

# Coastal Resilience Tool – Eastern Shore of Virginia

## Skills & Exercises List

### 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](https://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 for dropdown menu*

*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*

*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*

*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*

*Close the Flood and Sea Level Rise App*

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

*Press F5 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 for dropdown menu*

*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 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 Coastal Resilience base data, Virginia, and 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 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 red “X” icon twice*

*Open the Flood & Sea Level Rise App on the left*

*Click on Choose Data Source for dropdown menu 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 for dropdown menu 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*

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

*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.*

#### **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.*

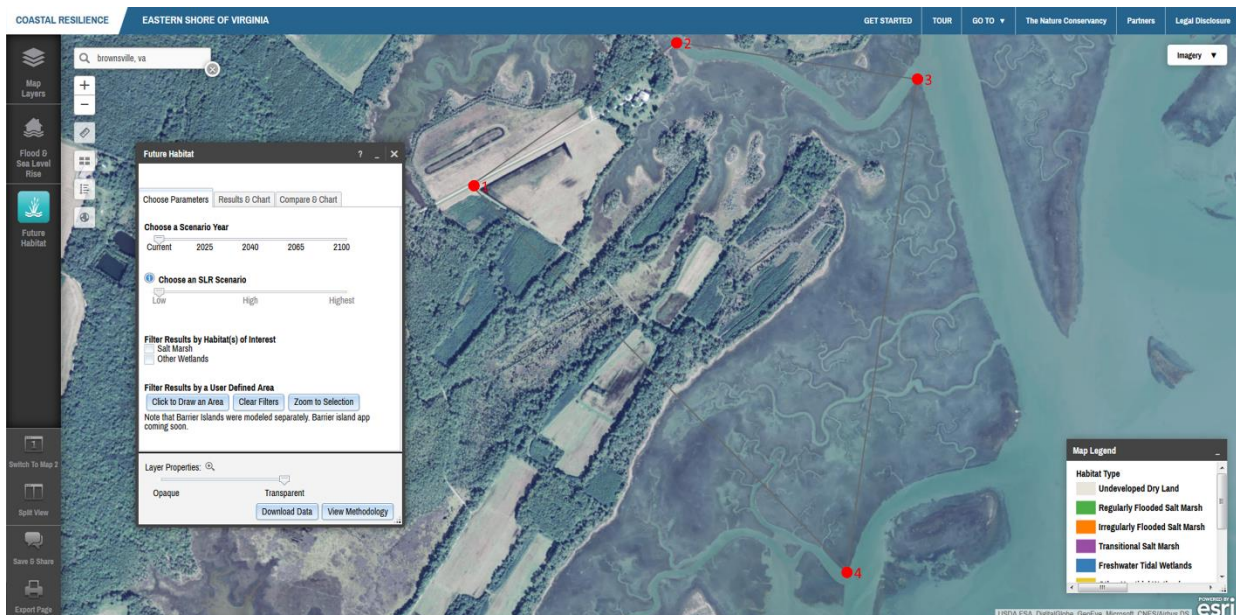
*Change the background layer to Imagery.*

*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. 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. 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. Remember, the roadway is colored yellow, so don't confuse it with the layer colors.*

*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*

*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 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.*

*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*

*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?
- How high should homes in Captain's Cove be raised to mitigate the effects of storm surge?
- 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?

**Resources:**

For a quick review, click on the **Tour** menu at the top of the map

Coastal Resilience website: <http://coastalresilience.org/>

Training Page: <http://coastalresilience.org/training/>

Mapping Portal General Navigation: <http://www.screencast.com/t/RnBTZlgSaL>

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

Flood & Sea Level Rise Try Me Video:

[http://media.coastalresilience.org/Sea\\_Level\\_Rise\\_Coastal\\_Hazards\\_tryme/Sea\\_Level\\_Rise\\_Coastal\\_Hazards\\_tryme.htm](http://media.coastalresilience.org/Sea_Level_Rise_Coastal_Hazards_tryme/Sea_Level_Rise_Coastal_Hazards_tryme.htm)

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