1 FLOODING & FLOODPLAIN MANAGEMENT

INTRODUCTION 1.1

A FLOODING 1.3

A.1 Types of Flooding 1.5

A.2 The Increasing Threat of Flooding 1.7

A.3 Flooding in Maryland 1.9

B FLOODPLAIN MANAGEMENT 1.15

B.1 Flood Insurance Rate Maps 1.15

B.2 National Flood Insurance Program 1.17

B.3 State & Local Floodplain Regulations & Ordinances 1.18

B.4 Evaluating a Property's Flood Risk 1.22

B.5 Community Rating System 1.25

REFERENCES 1.27

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INTRODUCTION

KEY QUESTION:

How do Maryland's waterways relate to the settlement patterns and development within the state?

The State of Maryland has an unusual shape and geography, with many of its boundaries defined by water. The Atlantic Ocean forms its easternmost shore. The Chesapeake Bay, America's largest estuary, separates the Eastern Shore of Maryland and Virginia from the "western shore." The south bank of the Potomac River defines Maryland's southern border with Virginia and West Virginia. Coursing across the state from the mountainous west to the low elevations of the east is a network of rivers, streams, creeks, and brooks. With proximity to water, of course, comes flooding, and Maryland's history of human settlement along these waterways has shaped the state's development overall and, in many cases, determined its vulnerability.

Figure 1.1 - Rivers of Maryland.

For thousands of years, within Maryland's current borders, Native Americans established settlements near water sources, leaving an untold number of archeological sites now threatened by shoreline erosion and riverine flooding. For ease of transit and transport, as well as access to food and water, European settlers followed a similar pattern and established Maryland's colonial capitals, Saint Mary's City (1633) and Annapolis (1694), at convenient landing points on the Chesapeake Bay. Numerous other towns grew around the Bay and its tributaries: Elk Landing, settled in 1694 at the head of the Bay, became Elkton (1787); Charlestown (1742) was Cecil County's first seat; Chestertown, founded 1706 on the Chester River, became Maryland's second leading port by the mid-18th century; St. Michaels, laid out in the 1770s, an early center of shipbuilding; Cambridge, settled in 1684, became an important center of agricultural commerce on the Eastern Shore; and Crisfield, which grew from a 17th century fishing village on Tangier Sound to a major hub of the seafood industry. The broadening of the Patapsco River at its confluence with the Bay created a protected harbor ideal for early industrial and maritime pursuits, giving rise to Baltimore Town (founded in 1729), where a scattered settlement soon evolved into dense urban neighborhoods.

Early European settlements were located close enough to waterways for easy access but distant enough to avoid flooding. With low populations, limited footprints, and little built infrastructure, these towns tended have a relatively light impact on the environment. The settlements connected to each other via waterways and a few roads, which were often adapted

Figure 1.2 - Ferry service is available in historic waterfront towns like Whitehaven, Wicomico County.

KEY QUESTION:

What kinds of historic communities and properties may be particularly at risk of flooding?

from Native American trails and sometimes paved with oyster shells. As time passed and technology improved, water facilitated transportation and commerce via steamboats, ferries, and canals – most notably the Chesapeake & Ohio Canal, which transported coal and other cargo between Washington, DC and Cumberland, Maryland from 1831 until 1924 (now maintained as the Chesapeake & Ohio National Historical Park). Convenient transportation via waterways also lead to the development of "river towns" like Port Deposit and Havre de Grace on the Susquehanna (the latter sited where the river flows into the Chesapeake Bay). Although roads now serve as the primary transit routes, parts of the historic system of small-scale ferries continue to serve travelers today, and ferry landings contribute to the character of historic waterfront towns like Oxford, Bellevue, and Whitehaven.

Throughout Maryland, water power spurred the development of mill communities. Some of these communities persist and some do not: for example, Ellicott City (1772) and Oella (1810) have survived, while the town of Daniels (1810) on the Patapsco River, marking the Howard/Baltimore county line, has vanished. In Baltimore, the Jones Falls, which bisected the early city, provided power for 19th-century textile mills, several of which were established in the flood plain of the stream valley and supported workers' housing on its slopes.

By the early-20th century, communities had established formal zoning, planning, and construction requirements that set standards for new development. Simultaneously, the ability to engineer the environment improved, allowing previously undevelopable land such as marshes and wetlands to be infilled, reshaped, paved, and developed. Over time, this confluence of factors altered the natural mechanisms for managing water that existed when the settlements were first formed. With industrialization, water began flowing from spigots rather than being collected by pail.

Because waterways have historically determined the state's settlement patterns, development, industries, and recreation, the present-day increase in precipitation, severe storm events, and relative sea level has made large areas of Maryland highly vulnerable to flooding. In many cases, particularly in more developed areas, flooding is exacerbated by the operational failure or insufficient capacity of aging infrastructure and by large areas of impermeable surfaces such as pavement and roofing. (Refer to Flooding, page 1.5.) Hurricanes routinely threaten coastal and Bay communities such as Crisfield, the "Oyster Capital of the World" in the late-19th century. (Refer to Flooding in Maryland, page 1.9.) A few miles off Crisfield in the Chesapeake Bay, Smith Island supports Maryland's most intact historic island communities; several other inhabited islands have vanished. (Refer to Maryland's Lost and Disappearing Islands, page 1.12.) In Dorchester County, shoreline erosion has exposed burial vaults at Anchor of Hope Cemetery, as well as Calverton, seat of Calvert County from 1669 to 1724, along with many other archeological sites. In Western Maryland, a network of rivers and streams carries runoff from the mountain slopes, and seasonal flooding is a common occurrence in communities located within the Youghiogheny and Potomac drainages.

Today, local planners and preservation advocates in flood-prone historic communities may recognize these issues as cause for concern, but often, they have a limited understanding of the factors that contribute to flooding

KEY QUESTION:

How can local planners and preservation advocates learn more about the effects of flooding and floodplain management on historic properties?

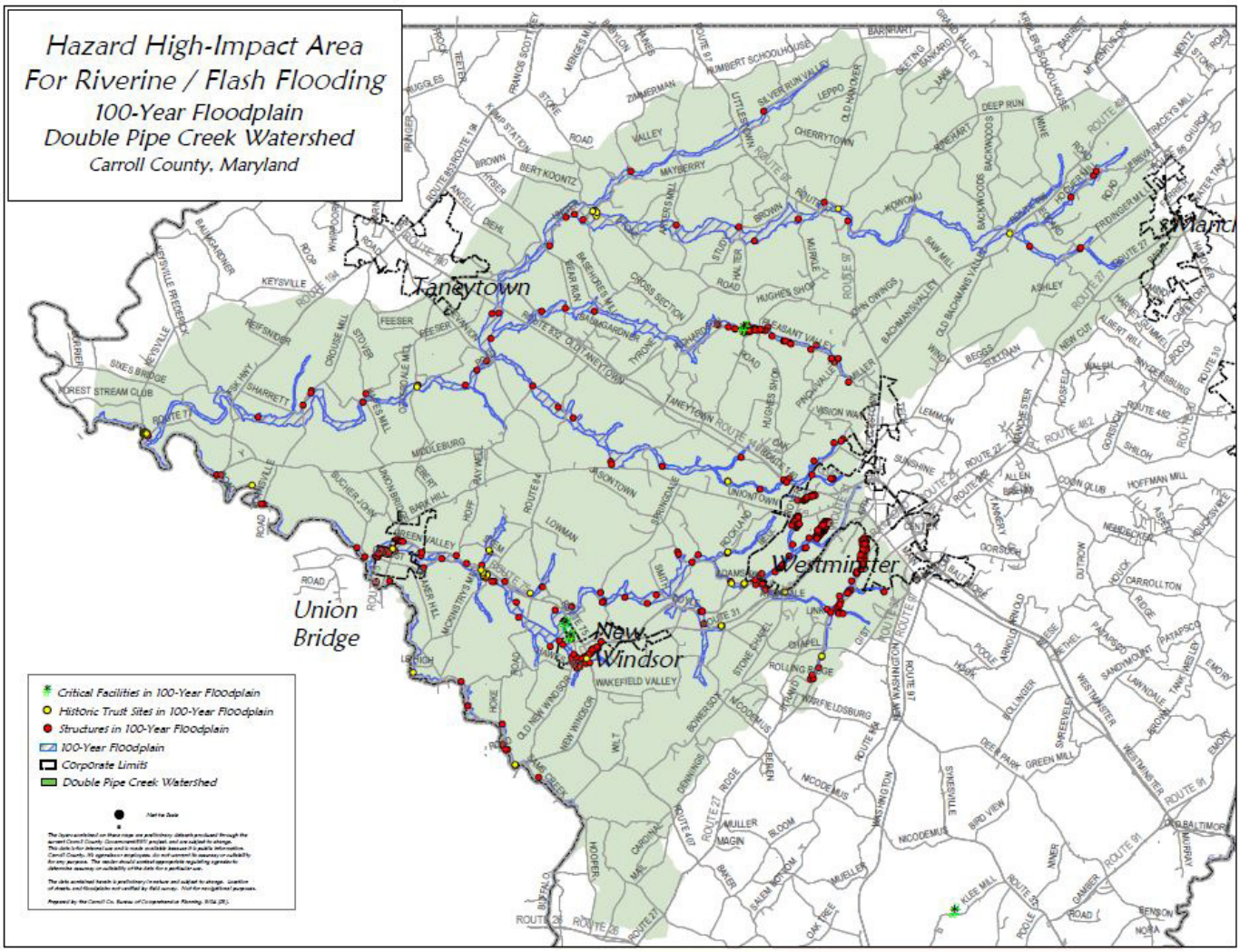

Figure 1.3 - Carroll County's Hazard Mitigation Plan maps a high-impact area for riverine and flash flooding that identifies the locations of historic properties.

and how the regulatory framework related to flooding may impact historic properties. ***To assist, this chapter of the Guide introduces some key concepts about flooding, provides a context for loss due to storm events and submersion, and explains how historic properties fit into floodplain management, including the National Flood Insurance Program.*** Readers who wish to get started on planning for vulnerable historic properties should consult *Chapter 2: Historic Preservation & Emergency Management*.

A. FLOODING

KEY QUESTION:

What factors can cause and exacerbate flooding?

Flooding is devastating, not only in terms of loss of life and property damage, but also because it displaces residents and makes businesses inoperable. Flooding can occur due to any of the following:

- Overflow of inland or tidal waters;
- Unusual and rapid accumulation or runoff of surface waters from any source;
- Mudflow;
- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion; and/or
- Undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above. (Definitions, 44 CFR 59.1.)

The extent and impact of flooding vary depending on topography, geological conditions, hydrology or stormwater systems, moon phases, a community's physical relationship to water, seasonal variations, and other conditions within the natural or built environment. Some key factors increasing the propensity for flooding are changes in land use, increased development, and elimination or modification of natural ecosystems. The most severe flooding occurs when multiple factors are at play.

A.1 TYPES OF FLOODING

There are two basic types of flooding: persistent flooding and event flooding. Each type of flooding can cause significant damage, but when an area that is plagued by persistent flooding is struck by an event flood, such as a hurricane or flash flood, the combined effect can be devastating.

a. Persistent Flooding

Persistent flooding, also referred to as nuisance flooding, is typically minor flooding which results in traffic problems,

road closures, overwhelmed storm drains, and occasionally infrastructure damage, in addition to public inconvenience and business interruptions. Depending on the frequency of flooding and whether the water is brackish, persistent flooding can alter the ecosystem of an area and disrupt its ability to support farming and other activities. As its frequency and severity worsen, persistent flooding can eventually affect the drinking water supply for those relying on well water. Persistent flooding can derive from the sources detailed below.

- **Tidal flooding** responds to high and low tides and moon phases. While nuisance flooding is traditionally associated with spring or king tides, increasingly even "normal" high tides can cause flooding, particularly in certain wind conditions.
- **Groundwater flooding or high water table** takes the form of spongy or soggy soil, particularly along the banks of waterways and low-lying, flatter areas near the Chesapeake Bay and Atlantic Ocean.

Persistent flooding can be caused or exacerbated by any combination of the phenomena described below.

- **Subsidence** is the lowering of ground plane elevation that results from geological factors and the compression of land mass following the extraction of groundwater from underground aquifers. Subsidence can exacerbate other types of flooding and increase the frequency of tidal flooding in low-lying areas, particularly when coupled with sea level rise.
- **Sea level rise**, a result of climate change, refers to the increased average elevation of coastal waters. The increased height of the seas can cause low lying coastal areas, such as those along the Chesapeake Bay and Atlantic Ocean, to experience more frequent flooding.
- **Overdevelopment and impervious surface increase** limit the ability of the soil to absorb stormwater.
- **Stormwater infrastructure failure** often occurs in aging systems or those undersized for current demands.
- **Shoreline modification** often alters natural buffers including oyster reefs, vegetation, and wetlands.

PERSISTENT FLOODING

In Annapolis, persistent flooding has increased 925 percent over the past 50 years. The city experiences this kind of flooding – usually corresponding to high tides – nearly 50 times a year. In the next 50 years, Annapolis may encounter persistent flooding every day.

b. Event Flooding

Event flooding is occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure. Event flooding an derive from the sources described below.

- **Flash floods** occur when streams, soils, or stormwater systems are unable to hold or absorb a sudden influx of water.
- **Storm surge** manifests when strong winds along the shores of large bodies of water, such as the Chesapeake Bay or the Atlantic Ocean, push high waves inland.

- **Ice jams** occur when openings under a bridge or through a culvert are blocked with ice and snow, preventing water flow. Ice jams can also form as ice dams, where the water surface freezes at locations away from bridges and culverts.

In Maryland, typical causes of event flooding include one or more of the following phenomena:

- **Precipitation** in the form of intense rainfall, ice, and snow;
- **Severe storms** such as hurricanes, tropical storms, and Nor'easters, which are often accompanied by high winds; and/or
- **Infrastructure failure**, including burst water mains and storm drains, as well as dam and levee breaches.

A.2 THE INCREASING THREAT OF FLOODING

KEY QUESTION:

Is flooding getting worse?

Many communities across the state are currently experiencing an increase in flooding over historical trends. Roads that used to weather a storm can now become impassable; temporary ponds form after heavy rains; and property owners have to address new, more frequent, or more severe impacts, such as flooded basements. Increased precipitation attributed to climate change is one of the key contributing factors, while along coastal areas such as the banks of the Chesapeake the condition is exacerbated by a combination of subsidence and sea level rise. These factors can occur separately or together, and all stress infrastructure systems that, in some cases, have already begun to fail due to age and/or lack of maintenance.

a. Climate Change and Precipitation

Climate change can cause more frequent and extreme precipitation events. The Northeast has experienced a greater recent increase in extreme precipitation than any other region in the United States; between 1958 and 2010, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events).

Significant increases in rainfall can overwhelm rivers and stormwater systems and lead to flash flooding. Severe hurricane winds and changing wind patterns can contribute to more frequent coastal flooding and higher storm surge, while drought caused by warming can decrease the soil's ability to absorb a downpour.

b. Sea Level Rise and Subsidence

The relationship between the height of the land and the height of the water is changing along Maryland's coastlines due to the combined effect of subsidence and sea level rise. This change can manifest as an increase in the groundwater levels in coastal regions, resulting in waterlogged soils that are unable to absorb more stormwater. As a result, in addition to overwhelming stormwater facilities, pressure from saturated soil puts underground construction at risk, including building foundations, utilities, archeological sites, and burial sites.

The narrowing gap between surface grades and water level, combined with an increase in the frequency and intensity of rain and storm events, results in more frequent and more severe flooding and, in some cases, submergence. The effect of these changes may be most apparent in the disappearance and reshaping of islands in the Chesapeake Bay. *(Refer to Maryland's Lost and Disappearing Islands, page 1.12.)*

In its 2016 Annual Report, the Maryland Commission on Climate Change recommends planning for a relative increase in sea level in the Chesapeake Bay of 2 feet by 2050, understanding that by the end of the century the number could reach 4.1 feet or higher with unrestrained growth in global emissions. ***Therefore, a critical factor in planning for flooding is establishing a timeframe to best understand, and prepare for, how the flood vulnerability may change over time.*** *(Refer to Establish a Timeframe for Planning Goals, page 2.20.)*

c. Reduced Capacity in Stormwater Management

Stormwater systems (e.g., sewers, culverts, and retention ponds) manage surface water runoff from precipitation by guiding runoff to streams and other waterways, via surface or underground channels, or to ponds where the runoff is stored and allowed to infiltrate the ground naturally. ***These systems are designed to meet the demand of predicted precipitation (typically based on historical patterns) and land use.***

Where upgrades and maintenance to stormwater systems have not kept pace with rapid development and increased impervious surface, the system may not be able to handle stormwater loads. Even if stormwater system maintenance and upgrades have kept pace with development, most systems struggle to accommodate changing precipitation patterns, extreme events, and higher tides that are occurring across the state due to shifting climatological conditions and a warmer, more expansive Chesapeake Bay.

In many communities, tidal outfalls (discharge points for stormwater to flow into a large body of water like a river or the bay), once intermittently covered by high tides, are now semi-permanently covered by fluctuating, higher water levels, which forces water back up through the stormwater system unless the end of the outfall (usually a large pipe) is fitted with a flap valve or another form of backflow prevention. Stormwater system upgrades may be delayed due to expense and buy-in for best practices, including, but not limited to, green infrastructure and lower-impact development in vulnerable areas. Given increasing expense of the status quo, however, it is likely that both stormwater systems and stormwater management policies will have to adapt to changing conditions in the not-too-distant future.

A.3 FLOODING IN MARYLAND

> *"We discovered the wind and waters so much increased with thunder, lightning, and rain that our mast and sail blew overboard, and such mighty wave over racked us… we were forced to inhabit these uninhabitable Isles which for the extreme of gust, thunder, rain, storms and ill weather, we called Limbo."*
>
> - Captain John Smith, *The General Historie of Virginia, New England & the Summer Isles* (1624)

KEY QUESTION:

How have storms, rising sea levels, and subsidence affected Maryland's communities in the past?

The earliest European settlers in Maryland recorded flooding and flood events, and Marylanders have developed a cultural legacy of adaptation. The manner and extent to which each community is impacted varies based upon local conditions and circumstances. ***This Guide recommends that local governments and property owners consider a community's history of adaptation when evaluating how best to address future flooding.*** *(Refer to Document & Assess Flood Risks to Historic Properties, page 2.21.)* To provide some context for the history of extreme flooding statewide, the following sections describe major storm events as well as the documented permanent inundation of land in the Chesapeake.

a. Major Storm Events in Maryland's History

Maryland's recorded storm history begins in 1649 when an unnamed coastal storm cut inlets through the coast along the barrier island where Ocean City is now located (Dawson, 2008). While all areas in Maryland have experienced flooding due to hurricanes, intense rainfall, and winter storms, these types of events have increased in frequency. A comparison of the number of recorded flood or storm events in the last half of the 20th century to the events recorded for the early-21st century is staggering. *(Refer to Maryland Flood Events, below.)*

MARYLAND FLOOD EVENTS

Event Type	Number of Occurrences Recorded : 1950 to 1999	Number of Occurrences Recorded : 2000 to 2016	Percent Increase
Coastal Flooding	21	90	329
Flash Flood	151	500+	231
Flood	15	455	2933
Hurricane	15	0*	0
Tropical Storm	12	59	392

*Table 1.1: Maryland Flood Events. Table Source - NOAA Storm Events Database. *Note: All hurricanes occurring thus far in the 21st century were downgraded to tropical storms before they struck Maryland.*

TIMELINE: DOCUMENTED FLOOD EVENTS IN MARYLAND

This list highlights key hurricane and coastal storm events to provide historical context in illustrating the severity and increasing frequency of particularly destructive storm events. More information on storms that were declared disasters can be found on FEMA's website (FEMA, 2018).

- **1667**: The "Dreadful Hurry Cane of 1667." Reportedly the hurricane destroyed an estimated 10,000 houses and roughly two-thirds to four-fifths of the crops due to flooding and hail throughout the tidewater region of the Chesapeake Bay (Dawson, 2008 and Mountford, 2005).
- **September 2-3, 1775**: The "Independence Hurricane" brought heavy rain that caused damage in coastal areas and winds that tore the dome from the State House in Annapolis (Dawson, 2008).
- **September 2-3, 1876**: The Centennial Storm caused tides nearly eight feet above normal in some areas in the Bay and cut Sharps Island in two (Dawson, 2008).
- **October 23, 1878**: An unnamed Category 2 hurricane was the strongest storm to have impacted the Baltimore-Washington region since storm record-keeping began in 1851 (National Weather Service, 2012).
- **1920**: An unnamed coastal storm caused tides 6.5 feet above normal in Ocean City and cut an inlet through Assateague Island (Dawson, 2008).
- **August 23-24, 1933**: Chesapeake Bay Hurricane caused record high tides on the western side of the Bay when the storm surge funneled up the Potomac River, resulting in an 11-foot storm surge in Washington, DC. On the Eastern Shore, the storm recorded 60 mph winds with heavy rainfall, producing the highest tide in the history of Crisfield, Maryland. The storm caused $79 million (adjusted to 1969) worth of damage in the region (National Weather Service, 2012; The Crisfield Times, 1933).
- **October 15, 1954**: Hurricane Hazel had reported gusts near 100 mph with a track through Western Maryland, near Hagerstown (Dawson, 2008; National Weather Service, 2012).
- **August 13, 1955**: Hurricane Connie, downgraded to a Tropical Storm when it reached Maryland, brought heavy rainfall (nearly 10 inches across the southern portion of the state) and flooding, with a track up the Eastern Shore (Dawson, 2008; National Weather Service, n.d.).
- **August 18, 1955**: Hurricane Diane, downgraded to a Tropical Storm when it reached Maryland, brought heavy rains and flooding across Central Maryland, particularly along the Potomac River. Following so closely after Hurricane Connie, many river systems were already at flood stage when Diane dropped an additional 1.48 to 2.67 inches of rain across the region (U.S. Weather Bureau, 1955).
- **June 22, 1972**: Hurricane Agnes dropped 10 to 14 inches of rain across Virginia, Maryland, and Pennsylvania, causing flooding along the Potomac River Basin as well as other major river systems. The storm surge in Washington, DC was estimated at 15.5 feet. In Maryland, the storm caused 19 fatalities and $110 million in damages (National Weather Service, 2012).
- **September 16, 1999**: Hurricane Floyd brought 12 to 14 inches of rain and wind gusts of up to 50 to 70 mph. The storm resulted in one fatality and left more than 250,000 customers without power. Storm surge in the Bay was estimated at 2 to 3 feet. Minor flooding occurred across southern Maryland. Under the Major Disaster Declaration, $5.4 million (1999 dollars) was obligated under FEMA Public Assistance for Anne Arundel, Calvert, Caroline, Cecil, Charles, Harford, Kent, Queen Anne's, Somerset, St. Mary's, and Talbot Counties (FEMA, 2018; National Weather Service, 2012).

- **September 19, 2003**: Hurricane Isabel only dropped 2 to 6 inches of rain across Maryland, but its large field of high wind toppled trees, which brought down powerlines and destroyed nearly 8,000 houses throughout Virginia, Maryland, and Pennsylvania. Isabel also caused substantial flooding due to its unusually high storm surge in the Chesapeake Bay and Potomac River Basin: 6 to 8 feet above normal tides, the highest levels since the Chesapeake Bay Hurricane of 1933. The storm surge in Annapolis reached 6.44 feet above mean sea level and in Baltimore reached 7.35 feet above mean sea level. Isabel prompted a Major Disaster Declaration in Maryland with $33 million dollars (2003 dollars) approved under FEMA Individual Assistance and $40.6 million dollars (2003 dollars) approved under FEMA Public Assistance for all 23 counties and the City of Baltimore (FEMA, 2018; National Weather Service, 2012).
- **August 27-28, 2011**: Hurricane Irene hit Maryland as a Category 1 hurricane with sustained winds of 85 mph accompanied by a large swath of rain that dropped 5 to 11 inches across the state. St. Mary's County received the largest amount of rainfall, roughly 8 to 11 inches, causing massive flooding throughout the county. The storm's high winds brought down trees, damaging nearly 1,000 homes in Virginia and Maryland and causing power outages for around 850,000 customers in Maryland. A Major Disaster Declaration was declared with $20 million (2011 dollars) obligated under FEMA Public Assistance for Baltimore City, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Queen Anne's, St. Mary's, Somerset, Talbot, Wicomico, and Worcester Counties (FEMA 2018; National Weather Service, 2012).
- **September 6-9, 2011**: The remnants of Tropical Storm Lee spread out across the Mid-Atlantic States as a large stationary swath of rain. Heavy rainfall was recorded throughout Maryland: 18.88 inches at Elkton; 12.07 inches in Bowie; 11.93 inches in Waldorf; 11.08 inches in Ellicott City; 10.22 inches in Gaithersburg, and 7.32 inches at Baltimore-Washington International Airport. Compounded by a wet summer and rain from Hurricane Irene, Lee's remnants caused massive flooding along the Susquehanna River. The storm's remnants also spawned several tornadoes, one of which touched down in southern Maryland on September 7th. A Major Disaster Declaration was declared with $9.7 million (2011 dollars) obligated under FEMA Public Assistance to Anne Arundel, Baltimore, Cecil, Charles, Harford, Howard, and Prince George's Counties (Brown, 2011; FEMA, 2018).
- **October 29, 2012**: Hurricane Sandy brought heavy rainfall in the extreme eastern portion of the state, which received 5 to 12 inches of rain, with a peak amount of 12.83 inches in Bellevue. The storm surge along the coast was 2 to 4 feet above ground level. The rain, combined with the storm surge, produced flooding along the Chesapeake Bay. High winds from the storm downed trees and powerlines. A Major Disaster Declaration was declared with $2.5 million (2012 dollars) approved under FEMA Individual Assistance for Somerset County and $32.2 million (2012 dollars) obligated under FEMA Public Assistance for 23 counties and the City of Baltimore (Blake, 2013; FEMA, 2018).
- **July 30, 2016**: A torrential rainstorm passed through Montgomery, Howard, and Baltimore Counties, causing flash flooding in and near Ellicott City and along the Jones Falls in Baltimore City. Nearly 6 inches of rain fell within two hours over Ellicott City. The ensuing flash flood caused two fatalities, destroyed six houses, damaged 91 houses, and damaged 90 commercial buildings, mainly within the National Register Historic District. A Major Disaster Declaration was declared with $2.1 million approved under FEMA Public Assistance for Howard County (National Weather Service, 2016).
- **May 27, 2018**: A torrential rainstorm caused about 8 inches of rain in a couple of hours in and around Ellicott City. "In under three hours, the river rose over 16.5 feet to a new record high of 24.36 feet. From 4:15- 5:30 p.m., the river rose nearly 3 feet every 15 minutes. The river went from normal to major flood stage in a little over an hour, an extremely short amount of time." (www.climate.gov) There was one fatality.

Figure 1.4 - Marshland creeping closer to a house on Tylerton, Smith Island, Somerset County.

b. Maryland's Lost and Disappearing Islands

The long-term effects of increasing persistent flooding and erosion in Maryland may be best illustrated by the histories of inhabited islands, primarily in the Chesapeake Bay, that are now submerged. Hundreds of islands have disappeared since the 1600s; primarily due to a combination of sea level rise, subsidence, and the erosion of protective coastlines and natural buffers. More than 500 named islands are recorded as lost in William Cronin's book *The Disappearing Islands of the Chesapeake*, which includes Maryland and Virginia.

Some islands had permanent settlements or were occupied year-round. Until the 1700s, many islands were used by Native Americans as temporary camps for collecting oysters and fishing, sometimes as part of a larger seasonal settlement that included villages on the larger islands. In time, European settlers occupied islands with early colonial farmsteads, often consisting of one or two houses. Others, like Holland Island, had thriving fishing and farming communities into the early-20th century, often including churches, schools, post offices, and general stores. Communities that still exist may have recent or cultural memories of nearby islands and their abandonment.

Many of Maryland's currently inhabited islands experience routine and increased impacts from flooding, loss of landmass by erosion, and loss of arable land as salt water intrusion kills trees and converts marshland to open water. *(Refer to Appendix A: Case Studies - Maryland's Historic Communities, Hoopers Island and Taylors Island.)*

Figure 1.5 - Trees killed by salt water intrusion as arable land is converted to marsh and open water, Taylor's Island, Dorchester County.

DORCHESTER COUNTY

- Occupied since 1669, Hoopers Island has supported farmers, boatbuilders, the seafood industry, and the canning industry. Of those vibrant lifeways, only the seafood industry remains, supplemented by charter sport fishing businesses. Hoopers Island experiences the greatest rate of erosion in the Bay, with a loss of about 24 acres/year (Cronin, 2005). By 2005, the island had been reduced to roughly 1/8th its size in 1683 (2005).
- In 1659, residents of Taylors Island were primarily farmers growing corn and tobacco. By the 19th century, boatbuilding and the seafood industry arose as the predominant occupations for islanders. Today the island is still farmed and still supports a small seafood industry, and it has become a hunting destination. Taylors Island is actively eroding, losing roughly 4 acres/year, which equates to about five percent of its landmass over the 20th century (Cronin, 2005).

SOMERSET COUNTY

- Settled in the 17th century, both Deal and Little Deal Islands were home to farmers and fishermen. The mid-19th and early-20th centuries saw the rise and fall of the canning industry and oyster-shucking houses. Softshell crabbing and the seafood industry still provide livelihoods for island residents. Between 1948 and 1998, Deal Island lost 330 acres, an average loss of 6.6 acres/year, while Little Deal Island lost 171 acres, more than 10 percent of its landmass, for a rate of loss of about 3.4 acres/year (Cronin, 2005). Residents of the island are actively engaged in planning to adapt to their changing environmental conditions to remain on-island for as long as possible. *(Refer to Adaptation, page 2.67.)*
- Settled in 1686, Smith Island is the last inhabited Bay island in Maryland that is reachable only by water. Island residents traditionally subsisted through farming and the seafood industry; now only the seafood industry remains, as marshes have claimed the available farmland. With a peak population of more than 800 in the early-20th century, the island now hosts fewer than 200 permanent residents (U.S. Census, 2010). From 1855 to 2005, Smith Island lost 277 acres, which equates to roughly 2 acres/year (Cronin, 2005). After Hurricane Sandy swept through the Bay in 2012, residents of Smith Island formed a nonprofit entity, Smith Island United, to conduct long-range planning for the survival and revitalization of the three island communities: Ewell, Rhodes Point, and Tylerton. The Smith Island Vision Plan, adopted as an amendment to the Somerset County Comprehensive Plan, outlines strengths, challenges, opportunities, and strategies for growing and sustaining watermen's culture; maintaining and improving the island's economy; developing and maintaining infrastructure; and increasing the year-round island population.

TALBOT COUNTY

- Once a thriving community dependent on boatbuilding and the seafood industry, the traditional lifeways of Tilghman Island have declined, and the island has reinvented itself as a vacation destination. The island has lost more than 670 acres over the past 150 years, at a rate of roughly 4.4 acres/year (Cronin, 2005).

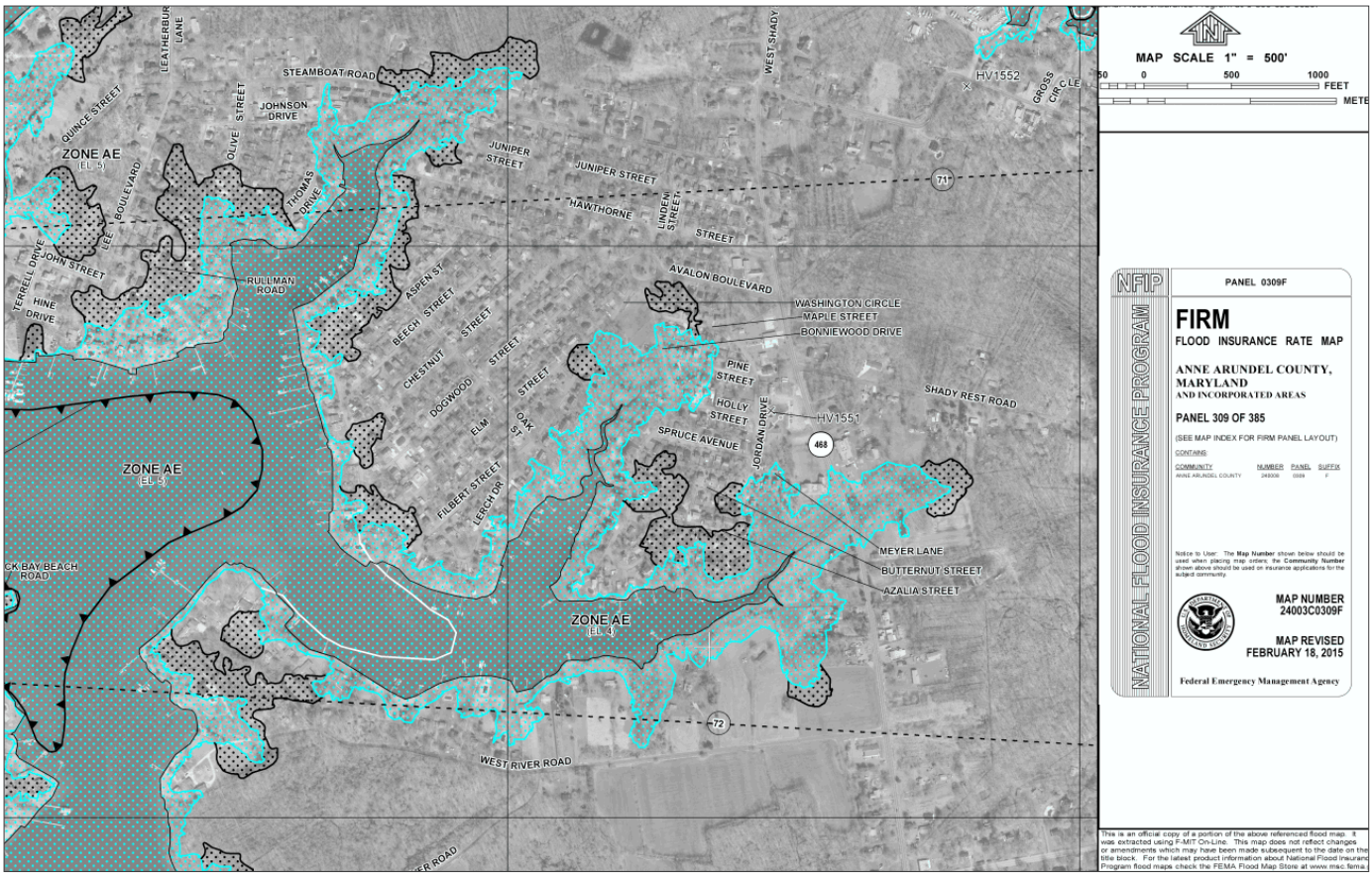

Figure 1.6: The pale blue dots on this Flood Insurance Rate Map indicate the Special Flood Hazard Areas (SFHAs). The SFHA (also known as the 1% annual chance flood, 100-year flood and base flood zone), has historically been subject to a 1% chance of flooding during any given year. In this case, the SFHA is defined as Zone AE, in which the base flood elevations are determined. The areas with the black dots represents areas of historically 0.2% annual chance flood (also known as the 500-year flood zone). Areas without dots have been determined to be outside of the historically 0.2% annual chance floodplain. It is important to highlight that these categories do not include future conditions due to the climate change. (Map obtained through FEMA's Map Service Center.)

B. FLOODPLAIN MANAGEMENT

KEY QUESTION:

Who is responsible for managing development within the floodplain?

Floodplain management is a local program of corrective and preventative measures that strive to minimize losses from floods and protect natural resources. To protect life, property, and public investment, buildings and infrastructure located in floodplains are managed via a federal-state-local partnership among various agencies, most notably the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE), the Maryland Department of the Environment (MEMA), the Maryland Department of the Environment (MDE), and the local jurisdiction's floodplain administrator. ***Floodplain regulations affect and influence the treatment of all properties in the floodplain; as a result, it is vital that local preservation planners and others concerned about flood-prone historic buildings understand how floodplain management works.***

Local floodplain administrators (sometimes referred to as "floodplain managers") typically regulate development in high risk areas through floodplain ordinances, which must meet certain minimum standards to be approved by the state and FEMA. Adoption of an approved floodplain ordinance allows that community to participate in the National Flood Insurance Program (NFIP), making insured properties eligible to receive federal funding following a flood event. The State NFIP Coordinator at MDE can verify a local government's participation in the NFIP and provide contact information for the local floodplain administrator.

B.1 FLOOD INSURANCE RATE MAPS

KEY QUESTION:

How can floodplain administrators measure a property's vulnerability to flooding?

FEMA develops and publishes maps, called Flood Insurance Rate Maps (FIRMs), which show the horizontal and vertical extent of the floodplain. ***FIRMs serve as the basis for floodplain regulation and management, as well as for determining flood insurance premiums.*** In the FIRMs, FEMA delineates three main areas to graphically depict flood risk: Special Flood Hazard Area (SFHA), which refers to the area predicted to have a 1% chance of flooding each year;

the 0.2% annual chance floodplain; and minimal flood hazard areas outside the floodplain. ***Properties located within the SFHA are considered high risk, while properties at an elevation higher than the 0.2% annual floodplain fall within minimal flood hazard areas and, consequently, have lower insurance premiums. Because FIRMs are based on modelling past storm events and/or present conditions, they do not address future threats such as sea level rise.*** To best plan for properties threatened by flooding, this *Guide* recommends that floodplain administrators and planners conduct additional analyses to accommodate climate projections and address future flood risks. *(Refer to Establish a Timeframe for Planning Goals, page 2.20.)*

The SFHA includes two different flood zones on the FIRMs: A Zones and V Zones. The difference between the two zones is that V Zones are subject to storm-induced velocity wave action (for example, a beach house that could be inundated in a storm), while A Zones are not. Therefore, buildings in V Zones must meet more stringent standards because of the forces they must withstand. ***Understanding the different requirements for each flood zone can be confusing; it is therefore recommended that planners meet with the local floodplain administrator prior to developing projects or plans to see how the floodplain ordinance may affect the project.***

FIRMs also depict the computed elevation to which floodwater is expected to rise during the 1% annual chance flood event (also known as the base flood). This height, the Base Flood Elevation (BFE), is the regulatory requirement for the elevation or floodproofing of structures. VE Zones (depicted on older FIRMs as V1-30), and AE (depicted on older FIRMs as A1-30) both have Base Flood Elevations delineated on the FIRMs. These elevations are determined by detailed hydraulic analyses based on flood models and information from past storm events.

FEMA maintains the regulatory FIRMs, which are available from the local floodplain administrator and online though FEMA's Map Service

"100-YEAR FLOODPLAIN"

The term "100-year floodplain" implies, inaccurately, that a flood is likely to occur only once in a 100-year period. (Likewise, "500-year floodplain" implies one flood every 500 years.) What "100-year floodplain" means is that the area within that boundary has a 1% chance or 1-in-100 chance of flooding in any given year: therefore the 100-year floodplain is also referred to as the 1% annual chance floodplain. In fact, properties could experience a "100-year flood" in two consecutive years, just as it is possible for properties located in minimal flood hazard areas to flood, particularly in a severe weather event such as a hurricane. For these reasons, and because FIRMs do not include climate change projections, it is recommended that local planners and preservation advocates use "1% annual chance floodplain" or "Special Flood Hazard Area" (SFHA) and that they account for climate change projections in any evaluation of flood vulnerability. However, they should be prepared to explain the term "100-year floodplain," especially in public outreach. *(Refer to Establish a Timeframe for Planning Goals, page 2.20.)*

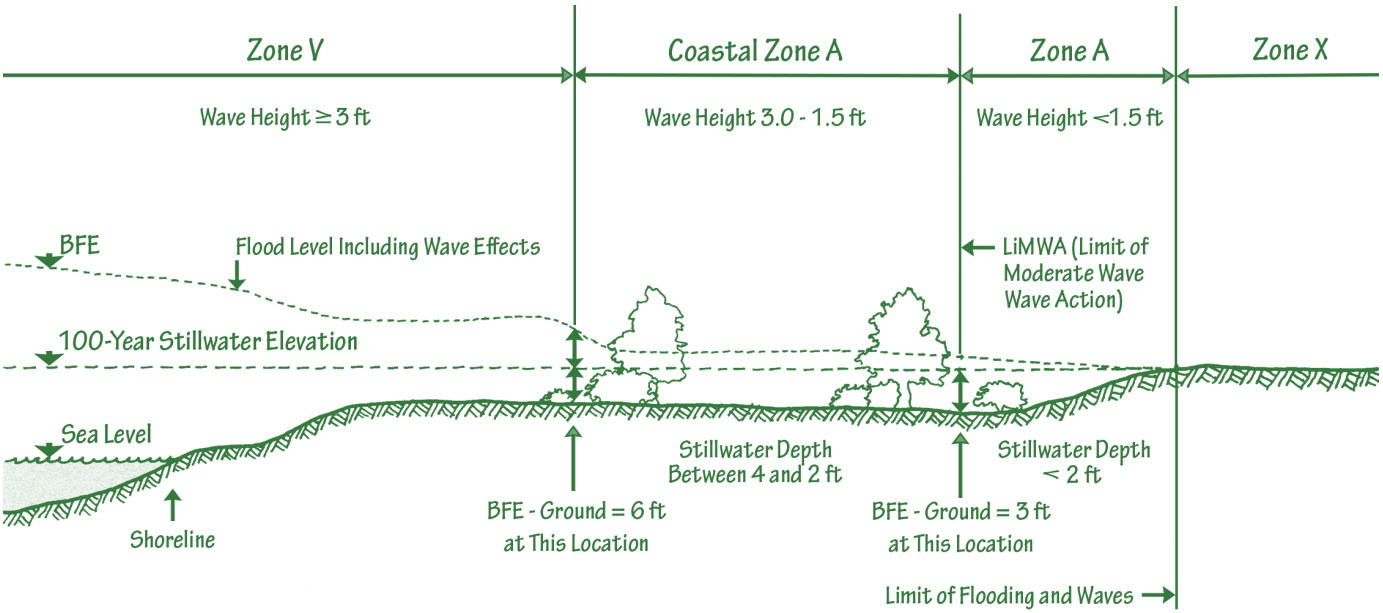

Figure 1.8 - Relationship between the stillwater elevations, BFE, wave effects, and flood hazard zones. (Base diagram obtained from FEMA.)

Center. The Maryland Department of the Environment (MDE) maintains a GIS-mapping platform with Digital Flood Insurance Rate Maps (DFIRMs), for reference and planning use only. The DFIRM mapping platform allows the user to add various informational map layers over the SFHA, such as sea level rise and storm surge. The mapping application also allows the user to locate resources in the floodplain such as properties listed in the Maryland Inventory of Historic Properties (MIHP), the Maryland Historical Trust's (MHT's) easement properties, and properties listed in the National Register of Historic Places. For preservation planners and advocates, the DFIRMs will likely serve as the most useful tool for understanding which historic properties fall in within the regulated floodplains. The local floodplain administrator and/or staff at MDE can provide assistance in using the mapping tools.

B.2 NATIONAL FLOOD INSURANCE PROGRAM

Established in 1968, the National Flood Insurance Program (NFIP) offers repair assistance for flood-damaged properties; provides maps of floodplain areas, delineating zones of risk; and makes flood insurance available to property owners. The intent of the NFIP was to:

- Allow property owners to purchase flood insurance from the Federal government where private insurance was unavailable or cost prohibitive;
- Provide a national insurance funding pool to distribute the risk across a larger geographic area, thus reducing premium costs; and
- Provide incentives for flood risk management, thus reducing the overall costs of flooding.

In many ways, flood insurance works like other types of insurance. In exchange for the payment of a premium, the insurance provider guarantees compensation or partial compensation for a covered loss. The cost of premiums varies with risk; for example, less flood-prone properties will have lower premiums than those in more vulnerable locations. With flood insurance, a property owner is eligible to receive funds for recovery following a flood event. Flood insurance typically covers damage to both the property (i.e., buildings) and contents (i.e., furnishings, objects).

To avoid penalizing property owners whose properties were constructed before the adoption of a community's FIRM and floodplain ordinance, these properties (known as pre-FIRM structures) were grandfathered into the insurance premiums at a lower rate despite their risk of damage by flood. *(Refer to Pre-Firm Structures sidebar, at left.)* This contributed to a situation where, over time, claims greatly exceeded premiums, requiring the Federal government to borrow money with interest to be able to pay claims. This ran contrary to Congress's intent that the NFIP be self-supporting (e.g., the funds from the premiums should cover the costs associated with claims from flood events) and had the unintended effect of the Federal government subsidizing property owners living in high risk areas. As a result, Congress passed the Biggert–Waters

PRE-FIRM STRUCTURES

Buildings constructed or substantially improved prior to the community's initial FIRM are called "pre-FIRM structures" and were likely not built to avoid or reduce flood damage. Buildings constructed or substantially improved after the community's initial FIRM should have been constructed in compliance with the local floodplain ordinance. Most historic buildings are pre-FIRM structures.

Flood Insurance Reform Act of 2012 and the Homeowners Flood Insurance Affordability Act of 2014 to gradually increase premiums for higher-risk properties, including many historic buildings defined as "pre-FIRM structures." These laws allow NFIP premiums to more accurately reflect the real risk of flooding and loss, while making it more expensive to insure properties which were previously effectively subsidized.

NFIP insurance is currently available to owners of eligible residential and commercial properties throughout the entire state, regardless of the property's flood risk. ***Flood insurance is required for some properties, such as mortgaged properties located within high-risk areas, but it should be considered by owners of all properties at risk for flooding.*** In cases where flood insurance is not required, each property owner must assess their property's level of risk and their ability to financially recover from a flood event when considering forgoing coverage. In the event of a flood, any flood-related damage not covered by insurance is the full responsibility of the owner.

Unfortunately, alterations required to protect a property from flooding (e.g., elevation, or raising the property on a new, higher foundation) and to achieve lower insurance premiums are frequently at odds with best practices for preservation. *(Refer to Elevation, page 3.22.)* Alterations can jeopardize the historic character and integrity of a building. For instance, elevation changes the appearance of a building and its relationship to its setting, while replacing plaster with tile or other water-resistant finishes changes the character of an interior space. FEMA has attempted to address this tension by providing flexibility for historic properties in meeting floodplain regulations. *(Refer to State & Local Floodplain Regulations & Ordinances, below. To consider specific options for reducing flood vulnerability at historic properties, refer to Identify, Evaluate & Prioritize Mitigation Options for Historic Properties, page 2.32, Mitigation, page 2.51, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*

B.3 STATE & LOCAL FLOODPLAIN REGULATIONS & ORDINANCES

To participate in the NFIP and allow property owners to take advantage of federal flood insurance, a local jurisdiction must adopt and enforce a floodplain management ordinance which restricts new construction and improvements to existing construction in the SFHA. *(Refer to Flood Insurance Rate Maps, page 1.15.)* ***Although FEMA develops the FIRMs, which identify areas vulnerable to flooding, and offers information and strategies for floodplain management, much of the responsibility for floodplain management occurs at the local level, with standards, assistance, and guidance from state and federal governments.*** *(Refer to Community Rating System, page 1.25, and Participate in the Community Rating System, page 2.59.)*

The Maryland Department of the Environment (MDE) establishes state standards and works with local communities to regulate construction in flood-prone areas through zoning, planning, and

building codes. Although all development projects within the SFHA must be reviewed for permitting at the local level, some projects also require state and potentially federal approval, especially regarding construction permits in state waterways, activities near non-tidal wetlands, and activities that may change tidal wetland boundaries. MDE helps communities conduct outreach related to floodplain management and flood insurance, quantify the risk of flooding, and identify mitigation actions to reduce the community's vulnerability to flood hazards. Many of these activities take place as part of the hazard mitigation planning process. *(Refer to Planning & Preparedness, page 2.3.)*

MDE also developed the Maryland Model Floodplain Management Ordinance, which integrates NFIP and state permitting requirements and contains additional provisions that are more stringent than the federal regulations (MDE, 2014). Nearly all communities in Maryland have adopted the model ordinance or some of its language. The local floodplain ordinance is codified in different places: for example, as its own article in the jurisdiction's code or under another article in the code, such as planning and zoning.

The local floodplain administrator ensures compliance with the floodplain ordinance; conducts outreach and education regarding the requirements of the NFIP and the community's floodplain regulations; reviews, approves, or denies updates to the community's FIRM; issues permits; participates in hazard mitigation planning activities; manages mitigation activities to protect vulnerable resources; and manages activities related to participation in the Community Rating System. *(Refer to Community Rating System, page 1.25.)* ***It is important for preservation planners and others interested in flood-prone historic properties to understand their local floodplain regulation and how it might impact historic properties.***

KEY QUESTION:

How are historic properties regulated within the floodplain, and what are some of the potential effects?

a. Floodplain Ordinances and Historic Properties

Floodplain ordinances typically err on the side of preservation rather than flood protection in their treatment of historic properties. Some jurisdictions adopt more restrictive floodplain ordinances to account for changes in local conditions (for example, more frequent nuisance flooding), to improve resiliency to flood events, or to lower insurance premiums for property owners. *(Refer to Community Rating System, page 1.25, and Participate in the Community Rating System, page 2.59.)*

Both NFIP's and Maryland's model ordinances require existing buildings to meet the ordinance's flood protection standards. The requirement to comply with the ordinance is triggered when the local floodplain administrator determines, via the permitting process, that a proposed alteration to a building is a "Substantial Improvement" (MDE, 2014) or that the proposed alterations to repair a building to its pre-damage condition indicate that the building has been "Substantially Damaged" (MDE, 2014). Compliance means that buildings determined to be "substantially improved" or "substantially damaged" must be protected against flooding up to the Base Flood Elevation

(BFE) plus any additional height (or "freeboard") required by the local floodplain ordinance.

When referring to historic properties, the NFIP and state model floodplain ordinances use FEMA's definition of "historic structure," which is not equivalent to definitions used by the National Park Service and or the MHT to describe historic and cultural properties (based on, but not limited to, the criteria for listing in the National Register of Historic Places). In Maryland, local jurisdictions may set their own criteria defining what properties are or are not "historic." This means that properties designated "historic" under local historic preservation ordinances may or may not qualify for special treatment under local floodplain ordinances unless the property is located in a municipality that is a Certified Local Government under the Certified Local Government Program, jointly administered by the National Park Service and the MHT.

The state's model ordinance provides local governments with two methods, or alternatives, that can be adopted into floodplain

MARYLAND MODEL FLOODPLAIN ORDINANCE DEFINITIONS

ALTERNATIVE 1

Alternative 1 requires property owners to seek a variance for any improvements (e.g., repair, alteration, or rehabilitation) to their "historic structure" that will trigger the substantial improvement requirements. For the variance to be considered, the application for the variance must include a determination that the proposed work will not preclude the structure's eligibility or designation as a "historic structure." Further, the documentation must be obtained from a source that is authorized to make such determinations (MDE, 2014).

Using the variance alternative, communities can place additional conditions to make "historic structures" more flood-resistant, so long as such conditions allow the building to continue to qualify as "historic." For example, a community could require that a variance be allowed only if the work meets other criteria, such as "not causing an increase in the elevation of the base flood" or that "all materials below the DFE/BFE meet the requirements of dry or wet floodproofing (as codified in the ordinance)." In this way, the variance alternative can be used to balance preservation and protection.

ALTERNATIVE 2

Alternative 2 excludes "historic structures" from complying with substantial improvement requirements so long as proposed alterations will not preclude the structure from meeting FEMA's definition of "historic." The model ordinance requires a property owner to provide documentation that the work as proposed will meet this standard.

ordinances to exempt from "historic structures" (as defined by FEMA) from alterations that are incompatible with historic preservation practice. *(Refer to Maryland Model Floodplain Ordinance Definitions, page 1.20.)* To understand how historic properties may be regulated, local preservation planners and advocates should know which of the two Alternatives their local jurisdiction has adopted.

On its face, **Alternative 2** may appear to be a benefit in that it does not mandate compliance with flood-related building regulations, thus limiting potential change and providing greater protection of the property's historic integrity. However, not requiring compliance:

- Leaves buildings vulnerable to flooding and damage;
- Does not relieve property owners from obtaining flood insurance if otherwise required; and
- May foster a belief that the flood risk is somehow reduced or eliminated.

Without guidance for how to reduce a property's vulnerability to flooding, Alternative 2 may also place property owners who seek to reduce risk or lower their flood insurance premiums at odds with local historic preservation commissions, which strive to limit alterations to historic properties that are not otherwise mandated.

The passage of the federal Homeowners Flood Insurance Affordability Act (FEMA, 2014), which allows for flood insurance premiums to increase to meet the actuarial rate for a property, may provide an impetus for property owners to alter historic structures to avoid rising flood insurance premiums, regardless of whether the changes to the properties affect their continued designation as historic. This Act, in effect, promotes property protection over historic integrity. This shift towards mitigating historic structures conflicts with the prevailing direction of floodplain regulations, which emphasize historic integrity over flood protection.

b. Repetitive Loss and Severe Repetitive Loss Properties

A history of flood loss likely indicates a building has a higher flood risk. FEMA tracks flood insurance policies and claims through a central database, using this data to identify properties that experience frequent or profoundly damaging flooding. These properties fall under two definitions established by the NFIP: "repetitive loss property " or "severe repetitive loss property." *(Refer to NFIP Definitions sidebar, at left.)*

Properties that fit the repetitive loss or severe repetitive loss definitions are the greatest burden to the NFIP; those few properties comprise roughly one quarter of all NFIP payments since the inception of the program in 1978. ***State and local hazard mitigation plans, therefore, often prioritize repetitive loss and severe repetitive loss properties for mitigation, usually***

NFIP DEFINITIONS

Repetitive Loss Property: An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.

Severe Repetitive Loss Property: Any building that:

1. Is covered under a Standard Flood Insurance Policy made available under this title;
2. Has incurred flood damage for which:
   a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
   b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss.

in the form of elevation or acquisition and demolition. However, the database only tracks insured properties (or properties that were at one time insured) where owners have submitted and been paid a flood insurance claim for building and/or contents damaged by flooding; this means that uninsured properties or properties without claims that experience routine flooding may not appear in FEMA's database. The local floodplain administrator should have a list of repetitive loss and severe repetitive loss properties in the community.

Properties are identified as repetitive loss and severe repetitive loss regardless of whether they meet the regulatory definition of "historic structure" in the community's floodplain ordinance. Although "historic structures" may not be required to comply with floodplain regulations, if a historic structure is also a repetitive loss or severe repetitive loss property, the local floodplain administrator may still decide to pursue mitigation. Repetitive loss properties are usually targeted for elevation or floodproofing, which reduce risk but can negatively affect a historic property's integrity and continued federal or local designation. Acquisition and demolition are other typical mitigation actions for severe repetitive loss properties with similarly negative impacts on historic properties.

If funded in part or in whole with state or federal dollars, a flood mitigation project will trigger historic preservation project review. *(Refer to Historic Property Project Review sidebar, page 2.36.)* However, flood protection, rather than preservation, is likely to prevail. In these cases, where protection and not preservation is emphasized, local preservation planners should review the list of repetitive loss and severe repetitive loss properties in the community to determine:

- Whether any buildings meet the local floodplain ordinance's definition of "historic structure;"
- Whether any of the properties are locally recognized as historic, but do not meet the local floodplain ordinance's definition of "historic structure;" and
- Whether there may be buildings 50 years of age or older which have not been studied to assess their architectural or historical importance.

Ideally, preservation planners will work with floodplain administrators to develop flood mitigation projects that will provide the best outcome in terms of protection and preservation for these properties. Where compromise is not possible, preservation planners should offer options to offset the detrimental effect that flood mitigation will have on the historic property (e.g., architectural and historical investigation or documentation and/or local designation of similar properties within a local jurisdiction).

B.4 EVALUATING A PROPERTY'S FLOOD RISK

The most accurate way to evaluate flood risk is to have a licensed land surveyor, registered professional engineer, or registered architect prepare an Elevation Certificate for an individual property.

LOCATION DEFINITIONS

Base Flood Elevation: The Base Flood Elevation (BFE) represents the height that water is expected to reach or exceed during the 1% annual chance (100-year) flood event. The BFE is measured at the lowest floor of a structure, including the basement.

Freeboard: An additional amount of height above the Base Flood Elevation (BFE) used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

Design Flood Elevation: The elevation of the "design flood," including the wave height, relative to the datum specified on the community's legally designated flood hazard map.

Lowest Floor: This is defined as the vertical location of the top of the lowest floor of the structure (in "A" type Zone) or the bottom of the lowest horizontal structural member (in "V" type Zones and recommended for Coastal A Zones) in relation to the Base Flood Elevation (BFE) and of building servicing systems in relation to the BFE.

An Elevation Certificate is an NFIP form used to provide elevation information (e.g., the height of the building's lowest floor in relation to the Base Flood Elevation (BFE) and other measurements related to the flood risk) to ensure compliance with floodplain regulations and to aid in determining the insurance rate for a specific property. ***For a building whose lowest floor is below the BFE, the Elevation Certificate will determine the height to which the building must be protected or elevated to mitigate that property's flood risk and comply with floodplain regulations.*** Communities may require preparation of Elevation Certificates as part of their permitting process; these certificates are kept on file by the local floodplain administrator. There are two important factors to consider when determining flood risk: a building's horizontal and vertical location in the floodplain and the building's foundation type.

a. Horizontal and Vertical Location within the Floodplain

Different areas of flood risk are depicted on the FIRMs. In the SFHA, flood zones (AE, A1-30, VE, and V1-30) also depict the BFE, the height to which floodwater is expected to rise during a 1% annual chance flood event. A building's vertical location in the floodplain is determined by comparing the height of the building's lowest occupied floor to the BFE. *(Refer to Location Definitions sidebar, page 1.22.)* ***For the purposes of this evaluation, the "lowest occupied floor" means the lowest floor that contains areas useable by the occupants (including a basement recreational room) or contains building systems, such as heaters and electric meters (including crawlspaces).*** In cases where there is no basement, the lowest floor may be a building's first floor (e.g. slab-on-grade). If a property's basement falls below the BFE, that property might have a higher flood risk, even if it lies outside the SFHA, particularly from groundwater or through water entry into window and door openings close to or below grade. Conversely, where the lowest floor of a property within a SFHA is raised above the BFE, the risk of

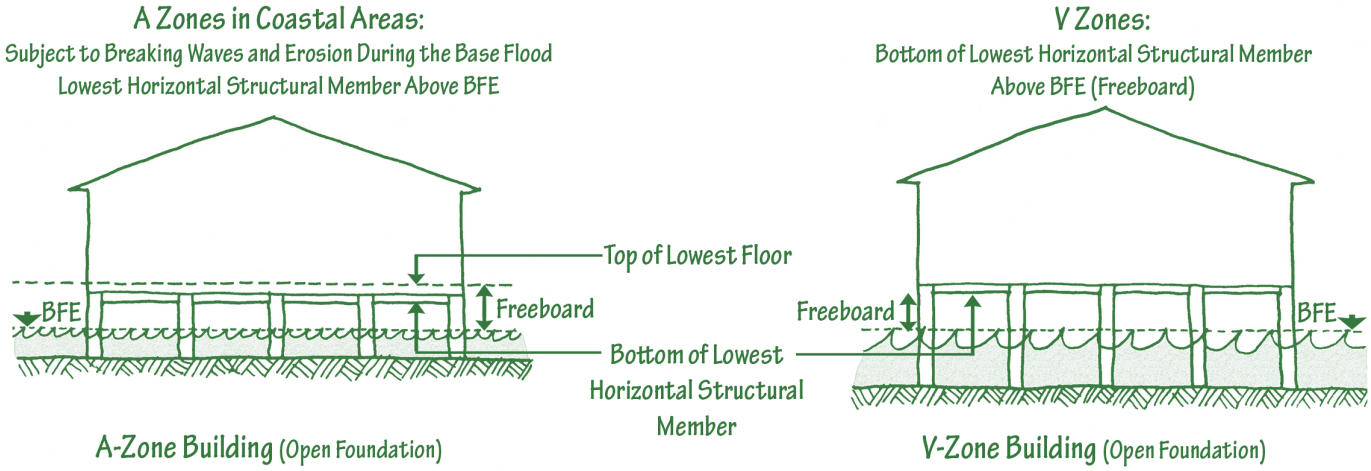

Figure 1.9 - NFIP minimum elevation requirements: A Zones – elevate top of lowest floor to or above BFE; V Zones – elevate bottom of lowest horizontal structural member to or above BFE. In both V Zones and A Zones, many people have decided to elevate a full story to provide below-building parking, far exceeding the elevation requirement. See Fact Sheet No. 1.2 for more information about NFIP minimum requirements in A Zones and V Zones. (Base diagram obtained at FEMA.gov.)

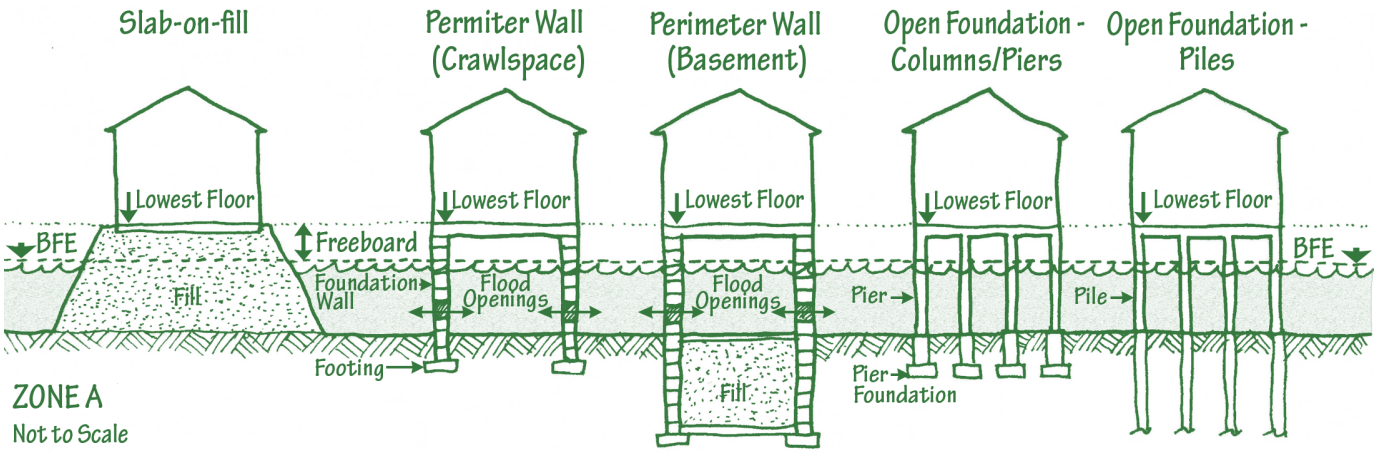

Figure 1.10 - Examples of NFIP-compliant homes in Zone A where the top of the lowest floor is located above the BFE. (Base diagram obtained from FEMA.)

damage to property and contents is reduced, potentially resulting in lower insurance premiums.

Some communities, particularly those that experience regular and severe flooding or which seek to lower premiums for greater numbers of property owners, can impose more stringent requirements by establishing a Design Flood Elevation (DFE), a height generally one to two feet above the BFE. *(Refer to Community Rating System, page 1.25, and Participate in the Community Rating System, page 2.59.)* This extra height requirement is called "freeboard." In Maryland, communities often differ in their floodplain ordinances as to the amount of freeboard they adopt. A few have no freeboard requirement, while most require one to two feet of freeboard, and one community has a three-foot freeboard requirement. ***Freeboard requirements can help protect properties from increased flooding in the future due to factors such as climate change, which is otherwise not a required consideration.***

b. Building Foundation Type

Properties located within a FIRM's V Zones should be constructed on foundations of piers, posts, or piles set deep enough to resist the effects of scour and erosion and strong enough to withstand the forces from waves, currents, flood loads and flood-borne debris. *(Refer to Flood Insurance Rate Maps, page 1.15.)* New basements are prohibited in V Zones but may be present in pre-FIRM structures.

In A Zones, buildings should be constructed on crawlspaces or continuous foundation walls with openings that allow floodwaters to enter and exit without restriction. *(Refer to Wet Floodproofing, page 3.24.)*

It is recommended that buildings in Coastal A Zones also be constructed to the same requirements as buildings in V Zones, since buildings in Coastal A Zones are also subject to breaking waves, scour, and erosion.

B.5 COMMUNITY RATING SYSTEM

Just as flood insurance rates can be reduced by lowering the risk of flood damage at individual properties, rates can also be dramatically reduced for local governments participating in the NFIP's Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management efforts that exceed the minimum NFIP requirements. The CRS uses a rating system from Class 9 to Class 1, with Class 9 being the lowest rated classification and Class 1 being the highest rated classification. Flood insurance premiums in SFHAs can be reduced by up to 45% for Class 1 communities (the highest rating in CRS) down to 5% for Class 9 communities. The reduction in flood insurance is commensurate with the actions, policy, and other steps the community has taken to reduce their potential for damage from flooding.

The goals of the CRS are to:

- Reduce property flood damage;
- Reinforce and support the insurance aspects of the NFIP; and
- Promote a community-wide, comprehensive approach to floodplain management.

Communities generally enter the CRS as a Class 8 or 9. In the CRS program, communities earn credits for taking specific initiatives that exceed the minimum requirements of the NFIP. For every 500 credits, flood insurance rates in a SFHA can be reduced by 5%. Examples of how communities can earn credits under the CRS include:

- Providing public information regarding flood hazards, flood insurance, and reduced flood damage;
- Mapping flood-prone areas and instituting regulations that limit new development in those areas;
- Reducing flood damage and flood risk at existing developments; or
- Providing flood preparedness through flood warning and levee and dam safety projects.

Participation in the CRS will generally improve the ability of a community and its property owners to recover from flooding. As indicated above, communities can increase their CRS classification by requiring a reduction in flood risk at existing developments. ***Although large-scale flood mitigation options can be considered, achieving the best classification will likely require the modification of individual properties. For historic properties, this could require more extreme alterations and impact the historic integrity of existing buildings.*** Examples of more extreme compliance which would affect historic structures include:

- Requiring higher Design Flood Elevations (DFE);
- Sealing lower window and door openings; and/or
- Eliminating residential use of lower building levels.

Although the CRS provides improved flood resilience and discounted flood insurance rates, each community will need to evaluate

KEY QUESTION:

What can local planners and preservation advocates do to protect historic properties and help property owners reduce their flood insurance rates?

MARYLAND CRS USERS GROUP

The Maryland Department of the Environment (MDE) established the Maryland CRS Users Group to provide a forum for participating communities and communities considering application to the program to exchange lessons learned, encourage collaboration, and access technical support. For those seeking more information, the Maryland CRS Users Group hosts quarterly meetings and periodic workshops around the state (FEMA, 2018).

options in terms of implementation, feasibility, cost/benefit (in losses avoided), and financial savings in insurance premiums. Some communities adopt higher floodplain regulations for historic properties than the NFIP or the State require.

In many cases, the physical alterations required at some historic properties to meet the goals of CRS compliance may negatively impact their historic integrity. Historic preservation planners should work with the floodplain administrator in the CRS application process to seek a balance between protection and preservation. If the affected properties are locally designated, proposed mitigations may need to be coordinated with the local historic preservation commission. Similarly, if the property has received or anticipates receiving funding or permits from state or federal governments, it is best to contact the MHT prior to undertaking any work to verify review requirements. *(Refer to Historic Property Project Review sidebar, page 2.36, and City of Baltimore - Community Rating System, below.)*

CITY OF BALTIMORE - COMMUNITY RATING SYSTEM

A leader in community floodplain management, the City of Baltimore achieved Class 5 under the Community Rating System in 2016, making property owners eligible for flood insurance discounts of 25% for properties located in Special Flood Hazard Areas and 10% for lower-risk properties. Becoming a CRS classified community was one of the goals identified in the City's combined hazard mitigation and climate adaptation plan, DP3: the Disaster Preparedness and Planning Project Plan.

To achieve a class 5 rating, Baltimore adopted a more stringent floodplain ordinance than the minimum standards contained in the NFIP or the higher standards set by the State, conducted massive outreach to promote resiliency, and integrated these efforts with other planning and preparedness activities. One of those higher standards is how the City's floodplain regulations treat properties that meet the definition of "historic structure." Rather than granting a variance outright to historic structures to relieve historic property owners from meeting substantial improvement requirements, Baltimore's floodplain ordinance states, in §5.8. Historic structures, "A variance may be issued for the reconstruction, rehabilitation, or restoration of an historic structure only if:

(1) the activity does not cause an increase in the elevation of the base flood;

(2) all construction efforts are made to meet the intent of the provisions of this Division I that deal with the elevation of electric, plumbing, mechanical, and other facility and utility systems;

(3) all materials below the flood-protection elevation meet the requirements of this Division I for dry or wet floodproofing; and

(4) the reconstruction, rehabilitation, restoration, or other activity will not preclude the structure's continued designation as an historic structure. (City Code, 1976/83, art. 7, §7(i); 2000, art. 7, §5-8.) (Ord. 88-188; Ord. 14-208.)"

In going beyond what is required for historic structures to receive a variance, the City is investing in the protection of historic properties to ensure that these buildings are more resilient to flood damage and that they continue to survive for future generations to enjoy. It should be kept in mind that compliance with the City's floodplain ordinance does not guarantee that any work done to historic structures to provide flood protection would be eligible for historic preservation financial incentives, including tax credits; nor does it guarantee approval under MHT's Easement Program.

REFERENCES

Note: All references are available online. References that are only available as online resources are noted as "online resource."

44 C.F.R. § 59.1. *Definitions*, National Flood Insurance Program (NFIP) Regulations.

Baltimore, City of. *Floodplain Code, Article 7*, Natural Resources (2016).

Blake, Eric S. et al. *Tropical Cyclone Report: Hurricane Sandy* (AL182012), 22-29 October 2012 (2013).

Brown, Daniel P. *Tropical Cyclone Report: Tropical Storm Lee* (AL132011), 2-5 September 2011 (2011)

Crisfield Times, The. "Crisfield and the Entire Eastern Shore Swept by Terrific Storm; Highest Tide in History of City," vol. XLVII, No. 6. Friday, August 25, 1933.

Cronin, William B. *The Disappearing Islands of the Chesapeake* (2005).

Dawson, James. *History of Maryland Weather including the Chesapeake Bay* (2008).

Federal Emergency Management Agency (FEMA). *Disasters database [Maryland]* (2018), online resource.

FEMA. *CRS Users Groups*, Community Rating System Resources webpage (2018), online resource.

FEMA. *Flood Map Service Center*, online resource.

FEMA. *Flood Insurance Rate Map: Anne Arundel County, Maryland and Incorporated Areas* (2016).

FEMA. *Homeowner Flood Insurance Affordability Act Overview* (2014).

FEMA. *FEMA Fact Sheet: Historic Structures and the Biggert-Waters Flood Insurance Reform Act of 2012* (2013).

Maryland Commission on Climate Change (MCCC). *Annual Report* (2016).

Maryland Department of the Environment (MDE). *Maryland Model Floodplain Management Ordinance* (2014).

MDE. *DFIRM (Digital Flood Insurance Map) Flood Risk Application*, online resource.

Maryland Historical Trust (MHT). *Certified Local Government Program*, online resource.

Mountford, Nancy K. *History of Regional Storms and Hurricanes* (2005).

National Oceanic and Atmospheric Administration (NOAA). *Storm Events Database* (2017).

National Weather Service (NWS). *Hurricane History for the Washington and Baltimore Region* (2012).

NWS. *Ellicott City Historic Rain and Flash Flood – July 2016 Report* (2016).

NWS. "Hurricane Hazel, October 15, 1954," Event Summary (n.d).

NWS. "Hurricane Connie – August 6-14, 1955," Event Summary (n.d.).

Smith, John. *The General Historie of Virginia, New England & the Summer Isles* (1624).

U.S. Census Bureau. *American Fact Finder, Smith Island, Maryland*, online resource.

U.S. Weather Bureau. *Preliminary Report on Hurricane Diane,* August 11-20, 1955 (1955).