

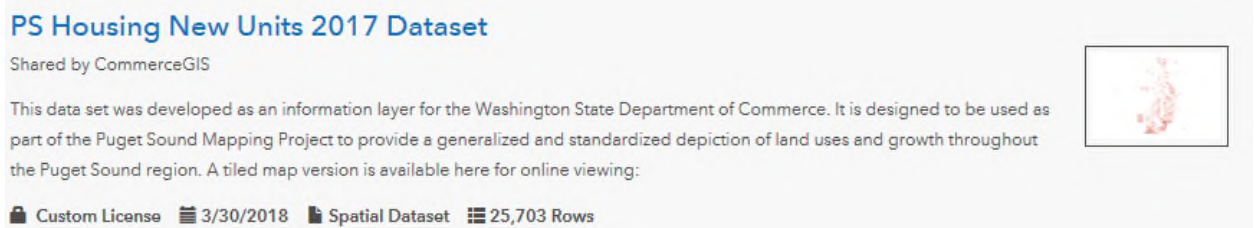
Determining Population Growth Using Map Layers

The amount of population growth can be determined for a particular area on the map (i.e. within a certain land use category, county, or urban growth area). The following steps provide a walk-through of how to download data, how to symbolize the layer in ArcMap, and how to calculate population growth by several selection methods.

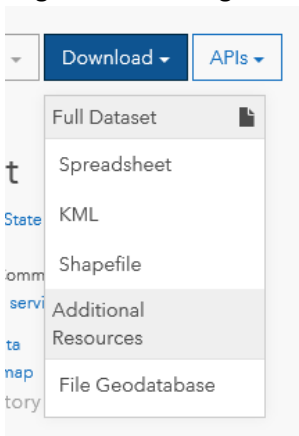
Acquiring data

First, download the shapefile of the dataset from the Washington State Open Data website at geo.wa.gov and add it to ArcMap.

1. Locate the population dataset you would like to use on geo.wa.gov. (All three population layer files contain the same data).



2. Select **Shapefile** from the **Download** drop down menu on the right hand side to begin downloading the shapefile of the dataset to your computer.

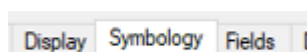


3. Add shapefile to a new ArcMap document. 

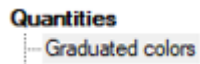
Symbolizing the Population Layer

- 1.) Right click on the layer and select **Properties** to open the Layer Properties Dialogue Box.

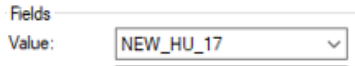
- 2.) Click the **Symbolology** tab.



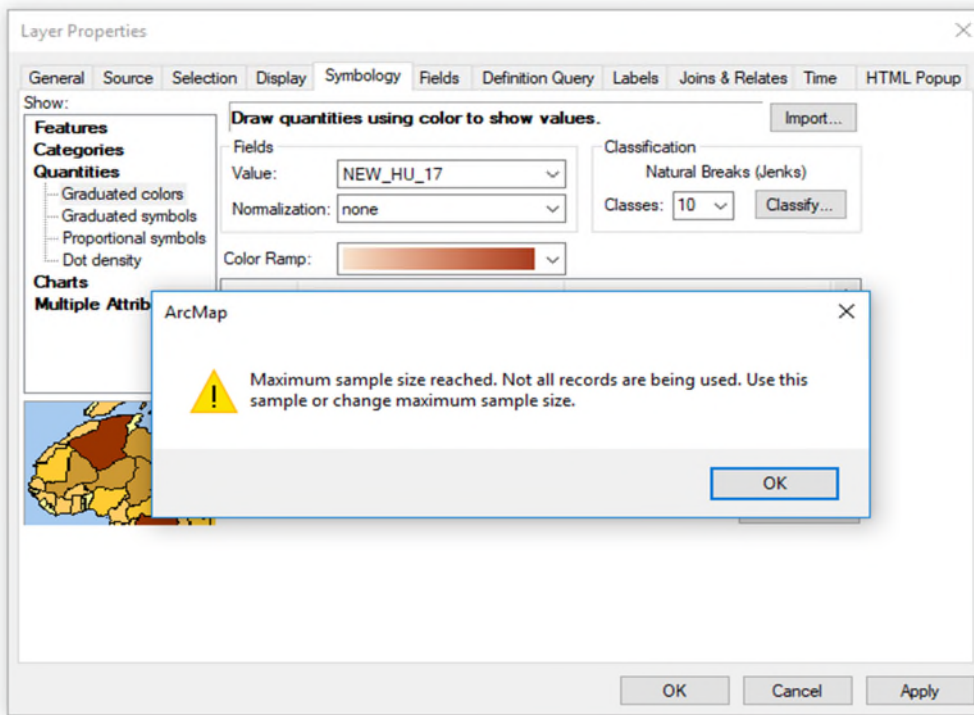
3.) Select **Quantities** and **Graduated Colors**.



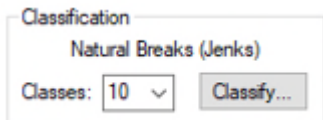
4.) Select the **Value** field and select the population dataset you want to use.



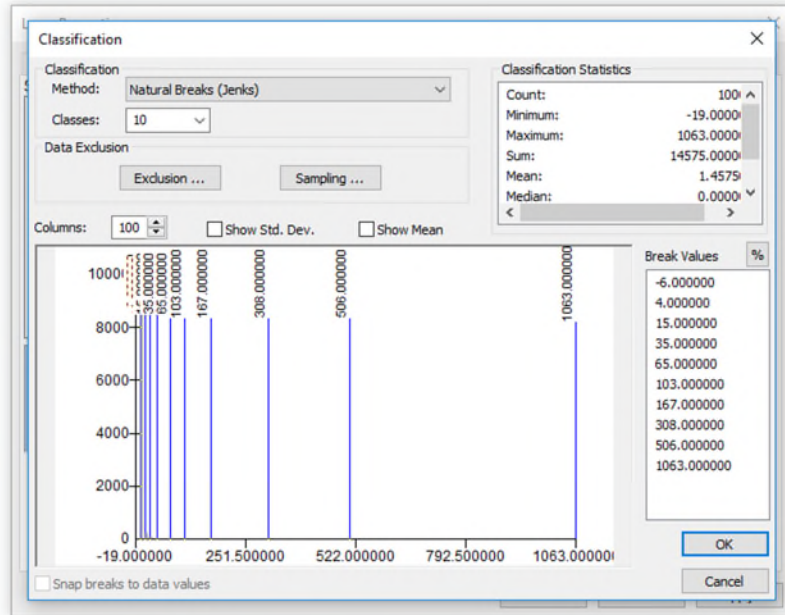
5.) You will get a message box stating the maximum sample size has been reached. Click OK.



6.) Under **Classification** select the number of classes you would like to use (ex. 10).



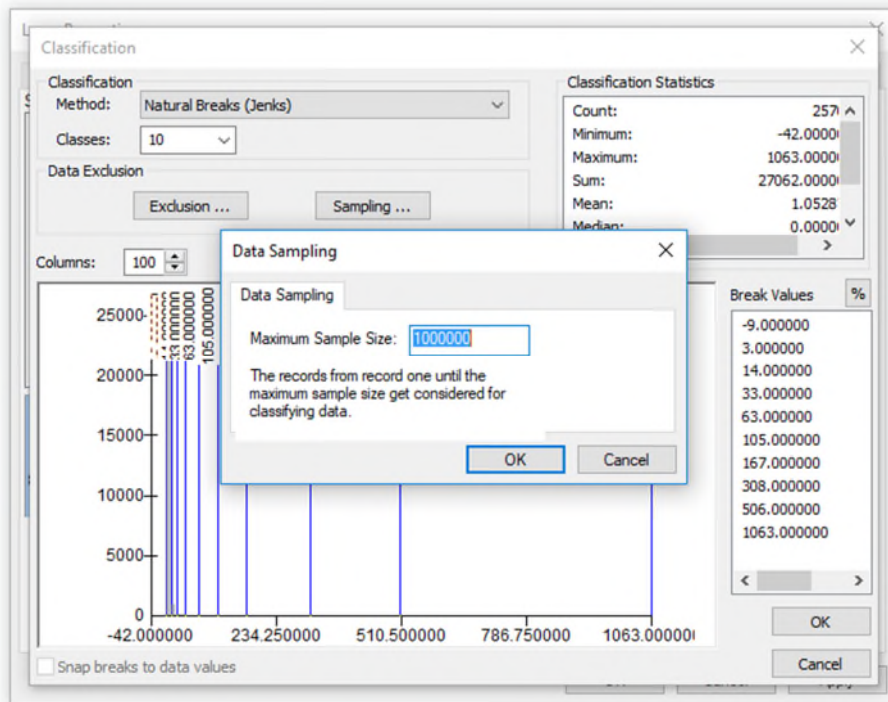
7.) Select the **Classify...** box to open the Classification Dialog Box.

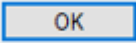


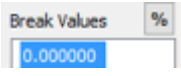
8.) Select the **Sampling ...** box to open the Data Sampling Dialogue Box.

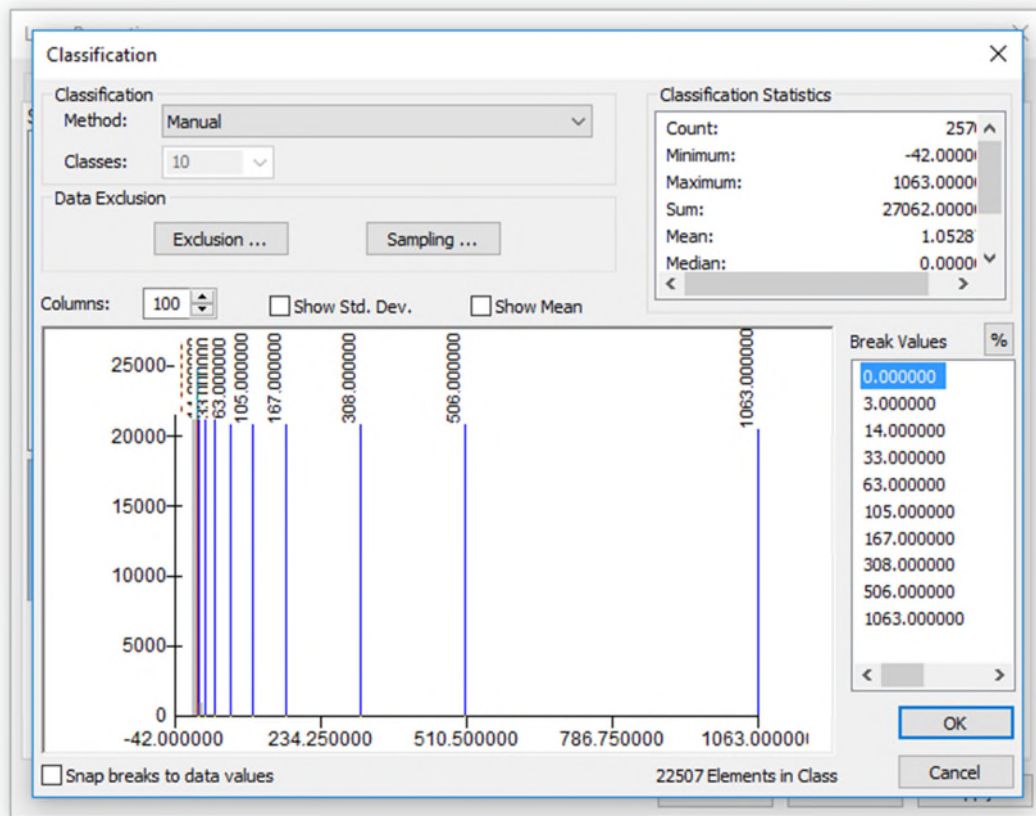
9.) Change the **Maximum Sample Size** from 10,000 to 1,000,000.

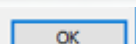
Maximum Sample Size: **1000000**





10.) Click  on the Data Sampling Dialogue Box.


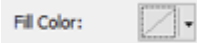
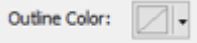

11.) In the Classification Dialogue Box under  change the first break value to 0 by clicking the top value twice slowly.

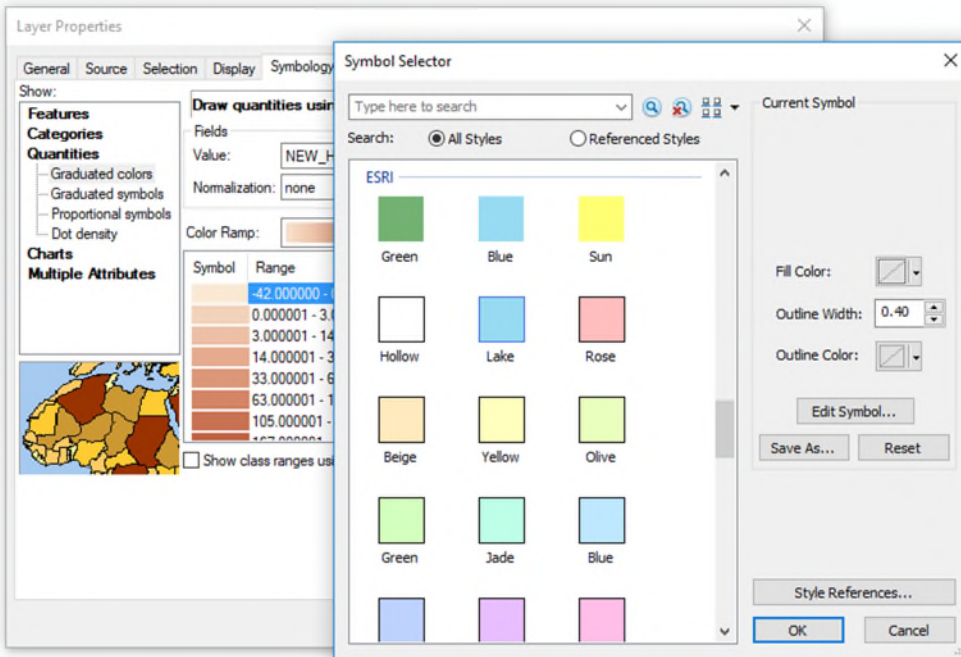


12.) Click  on the Classification Dialogue Box.

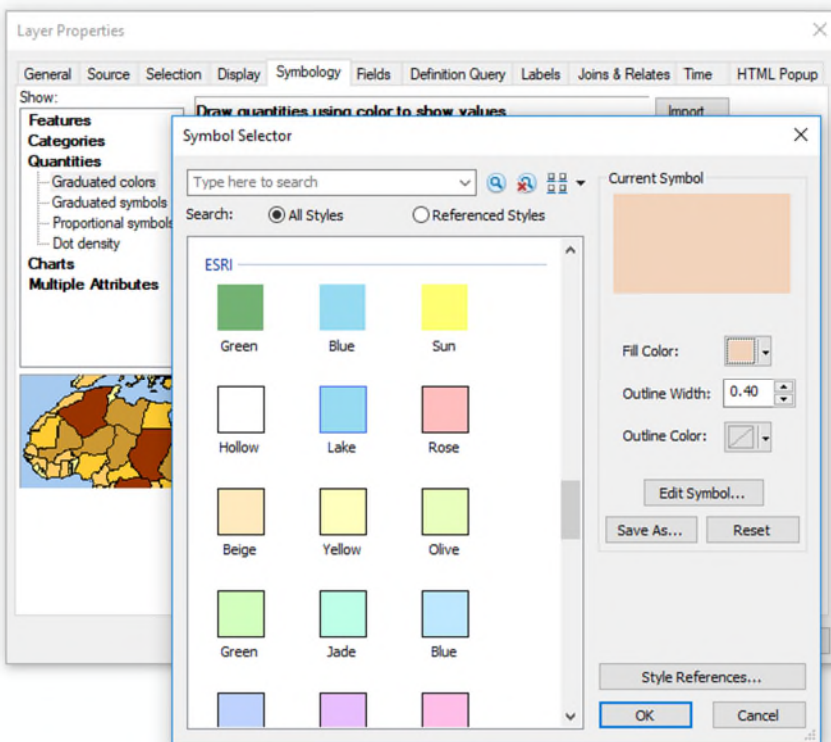
13.) Select a graduated  to display the data.

14.) Under  change the labels to remove the extra decimal places. 

15.) Optionally, you can change the first classification section of negative growth up to 0 to no color so it does not display. Double click the color box under  to open the Symbol Selector Dialogue Box. Under  and  select **No Color**. 



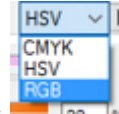
- 16.) Optionally, you can also remove the outline for each color box by selecting the color box for the other classifications under **Symbol** to open the Symbol Selector Dialogue Box. Under **Outline Color:** select **No Color**.



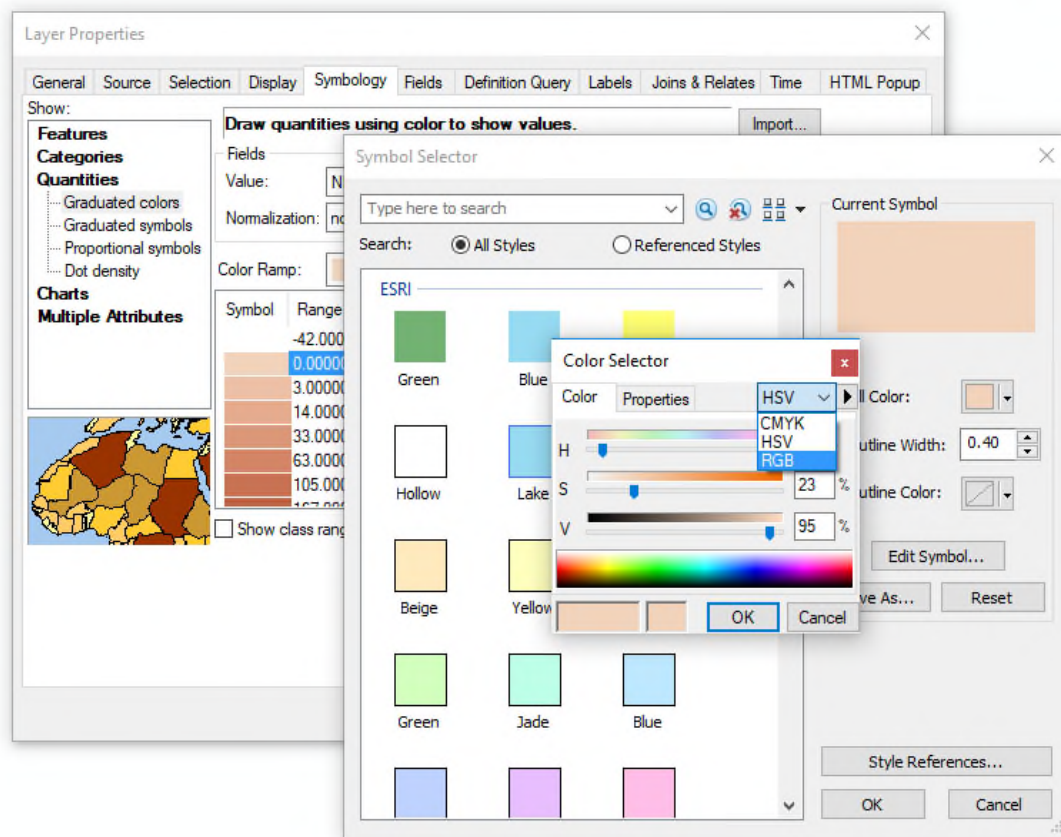
17.) Or you can change the outline color to match the fill color by selecting



and select



In the Color Selector Dialogue Box use the drop down box to select **RGB**.

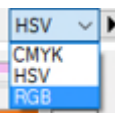


Note the **RGB** numbers, close the Color Selector Dialogue Box, and select



in the

drop down menu.

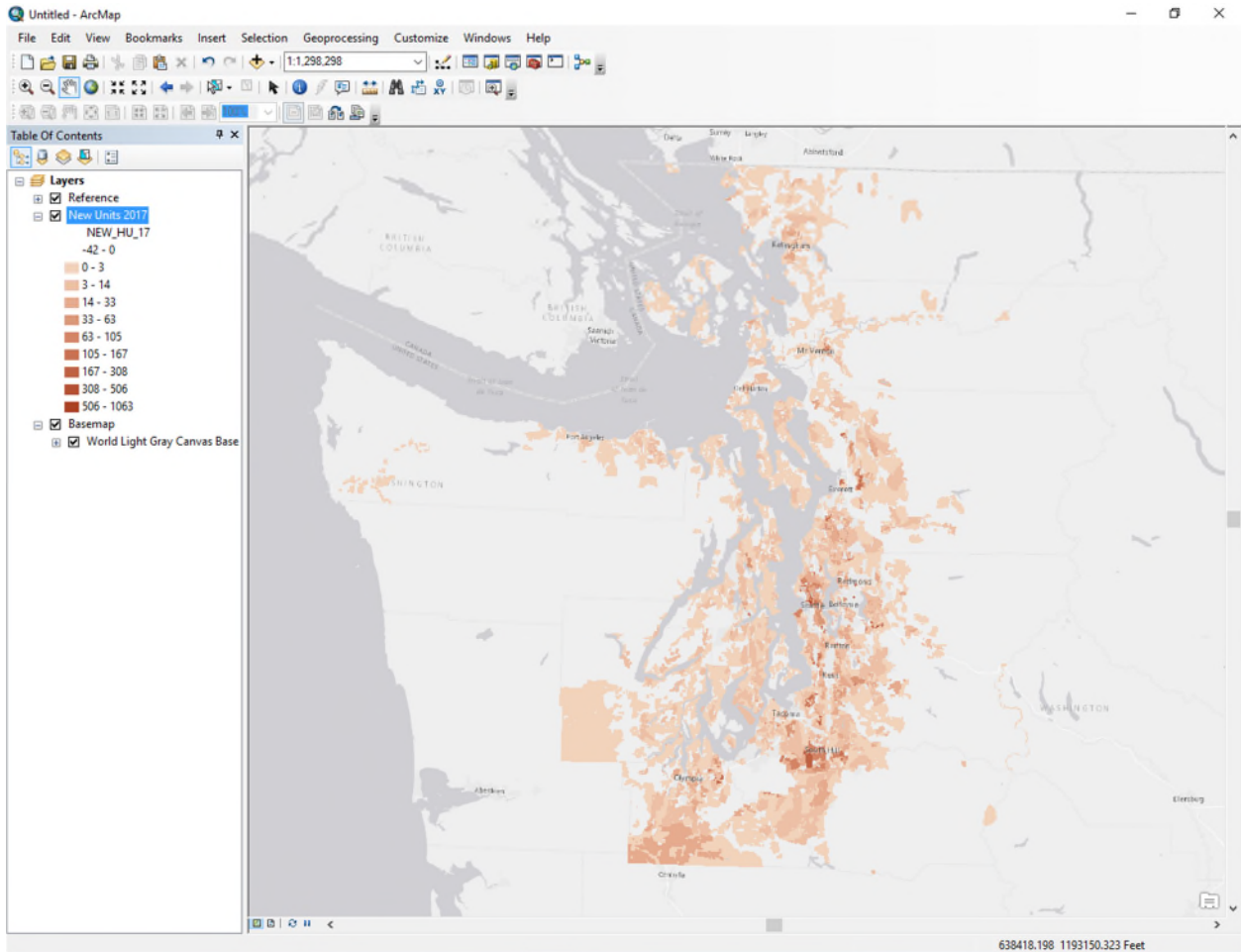


Select **RGB** in the Color Selector Dialogue Box if it is not already selected and type the **RGB** numbers from the **Fill Color** in the Outline Color Dialogue Box. (Note: If you have **No Color** previously selected you may need to select a preset color for the **Outline Color** before changing to a custom color to open the **RGB** box.)

Change the **Outline Width:** to 0.40.

18.) Click **OK** on the Layer Properties Dialogue Box.

19.) Add a **Basemap** (ex. [Light Gray Canvas](#))



Selecting Polygons Using Query (to select a land use or other attribute)

To select polygons by certain attributes you can use the **Query Builder**. We will use the Rural Transition land use subcategory as an example.

- 1.) To open the **Query Builder** right click on the layer and select



- 2.) Select the **Definition Query** tab and select



Query Builder...

to open the Query Builder Dialogue Box.

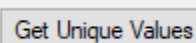
3.) For selection by a single attribute:

- a.) In the Query Builder Dialogue Box, select the attribute you want to use (ex. **SUB_CAT**) by double clicking on it.

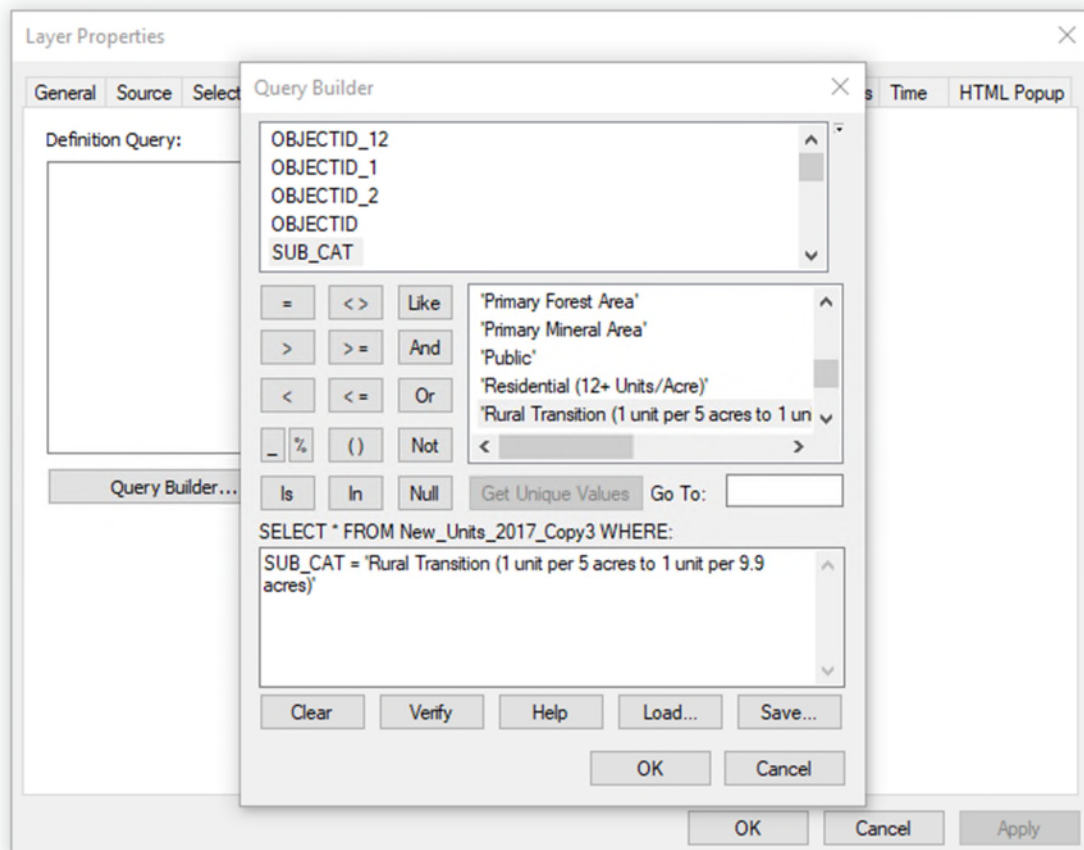
- b.) Click the




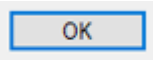
once and then select



- c.) Select the value you want to examine (ex. **Rural Transition (1 unit per 5 acres to 1 un**))



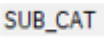
d.) Click  to see if there are errors. If there are errors clear the Query Builder and make sure the equation matches the one above (or is similar if choosing a different equation).

e.) If the expression is verified, click  on the Query Builder Dialogue Box.

f.) Click  on the Layer Properties Dialogue Box.

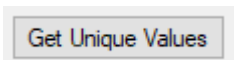
g.) Skip to the last section of the tutorial: *Calculating population growth for a selection*

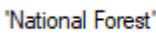
4.) For selection by multiple attributes:

a.) In the Query Builder Dialogue Box, select the attribute you want (ex. ) by double clicking on it.

b.) Click  once.

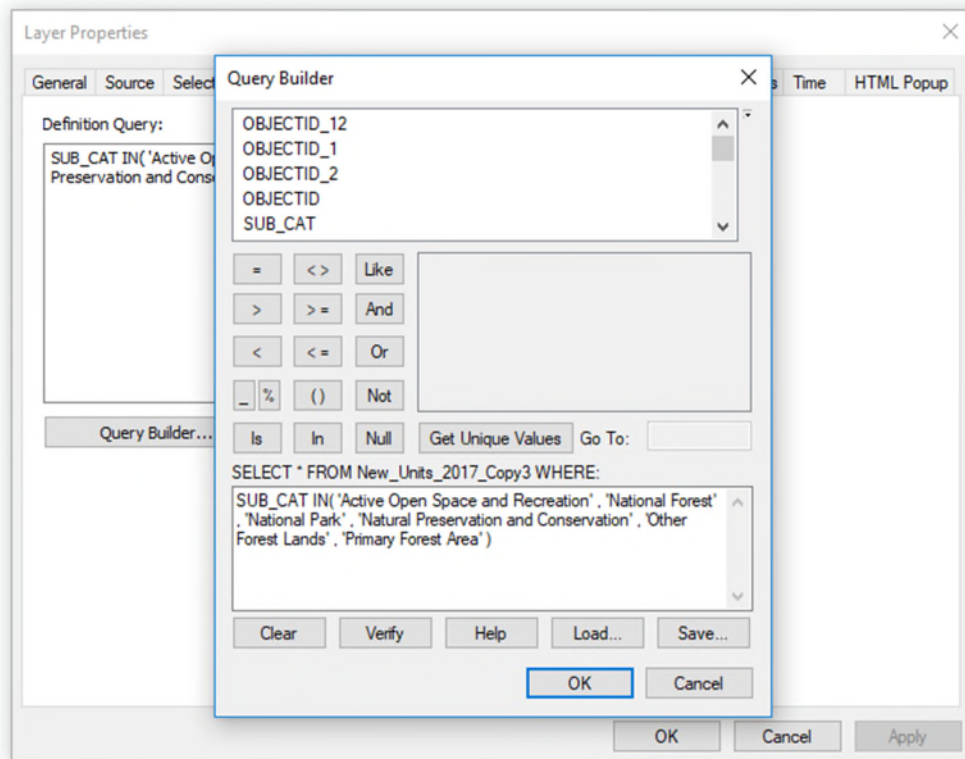
c.) Click the parenthesis symbol  once.


d.) Select .

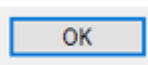
e.) Select the attributes you want to use by double clicking on them (ex. ). The attributes should show up inside the parentheses. Separate each attribute you select by adding a comma and a space. The formulas below are examples:

```
SUB_CAT IN( 'Active Open Space and Recreation' , 'National Forest' , 'National Park' , 'Natural Preservation and Conservation' , 'Other Forest Lands' , 'Primary Forest Area' )
```

```
SUB_CAT IN( 'Large Lot Residential (1 unit per 10 acres to 1 unit per 19.9 acres)' , 'Low Density Urban Residential (1.1-3 Units/Acre)' , 'Mixed Use/Planned Neighborhood (3.1-12 Units/Acre)' , 'Residential (12+ Units/Acre)' , 'Rural Transition (1 unit per 5 acres to 1 unit per 9.9 acres)' , 'Traditional Single Family Residential (3.1-12 Units/Acre)' , 'Urban Edge (1 unit per acre up to 1 unit per 4.9 acres)' , 'Very Large Lot Residential (1 unit per 20 acres or more)' )
```



f.) Click  to see if there are errors. If there are errors clear the Query Builder and make sure the equation matches the one above (or is similar if choosing a different equation).

g.) If the expression is verified, click  on the Query Builder Dialogue Box.

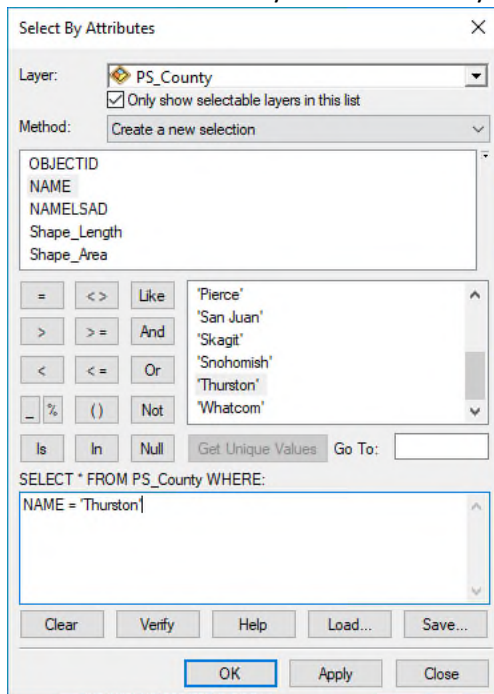
h.) Click  on the Layer Properties Dialogue Box.

i.) Skip to the last section of the tutorial: *Calculating population growth for a selection*

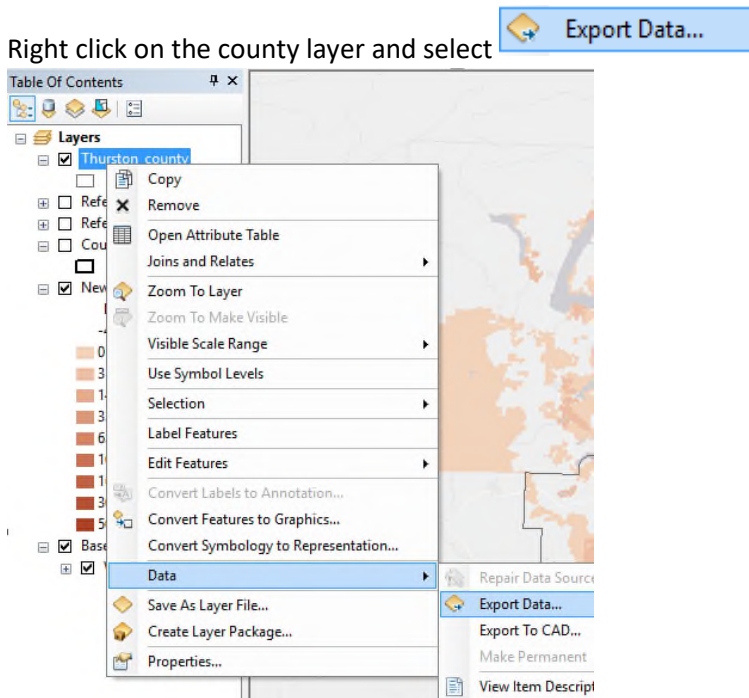
Selecting Polygons within a County (or other area)

Next, we will select an area based on county boundaries. The same process could be used to examine population within an urban growth area or other boundary. For the purposes of this tutorial, we are interested in population growth in Thurston County. A county boundary layer can be downloaded from geo.wa.gov in the same way as the General Land Use layer, or from elsewhere online.

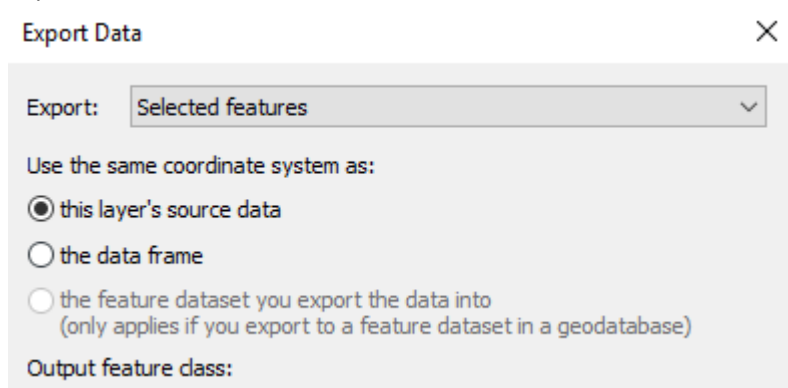
1. Select Thurston County from the County Boundary layer using Select by Attributes.



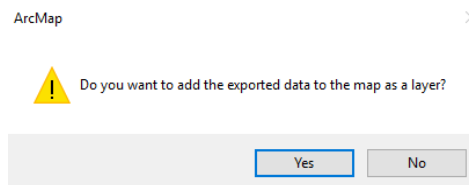
2. Right click on the county layer and select



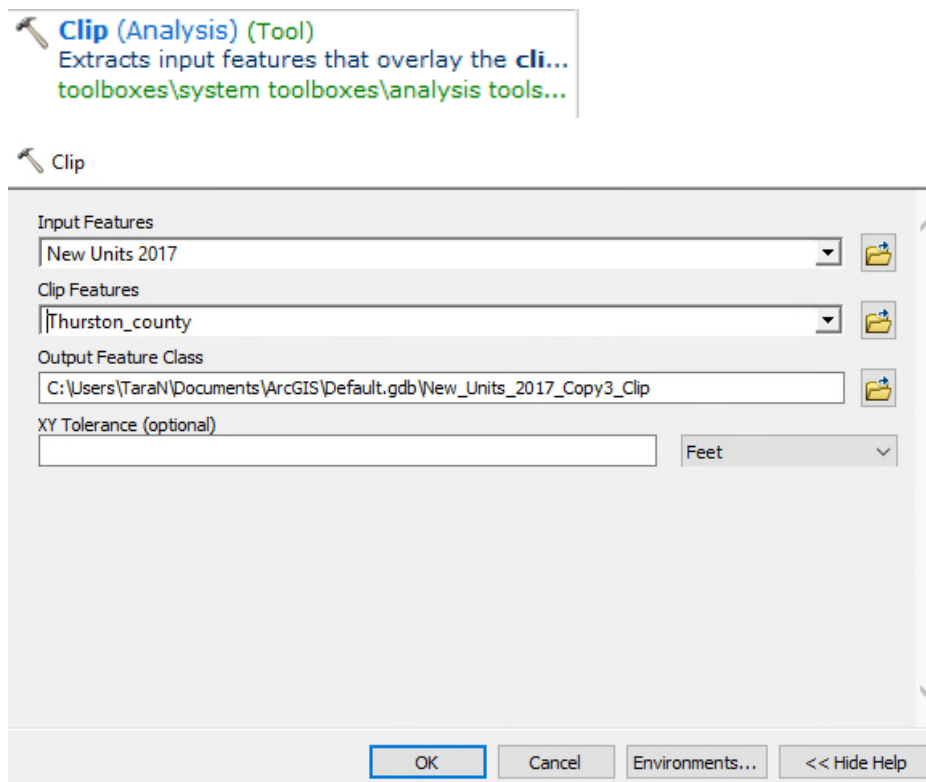
- Export selected features.



- Add exported data to the map as a layer. The new layer shows the county boundaries of Thurston County.




- Clip the population layer to the new Thurston County boundary layer using the clip tool from the ArcGIS Toolbox. A new layer will be added to the map showing population in Thurston County.

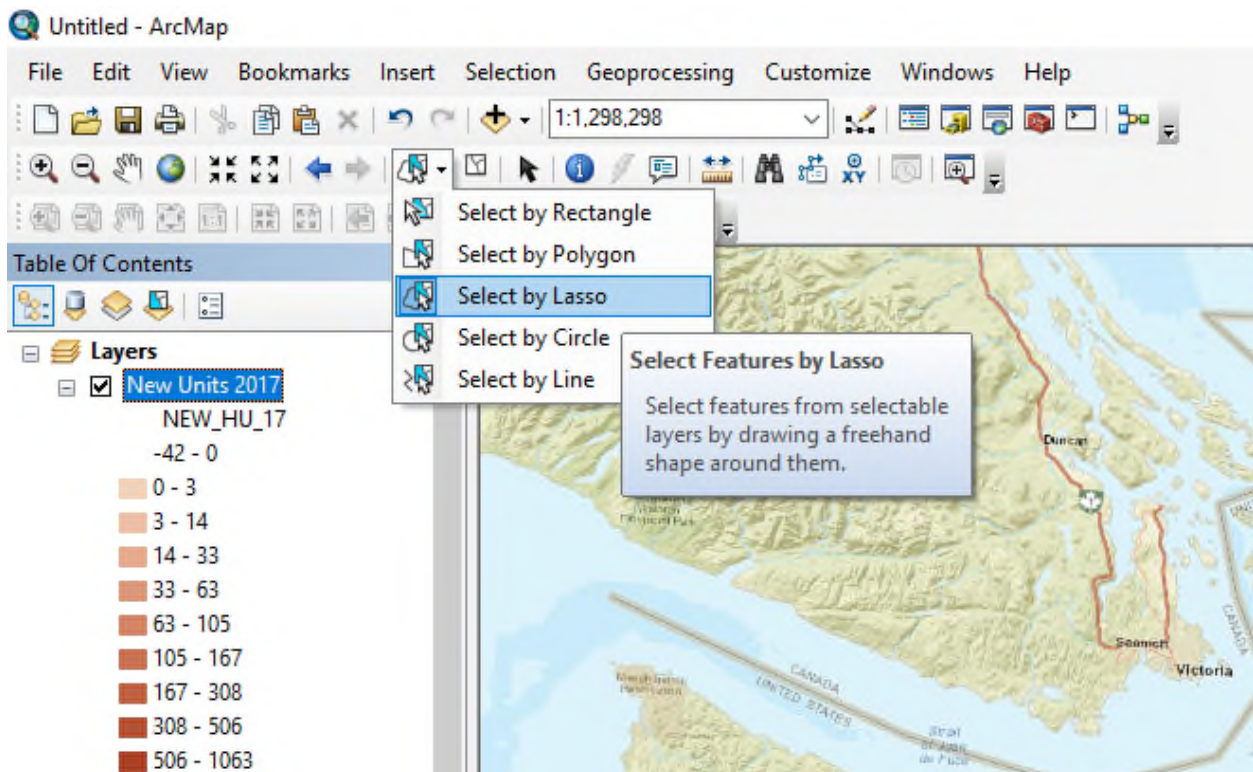


6. Optionally, symbolize the new Thurston County population layer using the desired color gradient, as described previously.
7. Skip to the last section of the tutorial: *Calculating population growth for a selection* (If you used this selection method, you can skip steps 1 and 2)

Selecting Polygons Using Lasso

If you want to select an area to examine manually, (i.e. if you do not have established boundaries to query from, the Select by Lasso tool can be used.

- 1.) Make sure the layer you want to select is turned on and use the selection tool and select the  **Select by Lasso** tool.

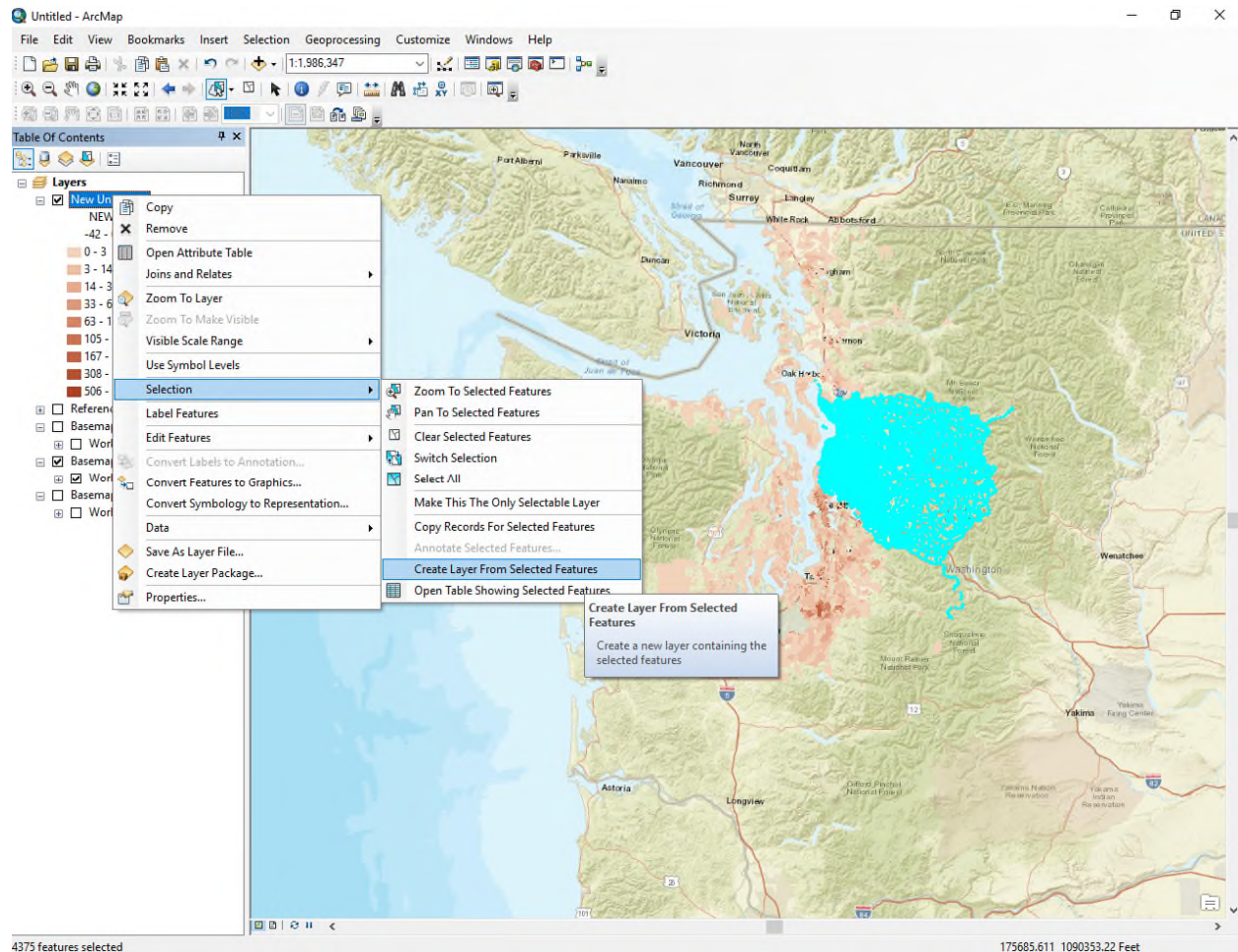


- 2.) Click and hold on the map where you want to make your selection and draw the shape, release when finished.

Calculating population growth for a selection

The amount of growth can be calculated for an area of interest after it is selected by any of the above methods, or by any other method of selecting features.

- 1.) Right click on the layer you selected from and navigate to **Selection** → **Create Layer From Selected Features**. (Note: Creating a layer from selected features will only have data from the selected features in the **Attribute Table** of the new layer.)



- 2.) A new layer including the selected features will show up in **Table Of Contents** that you may choose to symbolize following the previous symbology steps.
- 3.) Right click on the new layer and select **Open Attribute Table**
- 4.) Scroll to the year or range of years for which you would like to calculate growth (ex. **NEW_HU_17**).
- 5.) Right click on the column heading and select **Statistics...**

- 6.) A new window will pop up showing a histogram and summary statistics for the selected column. These include sum, mean, minimum, maximum, standard deviation, and count. Sum gives the population growth for the selected area.

