

CHAPTER 1: HAZARDS ON THE SHORE

INTRODUCTION

It is believed that the worst disaster the Shore ever experienced in recorded history was the Great September Gust of 1821. This hurricane caused an ocean recession in the vicinity of the Chincoteague Island. Although not completely understood, it is believed that the hurricane may have triggered a landslide on the continental slope causing a tsunami in tandem with the force of the hurricane. Its destruction was so complete that it is unlikely that any of the homes standing today predate this event. In fact, two of the oldest homes on the island were probably erected to replace destroyed houses (*Once Upon an Island*, Kirk Mariner). Flooding caused by hurricanes, northeasters, and tropical storms has proven to be the greatest natural hazard to people and property on the Eastern Shore of Virginia.

Coastal erosion, high coastal winds, storm water flooding, fires, ice storms, and drought have also caused substantial damage to the communities and environments on the Shore. These events have destroyed property, caused extended isolation of communities where provisions such as fuel and food have grown thin, and at several times whole industries have been wiped out or dealt such a heavy blow that months or years were necessary to recover. In modern times, investments in real estate, infrastructure, and industry have increased the potential for significant damage and the need for advance planning.

DESCRIPTION OF CONDITIONS

GEOGRAPHIC AND GEOLOGIC SETTING

The Eastern Shore is a low-lying peninsula separating two great bodies of water, the Chesapeake Bay and the Atlantic Ocean (Figure 1). The highest elevation on the Shore is near the Town of Melfa in Accomack County at 60 feet above mean sea level. The Eastern Shore of Virginia formed as a southward prograding peninsula that consists of unconsolidated sediments deposited predominantly in marine conditions during approximately the last 200,000 years. Sea level fluctuations during this time have created the landforms seen on the Eastern Shore today.

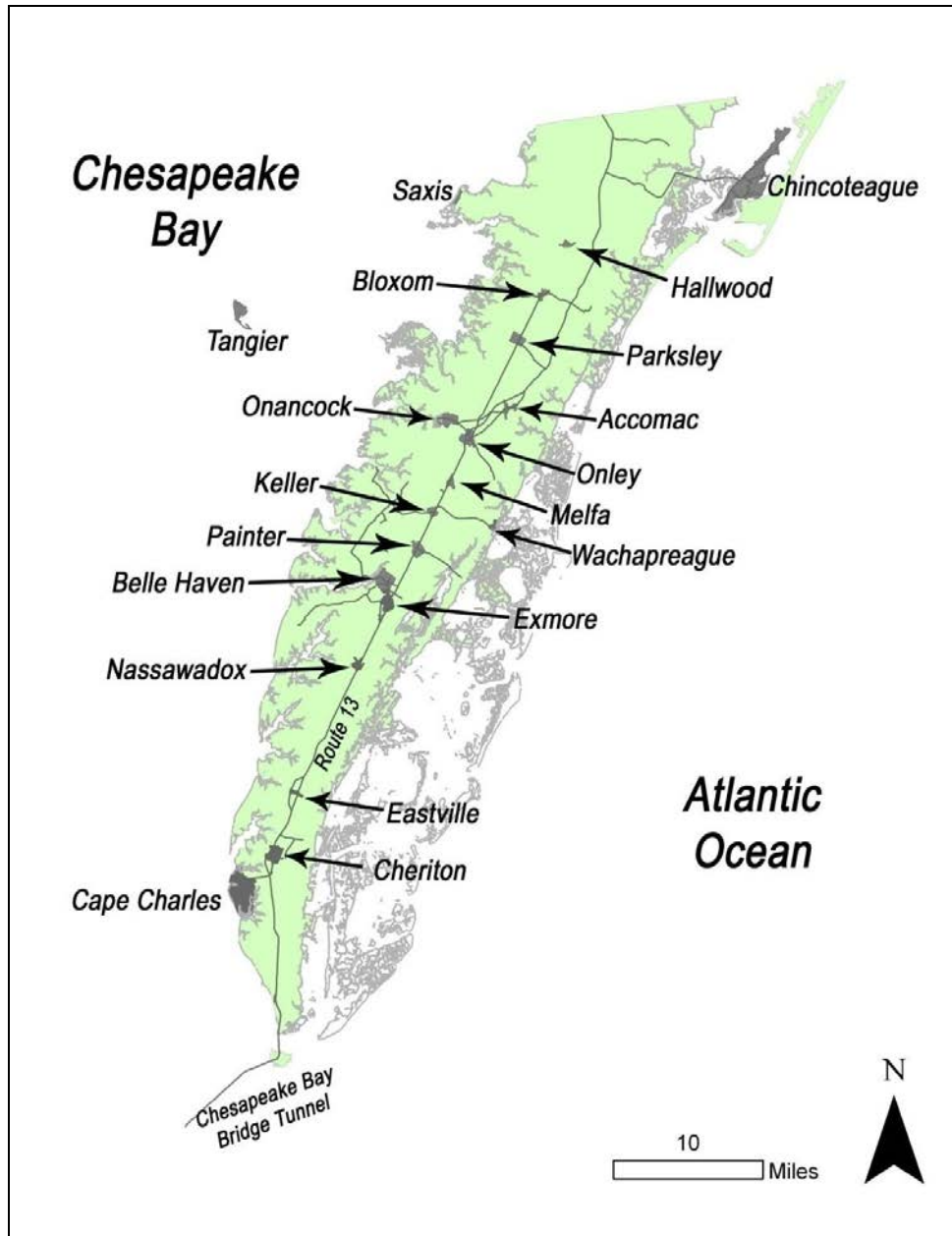


Figure 1: Vicinity Map of the Eastern Shore of Virginia

In addition to marine influences on the creation of the peninsula, there were two other phenomena that had a great influence on the geologic framework of the region: a bolide impact that occurred nearly 35.5 million years ago and the melting and retreat of a massive continental ice sheet.

Geologists have determined that a nearly 2-mile wide bolide, or object from space, struck near the area of what is now Cape Charles nearly 35.5 million years ago towards the end of the Eocene epoch. During this time, sea levels were much higher than today. The coastline existed above the Fall Line and west of the City of Richmond and what is now eastern Virginia lay beneath a shallow sea approximately 100 feet in depth. The impact created a crater twice

the size of Rhode Island and generated an enormous tsunami that engulfed the continent, possibly overtopping the Blue Ridge Mountains. The crater, now underlying all of Northampton County and portions of southern Accomack County, and the sediments that have buried it, have continuously settled over time, creating increased subsidence of landforms in the region. It is speculated that the subsidence associated with the crater has influenced the geologic evolution of the southern Delmarva Peninsula and southern Chesapeake Bay region (USGS Fact Sheet 049-98).

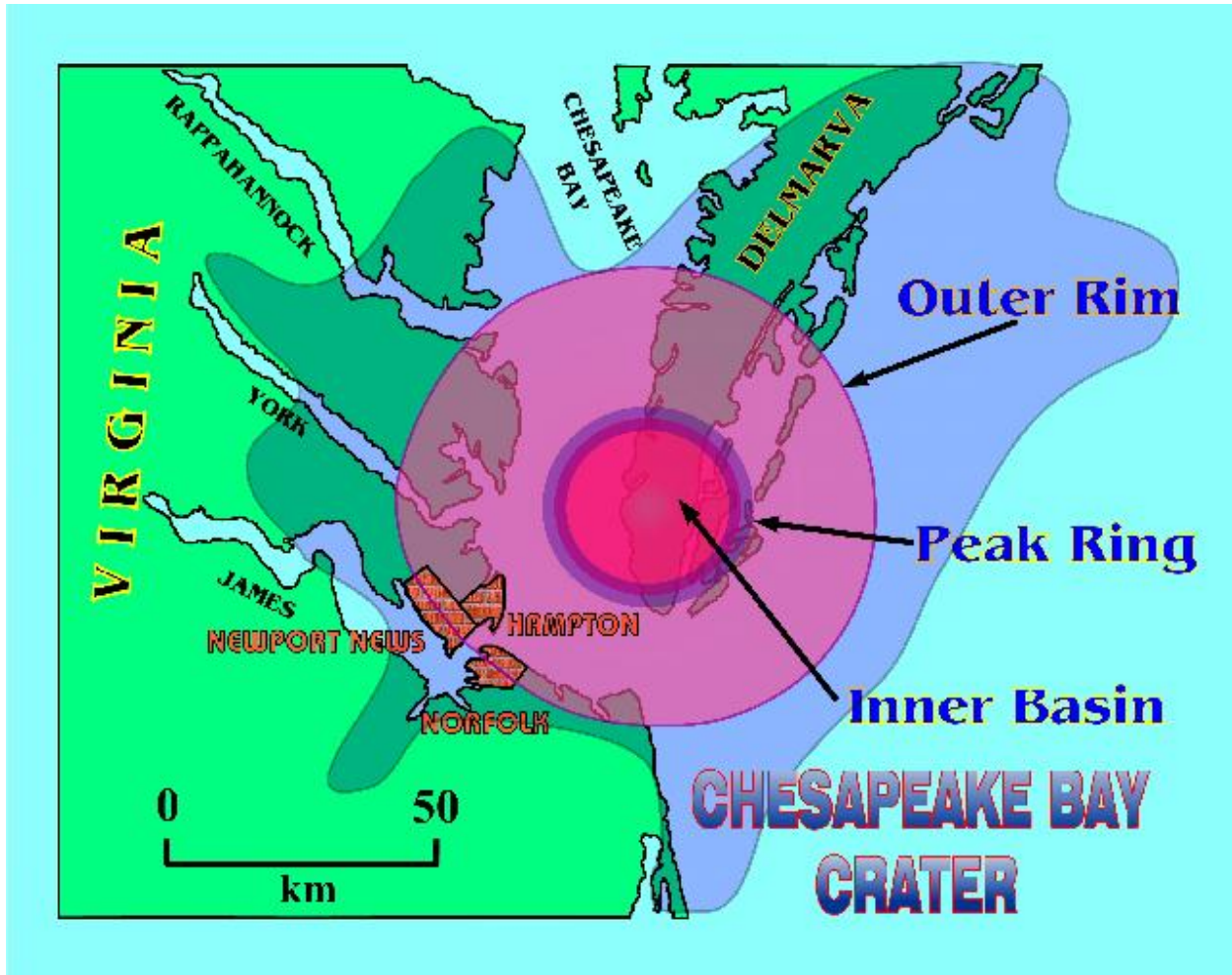


Figure 2: The Chesapeake Bay Impact Crater underlies approximately the southern half of the Eastern Shore. Source: USGS

The enormous weight of the three to four kilometer thick Laurentide ice sheet that covered most of Canada and a large portion of the northern United States existed from approximately 95,000 to 20,000 years ago created an extensive forebulge to the south of the ice sheet, causing the unconfined sediments of the coastal plain in Virginia to uplift. As global climate warmed, the ice sheet melted and retreated further northward. The sediments comprising the Eastern Shore responded elastically to this phenomenon causing subsidence in the region. The Eastern Shore is still subsiding today in response to the elastic rebound from the removal of the ice sheet, which is in part causing rates of relative sea level rise to be above average for the Atlantic coast.

Sea level during the last ice age approximately 20,000 years ago receded to a maximum of over 400 feet lower than present and the coastline was approximately 65 miles eastward of the modern shoreline at the edge of the

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continental shelf (NASA Science Briefs: *Sea Level Rise, After the Ice Melted and Today*, 2007). It is estimated that the oldest portions of the barrier island chain along the seaside of the Eastern Shore formed in response to sea level rise and other coastal processes approximately 3,500 years ago.

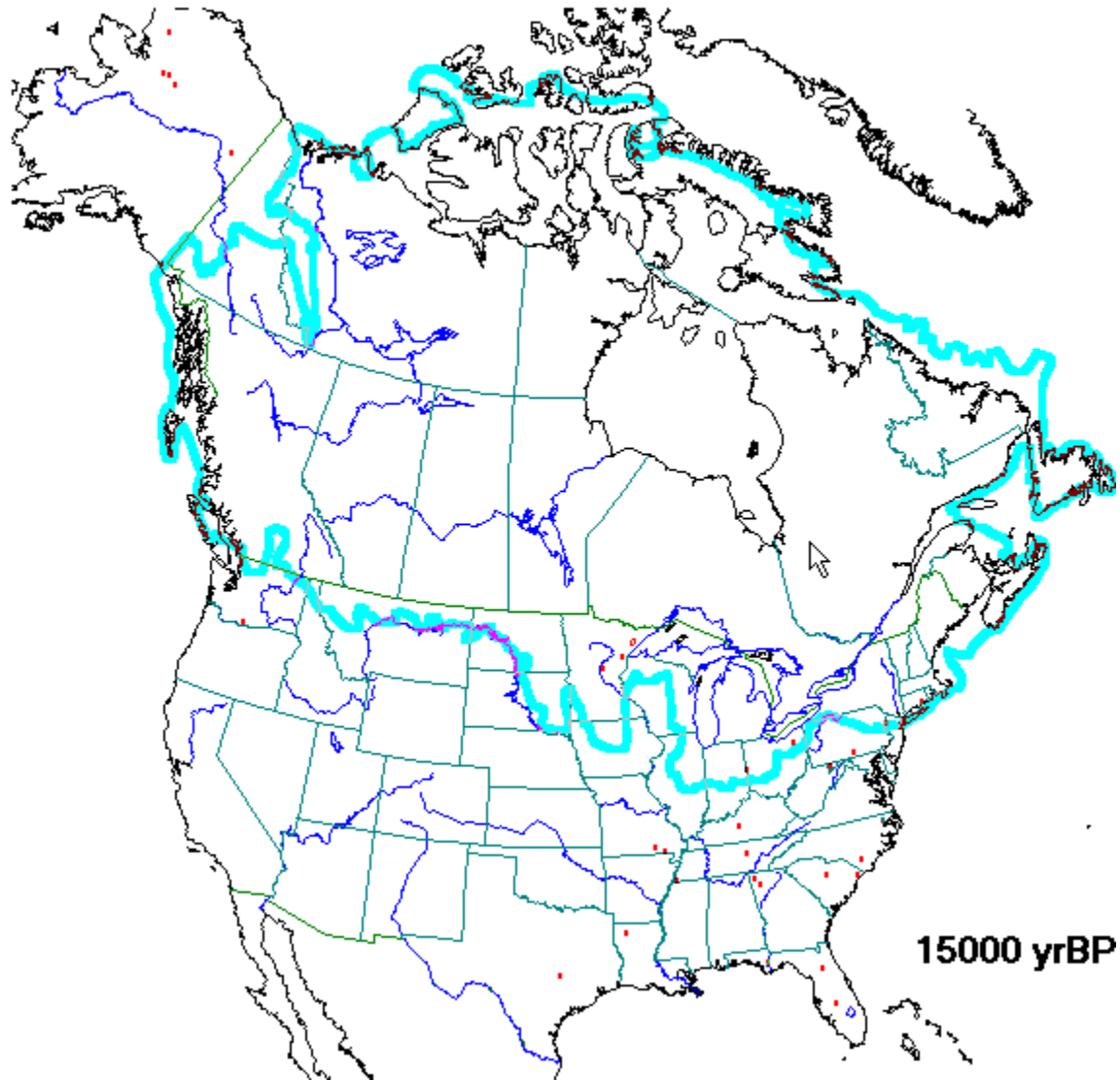


Figure 3: Extent of the massive Laurentide Ice Sheet (outlined in blue). Source: NOAA, National Climatic Data Center

The Chesapeake Bay consists of a series of drowned river valleys that were carved from layers of unconsolidated Coastal Plain sediments during a succession of sea-level fluctuations during the past 200,000 years. Three main paleochannels (Exmore, Eastville, and Cape Charles) are known to be buried beneath the Eastern Shore that still impact groundwater quality and control the locations of some creek basins, coastal inlets, and beach ridges. The modern Chesapeake Bay began to attain its modern resemblance sometime around 4,000 years ago as sea level had risen to levels where the Susquehanna River valley and its tributaries became partially and completely submerged (Sea Level Rise meeting with the EPA, February 2004).

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In addition to the peninsula, uninhabited barrier islands protect the Atlantic coastline. Many of these are part of the Nature Conservancy's Virginia Coastal Reserve. Some islands also exist in the Chesapeake Bay. Many of these islands once held communities, but in recent years many have been abandoned in the face of hazards from the sea. Nine of the islands still have development in some manner. Assateague, Chincoteague, Wallops, Cedar, Hog, Smith, and Fisherman's Islands in the Atlantic and Tangier and Saxis Islands in the Chesapeake Bay.

CHRONOLOGY OF HAZARD EVENTS ON THE SHORE

It is no surprise that four risks consistently rise to the top during the risk assessment process for the Eastern Shore: high winds, coastal flooding, coastal erosion, and storm water flooding. All four of these risks are typically embodied in the fierce, frequent, and familiar coastal storms known to area residents: hurricanes, tropical storms, tropical depressions, and nor'easters. This section recaps their histories from the earliest evidence through the most recent documentation.

PRE-1564

Inhabitants of the Eastern Shore have historically needed to adapt to the natural hazards that commonly occur in the area. Coastal storms have shaped the shorelines and both created and destroyed landforms on a regular basis. It was not until these natural events began to impact inhabitants' properties and affect local economies, especially during the 20th and 21st centuries that they were deemed "hazardous."

1564-1799

Virginia was affected by great storms throughout the 16th, 17th and 18th Centuries. Some 16th century storms were recorded because of the shipwrecks. The earliest of these records is believed to have occurred in 1564. Others followed in June 1566, June 1586, August 1587 and August 1591. The June 1586 storm dropped hail and caused waterspouts that threatened Sir Francis Drake's crew. Most information on hurricanes during this time is found in period correspondence, as American newspapers were scarce until the middle of the 18th Century.

Captain John Smith noted in his journal in 1608 that he encountered a fierce storm that he described as "such an extreame gust of wind, rayne, thunder, and lightening happened, that with great danger we escaped the unmercifull raging of that Ocean-like water". Newspaper accounts suggest that major coastal storms impacted the Mid-Atlantic region in August 1635, September 1675, and November 1706, though scarce information is available (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007).

The September 1667 hurricane, called the Dreadful Hurricane of 1667, was a great storm that destroyed at least 10,000 homes in Virginia and demolished the colony of Jamestown (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007). Historic records show that this hurricane and a July 1788 hurricane may have followed a similar track to the 1933 hurricane, which caused massive devastation on the Eastern Shore. Twelve days of rain accompanied the storm, potentially indicating a second storm skirting the coast. A storm that struck in October 1693 is named the Accomack Storm in reference to the only surviving account of the storm by a Mr. Scarburgh who was a resident of the Eastern Shore. Mr. Scarburgh wrote:

“There happened a most violent storme in Virginia, which stopped the course of the ancient channels, and made some where there never were any: So that betwixt the bounds of Virginia and Newcastle in Pennsylvania, on the seaboard side, are many navigable rivers for sloops and small vessels.” – Letter by a “Mr. Scarburgh”

(Transactions of the Royal Society, 1694)

There is little other information available from the Accomack Storm, but it can be inferred from this account that a considerable amount of erosion occurred in the region (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007).

In October 1703, an early snowstorm heralded the arrival of a hurricane just days later. The Great Gust of August 1724 actually refers to a pair of hurricanes that struck just days apart in the Chesapeake Bay region. The October 1749 storm was a great disaster for Virginians. Besides creating Willoughby Spit in Norfolk, the storm flooded the City of Hampton with four feet of water and bodies from shipwrecks washed up for days after the storm (*Virginia Hurricanes*, VDEM). Accounts estimate the storm surge from this powerful storm to be approximately 15 feet in the Chesapeake Bay (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007). A storm of this magnitude today would be catastrophic to the Eastern Shore.

The Great Chesapeake Bay Hurricane of September 1769, the Great Coastal Hurricane of 1785, George Washington’s Hurricane of July 1788, and a pair of hurricanes that occurred within 10 days in August 1795 all terrorized the Chesapeake Bay region and rank among the strongest storms during the 18th Century (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007).

THE 19TH CENTURY

As newspapers became more widespread throughout the Mid-Atlantic, accounts of storm events became increasingly accurate, recording a series of powerful storms that wreaked havoc on the Virginia coast during the 19th Century.

THE GREAT SEPTEMBER GUST OF 1821

This storm was also known as the Norfolk and Long Island Hurricane and passed over the Eastern Shore likely as an equivalent Category 2 strength hurricane. Accounts from Eastern Shore residents indicated that the storm covered Tangier Island with at least three feet of water; destroyed houses, trees, and crops at Bradfords Neck near Quinby; and potentially unleashed a tsunami that destroyed Assateague and Chincoteague, killing five residents in the process (*Hurricanes and the MidAtlantic States*, R. Schwartz, 2007).

Other notable hurricanes and other storms swept up the Virginia coast later that century.

- The residents of Smith Island reported to Second Lieutenant Robert E. Lee that the April Gale in 1831 nearly covered all of Smith Island with seawater (*Seashore Chronicles*, Brooks Miles Barnes & Barry R. Truitt).
- The Great October Gale of 1878 completely inundated Smith and Cobb Islands located in Northampton County (*Seashore Chronicles*, Brooks Miles Barnes & Barry R. Truitt).
- The April 1889 storm came from the east and inundated the Island of Tangier for 48 hours (*Seashore Chronicles*, Brooks Miles Barnes & Barry R. Truitt).

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- In October 1891, the proximity of two tropical storms and a hurricane created treacherous coastal currents and surf that sank the presidential yacht of President Benjamin Harrison off of the coast of Assateague Island (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007).
- During January 1893, the Eastern Shore suffered extreme cold, the Town of Accomac had 14 inches of snow and men could walk from Chesconessex to Watts Island (*Seashore Chronicles*, Brooks Miles Barnes & Barry R. Truitt).
- In October 1897, a tropical storm that lingered off Virginia for three days submerged Chincoteague, Cobb, Cedar, and other islands along the Seaside. The storm surge from this storm equaled that of the Great October Gale of 1878 (*Hurricanes and the Mid-Atlantic States*, R. Schwartz, 2007).

THE 20TH CENTURY

Major storms continued to pose hazards to life and property throughout the 20th century. The century started with three relatively quiet decades after the tremendous damages that occurred during the 1890s. The 1930s would change that trend.

Table 1 outline the major storms of the 20th century, and their lasting impacts on the Eastern Shore.



Figure 4: Flooding on Randolph Avenue, 3 ½ blocks from the Chesapeake Bay, in Cape Charles from one of the 1930s hurricanes. Photo Credit: U.S. Army Corps of Engineers Flood Plain Cape Charles Report

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Table 1: Major 20th Century Storms affecting the Eastern Shore of Virginia

20th Century Storms						
County	Date	System Name	Property Damage (in 2015 \$\$)	Crop Damage (in 2015 \$\$)	Description	Source
ACCOMACK/ NORTHAMPTON	8/23/1933	Chesapeake-Potomac Hurricane			The deadly Chesapeake-Potomac Hurricane of 1933, also called the August Storm, was a Category 1 storm that claimed the lives of six Eastern Shore residents. On Chincoteague, Main Street was flooded, and 25' waves broke over Assateague Island. The Towns of Cape Charles, Chincoteague, and Wachapreague, and the Villages of Willis Wharf and Kiptopeke all experienced flooding. Much of Tangier Island was inundated, and children jumped from second floor windows to swim. When the water receded parts of the island were gone.	<i>The Great Hurricane of 1933</i> , Assateague Naturalist , www.assateague.com ; <i>God's Island: The History of Tangier</i> , Kirk Mariner
ACCOMACK/ NORTHAMPTON	9/18/1936				This seaside hurricane was transitioning from Category 2 to Category 1 when it crossed from North Carolina to Virginia, causing heavy damage to agriculture and aquaculture. Late crops were destroyed and some 60,000 broiler chickens were killed. Eel grass, which is a critical habitat for clams, oysters, and bay scallops in the coastal bays along the seaside of the Eastern Shore, had already been decimated by widespread disease, and the succession of storms in the 1930s was likely the main factor in wiping out the remaining eel grass population, and crippling the industries associated with hard-shellfish varieties.	God's Island: The History of Tangier, Kirk Mariner; NOAA Historical Hurricane Tracks, https://coast.noaa.gov/hurricanes
ACCOMACK/ NORTHAMPTON	8/14/1953				Category 1 hurricane that produced record rain on Tangier Island, 10.62" in Onley, and 10.43" in Accomack County.	NOAA Historical Hurricane Tracks, https://coast.noaa.gov/hurricanes
ACCOMACK/ NORTHAMPTON	10/15/1954	Hazel			Hurricane Hazel's eye tracked through the center of Virginia bringing damaging winds and a storm surge of 3 to 7.5 feet that caused extensive erosion. Electric lines were damaged and many were without power.	<i>Wednesday Storm</i> , USACE; NOAA Historical Hurricane Tracks, https://coast.noaa.gov/hurricanes
ACCOMACK/ NORTHAMPTON	10/1/1957				The nor'easter caused tides in the Town of Wachapreague four feet above normal, and sinking many boats. The storm also caused wind gusts of 70 mph and brought a great deal of rain	<i>(Flood Reports of the 1962 Ash Wednesday Storm</i> , USACE)
ACCOMACK/ NORTHAMPTON	9/12/1960	Donna			Donna was a Category 2 with 105 MPH gusts as it swept past the Eastern Shore, but much of the damage was concentrated on the bayside. Flooding occurred in Cape Charles, Bayford, Onancock and other areas on the Chesapeake Bay. Donna was considered the most destructive storm since accurate weather records began in 1840.	<i>(Flood Reports of the 1962 Ash Wednesday Storm</i> , USACE)
ACCOMACK CO.	3/6/1962	Ash Wednesday Storm	\$7,885,166		The islands of Chincoteague and Assateague were completely underwater. Hundreds of thousands of chickens died, along with Chincoteague's poultry industry. Dead chickens posed an extreme health hazard causing Health Dept. to ask all women, children and elderly to evacuate. A million dollars in damage was done to NASA's Wallops Island Launch facility. One hundred Assateague ponies were killed, five homes destroyed, and 1,000 were inundated by storm water. Ninety percent of Chincoteague's automobiles were flooded.	Flood reports of the 1962 Ash Wednesday Storm, USACE, http://www.erh.noaa.gov/lwx/Historic_Events/va-winters.htm

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Table 2 (cont.): Major 20th Century Storms affecting the Eastern Shore of Virginia

County	Date	System Name	Property Damage (in 2015 \$\$)	Crop Damage (in 2015 \$\$)	Description	Source
ACCOMACK CO.	3/28/1984				Nor'Easter of March, 1984 took a track over the lower Chesapeake Bay. Storm hit Accomack County especially hard, with worst tidal flooding since Ash Wed. Storm of 1962. Saxis and Onancock up to 5' of water; Tangier had water over 75% of the island. East Point, Chesconnessex, Mears, and Sanford were all flooded.	Accomack Community Rating System Application.
ACCOMACK CO.	9/27/1985	Gloria			Hurricane Gloria brushed past the Eastern Shore causing \$2 million in damage to Accomack County. The storm was a Category 2 that caused wind gusts and rain, but did not directly strike the area.	Accomack County Community Rating System application
ACCOMACK/ NORTHAMPTON	10/31/1991	Halloween Nor'Easter			Halloween Northeaster hit unexpectedly, stranding residents, damaging barrier islands, and destroying piers and a motel.	Accomack County Community Rating System application
NORTHAMPTON CO.	8/28/1992	Andrew			Winds associated with Hurricane Andrew remnants blew down trees. No wind speed estimate available.	NOAA, National Climatic Data Center
ACCOMACK/ NORTHAMPTON	9/6/1996	Fran			Hurricane Fran was downgraded to tropical storm status as it arrived in Virginia, but it still brought damaging winds.	Accomack County Community Rating System application
ACCOMACK/ NORTHAMPTON	1/27/1998	Twin Nor'Easter #1			Nor'easter Jan. 27th, 28th. Slow storm movement combined with high astronomical tides created moderated coastal flooding. Two-4" of rain caused widespread flooding on streets and in poorly drained areas in both counties.	NOAA, National Climatic Data Center
ACCOMACK/ NORTHAMPTON	2/3/1998	Twin Nor'Easter #2			Nor'easter Feb. 3-5. Slow movement with extended period of gale-force winds resulted in moderate to severe coastal flooding, Rainfall totals of 5-7" also brought widespread storm water flooding in both counties.	NOAA, National Climatic Data Center
ACCOMACK/ NORTHAMPTON	9/1/1999	Dennis	\$8,536		Hurricane and Tropical Storm Dennis, Aug. 30 - Sept. 5. One of most prolonged periods of tropical cyclone conditions across eastern Virginia on record. Moderate coastal flooding and 46 mph winds	NOAA, National Climatic Data Center
ACCOMACK CO.	9/15/1999	Floyd	\$4,339,147	\$16,547,741	Hurricane Floyd was a Category 1 Hurricane when it impacted the Eastern Shore. Ten to 20" of rain brought flash floods along with 7' storm surge, which damaged 300 buildings (both counties)	Accomack Community Rating System Application.
ACCOMACK/ NORTHAMPTON	10/17/1999	Irene	\$1,271,556	\$3,055,714	Hurricane Irene brushed by the Eastern Shore bringing gusty winds, locally heavy rainfall, and widespread flooding and road closures. Highest sustained wind of 45 mph, with a peak gust of 66 mph, was recorded at Wachapreague; sustained wind of 49 mph with gusts to 63 mph recorded at Kiptopeke. Rainfall totals: 8.23" at Wallops; 7.13" at Onancock; 9.38" at Cashville; elsewhere generally 5"-8". Storm tides generally 4'-5' above astronomical tides in Accomack; 3'-4' in Northampton. The tide level at Wachapreague reached 9.30' MLLW; 6.48' MLLW at Kiptopeke. Irene spawned a torndado near Chincoteague.	NOAA, National Climatic Data Center



Figure 5: Flooding during the Ash Wednesday Storm of 1962. Photo printed in the Army Corp of Engineers Flood Plain Report for Wachapreague

THE 21ST CENTURY

Despite advancements in modern technology and understanding of coastal storms, the residents of the Eastern Shore still face the same hazards in the 21st Century that have plagued residents throughout history.

Table 2 summarizes the major storms affecting the Eastern Shore of Virginia since year 2000. The eight storms detailed in the table wrung \$73 million in damages from Eastern Shore residents, businesses, and farmers (damages have been converted to 2015 dollars).

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Table 3: Major 21st Century Storms affecting the Eastern Shore of Virginia

County	Date	System Name	Property Damage (in 2015 \$\$)	Crop Damage (in 2015 \$\$)	Description	Source
21st Century Storms						
ACCOMACK CO./ NORTHAMPTON CO.	4/10/2003		\$25,763	\$0	A spring nor'easter produced strong gusts up to 55 mph. The winds also downed some trees and utility poles, as well as produced minor structural damage.	NOAA, National Climatic Data Center
ACCOMACK CO./ NORTHAMPTON CO.	9/18/2003	Isabel		\$12,881,359	Hurricane Isabel made landfall over Ocracoke, NC, and continued overland toward Richmond. ESVA communities of Wachapreague, Oyster, Tangier, and Saxis all had significant coastal flooding. Farmers reported crop loss due to salt spray. Storm surge inundated communities on seaside and bayside. Wachapreague, Tangier, & Saxis all experienced significant coastal flooding. Wachapreague's tide monitor was swept away. Salt spray coated power lines causing outages until precipitation washed lines clean. One-2" of rainfall. Northampton farmers reported \$10M of agricultural damages, mostly losses of tomato and green bean crops. Winds reached 74 mph.	NOAA, National Climatic Data Center, local oral accounts of the storm, NOAA Isabella Pos-Storm Summary
NORTHAMPTON CO.	8/14/2004	Charley			Tropical Storm Charley. Sustained winds of 45 mph at CBBT, 51 estimated gust. Rain measured 3.17" at Wallops.	http://www.nhc.noaa.gov/data/tcr/AL032004_Charley.pdf
ACCOMACK CO./ NORTHAMPTON CO.	9/1/2006	Ernesto	\$37,621,745	\$0	Tropical Depression Ernesto interacted with a strong weather front to produce a tight pressure gradient resulting in high winds that caused numerous downed trees and power outages, along with significant structural damage. Tides were 4-5' above normal, and 6' to 8' waves caused significant damage to homes, piers, bulkheads, boats, and marinas. Sustained winds of 34 MPH and gusts to 51 MPH at Kiptopeke; 38 kts/44mph at Wallops. Delmarva Power reported 49,000 residents without power in MD and ESVA.	NOAA, National Climatic Data Center; Tropical Storm Ernesto Post-Storm Report, NWS, 2006
ACCOMACK CO./ NORTHAMPTON CO.	9/6/2008	Hanna	\$561,436	\$0	Tropical Storm Hanna. Heavy rain and gusty winds. 1.16" rain recorded in Onancock; 1.27" in Eastville. Minor beach erosion. Gusts to 50 mph at Wachapreague; sustained winds 39 mph.	NOAA, National Climatic Data Center

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Table 4 (cont.): Major 21st Century Storms affecting the Eastern Shore of Virginia

County	Date	System Name	Property Damage (in 2015 \$\$)	Crop Damage (in 2015 \$\$)	Description	Source
ACCOMACK CO./ NORTHAMPTON CO.	11/12/2009	Nor'Ida	\$4,430,260	\$0	Intense Nor'easter formed from the remnants of Hurricane Ida and produced moderate to severe coastal flooding. Peak tide height at Kiptopeke was 7.04 feet above MLLW, which was higher than Isabel's peak tide. Numerous homes and businesses were flooded with between 3-12" of water in the Chincoteague area. The boat ramp, dock and parking area were flooded during high tide in Onancock; Chesconessex area roads were flooded. A 4-5' storm surge battered Assateague and Chincoteague, and overtopped the Chincoteague causeway, which was closed 3 times. The Assateague beach was closed so workers could clear the parking lot of sand make repairs to a road, and there was severe beach erosion. The flooding in Chincoteague was comparable to the storm surge flooding experienced with Hurricane Gloria in 1985. At Wachapreague, flooding was comparable to Hurricane Isabel in 2003, although no major damage was reported. Winds gusted 50-70 mph, toppling trees and causing power outages in both counties. In Northampton County, peak tide at Kiptopeke was 7.04' above MLLW, higher than Isabel's peak tide. Generally 4-8" of rain fell across the counties, flooding roadways and poorly drained areas. Onley recorded 6.25"; 13" fell in Chincoteague.	NOAA, National Climatic Data Center
ACCOMACK CO./ NORTHAMPTON CO.	8/27/2011	Irene	\$1,422,487	\$3,055,714	Hurricane Irene, Aug. 27-28. The highest sustained winds were 45 mph with a peak gust of 66 mph at Wachapreague, and 49 mph sustained with 63 mph gust at Kiptopeke. Coastal storm tides of 4-5' above astronomical tide levels were common in Accomack Co., 3-4' above astronomical tides in Northampton Co. The tide level at Wachapreague reached 9.30 feet MLLW; at Kiptopeke it reached 6.48' MLLW. Rainfall totals: Wallops 8.23"; Onancock 7.13"; Cashville 9.38"; elsewhere across both counties generally ranged 5"-8". Widespread low-land flooding was reported across much area, including roadways which were washed out or closed. Tornado spawned from Irene downed trees and caused minor roof damage.	NOAA, National Climatic Data Center
ACCOMACK CO./ NORTHAMPTON CO.	10/28/2012	Sandy	\$13,334,997	\$0	Hurricane Sandy/Superstorm Sandy caused widespread coastal flooding and erosion, storm water flooding, and brought very strong winds (68 mph) that downed numerous trees and power lines and produced minor structural damage. Water levels were 3-5' above normal in Accomack Co.; 3'-4' above normal in Northampton Co. Wachapreague reached a tide of 8.40 feet MLLW; Kiptopeke reached a tide height of 6.82' MLLW. Chincoteague, Saxis, and Sanford received the most damage; estimated damage near \$2M in Chincoteague alone. Rainfall totals of 6"-10" were reported across the area, with numerous road closings.	NOAA, National Climatic Data Center



Figure 6: Storm water flooding on U.S. Route 13 during Tropical Depression Ernesto in 2006. Photo Credit: Jay Diem, Eastern Shore News

MODERN STORM TRACKING

Advances in modern technology have allowed for improved weather forecasting and storm tracking. Residents of the Eastern Shore are provided more information on approaching weather events from multiple media outlets including television, internet, and radio with the end result being increased hazard preparedness.

In addition, the Wallops Flight Facility in northern Accomack County is home to the NOAA Wallops Command and Data Acquisition Station, which is one of only two facilities of this type in the world (the other is in Alaska) (Figure 7). This facility provides accurate weather data to the entire nation and also has a global reach, monitoring natural phenomena such as sea surface temperatures, forest fires, icebergs in shipping lanes, hurricanes, tsunamis, and earthquakes, among others around the world.

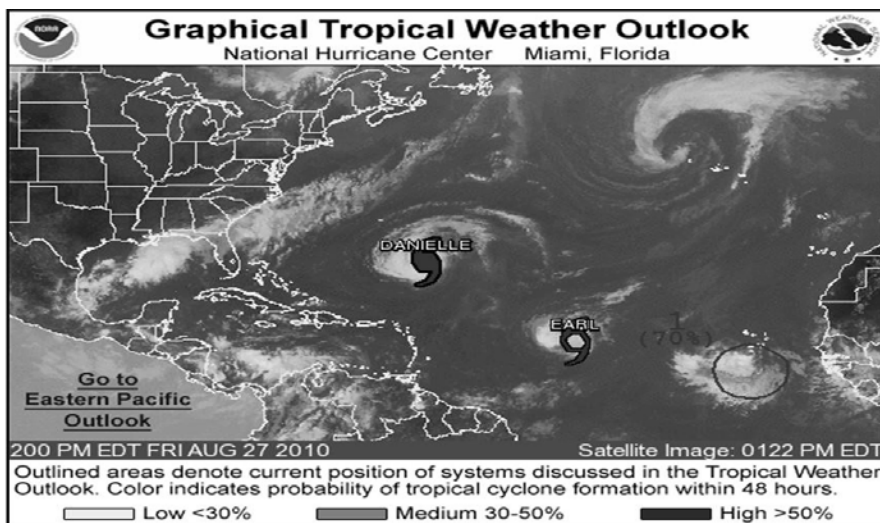


Figure 7: An example of modern storm tracking data from the NOAA Wallops Command and Data Acquisition Station at the Wallops Flight Facility in northern Accomack County. Courtesy of NOAA