

ArcGIS Training

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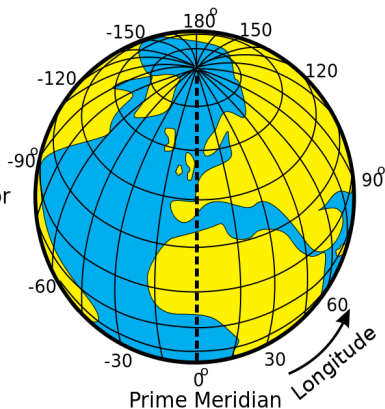
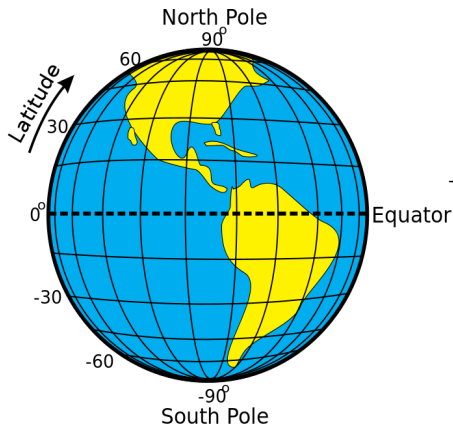
Innovations for Peace and Development

February 24, 2019

Geographic Coordinate Systems

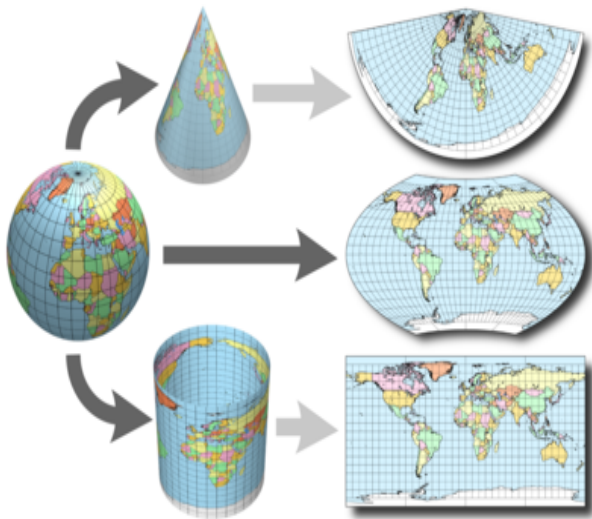
Most Common Coordinate System:

- World Geodetic System 1984 (WGS84)

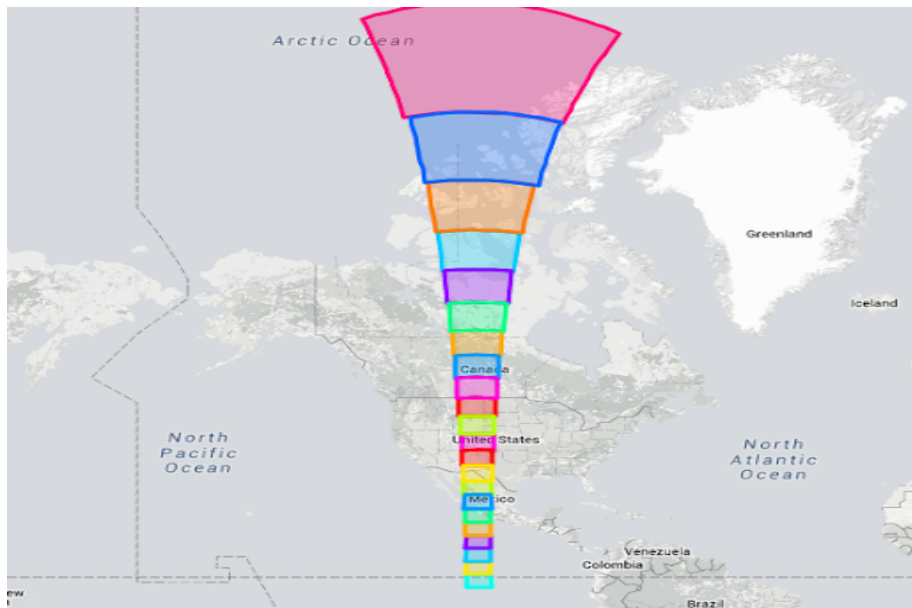


Map Projections

- Used to represent the Earth's 3D surface in 2D map
 - ▶ Conic
 - ▶ Azimuthal
 - ▶ Cylindrical
 - ▶ And more...
- Distortions are inevitable

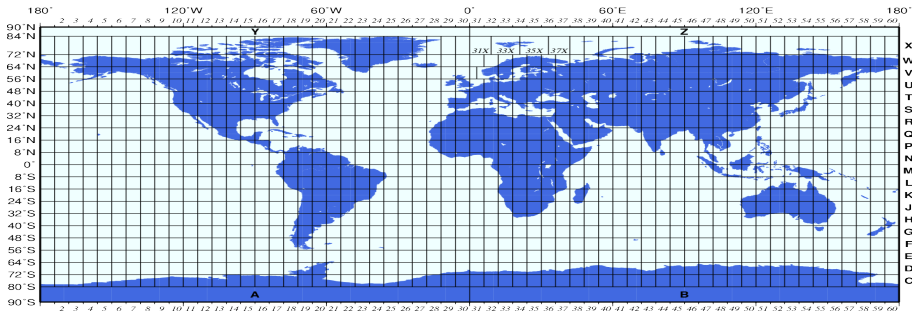


Visualizing Colorado under Different Locations



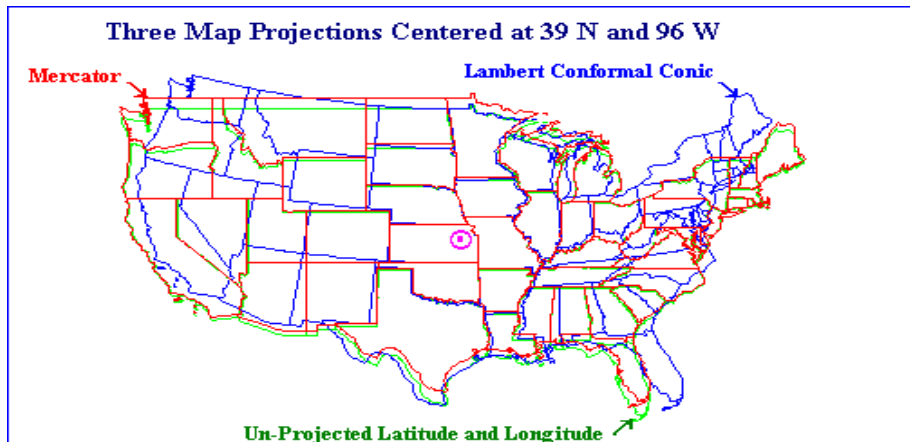
How to Choose Projections

- Choose Projection Based on Region
- Most Common Projection: Universal Transverse Mercator (UTM)
 - ▶ Uses WGS84 coordinate system
 - ▶ 120 zones. Make sure to choose correct zone!
 - ▶ UTM will not be useful if you are making a map spanning multiple zones
- Guide on projection selection



Unaligned Projections

- Unaligned projections among datasets are the primary source of all GIS problems
 - ▶ Ensure your layers are projected using the same projection before performing analysis



Vector Data

- Points

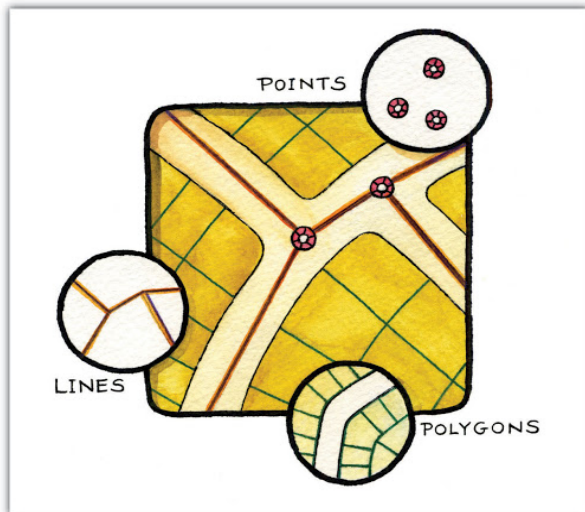
- ▶ Cities
- ▶ Schools
- ▶ Fire hydrants

- Lines

- ▶ Rivers
- ▶ Roads
- ▶ Pipelines

- Polygons

- ▶ Countries
- ▶ Lakes
- ▶ Land



Raster Data

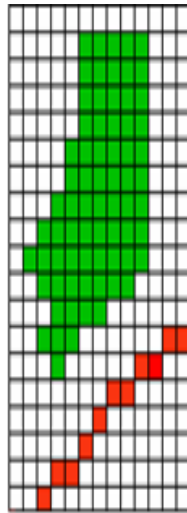
- Matrix of identically-sized pixels
- Each pixel contains a measured or estimated value for that location
- Used for things with no distinct shape
 - ▶ Elevation
 - ▶ Temperature
 - ▶ Rainfall
 - ▶ Windspeed
 - ▶ Night lights



Real World



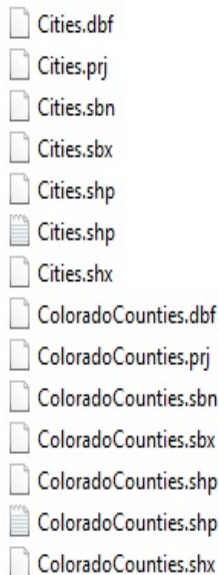
Vector



Raster

Shapefiles

- Come in a layer package with multiple files
- Don't open files individually: they won't work!
- Open the shapefile using ArcMap
 - ▶ Then, it will show up as one entity



Mapping Conventions

Required

- Title
- North arrow
- Scale bar
- Legend
- Data sources

Optional

- Frame line
- Neat line



Were You Paying Attention?

- ❶ What is the standard geographic coordinate system?
- ❷ Why are projections important?
- ❸ How do you send shapefile?

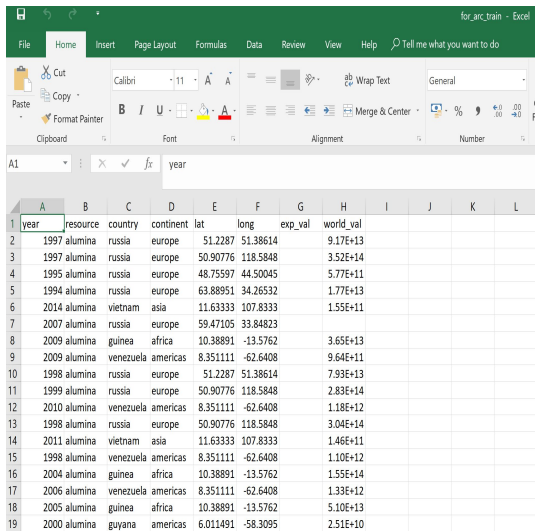
Answers to the Quiz

- ❶ What is the standard geographic coordinate system?
 - ▶ WGS84
- ❷ Why are projections important?
 - ▶ Unaligned projections among datasets are the primary source of all GIS problems
- ❸ How do you send a shapefile?
 - ▶ Share all of the files or send everything as a zip file

Cleaning Your Data for GIS Analysis

Required

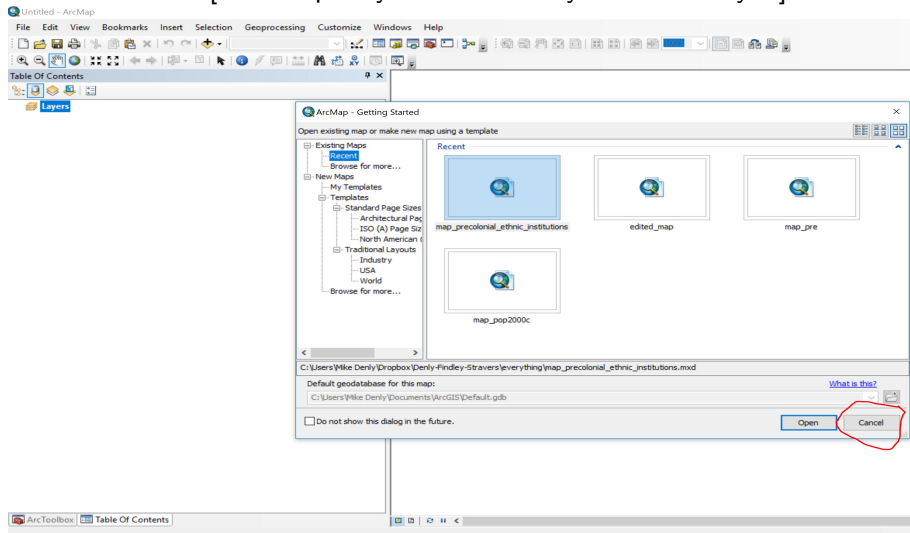
- The data needs to be clean and in the right format for GIS
 - ▶ Title of the Arc file can't have spaces
 - ▶ Variables names can't be longer than 10 characters
 - ▶ Variable names can't have spaces
 - ▶ Your data should be stored as a CSV file



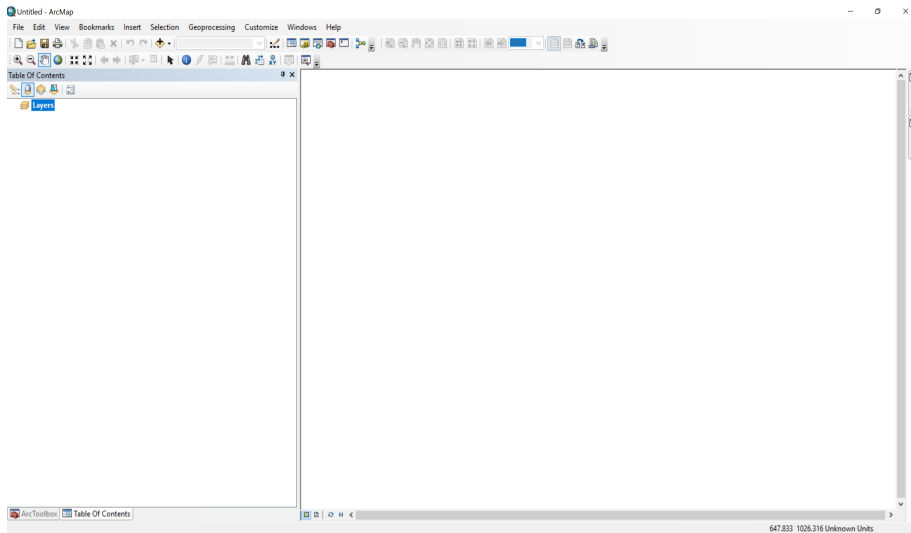
	A	B	C	D	E	F	G	H	I	J	K	L
1	year	resource	country	continent	lat	long	exp_val	world_val				
2	1997	alumina	ruissia	europa	51.2287	51.38614		9.17E+13				
3	1997	alumina	ruissia	europa	50.90776	118.5848		3.52E+14				
4	1995	alumina	ruissia	europa	48.75597	44.50045		5.77E+11				
5	1994	alumina	ruissia	europa	63.88951	34.26532		1.77E+13				
6	2014	alumina	vietnam	asia	11.63333	107.8333		1.55E+11				
7	2007	alumina	ruissia	europa	59.47105	33.84823						
8	2009	alumina	guinea	africa	10.38891	-13.5762		3.65E+13				
9	2009	alumina	venezuela	americas	8.351111	-62.6408		9.64E+11				
10	1998	alumina	ruissia	europa	51.2287	51.38614		7.93E+13				
11	1999	alumina	ruissia	europa	50.90776	118.5848		2.83E+14				
12	2010	alumina	venezuela	americas	8.351111	-62.6408		1.18E+12				
13	1998	alumina	ruissia	europa	50.90776	118.5848		3.04E+14				
14	2011	alumina	vietnam	asia	11.63333	107.8333		1.46E+11				
15	1998	alumina	venezuela	americas	8.351111	-62.6408		1.10E+12				
16	2004	alumina	guinea	africa	10.38891	-13.5762		1.55E+14				
17	2006	alumina	venezuela	americas	8.351111	-62.6408		1.33E+12				
18	2005	alumina	guinea	africa	10.38891	-13.5762		5.10E+13				
19	2000	alumina	guyana	americas	6.011491	-58.3095		2.51E+10				

Step 1a: Open ArcMap

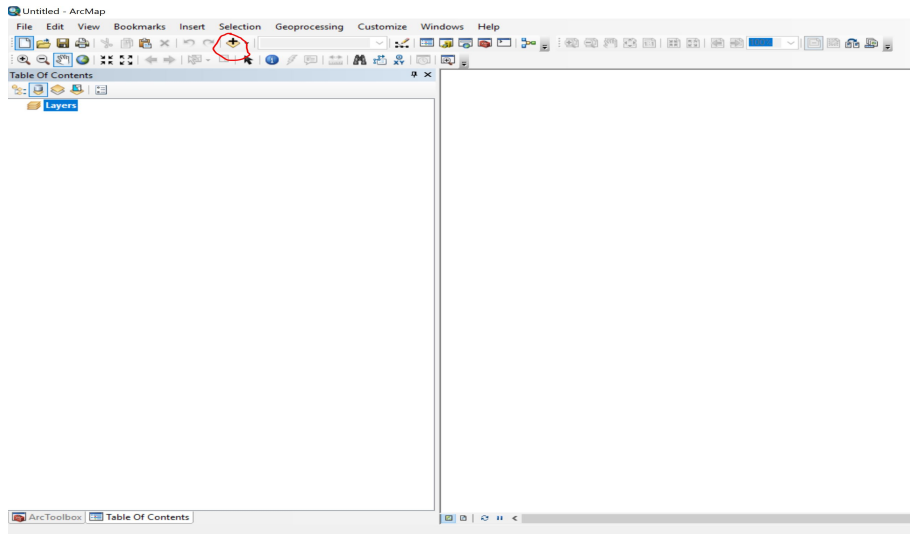
Select “Cancel” [This step may be unnecessary for some of you]



Step 1b: This is Your Blank Map

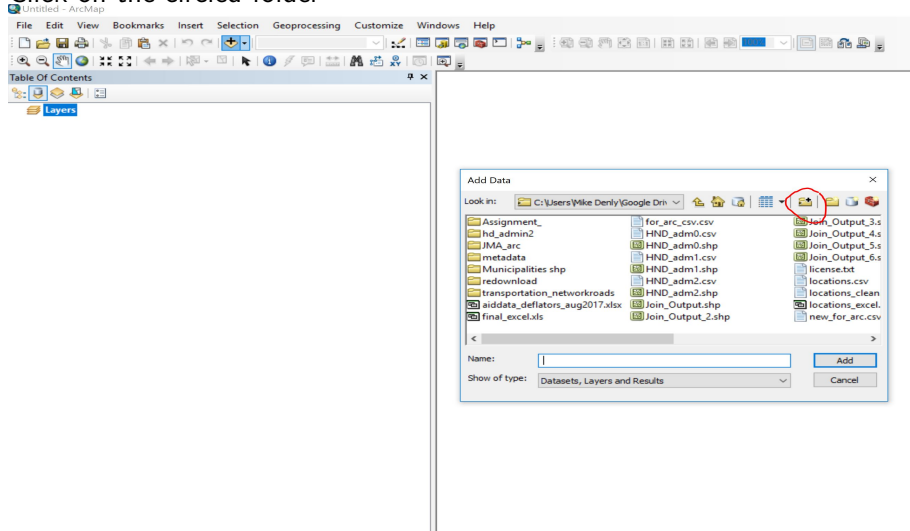


Step 2: Add your Data



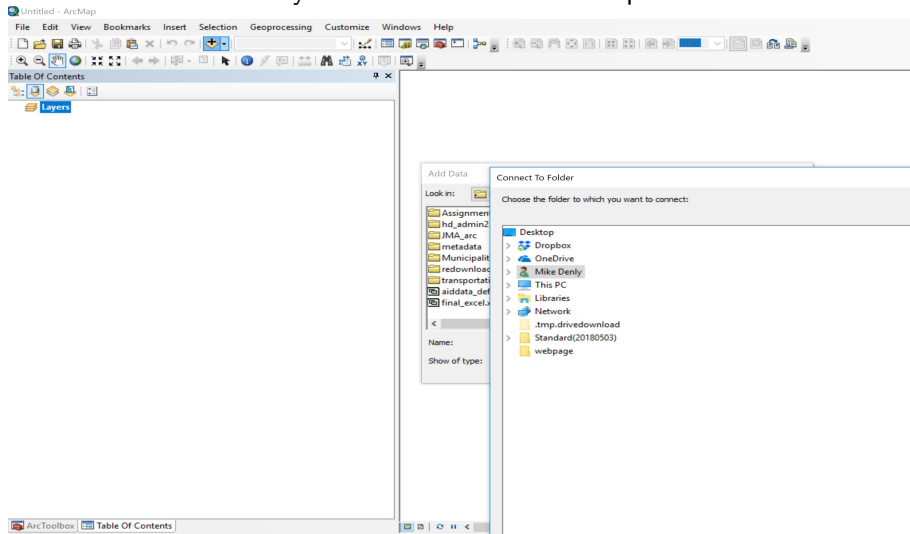
Step 3: Connect to Folder with Your Data and Shapefile

Click on the circled folder



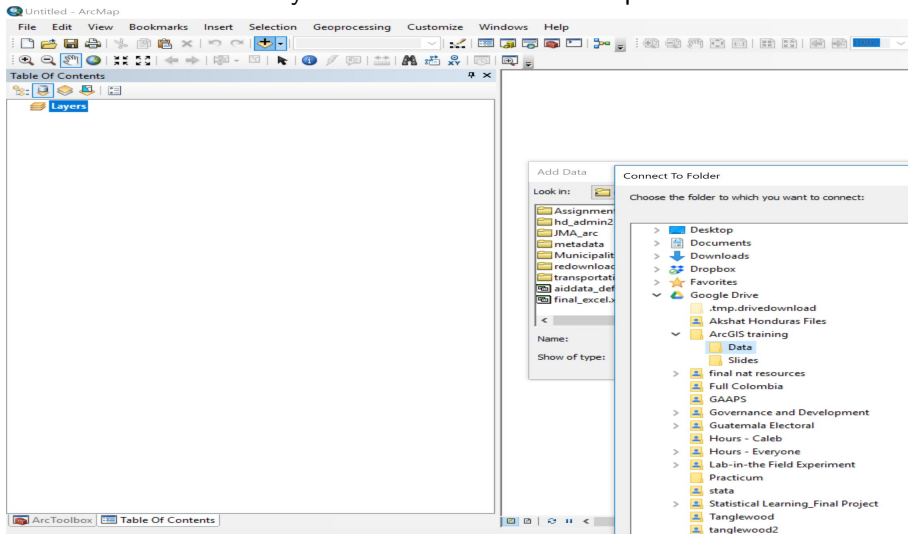
Step 4a: Select Your Folder with the Data

Go to the folder where you saved the data and shapefile



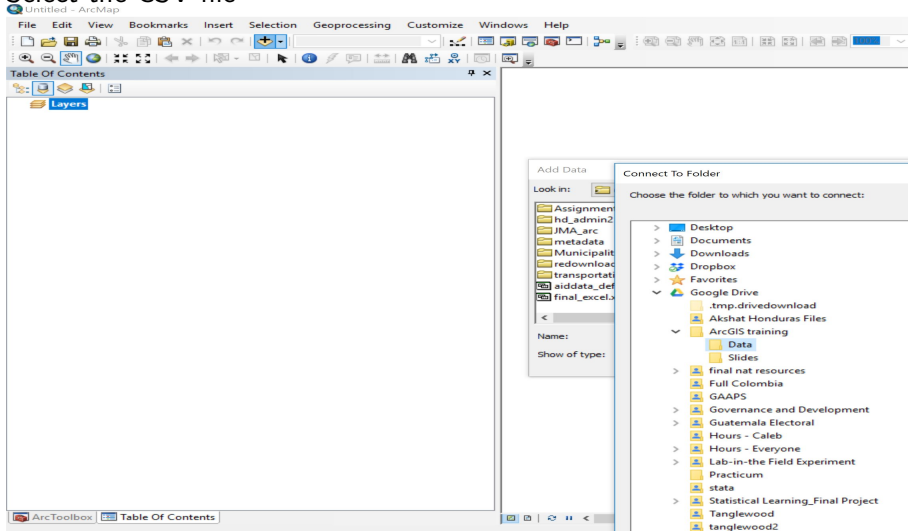
Step 4b: Select Your Folder with the Data

Go to the folder where you saved the data and shapefile



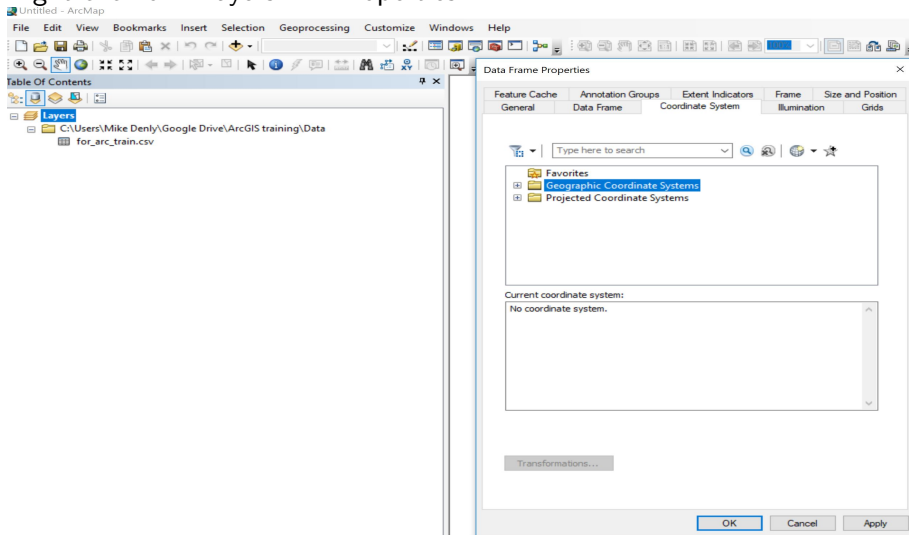
Step 4c: Select Your Folder with the Data

Select the CSV file



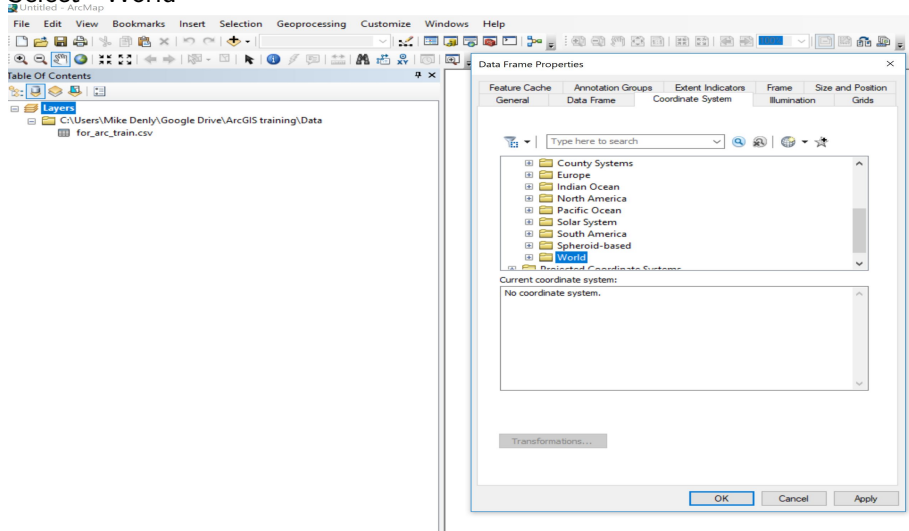
Step 5a: Indicate the Coordinate System

Right-click on “Layers” - “Properties”



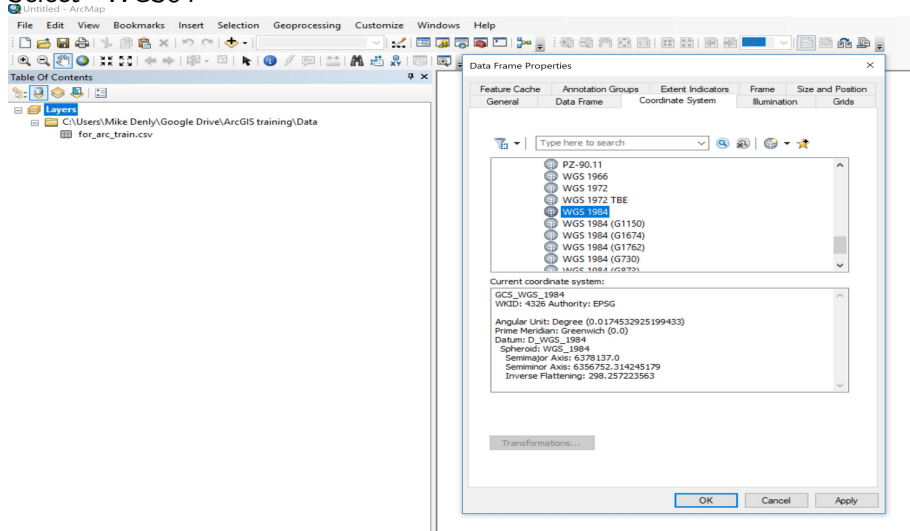
Step 5b: Indicate the Coordinate System

Select “World”



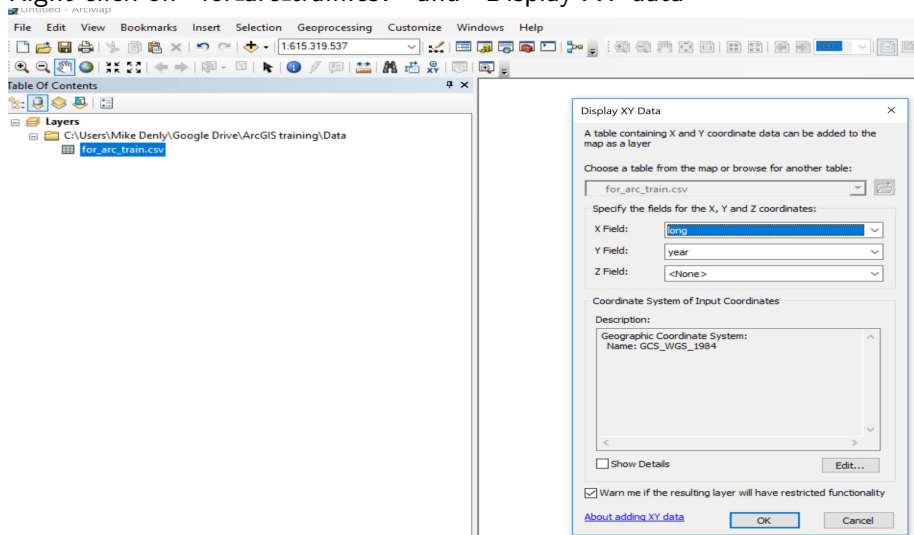
Step 5c: Indicate the Coordinate System

Select “WGS84”



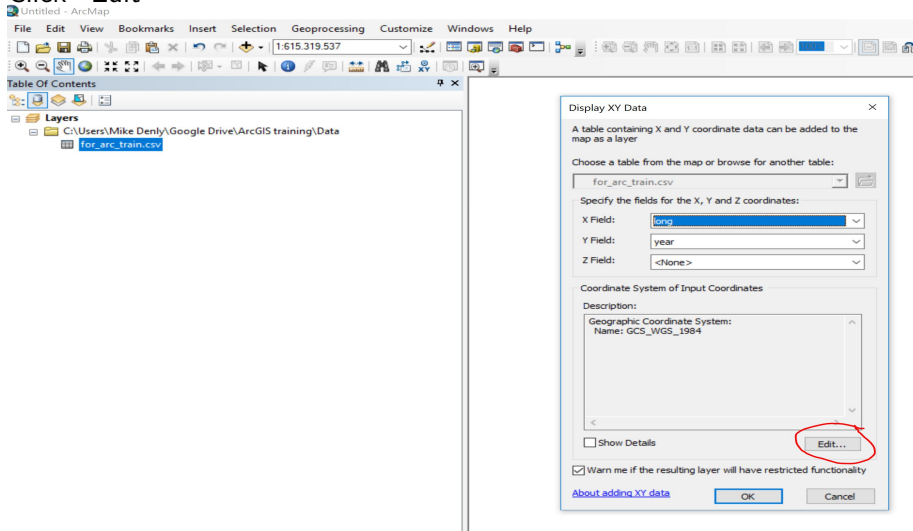
Step 6a: Indicate the Coordinate System for your Data

Right-click on “for_arc_train.csv” and “Display XY data”



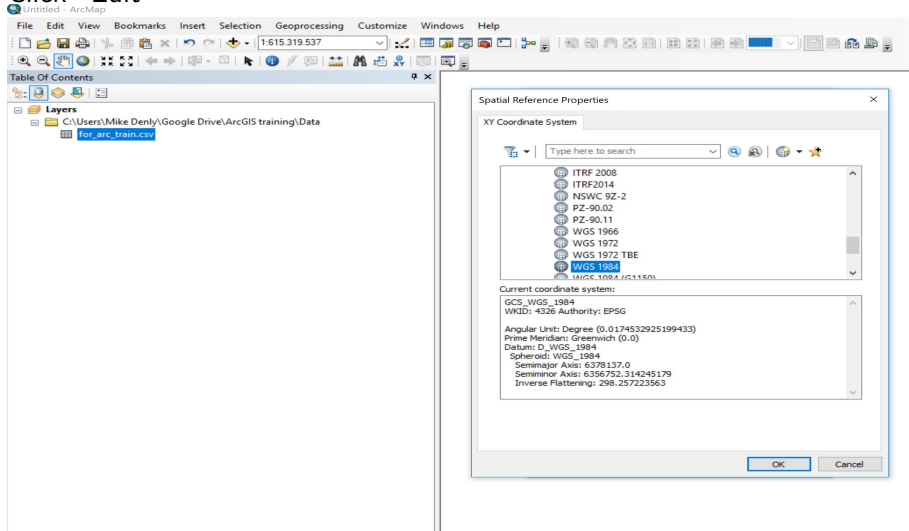
Step 6b: Indicate the Coordinate System for your Data

Click “Edit”



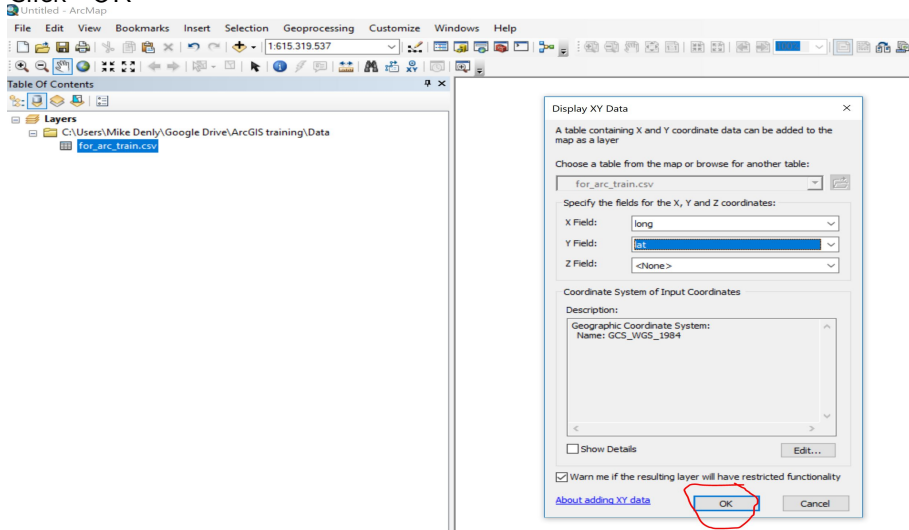
Step 6c: Indicate the Coordinate System for your Data

Click “Edit”



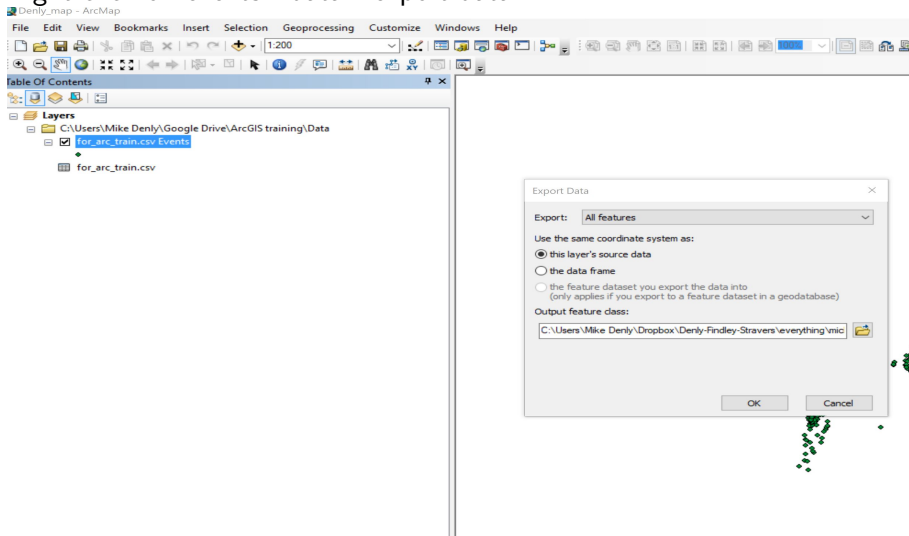
Step 7: Indicate your Latitude and Longitude

Click "OK"



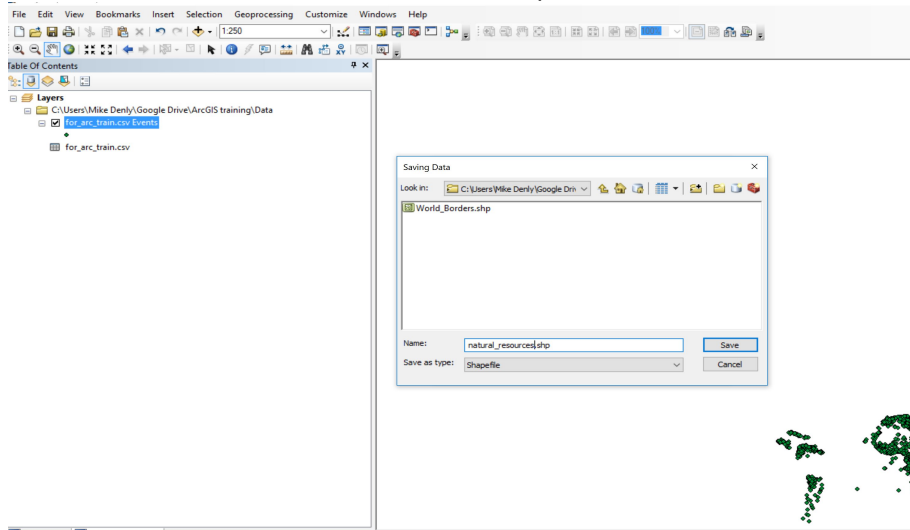
Step 8a: Save Events Data as a Shapefile

Right-click on events - data - export data



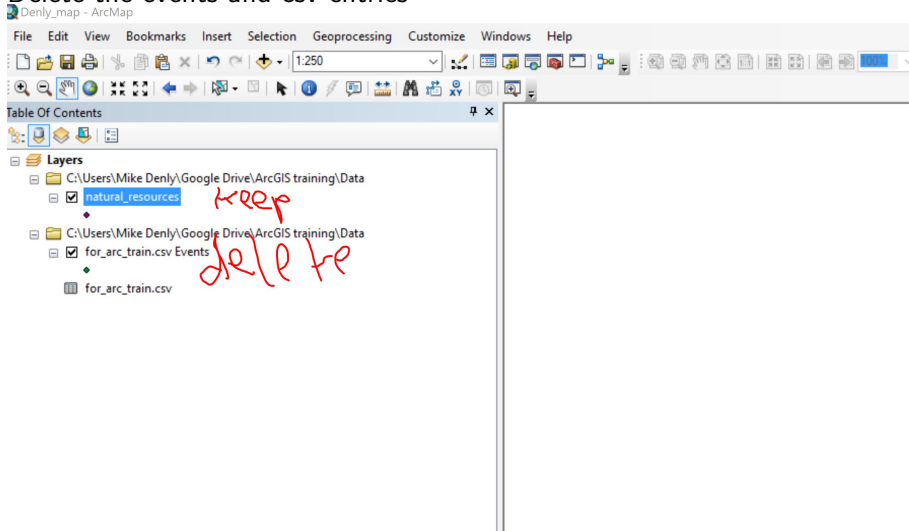
Step 8b: Save Events Data as a Shapefile

Go to connected folder and save it as a shapefile natural_resources

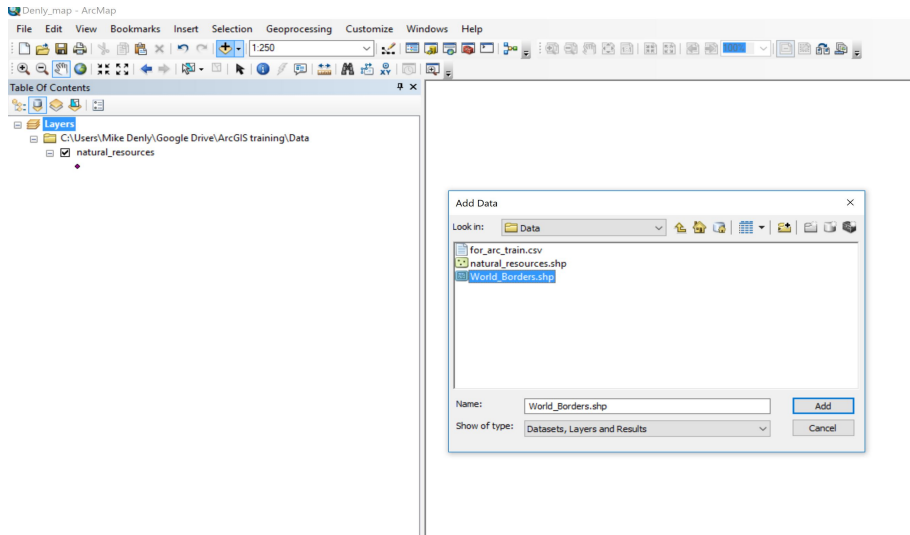


Step 8c: Save Events Data as a Shapefile

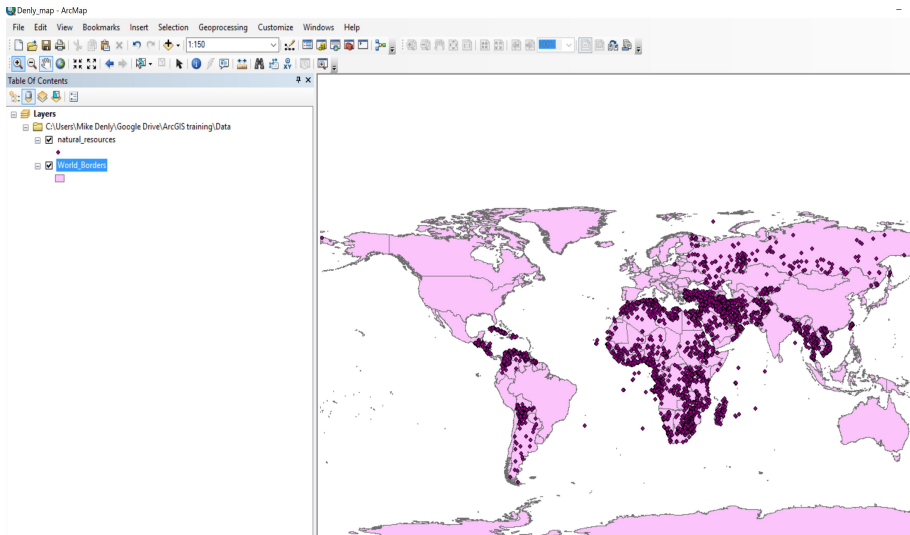
Delete the events and csv entries



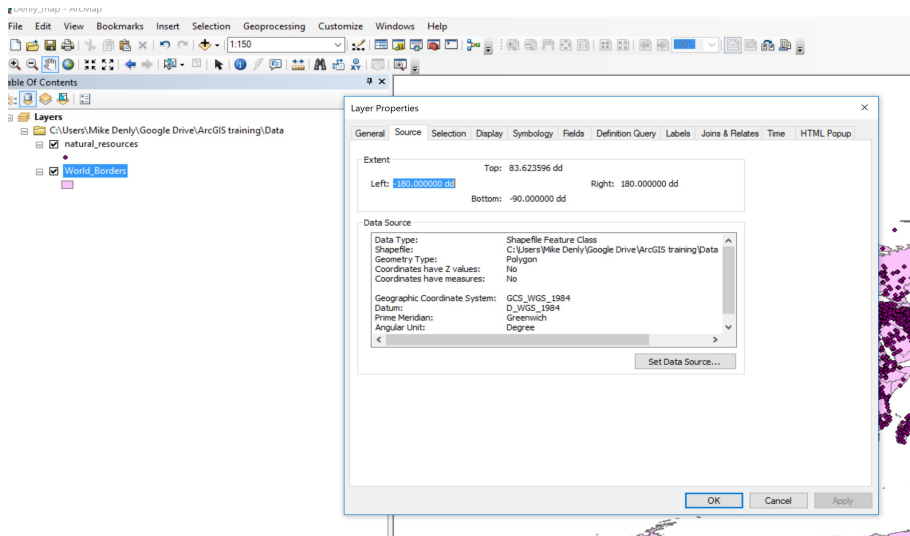
Step 9a: Add Your World Borders Shapefile as a Layer



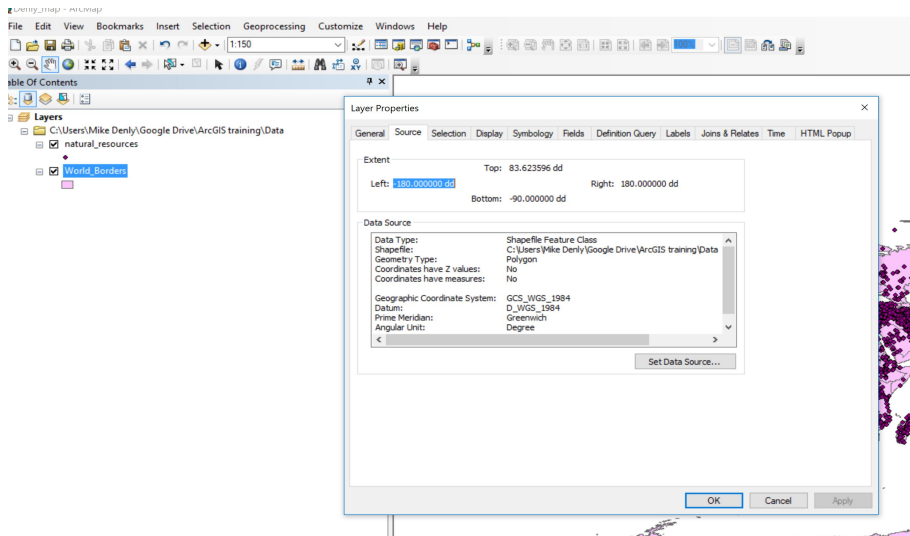
Step 9b: Add Your World Borders Shapefile as a Layer



Step 10: Check Projection on World Borders



Step 11: Check Projection on World Borders



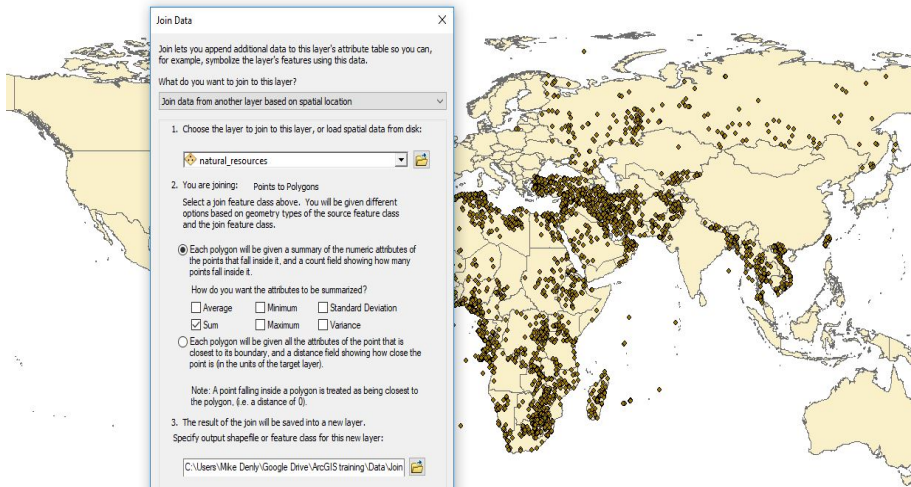
Step 12: Attribute Table

Right-click on either one of the things on the left-hand pane

Table										
natural_resources										
	FID	Shape *	year	resource	country	continent	lat	long	exp_val	world_val
	0	Point	1997	alumina	ruusia	europa	51.228702	51.388136		91701200000000
	1	Point	1997	alumina	ruusia	europa	50.907762	118.584761		3.519040e+14
	2	Point	1995	alumina	ruusia	europa	48.755966	44.500449		576897000000
	3	Point	1994	alumina	ruusia	europa	63.889513	34.265319		17665900000000
	4	Point	2014	alumina	vietnam	asia	11.633333	107.833333		155032000000
	5	Point	2007	alumina	ruusia	europa	59.471046	33.848229		0
	6	Point	2009	alumina	guinea	africa	10.388911	-13.57618		36454900000000
	7	Point	2009	alumina	venezuela	americas	8.351111	-62.640833		964194000000
	8	Point	1998	alumina	ruusia	europa	51.228702	51.388136		79284900000000
	9	Point	1999	alumina	ruusia	europa	50.907762	118.584761		2.829450e+14
	10	Point	2010	alumina	venezuela	americas	8.351111	-62.640833		11826000000000
	11	Point	1998	alumina	ruusia	europa	50.907762	118.584761		3.042560e+14
	12	Point	2011	alumina	vietnam	asia	11.633333	107.833333		145672000000
	13	Point	1998	alumina	venezuela	americas	8.351111	-62.640833		11038800000000
	14	Point	2004	alumina	guinea	africa	10.388911	-13.57618		1.547170e+14
	15	Point	2006	alumina	venezuela	americas	8.351111	-62.640833		13282400000000
	16	Point	2005	alumina	guinea	africa	10.388911	-13.57618		51047300000000
	17	Point	2000	alumina	guyana	americas	6.011491	-58.309543		25142355968
	18	Point	1998	alumina	ruusia	europa	63.889513	34.265319		19526500000000
	19	Point	2008	alumina	venezuela	americas	8.351111	-62.640833		13317000000000
	20	Point	1994	alumina	ruusia	europa	50.907762	118.584761		2.752660e+14
	21	Point	2002	alumina	guinea	africa	10.388911	-13.57618		1.084830e+14
	22	Point	2012	alumina	vietnam	asia	11.633333	107.833333		129530000000
	23	Point	2014	alumina	turkey	asia	37.440359	31.841229		26749954048
	24	Point	2012	alumina	iran	asia	56.41667	56.41667		28208842
	25	Point	1994	alumina	ruusia	europa	59.91211	32.351813		50559000000000
	26	Point	2009	alumina	ruusia	europa	56.235558	90.490614		0
	27	Point	2001	alumina	iran	asia	36.95012	56.38005		19518765056
	28	Point	2009	alumina	ruusia	europa	59.471046	33.848229		0
	29	Point	1995	alumina	ruusia	europa	56.235558	90.490614		2.307590e+14
	30	Point	2013	alumina	guinea	africa	10.388911	-13.57618		1.411810e+14
	31	Point	2000	alumina	ruusia	europa	51.228702	51.388136		80258900000000
	32	Point	1998	alumina	ruusia	europa	59.471046	33.848229		11038800000000

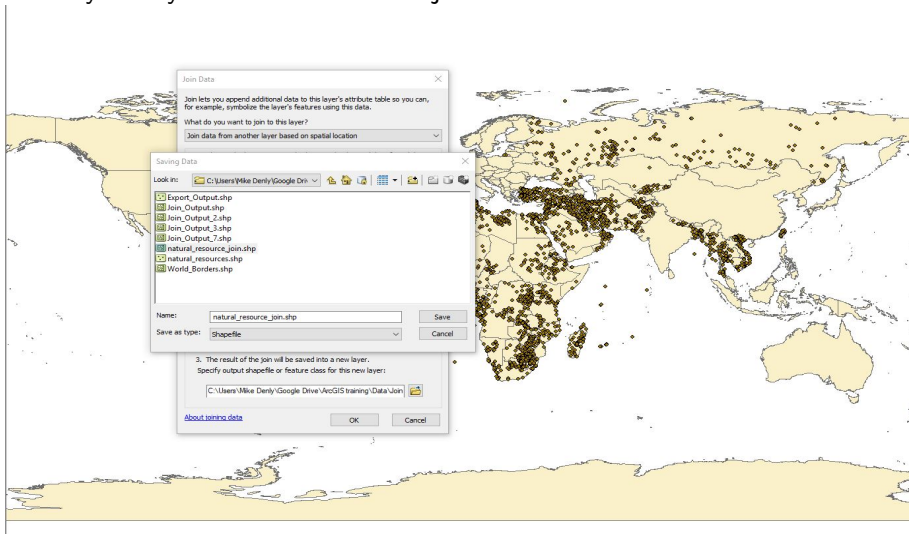
Step 13a: Join Your Layers

Right click on the World Borders Layer - Joins and Relates - Join Fill in everything as in the screenshot, ticking “sum”



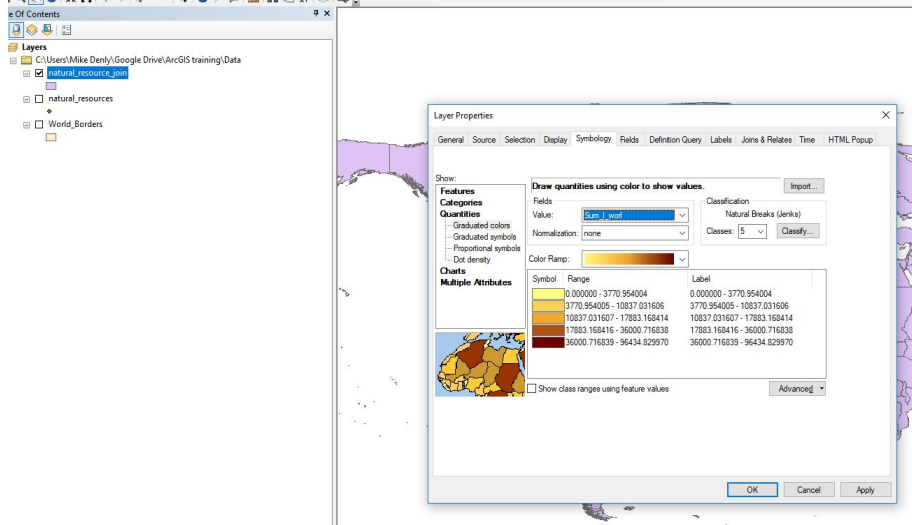
Step 13b: Join Your Layers

Name your layer “natural_resource_join”



Step 14a: Add Symbology

Right click on “natural_resource_join” - Properties - Quantities Graduated Colors - Select “Sum_I_world” - OK



The screenshot shows the ArcGIS Desktop interface. On the left, the 'Table of Contents' pane displays a list of layers: 'natural_resource_join' (selected), 'natural_resources', and 'World_Borders'. The main map area shows a world map with colored regions. The 'Layer Properties' dialog box is open, with the 'Quantities' tab selected. The 'Show:' section on the left lists 'Features', 'Categories', 'Quantities', 'Charts', and 'Multiple Attributes'. The 'Quantities' section is expanded, showing 'Draw quantities using color to show values.' The 'Fields' list contains 'Sum_I_world', which is selected. The 'Classification' section shows 'Natural Breaks (Jenks)' with 5 classes. The 'Color Ramp' is set to a graduated color ramp. The 'Symbol' section shows a table of ranges and labels.

Symbol	Range	Label
[Yellow]	0.000000 - 3770.954004	0.000000 - 3770.954004
[Light Orange]	3770.954005 - 10837.031606	3770.954005 - 10837.031606
[Orange]	10837.031607 - 17883.168414	10837.031607 - 17883.168414
[Dark Orange]	17883.168416 - 36000.716838	17883.168416 - 36000.716838
[Red]	36000.716839 - 96434.829970	36000.716839 - 96434.829970

☐ Show class ranges using feature values

Step 14b: Increase Classes to 10 and Change Color Ramp

The screenshot shows the ArcGIS Desktop interface with the 'Layer Properties' dialog box open for the 'Sum_Layer'. The dialog is set to the 'Symbolization' tab. The 'Draw quantities using color to show values' option is selected. The 'Fields' list shows 'Sum_Layer' as the selected field. The 'Classification' section shows 'Natural Breaks (Jenks)' as the method, with 'Classes' set to 10. The 'Color Ramp' is set to a sequential color ramp. The 'Multiple Attributes' table shows the following data:

Symbol	Range	Label
1689.457701 - 3081.140374	1689.457701 - 3081.140374	1689.457701 - 3081.140374
3081.140375 - 4408.493908	3081.140375 - 4408.493908	3081.140375 - 4408.493908
4408.493909 - 7561.276421	4408.493909 - 7561.276421	4408.493909 - 7561.276421
7561.276422 - 12149.804954	7561.276422 - 12149.804954	7561.276422 - 12149.804954
12149.804955 - 17883.168414	12149.804955 - 17883.168414	12149.804955 - 17883.168414
17883.168415 - 36000.716838	17883.168415 - 36000.716838	17883.168415 - 36000.716838
36000.716839 - 96434.829970	36000.716839 - 96434.829970	36000.716839 - 96434.829970

The background map shows a world map with the 'Sum_Layer' applied, displaying the same color scheme as the dialog. The 'Layers' panel on the left shows the 'Sum_Layer' selected under the 'natural_resources' folder.

15a: Label Your Map According to Conventions

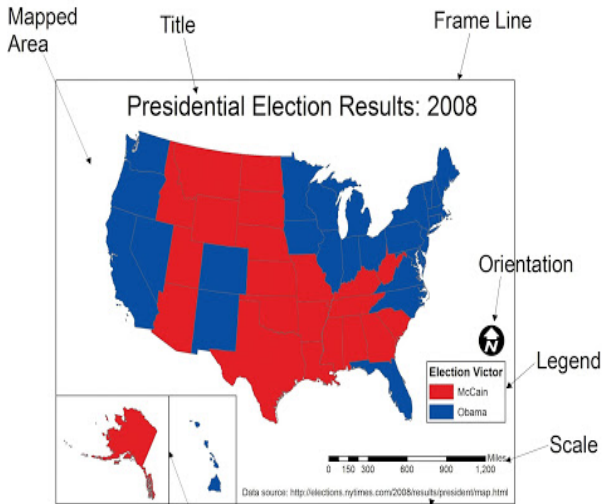
Remember?

Required

- Title
- North arrow
- Scale bar
- Legend
- Data sources

Optional

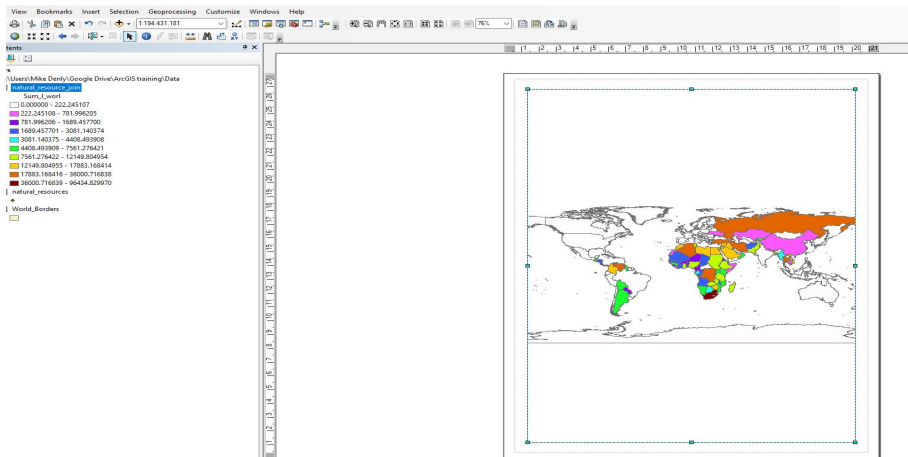
- Frame line
- Neat line



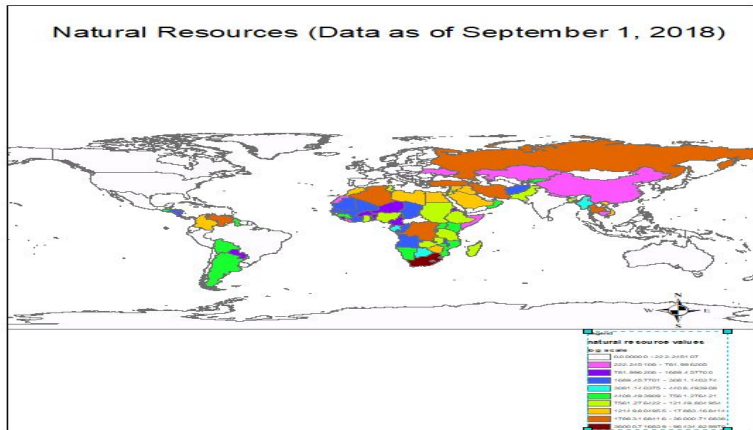
Step 15b: Label Your Map According to Convention

Go to “View” - “Layout View”

Use “Insert” to insert a title, legend, north arrow, and other necessary components



Step 16: Enjoy Your Completed Map!



Step 17: Your Turn!

Delete everything, start anew, and make a map just based on the count_
attribute