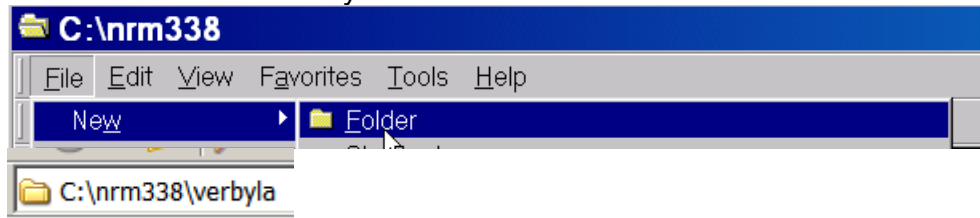


Lab#1: Introduction to ArcGIS10

In this lab, you will use ArcGIS to work with statewide GIS data of Alaska. You use ArcMap to:

- Create a data connection
- Edit GIS theme metadata
- Create data frames
- Add and remove GIS themes from data frames
- Activate and rename data frames
- Change the symbology of data layers
- Label features
- Build definition queries with data layers
- Create a layer file containing a query, layer name, and symbology
- Select features (points, lines, or polygons) based on locational queries
- Select features based on attribute queries
- Select features graphically from a data frame or table rows
- Save your work to an ArcMap document

Create a new folder for yourself in the **c:/nrm338** folder...



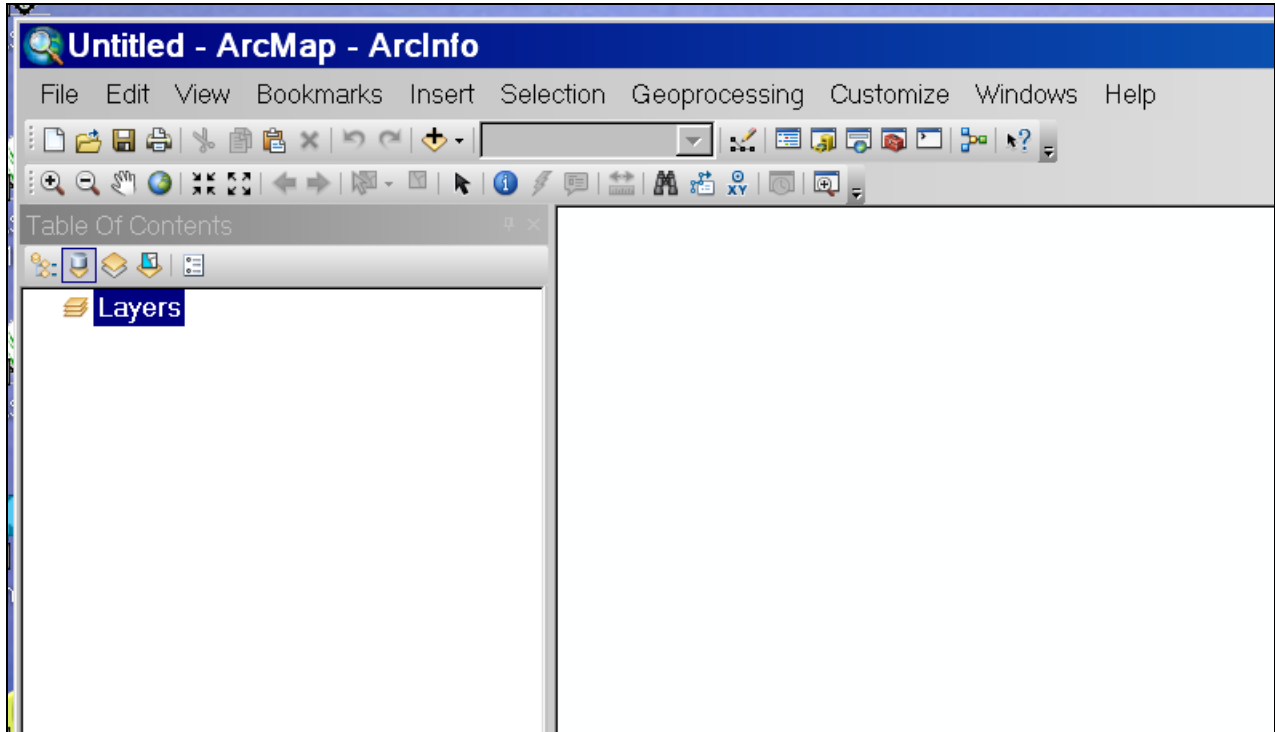
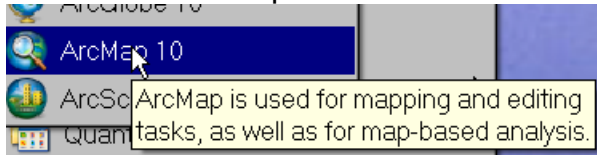
Download and unzip the file **lab1.zip** from the following website:

<http://dverbyla.net/nrm338/data/>

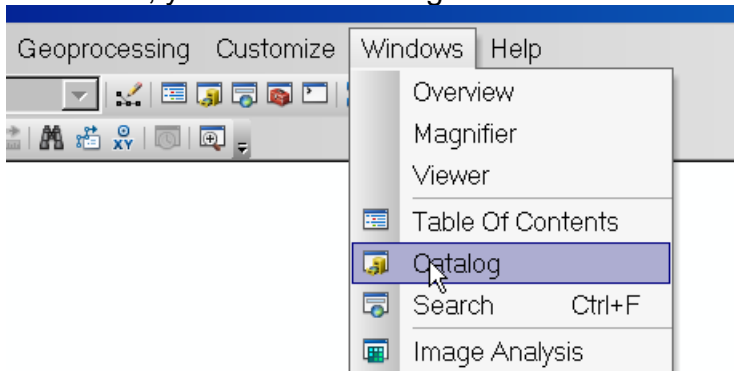
Right mouse-click on lab1.zip and extract the file to c:\nrm338\your_folder

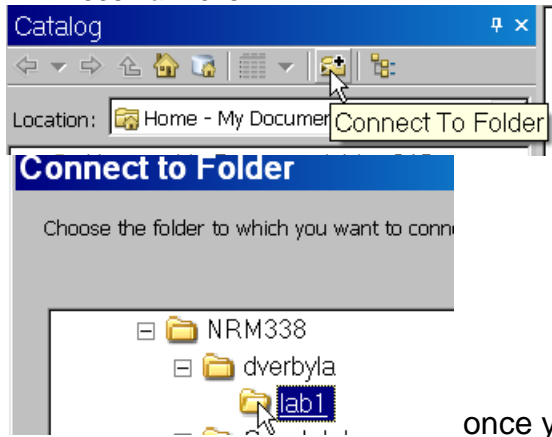
Data Connections

Start Arcmap.

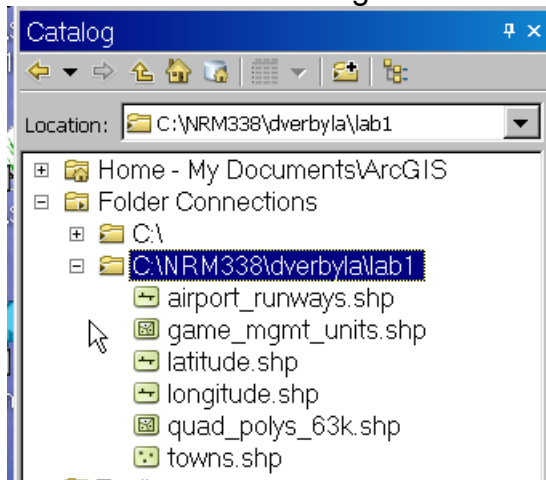


Create a data connection to your own folder on c:\nrm338____
To do this, you use the catalog





once you have connected to your folder, you can see a variety of GIS data in the catalog window...



From the icon, you can tell the type of feature class (point, line, polygon) each GIS theme is.

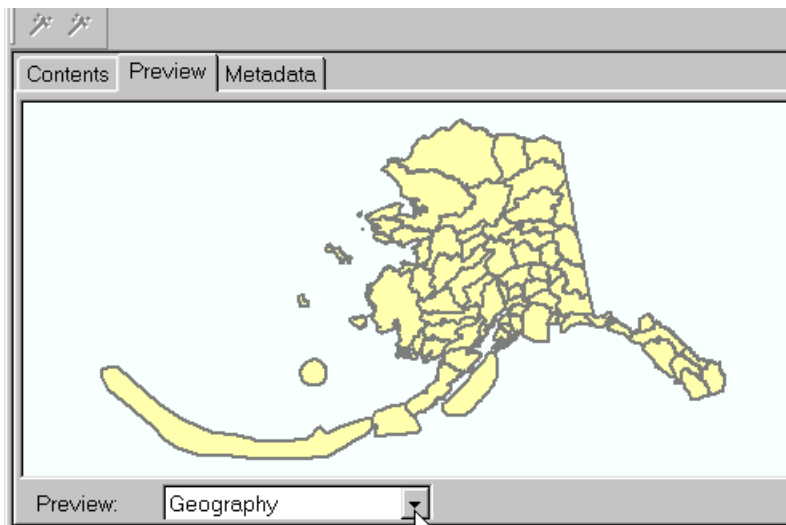
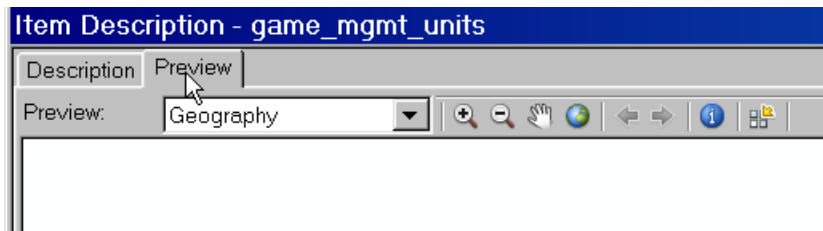
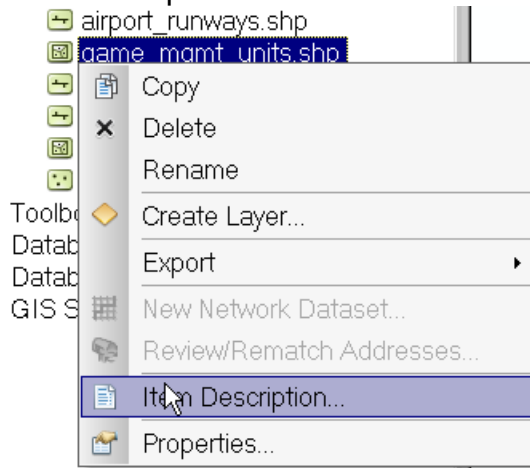
Which are point feature classes?

Which are line feature classes?

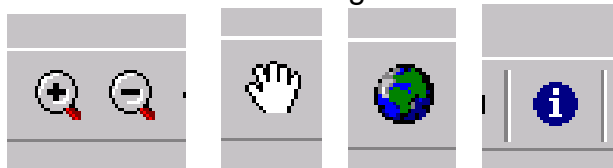
Which are polygon feature classes?

Previews in Catalog

You can preview any GIS theme in Catalog by right-mouse clicking on the theme and selecting Item Description...do this for the theme game_mgmt_units...



Use each of the following tools to determine their functions:



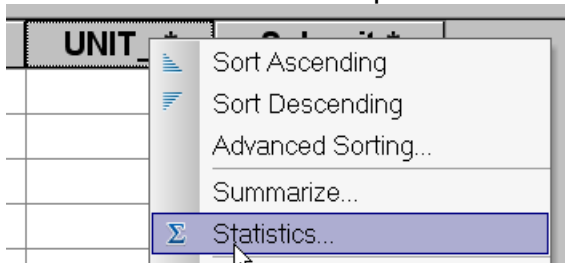
Change your preview from Geography to Table to see the information stored about each polygon in your GIS theme.

Preview: Table

FID	Shape *	UNIT_*	Subunit *
0	Polygon	26	A
1	Polygon	25	B
2	Polygon	25	D
3	Polygon	20	F
4	Polygon	25	C

FID stands for Feature ID and is automatically created by ArcGIS for any point, line, or polygon feature class. It is a unique ID number for each feature starting with zero and ending with the number of features – 1.

What is the maximum/minimum UNIT_ value? Right mouse click on the UNIT_* field and select statistics to see the descriptive statistics for any numeric field.

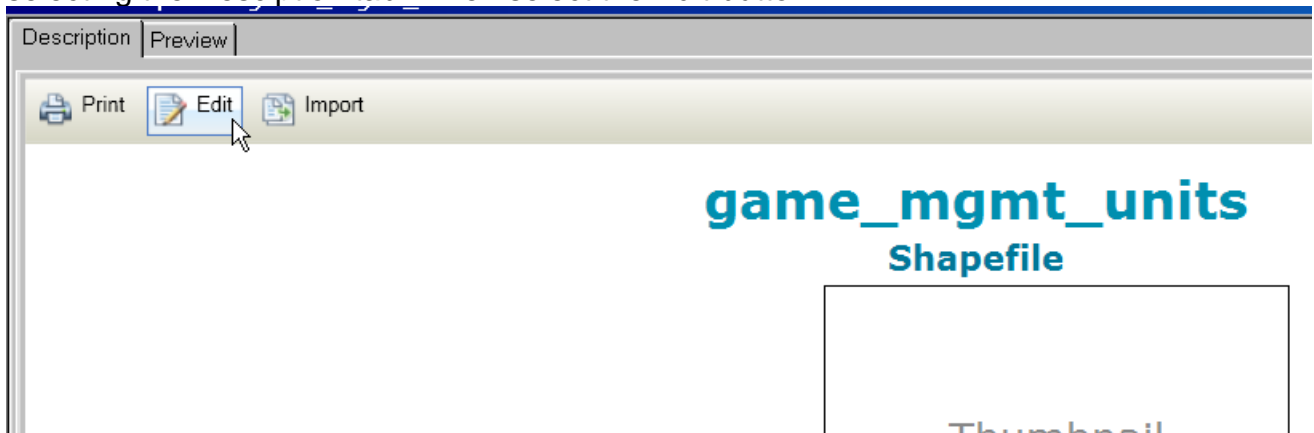


Another way to determine minimum/maximum field value is to select Sort Ascending/Sort Descending for that field. Do this to verify that the min/max in field statistics were correct.



Metadata

Metadata is information about a GIS theme. Sometimes you will have to edit metadata to improve the documentation about your GIS theme. You can do this in Catalog, by first selecting the Description tab. Then select the Edit button.

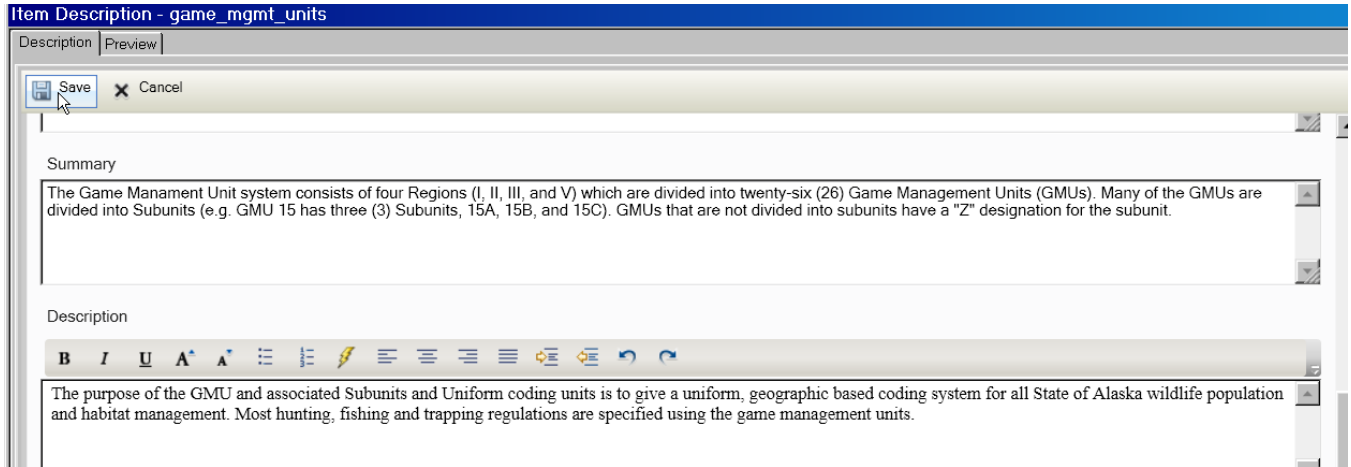


Add the following summary information (**copy and paste** the following) :

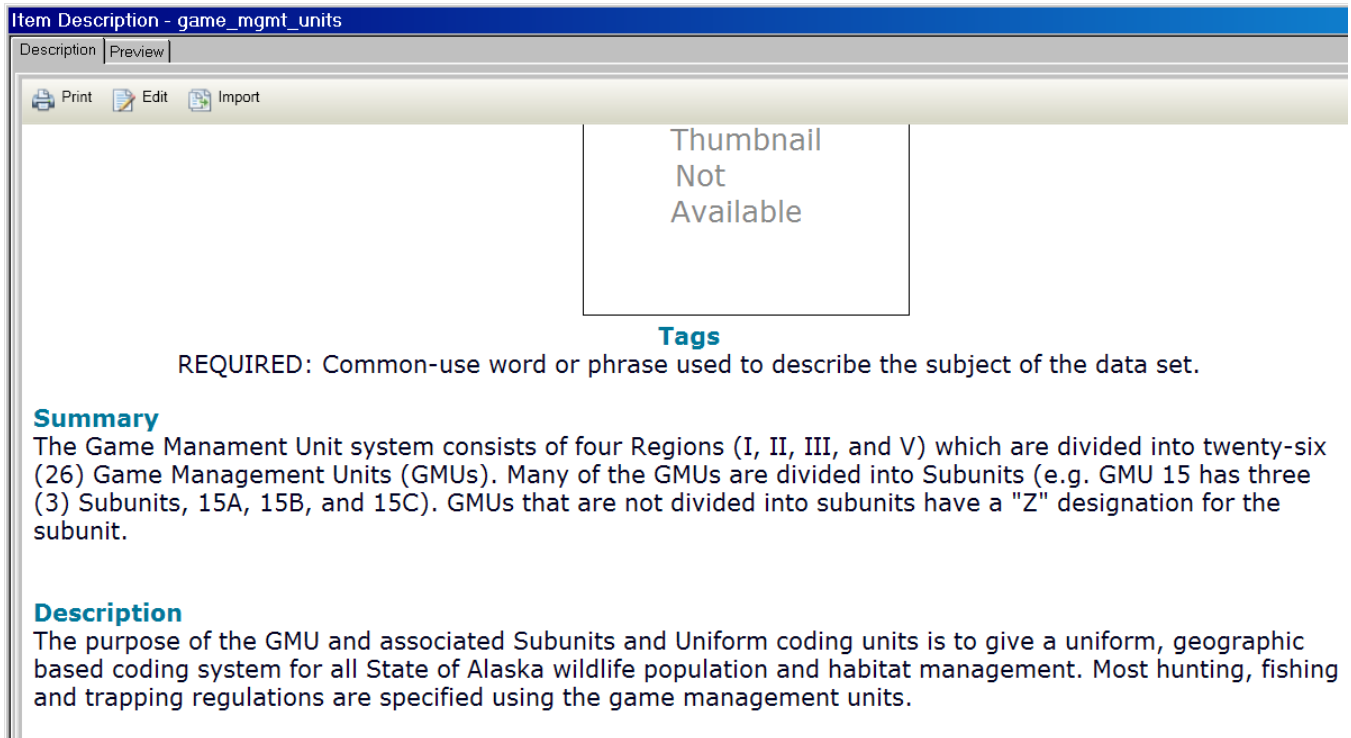
The Game Manament Unit system consists of four Regions (I, II, III, and V) which are divided into twenty-six (26) Game Management Units (GMUs). Many of the GMUs are divided into Subunits (e.g. GMU 15 has three (3) Subunits, 15A, 15B, and 15C). GMUs that are not divided into subunits have a "Z" designation for the subunit.

Add (**copy and paste**) the following description information:

The purpose of the GMU and associated Subunits and Uniform coding units is to give a uniform, geographic based coding system for all State of Alaska wildlife population and habitat management. Most hunting, fishing and trapping regulations are specified using the game management units.



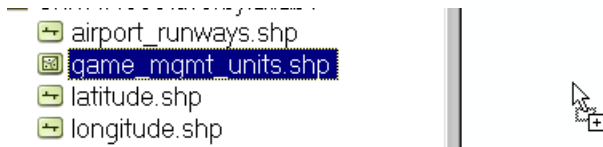
Select the Save button after you pasted in the Summary and Description text.



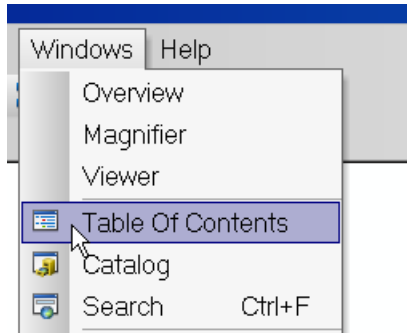
Adding Data

There are three ways to add GIS data into your arcmap data frame.

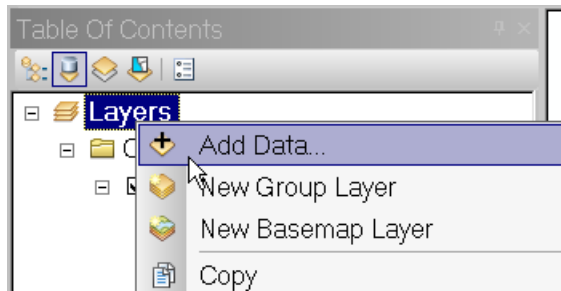
- 1) Drag the GIS theme from your Catalog window into your data frame.



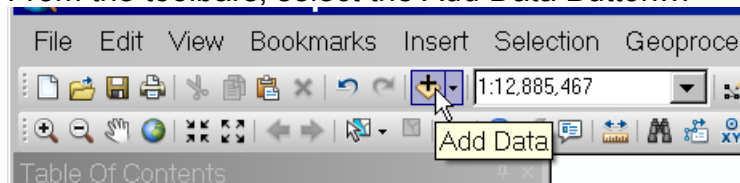
To see all the GIS themes in your data frame, change your window to Table of Contents.



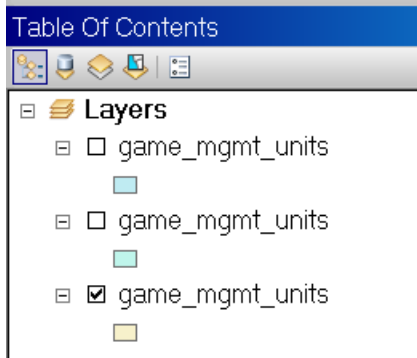
- 2) From your Table of Contents, right mouse-click on the Layers data frame object and select Add Data...



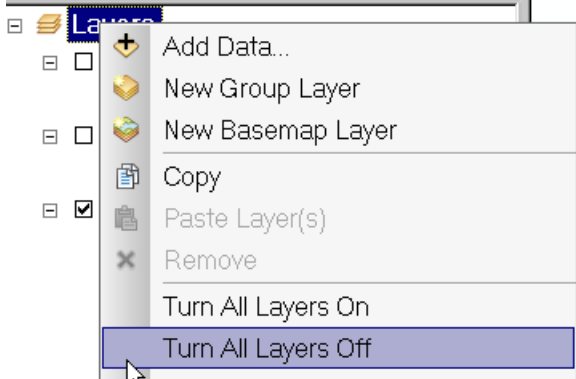
- 3) From the toolbars, select the Add Data Button...



Use these three methods to add your Game Management Units GIS theme to your ArcMap data frame.

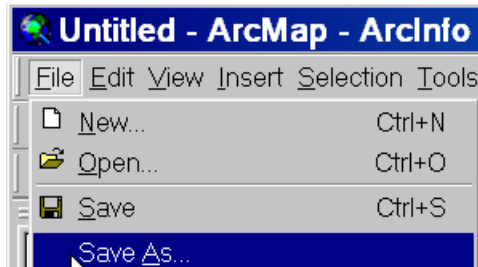


You can make any layer visible by checking it on. In the above example, the first two layers are checked off. If you want to check on/off all layers in your data frame, right-mouse click your Layers data frame object and select Turn All Layers On or Off



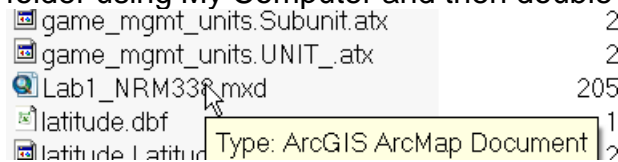
Saving Your Work!

When you save your document, ArcMap remembers all your GIS themes that have been added to your document. **Save your Arcmap document to your own folder as lab1.mxd.**

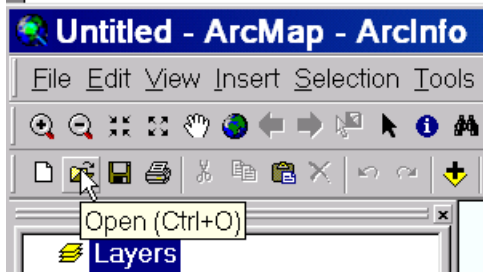


Then exit out of ArcMap.

You can recall your ArcMap document by browsing to your own folder using My Computer and then double-clicking on the Arcmap mxd file

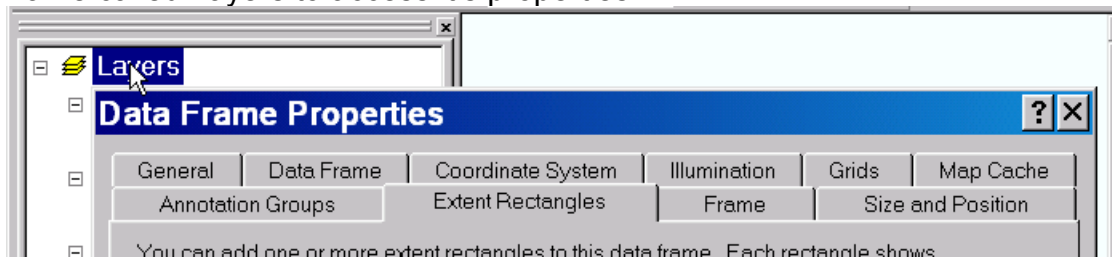


Or you can open your ArcMap document after starting the ArcMap application:

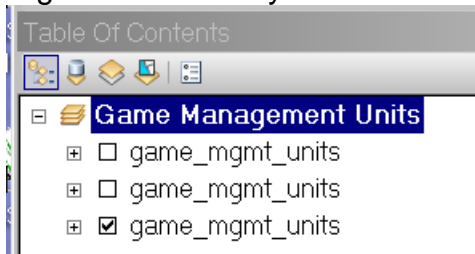


Creating and Activating Data Frames

ArcMap arranges GIS themes in containers called **data frames**. Right click on the first data frame called Layers to access it's properties.



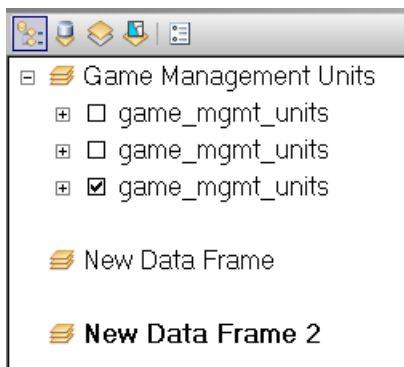
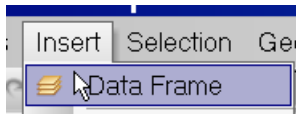
Under the General tab, name your data frame **Game Management Units**...OK. Right mouse-click your data frame, and collapse all layers....



Right mouse-click your data frame, and turn all layers off....

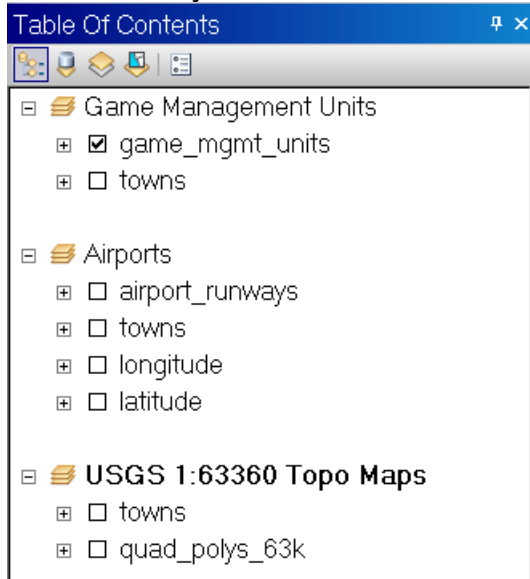
Save your Arcmap document.

Use the Insert Menu to insert two new data frames.



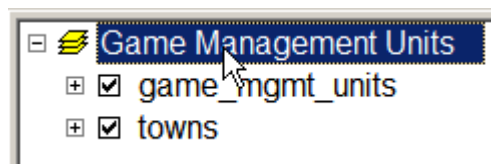
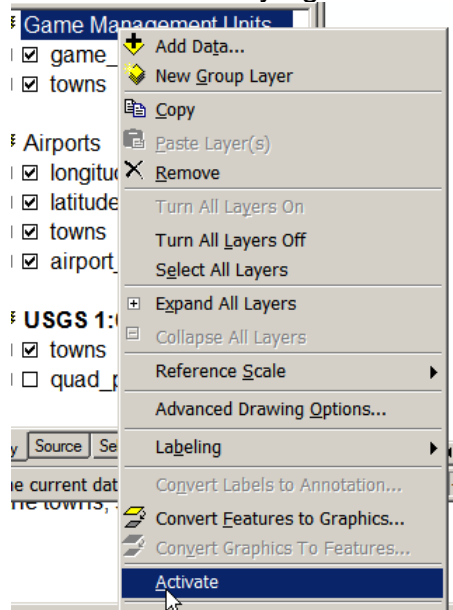
Re-arrange add your GIS themes into the data frames as follows:

And rename your data frames as follows:



Save your arc map document!

To display any data frame, right click on it and select Activate. Activate your first data frame... You can do this by right mouse-clicking on the data frame:



Or selecting the Data Frame and then pressing the **F11** key. Or use the **Ctrl-Tab** to cycle through your data frames.

Notice that your active data frame is in bold compared to the other data frames:

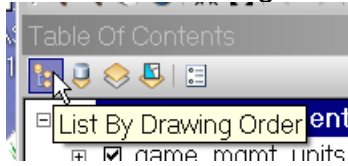
Drawing Order of Layers

The drawing order of GIS themes is specified by the order in the Table of Contents. For example, the **game_mgmt_units** theme is drawn over the towns, so most of the towns are covered up.

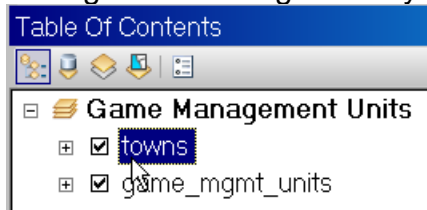
Most of the towns are hidden.



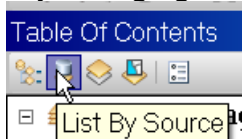
Select the Drawing Order tab at the top of your table of contents.



Change the drawing order by dragging the **towns** theme to the top of the drawing list.



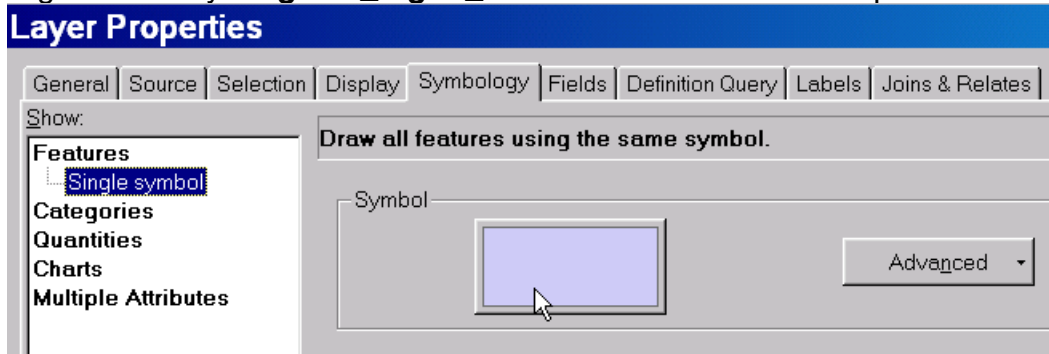
Try changing the drawing order with the Source tab selected. Can you do it?



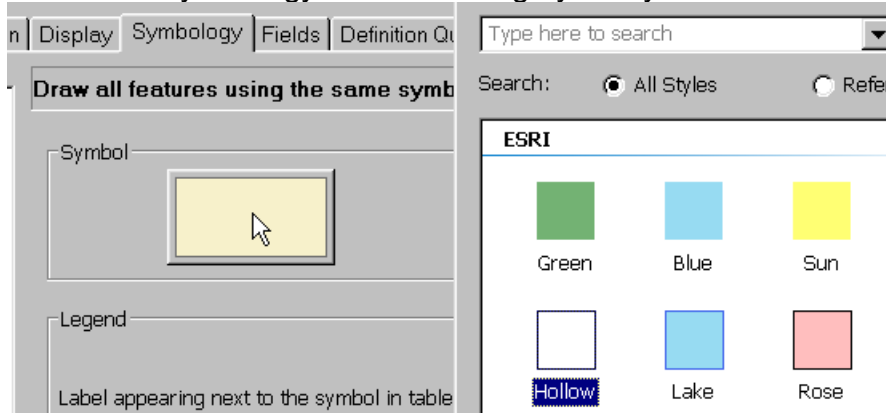
Why would you use the Source tab instead of the Display tab?

Changing Layer Symbology

You can change the symbology of any theme in your table of contents. Right click on your **game_mgmt_units** theme and select Properties...



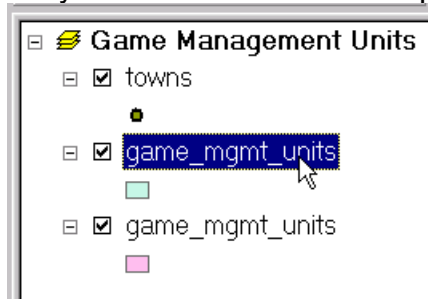
Select the Symbology tab and change your symbol to Hollow.



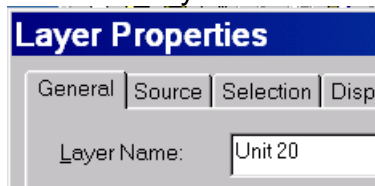
Save your arc map document!

Definition Queries

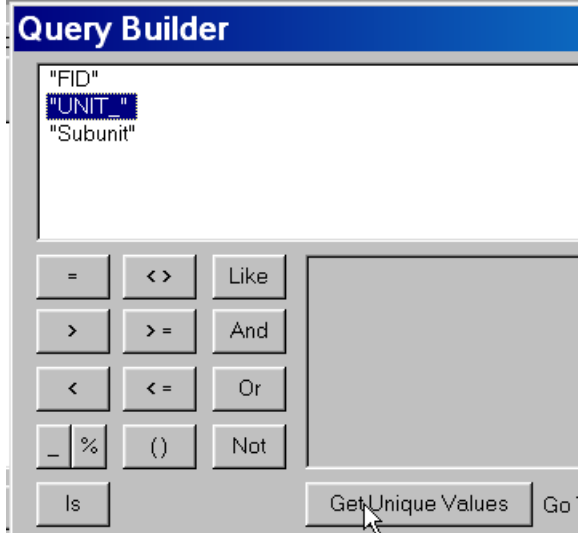
You can create new themes by querying the attributes of a theme and then saving the result to a layer file. Add a second copy of the **game_mgmt_units** theme.



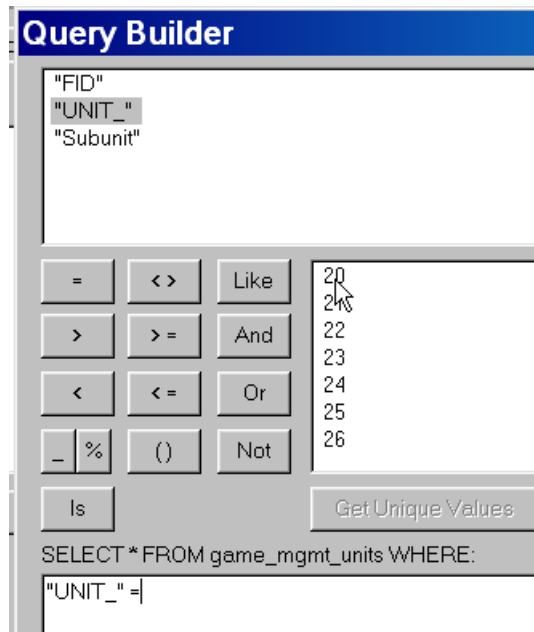
Right mouse-click on this layer to access its properties. Name the layer Unit20.



And Define this layer using the Query Builder



When working with categories, always use the Get Unique Values to see a list of valid values..



Double-click on "Unit" and then the = button then the unique value of 20.



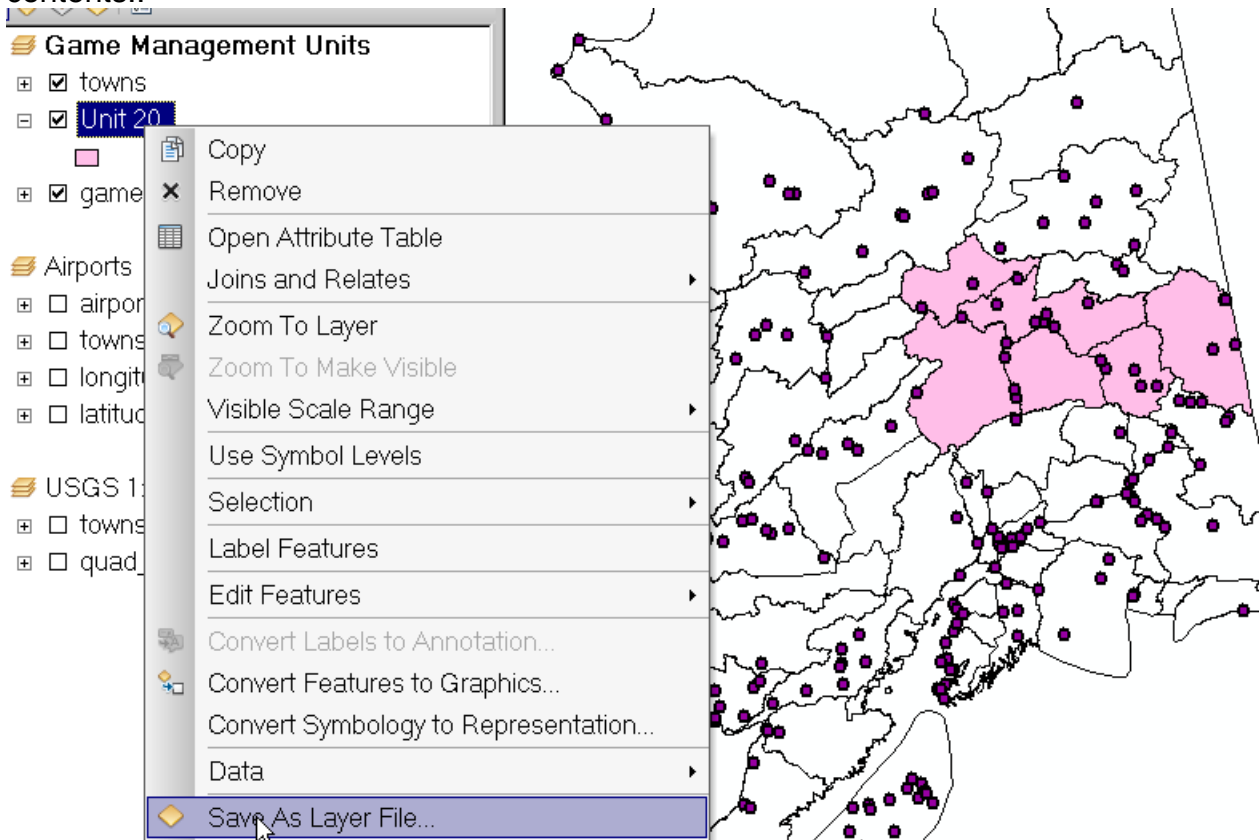
Always verify that your query expression is valid!



OK, now perform the query in this layer.

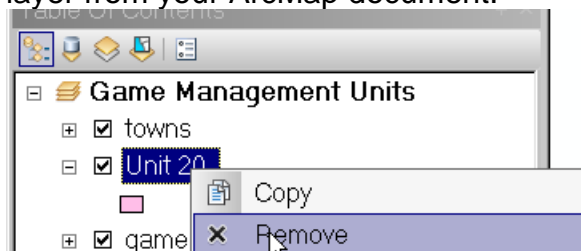
Saving To Layer Files

Save your Unit20 as a layer file by right mouse clicking on the layer from your table of contents..

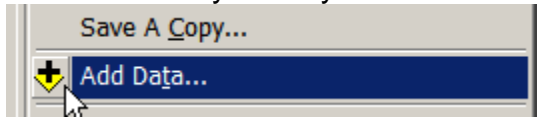


What is the extension of a Layer File?

There are several advantages of a layer file. 1) Your definition query is saved, so you have a theme called Unit20.lyr that is derived from your original game units GIS theme. 2) The symbology is also saved to your Layer File. 3) The layer name is saved. Remove your Unit20 layer from your ArcMap document.



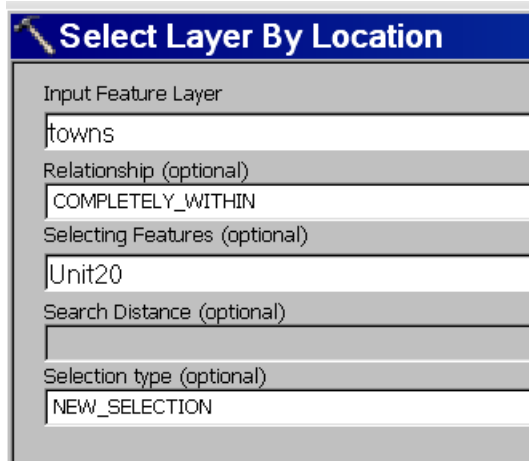
Then add the lyr from your folder into your ArcMap document.



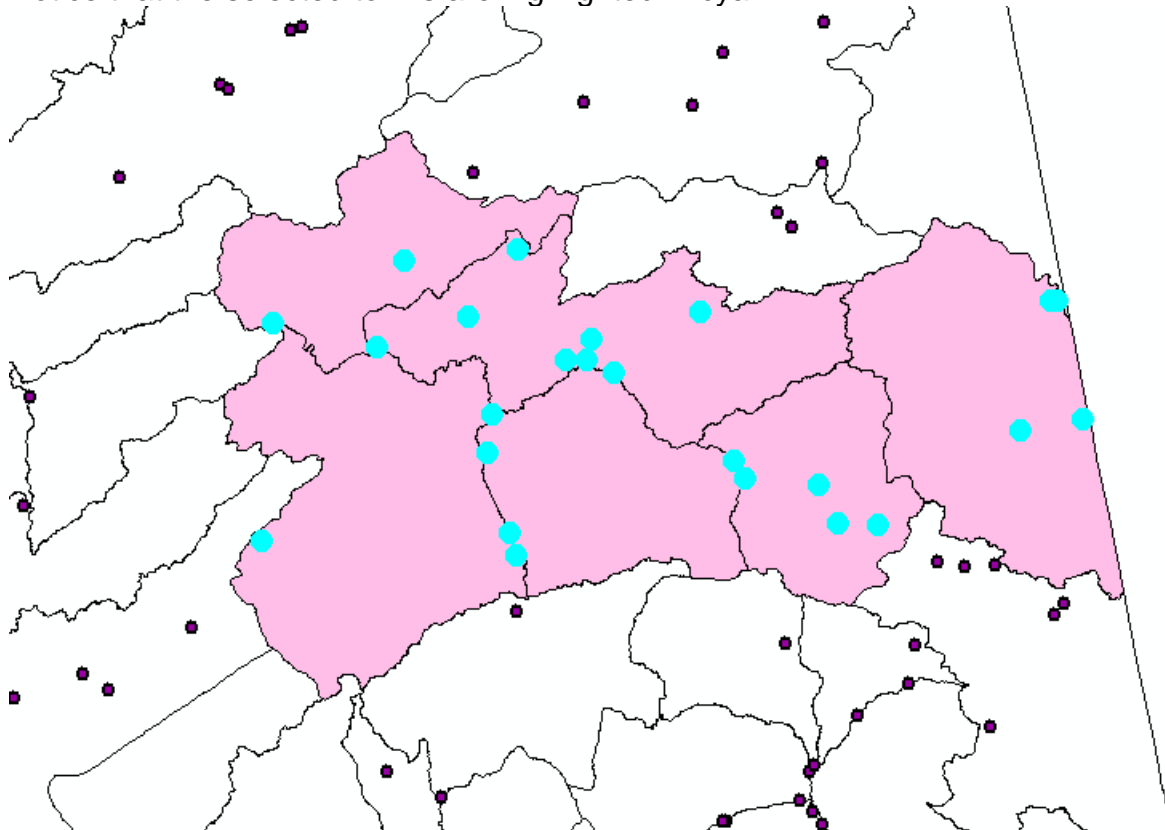
Save your arc map document!

Selecting Features By Spatial Relationship

What are the towns that are inside Unit 20? You can answer this question by using the **Select By Location** tool



Notice that the selected towns are highlighted in cyan.



You can look at the attributes of these selected towns by opening the attribute table for the **towns** layer. Right mouse-click on the **towns** layer and select Open Attribute Table. Select Show Selected Records at the bottom of your table.

towns			
	FID	Shape *	NAME *
▶	34	Point	Boundary
	38	Point	McKinley Park
	47	Point	Minto
	48	Point	Healy Lake
	49	Point	Dot Lake
	154	Point	Healy
	158	Point	Chicken
	159	Point	Delta Junction
	160	Point	Big Delta
	161	Point	Eagle
	162	Point	Eagle Village
	165	Point	Chena Hot Springs
	166	Point	Fairbanks
	167	Point	Fox

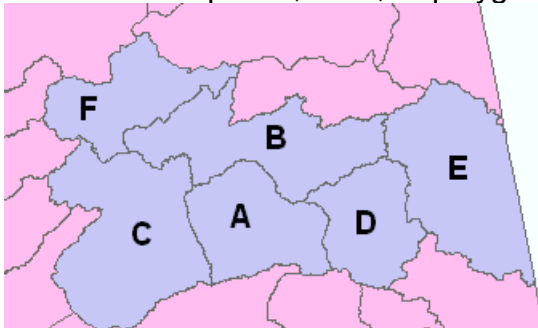
◀ 1 ▶ (24 out of 321 Selected)

towns Show selected records

There are 24 towns located inside game unit 20.

Feature Attributes As Labels

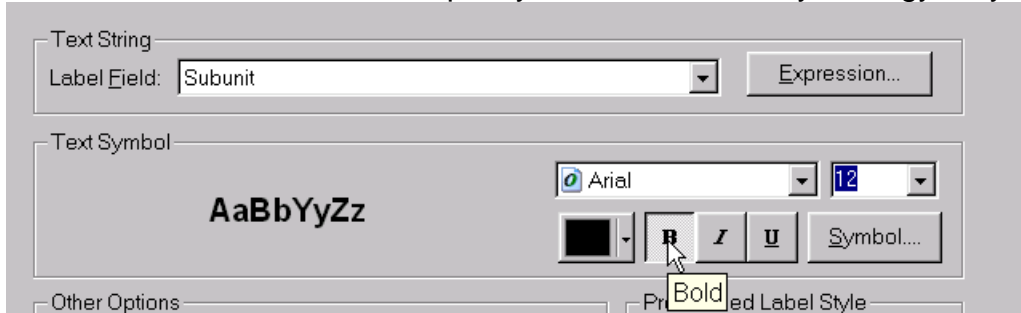
You can label points, lines, or polygons using the layer's attribute table.



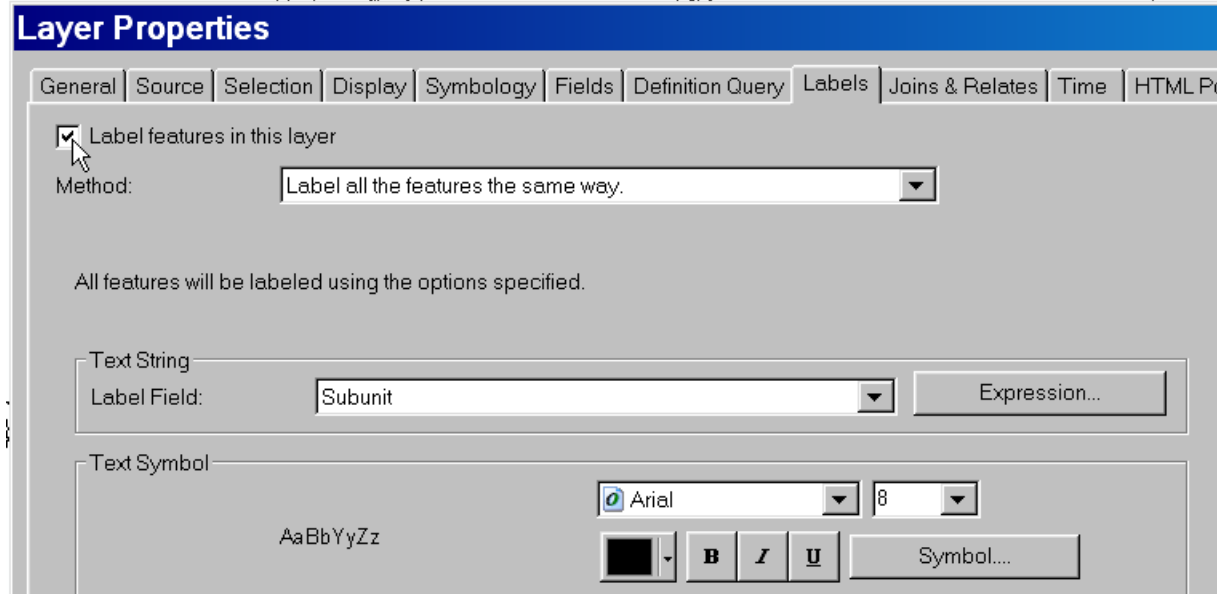
For example, label each polygon in Unit20 by its Subunit value.

Attributes of Unit 20			
	FID	Shape*	UNIT * Subunit*
▶	3	Polygon	20 F
	6	Polygon	20 E
	66	Polygon	20 B
	70	Polygon	20 D
	71	Polygon	20 A
	81	Polygon	20 C

First right-mouse click on your Unit 20 layer, select properties
Select the label tab, and then specify the attribute and symbology for your labels.

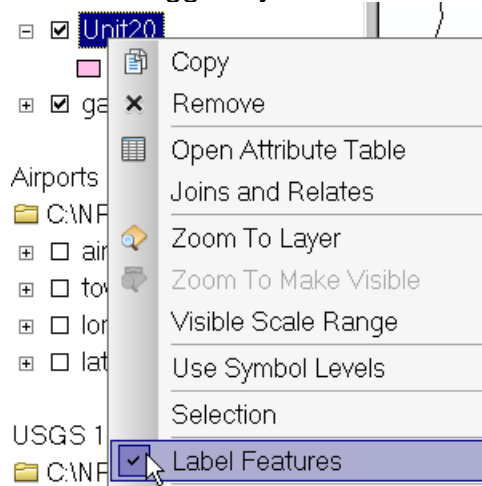


Then Check on Label features in this layer, and then OK.



Save your arc map document!

You can toggle layer labels on and off by right mouse-clicking on the layer and selecting



Selecting Sorted Features

Activate the Airports Data Frame. What are the three longest runways in Alaska? You can answer this question by opening the *airport_runways* layer's table. The right mouse click on the attribute named RWYLENGTH and sort descending.

RWYWIDTH	RWYLENGTH	RWYSURFACE
45		
45		
45		

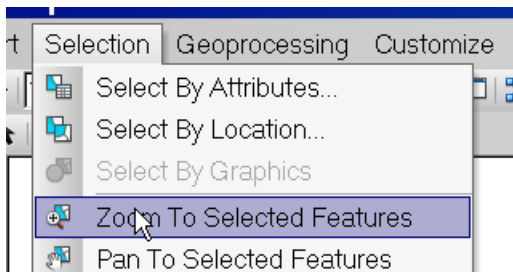
Select the top three records from your table by holding down the Ctrl key and left mouse clicking on the top three rows.

Attributes of airport_runways

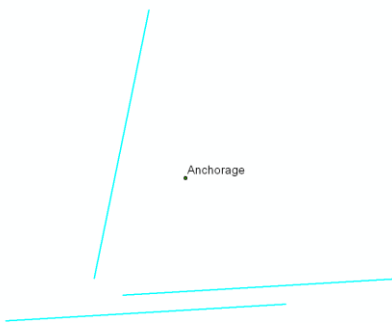
FID	Shape*	SITENUM	RWY ID	RWYWIDTH	RWYLENGTH	RWYSURFACE
0	Polyline	50034.*A	06L/24R	45	3230	ASPH-G
1	Polyline	50034.*A	06L/24R	45	3230	ASPH-G
2	Polyline	50034.*A	06L/24R	45	3230	ASPH-G
20	Polyline	50219.*A	01L/19R	45	3139	ASPH-G
21	Polyline	50219.*A	01L/19R	45	3139	ASPH-G
5	Polyline	50036.*A	05/23	60	3048	ASPH
6	Polyline	50036.*A	05/23	60	3048	ASPH
32	Polyline	50416.*A	11/29	45	2590	ASPH-F

Then exit from your table window.

Use the ArcMap Selection Menu to Zoom to Selected Features



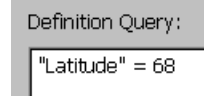
Then label the town that is in the display.



Interactively Selecting Features

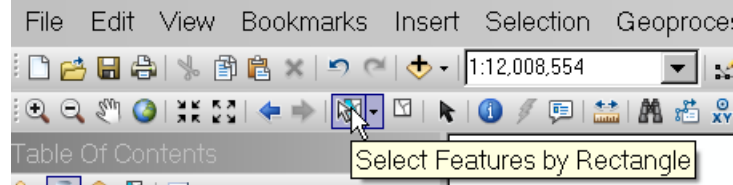
How many towns are there north of 68 degrees?

Change the layer properties so only the latitude line representing 68 degrees is visible (do a definition query) .

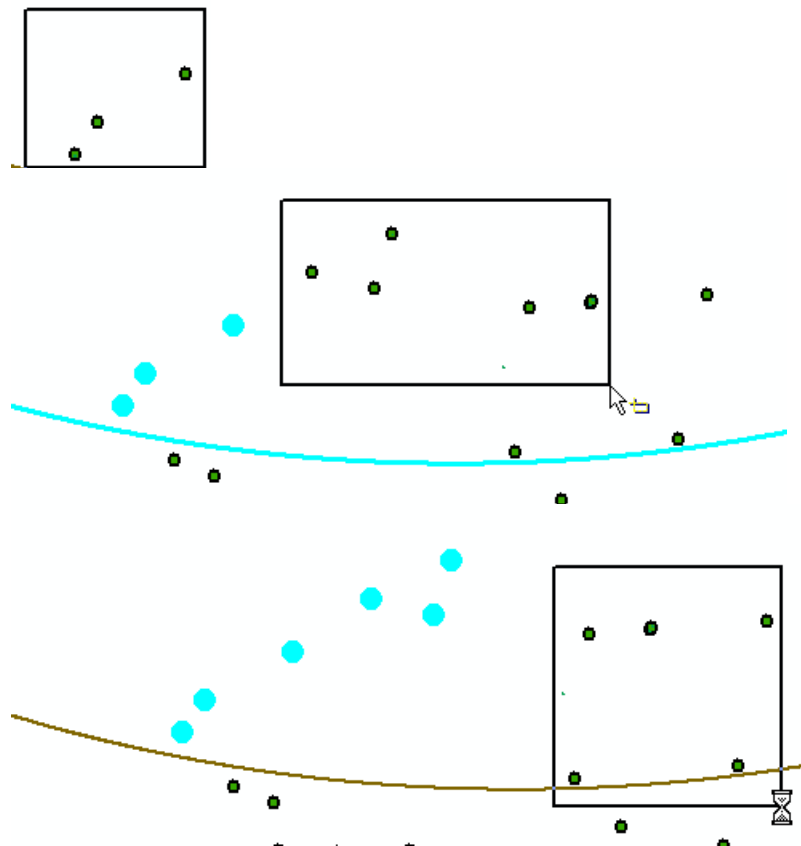


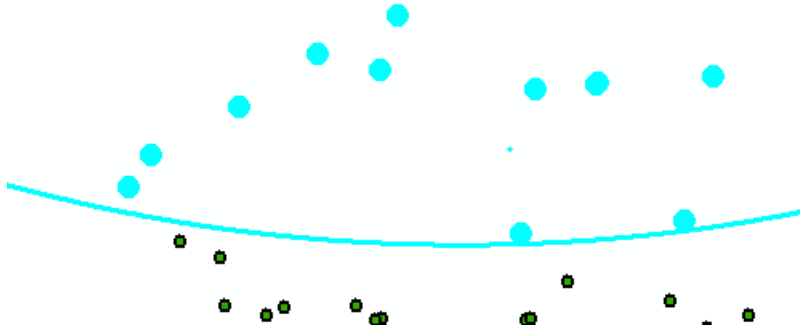
Save your arc map document!

Then use the select features tool to draw a rectangle around the area north of 68 degrees.



Hold the shift key down to use several selection rectangles...



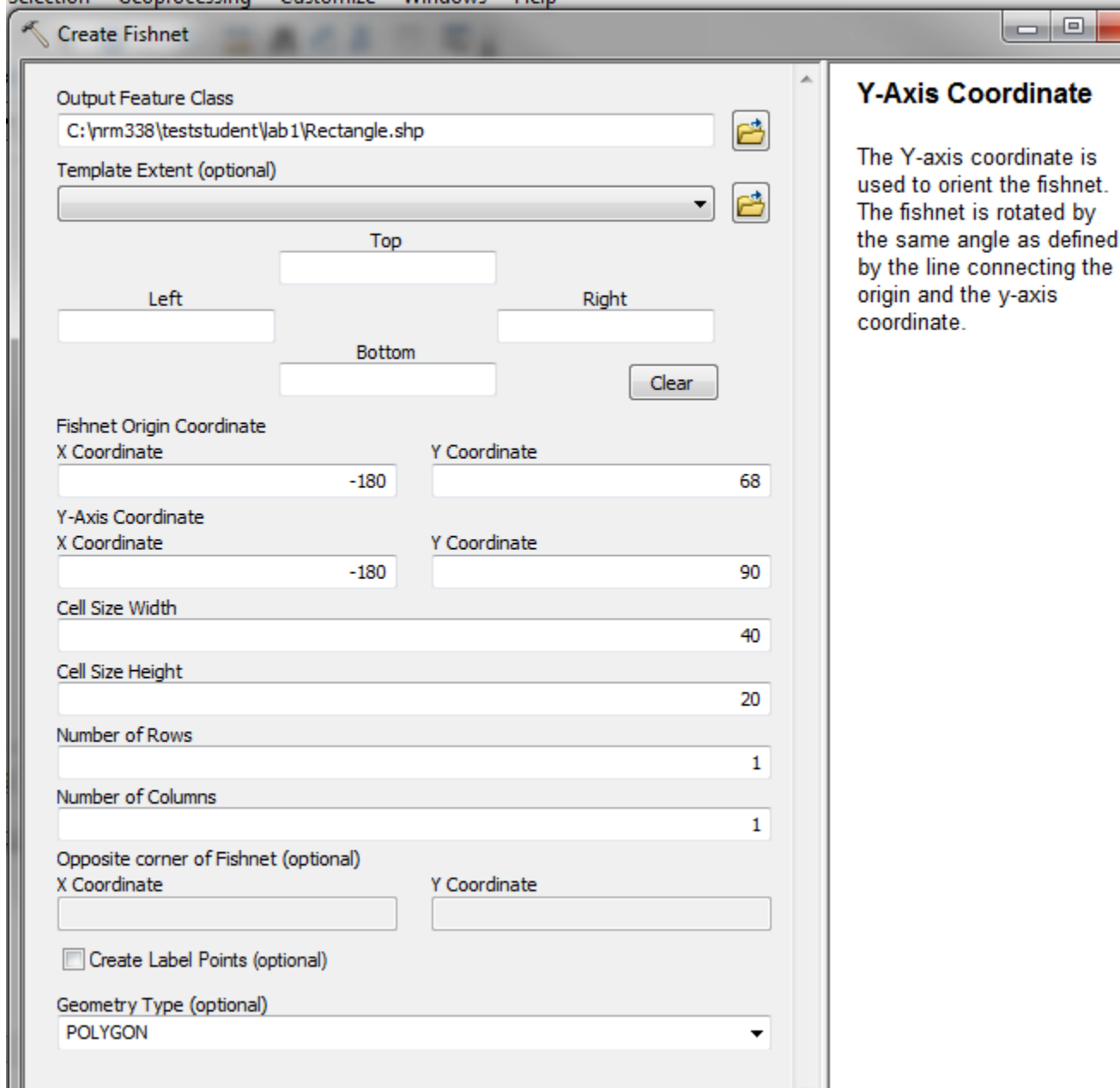


Open your towns attribute table to see the records of these 12 selected towns.

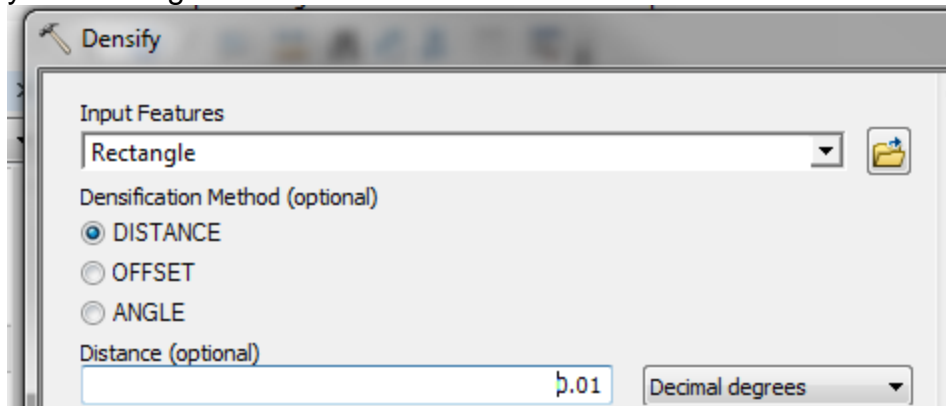
towns			
	FID	Shape *	NAME *
▶	55	Point	Cape Lisburne
	64	Point	Deadhorse
	71	Point	Prudhoe Bay
	182	Point	Anaktuvuk Pass
	197	Point	Wainwright
	198	Point	Point Lay
	199	Point	Point Hope
	200	Point	Atqasuk
	201	Point	Barrow
	202	Point	Nuiqsut
	203	Point	Kaktovik
	204	Point	Arctic Village

◀ ▶ 1 ▶▶ (12 out of 321 Selected)

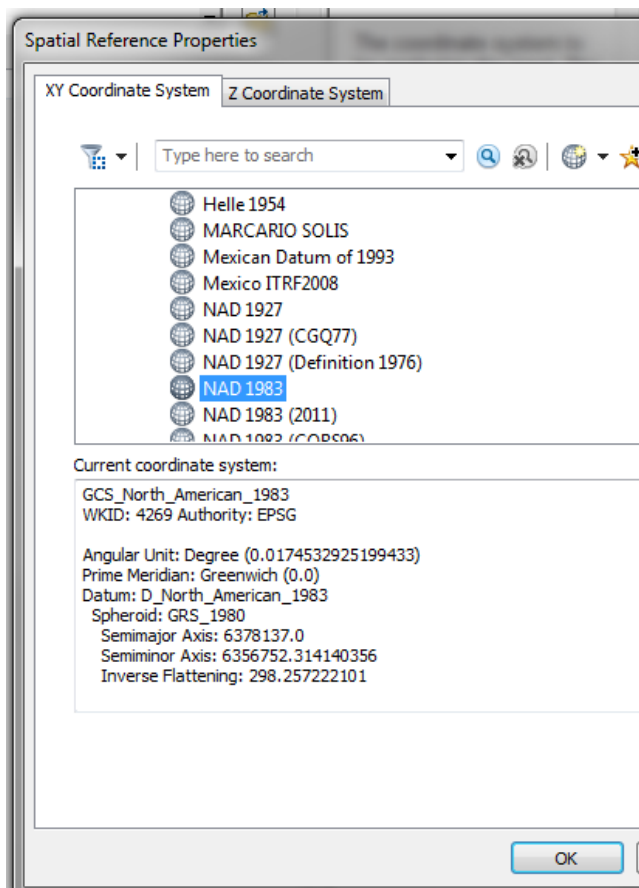
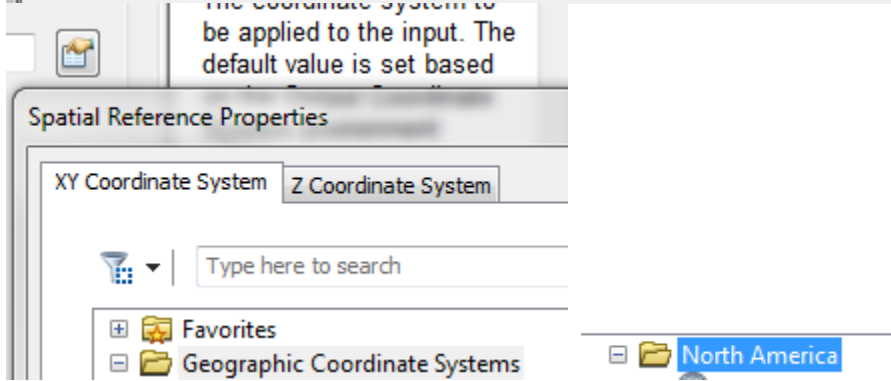
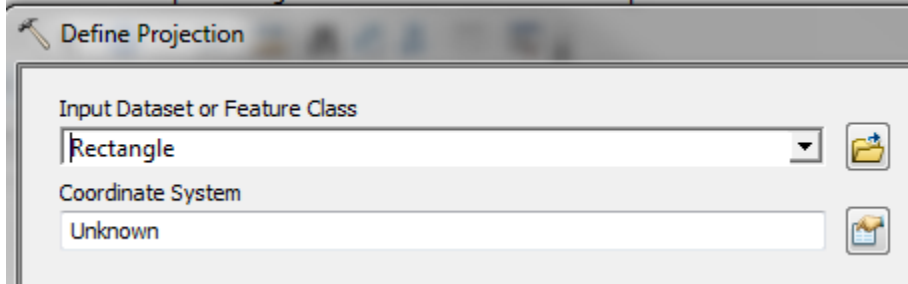
You can also select features inside polygons...first you must create a polygon. Do this by using the **Create Fishnet geoprocessing tool**.

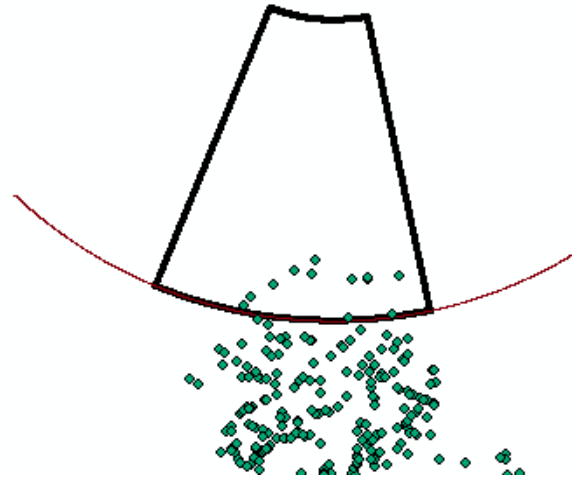
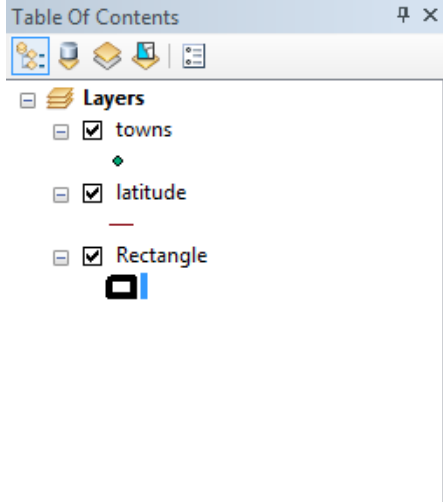


Use the **Densify geoprocessing tool** to put a vertex point every 1/100th of a degree along your rectangle.

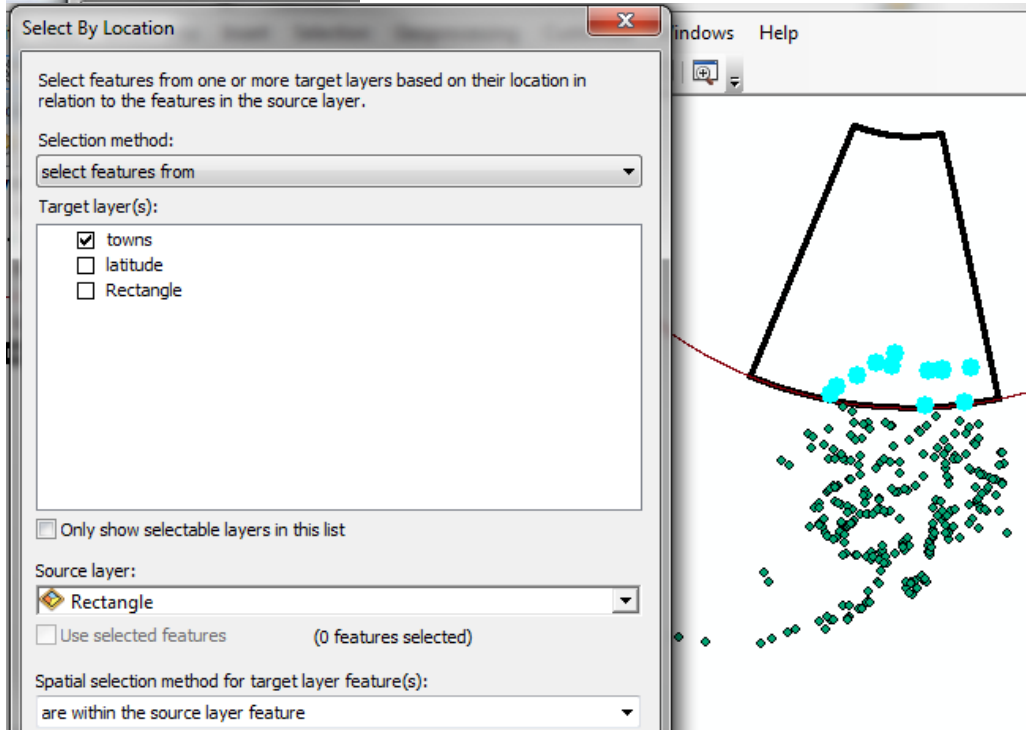
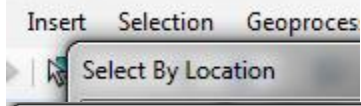


Next we need to specify to ArcGIS the coordinate system of our rectangle as longitude/latitude. Do this by using the **Define Projection geoprocessing tool**.





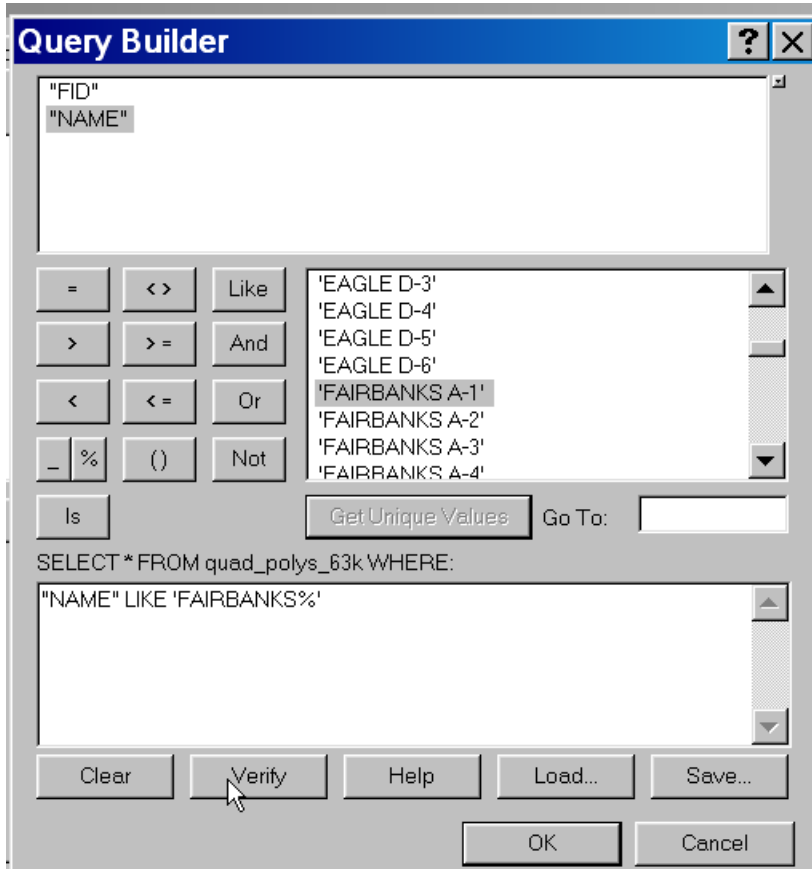
Use the Selectio menu to select the towns within your rectangle.



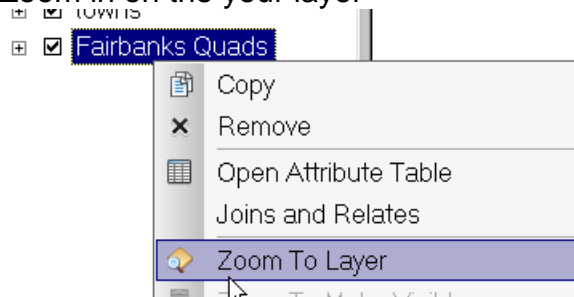
Querying Text Attributes

Next, activate the 63k USGS Maps Data Frame.

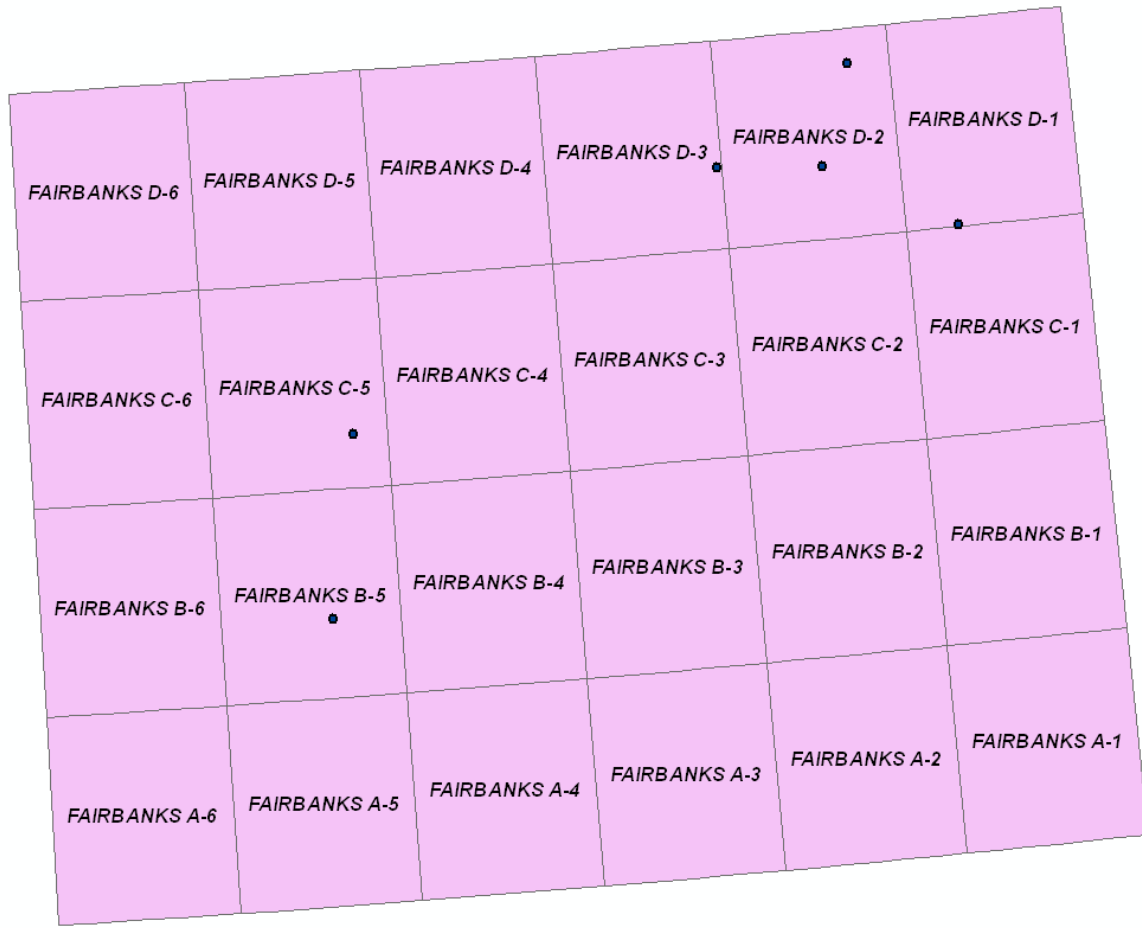
Make a definition query corresponding to Fairbanks by using the LIKE operator with a % wildcard:



Zoom in on the your layer



And label your polygons.

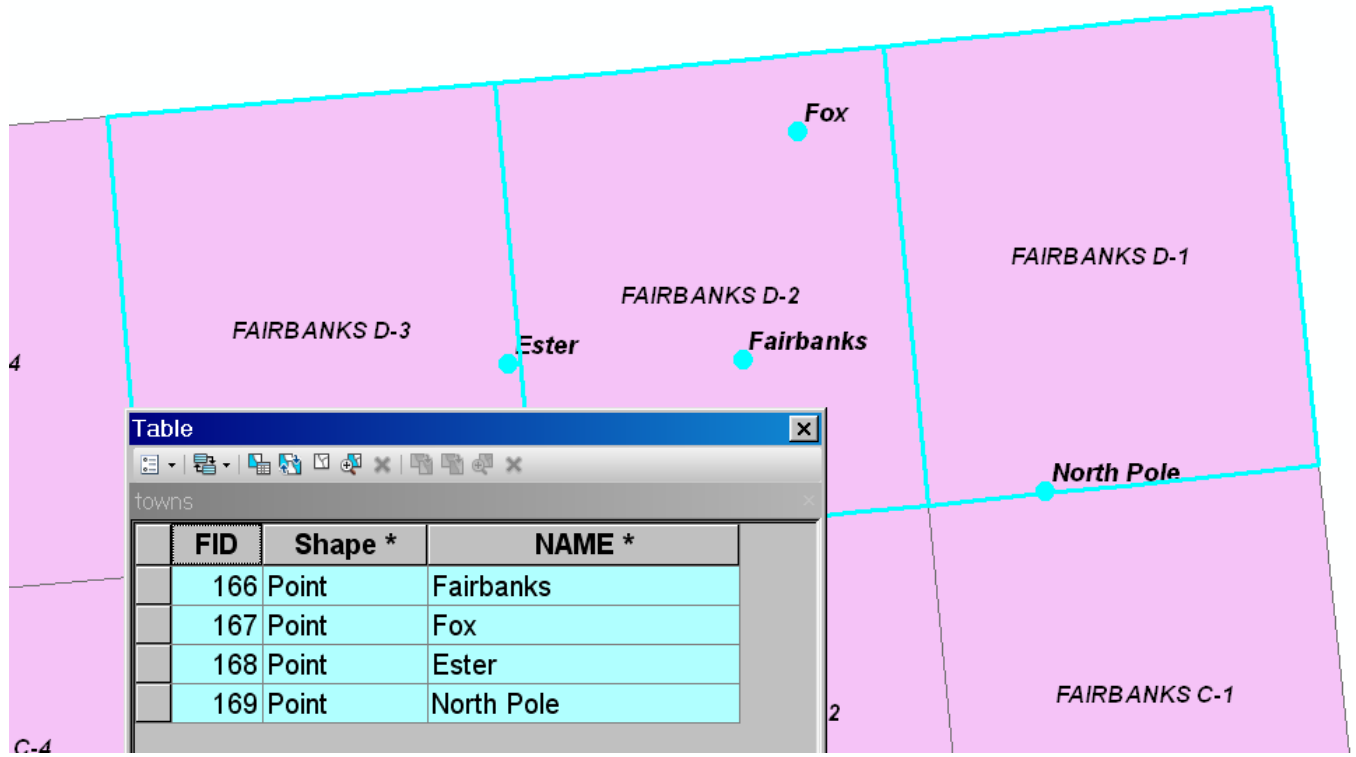


Save your arc map document!

What towns are in the Fairbanks D1, D2 and D3 polygons?
 First select your polygons.

Fairbanks Quads			
	FID	Shape *	NAME *
▶	1059	Polygon	FAIRBANKS D-1
	1063	Polygon	FAIRBANKS D-2
	1065	Polygon	FAIRBANKS D-3
	1069	Polygon	FAIRBANKS D-4
	1071	Polygon	FAIRBANKS D-5
	1075	Polygon	FAIRBANKS D-6
	1100	Polygon	FAIRBANKS C-1

Then use your **Select Layer By Location** tool to select the towns inside your three selected polygons...



Save your arc map document.

Congratulations...your successfully completed the first lab!