Prioritizing natural and nature-based features (NNBFs) that increase the resilience of coastal communities to flooding

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NOAA
Office for Coastal Management
National Oceanic and Atmospheric Administration

Wetlands Watch

NNBFs that enhance coastal flooding resilience

Goals

With a NOAA Coastal Resilience Grant, our goals:

1. Support the preservation and creation of natural and nature-based features (NNBFs) as a component of coastal community resilience
2. Incorporate water quality and flood insurance services into the assessment for existing features
3. Support localities' decision-making by:
   - Identifying NNBFs that provide multiple benefits
   - Identifying target areas for new NNBF creation/restoration

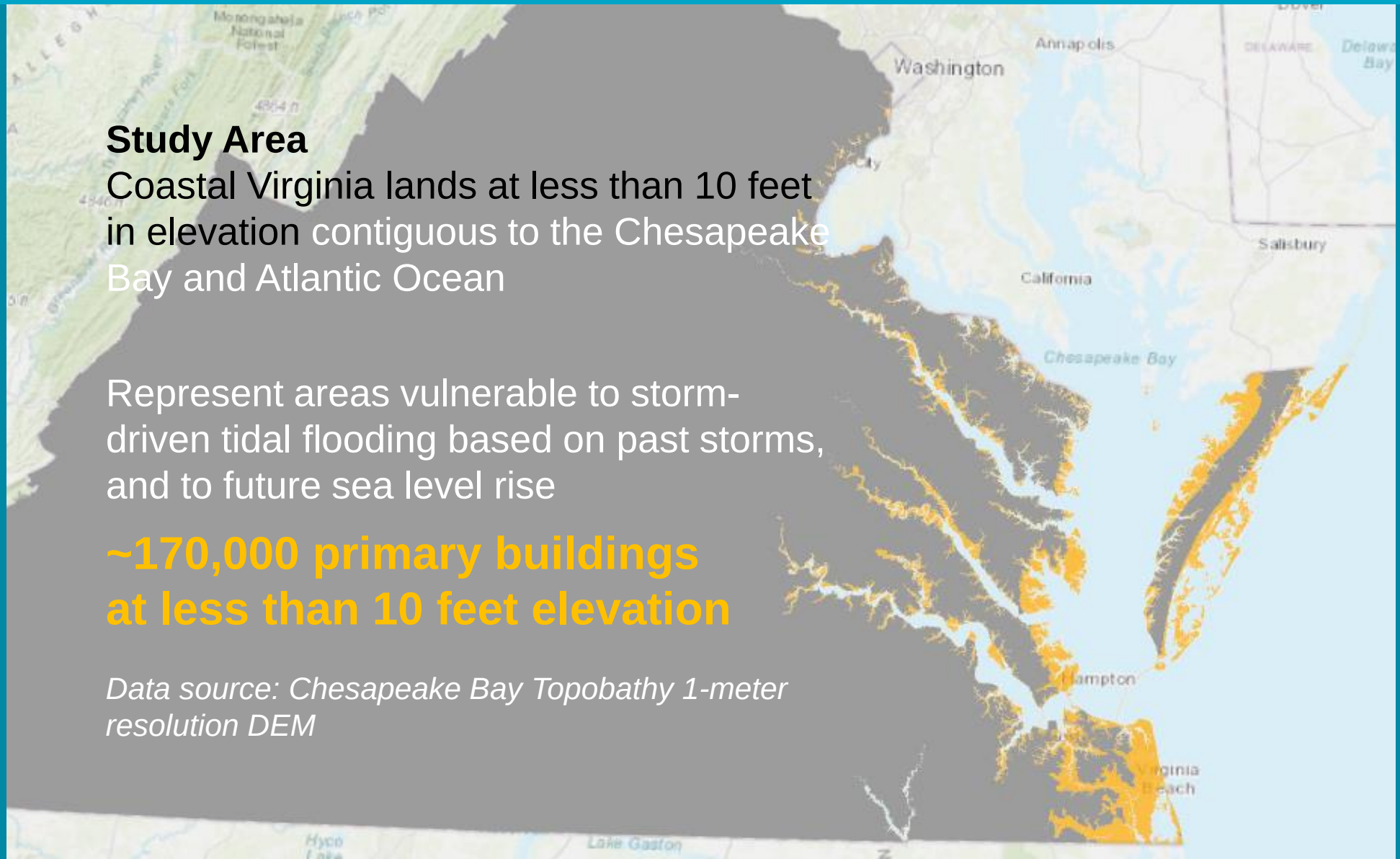
Goals

Three primary steps:

1. Map existing natural and nature-based features (NNBFs) and buildings at less than 10 feet elevation in the coastal zone
2. Identify and rank existing NNBFs that provide multiple benefits for communities
3. Identify target areas for new NNBFs to improve flood resilience

NNBFs that enhance coastal flooding resilience

Map Existing NNBFs and buildings



Study Area
Coastal Virginia lands at less than 10 feet in elevation contiguous to the Chesapeake Bay and Atlantic Ocean

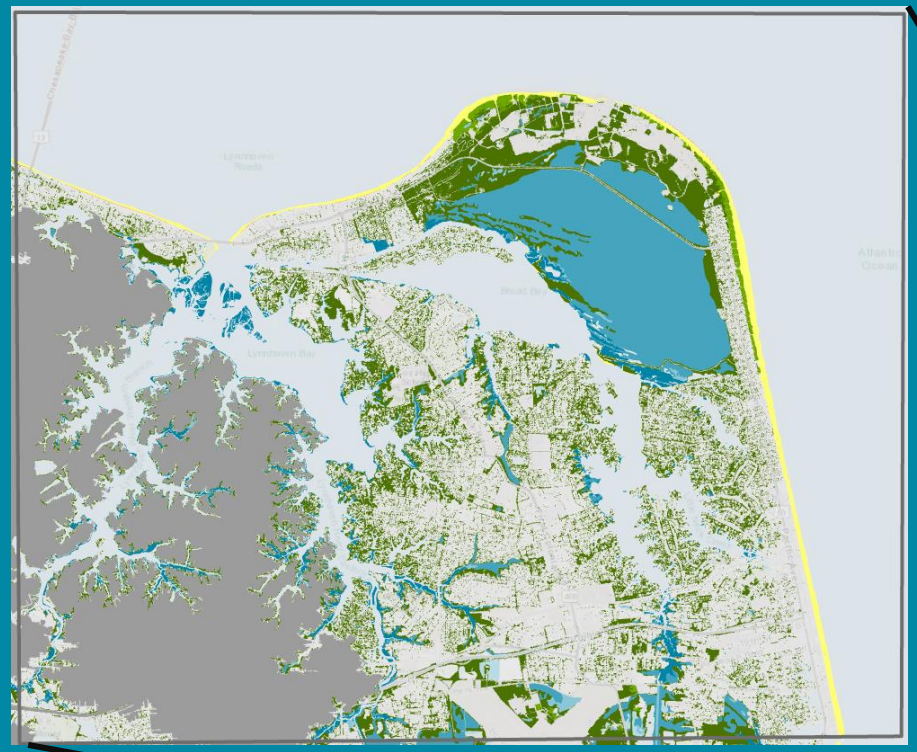
Represent areas vulnerable to storm-driven tidal flooding based on past storms, and to future sea level rise

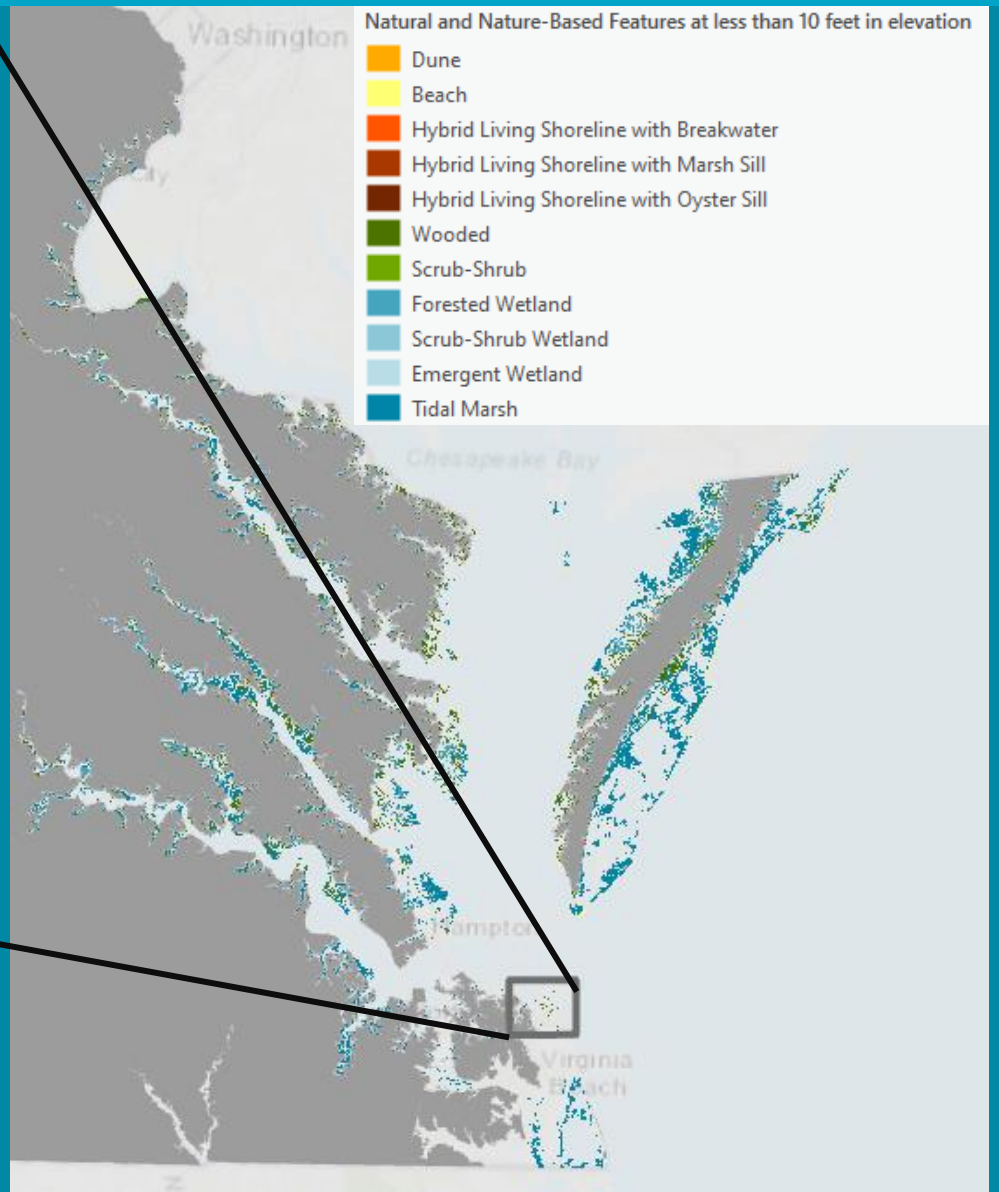
~170,000 primary buildings at less than 10 feet elevation

Data source: Chesapeake Bay Topobathy 1-meter resolution DEM

NNBFs that enhance coastal flooding resilience

Map Existing NNBFs and buildings





~ 350,000 NNBFs within study area

NNBFs that enhance coastal flooding resilience

Identify NNBFs that provide multiple benefits

How do we link NNBFs with buildings that they benefit?

Inundation Pathways (IPs)

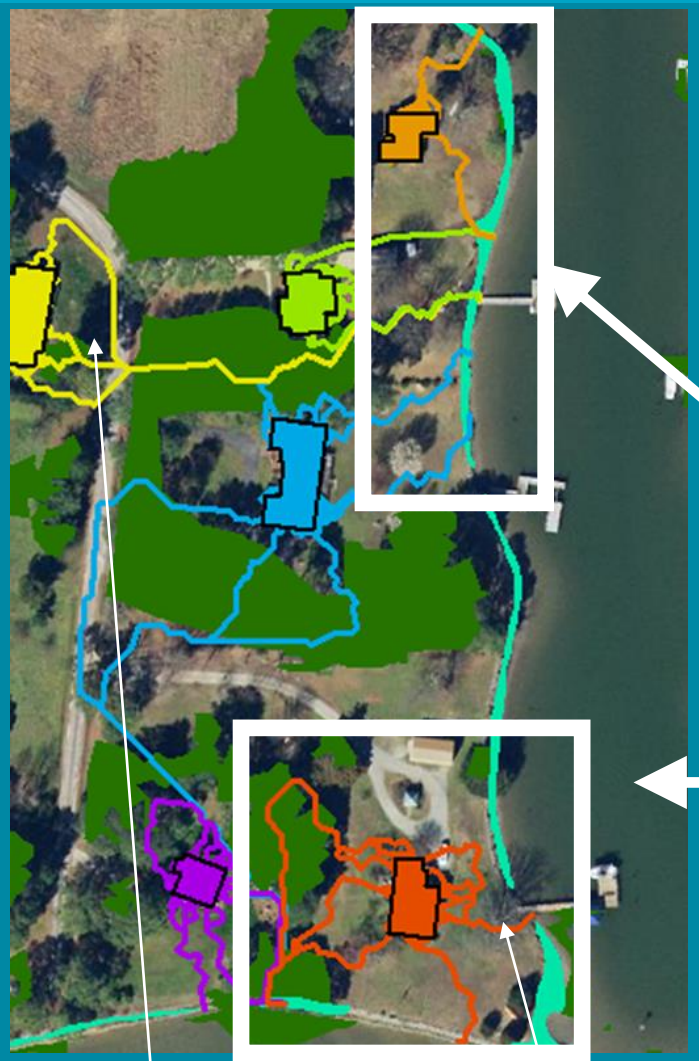
…depict lowest elevation areas connecting the shoreline to buildings.

IPs represent where rising waters begin to flood onto the land, but *do not represent flooding extent.*

IPs depicted as multicolored lines. Building footprints are outlined in black.

NNBFs that enhance coastal flooding resilience

Identify NNBFs that provide multiple benefits



Building footprint

Inundation Pathway (IP)

Using these IPs, we can find NNBFs that lie between the shoreline and building and in the path of rising water

For each NNBF, count the number of building IPs that intersect

→*This NNBF (tidal marsh) benefits 4 buildings*

For each building, count how many NNBFs intersect its' IP

→*This building receives benefits from 2 NNBFs (a tidal marsh and a wooded area)*

NNBF Types (on this map):

- Tidal Marsh
- Wooded

NNBFs that enhance coastal flooding resilience

Identify NNBFs that provide multiple benefits

NNBF Ranking

Four components or measures:

1. NNBF flooding mitigation services
2. How many buildings does the NNBF benefit?
3. Are there any critical community facilities the NNBF benefits?
4. **Can the NNBF be used to take advantage of existing programmatic incentives?**

Each NNBF is assigned a normalized score of low, medium, or high for each of these four components.

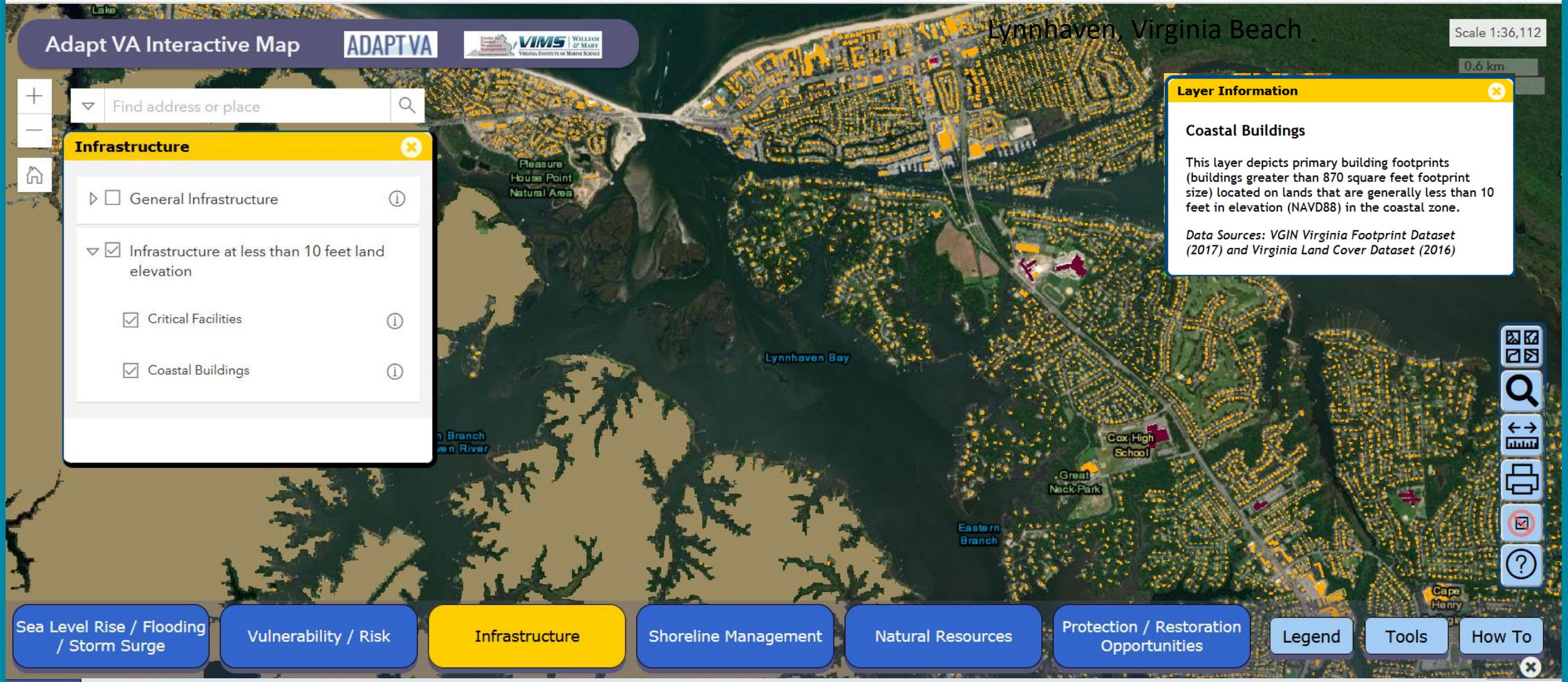
Overall NNBF Score for Priority Ranking: *Add score for each category*	**low**	**medium**	**high**
1. NNBF Total Capacity *Flooding mitigation potential based on elevation and feature type.*	0-0.0008 (1-33 percentile)	0.008-0.4 (33-66 percentile)	>0.4 (66-100 percentile)
2. Number of buildings impacted *Number of buildings that the NNBF benefits.*	0	1 building	>= 2 buildings
3. Critical Facility Benefit *Does the NNBF benefit a community critical facility?*	no		yes
4. Co-Benefits Potential *Potential for NNBF to be used in incentive programs.*	0	1 cobenefit	>=2 cobenefits
Score	**1**	**2**	**3**

NNBFs that enhance coastal flooding resilience

Identify NNBFs that provide multiple benefits

Identify NNBFs that may be used to take advantage of incentives

1. FEMA Community Rating System (CRS) credits. Potentially qualifying NNBFs are in 100-year flood zone Special Flood Hazard Area and overlay the Resource Protection Area (RPA) or RPA 100-ft buffer
   - Undeveloped set-aside lands in the Special Flood Hazard Area (SFHA).
   - Land must have some level of protection: Regulatory or Property ownership
   - Resource Protection Area Buffer considered Regulatory Protection
   - CRS Potential = all open space in SFHA and the Resource Protection Area 100 foot buffer
2. Water quality/TMDL credit potential – N, P, TSS reductions. All NNBFs except for beaches and dunes
   - NNBFs provide water quality services to varying degree dependent on intrinsic factors and location
   - Within the study area and proximal to the shore
   - Assumed all NNBF features other than beach and dune provide service
   - Existing Chesapeake Bay Program approved BMPs for tidal and nontidal wetlands and riparian buffers

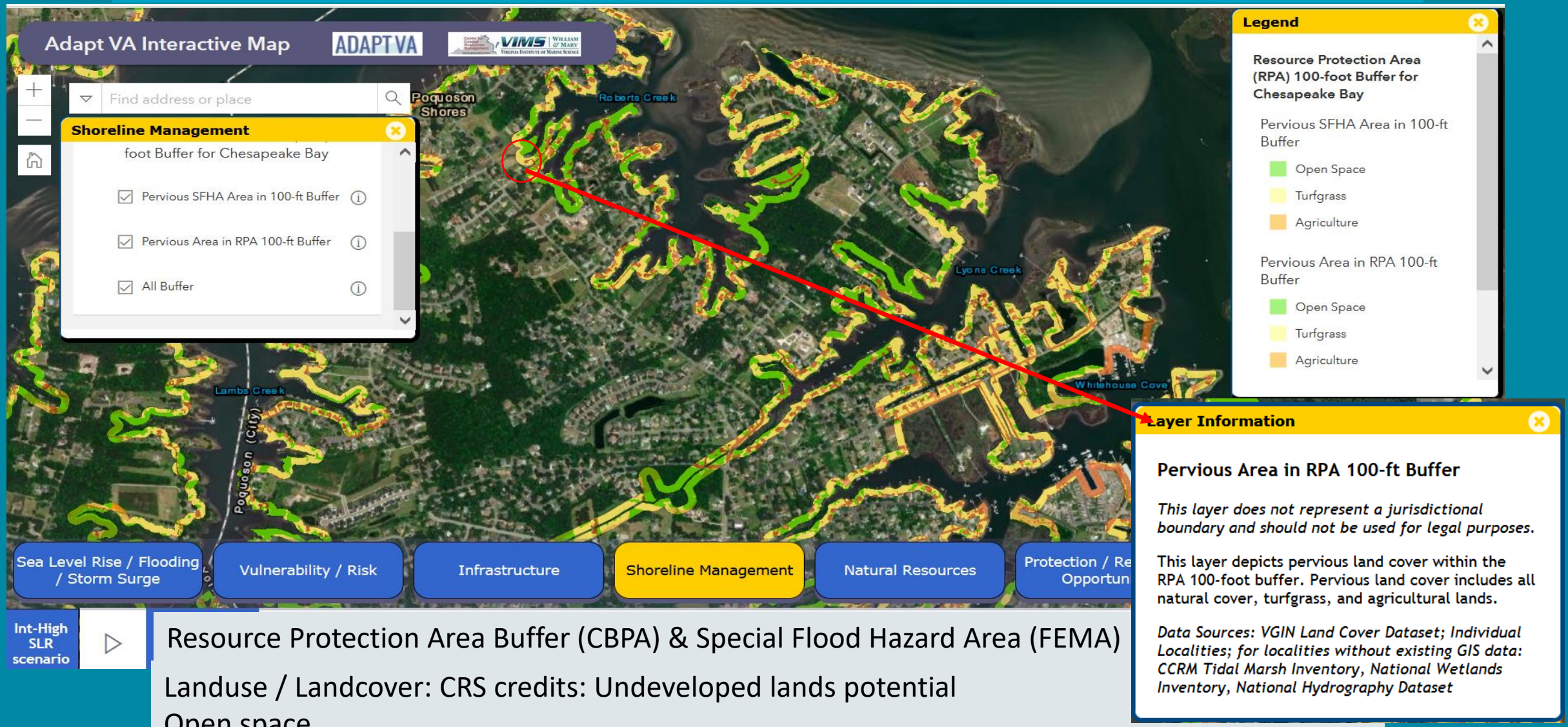


NNBF Study Area: Buildings on land elevation less than 10 feet
Critical Facilities

Beige mask is lands with elevation greater than 10 feet

Opportunities to improve coastal resilience

Identify Co-Benefits for NNBFs



Resource Protection Area Buffer (CBPA) & Special Flood Hazard Area (FEMA)

Landuse / Landcover: CRS credits: Undeveloped lands potential

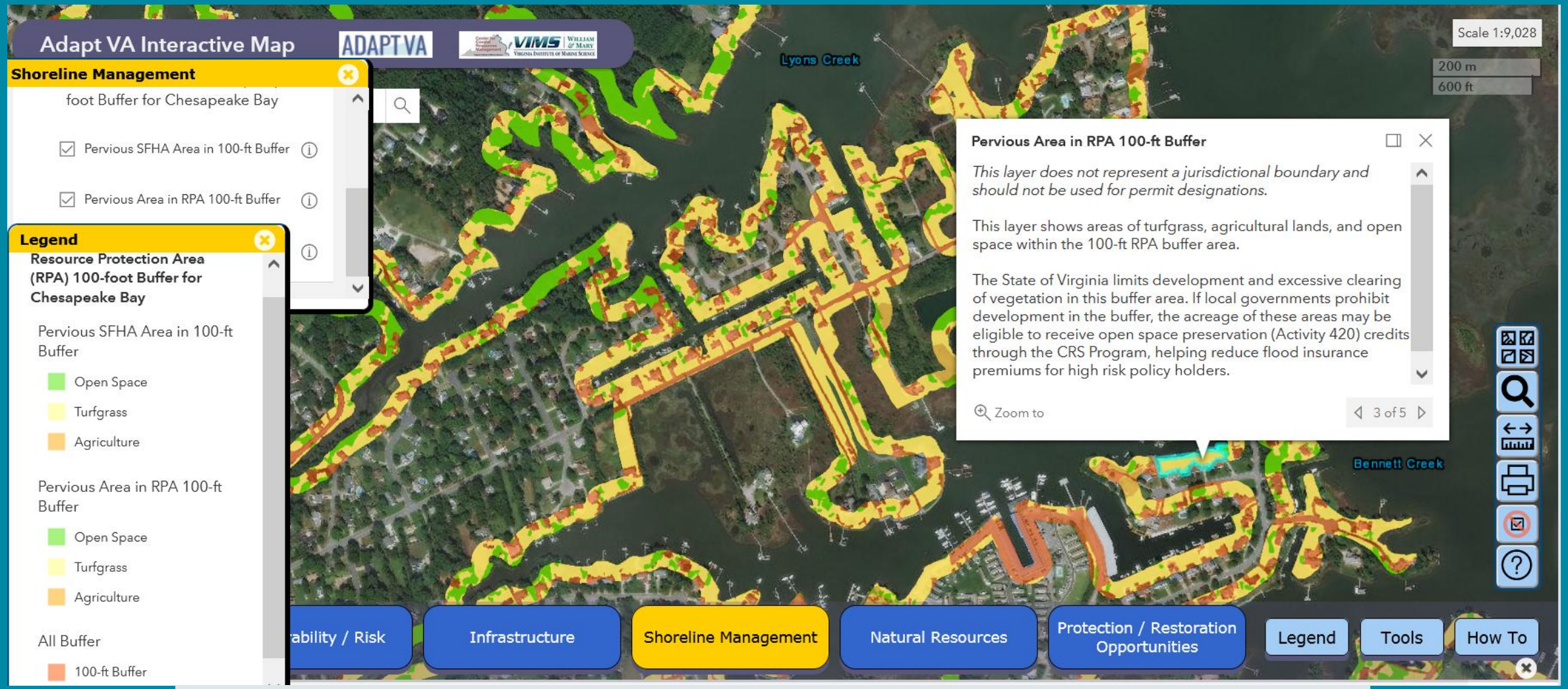
Open space

Turf

Agriculture

Opportunities to improve coastal resilience

Identify Co-Benefits for NNBFs



Possible open space credits for
FEMA National Flood Insurance Program Community Rating System

NNBFs that enhance coastal flooding resilience

Identify NNBFs that provide multiple benefits

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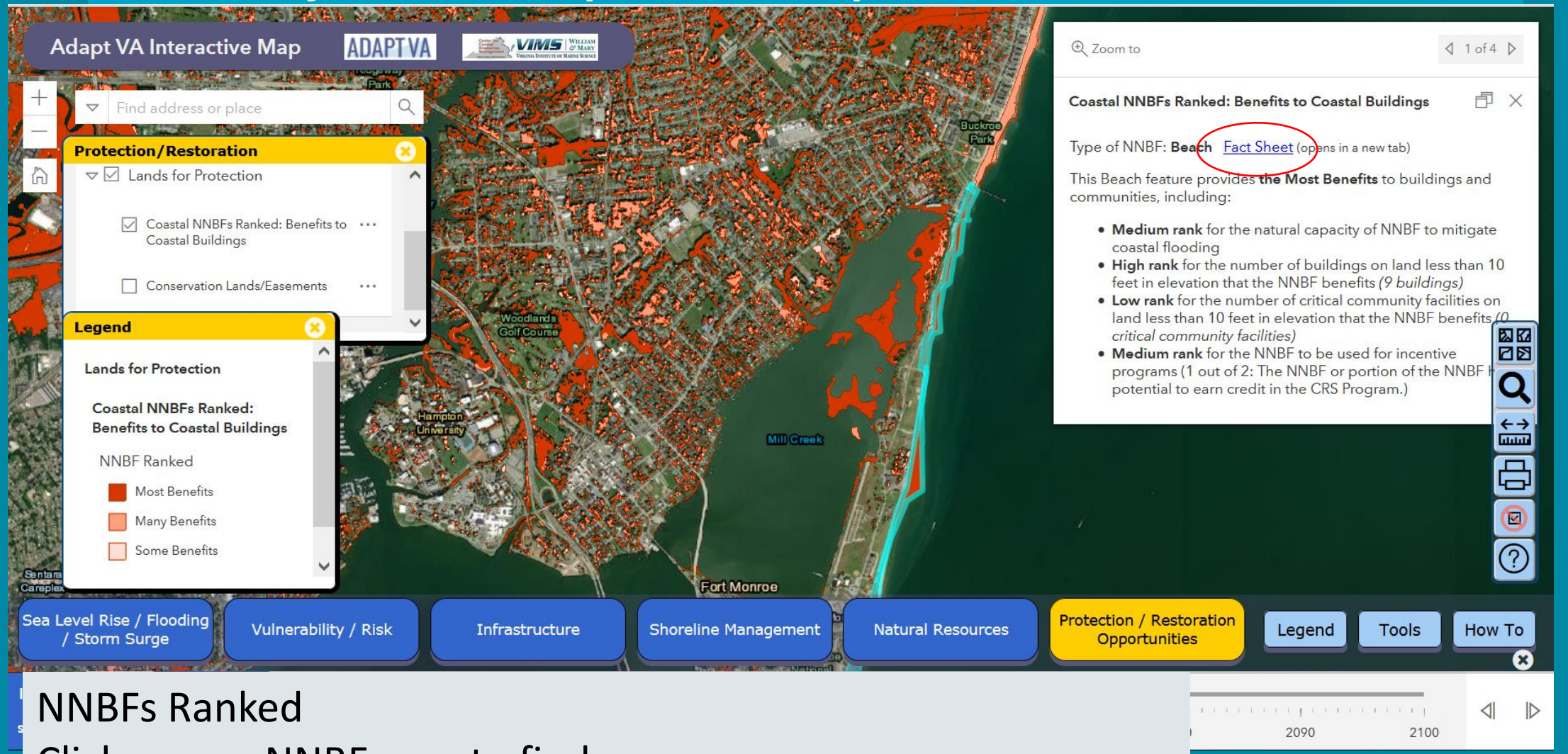
Identify NNBFs that provide multiple benefits



NNBFs Ranked

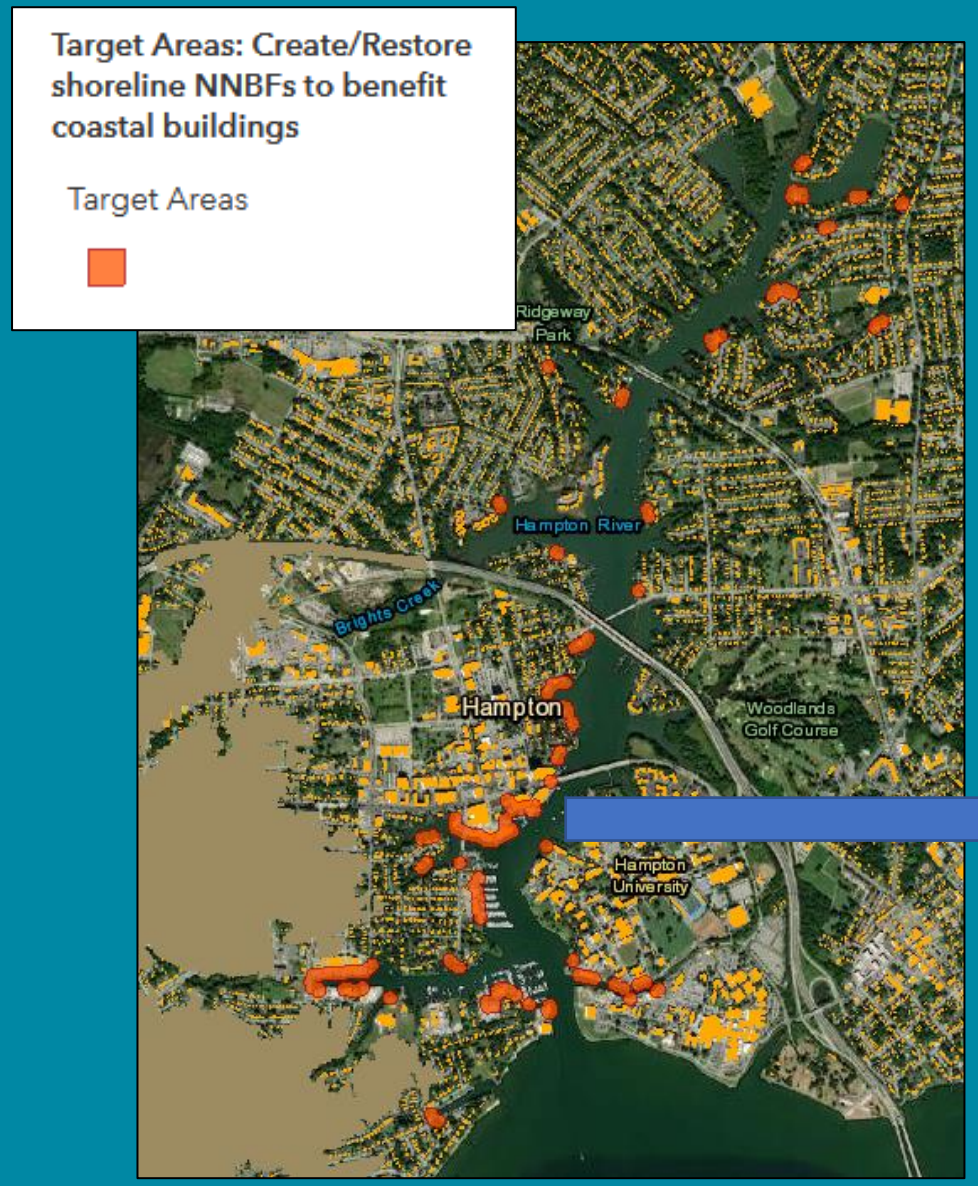
Click on any NNBF area to find:

-Ranking information specifics

- Fact Sheet

Mill Creek, Hampton

Identify Target Areas for NNBF Improvements



Shoreline areas where NNBF benefits are absent for vulnerable buildings

Target Areas: Create/Restore shoreline NNBFs to benefit coastal buildings

Total 208 building(s) will benefit
Including 78 building(s) with no other benefit from NNBFs

Potential NNBF Restoration Options

Convert Existing Land Cover:
Impervious
Turf Grass

Expand Adjacent Existing NNBFs:
Tidal Marsh, Wooded
(pdf links open in a new tab)

NNBF Erosion Control Recommendation (SMM v. 5.1)
Highly Modified Area. Seek expert advice.
Click here for more information

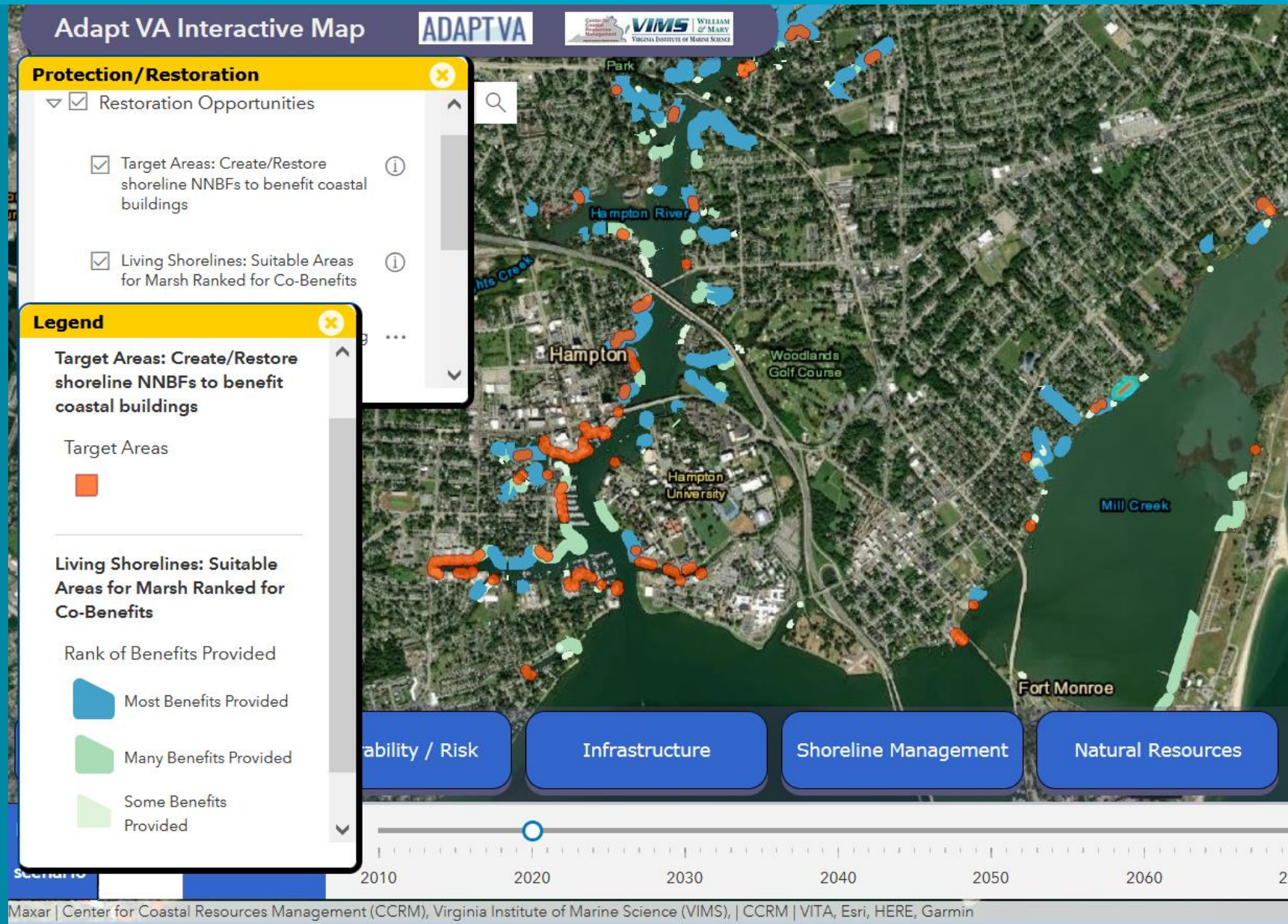
Shoreline Structure Enhancements
Add natural features to existing structures: Bulkhead, Marina, Unconventional, Wharf.

Opportunities to improve coastal resilience

Identify target areas for new NNBFs

Why target the shoreline?

- First line of defense
- Programmatic incentives – in RPA
- Other tools available to help inform NNBF creation (e.g., CCRM Shoreline Management Model)



Hampton River, Hampton

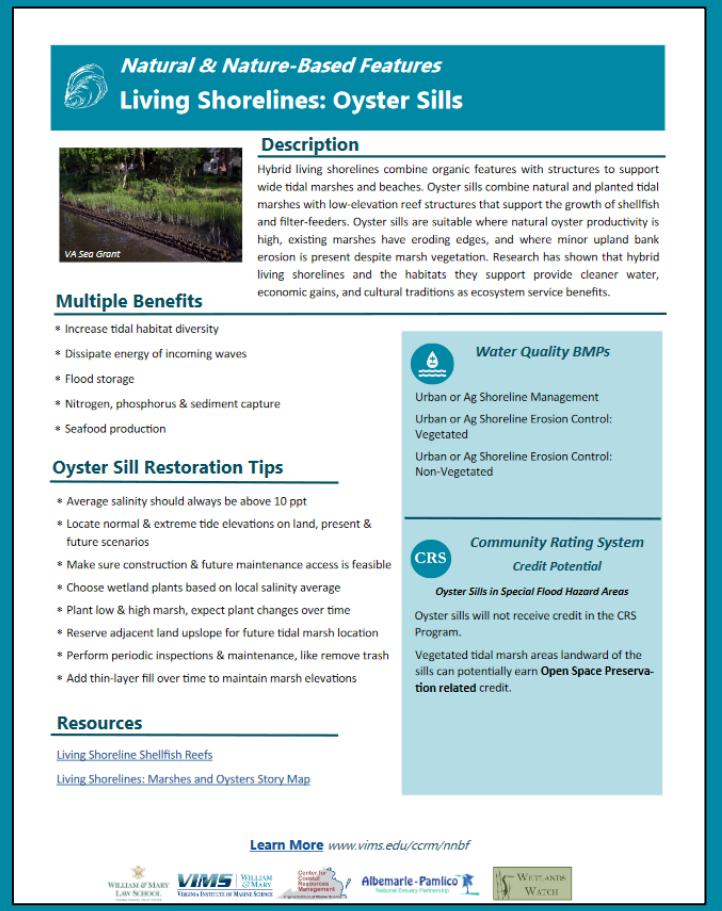
NNBF Project

Products (Fact Sheets & More) + Info on Adapt VA Map

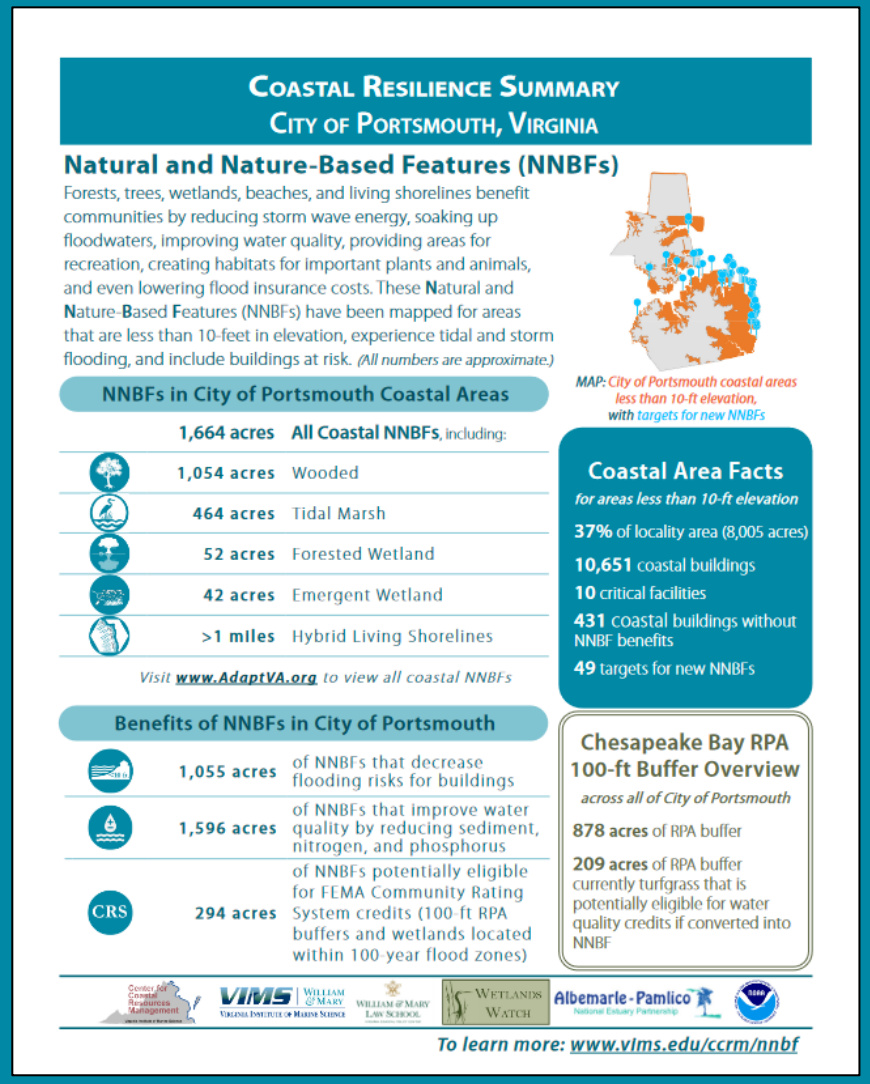
New Web Site

www.vims.edu/ccrm/nnbf

- Description of natural feature
- Benefits provided by it
- Restoration tips
- Links to additional resources
- Potential CRS & water quality credit info



NNBF Locality Summary Reports



Coastal Resilience Summary
City of Portsmouth, Virginia

Natural and Nature-Based Features (NNBFs)

Forests, trees, wetlands, beaches, and living shorelines benefit communities by reducing storm wave energy, soaking up floodwaters, improving water quality, providing areas for recreation, creating habitats for important plants and animals, and even lowering flood insurance costs. These **N**atural and **N**ature-**B**ased **F**eatures (NNBFs) have been mapped for areas that are less than 10-feet in elevation, experience tidal and storm flooding, and include buildings at risk. *(All numbers are approximate.)*

MAP: City of Portsmouth coastal areas less than 10-ft elevation, with targets for new NNBFs

NNBFs in City of Portsmouth Coastal Areas

1,664 acres	**All Coastal NNBFs**, including:
1,054 acres	Wooded
464 acres	Tidal Marsh
52 acres	Forested Wetland
42 acres	Emergent Wetland
>1 miles	Hybrid Living Shorelines

*Visit **www.AdaptVA.org** to view all coastal NNBFs*

Coastal Area Facts
for areas less than 10-ft elevation

- **37%** of locality area (8,005 acres)
- **10,651** coastal buildings
- **10** critical facilities
- **431** coastal buildings without NNBF benefits
- **49** targets for new NNBFs

Benefits of NNBFs in City of Portsmouth

1,055 acres	of NNBFs that decrease flooding risks for buildings
1,596 acres	of NNBFs that improve water quality by reducing sediment, nitrogen, and phosphorus
294 acres	of NNBFs potentially eligible for FEMA Community Rating System credits (100-ft RPA buffers and wetlands located within 100-year flood zones)

Chesapeake Bay RPA 100-ft Buffer Overview
across all of City of Portsmouth

- **878 acres** of RPA buffer
- **209 acres** of RPA buffer currently turfgrass that is potentially eligible for water quality credits if converted into NNBF

*To learn more: **www.vims.edu/ccrm/nnbf***

- **NNBFs identified below 10-feet land elevation**
- **Benefits of protecting and increasing NNBFs**
- **Information about what's at risk**

NNBFs that enhance coastal flooding resilience

Next steps…

- Work with localities to refine and communicate

Build on the Current Project:

- Add sea level rise projections
- Add co-benefits, e.g. RTE species habitats, habitat corridors…
- Incorporate offshore NNBFs: spits, SAV…
- Broaden target areas for NNBF creation to the upland

Thank you!

Questions?
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