

## **Different Displays of Thematic Maps:**

There are a number of different ways to display or classify thematic maps, including:

- Natural Breaks
- Equal Interval
- Quantile
- Standard Deviation

What's important to understand is: in a GIS software (ArcView), the legend in each map is determined by an algorithm within the software, based on whether you select Natural Breaks, Equal Interval, Quantile, or Standard Deviation thematic map type.

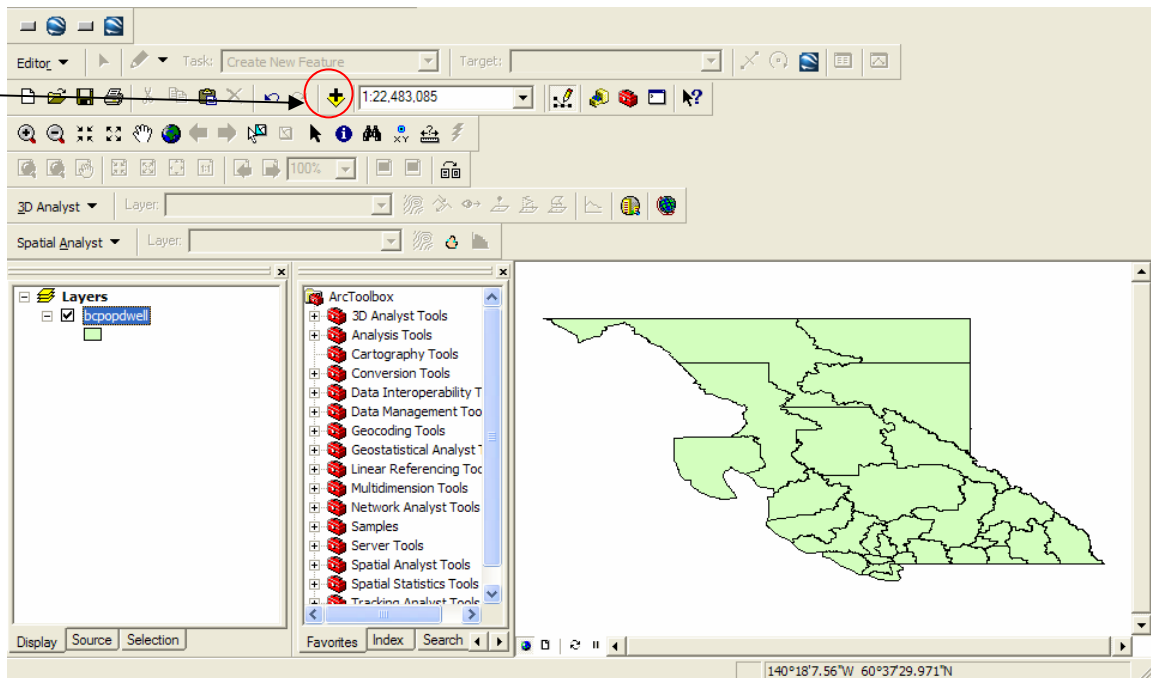
Today we will be mapping the % change in population from 2001 to 2006 by census division in British Columbia.

### **Natural Breaks & Equal Interval Thematic Map Types**

- Represents patterns in the data
- Useful for showing extreme values or disparities between census divisions.
- Natural Breaks- ArcView maps a change in color when there are big jumps in the percentage, rate, or ratio you are mapping
- Equal Interval- ArcView maps so that each class or colour has an equal range of values. E.g. You can see which census divisions make up the top fifth of the percentage of difference in population between 2001 and 2006 in British Columbia.

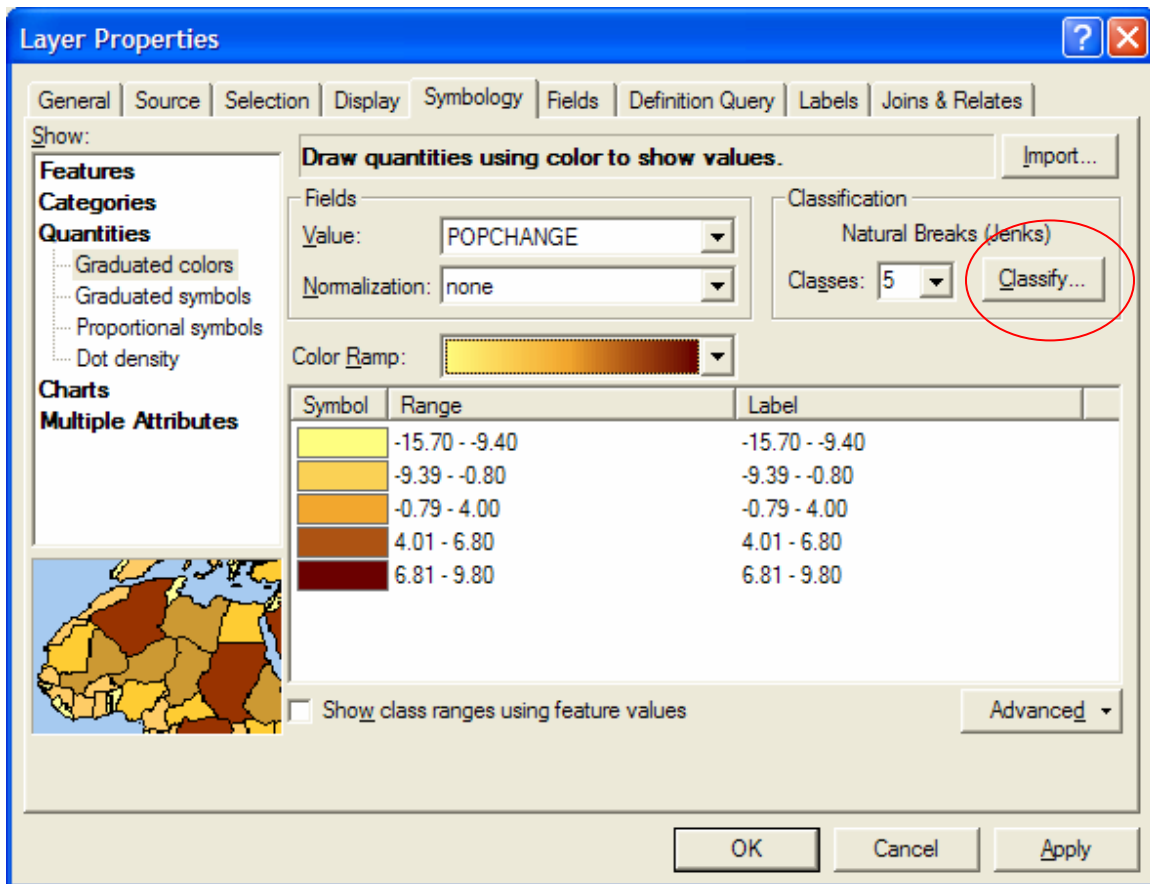
First, we must add our census division shapefile to ArcView. Click on the add layer button, and please follow the instructions at the workshop for this process.

Add Layer  
Button



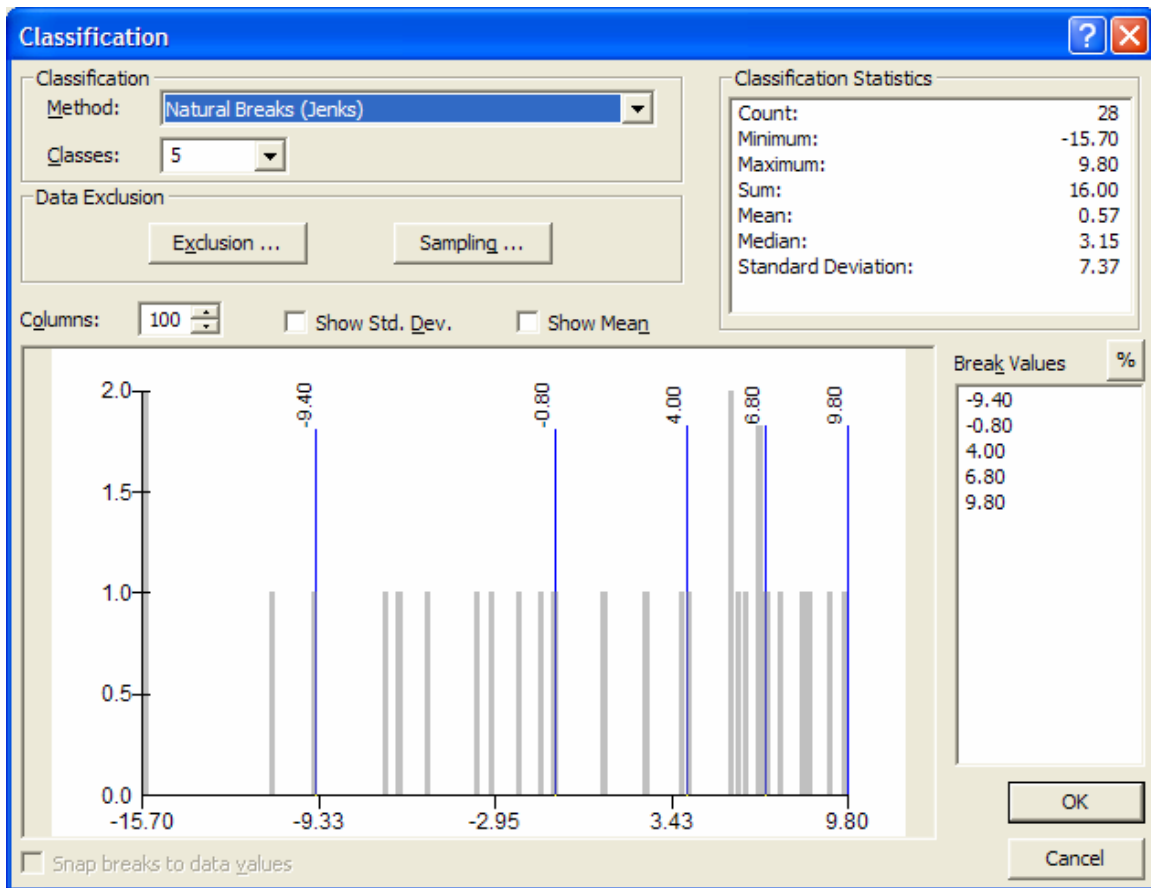
To create a thematic map using Natural Breaks, do the following:

- 1) Right click on the census division layer and select Properties, and a dialog box called Layer Properties will appear. Then, click on the Symbology tab.
- 2) Once in the Layer Properties dialog box, select Quantities – Graduated Colors
- 3) Select Pop Change as the Value to map
- 4) Select a Color Ramp

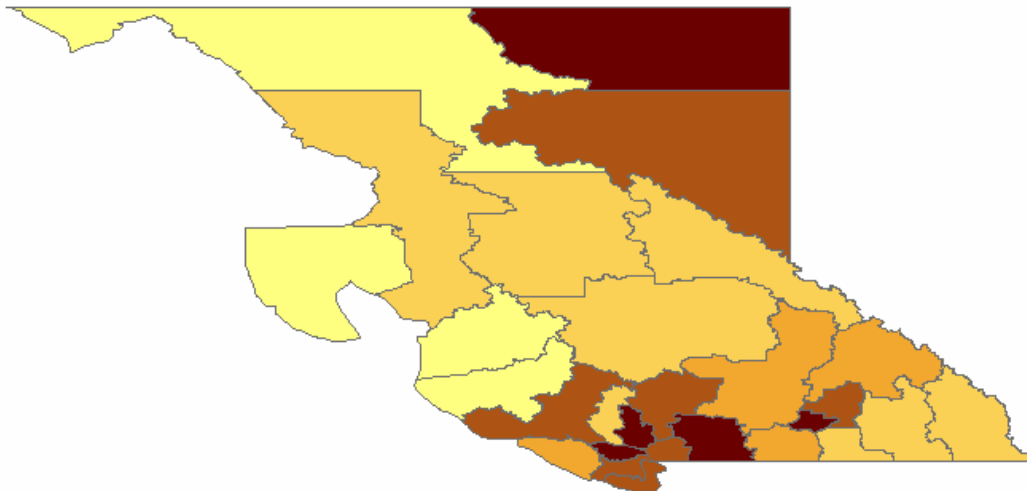


5) Click on Classify

6) Select Natural Breaks and Click OK., and click OK again



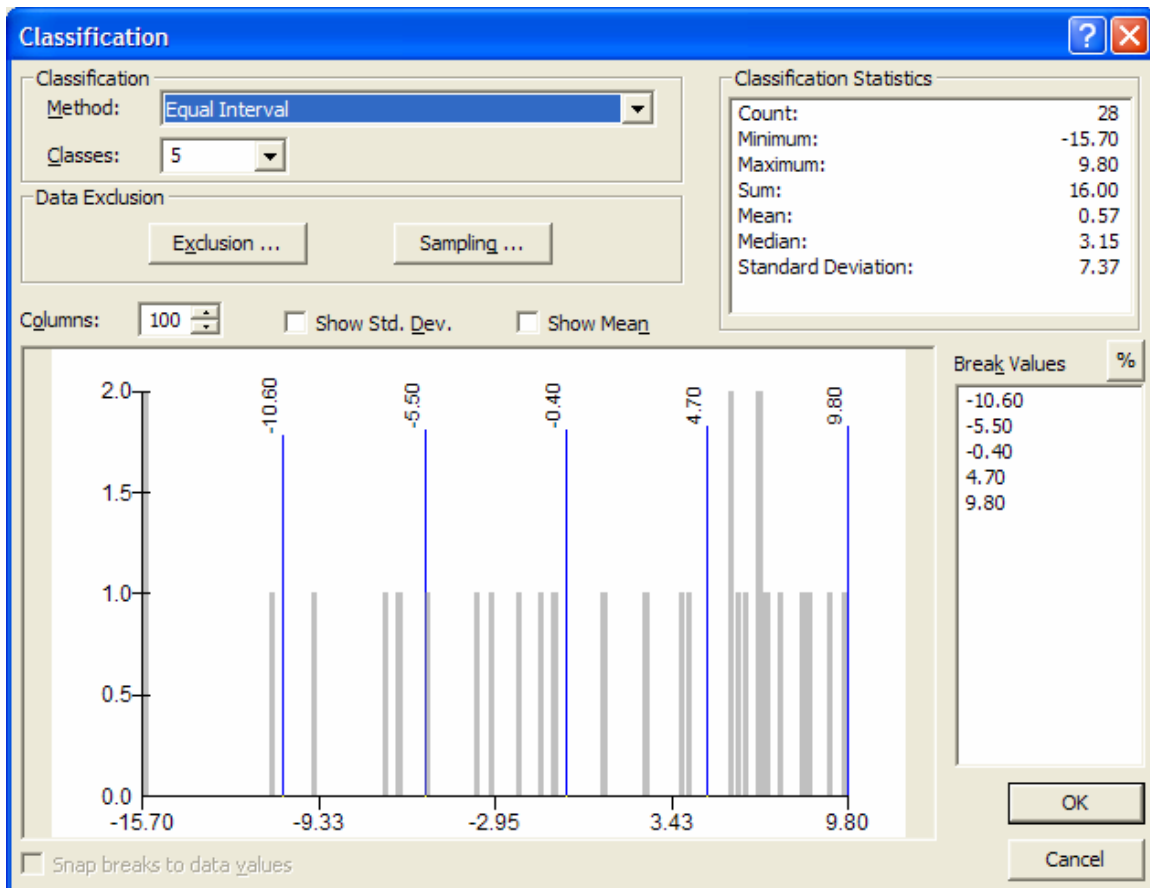
Your result should look similar to the result below.



To create a Thematic map using Equal Interval, do the following:

Repeat steps 1 to 5

6) Select Equal Interval and Click OK, and click OK again.



Your results will change and should look similar to the result below.

**Layer Properties** [?] [X]

General | Source | Selection | Display | **Symbology** | Fields | Definition Query | Labels | Joins & Relates

Show:

**Features**

**Categories**

**Quantities**

- Graduated colors**
- Graduated symbols
- Proportional symbols
- Dot density

**Charts**

**Multiple Attributes**

**Draw quantities using color to show values.** [Import...]

Fields

Value: POPCHANGE

Normalization: none

Classification

Equal Interval

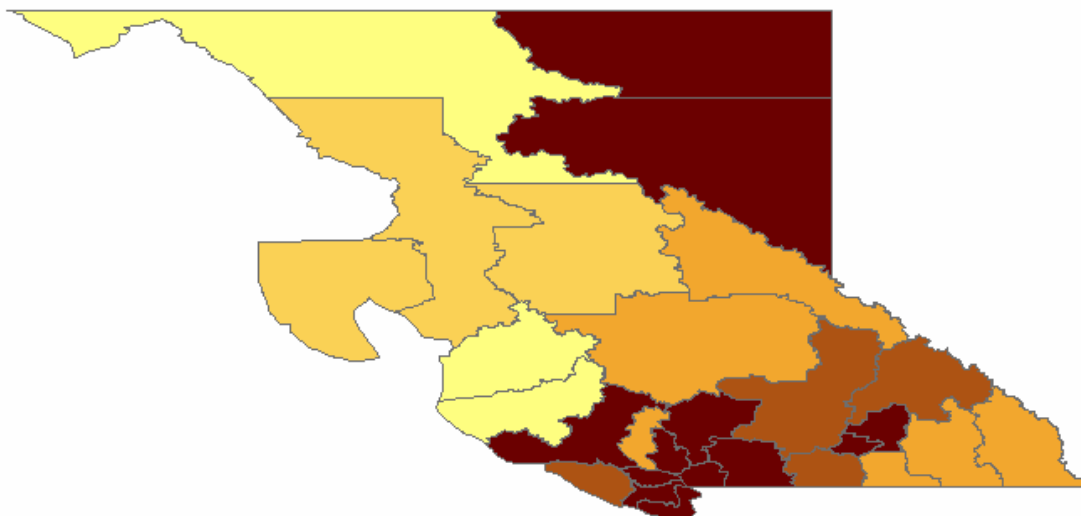
Classes: 5 [Classify...]

Color Ramp: [Color Ramp]

Symbol	Range	Label
[Yellow]	-15.70 - -10.60	-15.70 - -10.60
[Light Orange]	-10.59 - -5.50	-10.59 - -5.50
[Orange]	-5.49 - -0.40	-5.49 - -0.40
[Dark Orange]	-0.39 - 4.70	-0.39 - 4.70
[Dark Red]	4.71 - 9.80	4.71 - 9.80

☐ Show class ranges using feature values [Advanced]

[OK] [Cancel] [Apply]



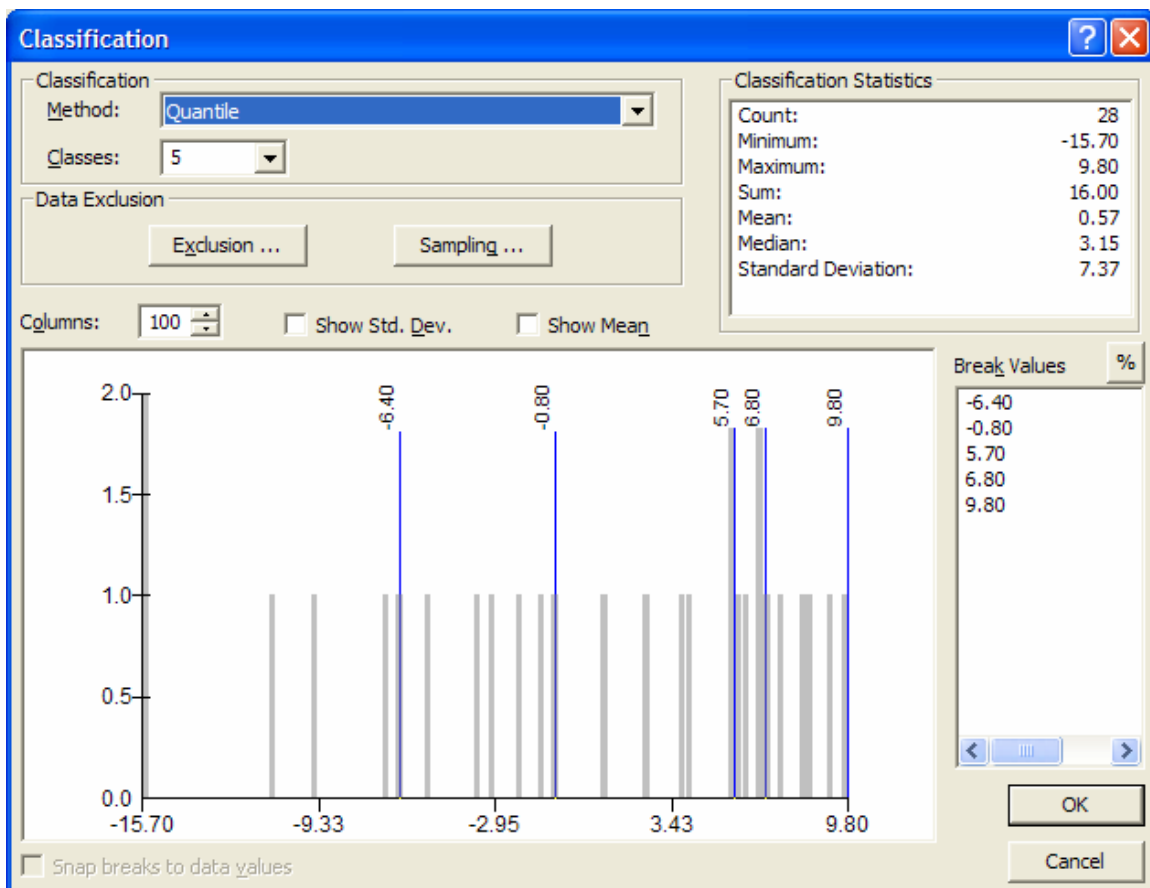
## Quantile Map Type:

- Each class or colour contains an equal number of census divisions
- Can sometimes be misleading because census divisions with very different percentage change in population can be grouped in the same class.
- Useful when there are a lot of census divisions that DO NOT have similar values
- Useful for better display of intermediate values

To create a thematic map using Quantile, do the following:

Repeat steps 1 to 5

6) Select Quantile and click OK, and click OK again.

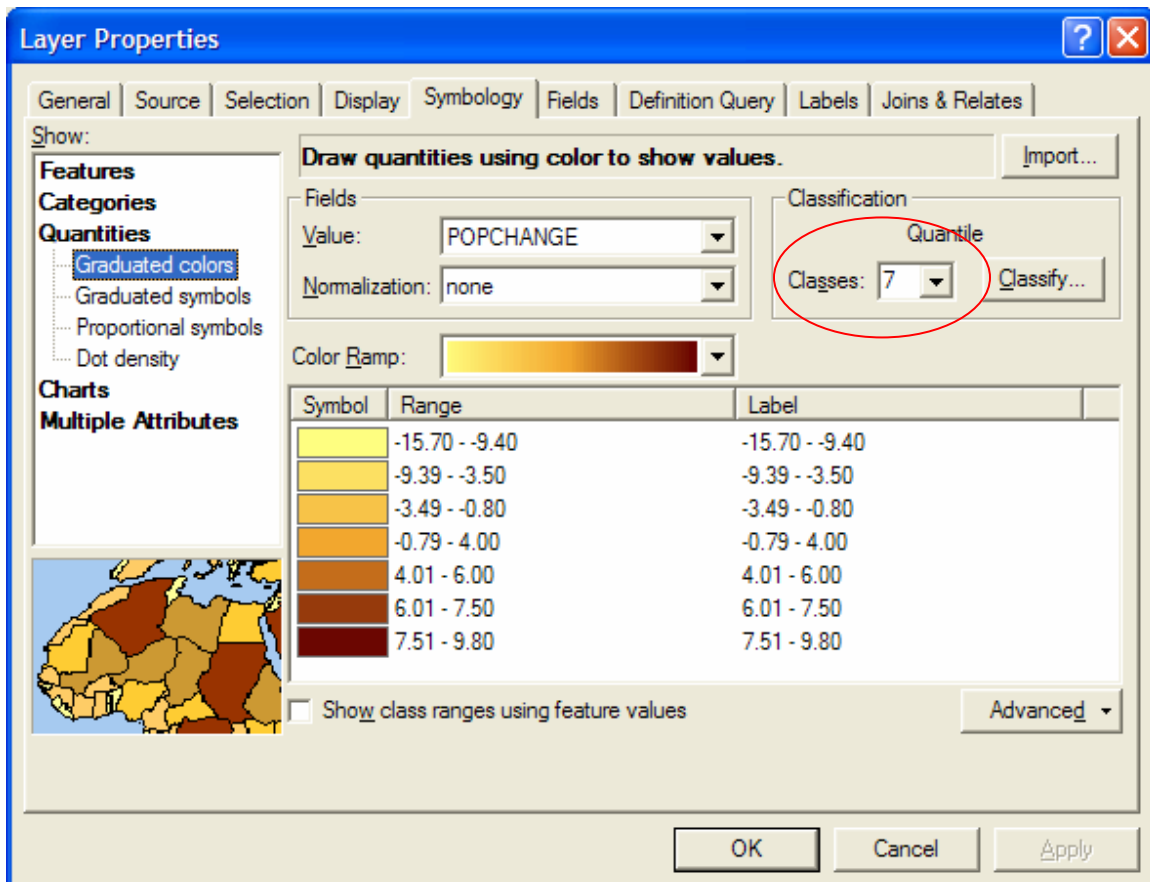


Your results will change and should look similar to the result below.

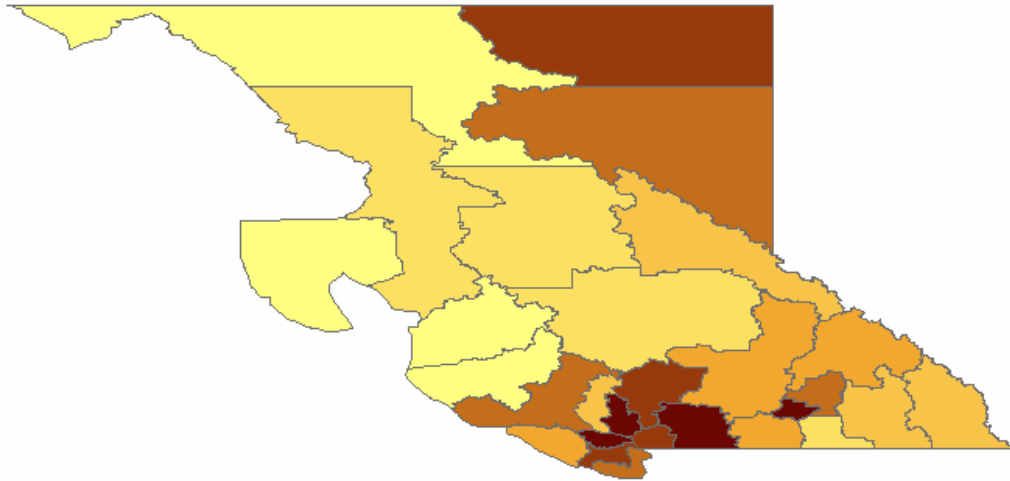




You can change the number of categories or classes that your map is displayed with, by adding classes in the Classes dropdown box.



Your results will change and should look similar to the result below.



Adding more classes improves the display of intermediate values.

### **Reflection:**

Which method of the three classification methods we just tried, best represents change in population from 2001 to 2006 in British Columbia? What are the pros and cons of each classification method? Which one would you use in this case?

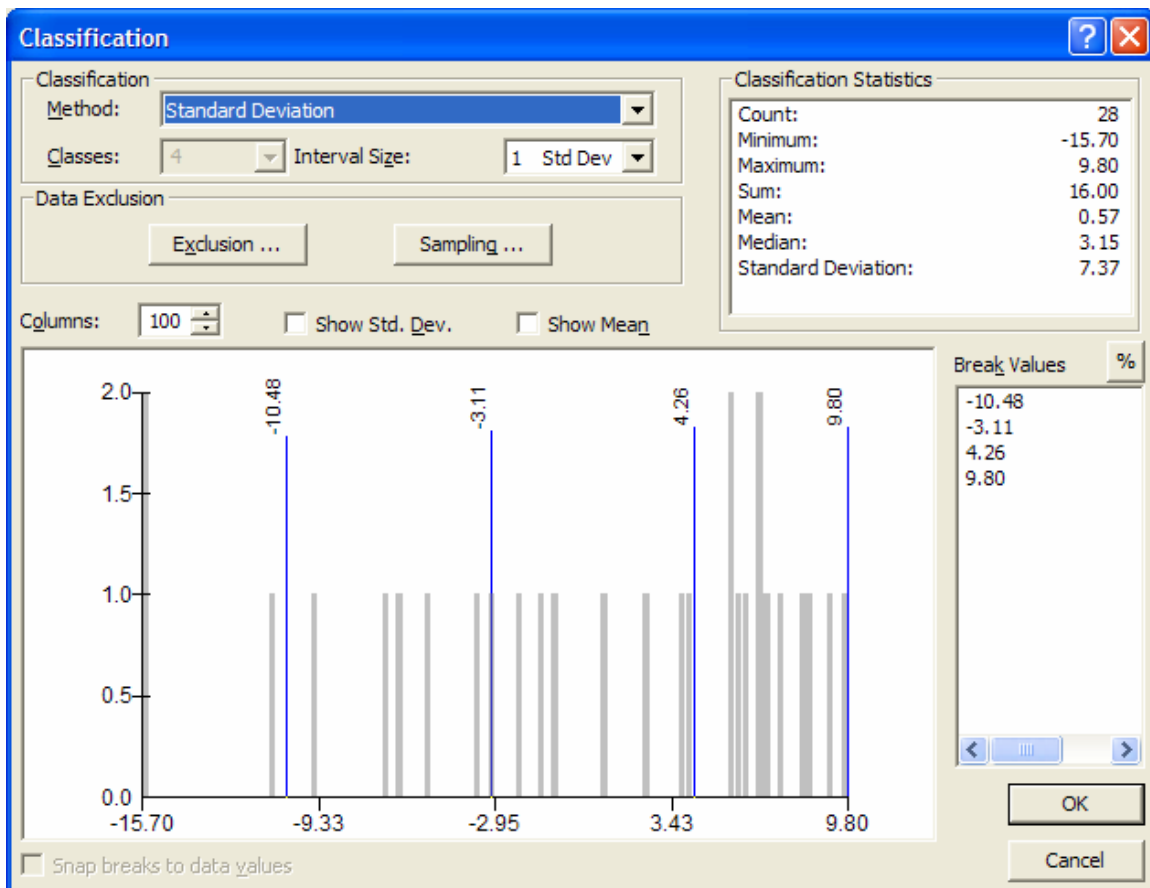
### Standard Deviational Map Type:

- Used to show how a census division's value differs from the mean of all the values in all the census divisions
- Useful when you need to know which census divisions have an above or below average % of population change between 2001 and 2006.

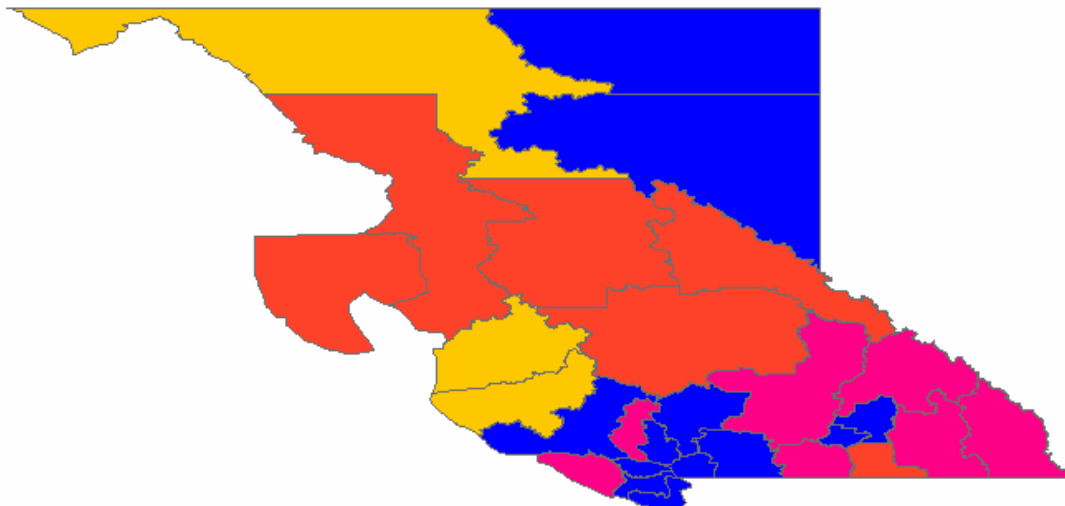
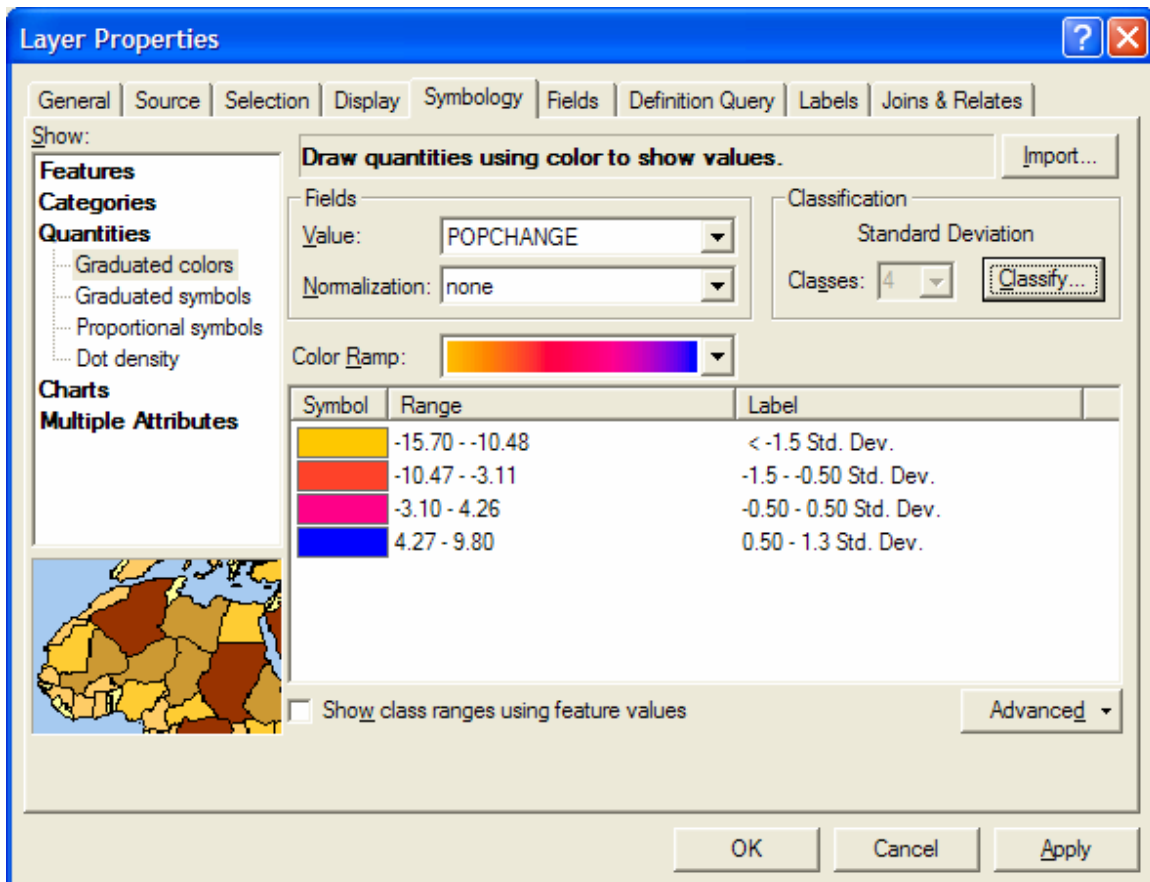
To create a thematic map using Standard Deviations, do the following:

Repeat steps 1 to 5

6) Select Standard Deviation and Click OK, and click OK again.



Your results will change and should look similar to the result below.



## **Graduated Symbol Map Types**

Raw numbers should be mapped as graduated symbols rather than as a thematic map.

Today we will be mapping number of new housing starts between 2001 and 2006 by census division in British Columbia.

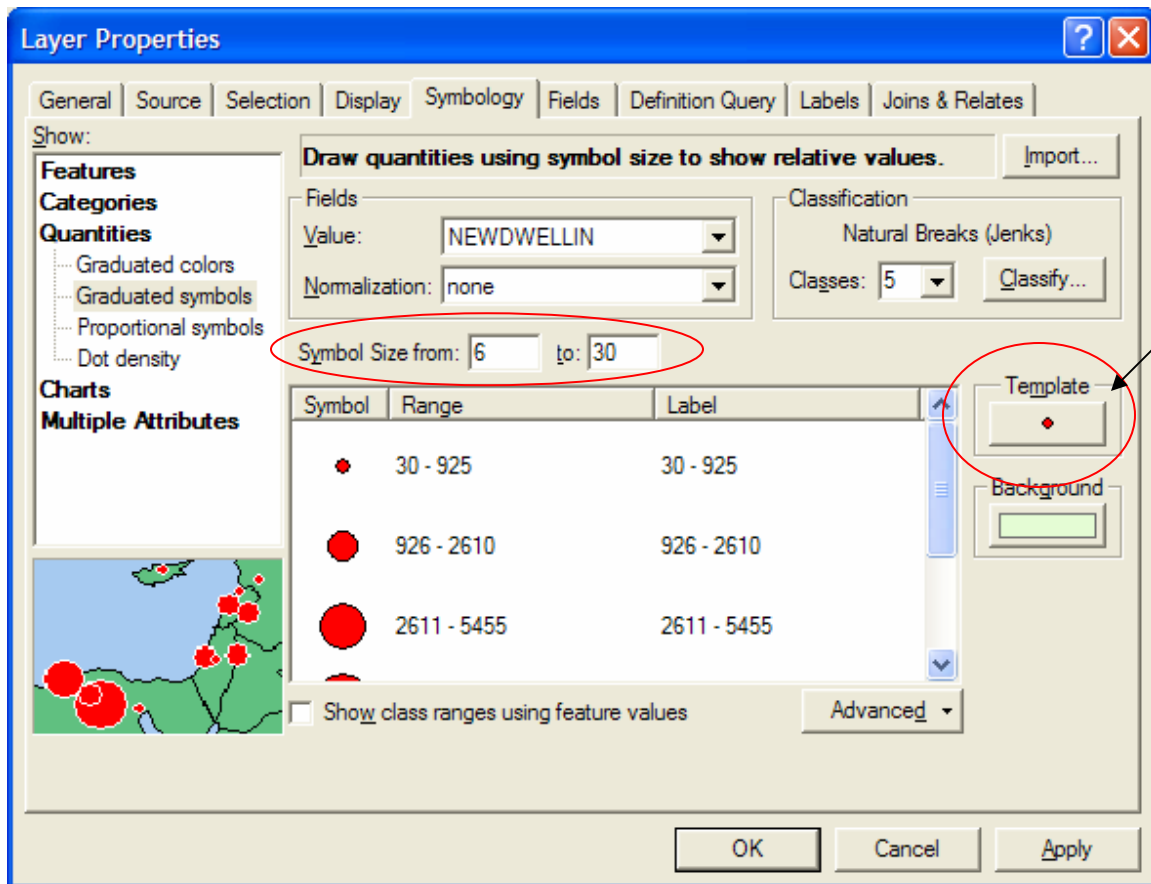
Graduated symbol maps show:

- Counts of raw numbers (not a rate, ratio, or percentage)
- Consist of a dot in each census division
- The larger the dot, the greater the number of new housing starts between 2001 and 2006

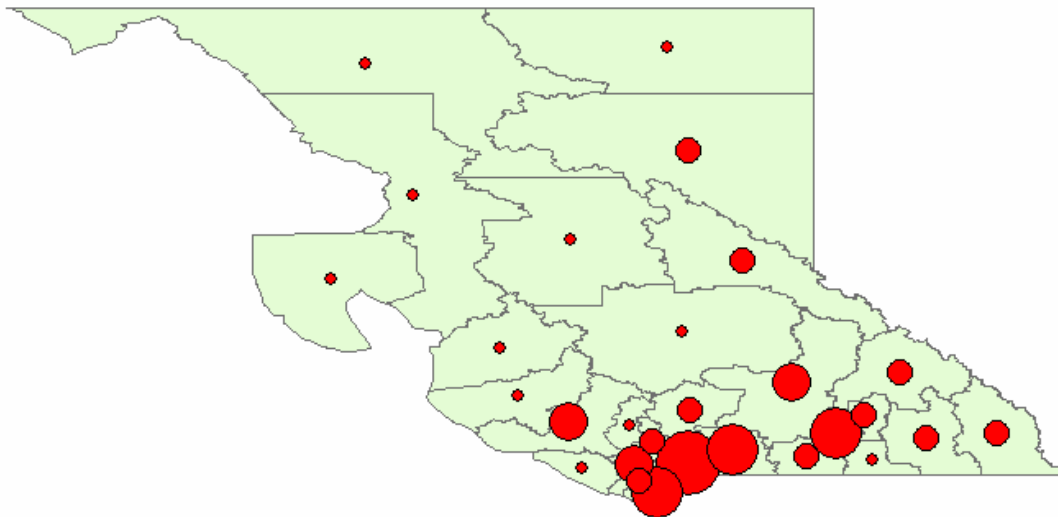
To create a graduated symbol map of new housing starts from 2001 to 2006, do the following:

- 1) Right click on the census division layer and select Layer Properties
- 2) Once in the Layer Properties dialog box, Select Quantities – Graduated Symbols.
- 3) Select new Dwelling as a value.
- 4) Select a Symbol Size, and a color for the dots, and Click OK.

Symbol  
Size



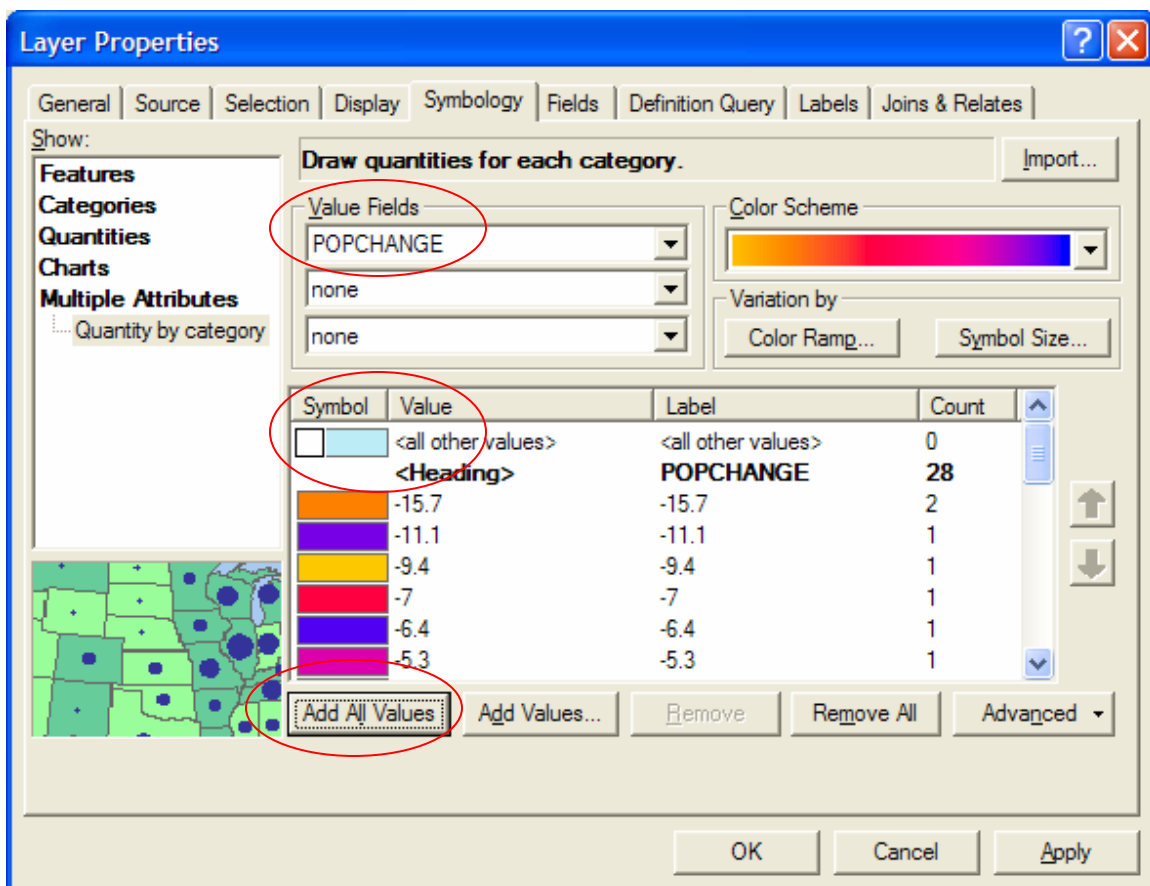
Your results should look similar to the result below.



## Combining Thematic and Graduated Symbol Map Types:

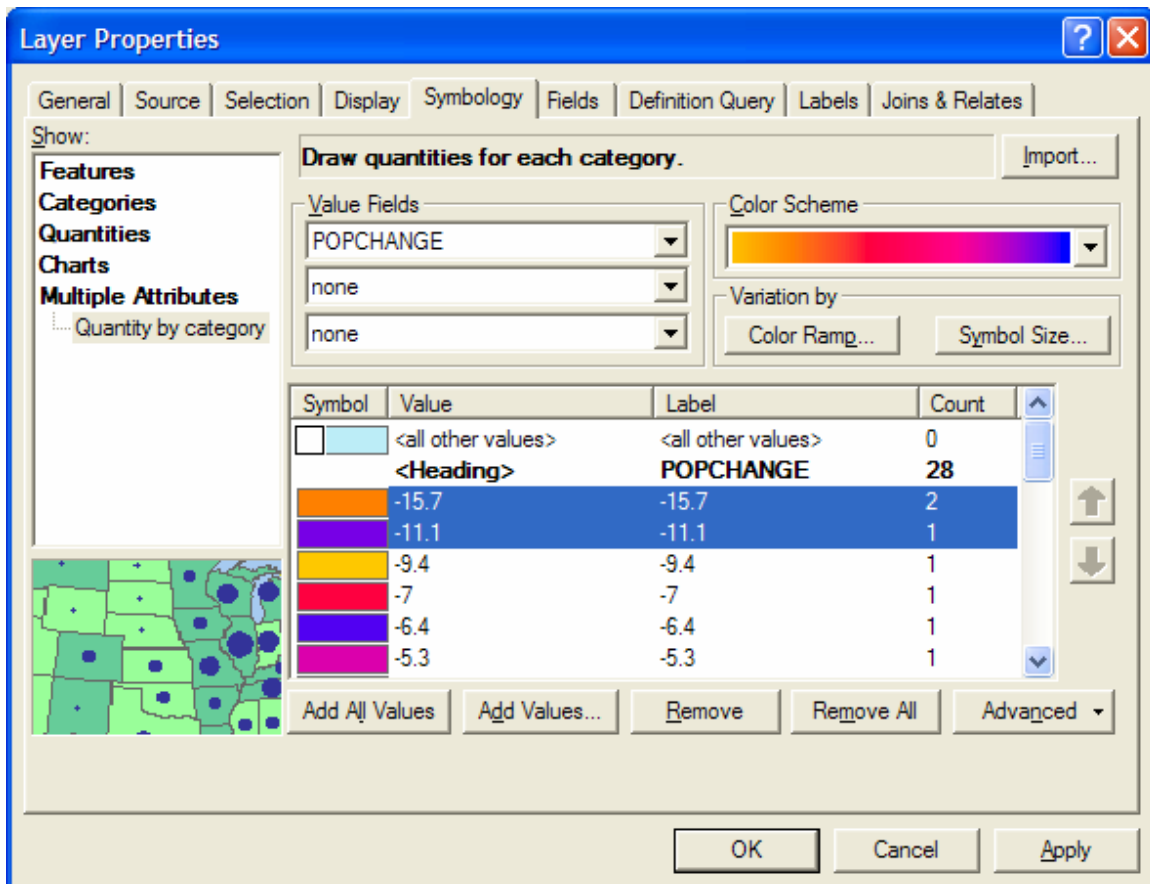
To combine Thematic and Graduated Symbol Map Types using a single layer, do the following:

- 1) Right click on the census division layer and select Layer Properties
- 2) Once in the Layer Properties dialog box, select Multiple Attributes.
- 3) Select new PopChange as a value, unclick <all other values>, and select Add All Values.



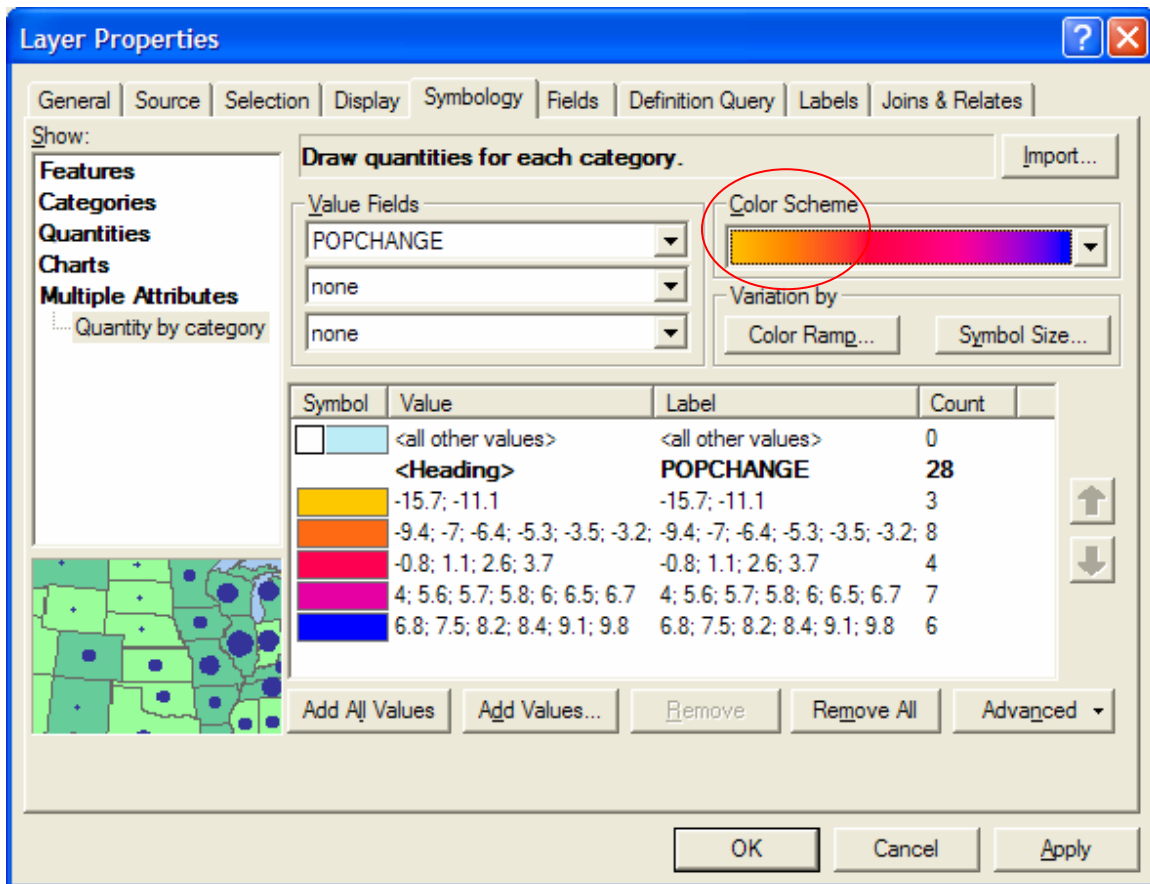
4) Next we will group our values in 5 Natural Breaks categories, by doing the following:

- Highlight the values for -15.7 and -11.1, as they are in class one, and hold down the shift key as you are highlighting the values.

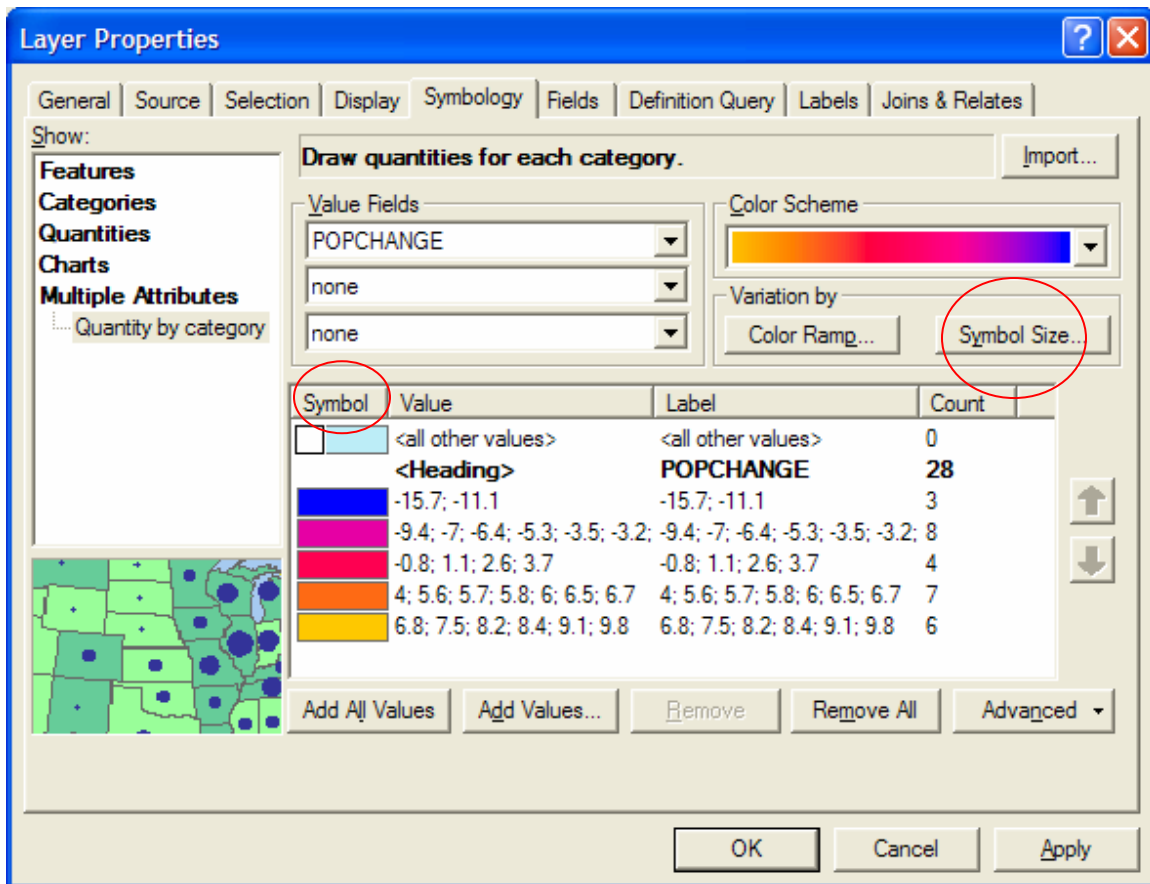


- Right click on these values and select Group Values.
- Repeat this procedure and group the following values:
  - Class two - -9.4; -7; -6.4; -5.3; -3.5; -2; -1.4
  - Class three - -0.8; 1.1; 2.6; 3.7
  - Class four – 4; 5.6; 5.7; 5.8; 6; 6.5; 6.7;
  - Class five – 6.8; 7.5; 8.2; 8.4; 9.1; 9.8
- Select a colour scheme





- Select Symbol and click flip symbols, in order to display the lowest values as blue and the higher values as red and yellow to be consistent with cartographic standards



- To symbolize the new housing starts from 2001 to 2006 as graduated symbols, do the following:
  - Select Symbol Size
- Select NewDwelling as the value, select a symbol size, and select a color for your dots, and Click OK.




Symbol  
Size

Draw quantities using symbol size to show relative values.

Fields  
Value: NEWDWELLIN  
Normalization: none

Classification  
Natural Breaks (Jenks)  
Classes: 5  
Classify...

Symbol Size from: 6 to: 30

Symbol	Range	Label
	30 - 925	30 - 925
	926 - 2610	926 - 2610
	2611 - 5455	2611 - 5455

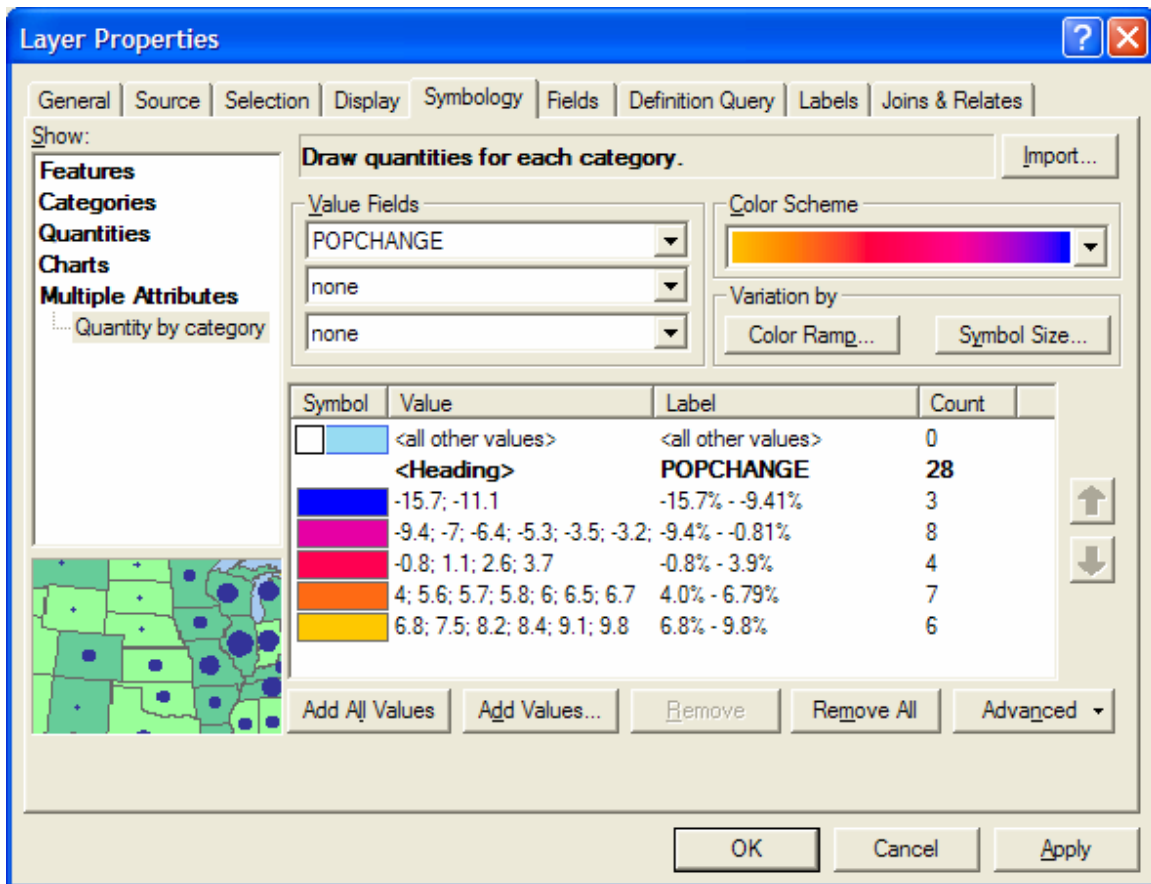
☐ Show class ranges using feature values

Template  
Background

OK Cancel

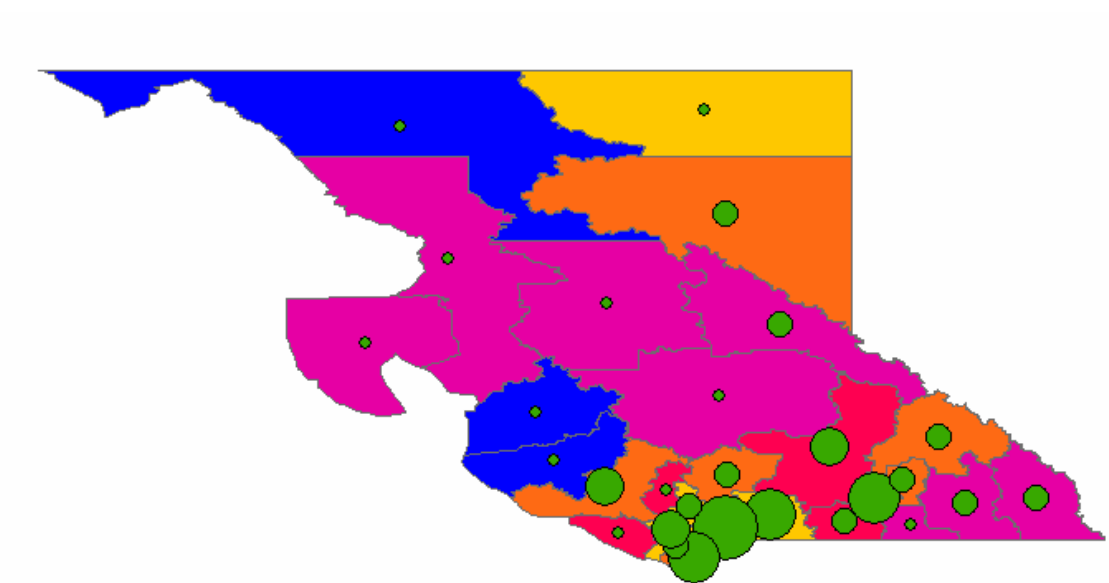
Change  
Color

- Next, we will label the classes for population change so that they make sense to the map reader. To accomplish this, do the following:
  - Click on the label area for the first class, and enter text to change it to (see below):



Then click OK.

Your results should appear similar to the results below.



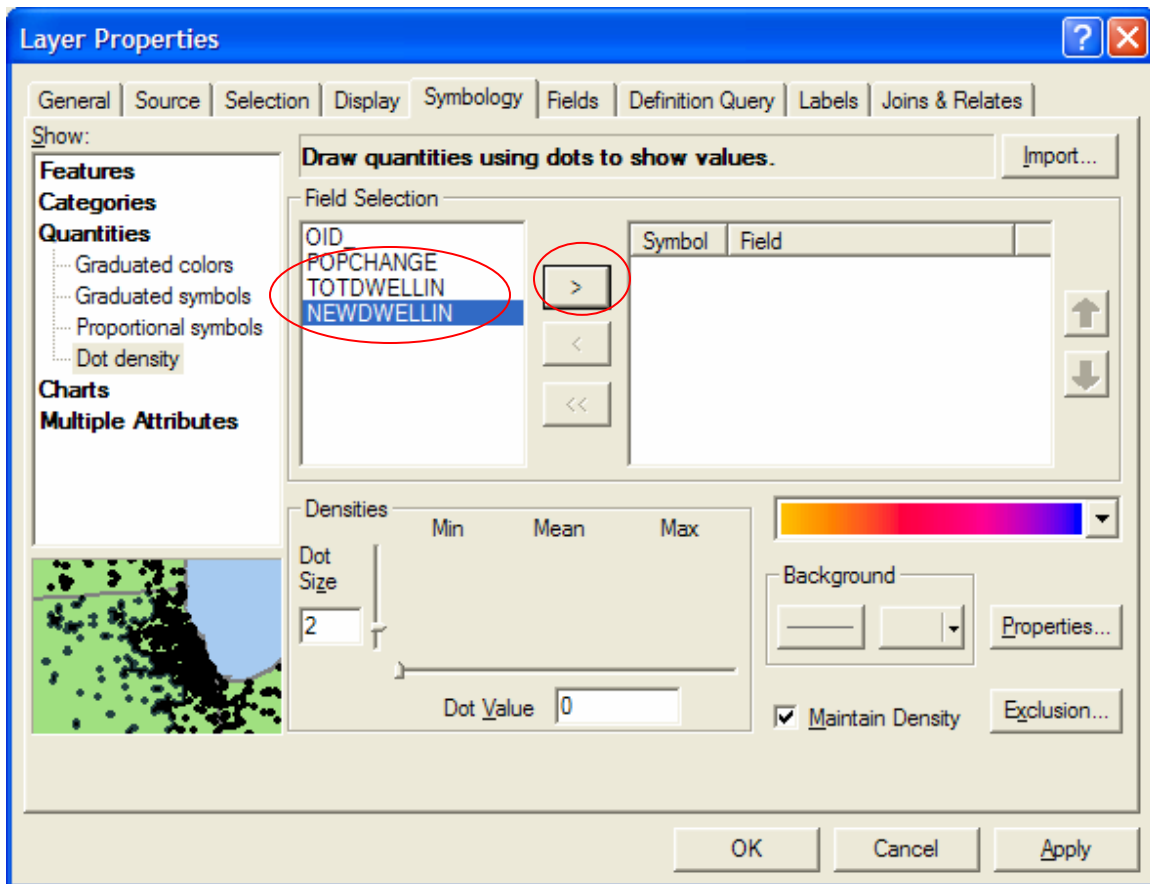
## Dot Density Map Types:

Today we will be mapping number of new housing starts between 2001 and 2006 by census division in British Columbia.

- Each dot represents a certain number of dwellings
- Used to represent the number of occurrences of a given data characteristic in a particular location.
- For example: number of people in Canada by census metropolitan area
- Useful for giving an impression of the **density** of spatial data
- Useful for showing where spatial data occur
- e.g. where in Alberta are there the most people
- Important to assign the correct number of dwellings to each dot so the information will display in a way that is easy to interpret.

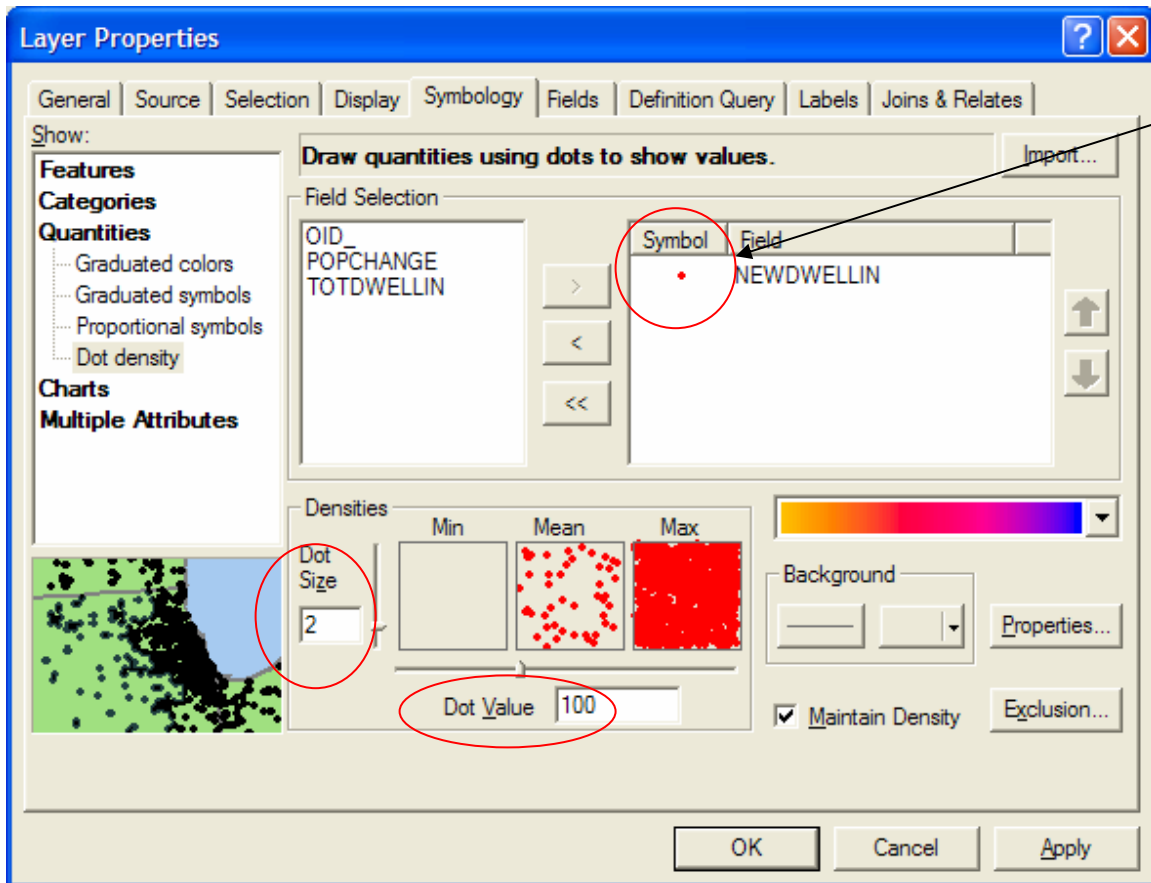
To create a dot density map of new dwelling starts from 2001 to 2006, do the following:

- 1) Right click on the census division layer and select Layer Properties
- 2) Once in the Layer Properties dialog box, select Quantities – Dot Density
- 3) In the field selection box, select Newdwellin and click the arrow to send newdwellin over to the box beside the field selection box.



4) Select a dot size and a dot value. We will choose a dot value of 100 because this will allow us to easily see and interpret which census divisions had the greatest number of housing starts between 2001 and 2006.

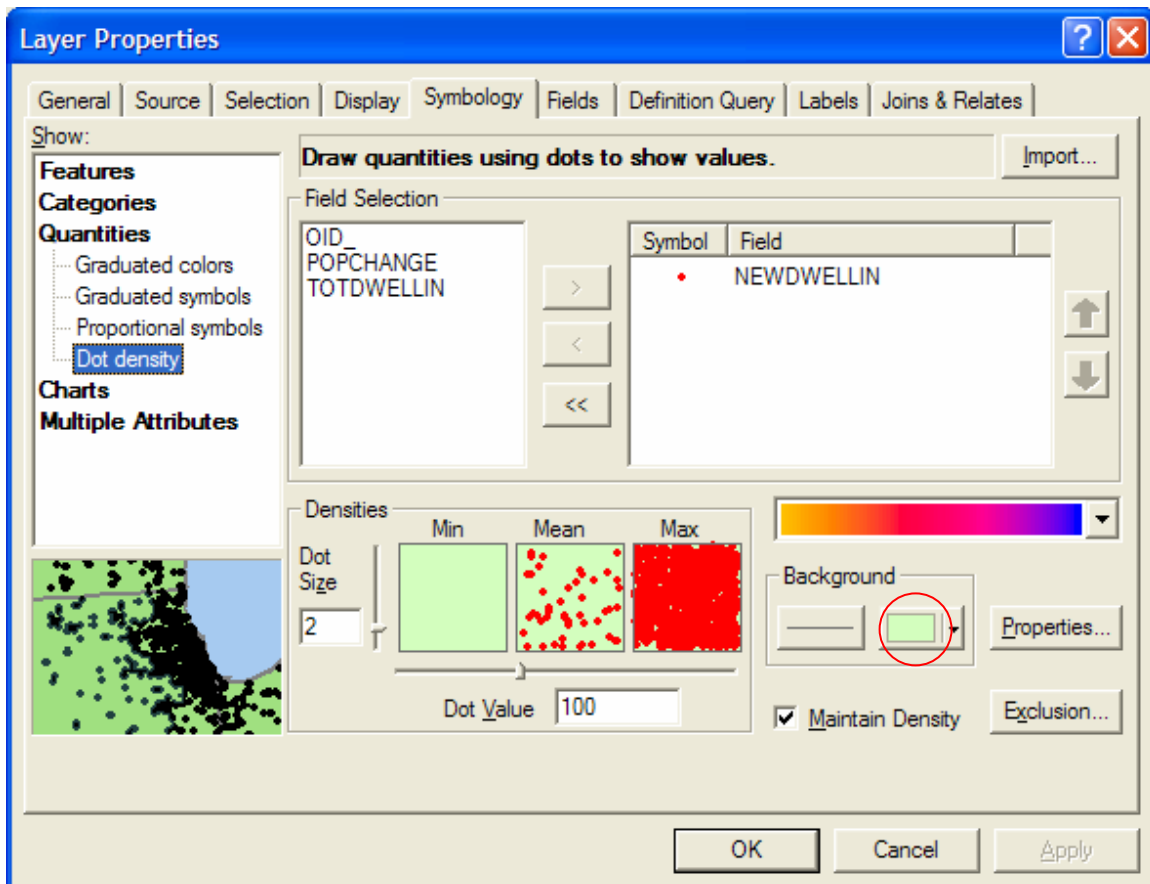
5) Select a dot color by clicking on the dot underneath symbol.



Change dot color here

6) Select a background color for your map, and click OK.



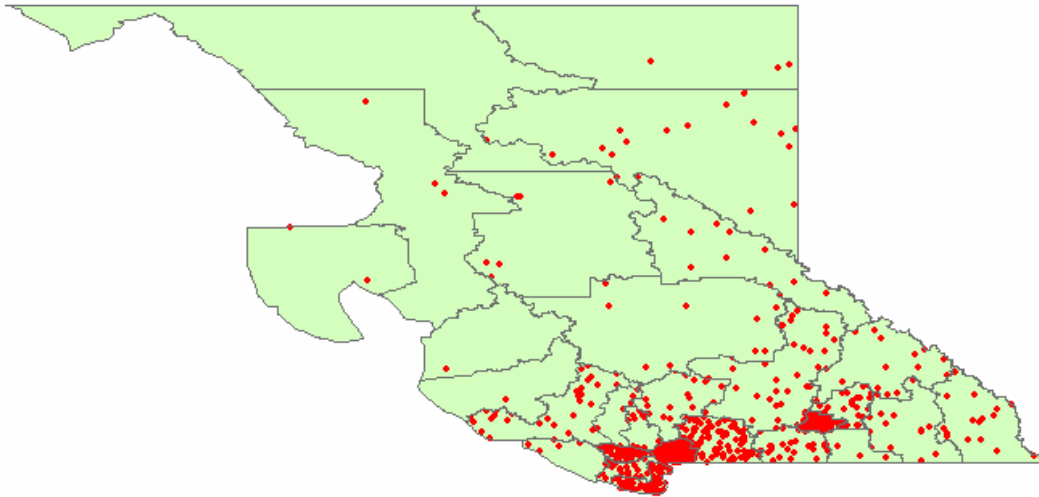


Your results should appear similar to the results below.

## Reflection:

Which areas in British Columbia had the greatest number of housing starts from 2001 to 2006?





## Changing Projections:

What is a projection?

- The Earth is approximately spherical
- A map surface is flat.
- A projection allows a cartographer to take an area of the spherical Earth and display it on a flat map surface
- Different projections preserve either shape or area or distance or direction, and which projection you choose depends on what you want to show or convey. But you can't have it all unless you draw it on a ball!

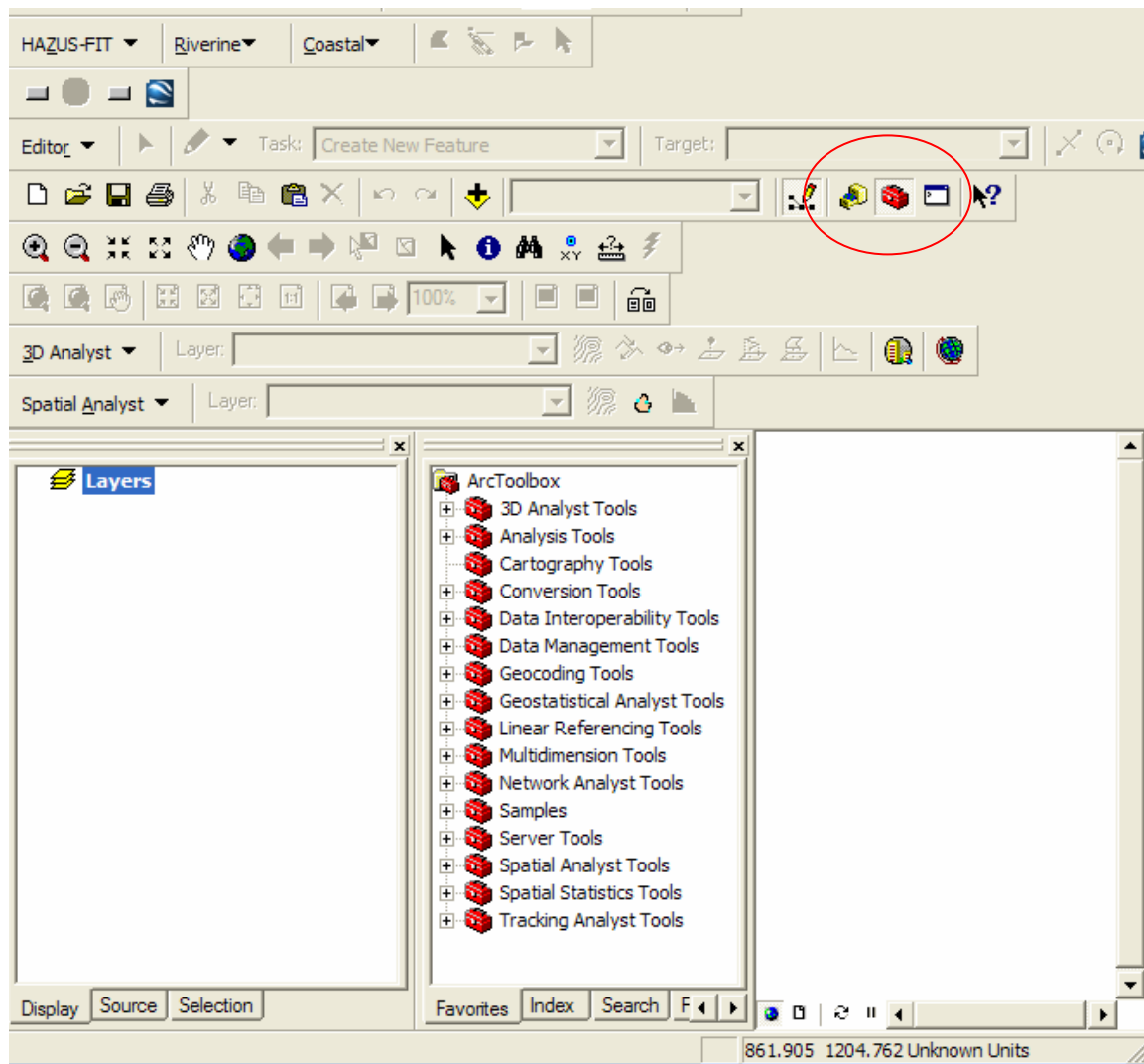
What is a datum?

- Control points that exist on the spherical or elliptical surface of the Earth so that you will know where each point on your flat map fits on the actual Earth surface.
- Many different datums for different parts of the Earth

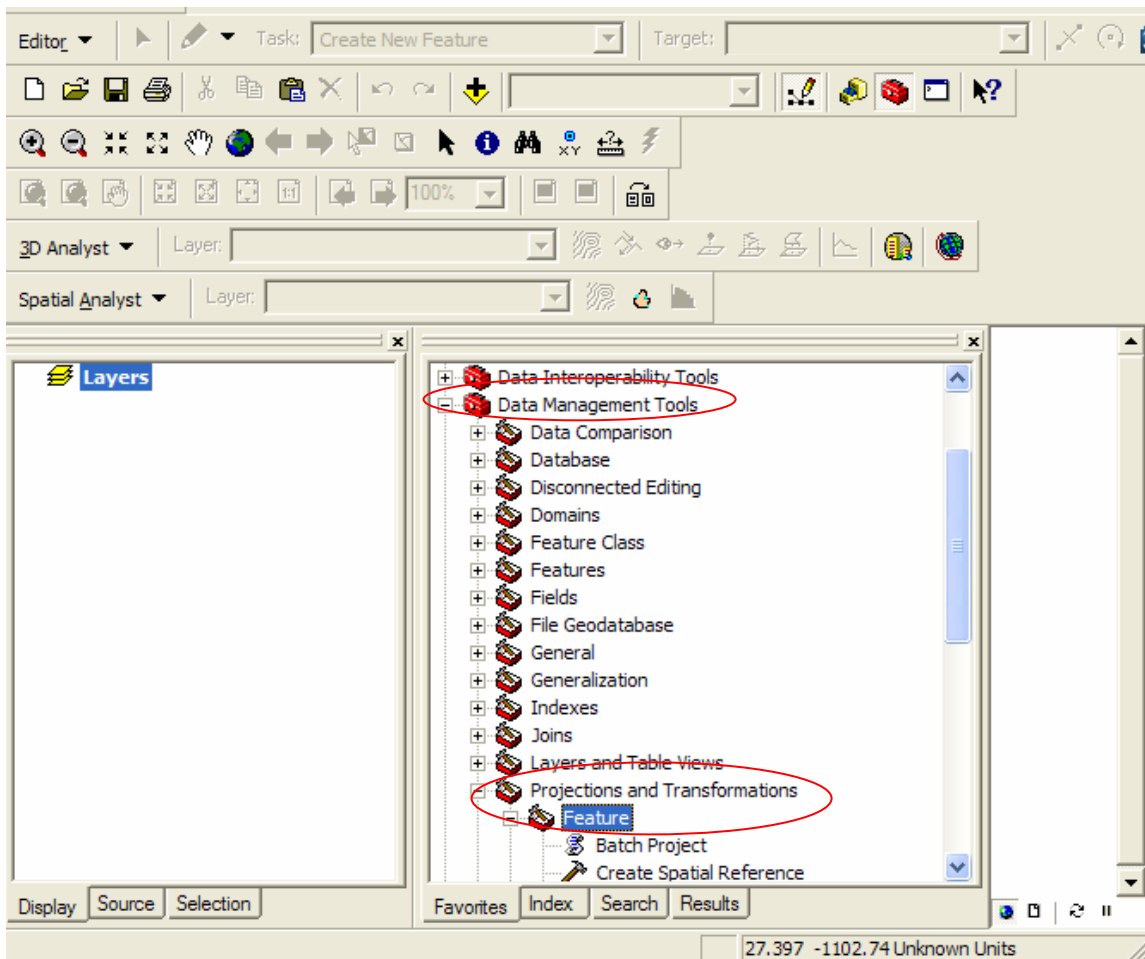
Currently, the census division layer we are using is in a Geographic Coordinate system with a NAD 83 datum. It is not in a projection yet, and is unprojected. Today we will be projecting the census division GIS layer into Canada Albers Equal Area Conic projection.

To project our census division layer for British Columbia, do the following:

1) Click the red rectangle as shown below. This will allow us to access our Toolbox with the projection Tool.

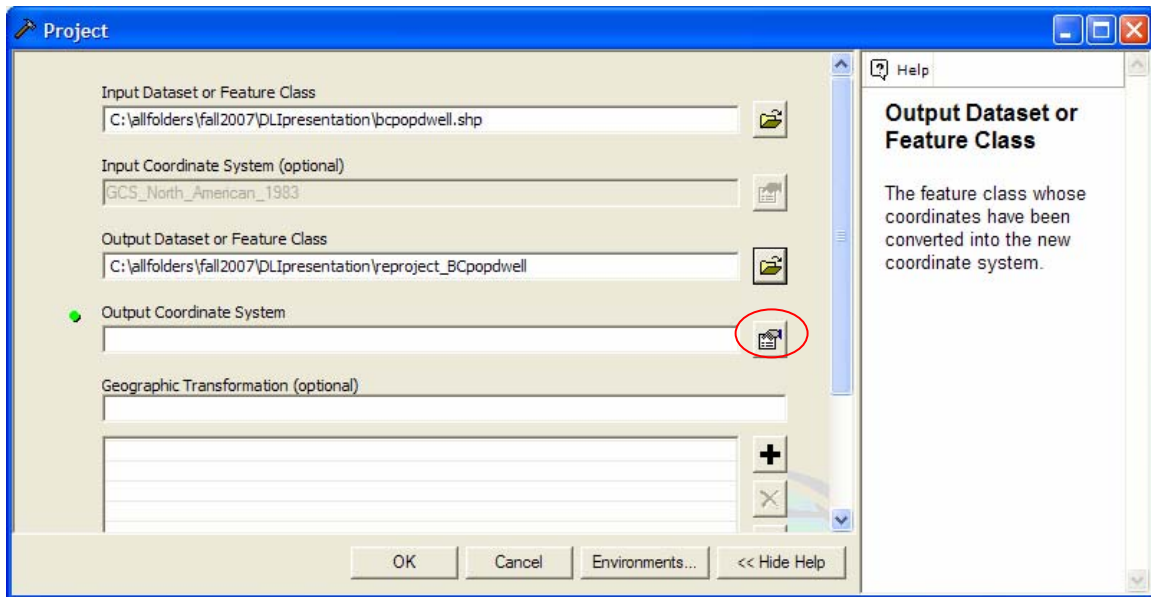


2) Select Data Management Tools – Projections and Transformations – Feature as shown below. We use feature because we are projecting a GIS layer and not an image.



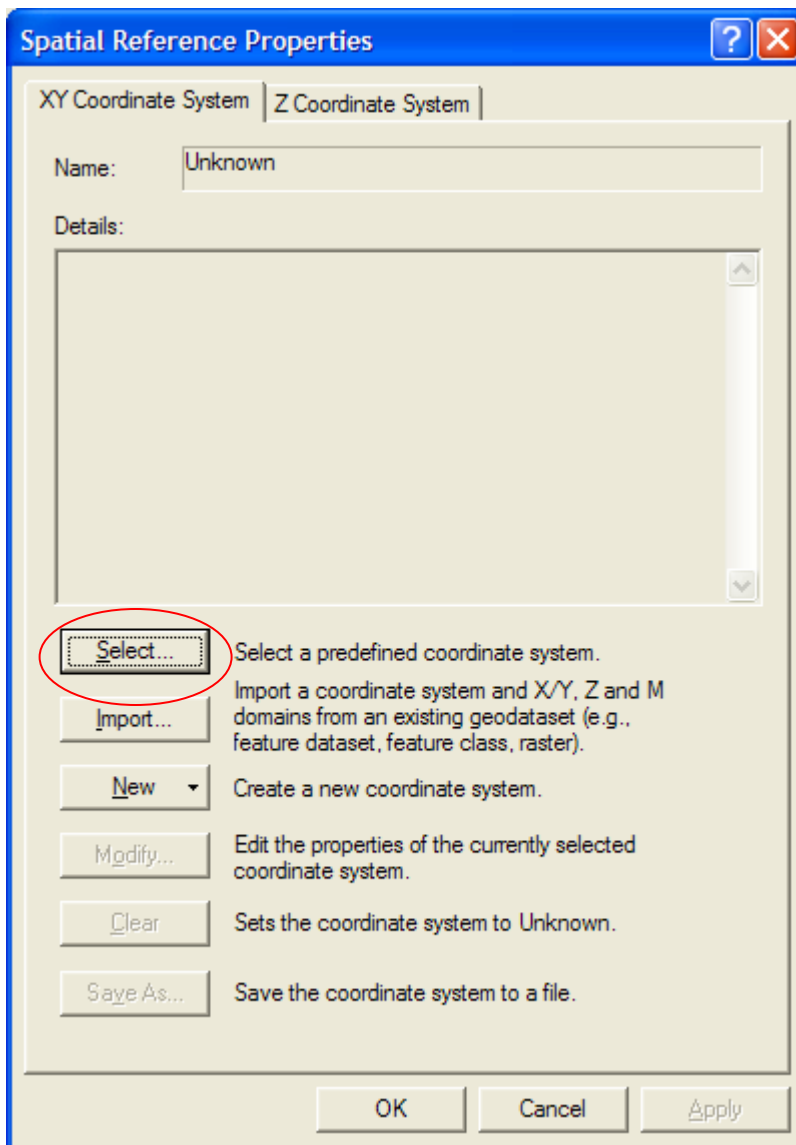
3) Select Project and a projection box will appear.

4) Select the BC census division layer as the input dataset, and give the projected layer you are going to create, a name (output dataset).

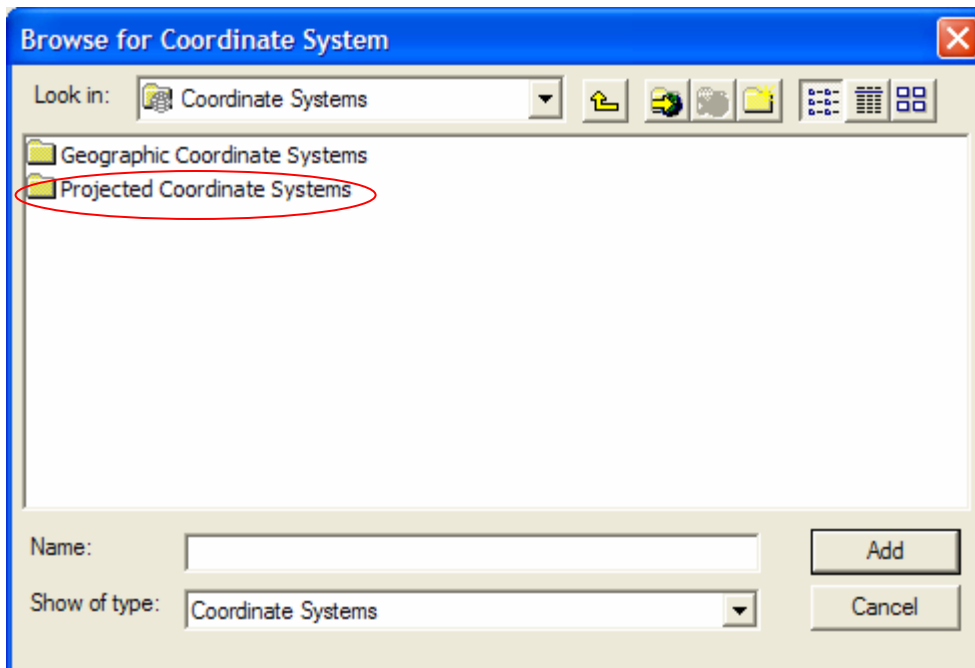


5) Select the projection or Output coordinate system by clicking on the button circled in red above.

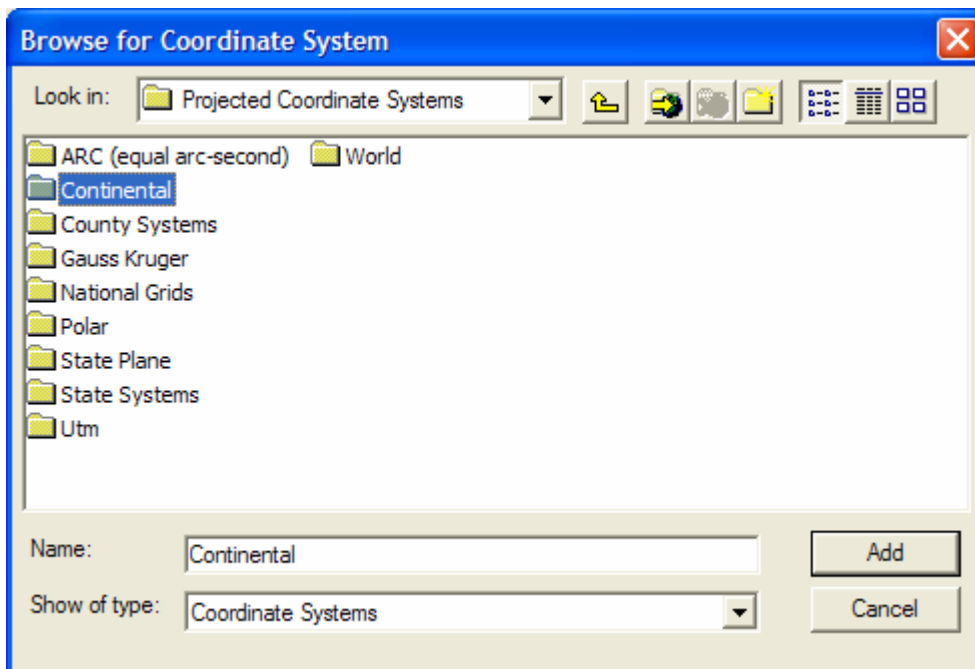
6) A coordinate system box will appear, and then click Select



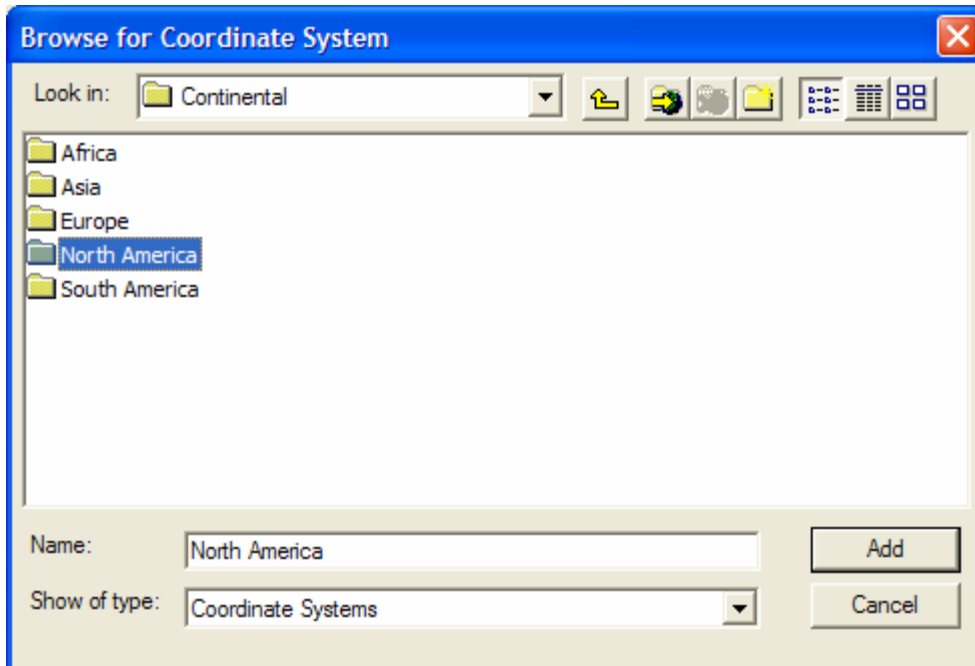
7) Select Projected Coordinate Systems



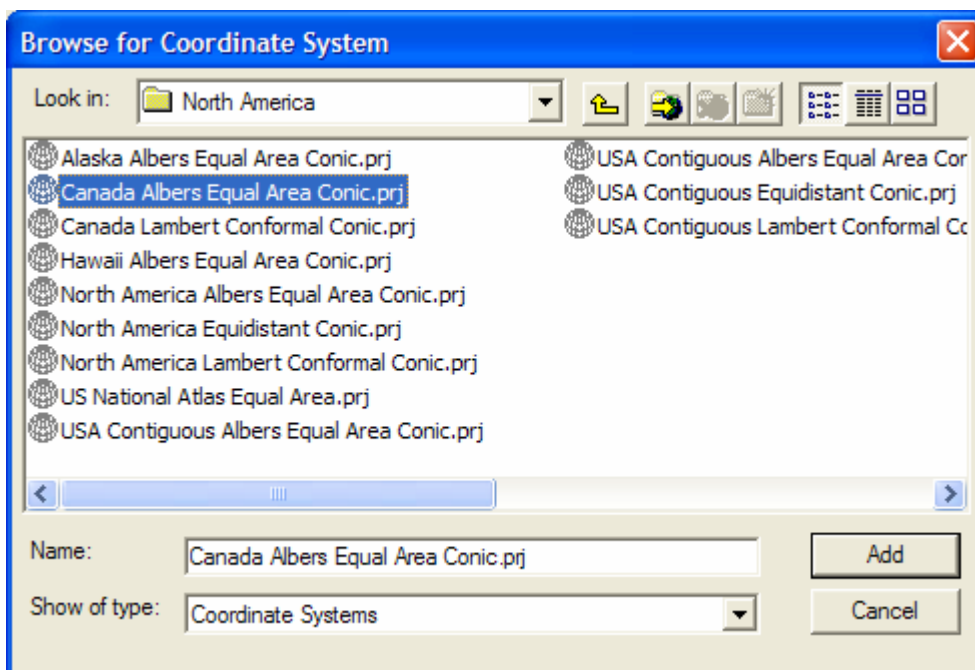
8) Select Continental



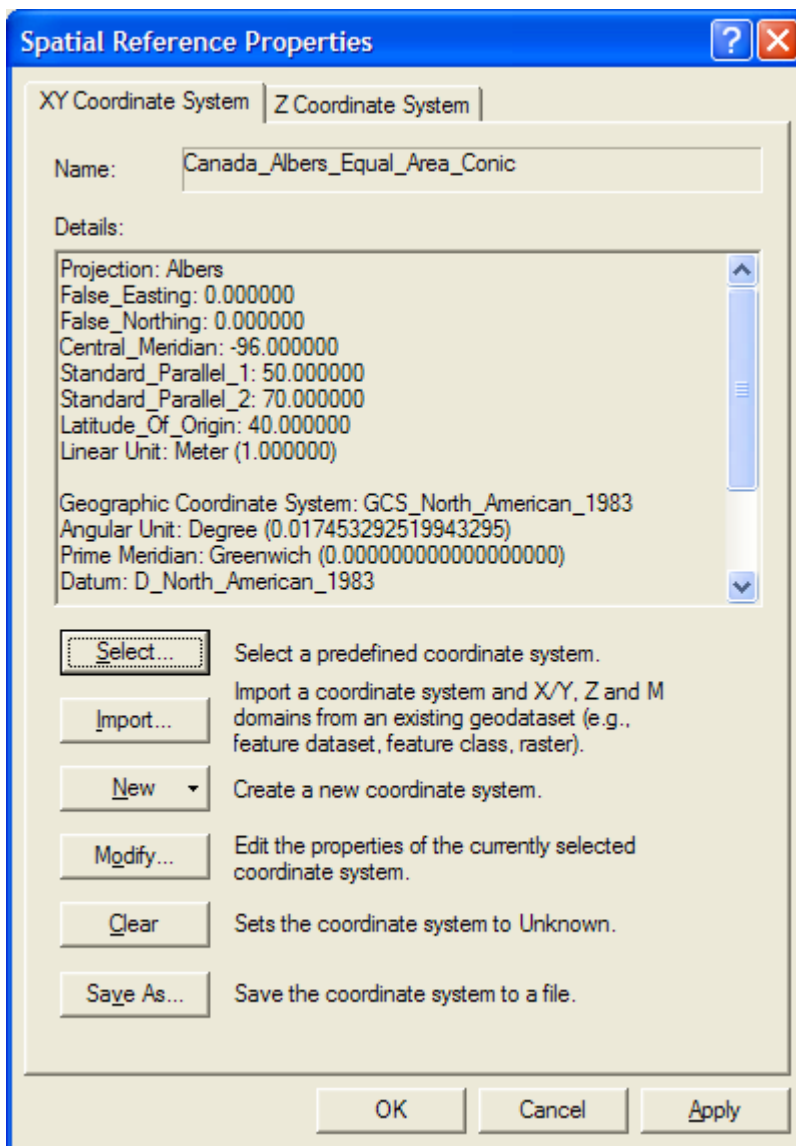
9) Select North America



10) Select Canada Albers Equal Area Conic, and click Add. This projection will show **area** of the census divisions in BC without much distortion, and Canada Albers Equal Area Conic is a good projection for large land areas, such as the province of British Columbia.

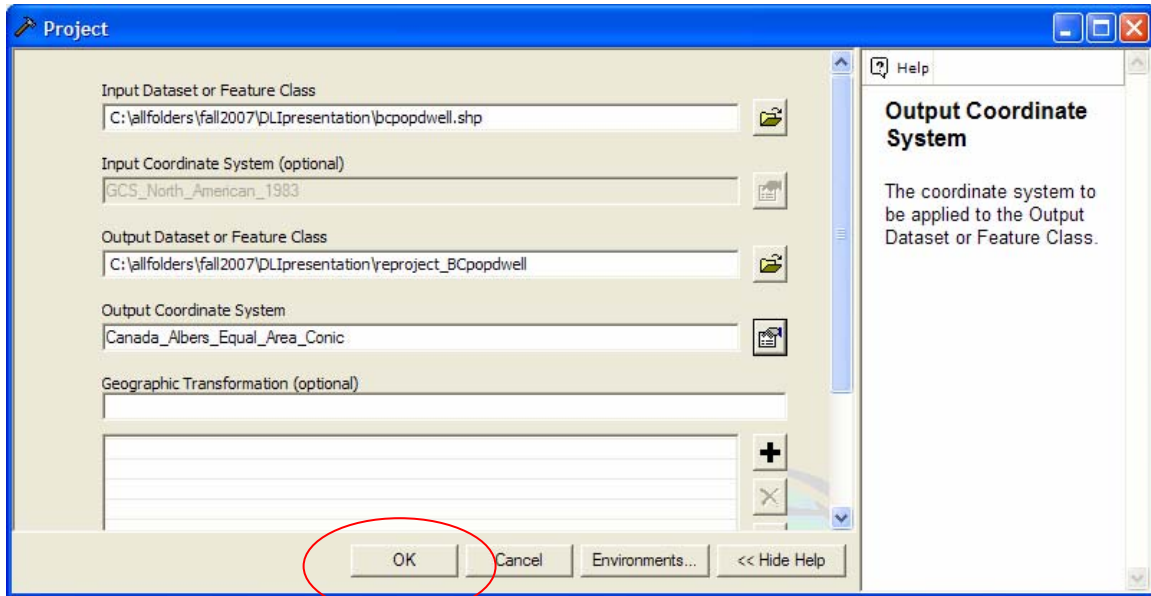


A box will appear showing you the projection you have chosen. Click OK.

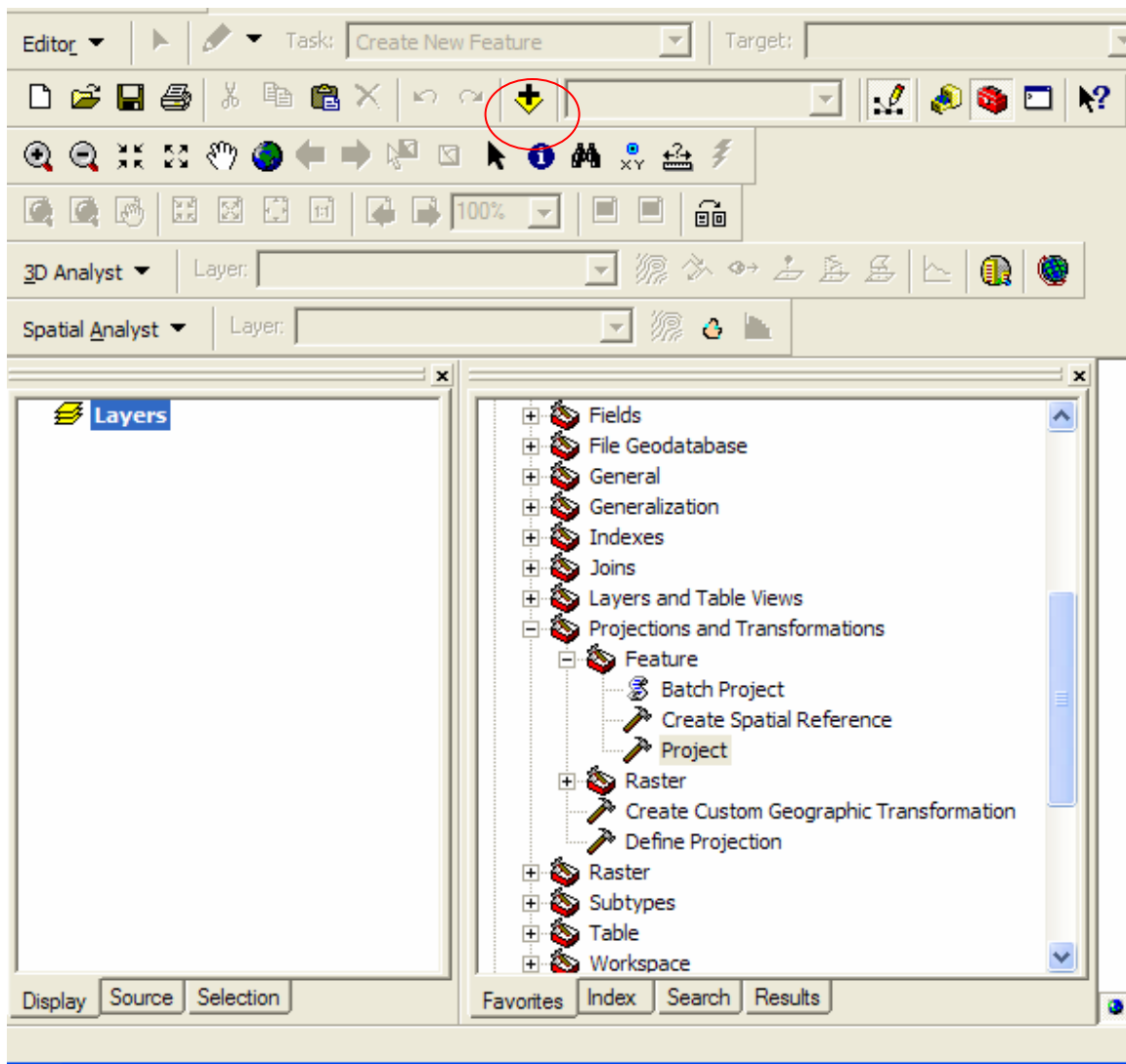


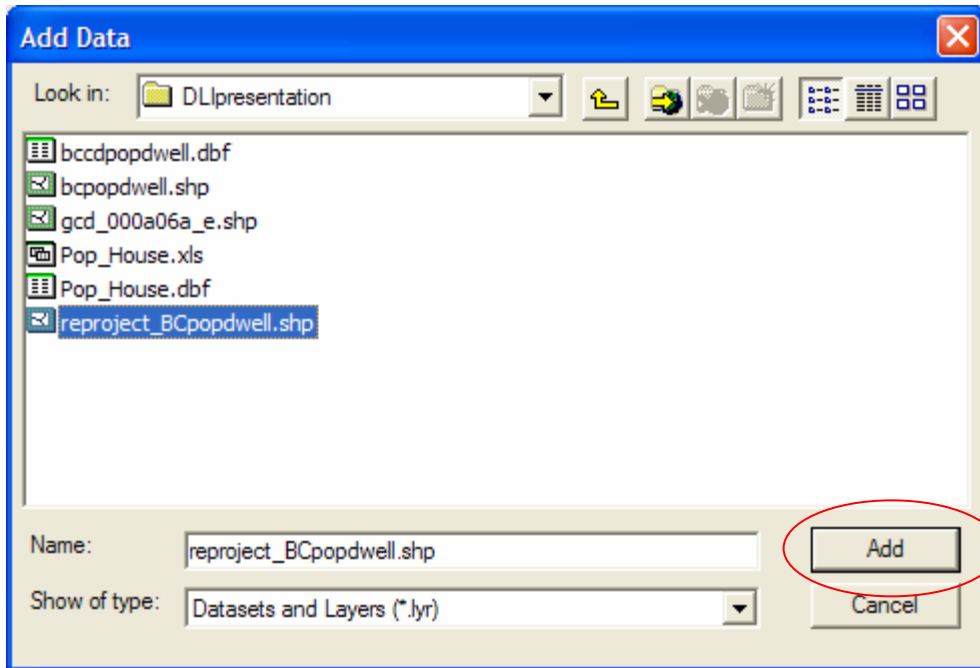


Clicking OK will bring you back to your original projection box. Click OK again, and the projection process will run for a minute or less.



11) Add your newly projected Census Divisions of BC layer to your map by clicking on the add layer button. A dialog box will open up, select your newly projected layer, and Click Add.

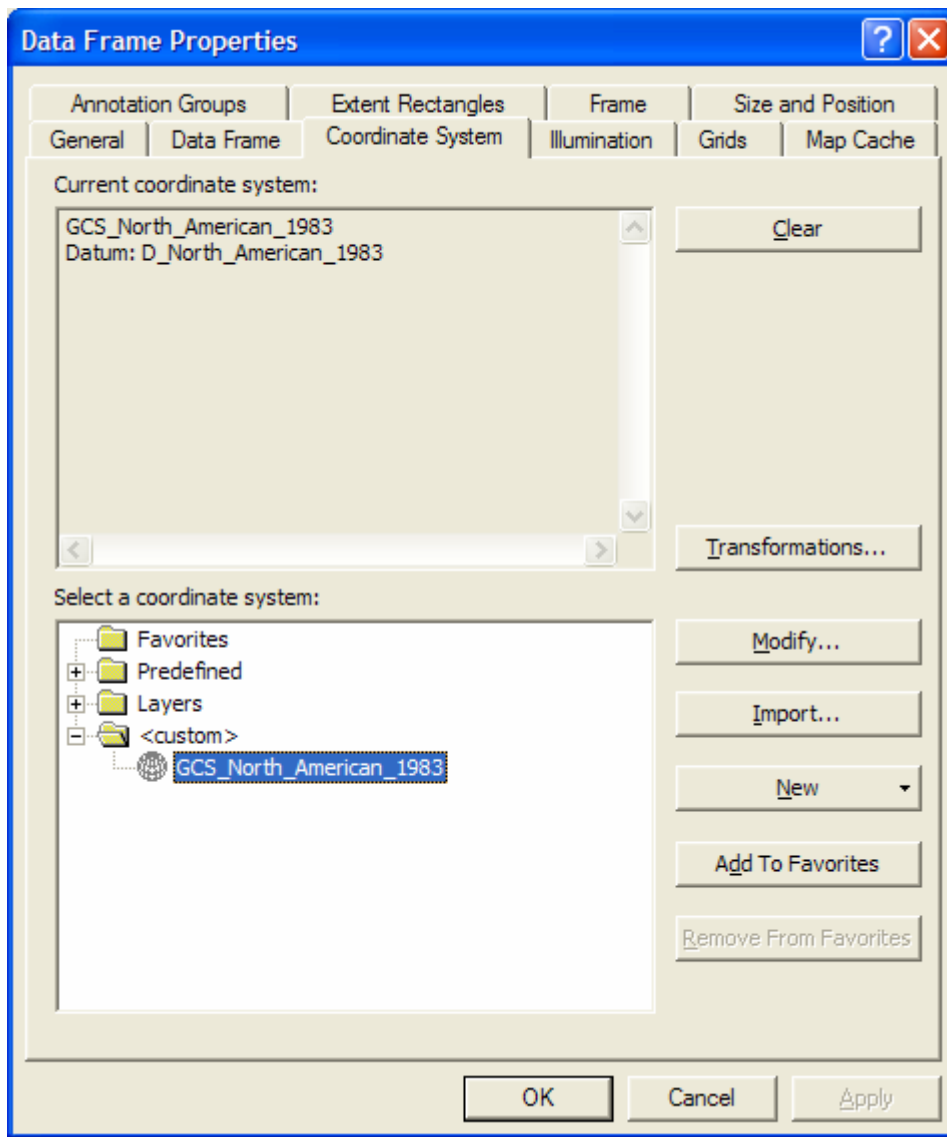




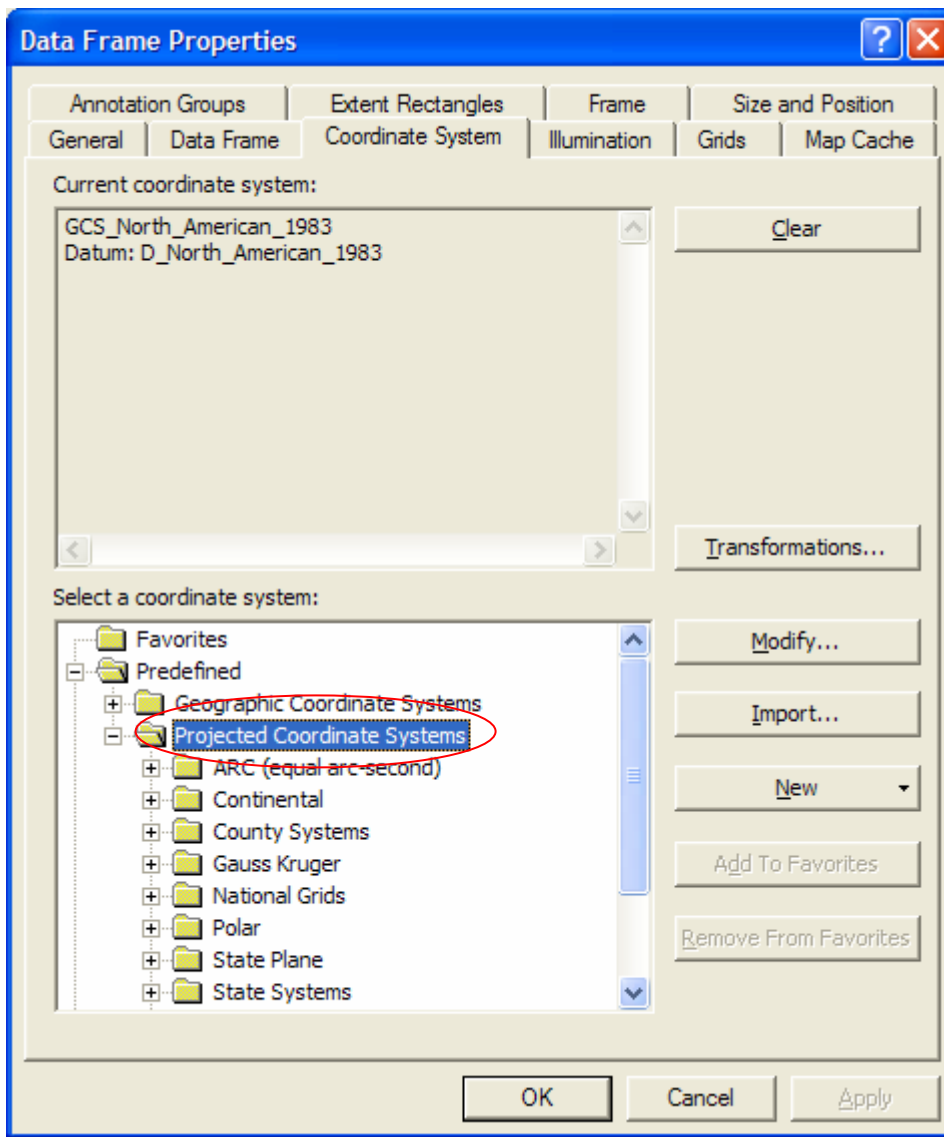
12) Change the projection of your data frame to match the new projection of your newly projected census division layer. We take this step because we want the newly projected layer to display in the new projection in the ArcView interface. If we leave the data frame in the old coordinate system, ArcView will do what is called an “on the fly reprojection” and will automatically take the newly projected shapefile and display it in the old coordinate system of our unprojected layer. So, unless we change the projection of the data frame, we will see the newly projected shapefile looking exactly the same as our unprojected shapefile.

To accomplish this step, do the following:

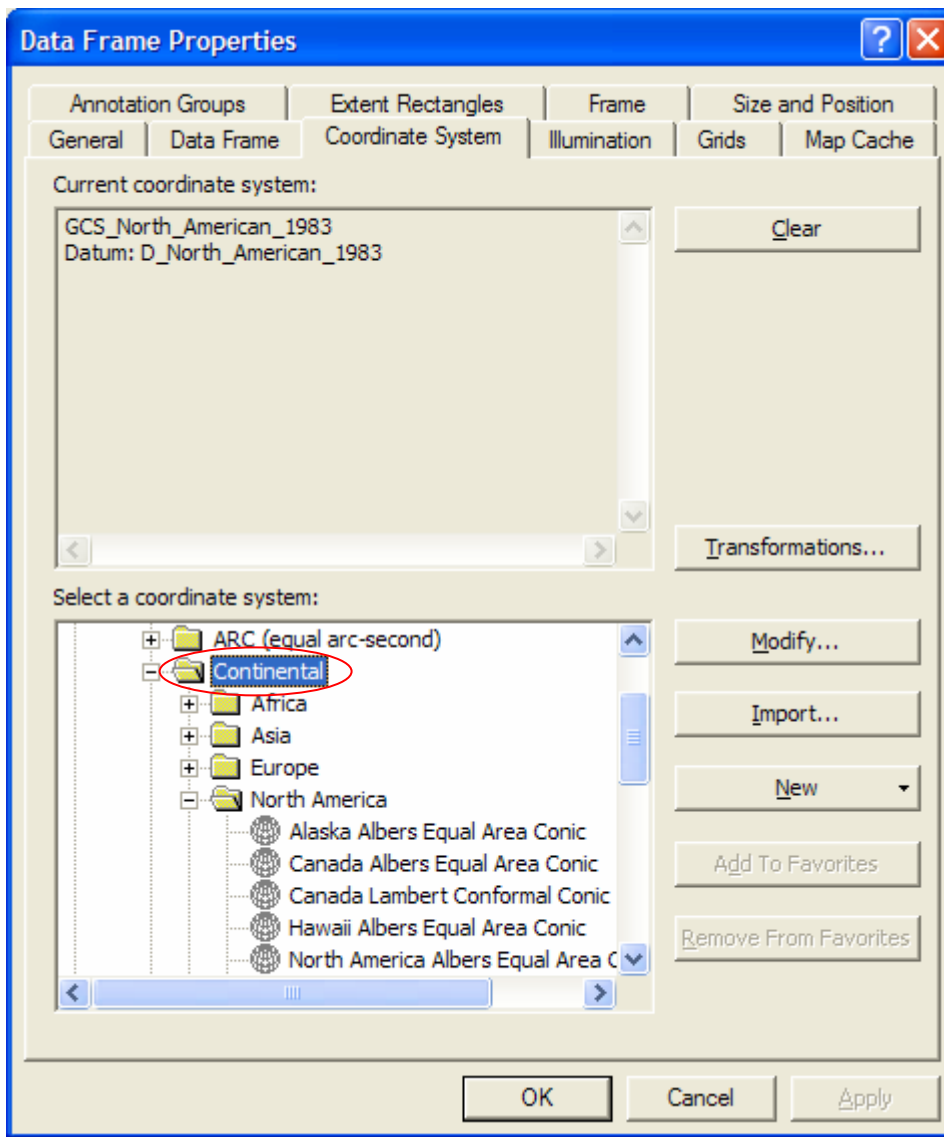
- Right Click on Layer in the table of contents, select properties, and select the coordinates tab in the properties dialog box that appears.



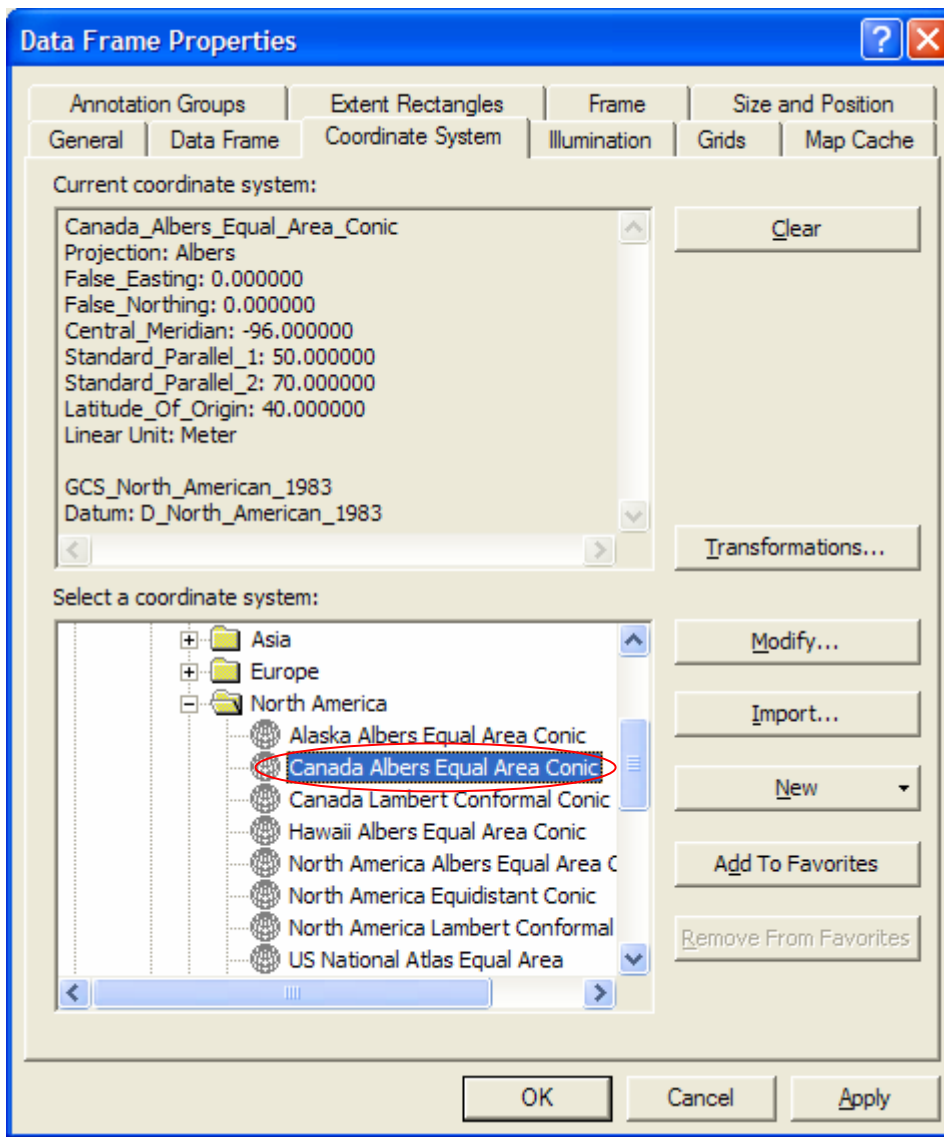
- Select Predefined, and then Projected Coordinate Systems



- Select Continental – North America



- Select Canada Albers Equal Area Conic projection



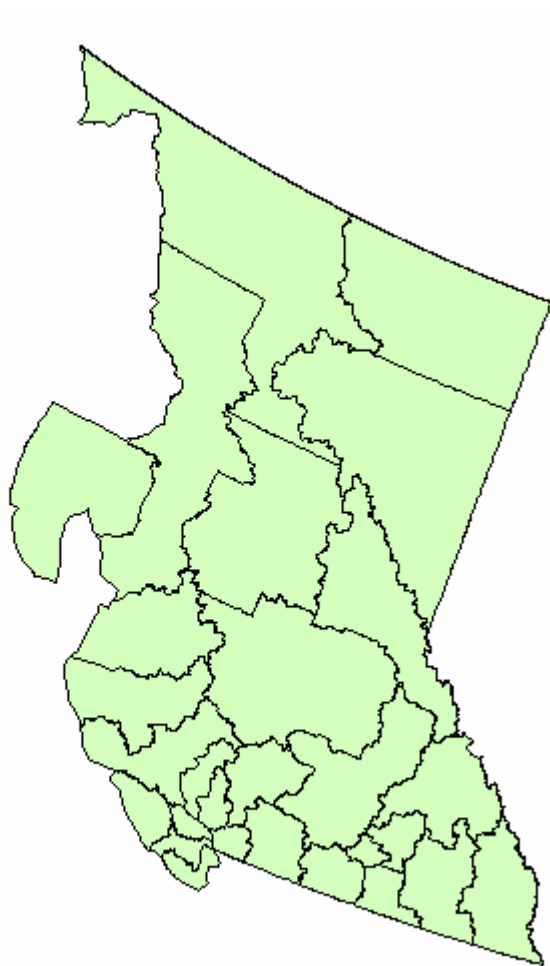
- Click Apply and then Click OK.

Your results should appear similar to the results below.

**Reflection:**

Compare the shape of the projected BC census division layer with the unprojected BC census division layer. They appear very different from one another. Which one do you like the most? Why?

Projected layer:





Unprojected Layer:

