

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, as seen in 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.

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.

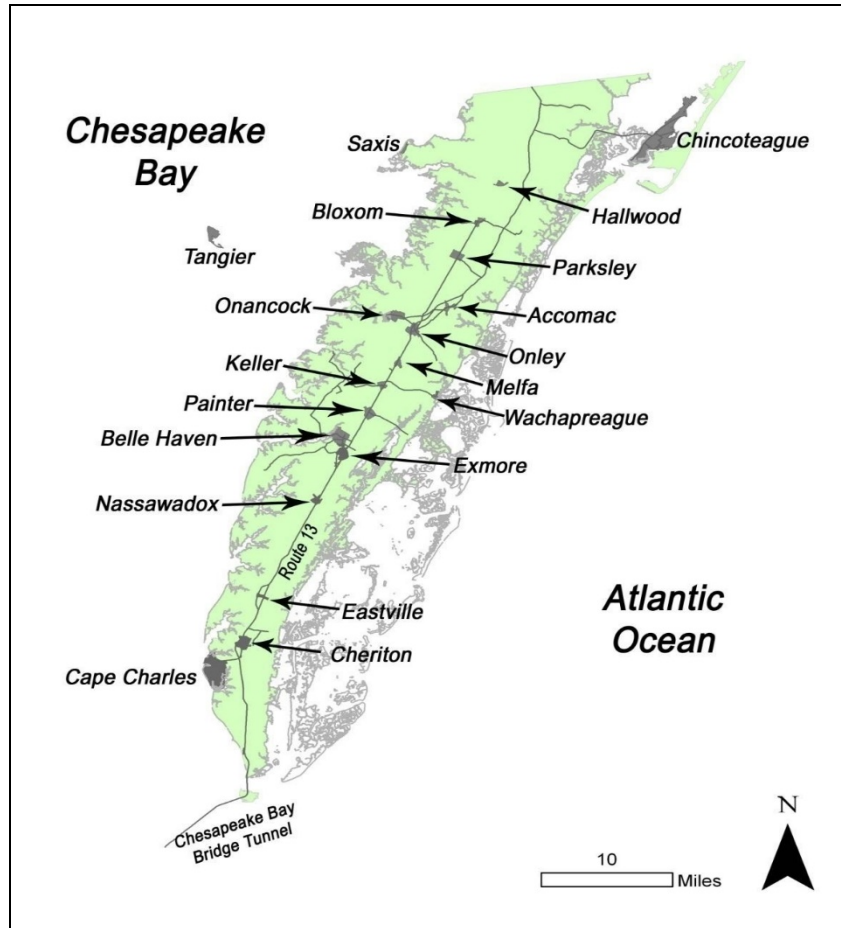


Figure 1: Vicinity Map of the Eastern Shore of Virginia

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.

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

Hazards on the Shore

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

20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	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 done.	<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.	<i>God's Island: The History of Tangier</i> , 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

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20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
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>Flood Reports of the 1962 Ash 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 sank many boats. The storm also caused 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 bay side. 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 submerged. Hundreds of thousands of chickens died, along with Chincoteague's poultry industry. Dead chickens posed an extreme health hazard causing the health department 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 inundated by stormwater. Ninety percent of Chincoteague's automobiles were flooded.	<i>Flood Reports of the 1962 Ash Wednesday Storm</i> , USACE,

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County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack Co.	3/28/1984	-	-	-	Nor'easter of March 1984 took a track over the lower Chesapeake Bay. The storm hit Accomack County especially hard, with the worst tidal flooding since the Ash Wednesday Storm of 1962. Saxis and Onancock were flooded up to 5' of water while 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 Co. The storm was a Category 2 that caused wind gusts and rain, but did not directly strike the area.	Accomack Community Rating System Application
Accomack / Northampton	10/31/1991	Halloween Nor'easter	-	-	Halloween Nor'easter hit unexpectedly, stranding residents, damaging barrier islands, and destroying piers and a motel.	Accomack 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 still brought damaging winds.	Accomack Community Rating System Application
Accomack / Northampton	1/27/1998	Twin Nor'easter #1	-	-	Nor'easter Jan. 27-28. Slow storm movement combined with high astronomical tides created moderate coastal flooding. Two-4" of rain caused widespread flooding on streets and in poorly drained areas in both counties.	NOAA, National Climatic Data Center

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20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
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 and 46 mph winds.	NOAA, National Climatic Data Center
Accomack / Northampton	9/1/1999	Dennis	\$8,536	-	Hurricane and Tropical Storm Dennis, Aug. 30-Sep. 5. One of the 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.	9/5/1999	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 in 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 ranged from 5-9.5". Storm tides generally 4-5' above astronomical tides in Accomack; 3-4' in Northampton. The tide level at Wachapreague reached 9.30'; 6.46' in Kiptopeke. Irene spawned a tornado near Chincoteague.	NOAA, National Climatic Data Center



Figure 2: 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 2: Major 21st Century Storms affecting the Eastern Shore of Virginia

20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack/Northampton	4/10/2003	-	\$25,763	-	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/Northampton	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, and 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. Rainfall totaled 1-2". Winds reached 74 mph.	NOAA, National Climatic Data Center, local oral accounts of the storm, NOAA Isabella Post-Storm Summary
Northampton Co.	8/14/2004	Charley	-	-	Tropical Storm Charley involved sustained winds of 45 mph at CBBT, 51 mph estimated gusts. Rain measured 3.17" at Wallops	NOAA National Hurricane Center

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20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack/Northampton	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 6-8' waves caused significant damage to homes, piers, bulkheads, boats, and marinas. Sustained winds of 34 mph and gusts to 51 mph at Kiptopeke; 44 mph at Wallops. Delmarva Power reported 49,000 residents without power in MD and the Eastern Shore of VA.	NOAA, National Climatic Data Center; Tropical Storm Ernesto Post-Storm Report, NWS, 2006
Accomack/Northampton	9/6/2008	Hanna	\$561,436	\$0	Tropical Storm Hanna produced heavy rain and gusty winds across much of the county. Few trees were downed. Rainfall amount of 1.16 inches was recorded near Onancock.	NOAA, National Climatic Data Center
Accomack Co.	11/12/2009	Nor'Ida	\$4,430,260	\$0	An intense nor'easter formed from the remnants of Hurricane Ida and produced heavy rain across much of central and eastern Virginia. Rainfall amounts ranged from three to as much as thirteen inches over the area, with the highest totals between seven and thirteen inches occurring over southeast Virginia.	NOAA, National Climatic Data Center

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County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack / Northampton	8/27/2011	Irene	\$1,422,487	\$3,055,714	Hurricane Irene moving northward over the outer banks of North Carolina and just off the Virginia and Maryland coasts produced heavy rains which caused widespread flooding across most of central and eastern Virginia Saturday afternoon, August 27th into early Sunday morning, August 28th. Storm total rainfall generally ranged from three to as much as eleven inches. Widespread low-land flooding was reported across the 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 / Northampton	10/28/2012	Sandy	\$13,334,997	\$0	Hurricane/Superstorm Sandy caused widespread coastal flooding and erosion, storm water flooding, and brought very strong winds that downed numerous trees and power lines and produced minor structural damage. Water levels reached 3.0 feet to 5.0 feet above normal adjacent to the Chesapeake Bay and Atlantic Ocean resulting in moderate to severe coastal flooding. Wachapreague reached a tide height of 8.40 feet MLLW. The towns of Chincoteague, Saxis, and Sanford received the most significant damage, with estimated losses near two million dollars in Chincoteague alone.	NOAA, National Climatic Data Center

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County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack / Northampton	9/2/2016	Hermine	\$5,000	-	Tropical Storm Hermine moving northeast along the Southeast Coast then off the Mid Atlantic Coast produced tropical storm force winds, minor to moderate coastal flooding, and locally heavy rainfall across portions of Hampton Roads, the Middle Peninsula, and the Virginia Eastern Shore from Friday afternoon, September 2nd into Saturday night, September 3rd. Rain bands associated with Tropical Storm Hermine produced generally 0.5 inch to 1.75 inches of rainfall across the county. Cape Charles (5 ENE) reported 1.35 inches of rain. Cape Charles (5.8 NNE) reported 0.83 inch of rain. Wind gust of 38 knots was measured at Kiptopeke State Park. Tropical storm wind gusts caused minor tree and structural damage. Coastal storm tides of 2 to 3 feet above astronomical tide levels were common, with only minor beach erosion reported. The maximum storm tide reached 5.46 feet MLLW at Kiptopeke, which resulted in moderate coastal flooding Saturday morning into Saturday afternoon.	NOAA, Storm Events Database

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County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack / Northampton	10/8/2016	Matthew	\$500,000	-	The combination of a cold front moving through the Mid-Atlantic and Post Tropical Cyclone Matthew tracking northeast just off the North Carolina and Virginia coasts, produced heavy rain which caused flooding across portions of the Virginia Eastern Shore from Saturday night, October 8th into early Tuesday evening, October 11th. Heavy rain caused an extended period of significant flooding across portions of the counties. Several roads were impassable or closed for a couple of days, and some homes and businesses were impacted.	NOAA, Storm Events Database
Accomack / Northampton	10/20/2019	Nestor	-	-	Remnant low pressure of Tropical Storm Nestor tracked northeast across eastern North Carolina and off the southeast Virginia coast. This storm produced heavy rain which caused some minor flooding across portions of central and eastern Virginia. Rainfall totals ranged from 1.5 inches to near 4.5 inches.	NOAA, Storm Events Database
Accomack / Northampton	9/17/2020	Sally	-	-	Post Tropical Cyclone Sally tracking northeast across the Southeast United States and off the Mid Atlantic Coast produced heavy rain across portions of Central and Eastern Virginia. Rainfall totals were between 1 and 4 inches.	NOAA, Storm Events Database

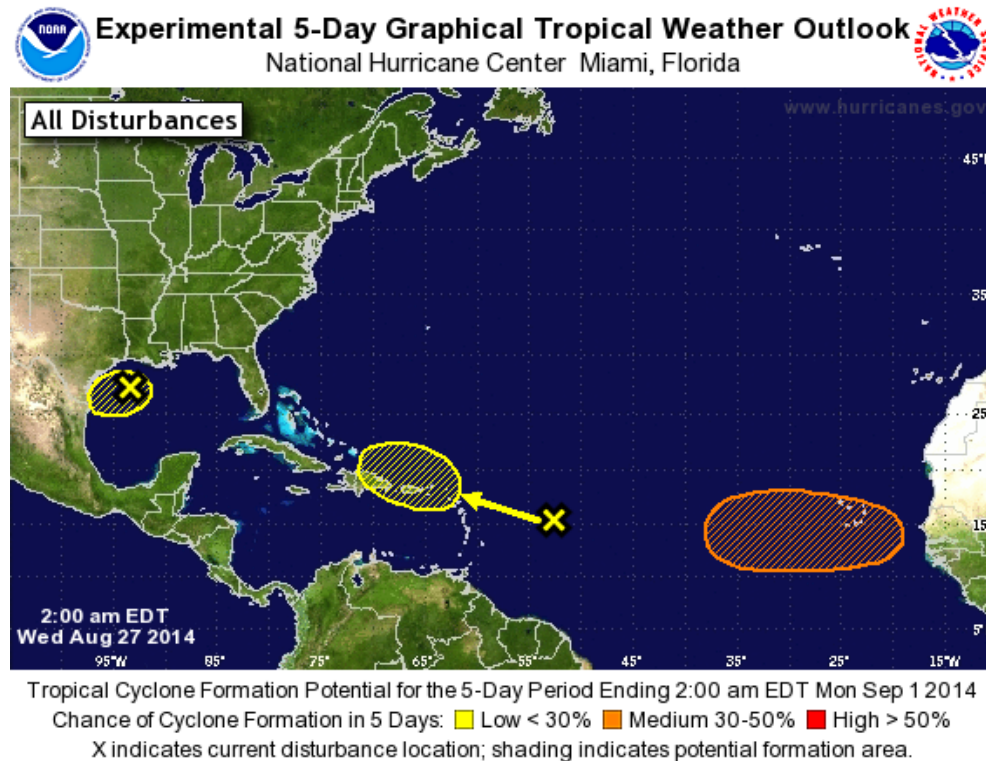
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20 th Century Storms						
County	Date	System Name	Property Damage (\$)	Crop Damage (\$)	Description	Source
Accomack / Northampton	10/11/2020	Delta	-	-	Post Tropical Cyclone Delta tracking east northeast across the Middle Atlantic region produced heavy rain across portions of central and eastern Virginia. Rainfall totals generally ranged between two inches and four inches across the county.	NOAA, Storm Events Database

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, radio, internet, and mobile phone alerts (including CodeRED alert system) 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 3). This facility provides accurate weather data to the entire nation and also has a global reach, monitoring natural phenomena around the world such as sea surface temperatures, forest fires, icebergs in shipping lanes, hurricanes, tsunamis, and earthquakes, among others.



**Figure 3: An example of modern storm tracking data issued by the National Hurricane Center (NHC) from
Courtesy of NOAA.**