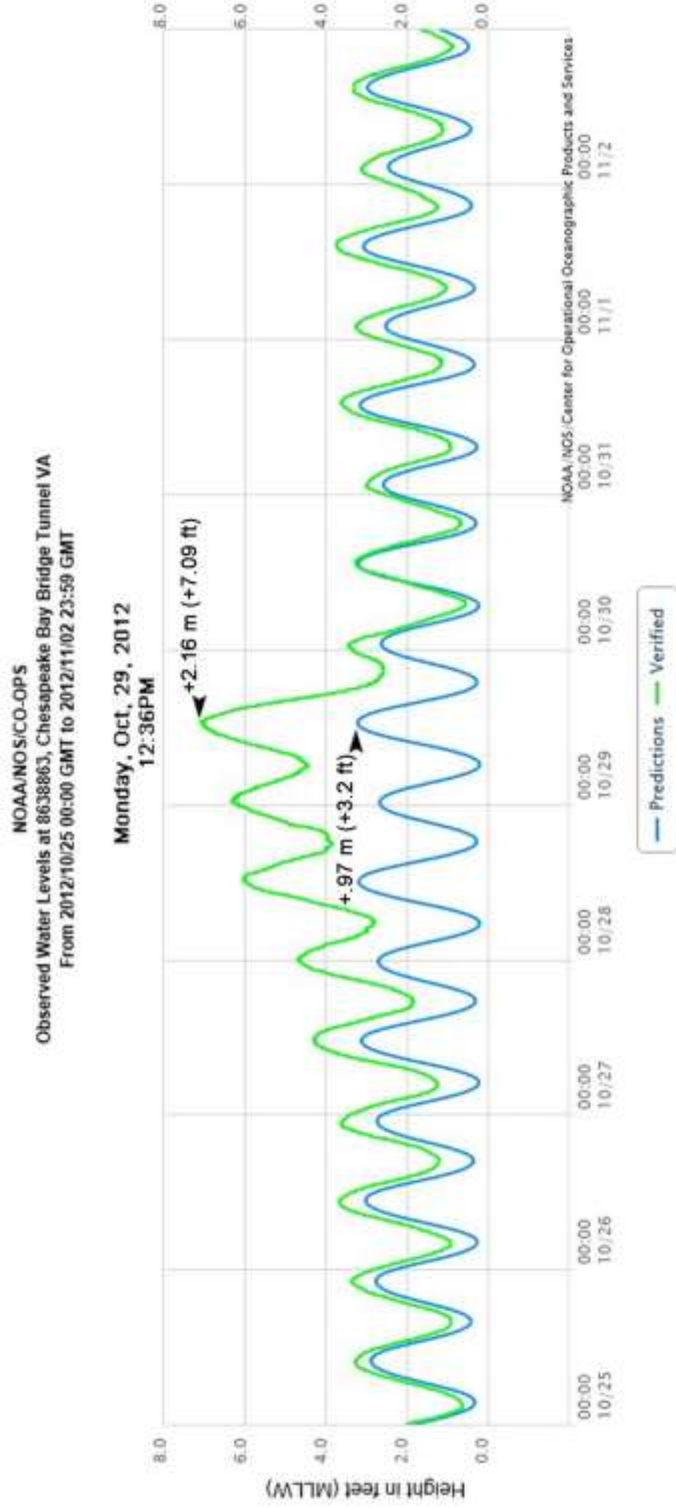

Figure 4.31. The graph illustrates the NOAA tidal magnitudes recorded at the mouth of the Chesapeake Bay from October 25th 2012 to November 2nd 2012, which encompasses the period associated with Hurricane Sandy.

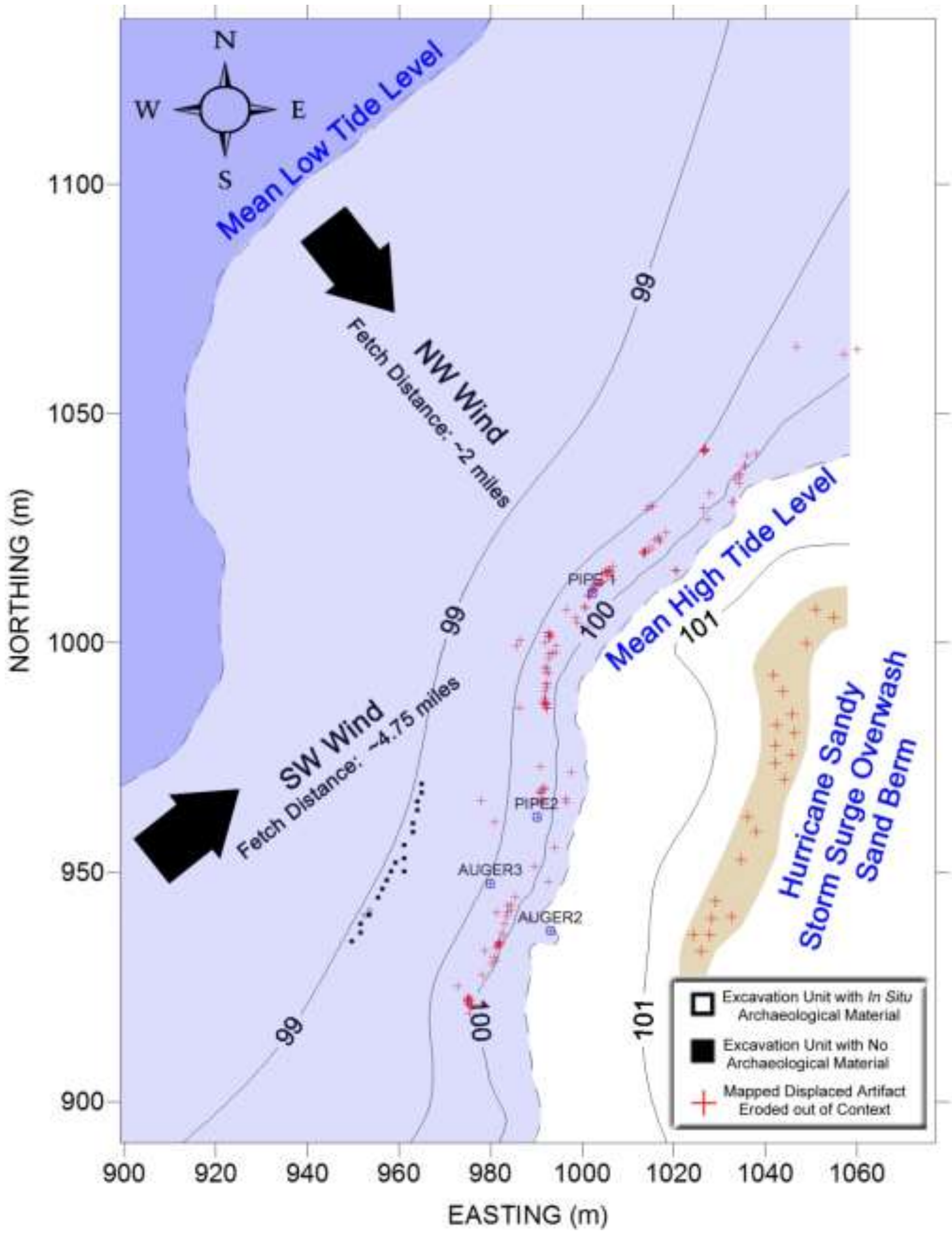

Figure 4.32. Under normal conditions eroded artifacts at 44NH233 are moved 25 to 60 meters inland and away from the in situ archaeological deposit or stratum. During a storm event, displaced artifacts concentrated near the normal high tide zone can be transported inland an additional 50 to 80 meters. The storm surge artifacts deposited on the surface of the overwash berm have been displaced inland ≥ 100 meters. Impacted by variations in fetch distance, the prevailing northwest and southwest wind and wave activity have resulted in the asymmetrical lateral displacement of artifacts within the swash and berm zone along the shoreline.

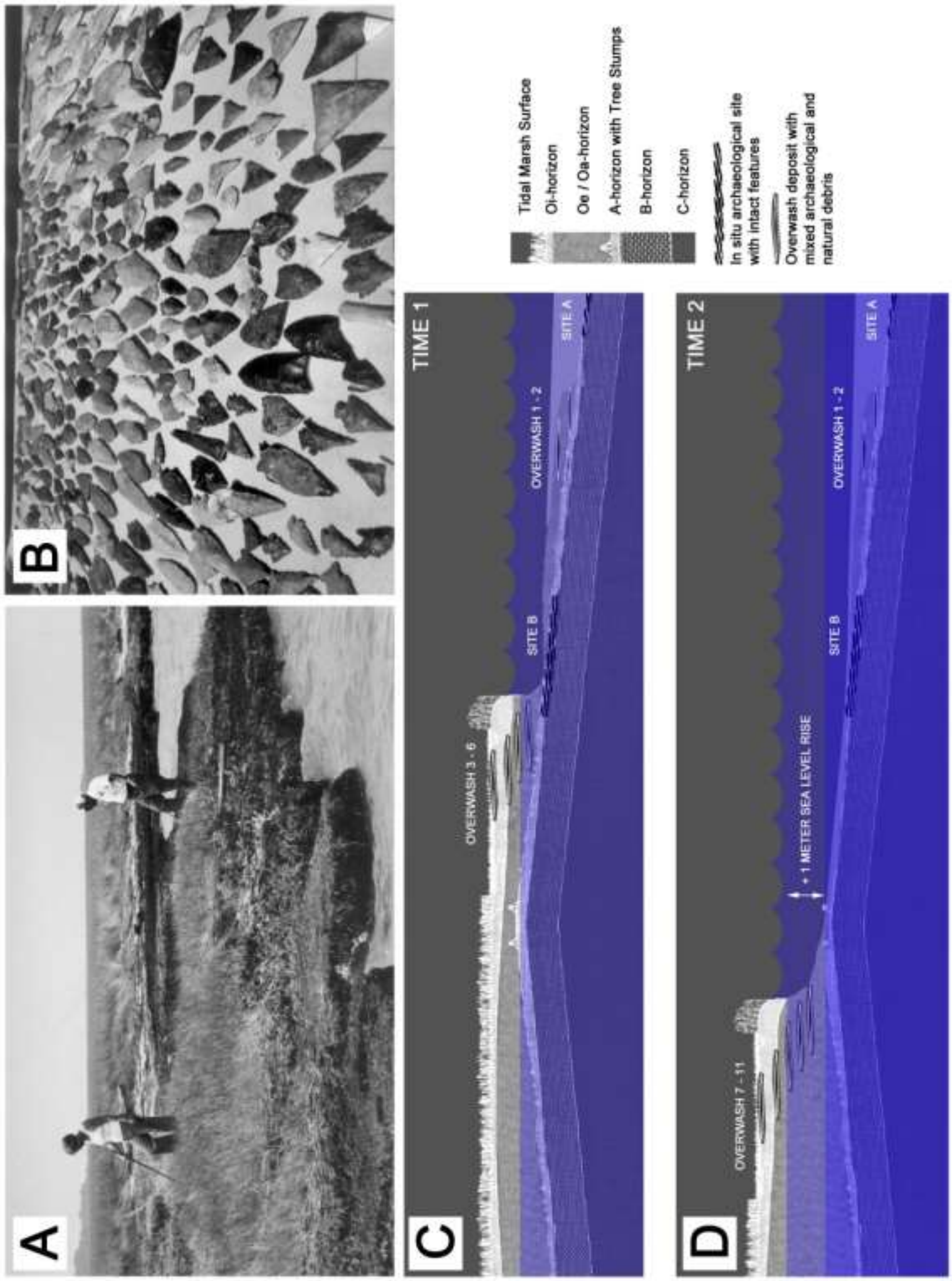

Figure 4.33. Recorded archaeological sites, such as 18SO152 (A) consist of very thick deposits of late Holocene tidal marsh peat and mixed surface assemblages of similar-sized artifacts (B). The site is actually a "natural collection area" expressive of long-term erosion, sea level rise, wave energy, and artifact redeposition (C and D).

AEOLIAN LANDFORMS, COASTAL BEACH FORMATIONS, AND ARCHAEOLOGY:

Along the lower end of the Delmarva Peninsula and within Northampton County, Virginia, three locations were recognized with buried late Holocene age archaeological deposits (see Figure 4.34). Latimer's Bluff, Butler's Bluff, and Savage Neck all have prehistoric archaeological sites buried beneath thick deposits of aeolian sand or coastal beach dunes. The sites associated with these landscapes would be largely invisible if the shorelines at these locations were not eroded. As such, the actual archaeological record along these stretches of coastline may be more extensive than already recognized.

The Savage Neck location encompasses the largest of these coastal dune formations. At Savage Neck, the dunes extend along the shoreline for about ~4 kilometers or ~2.5 miles. The dunes extend inland from the shoreline for about one-half of a kilometer or one-third of a mile. The dunes at Savage Neck can attain a height of ~20 meters or ~64 feet. Two sites (i.e., 44NH435 and 44NH434) have been recorded within a paleosol situated beneath the late Holocene dunes. 44NH434 has produced fourteen AMS-ages on archaeological remains, which span 700 calBC to 1370 calBC (see Rick et al. 2015). 44NH435 is located near the maximum apex or height of the dune and is situated almost 2 kilometers or 1.25 miles north of 44NH434. 44NH435 has produced an extensive archaeological record, which spans the Paleoindian through Late Woodland period. However, the bulk of the cultural remains found at this location can be directly attributed to the Middle Woodland period. Archaeological refuse within the paleosol at the base of the dune produced an AMS-age of 1007 ± 11 calAD. The area of the dune at Savage Neck encompasses almost 350 acres. As such, the archaeological record within the foot-print of the dune pre-dating circa 1000 calAD is largely inaccessible, unknown, and buried beneath a series of thick forested dunes.

The Butler's Bluff location is situated about 15 kilometers or 9.5 miles south of Savage Neck. At Butler's Bluff the late Holocene dunes extend along the shoreline for about ~2.5 kilometers or ~1.5 miles. Unlike Savage Neck, Butler's Bluff is a topographically high landscape, attaining a height of about ~ 9 to ~12 meters or ~30 to ~40 feet. Archaeological remains can be found within a paleosol buried beneath ~2 to ~4 meters or ~6.5 to ~13 feet of late Holocene aeolian sand. The inland extent of the dunes is hard to determine because of recent agricultural tilling. Cline et al. (2001) dated a fragment of charcoal to 842 ± 56 calAD, which was associated with a rhyolite flake within the young paleosol. During the recent survey, a fragment of shell within the paleosol and associated with conjoining fragments of Townsend ware at 44NH436 was dated to 1071 ± 45 calAD. Like Savage Neck, the archaeological record within the circa 1100 calAD paleosol beneath the dune at Butler's Bluff is largely inaccessible and unknown.

The Latimer's Bluff location is situated about 1.5 kilometers or 1 mile south of Butler's Bluff. The late Holocene paleosol at Latimer's Bluff is situated beneath about ~1 to ~2.5 meters or ~3 to ~8 feet of sand. A Latimer's Bluff the palesol can be traced along the eroded bluffs well-beyond the confines of the site designated as 44NH437. During the recent survey, a fragment of shell within the paleosol and associated with two fragments of Townsend ware found at 44NH437 was dated to 1272 ± 8 calAD. Like both Savage Neck and Butler's Bluff, the archaeological record within the circa 1200 calAD paleosol beneath the dune at Latimer's Bluff is largely inaccessible and unknown.

The dune surfaces at each location are currently inactive, stable, and covered with vegetation (see Figures 3.207, 3.215, and 3.219). The dunes at Savage Neck, Butler's Bluff, and Latimer's Bluff also appear on the mid-19th century coastal maps. The late Holocene palesol situated beneath the dunes at each location only show historic-era disturbances along the marginal fringes of the dune field (see Figure 3.196). Given the associated AMS-dates and the integrity of the paleosol, these were developing and building sometime between circa 1300 calAD and 1600 calAD. It is currently unknown what process or combination of processes (i.e., prehistoric anthropogenic landscape burning, regional climatic aridity, and changes in tidal amplitude) resulted in the formation of these late Holocene coastal dune fields. Regardless, the dune field areas hinder our ability to assess and gauge the magnitude of the archaeological resources along a large stretch of Chesapeake Bay coastline in southern Northampton County, Virginia.

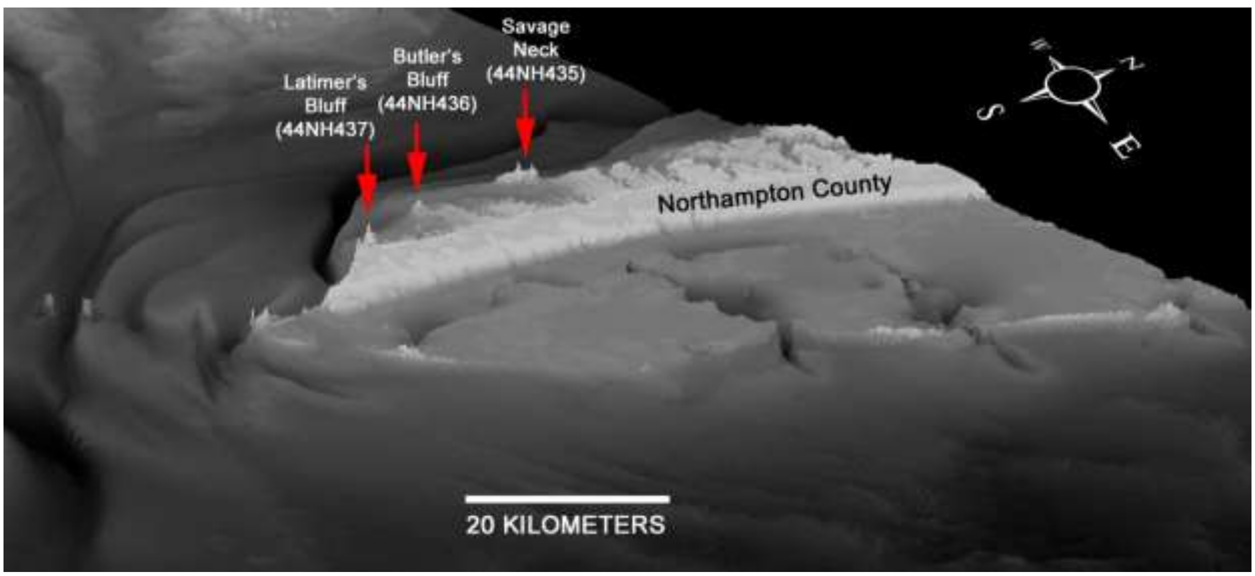

Figure 4.34. The late Holocene dune fields in southern Northampton County Virginia can be seen as noticeable peeks in this regional LIDAR map. Archeological sites (44NH437, 44NH436, and 44NH435) in these locations can only be detected along the eroding shorelines. Additional prehistoric sites may be located in these areas. However, the non-eroded sites immediately inland from the shoreline will be buried beneath ~1 meter to ~20 meters or ~3 feet to ~64 feet of sand.

ARCHAEOLOGICAL SUMMARY AND MANAGEMENT RECCOMENDATIONS:

For both Accomack and Northampton counties, the current shoreline survey, as well as prior surveys conducted by the author in the region (see Lowery 2001, 2003a, 2014) permit a better assessment of the regional archaeological patterns. Within the entire region, there are three regions locations, which contain a dense prehistoric presence. In other words, these areas were consistently occupied and re-occupied throughout prehistory. The prehistoric archaeological remains at Watt's Island, Savage Neck, and Mockhorn Island are extremely concentrated and diverse. In sum, these locations contain the greatest concentrations of significant archaeological sites. As such, the archaeological sites in these areas represent locations for future research and follow-up investigations.

Many of the sites described in section three of this monograph have produced evidence of intact features or in situ artifacts (see Figures 3.24, 3.47, 3.61, 3.115, 3.199, 3.200, 3.259, and 3.273). Many of the archaeological features are associated with drowned or inundated settings (see Figures 3.27, 3.30, 3.58, 3.66, 3.70, 3.73, 3.100, 3.115, 3.120, 3.148, 3.221, 3.294, 3.297, 3.306, and 3.307) and some of the features are related to eroding upland settings (see Figures 3.184, 3.205, 3.253, 3.287, 3.303, and 3.304). Many of the sites with features and in situ artifacts probably contain the most significant archaeological record within the region. As such, they may also represent locations for future research and follow-up investigations.

Nineteen AMS-dates were generated on features at sixteen coastal archaeological sites (see Table 4.2). Fourteen of the AMS-dates can be directly associated with diagnostic and in situ artifacts. Two of the sites produced AMS-dates, but their cultural and chronological affiliation is based largely on associated eroded artifacts, as well as speculation. In sum, the project has greatly increased the number of dated archaeological sites within the study area. Prior to the survey, 44NH434 had produced fourteen AMS-dates (see Rick et al. 2015), 44NH436 had produced one AMS-date (see Cline et al. 2001), 44NH454 had produced two AMS-dates (see Lowery 2013a), a single date had been generated for 44NH441 (see Lowery et al. 2015), and two dates were gleaned from excavated samples at 44NH440 (see Rick and Lowery 2013). In sum, the current survey almost doubled the number of AMS-dates for the region and clearly tripled the number of dated archaeological sites within the region.

The cultural chronologies recognized at each site are outlined in Table 4.3. In an attempt to illustrate the complexities of assessing archaeological sites in coastal settings, the previously recorded sites noted in Table 4.3 have two chronological summaries. One summary outlines the site chronological data gathered prior to the 2015-2016 shoreline survey and the other details the data gleaned as a result of the recent survey. Comparisons between the two datasets illustrate the restrictions of limited "one-time" shoreline survey assemblages. In sum, multiple examinations of or testing at eroding coastal shoreline sites provide higher-resolution chronological detail.

Eleven of the newly dated archaeological sites contain drowned or inundated archaeological features with diagnostic artifacts. These sites were dry upland landscapes at the time of occupation. In tandem with site specific soil data, many of these drowned upland sites provide a proxy for regional sea level change over the past 2,000 years. The youngest human presence at 44NH455 was dated to circa 22 calAD (see Table 4.2) and indicated by distinct styles of artifacts (Figure 3.264). The upland surface at 44NH455 is concealed beneath 1.5 meters or ~5 feet of intertidal deposits, which include tidal marsh peat, an oyster reef formation, and subaqueous silts. At 22 calAD, 44NH455 had to be a marginally-dry upland landscape to permit human habitation and settlement. For this to occur, relative sea level had to be ≥2 meters or ≥6.5 feet lower than present.

The most recent human occupation at 44NH454, which is located north of 44NH455, was dated to circa 500 calAD (see Table 4.2) and showed markedly different and younger artifact types (see Figure 3.261). The upland surface at 44NH454 is masked beneath 1 meter or ~3.28 feet of intertidal deposits, which also include tidal marsh peat, an oyster reef formation, and subaqueous silts. For 44NH454 to encompass a marginally-dry upland setting suitable for human habitation, relative sea level had to be ≥1.5 meters or ≥5 feet lower than present. With respect to the topographically-lower upland surface observed at 44NH455 to the south, the lack of younger style artifacts, like those observed at 44NH454, imply that 44NH455 was already drowned and inundated at circa 500 calAD.

Across Magothy Bay, the last human presence at 44NH462 is indicated by Late Woodland-style artifacts that have been dated to circa 900 calAD (see Figure 3.228). The upland surface at 44NH462 is encapsulated beneath ~40 to 50 centimeters or ~1.5 feet of tidal marsh. For 44NH462 to encompass a marginally-dry upland setting suitable for human habitation, relative sea level had to be ≥1 meter or ≥3.28 feet lower than present. With respect to the topographically-lower upland surface observed at 44NH454 across Magothy Bay, the lack of any Late Woodland style artifacts, like those observed at 44NH62, imply that 44NH454 was already drowned and inundated at circa 900 calAD.

Moving northward into Accomack County, the regional sea level history can be extended by incorporating the geoarchaeological and historical records associated with 44AC529. 44AC529 provides a high-resolution sea level history encapsulating the past 500 years. Based on the presence of a shell midden, associated diagnostic artifacts, and an AMS-date, pre-Contact prehistoric cultures occupied a large elevated hummock area at circa 1500 calAD. Refuse, in the form of a midden, was scattered across the hummock area. The western portion of the shell midden at 44AC529 was inundated and drowned before colonial occupation occurred. The upland surface and midden along the western margins of 44AC529 are submerged beneath ~22 centimeters or ~8.6 inches of tidal marsh peat (see Figure 3.70). For the drowned midden at 44AC529 to be suitable for human use, relative sea level had to be ≥50 centimeters or ≥1.6 feet lower than present.

The undrowned or extant upland portion of the midden at 44AC529 was historically-tilled (see Figures 3.68 and 3.69). The colonial agricultural practices fragmented the shell refuse associated with the earlier pre-Contact use of this landscape. However, the agriculturally-fragmented pre-Contact midden is associated with the colonial use of an upland landscape. The tilled midden is confined to a smaller portion of the hummock area. The drowned midden along the western margins of 44AC529 was not disturbed by colonial land-use practices. We can assume that the intact pre-Contact portion of the midden at 44AC529 was too wet and already influenced by saltwater intrusion at the time of initial colonial settlement. The archaeological record associated with the tilled portion of the hummock (see Lowery 2007) suggests that the site was initially occupied by colonists during the mid to late-18th

century. Historical data (see Whitelaw 1951: 1208) support a mid to late 18th century time of initial colonial occupation. As such, the combined datasets indicate that the amount of relative sea level rise over the past 250 years is <22 centimeters or <8.6 inches. In sum, the collective data generated during this survey has provided the opportunity to develop a high-resolution geoarchaeological proxy for relative sea level change within both Accomack and Northampton counties encompassing two millennia (see Figure 4.35). The results indicate that the modeled tide-based sea level changes reported for the past century in this region (see Boon 2012) have greatly overestimated the amount of marine transgression. The results also indicate that Middle Atlantic sea level was rising during the 480-year sea level still-stand episode reportedly to have occurred between 1400 calAD and 1880 calAD (see Kemp et al. 2011).

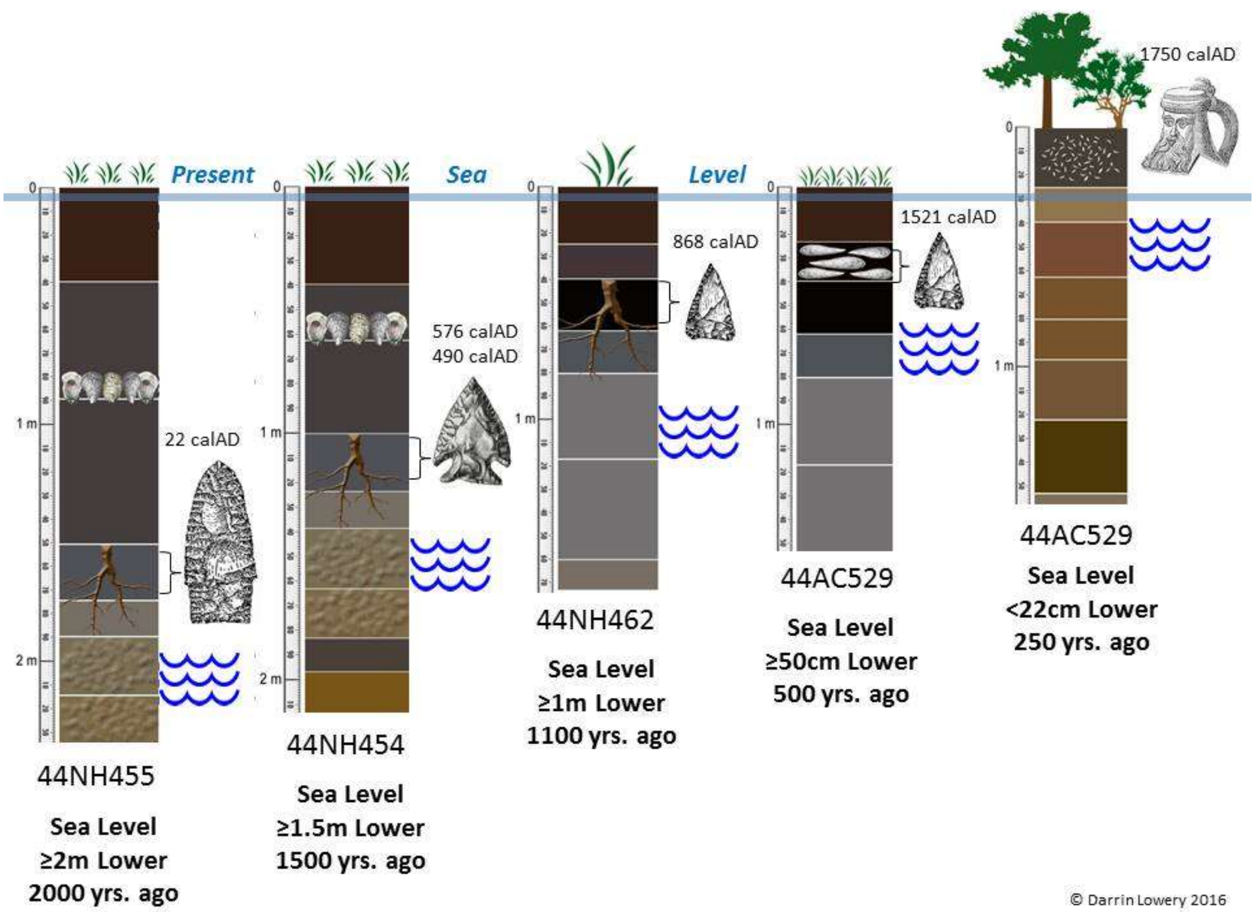

Figure 4.35. The graphic image illustrates the combined use of archaeology, stratigraphy, and AMS-dates to develop a high-resolution Late Holocene proxy of relative sea level change within both Accomack and Northampton counties.

Table 4.2. A List of AMS-Dates for Coastal Sites in both Accomack and Northampton counties.

Site Name and Number:	Calibrated Date:	Lab Number:	Associated Diagnostics:
Pitts Creek 5 - 44AC623 *	1007 ± 14 calAD	D-AMS 0010275	Townsend ceramics
Pitts Creek 4 - 44AC622 *	644 ± 12 calAD	D-AMS 0010271	Mockley ceramics
Pitts Creek 1 - 44AC620 *	1427 ± 11 calAD	D-AMS 0010276	Townsend ceramics (?)
Northwest Messongo Creek - 44AC633 *	978 ± 24 calAD	D-AMS 0015331	Townsend ceramics
Messongo Creek #2 - 44AC528 *	1185 ± 20 calAD	D-AMS 0015332	Townsend ceramics
South Messongo Creek - 44AC529 *	1521 ± 68 calAD	D-AMS 0015333	Townsend ceramics
Onancock Creek Hummock #1 - 44AC645 *	484 ± 40 calAD	D-AMS 0015329	Fox Creek point
Nandua South – 44AC512 *	66 ± 32 calBC	D-AMS 003045	Fox Creek points/Mockley ceramics
Nassawadox Creek #4 – 44NH431 *	493 ± 44 calAD	D-AMS 0015334	Jack's Reef material (?)
Savage Neck North Midden – 44NH435 *	1007 ± 11 calAD	D-AMS 005955	Potomac Creek ceramics
Savage Neck South Midden – 44NH434 a	845 ± 55 calBC	B-322117	Meadowood points, early Mockley ware, and other ceramics (see Rick et al. 2015)
Savage Neck South Midden – 44NH434 b	825 ± 125 calBC	B-312010	(same as above)
Savage Neck South Midden – 44NH434 c	855 ± 115 calBC	B-312009	(same as above)
Savage Neck South Midden – 44NH434 d	890 ± 110 calBC	B-349780	(same as above)
Savage Neck South Midden – 44NH434 e	895 ± 125 calBC	B-349881	(same as above)
Savage Neck South Midden – 44NH434 f	910 ± 140 calBC	OS-95244	(same as above)
Savage Neck South Midden – 44NH434 g	920 ± 130 calBC	OS-95249	(same as above)
Savage Neck South Midden – 44NH434 h	975 ± 75 calBC	B-322118	(same as above)
Savage Neck South Midden – 44NH434 i	990 ± 160 calBC	B-349782	(same as above)
Savage Neck South Midden – 44NH434 j	1055 ± 155 calBC	B-315746	(same as above)
Savage Neck South Midden – 44NH434 k	1115 ± 165 calBC	B-349778	(same as above)
Savage Neck South Midden – 44NH434 l	1115 ± 165 calBC	B-312011	(same as above)
Savage Neck South Midden – 44NH434 m	1115 ± 165 calBC	B-349783	(same as above)
Savage Neck South Midden – 44NH434 n	1205 ± 165 calBC	B-349779	(same as above)
Butler's Bluff - 44NH436 a *	1071 ± 45 calAD	D-AMS 0015335	Townsend ceramics
Butler's Bluff - 44NH436 b	842 ± 56 calAD	Beta-157935	Rhyolite flake (see Cline et al. 2001)
Latimer's Bluff - 44NH437 *	1272 ± 8 calAD	D-AMS 0015330	Townsend ceramics
Jones Cove – 44NH462 *	868 ± 55 calAD	D-AMS 006452	Rappahannock ceramics and a triangular point
Mockhorn Island #1 – 44NH445 a *	914 ± 36 calAD	D-AMS 0010268	Townsend ceramics and triangular points
Mockhorn Island #1 – 44NH445 b *	872 ± 56 calAD	D-AMS 0010269	Townsend ceramics and triangular points
Mockhorn Island #12 - 44NH454 a	490 ± 48 calAD	B-326584	Hell Island ceramics and Jacks Reef points (see Lowery 2013)
Mockhorn Island #12 - 44NH454 b	576 ± 25 calAD	B-312660	Hell Island ceramics and Jacks Reef points (see Lowery 2013)
Mockhorn Island #13 - 44NH455 *	22 ± 28 calAD	D-AMS 006453	Mockley ceramics and a Fox Creek point
Middle Ridge – 44NH441	465 ± 51 calBC	OS-79762	Mockley ceramics, Fox Creek-like points, early Adena material (see Lowery et al. 2015)
Upper Ridge – 44NH440 a	488 ± 42 calAD	OS-80194	Jack's Reef and fish remains (see Rick and Lowery 2013)
Upper Ridge – 44NH440 b	535 ± 125 calAD	OS-92580	Hard clam temper in Mockley ceramics (see Rick and Lowery 2013)
Red Hill - 44AC44 (Pit #1-upper) *	1366 ± 41 calAD	D-AMS 0010272	Townsend ceramics
Red Hill - 44AC44 (Pit #1-lower) *	1335 ± 40 calAD	D-AMS 0010273	Townsend ceramics
Red Hill - 44AC44 (Pit #2) *	1358 ± 38 calAD	D-AMS 0010274	Townsend ceramics

* : Site AMS-dated during the recent survey

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites.

Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
1 Hog Neck - 44AC653	X	X	X	X	X	X	X							
2 South Smith Island - 44AC651	X	X	X	X	X	X	X							
3 Goose Harbor - 44AC652	X	X	X	X	X	X	X							
4 NW Tangier Island – 44AC524	X	X	X	X	X	X	X							
2015-2016 Survey Data									X					
5 Tangier Uppers Cemetery – 44AC571							X					X	X	
2015-2016 Survey Data									X					X
6 Fort Albion – 44AC574												X		
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
7 Horse Hammock – 44AC6			X	X										X
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8 Great Fox Island - 44AC525	X	X	X	X	X	X	X							
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9 Watts Island 1 - 44AC214	X	X	X	X	X	X	X							
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10 North Central Watts Island - 44AC520	X	X	X	X	X	X	X							
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11 Watts Island 2 - 44AC522										X	X			
2015-2016 Survey Data											X			
12 Watts Island 3 - 44AC523	X	X	X	X	X	X	X							
2015-2016 Survey Data									X					
13 Watts Island 4 - 44AC521		X												
2015-2016 Survey Data				X										
14 Southern Watts Island - 44AC397					X									
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15 Pitts Creek 8 - 44AC626									X					
16 Pitts Creek 7- 44AC625										?	?	?		X
17 Pitts Creek 6 - 44AC624									X					
18 Pitts Creek 5 - 44AC623							X							
19 Pitts Creek 4 - 44AC622						X								
20 Pitts Creek 3 -44AC621							X							
21 Pitts Creek 2 - 44AC54					?	?	?							
2015-2016 Survey Data							X							
22 Pitts Creek 1 - 44AC620							X					X		
23 Bullbeggar Creek 3 - 44AC629									X					
24 Bullbeggar Creek 2 - 44AC628						X	X							
25 Bullbeggar Creek 1 - 44AC627						X								
26 Bullbeggar Hummock - 44AC630				X	X	X						X	X	
27 West Holdens Creek - 44AC631	X								X					
28 Pig Point - 44AC530				X										
2015-2016 Survey Data									X					
29 Pocomoke Sound 2 - 44AC632									X			X		
30 Pocomoke Sound 1 - 44AC14					X	X	X							
2015-2016 Survey Data					X	X								

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
31	Starling Creek - 44AC531									X					
	2015-2016 Survey Data									X					
32	Fishing Creek - 44AC526						X	X							
	2015-2016 Survey Data									X					
33	Northwest Messongo Creek - 44AC633							X							
34	Messongo Creek #1 - 44AC527					X	X	X							
	2015-2016 Survey Data									X		X	X	X	
35	Messongo Creek #2 - 44AC528					X	X	X							
	2015-2016 Survey Data						X	X							
36	South Messongo Creek - 44AC529				X	X	X	X				X	X		
	2015-2016 Survey Data							X				X	X		
37	Cattail Creek - 44AC639							X					X		
38	Old Tree Island - 44AC136			X	X										
	2015-2016 Survey Data									X					
39	Island Field Cove - 44AC503				X	X									
	2015-2016 Survey Data									X					
40	Guilford Creek #1 - 44AC498									X					
	2015-2016 Survey Data									X					
41	Guilford Creek #2 - 44AC499									X					
	2015-2016 Survey Data									X					
42	Cals Hammock - 44AC492				X	X	X	X							
	2015-2016 Survey Data									X					
43	Jobes Island – 44AC505									X		X	X		
	2015-2016 Survey Data							X				X	X		
44	Bundicks - 44AC213									X					
	2015-2016 Survey Data									?					
45	Cedar Island – 44AC493				X								X	X	
	2015-2016 Survey Data						X						X	X	
46	NE Halfmoon Basin – 44AC506				X										
	2015-2016 Survey Data									X					X
47	Bernard Islands – 44AC491													X	
	2015-2016 Survey Data													X	
48	North Little Back Creek - 44AC641					X	X								
49	Little Back Creek Hummock - 44AC640						X						X		
50	East Halfmoon #1 – 44AC496					X	X	X							
	2015-2016 Survey Data						X						X		
51	East Halfmoon #2 – 44AC497		X	X	X	X	X	X			?	X	X		
	2015-2016 Survey Data									X					X
52	Jacks Island – 44AC504									X					
	2015-2016 Survey Data									X					
53	Halfmoon Island – 44AC500									X			X		
	2015-2016 Survey Data									X					
54	Dix Cove – 44AC495				X										
	2015-2016 Survey Data									X					

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
55 Hunting Creek #1 – 44AC501												X		
2015-2016 Survey Data														X
56 Hunting Creek #2 – 44AC502														X
2015-2016 Survey Data														X
57 Deep Creek NW Harbor - 44AC494									X					
2015-2016 Survey Data									?					
58 Deep Creek #1 - 44AC489									X		X	X		
2015-2016 Survey Data							X				X	X		
59 Deep Creek #2 - 44AC490						X	X							
2015-2016 Survey Data									?					
60 Chesconessex Creek Hummock - 44AC642							X							
61 South Chesconessex Marsh - 44AC643			X											
62 Back Creek #1 - 44AC460									X					
2015-2016 Survey Data									?					
63 Back Creek #2 - 44AC461									X			X	X	
2015-2016 Survey Data									X			X		
64 Back Creek #5 - 44AC464									X			X		
2015-2016 Survey Data									X					
65 Back Creek #4 - 44AC463									X		X			
2015-2016 Survey Data									X					
66 Back Creek #3 - 44AC462				X	X									
2015-2016 Survey Data									X					
67 Back Creek #6 - 44AC465							X							
2015-2016 Survey Data					X	X								
68 Sound Beach #1 - 44AC484				X										
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
69 Sound Beach #2 – 44AC485		X		X										
2015-2016 Survey Data					?	?	?		X					
70 Sound Beach #3 - 44AC486						X								
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
71 Ware Point - 44AC162									X					
2015-2016 Survey Data									X					
72 Low Onancock Ridge - 44AC644									X		X	X		
73 Onancock Creek Hummock #1 - 44AC645						X								
74 Onancock Creek Hummock #2 - 44AC646												X	X	
75 West Onancock Marsh - 44AC647									X					
76 North Thicket Point - 44AC648												X	X	
77 South Thicket Point - 44AC487				X	X									
2015-2016 Survey Data									X		X	X		
78 Pungoteague Creek #9 – 44AC483				X										
2015-2016 Survey Data									?					
79 Pungoteague Creek #8 – 44AC161									X		X	X	X	
2015-2016 Survey Data												X	X	
80 Belote – 44AC160		X	X	X	X	X	X							
2015-2016 Survey Data									?					

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
81 Pungoteague Creek #1 – 44AC477			X											
2015-2016 Survey Data									X					
82 Pungoteague Creek #2 – 44AC478									X					
2015-2016 Survey Data									X					
83 Pungoteague Creek #3 - 44AC479									X					
2015-2016 Survey Data									X					
84 Pungoteague Creek #4 - 44AC480									X					
2015-2016 Survey Data									?					
85 Pungoteague Creek #5 - 44AC481									X			X		
2015-2016 Survey Data									X			X		
86 Pungoteague Creek #6 - 44AC482						X	X							
2015-2016 Survey Data									X					
87 Pungoteague Creek #7 - 44AC537						X								
2015-2016 Survey Data									X					
88 Butcher's Creek Marsh – 44AC655									X					
89 Butcher Creek #1 - 44AC466									X					
2015-2016 Survey Data				X										
90 Butcher Creek #2 – 44AC467									X					
2015-2016 Survey Data									X					
91 Butcher Creek #3 - 44AC468									X					
2015-2016 Survey Data									X					
92 Butcher Creek #4 - 44AC469									X		X	X		
2015-2016 Survey Data									X					X
93 Butcher Creek #5 - 44AC470									X	X				
2015-2016 Survey Data									X	X				
94 Butcher Creek #6 - 44AC471		X												
2015-2016 Survey Data									X					
95 Butcher Creek #7 - 44AC472					X	X	X							
2015-2016 Survey Data									X					
96 Butcher Creek #8 - 44AC473									X					
2015-2016 Survey Data									X					
97 South Butcher Creek – 44AC152		X	X	X										
2015-2016 Survey Data									?					
98 Nandua Creek #4 – 44AC535									X					
2015-2016 Survey Data									?					
99 Nandua Creek #1 - 44AC532									X					
2015-2016 Survey Data									X					
100 Nandua Creek #2 - 44AC533							X							
2015-2016 Survey Data									X					
101 Nandua Creek #3 - 44AC534							X							
2015-2016 Survey Data									X					
102 Nandua Creek #5 – 44AC536				X										
2015-2016 Survey Data									X					
103 Nandua Creek #6 – 44AC511				X										
2015-2016 Survey Data									?					

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
104	Interior Nandua #1 – 44AC474									X					
	2015-2016 Survey Data									?					
105	Interior Nandua #2 - 44AC475									X			X		
	2015-2016 Survey Data							X							X
106	Interior Nandua #3 – 44AC476									X					
	2015-2016 Survey Data									X					
107	Interior Nandua #4 – 44AC488							X	X		X				
	2015-2016 Survey Data										X				
108	Nandua South #4 – 44AC52			X									X		
	2015-2016 Survey Data									?					?
109	Nandua South #5 – 44AC515									X			X		
	2015-2016 Survey Data									?					?
110	Nandua South #6 – 44AC516												X		
	2015-2016 Survey Data														?
111	Nandua South #7 – 44AC517									X					
	2015-2016 Survey Data									X					
112	Nandua South #8 – 44AC518					X						X	X		
	2015-2016 Survey Data									X					X
113	Nandua South #3 – 44AC514									X		X	X		
	2015-2016 Survey Data									X					X
114	Nandua South #2 – 44AC513					X	X								
	2015-2016 Survey Data									X					
115	Nandua South – 44AC512				X		X	X							
	2015-2016 Survey Data						X								
116	Hyslop Marsh – 44AC510				X	X	X								
	2015-2016 Survey Data									X					
117	Craddock Creek #1 – 44AC507						X								
	2015-2016 Survey Data									X					
118	Craddock Creek #2 – 44AC508									X					
	2015-2016 Survey Data									X					
119	Craddock Creek #3 - 44AC509									X					X
	2015-2016 Survey Data									X		X	X		
120	Craddock Neck #4 - 44AC51			X	X			X	X						
	2015-2016 Survey Data									?					
121	Craddock Neck #3 - 44AC50		X				X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
122	Craddock Neck #2 - 44AC49		X	X	X	X	X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
123	Craddock Neck #1 - 44AC48		X	X											
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
124	Ortley - 44AC355					X	X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
125	Occohannock Creek #3 - 44AC356				X		X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
126	Kellam - 44AC357									X					
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
127	Occohannock Creek #10 - 44AC519						X	X							
	2015-2016 Survey Data									?					
128	Melson – 44AC393									X					
	2015-2016 Survey Data									?					
129	Occohannock Midden - 44NH194									X					
	2015-2016 Survey Data									?					
130	Occohannock Creek #1 -44NH192-44NH44									X					X
	2015-2016 Survey Data									X					X
131	Occohannock Creek #2 – 44NH420				X										
	2015-2016 Survey Data									?					
132	Occohannock Creek #9 - 44NH423					X	X	X							
	2015-2016 Survey Data									X					
133	Occohannock Creek #7 – 44NH422		X					X							
	2015-2016 Survey Data									X					
134	Occohannock Creek #8 – 44NH43				X		X								
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
135	Occohannock Creek #6 – 44NH421						X								
	2015-2016 Survey Data									?					
136	Occohannock Creek #4 – 44NH3		X	X	X	X	X	X	X		X	X	X		
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
137	Occohannock Creek #5 – 44NH65									X					
	2015-2016 Survey Data									X					
138	Occohannock Neck #2 – 44NH425							X				X	X		
	2015-2016 Survey Data									X					X
139	Sturgis Dwelling Area – 44NH64										X				
	2015-2016 Survey Data									?					?
140	Occohannock Neck #1 – 44NH424									X					
	2015-2016 Survey Data									X					
141	Hurricane Hotel - 44NH181													X	
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
142	Peaceful Beach Campground – 44NH179										X				
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
143	Silver Beach – 44NH63									X					
	2015-2016 Survey Data	X		X											
144	Fincin – 44NH167			X	X		X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
145	Nassawadox Creek #6 - 44NH432									X					
	2015-2016 Survey Data					X	X								
146	Nassawadox Creek #1 – 44NH428									X					X
	2015-2016 Survey Data									?					?
147	Nassawadox Creek #2 – 44NH429					X	X	X							
	2015-2016 Survey Data									X					

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
148 Nassawadox Residence - 44NH158												X		
2015-2016 Survey Data												X		
149 Original Glebe – 44NH42														X
2015-2016 Survey Data														?
150 Nassawadox Creek #3 – 44NH430					X	X	X							
2015-2016 Survey Data									?					
151 North Church Neck Wells – 44NH60										X				
2015-2016 Survey Data														?
152 Church Neck Wells – 44NH8										X	X			
2015-2016 Survey Data														?
153 Nassawadox Creek #4 – 44NH431				X	X	X	X							
2015-2016 Survey Data						X								
154 Williams - 44NH166			X	X										
2015-2016 Survey Data									?					
155 Westerhouse Creek #1 - 44NH479			X		X			X		X				
2015-2016 Survey Data									?					?
156 Floyd – 44NH116		X	X	X	X	X				X	X	X		
2015-2016 Survey Data	X	X	X	X	X	X								
157 Lohr – 44NH59										X				
2015-2016 Survey Data														?
158 Mattawoman Creek #1 – 44NH503			X											
159 Mattawoman/Hungars Creek – 44NH427									X					X
2015-2016 Survey Data												X	X	
160 Hungars Creek Island – 44NH426													X	
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
161 Hungar's Neck Trash Pit - 44NH49										X				
2015-2016 Survey Data														?
162 North Gulf Shore – 44NH225			X	X										
2015-2016 Survey Data									?					
163 Tankards Beach – 44NH222				X										
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
164 Savage Neck North Midden – 44NH435					X	X								
2015-2016 Survey Data	X	X	X	X	X	X	X							
165 Humphrey Locality – 44NH221		X	X	X	X	X	X							
2015-2016 Survey Data									?					
166 Savage Neck South Midden – 44NH434				X	X	X	?							
2015-2016 Survey Data					X									
167 South Cherrystone Creek - 44NH433									X					
2015-2016 Survey Data									?					
168 North Old Plantation Creek – 44NH438					X	X	X	X						
2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
169 Butler's Bluff - 44NH436	X	X	X	X	X	X	X							
2015-2016 Survey Data							X							
170 Latimer's Bluff - 44NH437	X	X												
2015-2016 Survey Data	X					X	X							

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
171	Dale's Gift Well - 44NH502										X				
172	Fisherman's Island – 44NH278													X	
	2015-2016 Survey Data													X	
173	Skidmore Island – 44NH458			X	X										
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
174	Southwest Magothy Bay #1 - 44NH500				X										
175	Southwest Magothy Bay #2 - 44NH501									X					
176	Jones Cove – 44NH462				X			X							
	2015-2016 Survey Data			X	X		X	X							
177	South Cushman's Landing – 44NH459									X	X				
	2015-2016 Survey Data									X	X				
178	Landing Shore – 44NH460				X										
	2015-2016 Survey Data									X					
179	Dunton Cove – 44NH461	X	X	X	X		X								
	2015-2016 Survey Data									X					
180	North Mockhorn Island - 44NH457	X	X	X	X										
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
181	North Stringer's Ditch – 44NH443				X		X	?							
	2015-2016 Survey Data									X					
182	South Stringer's Ditch – 44NH444			X	X	X	X	?							
	2015-2016 Survey Data									X					
183	Mockhorn West #2 - 44NH499						X								
184	Mockhorn West #1 - 44NH498	X		X			X								
185	Mockhorn Island #14 – 44NH456			X	X		X	?							
	2015-2016 Survey Data									X					
186	Mockhorn Island #7 – 44NH234				X	X	X								
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
187	Mockhorn Tower – 44NH331									X			X		
	2015-2016 Survey Data									X					
188	Mockhorn Island #8 – 44NH233		?	?	?						X	X			
	2015-2016 Survey Data	X									X	X			
189	Mockhorn Island #6 – 44NH450		?	?	?						X	X	X	X	
	2015-2016 Survey Data									?					?
190	Mockhorn Island #11 – 44NH453		X	X											
	2015-2016 Survey Data									X					
191	Mockhorn Island #10 – 44NH452		X	X											
	2015-2016 Survey Data									X					
192	Mockhorn Island #9 – 44NH451			X	X										
	2015-2016 Survey Data									X					
193	Mockhorn Island #5 – 44NH449			X	X										
	2015-2016 Survey Data									X					
194	Mockhorn Island #4 – 44NH448			X	X			?							
	2015-2016 Survey Data									X					
195	Mockhorn Island #3 – 44NH447	X	X	X	X	X	X	X							
	2015-2016 Survey Data									X					

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
196	Mockhorn Island #2 – 44NH446		X	X	X	X	X	X							
	2015-2016 Survey Data									X					
197	Mockhorn Island #1 – 44NH445	X	X	X	X	X	X	X							
	2015-2016 Survey Data							X							
198	North Haulover Hummock - 44NH496			X											
199	Cushman Lodge Hummock - 44NH497												X	X	
200	Mockhorn Island #12 - 44NH454		X		X		X								
	2015-2016 Survey Data						X								
201	Mockhorn Island #13 - 44NH455	X	X	X	X		X								
	2015-2016 Survey Data						X								
202	Lower Ridge – 44NH442	X	X	X	X										
	2015-2016 Survey Data									X					
203	Middle Ridge – 44NH441	X	X	X	X	X	X								
	2015-2016 Survey Data									X					
204	Upper Ridge – 44NH440	X	X	X	X	X	X	?							
	2015-2016 Survey Data									X					
205	South Bay #1 - 44NH490			X											
206	South Bay #2 - 44NH491		?	X	X		?								
207	South Bay #3 - 44NH492									X					
208	South Bay #4 - 44NH493									X					
209	South Bay #5 - 44NH494				X						?				
210	South Bay #6 - 44NH495									X					
211	Fowling Point Ridge - 44NH471			X	X										
	2015-2016 Survey Data									X					
212	South Bog Gut Ridge - 44NH467				X										
	2015-2016 Survey Data									X					
213	Castle Ridge #2 - 44NH469			?	?			?							
	2015-2016 Survey Data									X					
214	Bog Gut Ridge – 44NH466									X					
	2015-2016 Survey Data		X												
215	Red Bank Creek - 44NH465														X
	2015-2016 Survey Data														X
216	South Hammock - 44NH464				X										
	2015-2016 Survey Data									?					
217	The Hammocks #1 - 44NH53					?	?	?							
	2015-2016 Survey Data							X							
218	North Hammock - 44NH54				X	X									
	2015-2016 Survey Data									X					
219	Ramshorn Channel Lodge – 44NH505												X	X	
220	Sandy Point - 44NH463				X	X	X	X							
	2015-2016 Survey Data									X					
221	Parting Creek Ridge - 44NH472									X					
	2015-2016 Survey Data									X					
222	Upshur Neck Terminus - 44AC649									X					X

Table 4.3. The Cultural Chronology for Coastal Accomack and Northampton County Sites (continued).

	Site:	PI	EA	MA	LA	EW	MW	LW	CT	UP	17	18	19	20	UH
223	Upshur Bay Landing - 44AC548														X
	2015-2016 Survey Data														X
224	Burton's Shore - 44AC543									X					X
	2015-2016 Survey Data									X	X	X		X	
225	Mosquito Creek - 44AC546									X			X		
	2015-2016 Survey Data									X					
226	Red Hill - 44AC44					?	?	?							
	2015-2016 Survey Data							X							
227	Sinnickson – 44AC8						X	X							
	2015-2016 Survey Data									X					
228	Sinnickson Landing - 44AC654												X	X	
229	Captains Cove #1 - 44AC42				X	X	X	X							
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
230	Chin B – 44AC43									?					?
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
231	Shipwreck #1 - 44AC404											X			
	2015-2016 Survey Data														?
232	Lifesaving Boathouse #1 – 44AC409											X			
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
233	Fish Oil & Guano Company - 44AC414													X	
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
234	Fish Oil Plant – 44AC415													X	
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
235	Shipwreck #2 - 44AC413													X	
	2015-2016 Survey Data														X
236	North Wallops Earthworks – 44AC89											X	X		
	2015-2016 Survey Data														X
237	South Wallops Shell Mound – 44AC159									X					X
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
238	North Assawoman Island - 44AC544									X					
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
239	North Metompkin Island – 44AC545										X	X			
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
240	Metompkin Island – 44AC138			X	X										
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
241	North Cedar Island – 44AC547	X		X	X			X				X			
	2015-2016 Survey Data	*	*	*	*	*	*	*	*	*	*	*	*	*	*
242	Parramore Island Shipwreck – 44AC139												X		
	2015-2016 Survey Data												X		
243	Hog Island Shell Pile – 44NH56									X					
	2015-2016 Survey Data	-	-	-	-	-	-	-	-	-	-	-	-	-	-

PI: Paleoindian, EA: Early Archaic, MA: Middle Archaic, LA: Late Archaic, EW: Early Woodland,
MW: Middle Woodland, LW: Late Woodland, CT: Contact, UP: Unknown Prehistoric, 17: 17th Century,
18: 18th Century, 19: 19th Century, 20: 20th Century, UH: Unknown Historic
X: Component Present, ?: Component May Be Present, *: Component Eroded, -: Natural Landform / Feature
Chronological Data Prior to 2015 Survey ▢ 2015 Survey Chronological Data ▢

The final management recommendations generated as a result of this survey are outlined below. These recommendations are a byproduct of the field observations, as well as prior experience in similar coastal settings.

-Sea level rise and wave/tidal-related shoreline erosion occur on two markedly different time scales. The formation of tidal marsh over a former upland landsurface is an expression of sea level rise. Both sea level rise and the resultant formation of tidal marsh occur on the century or millennial time scale (see Figure 4.35). Wave and tidal-related shoreline erosion both occur on an hourly or daily time scale (see Figures 4.17, 4.18, and 4.31). Wave and tidal-related shoreline erosion represent the greatest threat to archaeological sites along any given shoreline. The erosion and subsequent archaeological feature loss observed at 44AC485 between October 31st and December 11th, 2014 (see Figure 3.109) exemplifies this issue. Importantly, sea level within the bay did not rise over this short forty-two day period! The wind and tidal conditions recorded during this period are well within the seasonal "normal" range. Cultural resource managers need to be aware that the greatest short-term collective threat to coastal archaeological resources is the connection between wave actions and tidal processes under the constraints of the "normal" seasonal weather conditions.

-Shoreline archaeological surveys should be repeated after a given interval of time. Unlike upland interior settings, archaeological sites along shorelines continue to erode, archaeological features are exposed for a short period, and then they are ultimately destroyed by erosion (see Figure 3.109). By repeating surveys in coastal settings, you can at a minimum continually document archaeological features as they are exposed along these eroded landscapes.

-To focus future testing efforts, cultural resource managers need to determine whether "threat" from erosion or archaeological "significance" is the principal defining factor for ranking which coastal sites to revisit (see Table 4.1). For example, sites like 44AC651 are heavily eroded. However, the expenditure time and resources spent to investigate 44AC651 may not produce significant results or be as successful if you were to investigate sites like 44AC44. Not to mention, the logistical issues of dealing with drowned site settings that are adjacent to precarious sections of the Chesapeake Bay, like the daily hazardous conditions that you would experience at 44AC651.

-Drowned sites (see Figures 3.30) can be tested or excavated, especially the coastal sites in Northampton County (see Figure 3.260) that are impacted by greater daily tidal amplitudes. The testing or excavation times are greatly shortened as a result of the limited duration time centered near maximum low tide. The testing or excavation time frames can be extended, however, as a byproduct of seasonal variations in celestial tidal circumstances, as well as weather-driven "blow-out" tides (see Figures 4.17 and 4.18).

-Upland sites adjacent to an eroded shoreline (see Figures 3.287 and 3.302) can be tested or excavated like a traditional interior upland site setting. However, some of these eroded upland areas may require a boat to gain access (see Figures 3.252 and 3.251).

-If future plans are to test some of the sites evaluated during this survey, a boat, trailer, and assorted navigation equipment are required. Additional equipment should include a Keene Engineering dredge to sieve secondary or associated nearshore coastal sediments for dislodged archaeological remains. A standard soil bucket auger with multiple extensions will allow the researcher to better define the landward dimensions of a drowned and eroded site (see Figures 3.57 and 3.58).

-With the erosion data presented in Table 4.1, you can model future erosion rates for all 243 coastal sites in Accomack and Northampton counties. However, the model will be flawed to some extent because it will be unable to take into consideration man-made or natural shoreline modifications (see Figures 3.209 and 4.13), which could accelerate or decelerate erosion. Thus, an erosion rate model should be viewed as a proxy for anticipated future land loss assuming conditions are constant, which we know that the conditions will change as the dimensions of the shoreline change.

-Developing models to predict archaeological sites along coastlines can be a daunting task and largely an unsuccessful endeavor. For example, the current survey area encompassed vast tracts of tidal marsh landscape. Beneath these tidal marsh landscapes are submerged uplands with varying topographic relief. Archaeological sites are located on many of these submerged undulating uplands. However, the long-term processes involved in tidal marsh formation flatten these landscapes and mask the underlying topography (see Figure 4.36 A), as well as any associated archaeological sites (see Figures 3.29, 3.30, 3.57, and 3.58). Additional nearshore areas, which contain coastal beach formations, have a similar consequence and the associated sand dunes mask the underlying topography (see Figure 4.29 B). The archaeological landscapes situated beneath these thick dune deposits (see Figures 3.198, 3.203, 3.207, 3.208, 3.213, 3.214, and 3.218) are hidden by the topography of the overlying dune and cannot be detected using LIDAR (see Figure 4.27) or satellite imagery (see Figures 3.204, 3.210, 3.220, and 4.36 B). The potential archaeological record associated with tidal marsh areas and nearshore regions with coastal dune formations can only be assessed by shoreline inspection and associated fieldwork.

-The seasonal variation is sediment distribution and accumulation along any given shoreline can greatly impact or influence the successfulness of a shoreline archaeological survey (see Figures 3.320 and 3.321). For example, archaeological features (see Figure 3.58) can be buried and invisible during a portion of the year and exposed at other times of the year. The collective data would imply that a shoreline archaeological survey should be conducted during the Fall/Winter, as well as the Spring/Summer. By conducting a survey during two yearly seasonal time frames, the researcher can fully understand the dynamics of nearshore sediment movement, the seasonal exposure of archaeological features, and the times of the year that a shoreline is eroded or stable (see Figure 4.37). Some archaeological sites, like 44AC14, are more obvious during the summer months; whereas other sites, like 44AC139, are more evident during the winter months. A shoreline archaeological survey conducted during a one narrow seasonal time of the year will miss archaeological sites and features in coastal settings.

-The recent survey examined over 1,200 linear miles of shoreline during a period spanning nine months. The amount of area surveyed seems somewhat daunting. However, the project clearly shows that a vast coastal zone can be surveyed over a relatively short period of time. The coastlines of Virginia, which encompass the Chesapeake Bay coast, shorelines along all of the estuarine tributaries of the bay, and the Atlantic seacoast, are immense and encompass a vast area. Even though the amount coastline within Virginia is massive, the current completed task clearly illustrates that an enormous section of Virginia's coastline can be surveyed (see Lowery 2001 and Lowery 2003a) and resurveyed; as outlined by information presented in this report. If there is a key interest among cultural resource managers within the state to document the eroding and disappearing archaeological resources of Virginia, a staff of three to four individuals with the proper equipment and skills could easily circumnavigate the entire coastline of Virginia multiple times over a two to three year period. In sum, the vanishing coastal archaeological resources of the state could be systematically documented and assessed.

-Erosion is a complex natural process. There is a tendency among observers to directly link erosion with sea level rise. Shoreline erosion will occur in settings where unconsolidated sediments come in contact with broad or open bodies of water. Shoreline erosion will occur in areas unaffected by tides and sea level (see Figure 4.7). There is also a tendency to link marked increases in erosion with climate change or global warming. The historical rates of land loss noted at Watts Island over the past two decades would be a prime contender supporting this argument (see Figure 4.38). However, the historical rates of land loss noted at Sharps Island, Maryland suggest the reverse situation (see Figure 4.11). Given the settings associated with both islands, we can thoroughly argue that the climatic conditions (e.g., warming or cooling and the weather) influenced both islands with the same degree of intensity or moderation. In sum, the marked dissimilarities in historical erosion witnessed at both Watts Island and Sharps Island are simply the byproduct of geologic differences between both island landscapes (see Figures 3.6 and 4.12). As such, the erosion and loss observed at each archaeological site along a given shoreline has to be gauged individually.

It has been a pleasure to revisit the coastlines of both Accomack and Northampton counties as a result of this project. When I initially examined these coastal areas in 1999 and 2001 (see Lowery 2001 and 2003a), I relented to myself that the only sad thing about these two survey projects is that they may never be repeated. At the time, I knew that erosion was an ongoing process. Therefore, some of the sites and features that I recorded in 1999 and 2001 would ultimately succumb to the onslaught of wave energy and tidal processes. The current survey has proven this prediction. Archaeological sites like 44AC214, which held immense potential in 1999, have succumbed to erosion and are now gone. Like myself, many of the sites (see Figure 3.283) are a little older and a little more weathered. With this project, Virginia has led the way towards addressing shoreline erosion and coastal archeological site loss. The current survey clearly proves that you can address archaeological sites in coastal settings. However, it does require a restructuring of the protocols and methods related to the principles of archaeological investigation. Nearshore or coastal archaeological sites are neither terrestrial nor underwater. Nearshore and coastal archaeological sites represent a strange purgatory region where land and water intertwine. In sum, shoreline archaeological sites are connected with difficult and dynamic landscapes. I can only hope that the results, outcomes, and suggestions generated as a consequence of this project will be heeded by current and future cultural resource managers.

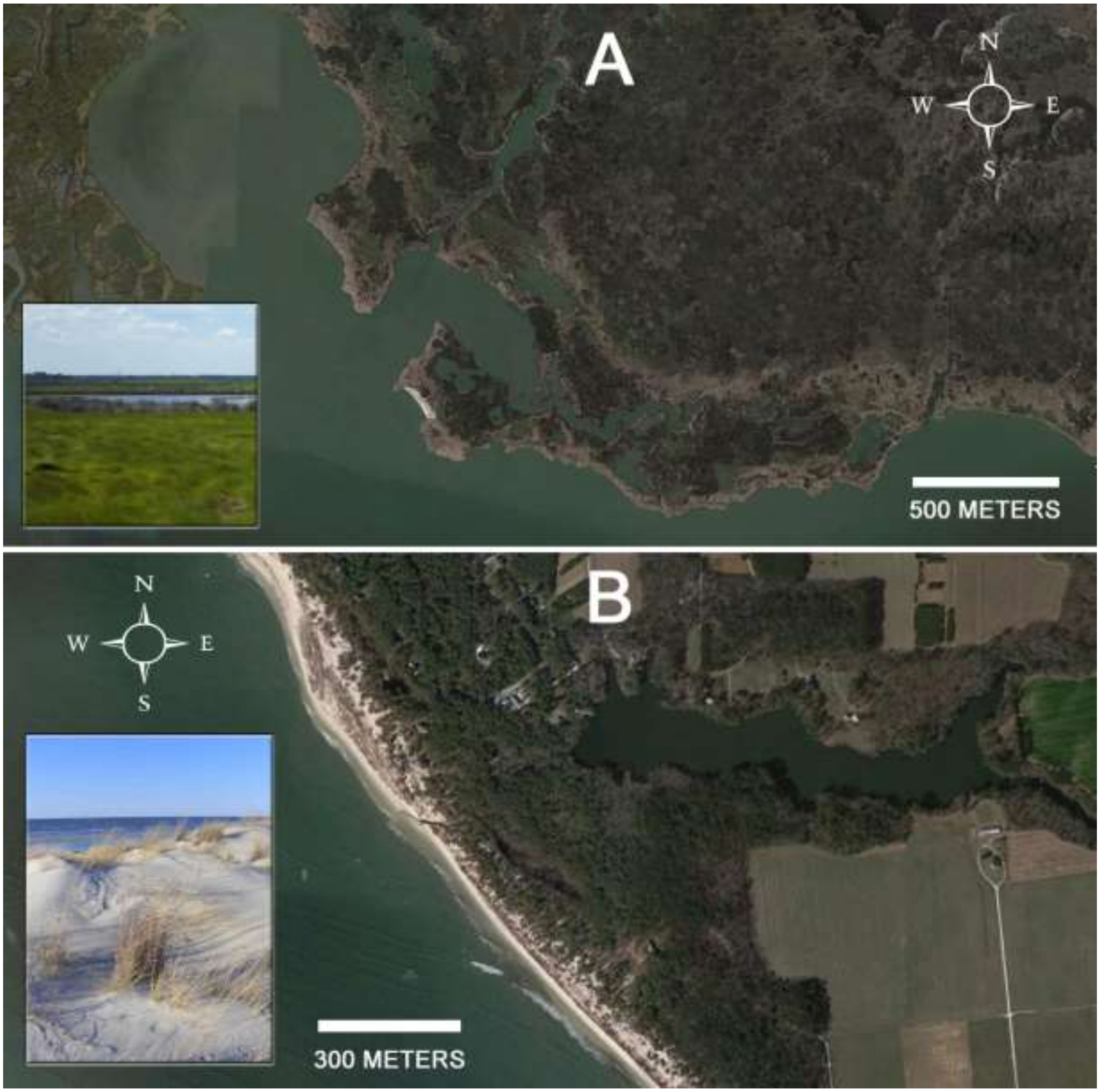

Figure 4.36. The images show two types of coastal settings that would be challenging if not impposible to develop archaeological site prediction models. Beneath the covering of tidal marsh (A) is a complicated topographic landscape containing archaeological sites. Beneath coastal dunes (B) is a buried landscape, which also contains archaeological sites.

Figure 4.37. The images show the same shoreline archaeological site over a two season period. One photo (A) shows the site during its winter erosional phase. The other photo (B) shows the site during its summer accretion or stable phase. Under these conditions, the visibility of the archaeological site and any of its associated features can be greatly impaired. The site would be missed and unrecorded if the shoreline area were surveyed only during the summer months.

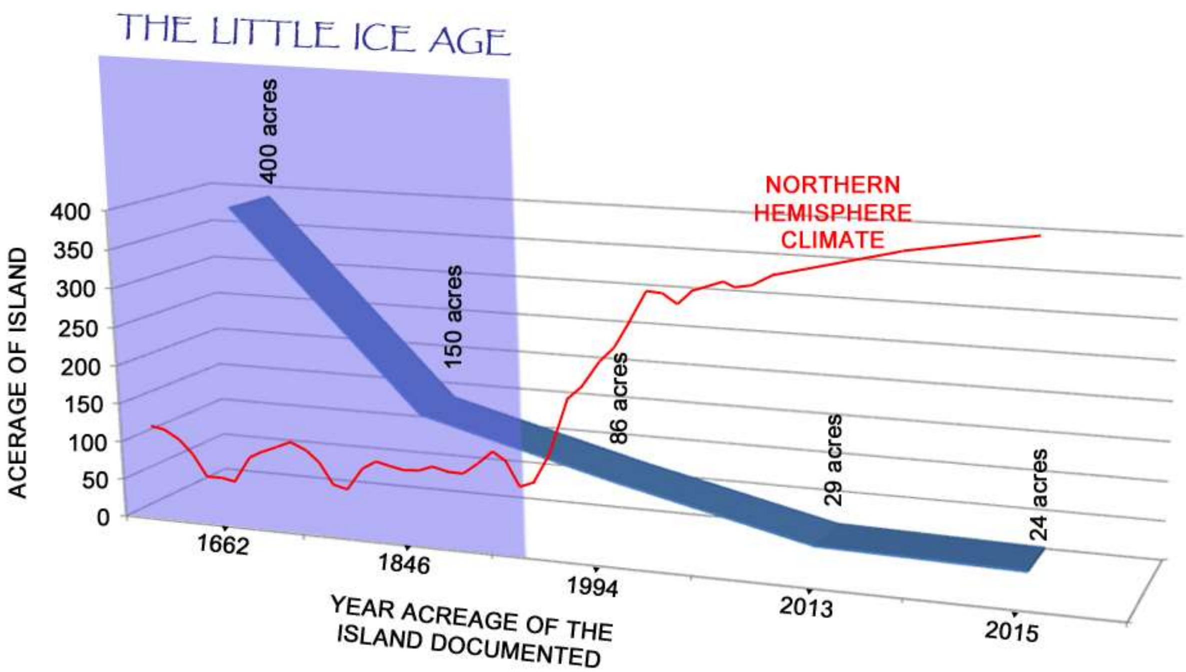

Figure 4.38. The graph illustrates the erosion rate at Watts Island, Virginia between 1662 and 2015. The superimposed northern hemisphere climate record would suggest that the erosion rate was ~1.3 acres per year between 1662 and 1846 during latter phase of the "The Little Ice Age". However, the erosion rate increased to ~2.9 acres per year over a short twenty-one year period encompassing the time frame between 1994 and 2015. Like the example illustrated for Sharps Island, Maryland (see Figures 4.11 and 4.12), the marked accelerated rates of erosion at Watts Island over the past two decades is a byproduct of the geologic variation associated with island (Figure 3.6). The marked increase in erosion noted at Watts Island over the past twenty-one years is a byproduct of the fact that the protective tidal marsh, which is more resistant to erosion, has been eroded and stripped from around the island's two upland ridges. As such, the exposed upland sub-soil at Watts is now eroding at a much faster rate.

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