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Quantitative Map Symbology

Learning Objectives

1. Differentiate between the proportional symbol map and graduated symbol map.
2. Explain when you would use a proportional symbol map versus when you would use a graduated symbol map.
3. Join spatial and non-spatial data using a common attribute.

Link for submission.

Introduction

An alternative to color as a method of showing variation in the distribution of values is the use of the visual variable size. There are two methods of using size. The first, a proportional symbol relates the data value directly to the symbol area size. The alternative is a graduated symbol map, where the data values are categorized and those categories are represented by symbol size.

We will use a dataset containing the number of Walmarts by state in the US for this lab. The data is stored in a CSV file with state abbreviation and the count of Walmart stores as of 2021. We will also use state boundaries from a shapefile available at the Census here.

CSV Data

Many times the data that we are interested in using is not readily available in a shapefile format. This means that we need to combine data sets. This is easily done in ArcPro or ArcMap.

- Select the Map tab, and Add Data. Navigate to the CSV file.
    a. In our case, there is not a set of geographic coordinates with the data so we will join this file to a shapefile. If you are working with data that contains geographic coordinates you can use the X,Y data tool.
- Using the Add Data button again, add your state boundary file.
    a. In order to create appropriate maps, you will need to reproject your shapefile. For this lab, please use the Albers Equal Area Conic projection. You can find specific instructions for this process in the previous choropleth lab.
    b. Once you have reprojected the shapefile you will need to change the projection of the map in order to see the result properly. To do this, right-click on the Map in the table of contents and change the coordinate system to the Albers Equal Area Conic projection.

- The shapefile contains an attribute STUSPS containing the states' postal abbreviations. These abbreviations correspond to the STATE attribute in the CSV file.
- Right-click on the state boundary shapefile and select Joins and Relates.
- Select Add Join.
    a. In the join window select the CSV file and use the attributes mentioned above to create a join between the two files.
- Use the attribute table to answer the following questions:
    a. How many records have a null value in place of a count of Walmarts?
    b. What state has the most Walmarts? Why would you expect this?

Graduated Map Symbology

1. Select a feature layer in the Contents pane.
2. Under the Appearance tab, in the Drawing group, click Symbology and click Graduated Symbols.
3. In the Symbology window, on the Primary symbology, choose the field for the data to be mapped.
4. Note that in some cases you may want to normalize the data. While you do not need to do this for the current example, These steps are included here:
    a. Choose a field from the Normalization menu, or choose percentage of total to divide the data value to create ratios, or choose log to symbolize on the logarithm of each value.
    b. The log can be an effective way to generate a smaller range of values if the dataset includes significant outliers.
5. Classify the data using an appropriate classification method and number of classes.
6. Set the minimum and maximum sizes of the symbol representing your data.

Proportional Map Symbology

1. Select a feature layer in the Contents pane.
2. Under the Appearance tab, in the Drawing group, click Symbology and click Proportional Symbols.
3. Select the Primary symbology tab, choose the numeric field.
4. Relative-Size Proportional Symbols
    a. Choose Unknown for the Unit. Set the Minimum size and the Maximum size.
5. Actual-Size Proportional Symbols
    a. Choose a Unit to represent the data. Set the Data represents control to Area, Radius, Height, Width, or Distance from Center. Note that these different controls can be limited by the symbol type.

6. Adjust the symbol form, symbol fill, and background symbol as needed.
    a. Compare the results of the proportional symbol map and the graduated symbol map. What do you notice about the patterns that are apparent in each of the maps?
    b. What are two questions you might ask about Walmart locations, and which of the two maps would be more suitable for answering each question? Explain your reasoning.

Solutions

- How many records have a null value in place of a count of Walmarts? 4
- What state has the most Walmarts? Why would you expect this? Texas has the most Walmarts at 602. I would expect this because Texas is the second largest state by area and has a higher population density than the largest state (Alaska).
- Compare the results of the proportional symbol map and the graduated symbol map. What do you notice about the patterns that are apparent in each of the maps? The proportional symbol map creates a much larger range of symbols than the graduated symbol map because it directly relates the value of Walmart stores to the map symbol size. In contrast, the graduated symbol map uses a much narrower size.
- What are two questions you might ask about Walmart locations, and which of the two maps would be more suitable for answering each question? Explain your reasoning. Answers will vary.