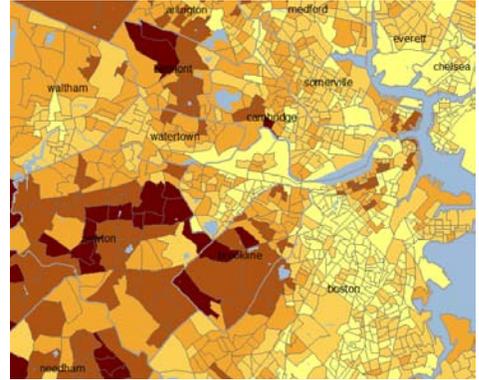


# Working with Census 2000 Data from MassGIS

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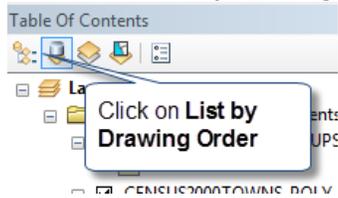
Author: Barbara Parmenter, revised September 24, 2011

In this tutorial, you will use pre-processed census data from Massachusetts to create maps of demographic and housing variables at the Block Group level. **Important: this tutorial uses Census 2000 data, not 2010!**

## Data Preparation

1. Open Firefox and go to the MassGIS web site for Census 2000 Blockgroups layer - [http://mass.gov/mgis/cen2000\\_blockgroups.htm](http://mass.gov/mgis/cen2000_blockgroups.htm) - you will use this as reference later on
2. Start ArcMap with a blank (new) map
3. Add the following MassGIS census data from M:\State\MA\MassGIS\Census2000) and change their names in ArcMap as follows:
  - a. CEN2K\_BG\_INCOME\_HH
  - b. CENSUS 2000blockgroups\_poly.shp -- *Block Groups*
  - c. CENSUS2000TIGERhydro\_poly.shp -- *Water*
  - d. CENSUS2000towns\_poly.shp -- *Towns*
4. Open up the attribute table of the *Blockgroups* layer to see what information it has
5. Open up the attribute table of CEN2K\_BG\_INCOME\_HH and look at the different columns
6. For an explanation of the column names, go to the MassGIS Blockgroups web site, scroll down to the section on *Related Demographic Tables*, then click on [Field Descriptions](#).
7. Use Firefox's *Edit-Find* function to find *inc\_med\_hs* the Field Descriptions table – you'll see that it mean "Median household income in 1999 (dollars)" – we're going to map this value later.
8. Make the Water blue with no outline
9. Make the Towns hollow with a 1.5 width black outline

- Click on the **List by Drawing Order** tab (at the top left of the *Table of Contents*)

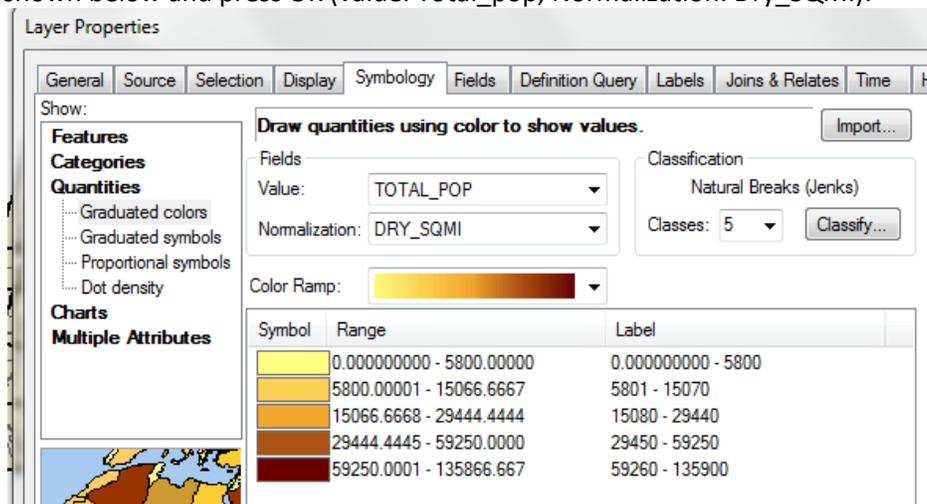


- Drag the *Towns* to the top with *Water* below it

## Creating a map of population per square mile

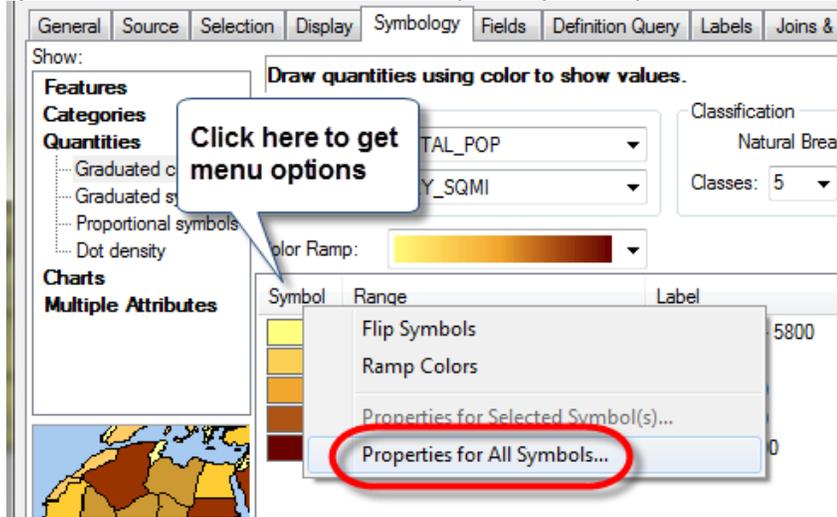
Because blockgroup data layer has attributes for total population and area, you can easily create maps showing population density.

- Open the symbology properties for *blockgroups* layer (right click on blockgroups and choose *Properties*, then *Symbology* tab)
- Click on the *Quantities – Graduated Colors*, and then set up the *Fields* information as shown below and press OK (value: *Total\_pop*; Normalization: *Dry\_SQMI*):



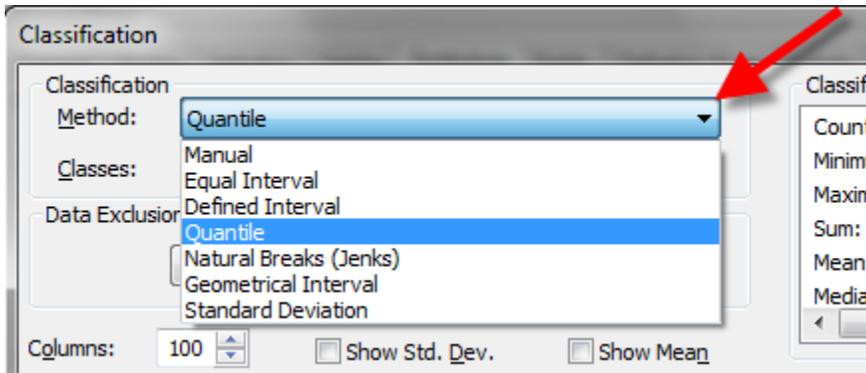
- Press OK
- The census blockgroup boundary outlines are getting in the way of seeing some of your data. You can turn them off by going back to the *Symbology* properties and clicking on

Symbol as shown below to set the Properties for All Symbols:



5. When you get the properties box, set the *Outline* color to **No Outline** and click **OK**
6. You can also turn off Water and Towns if you like.

You also have other classification methods available besides the default *Natural Breaks* method. In the Symbology properties box, click on the **Classify...** button and experiment with the different methods:

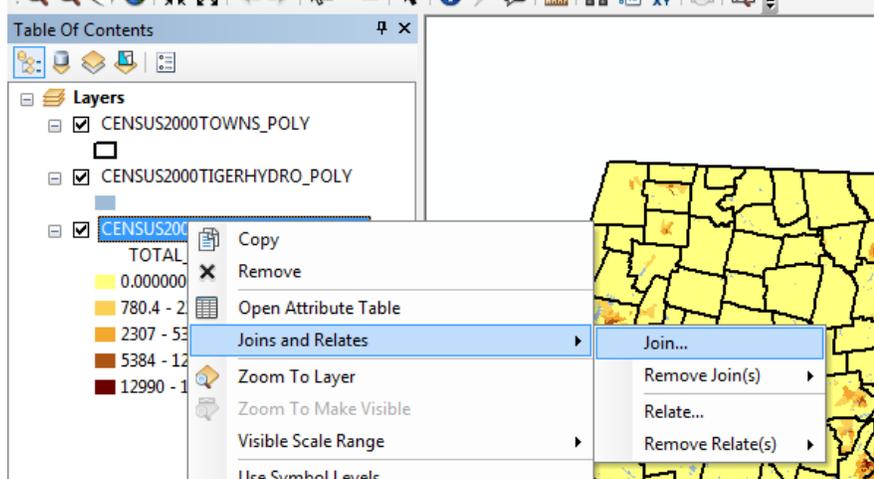


Note that, as you play around with your symbology properties, you can click on the “apply” button rather than the “ok” button. This allows you to see the effects of your changes without closing the dialogue box, so you can continue to play around with your symbology until you have it set up how you want.

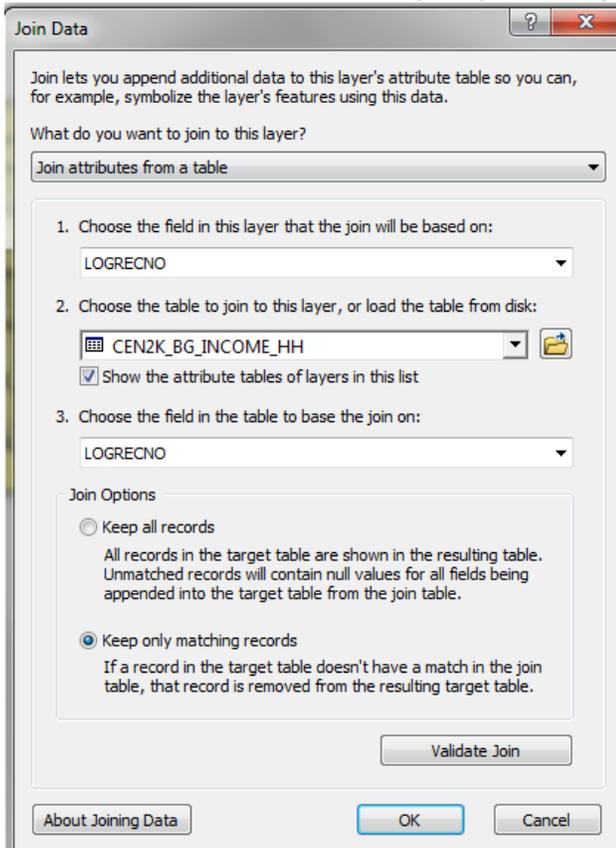
## Joining tabular data to a geographic layer

The only attribute field shared in common between the *Census Blockgroup geographic* layer and the *CEN2K\_BG\_INCOME\_HH* is the field **LOGRECNO**. This is going to be the field by which you link (join) the tabular data to the geographic data. The same holds true for all the MassGIS census geographic files and data tables.

1. **Right-click** on the *Blockgroup* data layer in the *Table of Contents*, and then click on *Joins and Relates – Join*:



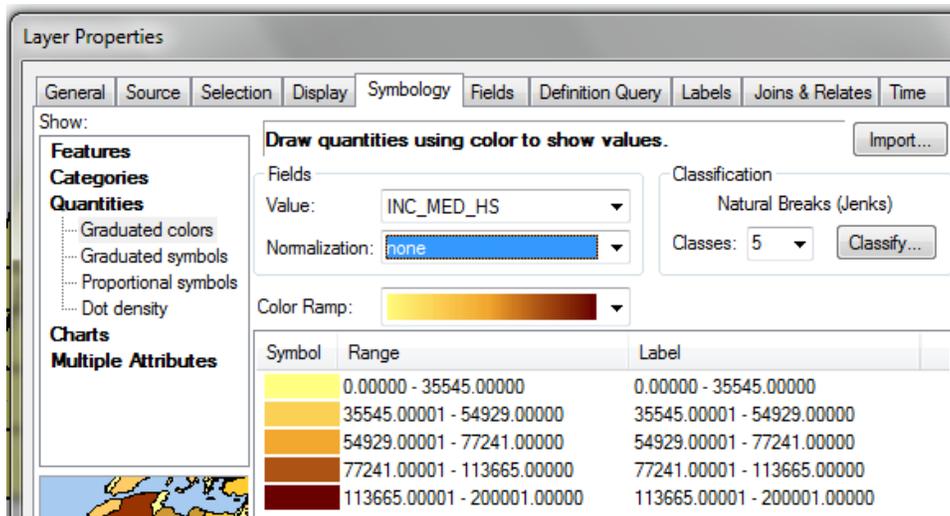
2. In the *Join Dialog* box, you want to *Join Attributes from a Table* (make sure that you choose that option), based on the **LOGRECNO** field in the blockgroups layer, joining to (in this example) the *CEN2K\_BG\_INCOME\_HH* table, using the **LOGRECNO** again, as shown below – also checkmark *Keep Only Matching Records*:



3. Press **OK** when you are ready to make the join.
4. Press **No** if you are asked about creating an *Index*
5. Open the *Blockgroups* attribute table (*right-click on the data layer* and choose *Open Attribute Table*) and scroll toward the end of the table to the right. You should see the tabular data is now joined to the original tracts table.

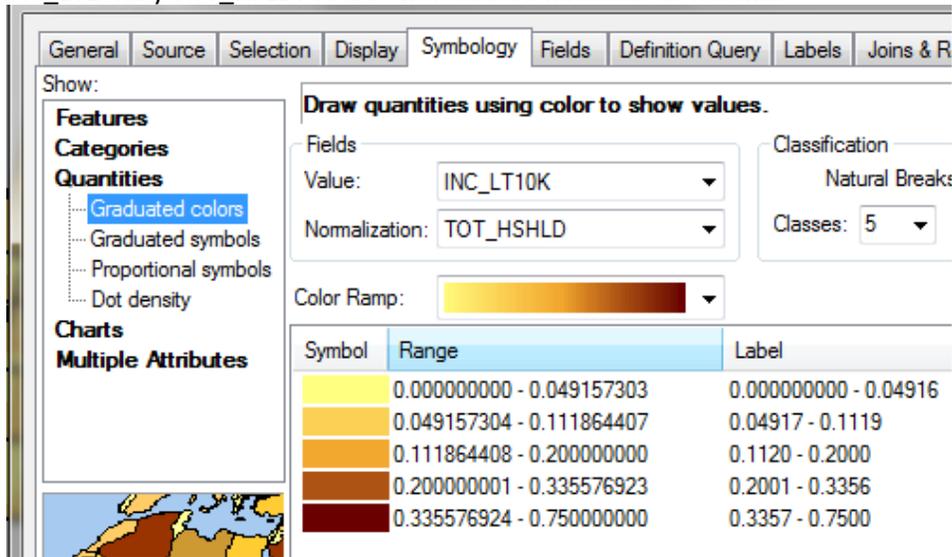
If you see “Null” repeatedly, this means that you have made a mistake, and either used the wrong field or tried to join data from or to tracts or some other data table. If you see all Null data, right click on Census Blockgroups layer again, choose Joins and Relates – Remove Join(s) and remove the join to the table that you just made. Then try it again, being very careful to fill in the dialog box as show above.

6. Close the table.
7. Try creating a map of *Median Household Income (INC\_MED\_HS)* – make sure the *Normalization* box is set to NONE:

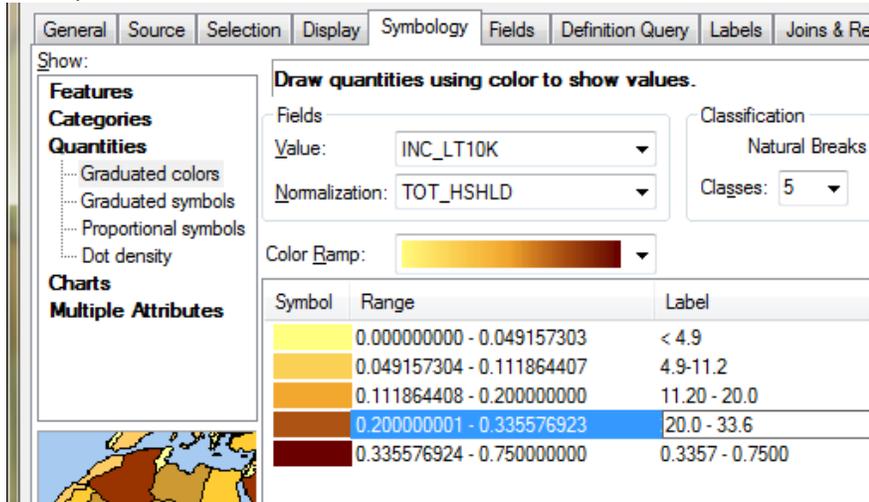


8. Try the Quantiles classification method on the median income
9. Try the Standard Deviation classification method on median income
10. Try mapping the percent of households earning less than \$10,000 a year in each blockgroup – you have a COUNT of households earning less than 10K (INC\_LT10K), and you have a COUNT of Total Households (TOT\_HSLD). So you need to divide (normalize)

INC\_LT10K by TOT\_HSHLD. Your box should be filled out as follows:



- The result is a fraction, but you can type in the label area for each class to make it read as a percent by clicking on the number in the “Label” category and re-writing the fractions as percents (multiply by 100 so that 0.0491577303 becomes 4.9 as shown below)

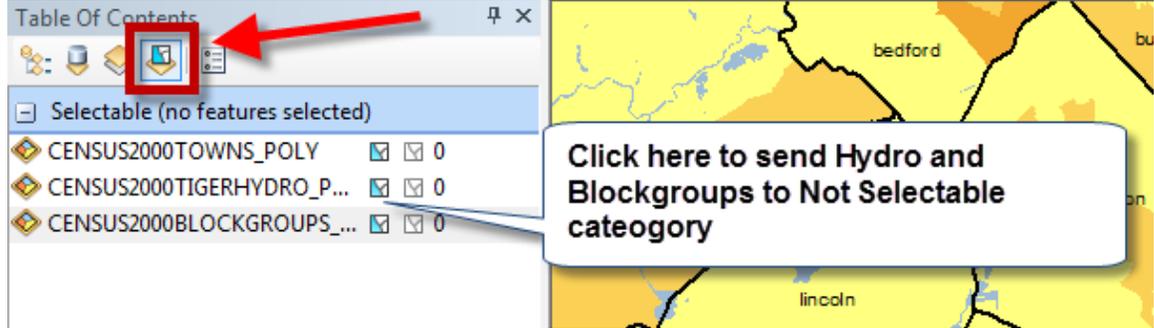


## Creating a smaller subset data set of the Boston metro area

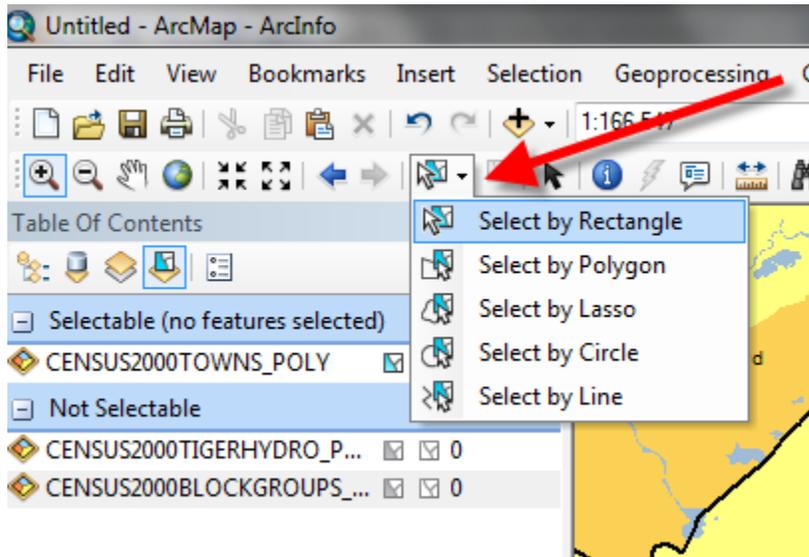
We are going to create a subset data set of the census blockgroups for the Boston Metro Area, so that we get a more nuanced view of the data:

- Zoom into the Boston metro area
- Turn on the towns layer and label the towns with the town name (right click on the Towns layer and chose Label Features)

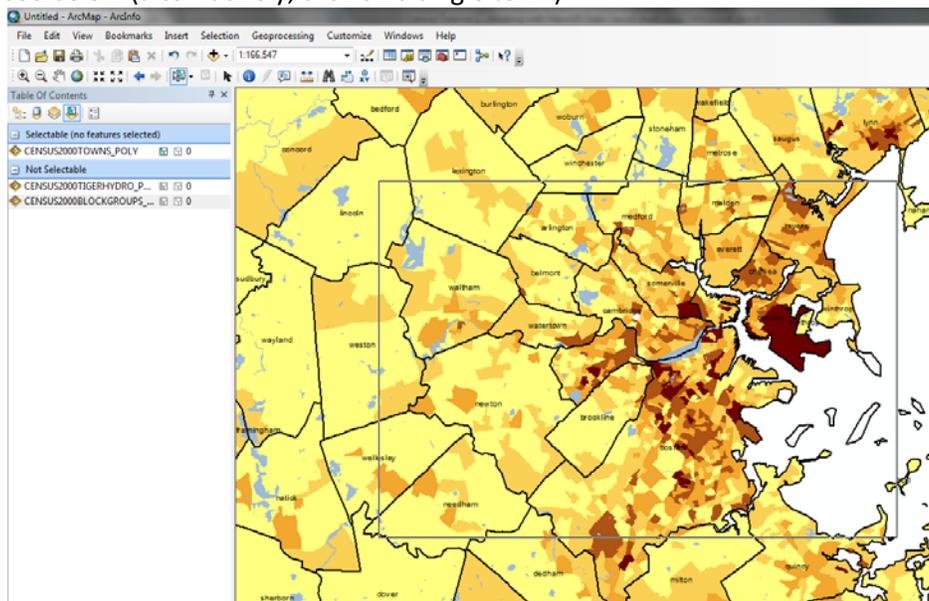
3. Click on the **List by Selection** tab as shown here and uncheck Water and Blockgroups – only Towns are now “selectable”



4. Click on the **selection** tool to make it active

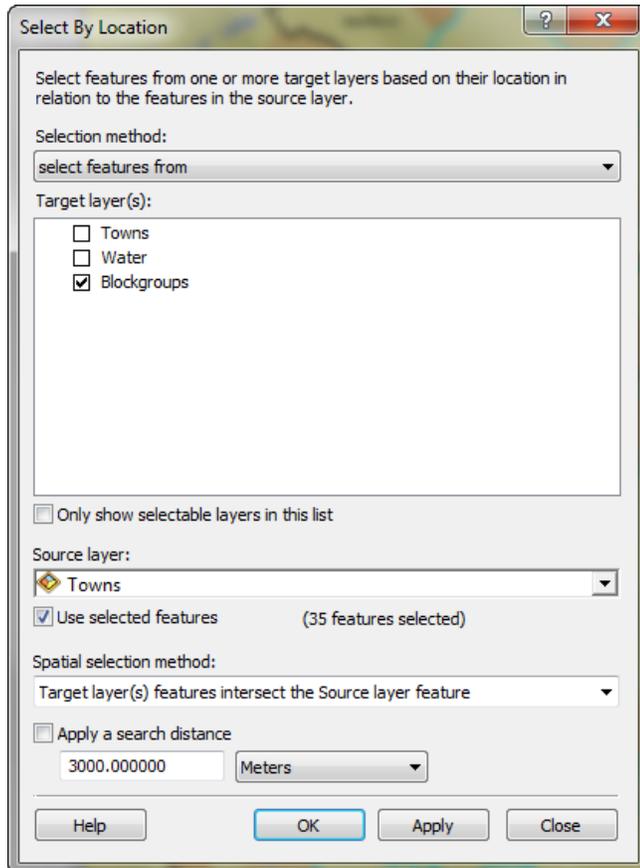


5. Draw a box around to include the urban core and some of the suburban towns like you see below (alternatively, click on a single town):



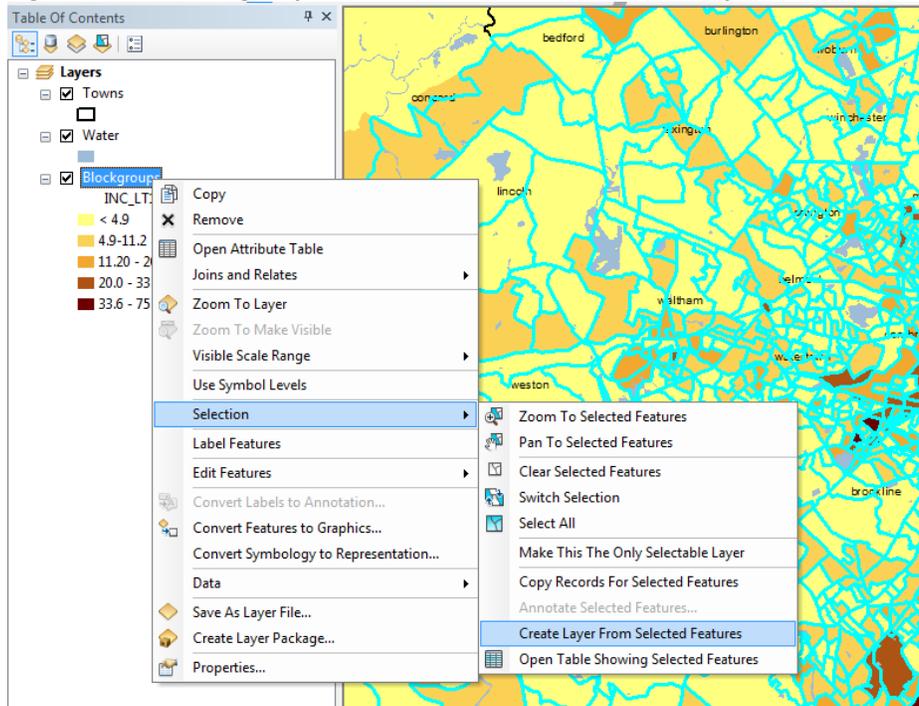
All the towns that are inside or touch this box will be selected and highlighted in blue.

6. Click on **Selection** in the ArcGIS menu and choose **Select by Location**
7. Fill out the dialog box as you see below - this will select all the blockgroups that fall within or touch the selected towns:

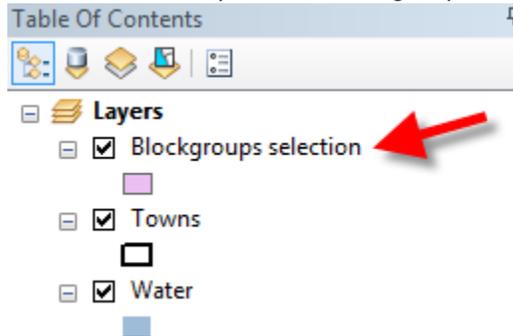


8. If you want to get remove some of the selected blockgroups from your selection
  - a. Click the *Selection* menu and choose *Interactive Selection Method*, and then *Remove...* option.
  - b. Now with the **Selection tool**  point to the blockgroup(s) you want to or remove (you can click on them one at a time). If you want to add a blockgroup, go back to the *Selection* menu and choose *Interactive Selection Method*, and choose *Add to the Selected Set*.
9. When you have the selected group of blockgroups you want, go back to the **List by Drawing Order** tab in the *Table of Contents*

10. Right-click on **Blockgroups** and choose **Selection – Create Layer from Selected Features**



11. You see now that you have *Blockgroups selection* added to your map:



12. Turn off the original *Blockgroups* layer

13. Click on the *Clear Selection* icon:

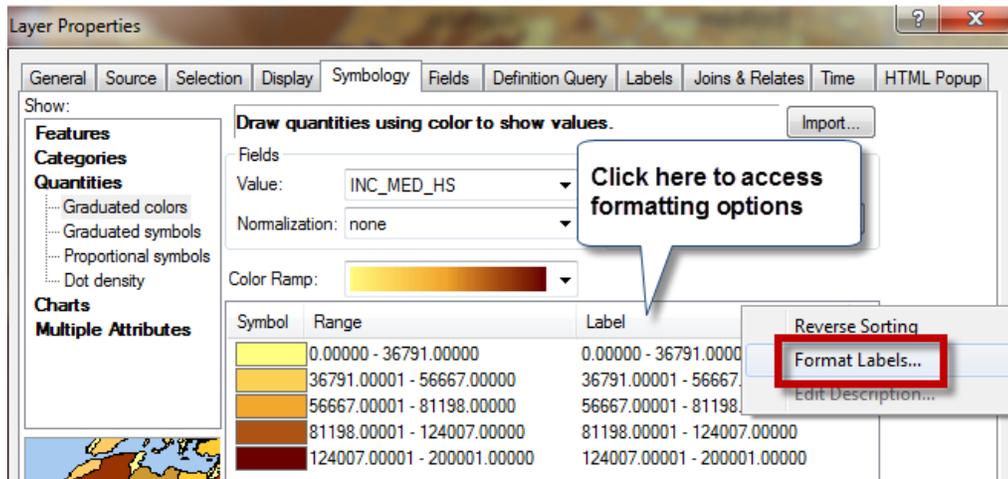


14. You can now create maps of census variables using just the selected set.

### Creating a permanent shape file with the Boston Metro census data

You have done two things here that are temporary – the join between the Blockgroups GIS data layer and the household income table is temporary. And the selection of Boston Metro Census blockgroups is temporary. If you were to be using this median household income for the Boston metro area a lot, you can create a permanent shape file of it. To do this:

1. **Right-click** on the *Blockgroup Selection* geographic data layer and choose **Data - Export Data**. In the dialog box that appears, leave the default settings as they are but give the new shape file an appropriate name, like *Metro\_Boston\_blockgroups\_household\_income.shp* and make sure you use *Browse* to put it in your personal folder.
2. Choose **Yes** when asked if you want to add it to your map. This exports the selected data set to its own shapefile with the *Household Income* table permanently attached
3. Now try making a new map of *median household income* just for the Boston metro area based on this new exported shape file.
4. After you've made the map, go back to its *Symbology* properties and click as you see below:



5. Set the number of decimal places to 0, and click on *show thousands separators*
6. Explore with different mapping methods and variables.

All the MassGIS census tables work the same way – you join them via the LOGRECNO field. Try joining another data table (starting with CEN2K\_BG...) to your blockgroups and mapping one of the variables.

**VERY IMPORTANT to remember:**

You **must** pay attention to the **level of census geography** you are working with, e.g., blocks, blockgroups or tracts.

JOIN **blockgroup data tables** (table names start with CEN2K\_**BG**...) to **blockgroup polygons**

JOIN **tract data tables** to **tract polygons** (table names start with CEN2K\_**CT**...)

And so on...if you join a table to the wrong level of geography (e.g., blockgroup data table to tract polygons), things go downhill in a hurry!