

GEOG 2017EL  
Applied Cartography and Introduction to GIS  
Lab 9  
Chart Maps, masks and labelling.

## Part 1 Chart maps (7 points)

Another way to represent thematic data is through chart maps. Chart maps can be either Pie Charts or Bar Charts in ArcGIS. Whether using Pie Charts or Bar Charts, you should typically have more than one field or variable to map. This is especially true of Pie Charts and Stacked Bar Charts where the intent is usually to show what proportion of a whole a component variable represents.

Use the data from Part 1 of Lab 8. From the **Housing** universe you should have:

- Total number of private households by household type - 20% sample data
- One-family households, private households by household type
- Multiple-family households, private households by household type
- Non-family households, private households by household type

Make sure this tabular data is joined to your CSD shapefile (GEOCODE to CSDUID; again, there's no need to create SHORTGEO, since the keys you are joining already match in type and length)

### ***Definition Query***

We don't want to create a pie chart for every CSD in Ontario because this will be too cluttered, so you will learn how to limit the number of CSDs which you are mapping. In ArcGIS you do this with a **Definition Query**. It's very similar to "select[ing] features by attribute" which you have done to "cull" the Ontario features from the national files. The difference is you don't get rid of the features you don't want to map; they simply don't show in the final product when using a Definition Query.

1. Go to the Definition Query tab in Layer Properties
2. Click on Query Builder button
3. Build a query that will select the CSDs in the Economic Region of your choice.
  - a. Double-click on the variable with ERNAME (it will be preceded with your Ontario CSD file name if you've joined the data)
  - b. Single-click on the "=" sign
  - c. Single-click on "Get Unique Values" button
  - d. Scroll to the ER of your choice then double-click on the name
4. This should give something like "Ontario\_CSD.ERNAME" = 'Stratford - Bruce Peninsula' (be careful, don't simply copy this query because your file and field names may be different.)
5. Click OK

### ***Now continue on to create your Pie Chart map:***

6. Select the Symbology tab in the Layers Properties window
7. Choose Chart>Pie

8. From Fields Selection area select the three subcategories of Household type, Single, Multi and Non-Family (This should be Field\_140, Field\_141, Field\_142)
9. Click Apply, not OK, you want to keep the Layer Properties window open. Move it if you cannot see your pie charts.

In the Symbology tab you can, and may have to in order to have proper cartographic balance, unity and harmony, change many aspects of your pie charts.

- You can change the **Background** colour and the **Color Scheme** (if you change the colour scheme you need to be careful that each piece of a pie is easily distinguishable from the background.) ArcGIS defaults tend to have reasonable contrast (cartographic design consideration) between background and pie segment colours; however you should experiment with these.
- You can also change individual symbol colours by clicking on the symbols themselves next to each variable name on the right.
- **Prevent chart overlap**, will cause some charts to be moved away from the CSD they represent, but a “leader line is create” that points to the respective CSD (I’ve changed the properties of my leader line by exaggerated with for demonstration purposes below)
- Click the **Properties** button (opens Chart Symbol Editor) to change a number of Pie Chart characteristics. If you use 3D pies (default) you can manage the tilt and thickness of the pies. This can be VERY important especially if you change some of the size characteristics (next point). Click OK to close the Chart Symbol Editor window.
- The **Exclusion** button allows you to further limit the features that are mapped/not mapped. We will not make any exclusions in this exercise, but you may find this useful for your term project. You use exclusions in the same way as other queries. Say you wanted to Exclude features that had values of 0 (Zero), you would create a query that would read something like:

"Lab8.Field\_139" = 0

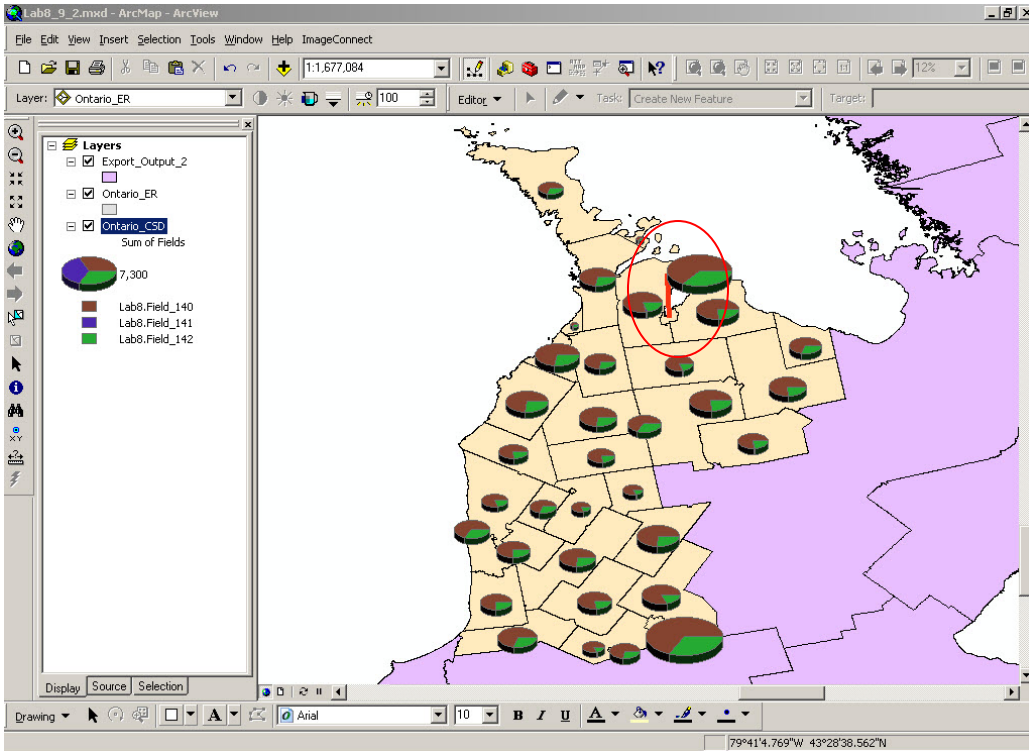
If you want this exclusion to be clearly labelled on your map, you would go to the Legend tab in the Data Exclusion Properties window and select an appropriate symbol after checking the “Show symbol for excluded data” checkbox.

- **Probably most important is how to manage the size of your pie charts ():**
  - Click the **Size Button in Symbology tab**
  - This brings up the Pie Chart Size window
  - Try “Fixed size” vs. “Vary size using sum of the field values” options. You’ll have to click OK in Pie Chart Size window, then Apply in Layer Properties window (not OK again).
  - Make sure “Vary size...” is selected. In the Symbol section, you can adjust and preview the minimum and maximum pie sizes. With data that has a very wide range of values, you may have to make the minimum size as small as practicable. Note too that you can adjust Appearance Compensation (Flannery). **Q. What is the purpose of Flannery Compensation? (1 point)**
  - Note that you can also access the pie Properties and Exclusions buttons from the Pie Chart Size window. You may again want to adjust the tilt and thickness of your pies.

**Go to Layout View, add title, Legend, etc..**

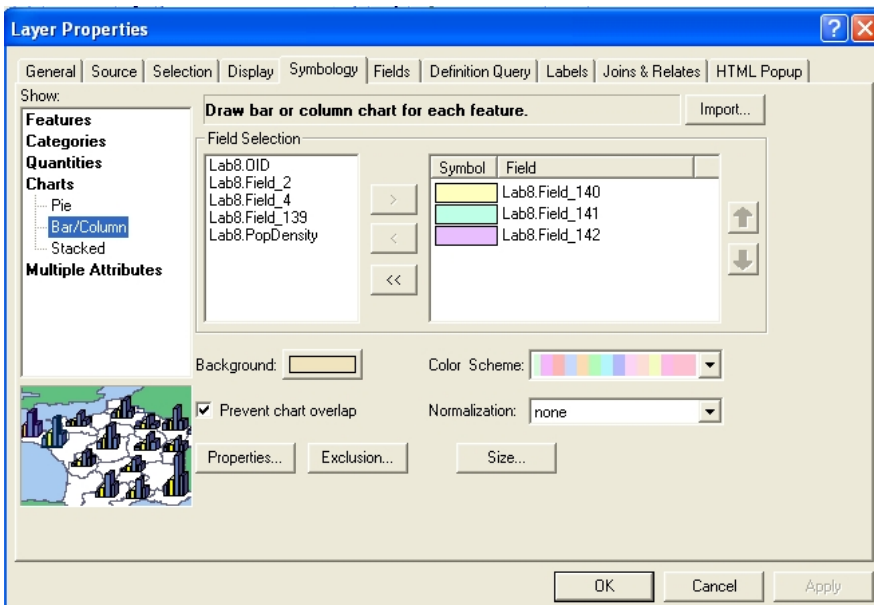
**Save your Pie Chart map, export to PDF and send to TA and I. (2 Points).**

**Don’t close your map, but go back to Data View.**



## Creating a Bar Chart map

Without having to change any settings, you can change the Pie Chart to a Bar Chart simply by selecting “**Bar/Column**” chart under “Show:” in the Symbology tab of the Layers Properties window (on the left).



Simply click Apply or Ok. Again, you may have to “Play” with Properties and Size buttons to make the map legible/balanced.

**Go to Layout and add title, legend, etc..**

**Save this map as Bar Chart (your name etc.) export to PDF and send to TA and I. (2 Points).**

### ***Create a Stacked Bar Chart***

Now do the same as above but select **“Stacked”** to create a Stacked Bar Chart

**Go to Layout and add title, legend, etc..**

**Save this map as Stacked Bar Chart (your name etc.) export to PDF and send to TA and I. (2 Points).**

## **Part 2 Creating a mask (2 points)**

Another way to limit the area that is thematically mapped, thus reducing clutter, is to create a thematic map for the whole province then overlay a mask that only shows a particular area of interest (Remember, a visible layer hides layers underneath it). Masks however only work with Choropleth and Dot Density maps; nevertheless, they can be very useful.

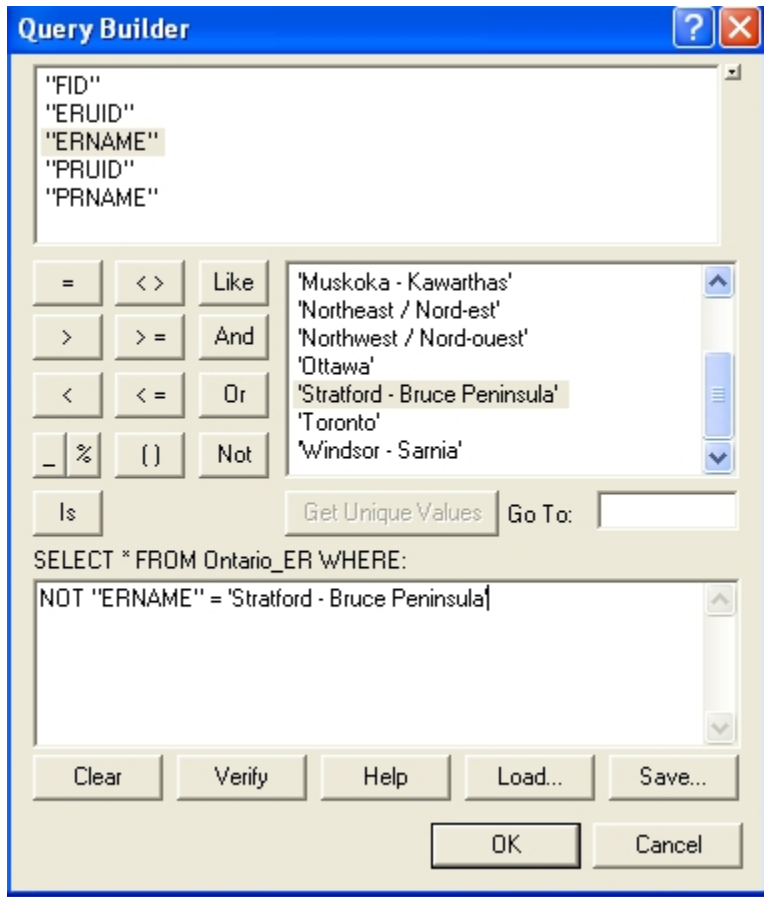
We limited the mapped area in Part 1 above by selecting the CSDs of interest using a Definition Query. This worked well with the Pie and Bar charts but their symbolization don't depend on a classification breakdown of the data values (equal interval, natural breaks, etc.) like a Choropleth map does. If you plan to make a choropleth map of an ER with only 20 selected CSDs in it, then your classification scheme would depend on only those twenty CSDs. That's ok depending on your intent, but you may want your class scheme to be based on the data distribution of all 585 CSD's in Ontario making it more relevant to the context.

The mask will hide all other CSDs except the ones you want to show. Our mask will be based on ERs. To create the mask you will do a Definition Query similar to the one above in Part 1 but reversed (a NOT query). Here's how:

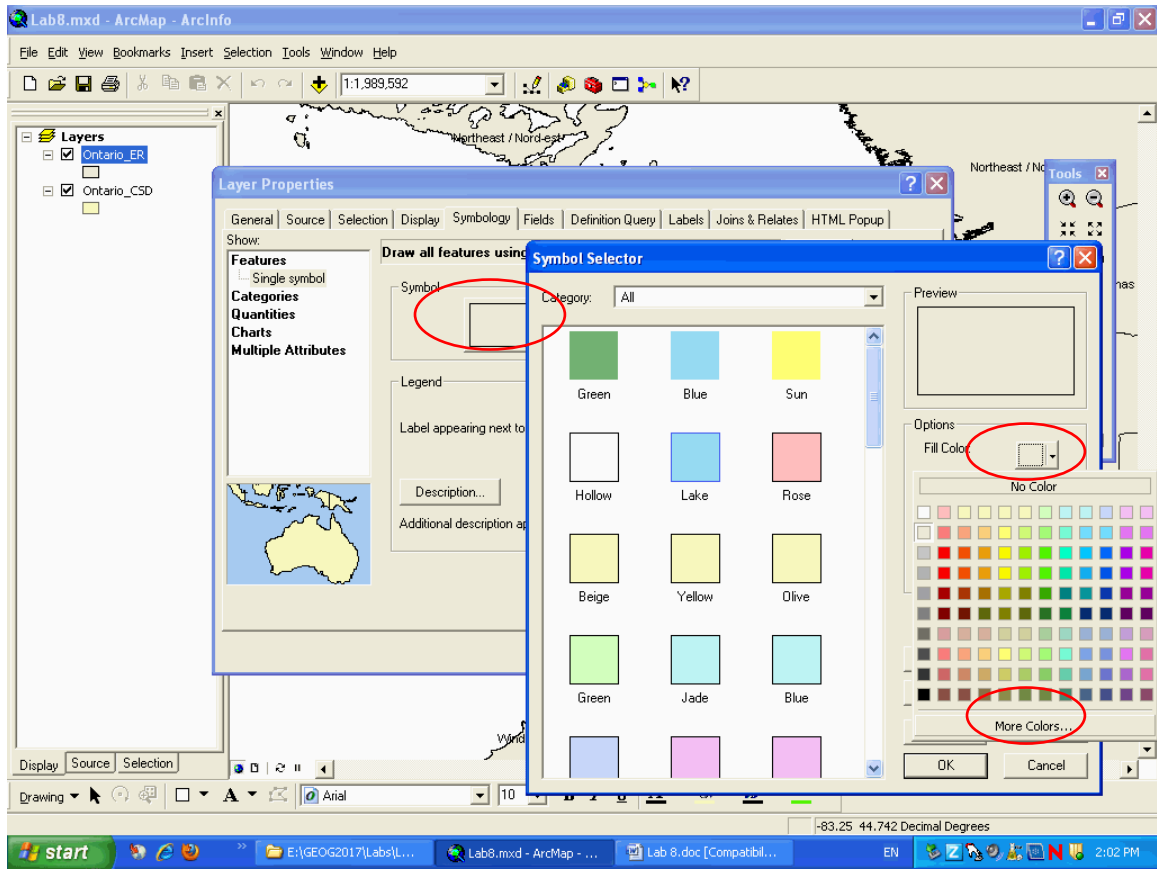
1. Open your choropleth map from Lab 8 Part 2 (should have been saved in step 11)
2. Make sure your Ontario ER shapefile is added to your map.
3. Right-click on the Ontario\_ER layer (or whatever you called it) and select Properties. You can open the Properties window by double-clicking on the layer name
4. Select the **Definition Query** tab
5. Click the **Query Builder** button.

The Query builder window is very similar to the Select by Attribute window. In this case we want to select all but the Economic region of interest. To do this:

6. Click the **“Not”** button in the functions (bottom right of functions)
7. Double-click on “ERNAME”
8. Click the **“=”** function
9. Click **“Get Unique Value”** button
10. Scroll down to 'Stratford - Bruce Peninsula' and double-click



11. You can check if your query was valid before clicking OK by selecting the **Verify** button. This will tell you if your query is properly constructed, however, if there is an error, it will not show you where that error is.
12. Click **OK** at the Query Builder window. You will now be able to see all the Economic Regions EXCEPT for the one for which you will map Census Subdivision data. Your mask, essentially hides all the other CDSs except the ones you want to see. For this to work however, your ER layer has to be visible and on top of the CSD layer.
13. You may want to use a very neutral colour such as grey or beige for your mask. To do this, use the Symbology tab in Properties window.
  - a. Select Feature> Single Symbol
  - b. Click on the coloured symbol, this will bring up the symbol selector window.
  - c. Go to Options and select a colour from the Fill Drop down menu. Notice all the colours from which you can choose.



TIP: There is an infinite amount of colours at your disposal if you click the **More Colors** button (you don't need to do this for the lab). This brings up a Colour Selector window that allows you to create almost any colour by adjusting the Red, Green and Blue components of your symbol. You will recall in an early lecture I had introduced the ColorBrewer website at <http://colorbrewer2.org/> which helps you select proper gradients for ordinal and ratio-interval data (sequential and divergent), or qualitative (nominal or categorical) colour schemes, depending on whether the maps will be on screen, printed, photocopied etc.

**Add a title, legend etc in Layout View .Save your new choropleth map with the mask, export and send to your TA and me. (2 points)**

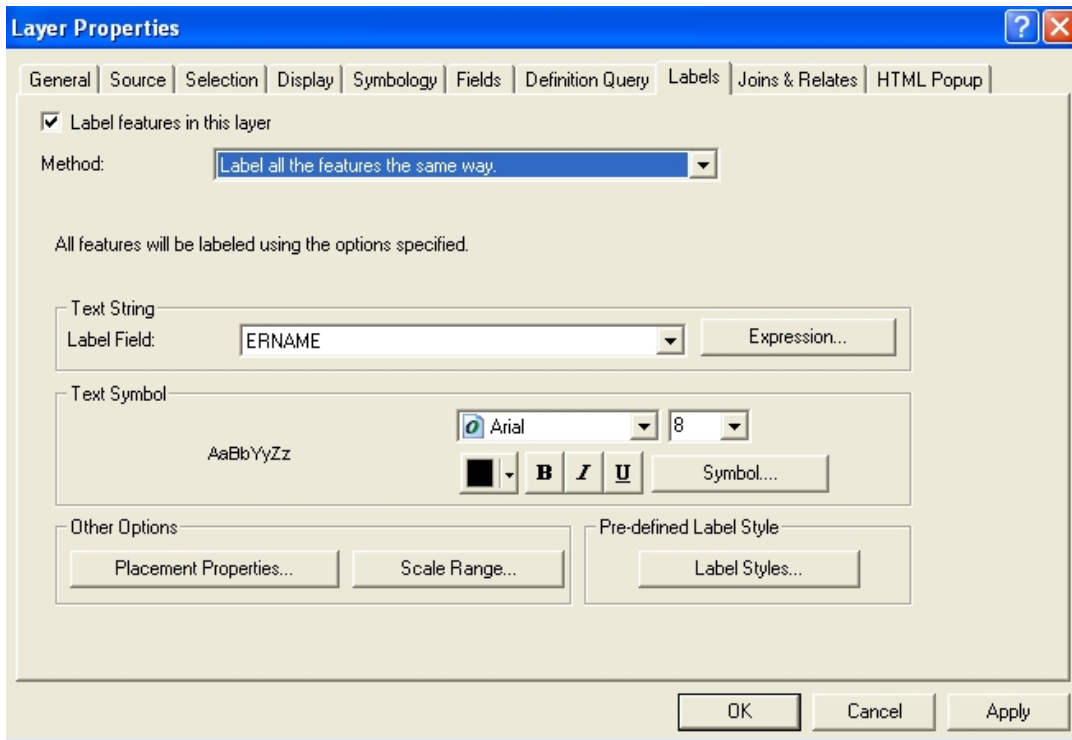
## Part 3 Labelling (3 points)

It's very easy to label a feature in ArcMap, however labelling can add a great deal of clutter to a map, therefore it has to be used judiciously (hence the need for generalizing and simplifying). It would be near impossible to label all the Census Subdivision if you had not created the ER Mask. It would be possible to label the CSD's in your selected ER using the method below. However, to simplify this exercise, we will only label the Economic Regions that border your ER of interest to help give the map reader some context.


You can quickly label your economic regions by right-clicking on the ER layer and selecting "Label Features" from the context menu (that's any menu that comes up when you click on your screen). Note the checkmark next to Label Features. You can turn off labelling simply by clicking on Label Feature again. This toggles labelling on/off.

This method selects an arbitrary field as the label value, so unless you have pre-set this field you must learn how to control labelling. To properly control labelling in ArcMap, it's best to do the following

1. Continue using the choropleth map and mask from Part 2 above
2. Don't worry if the labels for your ER are still on.
3. Open the Layer Properties window and select the Labels tab (see below)
4. Note the check-box next to "Label features in this layer". This does the same as the check-mark next to the Label Features selection in the context menu.
5. Make sure the box is checked
6. Make sure Method is set to "Label all the features the same way". You can control all sorts of aspects of labelling in this window by creating special queries (e.g. if you were labelling cities you could set criteria such that cities with >100,000 population could be labelled with capital letters, cities with <1,000 could have no label, etc.). We will keep it simple by labelling all features the same way.
7. Make sure ERNAME is the Label Field selected as **Text String**
8. The Expression button (don't click it) would allow you endless possibilities of labelling your features. You could for example combine two fields, or add your own text (e.g. Econ. Reg.) to ERNAME to create a label like "Toronto (Econ. Reg.)"
9. Keep the **Text Symbol** as Arial 8 point
10. Click OK



#### IMPORTANT

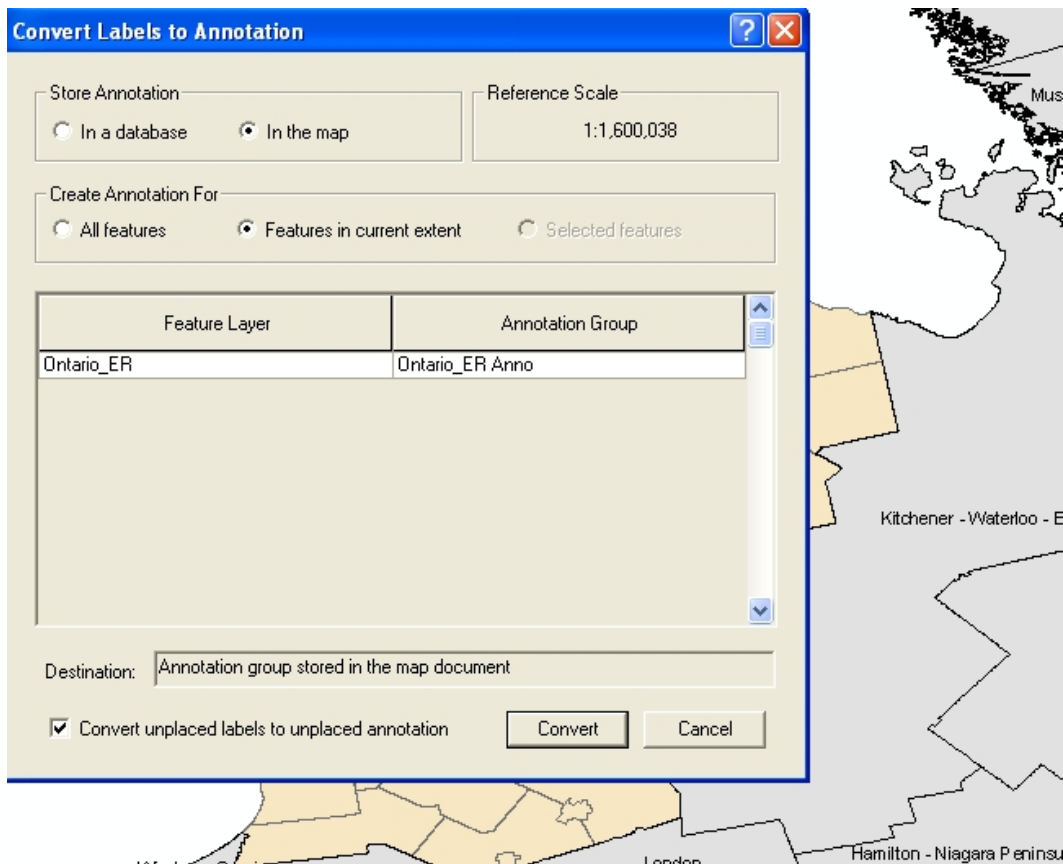
You can change any aspect of the label through the use of the Layer Properties>Labels tab, but you will notice that you cannot move or select the labels using the **Select Elements** arrow  in the Data or Layout Views. The labels are NOT elements yet. To be able to move labels around you have to convert them to graphics.

First, in Data View make sure you have zoomed in to a decent composition for your area of interest. It's perfectly ok to have other ERs showing (in fact you want this for context), but your region of interest should take up most of your Data View.

1. Right-click on ER layer to bring up the context menu, then
2. Select Convert Labels to Annotation  
You want to
3. Store the Annotation "In the Map" and
4. Create Annotation For "Features in the current extent" (this is not strictly necessary but tends to work better than All Features, especially if you have lots of features that you've not included in your composition)
5. Click Ok

Now you can select, move, even edit the text of each label. Try moving the labels around to improve map design.

**Add a title, legend, etc. in Layout View and save your Choropleth with Mask and Labels map, then export to PDF and send to TA and I. (3 points). Pay particular attention to the weight caused by labelling the ER regions.**



## Part 4 Creating an Extent map (3 points)

Because you've zoomed in to your area of interest, it may be difficult for a map reader who doesn't know the province to understand where your ER is. Use the methods from Lab 6 Part 1 "Add Multiple Data Frames..." to copy your data frame from the map in Part 3 above to create a second data frame in your Table of Contents that will act as a context or extent map. You should have two data frames visible in Layout View:

- One that is zoomed in to your area of interest
- One that is zoomed out to full extent (all of Ontario) this will be your context map

### ***Working in the Layout View***

The layout view shows all your data frames. You can work with each of your data frames from here without having to go back to your Data View and Activating the frame you want to work on.

To work on a specific data frame while in Layout view, simply select it using the Select Elements tool

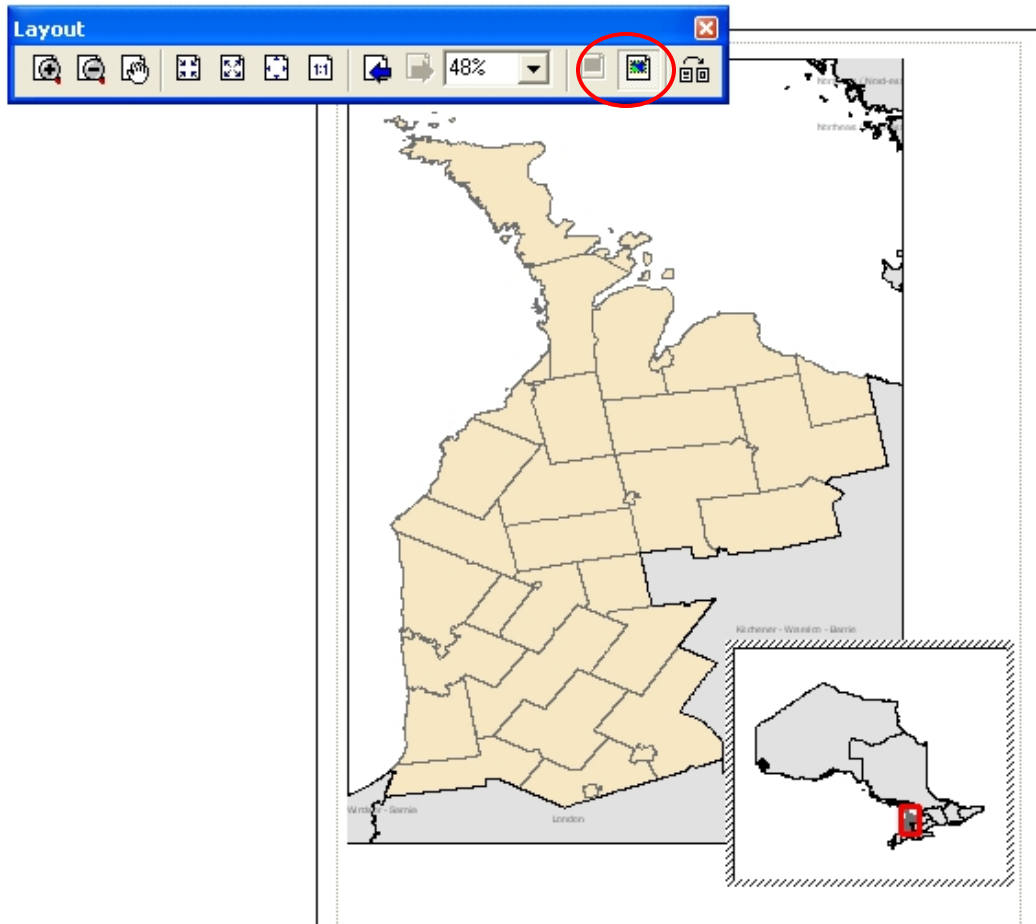


from the Tools toolbar. The data frame you selected will have light blue "handles around it." Any action you take with a tool (pan, zoom, select, identify) will affect only that data frame.

IMPORTANT: if you double-click on a data frame, you will notice a hatched line around it. Also, the Focus Data Frame icon in the Layout toolbar will be toggled on (shows as lighter gray to give the

impression that the button is depressed - circled below). This simply doubly ensures that all your subsequent actions will only affect that data frame (avoids accidentally affecting another data frame)

From the Layout View, use the Identify tool to answer the following  
What is the ERUID of the Northwestern Economic Region?



## Creating the Extent Rectangle

To highlight the area in one data frame related to another data frame, as in the example above where the red box or extent rectangle (thick rectangle if this is a black and white copy) shows us where the Bruce Peninsula is in relation to the province, do the following:

1. In Layout View, select the data frame (on Layout View or the Table of Contents) in which you want to create the "extent rectangle"
2. Right-click for a context menu and
3. Select **Properties** at the very bottom
4. Click the **Extent Rectangles** tab and simply add the data frames (only one in this case) from the list on the left hand side that you want highlighted. If you click the **Frame** button, you can change the properties of the highlighting frame.

**Add a title, legend etc. and save your mxd and export as pdf then send to TA and me. (3 points)**