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Using ArcGIS 9.x: Quickstart Tutorial

ArcGIS is a program which allows the user to view and manipulate spatial data. It is useful in creating maps and displaying data spatially. This tutorial explains the basics of using ArcGIS, how to open and view a shapefile, and some simple ways to represent information spatially.

Requirements:

- ArcGIS
- Spatial data

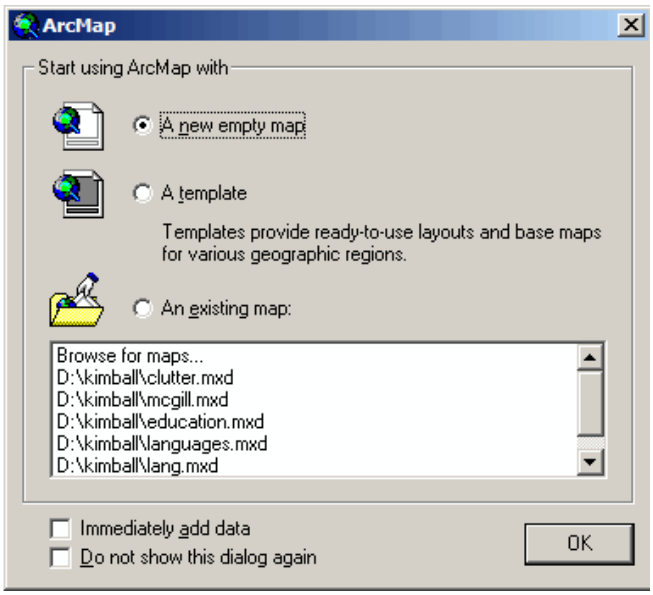
There are two major types of data that can be displayed in a GIS: raster and vector data. Vector data displays information as points, lines, and polygons. Raster data is stored as a continuous series of pixels. Vector data is stored with the file extensions .jpg, .tif, .gif., or bmp. Raster data is commonly stored as a shapefile (.shp), a format specific to ArcGIS.

If you do not already have spatial data you want to use, the shapefiles of Canada used in this tutorial are available here
http://www.edrs.mcgill.ca/GIS/dmti/censusboun/webpage/census_2001.html#canada
These data can only be downloaded with a McGill IP address, either on campus or using a VPN. These filed will need to be unzipped. Click on each file you want to unzip, choose Open, and click on "Extract all Files" from the left-hand side of the box displaying the zipped files. A wizard will take you through the steps to unzip the files. Choose the same destination folder for each set of files.

Procedure:

Loading data

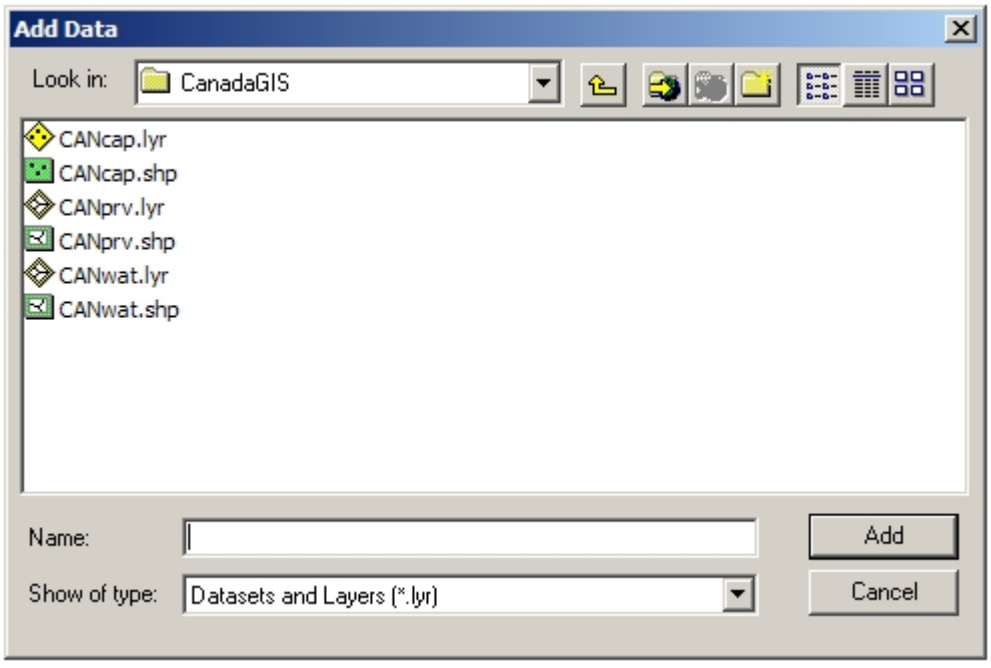
1. Follow the link above and download provincial boundaries (CANprv), national coarse water (CANwat), and capital cities (CANcap). Unzip the files to the same folder.
2. In the start menu, select ArcGIS from the programs folder. Several options will appear. Choose ArcMap.
3. Once the program loads, a dialog box will appear:



Select "A new empty map" and click OK.

4. Go to File→Add data. You can also click directly on this symbol  .

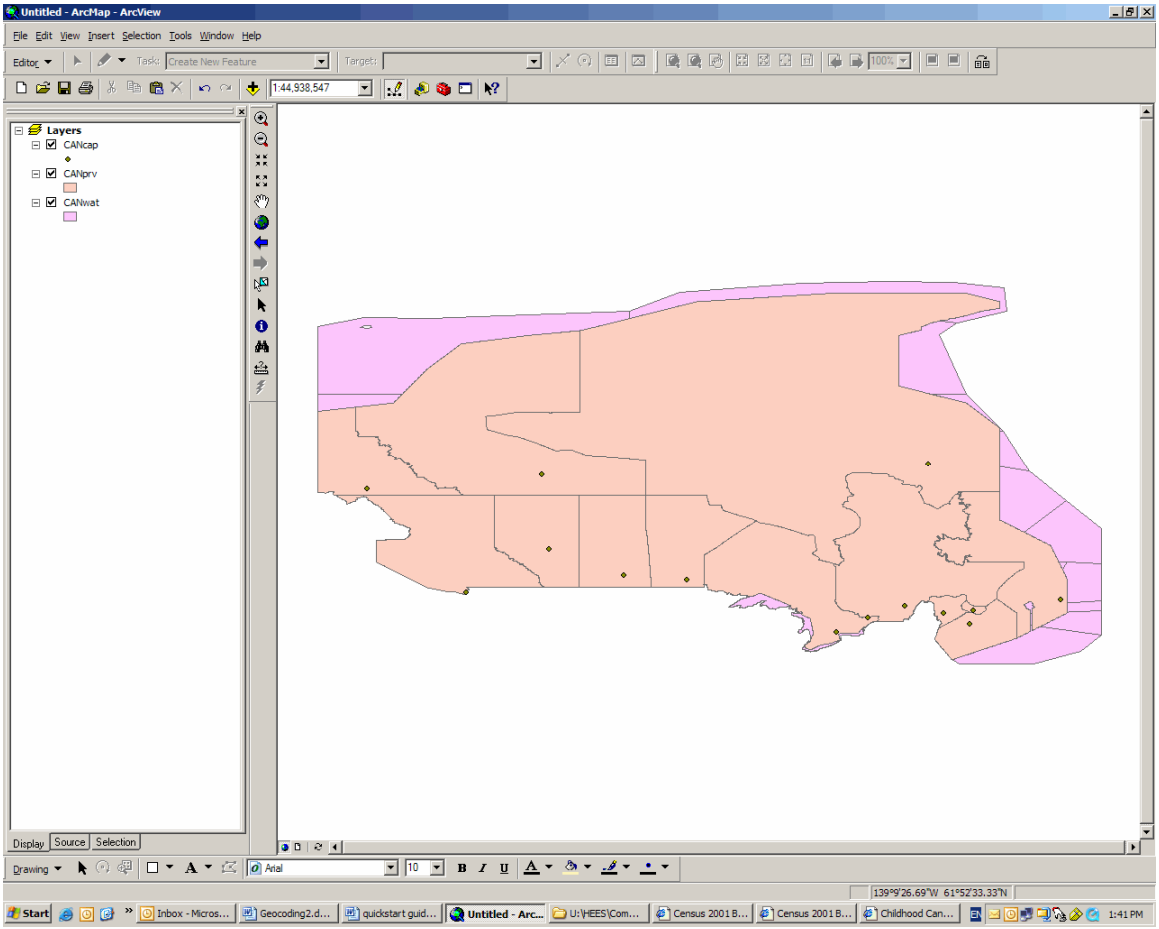
5. Navigate to where your data is stored using the drop-down menu at the top of the box.



The .shp suffix indicates that these are "shapefiles", the format used by ArcGIS for raster data. Layer files have the suffix .lyr. These files contain specified colors and representations, whereas the shapefiles contain the actual data. In this exercise (and for most ArcGIS work), shapefiles are the best format to use.

The symbols preceding the name of the file shows which format the file is in. Cities will appear as points. Provinces and water will appear as polygons. Drainage, rivers, and roads, if these files were available, will appear as lines. Hold down the shift button and select all of the shapefiles. Click Add.

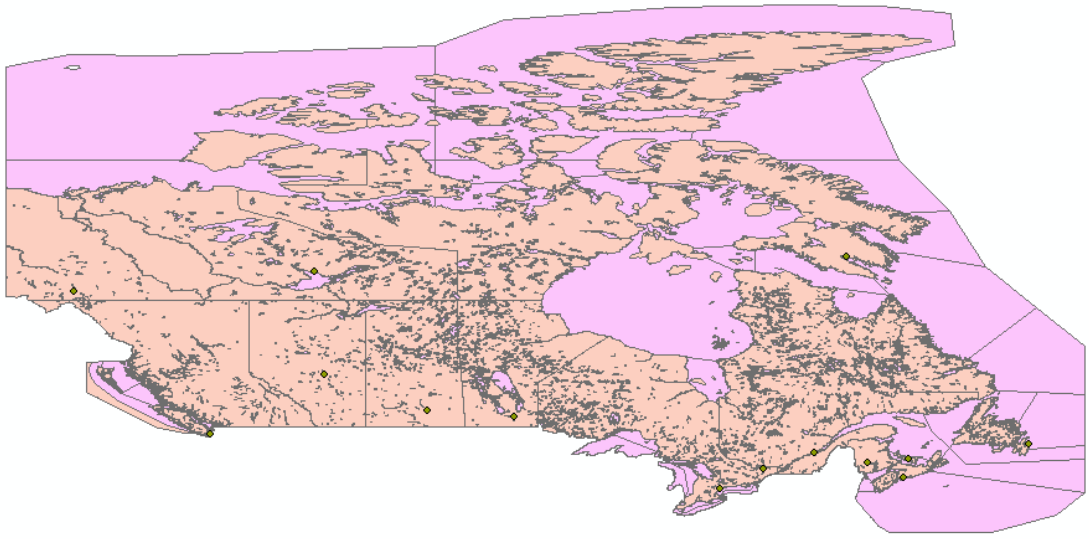
You now have a map of Canada:



Ordering Layers

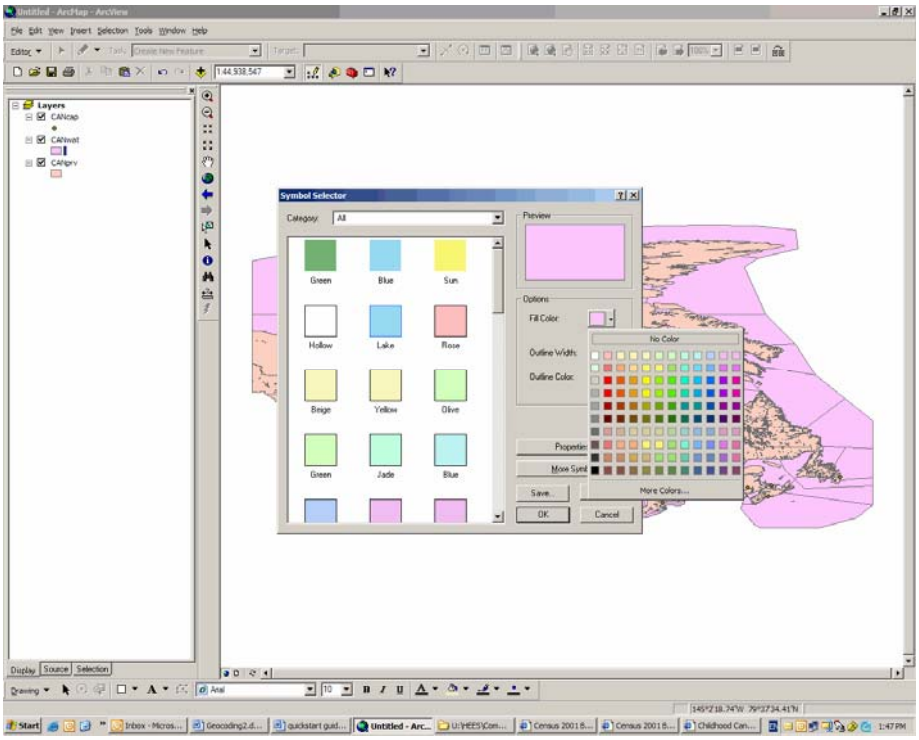
The column on the left-hand side is called the Table of Contents and it displays a list of the layers in the map. The layers can be turned on or off by checking or unchecking the box next to the name. The order of the layers can also be changed by dragging the files up or down within the index.

The map looks strange because the land file does not include the water, and the water file is behind the land file. First, make sure the "Display" tab is selected at the bottom of the Table of Contents. Click on the CANwat file (the water file) in the left hand column and drag it so that it is listed above the CANprv (the province file) layer. The points which represent the capital cities can remain on top. This is the result:

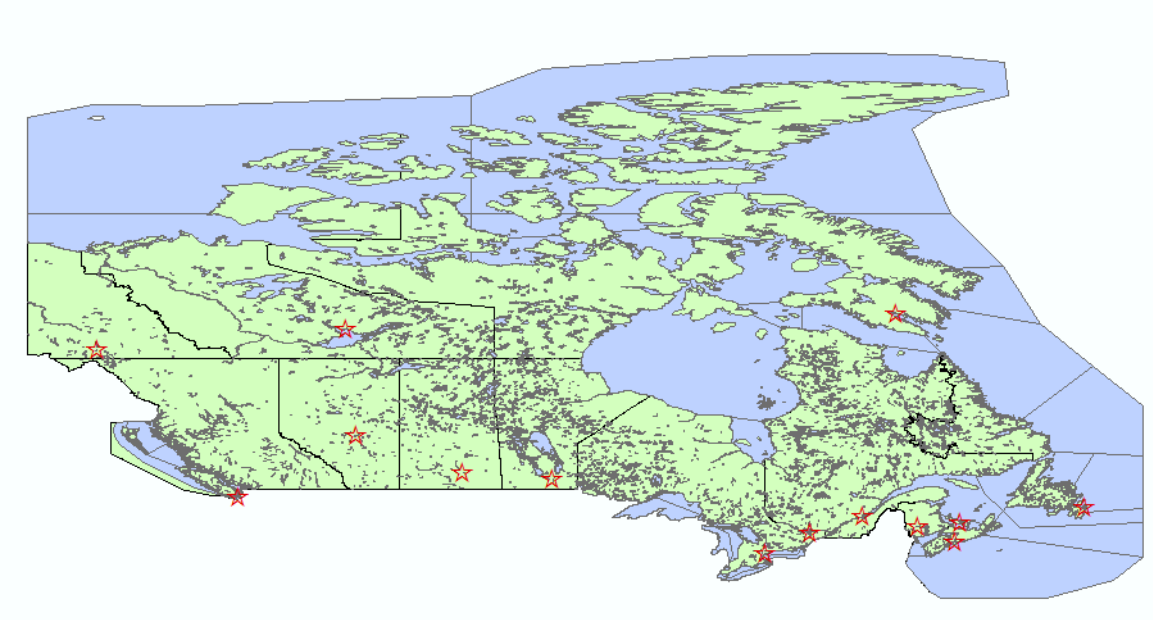


Changing colors and symbols

ArcGIS randomly chooses colors for its layers. Your map will probably have different colors than this example, but the pink and orange in this map are difficult to look at. Click on the box just below the CANwat layer. The Symbol Selector menu will appear. You can change the color by selecting a box from the left hand side of the menu, or by clicking on down arrow next to the Fill Color box. A menu of colors will appear from which you can select.



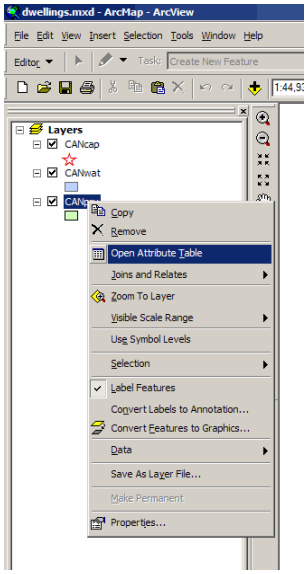
Turn the water blue and the land mass green or brown (or whatever you choose). The symbol for the cities can also be changed using the same menu. The result is a better map than the pink and orange image seen previously.



Moving around the map
The following tools are used to change which portion of the map you want to see:

Zoom in—use this tool to click on or draw a box around an area you want enlarged
Zoom out—use this tool to click on or draw a box around an area you want reduced
Fixed zoom in—zooms in toward the center of the screen
Fixed zoom out—zooms out from the center of the screen
Pan—"pulls" the image without changing the scale
Full extent—shows the full image of all the layers in the map
Go to Previous extent—changes the map back to the last view of the map
Go to Next extent—allows you to navigate forward to a different view
Select features—highlights a feature on the map and in the table
Select element—allows you to move elements such as text boxes, pictures, etc.
Identify—reveals information "hidden" in the data file
Find—finds a location and will zoom to it or mark it with a point
Measure—measures the distance between two points
Hyperlink—this button is usually not activated unless there is a link associated with a layer

Any further manipulation of the map depends on the data within each shapefile. Right click on the name of a layer and select Open Attribute Table.



A table like this will appear:

Attributes of CANprv

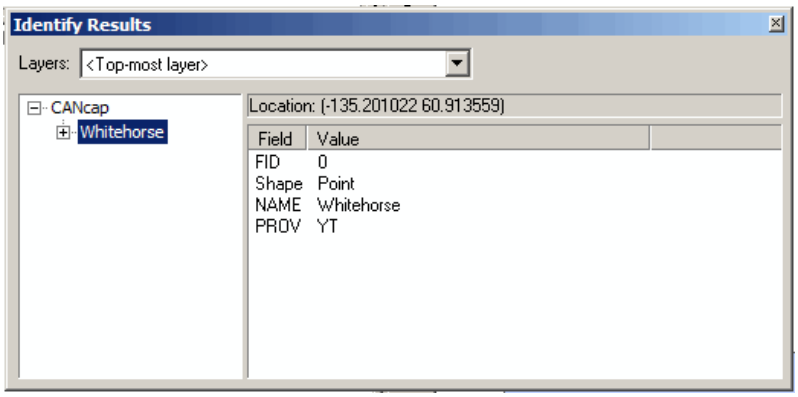
FID	Shape*	NAME	POP2001	DWELL2001	AREA_SQKM	POP_SQKM	PROV
0	Polygon	Newfoundland and Labrador	512930	227570	370501.6897	1.3844	NL
1	Polygon	Prince Edward Island	135294	55992	5684.3925	23.801	PE
2	Polygon	Nova Scotia	908007	403819	52917.4284	17.1589	NS
3	Polygon	New Brunswick	729498	313609	71355.6695	10.2234	NB
4	Polygon	Québec	7237479	3230196	1357743.0849	5.3305	QC
5	Polygon	Ontario	11410046	4556240	907655.5945	12.5709	ON
6	Polygon	Manitoba	1119583	477085	551937.867	2.0285	MB
7	Polygon	Saskatchewan	978933	431628	586561.3528	1.6689	SK
8	Polygon	Alberta	2974807	1171841	639987.1217	4.6482	AB
9	Polygon	British Columbia	3907738	1643969	926492.4782	4.2178	BC
10	Polygon	Yukon Territory	28674	13793	474706.9707	0.0604	YT
11	Polygon	Northwest Territories	37360	14669	1141108.3662	0.0327	NT
12	Polygon	Nunavut	26745	8177	1925460.1818	0.0139	NU

Record: 1 Show: All Selected Records (0 out of 13 Selected.) Options

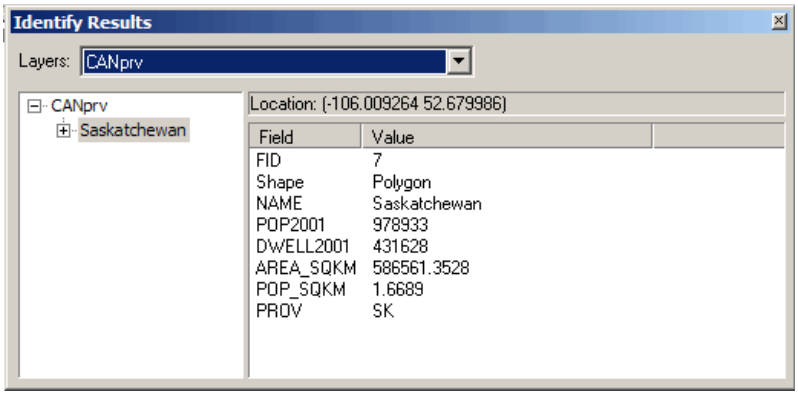
In this file, there is data for the population in 2001, the number of dwellings, area in square miles, the population per square mile, and the name of each province. The information in the attribute table can be represented and visually on the map.

Identifying map features

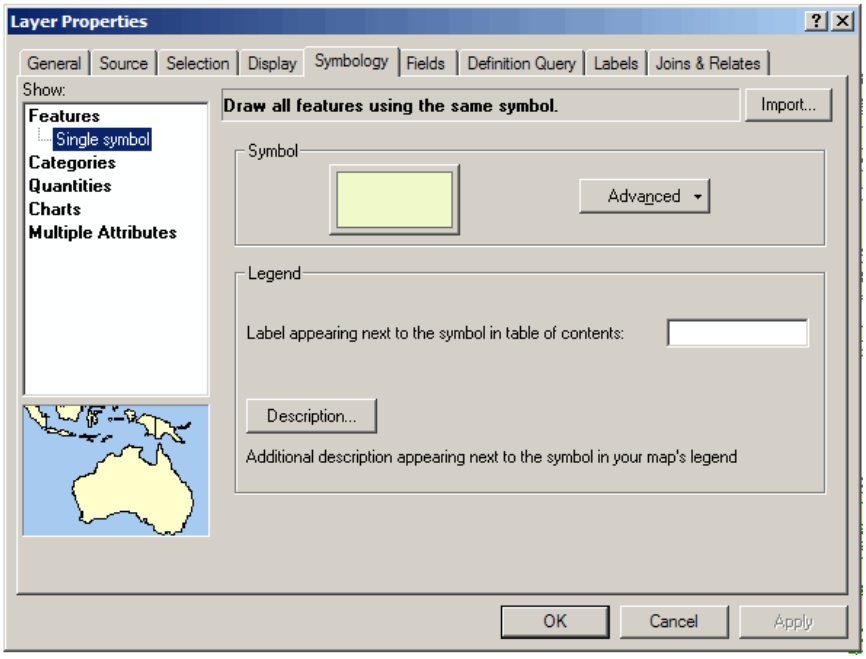
Click on the Identify tool . Clicking with this tool on any part of the map will open a box with information about the shape or point you chose. For example, clicking on the red star in the western-most part of the country brings up this box:



Try clicking on other parts of the map. Changing the settings in the top of the box will allow you pinpoint exactly which layers you want to identify. For example, by choosing the province layer, you will not accidentally bring up any information about bodies or water or capital cities. The identify results for Saskatchewan show all the information listed in the table for that province, such as the population in 2001 and the area in square kilometers:



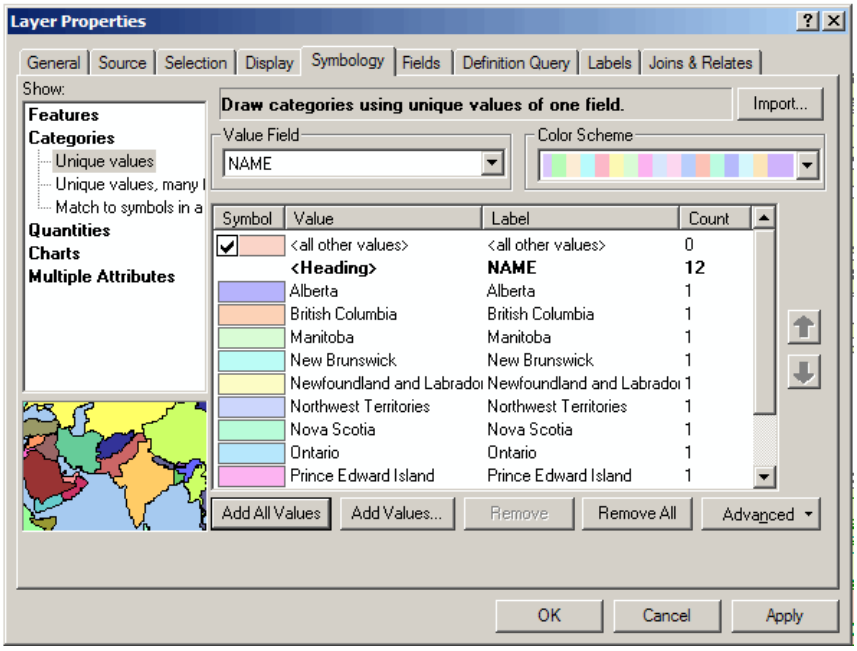
The information in the tables can also be displayed graphically. This is one of the most popular and useful applications of a GIS. To do so, right-click on a layer and select "Properties…". This menu will appear:



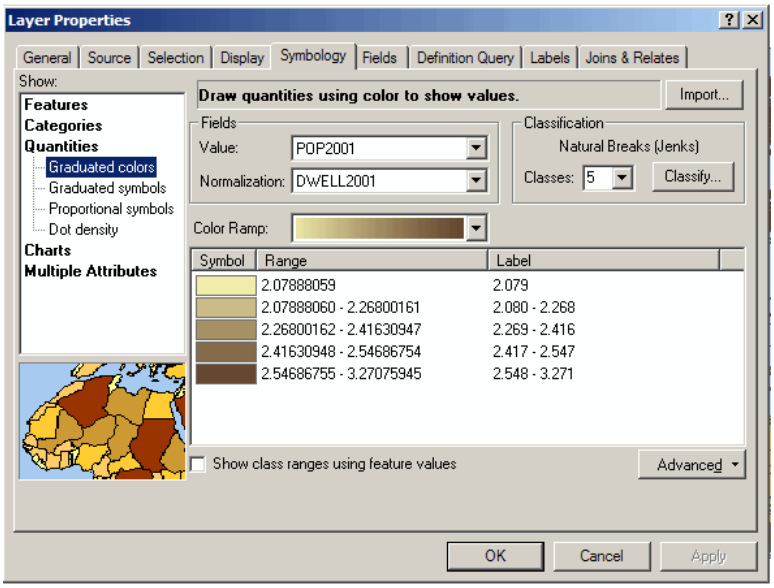
The symbology tab allows you to change the display of each layer, just as you did before by clicking on the symbol for each layer. Under Features→Single Symbol, the color and representation of points, lines, or polygons can be changed. For example, you might want to change the colors so that rivers are blue, cities are represented by stars, and roads are black.

By selecting Categories→Unique values, you can give each category within a file a different color or representation. Choose the field you want to represent from the Value Field menu and click Add All Values.

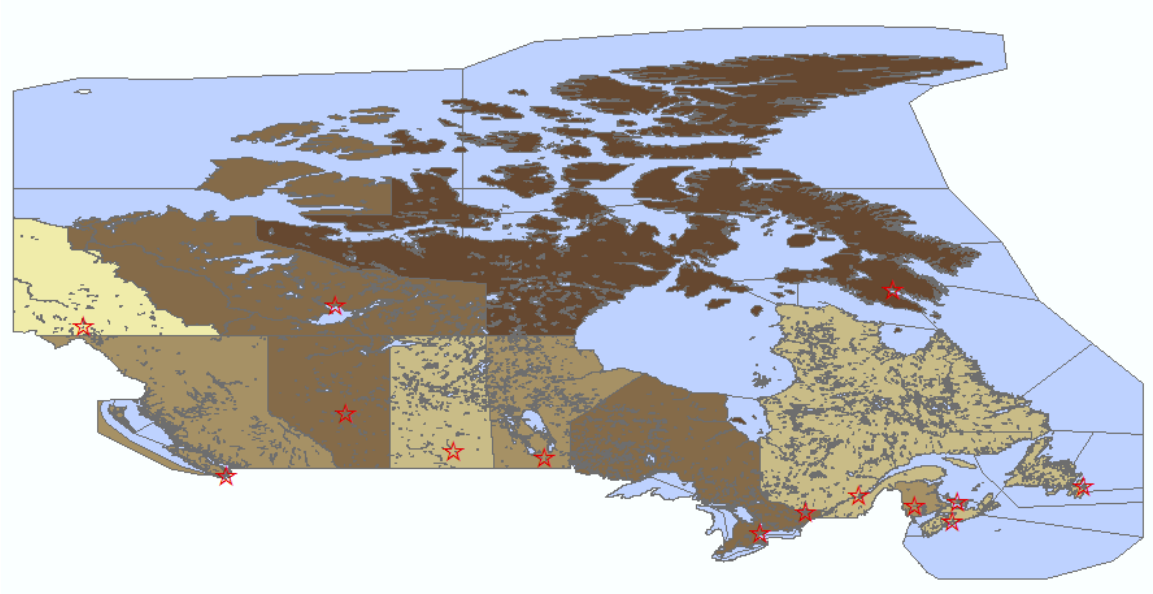
In this example, each province will be given a unique color. The colors can be changed by choosing a different scheme from the drop-down menu, or by individually clicking on each box to the left of the heading name.



By choosing Quantities→Graduated colors you can display the quantitative data associated with the file. In the Value field, select the data you want represented. In the Normalize By, you can select any other variable available to make a simple ratio. In this example, Population is normalized by Dwellings to reveal the average number of people to a dwelling in each province. The classification/natural breaks box allows you to choose how many categories (i.e., shades of brown) you want to display.



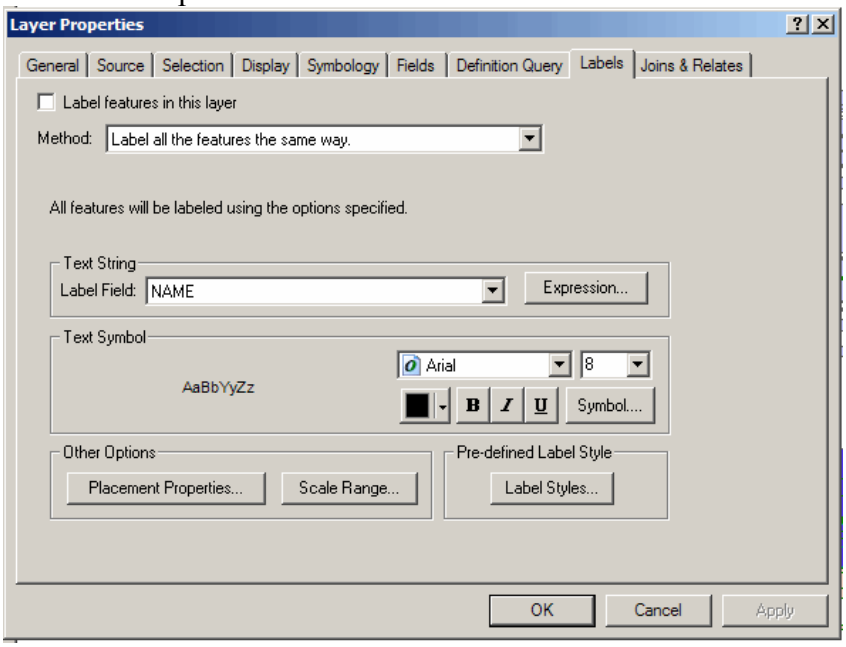
This is the result:



This reveals that there are more people living in each dwelling in Nunavut than in any other part of Canada.

Labeling Features

Also in the properties menu is the Labels tab. Select this tab. In the upper lefthand corner, select "Label features in this layer". This box will allow you change the font and font size and the label style. The "Other Options" box allows you to set parameters for whether labels will overlap or not.



After choosing Label Styles→Properties→Symbol Properties→Properties→Mask (quite a long way to go), there is the Halo option which allows you to put a halo of color around the label. There are many other options available. Explore the various menu options and have fun making a unique map.

There are many more ways in which data can be displayed spatially. Recommended resources for learning more about the ArcGIS software are:

Getting to know ArcGIS desktop : basics of ArcView, ArcEditor, and ArcInfo. Tim Ormsby ... [et al.]. Redlands, Calif.: ESRI Press, 2004.Gorr, WL and Kurland, KS.

GIS tutorial : workbook for ArcView 9. Wilpen L. Gorr, Kristen S. Kurland. Redlands, Calif.: ESRI Press, 2005.

Both books are available on a three-hour loan at the GIC.

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