GIS Tutorial for Atmospheric Sciences

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Section 1: Basic GIS Fundamentals

Exercise 1

Exploring ArcMap and ArcCatalog

Use Case: Tornado Tracks

In this first Exercise you will begin exploring the ArcGIS for Desktop environment. In particular, you will work with the ArcMap and ArcCatalog interfaces to become familiar with their functionality and application. These two interfaces form the foundation of the ArcGIS for Desktop environment where much of your GIS data management, exploration, analysis, and mapping will take place.

Sub-Sections in Exercise 1:

1. *Opening and Exploring ArcMap*
2. *Adding Data to ArcMap*
3. *Working with Attribute Data in ArcMap*
4. *Navigating and Using ArcCatalog*

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Opening and Exploring ArcMap

<u>Step 1</u> Start ArcMap and open a Map Document file.

In this first step you will open an existing map in ArcMap.

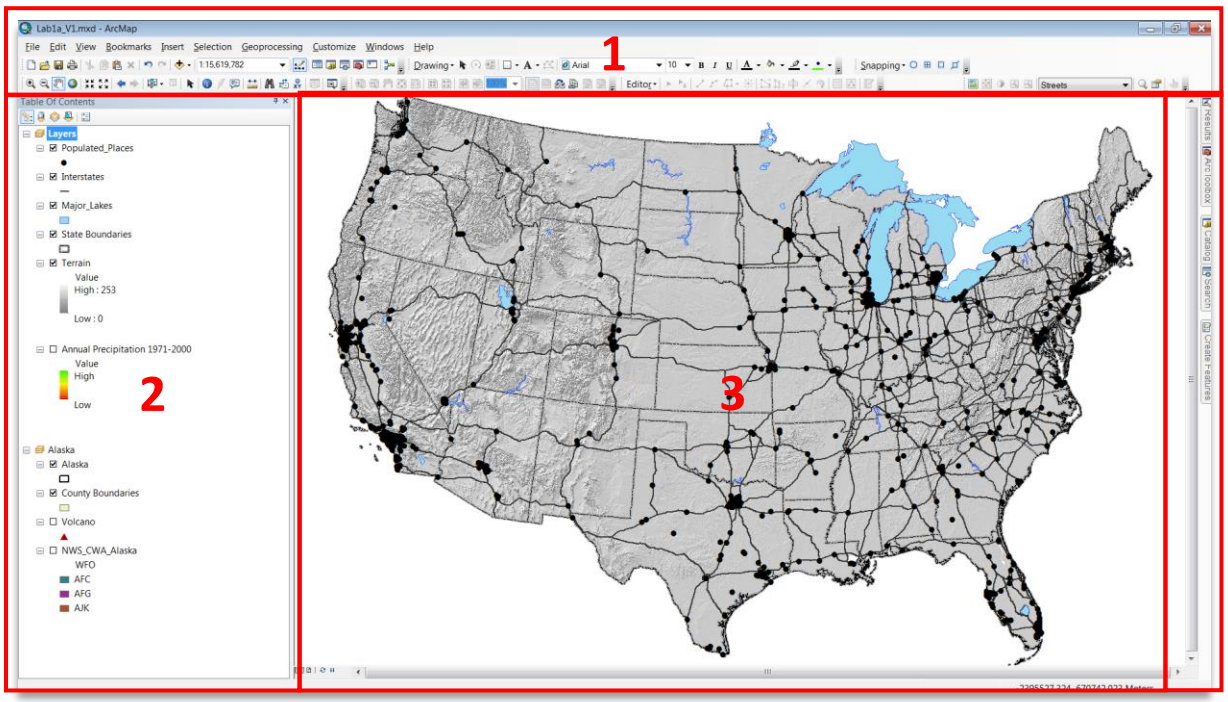
- Click **Start > All Programs > ArcGIS > ArcMap 10.X.**
- If a dialog box appears prompting you to select a map, click **Cancel**.
- From the **File** menu in the upper left, click **Open...**

- Browse to ***C:\Exercise1\maps*** and select the ***module1.mxd*** file.

TIP: The .mxd file extension identifies ArcMap document files.

- Click **Open** to open the map document**.**

When the document opens, you see the basic ArcMap interface. It consists of three key sections: 1) the menu tabs and toolbars at the top, 2) the Table of Contents on the left, and 3) the map display in the middle. (See image of the following page).



- Take a moment to explore the various menu tabs at the top. Notice that some of these are not very different from other Windows-based programs such as Microsoft Office. Hover your mouse over a tool in order to see the tools name.

- Now save the document by clicking the **File** menu, and then **Save As**. Save the map document in ***C:\Exercise 1\maps*** as ***Exercise1_<your name>.mxd.***

TIP: It is good practice to use only alpha-numeric characters or underscores in your file names and to leave no spaces.

Step 2 Exploring Toolbars and Windows

Toolbars are the manner in which tools are organized in ArcMap.

- Click the **Customize** menu.
- Then hover your mouse over **Toolbars.**

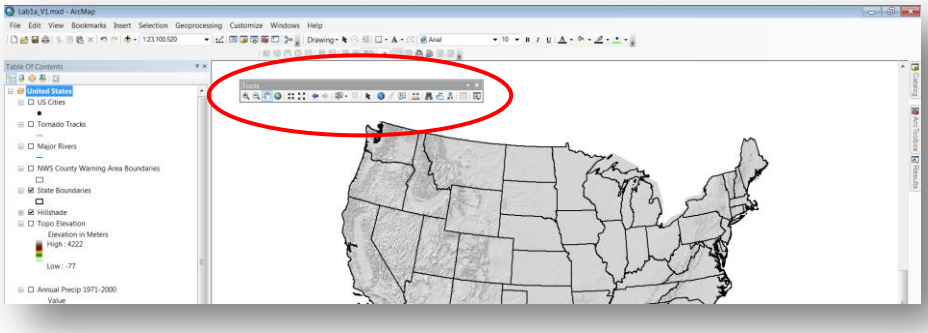
Notice all of the different toolbars available. The toolbars allow you to access many of the ArcMap functions and tasks. The Standard and Tools are the key toolbars. Notice a checkmark beside each of them, indicating that they are already turned on. You can turn toolbars on and off by clicking on them in this menu.

- Click anywhere outside the toolbar menu to close it.

Once turned on, toolbars can be moved around to best fit within the ArcMap interface. More specifically, they can either be docked to the side of the screen or they can be left to float in the middle. Currently, all three of the main toolbars are docked above the Table of Contents and Map Display section of the ArcMap interface (section 1 in the image above).

- Click on the grey handle of the Tools toolbar, indicated by the vertically aligned dots on the left edge of the toolbar, and drag the toolbar to the Map Display area.

Note that the name of the toolbar now appears, along with the option to close the toolbar completely.



- Click on the grey bar at the top of the Tools toolbar and drag it back to the top of the screen to re-dock it.

TIP: Another way to dock a toolbar is to double-click on the grey top part of the toolbar.

Often, it is nice to expand the Map Display area for a better view. One way to do this is to turn off the Table of Contents.

- Click the **X** in the upper-right corner of the Table of Contents (TOC) window.
- To turn it back on, click on the **Windows** menu at the top, and then **Table of Contents.**

Alternatively, you can set the window so that it disappears automatically when you don't need it.

- In the upper-right corner of the Table of Contents window, click the thumbtack icon (**Auto Hide**) to create a quick access tab for the Table of Contents.
- Hover your mouse over the new tab. This will open the Table of Contents window. Once you move your cursor away, the display minimizes again.

- Click the **Table of Contents** tab and then the **Auto Hide** button to restore the window to its original docked position.

Windows such as the Table of Contents window can be docked in multiple locations or they can be left to float, similar to toolbars.

- Click the Title Bar (top) of the Table of Contents window and drag it away from the left side of the Map Display and drop it on your map.
- Double click the Title Bar to dock the Table of Contents (TOC).

Step 3 Navigating and using the Zoom and Pan Tools

Typically you will want to interactively explore your layers by zooming in closer to a particular location or panning to nearby areas.

- Click the **Zoom In** button on the Tools toolbar.

TIP: For a description of each tool in the toolbars, simply hover your mouse over the tool and a tool-tip window will appear.

- Click once near the northwest corner of Colorado and keep holding down the mouse.
- Drag a box around the rest of the state and release the mouse.

Once you have zoomed in to an area of interest, such as Colorado, you may want to pan to a nearby area.

- Click the **Pan** button on Tools toolbar (notice that the cursor becomes a hand).
- Click and drag the map to the left until you can see Kansas.

TIP: Another option for zooming in and out is to use the Fixed Zoom In and Fixed Zoom Out buttons found on the Tools toolbar. Yet another and perhaps more convenient option is to use the scroll wheel on your mouse. Place your cursor over the area that you want to zoom to and then roll the scroll wheel backwards.

Now that you have explored the area up close, it is time to zoom back out to get a wider picture. You can zoom out in small increments using the **Zoom Out** button on the Tools toolbar (similar to the Zoom In function), or you can zoom out to the furthest extent of the data in your ArcMap document. Zoom to the full extent now to view all of your data at once.

- Click the **Full Extent** button (globe icon) on the **Tools** toolbar.

If you want to return to the previous close-up view, you can use the Back to Previous Extent button.

- Click the **Go Back To Previous Extent** button (left arrow icon) on the **Tools** toolbar.

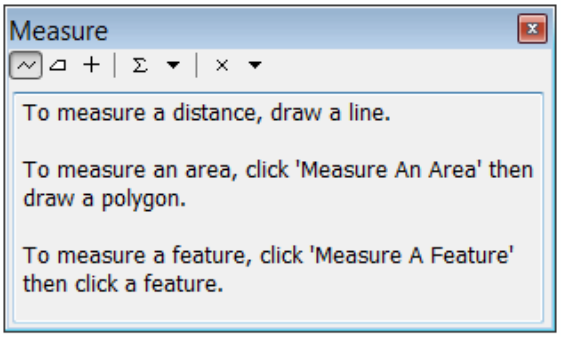
- Now your map view is back in Kansas or wherever you were just prior to zooming to the full extent. When you have finished exploring the data, zoom back to the full extent.

Step 4 Using the Measure tool to measure distances

ArcMap provides many options for measuring linear and area distances in a variety of units.

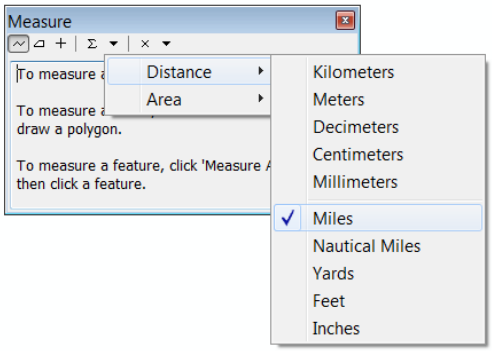
- On the Tools toolbar, click the **Measure** button.

The Measure window appears.



The **Measure** tool is default-set to measure a line, indicated by the line symbol, first from the left in the Measure window, being active.

- From the first drop-down arrow, click **Distance** and then **Miles**.



Checking **Miles** will ensure that your measurements are in miles.

- Using your cursor, which now appears as a ruler, measure the width of the state of Kansas.

In the **Measure** window, you see a **Segment and Length Measurement**. Both are about 380 miles, indicating that the width of Kansas is 380 miles. If you wanted to add additional segments to your measurement, you could click another point, and the Length measurement would total both line segments.

- Double click to release the **Measure** tool.
- Close the Measure tool window.

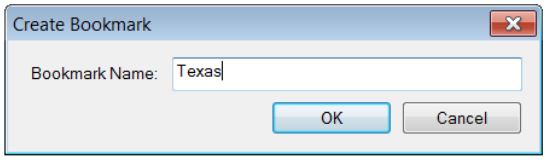
Step 5 Accessing and creating Bookmarks

Bookmarks are a convenient way to store the zoom displays of areas you might want to visit often. In this map document, three bookmarks have been set up for you: Zoom Full Extent – US, Colorado and Southeast.

- Click on the **Bookmarks** menu.
- Click on **Colorado** (The Map Display automatically zooms to the state of Colorado).
- Click on the **Bookmarks** tab again.
- Click on **Zoom Full Extent – US** so that the Map Display is zoomed back to where you started.

In the previous step, you accessed Bookmarks that had been created and saved in the map document. Now you will create your own Bookmark.

- Using the **Zoom In** button on the Tools toolbar, zoom into Texas.
- From the Bookmarks menu, click **Create Bookmark**.
- Type Texas into the **Create Bookmark** window.



- Click **OK**.
- Click on the Bookmarks menu again.

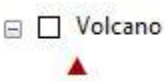
Texas now appears in the list of Bookmarks.

Step 6 Getting to know Layers and Data Frames

Let's look more closely at the items in the Table of Contents. Notice that there are two collections of layers called ***Layers*** and ***Alaska***. These are called **Data Frames**. While both Data Frames are listed in the Table of Contents window, we currently only see the map of the continental United States. This is because the Alaska Data Frame is not active.

- Right-click on the title of the second Data Frame, **Alaska**.
- Click **Activate**.

The map of Alaska appears in the Map Window and the title, ***Alaska***, assumes a bold type-face indicating that it is the active Data Frame.



- In the **Alaska** Data Frame, click the check-box next to the ***Volcano*** layer. This will toggle the layer on.

Even though the ***Volcano*** layer has been turned on, many of the volcanoes appear to be hidden.

Look in the table of contents and identify which layers are drawn on top of the volcanoes layer. To make the ***Volcano*** layer completely visible, we will need to change the "drawing order".

- Click the ***Volcano*** layer and, while holding the mouse down, drag it above the ***Alaska*** layer.

Now that the ***Volcano*** layer is drawn on top, all of the volcanoes come into view.

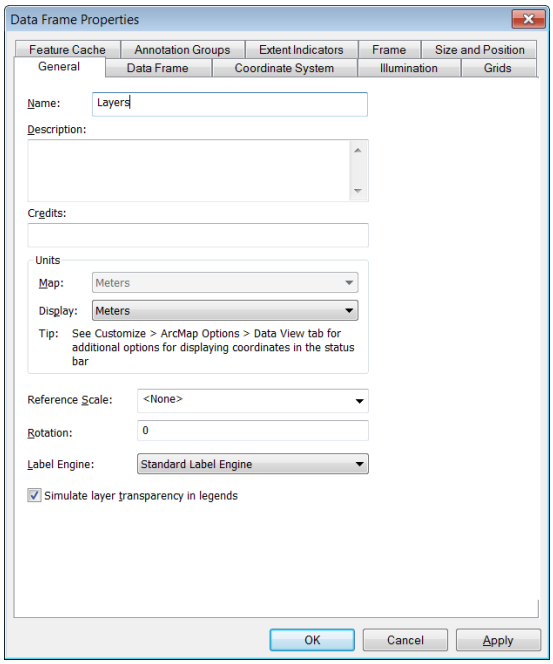
- Re-activate the ***Layer 1*** Data Frame by right-clicking on the Data Frame ***Layers*** 1 and selecting **Activate**.

Step 7 Data Frame Properties

When a new Data Frame is created, it is given the default name, ***Layers***. This can be changed in the Data Frame Properties.

- To access the Data Frame Properties, click the **View** menu and then click **Data Frame Properties...**

In the Data Frame Properties window there are ten different menu tabs that allow you to view and edit various properties of the Data Frame.



- Click the **General** tab and enter United States into the **Name** box. You could choose to enter a description and credits as well. For now, we'll leave these blank.
- Click **Apply** to set the new name.
- If a Warning message appears regarding the coordinate system being different between the layers, click **Yes**. We will work on coordinate systems in Exercise 5.

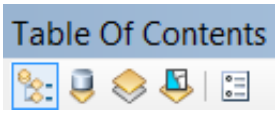
You can see that the Name has been updated in the Table of Contents. You can explore the other tabs in the Data Frame Properties window on your own.

- Close the Data Frame Properties dialog box by clicking **OK**.
- Again click **Yes** if the Warning window appears.

Step 8 Viewing Layers in the Table of Contents

A map document consists of a collection of layers that are displayed, managed, and accessed from the ArcMap Table of Contents window. The layers themselves are not actually stored within the map document; rather they are accessed through the map document. You will learn more about where and how layers are stored in Exercise 2.

ArcMap offers a few different options for how layers in the Table of Contents are displayed. Notice the five small icons in the upper-left corner of the Table of Contents window.



The blue box surrounding the left-most icon indicates that this is the active view. In this view, the layers are listed by drawing order – the layer drawn on top is at the top of the list.

- Click on the second icon from the left, the **List by Source** option.

In this view, the path names appear, indicating where the layer is stored. This can be helpful if you forget where the dataset behind the layer in your map resides.

- Click on the layer ***Populated Places*** and try to drag it below ***Major Lakes***.

Notice that you are unable to reorder layers when the Table of Content is displaying layers by List by Source.

We will explore the other display options, including List by Selection, in a later exercise.

- Change back to the **List by Drawing Order** view.
- Now try to drag ***Populated Places*** below ***Major Lakes***.

When the data are displayed by List by Drawing Order, you are able to reorder layers.

- Reorder the data so that ***Populated Places*** is at the top of the list.

Step 9 Layer Properties

Similar to the Data Frame Properties of ArcMap, each layer contains its own properties that can be viewed and changed. To access these properties, you will right-click on the layer name in the Table of Contents.

- Right-click on the ***Populated Places*** layer.
- Select **Properties**…

In the Layer Properties window, there are several tabs that allow you to view and edit the layers' properties. Commonly used tabs include General, Source, Symbology, and Labels.

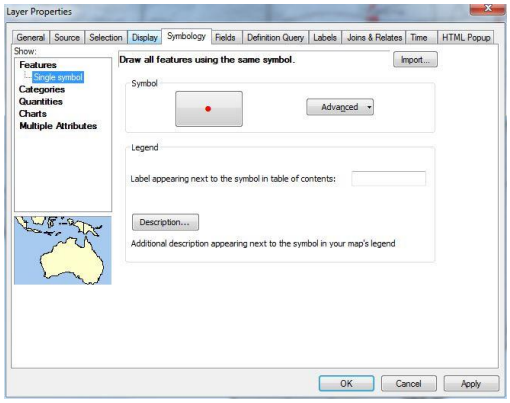
- Click the **General** tab.
- Change the Layer Name to **Cities**.

Changing the Layer Name only affects how the name appears in the Table of Contents. It does not change the name of the underlying data. Keep this in mind as the layer name in the Table of Contents will not always match the file name where the data are stored. As previously mentioned, the map document is just accessing the layers, not storing them. We will discuss this more in Exercise 2.

- Click the **Source** tab.

The source tab displays basic metadata information about a layer, including the type of layer, its actual file or source name, and coordinate system information. Metadata is "data about data" and is critical for understanding the details of a particular dataset such as where the dataset came from, how it was created, the date it was created, among other details.

- Click the **Symbology** tab.

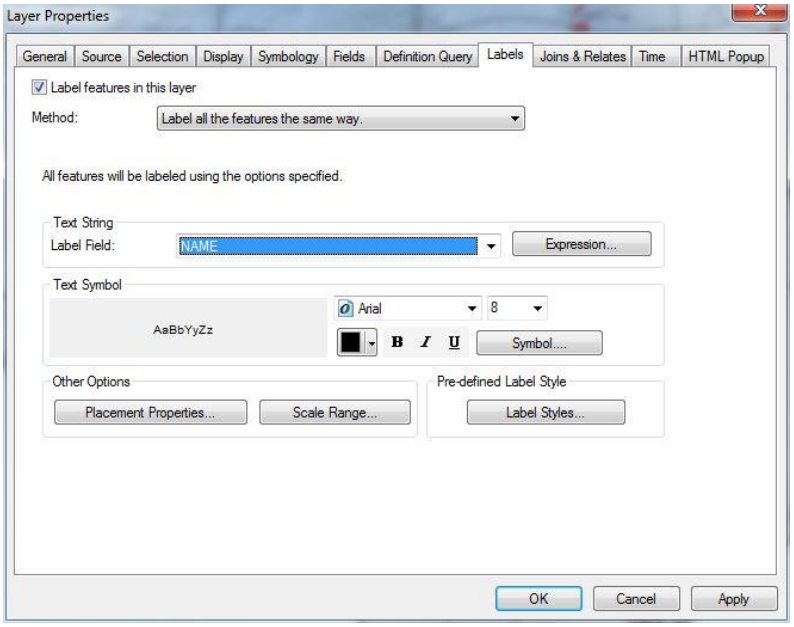


- In the middle of the display window under Symbol, click the **symbol** button and change the color to red.
- Click OK in the Symbol Selector window.
- Click Apply in the Layer Properties window.

This will apply the rendering but not close the window.

Notice that all of the points on the map that represent cities have turned red. There are many symbology options available for choosing how you want to display a layer on a map. We will cover these in more detail in Exercise 3.

- Click the **Labels** tab.
- Place a checkmark next to "Label features in this layer."
- Make sure the "Text String, Label Field:" is set to **NAME**.
- Close the Layer Properties window by clicking **OK**.



TIP: You can also turn a layer's labels on and off by right-clicking on the layer name in the Table of Contents and then clicking Label Features.

- Save and close ArcMap.

Adding Data to ArcMap

In the next few steps you are going to add data to ArcMap to map all tornado tracks since 1950 along with the National Weather Service County Warning Areas.

Step 10 Starting a new ArcMap document

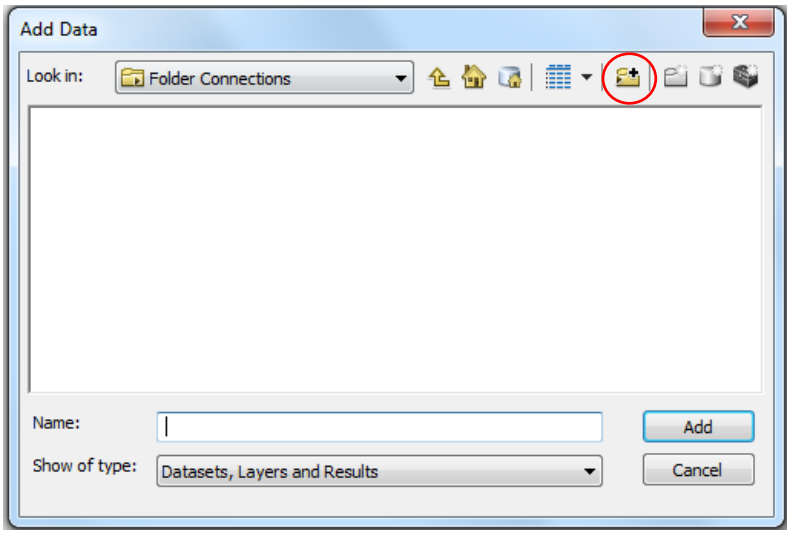
In Step 1 you opened an existing map document. In this step you are going to open a blank ArcMap document and add data yourself.

- Click on **File** > **New** to open a new, blank ArcMap document.
- Click the ***Blank Map*** template and **OK**.

When starting a new map, it will be a blank map document requiring you to add your own data to the Table of Contents.

- Click **File** > **Add Data** > **Add Data…**

The Add Data window appears. If there are no existing folder connections in ArcMap, the connections folder will be empty.



- In the Add Data dialog box, click on the icon that contains a plus symbol over a folder (**Connect To Folder**).
- In the window that appears, browse to ***C:\Exercise1*** and click **OK**. Click Cancel.

- Click the **Add Data** button on the Standard toolbar and browse to ***C:\Exercise1*****data** folder, which should now appear in your connections list.
- Highlight the ***States_Boundaries.shp*** layer. Click **Add**.

TIP: Make sure you add the file with the .shp extension. This is a shapefile. The datasets with a .lyr extension are layer files. A layer file is a file which points to a dataset and which contains information about how that dataset is rendered. But it does not contain the data itself. We will talk more about layer files in exercise 4.

The *States_Boundaries* layer is added with a random fill color. In the previous section, the *States_Boundaries* layer you saw had its own unique symbology applied.

- Using the same procedure described above, also add the ***NWS_CWA_Boundaries.shp, Interstates.shp,*** and ***Tornado_tracks.shp*** layers.

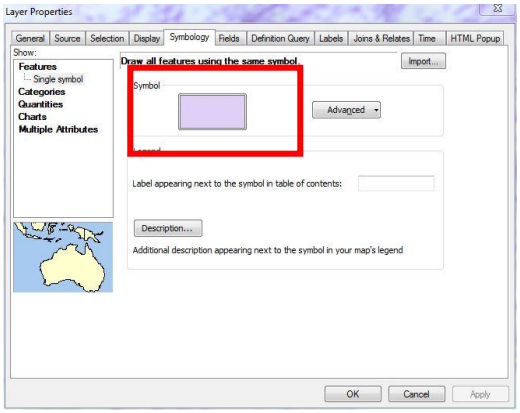
TIP: You can add multiple layers at once by holding the CTRL key and selecting multiple layers in the **Add Data** dialog box.

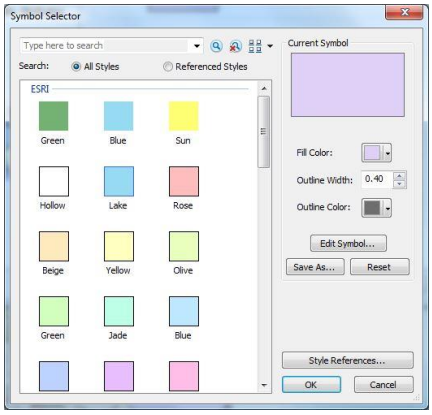
The layers are added to ArcMap and listed in the Table of Contents. Notice that ArcMap orders data based on geometry type. ArcMap will always place Point geometry on top of Line geometry, and Line geometry on top of Polygon geometry. This is because ArcMap draws data starting at the bottom of the Table of Contents.

When you added the *NWS_CWA_Boundaries* layer, it hides the *State_Boundaries* layer. It is possible to manually change this order by rearranging the layers in the Table of Contents.

- If you brought ***NWS_CWA_Boundaries, Interstates,*** and ***Tornado_tracks*** layers into ArcMap at the same time, both layers will be highlighted. In this case click somewhere in the white space in the Table of contents in order to un-highlight these layers.
- Reorder the layers in the Table of contents by clicking and dragging the ***NWS_CWA_Boundaries*** layer below the ***States_Boundaries*** layer.
- Double click on the layer ***States_Boundaries*** to open the Layer Properties window.

- Click the **Symbology** tab.
- Click the **Symbol** patch to open the **Symbol Selector** window.





- Change the symbol to **Hollow**.
- Click **OK** twice to apply your changes and close the windows.
- Turn off the layer ***NWS_CWA_Boundaries*** in the Table of Content by click the check box next to its name.
- Click **File > Save** and save your maps to ***C:\Exercise1\maps*** as ***tornadoes.mxd***.

Step 11 Using the Esri Basemaps

A Basemap is a layer that provides background information or context to your map. Using ArcMap, it is possible to add pre-made basemaps to your project using basemap services. A basemap service is a map that has been created, published, and shared as a web mapping service (WMS) across the web. A WMS is a standardized format that allows you to share detailed map information via the web without having to distribute the actual raw data, which can be computationally demanding. This includes satellite imagery, street atlases, and terrain data, to name a few. We will learn more about basemaps and other WMS services in a later exercise.

- Click the drop-down arrow next to the **Add Data** button on the Standard toolbar and then click **Add Basemap...**
- In the Add Basemap gallery window, click on ***Streets***, and then click **Add**.

- Using the **Zoom In** tool, zoom into the border area of Texas and Louisiana, the area where many tornadoes occurred in the year 2000.

When you zoomed in, more streets and other information became visible. Many basemap services are designed this way so that more detailed information becomes available as you zoom in. This is a very convenient feature when using basemap services. Remember, these data are being served over the web, so you will have to be connected to the internet to use these services.

- Right-click on the ***State_Boundaries*** layer in the Table of Contents and select Zoom to Layer so that all the states become visible again.

Step 12 Remove a Layer from ArcMap

Just as layers can be added to ArcMap, they can also be removed.

- Right-click on the ***Interstates*** layer and click **Remove.**

When layers are removed from ArcMap they are not deleted, they are simply removed from your Data Frame. The layers still reside in their original location on your hard drive.

- Click **File** > **Save** to save your map document.

Working with Attribute Data in ArcMap

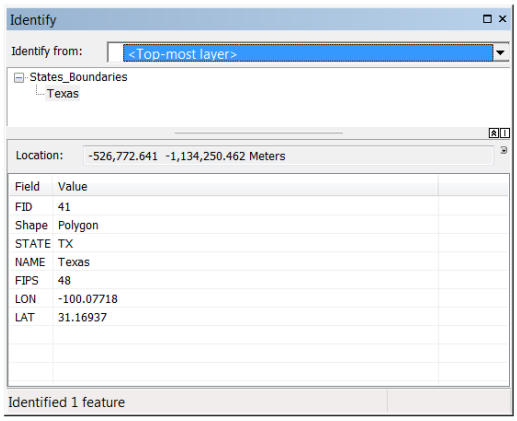
Step 13 Identifying Features on the map

Every individual feature that comprises a layer stores two types of information – spatial information describing where the feature is in space (location) and text-based, non-spatial information describing the characteristics of the feature (attributes). Attributes are stored in a database and can be accessed in one of two ways.

One way to access the information in the Attribute Table is to use the Identify tool.

- On the Tools toolbar click the **Identify** button and then click on the state of Texas in a location where there are no tornado tracks.

The **Identify** window appears, providing information about the name, abbreviation, and other non-spatial data associated with the state of Texas. The list and type of information identified will be determined by what is stored in the Attribute Table.



- Close the **Identify** window.

Step 14 Viewing the Attribute Table

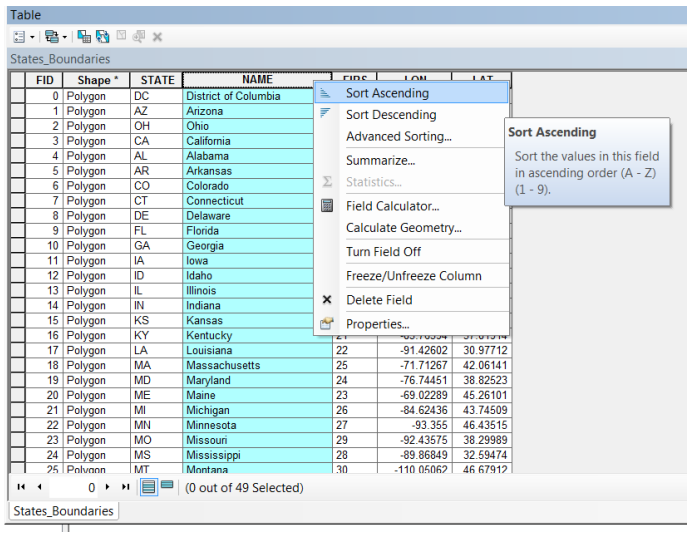
While the Identify tool allowed us to view the attributes of an individual feature, the Attribute Table makes it possible to view all of the attributes for every feature in a layer.

- Right-click on the ***States_Boundaries*** layer in the Table of Contents and click **Open Attribute Table**.

The Attribute Table is similar to any other database table and is displayed as a series of rows and columns. In the GIS world, we refer to these as records and fields, respectively. Here we can see there are fields describing the states' name, centroid location, and abbreviated name.

At the bottom of the table it says "(0 out of 49 Selected)" indicating that there are a total of 49 features in this layer. You can sort a field in an Attribute Table just as you would in Excel or Access.

- In the Attribute Table, click on the NAME field to highlight it and then right-click on the field heading (NAME) and choose **Sort Ascending**.



The table has been re-sorted by the NAME field in alphabetical order.

Sometimes it is useful to "dock" the Attribute Table as you would the toolbars.

- Click on the top of the Attribute Table in the light blue ribbon and move the table around.

Notice that when you dock it, the blue triangles appear on all four sides of your screen. Dragging the Attribute Table over one of these triangles will dock it in that location.

- Drag the Attribute Table over the triangle at the bottom of the map display area and let go.

The Attribute Table is now docked in place at the bottom of ArcMap. To un-dock the Attribute Table, click on the light blue ribbon at the top of the table and drag it away.

- Click on the Attribute Table and drag it back to the center of the screen.
- Close the Attribute Table by clicking the **X** button in the top right corner of the table.

There are many options for working with an Attribute Table and we will be exploring them throughout this and later exercises.

Step 15 Manually selecting Features

In GIS, there is a direct relationship between records in the Attribute Table and "features" on the map. For instance, each individual **County Warning Area** polygon visible in the *NWS_CWA_Boundaries* layer has a single record stored in the Attribute Table.

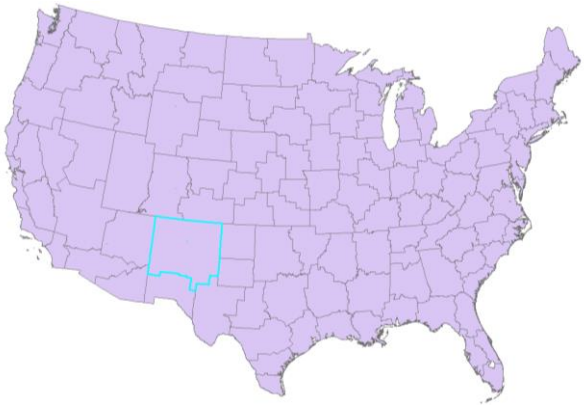
- Turn off the ***Tornado_tracks*** layer by un-checking the checkbox in the Table of Contents and make sure the ***NWS_CWA_Boundaries*** layer is turned on.
- Turn off ***States_Boundaries***.

County Warning Areas are individual regions partitioned by the National Weather Service (NWS) where forecast and warnings are issued. Each County Warning Area has its own NWS Forecast Office.

Now select one of these areas manually using the **Select Features** tool. This is referred to as a manual selection. In a later Step, you will learn to select features using a Definition Query.

- On the **Tools** toolbar, click the **Select Features** button.
- Click on the large County Warning Area polygon found in northern New Mexico.

The polygon is highlighted with a light blue outline indicating that it has been selected.



TIP: You can change the color of selected features from the default blue to another color.

- Right-click on the ***NWS_CWA_Boundaries*** layer in the Table of Contents and open the Attribute Table.
- Right click the field name *WFO* and select **Sort Ascending**.

FID	Shape *	WFO	CWA	AREA	LON	LAT
3	Polygon			0	-82.66098	41.76506
90	Polygon	ABQ	ABQ	0	-106.02705	34.76164
78	Polygon	ABR	ABR	0	-99.05482	44.76232
122	Polygon	AFC	AFC	0	-157.71705	59.49039
123	Polygon	AFG	AFG	0	-156.42428	66.30902
118	Polygon	AJK	AJK	0	-133.08815	57.71825
68	Polygon	AKQ	AKQ	0	-76.89361	37.25746
95	Polygon	ALY	ALY	0	-73.82533	42.77903
98	Polygon	AMA	AMA	0	-101.51059	35.87242
72	Polygon	APX	APX	0	-84.78861	45.29764
43	Polygon	ARX	ARX	0	-91.32398	43.94591
94	Polygon	BGM	BGM	0	-76.05805	42.25659
87	Polygon	BIS	BIS	0	-101.0326	47.4677

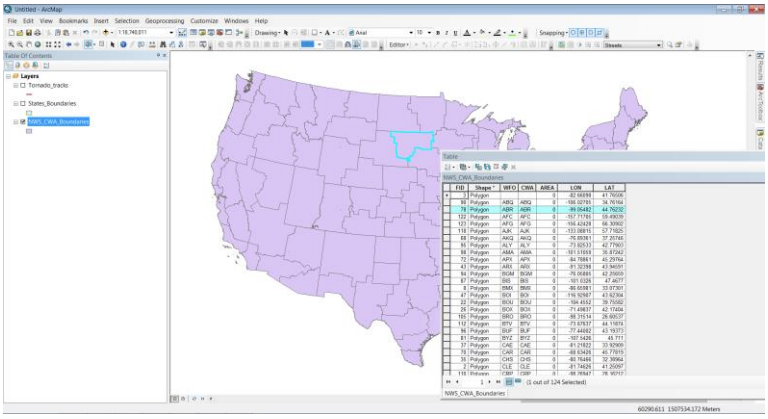
The selected County Warning Area polygon is highlighted in blue and listed in the record under the WFO field (column) as ABQ, or Albuquerque. Again, this demonstrated the direct link between individual “features” seen on the map and “features” (records) found in the Attribute Table.

You selected a feature on the map with the Select Features tool and the same feature was also highlighted in the Attribute Table. However, you can also select a feature (record) in the Attribute Table and it will also be selected on the map.

- Click on the record underneath with ABR listed as the WFO by clicking on the grey box to the left of the record.

This record should now be highlighted in light blue.

- Position the Attribute Table so that you can see the map and the highlighted County Warning Area polygon as well. (see image on the following page)

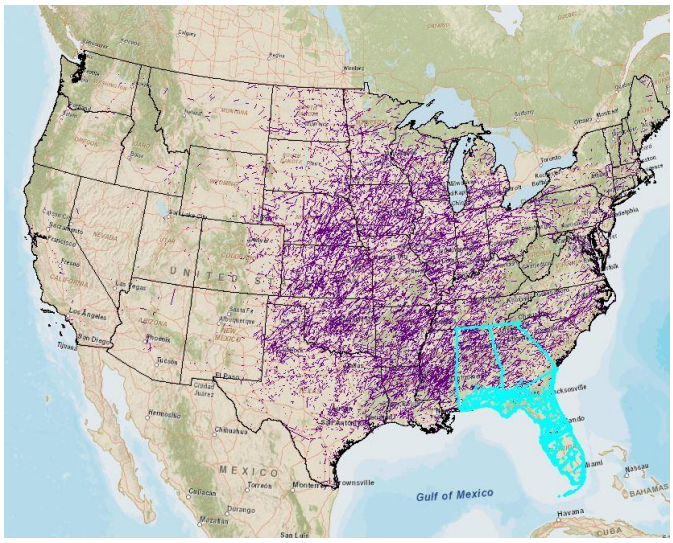


Once you have finished selecting features, you can “clear” them to make sure that no features are selected.

- Click the **Clear Selected Features** from the **Tools** Toolbar.
- Close the Attribute Table.

It is also possible to select multiple features at the same time.

- Toggle off the ***NWS_CWA_Boundaries*** layer and turn on the ***Tornado_tracks***, and ***States_Boundaries*** layer.
- Click the **Select Features** button on the Tools toolbar.
- Click and drag a box around the state of Florida.



You can see that multiple features (tornado tracks) have been selected.

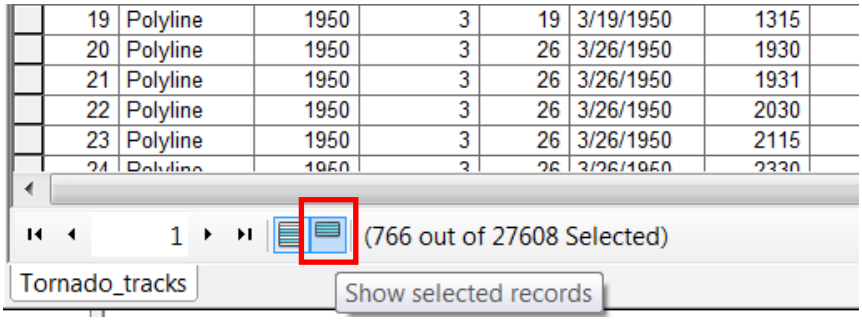
- Right-click on the ***Tornado_tracks*** layer in the Table of Contents and open the Attribute Table.

Notice at the bottom of the table that is says (766 out of 27608) Selected. Your selection number may be different depending on the selection box you drew.

This means that 1) there are 27,608 features (individual tornado tracks) in this layer and that 2) approximately 766 are in Florida.

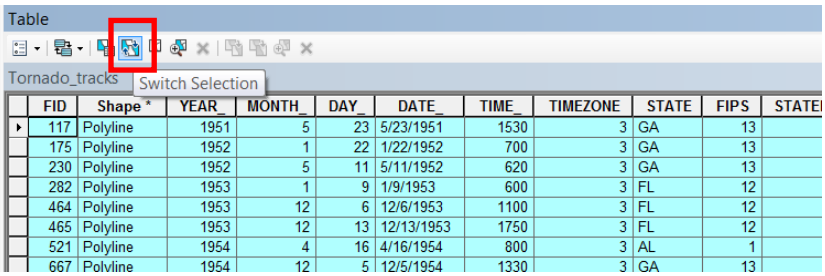
Often you will want to isolate the selected features in the Attribute Table.

- At the bottom of the table, click the **Show selected records** button.



Now just the 766 features (records) appear in the Attribute Table. Sometimes it is useful to switch the selection and see the other features that you did not originally select.

- In the list of buttons at the top of the Attribute Table, click the **Switch Selection** button.



Now you see that all of the features not selected before have now been selected.

- Click the **Show all Records** button at the bottom of the Attribute Table window.
- Close the Attribute Table.

You can now see that all but the features in the Florida area are selected.

- Click the **Clear Selected Features** from the **Tools** Toolbar.
- **Save** your ArcMap document.

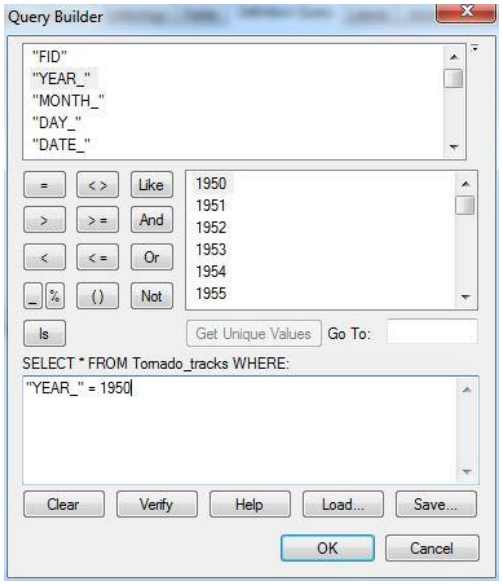
Manually selecting data is just one way to isolate certain features in your datasets. There are also automated ways for doing this that will be shown in the next Step.

Step 16 Applying a Definition Query

The *Tornado_tracks* layer contains a field called YEAR_. You are now going to apply a Definition Query to see tornadoes sorted by the year they occurred. A Definition Query is one way to explore data based on the features' attributes. Definition Queries will only highlight data that match your SQL-based query. Data that do not match your query are not deleted, just not visible.

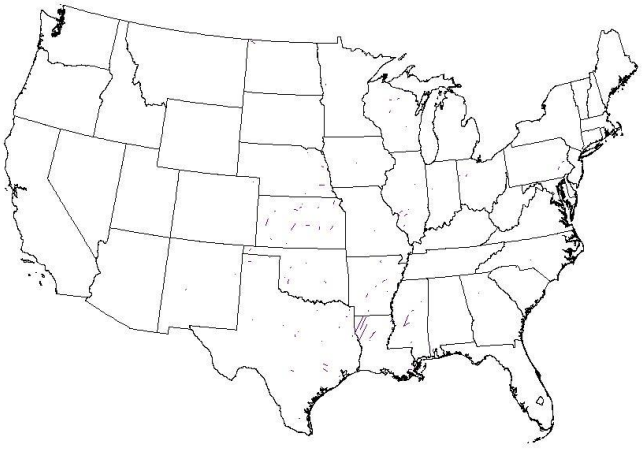
- Double click on the layer ***Tornado_tracks*** in the Table of contents to open the Layer Properties window.
- Select the **Definition Query** tab.
- Click the **Query Builder** button.
- In the Query Builder window double click on the field "YEAR_". It should now appear in the dialog box section of the Query Builder window.
- Single click the "**=**" sign.
- Click the **Get Unique Values** button.
- Double click on the year 1950.

Your window should look like the one below.



- Click **OK** to close the Query Builder window and click **OK** in the Layer Properties window.
- Turn off the ***Basemap*** layer so that you can see the tornado tracks better.

You have just mapped only the recorded tornadoes that occurred in the year 1950.



- Open the Attribute Table for the ***Tornado_tracks*** layer.

How many tornadoes occurred in 1950 according to this dataset? (Look at the number of features in your table). Close the Attribute Table. Using the steps above, fill in the table below performing definition queries and looking at the number of features in your table.

YEAR	How many tornadoes?
1960	
1970	
1980	
1990	
2000	

A Definition Query is just one example of the types of Queries possible in ArcMap. Building queries are how you begin exploring your data in more detail and performing spatial analysis. We will work more with Queries in a later Exercise.

- Save ArcMap.
- Close ArcMap by clicking **File > Exit**.

The ArcMap document you've just saved displays all the recorded tornadoes for the year 2000. The map is saved as a .mxd file. This file does not contain the data in your map. It simply contains pointers to your data and the symbology and drawing order you chose.

Navigating and Using ArcCatalog

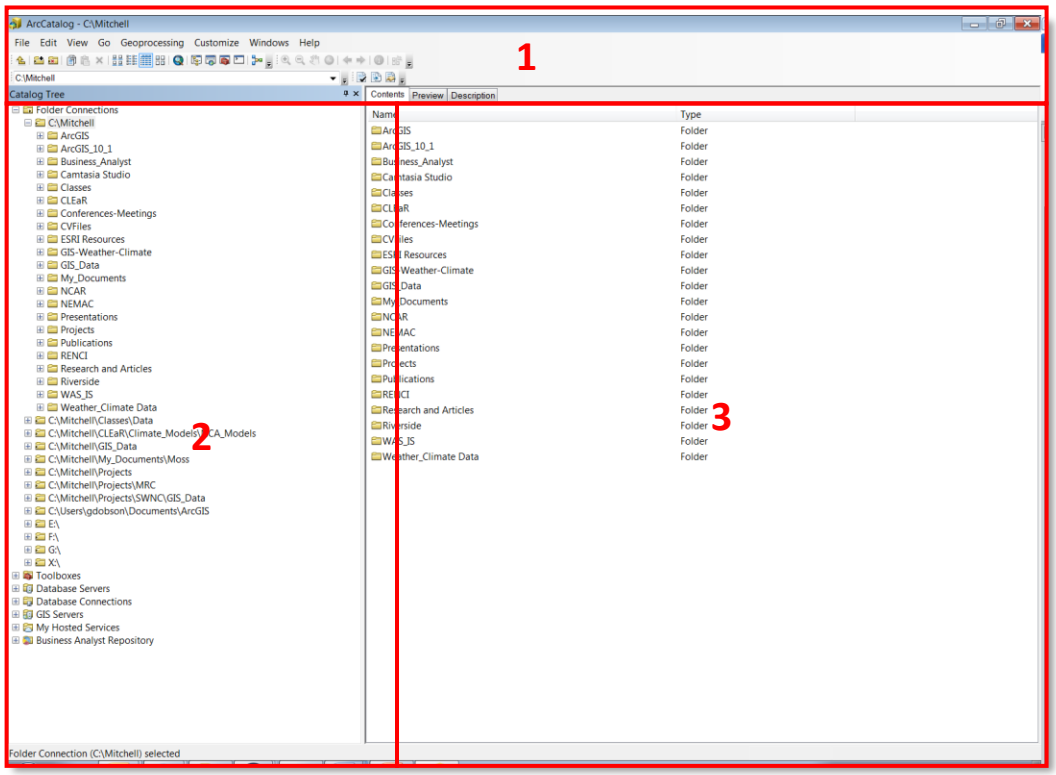
ArcCatalog is the interface of ArcGIS for Desktop where you create and manage GIS data layers, databases, services, metadata, and folder connections. One of the main functions of ArcCatalog is to manage GIS data layers; which includes copying, deleting, or moving data layers from one location to another. Generally speaking, ArcCatalog is the “Windows Explorer” of ArcGIS for Desktop, and should always be used instead of Windows Explorer when managing GIS data.

Besides data management, ArcCatalog can also be used to access other ArcGIS for Desktop tools and applications such as ArcMap, ArcToolbox or Model Builder. In practice, ArcCatalog can be accessed from within ArcMap or as a stand-alone interface.

<u>Step 17</u> Exploring the stand-alone ArcCatalog interface

- Start ArcCatalog by clicking **Start** > All Programs > ArcGIS > ArcCatalog**.**

The ArcCatalog interface has a similar appearance to Windows Explorer with three main sections: 1) a collection of menu tabs, toolbars, and a directory path at the top, 2) the Catalog Tree on the left, and 3) the Catalog Window area in the middle. (See image below).



Recall from earlier in this chapter that to access GIS data using ArcMap, you had to establish a new folder connection. The same is true for ArcCatalog. In fact, even though folder connections can be made in the Add Data interface within ArcMap, establishing and managing these connections with ArcCatalog is a better method.

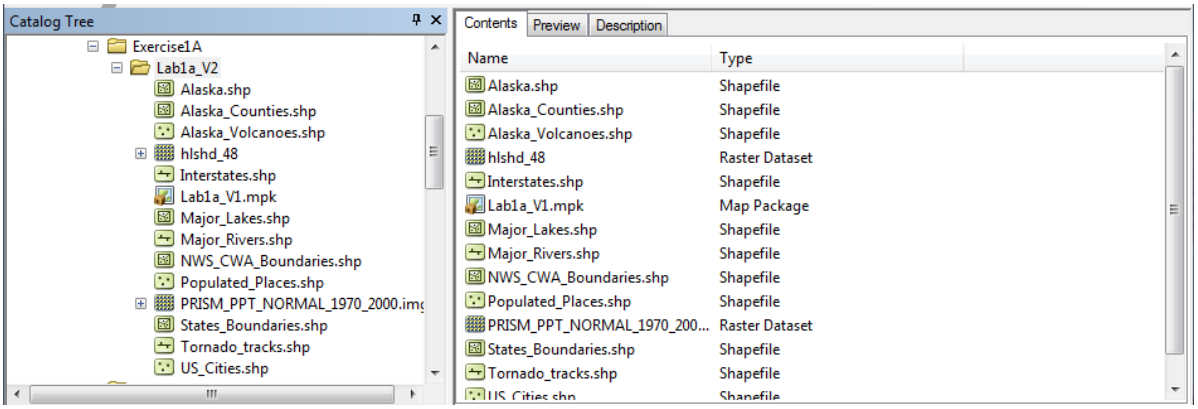
You should see your connection to C:\Exercise1, which you established in Step 11. If you do not see this connection, then complete the step below.

- Click the **Connect to** Folder button on the Standard toolbar in the top left corner of ArcCatalog. Browse to the ***C:\Exercise1*** directory, click on the path name, and then click **OK**.

The connection, or path, is now stored and is visible in the Catalog Tree on the left. If you ever wish to delete a folder connection, simply right click on the folder in the Catalog Tree and choose Disconnect Folder.

The Standard toolbar in ArcCatalog is different from the Standard toolbar in ArcMap. In ArcCatalog, the Standard toolbar contains the **Up One Level** button, which allows you to navigate up a level in the Catalog Tree, the **Connect to Folder** button, the **Copy** button, and other buttons that allow you choose how you want the contents of ArcCatalog to be displayed, as well as shortcuts to ArcMap, ArcToolbox, and other programs.

- Hover over each tool in the Standard toolbar.
- Navigate to ***C:\Exercise1*** and click on ***data*** folder in the Catalog Tree and notice the contents (data) in the Catalog Window area.



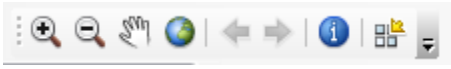
- Now expand the data folder in the Catalog Tree by clicking the **+** sign to the left of the folder.
- Click on the ***NWS_CWA_Boundaries*** layer.

Notice the three tabs at the top of the Catalog Window area – Contents, Preview, and Description.

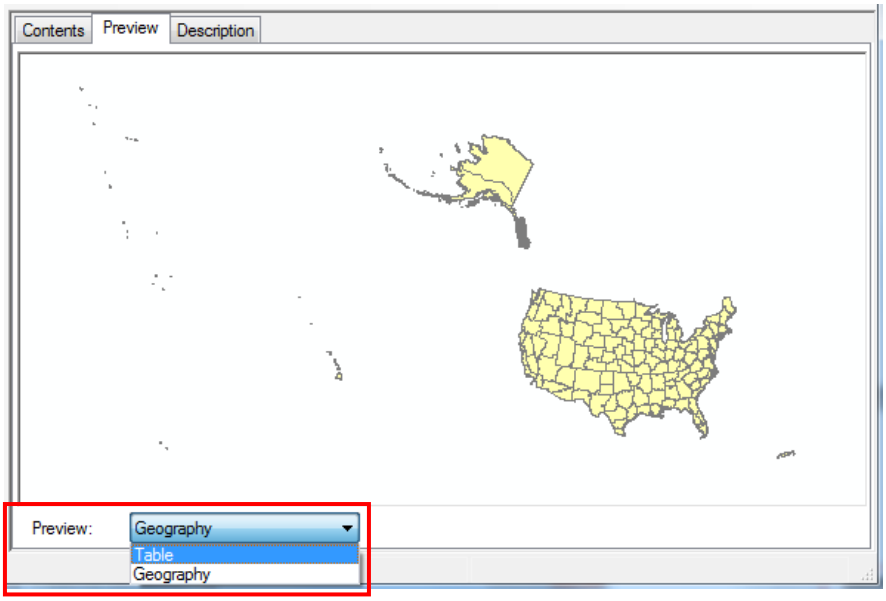
- Click on the **Preview** tab at the top of the Catalog window.

The Preview tab in ArcCatalog lets you physically see what the geometry of the data looks like.

- Use the tools on the Geography toolbar to further explore the data.



- At the bottom of the main ArcCatalog window, toggle the Preview option from **Geography** to **Table**.



Now you can explore the attribute table as well.

- Click on the Description tab.

The **Description** tab displays the metadata associated with a particular layer. Note the options to print and edit the metadata. Additionally, you can import metadata from an XML file or some other format.

- Close ArcCatalog by clicking **File > Exit**.

Step 18 Using ArcCatalog from within ArcMap

In ArcMap, ArcCatalog is simply referred to as Catalog.

- Open your ***C:\Exercise1\Exercise1_<your name>.mxd*** ArcMap document that you saved in Step 1.
- Click the catalog button found on the Standard toolbar.

A Catalog window appears.

The Catalog window in ArcMap is essentially a simplified version of ArcCatalog. Notice how this window looks very similar to the Catalog Tree in ArcCatalog.

TIP: With any of the interface windows in ArcMap, you can choose for them to be permanently displayed or in Auto Hide mode by clicking the thumbtack icon in the upper-right corner of the interface window.

- Double click on the Title Bar for Catalog to dock the window.
- From the Catalog window, navigate to **C:\Exercise1\data.**

Notice the contents are exactly the same as they appeared in ArcCatalog in the previous step.

One advantage to using the Catalog window in ArcMap is that you can work on your map and also easily see all of the data available. Additionally, you can add data directly to the ArcMap Table of Contents from the Catalog window.

- Click on the ***Major_Rivers*** layer and drag it to the ArcMap Table of Contents above ***State Boundaries***.

This is a quick and easy method to use when you only need to add one or two layers.

- Save and close the ArcMap document.