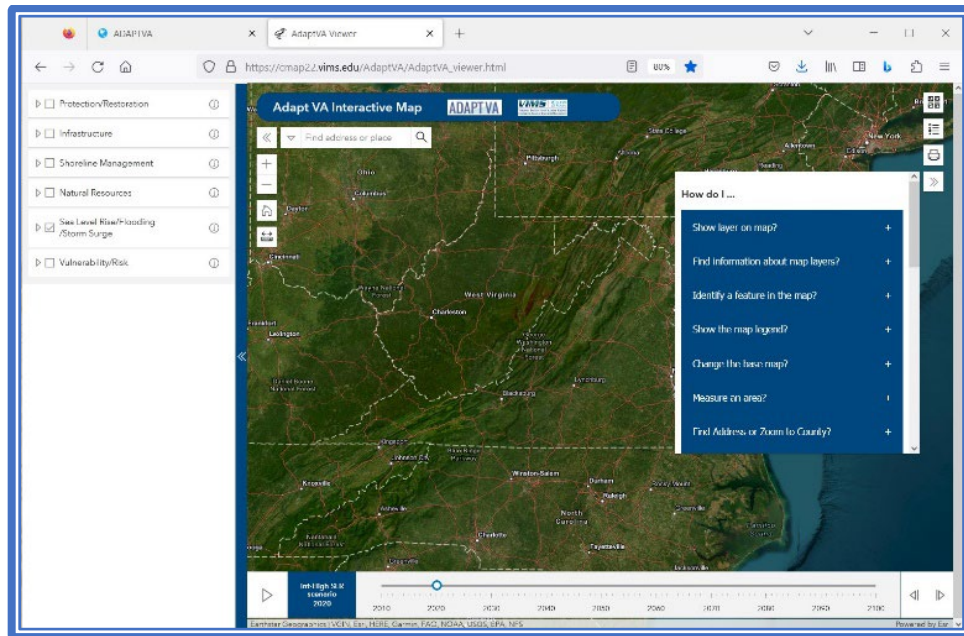




# ADAPTVA INTERACTIVE MAP

## User Guide



August 2023

Virginia Institute of Marine Science  
Center for Coastal Resources Management



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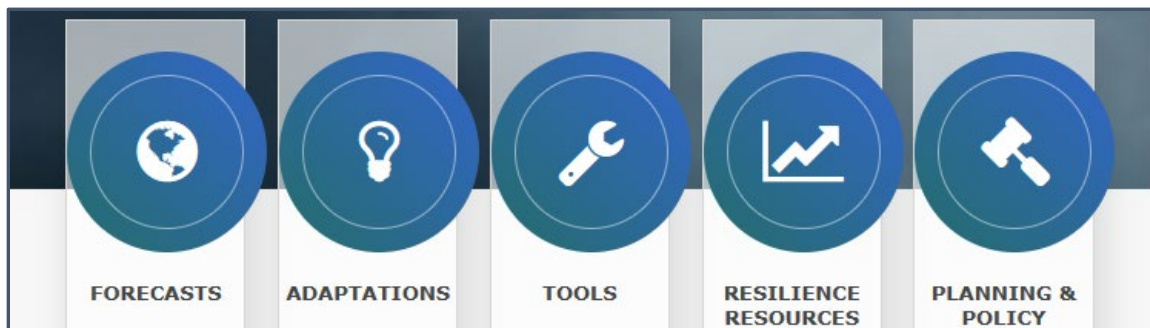
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## ABOUT ADAPTVA

[www.adaptva.org](http://www.adaptva.org) & [www.adaptva.com](http://www.adaptva.com)

- ADAPTVA - short for Adapt Virginia – **evidence-based planning for a changing climate**.
- Integrates the **best available science** with **legal guidance** and **planning strategies**.
- Launched in 2017 by partners from Virginia Institute of Marine Science, William & Mary, Virginia Coastal Policy Center and Wetlands Watch.
- Offers a single point of access to **interactive map viewers, story maps, and policy guides** focused on short and long-term sea level curves and maps, flood mapping and decision-support tools, legal and policy resources, and stories that illustrate adaption through maps and pictures.

### 5 RESOURCE SECTIONS



### Contributing Partners

Virginia Institute of Marine Science, Center for Coastal Resources Management (site administrator)

Virginia Coastal Policy Center, William & Mary Law School

William & Mary Program in Public Policy

Wetlands Watch

### Contact Info

General Information [adaptva@vims.edu](mailto:adaptva@vims.edu)


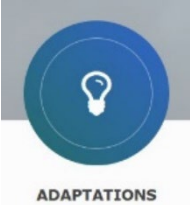
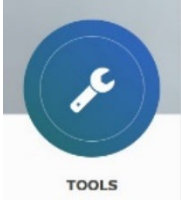
GIS maps, tools, data and downloads Karinna Nunez [karinna@vims.edu](mailto:karinna@vims.edu)


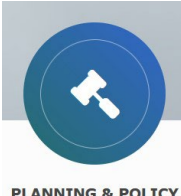
Planning, policy, local ordinances, comprehensive planning Pam Mason [mason@vims.edu](mailto:mason@vims.edu)

Sea level rise projections, sea level report cards, Tidewatch Maps<sup>®</sup> Molly Mitchell [molly@vims.edu](mailto:molly@vims.edu)

### Recommended Citation

ADAPTVA. (2023). Adapt Virginia website. Center for Coastal Resources Management, Virginia Institute of Marine Science, William & Mary, Gloucester Point, Virginia. ADAPTVA. <http://adaptva.org/>

ADAPTVA SECTION	CONTENTS
 <p><i>Present and future water level information</i></p>	<p>About VA Sea Level  Tidewatch observing stations  Tidewatch Map©  Sea Level Projection Viewer  Sea-Level Report Cards</p>
 <p><i>Case study story maps showing how people adjust to a changing climate through zoning, construction, engineering, and policy practices</i></p>	<p>Living Shorelines: Marshes and Oysters  Living Shorelines: Beaches and Dunes  Shoreline Green Enhancements  Flood Barriers  Building Modification  Managed Retreat  Transportation Adaptation  Water Storage and Management  Zoning  Planning  Financial Incentives</p>
 <p><i>Interactive map viewers and resources to assess risk and vulnerability</i></p>	<p><b>Flood Risk</b>  VAFRIS 2.0 <i>Virginia's Flood Risk Information System</i>  Locality Road Flood Tool  Virginia Wastewater Data Viewer</p> <p><b>Shoreline Management</b>  Comprehensive Coastal Resource Management Guidance  Shoreline Management Model &amp; Manual</p> <p><b>Comprehensive Map Viewer</b>  <b>ADAPTVA Interactive Map</b></p>

ADAPTVA SECTION	CONTENTS
 <p data-bbox="383 569 477 604">RESILIENCE RESOURCES</p> <p data-bbox="196 632 659 699"><i>Community adaptation data, websites, other resources</i></p>	<p data-bbox="737 226 1008 258"><b>Community Resources</b></p> <p data-bbox="737 268 1182 499">Community Climate Outlooks Natural Resource Climate Change Shoreline Restoration for Resilience Resiliency Database: Plans &amp; Funding Quick Guide to Resilience Natural and Nature-Based Features</p> <p data-bbox="737 527 980 558"><b>Maps and Websites</b></p> <p data-bbox="737 569 1417 684">Commonwealth Center for Recurrent Flooding Resiliency Virginia Center for Housing Research Virginia Coastal Resilience Master Plan</p> <p data-bbox="737 711 951 743"><b>Social and Justice</b></p> <p data-bbox="737 753 1471 905">Social Vulnerability Viewer Vulnerability Viewer Fact Sheets Chesapeake Bay Environmental Justice and Equity Dashboard EPA’s Environmental Justice Screening and Mapping Tool</p>
 <p data-bbox="345 1142 516 1161">PLANNING &amp; POLICY</p> <p data-bbox="168 1178 688 1293"><i>Non-structural adaptations planning, zoning, building codes &amp; National Flood Insurance Program</i></p>	<p data-bbox="737 1037 1114 1068">NFIP Community Rating System</p> <p data-bbox="737 1094 1252 1125">Searchable Local Ordinances <i>updated 2022</i></p> <p data-bbox="737 1150 1114 1182">State Legislation and Provisions</p> <p data-bbox="737 1207 1086 1239">Virginia Coastal Policy Center</p>

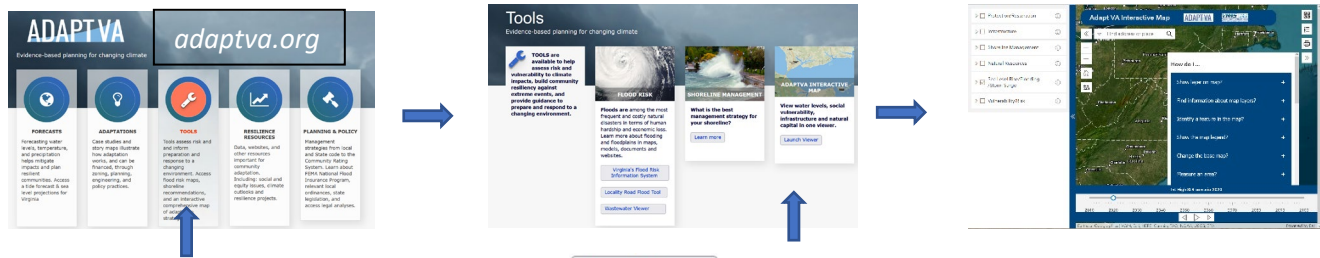


*Every attempt has been made to ensure that AdaptVA data and documentation are reliable and accurate. Information is provided with the understanding that the records are not guaranteed to be correct or complete, and conclusions drawn from the data are the sole responsibility of the user. CCRM, VIMS, and any disclosed collaborative agency make no warranty, expressed or implied, as to the accuracy, completeness, or utility of this information, nor does the fact of distribution constitute a warranty.*

## ADAPTVA INTERACTIVE MAP

The ADAPTVA Interactive Map viewer integrates data from trusted sources throughout the ADAPTVA portal into a single mapper. Map users can look at sea level rise forecasts along with critical infrastructure, natural resources and socioeconomic data. Models using data layers from AdaptVA offer analysis for specific applications, including a shoreline management model that analyzes multiple data layers and makes suggestions for shoreline stabilization based on mapped conditions.

### Where to Find It



Go to [adaptva.org](https://adaptva.org) Select Tools

Select [Launch Viewer](#) under AdaptVA Interactive Map

AdaptVA Interactive Map direct link [https://cmap22.vims.edu/AdaptVA/AdaptVA\\_viewer.html](https://cmap22.vims.edu/AdaptVA/AdaptVA_viewer.html)

## Help & Information

**How do I....**Frequently Asked Questions appear by default when the map viewer first opens. Scroll down to see all questions. Click the '+' symbols to expand answers. Some answers provide links to additional information.


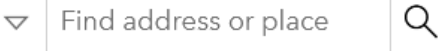










How do I ...

Show layer on map?	+	Measure an area?	+	Learn about shoreline best management practices (BMPs)?	+
Find information about map layers?	+	Find Address or Zoom to County?	+	Find the shoreline BMPs definitions?	+
Identify a feature in the map?	+	Print a map?	+	Learn about the social vulnerability data?	+
Show the map legend?	+	Navigate around the map?	+	Find source citations?	+
Change the base map?	+	Hide this popup?	+	Find information (metadata) about the layers?	+
		Learn about FEMA Zones?	+	Download data?	+
		Learn about physical risk?	+	See the Disclaimer?	+
		Learn about the sea level rise inundation data?	+	Ask questions?	+

Click on the right side of the map to open Help & Information. Click to close it.

# General Map Navigation

## Map Symbols Quick Guide

GENERAL NAVIGATION	
	Expand or Collapse windows
	Address search with source choices
	Open Address search
	Zoom map view in or out
	Default map view
	Expand measurement tool
	Basemap Gallery
	Expand Map Layer List
	Expand Map Legend
	Expand Print Tool
	Expand Help & Information
	Locate or enter coordinates with conversions



GIS DATA LAYERS	
	Expand or collapse main category to view data layers
	Layer information including data source displayed in a popup window near the lower left corner of the map.
	More Options button includes Information button and opacity adjustment to increase or decrease layer transparency. Appears blue when open.
	Adjust layer transparency when viewed with other layers. Increase opacity makes layer darker. Decrease opacity makes layer more transparent.
FEATURE IDENTIFICATION	
	Multiple layers on map display. Scroll through arrows for feature information.


### Navigation Tool Bars

General map viewer navigation icons are located in tool bars on both sides of the map viewer.

The screenshot shows the AdaptVA Interactive Map interface. On the left side, there is a vertical toolbar with icons for: Find Address (magnifying glass), Zoom (plus and minus signs), Default view (house icon), and Measurement tool (ruler icon). On the right side, there is another vertical toolbar with icons for: Base Map Gallery (grid icon), Map Contents (layers icon), Legend (list icon), Print Tool (printer icon), and Help and Information (question mark icon). The map itself shows an aerial view of a coastal area with roads like Franklin Rd, Greato Rd, and George Washington Memorial Hwy, and buildings like the Virginia Institute of Marine Science. At the bottom, there is a scale bar showing 100 meters and 300 feet, and a scale of 1:4,514. The bottom of the map has a copyright notice: "Maxar | Esri Community Maps Contributors, VGIN, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechn... Powered by Esri".


## Find Address – Zoom to Locality



Select  to use a specific address database OR Click inside field to enter address.



- All (default)
- ArcGIS World Geocoding Service *global addresses*
- VGIN Composite Locator *Virginia address points & road center lines provided by local governments to Virginia Geographic Information Network VGIN*
- Virginia Locality *zoom to a locality*

Address choices or locality names will appear with typing entry. Select desired location from list to automatically zoom to that location.

OR Type address then click  to zoom to the location.

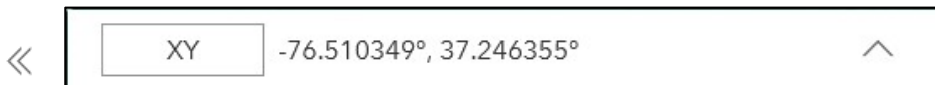



Click X to clear address-locality name from the search field and the location on the map.

Click  to hide Find Address. Click  to open it again.

## Enter or Find Coordinates

A Coordinates Widget is located in lower left corner of the map. XY is the default setting. The coordinates change as the cursor moves across the map.



Click  to open coordinates input and capture window.




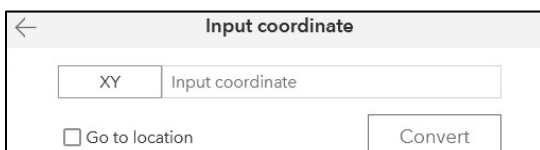
Input coordinates





Capture mode


Pull down Add conversion list to change coordinates.



Click  to input coordinates and go to that location.



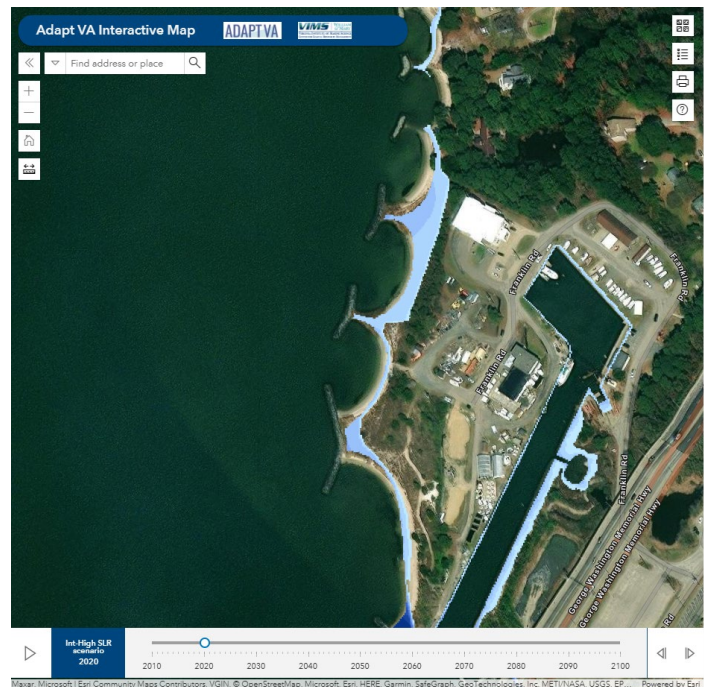
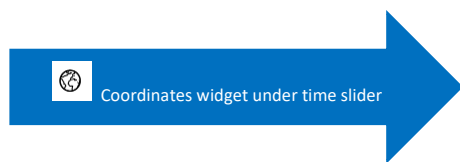
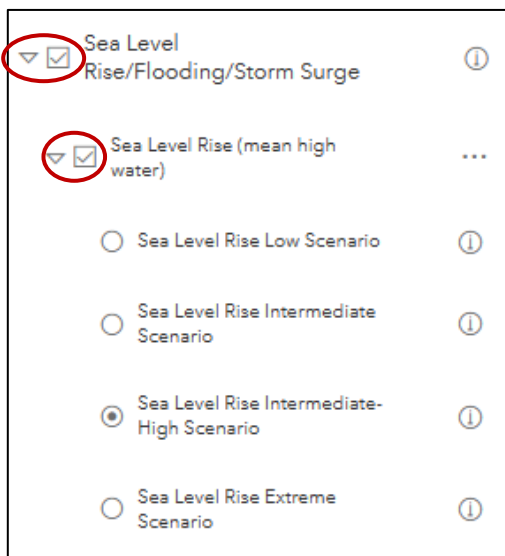
Click  to capture coordinates from selected locations on the map. Move cursor to map and click on desired coordinates location(s).

Click  to close coordinate capture mode.

Click  to close input and capture window.

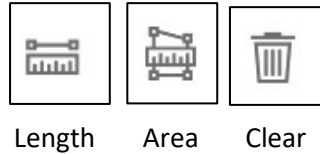
Click  to hide Coordinates widget. Click  to open it again

**TIP: The Coordinates widget might be hidden under a sea level rise time slider at the bottom of the map. Uncheck the box next to Sea Level Rise/Flooding/Storm Surge OR the Sea Level Rise (mean high water) to hide the time slider.**




## Measurement Tool

Click  to open Measurement Tool with 3 option buttons:

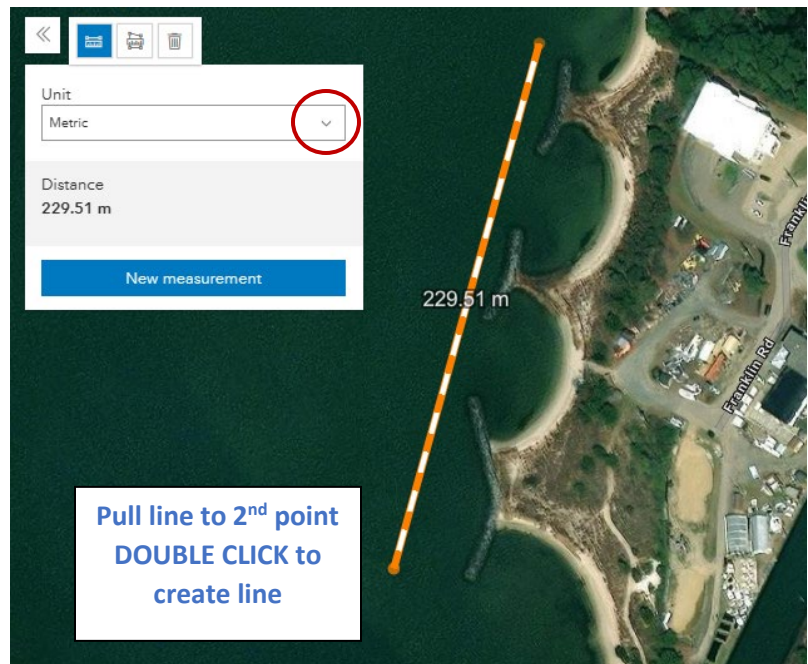



### Measure Length

Click  then click and release on the map at the first point. Pull a line to the second end point and double click to complete the line.



**CLICK AND RELEASE**  
to set 1<sup>st</sup> point

Default length unit is metric  
Change units after drawing line




Click  to clear measurement from the display.

Click New Measurement to measure another length or area.

Click  to hide Measurement tool. Click  to expand it.

## Measure Area



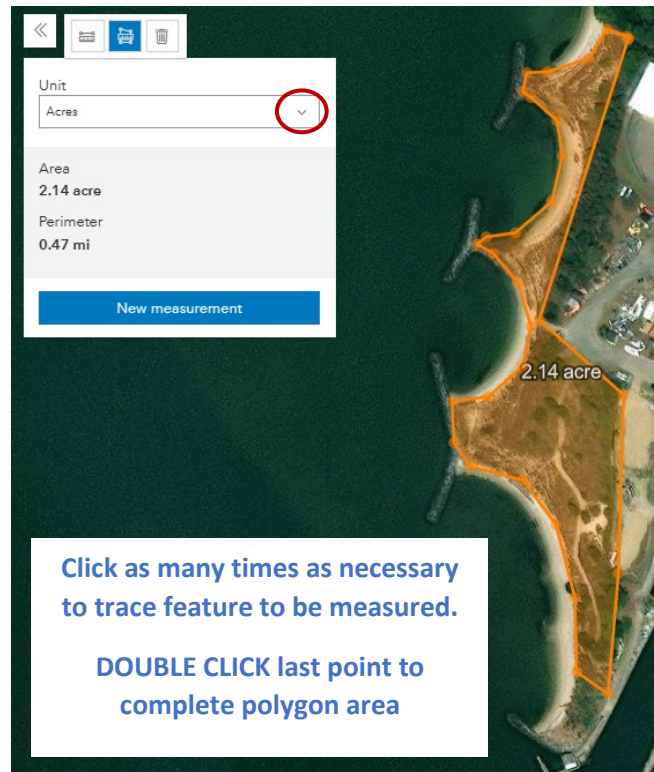
Click  then click and release on map to place the first point of a polygon area. Continue to place points around area to be measured. Area is calculated as polygon is drawn. Double-click on the last point to finish drawing the area to be measured.


Default unit is metric

Change units after drawing area

Area and perimeter drawn calculated



**TIP: Move map display over to the right side of screen to avoid overlap by measurement results window**



Click  to clear measurement from the display.


Click New Measurement to measure another length or area.



Click  to hide Measurement tool. Click  to expand it.




## Base Map Gallery



A basemap gallery is available to change the background map. Click  in the upper right corner of the map to see available options, including imagery, streets, topography and other maps from ArcGIS Online to display in the background.

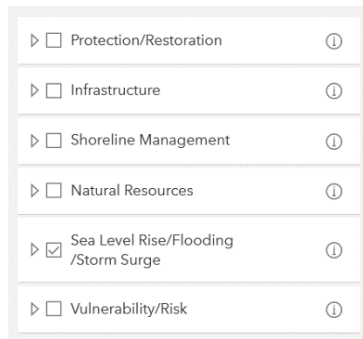
**TIP: Background imagery may change with zooming in and out based on what images are available at each scale. Background images may not accurately portray present conditions.**

## Map Contents - GIS Layer List

A variety of geo-referenced information can be displayed on the map one at a time or simultaneously. The Layer List or Table of Contents appears on the left side of the map by default for larger screens. The Layer List window will remain docked on the left side until the screen size is reduced.

For resizable and small screens, click  to find and open the Layer List. The open Layer List will float over the map view.


The GIS Layer List has six main categories. Click  to expand each main category to view data layers under each one. Click  to collapse layer lists.




Sea Level Rise/Flooding/Storm Surge  
Checked on by default

## GIS Data Sources

A variety of GIS data sources were used to generate the Layer List. The available layers include static GIS data obtained from external federal, state and locality GIS sources. Some data layers were generated by the VIMS Center for Coastal Resources Management VIMS-CCRM, including static data plus models that automatically evaluate multiple data layers.

Click  for more information about a category, sub-category, or data layer. Layer information is displayed in a popup near the lower left corner of the map. Only one layer information window can be open at a time.

Help and Information  includes links to full metadata (data about data) under *How do I....find information (metadata) about the layers?*

## GIS Data Downloads

Some GIS data layers are available for downloading. Other data layers may be available on request. See Help and Information – *How do I.....download data?*

Contact [adaptvainfo@vims.edu](mailto:adaptvainfo@vims.edu) to request other GIS data downloads.

## GIS Layer List Quick Guide

*Color-coded categories and data layers*

### MAIN CATEGORY

#### ***Sub-category***

GIS data layers

### PROTECTION / RESTORATION

#### ***Restoration Opportunities***

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

Living Shorelines: Suitable Areas for Marsh Ranked for Co-Benefits

Protected Lands Suitable for Living Shoreline

Opportunity for Wetlands Migration: Existing Turf Grass in Potential 2050 Wetland Areas

#### ***Lands for Protection***

Coastal NNBFs Ranked: Benefits to Coastal Buildings

Conservation Lands/Easements

### INFRASTRUCTURE

#### ***General Infrastructure***

Various building types

Virginia Parcels

Road Centerlines

#### ***Infrastructure at < 10 feet land elevation***

Critical Facilities

Coastal Buildings

### SHORELINE MANAGEMENT

Shoreline Management Model

#### ***Existing Structures***

Public/Private Access (Docks/Piers/Boathouses)

Defended Shoreline

Marina

#### ***Chesapeake Bay Preservation Act***

##### ***Resource Protection Area (RPA) 100-foot Buffer***

Pervious SFHA Area in 100-ft Buffer

Pervious Area in RPA 100-ft Buffer

100-ft RPA Buffer

Potential 2050 Upland Interface Shoreline: NOAA 2017 intermediate high curve

Potential 2050 Wetlands: NOAA 2017 intermediate high curve

##### ***Sea Level 5-year Intervals***

DEQ Sea Level Rise 2050-2054

DEQ Sea Level Rise 2055-2059

DEQ Sea Level Rise 2060-2064

DEQ Sea Level Rise 2065-2069

*GIS Layer List Quick Guide (continued)*

**NATURAL RESOURCES**

Tidal Marsh

***Natural and Nature-Based Features < 10 ft land elevation***

Existing living shoreline projects (all types) 2018

Beach Nourishment

Hybrid: Breakwater

Hybrid: Marsh Sill

Hybrid: Oyster Sill

Marsh Plantings

Dunes

Beaches

Tidal Marshes

Wetlands <10 feet land elevation

Scrub-shrub wetlands

Forested wetlands

Emergent wetlands

Upland Wooded Areas

Upland Scrub-Shrub

***Shoreline Conditions***

Shoreline Bank Height

Shoreline Bank Cover

Riparian Land Use/Land Cover

Tree Fringe

Phragmites australis

***Shoreline***

Upland Interface Shoreline

Water Interface Shoreline

Nontidal NWI Wetlands (all Virginia)

***Submerged Aquatic Vegetation (SAV)***

SAV most recent

SAV Habitat

SAV Habitat (5 years)

SAV Habitat (10 years)

***Hydrology***

Hydrologic Units (12-digit)

National Hydrography Dataset (NHD)

Contours



## *GIS Layer List Quick Guide (continued)*

### **SEA LEVEL RISE / FLOODING / STORM SURGE**

#### ***Sea Level Rise (mean high water)***

- Sea Level Rise Low Scenario
- Sea Level Rise Intermediate Scenario
- Sea Level Rise Intermediate-High Scenario
- Sea Level Rise Extreme Scenario

#### ***Flooding***

- Limit of Moderate Wave Action (LiMWA)
- Flood Hazard Zones (FHZ)
- Coastal Barrier Resource System

#### ***Storm Surge***

- Category 4 – Flood Height
- Category 3 – Flood Height
- Category 2 – Flood Height
- Category 1 – Flood Height

### **VULNERABILITY / RISK**

#### ***Tidal Marsh Vulnerability Assessment***

- Vulnerability Classification 2050
- Vulnerability Classification 2100

#### ***Social Vulnerability***

- Social Vulnerability Classification
- Social Vulnerability Index Score
- Vulnerable Housing Classification
- Hazardous/Toxic Index Score
- Social Vulnerability by Block Group
- Physical Risk

## GIS Layer Map Display

Expand categories to see available data layers. Boxes must be checked next to main and sub-categories and data layers for map display.

The diagram illustrates the process of expanding a GIS layer category. On the left, a collapsed list of categories is shown. The 'Natural Resources' category is selected and circled in green. A blue arrow labeled 'Expanded Main Category' points to the right, where the expanded view is shown. In the expanded view, the 'Natural Resources' category is checked (green checkmark) and circled in green. Below it, 'Tidal Marsh' is also checked (green checkmark) and circled in green. Other sub-categories and data layers are shown with their respective checkboxes: 'Nontidal NWI Wetlands (all Virginia)' is unchecked (red circle), 'Submerged Aquatic Vegetation (SAV)' is unchecked (red circle), 'SAV (most recent)' is checked (green checkmark), 'SAV Habitat' is checked (green checkmark), 'SAV Habitat (5 years)' is checked (green checkmark), and 'SAV Habitat (10 years)' is unchecked. To the right of the expanded view, text explains the status of each category: 'Main Category & Data Layer Checked' (green), 'Tidal marshes will be displayed on map' (green), 'No Display' (red), 'Main Category checked at top' (green), 'Natural Resources Data layers checked' (green), and 'Sub-category not checked' (red).

**Main Category & Data Layer Checked**

**Tidal marshes will be displayed on map**

**No Display**


**Main Category checked at top**


**Natural Resources Data layers checked**

**Sub-category not checked**


**TIP:** Boxes must be checked next to the main category at the top of the layer list, a sub-category if there is one AND the data layer for map display. If a data layer does not display on the map, make sure all the category boxes are checked also.

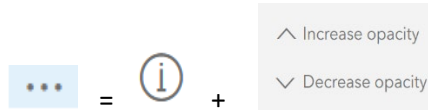
## Layer Legend

Click the Layer Legend icon  for a list of all layers checked on and displayed on the map. The legend is arranged in the same order as the Layer List.


Click  to close the Layer Legend.

## Layer Options

Some layers have controls for information and transparency located under More Options . The More Options button is blue when expanded.



Click Increase opacity to make the layer opaquer, or less transparent. Click Decrease opacity to increase transparency to see through a layer to other layers underneath on the map.

Click  to collapse More Options.

## Scale-Dependent Layers

Some layers are scale-dependent and will only appear after the user zooms in or out. These layers are "greyed out" in the layer list until a suitable scale is reached. The following layers have a set display scale and will appear when zoomed to and below:

- Flood Hazard Zones 1:50,000
- Limit of Moderate Wave Action (LiMWA) 1:50,000
- Coastal Barrier Resource System 1:3,000,000
- Infrastructure Layers (most) 1:300,000
- Parcels 1:100,000
- Hydrology 1:500,000
- Contours 1:50,000



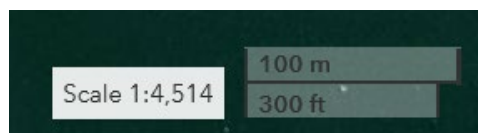
Zoomed too far out, will not display



Zoomed in close enough to display

## Map Scale

A map scale is located in the lower right corner. The size of the white bars indicates the scale for the distance shown in metric and English units. Use the scale ratio to determine where the zoom level needs to be to display scale-dependent layers.




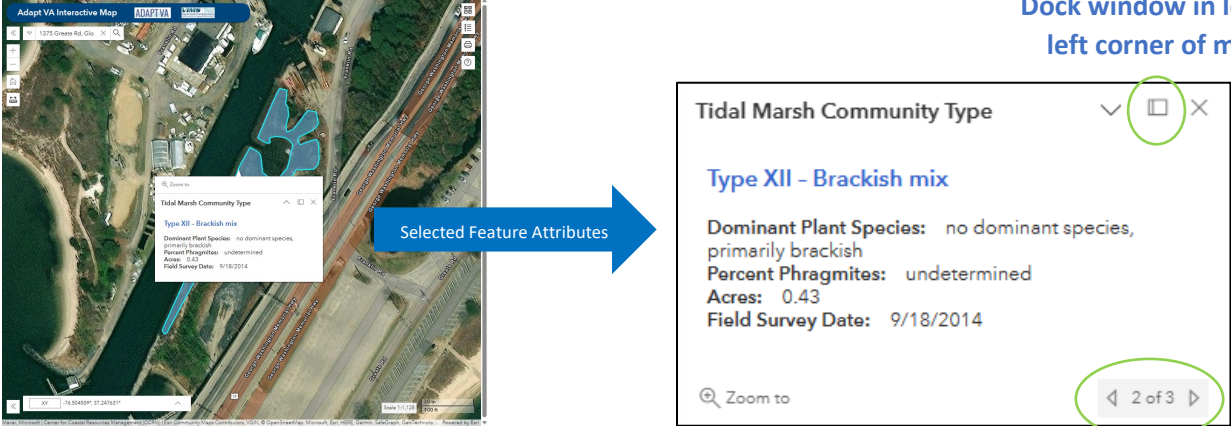
## Identify Mapped Features

Each GIS data layer contains **Features** that are mapped points, lines, or polygons with unique characteristics.

Click on a mapped feature and a pop-up window will display more details about the feature. Information can only be retrieved for layers that are selected for display in the Layer List.

The selected feature will be outlined. If more than one feature is displayed in the same vicinity, the pop-up window will have more than one page of feature information. Scroll through arrows to find feature of interest.

The pop-up window can be docked to the lower left of the map by clicking  .



**Dock window in lower left corner of map**


**Selected Feature Attributes**


**Number of displayed features**

**TIP: When several layers are displayed together, the attribute window will have more than one page of feature information. Look for a gray box with the number of layers between arrows. Scroll through these pages to find the feature of interest.**

## Print Tool



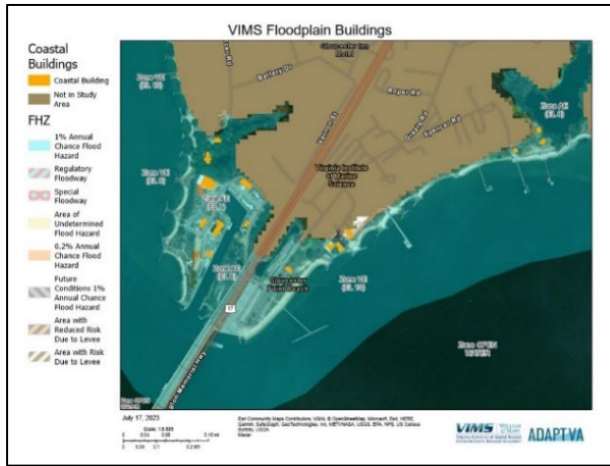
Click the Print tool button  to open a panel with settings for saving a copy of a map display. Select the Layout tab to export a map with a legend. Enter a map title, select landscape or portrait orientation, and the file format.

Select the Map only tab to capture just the map display without a legend. Adjust the width and height for size and choose an orientation. Switch between these two orientations by clicking  .

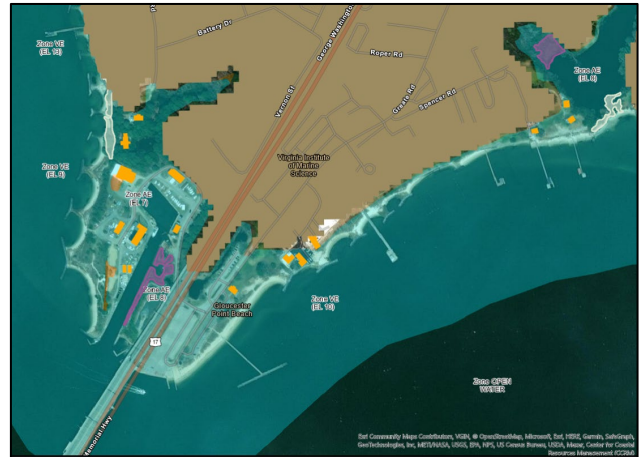
Click Export to generate the file. Click on a file name to download it. A list of exported files from each session will appear on the Export panel.

## Print Tool Layout Examples

Layout Print Export with legend



Map Only Export without legend



**Tip:** Multiple export file formats are available. A list of exported files for downloading will appear at the bottom of the Print Tool window.

### GENERAL NAVIGATION TIP:



Frequently Asked Questions are located in Help & Information

## GIS Data Layer Descriptions

Additional information about some of the GIS data layers.

### INFRASTRUCTURE

#### General Infrastructure

The sub-category General Infrastructure includes facilities that may be needed during emergency response, such as fire and emergency management stations, law enforcement buildings, hospitals, airports, educational facilities, places of worship and airports. All facility types are checked on by default at the data layer level only.

#### Virginia Parcels

Virginia parcels were retrieved from the Virginia GIS clearinghouse portal. These parcel boundaries represent legal descriptions of property ownership as recorded in various public documents in local jurisdictions. Tax parcel boundaries have not been edge-matched across municipal boundaries. The parcel geography and attributes are intended for map and spatial analysis only, and not for use as legal descriptions or property surveys.

This layer has a set display scale and will only appear when zoomed to and below 1:100,000. The layer name will be grayed out until the display scale is reached.



Zoomed too far out, parcels will not display



Zoomed in close enough to display parcels

#### Road Centerlines

Road centerlines are retrieved from the Virginia GIS clearinghouse portal. It is a dynamic, statewide dataset supported by local governments, VDOT, and the Virginia Geographic Information Network as part of the Virginia Base Mapping Program.

#### Infrastructure at less than 10 feet land elevation

Critical facilities and other coastal buildings located in the lowest-lying geography below 10 feet of land elevation can be displayed with two data layers. Coastal building footprints are included from the VGIN Virginia Footprint Dataset (2017) and Virginia Land Cover Dataset (2016). Only buildings greater than 870 square feet are included to leave out small buildings like detached garages and accessory buildings.

**TIP:** A statewide Building Footprint data layer is available in other map viewers, e.g. Virginia Flood Risk Information System <https://consapps.dcr.virginia.gov/VFRIS/>

### NATURAL RESOURCES

#### Tidal Marsh

Tidal Marsh areas were derived from the VIMS Tidal Marsh Inventory conducted for each locality over different time spans. The same Tidal Marsh data layer is available at the top of the Natural Resources layer list and again under Natural and Nature-Based Features less than 10 feet land elevation. Tidal marshes observed during these field surveys are categorized based on the dominant plant species observed. Use the feature identification tool to locate the tidal marsh size, field survey date, plus dominant plant species and the percent *Phragmites australis* observed.

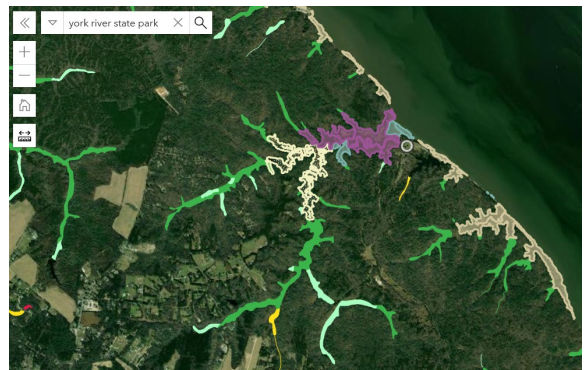
### Natural and Nature-Based Features (NNBFs) less than 10 feet land elevation

This sub-category was derived from a project that identified vulnerable land and buildings located below 10 feet land elevation. Various Natural features can be displayed, including Tidal Marsh and other wetlands, Beaches and Dunes. Nature-based features include a select group of living shoreline projects with permit records from 2002-2018. Natural features were obtained from existing shoreline and wetland inventories and the VGIN Virginia Land Cover Dataset (2016).

### Nontidal NWI Wetlands (all Virginia)

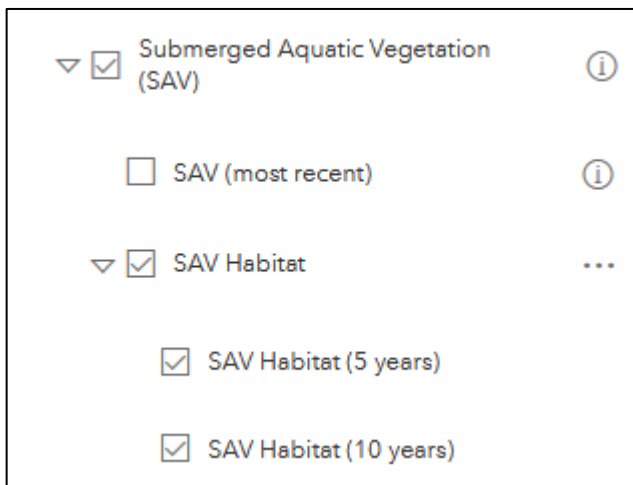
This layer displays nontidal wetlands extracted in 2021 from the National Wetlands Inventory. Each wetland was assessed for water quality and habitat condition based on surrounding landscape patterns and individual wetland characteristics. Visit Virginia Department of Environmental Quality to learn more about the wetland condition assessment.

**TIP: View tidal and non-tidal adjacent wetlands by displaying Tidal Marsh + Nontidal NWI Wetlands.**



### Submerged Aquatic Vegetation (SAV)

Three data layers from the VIMS SAV Monitoring and Restoration Program are available to view SAV habitat in shallow nearshore areas, including the most recent inventory plus composite maps from the past 5 and 10 years. Click on a SAV (most recent) polygon in the map to see the SAV survey year and bed density. Click on a SAV Habitat 5 or 10 year composite area to see the timeframe used.



**TIP: To view 5 & 10-year SAV composites on the map, check the main category at the top PLUS the sub-category SAV Habitat PLUS the data layers**

## Shoreline Conditions

Shoreline characteristics from the VIMS Shoreline Inventory are displayed under Shoreline Conditions. Bank Height was estimated from imagery, field inspection, videography, LiDAR or a combination of all data sources. Bank Cover, Tree Fringe, and *Phragmites australis* layers display vegetation observed at the time of the inventory. Two different baseline Shorelines are available. These are not tidally referenced or surveyed. These lines are used in GIS to code other features along the same line.

## Hydrology

Layers in this category are extracted from USGS National Hydrography Products to represent water drainage areas and flow lines. Hydrologic Units (12-digit) represent delineated drainage areas that can be nested into larger drainage systems. The National Hydrography Dataset (NHD) represents flow lines for streams, rivers and artificial flow paths.

## Contours

Topographic contours are provided through the USGS National Map Contours map service. It displays contours developed from the National Elevation Dataset. This is a scale-dependent layer that only displays at scales 1:50,000 and below. Contour intervals vary across Virginia with the smallest contour being 5 feet.

# AdaptVA Models & Forecasts

## *Shoreline Management – Living Shorelines*

### Shoreline Management Model

The Shoreline Management Model (SMM) layer provides a recommended approach for tidal shoreline erosion control based on input from other available GIS data layers. The model accuracy depends on the availability and timeframe of the data.

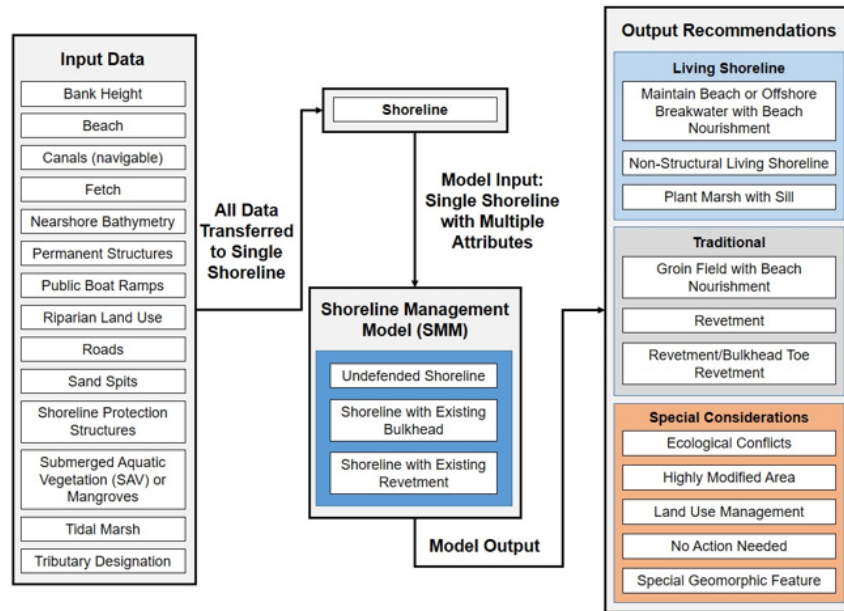
The Shoreline Management model recommendations include six specific management practices, including living shorelines. Another five recommendations are based on the need for special considerations, like the presence of submerged aquatic vegetation close to the shoreline, highly modified areas, or special geomorphic features. Additional information is available at the SMM-Virginia web site about all eleven SMM recommendation categories. <https://www.vims.edu/ccrm/advisory/ccrmp/bmp/smm/virginia/index.php>

Shoreline conditions that factor into the recommendations include, but are not limited to, presence of tidal marsh, beach, and submerged aquatic vegetation (SAV), riparian land cover, bank height, nearshore bathymetry, fetch, proximity of roads and other structures, and the presence or absence of existing shoreline defense structures.

Other important suitability parameters are not available as remotely sensed GIS data layers and are not included in this model. These additional considerations include shoreline length, erosion rates, flooding potential, boat wakes and other navigation concerns (proximity to channels and mooring facilities, sand migration), potentially conflicting land and water uses, and others.



## Shoreline Management Model flow diagram



Source: Nunez, Karinna; Rudnick, Tamia; Mason, Pamela; Tombleson, Christine; and Berman, Marcia, A geospatial modeling approach to assess site suitability of living shorelines and emphasize best shoreline management practices (2022). *Ecological Engineering*, 179, 106617. doi: 10.1016/j.ecoleng.2022.106617

### Living Shorelines: Suitable Areas for Marsh Ranked for Co-Benefits

This layer shows areas determined to be suitable for non-structural plant marsh or plant marsh with sill recommendations, as determined by the Shoreline Management Model (SMM). These areas are ranked for potential co-benefits provided using a scoring method that considers nutrient removal potential, benefits provided to coastal buildings, the potential for the project to provide habitat continuity and enhancement, and the potential for the project to add resilience for socially vulnerable communities. Additional information is available in a report *Expanding the Use of Natural and Nature-Based Infrastructure to Enhance Coastal Resiliency Final Project Report 2021*. <https://scholarworks.wm.edu/reports/2384/>

### Protected Lands Suitable for Living Shorelines

This layer identifies possible locations for living shoreline treatments on existing Conservation Lands. It combines conservation lands from the DCR Conservation Lands Database with living shoreline treatment options from the output of the Shoreline Management Model version 5. Protected Lands living shoreline treatments are described with the feature identification tool.

### Coastal NNBFs Ranked: Benefits to Coastal Buildings

This layer displays Natural and Nature-Based Features (NNBFs) located on lands that are generally less than 10 feet in elevation. Each NNBF is ranked by their benefits provided to buildings and localities. NNBFs were categorized into three groups: Some Benefits, Many Benefits, and the Most Benefits provided. Rankings are based on a characterization of four components: tidal flooding mitigation, how many buildings the NNBF benefits, if there are any critical facilities that the NNBF benefits, and if the NNBF can be used to take advantage of existing programmatic incentives (e.g., FEMA Community Rating System Open Space credits).

Additional information is available at a web site dedicated to Nature-Based Solutions. [https://www.vims.edu/ccrm/research/climate\\_change/adaptation/nnbfs/index.php](https://www.vims.edu/ccrm/research/climate_change/adaptation/nnbfs/index.php)

### Resource Protection Area (RPA) 100-foot Buffer

There are three related GIS data layers in this sub-category. None of these visualizations represent jurisdictional boundaries and should not be used for legal purposes. They are intended to compliment, not replace, locality maps and site-specific delineations.

**100-ft RPA Buffer:** This layer depicts a 100-ft wide buffer landward of Resource Protection Area features, including wetlands and streams connected by surface flow to the Chesapeake Bay and/or tidal shores. The City of Virginia Beach and Arlington County also include steep slopes in their RPA buffer definition. Locality data used for this layer varies in date and delineation approach. For localities without existing GIS data for this layer, data sources included the Tidal Marsh Inventory, National Wetlands Inventory, and the National Hydrography Dataset.

**Pervious Area in RPA 100-ft Buffer:** This layer depicts pervious land cover within the RPA 100-foot buffer. Pervious land cover includes all natural cover, turfgrass, and agricultural lands. The combined data sources include VGIN Land Cover Dataset (2016) and Individual Localities.

**Pervious SFHA Area in 100-ft Buffer:** This layer depicts pervious land cover (all natural cover, turfgrass, and agricultural lands) within both the FEMA Special Flood Hazard Area (SFHA) and the Chesapeake Bay Resource Protection Area (RPA) 100-ft buffer for coastal Virginia localities. The combined data sources include FEMA, VGIN Land Cover Dataset (2016), and Individual Localities.

### Potential 2050 Upland Interface Shoreline

The projected 2050 shoreline location depends upon the presence/absence of tidal wetlands. Where absent, the 2050 shoreline is the projected location of Mean High Water (0.9m elevation). Where Potential 2050 Wetlands are present, the 2050 shoreline is the interface between wetlands and the upland (1.5m elevation).

### Potential 2050 Wetlands

The Potential 2050 Wetlands visualization shows the forecasted future location of existing tidal wetlands and immediately adjacent non-tidal wetlands that meet Resource Protection Area criteria, along with upland areas within the NOAA Intermediate High projected sea level rise area expected to be flooded daily by high tides and to become tidal wetlands by 2050.

### Sea Level 5-yr Intervals

NOAA sea level rise predictions for the intermediate-high projection (2017) are displayed in five-year time steps mapped to provide decision support for the Virginia Chesapeake Bay Preservation Act program. The data layers display forecasted inundation areas at mean high water. They exclude inundation depth on the ground of less than 0.5 feet (six inches) and only show inundation depth on the ground of 0.5 feet and greater.

Additional information about all of the Chesapeake Bay Preservation Act related data layers and models is available in a report *New Guidance to Build Resiliency and Mitigate for Sea Level Rise as Elements of the Chesapeake Bay Preservation Act 2021*. <https://scholarworks.wm.edu/reports/2839/>

## Sea Level Rise / Flooding / Storm Surge

### Sea Level Rise (mean high water)

Sea level rise refers to the gradual increase in the vertical elevation of the average, or mean, tide level. The elevation of high and low tides fluctuates above and below the mean sea level. The forecasted rise of the mean sea level can be displayed in different ways on GIS maps.

Sea level rise visualization in the AdaptVA interactive map starts with accurate land elevation surface data (LiDAR). Land elevation surfaces were converted to a Mean High Water reference using VDatum.

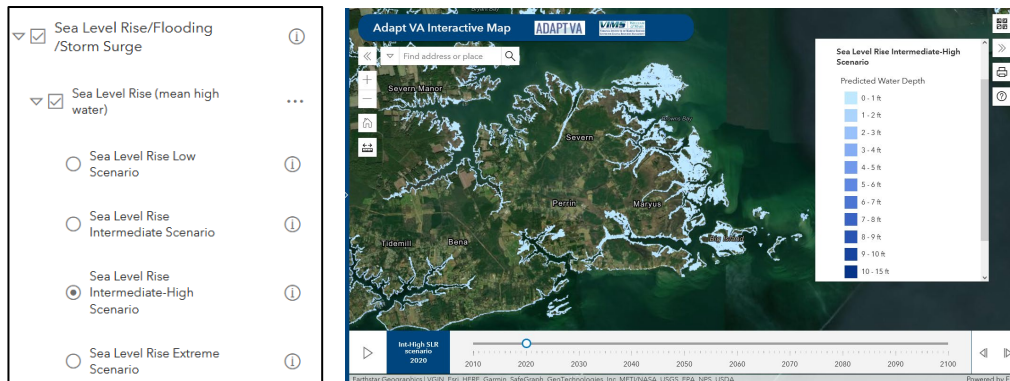
Four sea level rise scenarios are based on NOAA 2017 sea level projections: Low, Intermediate, Intermediate-High, and Extreme. NOAA's relative sea level rise rates were further adjusted by adding a constant estimation of land subsidence in southeastern Virginia of 3.1 mm/yr (Sewell's Point).

For map display, the main category **Sea Level Rise/Flooding/Storm Surge** and the sub-category **Sea Level Rise** are checked on by default. This automatically displays the Intermediate High sea level rise scenario with a time slider bar at the bottom of the map set by default at 2020 when the map is first opened.

The map displays the projected location of Mean High Water under the selected scenario and timeframe. The areas shaded in blue are expected to be flooded daily at high tide for the time selected. Darker shades indicate deeper inundation above the land surface.

**TIP: Only one of the four sea level rise scenarios can be displayed at a time.**

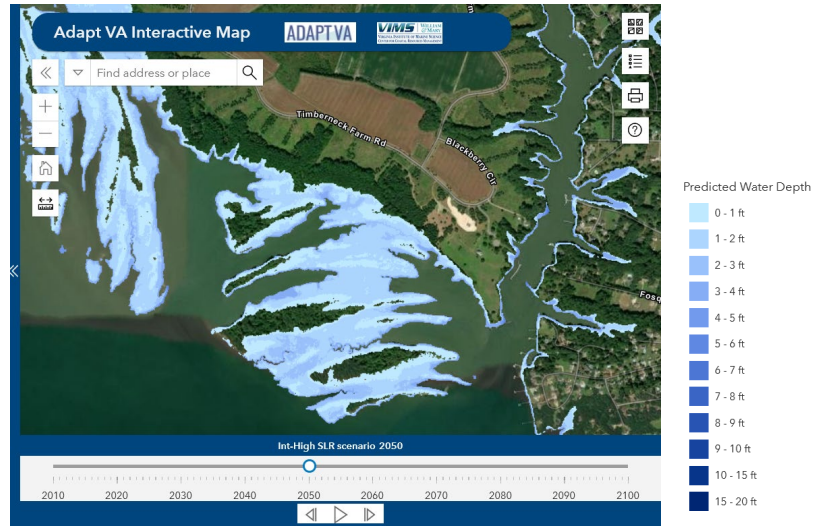
### Default Sea Level Rise Map Display





10-yr time slider default set at 2020

## Sea Level Rise (mean high water) *continued*

Land areas shaded in blue are expected to be flooded by regular high tides, at the year indicated on the time slider bar.



The time slider appears at the bottom of the map only when the Sea Level Rise main category AND sub-category are checked on. Only 10-yr time steps are available. Click the Play arrow to automatically move through the decades, click forward or back arrows for single decade steps, or drag the blue circle along the time slider to see how the mean high water inundation areas are forecast to change over time.

**TIP:** Increase transparency of the sea level rise scenario by clicking  next to the sub-category Sea Level Rise (mean high water). Then click the down arrow next to Decrease opacity. Click  to close the More Options button.

This sea level rise visualization does not represent the extent of all potential tidal flooding. Actual high tides will likely occur above and below the inundation areas depicted on the map. Precipitation flooding is not included with this model.

**TIP:** To remove time slider from map display, uncheck box next to either main Sea Level Rise category or sub-category. The slider will re-appear when a sea level rise scenario layer and the associated category layers are checked on.

## Flooding

There are three related GIS data layers in the Flooding sub-category from FEMA and the Coastal Barrier Resources System (CBRS) REST map services. When FEMA and CBRS update the data in their services, changes will appear in the AdaptVA Interactive Map. Consult with local floodplain managers for the most current FEMA flood maps.

**Limit of Moderate Wave Action (LiMWA):** This layer depicts the inland limit where breaking waves are expected to reach during a 1% annual chance flood event. See FEMA’s LiMWA Fact Sheet for more information. [https://www.fema.gov/sites/default/files/documents/fema\\_using-limit-oderate-wave-action\\_fact-sheet\\_5-24-2021.pdf](https://www.fema.gov/sites/default/files/documents/fema_using-limit-oderate-wave-action_fact-sheet_5-24-2021.pdf)

**Flood Hazard Zones:** FEMA has classified geographic areas into flood hazard zones according to the severity or type of potential flooding. Moderate to Low Risk Areas are defined as zone B, C, or X (shaded or unshaded). High Risk Areas are flood zones beginning with the letters A or V. For more information visit FEMA’s Flood Maps. <https://www.fema.gov/flood-maps>

**Coastal Barrier Resource System:** This layer includes mostly undeveloped areas along the Atlantic, Gulf of Mexico, Great Lakes, U.S. Virgin Island, and Puerto Rico coastlines where federal incentives for development is not allowed. Visit the USFWS Coastal Barrier Resources Act web page for more information. <https://www.fws.gov/program/coastal-barrier-resources-act>

## Storm Surge

Storm surge is defined as the abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Flooding from storm surge depends on many factors, such as the track, intensity, size, and forward speed of the hurricane and the characteristics of the coastline where it comes ashore or passes nearby. This layer displays output from the hydrodynamic SLOSH model (Sea, Lake, and Overland Surges from Hurricanes), a numerical model used by the National Weather Service (NWS) to generate National Storm Surge Risk Maps with expected flood heights during different tropical storm intensities (Category 1 – 4).

Select one or more storm scenarios, then view what the storm surge depth above ground is expected to be using the Feature Identification tool. Darker shades of orange indicate deeper storm surge depths. Lighter shades of yellow indicate shallower depths.

**TIP: Check more than one Storm Surge Category storm and use the Feature Identification tool to evaluate how expected depth changes with storm intensity.**



<b>Storm Surge Category 4</b> The SLOSH Category 4 hurricane storm surge is predicted to be 17 to 18 feet above ground Zoom to 1 of 4
<b>Storm Surge Category 3</b> The SLOSH Category 3 hurricane storm surge is predicted to be 13 to 14 feet above ground Zoom to 2 of 4
<b>Storm Surge Category 2</b> The SLOSH Category 2 hurricane storm surge is predicted to be 09 to 10 feet above ground Zoom to 3 of 4
<b>Storm Surge Category 1</b> The SLOSH Category 1 hurricane storm surge is predicted to be 05 to 06 feet above ground Zoom to 4 of 4

## *Vulnerability / Risk*

### **Tidal Marsh Vulnerability Assessment**

This project assessed the vulnerability of tidal marshes to climate change for the time periods 2050 and 2100 throughout Virginia. The vulnerability scores given to the marshes combine exposure, habitat potential for sentinel species, sensitivity and adaptive capacity of wetland habitats within tidally-connected wetland complexes.

### **Social Vulnerability**

Available Social Vulnerability layers use census tract data and many different vulnerability factors to assign an easy to interpret **Social Vulnerability Index Score** which can be ranked relative to other areas. The **Vulnerable Housing Classification** layer assesses housing stock likely to face higher than usual damages in the event of a hurricane or Nor'easter. The **Hazardous/Toxic Index Score** measures the potential exposure to hazardous and toxic substances based on the types of facilities and amount of hazardous and toxic pollutants in the census tract. **Social Vulnerability Index by Block Group** uses data from the 2015-2019 American Community Survey at the census block group level.

### **Physical Risk**

The Physical Vulnerability Index provides a general context for vulnerability to general flood impact in Virginia's Tidewater region. It creates a composite measure of general flood impact rather than the threat of any one particular storm track.

### ***AdaptVA Interactive Map Contact Info***

General Information [adaptva@vims.edu](mailto:adaptva@vims.edu)

GIS maps, tools, data and downloads Karinna Nunez [karinna@vims.edu](mailto:karinna@vims.edu)

Planning, policy, local ordinances, comprehensive planning Pam Mason [mason@vims.edu](mailto:mason@vims.edu)

Sea level rise projections, sea level report cards, Tidewatch Maps<sup>®</sup> Molly Mitchell [molly@vims.edu](mailto:molly@vims.edu)

### ***Recommended Citation***

VIMS Center for Coastal Resources Management. 2023. *AdaptVA Interactive Map User Guide*. Final Guide August 2023. Virginia Institute of Marine Science, William & Mary.

## Appendix A. AdaptVA Resources

### AdaptVA Interactive Map Quick Guides

Map Symbols Quick Guide

GIS Layer List Quick Guide

### VIMS YouTube Channel

**ADAPTVA.ORG orientation** featuring VIMS emeritus professor Carl Hershner, April 2020 (7:43)  
<https://www.youtube.com/watch?v=1FeHH8e-79w>

**ADAPTVA.ORG background** featuring VIMS scientist Pam Mason VIMS Marine Science Day, May 2021  
 (21:34) <https://www.youtube.com/watch?v=pPrOwULiYfY>

### AdaptVA Recommended Citations

ADAPTVA <a href="http://adaptva.org/">http://adaptva.org/</a>	Center for Coastal Resources Management (CCRM). <i>AdaptVA</i> . Virginia Institute of Marine Science, William & Mary. <a href="http://adaptva.org/">http://adaptva.org/</a> . Accessed {date}.
AdaptVA Interactive Map <a href="https://cmap22.vims.edu/AdaptVA/AdaptVA_viewer.html">https://cmap22.vims.edu/AdaptVA/AdaptVA_viewer.html</a>	Center for Coastal Resources Management (CCRM). <i>AdaptVA Interactive Map</i> . Virginia Institute of Marine Science, William & Mary. <a href="https://cmap22.vims.edu/AdaptVA/AdaptVA_viewer.html">https://cmap22.vims.edu/AdaptVA/AdaptVA_viewer.html</a> . Accessed {date}.
Locality Road Flood Tool <a href="https://cmap22.vims.edu/Roads_Impacts/Inaccessible/index.html">https://cmap22.vims.edu/Roads_Impacts/Inaccessible/index.html</a>	Center for Coastal Resources Management (CCRM). <i>VA Road Accessibility and Flooding</i> . Virginia Institute of Marine Science, William & Mary. <a href="https://cmap22.vims.edu/Roads_Impacts/Inaccessible/index.html">https://cmap22.vims.edu/Roads_Impacts/Inaccessible/index.html</a> . Accessed {date}.
VA Wastewater Data Viewer <a href="https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/">https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/</a>	Center for Coastal Resources Management (CCRM). <i>VA Wastewater Data Viewer</i> . Virginia Institute of Marine Science, William & Mary. <a href="https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/">https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/</a> . Accessed {date}.
Sea Level Projection Viewer <a href="http://cmap2.vims.edu/SeaLevelRise_Depth/SLRDepth_revised4.html">http://cmap2.vims.edu/SeaLevelRise_Depth/SLRDepth_revised4.html</a>	Center for Coastal Resources Management (CCRM). <i>Sea Level Projection Viewer</i> . Virginia Institute of Marine Science, William & Mary. <a href="https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/">https://experience.arcgis.com/experience/4c8fea3204fd47cc842df6b0de92ee3f/</a> . Accessed {date}.
Sea-Level Report Cards <a href="https://www.vims.edu/research/products/slrc/index.php">https://www.vims.edu/research/products/slrc/index.php</a>	Virginia Institute of Marine Science. <i>Sea-Level Report Cards</i> . <a href="https://www.vims.edu/research/products/slrc/index.php">https://www.vims.edu/research/products/slrc/index.php</a> . Accessed {date}.
Tidewatch Map <a href="https://cmap2.vims.edu/SCHISM/TidewatchViewer.html">https://cmap2.vims.edu/SCHISM/TidewatchViewer.html</a>	Center for Coastal Resources Management (CCRM). <i>Tidewatch Map</i> . Virginia Institute of Marine Science, William & Mary. <a href="https://cmap2.vims.edu/SCHISM/TidewatchViewer.html">https://cmap2.vims.edu/SCHISM/TidewatchViewer.html</a> . Accessed {date}.