

Lab 2 Exercise

Map Types & Attribute Visualization

In this lab, you will learn how to represent various indicators of demography (e.g. total population, percentage living in poverty, etc.) using four different types of maps: a choropleth map with graduated colors, a bivariate choropleth map, a map with graduated symbols, and a dot density map. The shapefile you will utilize to create these maps can be found in Canvas under Lab #2 Assignment. You should download and unzip this data. This shapefile contains numerous attributes for each county in VA. You will use 3 different attributes (variables) to create your four maps:

- Individuals: The number of individuals living in poverty
- POP2010: Total population in the 2010 census
- Percent: The percent of the county's population living in poverty

Learning Objectives:

1. Import a shapefile into ArcGIS Pro.
2. Create a choropleth map using graduated colors.
3. Create a graduated symbol map.
4. Create a dot density map.

Goal 1: Importing the Data (Shapefile)

Step 1.1: Open ArcGIS Pro and create a new project.

- **See lab 1 for how to create a new project**

Step 1.2: In the "Catalog" pane, navigate to the folder containing your Lab#2 data (CountyDemogVA.shp).

Step 1.3: Right-click the shapefile and select "**Add to Current Map**".

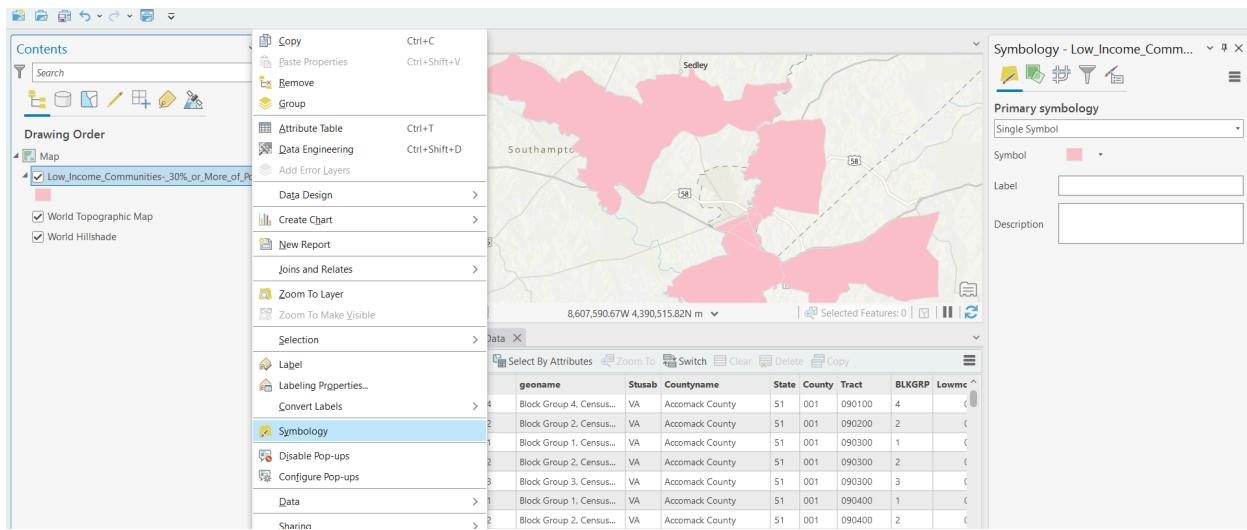
Step 1.4: Open the attribute table of the shapefile and verify the critical fields (attributes) exist: POP2010, Percent, Individual.

- **Why?**: Verifying the existence of the critical fields ensures you have the correct attribute data for the upcoming visualizations.
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Goal 2: Creating a Choropleth Map with Graduated Colors

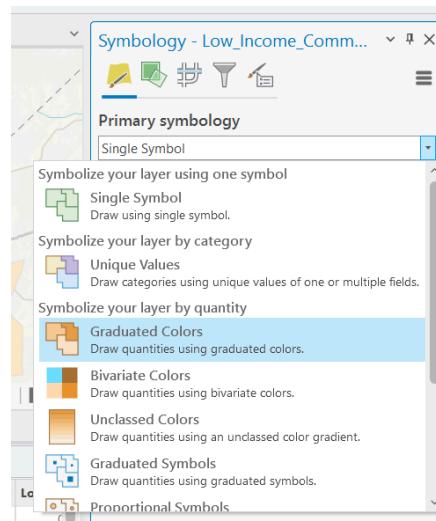
Step 2.1: In the **Contents** pane, right-click the shapefile layer and select "Symbology".

- **Why?**: Accessing symbology settings allows you to change how the data is visually represented on the map.



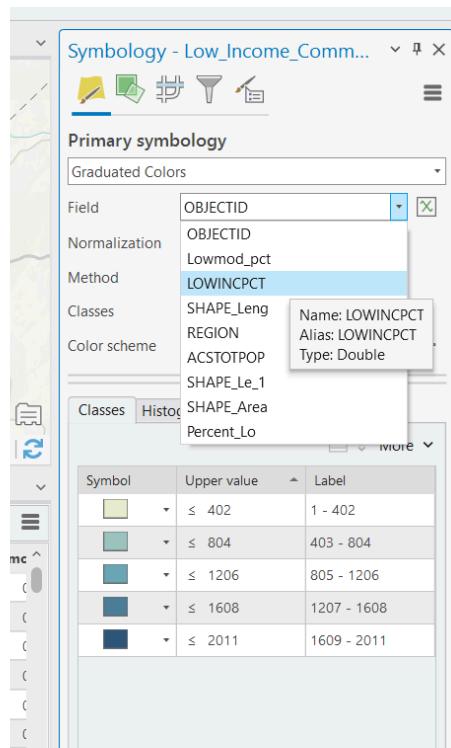
Step 2.2: In the symbology pane, change the type from “Single Symbol” to “Graduated Colors” as the symbology type.

- **Why?**: Choropleth maps use color gradation to represent variations in data, making this the appropriate choice for mapping percentages or total values.



Step 2.3: For the **Field** option, select **Percent**.

- **Why?**: This ensures that the color graduation is based on the percentage of the population living in poverty.



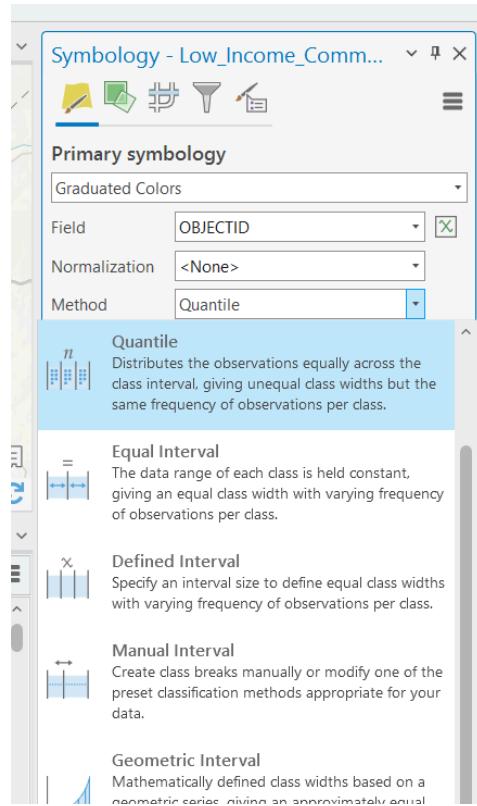
Step 2.4: Choose an appropriate **color ramp** (e.g., light to dark) to visually represent the data.

- **QUESTION: Why did you choose this color scheme (write your answer Below in 1-2 sentences)?**

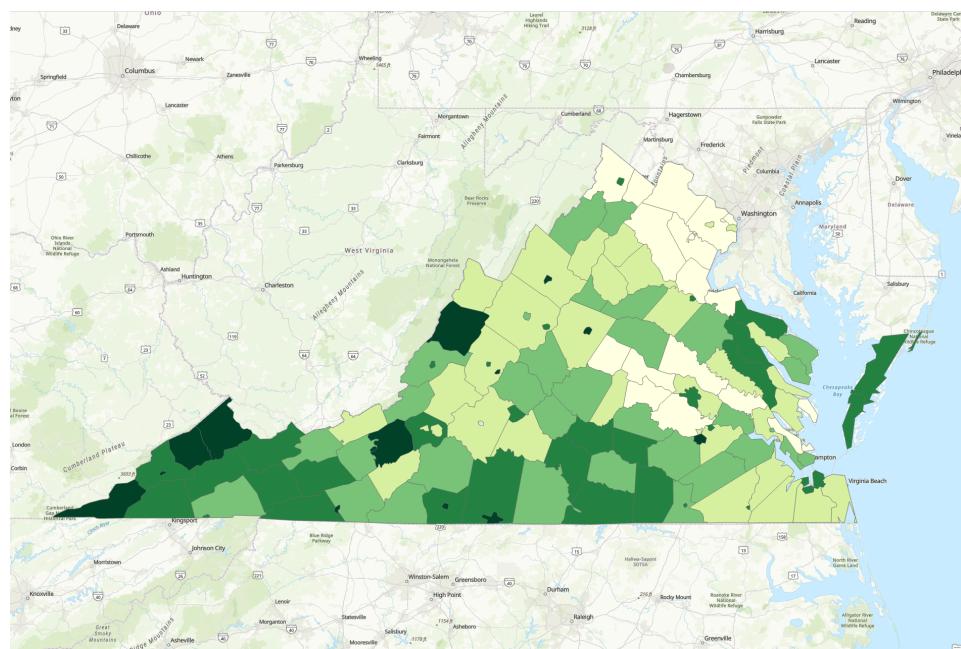
The light to dark gradient is intuitive and easy for the general public to understand; lighter colors represent a lower percentage of the population living in poverty and the darker colors represent a higher percentage of the population living in poverty. This color gradient also makes it easy to distinguish different percentage bins.

Step 2.5: Take some time to explore the options for the **classification method** (i.e., read the descriptions of Natural Breaks, Equal Interval) and examine what happens when you change the number of **classes** (e.g., 5)

- **Why?**: Adjusting the classification allows you to control how the data is divided into ranges, which affects the clarity of the map.

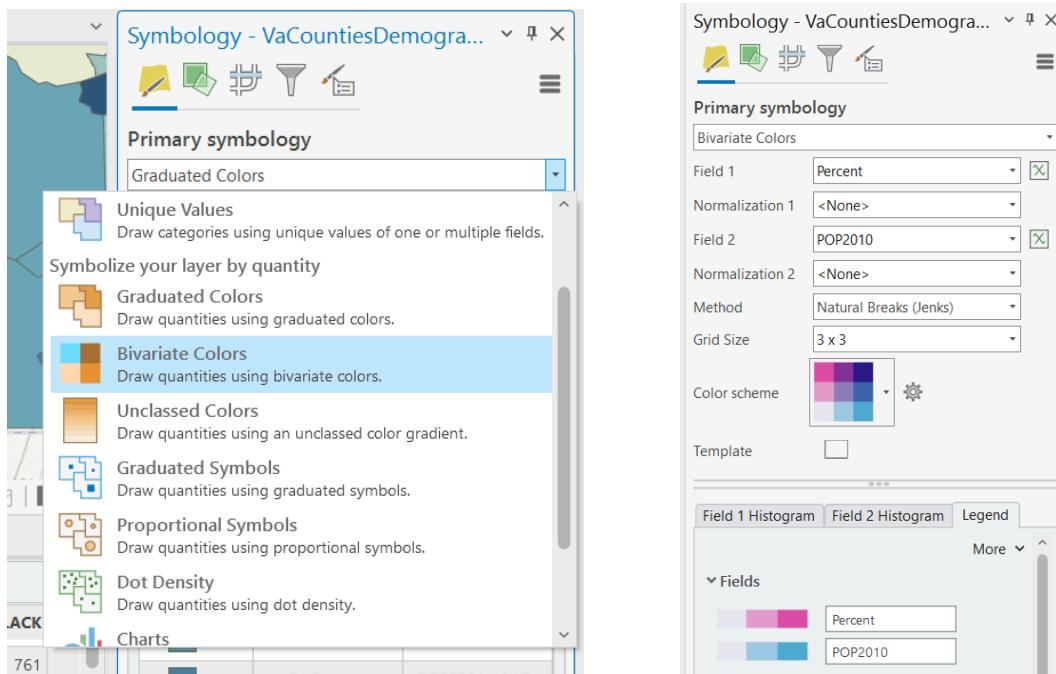


Step 2.6: After exploring the classification method options and altering the number of classes, choose the **Natural Breaks (Jenks)** method and select 5 classes. Right click the shapefile in the Contents pane and select Zoom To Layer, which sets the map view to the extent of the shapefile selected. Paste a screenshot below showing your choropleth map of all counties with 5 classes representing the percent of the population living in poverty.

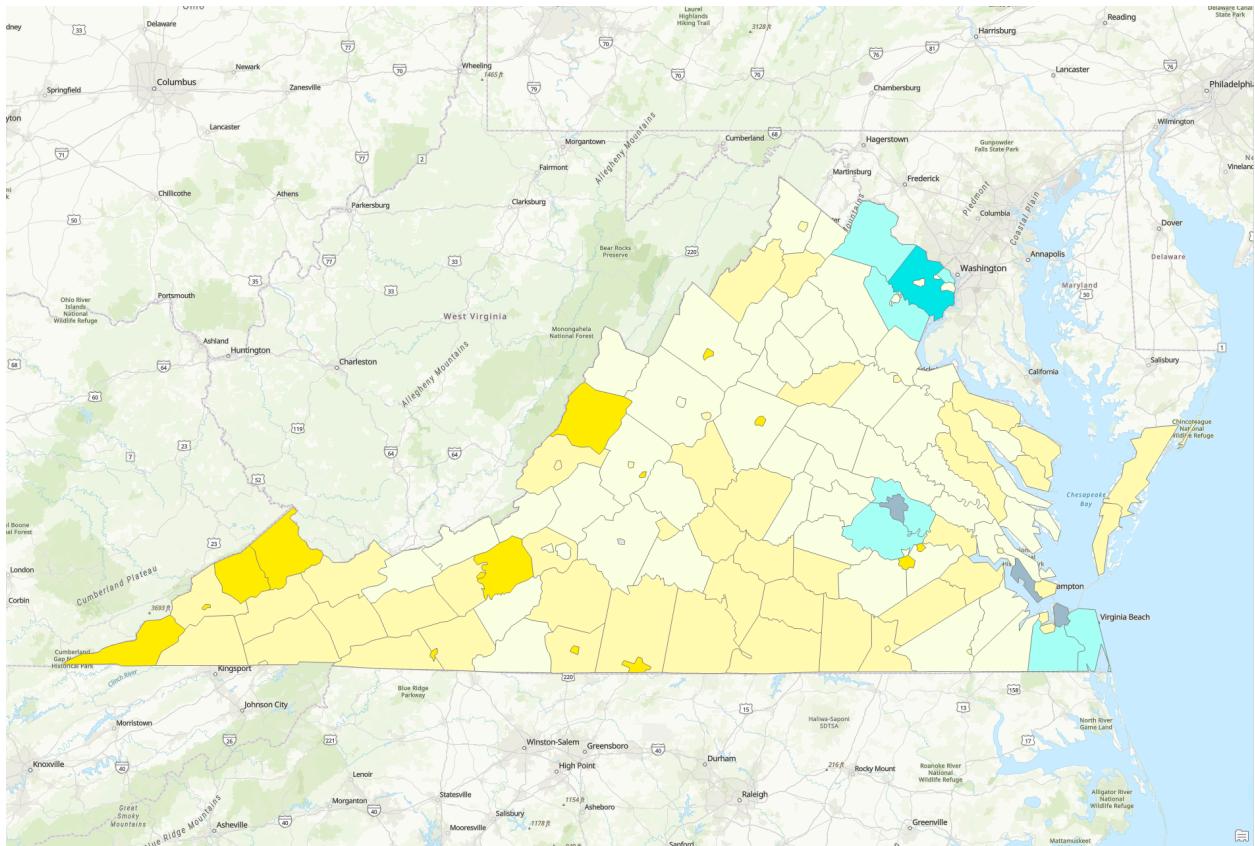


We will now create a bivariate map using the **POP2010** and **Percent**. This will create a map that conveys the relationship between a given county's total population and the percentage of that population living in poverty. For example, we will be able to see which counties have a high total number of inhabitants as well as a high percentage living in poverty, or counties with low populations and high poverty rates.

Step 2.7: Change the symbology to **Bivariate Colors**. In the drop down menu for Field 1 enter the **Percent** attribute. In the drop down menu for Field 2 enter the **POP2010** attribute. Set the “Method” to **Natural Breaks (Jenks)**.



Step 2.8: Examine the map. Notice that the symbology appears as a 2-tone color gradient, where one color represents the total population in 2010 and the other represents the percent of the population living in poverty. Take a screenshot of your bivariate map and paste it below.



Step 2.9: Using the explore option in the Navigate ribbon, zoom in to identify Richmond City by clicking on the map view. This will highlight the polygon and show you the attributes for this individual feature.

Field	Value
FID	67
NAME	Richmond City
STATE_NAME	Virginia
Percent	19.5
Individual	42324
NationalRa	2589

QUESTIONS:

- Based on the color of Richmond City, what can you infer about its population and the level of poverty (e.g. How does it compare to the rest of the state?), explain your answer.
- Do the same for Petersburg, located just south of Richmond.
- Overall, how would you describe the spatial pattern in poverty rates and total population (i.e. in 3-5 sentences, explain what this map shows)

From the map I can infer that Richmond City has a high population and only a small percentage of the population does not live in poverty. In fact, it is one of the few areas within Virginia that has a high population count and a relatively low percentage of the population living in poverty. The same cannot be said for Petersburg which is not too far south of Richmond City. It has a smaller population size and a higher percentage of living in poverty. The areas with a high population within Virginia tend to have a lower percentage of their population living in poverty. Areas such as Fairfax, Loudon, Henrico, and Virginia Beach follow this same pattern.

Goal 3: Creating a Graduated Symbol Map

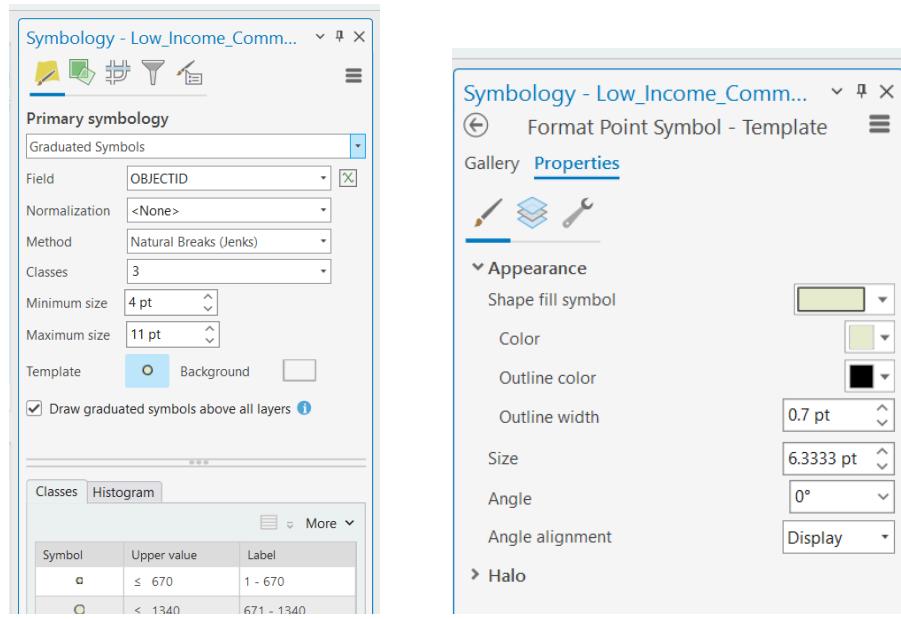
Step 3.1: In the symbology pane, choose "**Graduated Symbols**" as the symbology type.

- **Why?**: Graduated symbols use different sizes of symbols to represent variations in data, which is useful for visualizing proportional data like percentages.

Step 3.2: Ensure that **Percent** is selected as the field to base the symbol size on.

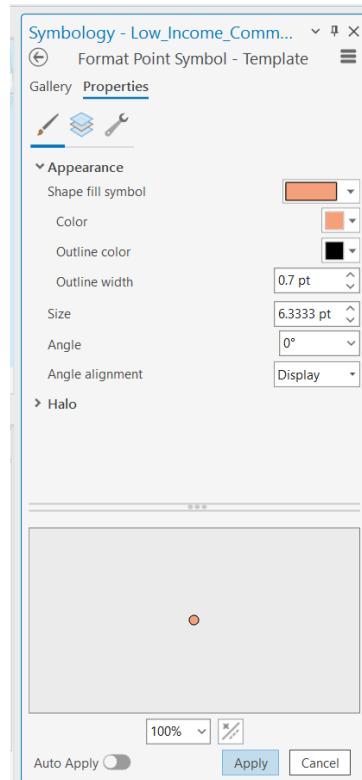
Step 3.3: Adjust the **symbol size range** to make sure the symbols are appropriately scaled for your map. You can alter the minimum and maximum values.

Step 3.4: Click the symbol located next to **Template** and navigate to the **Properties** tab



Step 3.5: Select a new color from the dropdown box next to **Color** and click the **Apply** button.

- **Why?:** In many cases you may wish to use a custom color to display your data. This is done through the properties tab of the symbology pane.

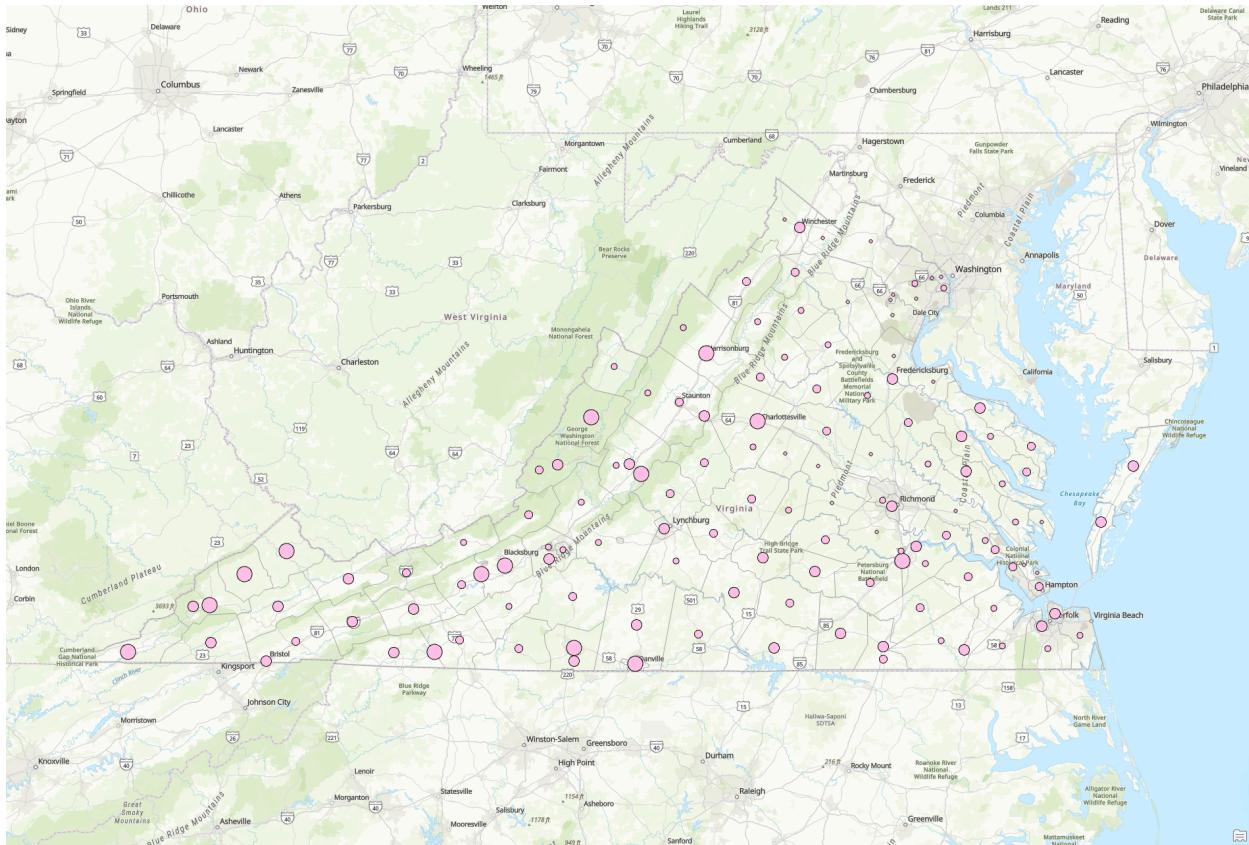


Step 3.6: Exit the Symbology pane and take a minute to look at your map.

- Question: How does the visualization compare to the choropleth map that showed the poverty rates? Is it easier or more difficult to interpret?

I think it is easier to interpret the percentage of the population in poverty when looking at the graduated symbol map. Bigger equals more, smaller equals less. However, the choropleth map is more visually appealing and it is easier to see the overall trends occurring within the map. They both have their strengths and weaknesses, overall I prefer the choropleth however.

Step 3.7: Take a Screenshot of your map and paste it below into your document.



Goal 4: Creating a Dot Density Map

Step 4.1: In the **Contents** pane, right-click the shapefile layer and select "**Symbology**".

Step 4.2: In the symbology pane, select "**Dot Density**" as the symbology type.

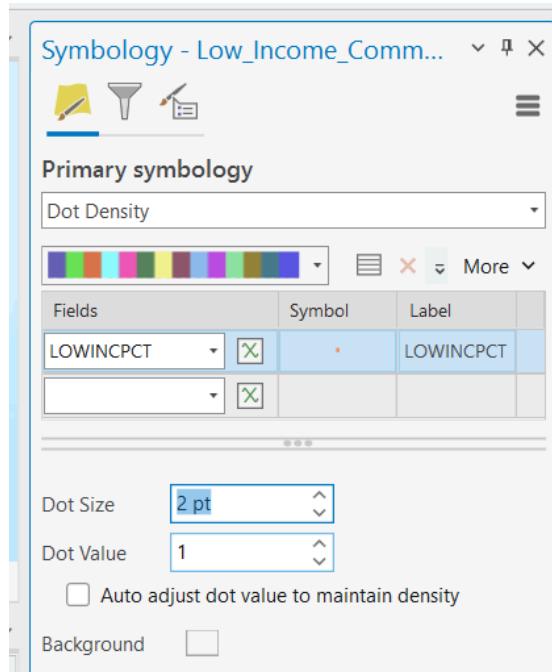
- **Why?:** Dot density maps represent quantities through randomly placed dots, which is an effective way to visualize population distributions.

Step 4.3: Under the **Field** option, select **Individuals** as the field to represent with dots.

Step 4.4: Set the **dot size** and **dot value** to appropriately reflect the data.

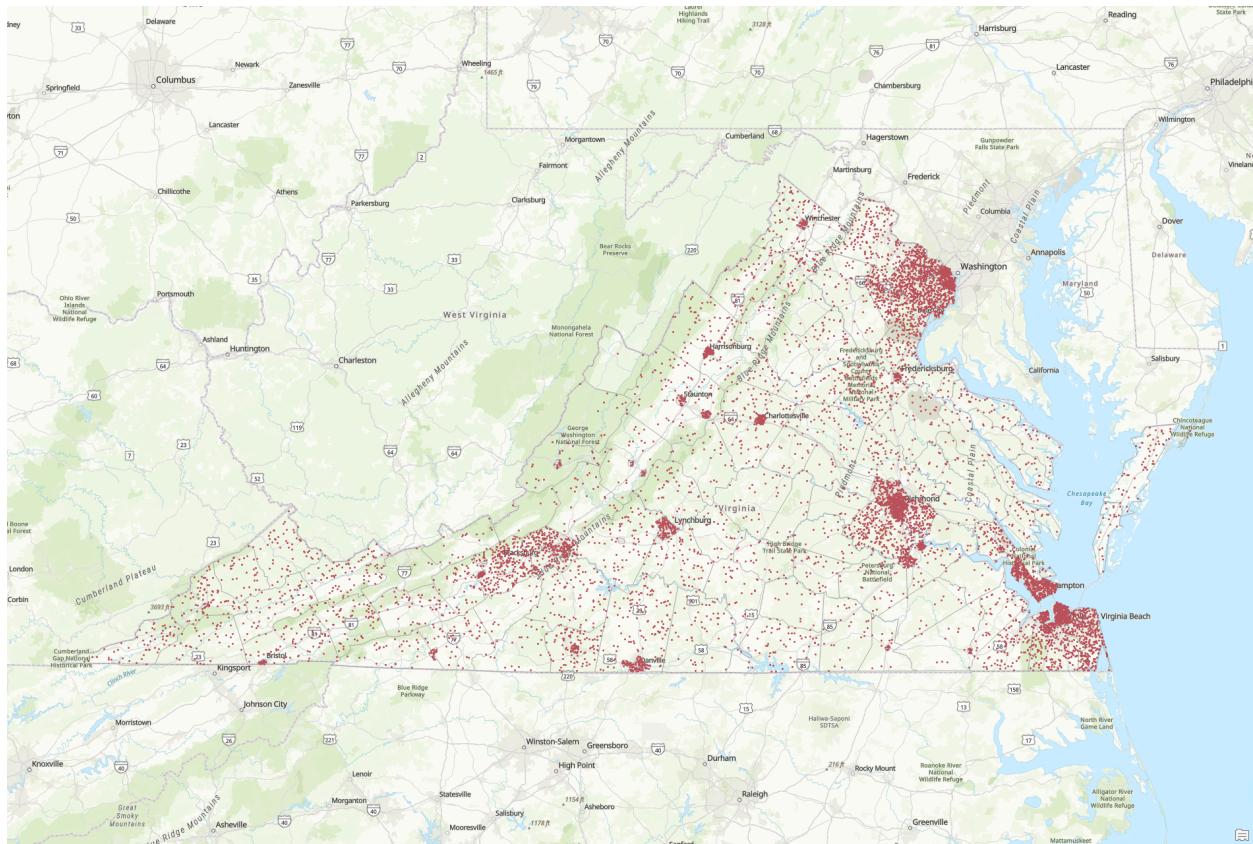
- **QUESTION: What is the Dot Value? And why is Dot Size important?**

Dot value represents the quantity of our variable, in this case it is “Individual”. In order to present a legible map, the dot size must be able to represent the data without overlapping too much.



Step 4.5: Adjust the **color** of the dots if needed to improve visibility.

Step 4.6: Take a Screenshot of your map and paste it below into your document.



QUESTION: Based on the dot density map, which county has the highest concentration of people living in poverty.

There are a couple of counties that tie for the highest concentrations of people living in poverty spot; Arlington, Richmond, Norfolk, and Hampton.

How does this differ from the choropleth map that showed poverty rate (Percent variable)?

The choropleth maps show the percentage of a population that live in poverty (PLP), not the total concentration of people living in poverty. An area with a high population density would have a lower percentage of PLP than an area with a low concentration. However, the areas with a high population density would have more PLP in comparison to a smaller county with a lower total population.

Take Home Question

If you were a state employee tasked with reducing poverty, how would you use these maps to geographically focus your efforts? Select a general region or group of counties in which you would focus your resources and explain why you chose that region. Ideally, how would your intervention change the appearance of the maps you created today?

I would focus my efforts in areas with a higher population density such as Richmond City and the greater Richmond area. The higher population density means there are more people in poverty in a smaller area; this would make transporting resources, opening offices/help centers, and moving within the area much easier, less resource intensive, and less time consuming. This intervention would make the darker red areas less intense therefore representing a lower total population of people in poverty in these population dense areas.

Select the map type you find most useful for your explanation to the question above, and create a layout for this map. Be sure to include all necessary map elements (title, legend, etc.) and that these are appropriately placed on your map. If you need a reminder on how to create a map layout, see [Lab #1](#).

Make a map with a legend as in the last assignment for one of the maps above.

VA Percent Population in Poverty

