

Introduction to ESRI's ArcGIS I
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2017 CSDE Workshop for EPI Scholars

The goal of these exercises is to give you a general overview of what ESRI's GIS software has to offer. Keep in mind we have only a limited amount of time, so our focus today will be breadth rather than depth! Don't worry, we'll offer more workshops in the future. Please feel free to **ask questions** as we proceed if something doesn't make sense, and certainly be vocal if find you've missed a step.

ArcGIS Applications Description



ArcCatalog (Storing GIS Data):

ArcCatalog allows the user to easily access and manage geographic data that is stored in folders on local disks or relational databases that are available on the user's network. Data can be copied, moved, deleted, and quickly viewed before it is added to a map. In addition, metadata can be either read or created using this ArcGIS application.



ArcMap (Mapping GIS Data):

ArcMap allows the user to display and query maps, create quality hardcopy maps and perform many spatial analysis tasks. ArcMap provides an easy transition from viewing a map to editing its spatial features.



ArcToolbox (Analyzing GIS Data):

ArcToolbox provides an environment for performing geoprocessing operations (i.e., operations that involve alteration or information extraction). Tools step the user through the many geoprocessing tasks. ArcToolbox is embedded in both ArcCatalog and ArcMap. *We won't use ArcToolbox in this exercise, but it will be important for most GIS analysis*

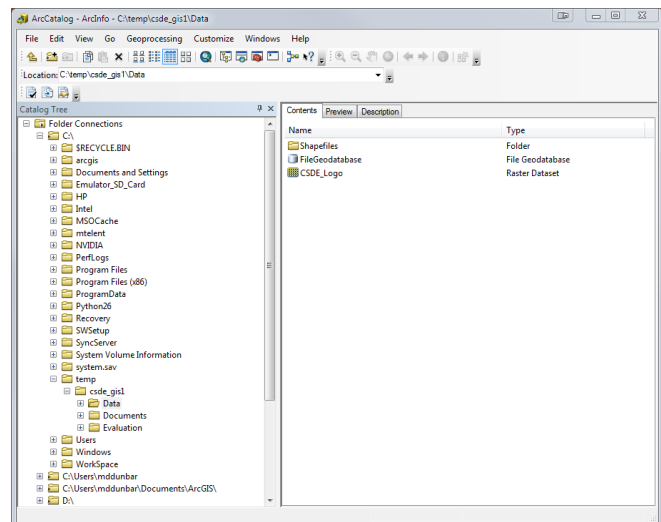
Exercise Download & Setup

1. **Open a Windows File Explore and Navigate to "C:\temp\".**
NOTE: This is the only location you can write files in the CSSCR computer Lab.
2. To avoid confusion, **delete any existing folders with names containing "csde" and "gis"**.
3. Go to the following web site: **<http://csde.washington.edu/>**. Navigate to **Training->Workshops**, and select the **"Introduction to GIS Workshop"** link, and then click the **EPI Scholars Part 1** link from the Materials section.
4. **Extract** the folder **"csde_gis1_EPI"** from csde_gis1_EPI.zip into the folder **"C:\temp\"**.

Exploring Data in ArcCatalog

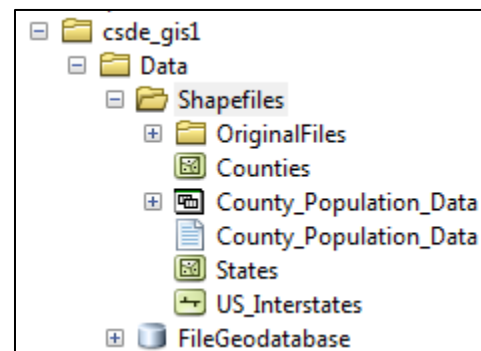
1. **Start ArcCatalog: Start>Programs>ArcGIS>ArcCatalog 10.** The ArcCatalog application window includes a catalog display that allows you to preview data, either spatially or as tables, a catalog tree for browsing the data, and several toolbars.
2. If the drive you would like to work from is not in the catalog tree on the left of the application, you can add it. Click the "Connect to Folder" Icon  on the main toolbar. Highlight your desired drive and select "OK". Your drive will now appear in the catalog.

3. We'll start by exploring the data you just copied to your H: drive.
Navigate to the "C:\temp\csde_gis1_EPI\Data\" in the catalog tree and highlight this folder.

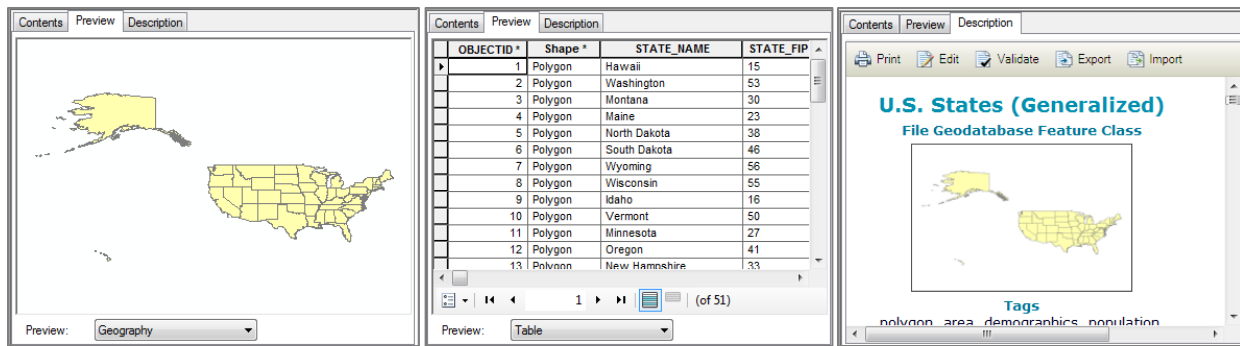


4. You will see two objects in the folder: "Shapefiles" and "FileGeodatabase.gdb." These are two copies of the same datasets, in different formats used by ArcGIS.
Start by **expanding the "Shapefile" folder in the Catalog tree.**

5. A shapefile dataset (.shp) is stored in a folder, is composed of geographic features and their attributes, and contains a single feature class. Points, lines, or polygons (areas) represent geographic features in a shapefile.



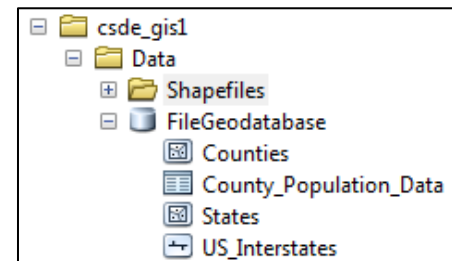
6. Our "Shapefiles" folder contains 3 shapefile datasets: Counties, States, and US_Interstates. Two of these shapefiles contain polygon features and one contains line features. The name of the files and the icons used to represent them should give this away.
7. There are also two tabular datasets in this folder: County_Populations_Data as an Excel and tab-delimited Text file. Please notice the "OriginalFiles" folder, containing a backup copy of all the data in case you need to start over later.



8. Next, we will look at the various ways to explore GIS data in the Catalog Display. **Click on States.shp** in the catalog tree. **Select the "Preview" Tab**. The geographic representation of the layer will now be visible.

9. At the bottom of the catalog display, there is a preview drop-down list. This allows the user to view either the geography or the associated attribute table for the data layer. **Select the "Table" option**. **Scroll through the table** to see the attributes contained within the counties layer. The only option available for Tabular data will be "Table".

10. Finally, click on the **"Description"** tab in the catalog display. Information about the data set (Metadata) is displayed (such as its coordinate system, its spatial extent, description of its attributes, and descriptive information about when and how the data was created). **Explore the other datasets in the "Shapefiles" folder** before moving on.



11. Now we'll look at another way of storing GIS data, the File Geodatabase. **Expand "FileGeodatabase.gdb" in the catalog tree**. Notice that the Geodatabase contains the same 3 geographic features as the shapefiles, and just one data table. The only difference in appearance is the grey icons.

12. Use ArcCatalog to **explore the geographic and table features in the geodatabase**.

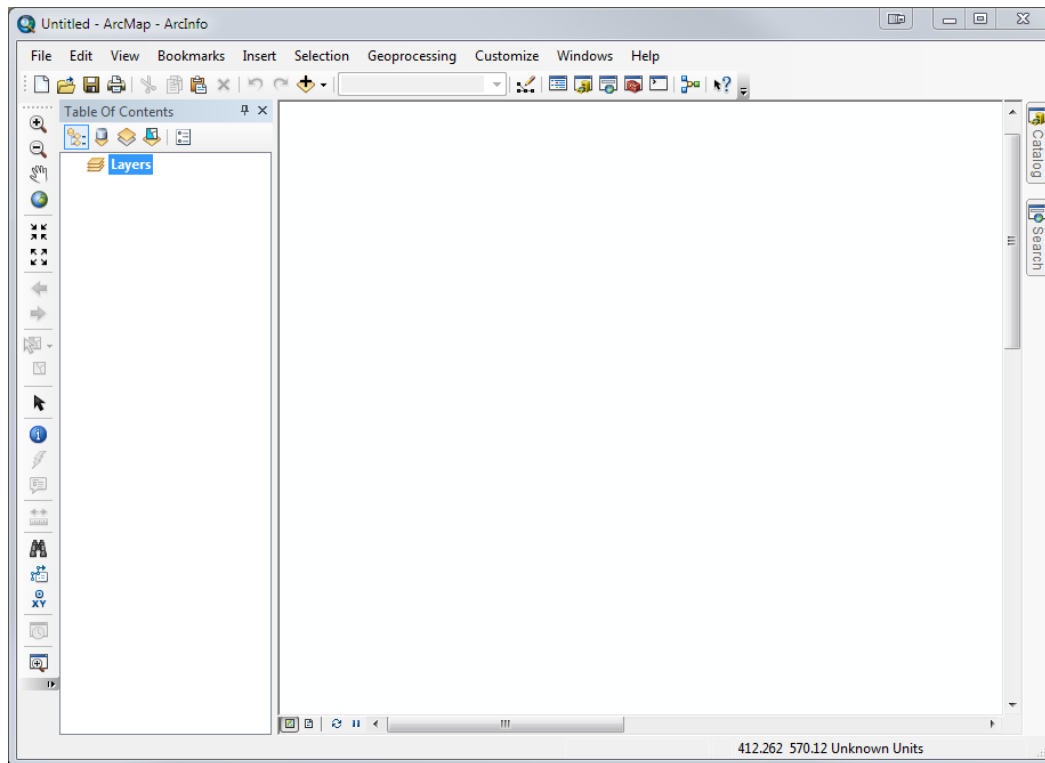
13. Why would you use a geodatabase instead of separate shapefiles and tables? The Geodatabase acts like a container, to store all the data layers that make up your GIS project. In addition to organization, they offer improved performance for large datasets, enhanced control over the formatting of data and how layers interact, as well as many other advanced features. It is fine to start working with shapefiles, but you should be

aware of what a geodatabase is and when it may be appropriate for your work. **New in ArcGIS 10**, ESRI has chosen the **file geodatabase** as the **default spatial data storage type**. Once you become familiar with GIS, it is recommended that you begin new projects by first creating your own file Geodatabase.

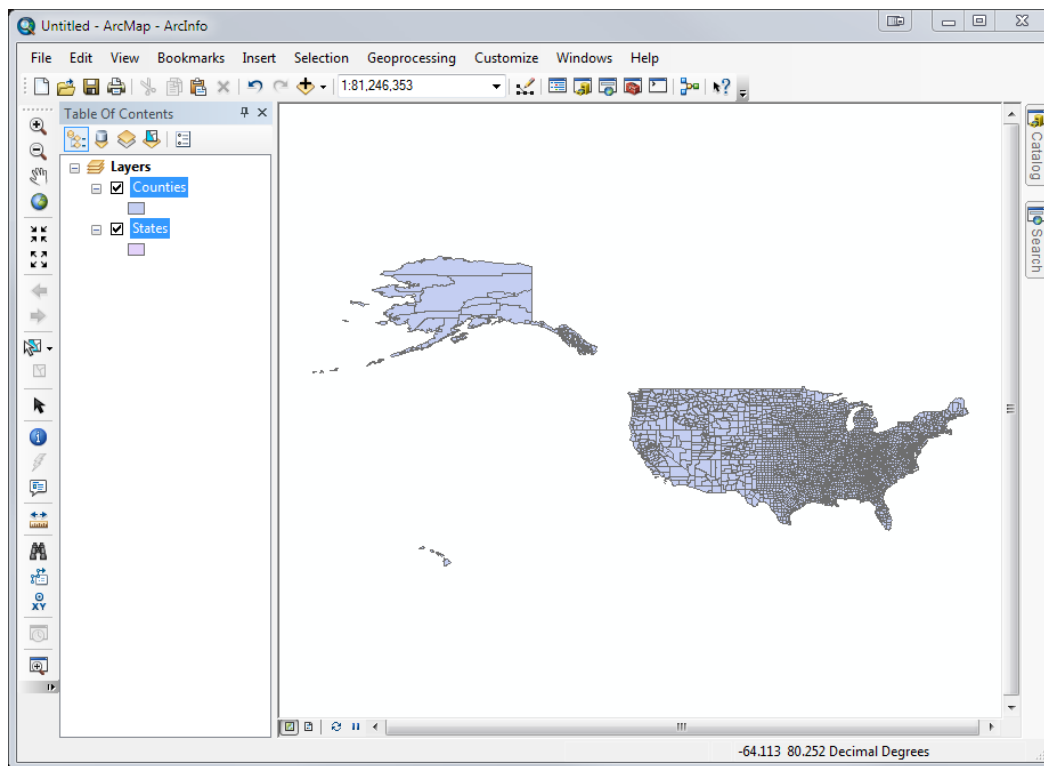
14. Before we start making maps, let's look at the same data structure in Windows Explorer. **Open Windows Explorer and navigate to "C:\temp\csde_gis\Data\"**. Look at the contents of both the "Shapefiles" folder and the "FileGeodatabase.gdb" folder. A single shapefile is a collection of many files with the same base file name but different extensions. A geodatabase is stored within one folder, but contains a large number of files with assorted complex names. Shapefiles can be relocated by copying ALL files with the same base name and various extensions. An entire File Geodatabase can be relocated by copying the entire folder containing the geodatabase.
15. ArcGIS supports many other file formats for the various data structures used in GIS (vector, raster, table, etc). Some tips for working with other data types:
 - See if ArcCatalog recognizes and will display your data's geographic or tabular information
 - Check the extensive and well written ArcGIS help system for your file type

Viewing Data in ArcMap

1. **Start by opening ArcMap: Start>Programs>ArcGIS>ArcMap 10.** Once the software opens, you'll be prompted for how you'd like to begin. **Select "Blank Map" and click "OK".** You should now see a blank slate to start your GIS work.



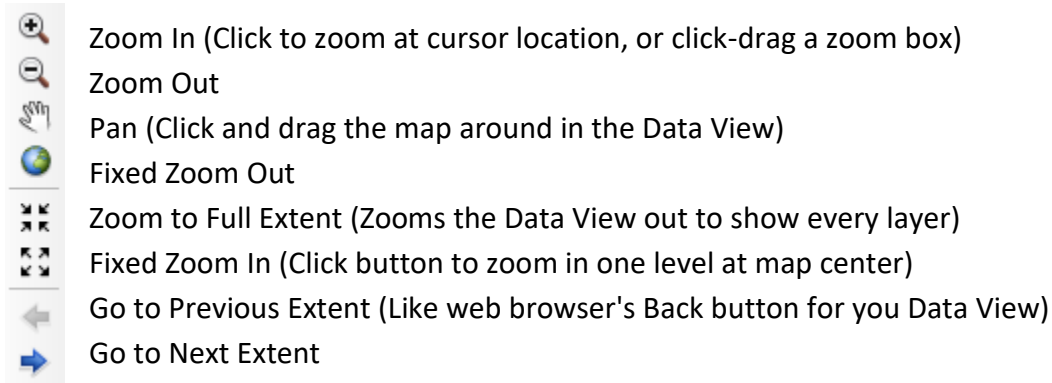
2. Your application may look different from the example, with different toolbars loaded by default in different locations. **Use Customize>Toolbars to check only the following toolbars: Standard and Tools.** Also, **drag your toolbars to the same area of the screen as shown in the figure.** Drag a toolbar by clicking and holding the left mouse button, dragging the toolbar across the screen, and releasing the button to dock the toolbar.
3. Before we begin, take **note of the Catalog and Search Tabs** along the right side of ArcMap. Take note of their auto-hide behavior. We will cover their use later.
4. Now let's add some of the shapefile data we looked at in ArcCatalog. On the top toolbar, **click the Add Data Icon** . When the dialog box appears, **Navigate to "C:\temp\csde_gis1_EPI\Data\Shapefiles\"** and select **both "Counties.shp" and "States.shp"** (hold down Ctrl while clicking each file name). When they are both selected **click "Add"**.



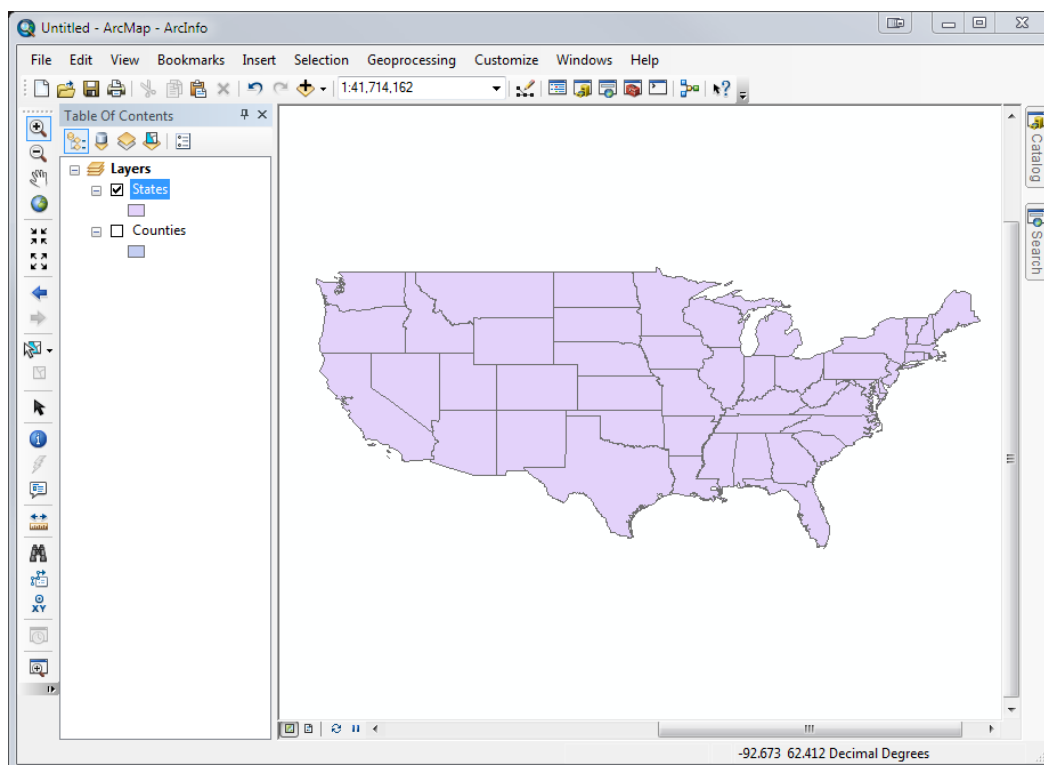
5. Once you've added data, you should notice two changes in ArcMap. Your shapefiles have been added into the Layers list in the Table of Contents on the left. Also, in the Data View on the right, you should now see a geographic view of these files. The colors of your layers will vary, as ArcMap assigns new layers a single random color.
6. You can turn on and off the display of layers by clicking the checkbox next to the layer name. **Turn off the Counties Layer.** Your Data View will now show the States layer, as the Counties layer that was covering it is no longer being displayed. **Turn on the Counties Layer.**
7. You can also re-arrange the order of layers. First make sure to unselect both layers if they are still highlighted grey. **Clear the selected layers by clicking any white area in the layer content panel.** Next, **left-click and drag the States layer name above the counties layer.** Your Data View should again show the States Layer, even though the Counties layer is still turned on. When designing the appearance of your map in the data view, always keep in mind the layers are drawn on the screen from bottom (first) to top (last) like layered transparencies placed on top of each other. To finish this step, **turn off the counties layer.**

Map Navigation

1. Now let's try some of the navigation features in ArcMap that allow us to move around in the Data View. The following sets of tools are available in ArcMap:



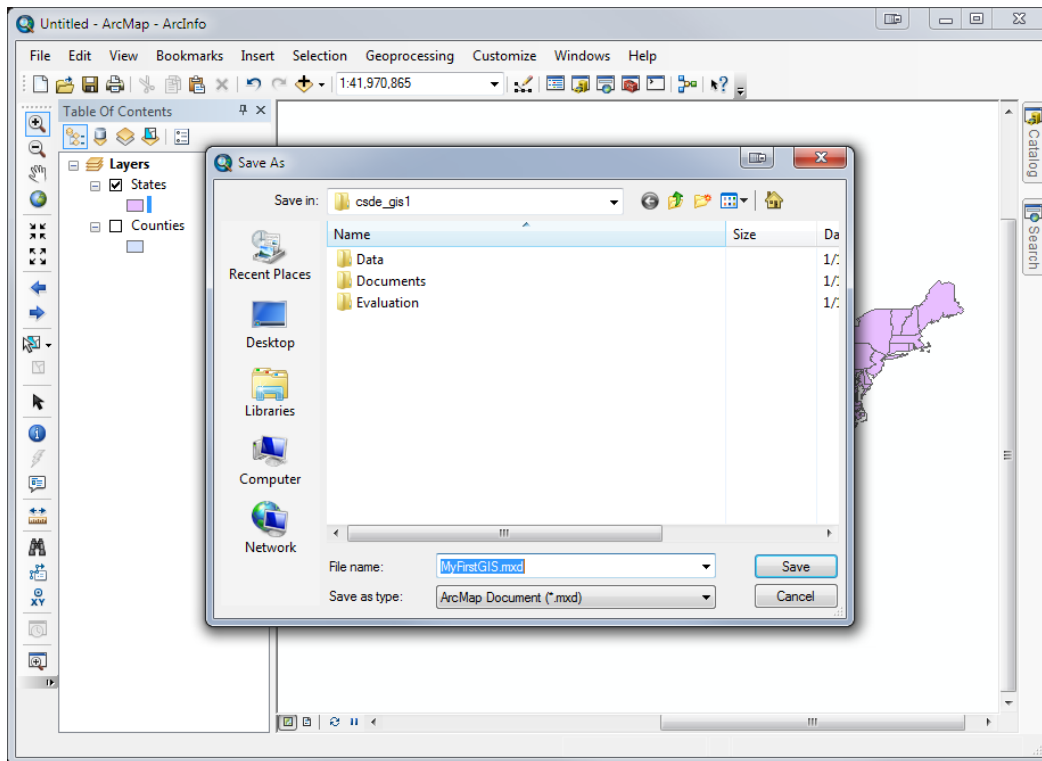
2. **Experiment with the various Navigation Tools.** Notice that some tools change the cursor and must be used in the Data View (Zoom In/Out and Pan) while some simply activate when pressed (Fixed Zoom In/Out, Full Extent, Previous and Next).



3. When you feel comfortable with the various tools, **zoom the extent of your data view to the lower 48 states.**

Saving your Map Document

1. Now that we've got our data arranged and the extent set correctly, let's save our Map. In the main menu **go to File>Save**. **Navigate to "C:\temp\csde_gis1\EPI\" and enter an appropriate file name ("MyFirstGIS.mxd")**.

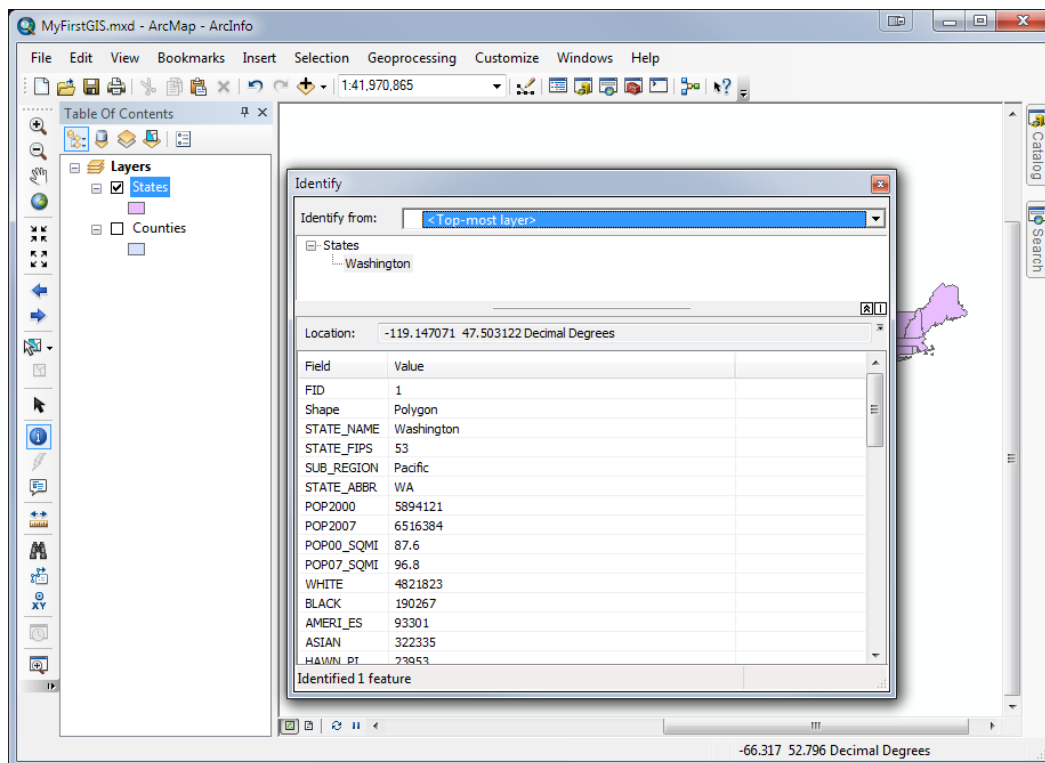


2. What's actually being saved in this .mxd file? The following items: A list of all the layers and tables in the Table of Contents with their order and status, the current view in the Data View window, the symbolization and classification of all of your layers, table, joins, selections, and all map elements in the Layout View (which we'll cover later).
3. What isn't saved in the mxd? Your actual GIS layers and tables. They are not stored in the mxd file. Rather, the .mxd file links to these files, which are stored outside either in folders or in geodatabases. When you are changing how data is displayed in your map, you are not actually changing the data files themselves. You are simply changing how you are viewing them within your .mxd file.

*NOTE: When you move your GIS project, you have to move your data along with the .mxd file. For this reason, we recommend you store your data in subdirectories below your mxd files - you can't store them in separate unrelated folders, otherwise ArcGIS won't be able to find your files!

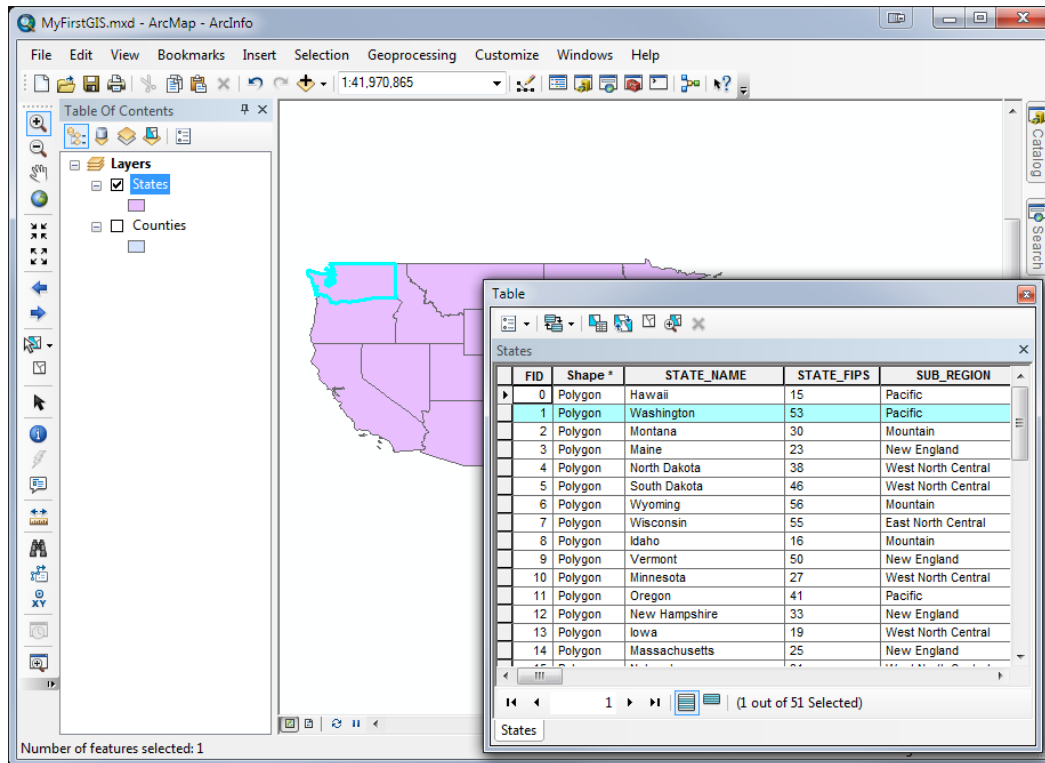
Identifying and Selecting Features

1. When you want information about a feature displayed in ArcMap, you can use the Identify tool. **Click on the Identify tool  to turn it on.**
2. The Identify tool allows you to see the attributes of your data and is an easy way to learn about a location in a map. With the Identify tool selected, **click inside of the state of Washington.**



3. You will see displayed a window containing all the tabular (attribute) data located in your States shapefile for the record corresponding to the state of Washington. These fields should look familiar from your exploration in ArcCatalog. **Scroll through the list of attributes and select another few states. Close the identify window.**
4. Now let's revisit the attribute table for the States layer. **Right-click on the "States" layer name in the table of contents and select "Open Attribute Table".** The same complete table of data we looked at in ArcCatalog should now be visible on the screen.

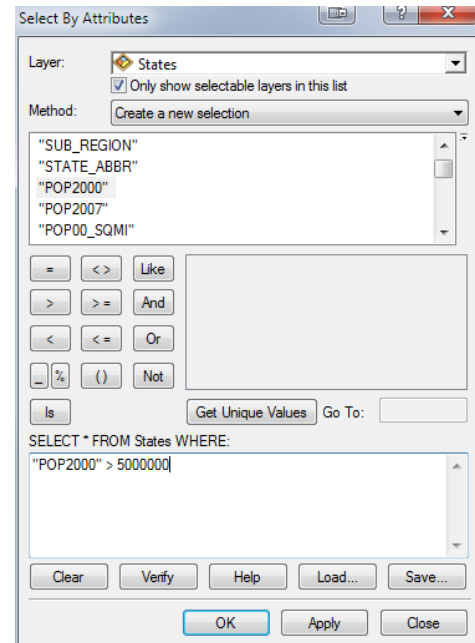
- Position the Attribute table so that you can see it as well as the Data view showing your map. **Find the row corresponding to Washington state and select that feature by clicking on the small grey box next to FID.** This will highlight the record in the attribute table as well as the corresponding feature in the Data view.



- Now select a second state by ctrl-clicking in another grey box. You should now see two rows highlighted in your table and two features highlighted on the map.
- Clear the selected features: from the main menu go to **Selection>Clear Selected Features**.
- Features can also be selected in the Data view from your map. **Activate the Select Features tool** . Now click on any state in the Data view to select that feature on the map and in the attribute table.
- Clicking rows in the attribute table or features in the Data view aren't the only way to select features, you can also build queries to search through the attribute table and select only features you are interested in. Create an attribute query by **choosing Selection>Select by Attribute** from the main menu.

10. We want to select all states with a population greater than 5 million in the 2000 census. First **double-click on the "POP2000" variable name**. Next **select the greater than or equal to button (>=)**. Finally, at the end of the query string that is built, **type 5000000**. Click **OK**.

11. You have now selected all features that match this query. States should be selected in your Data view and in your attribute table. Check the bottom of the attribute table to see that 20 were selected. If you would like to just look at the selected features in the attribute table, **press the button labeled "Selected"**.

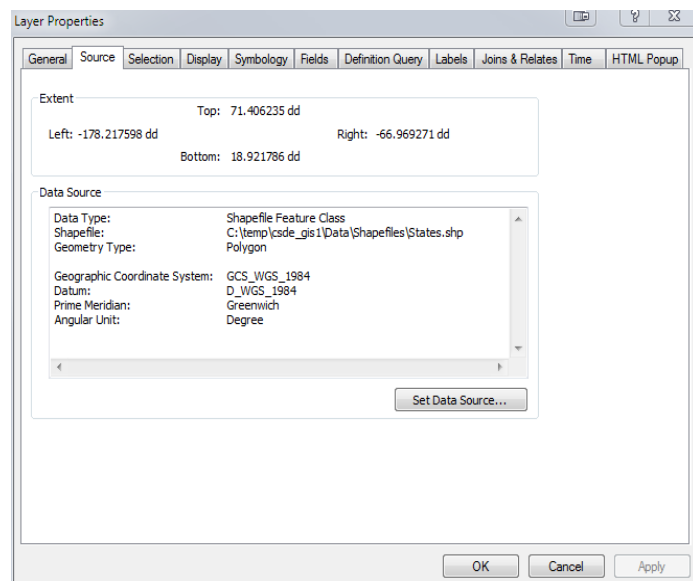


12. **Close the attribute table and clear the selected features.**

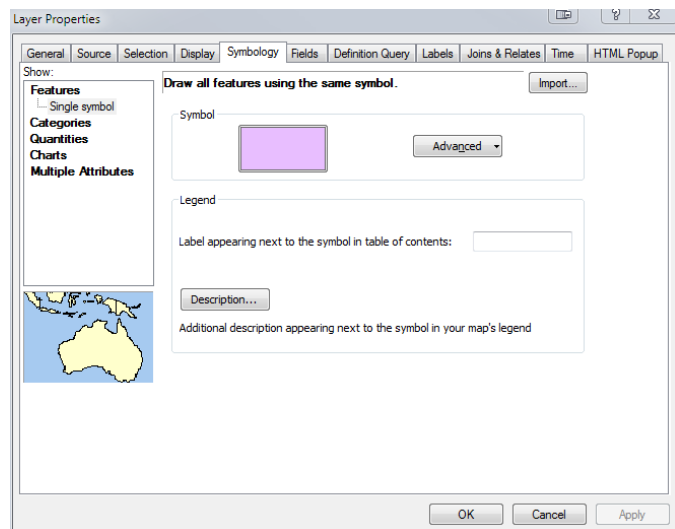
Layer Properties, Symbology and Labeling

1. Each layer in our table of contents has additional properties we can view and manipulate. **Right-click on the States layer name and select "Properties"**.

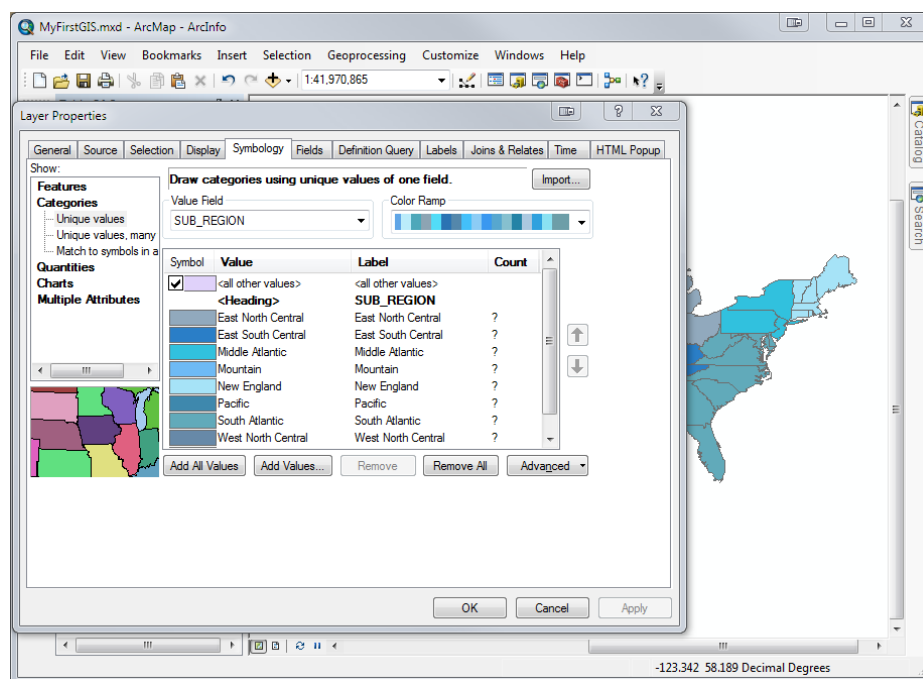
2. The Layer Properties window that appears has several different tabs relating to various aspects of our data. Start by **selecting the "Source" tab**. Here you will find two important pieces of information. First, this tab shows where the data layer is stored. Second, this tab also shows the Geographic Coordinate System of the layer. Remember that a GIS data layer must have a defined coordinate system to correctly integrate with other layers.



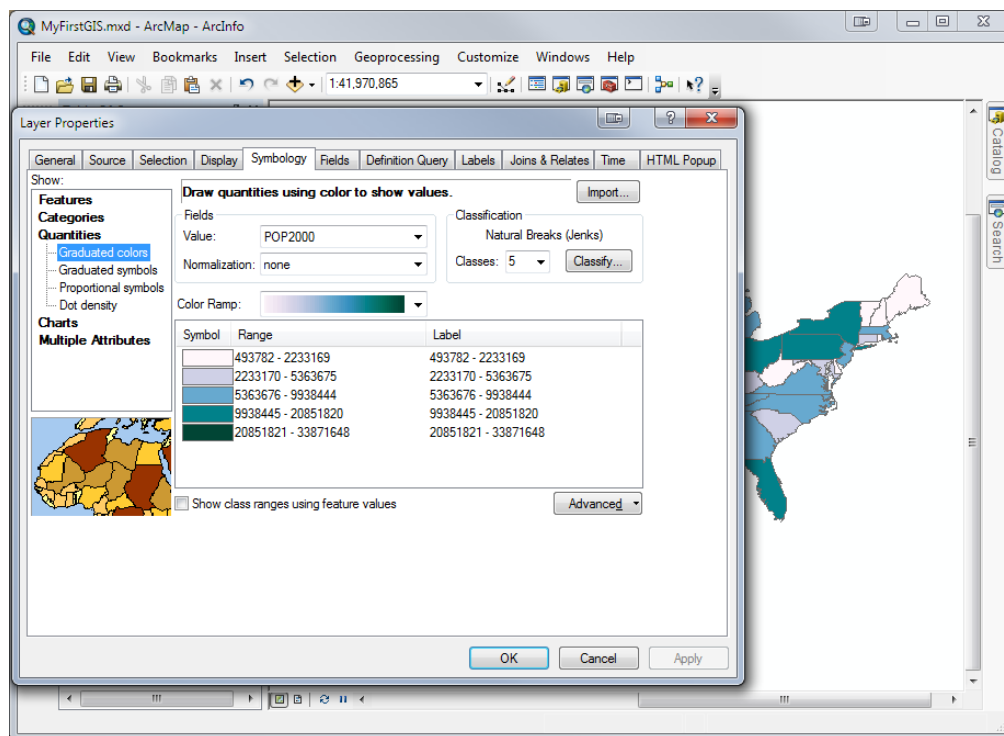
- Next, click on the **"Symbology"** tab. This is where you decide how features and data will be displayed on the map in your Data view. By default ArcMap displays all features in a layer using a single symbol.



- Let's change the symbology to show state grouped together by their geographic region, each region with its own unique color. **Select the "Categories" option** in the list on the left of the Symbology tab, as region is a nominal scale or category variable type. In the **Value Field drop down menu** select **SUB_REGION**, which is the variable we would like to base our color selection on. **Then click the "Add All Values" button** to populate the list with our state names. Finally, **click "Apply"** to update the map in our Data view. If you don't like the colors that were chosen, select a different "Color Ramp" from the Symbology tab.



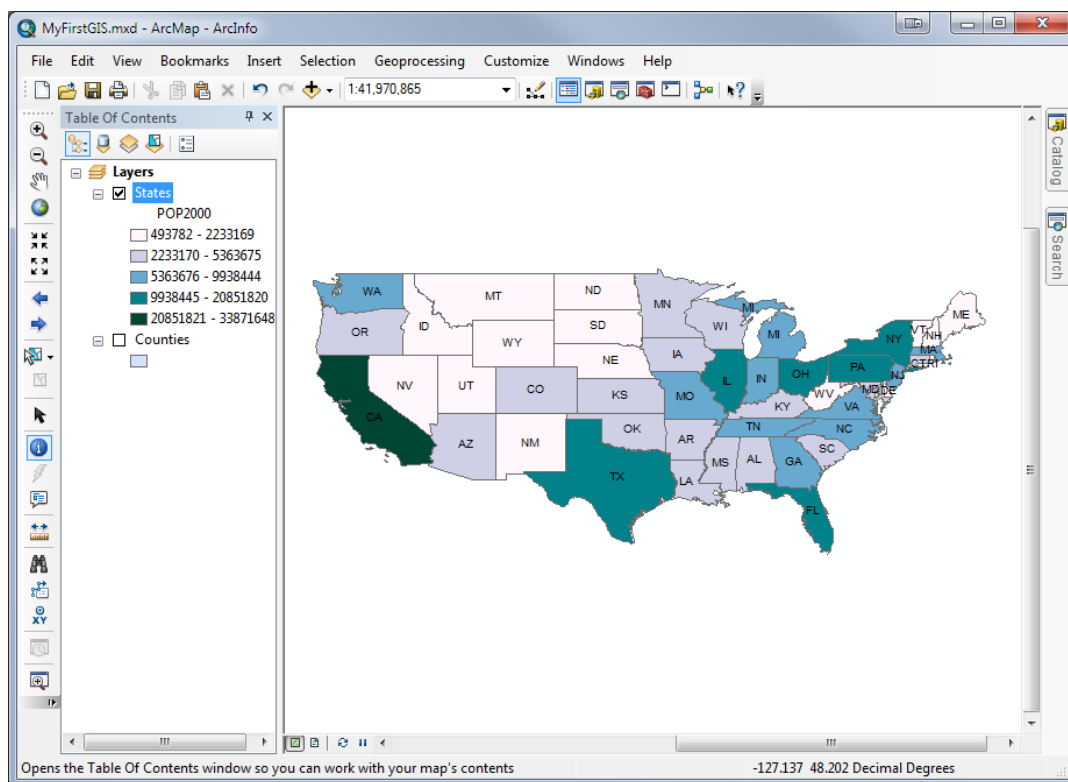
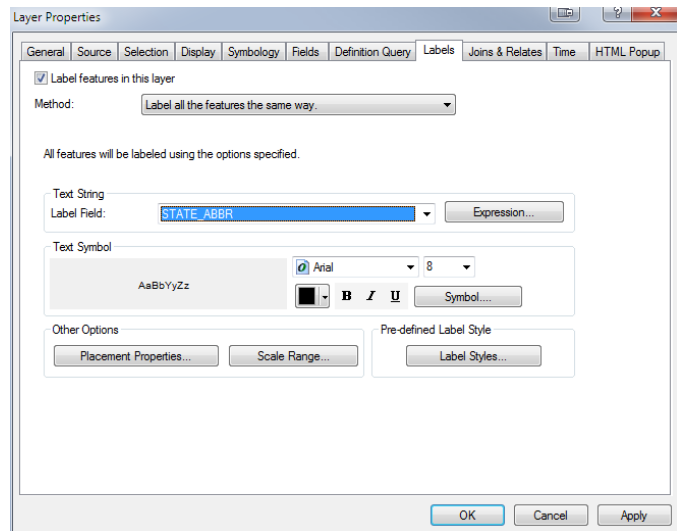
5. By classifying geographic features into groups based on a numeric field in their attribute table, we can construct a thematic map. **Select the "Quantities" option** in the list on the left of the Symbology tab. In the **Value Field drop down menu select POP2000**, which is the variable we would like to base our color selection on. Once a variable is selected, the data will be automatically classified into 5 groups. Finally, **click "Apply"** to update the map in our Data view and see the result.



6. As the Symbology tab suggests, there are many ways to represent your data in ArcMap. Time permitting, we'll look at the following:
- Try changing the number of classes. Start with 10, then try 3. What is lost or gained with more or fewer classes?
 - Change the Value field to Females and look at the default 5 class map. Now use Normalization by POP2000 to create a map of Percent Female. What does each map show you?
 - Make the same normalized map with Male population for comparison.
 - Investigate other Classification Methods.
 - Create a second copy of the states layer, and display another variable (Med_Age_Male) using Graduated Symbols.
 - Remove the second copy of the states layer by right clicking on the layer and selecting "Remove."

NOTE: Be sure to ask any questions if you would like to see something in particular explained.

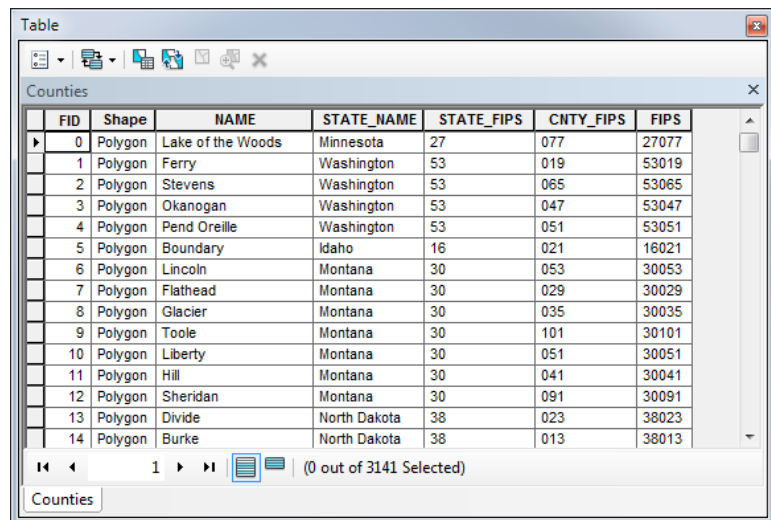
- The last thing we will do in the Layer Properties is to label the features in our Data view. **Go to the "Labels" tab.** Turn on labeling by **checking the box "Label features in this layer"**. We must tell ArcMap what field to label our states feature with. Let's use the state name abbreviation by **selecting "STATE_ABBR" as the Label Field**. The defaults are fine for this example. **Click "OK"**.



Adding and Joining Data Tables

1. You will often find that your spatial data files do not contain all of the attributes you want to work with. For this example, the Counties shapefile contains far less information than we need to create a useful map. **Turn off the States layer and turn on the Counties layer.** Next, **open the attribute layer for Counties** (right-click "Counties" and select "Open Attribute Table")

2. The attribute table only contains basic geographic information about each county (name, state, FIPS or Federal Information Processing Standards code, etc). We will now bring in additional information in the form of tabular data to augment the shapefile.



FID	Shape	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS
0	Polygon	Lake of the Woods	Minnesota	27	077	27077
1	Polygon	Ferry	Washington	53	019	53019
2	Polygon	Stevens	Washington	53	065	53065
3	Polygon	Okanogan	Washington	53	047	53047
4	Polygon	Pend Oreille	Washington	53	051	53051
5	Polygon	Boundary	Idaho	16	021	16021
6	Polygon	Lincoln	Montana	30	053	30053
7	Polygon	Flathead	Montana	30	029	30029
8	Polygon	Glacier	Montana	30	035	30035
9	Polygon	Toole	Montana	30	101	30101
10	Polygon	Liberty	Montana	30	051	30051
11	Polygon	Hill	Montana	30	041	30041
12	Polygon	Sheridan	Montana	30	091	30091
13	Polygon	Divide	North Dakota	38	023	38023
14	Polygon	Burke	North Dakota	38	013	38013

3. As luck would have it, you have the required tabular information in your Data directory. **Click the Add Data Icon** . When the dialog box appears, **Navigate to "C:\temp\csde_gis1_EPI\Data\Shapefiles\". Select "County_Population_data.xls", then select the Excel sheet "County_PopulationData\$", and click "Add".**

4. The new excel spreadsheet file has been added to the ArcMap document, but there is no change in the Data view. As this is tabular data, there is no new geographic information to display. However, there is a change in the Table of Contents. Notice the icons along the top. Adding this dataset has changed the view from List by Drawing Order  (showing just the map layers and their symbology) to List by Source  (showing all data files arranged by location on the computer and data type).

5. You can look at the new tabular data by **right-clicking the "County_PopulationData\$" and selecting "Open"**. This file contains a large number of population-based data. Also, this table has the same FIPS attribute as the County shapefile.

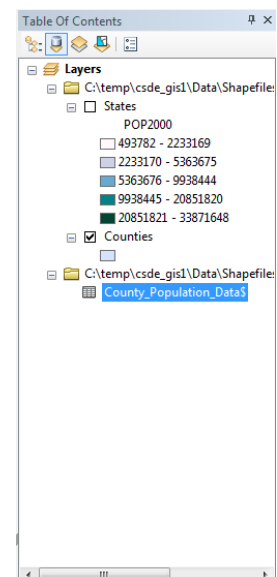
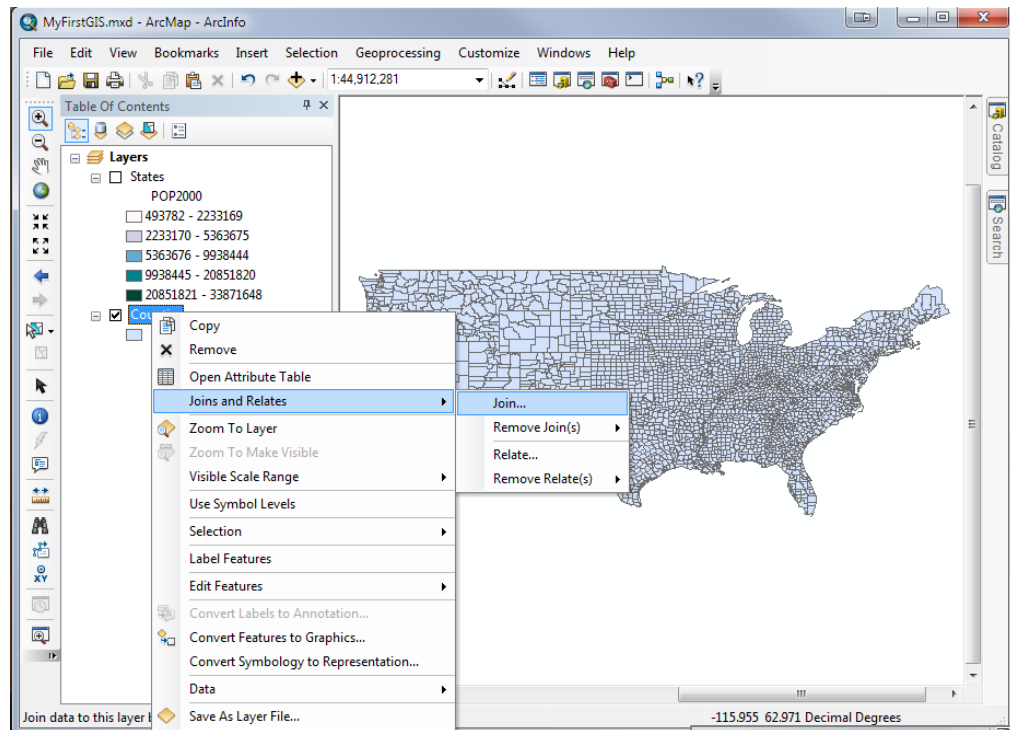


Table of Contents

- Layers
 - C:\temp\csde_gis1\Data\Shapefile:
 - States
 - POP2000
 - 493782 - 2233169
 - 2233170 - 5363675
 - 5363676 - 9938444
 - 9938445 - 20851820
 - 20851821 - 33871648
 - Counties
 - C:\temp\csde_gis1\Data\Shapefile:
 - County_PopulationData\$

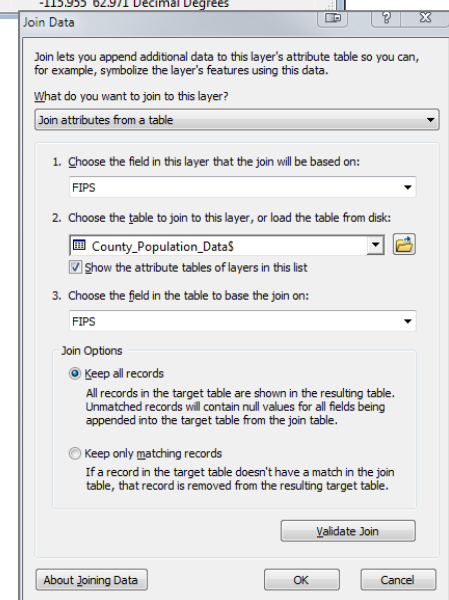
6. **Close the Attributes table** and return the table of contents to List by Drawing Order by clicking on the icon .

7. Now let's join the Attribute table of our Counties shapefile to the new data table. **Right-click on the Counties layer** in the table of contents and **select Joins and Relates > Join**.



8. In the Join Data Window, **"Join attributes from a table"** should be the option in the first drop down box. For the field in the layer that the join will be based on, **select "FIPS"**. The remaining options should be selected for you as there is only one table in your ArcMap project and only one field in that table that is a likely match ("FIPS" also). Check your options to make sure they match and then **select "OK"**.

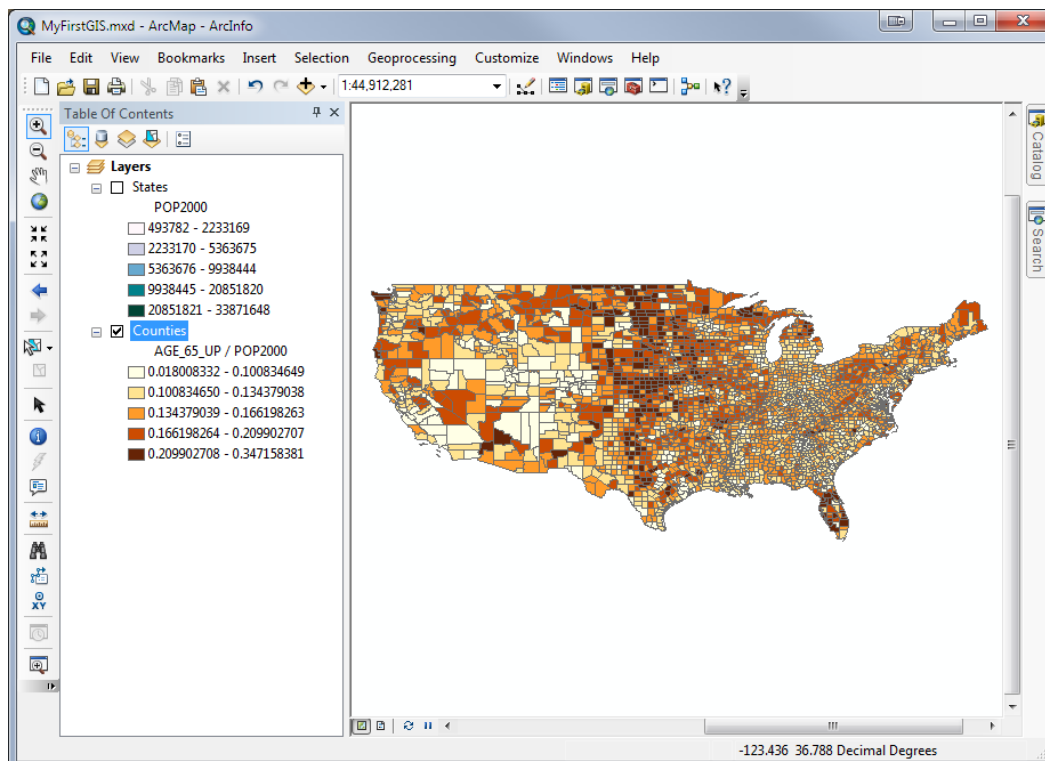
***NOTE:** The data type of joined fields must be identical (e.g. number vs. text). This is a VERY COMMON issue, as ID fields, such as FIPS, are often stored as Text to allow the use of leading 0's to insure consistent ID length.



9. Nothing will visibly change in ArcMap, but **open the attribute table for the Counties layer to see the result**. The attribute table now contains all the original data from the Counties shapefile, in addition to the fields contained in the .xls table.

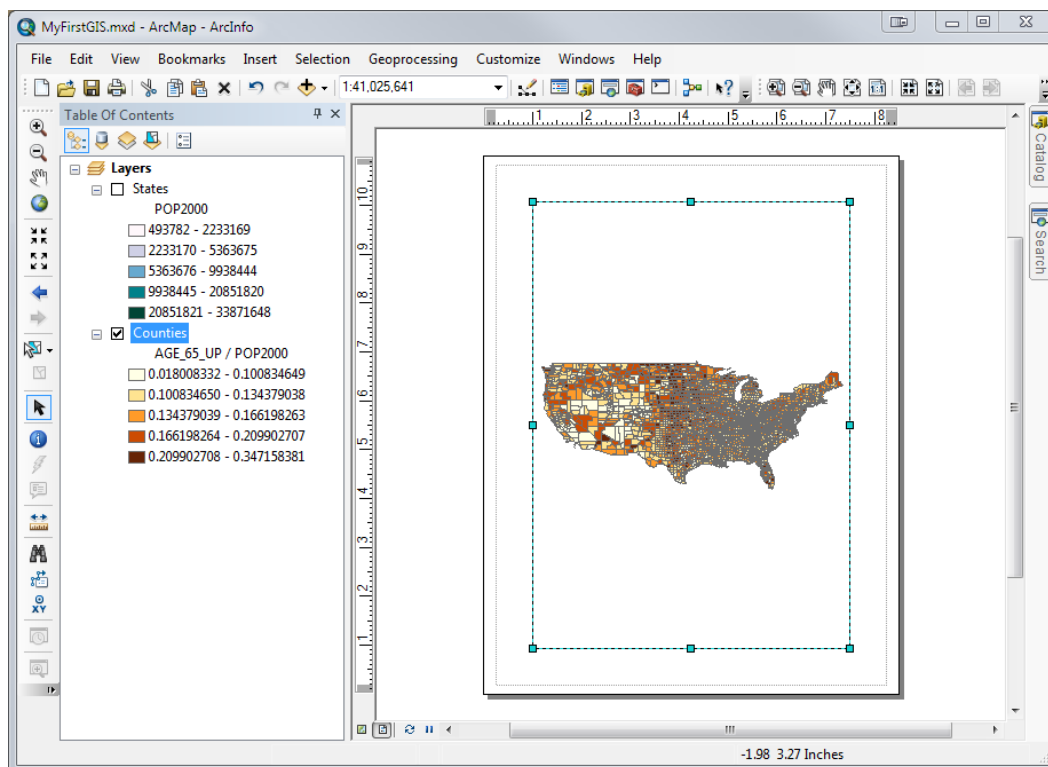
FID	Shape	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS	FIPS	POP2000	POP2007	POP00_SQMI	POP07_SQMI	WHITE	BLACK
0	Polygon	Lake of the Woods	Minnesota	27	077	27077	27077	4522	4546	2.5	2.6	4396	13
1	Polygon	Ferry	Washington	53	019	53019	53019	7260	7641	3.2	3.4	5480	15
2	Polygon	Stevens	Washington	53	065	53065	53065	40066	43123	15.8	17	36078	111
3	Polygon	Okanogan	Washington	53	047	53047	53047	39564	41225	7.4	7.8	29799	109
4	Polygon	Pend Oreille	Washington	53	051	53051	53051	11732	12599	8.2	8.8	10973	17
5	Polygon	Boundary	Idaho	16	021	16021	16021	9871	10868	7.7	8.5	9401	16
6	Polygon	Lincoln	Montana	30	053	30053	30053	18837	19170	5.1	5.2	18100	21
7	Polygon	Flathead	Montana	30	029	30029	30029	74471	86440	14.2	16.4	71689	113

10. The joined data in the attribute table can be accessed as if it were part of the original shapefile, although the shapefile has not been modified. Let's create a map using a field from the joined table. **Open the Counties Layer Properties** and go to the **Symbology** Tab. Select **Graduated Colors**, set the **Value: field "AGE_65_UP"**, the **Normalization: field to "POP2000"**, and **select a single color-based color ramp** (i.e. light to dark red). This variable does not exhibit a distinct spatial pattern. **Try selecting another variable** that might **make a more meaningful map** (hint: try race/ethnicity).

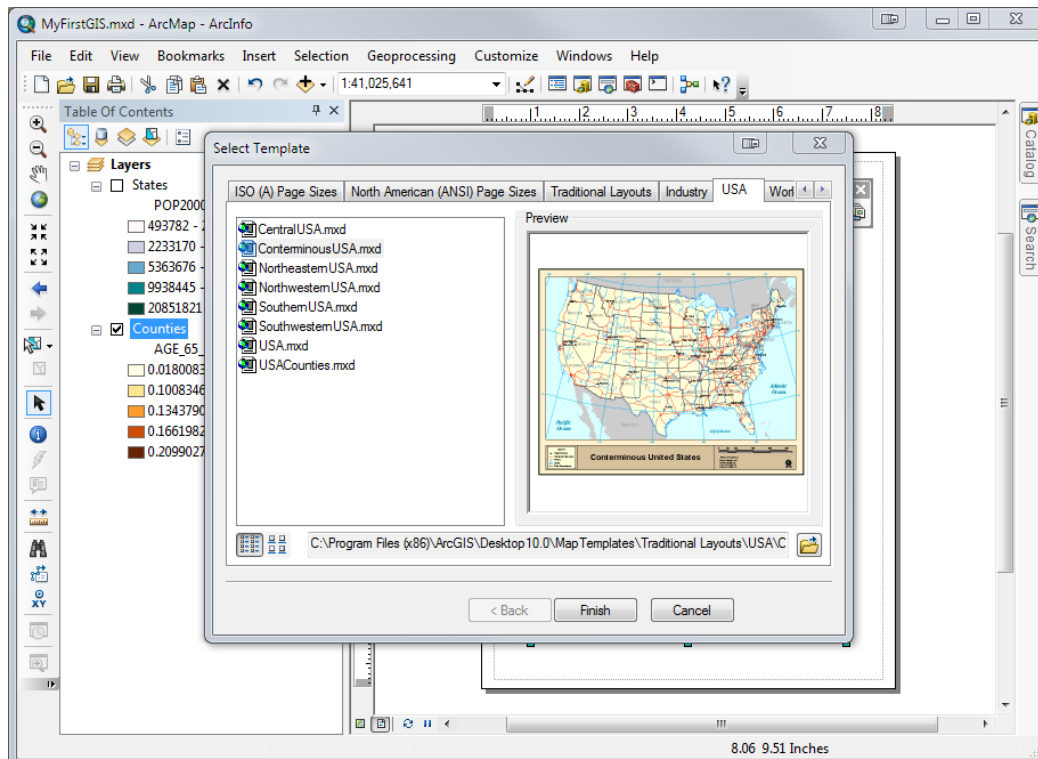


Designing and Exporting a Map

1. You can quickly export a copy of whatever you see in the ArcMap dataview. From the main menu choose **File>Export Map**. Navigate to your "C:\temp\csde_gis1_EPI\" directory and **select a name** for your file. **Save as type "PNG (*.png)"** and set the **Resolution to "300"** to make a nice large image. After you export the image, **use windows explorer to view the file**.
2. This approach is great for generating a quick figure for a report or publication, but what if you need to make a complete map product (i.e. to distribute on its own)? To do this we will need to use the layout and map design tools in ArcMap. This can be a lengthy process for a detailed map; to save time we will use a pre-defined Map Template.
3. The first step in designing a map is to switch from the now-familiar Data view to the all new Layout View. Notice the following two small icons at the lower left of the Data view . **Click on the icon that looks like a small sheet of paper to enter Layout view**.
4. The first thing you will notice is that your Data view has been replaced with something that looks like our original map on a sheet of paper. You should also see a new toolbar somewhere on your desktop. **Move the new Layout toolbar somewhere convenient**.

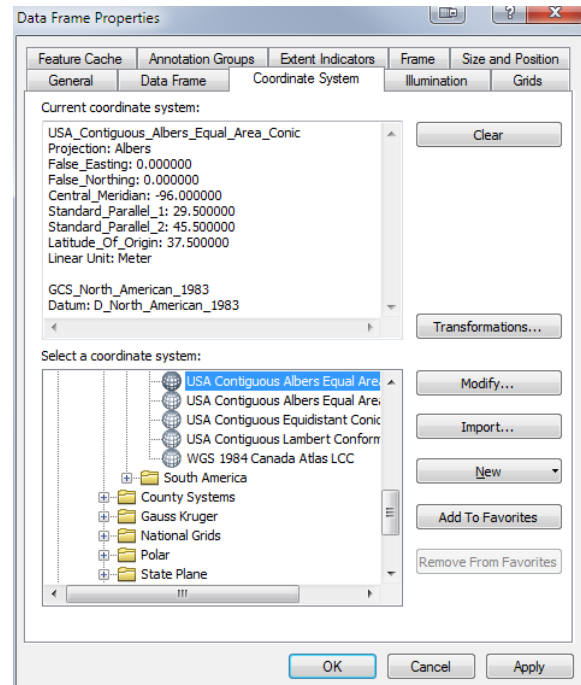


5. Notice all the navigation tools are replicated on the Layout toolbar (with a piece of paper behind them). While the original navigation tools manipulate your view of your geographic data, the layout navigation tools manipulate your view of the map layout you are designing (that piece of paper your map is now on). **Take a moment to explore the difference between the Layout and Standard navigation tools.**
6. The first step to creating our map is selecting the template we would like to use. From the Layout navigation toolbar, **select the Change Layout icon** .
7. The Select Template window will appear, which contains several tabs. **Go to the "USA" tab (press right arrow button at top right).** We will keep our map constrained to the lower 48 states, so select the **"ConterminousUSA.mxd" template** and **click Finish.**

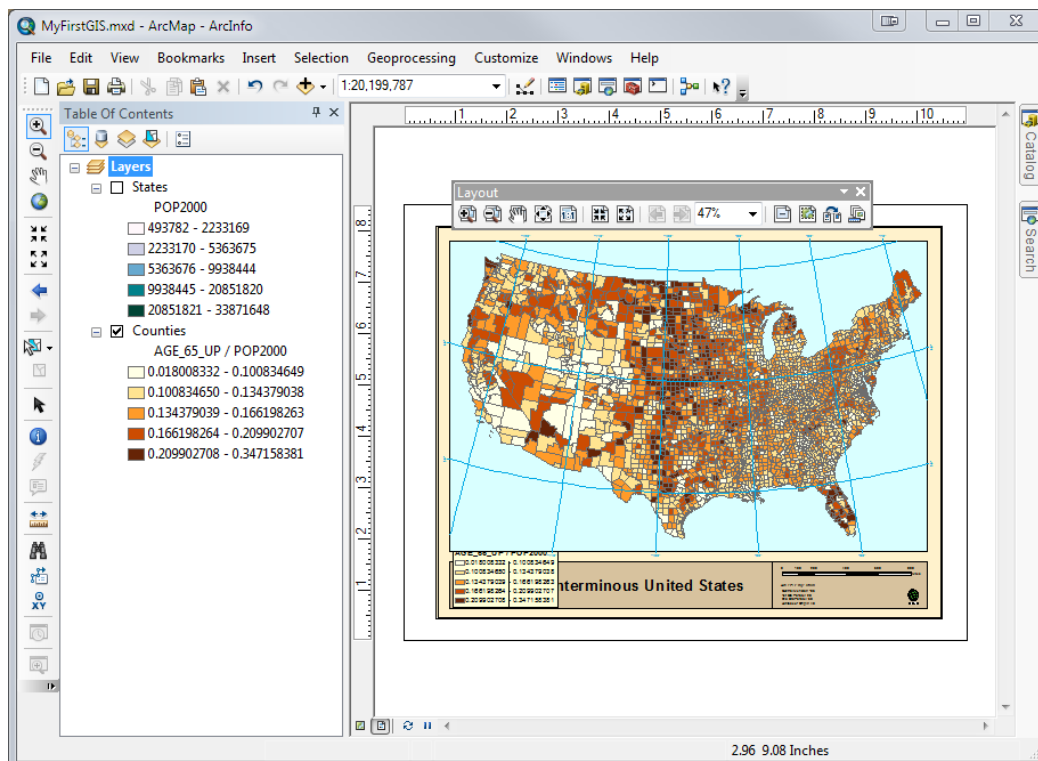


8. The new map layout should appear a little more attractive. There are still some things we need to fix. Templates are not an "Easy Button" approach to map making. In the next few steps we will 1) Fix the map projection to something more appropriate for this spatial extent, 2) Fix the legend and map title, and finally 3) Replace the ESRI logo.

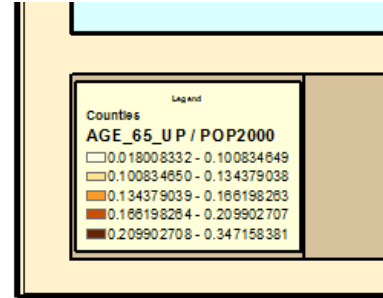
9. First, to change the map projection **double-click on the word "Layers" in the table of contents**. In the Data Frame Properties window that appears, **navigate to the "Coordinate System" tab**. Notice that the current coordinate system is GCS_WGS_1984, which is actually not a "projected" at all (GCS or Geographic Coordinate System simply stores data by their degrees latitude and longitude, like on a globe. This is an easy way to store data, but a bad way to draw it on a map).



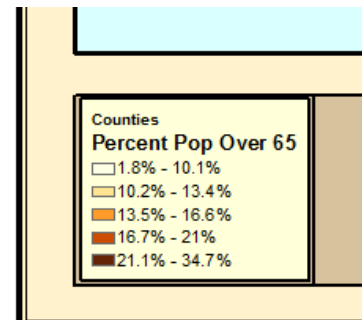
10. From the box labeled "Select a coordinate system", **navigate to the following folder "Predefined > Projected Coordinate Systems > Continental > North America"** and select **"USA Contiguous Albers Equal Area Conic"**. Click **"OK"** to set the new map projection. The warning message that appears lets you know that your data and the new map's coordinate systems are different. Click **"Yes"** to accept the changes. **Zoom and center your geographic data** to maximize the lower 48 states it within the map display area.



11. Next we will fix the map legend. Use the **Layout zoom tool**  to **enlarge the lower left portion of the map** where the legend is located. First we will resize the Legend. From the Standard toolbar, **turn on the Select tool** . **Click on the Legend** to activate its resize controls (small green rectangles). **Make the legend small enough to fit inside the small black box.**

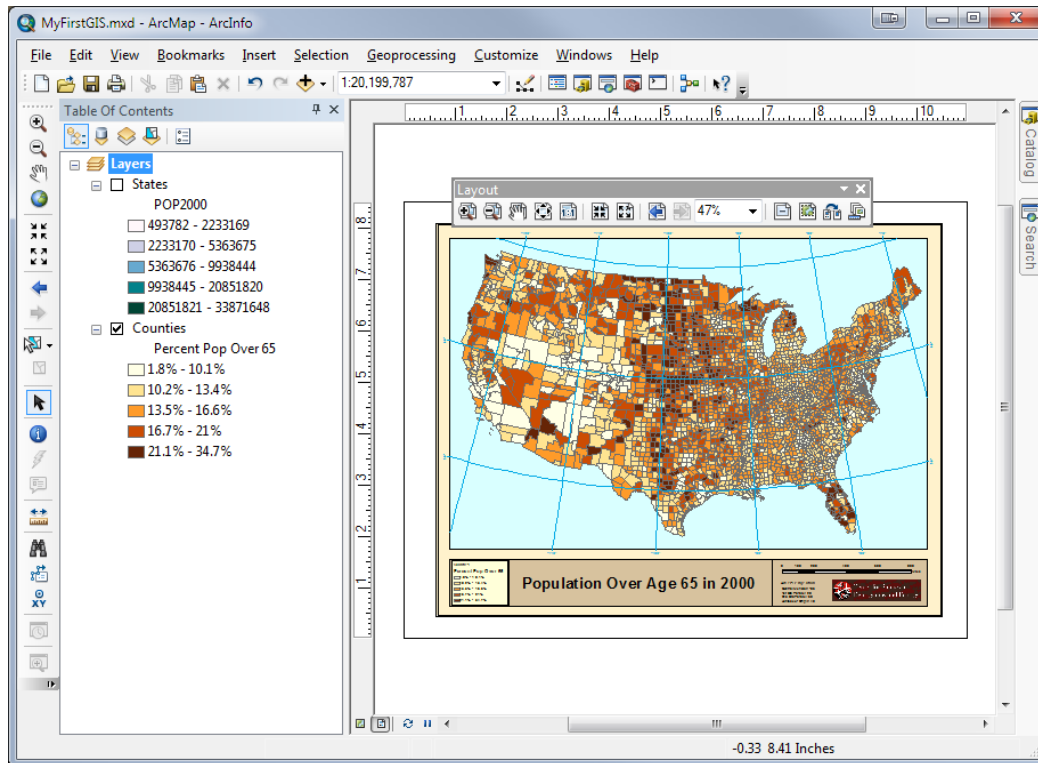


12. Next we will remove the small word "Legend". **Double click on the box containing the legend** to open the Legend Properties. From the **"Legend" tab**, **uncheck the "Show" box**, and click **"OK"**. You may need to resize the legend to fill the box correctly.
13. Our next task is to fix the remaining labels in the legend. First we will change the text **"AGE_18_21/POP2000"** to something a bit more pleasant. In the table of contents, **click once on the text "AGE_65_UP/POP2000"** to highlight it. **Click the same text again** to begin editing it. **Change this text to "Percent Pop Over 65"**.
14. Our last change to the legend will involve the labels for each class of data. It would be much easier to read if these numbers were shown as actual percentages and using fewer decimal places. Open the **Counties feature's Layer Properties** (right-click > Properties) and go to the **"Symbology" tab**. Next, **click in the grey box "Label"** and select **"Format Labels"**. Change the **Category: to "Percentage"** and then **select the option "The number represents a fraction"**. Finally, **click the "Numeric Options" button**, and set the **"Number of decimal places" to 1**. Apply these changes by clicking **"OK" three times**.



15. Moving on, let's update the Map title. **Double click on the current title "Conterminous United States"** and **change the text to "Population Over Age 65 in 2000"**. We'll also need to make the text a bit smaller, so **click the "Change Symbol" button**, set the **font size to 20**, and **click "OK" twice** to apply these changes.
16. We've almost finished our map! The last step will be to remove the ESRI Globe-logo from the lower right corner and replace it with our own. **Click on the ESRI logo** to highlight it, and **press the Delete key on your keyboard** to remove it. Now we'll add a new, more appropriate log. **Select Insert>Picture** from the main menu (note the other

options here, as this is where you would select elements to create a map from scratch). Navigate to "C:\temp\csde_gis1_EPI\Data\" and select the file "CSDE_Logo.jpg". **Resize and place the logo in the lower right corner of the map**, where the ESRI logo was.



17. Now that we've got a decent looking map, let's save it. Instead of a image/graphic file format like we've already used, let's output our finished map as a .PDF file. From the main menu, **select File > Export Map**. Set the "Save as type" to "PDF (*.pdf)", name **your file**, and place it in your "C:\temp\csde_gis1_EPI\" folder.

18. Use windows explorer to navigate to your map and have a look!