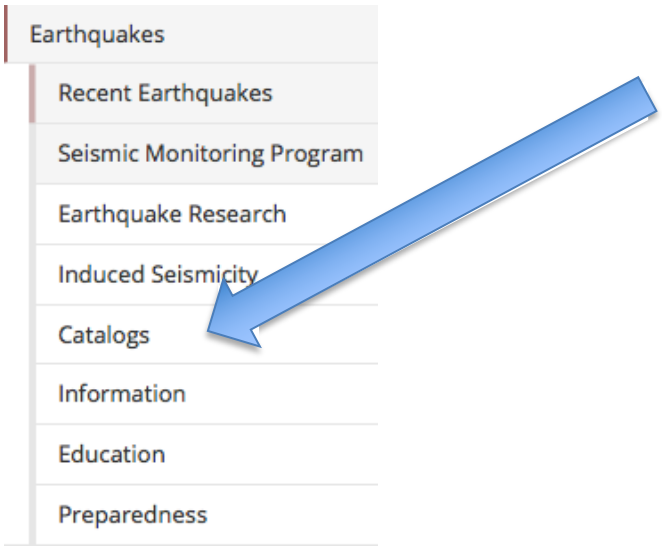
Part 1: Finding and Downloading Geographic Data

Before we begin mapping in ArcGIS, we have to figure out where and how we get our data. This is a tedious process. There're several websites that contain data, but as we learned from our last lab, not all data are created equal. Also, please keep in mind that when I created this lab, I used data on a specific day, so my images might look different than yours.

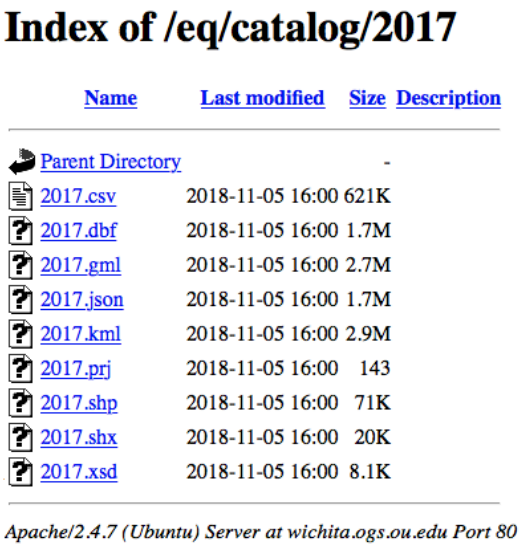
Shapefiles are files that, well, shape the map—but that's probably not why they're called shapefiles. Remember, shapefiles are storage files for **vector** information. As well, one shapefile is made up of several different files, and it's important that you have all of them so that the file can project in the mapping program. NOTE: while shapefiles are primarily used for ESRI programs, many open source platforms, such as GRASS or QGIS, can also project shapefiles.

Last lab we worked with Oklahoma earthquake data. Let's continue exploring that data. Return to the OGS website.



Navigate to the 2017 Catalog.

Click on that folder. Notice all the files within that folder.



Index of /eq/catalog/2017

Name	Last modified	Size	Description
Parent Directory		-	
2017.csv	2018-11-05 16:00	621K	
2017.dbf	2018-11-05 16:00	1.7M	
2017.gml	2018-11-05 16:00	2.7M	
2017.json	2018-11-05 16:00	1.7M	
2017.kml	2018-11-05 16:00	2.9M	
2017.prj	2018-11-05 16:00	143	
2017.shp	2018-11-05 16:00	71K	
2017.shx	2018-11-05 16:00	20K	
2017.xsd	2018-11-05 16:00	8.1K	

Apache/2.4.7 (Ubuntu) Server at wichita.ogs.ou.edu Port 80

Some of you downloaded the CSV, while others used the DBF. There're several files you'll need to actually make the shapefile work. Some websites will do something similar to what OGS does. Why? I don't know. It's a pain.

Here're the files you'll need: the .dbf, .prj, .shp, .shx. Some files may not download automatically. If that's the case, right click on the blue hyperlink and click "save link as" (or some variant thereof).

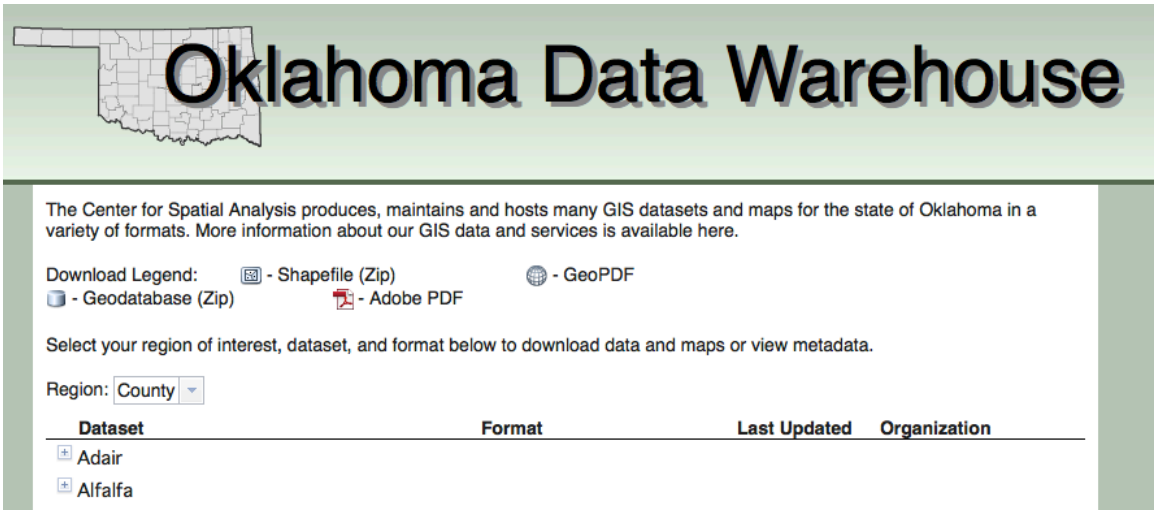
Once you have all of them downloaded, create a new folder titled Lab 3. Then create another folder in that folder titled 2017EQ. Copy the files from your downloads folder, and paste them into your newly created folder.

NOTE: KML, again, is a Google file. GML is used in a variety of applications that computer programmers tend to use.

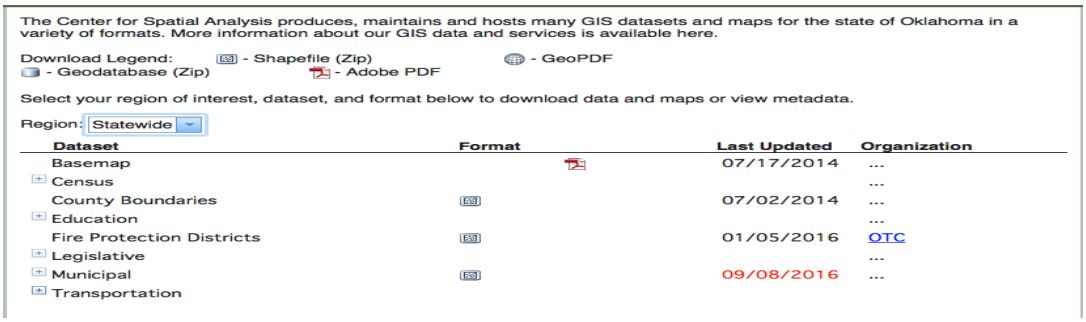
How did I know which files to pull to make it work? Let's download another vector file from another data warehouse before we open ArcMap.

One of Oklahoma's data warehouses is housed here at OU. Go to https://data.csa.ou.edu . Once there, go to the Data tab and click on "List".

In the “Region” drop down menu, change the selection to “Statewide.”



Then, underneath the “Format” column, click on the polygon shapefile icon.



Under dataset, find County Boundaries. To the right, under format, click on the shapefile symbol/icon to download it.

1. **When was this shapefile published (last updated)—i.e. put on the CSA website?**

Notice that there's a lot of information on that download page. Identification Information, Data Quality Information, etc. This is your **metadata**. It should also be in a txt or xml file that's in your downloaded folder.

After you download the file, title your file folder OKCOUNTY.

2. **What files (types/extensions) are in the folder you just downloaded?**

Open up the txt or xml file.

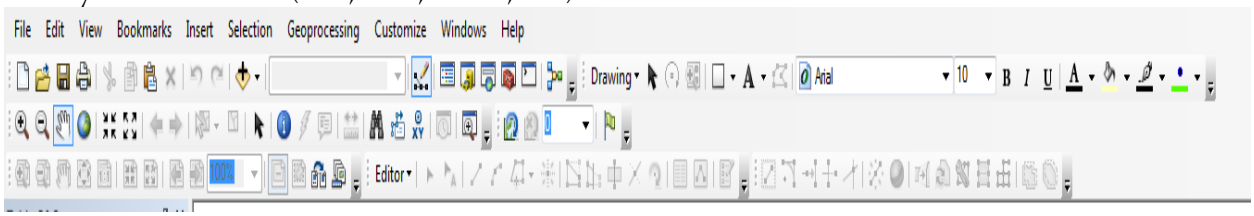
3. **What information did the CSA use to create this shapefile? What does this mean to you?**

OK, go to your Windows icons and go to All Programs, ArcGIS, and select ArcMap 10.7.

Open an ArcMap session. In the ArcMap Getting Started Box, click X.

Like we did in Google Earth, take some time to get to know what you're looking at.

Notice that the GUI looks similar to an old-style Microsoft Office Document. You have your Menu tab (File, Edit, View, etc).



Then you have your Standard Tab: (new document, open, save, print, etc.)

It gets different, though, after the undo/redo buttons. Hover over the icon with a + and a flat page under it.

4. **What is it, and what does it do?**

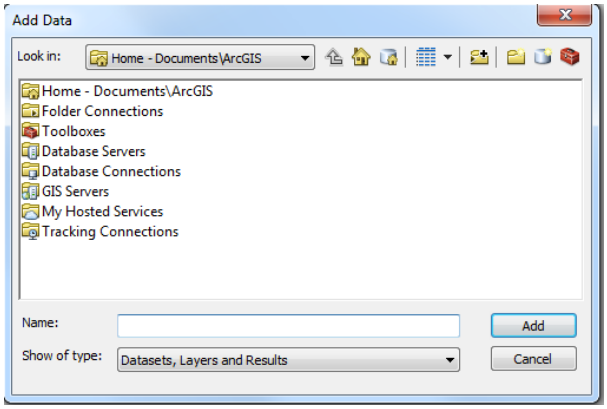
The other toolbar you'll always want handy is the Tools toolbar, which has the magnifying glass, panning hand, etc. If a Toolbar is missing, you can add it by going to customize, toolbars, and scrolling and selecting the appropriate options.

Scroll over the globe in the Tools toolbar. What is the globe's function?

Continue scrolling over the icons finding out what they do.

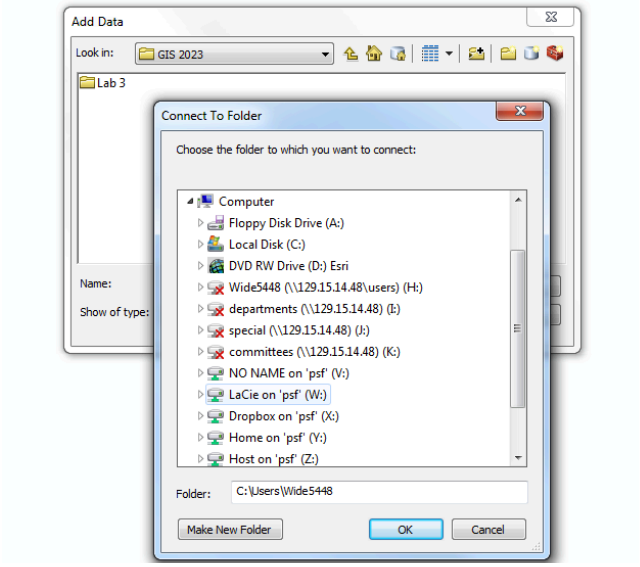
Also notice that there's a box on the left hand side of the screen called table of contents. The big blank area next to it is where your data will appear.

So, let's add our data. Click the add data button (refer to the instructions above if you've forgotten which button it is). You'll get a box that looks like this:



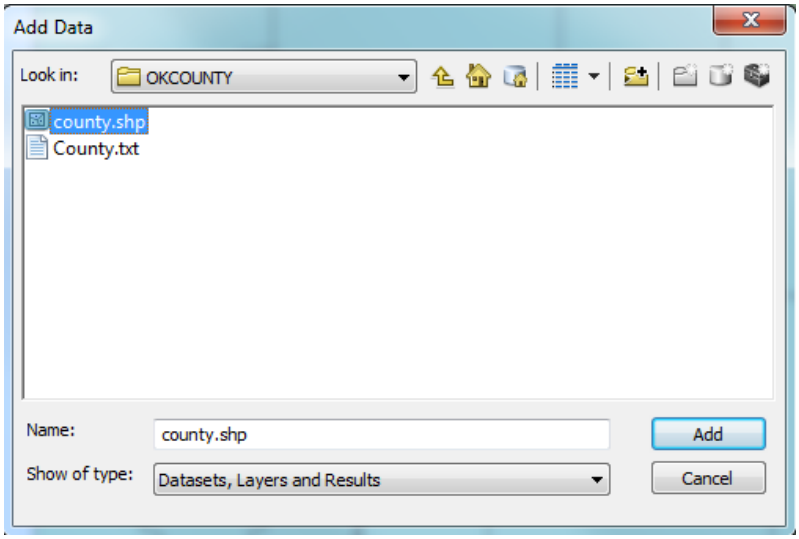
We need to connect to your student folder in order to access your data. Click the connect to folder, which looks like this:

Navigate to your folder that you saved your downloaded files to.

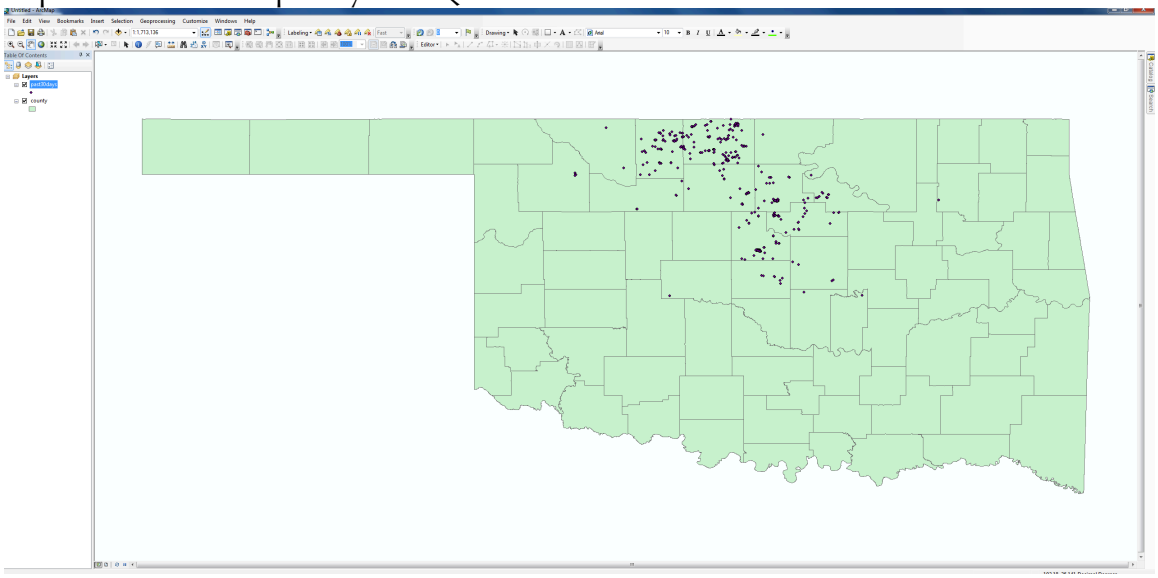


Click on it and select OK. This will bring you back to the Add Data box. Click the Look In box and select your file path.

Now, open up your OKCOUNTY Folder. Add the .shp file.

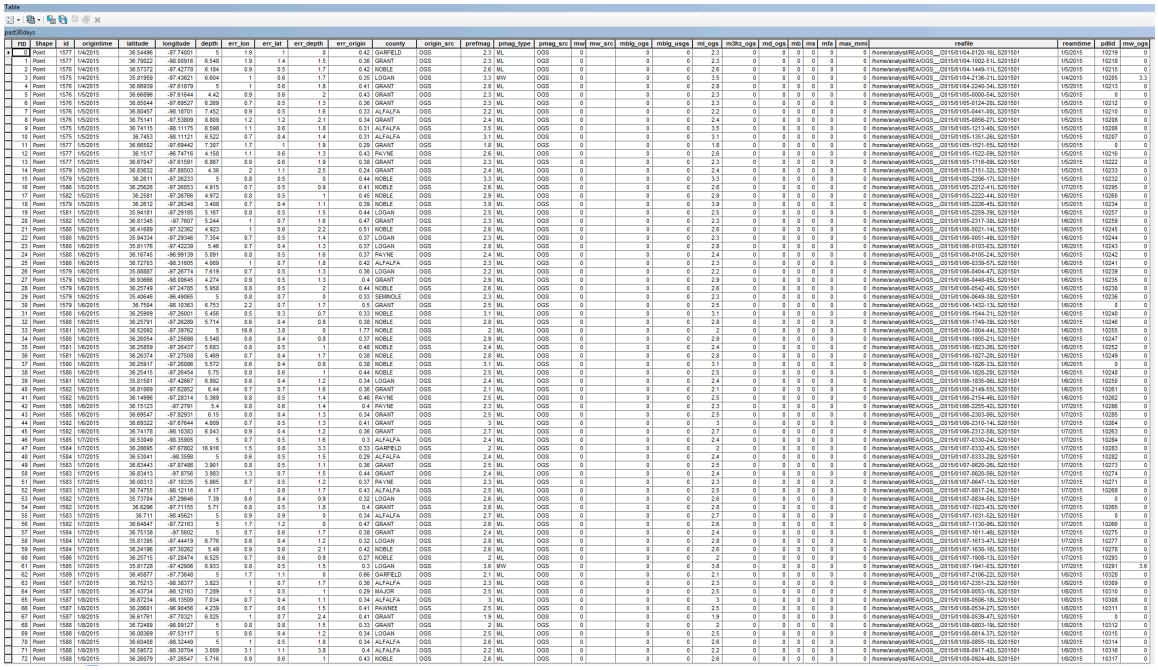


Repeat the same step for your EQ data.



Here's an example of what you should be looking at (note: my data in the images is from a different time period, you'll have some dots in KS).

Right click on "2017" in your TOC and open up the attribute table.



Doesn't this look a lot like the Excel table you used in Lab 2?

5. **How many earthquake records do you have?**

Find the "prefmag" column. Double click on it.

6. **What is the lowest magnitude earthquake in OK?**

Double click it again.

7. **What is the largest magnitude earthquake in OK?**

Scroll over to the far left side of the AT. Holding your shift key, click the gray box next to the first row of your large magnitude earthquake, scroll down to the last 2.5 eq and select it and all of the eqs above it.

past30days

	FID	Shape	id	origintime	latitude	longitude	depth	err_lon	err_lat	err_depth	err_origin	county	origin_src	prefmag
	355	Point	1619	1/26/2015	36.84761	-97.69904	6.645	0.5	0.3	1	0.3	GRANT	OGS	4.3
	437	Point	1626	1/30/2015	36.80791	-98.36349	3.755	0.6	0.3	1	0.26	ALFALFA	OGS	4.1
	451	Point	1629	2/1/2015	36.94536	-97.62965	4.842	0.6	0.6	1.4	0.37	GRANT	OGS	4.1
	89	Point	1590	1/9/2015	35.81442	-97.41476	6.964	0.6	0.3	1	0.33	LOGAN	OGS	4
	337	Point	1616	1/25/2015	36.95097	-97.61547	5	0.6	0.6	1.5	0.39	GRANT	OGS	4
	361	Point	1620	1/27/2015	36.26183	-97.26426	3.408	0.9	0.6	1.8	0.37	NOBLE	OGS	4

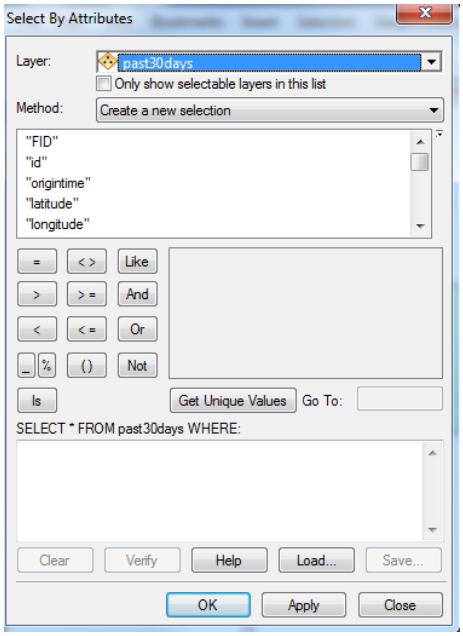
Minimize or x out of your AT.

8. **Looking at your map, what happened to the points of the magnitude 2.5 and above earthquakes?**

This is called a **selection**. There are several ways to do a selection.

Let's do a different type of selection to clean up the data.

On your File toolbar, click selection and choose select by attributes.



We're going to select earthquake greater than or equal to 2.5. So, here's what you do:

a. make sure your layer is "2017"
b. make sure method is create a new selection
c. in the box filled with your attributes, scroll down and double click on "prefmag"
    a. this moves it down to your SELECT *FROM 2017 WHERE: box
d. now, choose the greater than or equal to operator and click once
e. hit the space bar one time and type 2.5
f. click verify
g. if your selection was successfully verified, click OK

OK, now reopen your AT.

I'm a big proponent of making you recognize your environment, so see if you can find where on your attribute table this next question is. Hopefully, you're not counting!

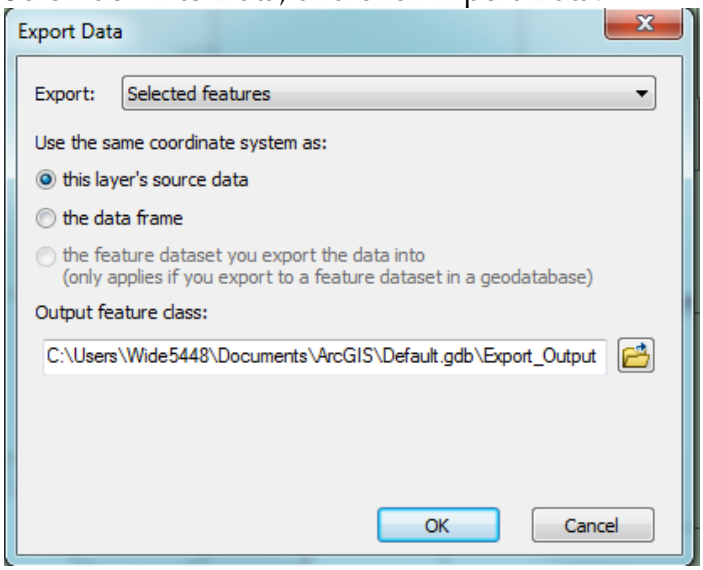
9. **How many earthquakes occurred that were greater than, or equal to, a magnitude of 2.5?**

OK, now, let's create a new shapefile based off this selection.

Close your AT, but don't click on your map anywhere. If you do, you'll lose your selection.

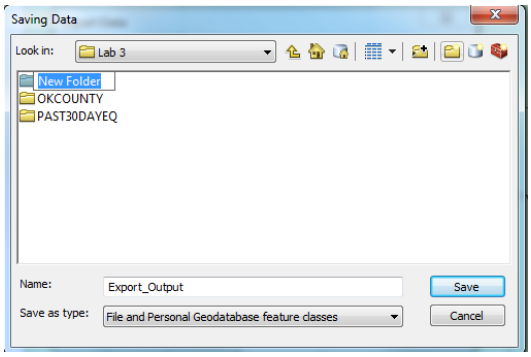
Right click on your 2017 shapefile, which is stored under Layers, in your TOC.

Scroll down to Data, and click Export Data.



Make sure the Export box says Selected features and this layer's source date is checked.

For your output feature class, click the Folder with the arrow. Save this file to your student drive under Lab 3 in a new folder called 2.5ORGreater.



Title your file name 25orGreater and click save.

Switch the Save as type to Shapefile.

Click OK, click OK, click yes.

10. **Where did your new shapefile appear in your TOC?**

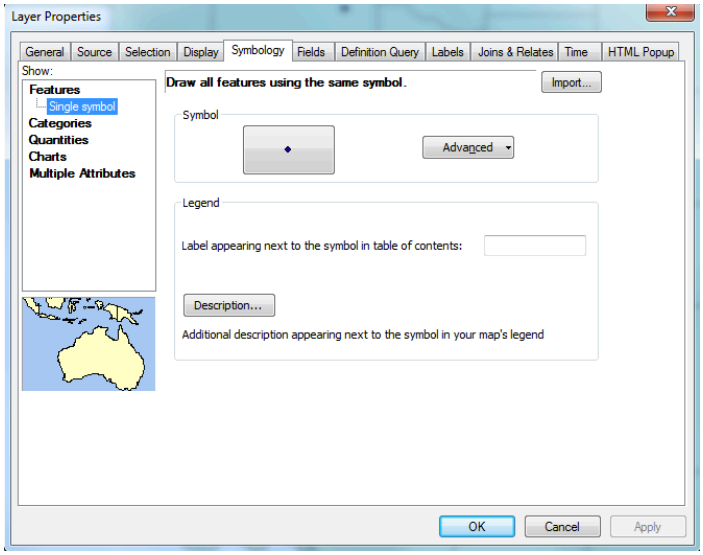
OK, to turn off your selection, click  the white page without the blue/arrow dropdown menu.

Turn off your 2017 shapefile by clicking the checkmark in the box.

11. **What patterns can you see with the 2.5ORGREATER points?**

Now let's symbolize these points based on a classification scheme.

Double click on your 2.5ORGreater Layer.



Scroll over and select your Symbology tab.

Let's go through several of the "Show" box (on the left) options.

Begin with Categories, Unique Values.

In the Value Field, select County and hit apply.

12. **What are the counts that make up the three counties with the most earthquakes (also give me the counties)? NOTE: If there's nothing listed under counts, click "Add All Values" toward the bottom of the window.**

Now let's show Unique Values, Many Fields.

In the Value Fields, select County and Prefmag. Hit apply. If apply's not available, hit "Add All Values"

13. **What county and what prefmag had the most counts?**

OK, now let's go to showing Quantities.

In the value field, select prefmag.

14. **What type of classification is being used? How does this classification type make its breaks (might require a bit of Googling)?**

This classification scheme is actually a good default. Let's create some symbology to show it.

***Click on the first range of earthquakes on the box (it should be highlighted blue). Hold your shift button down and click on the last range in the style box. Now, right click on the selected ranges and select "Properties for Selected Symbols."

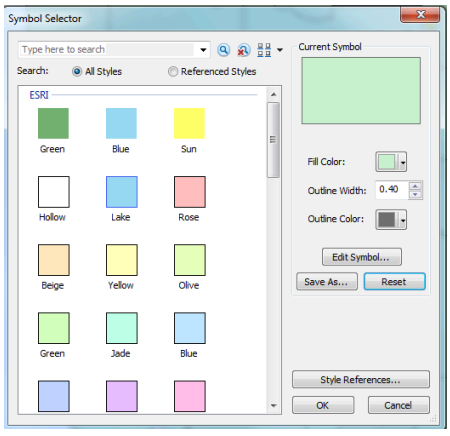
Choose circle two and make its size a 12.

Select the blue-yellow-red color ramp and select OK.

Let's think about these colors for a minute. They're not bad, they're not great. Red obviously is showing the strongest earthquakes, which is good, and colors decrease as magnitude lessens, which to a reader is a good thing, right? We'll leave them be for now, but I want you to think about how we can make them stand out even more.

Let's change the colors of our county layer.

Double click the colored rectangle below county.



I want you to pick a color that you think best showcases the blue, tan, to red symbols.

15. **Describe to me why you chose that color.**

16. **Paste a picture of your map here.**

Now, let's choose a different sybmology for our earthquakes. Again, you pick it.

17. **Explain why you chose that color.**

18. **Paste a picture of your map.**

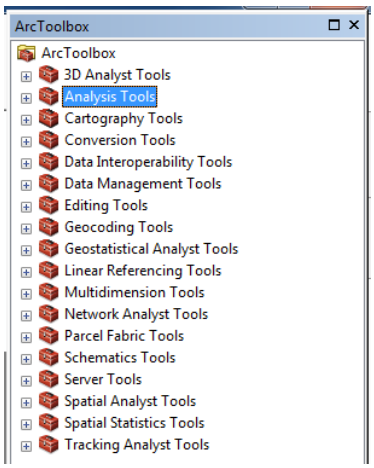
So we've messed around with symbologies, we've selected attributes, we've added data, we've downloaded data. Again, I'm just introducing you to some of the stuff you can do with ArcGIS. You'll continue to gain more skills as we go throughout the class. Let's conclude this Lab with a spatial analysis tool.

We've worked with points that show prefmag, but how would you show how many earthquakes have happened in each county using the county boundary as the symbol instead of a point?

As I've mentioned in lecture, you can create a map in a variety of programs. Not all of those programs, however, allow you to query and analyze data like a GIS does.The spatial analysis tool we'll use to finish up this lab is called a "spatial join." Before we do this, I want you to go here to read about spatial joins: http://desktop.arcgis.com/en/arcmap/10.3/tools/analysis-toolbox/spatial-join.htm.

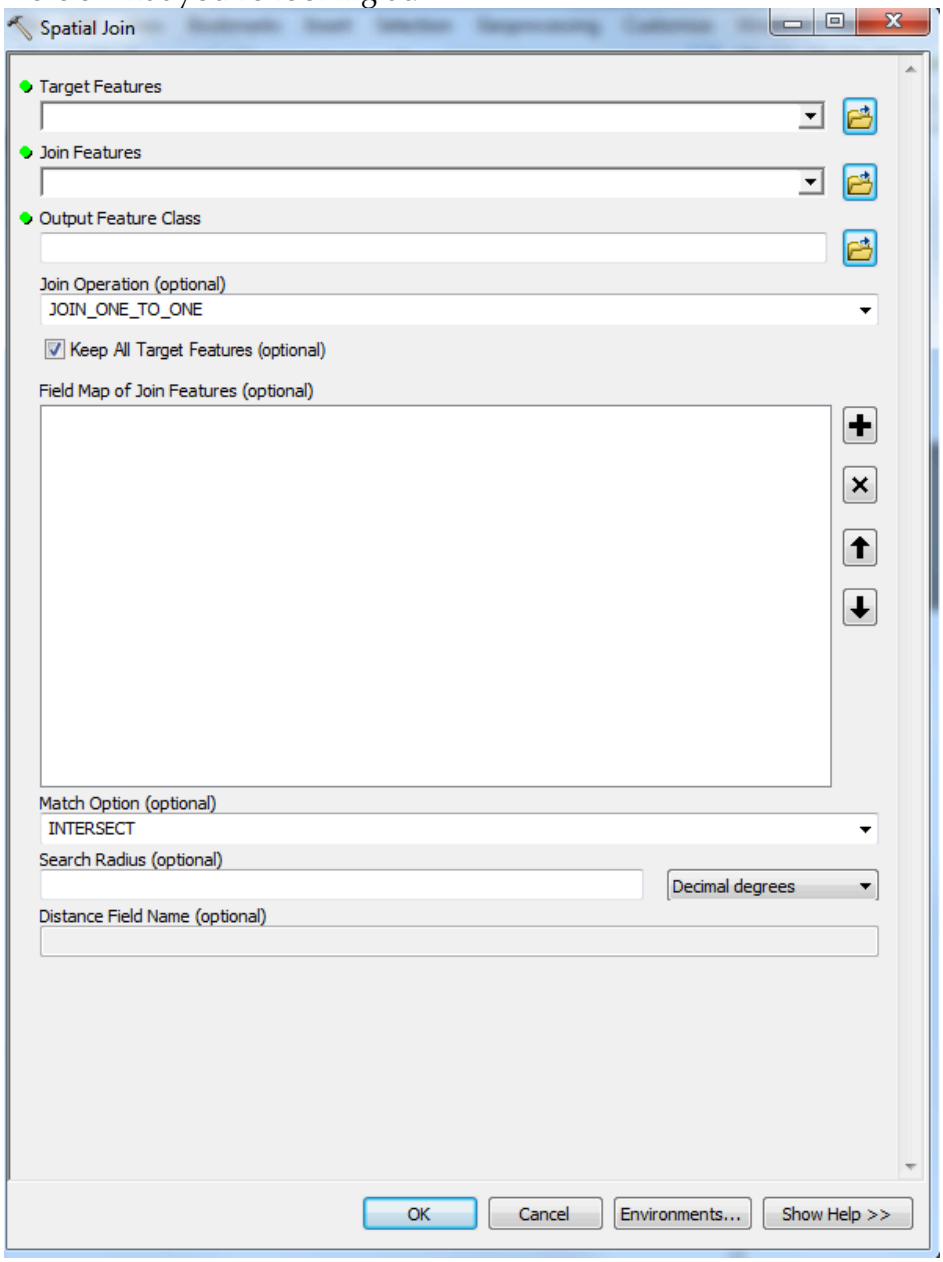
19. **What does the intersect match option do?**

OK, in your Standard toolbar, select ArcToolbox. It should open a window that looks like this:



Click the + on Analysis Tools and select Spatial Join in the Overlay sub-toolbox.

Here's what you're looking at:



Click the show help button if it's not already opened.

20. What does a spatial join do?

OK, click in target features. Which layer file do you think the target file is based on if you want to show polygons instead of points?

If you guessed county, winner, winner, chicken dinner!

Next, click the join features and select your 2.5ORGREATER file.

Save your output feature class to your Lab 3 folder in a new folder and title it Spatial Join, give that title to your shapefile or feature class, too. Click save.

In the Match Option, select Intersect.

Click OK.

Wait a couple seconds and you should have a new layer appear in your TOC.

21. **What kind of a vector file was created from this spatial join?**

Open the AT to your new file.

22. **How many rows of records do you have? Is this more or less than your selection of 2.5ORGREATER? Why is there this number of records?**

Find the field "Join_Count" and double click it until you see the counts above 0. Select those counties and create another shapefile (if you don't remember how to export data, refer to the steps above.) Save it in your 2.5ORGREATER folder, but title the shapefile 2.5ORGREATER_poly.

23. **How many counties experienced earthquakes in 2017?**

24. **Paste a copy of your current map view here.**

Let's symbolize your new county layer based on number of earthquakes each county experienced using Natural Breaks (Jenks) classification and five (5) classes. Select an appropriate color ramp.

25. **Explain how you did this step in detail and paste an image of your map.**

My map's on the next page (again, it's data from a different year!), but you should be close to something like this.

Save your map project in your Lab 3 folder on your student drive as "Lab3." It'll be an mxd file, which is the saved map file from ArcMap.