Helping restore a watershed

Chesapeake Bay states land-use enrichment

The Chesapeake Bay is the largest estuary in the contiguous US. The watershed covers 64,000 square miles and is fed by 50 major rivers and streams. Everything always flows downstream. Because of this downstream flow, all the results of human habitation run into the ocean. Human habitation includes farms and developed lands. As the land is farmed and developed more, there is less land to absorb and filter the water. Restoration efforts have made modest ecological gains, but they have been largely offset by rapid population growth. Agriculture and developed land are one of the land-use classifications that are used to study the health of the bay.

The Chesapeake Bay Foundation is interested in correctly assigning funds and resources to the seven states that make up the Chesapeake Bay watershed. To do this, the foundation asked for both quantitative and qualitative information from its GIS department. The foundation wants to know what percentage of land use is in each designated state's watershed area and presented in a compelling way to present to the community.

Build skills in these areas

- Opening a map
- Enriching a layer
- Configuring pop-ups
- Using pop-up media
- Calculating percentage
- Publishing as a web app

What you need

- Account required
- Estimated time: over 1 hour

1. Open and save the map

1. Sign into your ArcGIS organizational account.
2. Open Chesapeake Bay Landuse.

   The map opens showing the Topographic basemap and the outline of the Chesapeake Bay showing the section of each state that is in the bay.

3. On the ribbon click the Save button and choose Save As.
4. In the Save Map window, type Chesapeake Bay Landuse_yourinitials.
5. Tags: Remove the tags and add individualized tags
6. Write a brief description of the map's content.

Save Map

Title:	Chesapeake Bay Landuse__Your Initials
Tags:	chespeake ✕ watershed ✕ enrich ✕ calculate ✕
	IGARC2_landuse_your_initials ✕
	Add tag(s)
Summary:	Calculate land use of each of the seven states in the Chesa
Save in folder:	▼

SAVE MAP   CANCEL

# 2. Display the Bay Area by state abbreviation

The Bay Area by State layer is displayed without any cartographic styling.

1. Click Contents.
2. To open the Change Style pane click the Change Style icon, which opens the Change Style Pane.
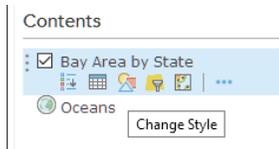
3. The states are shown by location only. Choose STATE_ABBR in the Choose an attribute to show tab.
4. Click DONE.

The states are now displayed by individual colors.
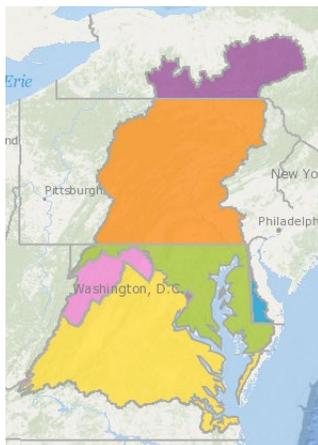
Write several spatial observations about the Chesapeake Bay watershed. Include in your observations a discussion of political vs natural boundaries. The observations that are written here will be used later in the exercise when you construct your story map.
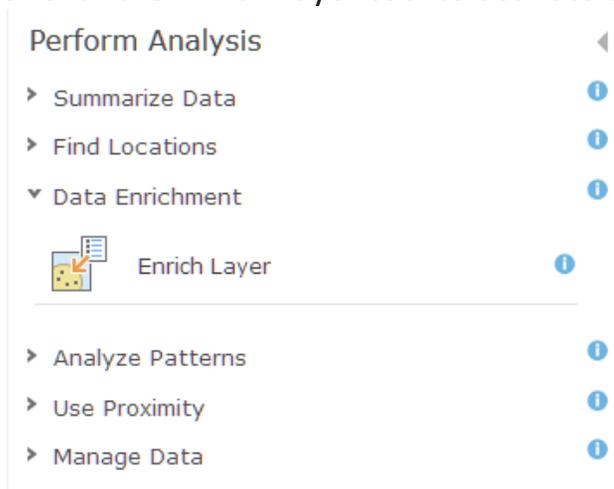
3. Use the data enrichment tool

The data enrichment tool helps you explore the character of areas. Detailed information is returned for the chosen area. For this area, you would like to know information about the percentage of land use or landcover in each of the states represented in the Chesapeake Bay.

1. Click the Perform Analysis icon.

Contents

☑ Bay Area by State

Oceans

Perform Analysis
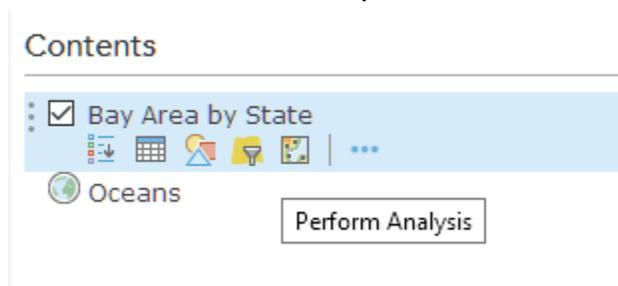
2. Click Data Enrichment.
3. Click the Enrich Layer tool to activate the Enrich Layer menu.

Perform Analysis ◄

❯ Summarize Data   ⓘ
❯ Find Locations   ⓘ
▾ Data Enrichment   ⓘ

    Enrich Layer   ⓘ

❯ Analyze Patterns   ⓘ
❯ Use Proximity   ⓘ
❯ Manage Data   ⓘ

4. The Bay Area by State is selected by the layer to enrich. Click SELECT VARIABLES to pick the land cover information that you want to retrieve.
5. In the Data Browser in the upper right corner be sure that United States is selected.
6. Click the arrow to show the next page.
7. Click Landscape.
8. Click LANDCOVER.

9. Select all seven variables by selecting the Landscape Analyst Variables.
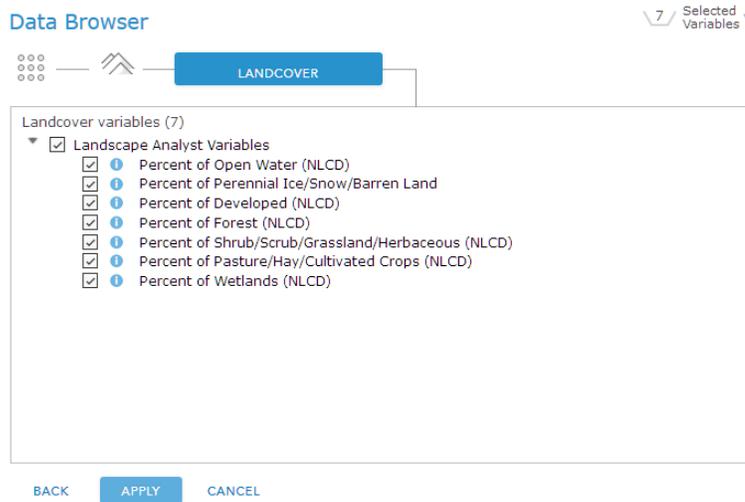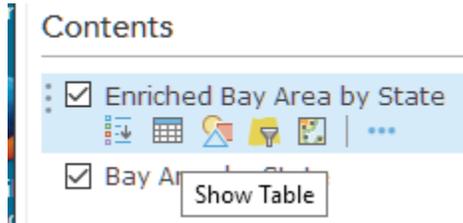

10. Click APPLY.

11. The Result layer name = Enriched Bay Area by State_your initials.
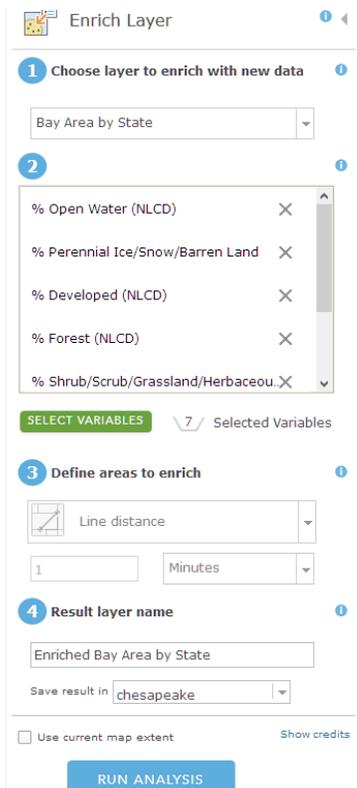
12. Uncheck Use current map extent.
13. Click RUN ANALYSIS.

   The Enriched Bay Area by State layer will be added to the Content Pane.

14. Click on the Show Table icon.

   When you open the table, you will see that each bay state has been
   populated with percentage of land use.

15. When you examine the table you will see several fields that are not
    necessary for the analysis. Click Table Options in the right corner and
    click Show/Hide Columns. Uncheck the fields listed below:
    - STATE_Name
    - ID
    - ENRICH-FID
    - sourceCountry
    - HasData
    - Aggregationmethod
16. Close the table by clicking the X in the right corner.

STATE_NAME	STATE_ABBR	ENRICH_FID	ID	sourceCountry	HasData	% Open Water (NLCD)	% Perennial Ice/Snow /Barren Land	% Developed (NLCD)	% Forest (NLCD)	% Shrub /Gras /Herb (NLCD		
Maryland	MD	6	5	US	1	6.73	0.31	17.65	31.29	1.96		96
Virginia	VA	7	0	US	1	3.55	0.18	10.93	56.55	3.34	20.57	4.89

17. Uncheck Bay Area by State in the Contents Pane.
18. Display Enriched Bay Area by State by STATE_ABBR.
19. Click DONE.

4. Configure attributes and show charts

You can display the bay states by land use percentage, but the amount of information that you portray is neither compelling nor quantitative. A better way to present your data is to create a chart. A chart will graphically display the values of numeric attribute fields, in this case, percentage of land use.

Before you chart your data, you need to configure your pop-ups.

1. Click the three small dots after Enriched Bay Area by State and go to Configure Pop-up.
2. Enter a title for your pop-up. Title = Enriched Bay Area by State.
3. Display: A list of field attributes.
4. Click Configure Attributes and uncheck the following:
   - STATE_Name
   - ID
   - ENRICH-FID
   - sourceCountry
   - HasData
   - Aggregationmethod
5. Click within the attributes and change to the following. Ensure the following stay on:
   - STATE_ABBR
   - % Open Water
   - % Barren Land
   - % Developed
   - % Forest
   - % Herbaceous
   - % Pasture/Crops
   - % Wetlands

Configure Attributes

Check the fields you want to display. Select a field to change its alias, order it, and format it.

| Display	Field Name	Field Alias
☑	{NLCDoH2OPt}	% Open Water
☑	{NLCDsnIcPt}	% Barren Land
☑	{NLCDDevPt}	% Developed
☑	{NLCDfrstPt}	% Forest
☑	{NLCDssgPt}	% Herbaceous
☑	{NLCDAgPt}	% Pasture/Crops
☑	{NLCDWetPt}	% Wetlands

Format

2 decimal places ▼

☑ Use 1000 Separator

6. Click OK.
7. Under Pop-up Media click ADD and add a Pie Chart.
8. Configure Bar Chart as follows:
- Title= Chesapeake Bay Land Use
- Caption = % of Land Use by State
- Check
    o % Open Water
    o % Barren Land
    o % Developed
    o % Forest
    o % Shrub/Scrub/Grassland/Herbaceous (NLCD)
    o % Pasture/Hay/Cultivated Crops (NLCD)
    o % Wetlands
9. Click OK.

Now when you click on each of the states it shows the percentages of
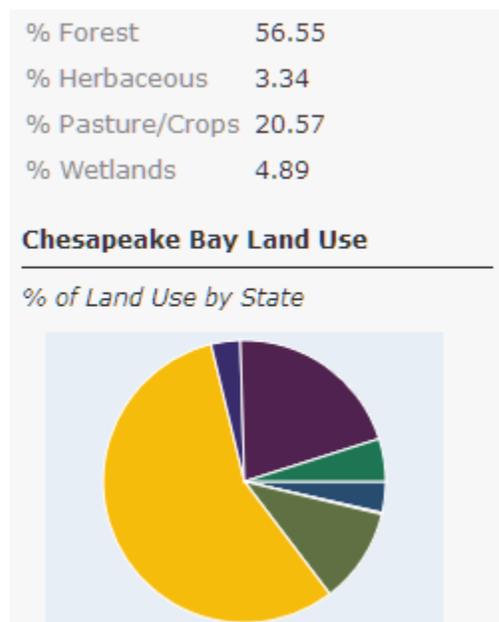
land use in both a table and a pie chart.

5. Use the table

Don't forget the interactive table is a quick way to analyze information and make decisions. Sorting by a specific attribute is always useful.

1. Show the table.
2. Click the field % Developed.
3. Choose Sort Descending. That puts the values in order from highest to lowest, and you can see that DC is by far the most developed state, followed by MD and VA.

STATE_ABBR	% Open Water	% Barren Land	% Developed				
				↕ Sort Ascending			
				↕ Sort Descending			
DC	3.47	0.08	80.76	Σ Statistics			
				Calculate			
MD	6.73	0.31	17.65	Delete			
VA	3.55	0.18	10.93	56.55			3.34

You can also sort the table to arrive at more quantitative data.

4. Close the table.
5. Click Save.

6. Create a web app

The Chesapeake Bay Foundation asked you to show the percentage of land use area in the bay by each state in a compelling way to present to the community. You have decided to make a story map to fulfill this task. You have selected a story map that presents a series of maps and other content organized using tabs.

1. Click Save to be sure your work has been saved.

You have decided that the individual state maps that you want to use in your story map will look better if the basemap is Imagery with Labels.

2. Change the basemap to Imagery with Labels.
3. Save the map as Answers: Chesapeake Bay Landuse 2.
4. Click Share and Share with Everyone.

Answers: Chesapeake Bay Landuse 2 is the beginning map for your story map series.

You will also need individual maps of each watershed.

5. Filter the map by STATE_ABBR and select NY.
6. Save the map as NY.
7. Share with everyone.
8. Repeat steps 5-7 for all the states.

You should have seven maps.

9. Choose Answers: Chesapeake Landuse.
10. Open Answers: Chesapeake Landuse2.
11. Click Share.
12. Click CREATE APP.
13. Click Build a Story Map.
14. Click Story Map Series.
15. Click CREATE WEB APP.
16. Specify a title, tags, and a summary for the new web app.
17. Click DONE.
18. Select Tabbed on the Welcome to Map Series Builder.
19. Type Chesapeake Bay Watershed as the title for your Tabbed Map Series.
20. Click the Arrow.
21. Add Land Use Analysis for the ADD TAB.
22. Select or create a map pull-down and pick Chesapeake Bay Landuse.

23. Click ADD.
24. At the Top Ribbon click SETTINGS.
25. Click Map options.
26. Uncheck Synchronize map locations.
27. Click APPLY.
28. Add some appropriate text about the Chesapeake Bay to the text box such as:

The Chesapeake Bay is the largest estuary in the contiguous US. The watershed covers 64,000 square miles and is fed by 50 major rivers and streams. Everything always flows downstream. Because of this downstream flow, all the results of human inhabitation run into the ocean. Human inhabitation includes farms and developed lands, and as the land is farmed and developed more, there is less land to absorb and filter the water. Restoration efforts have made modest ecological gains, but they have been largely offset by rapid population growth. Agriculture and developed land are one of the land use classifications that are used to study the health of the bay.

29. Click ADD.
30. Select a map. Select NY.
31. Click ADD.
32. Click on the bay part of New York and copy the percentages and add to your text box.
33. Repeat steps 28-30 for the other six states.
34. Click SAVE in the upper right corner.
35. Click VIEW LIVE to review your story map.