ANNE ARUNDEL COUNTY
MARYLAND

Planning for Climate Resiliency in the Chesapeake Crossroads Heritage Area

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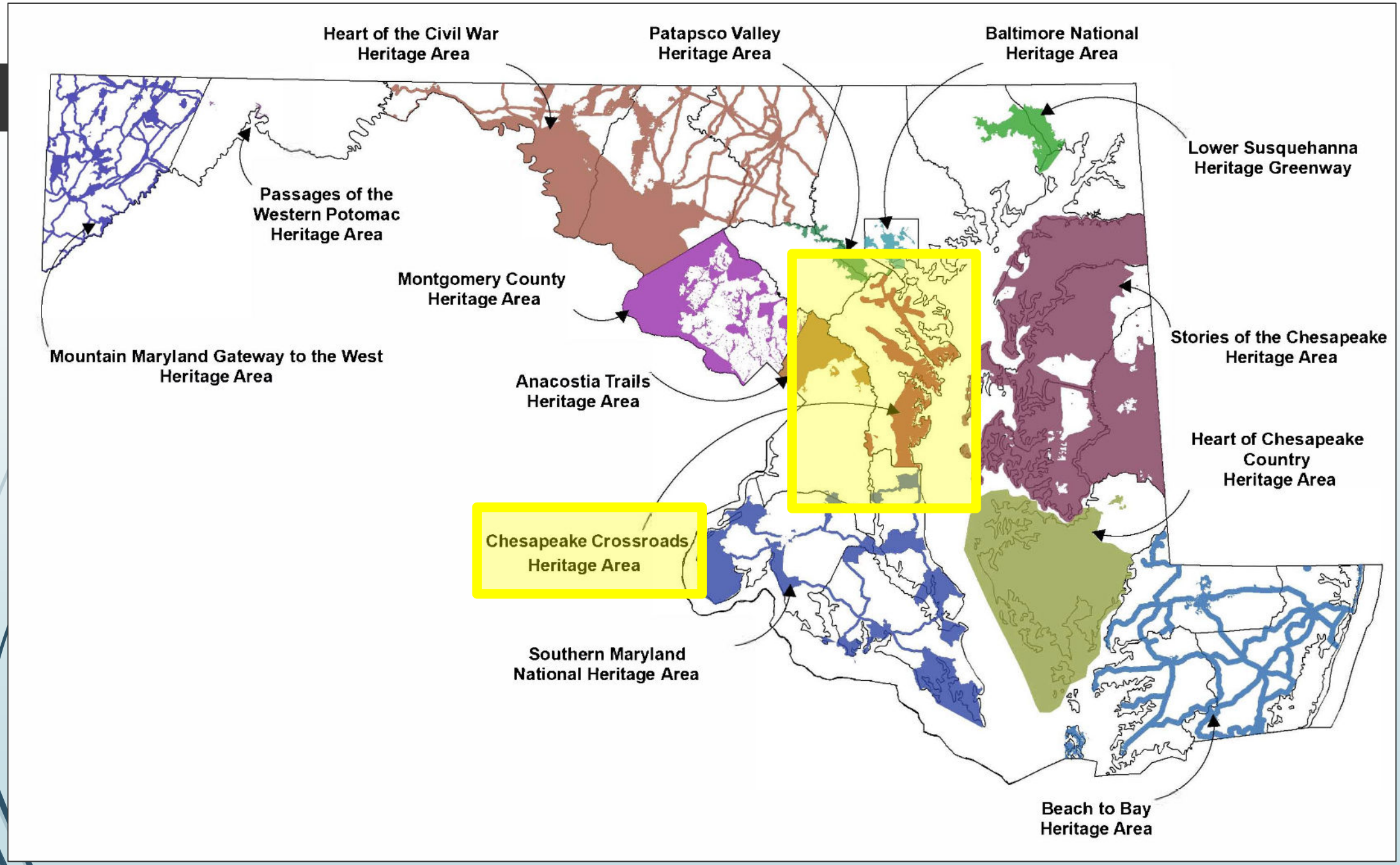
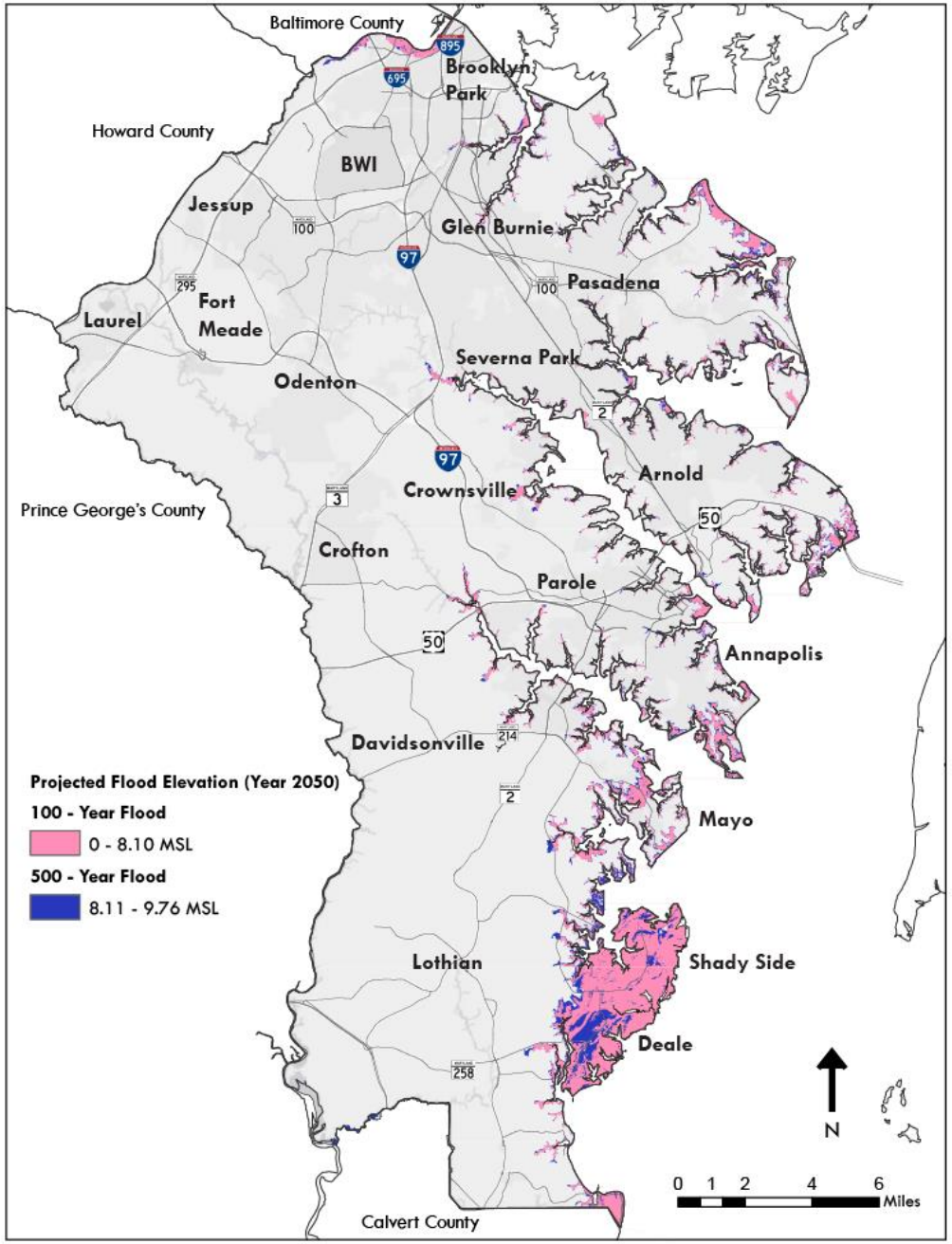
Hazards exacerbated by Climate Change

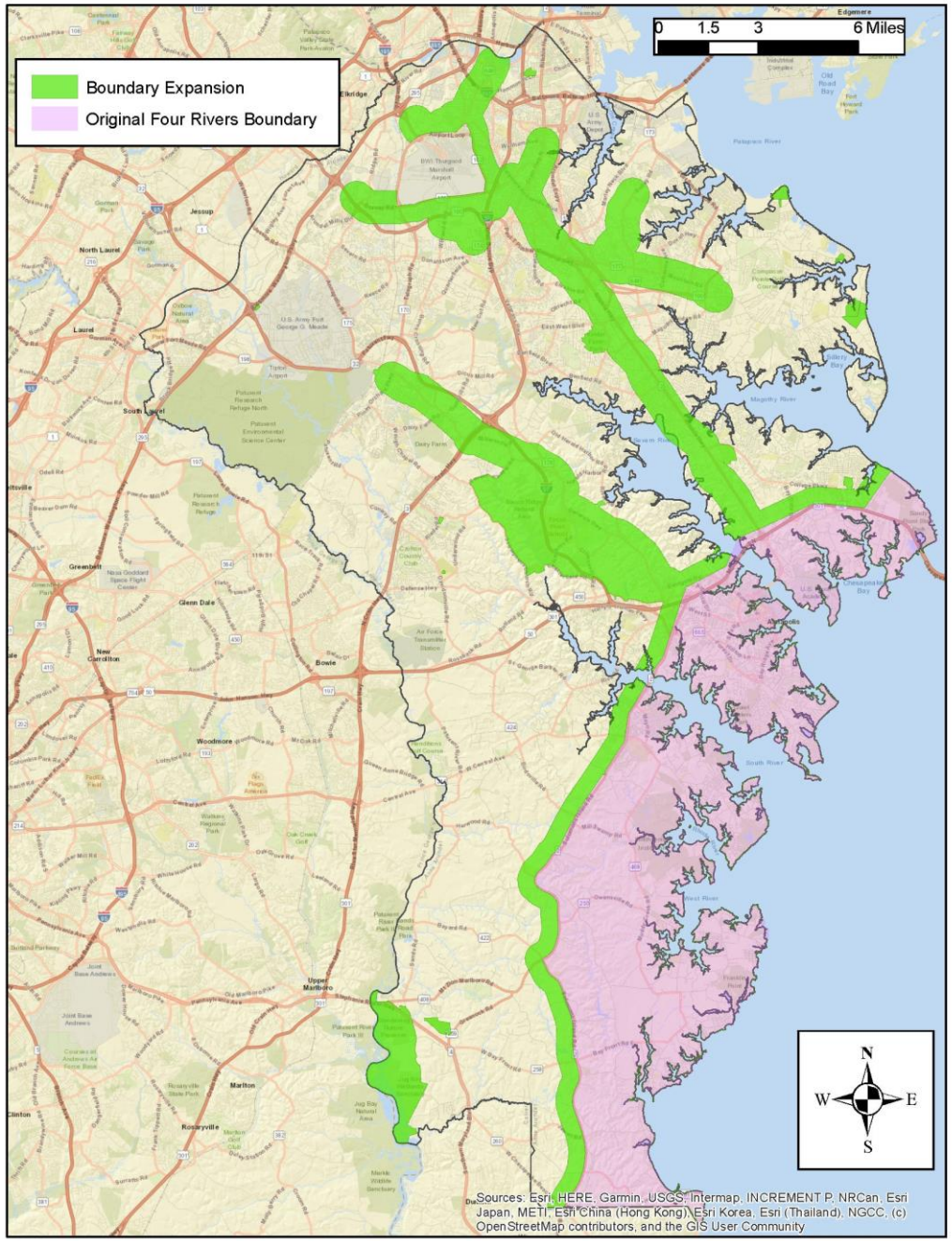
- **Coastal & Riverine Flooding**
- **Strong Winds**
- **Extreme Heat**
- **Rapid Freeze/Thaw**
- **Hail**
- **Wildfires**
- **Erosion**
- **Relative Sea Level Rise**
- **Hurricanes**
- **Ice Storms**
- **Tornadoes**

- **Infrastructure Failures** (Storm Drains, Wells, Road Closures, Electricity & Telecommunications)
- **Immediate** & **Long Term Property Damage**
- **Loss of Property Area & Value**
- **Irreparable damage to heritage sites & loss of historic data**

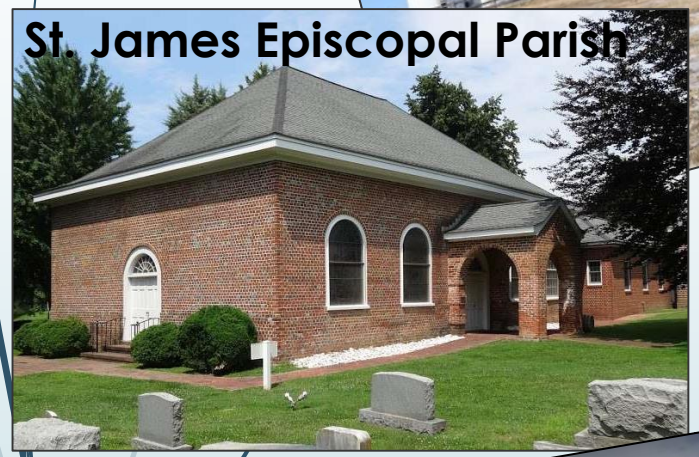

Heart of the Civil War Heritage Area
Patapsco Valley Heritage Area
Baltimore National Heritage Area
Lower Susquehanna Heritage Greenway
Passages of the Western Potomac Heritage Area
Montgomery County Heritage Area
Mountain Maryland Gateway to the West Heritage Area
Anacostia Trails Heritage Area
Stories of the Chesapeake Heritage Area
Heart of Chesapeake Country Heritage Area
Chesapeake Crossroads Heritage Area
Southern Maryland National Heritage Area
Beach to Bay Heritage Area

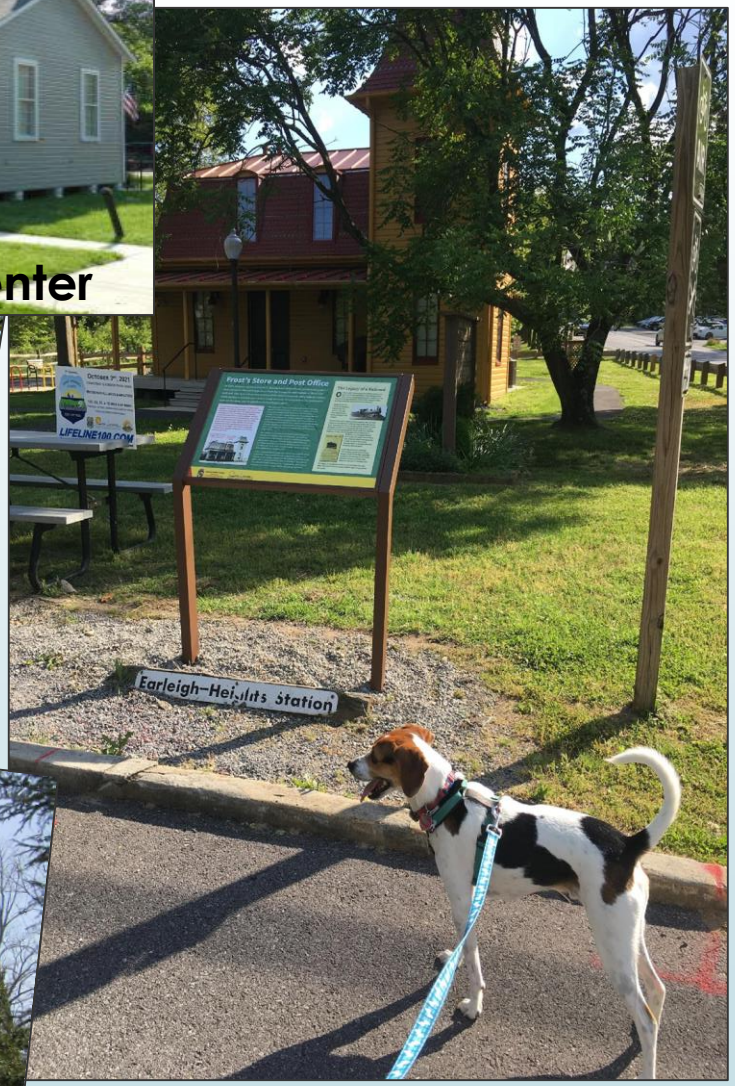


Chesapeake Crossroads Heritage Area Boundary Expansion



THIS PLACE MATTERS®





Erosion

Figure 207: 500ft (Approximately 7.6 acres) of Erosion at Franklin Point Farmstead since 1961

Storm Surge & Wind Damage

Figure 111. Picture of concession stand (AA-898D) prior to Hurricane Isabel damage taken in 1984.

Figure 112. Concession Stand with Hurricane Isabel and other weather damage (taken in 2013).

- **September 2003-** Hurricane Isabel
  - water levels at USNA reached about 6.5 feet above average (more than 2 feet over the 100-year flood level)
- **October 29, 2012** – Hurricane Sandy
  - Heavy rainfall and high winds with storm surge 2-4 feet above ground level
- **July 2016** – Torrential Rainstorm
  - Flash flooding in Ellicott City mainly in the National Register Historic District
- **May 2018** – Torrential Rainstorm
  - Flash flooding in Ellicott City, in under 3 hours the river rose to a record of 24.36 feet
- **Jan 10 2024** – Winter Storm
  - Third highest recorded storm surge in Annapolis, record flood of 5.1 feet; schools closed, roads closed, power outages

Stormwater Flooding & Extreme Weather Changes

Asbury Broadneck UM Church

Photo Source: "Historic African-American church secures funding to restore flood damage," by Selene San Felice. *The Capital Gazette, 10/3/17*

Freeze-thaw damage

U.S Climate Resilience Toolkit

Graphic by Anna Eshelman, NOAA.

https://toolkit.climate.gov/

Anne Arundel County's Planning for Resilience

- **RISK ASSESSMENTS AND RESILIENCE PLANS**

- Sea Level Rise Strategy (2011) & Update of Risk Assessment (2023)
- 2018 Cultural Resources Hazard Mitigation Study
- Hazard Mitigation Plan (2020)
- Nuisance Flooding Plan (2020)
- Plan2040 (Adopted 2021)
- US Navy Military Installation Resilience Review (2022-3)
- Roadway Vulnerability Assessment (DPW) - *Underway*
- Shady Side - Deale Adaptation Study (BWPR) - *Pending*

Anne Arundel County's Planning for Resilience

- **CAPITAL PROJECTS**

- County operations and capital projects are incorporating **energy efficiency and lower emission**s.

- The County is investing in **living shoreline** projects to withstand rising sea levels, nature-based design solutions that improve resilience and reduce flood risk.

- Bureau of Watershed Protection & Restoration Grant Program

Anne Arundel County's Planning for Resilience

- Established by our local government in Oct. 2022, authorized by the recent passing of Senate Bill 457 in 2020, first multi-jurisdictional resilience authority in the nation.
- By the end of 2023, the Resiliency Authority secured more than $20 million in federal, state, and local grant funds to protect Anne Arundel County's shorelines, communities, and residents from climate threats like increased flooding, heat waves, sea level rise, and extreme weather events.
- Projects include renewable energy, shoreline restoration, stormwater infrastructure, elevating buildings, and flood barriers.

THE RESILIENCE AUTHORITY
Of Annapolis and Anne Arundel County Inc.

ANNE ARUNDEL COUNTY MARYLAND

CITY OF ANNAPOLIS

https://www.aacounty.org/planning-and-zoning/countywide-planning/sea-level-rise

ANNE ARUNDEL COUNTY MARYLAND

Services Government Departments Search

Home > Planning and Zoning > Countywide Planning

Sea Level Rise

Anne Arundel County, surrounded by more than 530 miles of shoreline, is vulnerable to increased flooding as a result of relative sea level rise (SLR). The County has conducted studies of SLR risk and is taking actions to increase resilience to coastal flooding.

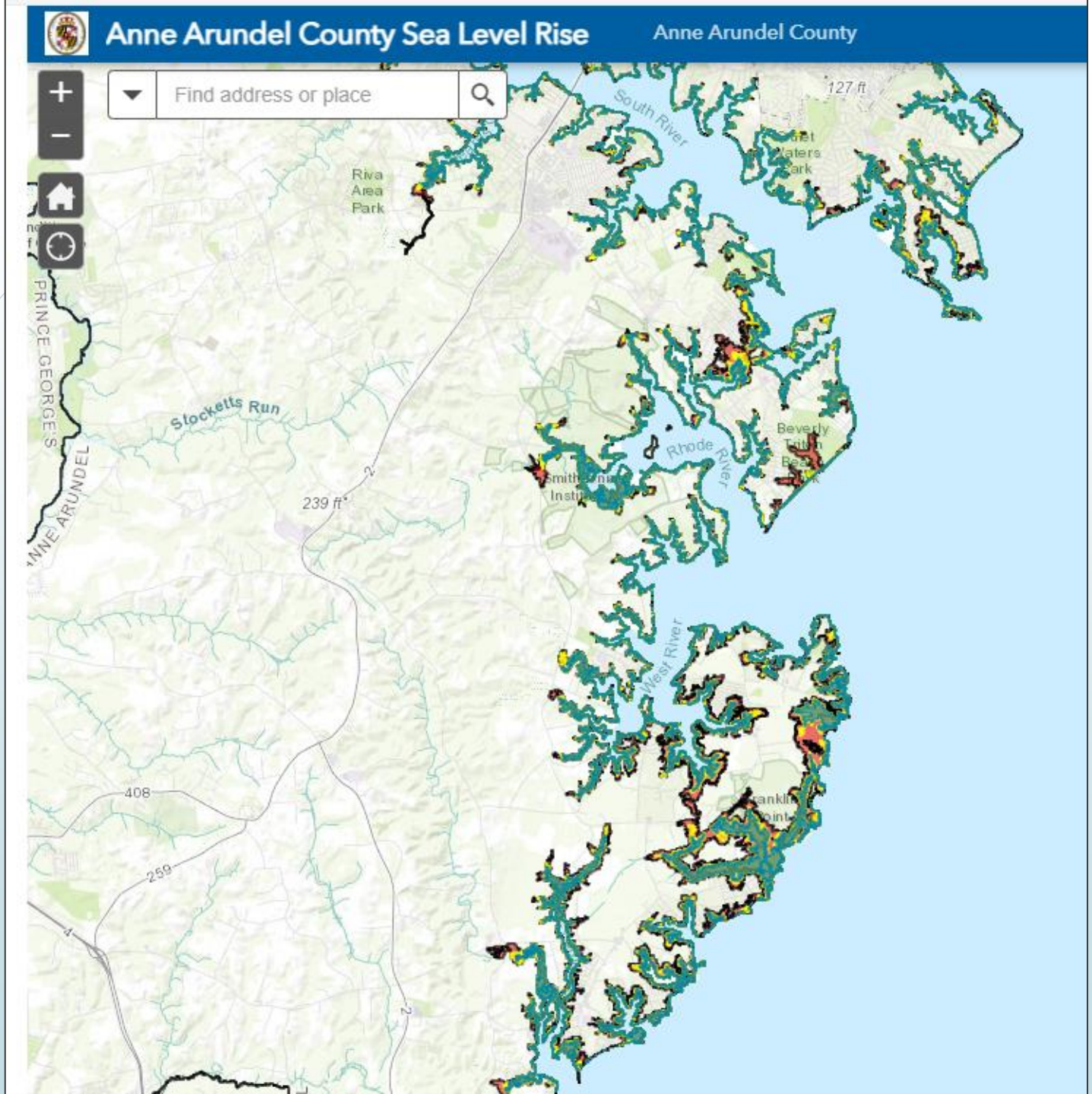
Countywide Planning

- Comprehensive Zoning
- Countywide Planning FAQ
- Green Infrastructure
- Plan2040
- Sea Level Rise

In 2011, the County conducted an SLR risk assessment and developed a Strategic Plan. The Strategic Plan included a vulnerability assessment; identified major planning issues for the County related to SLR; and recommended future actions to protect resources and minimize impacts.

Since scientists have refined global and regional models for SLR projections, the County obtained National Oceanic and Atmospheric Administration (NOAA) grant funding in 2022 from Maryland's Department of Natural Resources (DNR) through its Community Resilience Grant Program to update the risk assessment in the 2011 SLR Strategic Plan.

- Storymap that summarizes findings of the study and provides an interactive map of potential future SLR flooding
- SLR Vulnerability and Risk Assessment Update Report


Anne Arundel County Sea Level Rise
Anne Arundel County
Find address or place
South River
127 ft
Riva
Area
Park
PRINCE GEORGE'S
ANNE ARUNDEL
Stocketts Run
239 ft
Rhode River
West River
408
259

Near Term Recommendations

- ***Coastal Ecosystems-*** Continue and expand County efforts to restore living shorelines; Incorporate SLR projections into project design.
- ***Existing and Future Development-*** Target flood-prone properties, as priorities for conservation easements or fee simple acquisition.
- ***Transportation Infrastructure -*** Conduct feasibility study to prioritize roads/bridges for improvements to reduce flood risk
- ***Wells -*** Expand efforts to educate private well owners on flood risk and actions they can take to protect their wells.
- ***Septic Systems -*** Expand technical/ financial support for property owners to upgrade septic systems or connect to public sewer.
- ***Cultural Resources -*** Increase and prioritize survey, documentation, and preservation efforts; provide support, professional staff, resources, and financial means to conduct emergency salvage archaeology and historic site documentation for significant sites.

mht.maryland.gov/Pages/planning/sea-level-rise.aspx

isa | LUN-OPZ | Historic Map Review | AA Portal | ArcGIS Online | AAGIS Staging | OneLogin | CONNECTExplorer™... | USGS Maps | ADP Portal | MDLANDREC | Calendar | Soil Survey | MDOT

Medusa

Quick Links

Local Issue: Hazard Mitigation Planning
Certified Local Governement Program

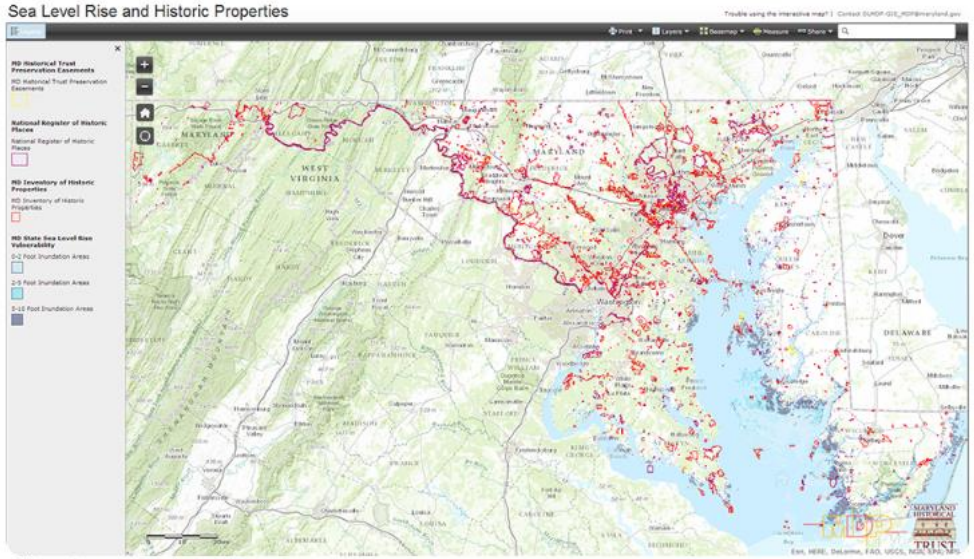
Resources

CoastSmart
Coastal Planning
Climate Change in Maryland
Maryland Climate Science

Sea-Level Rise and Historic Properties

The most recent **estimates** for sea-level rise in Maryland encourage planning for a rise of approximately two feet over 50 years, and as much as 3.7 feet by the year 2100. Of more immediate concern is that the intensity of coastal storms and the height of coastal flood waters, such as those generated by Hurricane Sandy, may increase as a result of the changing climate, creating additional risk. With vulnerability to rising tides and storm surges varying along the coast, planning for sea-level rise must take place on a local level.

As the Chesapeake Bay and rivers and streams within the watershed were the primary historic and prehistoric trade and transit routes in Maryland, the coastal areas of the Chesapeake contain a high concentration of vulnerable historic architecture and archaeological sites. The Lower Eastern Shore, including the internationally significant historic places associated with Harriet Tubman, is particularly threatened.



Click on image to view interactive map.

With funding from the **Certified Local Governments program**, the Maryland Historical Trust is partnering with the City of Annapolis

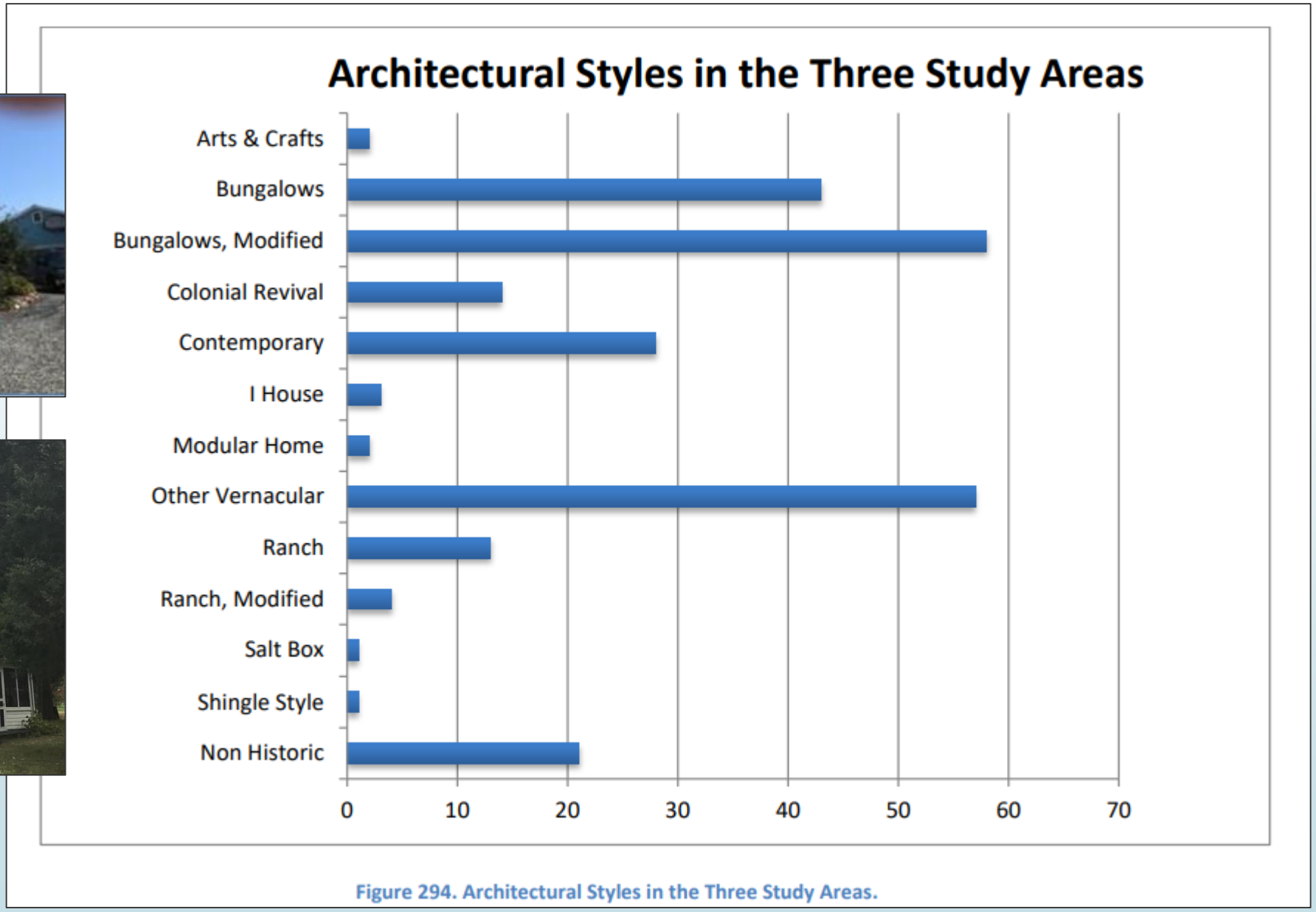


Figure 294. Architectural Styles in the Three Study Areas.

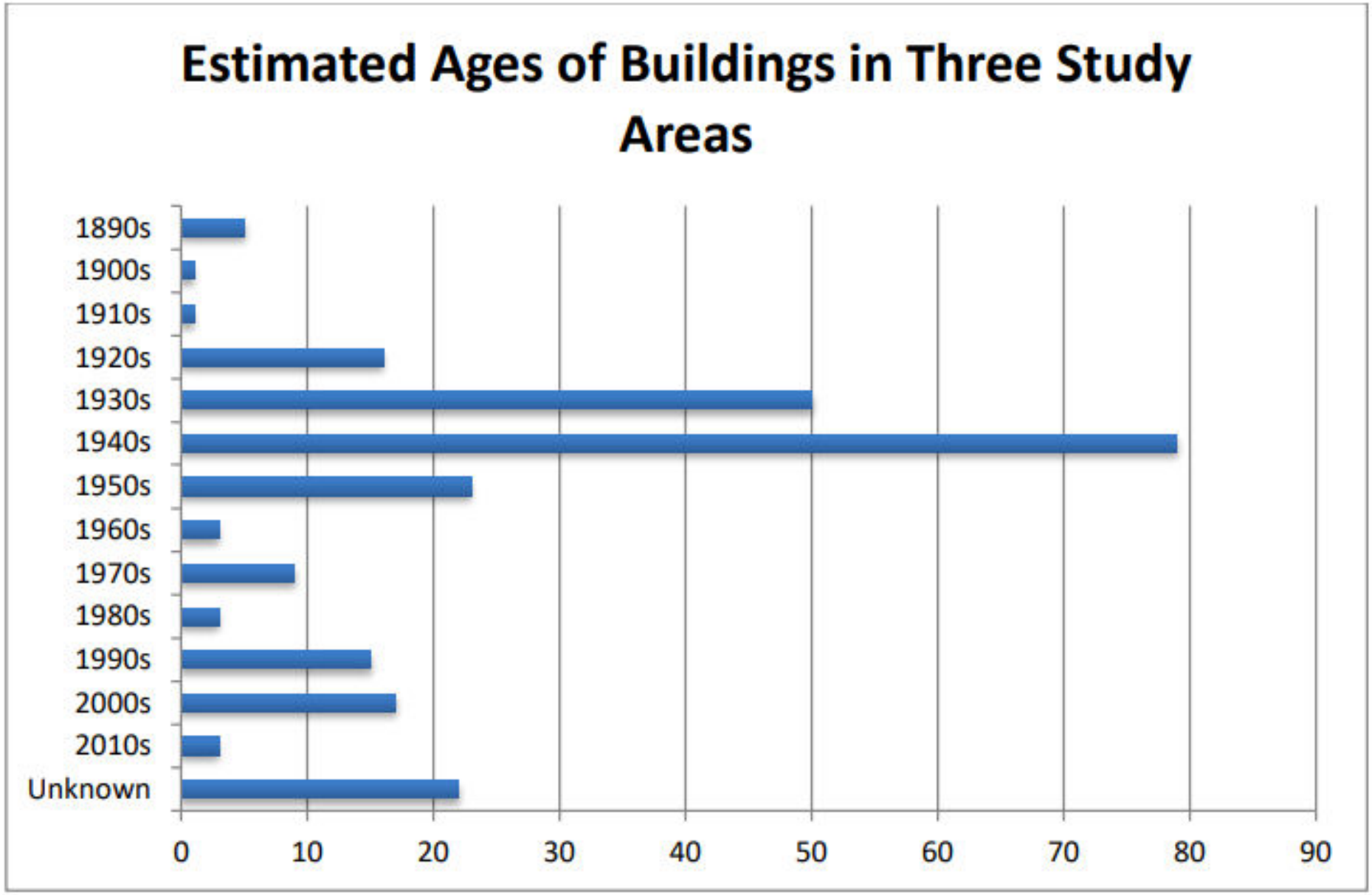


Figure 293. Building Counts by Age in the Study Areas, based on Field Review.

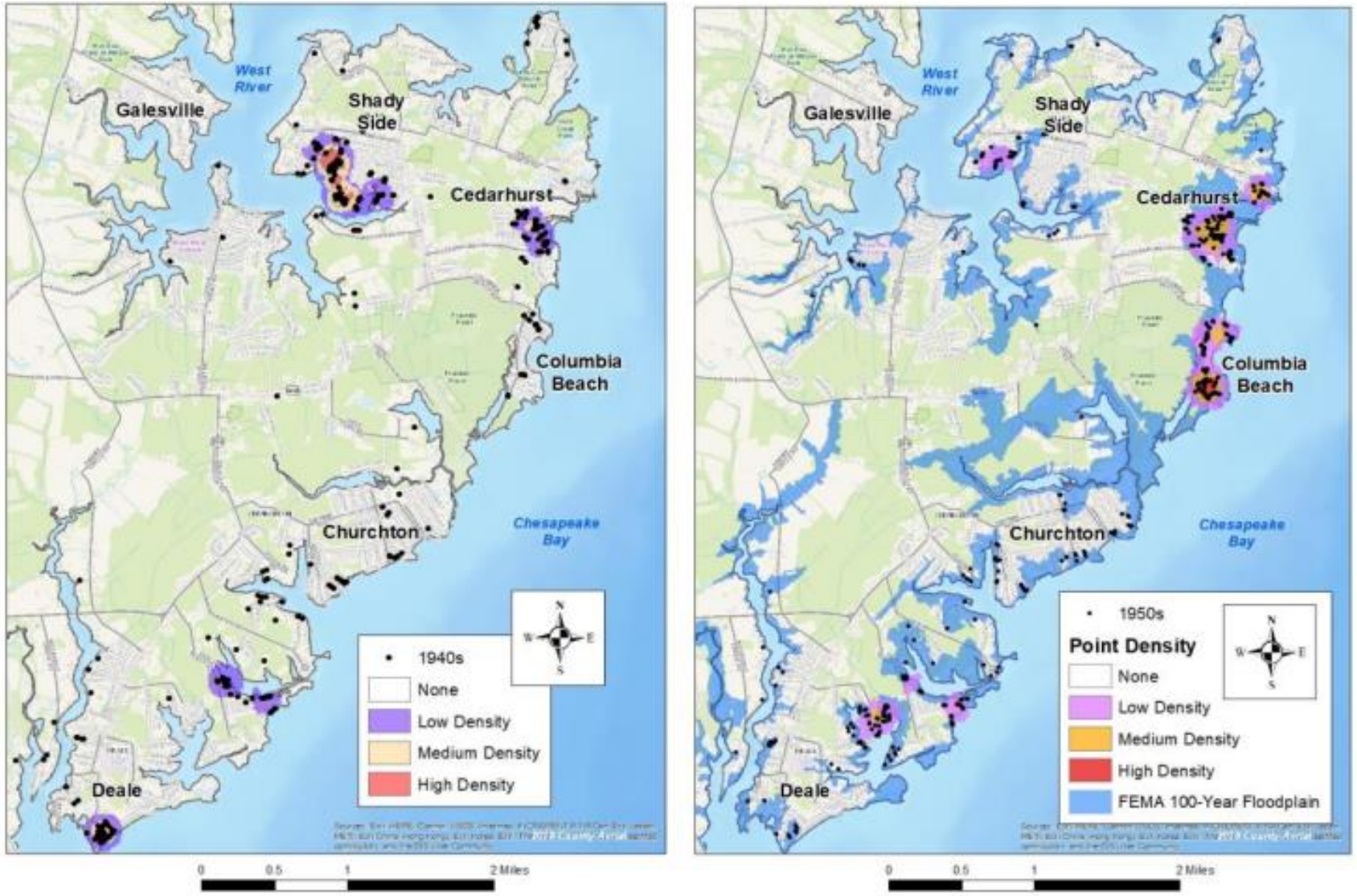
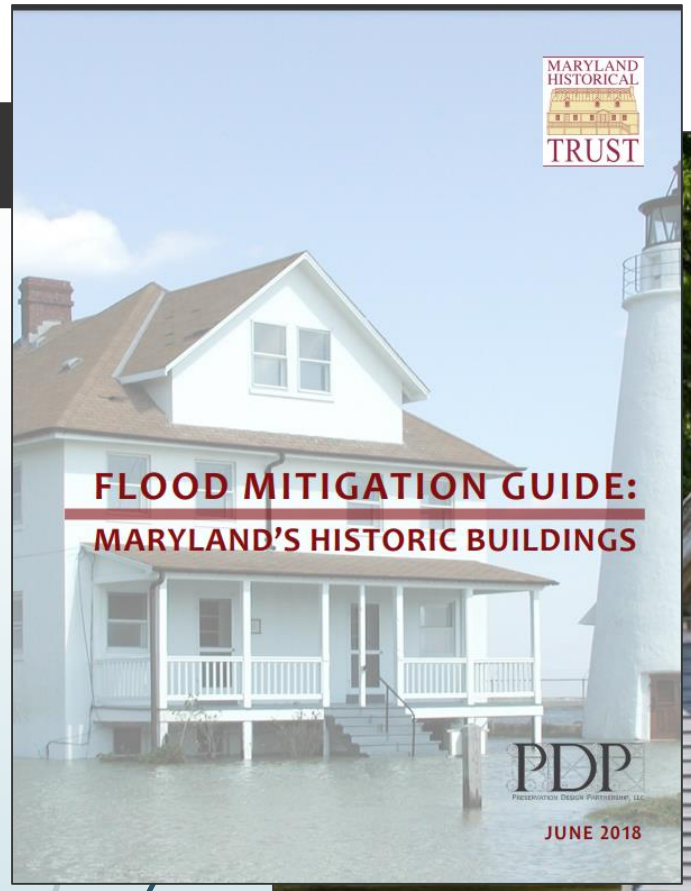


Figure 279. Potential extant historic properties located within the 100-Year FEMA floodplain, 1940s-era on the left, 1950s-era

2018 Vulnerability Assessment of Historic Properties in the 100-Year Floodplain

Figure 241: Beach Bungalows in the Cedarhurst Study Area (Photos provided by Historic Preservation Services, 2017).



"The Guidelines on Flood Adaptation for Rehabilitating Historic Buildings should only be applied to historic properties with an established risk of flooding."

"Treatments that might not be considered in other rehabilitation contexts because of their impacts on the historic character of a property may be acceptable in the context of adapting the property to flooding hazards."

https://www.nps.gov/orgs/1739/upload/flood-adaptation-guidelines-2021.pdf

Planning & Assessment for Flood Risk Reduction of Historic Sites

- **Identify** flood risks and vulnerabilities and any existing capacity for resilience
- **Monitor** the property's condition and regularly reevaluate flooding risk and vulnerability.
- **Document** the historic Property.
- **Review** the local floodplain ordinance.
- **Identify & assess feasible adaptation treatment options** to address flood risk.
- **Evaluate** the treatment options impact to the historic property's integrity.
- **Select an adaptive treatment that minimizes the impact to the historic character** and appearance of an individual property and/or larger historic district.
- Consider adaptive options, whenever possible, that would **protect multiple historic resources;** consider other properties nearby in planning flood adaptations to ensure that they do not increase the risk or exposure to neighboring properties,

Site and Landscape Adaptations**

- Basic regrading to promote drainage away from historic buildings
- Large engineered structures
- Infrastructure projects
- Storm-water management systems, berms, and floodwalls
- Levees and the restoration of natural flood control systems like living shorelines, dunes, marshes, and wetlands are additional tools for larger-scale interventions

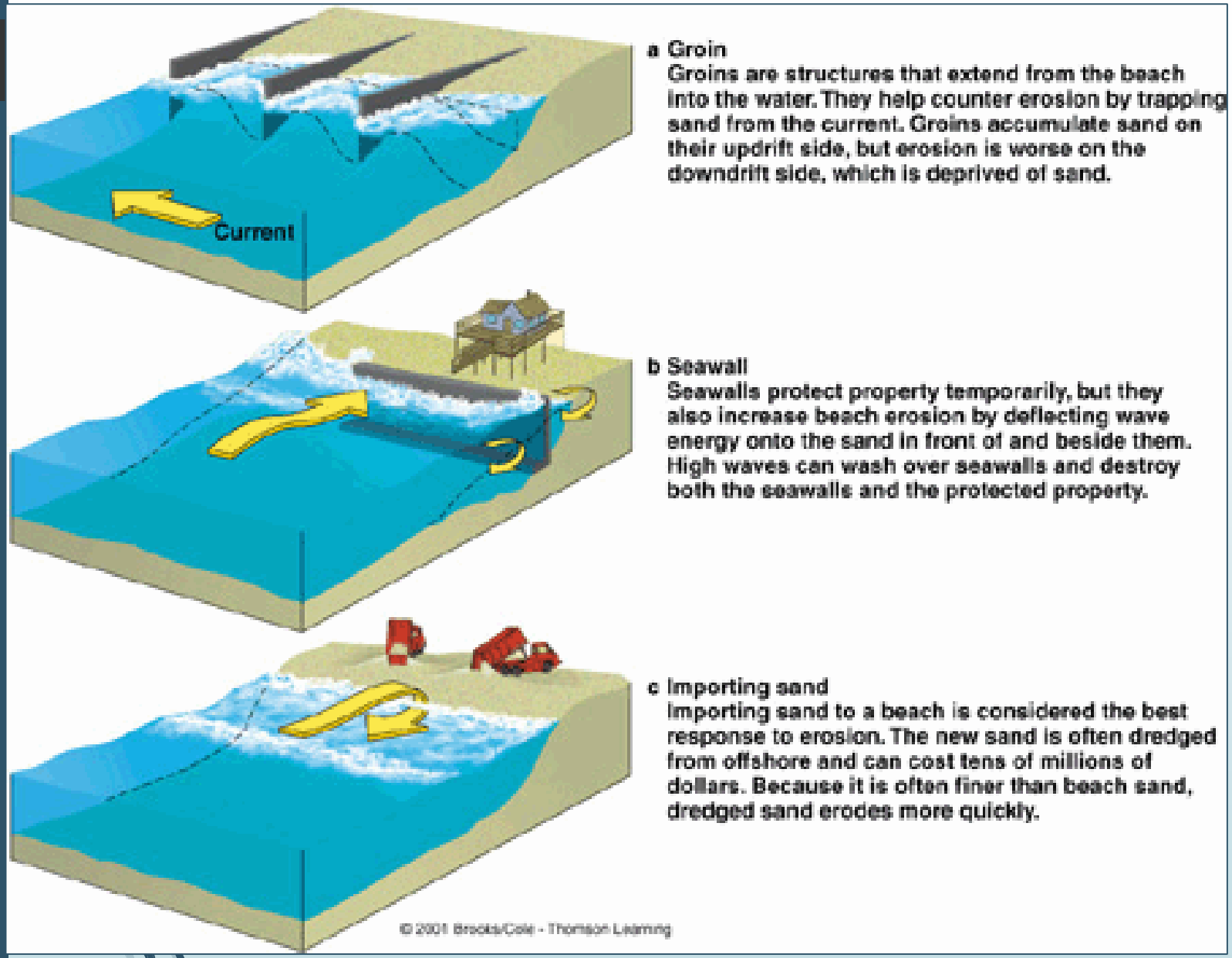
****Require careful planning to avoid negatively impacting the property's historic integrity and any historic landscape features, archeological resources, and other cultural or religious features.**

Site mitigation will change how water moves through and around a property. Altering the existing site conditions must be done with thoughtful examination of potential impacts to neighboring properties adjacent to and downstream from a property.

Landscape Improvements for Individual Property Owners

- Bulkheads
- Riprap
- Retention Ponds
- Berms
- Swales
- Disconnection from stormwater drainage
- Impervious surface reduction/pervious surface introduction
- Rain Gardens
- Drywells
- Native Planting
- Rain Barrels

Anne Arundel County Watershed Stewards Academy
https://aawsa.org/

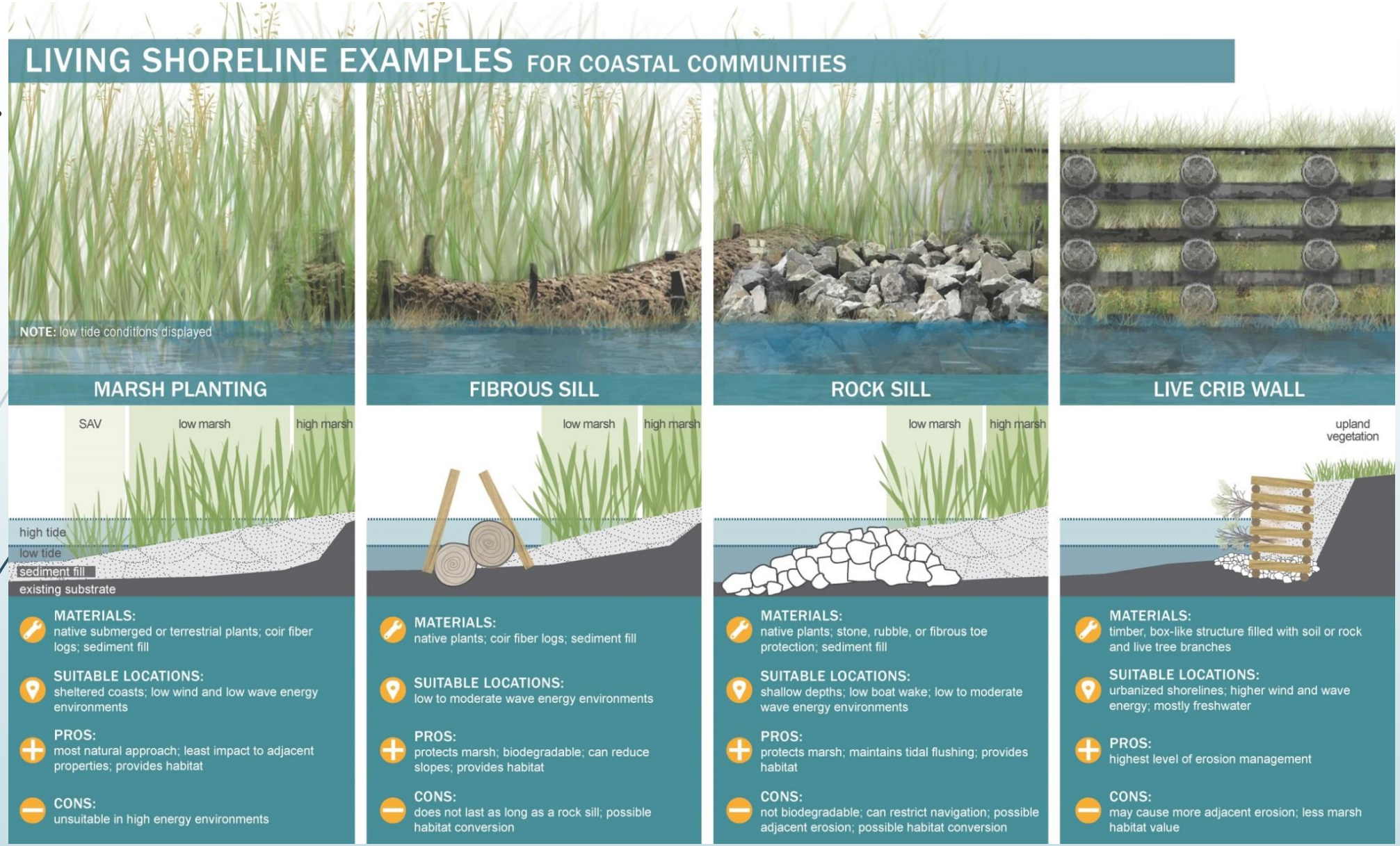


Structural & Natural Shoreline Protections

- Levees, Dikes, Embankments
- Bulkheads
- Jetties
- Revetments, Rip Rap
- Flood Gates
- Stone/Concrete Breakwaters

- Wetland Reclamation
- Floodplain Restoration
- Dune Re-Establishment
- Beach Nourishment
- Oyster Reef Breakwaters

http://www4.ncsu.edu/~ceknowle/Envisions/chapter12copy/part2.html



http://nhblog.stormsmart.org/wagonhillfarm-durhamday/

Some options for different living shorelines in coastal communities like Durham. Illustration by Liz Podowski King. Original content developed by Carolyn LaBarbiera and Liz Podowski King with support from the New York Department of State. Adapted for use by the NHDES Coastal Program.

- Wind Resistant Native Trees
- Vegetative ground cover to reduce erosion
- Maintenance of trees and buffering to minimize damage from tree fall
- Clearing site debris that might become waterborne or airborne (if high winds accompany the flood), clog storm drains, provide fuel for a fire, and harbor pests or cause damage to the historic building or surrounding buildings;

Basic Property Improvements

- Maintain or improving roofing, flashing, gutters, and downspouts to improve capacity to direct stormwater away from buildings
- Repointing masonry, including chimneys, walls, foundations, and piers, to prevent collapse and stormwater infiltration
- Replacing or securing missing/dislodged siding to prevent stormwater infiltration and potential windborne debris
- Replacing cracked window glass that can shatter in a wind storm and allow water infiltration
- Relocation of critical systems and equipment above flood-prone elevations
- Installation of solar collectors to allow electrical independence after a storm
- Use of flood damage-resistant materials
- Protect wells with elevated well cap heights.

Building Adaptations for Individual Property Owners

- Elevation
- Wet floodproofing
- Dry floodproofing
- Perimeter barriers
- Relocation
- Acquisition/demolition

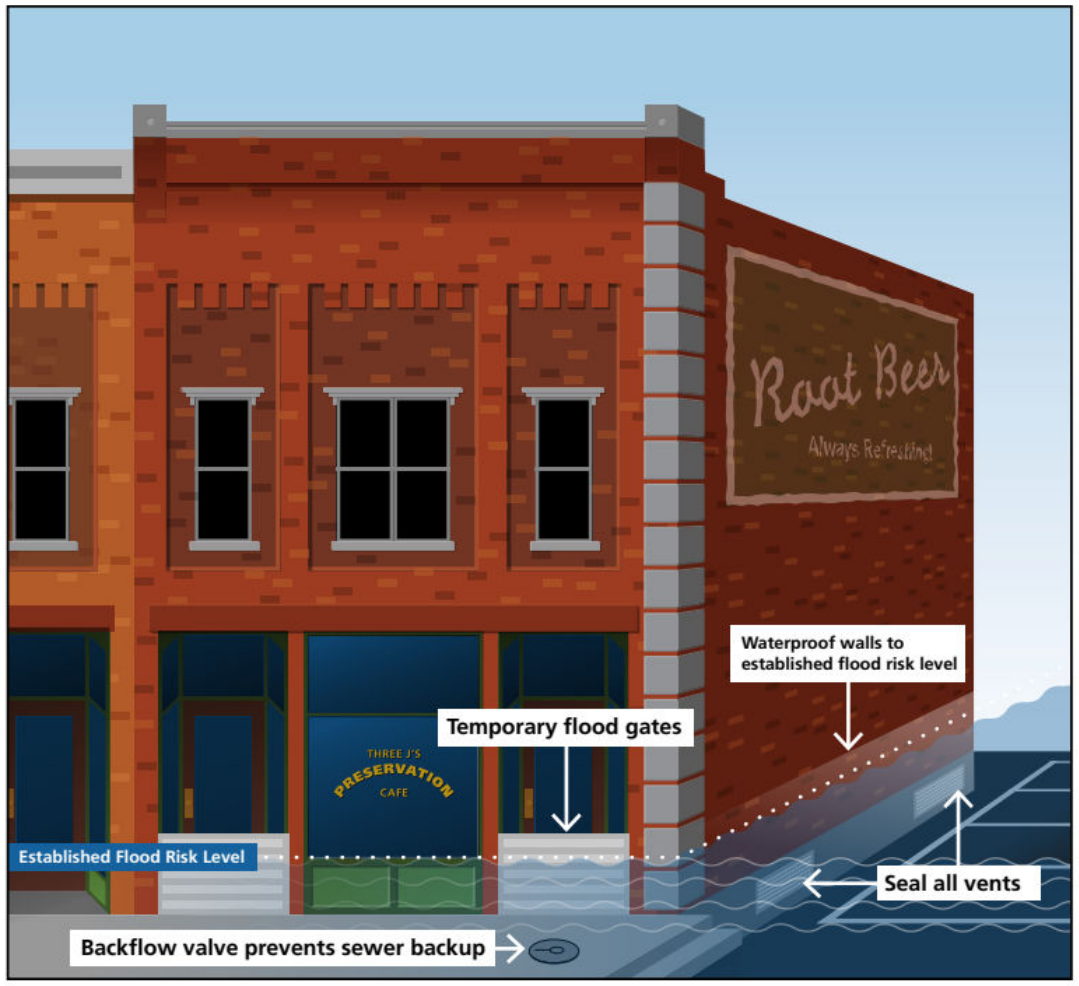
[20] Temporary measures such as sandbags can be a simple and inexpensive solution for protecting buildings in low-lying and vulnerable areas, but they are not meant to withstand moving floodwaters for extended time periods. *Photo: Eduardo Munoz/Reuters*

[21] A rural homeowner has deployed a water-filled temporary dam or water bladder to act as a floodwall around their residence. Water bladders require a storage area when not in use and the resources and time to fill them when a flood is imminent. *Photo: Aqua Dam, Inc*

[22] This floodgate is a temporary solution that can only be deployed with enough notice of a potential flood event. Storage of the gate apparatus must be on or close to the property with ready access in order to be actively deployed. *Photo: Liz Petrella/NPS*

[23] A combination of different temporary measures can be an effective short-term solution to flooding. In this case, a building wrap of waterproof fabric is anchored by sandbags. *Photo: Chapelboro.com*

Dry Floodproofing: *Keep the Water Out*

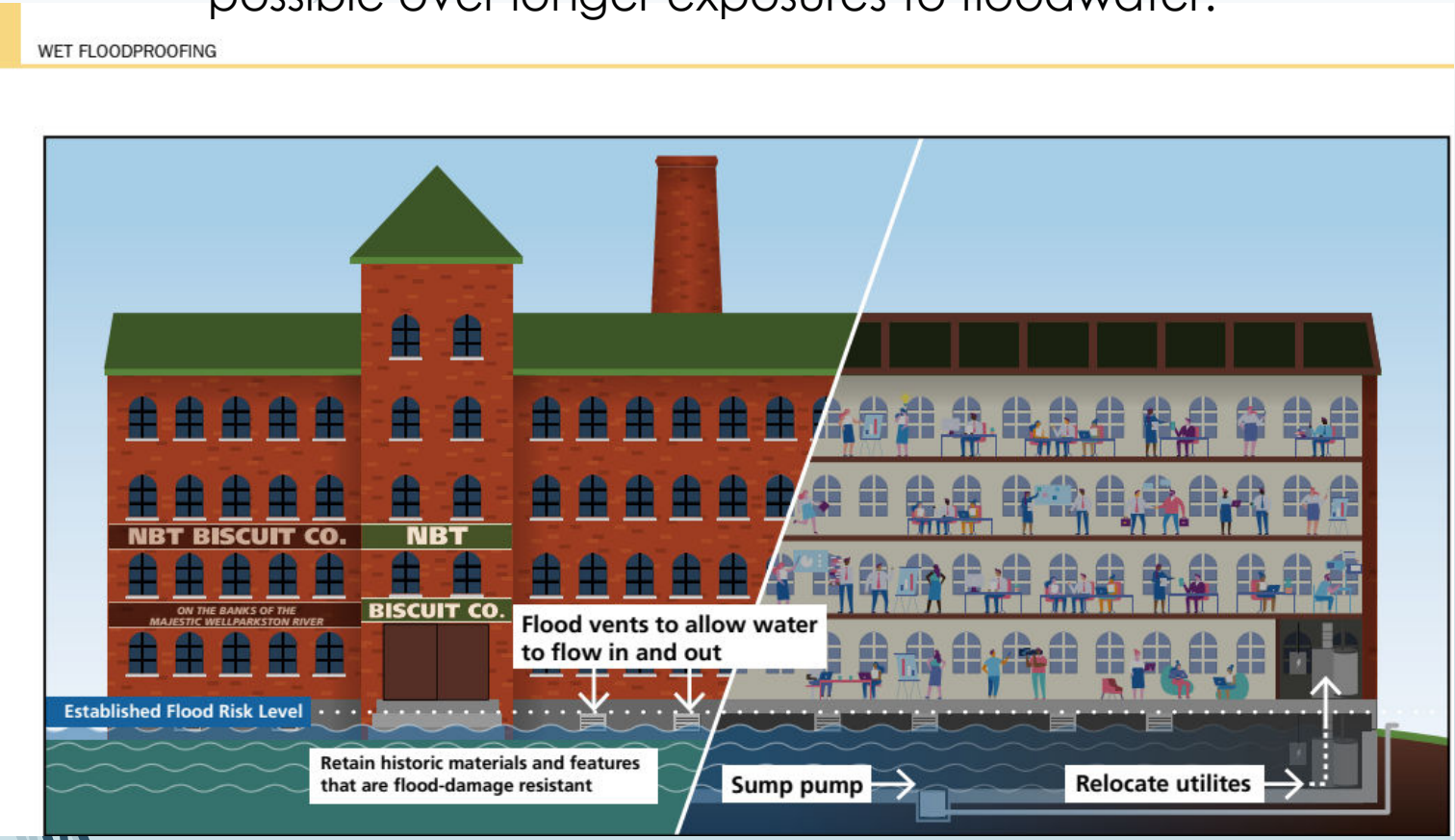


45 GUIDELINES ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS

- Requires establishing a **watertight seal** on the exterior of the foundation and sealing all interior spaces below the established flood risk level.
- This method includes waterproofing walls, sealing openings, and installing backflow prevention devices. Any waterproof coatings should be carefully researched before applying them to historic wall surfaces and materials.
- Because of the strength of flood forces, dry floodproofing is generally **not recommended for projected flood inundation levels that are more than three feet**, particularly for unreinforced masonry.
- This method can require significant changes to the foundation of a historic structure and watertight seals can trap moisture inside a building causing long term damage to historic materials.

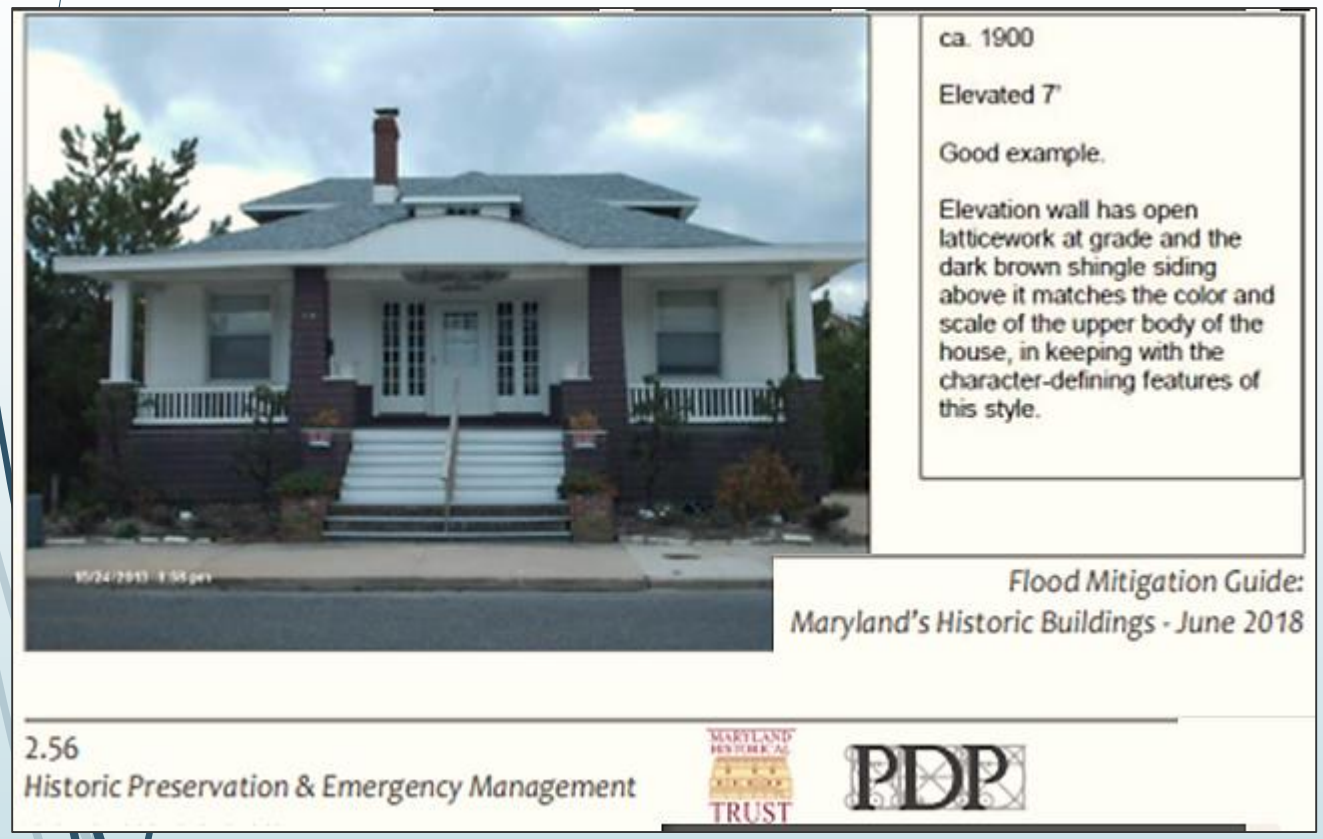
Wet Floodproofing: *Let the Water In*

This adaptation **is not viable for buildings where flooding will likely exceed 24 hours** due in part to the potential for damage, contamination, and biological growth possible over longer exposures to floodwater.



- Water is allowed to safely enter and exit during a flood event.
- Utilities must be relocated/protected
- Openings or flood vents are required to allow water to flow in and out of the building
- Any historic or other materials in the spaces that will flood must be flood damage resistant and their must be adequate ventilation for drying out after the flood event.
- A sump pump is needed to drain the floodwater.

Other Structural Adaptations



- Fill the Basement (can only be used for those below ground level with masonry on all sides).
- Elevate the Building on a New Foundation
- Elevate the Interior Structure of a Building
- Abandon the First Story
- Move the Historic Building
- Hydraulic Lifts and Anchoring Systems
- "Amphibious Architecture" – Retrofits with buoyant foundations, vertical guideposts

Last Thoughts & Recommendations

- The protection of these endangered resources will take **both public and private investment.**
- **Foster interdepartmental coordination during feasibility studies for coastal resiliency and adaptation** between the Cultural Resources Section and other County departments, such as DPW and OEM and continue to align priorities across planning documents to help develop mitigation actions for historic resources.
- Expand the **Historic Tax Credit Program** to include hazard mitigation actions that would protect the integrity of a historic site and alleviate threats of sea level rise, climate change, and coastal erosion.
  - Shoreline and site stabilization
  - Wet/Dry flood-proofing
  - Erosion Control
  - Flood vents
  - Elevation
- Identify strategies **for integrating historic site preservation** and other cultural resource considerations with natural resource conservation through County **shoreline protection projects and other resiliency plans and actions**, including environmental monitoring.

And a few more…

- We need to **continue to document, assess, and monitor** flood risks to historic properties, cemeteries, and archaeological sites.

- **Increase and prioritize survey, documentation, and preservation efforts on flood-prone areas**, and provide for the support, staffing, resources, and financial means to conduct professionally-led emergency salvage archaeology/historic site documentation for significant sites.

- **Expand public outreach and education in floodprone communities** to provide guidance on flood mitigation for historic structures, to establish volunteer site stewardship monitoring programs, and to encourage community investment into preservation actions for significant, endangered cultural resources.

- **Develop guidelines and requirements** for the potential displacement and destruction of vulnerable historic resources and archaeological sites when shoreline stabilization is not a feasible strategy for permanent protection.

Resources

- **FEDERAL**
  - The Secretary of the Interior's Standards for Rehabilitation & Guidelines on Flood Adaptation for Rehabilitating Historic Buildings
  - National Center for Preservation Technology & Training
  - U.S. Climate Resilience Toolkit
- **STATE**
  - MHT's Climate Change Planning and Adaptation for Historic Properties and Cultural Sites
  - *Flood Mitigation Guide: Maryland's Historic Buildings*
  - DNR's *CoastSmart* Resource Center
  - Maryland Commission on Climate Change
- **COUNTY**
  - Anne Arundel County's Sea Level Rise Page
  - Resilience Authority of Annapolis & Anne Arundel County
  - Bureau of Watershed Protection & Restoration
  - Anne Arundel County Watershed Stewards Academy