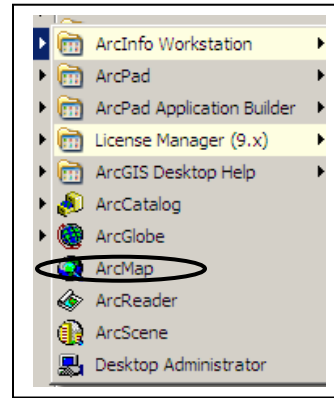


Exercise 1: Working with ArcMap 9.1

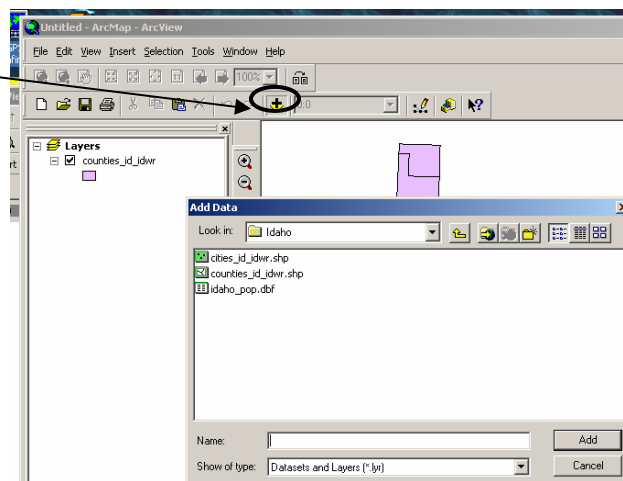
This introductory lab will help you become familiar with the ArcMap interface and tools. You will learn how to add data, modify symbology, add labels, work with tabular data, join tables, perform queries and create map payouts.

Add Data

Step 1: Start ArcMap (in the ArcGIS menu) and begin a new empty map.



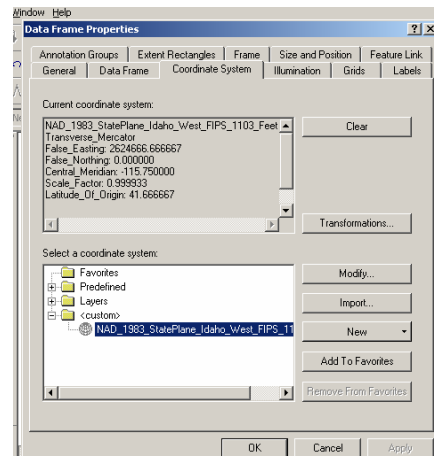
Step 2: Click the 'Add Data' icon and browse to c:\NR402\Idaho. Choose the data layer *counties_id_idwr*



Data Frame Properties

Right-click on 'Layers' at the top of the table of contents, then select 'Properties' to view the data frame properties.

NOTE: *The FIRST layer added to the data frame will define the map projection for the data frame. Additional layers will be 'projected on the fly' to match the data frame projection (if they have a map projection defined). If a data layer projection is not defined you will get a warning message telling you that the projection is not defined and the data may not line up with other data in the view.*



Description of tabs in Data Frame Properties

General – Describes the data frame name, map and display units.

Data Frame – Gives the user the option to specify an extent or scale for data display.

Coordinate System – Describes the current map coordinate system of the data frame (map projection). *The FIRST layer added to the data frame will define the map projection for the data frame.* Additional layers will be ‘projected on the fly’ to match the data frame projection (if they have a map projection defined).

Illumination – Sets the illumination of the data frame

Grids – Adds grids or graticules to a map layout. Graticules are map coordinate grids or tic marks labeled with current map coordinates.

Labels – Defines label priorities between data layers in the data frame.

Annotation Groups –

Extent Rectangles – An extent rectangle shows the extent of the data in one of the other frames and automatically updates if the extent changes. Useful for making locator maps.

Frame – Gives the user options to modify the neat line around the data frame in the map layout.

Size and Position – Specify the size and position of the data frame

Feature Link – Specify how links between vertices and survey data will be drawn by the Survey Analyst Extension.

Each data layer in the table of contents also has Properties. Right-click on the layer to view the Layer Properties.

Description of tabs in Layer Properties

General – Describes the layer name and specifies the range of scales the layer will be shown within.

Source – Location of data set on the computer; map coordinate system

Selection – Specify the symbol used for selected features of this data layer

Display – Transparency; Hyperlinks; Feature exclusion

Symbology – Legend editor

Fields – Attributes in the data set

Definition query – Gives the option to only show a selected part of the data layer

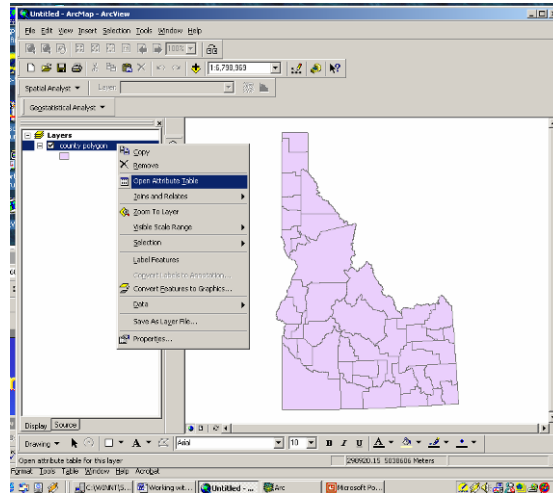
Labels – Options to change labeling methods and fields

Join & Relates – Lists tables that has been joined or related to this layer

Open Attribute Table

Step 3: The Idaho counties will appear in a single symbol.

Right-click on the *counties_id_idwr* layer and select *Open theme table*



Attribute table of Idaho counties.

Each polygon in the spatial dataset corresponds to a line in the attribute table.

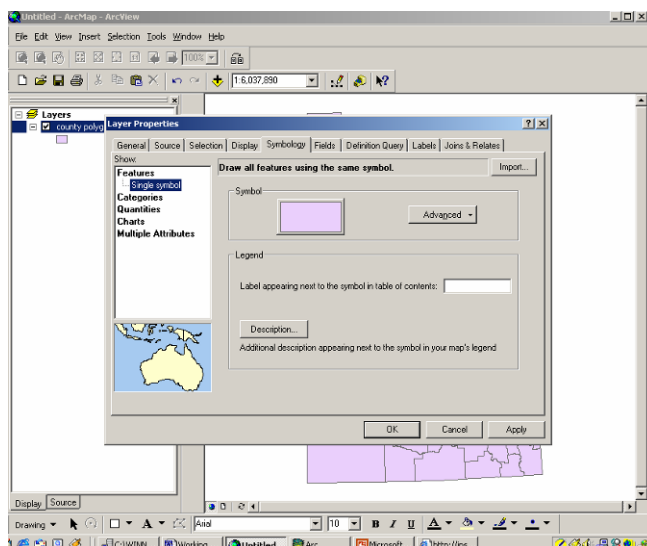
Each polygon may have many attributes describing the properties of the polygon, for example area, county name, population etc.

FID	Shape*	AREA	PERIMETER	COUNTY#	COUNTY-ID	NAME	REGION	INTERE	ACRES
1	Polygon	3305659056	255488.203125	2	1	BOUNDARY	PANHANDLE	5	795
2	Polygon	4964624304	277512.40625	2	2	BONNER	PANHANDLE	1	1120
4	Polygon	6040681472	482882.56875	4	3	SHOSHONE	PANHANDLE	0	1570
5	Polygon	3387643904	249334.328125	5	4	KOOTENAI	PANHANDLE	5	777
6	Polygon	2032925056	199165.625	6	5	BENEWAH	PANHANDLE	5	468
7	Polygon	2785770944	236528.734375	7	6	LATAH	CLEARWATER	5	628
8	Polygon	6442261504	426477.78125	8	-1	CLEARWATER	CLEARWATER	0	1470
9	Polygon	22007319520	861503.4375	9	8	IDAHO	CLEARWATER	3	9265
10	Polygon	2213071616	281817.59375	10	-1	NEZ PERCE	CLEARWATER	3	520
11	Polygon	1243284480	227375.546875	11	10	LEWIS	CLEARWATER	3	288
12	Polygon	11848057536	775617.0625	12	11	LEMHI	EASTERN	1	2271
13	Polygon	3544663552	312910.63125	13	12	ADAMS	SOUTHWEST	0	811
14	Polygon	9670873680	528801.3125	14	13	VALLEY	SOUTHWEST	5	2222
15	Polygon	12793611936	729164	15	14	CLUSTER	EASTERN	5	2938
16	Polygon	4922100096	390648.2125	16	16	FREMONT	EASTERN	1	1122
17	Polygon	3813502464	296072.21875	17	15	WASHINGTON	SOUTHWEST	5	878
18	Polygon	4983909376	387768.625	18	17	CLARK	EASTERN	5	1065
19	Polygon	1461223168	247787.875	19	18	DEM	SOUTHWEST	5	338
20	Polygon	4937164768	423880.8125	20	19	BOISE	SOUTHWEST	5	1122
21	Polygon	5884067040	401262.625	21	20	BUTTE	EASTERN	0	1322
22	Polygon	2899118464	263680	22	23	JEFFERSON	EASTERN	0	658
23	Polygon	1061658824	170669.578125	23	21	PAVETTE	SOUTHWEST	5	242
24	Polygon	1170082560	166890.71875	24	24	TETON	EASTERN	5	288
25	Polygon	8031960768	542691.125	25	22	ELMORE	SOUTHWEST	5	1842

Edit Legend

Step 4: Double click on *counties_id_idwr* to start the Legend Properties window

You can also start the Legend Properties by right-clicking on the *counties_id_idwr* layer – then select Properties.

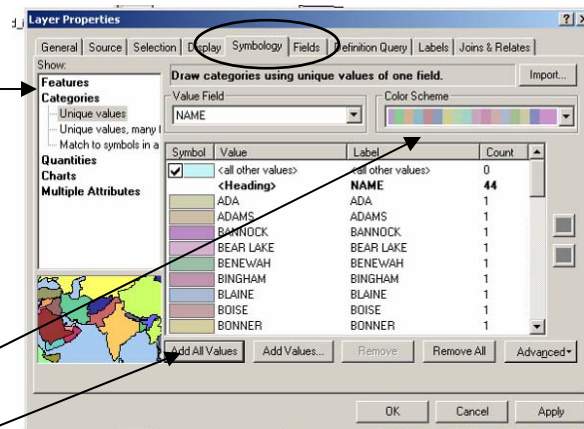


Step 5: Click on the Symbology tab to edit the display of the counties. Select Categories instead of Single Symbol to enable display of the counties in different colors

Choose Value Field NAME to display the counties by their names.

Select a color scheme

Click Add All Values
Click OK



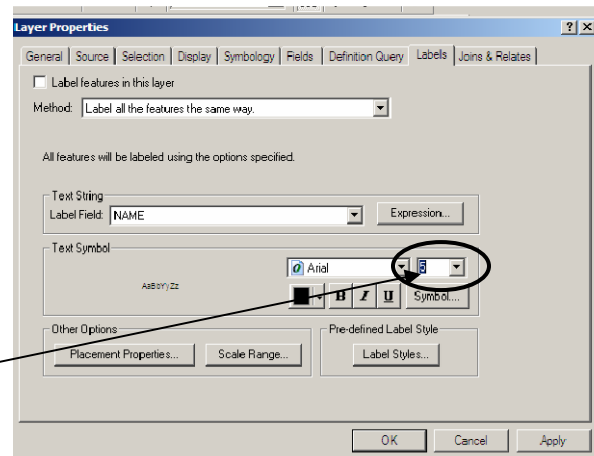
Add Labels

Step 6: Bring up the Layer Properties again. Go to the Labels tab.

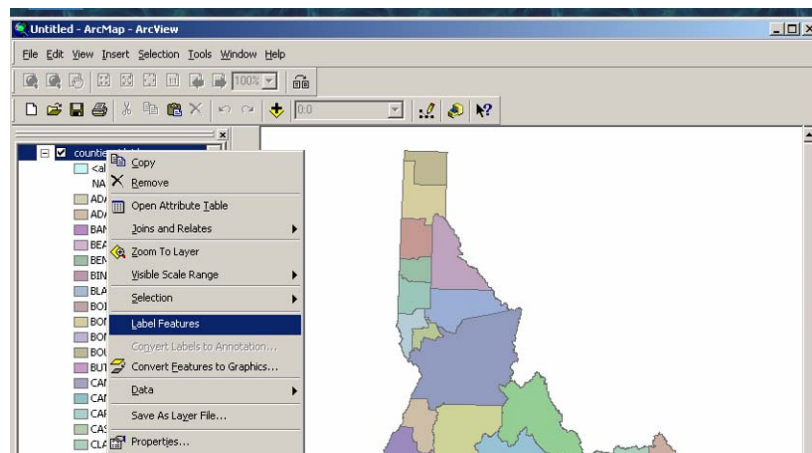
Set the label field to NAME (the county names).

Change the symbol size to 5

Click OK.



Step 7: Right-click on the county layer and select Label Features to display the county names on the map.

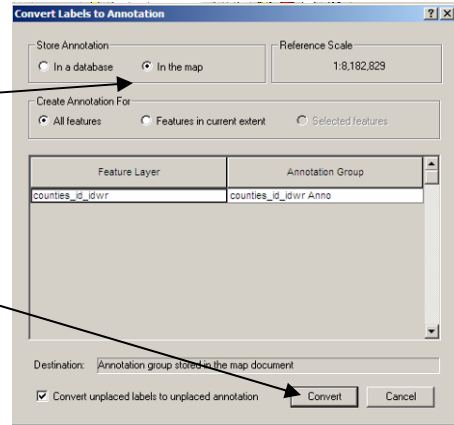


Step 8: It would be desirable to move some labels to make them more readable. Before you can move labels you must convert the labels to an annotation layer.

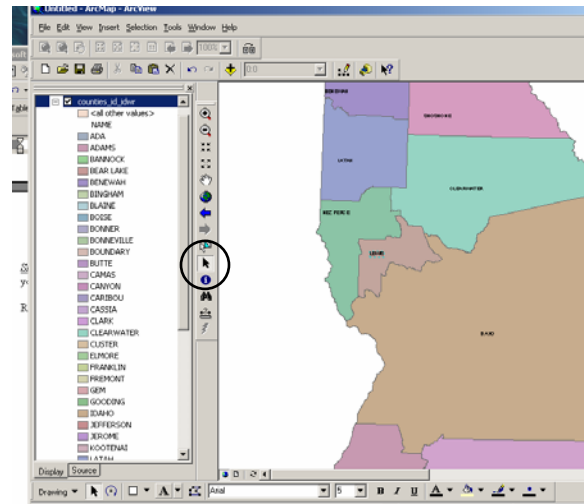
Right-click on *counties_id_idwr* and select *Convert Labels to Annotation*

Store the annotation in the map.

Click 'Convert'.



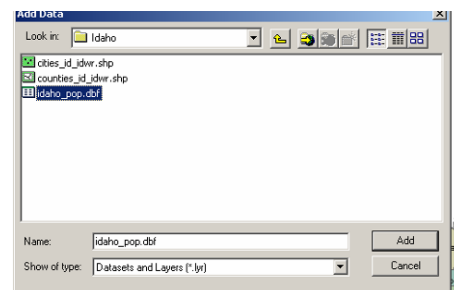
Step 9: Click on the 'pointer arrow'. You can now select and move individual labels for better placement. If you double-click on a label you can modify the text as desired.



Joining and Linking Tables

In this example we will link population information to the county data in order to display Idaho based on population count. The table *idaho_pop.dbf* contains information about county population in 1990 and 1997.

Step 10: Click on the Add Data icon and select *idaho_pop.dbf*



Step 11: Open the table Idaho_pop.dbf and also the attribute table for the Idaho counties.

The two tables can be joined on the county name in upper case font.

Notice that the spelling of the county names must be identical in the two tables – otherwise the tables will not join properly.

FID	Shape	AREA	PERIMETER	COUNTIES	COUNTIES_I	ACRES	NAME	REGION
0	Polygon	2788678656	236652.937	2	6	689090.1	LATAH	CLEARWATER
1	Polygon	9671461888	528611.187	3	13	2389844.5	VALLEY	SOUTHWEST
2	Polygon	4913488384	389919.437	4	16	1214136.4	FREMONT	EASTERN
3	Polygon	4570373632	387190.406	5	17	1129351.8	CLARK	EASTERN
4	Polygon	4938266112	423078.687	6	19	1220259	BOISE	SOUTHWEST
5	Polygon	5791139840	400913.656	7	20	1431006.4	BUTTE	EASTERN
6	Polygon	2786695424	282577.937	8	28	688600	CAMAS	MAGIC VALLEY
7	Polygon	2745124352	230892	9	29	678327.7	ADA	SOUTHWEST
8	Polygon	4921038848	372116.437	10	31	1216002.1	BONNEVILLE	EASTERN
9	Polygon	5485239296	400896.062	11	32	1355417.5	BINGHAM	SOUTHWEST
10	Polygon	3119968256	239899.422	12	35	770952.6	LINCOLN	MAGIC VALLEY

OID	NAME	STATE_FIPS	CNTY_FIPS	FIPS	POP1990	POP1997	NAME_UP
0	Ada	16	1	16001	205775	266546	ADA
1	Adams	16	3	16003	3254	3959	ADAMS
2	Bannock	16	5	16005	66026	74490	BANNOCK
3	Bear Lake	16	7	16007	6084	6584	BEAR LAKE
4	Benewah	16	9	16009	7937	9127	BENEWAH
5	Bingham	16	11	16011	37583	41681	BINGHAM
6	Blaine	16	13	16013	13952	17372	BLAINE
7	Boise	16	15	16015	3509	5027	BOISE
8	Bonner	16	17	16017	26622	34878	BONNER
9	Bonneville	16	19	16019	72207	80134	BONNEVILLE

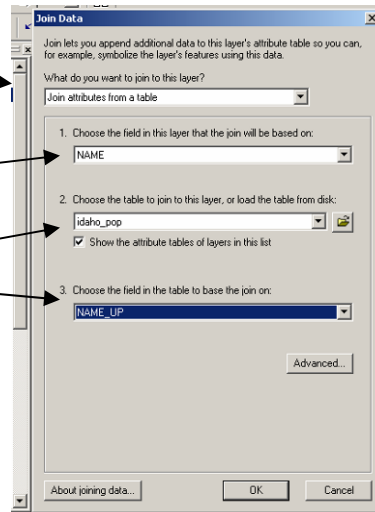
Step 12: Close tables. Right-click on county_id_idwr and select Joins and Relates - Join.

Step 13: On the first line select option: Join attributes from a table.

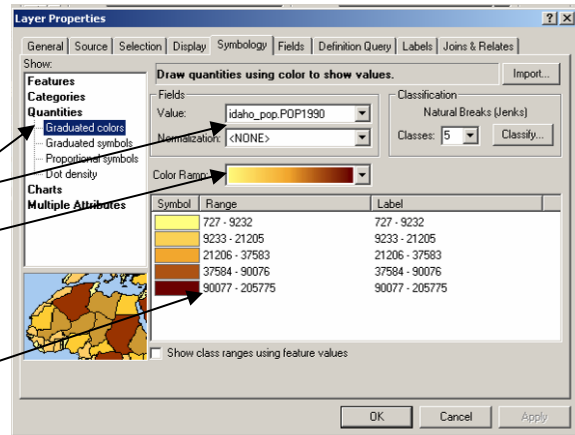
We will join based on the attribute NAME.

We will join to Idaho_pop and use the attribute NAME_UP in that table. OK. Select YES to Indexing.

Open the county attribute table to confirm that the join was successful.



Step 14: Use the Layer Properties (the Symbology tab) to display Idaho counties with graduated colors (in the Quantities menu) based on the population in 1990. Choose a color ramp. You can manually modify colors, number of classes and class breaks.



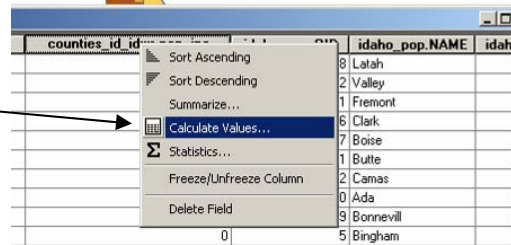
Edit Attribute Tables

In this section we will add an attribute to the county attribute table that shows percent population increase from 1990 to 1997.

Step 15: Open the attribute table to the counties_id_idwr. Select *Options* in the lower right corner. Select *Add field*.

Name the new field *pop_inc*. Type: *float* Precision: *6*; Scale; *1*

Step 16: Right-click on the new field name in the table and select *Calculate field values*.
It is OK to calculate the new values outside of an editing session.

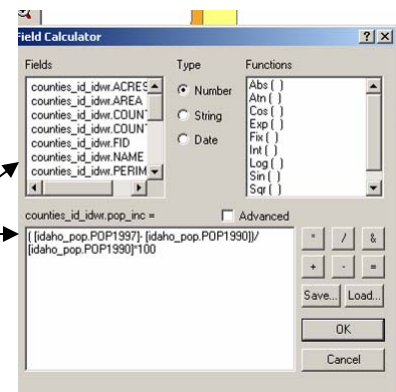


Step 17: In the field calculator add the expression:

$100 * ([idaho_pop.POP1997] - [idaho_pop.POP1990]) / [idaho_pop.POP1990]$

Rather than typing 'idaho_pop.POP1997' etc. – select from the 'Fields' list.

The percent population increase by county will be calculated and stored in the database.

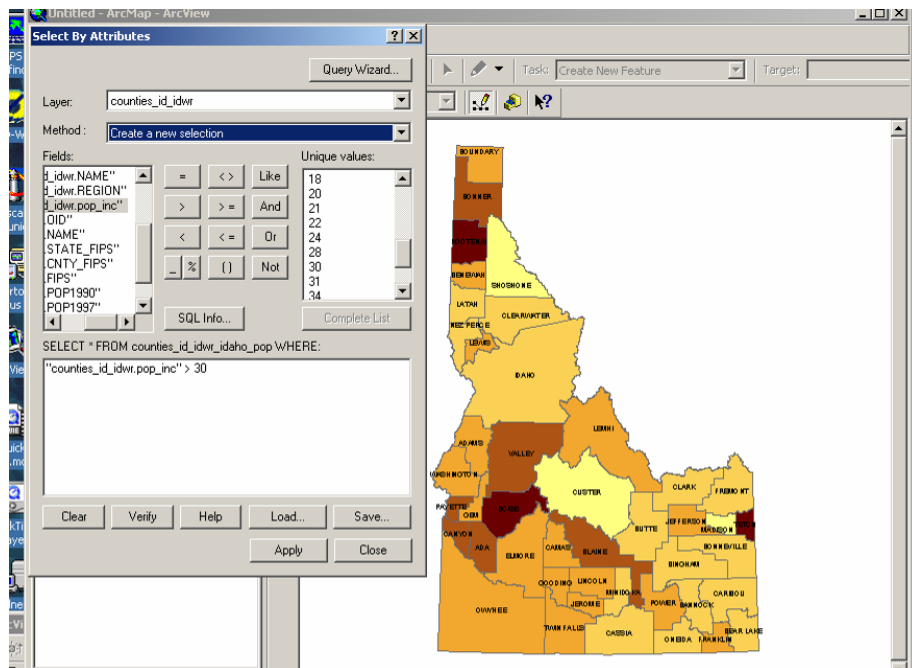


Step 18: Display Idaho counties using the new attribute population increase from 1990 to 1997.

Query

As an example of a Query, query for the counties with more than 30% growth.

Step 19: Choose *Select by attribute* under *Selection* in the main menu.



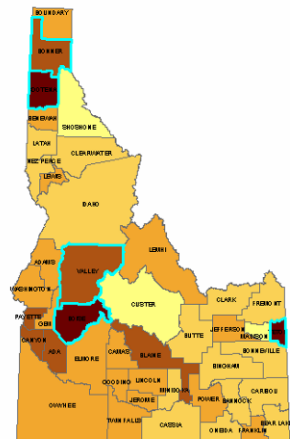
Step 20: Select *pop_inc* greater than 30%. Click OK. The counties with more than 30% population growth will be selected (appear with a blue outline).

Your selected counties can be saved in a separate shapefile. Save the selection in a new shapefile by right-clicking on the county layer – choose *Data – Export Data*.

(if you instead chose *Create Layer from Selected Feature*, a new shape file will NOT be created, simply a data subset that is tied to the original shapefile. The layer file cannot be used by itself, but must always be in the same folder as the original shapefile)

Specify a location and name for the new shapefile. You can 'turn off' the new shapefile if you wish.

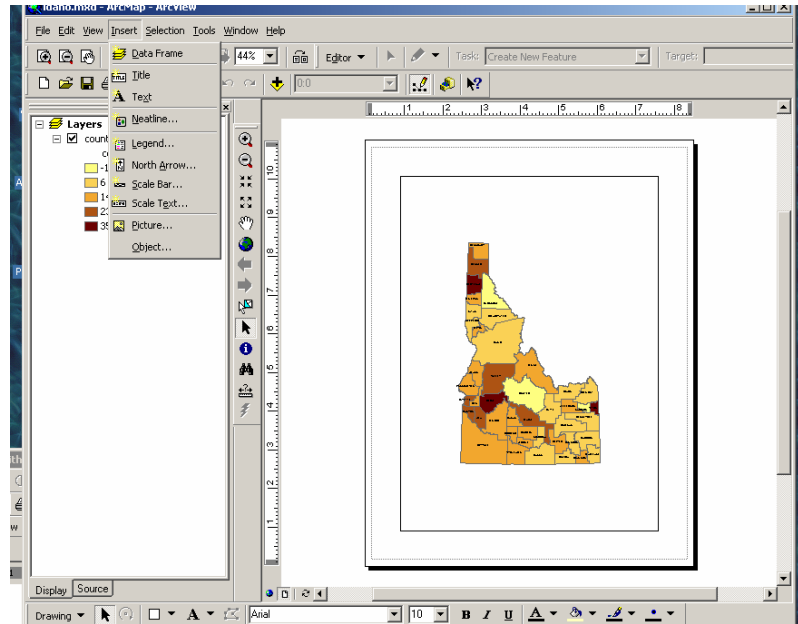
Clear selection: Right-click on the county layer – choose *Selection – Clear Selected Features*.



Step 21: Put the view frame in Layout mode.

Using the options in the Insert menu you can now add scale bar, north arrow, text and more data frames.

Add a north arrow to the layout.



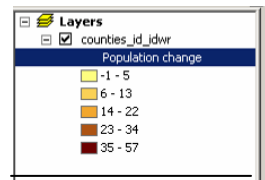
Step 22: In order to add a meaningful scalebar you must first specify the map units for the data frame. The county shapefile is projected in Idaho Transverse Mercator Projection and the map units are meters. We will talk more about map projections in week 2 of this course.

Select *Data Frame Properties* in the *View* menu. Click the *General* tab. Specify **meters** for the map units.

Step 23: Add a scale bar to the layout.

Step 24: Add a title to the layout: “ Population change by county in the state of Idaho 1990 to 1997”

Step 25: Add a legend to the layout.
Before you add the legend – change the name of the layer to ‘Population change’



Step 26: Add information about the data source. The data source information is here given in the box below:

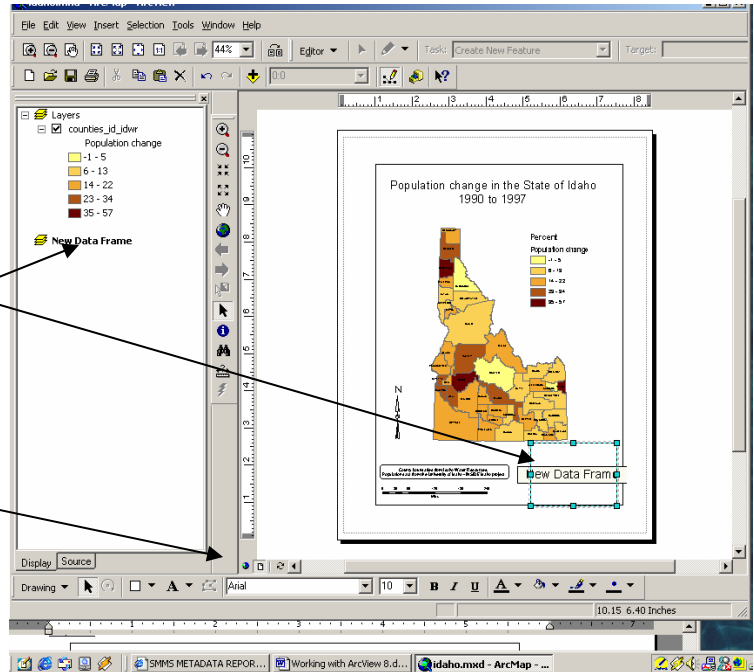
County boundaries from Idaho Water Resources. Population data from the University of Idaho Library – INSIDE Idaho project.

You can put a neat line around the text by selecting Neatline in the Insert menu.

Step 27: As the last item we will add a locator map showing the location of Idaho in the continental United States. Select *Data Frame* in the insert menu.

A new data frame will appear in the layout and also in the layer table.

With the new data frame active click on the *Data View* icon.



Step 28: Add the states using the ESRI data that comes with ArcView.

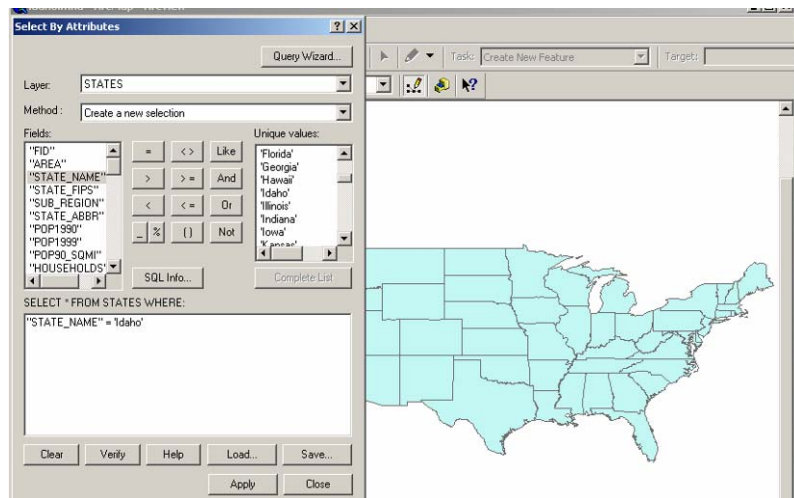
C:/ESRI/ESRIDATA/USA/STATES

Zoom to the continental US. All the states are showing with a single symbol – however we want to emphasize the location of Idaho on the USA map.

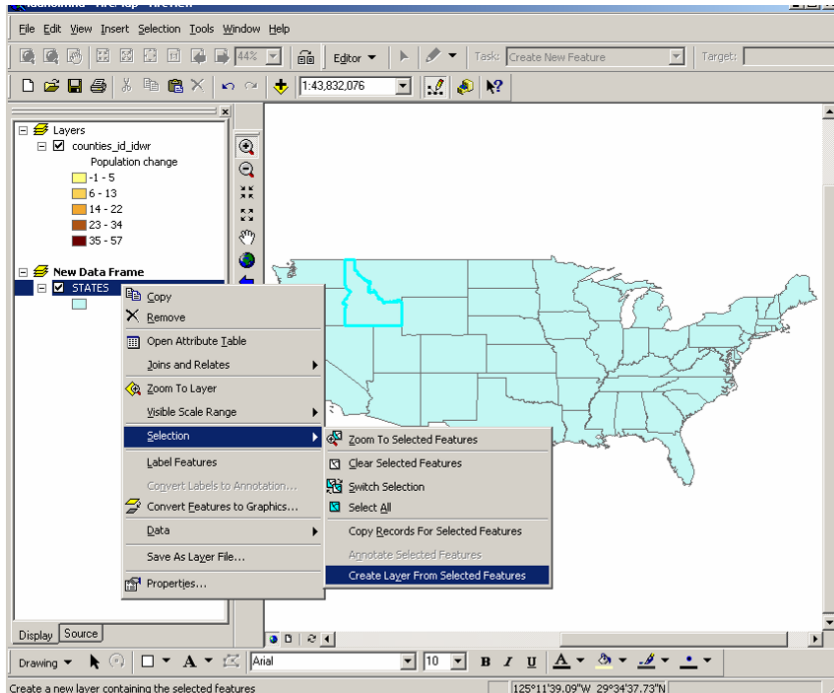
Step 29: Make STATES the active layer. Choose Select by attribute in the Selection menu.

Query for
STATE_NAME =
Idaho

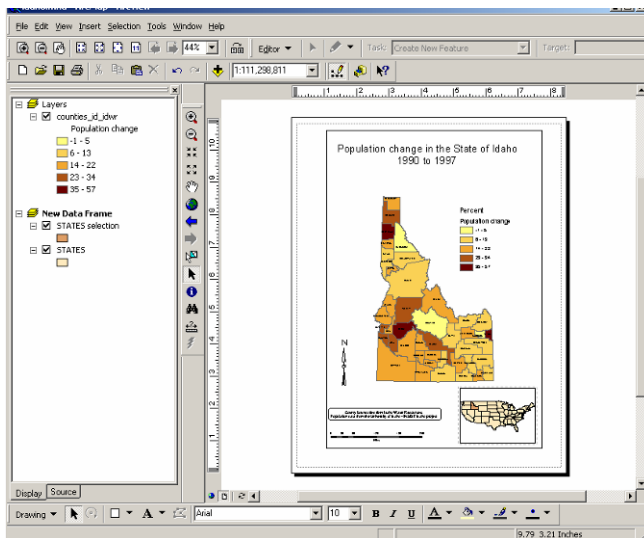
Apply then Close



Step 30: Right-click on STATES. Choose *Selection* then *Create Layer from Selected Features*. (or create a new shapefile by selecting *Data-Export data*)



Step 31: Select colors for the states and for Idaho. Go back to Layout mode and view your finished work.



In this exercise you learned how to work with vector data in ArcMap. You learned how to:

- Start a new ArcMap project
- Add data to an ArcMap project
- Understanding Dataframe Properties and Layer Properties
- View and edit tables
- Work with the Symbology in ArcMap
- Add labels to a map
- Query a GIS database and save the selection as a separate data layer
- Create a map layout
- How to export a map

Step 32: Save your map as a .jpg file by selecting *Export Map* in the *File* menu. Set the file type to .jpg and the resolution to 100 dpi. **This map is the deliverable for Exercise 1.**