

Virginia Eastern Shore Coastal Resilience Tool

Introductory Workshop & Training Manual

Skills & Exercises

Learning Outcomes

- I. Desired Learning Outcomes – Participants will be able to:
 1. Briefly explain the purpose, use and limitations of the Coastal Resilience Tool to support decision-making.
 2. Activate and use the **Flood & Sea Level Rise** app, including the following options and settings:
 - a. **Choose a Data Source** for **Basic Inundation** or **Storm Surge**
 - b. **Scenario Year**
 - c. **SLR** (Sea Level Rise)
 - d. **Storm Type**
 - e. Additional Layers
 - f. **Opacity**
 3. Navigate around the map to **Zoom** in and out and **Pan** by:
 - a. Zoom in and out using the +/- buttons or the mouse wheel
 - b. Pan by clicking on the map, holding the mouse button down and dragging
 4. Activate and use the **Future Habitat** app, including the following options and settings:
 - a. **Choose Parameters**
 - b. Scenario Year
 - c. Draw a **User Defined Area** and **Zoom to Selection**
 - d. **Filter Results by Habitat(s) of Interest**
 - e. Find the analysis results in the **Results & Chart** tab and the **Compare & Chart** tab
 5. Activate and use the **Map Layers** app and set the following parameters:
 - a. Set the data points on the map within the following layer options:
 - i. **Base Data**
 - ii. **Infrastructure**
 - iii. **Coastal Management**
 - iv. **Habitats**
 - v. **Physical Features**
 - vi. **Social and Economic**
 - b. Set the **Opacity**
 - c. Use the layers in combination with other apps
 - d. Use the **Clear All** function to remove all layers
 6. See a demonstration of how the **Launch Pad** can be used to have a pre-set map ready to show others or use as a teaching example
 7. Briefly explain the key points of the **Flood & Sea Level Rise**, **Future Habitat**, and **Map Layers** app as follows:

- a. The difference between **Low**, **High**, and **Highest SLR** (sea level rise)
 - b. **Scenario Years**
 - c. **Inundation**
 - d. **Storm Surge**
 - e. **Opacity**
8. Activate the **Split View** and **Link** tool to show two maps and use apps to compare data in two maps
 9. Use the map tools to **Search** for an area, draw a **User Defined Area**, zoom in and pan around an area and use the apps on that particular area
 10. Use the **Save & Share** function to save a map, copy the link and share it with others for later use a particular map

Skills and Exercises

Open the Coastal Resilience Tool for the Eastern Shore of Virginia:

maps.coastalresilience.org/Virginia

Click on Explore the Map in the “Getting Started” Launch Pad window.

I. CR Tool Basic Skills – Navigation & Apps

a. Flood & Sea Level Rise App – Basic Inundation Option

Click on the Flood & Sea Level Rise App on left

Click on Choose Data Source in the upper left corner

Click on Basic Inundation

Note that the Map Legend in the bottom right corner is now populated

Look at the three sea level options under Choose SLR (Sea Level Rise)

Click on the blue “i” for information on SLR

Click on the “X” to close the “i” SLR info window

Slide the bar to set SLR to High

Look at the four options under Choose a Scenario Year

Slide the bar to set Scenario Year to 2040

Look at the results

Set Scenario Year to 2065

Set Scenario Year to 2100 – set SLR to Highest

Minimize the App by clicking on the Minimize button on the top right corner of the App window

Click on App to reopen (note App button is blue when still active)

Zoom in by clicking on the plus sign [+] on the left or using the mouse wheel

Pan: move the map by dragging the screen: hold left mouse button down and move

Zoom out by clicking on the minus sign [-] on the left or using the mouse wheel

Click on the lower right corner and pull on App to expand view

maps.coastalresilience.org/Virginia

Close the Flood and Sea Level Rise App by clicking on the “X” in the top right corner

Return the map to the full extent view by clicking on globe button on the left

Press F5 (reload/refresh) to clear the map

Click on “Explore the Map” in the Launch Pad

SKILLS COMPLETED

Choose Basic Inundation, set SLR to High and Scenario Year to 2040, 2065, 2100

Choose Basic Inundation, set SLR to Highest and Scenario Year to 2040, 2065, 2100

Click on the zoom in [+] and zoom out [-] tools, and pan around the map using the mouse

Return map to the full extent main view

NOTES:

b. Future Habitat App

Click on the Future Habitat App on left

Click continue (you may need to check box to skip the opening picture)

Begin with the Choose Parameters tab

Set the Scenario Year to 2065

Set the SLR to High

Check the box for Salt Marsh under Filter the Results by Habitat of Interest

Look under the Filter Results by a User Defined Area section

Click on Click to Draw an Area - the cursor is now active and ready to draw a shape

Draw a shape with at least three sides – click once for each point and twice for the final point to end [don’t hold the mouse button down as you draw]

Zoom in by clicking on Zoom to Selection

View the results [see legend]

Click on Clear Filters to remove the Draw Area

Close the app

Return to full extent (click on the globe to the left)

Press F5 to clear the map

Click on “Explore the Map” in the Launch Pad

SKILLS COMPLETED

Choose Scenario Year 2065, set SLR to HIGH, click on Click to Draw an Area, create a box around a particular area, click on Zoom to Selection, and filter results by salt marsh

NOTES:

c. Flood and Sea Level Rise App - Storm Surge Option

Click on the Flood & Sea Level Rise App on the left

Click on Choose Data Source

Click on Storm Surge

Notice that the app shows Nor'Ida impacts when opened

Click on the blue "i" as needed

Look at the three options under Choose a Scenario Year

Slide bar to set Scenario Year to 2040

Look at the four options under Choose a Storm Type

Slide bar to set Storm Type to Moderate Intensity

Look at the options under Depth or Difference and notice that the app is automatically set to Water Depth (ft)

Use the scroll bar at the right (if necessary) to view the Additional Layers below or expand the size of App by pulling on lower right corner

Click on the Show tidal range option

Hold a shift key and draw to zoom on an area to focus on

Minimize the Legend for a clear view

Re-open the Legend by clicking on the button on the left above the globe

Close the app

Return to full extent (click on the globe to the left)

Press F5 to clear the map

Click on "Explore the Map" in the Launch Pad

SKILLS COMPLETED

_____ Choose Storm Surge, set Scenario Year to 2040, set Storm Type to Nor'Ida, then to Moderate Intensity

_____ Choose Storm Surge, set Scenario Year to 2065, set Storm Type to Moderate Intensity, and set Depth or Difference to Water Depth

_____ Under Additional Layers, select Show Tidal Range

NOTES:

d. Map Layers App and Use with Future Habitat

[NOTE: When using the Map Layers App with other Apps, always open the Map Layers App last]

Click open the Future Habitat App

Choose the Year 2065

Choose the SLR Scenario at High

Click on the Map Layers App on the left

Click on the plus signs (+) to open the menu for Virginia

Click on plus sign to open each menu for:

Base Data

Infrastructure

Coastal Management

Habitats

Physical Features

Social and Economic

Look at available options under each menu (roads, schools, populations, etc.)

Click the checkboxes beside Infrastructure. Look at the options specific to roads.

Click each checkbox for the Roads Vulnerable to 1 ft, 2 ft, and 3 ft Sea Level Rise

[NOTE: This step allows the Map Layers to show over the Future Habitat App]

Look for roads covered by water or marshes

Use the zoom in [+] tool to get a closer look

Click on Clear All to remove all layers

Close the app

Return to full extent (click on the globe to the left)

Press F5 to clear the map

Click on "Explore the Map" in the Launch Pad

SKILLS COMPLETED

____ Map Layers with Future Habitat App:

Click on Map Layers. Under Infrastructure, click checkboxes for Roads vulnerable to 1 ft., 2 ft. and 3 ft. Sea Level Rise. Open Future Habitat and set Scenario Year to 2065 and SLR to High. Look at how the roads have been covered by water or marshes. Zoom in [+] for a better view.

NOTES:

II. Next Level Skills – Additional Tools

a. Search Tool, Imagery, Use of Split Screen, & Measuring

SEARCH TOOL & IMAGERY

To find a particular area on the map by name, use the search tool

Click on the search tool (magnifying glass button) at the top left, type the name of the location into the search bar, and hit enter. Search for Brownsville, Virginia.

Choose the correct location from the dropdown menu: “Brownsville (historical) Virginia, United States”

Close the search function by clicking on the “X” icon twice

Open the Flood & Sea Level Rise App on the left

Click on Choose Data Source and select Basic Inundation

Set Choose SLR to Low and set Scenario Year to 2100

Change the background layer type by mousing over the dropdown menu at the top right (currently says “Topographic”). Click on the Imagery option.

In the Flood & Sea Level Rise App window, find the Layer Properties slider bar.

Set the Layer Properties bar to more transparent in order to see the background layer below the Flood & Sea Level Rise App layer

SPLIT SCREEN TOOL & MEASURING

Now you can split the screen to compare two maps

Click on Split View on the bottom left

Minimize open apps and legends so you have a clear view of both Maps

Note that the second map (Map 2) does not start with the same background layer or apps as Map 1

Click on Link Maps at the bottom of the middle bar – this locks the maps together so Map 2 follows any zoom or pan changes in Map 1

Click on the zoom out [-] tool in Map 1 and watch Map 2 respond

This feature allows you to do a side-by-side comparison of scenarios

Change the background layer for Map 2 to Imagery so it matches Map 1

Open the Flood & Sea Level Rise App in the middle bar (for Map 2)

Click on Choose Data Source and select Basic Inundation

Set Choose SLR to High and set Scenario Year to 2100. Minimize the App.

Compare the two SLR scenarios between maps

Adjust Opacity to be equal on both maps

YOU ARE NOW COMPARING 2 MAPS IN THE YEAR 2100, ONE SHOWING LOW SLR AND ONE SHOWING HIGH SLR

You may have to pan to get back to Brownsville

Click on the measure tool (ruler symbol) on the left side of either map

Measure the length of the narrow pond at the northwest edge of the Brownsville grounds by clicking once at the start point and double-clicking at the end.

Note the information box with results, then click the “X” next to the tool to close the results window

SAVE AND SHARE

Click on Save and Share

Copy the permalink at the top

Paste the URL into a new browser window [opens to the same maps where you left off]

You can send this URL to colleagues to view the same maps

Close all apps (in both maps).

Return to full extent (click on the globe to the left)

Press F5 to clear the map

SKILLS COMPLETED

____ Search tool and imagery:

Map 1: Type the location Brownsville, Virginia, into the search bar, open the Basic Inundation App, set Choose SLR to Low, set Scenario Year to 2100, select Imagery from the background layer dropdown menu, and change the Flood & Sea Level Rise Layer Properties slider to more transparent.

____ Split screen and measuring:

Map 2: Click on Split View, minimize open apps, click on Link Maps, change the background layer of Map 2 to Imagery, open the Basic Inundation App in Map 2, set Choose SLR to High, set Scenario Year to 2100, and minimize the app. Compare the inundation maps for Brownsville in the present and future conditions. Click on the measure tool and measure the length of the narrow pond at Brownsville by clicking once at the start and double-clicking at the end.

____ Save and Share function

III. Exercises

a. Future Habitat App – Use of the Brownsville, VA Map

Search for Brownsville, Virginia. Choose the third (“historical”) option.

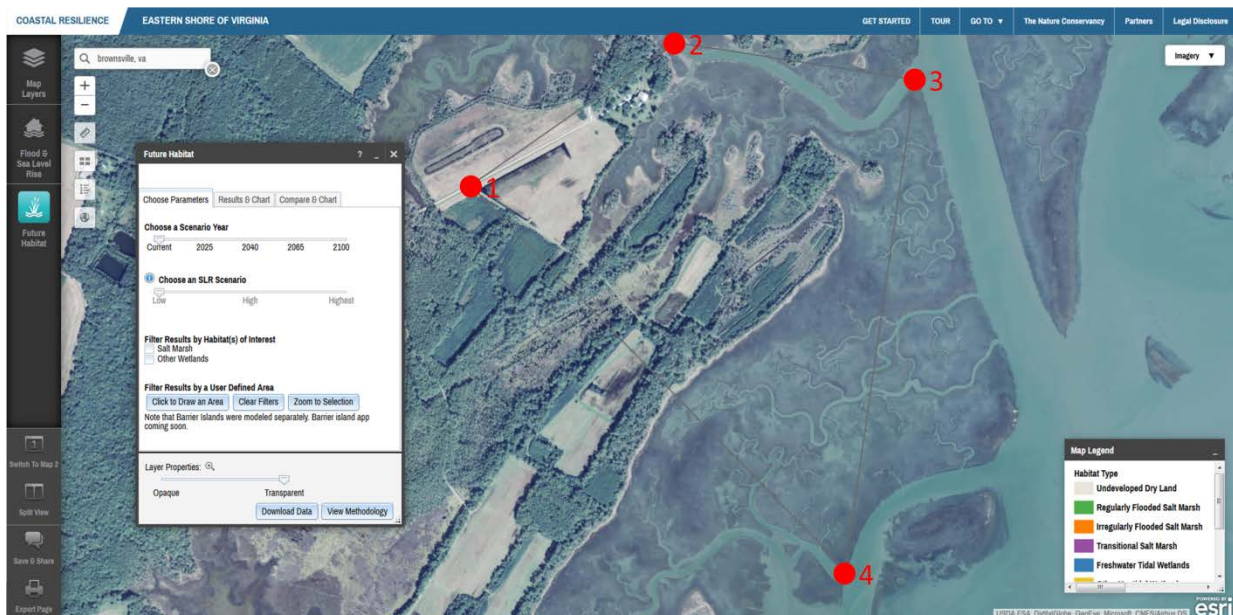
Change the background layer to Imagery.

Open the Future Habitat App, set the Scenario Year to 2025, and set the SLR Scenario to High

Set the Layer Properties to completely transparent

Under the Filter Results by a User Defined Area, click on Click to Draw an Area

Draw a polygon starting with the fork in the road leading to Brownsville, then the Brownsville dock, followed by the northern point of the marsh east of the dock, and ending (double-click) at the point of the marsh almost directly south from there. Use the image below as a guide, clicking on points 1 through 3 in order, then double-clicking on point 4.



Set the Layer Properties bar to completely opaque

Click on the Compare & Chart tab (scroll down if necessary)

View the results. These represent changes from current conditions

Questions: How much tidal flat exists in 2025 under the High SLR scenario? What about transitional salt marsh? How have these values changed from current conditions?

Advanced Question: Now split the screen into two maps, link the maps, and recreate the steps above, but set the Scenario Year to 2065 and SLR to High.

How do the results for regularly flooded salt marsh compare between years?

Close apps and return to full extent (click on the globe to the left)

Press F5 to clear the map

b. Map Layers App – Cape Charles

Set the background layer to Topographic

Search for Cape Charles, Virginia (choose the first option)

Zoom and pan so Cape Charles fills the screen, but you can still see Kings Creek to the north

Open the Map Layers App and choose Coastal Management, and Flood Hazard Areas

Also activate the Social and Economic layer, Persons per Square Mile

Click on the round, orange “i” icon beside Social and Economic and adjust layer transparency to see overlap

Note the overlap of the Flood Hazard Area and the concentration of people per square mile

Zoom in to Cape Charles, notice the rectangle in the center. That is Central Park.

Questions 1: What Flood Hazard Area affects Cape Charles’ Central Park? How many people per square mile does this affect? What about the rest of Cape Charles?

In the Map Layers App, unclick the Persons per Square Mile layer under Social and Economic

Activate the Flood & Sea Level Rise App and select Storm Surge data. Set the Scenario Year to 2065 and the Storm Type to Moderate Intensity.

Adjust opacity to slightly less than mid-range.

Note how the layers overlap, using the legend to compare data (scroll down if necessary)

Questions 2: What storm surge levels line up with the 0.2 Pct Annual Chance Hazard Flood Hazard (“500-year storm”)? What does this tell you about the likelihood of this level of storm in 2065?

Advanced questions: What road in Cape Charles could become impassible in the case of four feet of SLR or a major flood event? Hint: it is in an AE Flood Hazard Area. Also, based on aerial imagery, what businesses would likely be impacted if this road was blocked by SLR or flood waters?

Close apps and return to full extent (click on the globe to the left)

Press F5 to clear the map

c. Flood & Sea Level Rise Storm Surge App – Quinby, Virginia

Search or pan and zoom to Quinby, Virginia

Notice the Quinby Bridge and causeway, listed as Route 182

Open the Flood & Sea Level Rise App Storm Surge option and adjust opacity to mid-range

Compare Nor'Ida scenarios across Scenario Years

Questions 1: How much flooding (feet of storm surge) would the Quinby Bridge and causeway experience in a 2040 Nor'Ida event? Zoom in if necessary and use the legend to find your answer.

Activate the Map Layers App and the Infrastructure layer. Click through the Roads Vulnerable to Sea Level Rise options until you see one that affects the Quinby Bridge and Causeway.

Questions 2: Which vulnerability to SLR checkbox applies to the Quinby Bridge and causeway? Based on this information, can you estimate the elevation of the Quinby Bridge and causeway? What percent of people in Quinby affected by closing the bridge during a Nor'Ida storm in 2040 are employed in agriculture, fishing, or forestry? Hint: use additional Map Layer App options.

Advanced Question: In the same year in which the Quinby Bridge and causeway become impassible due to SLR, will people be able to access the town using other, existing infrastructure?

Close apps and return to full extent (click on the globe to the left)

Press F5 to clear the map

IV. Exercises from Participants

a. Examples from the group

b. Extra example:

Future Habitat App – Saxis and Onancock, VA

Search or zoom and pan to Saxis, Virginia

Open the Future Habitat App and adjust opacity to mid-range

Examine how habitat types change across Scenario Years and the low and high SLR Scenarios

Questions 1: What is the directional trend for habitat change in Saxis? Is it mainly north-south, east-west, etc.?

Open the Flood & Sea Level Rise App, Basic Inundation data. Examine how sea level rise changes across Scenario Years and the low and high SLR Scenarios

Questions 2: How does the directional trend of inundation compare to what you saw in the Future Habitat App?

Close both Apps

Click on Split View on the bottom left

In Map 1, pan so that Saxis is in the middle of the map, or use the search option to center the map on it. Open the Flood & Sea Level Rise App and select the Basic Inundation data source.

In Map 2, search for or zoom and pan to Onancock, Virginia

In Map 2, open the Flood & Sea Level Rise App and select the Basic Inundation data source

In the Flood & Sea Level Rise App in both maps, set SLR to high and the Scenario Year to 2040

Minimize apps for a better view of the two maps

Questions 3: How do the towns differ in terms of impacts from sea level rise?

In the Flood & Sea Level Rise App in both maps, adjust the Scenario Year to 2065

Questions 4: What developed areas are most affected in each town? How are infrastructure features such as roads and marinas affected? Hint: use imagery to answer this question.

In both maps, activate the Map Layers App and the Social and Economic, Percent population age 65 and over layer. Compare the results between maps, adjusting opacity if necessary.

Questions 5: Between these two towns, which age group(s) are most affected by sea level rise?

Advanced Questions: Using additional Map Layers App data, and assuming that tidal range (under Base Data) remains the same, how much SLR is necessary before Dennis Drive in Saxis is flooded by high tides? What about Chandler Street in Onancock? Hint: Close any other apps. You may have to zoom in to see the street name.

Close apps and return to full extent

Press F5 to clear the map

V. Use of Tool in Decision-Making

a. Comparison - which fire station floods first?

Open the Flood & Sea Level Rise App, Basic Inundation data

*Open the Map Layers App and the Infrastructure, Fire and Rescue Stations layer
Change to Imagery*

Questions: Which of the Fire and Rescue Station in Accomack County floods first and when? What about Northampton County?

Questions 2: What is the rough distance between those Fire and Rescue Stations that flood first in each county and the nearest station that is still dry? Hint: use the measure tool to find your answers.

Close apps and return to full extent

Press F5 to clear the map

b. Group suggestions for locations, settings

c. Individuals or groups working on additional examples

- Which Eastern Shore of Virginia schools will be most impacted by SLR in the next 50 to 100 years?
- What level of Storm Surge may be experienced by homes in Captain's Cove?
- Which access routes to coastal island communities are most vulnerable to SLR, and for how long are these communities predicted to remain as uplands?
- Which of the two Eastern Shore of Virginia counties will experience the most habitat change (disregarding barrier islands), and which is most impacted in terms of developed dry land?

Send any questions, feedback, or suggestions to
vacoastalresilience.org@tnc.org

Additional Resources:

For a quick review, click on the **Tour** menu while in maps.coastalresilience.org/Virginia.

Coastal Resilience website: coastalresilience.org

Coastal Resilience Training Page: coastalresilience.org/training

Coastal Resilience Mapping Portal General Navigation:

<http://www.screencast.com/t/RnBTZlgSaL>

Coastal Resilience Introduction to Scenario Planning: <http://www.screencast.com/t/1yfX0fV2y>

Coastal Resilience Flood & Sea Level Rise Try Me Video:

http://media.coastalresilience.org/Sea_Level_Rise_Coastal_Hazards_tryme/Sea_Level_Rise_Coastal_Hazards_tryme.htm

Coastal Resilience Future Habitat App: <http://coastalresilience.org/our-approach/assess-risk-vulnerability/future-habitat/>

NOTE:

Export Page

In future you will be able to generate printed maps:

Click on the 'Export Page' at the bottom left of the screen

Enter a title for a map

Check the show legend box

Click 'Generate Map' button - a link to a pdf is generated that you can share or print

maps.coastalresilience.org/Virginia