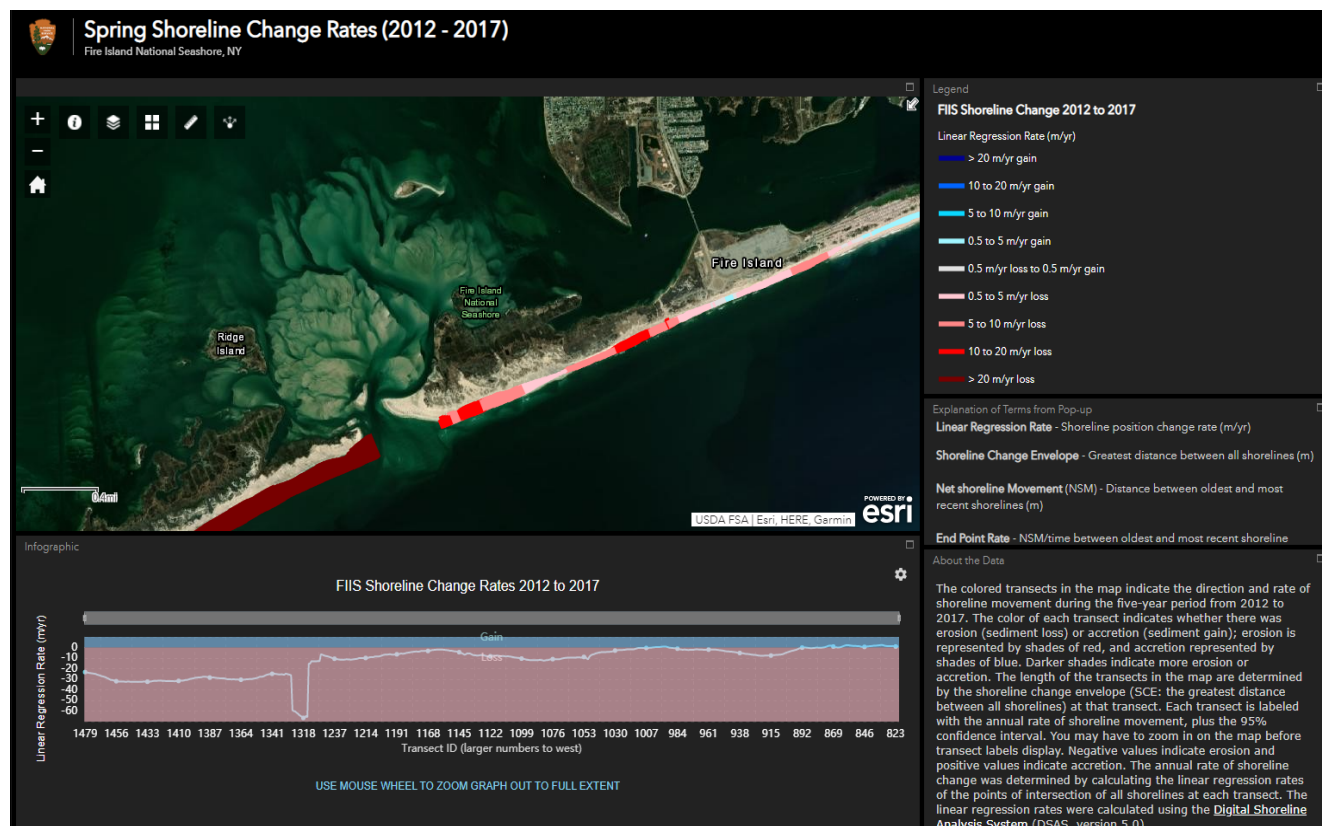




How to Create Web Mapping Applications for Visualizing Shoreline Change Rates Using ArcGIS Online

Version 1.0

Standard Operation Procedure for the Northeast Coastal and Barrier Inventory and Monitoring Network



November 2020

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Cover Photo: Shoreline change visualizer at Sandy Hook, Gateway National Recreation Area
Credit: Thom Curdts

Contents

	Page
Figures.....	vi
Appendices.....	xi
Acknowledgments.....	xiii
1. Introduction.....	1
2. Methods.....	3
2.1 ArcMap and Digital Shoreline Analysis System (DSAS) v5.0 Processes	3
2.1.1 Acquire and Install DSAS Software.....	3
2.1.2 Acquire Shoreline (and associated) Data.....	3
2.1.3 Examine and Update Baseline, Transect, and Shoreline Data	3
2.1.4 Set DSAS Default Parameters.....	5
2.1.5 Cast Transects.....	7
2.1.6 Calculate Rates	9
2.1.7 Data Visualization	10
2.2 ArcGIS Pro Processes.....	18
2.2.1 Convert the Personal Geodatabase to A File Geodatabase.....	18
2.2.2 Create a New ArcGIS Pro Project and Add the Data from the GDB	18
2.2.3 Symbolize and Label the Shoreline Data	20
2.2.4 Symbolize and Label the Shorelines Change Rate Data	24
2.2.5 Publish the Shoreline and Shoreline Change Rates Layers as Services	27
2.3 ArcGIS Online Processes	33
2.3.1 Create a Web Map	33
2.3.2 Create a Web Mapping Application	40
2.3.3 Finalize the Web Mapping Application	63
2.4 Update an Existing Web App	64
References.....	67

Figures

	Page
Figure 1. Digital Shoreline Analysis System (DSAS) version 5.0 toolbar in ArcMap. Each function on the toolbar is explained in the DSAS User Guide.	3
Figure 2. Examples of minor shoreline data anomalies (blue) that intersect transects (brown).....	4
Figure 3. The DSAS v5.0 toolbar with the Attribute Automator tool outlined in red.	5
Figure 4. The DSAS v5.0 toolbar with the Set Default Parameters tool outlined in red.	5
Figure 5. The DSAS Set Default Parameters window, Baseline Settings tab.....	6
Figure 6. The DSAS Set Default Parameters window, Shoreline Settings tab.	7
Figure 7. The DSAS v5.0 toolbar with the Cast Transects tool outlined in red.....	7
Figure 8. The DSAS Cast Transects window.....	8
Figure 9. The Cast Transects user interface showing how smoothing distance affects transect orientation on different types of coastline (curvy and straight). In this example, a smoothing value of 500 meters is ideal to produce transects orthogonal to the coast and therefore measure the appropriate shoreline change (From DSAS User Guide, Figure 19).....	9
Figure 10. The DSAS v5.0 toolbar with the Calculate Rates tool outlined in red.	9
Figure 11. The DSAS Calculate Rates window.	10
Figure 12. Transects (brown) before trimming. All transects are the same length, which is equal to the maximum search distance from baseline, specified in the default parameters; shown here with the baseline (purple) and shorelines (blue hues).	11
Figure 13. DSAS Data Visualization tool, showing the Clip rates to SCE tab.....	11
Figure 14. DSAS Data Visualization tool, showing the Rates display tab.	12
Figure 15. Results of applying the DSAS “Scale to my data” option.....	12
Figure 16. Modifying the symbology in ArcMap by flipping the symbols and reversing the sorting.....	13
Figure 17. Results of flipping the symbols and reversing the sorting of values in ArcMap.....	14
Figure 18. Results of flipping the symbols and reversing the sorting of values in ArcMap.....	14
Figure 19. The shorelines layer attribute table showing the Date2 field and its calculated values.	16
Figure 20. Symbolizing the shorelines by first picking a color ramp.	17

Figure 21. Two images of the Edit Color Ramp window, with red boxes indicating how to modify the properties of the color ramp by specifying the value of Color 1 (left) and Color 2 (right).	17
Figure 22. The initial ArcGIS Pro window, showing how to create a new ArcGIS Pro Project.	19
Figure 23. Adding data to an ArcGIS Pro project.....	20
Figure 24. Importing symbology in ArcGIS Pro.	20
Figure 25. The ArcGIS Pro Label Class window, Class tab, showing how to specify a customized label expression.	22
Figure 26. The ArcGIS Pro Label Class window, Class tab, showing how to set a label's visibility range.	23
Figure 27. The ArcGIS Pro Label Class window, Symbol tab, showing how to format the shorelines labels.	24
Figure 28. The ArcGIS Pro Symbology window, advanced symbol options, showing how to remove the data exclusion clause.....	25
Figure 29. Shoreline change rates transects symbolized and labeled in ArcGIS Pro.	27
Figure 30. Original and new feature class names. Prior to publishing the feature classes as services, the feature class names are edited to be more descriptive.	28
Figure 31. Insert a new map in ArcGIS Pro.....	29
Figure 32. The ArcGIS Pro Project window, showing how to sign in to your NPS ArcGIS Online account by clicking the link in the upper right corner. Note the three map tabs above the imagery (Original Map, Shorelines, and Change Rate Transects). The Change Rate Transects Map is displayed.	29
Figure 33. ArcGIS Pro's Publish Web Layer tool.	30
Figure 34. The ArcGIS Pro Share As Web Layer window, General tab.	31
Figure 35. ArcGIS Pro message showing successful publication and providing link to manage the web layer.....	32
Figure 36. The ArcGIS Online Overview page of a published web layer. Note the Description and Terms of Use fields that were not present in the ArcGIS Pro Share as Web Layer window (Figure 34).....	33
Figure 37. ArcGIS Online web map, showing how to open the Configure Pop-up tool.	34
Figure 38. AGOL pop-up attribute configuration window, showing the two shoreline attributes to select and their Field Aliases.	35

Figure 39. AGOL web map pop-up window, showing date and length for one of the shorelines, as configured in the preceding text.	36
Figure 40. AGOL web map, Manage Labels edit tool, showing expression for shoreline labels that results in labeling each shoreline with the year in which it was collected.	36
Figure 41. AGOL web map, showing the Visible Range slider bar adjusters and the results of formatting the shoreline labels.	37
Figure 42. AGOL web map, showing how to add data to the map from your My Content folder.	38
Figure 43. AGOL pop-up attribute configuration window, showing which of the shoreline change rate attributes to select, their Field Aliases, and the order in which they should be arranged.	39
Figure 44. AGOL web map pop-up window, showing selected statistics for one of the shoreline change rate transects, as configured in the preceding section.	40
Figure 45. The AGOL My Content page with red boxes indicating how to begin building a web app.	41
Figure 46. The AGOL Create a Web App window with sample text filled in.....	42
Figure 47. The AGOL Web AppBuilder, showing the initial Dashboard Theme template under the Theme Tab. Note the other three tabs in the upper left: Map, Widget, and Attribute.	43
Figure 48. The AGOL Web AppBuilder, showing a modified layout for the Dashboard Theme template.....	43
Figure 49. The AGOL Web AppBuilder, showing the Map tab and choosing a web map.	44
Figure 50. The AGOL Web AppBuilder, showing the Widget tab and the four widget icons that correspond to the four map panels.....	45
Figure 51. The AGOL Web AppBuilder, showing the Choose Widget window, highlighting the Legend widget.	45
Figure 52. The Web AppBuilder's Configure Legend window, showing the desired settings.	46
Figure 53. The AGOL Web AppBuilder's Choose Widget window, highlighting the About widget.....	47
Figure 54. The AGOL Web AppBuilder's configuration window for the About widget, showing how to make sure the hyperlink target opens in a new browser window.	48
Figure 55. The AGOL Web AppBuilder's Infographic widget's Choose a Template window, showing the Line template option.	50

Figure 56. The AGOL Web AppBuilder's Infographic widget configuration window.....	51
Figure 57. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Data window.....	52
Figure 58. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Display window.....	53
Figure 59. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Marks window.	54
Figure 60. The nearly complete web app configuration. Note the five numbered squares in the upper left corner of the map, and their corresponding configuration icons in the lower left. these map panel widgets will become the Reference, Layer List, Basemap Gallery, Measurement, and Share widgets.....	56
Figure 61. The Splash Screen icon showing the Edit button (lower right) and the Show/Hide toggle button (upper right), which is used to activate or hide the widget. These two control buttons are found on many widgets.	57
Figure 62. The AGOL Web AppBuilder's configuration window for the About widget, showing where the Insert Image tool is found and the inserted image.	58
Figure 63. The AGOL Web AppBuilder Splash widget configuration window, Appearance tab, where dimensions and background color of the Splash screen are set.	60
Figure 64. The AGOL Web AppBuilder, showing the Attribute tab, and how to customize the logo with an NPS arrowhead.	60
Figure 65. The AGOL Web AppBuilder's Attribute tab's Set Logo window, where you upload an image and specify a URL where the user will be directed when they click the logo.	61
Figure 66. The AGOL Web AppBuilder's Attribute tab where you enter the Title and Subtitle of the web app.	61
Figure 67. The AGOL Web AppBuilder, Widget tab, showing the Header widget and it's Show/Hide icon in the upper right corner.....	62
Figure 68. Image of a completed shoreline change rate web mapping application as it appears upon opening, with a header at the top and the splash screen prominently displayed in the middle.	62
Figure 69. The AGOL overview page for the web app, showing Sharing window options.....	63
Figure 70. Web mapping application, with red boxes indicating how to make a copy, using the Save As option.....	64
Figure 71. Web mapping application, with red box indicating how to choose a new map.	65

Figure 72. Web mapping application, showing the Map Switch Confirmation window.....66

Appendices

	Page
Appendix A: Shoreline Change Rate Transect Colors.....	69
Appendix B: Example Text for Data Details	71
Appendix C: Example Text for the ‘About the Data’ Widget in the Web App.....	73
Appendix D: Example Text for the ‘Explanation of Terms from Pop-up’ Widget in the Web App	75
Appendix E: Example Text for the Reference Widget in the Web App.....	77
Appendix F: Example Text for the Splash Screen Widget in the Web App.....	79
Appendix G: NPS Arrowhead Image Used in Header.....	81

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1. Introduction and Purpose

The National Park Service (NPS) Northeast Coastal and Barrier Network (NCBN) created 16 shoreline change web mapping applications (web apps) for four of its coastal parks. These web apps help visualize the changing positions of our dynamic shorelines. As new shoreline data are collected and new shoreline change trends are reported, new web apps will be needed to visualize the data. This document describes how to create a shoreline change web mapping application that is consistent with the existing NCBN web apps, which are available from the [NCBN Ocean Shoreline Position web page](#) (NCBN, 2020), where they are referred to as “ocean shoreline change visualizers.”

The process of creating the web apps can be thought of in three phases that use different software. This document is organized with the following three software phases in mind. The software versions used for this project are listed after the software name in the following list:

1. *ESRI ArcMap (10.7.1)* (ESRI, 2020a) and *Digital Shoreline Analysis System (DSAS) v5.0* (USGA, 2020a) – Used for data QA/QC, data preparation, creation of baselines and transects, calculation of shoreline change rates, creation of a shoreline change rates feature class, and application of initial symbology. This document will explain the basics of using DSAS to create a NCBN shoreline change web mapping application. But it is expected that the user will need to delve into the DSAS User Manual and spend some time learning and experimenting with DSAS to gain a thorough understanding of the processes and to produce the desired results.
2. *ESRI ArcGIS Pro (2.5.1)* (ESRI, 2020b) – Used to refine the symbology of the shorelines and shoreline change rates feature classes, and to publish the shorelines and shoreline change rate feature classes as services to ArcGIS Online (AGOL).
3. *ESRI ArcGIS Online (AGOL)* (ESRI, 2020c) – Used to create the web maps and web mapping applications from the services produced in ArcGIS Pro.

2. Methods

2.1 ArcMap and Digital Shoreline Analysis System (DSAS) v5.0 Processes

2.1.1 Acquire and Install DSAS Software

To create the web apps, you will need to download the DSAS software from the [U.S. Geological Survey DSAS website](#) (USGS, 2020a). DSAS is an add-in to ESRI ArcGIS Desktop 10.4-10.6 that enables users to calculate rate-of-change statistics from multiple historical shoreline positions. There is currently no DSAS add-in for ArcGIS Pro. DSAS version 5.0 is the current version and includes the option to create a shoreline rates change feature class (ArcGIS data layer). The rates change feature class is the primary data input for the NCBN shoreline change web apps, so DSAS version 5 (or newer) must be used.

Installation instructions and a [DSAS User Guide](#) (Himmeltoss, 2018) can be found on the [DSAS website](#) (USGS, 2020b). The DSAS User Guide is extremely helpful when learning to use DSAS, and software is well supported by USGS.

As an ArcMap add-in, there will be a DSAS toolbar in ArcMap (Figure 1) after DSAS is installed.

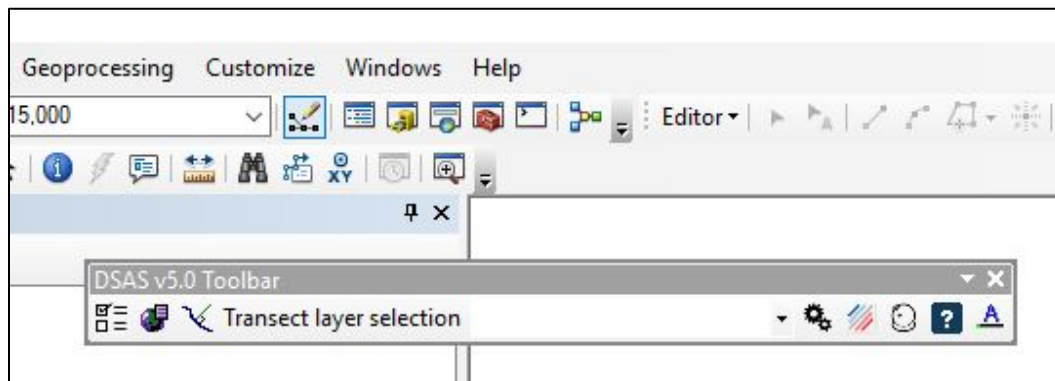


Figure 1. Digital Shoreline Analysis System (DSAS) version 5.0 toolbar in ArcMap. Each function on the toolbar is explained in the DSAS User Guide.

2.1.2 Acquire Shoreline (and associated) Data

Shoreline data are collected each year, following the [Northeast Coastal and Barrier Network Geomorphological Monitoring Protocol: Part I—Ocean Shoreline Position](#). (Psuty & Others, 2010). Periodically (typically every five years) shoreline position trends are analyzed, and a trend report is published. The shoreline data, baseline, and transect data used in the trend analysis, and the shoreline trend reports can be obtained from the NCBN Data Manager or from the [NPS Data Store](#) (NCBN, 2006).

2.1.3 Examine and Update Baseline, Transect, and Shoreline Data

2.1.3.1 Check for Baseline/Transect Compatibility

Check for baseline/transect compatibility and recognition by DSAS version 5. For DSAS to recognize a set of transects, the original baseline from which those transects were cast must be

present in the ArcMap project. If DSAS does not recognize the transects, check with the NCBN Data Manager to make sure that you have the correct baseline data.

2.1.3.2 Examine Shoreline Data

Note that shoreline data are collected twice annually, in spring and fall. Only spring shorelines are used in the NCBN shoreline visualizer web apps, so it is likely that you will have to create a subset of spring only shorelines from the data received from the NCBN data manager.

Look for missing shorelines sections, errant lines, “rat’s nests”, etc. (Figure 2). Shorelines should be examined at a large enough display scale to detect any bad or missing data that fall on one or more transects (spaced 10 meters apart). In order to see details in the shorelines, it is best to first look at the shorelines with no basemap and symbolize the shoreline with a dark color or one that provides high contrast with the background. If shoreline anomalies are detected, they should then be examined with an imagery basemap turned on, which can provide context. In some cases, what first appeared as errant data, can be explained by things like manmade features or erosional features that affect the shoreline shape. It is best to have a clean shoreline dataset with no anomalies or missing sections, but if an anomaly is located between transects, it will not affect the shoreline change analysis. Check with the network data manager to determine if the inaccurate data should be corrected.

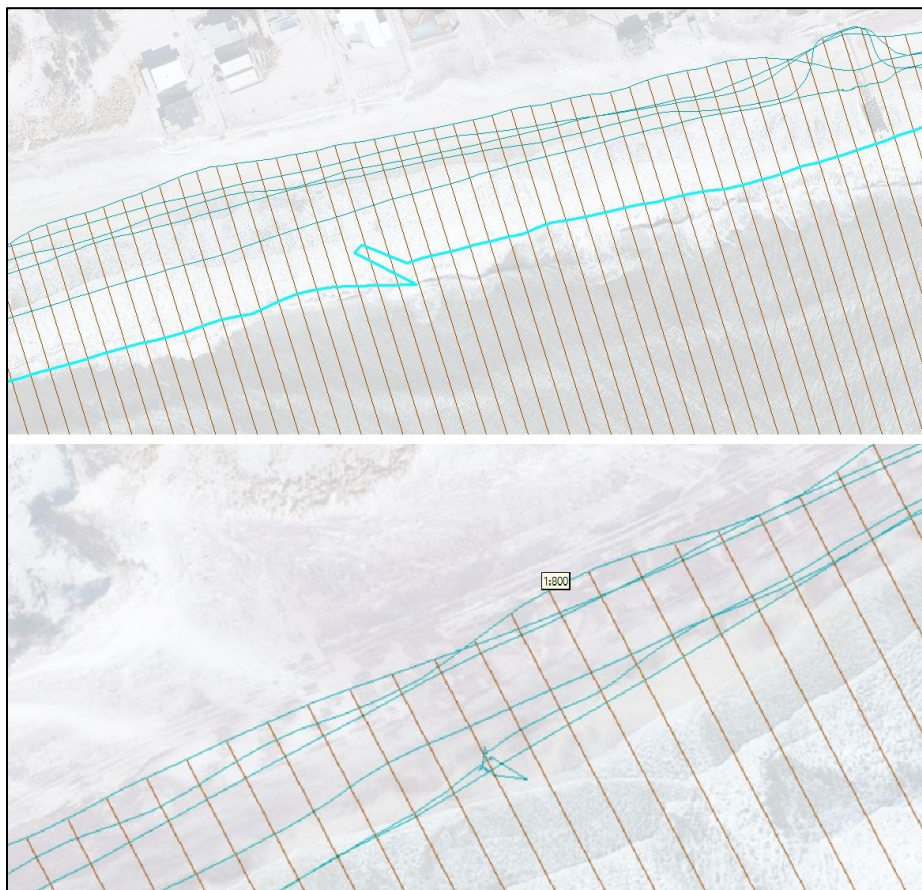


Figure 2. Examples of minor shoreline data anomalies (blue) that intersect transects (brown).

2.1.3.3 Shoreline and baseline attribute requirements

Shoreline and baseline data must contain certain attributes for DSAS to function properly. Attribute requirements are discussed thoroughly in section 5.2.3 (shorelines) and section 5.3.3 (baselines) of the DSAS User Guide (Himmeltoss, 2018). DSAS provides a Shoreline Attribute Automator tool (Figure 3) that facilitates the addition of required attributes to both the shoreline and the baseline files. Attributes may also be added to the attribute table manually, without the use of the Shoreline Attribute Automator tool.



Figure 3. The DSAS v5.0 toolbar with the Attribute Automator tool outlined in red.

2.1.3.4 Data Organization

For DSAS to recognize and utilize data, all data layers (shorelines, baseline, and transects) must be in the same personal geodatabase. A personal geodatabase is a single Microsoft Access file (.mdb). DSAS will not recognize data layers in different personal geodatabases, nor in a file geodatabase. A file geodatabase (.gdb) is a file folder that holds multiple ESRI-compliant dataset files.

2.1.4 Set DSAS Default Parameters

Once your shoreline and baseline data layers are prepared, you are ready to set the default parameters in DSAS (Figure 4). The default parameters must be set before you can cast new transects or calculate shoreline change rates.



Figure 4. The DSAS v5.0 toolbar with the Set Default Parameters tool outlined in red.

2.1.4.1 Baseline Settings (Figure 5)

- **Baseline Layer:** Choose your baseline layer from the drop-down menu. This layer must be loaded in your ArcMap project.
- **Baseline ID Field:** This is required by DSAS.
- **Show Baseline Orientation:** Check this box to see the direction of your baseline in your ArcMap display. This allows you to determine the location of the land (left or right) relative to your baseline.
- **Baseline Placement:** This allows you to specify whether your baseline is onshore, offshore, or midshore.

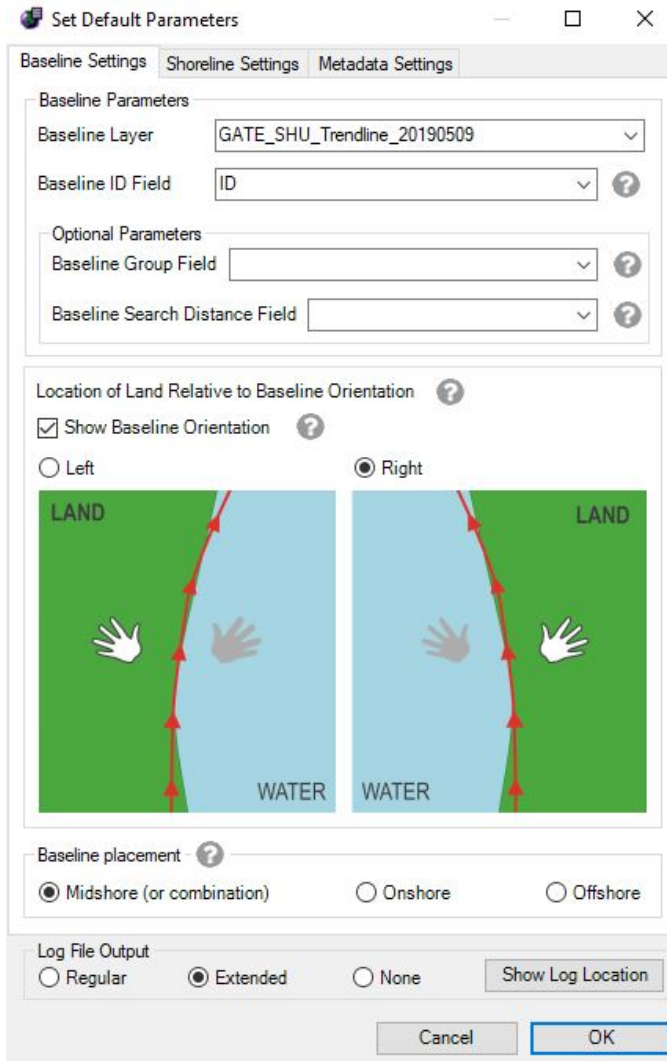


Figure 5. The DSAS Set Default Parameters window, Baseline Settings tab.

2.1.4.2 Shoreline Settings (Figure 6)

- Shoreline Layer: Choose your shoreline layer from the drop-down menu. This layer must be loaded in your ArcMap project.
- Shoreline Date Field: This is required by DSAS.
- Shoreline Uncertainty Field: This is optional.
- Default Data Uncertainty: This value can be obtained from the shoreline trend report. Searching the report for the word “uncertainty” should take you to the appropriate paragraph of the methods section. Use the value for the intrinsic uncertainty of any surveyed shoreline, not the value for a comparison between two survey lines.
- Intersection Parameters: Usually you will choose Seaward Intersection.

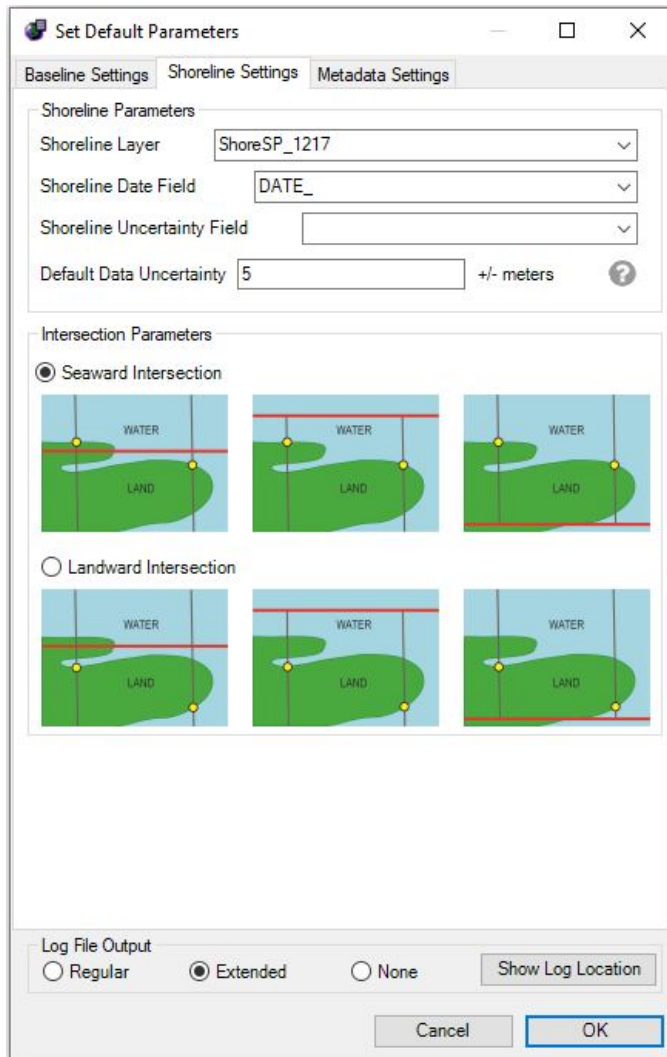


Figure 6. The DSAS Set Default Parameters window, Shoreline Settings tab.

2.1.4.3 Metadata Settings

Fill in the metadata fields, especially contact information for NCBN.

2.1.5 Cast Transects

After the baseline and shoreline default parameters are set, open the DSAS Cast Transect tool (Figure 7).



Figure 7. The DSAS v5.0 toolbar with the Cast Transects tool outlined in red.

- You'll get a warning message suggesting that you fill out some basic metadata information in the Set Default Parameters window. Completing the metadata is an excellent idea but not mandatory to continue. Click OK and the Cast Transects window will open (Figure 8).

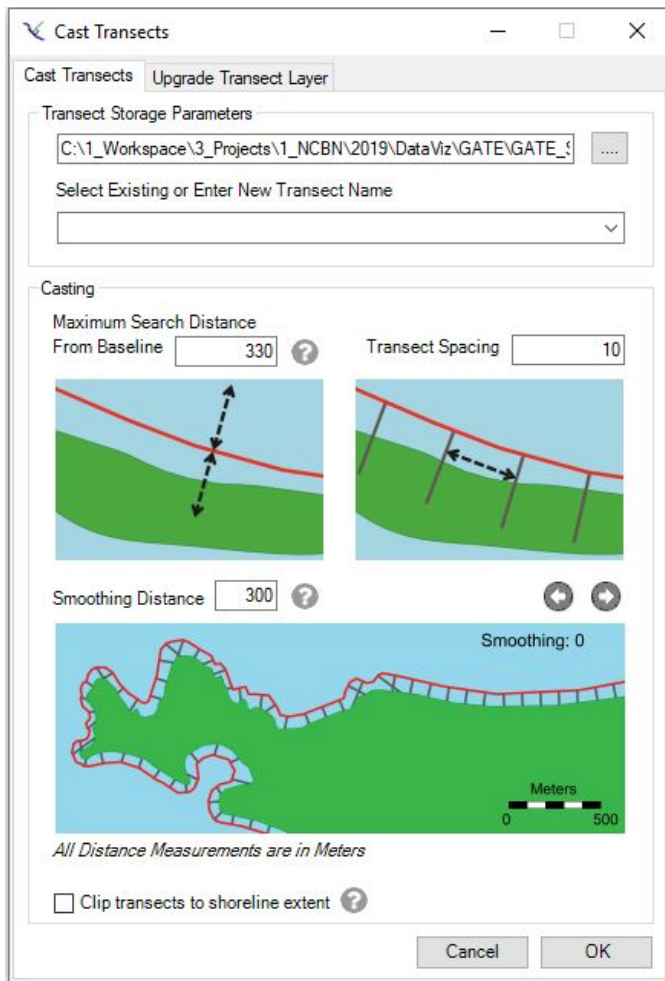


Figure 8. The DSAS Cast Transects window.

- Cast transect parameters:
 - Select Existing or enter New Transect Name: Enter a name for the new transects you are about to cast.
 - Maximum Search Distance From Baseline: Enter a value in meters that is large enough to cover the distance from the baseline to the shoreline segment farthest from the baseline.
 - Smoothing Distance: This parameter can be used to essentially smooth the curve in the baseline (behind the scenes) which allows the transects to diverge from being perpendicular to the baseline. The actual baseline is not altered, but the angles of the transects relative to the baseline will change. Figure 9 is taken from the DSAS User Guide and illustrates the effects of various smoothing distances on transect orientation.

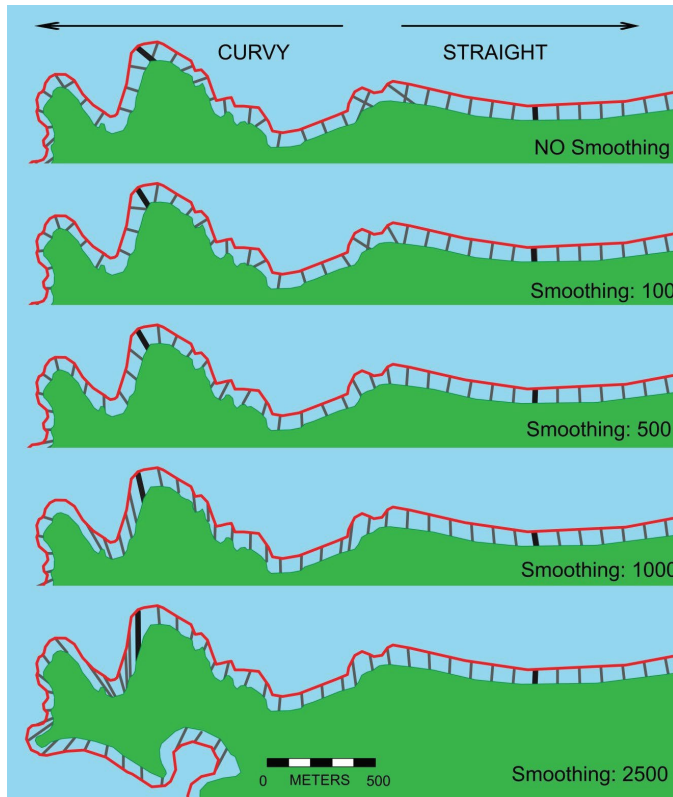


Figure 9. The Cast Transects user interface showing how smoothing distance affects transect orientation on different types of coastline (curvy and straight). In this example, a smoothing value of 500 meters is ideal to produce transects orthogonal to the coast and therefore measure the appropriate shoreline change (From DSAS User Guide, Figure 19).

Setting the correct smoothing distance will require some trial and error until you get the desired results. While working with the smoothing distance, you might also decide that you need to edit the shape of the baseline. If so, you'll need to save the new baseline. If the name of the baseline changes, be sure to update the Default Parameters (baseline tab) to reflect the new name before casting transects again.

2.1.6 Calculate Rates

After you succeed in casting transects that replicate the Rutgers transects as closely as possible, calculate the rates of shoreline change, using the DSAS Calculate Rates tool (Figure 10).



Figure 10. The DSAS v5.0 toolbar with the Calculate Rates tool outlined in red.

In the calculate rates window you have the option of calculating several different statistics and specifying parameters (Figure 11).

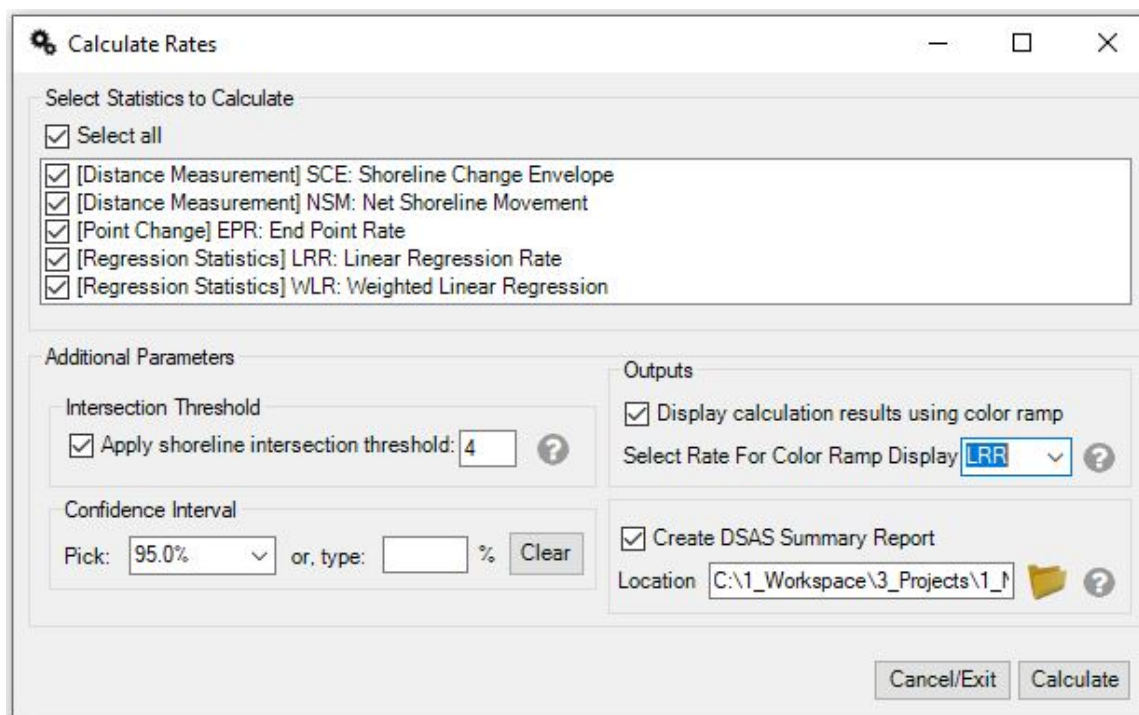


Figure 11. The DSAS Calculate Rates window.

- **Select Statistics to Calculate:** Although we are primarily interested in the LRR (linear regression rate) for the NCBN shoreline change rate web apps, it is advisable to “select all” in case future projects can utilize the additional statistics.
- **Intersection Threshold:** Select the minimum number of shorelines that a transect must intersect in order to be included in the analysis. Click the question mark next to the value box for a more detailed explanation.
- **Confidence Interval:** Select or enter 95%.
- **Select Rate For Color Ramp Display:** Select LRR (Linear Regression Rate).
- Click Calculate.

2.1.7 Data Visualization

The transects you cast will all be the full length of the “maximum search distance from baseline” that were specified in the default parameters (Figure 12).

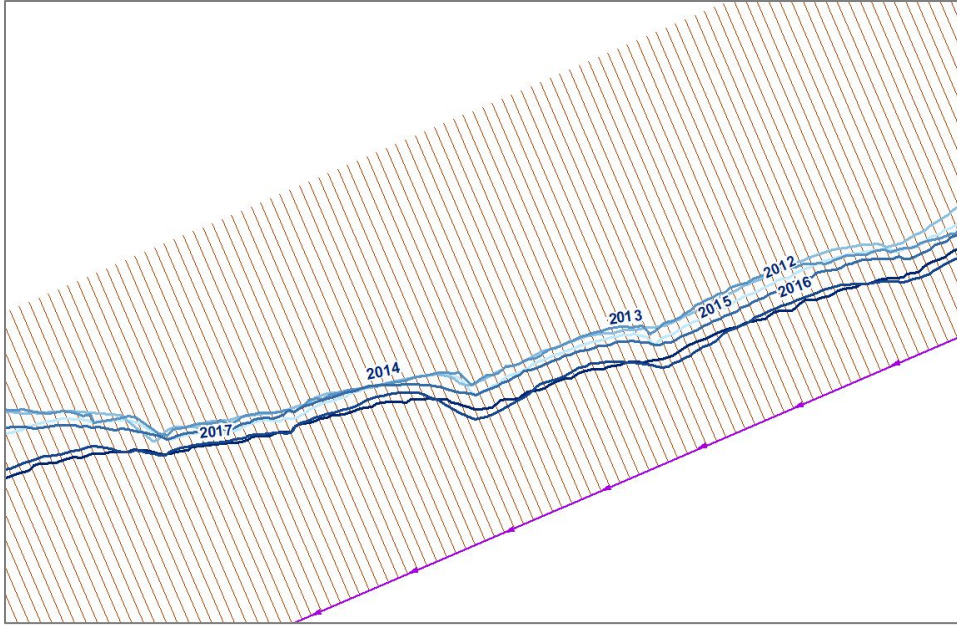


Figure 12. Transects (brown) before trimming. All transects are the same length, which is equal to the maximum search distance from baseline, specified in the default parameters; shown here with the baseline (purple) and shorelines (blue hues).

2.1.7.1 Clip the Transects to the Shoreline Change Envelope

- Use the DSAS Data Visualization tool (Figure 13) to trim the transects to show only the transect segments that occur within the shoreline change envelope (SCE). The SCE is the space between all the shorelines in the analysis. In the DSAS Visualization tool window, click the “Clip rates to SCE” tab. Select the rates layer and clip “Clip.”

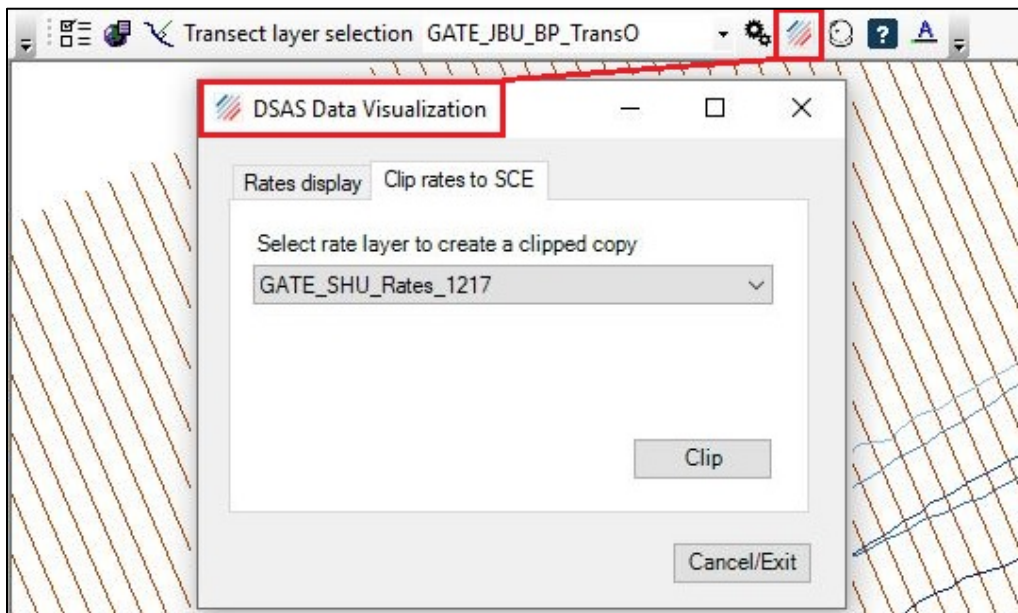


Figure 13. DSAS Data Visualization tool, showing the Clip rates to SCE tab.

2.1.7.2 Symbolize the Rates Layer

- In the DSAS Visualization tool window, click the “Rates Display” tab. Select the clipped rates layer, and select LRR from the color ramp display drop-down menu (Figure 14).

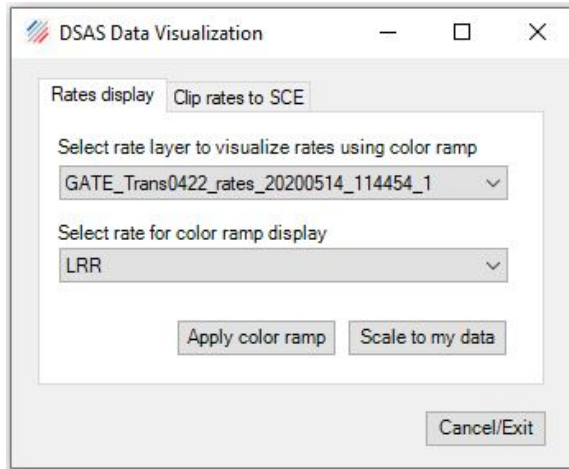


Figure 14. DSAS Data Visualization tool, showing the Rates display tab.

- As seen in Figure 14, DSAS provides two options for symbolizing the rates data: Apply color ramp and Scale to my data. From the DSAS User Guide:

Options for displaying rates default to a standardized output established by DSAS (“Apply color ramp”) or an output adjusted to user data (“Scale to my data”) that uses the full range of rate values within the dataset. This symbology is designed to enhance the initial visualization of the rate data but can always be edited by using standard symbology in the layer properties in ArcMap.

- For the NCBN shoreline change web apps, a modified version of “Scale to my data” was used:
- Start by applying the DSAS “Scale to my data” option (Figure 15).



Figure 15. Results of applying the DSAS “Scale to my data” option.

- In ArcMap, double-click the clipped rate change feature class to open its layer properties window. Click the Symbology tab, select all items, right-click, and select “Flip Symbols,” then “Reverse Sorting” (Figure 16).

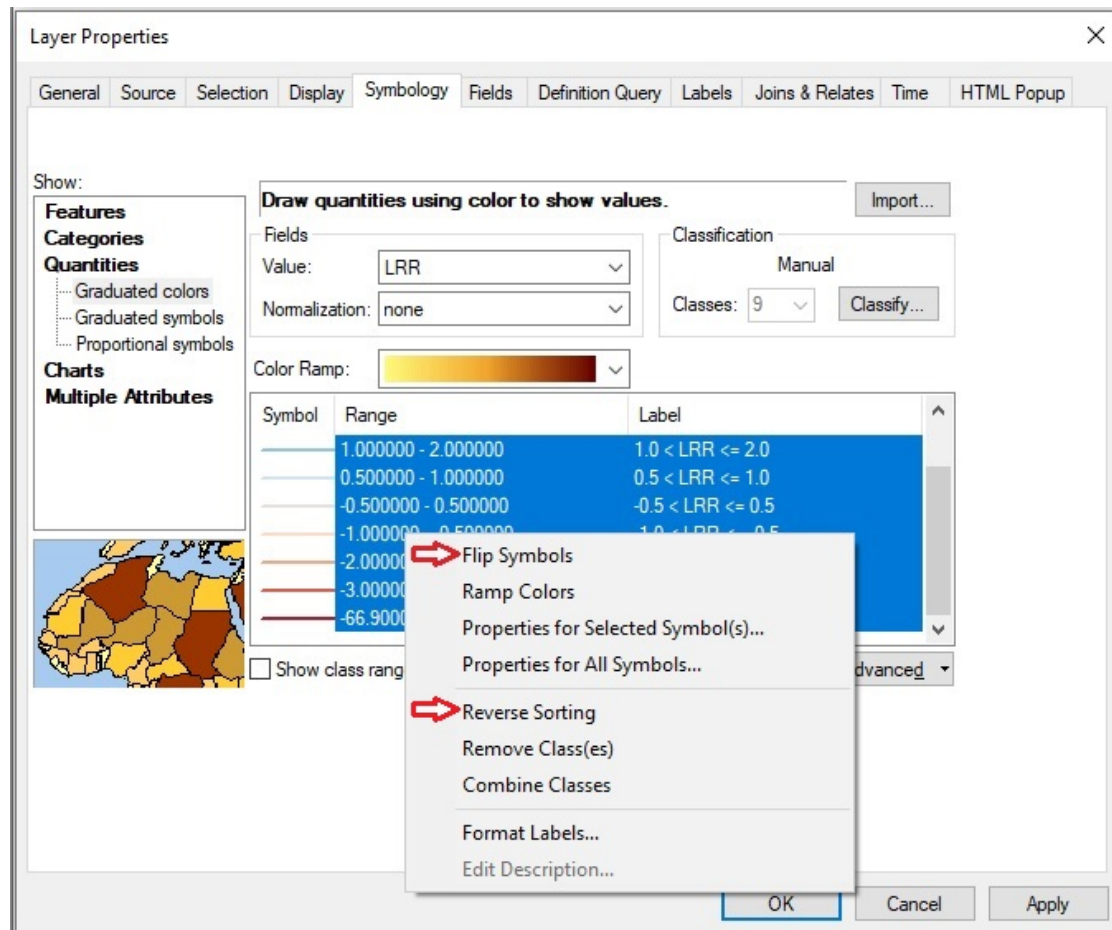


Figure 16. Modifying the symbology in ArcMap by flipping the symbols and reversing the sorting.

- Flipping the symbols and reversing the sorting puts the positive values (representing accretion) on the top and the negative values (erosion) on the bottom (Figure 17) and maintains blue shades for accretion and red shades for erosion. This matches the standard used in the NCBN shoreline change trend reports.



Figure 17. Results of flipping the symbols and reversing the sorting of values in ArcMap.

- In the ArcMap Symbology Label column (see Figure 16) change the labels for each category to use the words “gain” and “loss” (which represent accretion and erosion, respectively) to read like those shown in Figure 18.

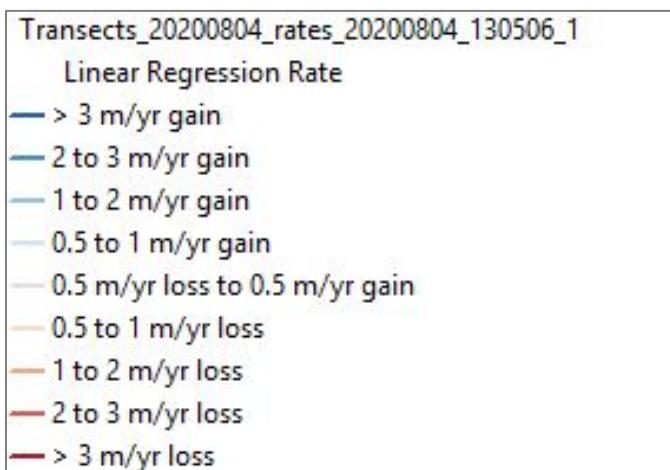


Figure 18. Results of flipping the symbols and reversing the sorting of values in ArcMap.

- The default color ramp that DSAS uses to symbolize transects approximates, but is slightly duller than, the colors in the NCBN trend reports. The colors used in the NCBN web apps for a nine-category classification can be found in Appendix A. You could change the colors now in ArcMap, or later in ArcGIS Pro (see Section 2.2.4). The advantage of changing the colors later in ArcGIS Pro is that you can enter a single hex value for each symbol. In ArcMap you must enter the three RGB values for each symbol since there is no hex value option.
- To change the line width of all the transect symbols, click on one of the colored lines in the Symbol column in the Layer Properties window (see Figure 16). Select all the symbols using the CTRL-A keyboard shortcut. Right-click in the selected symbols and

select Properties for Selected Symbol(s).”¹ In the Symbol Selector window that opens, change the Width to 4. Click OK to close the Symbol Selector window and OK to accept the changes and close the Layer Properties window.

- Right-click the shoreline change rates feature class in the ArcMap table of contents and click Save As Layer File. This will save a .LYR file that will be used later to import the symbology into ArcGIS Pro.

In the previous example (Figures 15 – 18) the change rate categories had logical break points of 0.5 or 1 meter. In some cases, the break points will not be so tidy, and you may need to modify the DSAS classes to have logical incremental breakpoints (every 1, 2, 5, 10 m/yr, etc.). You may also choose to modify the category breakpoints so that shorelines in the same park, or ocean and bay side shorelines of the same area, use the same categories. DSAS seems to always use +/- 0.5 m/yr for the category closest to zero m/yr change ($-0.5 < \text{LRR} \leq 0.5$ m/yr). For consistency, the NCBN web apps accepted that default category.

2.1.7.3 Symbolize the Shorelines Layer

- To facilitate symbolizing the shorelines, add a new date field to the shorelines layer whose YYYYMMDD format will allow chronological sorting. Open the attribute table of the shorelines layer and add a field called “Date2” (Data Type: text; Length: 10).
- In the attribute table, right-click the Date2 column header and select “Field Calculator...” Assuming that the existing DATE_ field of the shorelines layer is in DD/MM/YYYY format, the following expression will calculate the format of the Date2 field to YYYYMMDD (Figure 19):
 - `Date2 = right([DATE_], 4) + left([DATE_],2) + mid([DATE_],4,2)`

¹ In theory, you should also be able to just right-click and select “Properties for All Symbols” without first selecting any symbols. But this functionality was not working properly for the duration of this project and at the time of publication.

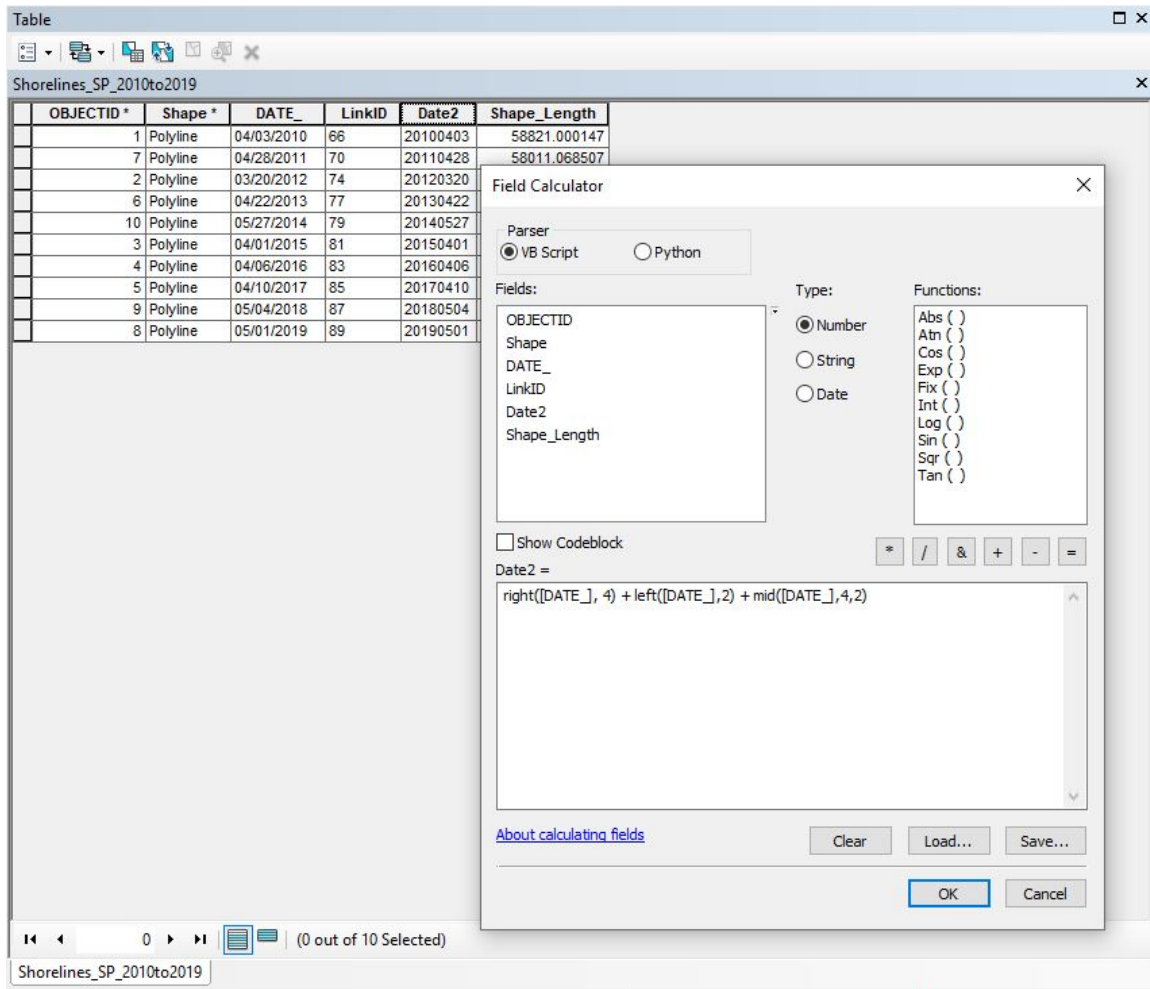


Figure 19. The shorelines layer attribute table showing the Date2 field and its calculated values.

- Right-click the Date2 column header and select Sort Ascending. This will sort the shorelines from oldest to most recent.
- In the ArcMap table of contents, double-click the shorelines feature class to open its layer properties window. Click the Symbology tab.
 - Under “Show,” click Categories, then click Unique values.
 - In the Value Field, select Date2.
 - Click Add All Values.
 - Below the values, click the Select All Values box.
 - Under Color Ramp, select the fourth color ramp from the top, which is a ramp that goes from light blue to dark blue (Figure 20).

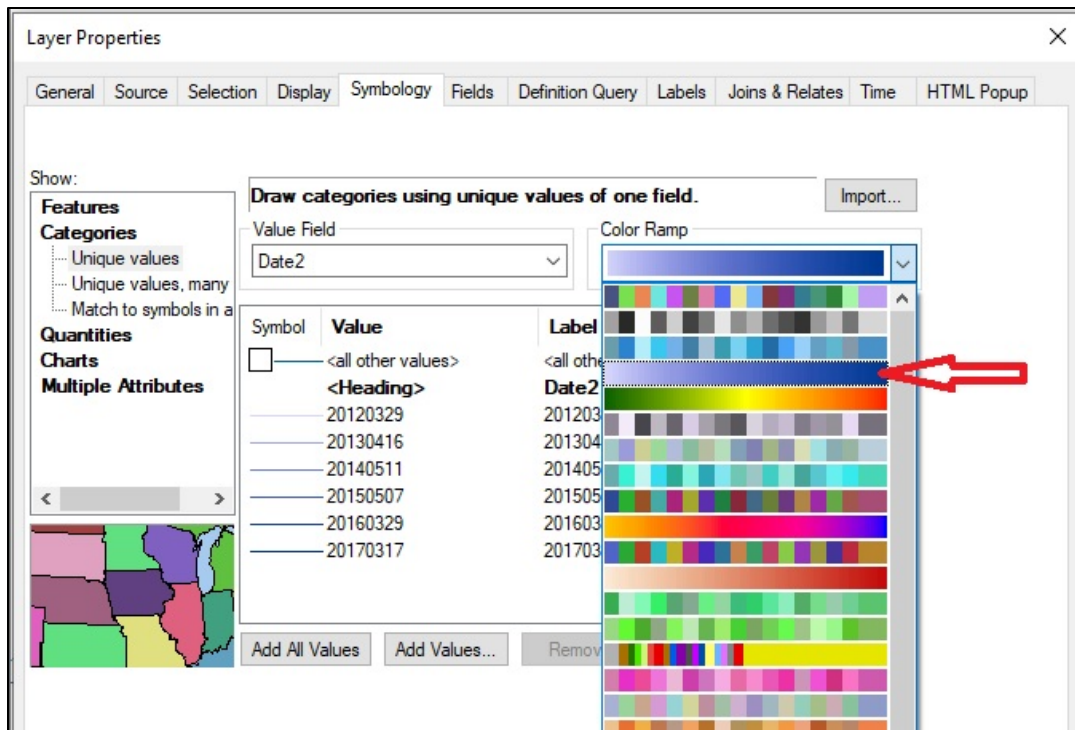


Figure 20. Symbolizing the shorelines by first picking a color ramp.

- Right-click the color ramp graphic and select Properties.
- For Color 1, pick Sodalite Blue (top row, fourth from right column) (Figure 21). The RGB values for Sodalite Blue are 190, 232, 255.

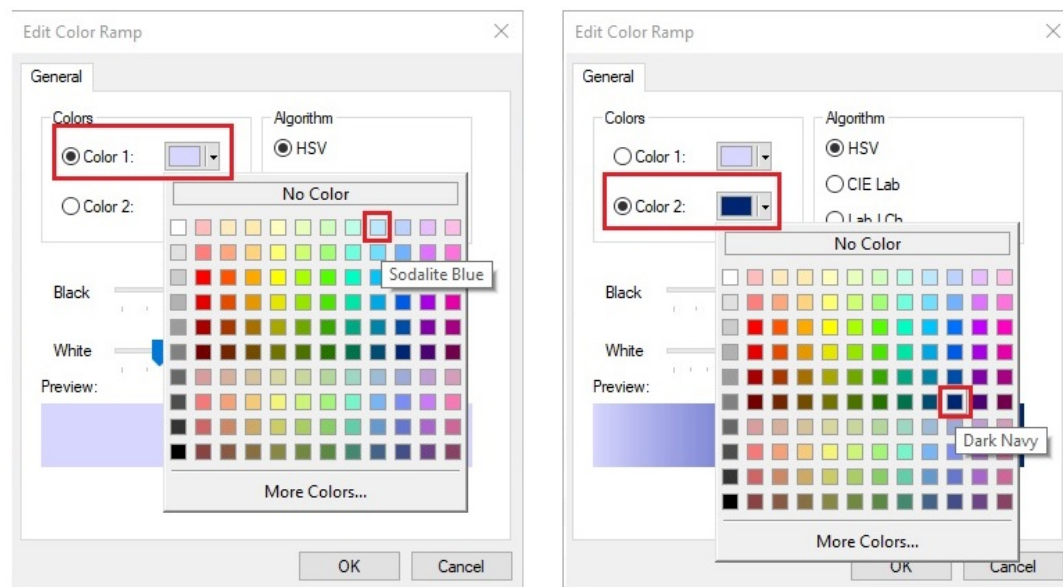


Figure 21. Two images of the Edit Color Ramp window, with red boxes indicating how to modify the properties of the color ramp by specifying the value of Color 1 (left) and Color 2 (right).

- For Color 2, pick Dark Navy (row 6, third from right column). The RGB values for Dark Navy are 0, 38, 115.
- Click OK/Apply
- The shorelines are now symbolized with the oldest to most recent shorelines going from light blue to dark blue.
- Right-click the shorelines feature class and click Save As Layer File. This will save a .LYR file that we'll later use to import the symbology into ArcGIS Pro.

2.2 ArcGIS Pro Processes

One of ArcGIS Pro's strengths is its integrated functionality with ArcGIS Online (AGOL) and the ease with which you can publish services and share data and information online.

However, before starting an ArcGIS Pro project and publishing our shoreline rate change data as services, we need to convert the data that we prepared in ArcMap to a file geodatabase (.gdb) so that it can be used in ArcGIS Pro. Remember that DSAS requires the data it uses to be in a personal geodatabase format (.mdb).

2.2.1 Convert the Personal Geodatabase to A File Geodatabase

2.2.1.1 In ArcCatalog, Create an Empty File Geodatabase (GDB):

- Right-click on the folder in which you want to house the GDB.
- Select New/File Geodatabase.
- Name the new GDB.

2.2.1.2 Import the MDB Feature Classes Into the New GDB

- Right-click the new GDB.
- Select Import/Feature Class (multiple).
- In the Feature Class to Geodatabase (multiple) window, click the folder icon to the right of the Input Features box.
- Navigate to and select the feature classes from the personal geodatabase (MDB) that you created in the previous section using ArcMap and DSAS v5. You will need the shorelines and the trimmed shorelines change rates feature classes to create a web app. It is a good idea to also import the baseline and transects so you will have them as references as you work in ArcGIS Pro.
- Click OK.

2.2.2 Create a New ArcGIS Pro Project and Add the Data from the GDB

- Open ArcGIS Pro and select New/Map (Figure 22).

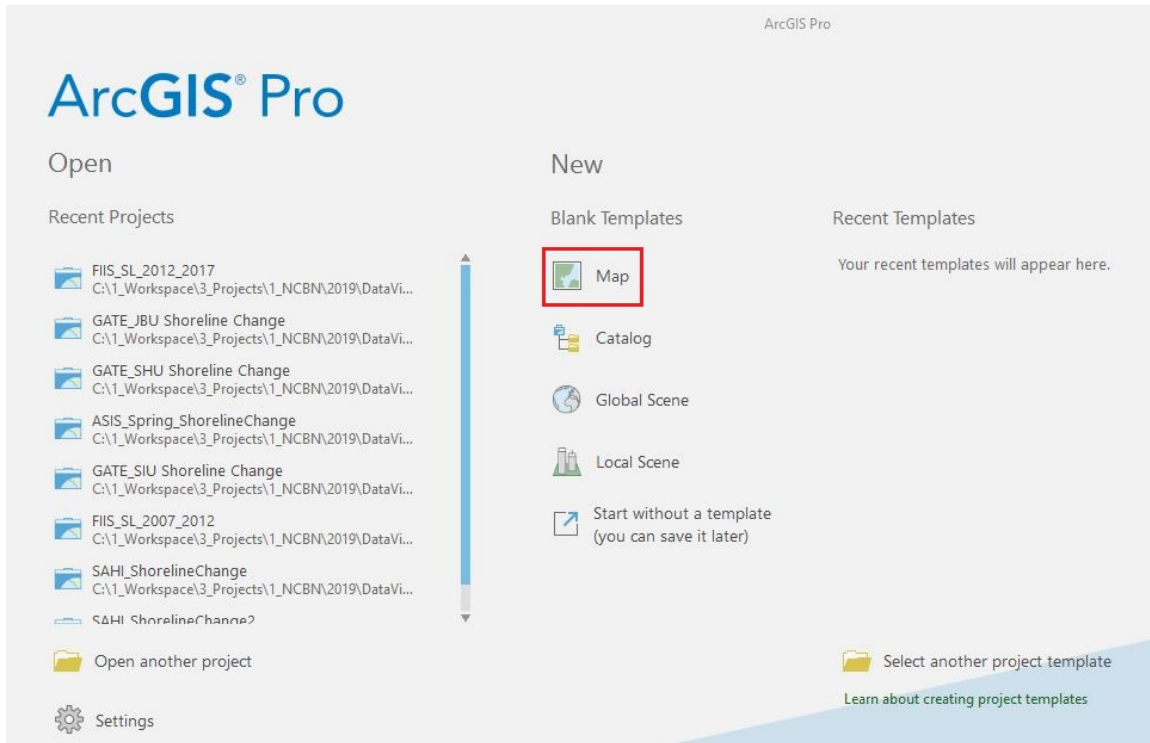


Figure 22. The initial ArcGIS Pro window, showing how to create a new ArcGIS Pro Project.

- Name your project
- Specify the path and location for your project
- Click Ok

2.2.2.1 Add Data to the ArcGIS Pro Project

- In the ArcGIS Pro project window, select the Map tab
- Choose your basemap. The NCBN web apps use Imagery With Labels.
- In the Layer Section, click Add Data/Data (Figure 23)

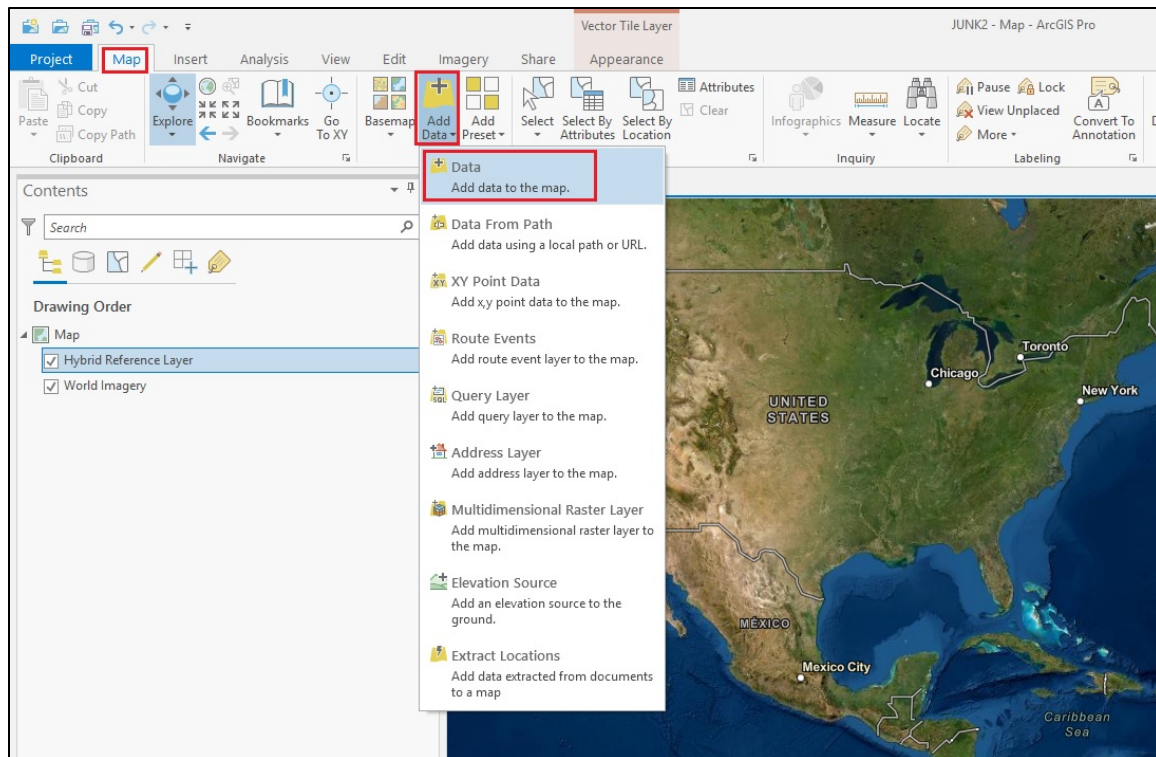


Figure 23. Adding data to an ArcGIS Pro project.

- Navigate to your new GDB and select the layers to add
- Save your project

2.2.3 Symbolize and Label the Shoreline Data

2.2.3.1 Symbolize the Shoreline Data

- In the ArcGIS Pro table of contents, right-click the Shorelines layer and select Symbolology.
- In the upper right area of the Symbolology window, click the three bars and select Import symbology (Figure 24).

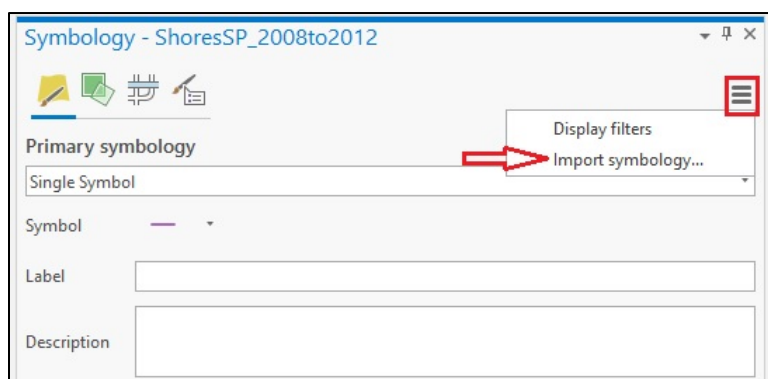


Figure 24. Importing symbology in ArcGIS Pro.

- In the Geoprocessing window that opens, verify the correct Input Layer.
- Symbology layer: Navigate to and select the LYR file you created in ArcMap.
- The Type, source Field and target Field should populate based on the LYR file you selected.
- Click Run.
- The shorelines should now be symbolized in chronological order with light blue (oldest) to dark blue (most recent).

2.2.3.2 Label the Shoreline Data

- Right-click the shorelines feature class in the ArcGIS Pro table of contents.
- Select Labeling Properties...
- In the Label Class window, Select Language: Arcade.
- In the expression box, type:
 - `Left($feature.Date2,4)`
- This should label each shoreline with the four-character year in which it was collected (e.g. 2012). Click the checkmark icon to Verify the expression.
- If expression is valid, click Apply (Figure 25).

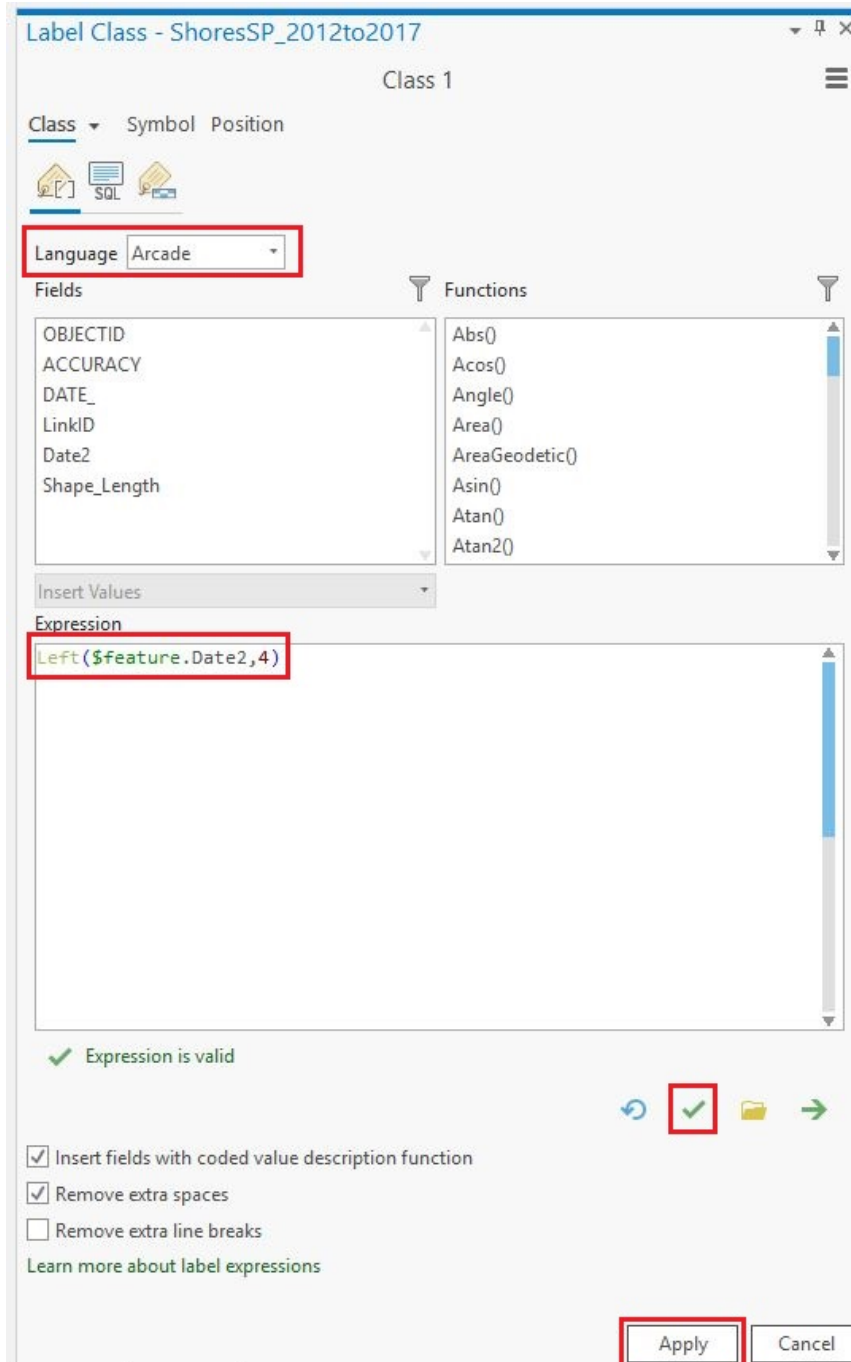


Figure 25. The ArcGIS Pro Label Class window, Class tab, showing how to specify a customized label expression.

- In the Label Class window, select the Visibility Range icon (Figure 26).
 - In beyond (Maximum Scale): <None>
 - Out beyond (Minimum Scale): 1:2000 (Note: Use your discretion, but 1;2,000 seemed appropriate in most cases.)

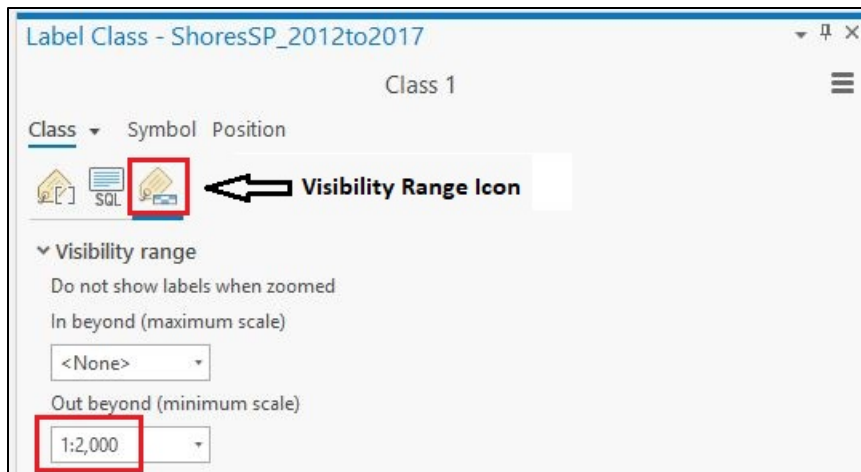


Figure 26. The ArcGIS Pro Label Class window, Class tab, showing how to set a label's visibility range.

2.2.3.3 Set the Size and Color of the Labels

- In the Label Class window, select the Symbol tab (Figure 27).
 - Font name: Arial
 - Font Style: Bold
 - Size: 10 pt
 - Text fill symbol color: Ultra Blue (Row 5, 3rd column from right; RGB = 0,77,168)
 - Halo color: White or Sahara Sand (whose RGB values are 255,235,190)
 - Halo outline width: 0 pt
 - Halo size: 2 pt

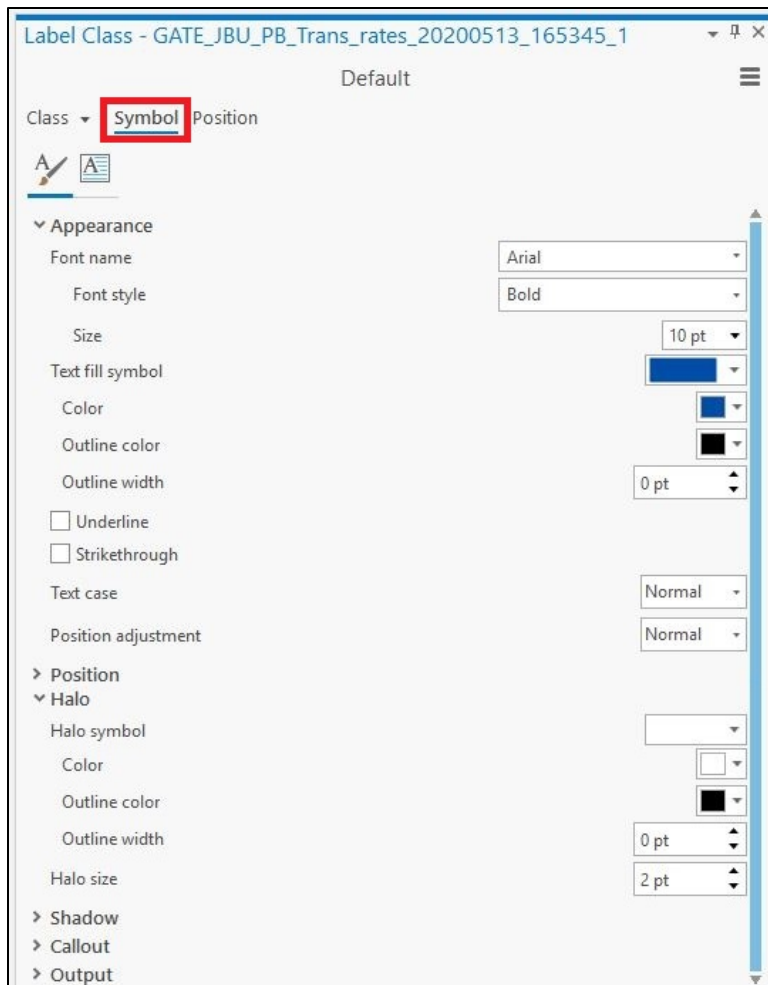


Figure 27. The ArcGIS Pro Label Class window, Symbol tab, showing how to format the shorelines labels.

- Right-click the Shorelines feature class in the ArcGIS Pro table of contents and click Label to turn on the shoreline labels.
- Zoom in and out on the shoreline layer to verify that the symbology, labeling and label visibility range is displaying correctly.
- Right-click the shorelines feature class and click Sharing/Save As Layer File.
- Navigate to the folder where you want to save the layer file and click Save. This will save a LYRX file (ArcGIS Pro format).

2.2.4 Symbolize and Label the Shorelines Change Rate Data

2.2.4.1 Symbolize the Shorelines Change Rate Data

- In the ArcGIS Pro table of contents, right-click the rates layer and select Symbology.

- In the upper right area of the Symbology window, click the three bars and select Import symbology...
 - In the Geoprocessing window that opens, verify the correct Input Layer.
 - Symbology layer: Navigate to and select the LYR file you created in ArcMap.
 - The Type, source Field and target Field should populate based on the LYR file you selected.
 - Click Run.
- If the data does not display, check for a warning in the Symbology window. If you see “*The renderer has exclusion setup. Use the advanced page to verify the validity of the exclusion clause.*” click the Advanced Symbol Options icon (Figure 28). Then click the Data Exclusion option and Remove to remove the clause. Click Apply. Your data should now display.

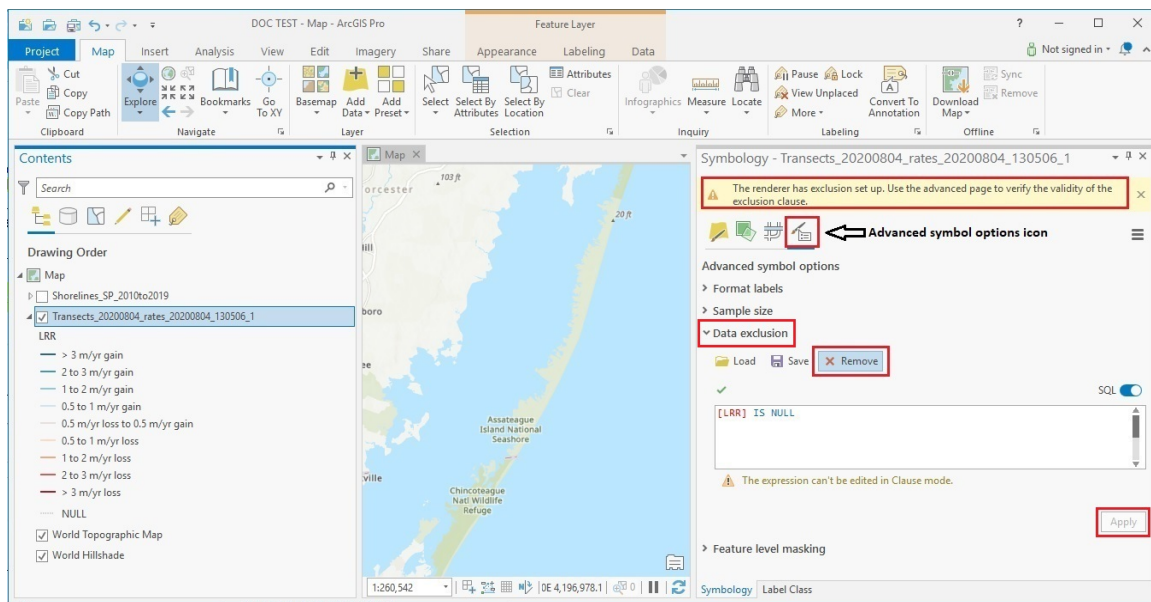


Figure 28. The ArcGIS Pro Symbology window, advanced symbol options, showing how to remove the data exclusion clause.

- Verify that the transects are symbolized with the correct colors and line widths. As mentioned in Section 2.1.7, the NCBN web apps use slightly different colors to symbolize the shoreline change rate transects than the DSAS default color ramp. The hex and RGB values for the NCBN colors are found in Appendix A. To apply these colors, click one of the symbols in the ArcGIS Pro table of contents. In the Symbology window’s Property tab, click the color patch, click Color Properties... and enter the appropriate hex value from Appendix A. Click OK, and repeat until all the colors have been changed. Save the ArcGIS Pro project.

2.2.4.2 Label the Shorelines Change Rate Data

- Right-click the shoreline change rate feature class in the ArcGIS Pro table of contents.
- Select Labeling Properties...
- In the Label Class window, Select Language: Arcade.
- In the expression box, type:

- `$feature.LRR + " m/yr (+/- " + $feature.LCI95 + ")"`

This use the attribute names LRR and LCI95 to label each transect with its linear regression rate and the 95% confidence interval value (e.g. 4.25 m/yr (+/- 2.49)). If for some reason the expression is not working, verify that your attribute names are indeed LRR and LCI95. If you use a different confidence interval, the attribute name will reflect that. For example, if you use a 90% confidence interval, the attribute name should be LCI90.

- In the Label Class window, select the Visibility Range icon (Figure 26).
 - Maximum Scale: <None>
 - Minimum Scale: 1:2000 (Note: Use your discretion, but 1;2,000 seemed appropriate in most cases)

2.2.4.3 Set the Size and Color of the Labels

- In the Label Class window, select the Symbol Tab (Figure 27). Refer to the text between Figures 26 and 27 (above) to format the label text.
- In the ArcGIS Pro table of contents, right-click the shoreline change rates feature class and click Label to turn on the transect labels.
- The results should look like Figure 29.

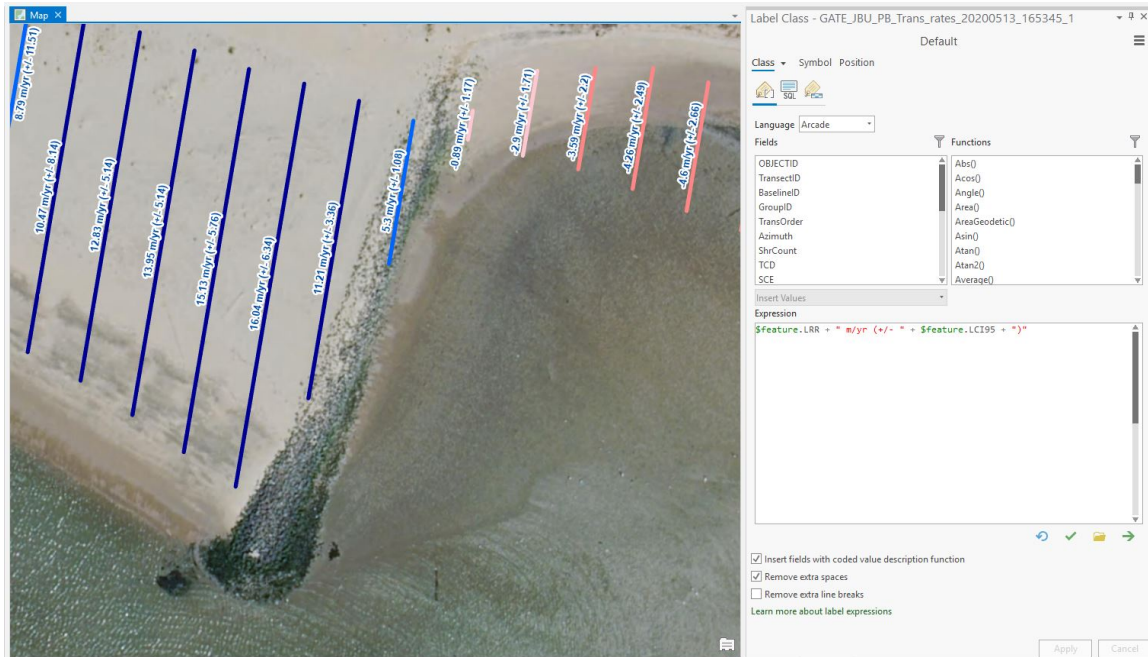


Figure 29. Shoreline change rates transects symbolized and labeled in ArcGIS Pro.

- Right-click the shoreline change rates feature class and click Sharing/Save As Layer File.
- Navigate to the folder where you want to save the layer file and click Save. This will save a LYRX file (ArcGIS Pro format).
- Save the project.

2.2.5 Publish the Shoreline and Shoreline Change Rates Layers as Services

- In the ArcGIS Pro table of contents, change the names of the feature classes that you wish to publish, and the attribute name that appears above the symbols (Figure 30). The new names should be more descriptive and will be published with the feature classes. The new “names” are actually aliases; the original names of the feature classes are unchanged and can be seen in the Layer Properties window.



Figure 30. Original and new feature class names. Prior to publishing the feature classes as services, the feature class names are edited to be more descriptive.

- For the NCBN web apps, we will publish each feature class separately. Each feature class will have to be alone in its own ArcGIS Pro map in order to be published as its own service. To accomplish this, go to the ArcGIS Pro tool bar (Figure 31) and click Insert/New Map. Give your map a descriptive name, similar to the new names in Figure 31. The name of the published service will default to the map name. You can also change the name later during the publishing process. To get the data into each new map, simply select and copy a feature class from the original composite map and paste it into the new single layer map. You may want to change the basemap in the new maps to Imagery with Labels for visual reference, but the basemap will not be included in the published service.

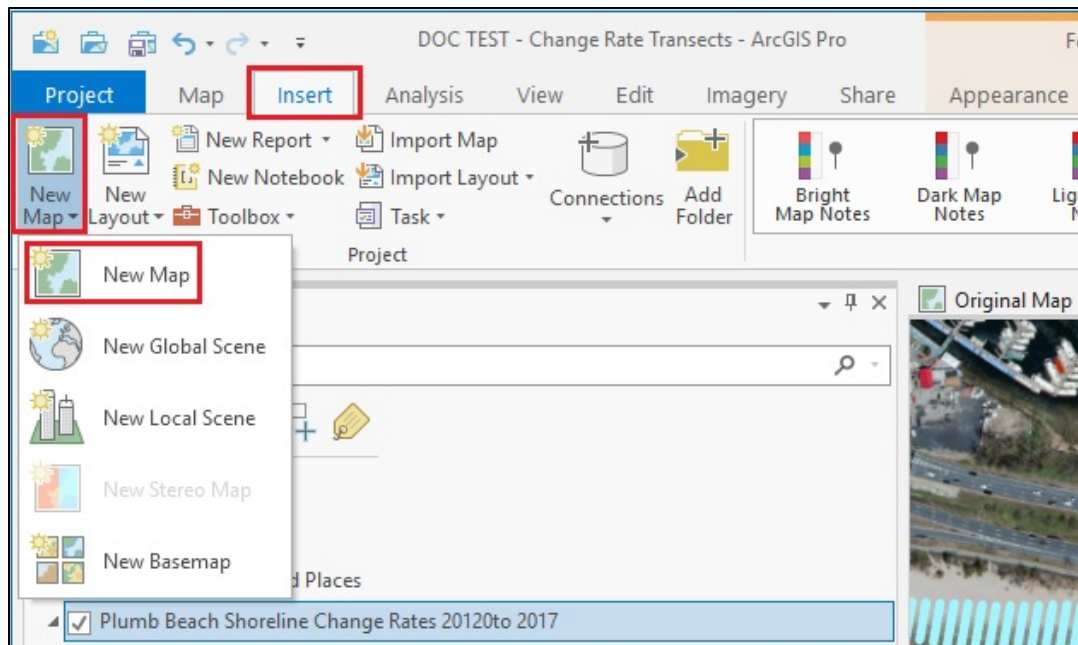


Figure 31. Insert a new map in ArcGIS Pro.

- After you have established the correct symbology, labels, aliases, and new maps, you're ready to sign in to your NPS AGOL account and publish the feature classes as services. Sign in to your AGOL account by clicking the Not Signed In line in the upper right of your ArcGIS Pro project, and then click the Sign In link (Figure 32).

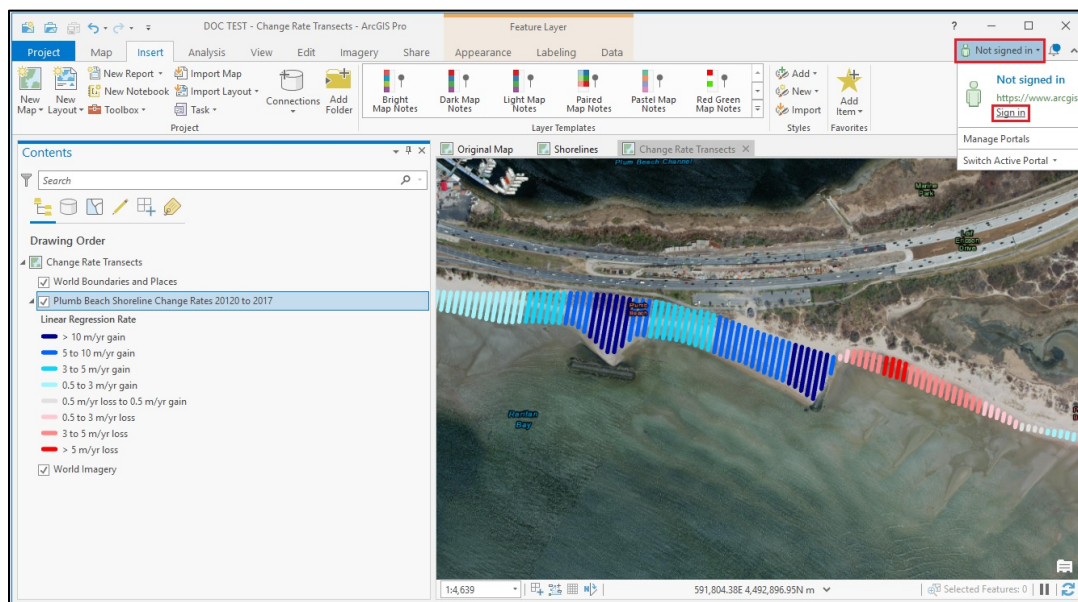


Figure 32. The ArcGIS Pro Project window, showing how to sign in to your NPS ArcGIS Online account by clicking the link in the upper right corner. Note the three map tabs above the imagery (Original Map, Shorelines, and Change Rate Transects). The Change Rate Transects Map is displayed.

- Before signing in to AGOL, many of the sharing tools will not be available. But now that you are signed in, you may click the Share tab on the main ArcGIS Pro ribbon. Then in the Share As section, click Web Layer and Publish Web Layer (Figure 33).

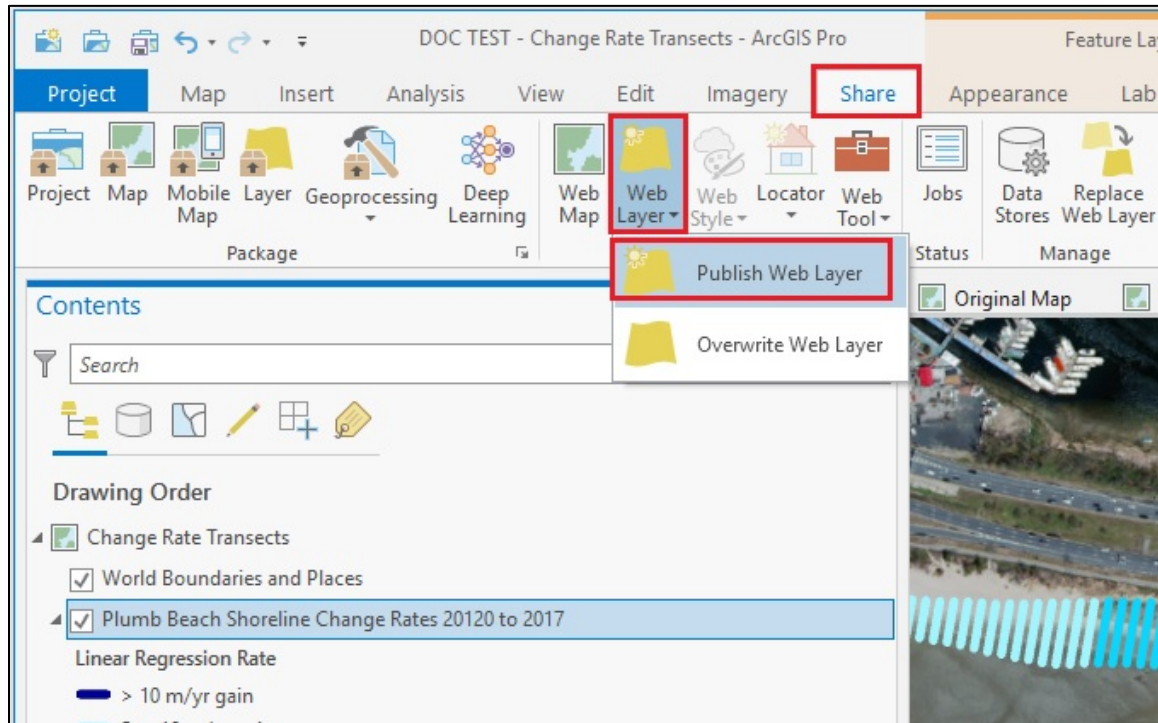


Figure 33. ArcGIS Pro's Publish Web Layer tool.

- The Share Web Layer window will open (Figure 34).

Share As Web Layer

Sharing Change Rate Transects As A Web Layer

General Configuration Content

Item Details

Name
Change Rate Transects

Summary
Blah

Tags
Blah × Add Tag(s)

Layer Type ⓘ

☒ Feature
☐ Tile
☐ Vector Tile

Location

Folder
GATE Shorelines

Share with

☐ Everyone
☒ National Park Service
Groups ▾

Finish Sharing

Analyze Publish Jobs

Figure 34. The ArcGIS Pro Share As Web Layer window, General tab.

- Fill in the name of the service that will be published, a brief data summary, and any tags. You may fill in complete information at this stage, or fill in minimum required information now, and enter the complete information after the service has been published. One reason for completing the text after publishing is that if your text contains hyperlinks, they will be broken during the publishing process and you will have to re-enter the hyperlinked text. Another reason to finalize the Item Details fields after publication is that there are two additional fields that you will need to populate after publishing the service: Data Description and Terms of Use.
- One approach to completing these fields is to maintain text files or Word documents for each feature class with all the text you will ultimately need (brief data summary, longer data description, tags, and the NPS Terms of Use disclaimer statement). An example document for GATE, Breezy Point is provided in Appendix B: Data Details Text. Most of the text will be the same for every web app, but the references to a particular park, shoreline name, and the date range will have to be edited for each web app.

- For Layer Type, select Feature
- For Location Folder, specify the AGOL folder to which you'll publish the service
- At this stage, it is advisable to share with National Park Service rather than Everyone. After the maps have been reviewed and approved, you can change the sharing permissions to Everyone (public).
- Click the Analyze box in the lower left corner (green check mark, Figure 34) and ArcGIS Pro will analyze your map and display warning and/or error messages. Error messages must be addressed before you can publish the service, but warnings will not prevent publication. If you have a basemap in your ArcGIS Pro map, expect to get a warning that the "Layer's data source is not supported." This warning is referring to the basemap and is not a concern since we want to publish the feature class without the basemap anyway. If there are no errors, click Publish.
- You will see several status messages as the service is being published. Finally, there will be a green status box at the bottom of the Share As Web Layer Window that indicates successful publication and provides a link to manage the web layer (Figure 35).

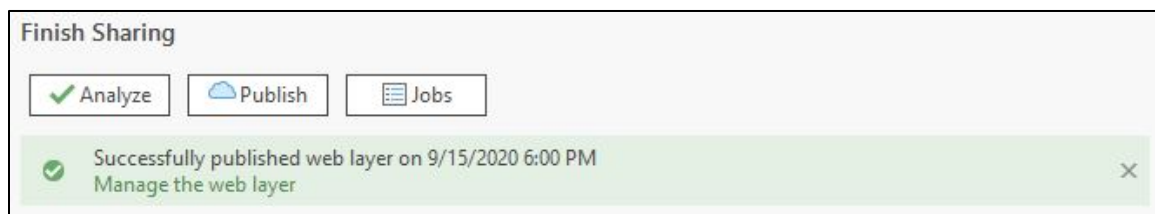


Figure 35. ArcGIS Pro message showing successful publication and providing link to manage the web layer.

- Click the Manage the Web Layer link and you will be taken to the web layer's Overview page where you can fill in several metadata fields, open the change sharing status, edit the thumbnail image, and perform other data management tasks (Figure 36).

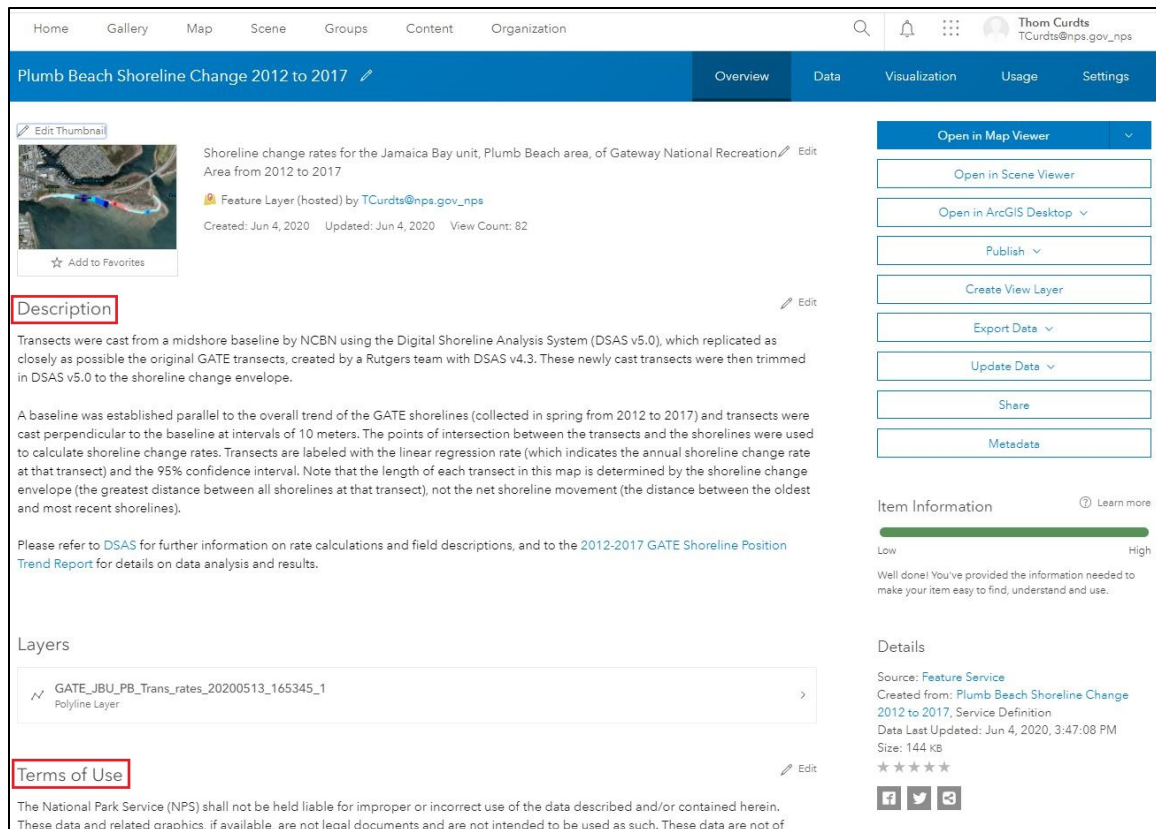


Figure 36. The ArcGIS Online Overview page of a published web layer. Note the Description and Terms of Use fields that were not present in the ArcGIS Pro Share as Web Layer window (Figure 34).

- Repeat the publication process for any additional Shoreline Change Rate layers and the Shorelines layer(s).

2.3 ArcGIS Online Processes

2.3.1 Create a Web Map

- Open a Google Chrome browser. Other browsers can be used, but the results (especially formatting) might be different than described in this document.
- Log in to your AGOL account.
- Click on the My Content tab.
- Find your published services in the folders in which you saved them. For each service you should see two items: Service Definition and Feature Layer (hosted).

2.3.1.1 Open Shorelines Layer in Map Viewer

- Right-click the Shorelines Feature Layer and open the link in a new tab.
- Hover over the thumbnail image and click Open in Map Viewer or click the Open in Map Viewer tab in the upper right of the page.

- A map should open with the Feature Layer displayed as it was symbolized in ArcGIS Pro when you published it. The default basemap is Topographic. Change the basemap to Imagery with Labels.
- In the map's table of contents, click the ellipsis below the Feature Layer name and select Zoom To. This should set the map extent to the extent of the shorelines layer.
- In the main toolbar, click Save. The first time the map is saved you are creating a web map. Provide a title, tags, brief summary, and select the folder in which you want it to be saved. Click Save Map.

2.3.1.2 Configure the Shorelines Data Pop-Up

- In the map's table of contents, click the ellipsis below the Feature Layer name and select Configure Pop-up (Figure 37).

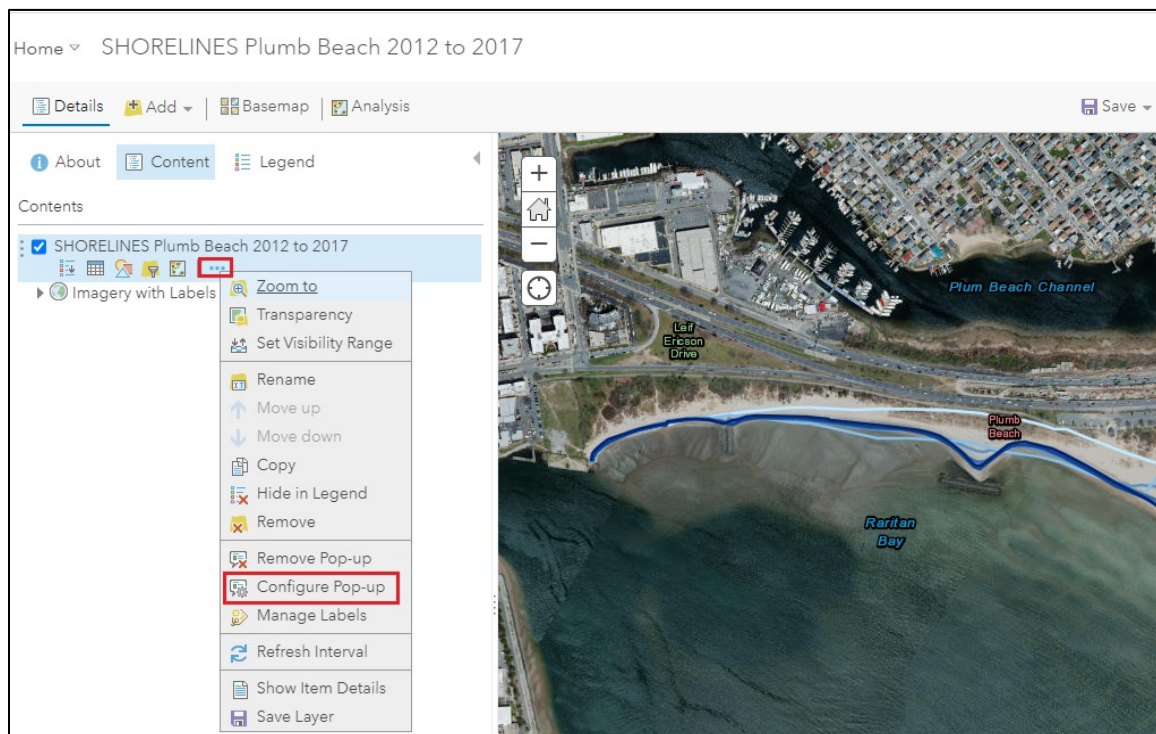


Figure 37. ArcGIS Online web map, showing how to open the Configure Pop-up tool.

- In the Configure Pop-up window that opens, enter the Pop-up title of “Shoreline Info” (Figure 38).

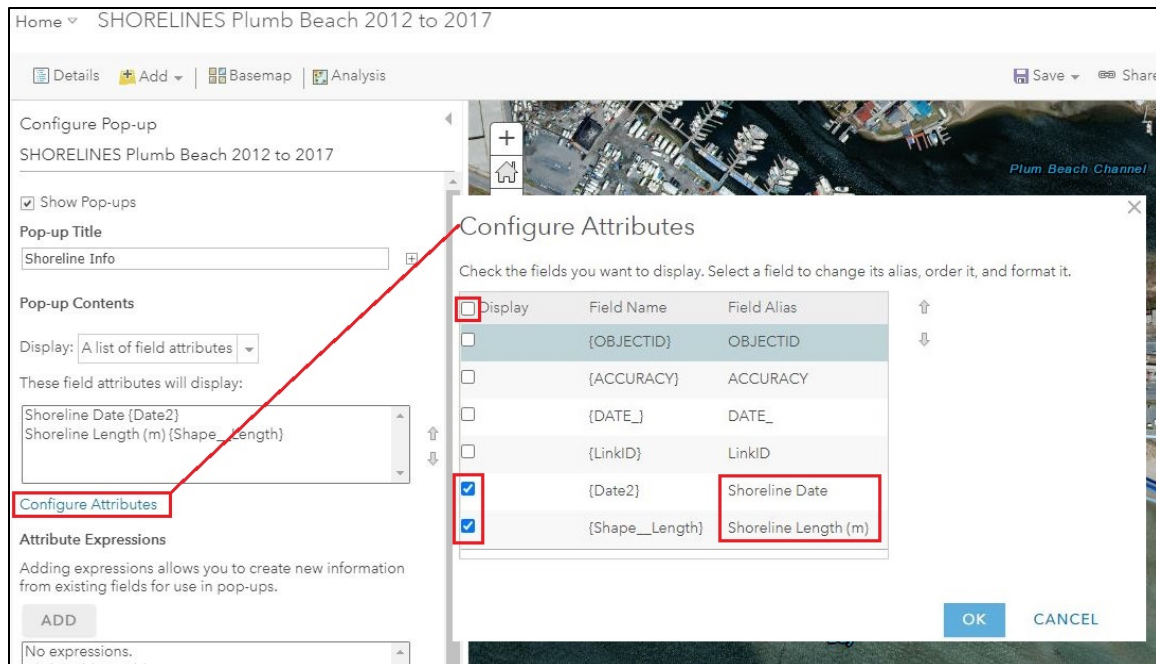


Figure 38. AGOL pop-up attribute configuration window, showing the two shoreline attributes to select and their Field Aliases.

- Click the blue “Configure Attributes” link.
- Click the Display box to first select all attributes and then to unselect all.
- In the Display column select the box for {Date2} and {Shape__Length}.
- In the Field Alias Column change Date2 to Shoreline Date, and change Shape__Length to Shoreline length (m).
- Click OK to close the Configure Attributes window.
- Click OK at the bottom of the Configure Pop-up window to save and implement the changes.
- Click Save on the top menu bar to save the map.

Now when a user clicks on a shoreline in the map, the shoreline will be selected, and a pop-up window will appear showing the shoreline date and length (Figure 39).

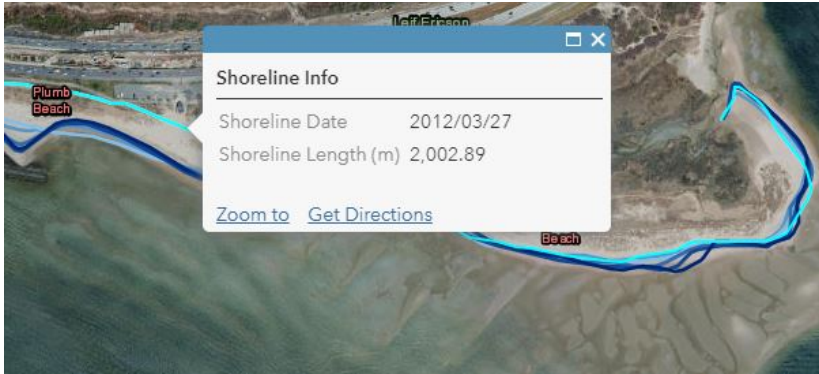


Figure 39. AGOL web map pop-up window, showing date and length for one of the shorelines, as configured in the preceding text.

2.3.1.3 Verify Correct Label Format for the Shoreline Feature Layer

- Formatting should have been maintained in the publishing process, but it is prudent to verify it here. In the map's table of contents, click the ellipsis below the Feature Layer name and select Manage Labels.
- Check the Label Features box to activate labeling.
- Click the edit tool icon to the right of the Text box that says, "Class 1 (Expression)." In the expression box, make sure the expression reads "Left(\$feature.Date2,4)" (Figure 40).

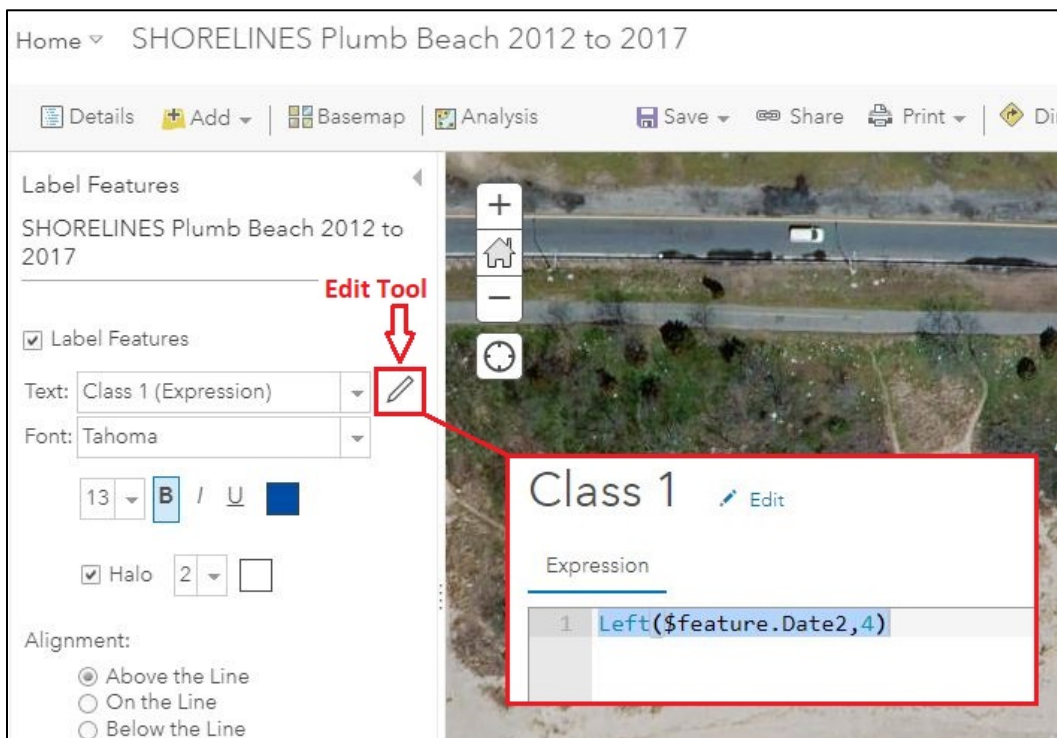


Figure 40. AGOL web map, Manage Labels edit tool, showing expression for shoreline labels that results in labeling each shoreline with the year in which it was collected.

- Font should be Tahoma, size 13 pt and Bold.
- Font color box should indicate Medium Blue (2nd row from bottom, 3rd column from right).
- Halo box size should be 2 pt and the halo color white.
- Zoom in to the level at which you want the labels to start displaying. This will vary depending on the extent and distribution of the shorelines and your cartographic preferences. Use the two slider bar adjusters to define the Visible Range for the labels. The black triangle above the slider bar indicates the map's current zoom level (Figure 41).

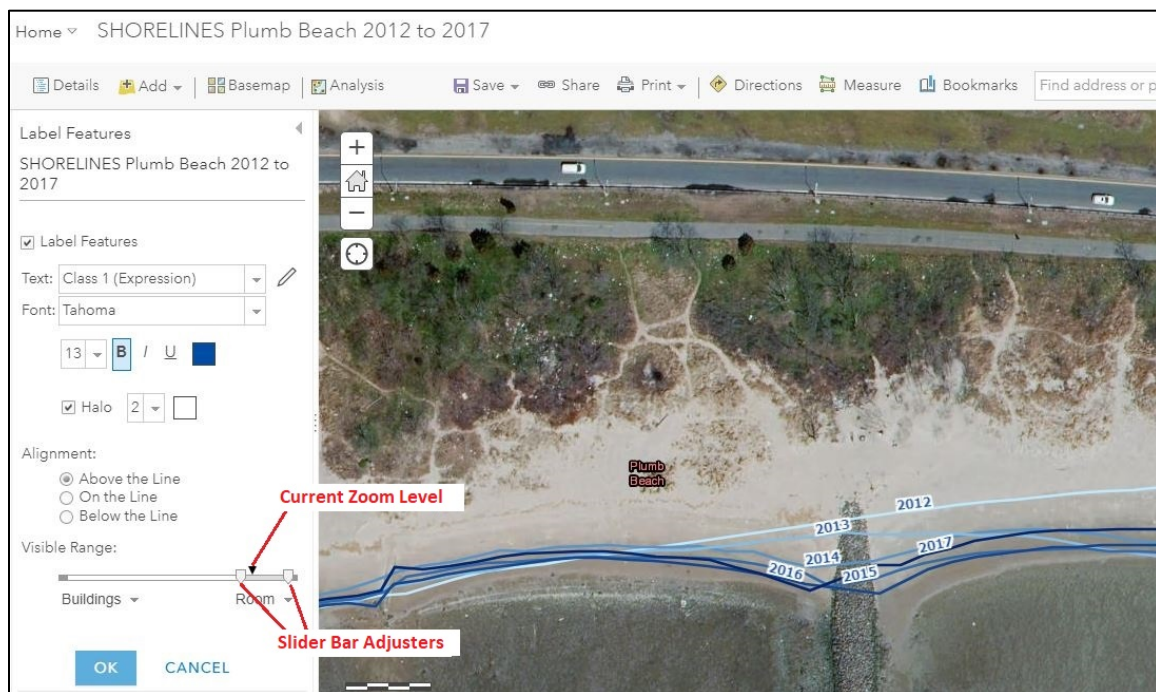


Figure 41. AGOL web map, showing the Visible Range slider bar adjusters and the results of formatting the shoreline labels.

- Click OK, click the Home button to zoom back out to the full map extent, and save the map. Note: If the map gets saved while zoomed in, the zoomed map extent will become the new default map extent. To fix this, simply zoom back out to the full extent and save the map again.

2.3.1.4 Add the Shoreline Change Rate Feature Class to the Map

- In the top left toolbar, click Add button and Search For Layers. The data layers in your AGOL account should appear. If not, check that text under the toolbar reads “My Content.” If it says something else like Living Atlas or My Organization, click that text and select My Content. Find the layer you want to add and click the add icon (⊕) (Figure 42).

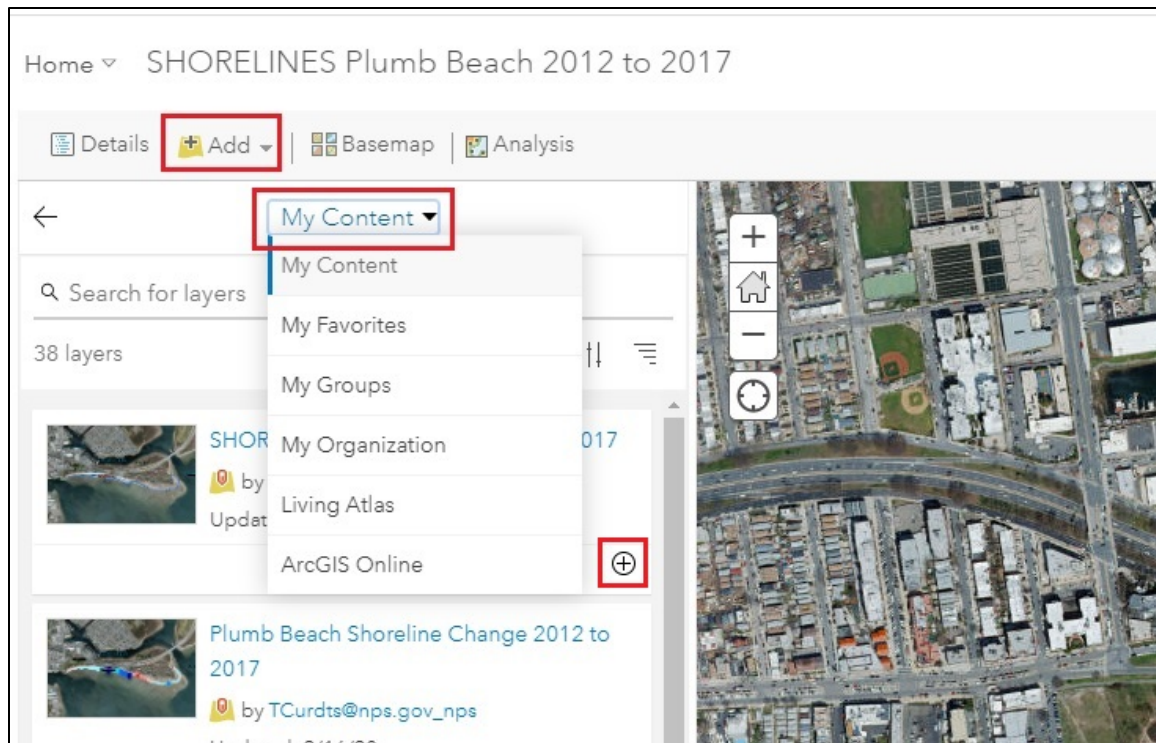


Figure 42. AGOL web map, showing how to add data to the map from your My Content folder.

- After adding the Shoreline Change Rate layer to your map, click Details in the upper left to go back to the map's table of contents.

2.3.1.5 Configure the Shoreline Change Rate Data Pop-up

- In the map's table of contents, click the ellipsis below the Change Rate Feature Layer name and select Configure Pop-up, like you did for the Shoreline Feature Layer (Figure 37).
 - Pop-up title: Under Pop-up Title click the "+" to the right to expand the Add Field Name or Expression drop-down menu. This will give a drop-down menu with a list of all the attributes in the layer.
 - Select {TransectID}.
 - Type "Transect #" before {TransectID} and the final expression should be Transect #{TransectID}.
 - Click the blue "Configure Attributes" link.
 - Click the Display box to first select all attributes and again to unselect all attributes.
 - In the Display column select the boxes for seven attributes, as seen in Figure 43. Figure 43 also shows the alias names that you should enter. Change the order of the fields so that they are as shown in Figure 43; this is the order in which the fields will be displayed in the pop-up window.

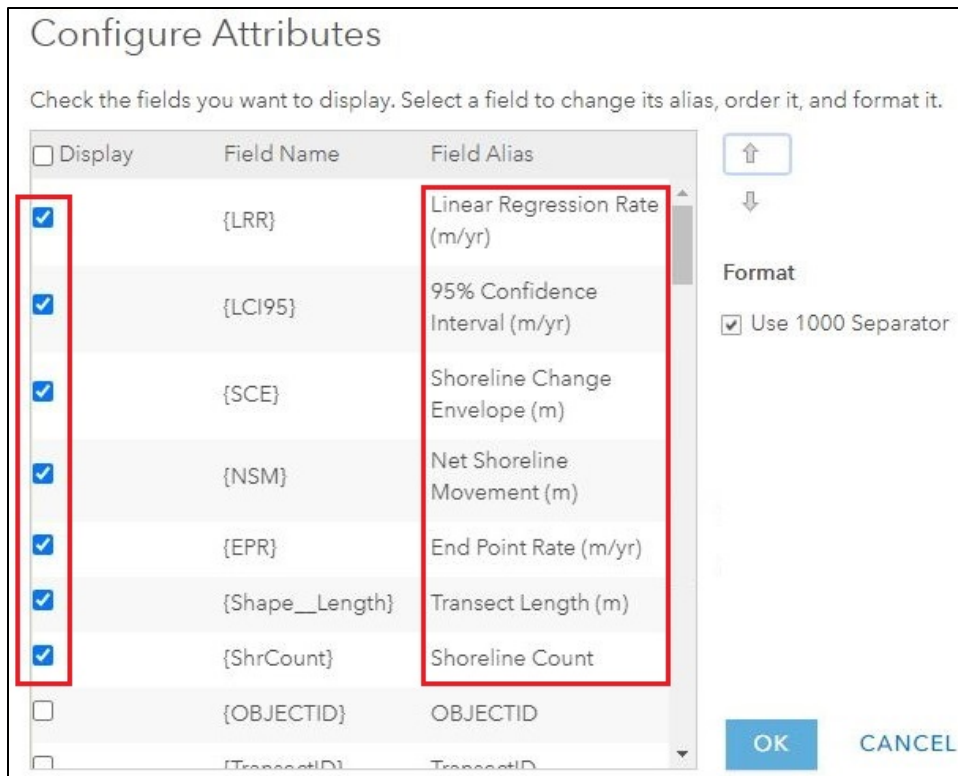


Figure 43. AGOL pop-up attribute configuration window, showing which of the shoreline change rate attributes to select, their Field Aliases, and the order in which they should be arranged.

- Click OK to save changes and close the Configure Attributes window.
- Click OK at the bottom of the Configure Pop-up window to save and implement the changes.
- Click Save on the top menu bar to save the map.
- Click on a transect to test your pop-up results. The pop-up should look like Figure 44.

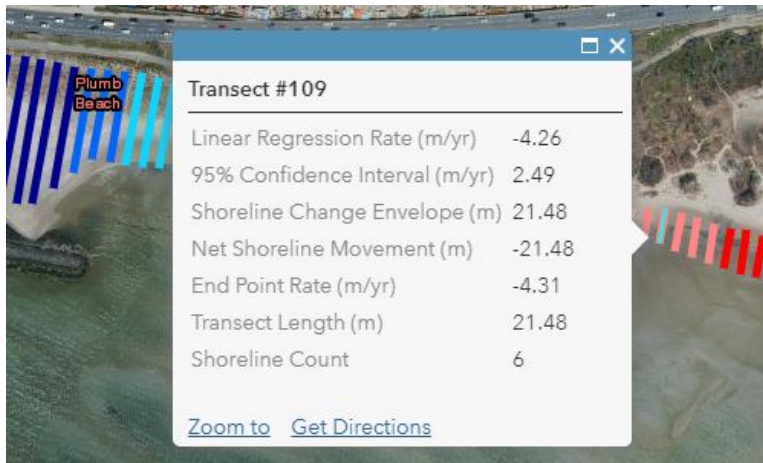


Figure 44. AGOL web map pop-up window, showing selected statistics for one of the shoreline change rate transects, as configured in the preceding section.

2.3.1.6 Verify Correct Label Format for the Shoreline Change Rate Feature Layer

- Label formatting should have been maintained in the publishing process, but it is prudent to verify it here. In the map's table of contents, click the ellipsis below the Feature Layer name and select Manage Labels.
 - Check the Label Features box to activate labeling.
 - Click the edit icon to the right of the Text box that says, "Class 1 (Expression)." In the expression box, make sure the expression reads as follows:
 - `$feature.LRR + " m/yr (+/- " + $feature.LCI95 + ")"`
 - Font should be Tahoma, size 13 pt and Bold.
 - Font color box should indicate Medium Blue (2nd row from bottom, 3rd column from right).
 - Halo box size should be 2 pt and the halo color white.
 - Zoom in to the level at which you want the labels to start displaying. This will vary depending on the extent and distribution of the shoreline change rate transects and your cartographic preferences. Use the two slider bar adjusters to define the Visible Range. The black triangle above the slider bar indicates the map's current zoom level (Figure 41).

2.3.2 Create a Web Mapping Application

- In your AGOL My Content page, click on the Create button in the upper left, then select Web AppBuilder (Figure 45).

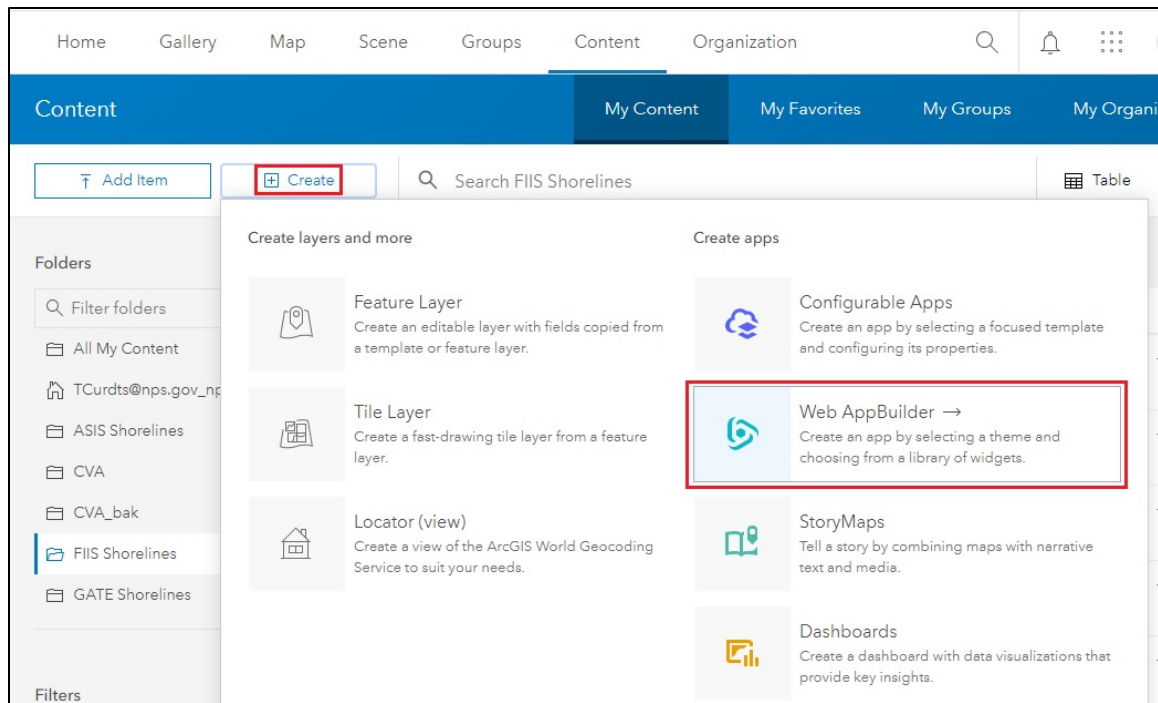


Figure 45. The AGOL My Content page with red boxes indicating how to begin building a web app.

- The Create a Web App window will appear.
- Choose 2D (default).
- Specify a Title, Tags, and Summary (Optional).
- Scroll down and specify the folder in which you wish to save the web app and click OK (Figure 46).

Create a web app

☒ 2D ☐ 3D

Specify a title, tags, and summary for the new web mapping application.

Title:

GATE_JBU Breezy Point (bay and ocean sides) Shoreline Change 20

Tags:

GATE X Gateway National Recreation Area X

Jamaica Bay X Breezy Point X Geomorphology X

Beaches X Beach Dynamics X Coastal Dynamics X

Erosion X Shoreline X Shoreline Change X Storms X

Geology X Environment X Geoscientific Information X

Add tags

Summary: (Optional)

Shoreline change rates for the Jamaica Bay unit, Breezy Point area (ocean side) of Gateway National Recreation Area from 2012 to 2017.

Categories:

+ Assign Category

Save in folder:

DOC TEST

OK Cancel

Figure 46. The AGOL Create a Web App window with sample text filled in.

The ArcGIS Web AppBuilder will open with four tabs in the upper left: Theme, Map, Widget, and Attribute. We will work our way across these tabs from left to right as we build the web app.

2.3.2.1 Web AppBuilder Theme Tab

- Select Dashboard Theme, and the Dashboard template will appear. It contains the primary map panel and five blank widget panels (Figure 47).

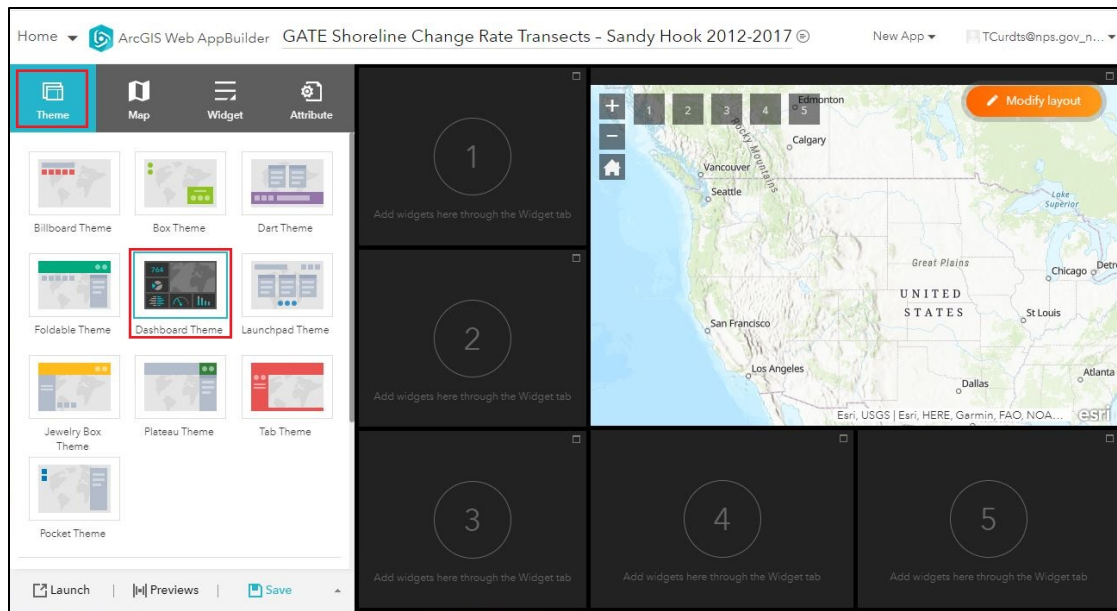


Figure 47. The AGOL Web AppBuilder, showing the initial Dashboard Theme template under the Theme Tab. Note the other three tabs in the upper left: Map, Widget, and Attribute.

- Modify the Dashboard Layout
 - Click the orange Modify Layout button in the upper right.
 - Drag the Map Area panel to the upper left.
 - Delete one of the widget panels and reposition the other four widget panels so that they are arranged like those in Figure 48 and click OK.

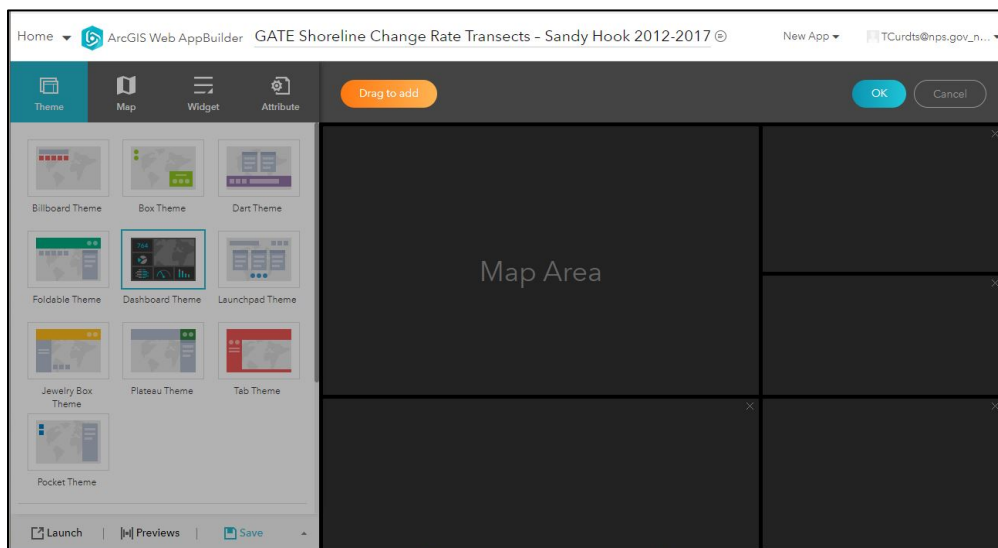


Figure 48. The AGOL Web AppBuilder, showing a modified layout for the Dashboard Theme template.

2.3.2.2 Web AppBuilder Map Tab

- Click the Map Tab in the upper left.
- Click the teal colored Choose Web Map box (Figure 49).

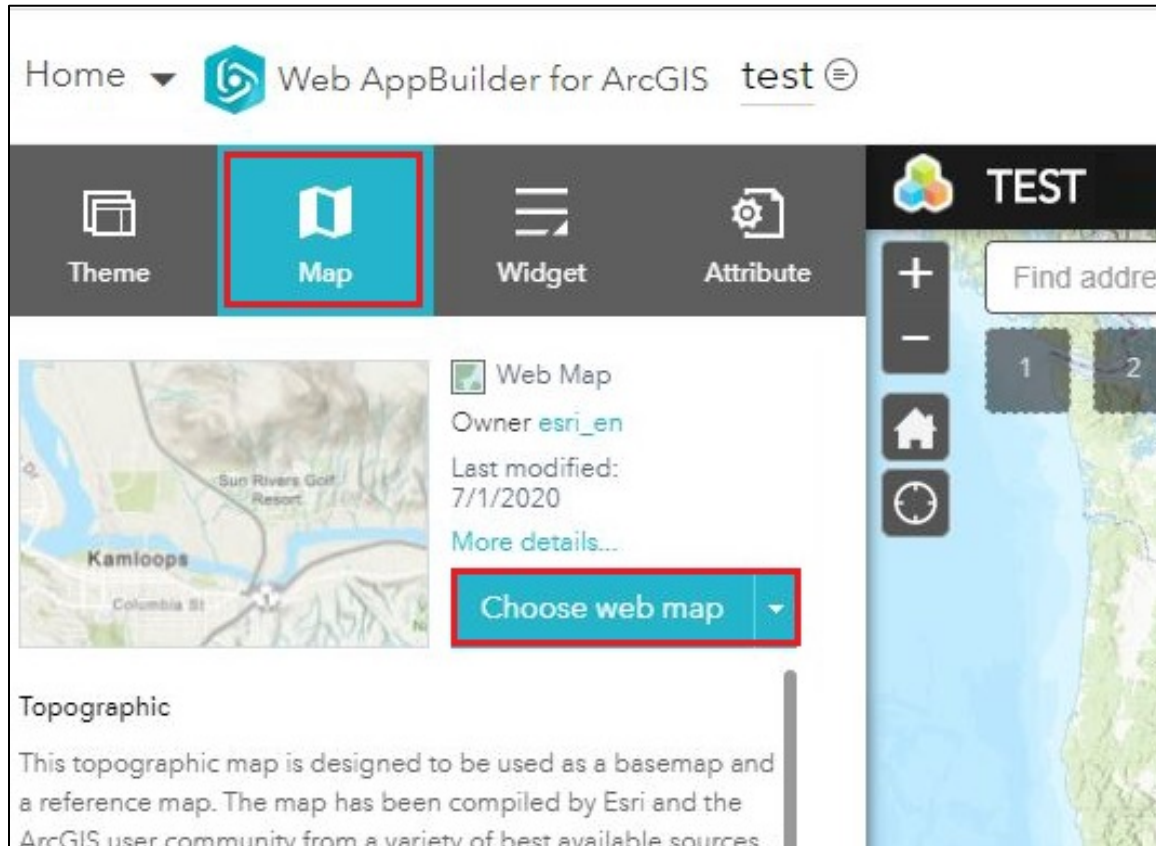


Figure 49. The AGOL Web AppBuilder, showing the Map tab and choosing a web map.

- Choose the web map that you saved in Section 2.3.1.
- If necessary, adjust the map extent to show the entire data set and, under Initial Extent, click Use Current Map View.

2.3.2.3 Web AppBuilder Widget Tab

The Widget Tab is where most of the work to build your web app will occur. Be forewarned that some of the tools and interfaces, especially concerning formatting, are a bit buggy and awkward.

- In the upper left corner of the Web AppBuilder, click the Widget Tab (to the right of the Map tab). Four gray, numbered widget icons will appear in the upper left below the four main tabs. These widget icons correspond to the four widget panels in the web app layout. Hovering over a widget icon will cause its corresponding widget panel to turn red (Figure 50).

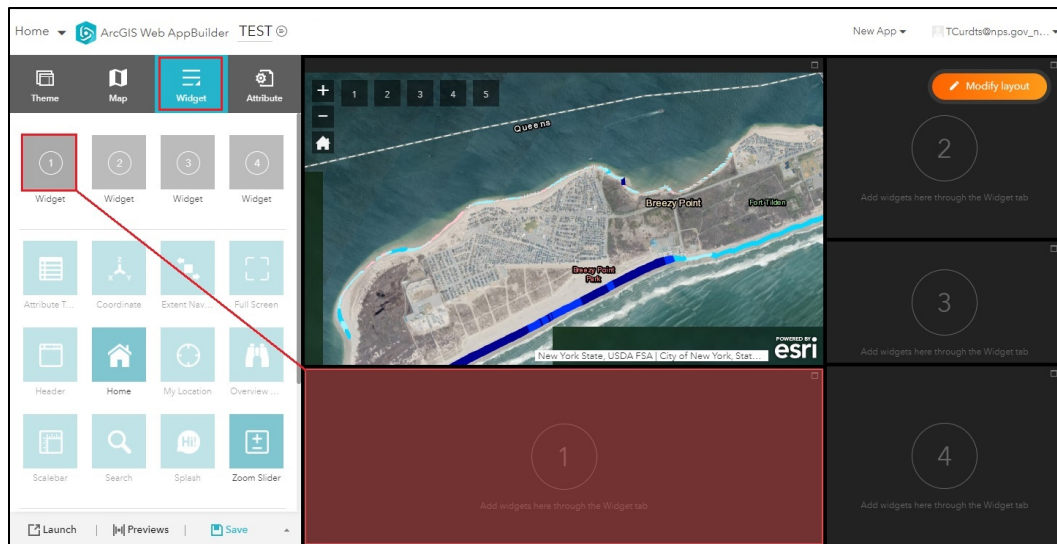


Figure 50. The AGOL Web AppBuilder, showing the Widget tab and the four widget icons that correspond to the four map panels.

Legend Widget

- Click on the widget icon that corresponds to the widget panel in the upper right of the layout, to the right of the map panel.
- From the Choose Widget window that appears, select the Legend widget (Figure 51) and click OK.

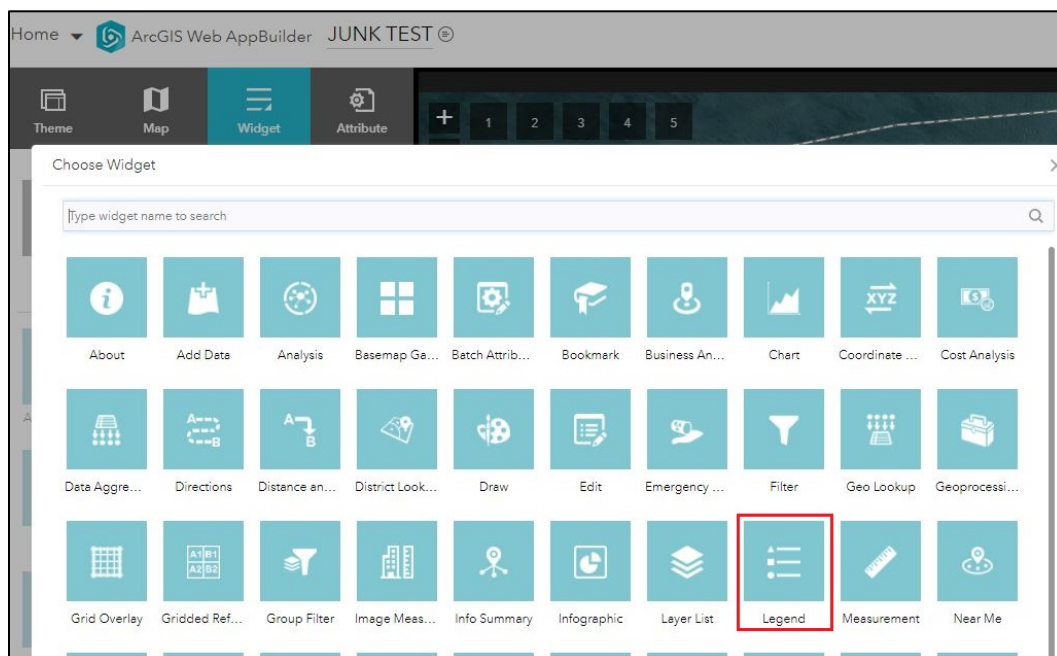


Figure 51. The AGOL Web AppBuilder, showing the Choose Widget window, highlighting the Legend widget.

- In the Configure Legend window, check the box on the right side that says, “Honor the web map’s setting.” Accept all the other default settings, as shown in Figure 52. Click OK and the legend, with the symbology you set earlier, should appear. It might be necessary to adjust the sizes of the widget panels to that the legend and other widgets fit well, but it is best to wait until the end of the web app building process.

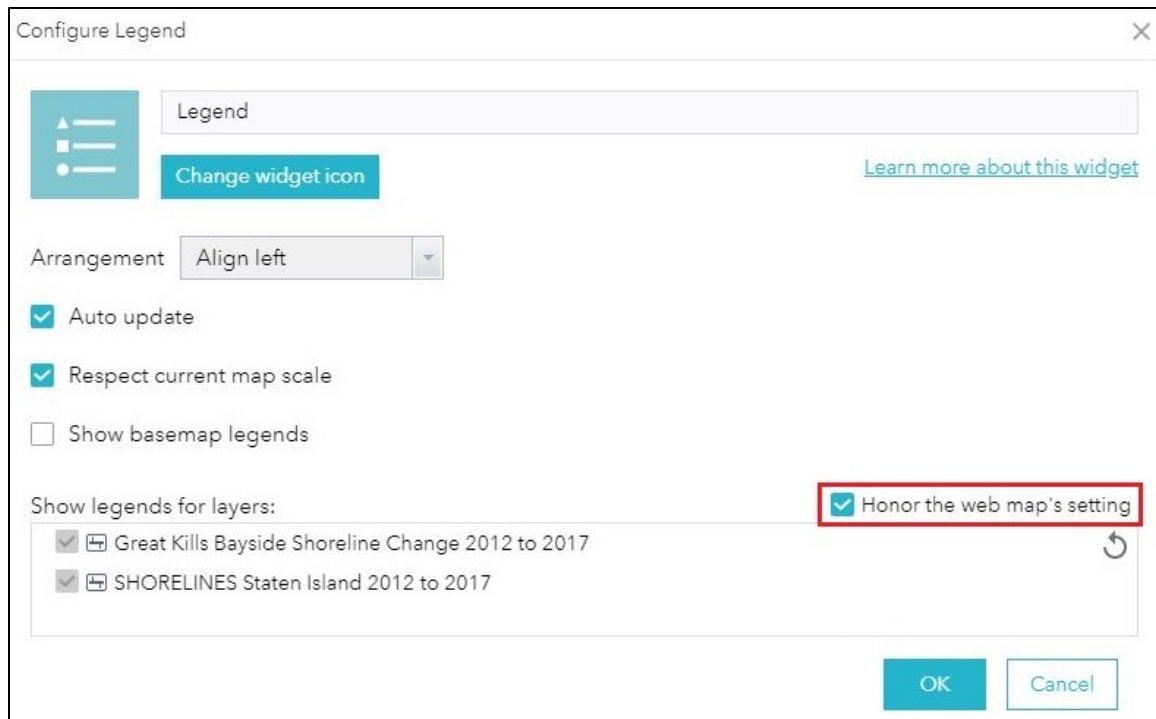


Figure 52. The Web AppBuilder’s Configure Legend window, showing the desired settings.

About the Data Widget

The two widget panels directly below the legend will be filled with text, and we’ll use the “About” widget for these two panels (Figure 53). The text will be copy/pasted from pre-prepared text files.

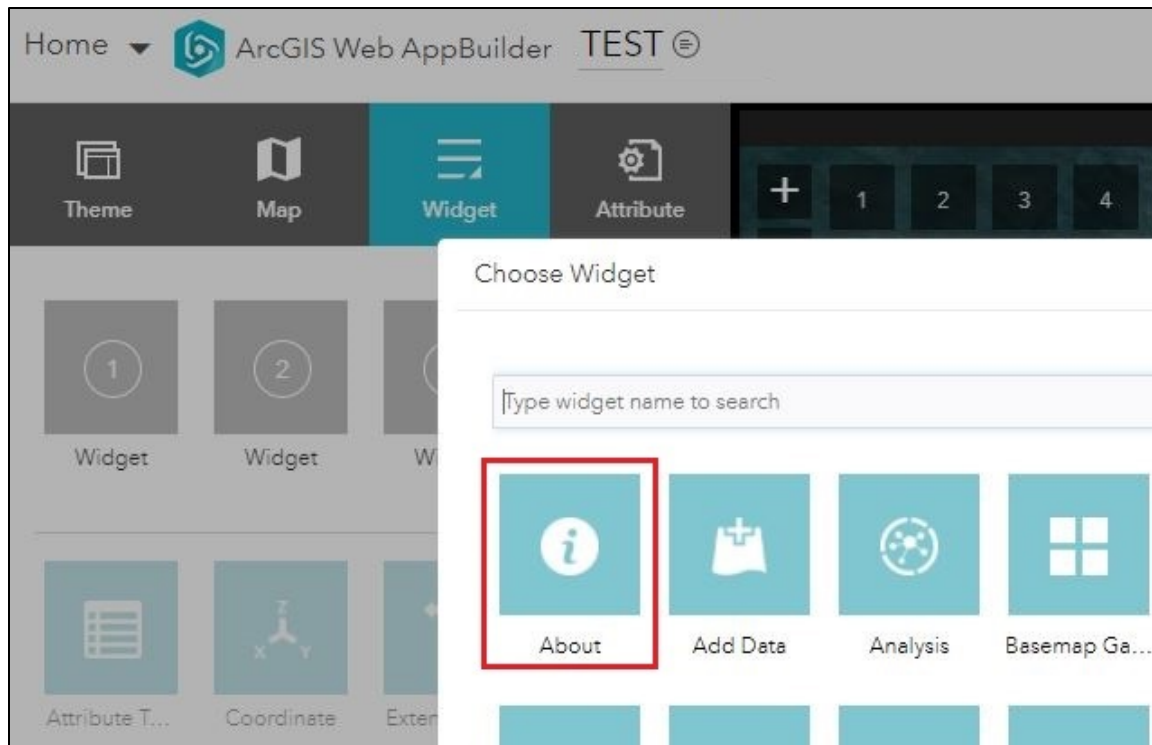


Figure 53. The AGOL Web AppBuilder's Choose Widget window, highlighting the About widget.

The widget panel in the lower right corner of the web app layout is the “About the Data” widget. It explains the shoreline change rate transects and how to interpret their symbology and labels. The text in this panel also provides links for users that want to learn more about the methods and software that were used to create the data, as well as a link to the relevant NCBN Shoreline Trend Report.

- Click on the gray widget icon in the upper left that corresponds to the widget panel in the lower right corner of the web app layout and select the About widget.
- Click OK.
- In the text box at the top of the Configure About window, copy and paste “About the Data.” This will be the title of the widget in the web app.
- Click in the main text box below all the formatting buttons and clear all contents by selecting all (Ctrl-a) and deleting.
- Copy and paste the text from Appendix C – About the Data. Note that most of the text will be the same for every web app, but the references to the date range will have to be edited for each web app. Make sure that the text and link at the bottom refer to the correct trend report.
- Select all text and set Background Color to transparent.

- Set Foreground Color (text color) to Seashell (Hex #FFF5EE). The background color of the About widget in the web app is dark so we need a light text color for final display. If the text were set to white, it would not be visible on a transparent background in the configuration window. With a little bit of color, the text is barely visible for editing in the configuration window, and in the web app the Seashell color appears nearly white against a dark gray background.
- Check the formatting to ensure correct spacing and formatting. Sometimes there is an extra carriage return (or none) between paragraphs.
- Verify that hyperlinks are working correctly. They are supposed to open in a new browser window. If one opens inside the web app, select the hyperlink text in the “Configure About the Data” window. Click the Create Link tool from the formatting toolbar above the text block. In the Link Properties box that opens, make sure the Target is New Window (Figure 54).

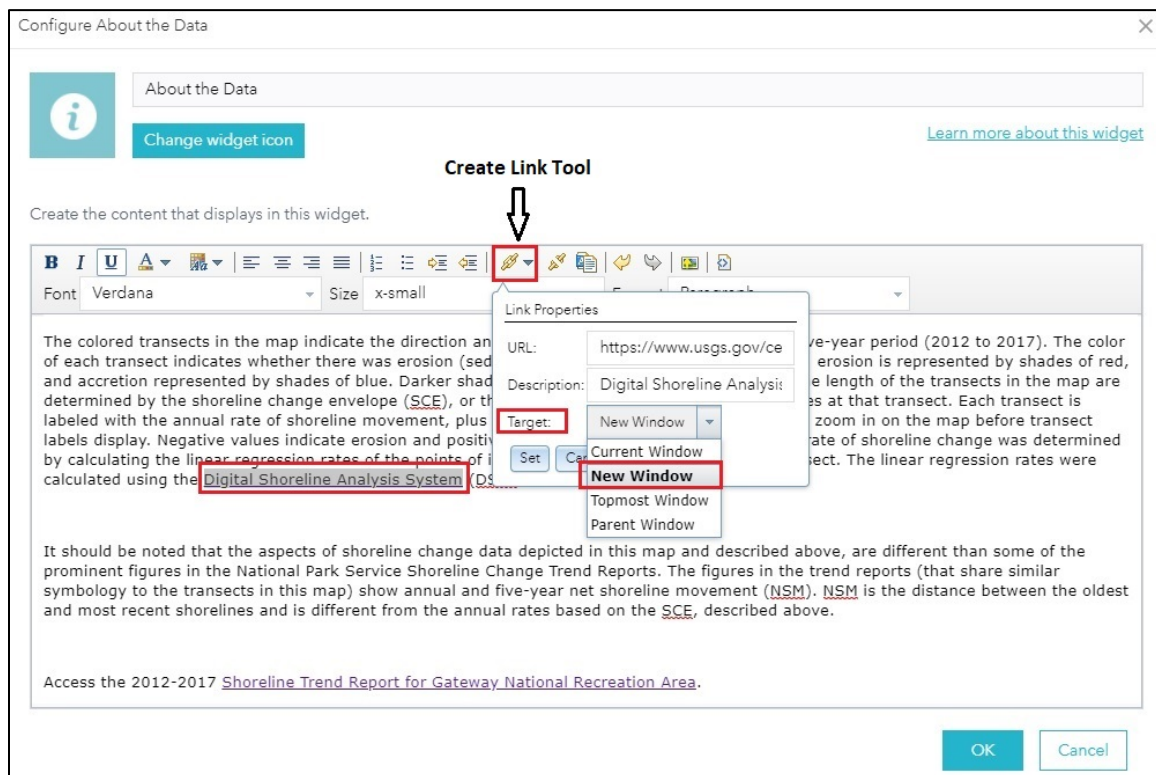


Figure 54. The AGOL Web AppBuilder’s configuration window for the About widget, showing how to make sure the hyperlink target opens in a new browser window.

Explanation of Terms Widget

The panel between the legend and the About the Data panels is the “Explanation of Terms from Pop-up” panel; it contains definitions that explain terms displayed in the pop-up when a user clicks a transect in the main map panel.

- Click on the gray widget icon in the upper left that corresponds to the widget panel directly below the legend and select the About widget.
- Click OK.
- In the text box at the top of the Configure About window, copy and paste “Explanation of Terms from Pop-up.” This will be the title of the widget in the web app.
- Click in the main text box below all the formatting buttons and clear all contents by selecting all (Ctrl-a) and deleting.
- Copy and paste the text from Appendix D – Explanation of Terms from Pop-up.
- Format the text like we did for the About the Data panel: background color transparent, foreground color Seashell (Hex #FFF5EE). Double-check that the formatting is correct (refer to the previous *About the Data Widget* section for details).

Infographic Widget

The Infographic widget is the most complex and finicky widget that we will be configuring. At the time of publication, it was not possible to save your configuration to be applied to another map. ESRI support was consulted and they submitted an enhancement request to be able to save widget configurations.

- Click on the gray widget icon in the upper left that corresponds to the widget panel directly below the map panel and select the Infographic widget.
- In the Choose a Template window that opens, choose the Line template (Figure 55) and click OK.

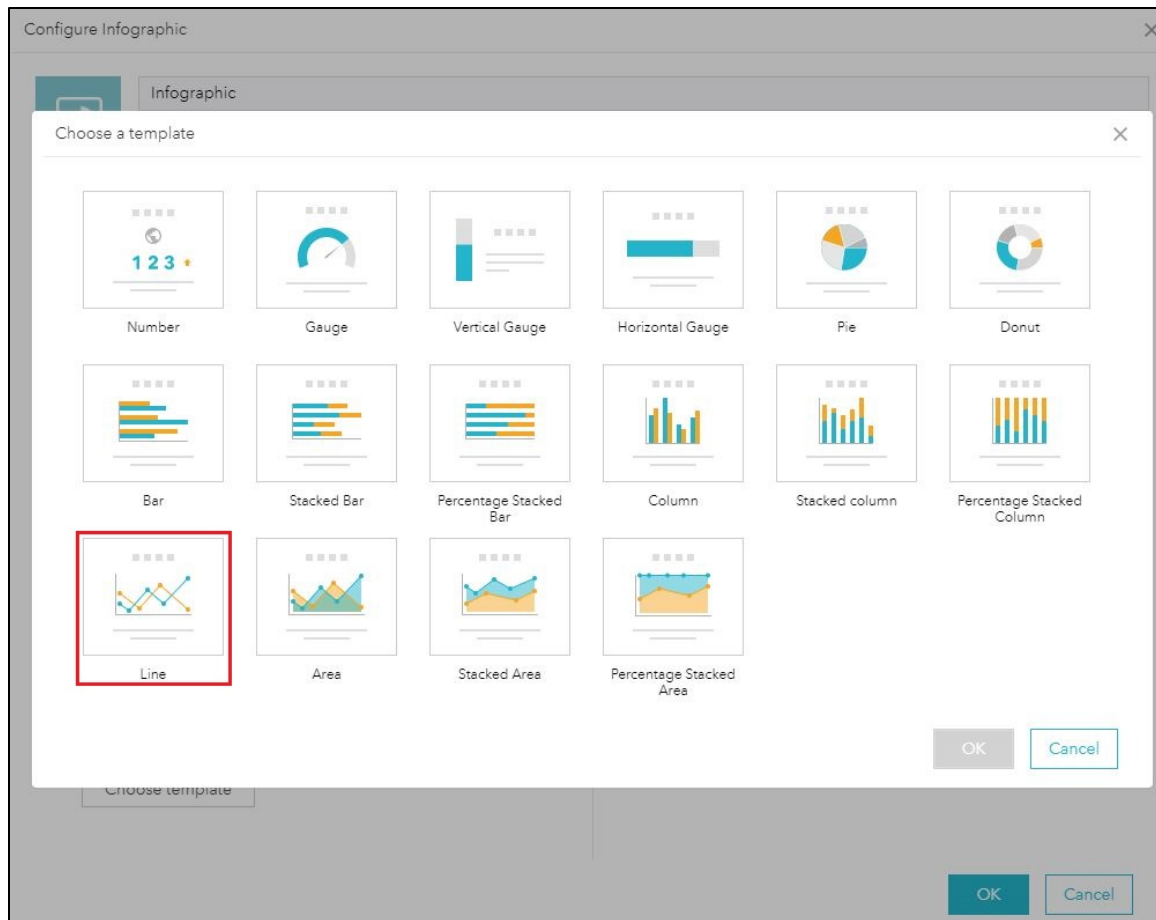


Figure 55. The AGOL Web AppBuilder's Infographic widget's Choose a Template window, showing the Line template option.

- In the Set Data Source window, select the shoreline change rate layer and click OK.
- The main Infographic configuration window will open. You should see the Data Source that you selected.
- Below the Data Source box there is the Use Selection option, that is checked on by default.
- Check the Filter by Extent option which is to the right of the Use Selection option and is unchecked by default. This will enable the Infographic chart to be spatially linked with the map. As the map is zoomed in and out, the chart should change to display only the transects visible in the map.
- Below the Use Selection and Filter by Extent options, there are the three main sections of the Infographic widget panel: Title, Chart, Description (Figure 56).

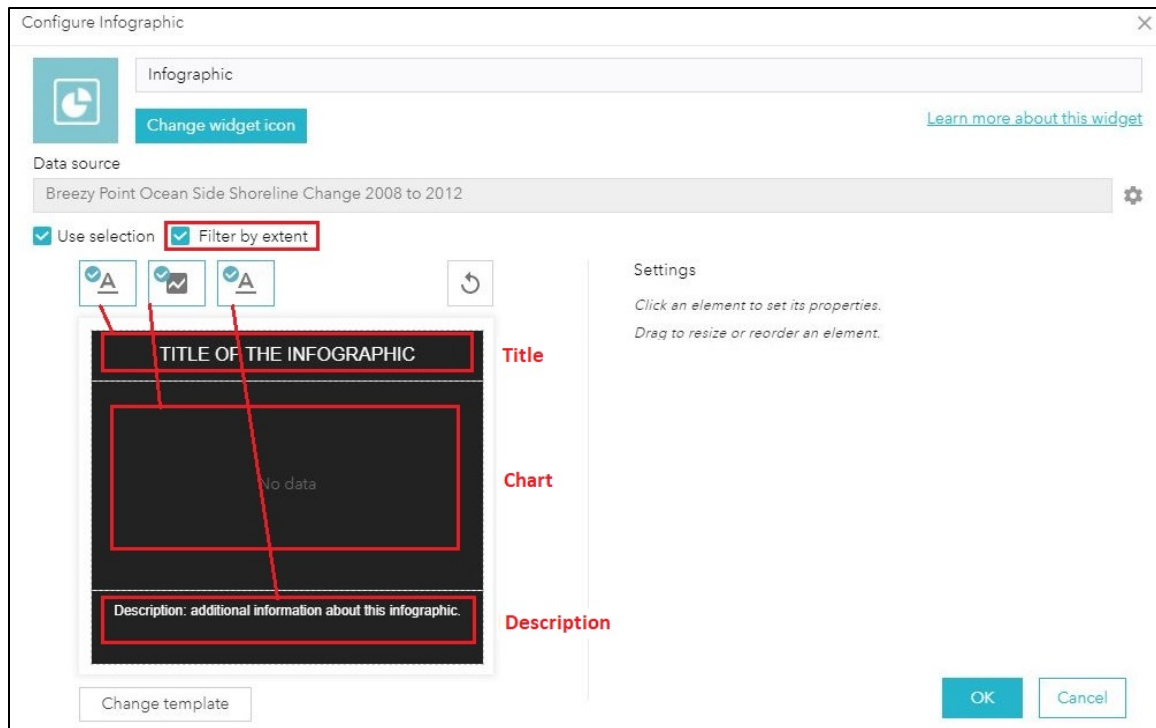


Figure 56. The AGOL Web AppBuilder's Infographic widget configuration window.

INFOGRAPHIC TITLE SECTION: Click the Title section, enter the title in the text box and accept the text symbology defaults. The format for the title in the NCBN web apps is “[Park Code] Shoreline Change Rates [Data Range]” (e.g. FIIS Shoreline Change Rates 2012 to 2017). In parks with multiple named shorelines, you can enter the name of the shoreline location instead of the park code (e.g. Breezy Point Shoreline Change Rates 2012 to 2017). The park is identified in other portions of the web mapping application.

INFOGRAPHIC CHART SECTION: Click the Chart section, where it says, “No Data.” The Chart Settings window will open on the right side of the Infographic configuration window. The Chart Settings window has three tabs: Data, Display, and Marks

Chart Settings Data Tab

- Display mode: accept the default of Display Values Feature by Feature
- Category field: select TransectID
- Value fields: check Linear Regression Rate (m/yr)
- Sort by: select TransectID. To the right of the selection box there are two arrows that give you the option of sorting in an ascending (up arrow) or descending (down arrow) order (Figure 57). For shorelines where the transects are numbered from east to west (right to left), you would choose to sort in descending order; for transects numbered from west to east,

choose ascending. For shorelines with a north-south orientation, use your discretion on sorting order.

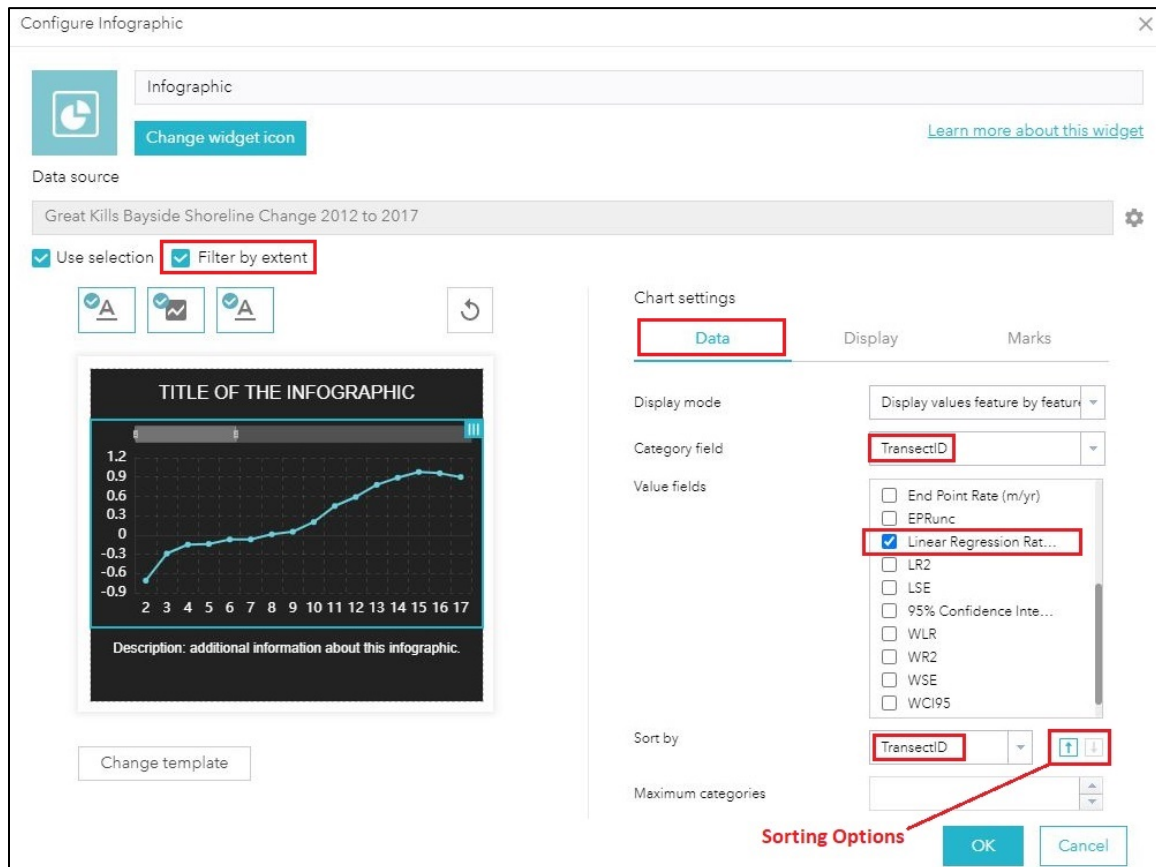


Figure 57. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Data window.

Chart Settings Display Tab

- Make sure the Vertical axis is active.
- Title box (below Vertical axis): enter Shoreline Change Rate (m/yr) (Figure 58).

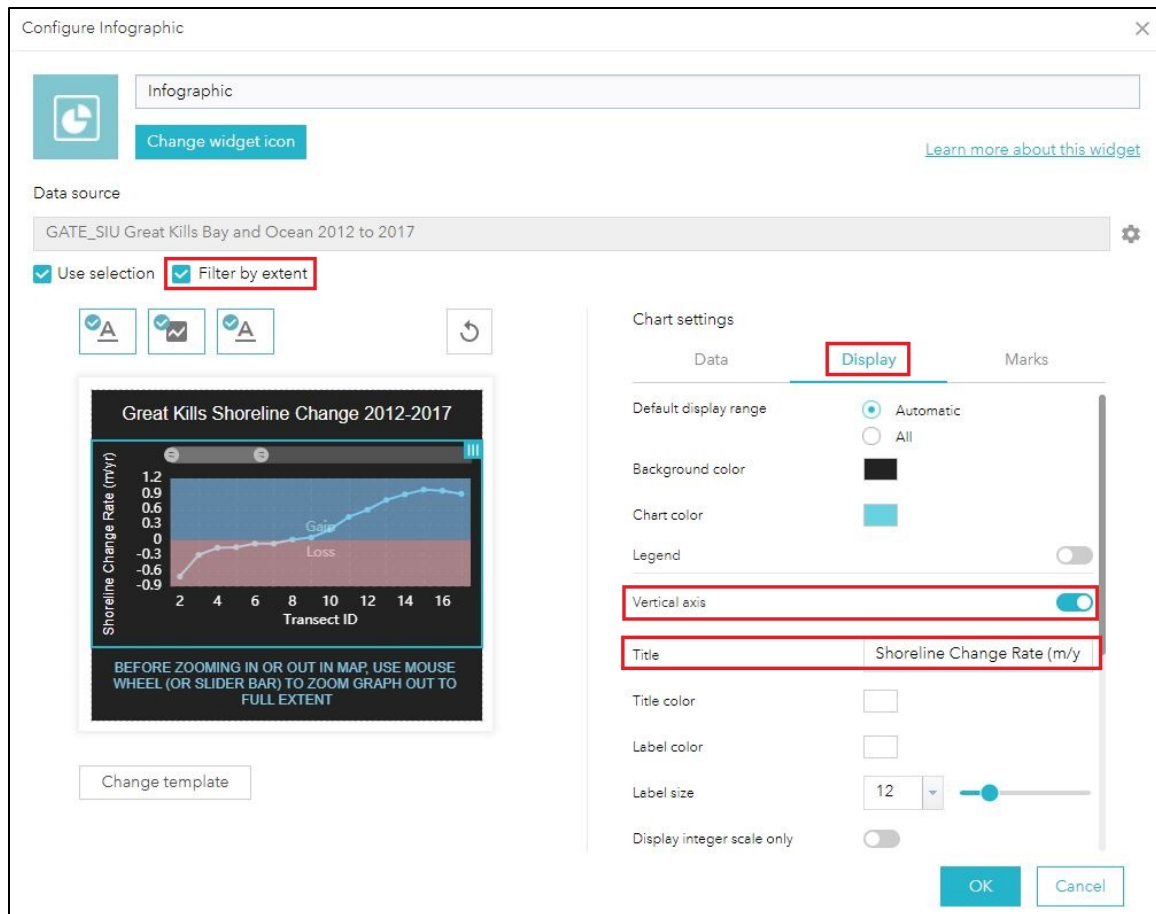


Figure 58. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Display window.

- Make sure the Horizontal axis is active.
- Title box (below Horizontal axis): enter Transect ID. Note: for maps where Transect ID numbers are not increasing from left to right, you may add a parenthetical statement describing the sorting (e.g. "Transect ID (larger numbers to the west)" or "Transect ID (larger numbers to the south)").
- Accept all other defaults.

Chart Settings Marks Tab

We will be adding two area marks, which will be used to add blue and pink areas to the chart. The blue area will be the positive values and denote gain or accretion. The pink area will be the negative values and represent loss or erosion (Figure 59).

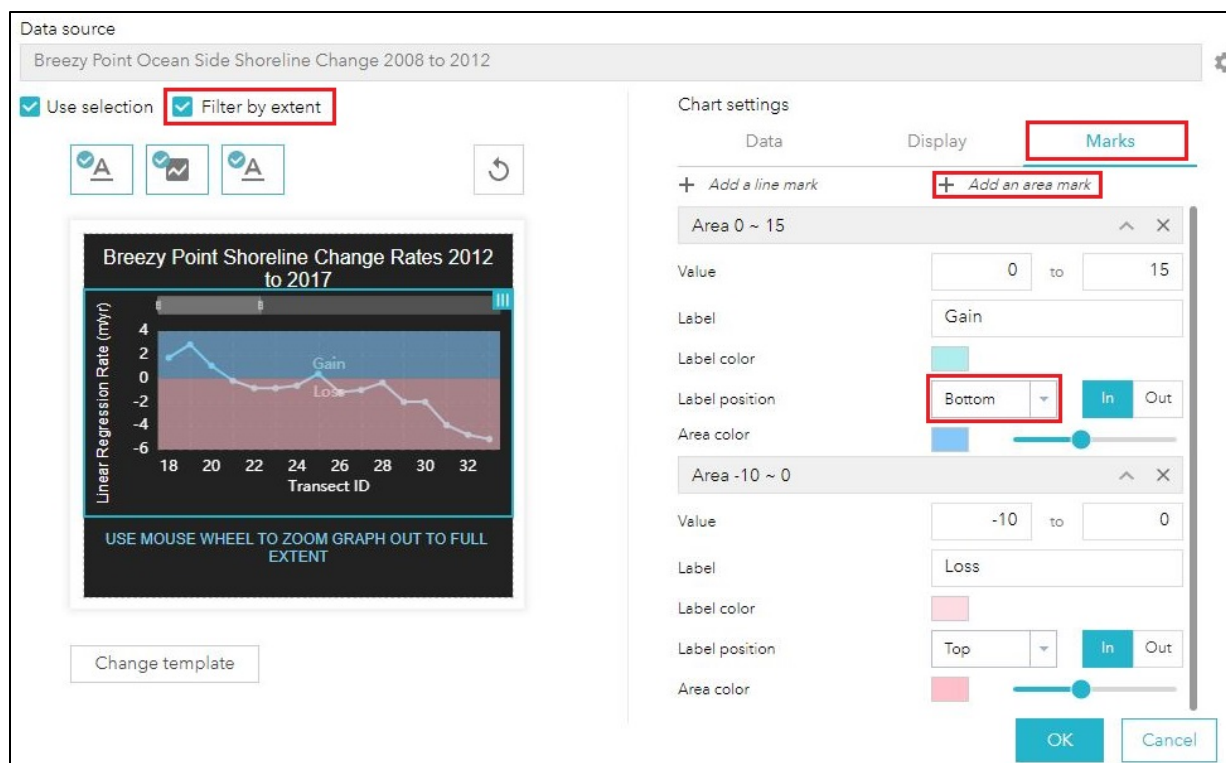


Figure 59. The AGOL Web AppBuilder's Infographic widget's configuration window, showing the Chart Setting tab's Marks window.

- Click Add an Area Mark for positive values.
 - Value: Enter 0 in the left box and the max value of your data (or greater) in the right box.
 - Label: enter Gain
 - Label color: click the color box, click custom, and enter the hex value of #afeeee (light blue)
 - Label position: Bottom and In (Top is the default, so you'll need to change it to Bottom).
 - Area color: click the color box, click custom, and enter the hex value of #87c8fa (slightly darker blue than the label color).
 - Leave the opacity slider alone. The default position is one notch left of center.
- Click Add an Area Mark for negative values.
 - Value: Enter the minimum value of your data (or less) in the left box and 0 in the right box.
 - Label: enter Loss

- Label color: click the color box, click custom, and enter the hex value of #fddde3 (light pink).
- Area color: click the color box, click custom, and enter the hex value of #ffc0cb (slightly darker pink than the label color).
- Leave the opacity slider alone. The default position is one notch left of center.
- Click OK to close infographic configuration window.
- Click “Save” at bottom left to save the web app.

INFOGRAPHIC DESCRIPTION SECTION: Click the Description section where it says, “Description; additional information about this infographic.” The Description section is the lowest of the three sections on the left side of the Infographic configuration window, just below the Chart section (see Figure 56). The Text Settings window will open on the right side of the Infographic configuration window.

- Text: enter BEFORE ZOOMING IN OR OUT IN MAP, USE MOUSE WHEEL (OR SLIDER BAR) TO ZOOM GRAPH OUT TO FULL EXTENT
 - Text color: hex #87ceeb (sky blue)

Note: This is an ESRI glitch, but the user needs to zoom the graph out to its full extent to ensure a proper link between the map and the graph. After zooming out to the full extent in the graph, when the user zooms in and out of the map, the extent of the graph will change to show only the transects in the current map view.

Map Section Widgets

There are five more widgets to configure whose icons appear in the upper left corner of the map panel: After configuration, these map panel widgets will be the Reference, Layer List, Basemap Gallery, Measurement, and Share widgets (Figure 60). Their configurations are relatively simple.

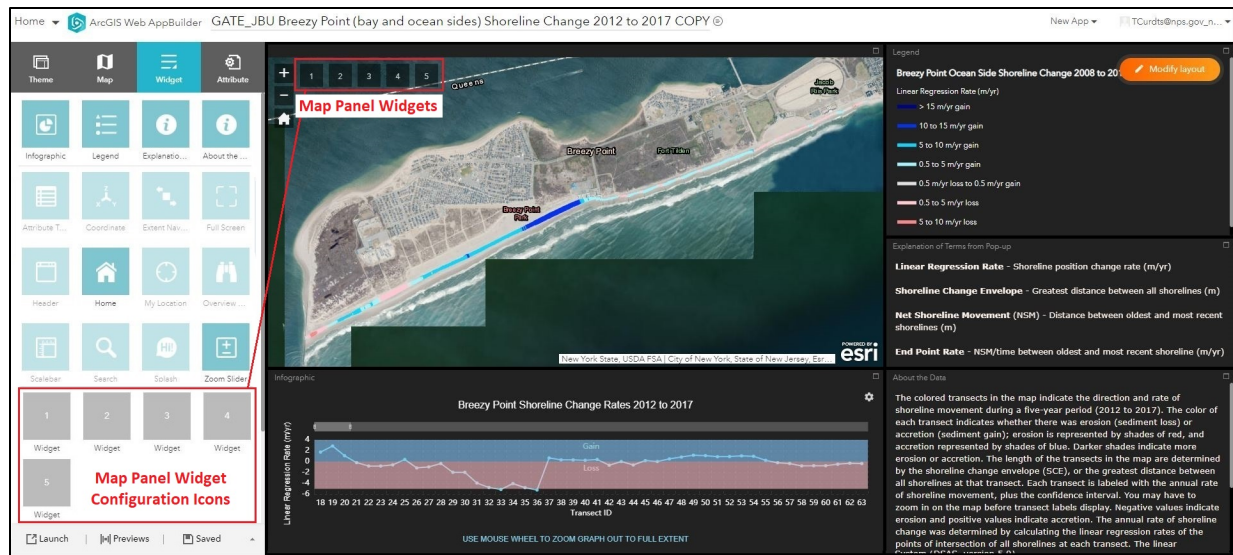


Figure 60. The nearly complete web app configuration. Note the five numbered squares in the upper left corner of the map, and their corresponding configuration icons in the lower left. these map panel widgets will become the Reference, Layer List, Basemap Gallery, Measurement, and Share widgets.

There are five small widget icons in the upper left corner of the map panel:

1. About Widget – Click the #1 gray widget box in the lower left. In the topmost text box of the configure window, name this widget References. Copy and paste the text from a pre-prepared text file. An example for GATE, Breezy Point is provided in Appendix E. Specific references for the park and/or shoreline name, plus the date range will have to be edited for each web app. Text includes links to NCBN, DSAS, and NCBN Shoreline Position Monitoring Protocol. Format the text as described in the *About the Data Widget* section, above.
2. Layer List - Click the #1 gray widget box and select the Layer List widget from the Choose Widget window. Accept the defaults.
3. Basemap Gallery - Click the #1 gray widget box and select the Basemap Gallery widget from the Choose Widget window. Accept the defaults.
4. Measurement - Click the #1 gray widget box and select the Measurement widget from the Choose Widget window. Set the default area units to hectares and the default length units to kilometers. Accept the remaining defaults.
5. Share - Click the last gray widget box in the lower left and select the Share widget from the Choose Widget window. Accept the defaults.
 - Click Save in the lower left to save the web app.

Splash Screen Widget

- To activate the Splash widget, click on the main Widget Tab and then hover your mouse in the Splash widget icon. An eyeball icon will appear the upper right of the icon.

- Click the eyeball icon to activate the widget (make it visible).
- Click the Edit icon (configure this widget) in the lower right of the Splash widget icon (Figure 61).



Figure 61. The Splash Screen icon showing the Edit button (lower right) and the Show/Hide toggle button (upper right), which is used to activate or hide the widget. These two control buttons are found on many widgets.

- In the Content tab of the Splash configuration window, copy/paste the splash screen content from a pre-prepared text or Word document.
- An example document for GATE, Breezy Point is provided in Appendix F. Most of the text will be the same for every web app, but the references to a particular park, shoreline name, and the date range will have to be edited for each web app.
- Note that an image of several tool icons is included in the text block in Appendix F. The image will not copy/paste into the Splash configuration window, so it will have to be inserted manually. To do this, right-click this image, select Save as Picture and insert the saved image into the text block of the Splash widget using the insert image tool (Figure 62).

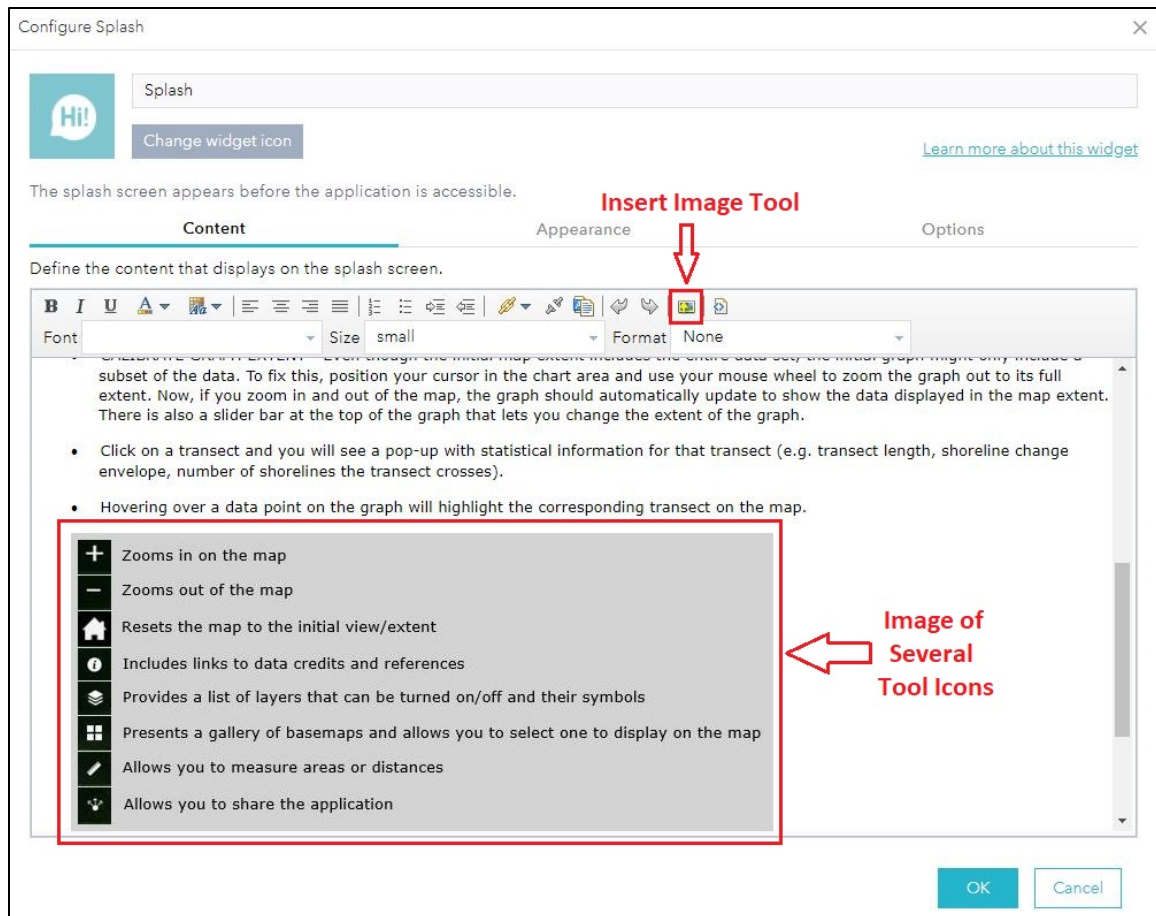


Figure 62. The AGOL Web AppBuilder's configuration window for the About widget, showing where the Insert Image tool is found and the inserted image.

- Format text sizes:
 - Title: medium and bold
 - First Paragraph: small
 - All other: x-small
- Establish DSAS hyperlink:
 - In the third paragraph of the Splash screen text block, select the “Digital Shoreline Analysis System (DSAS)” that you want to hyperlink.
 - Click the yellow Create Link tool in the top menu bar (see Figure 54) and enter:
 - URL = https://www.usgs.gov/centers/whcm/science/digital-shoreline-analysis-system-dsas?qt-science_center_objects=0#qt-science_center_objects
 - Target = New Window

- Click Set.
- Establish the NCBN protocol hyperlink:
 - In the final paragraph of the Splash screen text block, select the word “here” to link to the NCBN’s ocean shoreline monitoring protocol.
 - Click the yellow Create Link tool in the top menu bar (see Figure 54) and enter:
 - URL = <https://irma.nps.gov/DataStore/Reference/Profile/664308>
- Format the text:
 - Select all text and set:
 - Foreground Color (text) = Black
 - Background Color = Transparent
 - Finally, select both linked text blocks and change the foreground color (the text color) to Medium Blue (row 6, col 8).

NOTE: The AGOL interface for text formatting is finicky and you may have to modify some of the settings (text size, text color, spaces between paragraphs, indents on bulleted lists, etc.) if you get unexpected results. The text format can also vary, depending on the browser you use to configure and/or view the web mapping application. For example, hyperlinked text has a white underline in Microsoft Edge, even when you specify blue font color. In Chrome, the blue hyperlinked text has a blue underline.

In the Appearance tab of the Splash configuration window:

- Set the size of the Splash box to Width = 800 px and Height = 600 px
- Set the Background Color Fill to “light gray” (hex #d3d3d3), which is just below the white swatch (Figure 63).

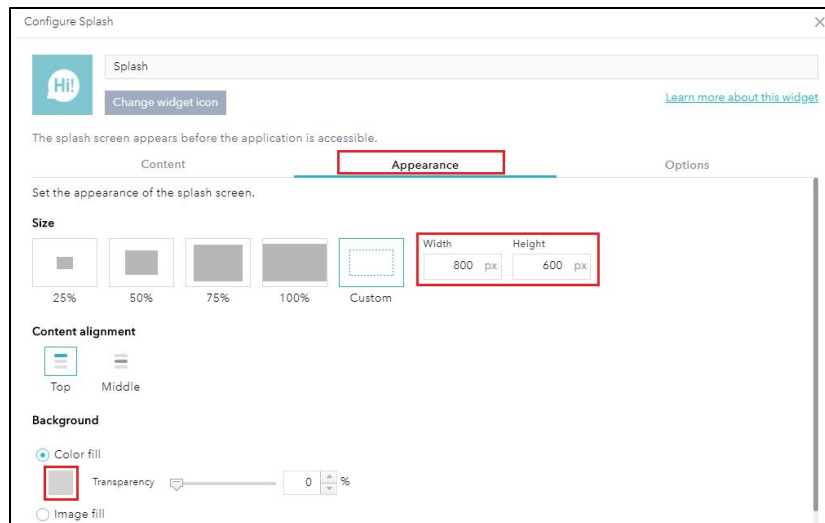


Figure 63. The AGOL Web AppBuilder Splash widget configuration window, Appearance tab, where dimensions and background color of the Splash screen are set.

In the Options tab of the Splash configuration window:

- Uncheck the box next to “Option for users to disable splash screen on application startup.”

2.3.2.4 Web AppBuilder Attribute Tab

- Click the Attribute tab in the upper left.
- Under Branding, hover over the logo and click Custom... to change the icon to an NPS arrowhead (Figure 64).

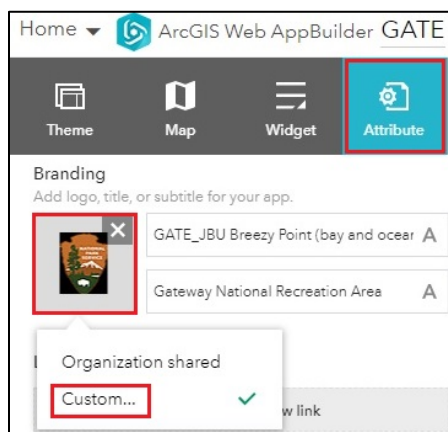


Figure 64. The AGOL Web AppBuilder, showing the Attribute tab, and how to customize the logo with an NPS arrowhead.

- In the Set Logo window, choose Upload (Figure 65) and navigate to small, black NPS arrowhead logo (ah_small_black.gif). This image is provided in Appendix G.

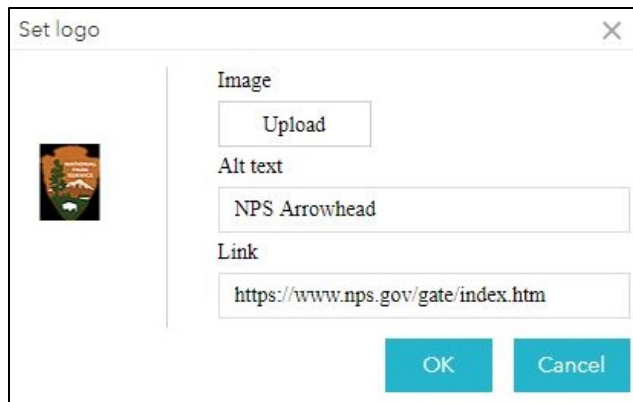


Figure 65. The AGOL Web AppBuilder's Attribute tab's Set Logo window, where you upload an image and specify a URL where the user will be directed when they click the logo.

- Alt text: Type NPS Arrowhead. I think this text only appears if there is a problem displaying the logo.
- Add New Link: Enter the URL to the relevant park.
- Click OK to save and close the Set Logo window.
- In the Title text block, enter the title of the web app (usually [ParkCode] Shoreline Change [Date Range]) (e.g. GATE Breezy Point Shoreline Change 2012 to 2017).
- In the sub-title text block, enter the full name of the park (e.g. Gateway National Recreation Area).
 - App State: Uncheck this. Otherwise, an annoying message appears on the map every time you open it (Figure 66).

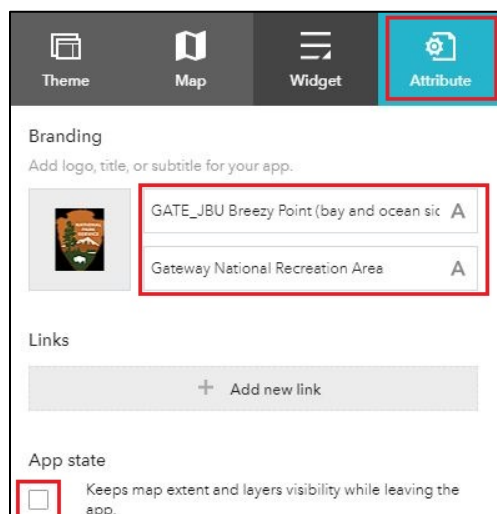


Figure 66. The AGOL Web AppBuilder's Attribute tab where you enter the Title and Subtitle of the web app.

- Click Save in the lower left to save the web app.
- **IMPORTANT!** After configuring the Attribute Tab, you must turn on the Header widget in order to make the header appear on your map. To do this, click the main Widget tab and hover your mouse in the upper right corner of the Header widget icon. The Show/Hide icon that looks like an eyeball will appear (Figure 67). Click this icon to activate the widget.

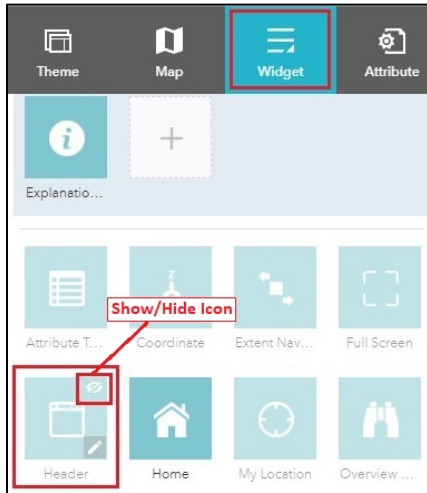


Figure 67. The AGOL Web AppBuilder, Widget tab, showing the Header widget and it's Show/Hide icon in the upper right corner.

The header should now appear at the top of the web app (Figure 68).

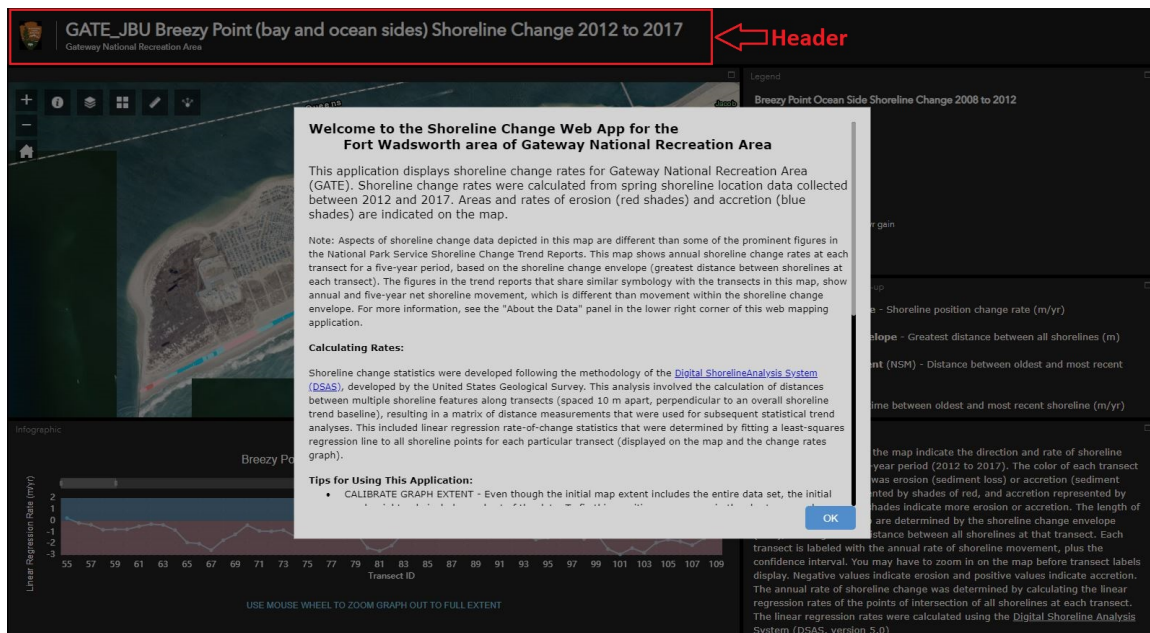


Figure 68. Image of a completed shoreline change rate web mapping application as it appears upon opening, with a header at the top and the splash screen prominently displayed in the middle.

2.3.3 Finalize the Web Mapping Application

2.3.3.1 Launch and Examine

- After saving your web app, click the Launch button in the lower left.
- Examine the layout of the five panels and determine if any need to be resized for cartographic reasons. If so, go back to the editable version and use the orange Modify Layout button in the upper right.
- Read through all text one more time to look for typos, proper paragraph spacing, etc.

2.3.3.2 Peer Review

- Submit to NCBN staff for the peer review process.
- After peer review, make any final edits and suggested changes.

2.3.3.3 Finalize and Share Publicly

- Go to your AGOL My Contents page and open the web mapping application in a new browser tab. Make sure the web app summary, description, terms of use, and tags are completed.
- Click the Share button on the right side of the web app's overview page, change the sharing level to Everyone (public), and save it (Figure 69).

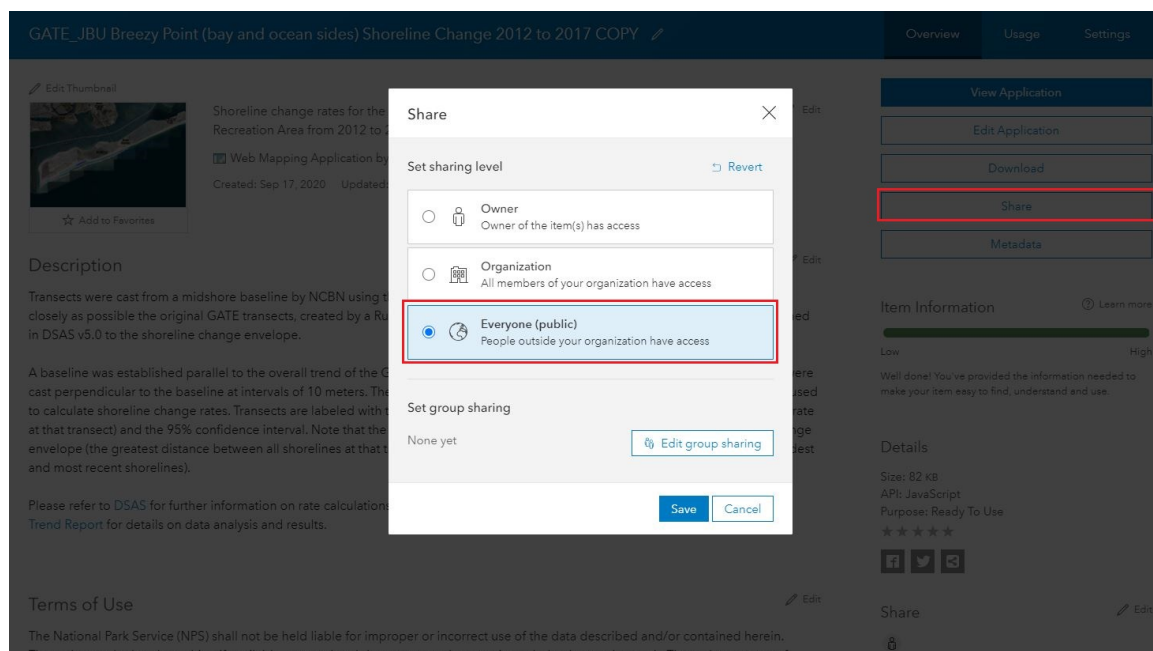


Figure 69. The AGOL overview page for the web app, showing Sharing window options.

2.4 Update an Existing Web App

This section describes how to update an existing web app with new data and will refer to previous sections of this document.

- Complete all steps in Sections 2.1 and 2.2 which will result in publishing two new feature services, one for the new shorelines data and one for the related shoreline change rates layer.
- Create a web map (Section 2.3.1) and add the two new feature service to this new web map.
- Configure the pop-ups for both new layers (Sections 2.3.1.2 and 2.3.1.5).
- Verify correct label format for both new layers (Sections 2.3.1.3 and 2.3.1.6).
- Save the map.
- Locate the existing web app that you want to update with new data and open it in edit mode. In the lower left area, to the right of where it says Saved, click the small triangle (Figure 70) to expand the context menu. Select Save As and create a copy of the web app. Give it a title that reflects the time period and park/shoreline of the new data, change the description to reflect the new data, and save it to your appropriate AGOL folder.

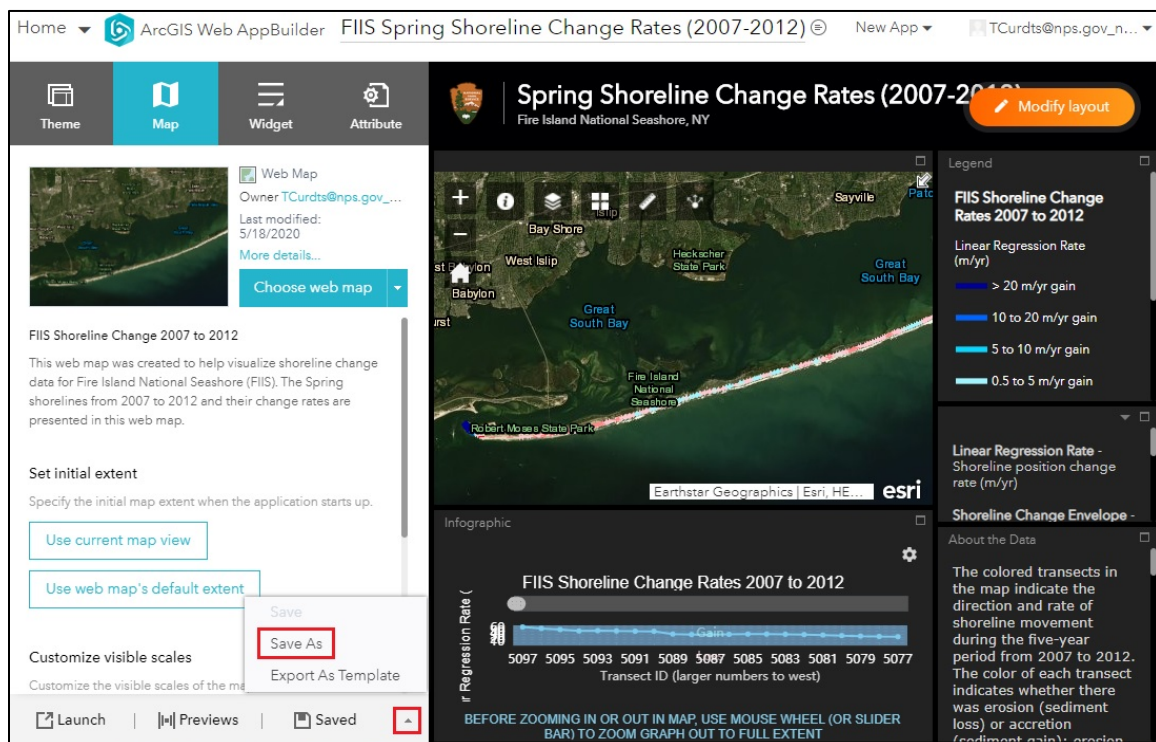


Figure 70. Web mapping application, with red boxes indicating how to make a copy, using the Save As option.

- To update the data in this newly created copy of the existing app, click the Map tab, then select Choose Web Map (Figure 71). Choose the new map that you just created with the new data sources.

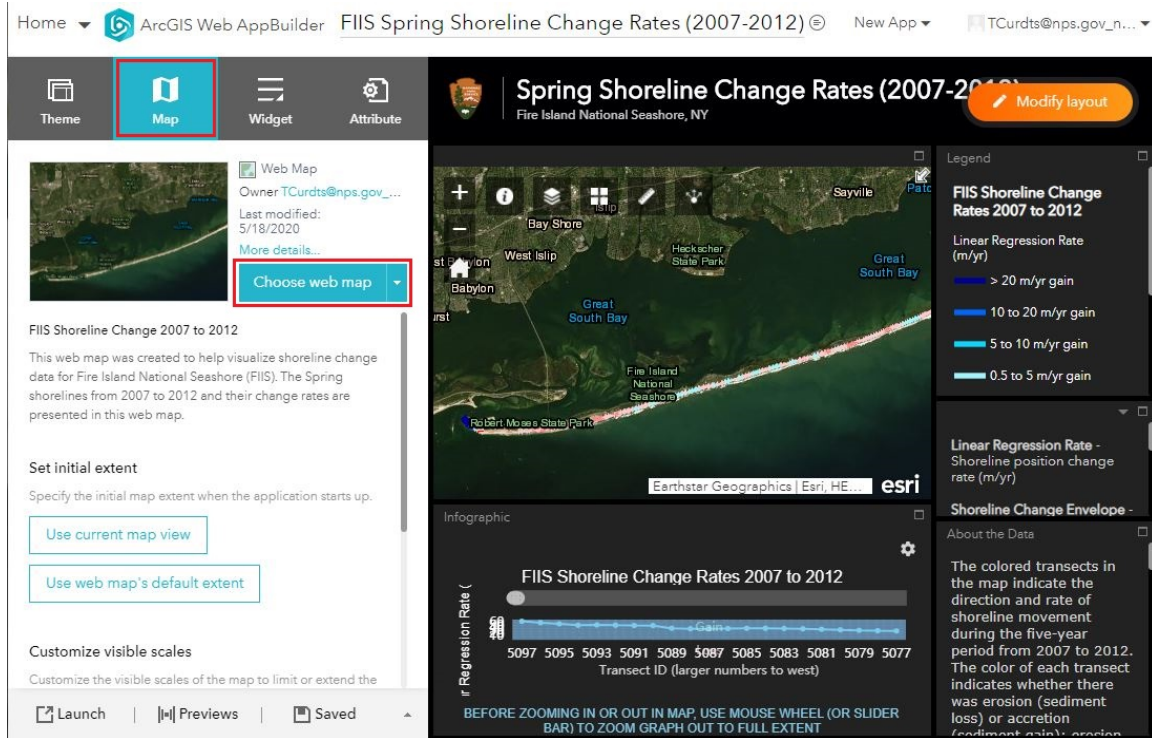


Figure 71. Web mapping application, with red box indicating how to choose a new map.

- After choosing a new map, you should see a Map Switch Confirmation window warning you that the Infographic and Layer List widgets configured in the old map might not be valid in the new map and asking if you are sure you want to switch maps. Click OK (Figure 72).

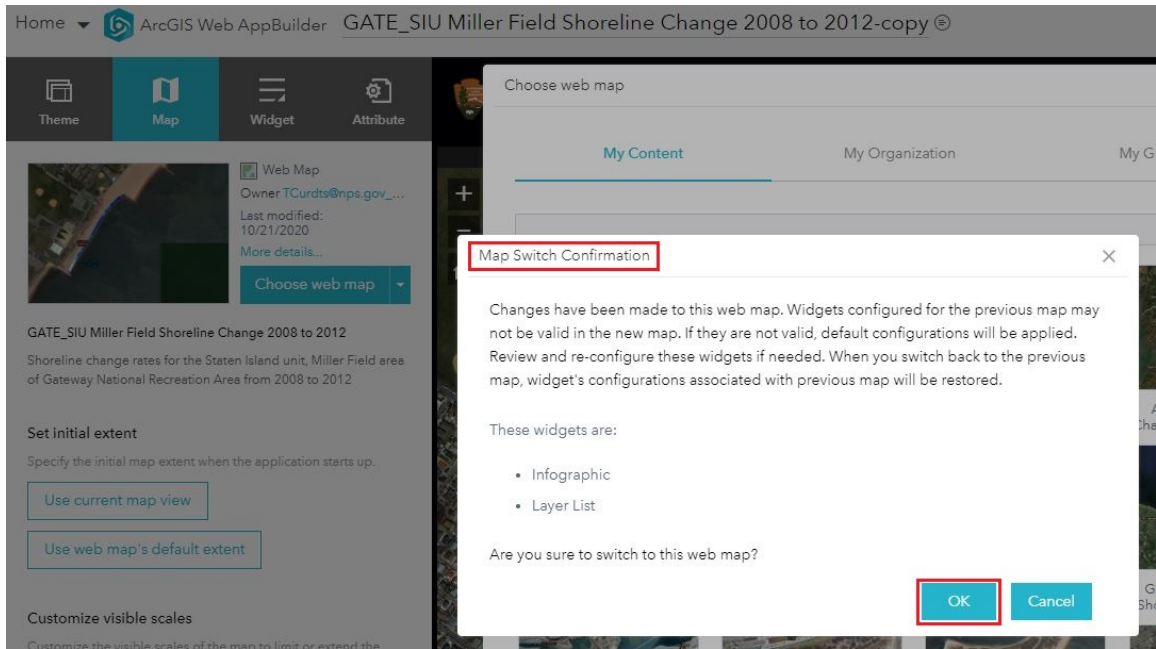


Figure 72. Web mapping application, showing the Map Switch Confirmation window.

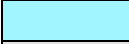
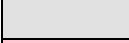
- Configure the Infographics widget as described in Section 2.3.2.3 (*Infographic Widget*, pp 60-64).
- Open the Layer List widget and turn off the shoreline layer. Zoom to the full extent. Save and close the app.
- Finalize the web app (Section 2.3.3).

References

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Appendix A: Shoreline Change Rate Transect Colors

Table A1. Color values for shoreline change rate transects

Color	Hex#	Red	Green	Blue
	000091	0	0	145
	0064FF	0	100	255
	0AD7FF	10	215	255
	A0F5FF	160	245	255
	E1E1E1	225	225	225
	FFC8D2	255	200	210
	FF8787	255	135	135
	FF0000	255	0	0
	780000	120	0	0

Appendix B: Example Text for Data Details

Data details are basic metadata fields, most of which are required in order to publish web services through ArcGIS Online. Below is an example of text needed for shoreline change rate data for Breezy Point, Gateway National Recreation Area (GATE). The park name, shoreline name, date ranges, and link to the Trend Report will have to be edited if using this text for another park.

GATE Shoreline Change Rate Transects – Breezy Point ocean side 2012-2017

Summary:

Shoreline change rates for the Jamaica Bay unit, Breezy Point area (ocean side) of Gateway National Recreation Area from 2012 to 2017.

Description:

Transects were cast from an offshore baseline by NCBN using the Digital Shoreline Analysis System (DSAS v5.0), which replicated as closely as possible the original GATE transects, created by a Rutgers team with DSAS v4.3. These newly cast transects were then trimmed in DSAS v5.0 to the shoreline change envelope.

A baseline was established parallel to the overall trend of the GATE shorelines (collected in spring from 2012 to 2017) and transects were cast perpendicular to the baseline at intervals of 10 meters. The points of intersection between the transects and the shorelines were used to calculate shoreline change rates. Transects are labeled with the linear regression rate (which indicates the annual shoreline change rate at that transect) and the 95% confidence interval. Note that the length of each transect in this map is determined by the shoreline change envelope (the greatest distance between all shorelines at that transect), not the net shoreline movement (the distance between the oldest and most recent shorelines).

Please refer to [DSAS](#) for further information on rate calculations and field descriptions, and to the [2012-2017 GATE Shoreline Position Trend Report](#) for details on data analysis and results.

Tags:

GATE, Gateway National Recreation Area, Jamaica Bay, Breezy Point, Geomorphology, Beaches, Beach Dynamics, Coastal Dynamics, Erosion, Shoreline, Shoreline Change, Storms, Geology, Environment, Geoscientific Information

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Appendix C: Example Text for the ‘About the Data’ Widget in the Web App

Below is an example of text needed for the About the Data section for a web app for Breezy Point, Gateway National Recreation Area (GATE). The park name, shoreline name, date ranges, and link to the Trend Report will have to be edited if using this text for another park.

About the Data

The colored transects in the map indicate the direction and rate of shoreline movement during a five-year period (2012 to 2017). The color of each transect indicates whether there was erosion (sediment loss) or accretion (sediment gain); erosion is represented by shades of red, and accretion represented by shades of blue. Darker shades indicate more erosion or accretion. The length of the transects in the map are determined by the shoreline change envelope (SCE), or the greatest distance between all shorelines at that transect. Each transect is labeled with the annual rate of shoreline movement, plus the confidence interval. You may have to zoom in on the map before transect labels display. Negative values indicate erosion and positive values indicate accretion. The annual rate of shoreline change was determined by calculating the linear regression rates of the points of intersection of all shorelines at each transect. The linear regression rates were calculated using the [Digital Shoreline Analysis System](#) (DSAS, version 5.0)

It should be noted that the aspects of shoreline change data depicted in this map and described above, are different than some of the prominent figures in the National Park Service Shoreline Change Trend Reports. The figures in the trend reports (that share similar symbology to the transects in this map) show annual and five-year net shoreline movement (NSM). NSM is the distance between the oldest and most recent shorelines and is different from the annual rates based on the SCE, described above.

Access the 2012-2017 [Shoreline Trend Report for Gateway National Recreation Area](#).

Appendix D: Example Text for the ‘Explanation of Terms from Pop-up’ Widget in the Web App

Below is the text needed for the Explanation of Terms from Pop-up section for a web app. This text will be the same for all web apps, regardless of park unit or shoreline name.

Linear Regression Rate - Shoreline position change rate (m/yr)

Shoreline Change Envelope - Greatest distance between all shorelines (m)

Net Shoreline Movement (NSM) - Distance between oldest and most recent shorelines (m)

End Point Rate - NSM/time between oldest and most recent shoreline (m/yr)

Appendix E: Example Text for the Reference Widget in the Web App

Widget Title: References

Widget Content:

For more information, click the following links:

- [Northeast Coastal and Barrier Inventory & Monitoring Network \(NCBN\)](#)
- [Digital Shoreline Analysis System \(DSAS\) User Guide](#)

Himmelstoss, E. A., Henderson, R. E., Kratzmann, M. G., and Farris, A. S., 2018, Digital Shoreline Analysis System (DSAS) version 5.0 user guide: U.S. Geological Survey Open-File Report 2018–1179, 110 p., <https://doi.org/10.3133/ofr20181179>.
ISSN 2331-1258 (online)

- [NCBN Geomorphological Monitoring Protocol: Part I - Ocean Shoreline Position](#)

Psuty, N. P., M. Duffy, J. F. Pace, D. E. Skidde, and T. M. Silveira. 2010. Northeast Coastal and Barrier Network geomorphological monitoring protocol: part I—ocean shoreline position. Natural Resource Report NPS/NCBN/NRR —2010/185. National Park Service, Fort Collins, Colorado.

Appendix F: Example Text for the Splash Screen Widget in the Web App

Below is an example of text needed for the Splash Screen for a web app for Fort Wadsworth shoreline, Gateway National Recreation Area (GATE). The park name, shoreline name, and/or date ranges will have to be edited if using this text for another park or shoreline.

Welcome to the Shoreline Change Web App for the Fort Wadsworth area of Gateway National Recreation Area

This application displays shoreline change rates for Gateway National Recreation Area (GATE). Shoreline change rates were calculated from spring shoreline location data collected between 2012 and 2017. Areas and rates of erosion (red shades) and accretion (blue shades) are indicated on the map.

Note: Aspects of shoreline change data depicted in this map are different than some of the prominent figures in the National Park Service Shoreline Change Trend Reports. This map shows annual shoreline change rates at each transect for a five-year period, based on the shoreline change envelope (greatest distance between shorelines at each transect). The figures in the trend reports that share similar symbology with the transects in this map, show annual and five-year net shoreline movement, which is different than movement within the shoreline change envelope. For more information, see the "About the Data" panel in the lower right corner of this web mapping application.

Calculating Rates:

Shoreline change statistics were developed following the methodology of the [Digital Shoreline Analysis System \(DSAS\)](#), developed by the United States Geological Survey. This analysis involved the calculation of distances between multiple shoreline features along transects (spaced 10 m apart, perpendicular to an overall shoreline trend baseline), resulting in a matrix of distance measurements that were used for subsequent statistical trend analyses. This included linear regression rate-of-change statistics that were determined by fitting a least-squares regression line to all shoreline points for each particular transect (displayed on the map and the change rates graph).

Tips for Using This Application:

- CALIBRATE GRAPH EXTENT - Even though the initial map extent includes the entire data set, the initial graph might only include a subset of the data. To fix this, position your cursor in the chart area and use your mouse wheel to zoom the graph out to its full extent. Now, if you zoom in and out of the map, the graph should automatically update to show the data displayed in the map extent. There is also a slider bar at the top of the graph that lets you change the extent of the graph.
- Click on a transect and you will see a pop-up with statistical information for that transect (e.g. transect length, shoreline change envelope, number of shorelines the transect crosses).
- Hovering over a data point on the graph will highlight the corresponding transect on the map.

	Zooms in on the map
	Zooms out of the map
	Resets the map to the initial view/extent
	Includes links to data credits and references
	Provides a list of layers that can be turned on/off and their symbols
	Presents a gallery of basemaps and allows you to select one to display on the map
	Allows you to measure areas or distances
	Allows you to share the application

NOTE: This image will not copy/paste into AGOL Splash widget. The work around is to right-click this image, select Save as Picture and insert the saved image into the text block of the Splash widget.

More Information:

- Additional layers include relevant spring shorelines. These can be turned on or off with the Layer List widget.
- Use a different basemap if data (including labels or shorelines) are difficult to view.
- A full description of the ocean shoreline monitoring program for the Northeast Coastal and Barrier Network (NCBN) is available [here](#). The NCBN is one of 32 natural resource monitoring networks in the National Park Service Inventory and Monitoring Division.

Appendix G: NPS Arrowhead Image Used in Header

The following image is used in the header for each NCBN shoreline change rate web mapping application. Right-click the image, select “Save As Picture...” and save it locally. It can then be accessed and inserted in your web app. This image is copyrighted (NPS only).

