ArcGIS Training

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Innovations for Peace and Development

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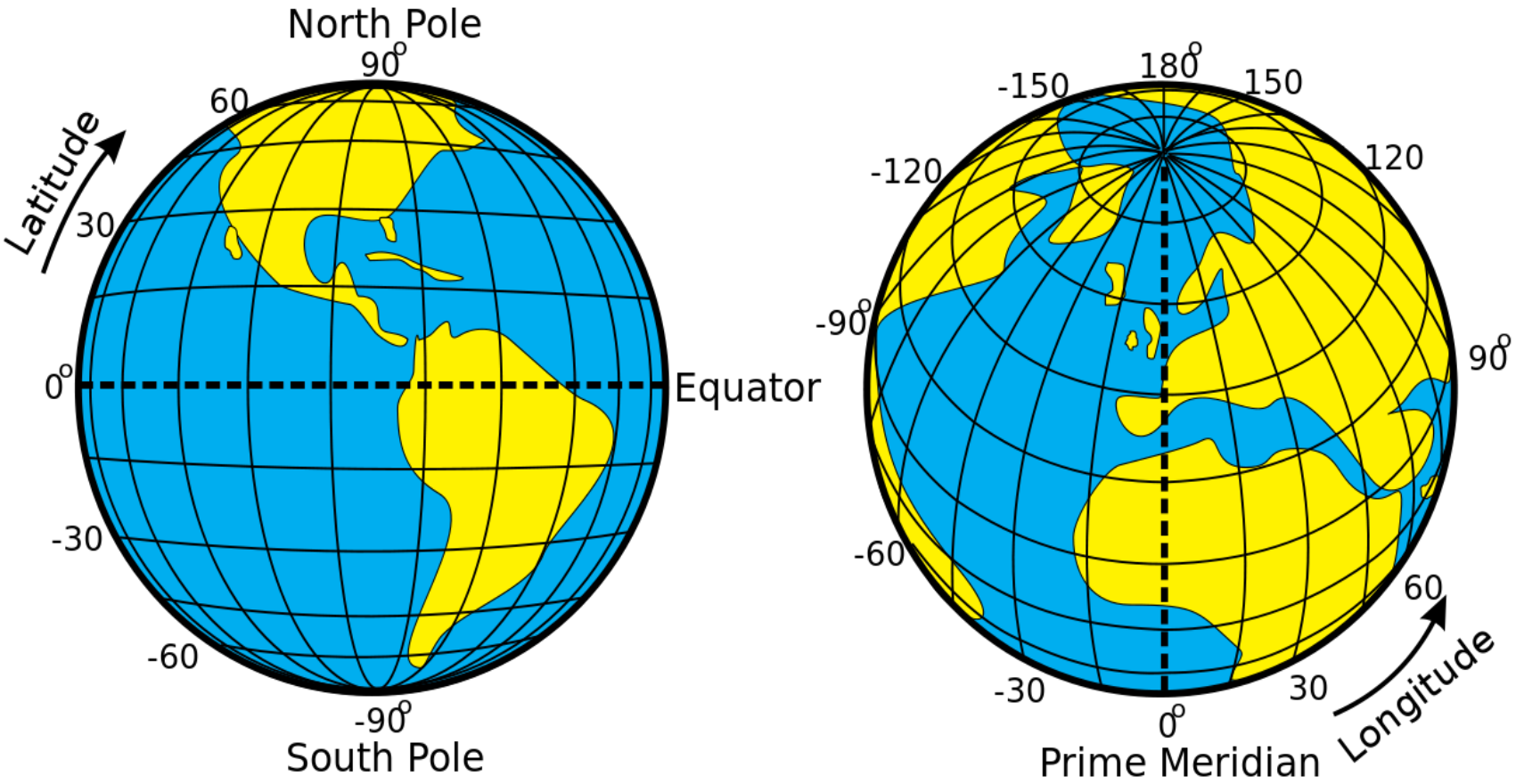
Geographic Coordinate Systems

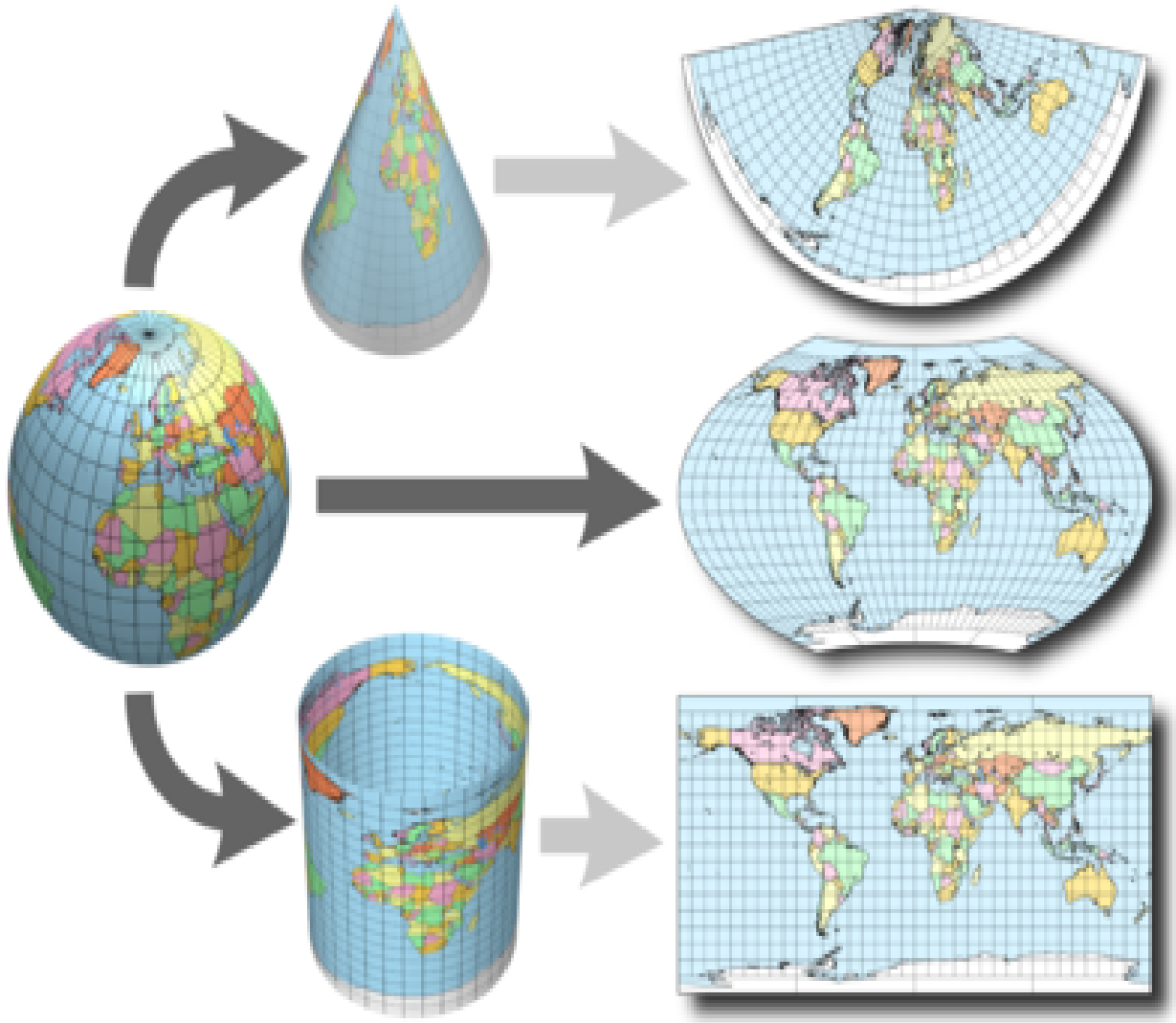
Most Common Coordinate System:

- World Geodetic System 1984 (WGS84)

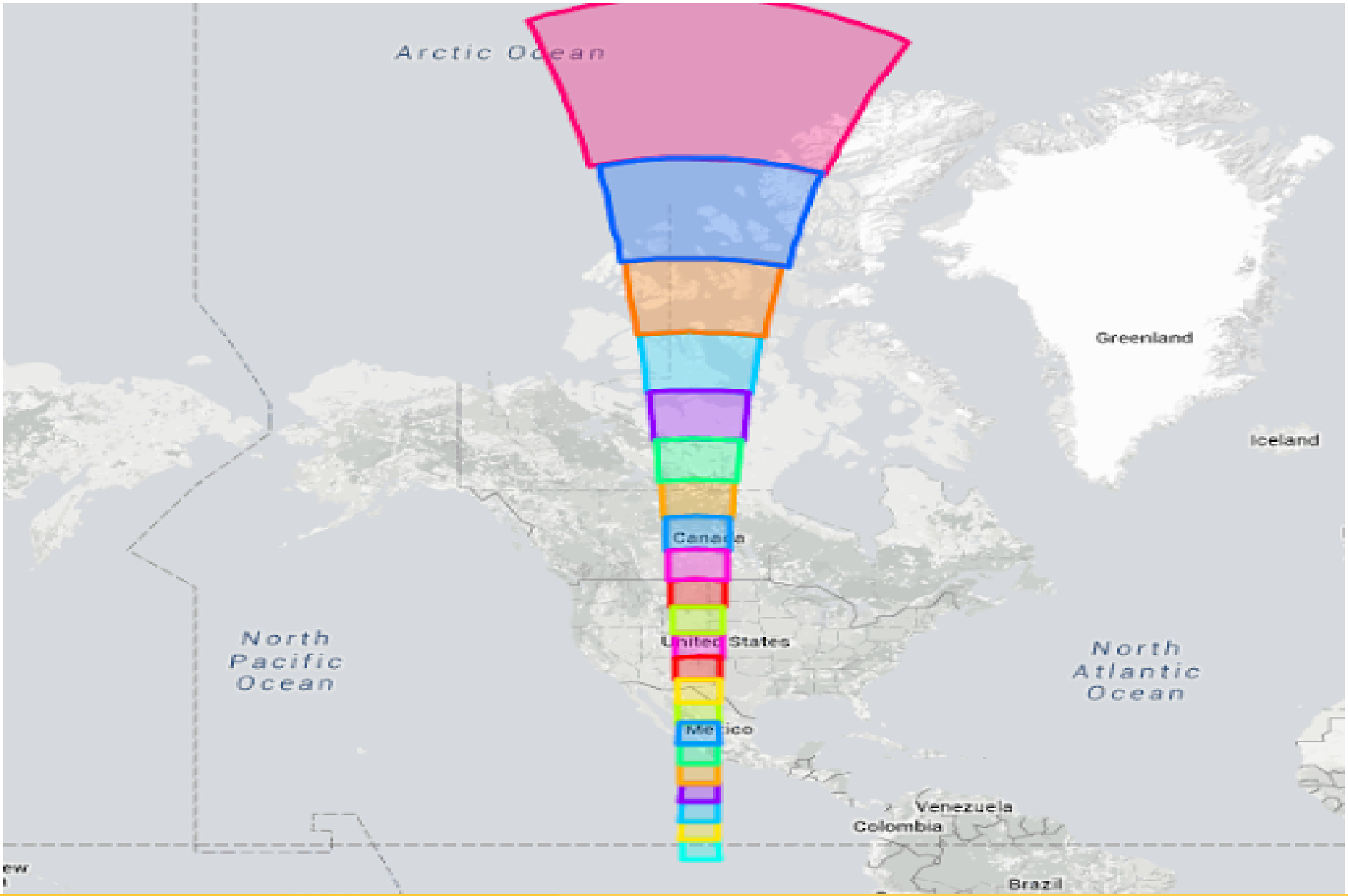


Map Projections

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

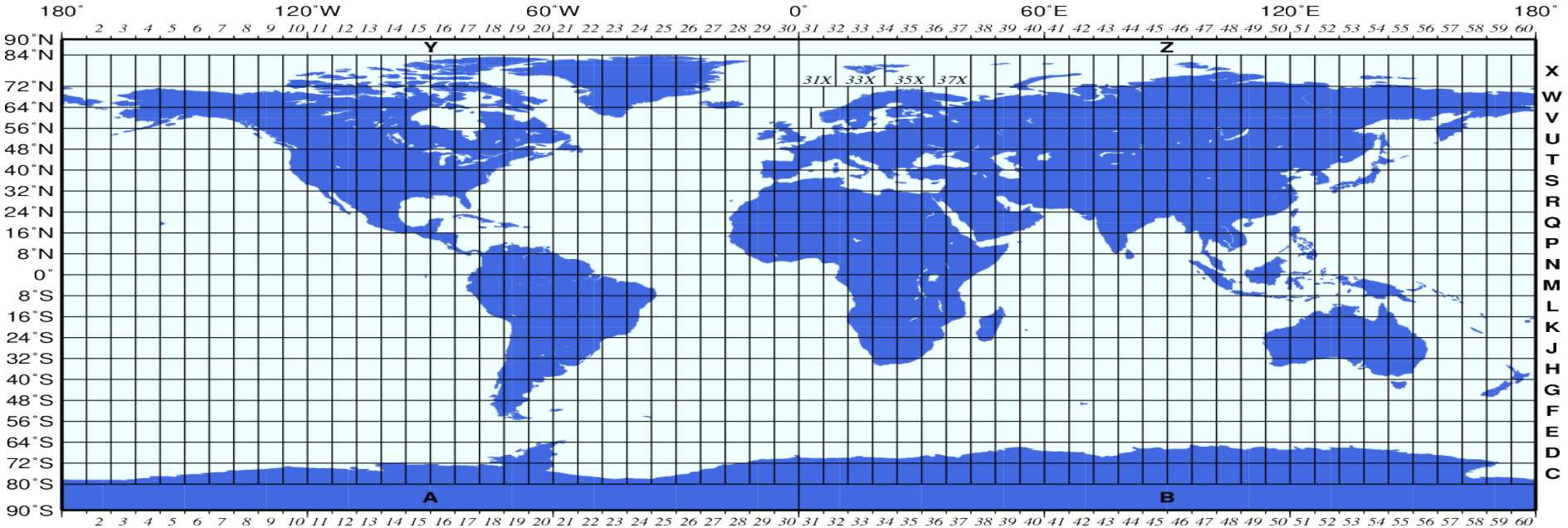


Visualizing Colorado under Different Locations



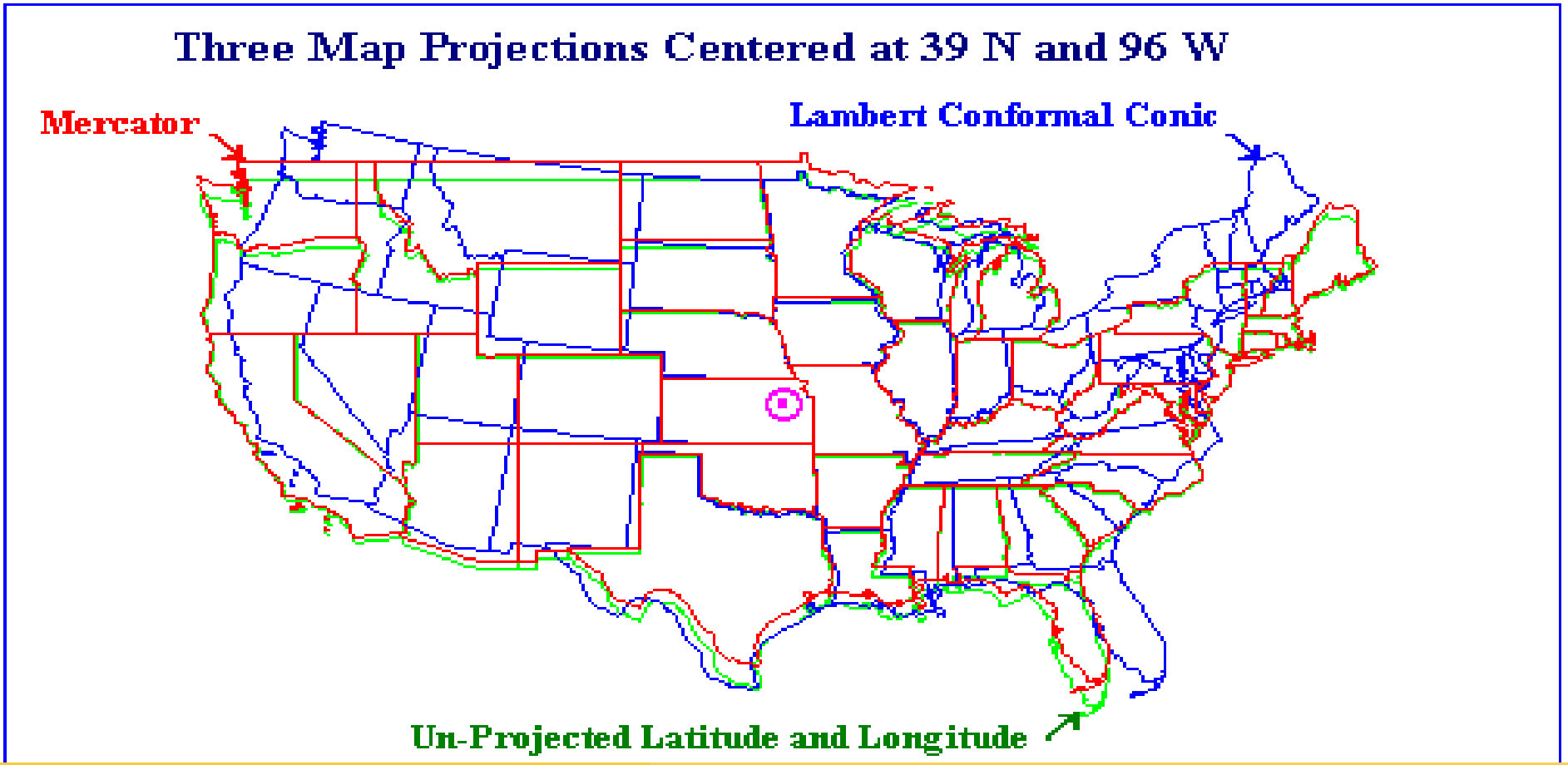
How to Choose Projections

- 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



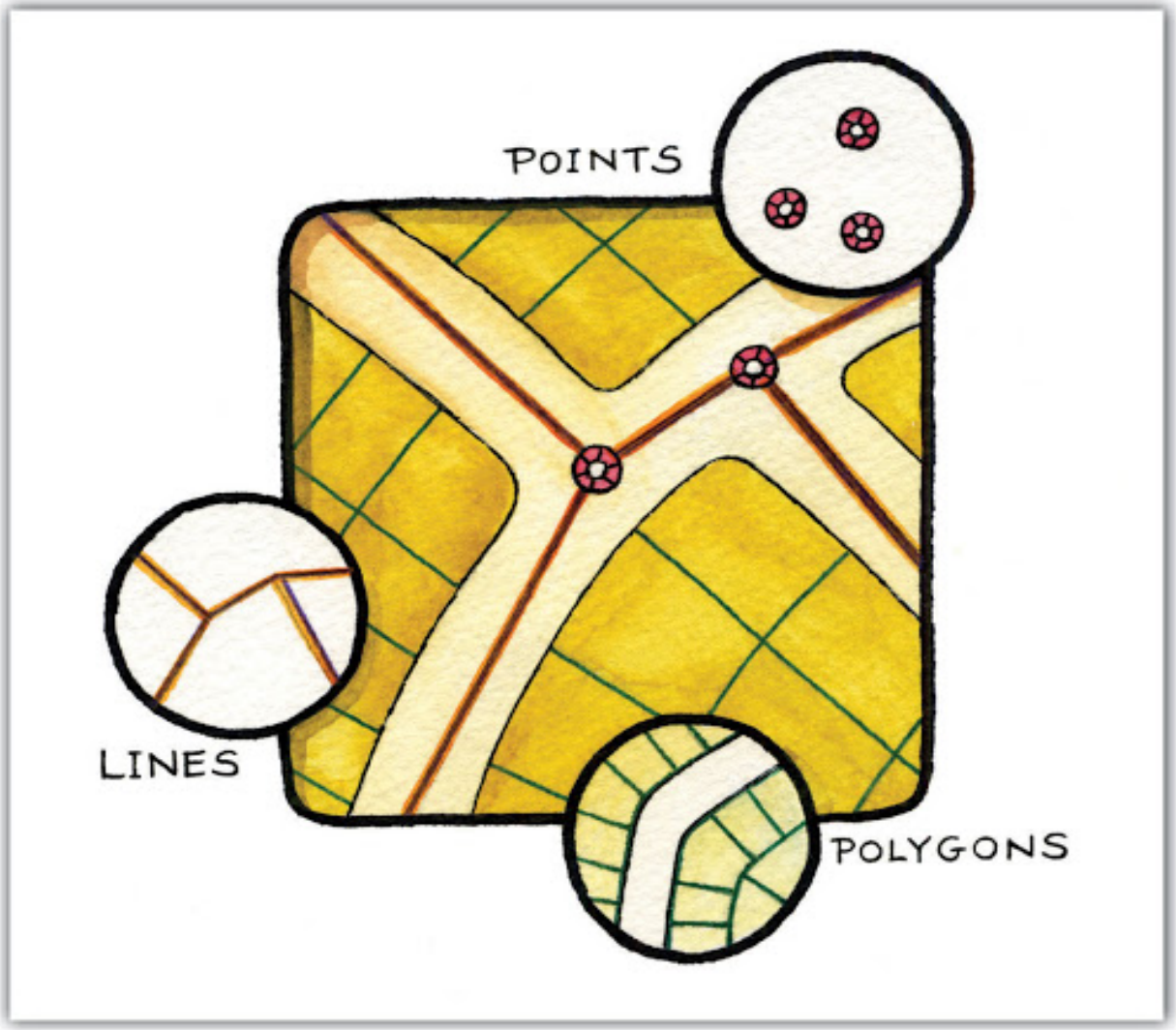
Unaligned Projections

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



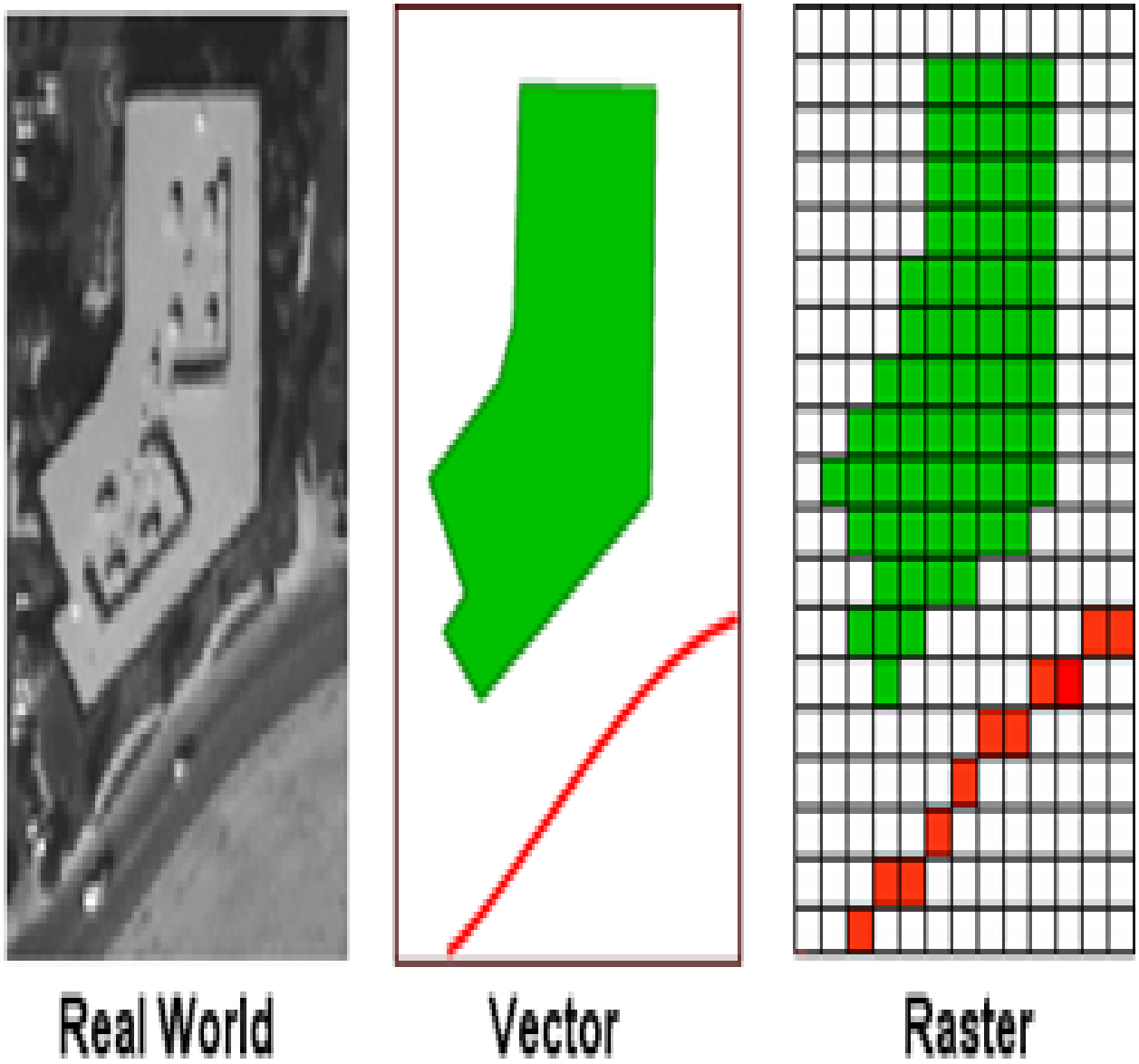
Vector Data

- Points
  - Cities
  - Schools
  - Fire hydrants
- Lines
  - Rivers
  - Roads
  - Pipelines
- Polygons
  - Countries
  - Lakes
  - Land



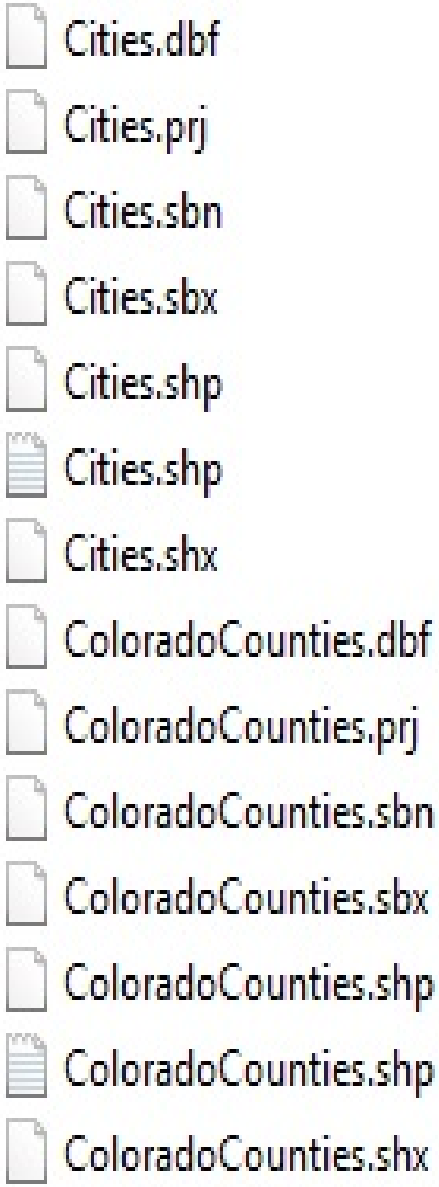
Raster Data

- 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



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



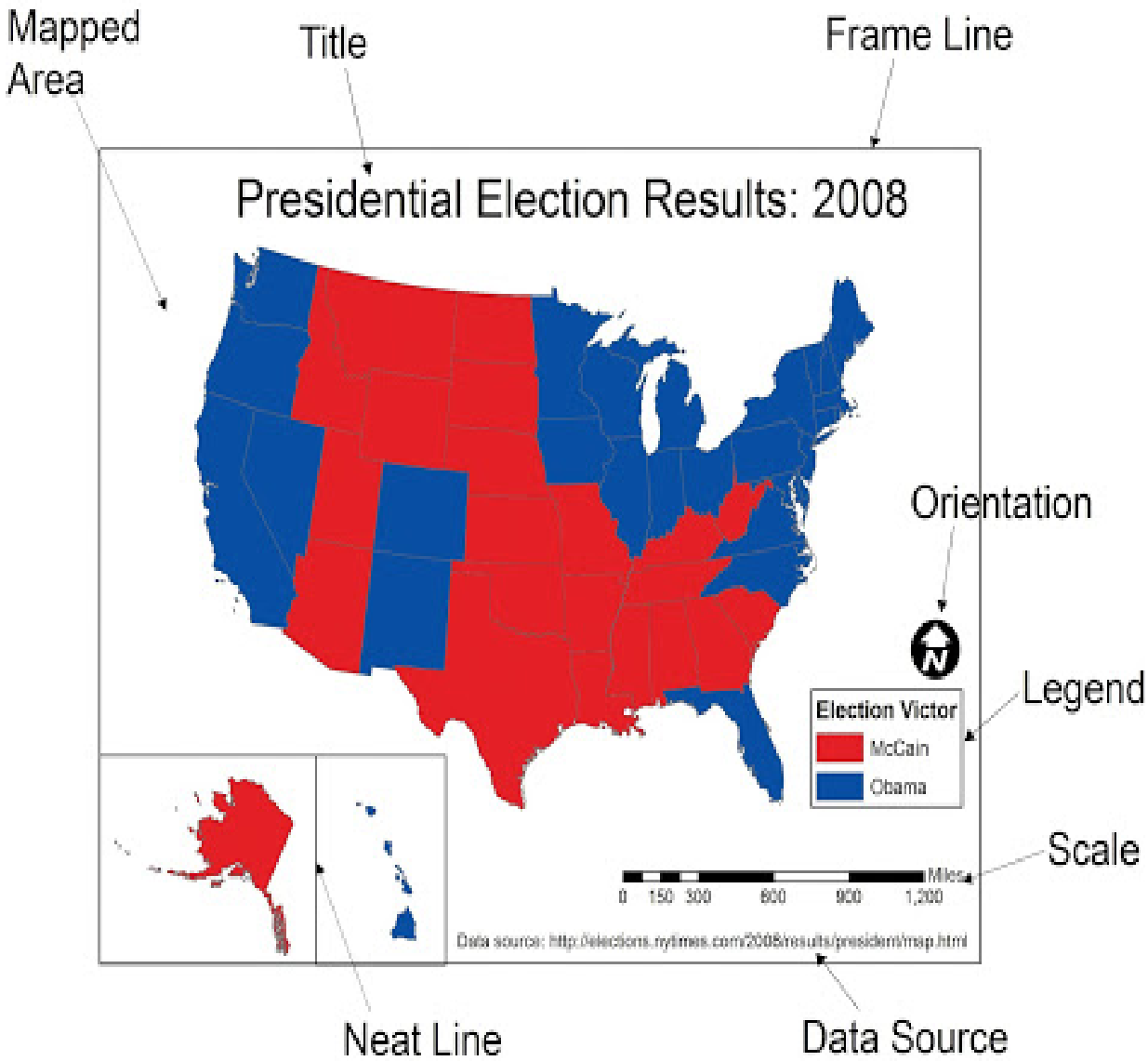
Mapping Conventions

Required

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

Optional

- Frame line
- Neat line



Were You Paying Attention?

1. What is the standard geographic coordinate system?
2. Why are projections important?
3. How do you send shapefile?

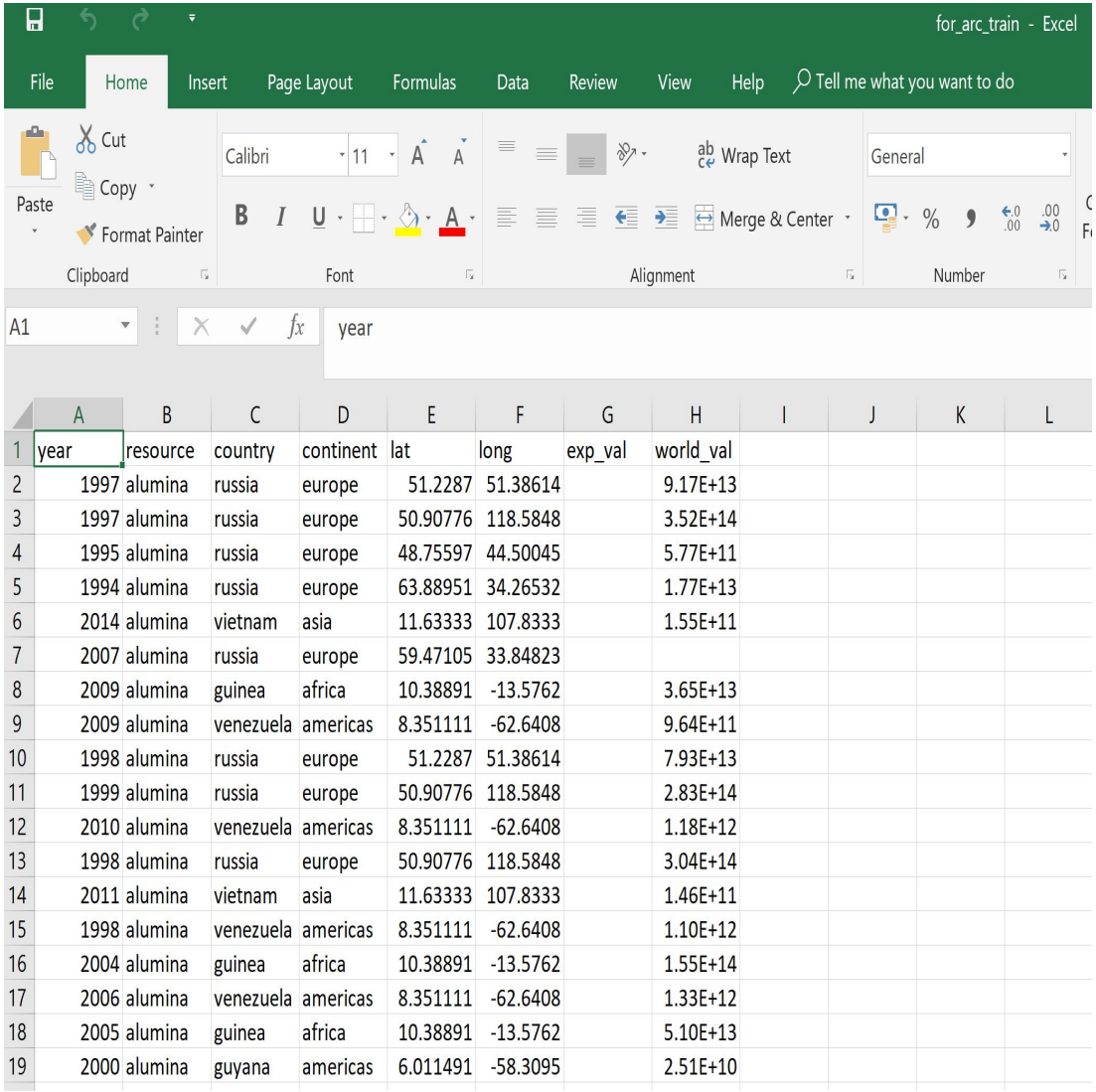
Answers to the Quiz

1. What is the standard geographic coordinate system?
   - WGS84
2. Why are projections important?
   - Unaligned projections among datasets are the primary source of all GIS problems
3. 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

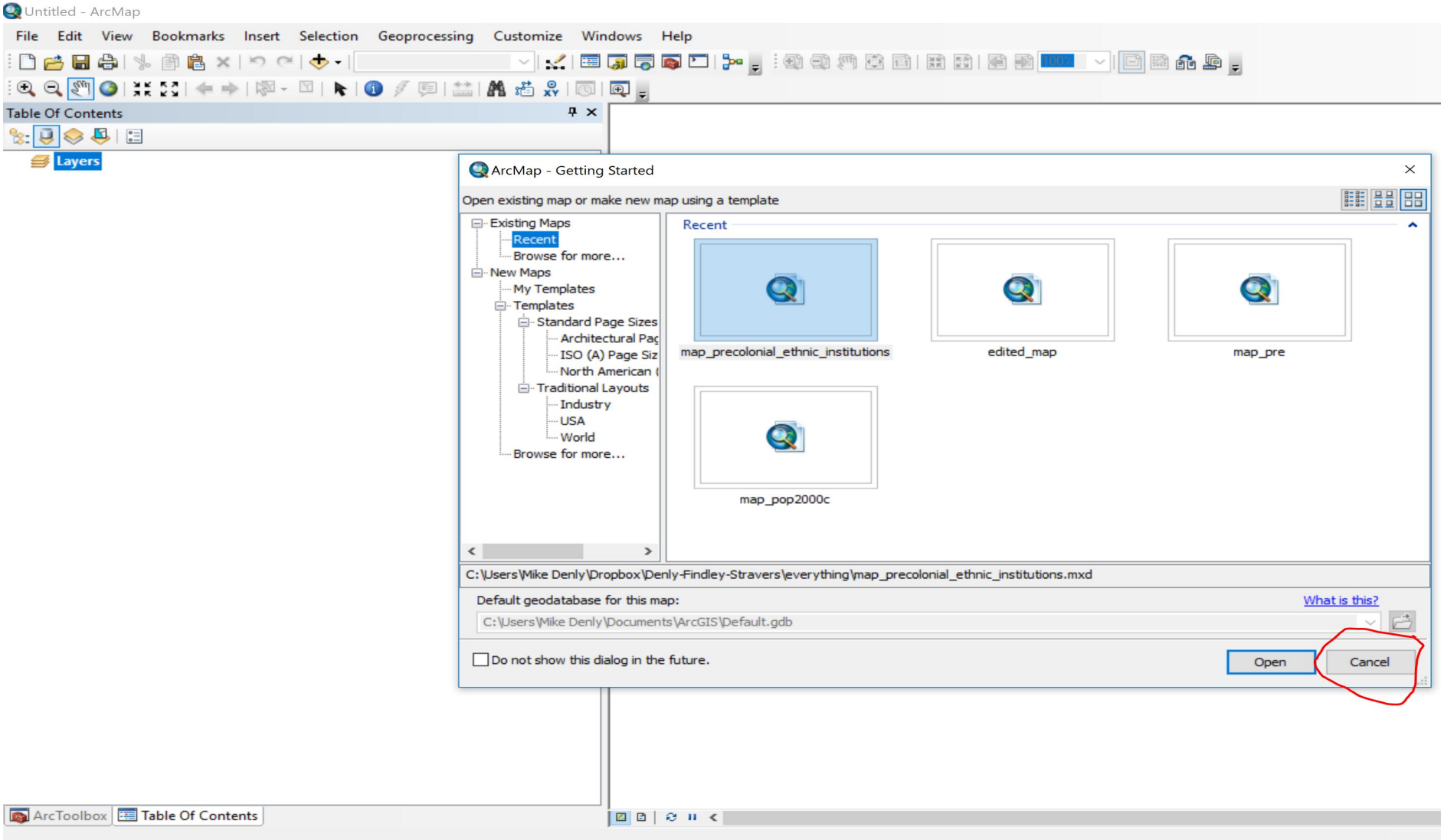
- The data needs to be clean and in the right format for GIS
  - Title of the Arc file can't have spaces
  - Variables names can't be longer than 10 characters
  - Variable names can't have spaces
  - Your data should be stored as a CSV file



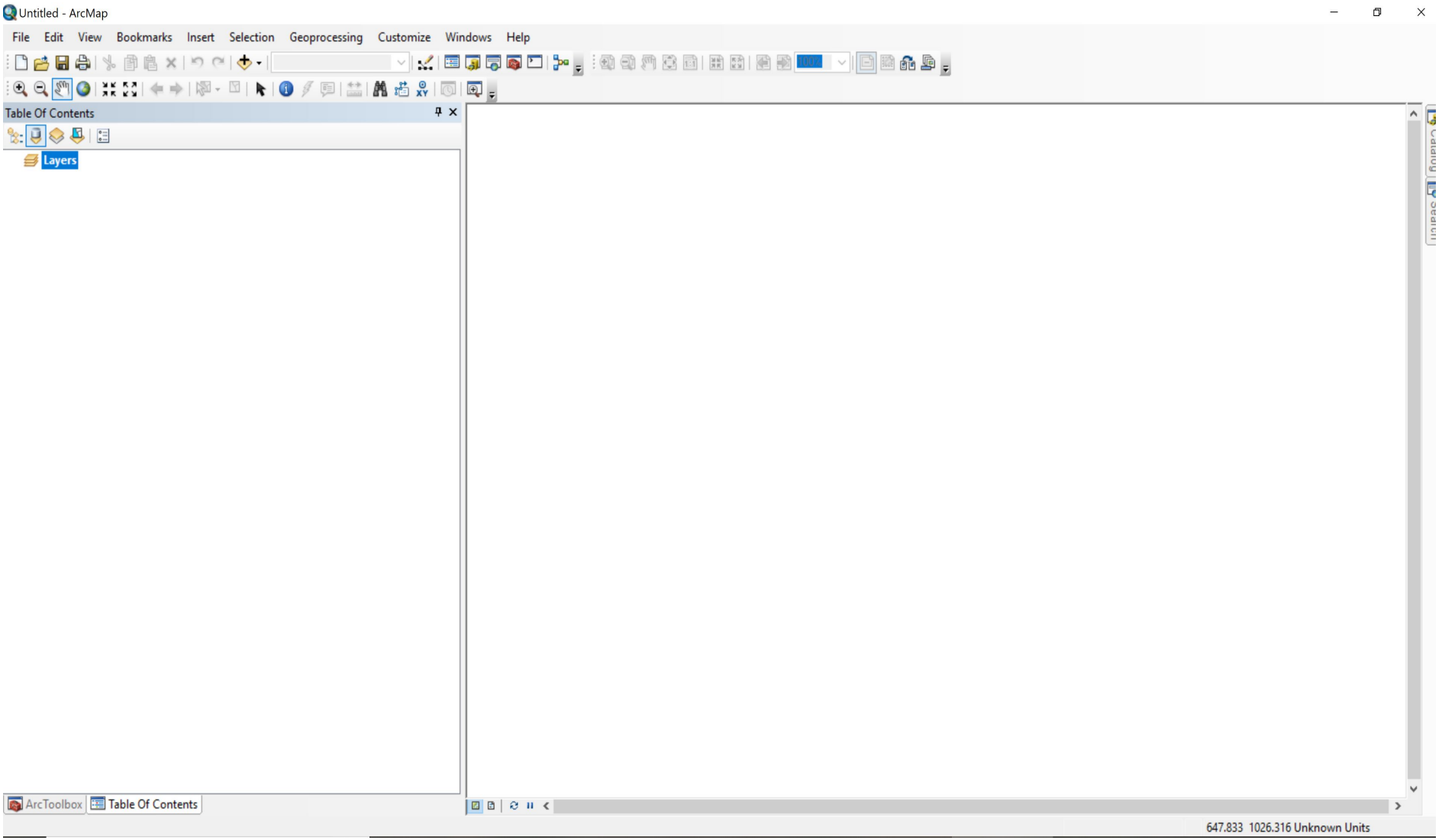
	A	B	C	D	E	F	G	H
1	year	resource	country	continent	lat	long	exp_val	world_val
2	1997	alumina	russia	europe	51.2287	51.38614		9.17E+13
3	1997	alumina	russia	europe	50.90776	118.5848		3.52E+14
4	1995	alumina	russia	europe	48.75597	44.50045		5.77E+11
5	1994	alumina	russia	europe	63.88951	34.26532		1.77E+13
6	2014	alumina	vietnam	asia	11.63333	107.8333		1.55E+11
7	2007	alumina	russia	europe	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	russia	europe	51.2287	51.38614		7.93E+13
11	1999	alumina	russia	europe	50.90776	118.5848		2.83E+14
12	2010	alumina	venezuela	americas	8.351111	-62.6408		1.18E+12
13	1998	alumina	russia	europe	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

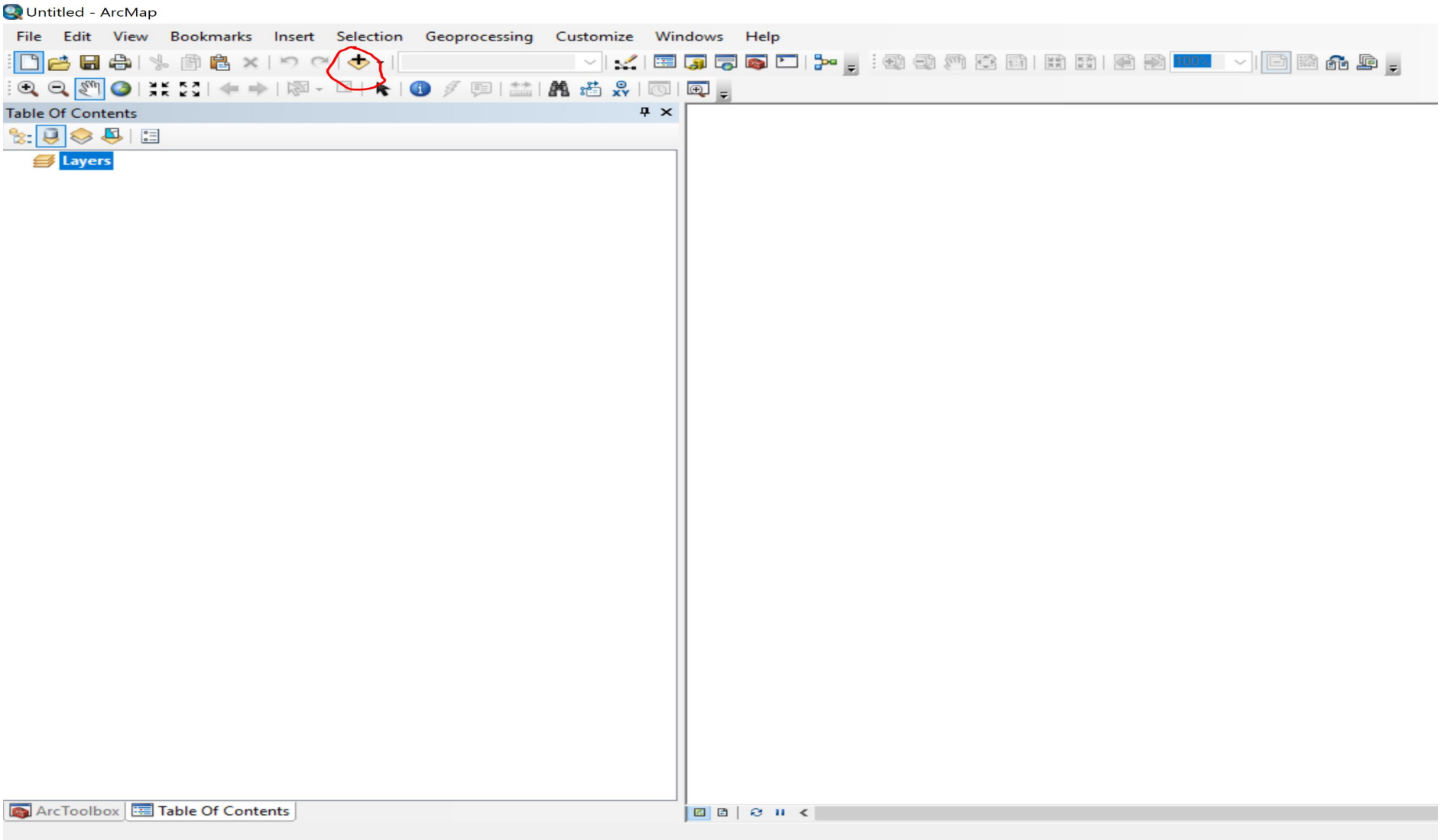
Select "Cancel" [This step may be unnecessary for some of you]



Step 1b: This is Your Blank Map

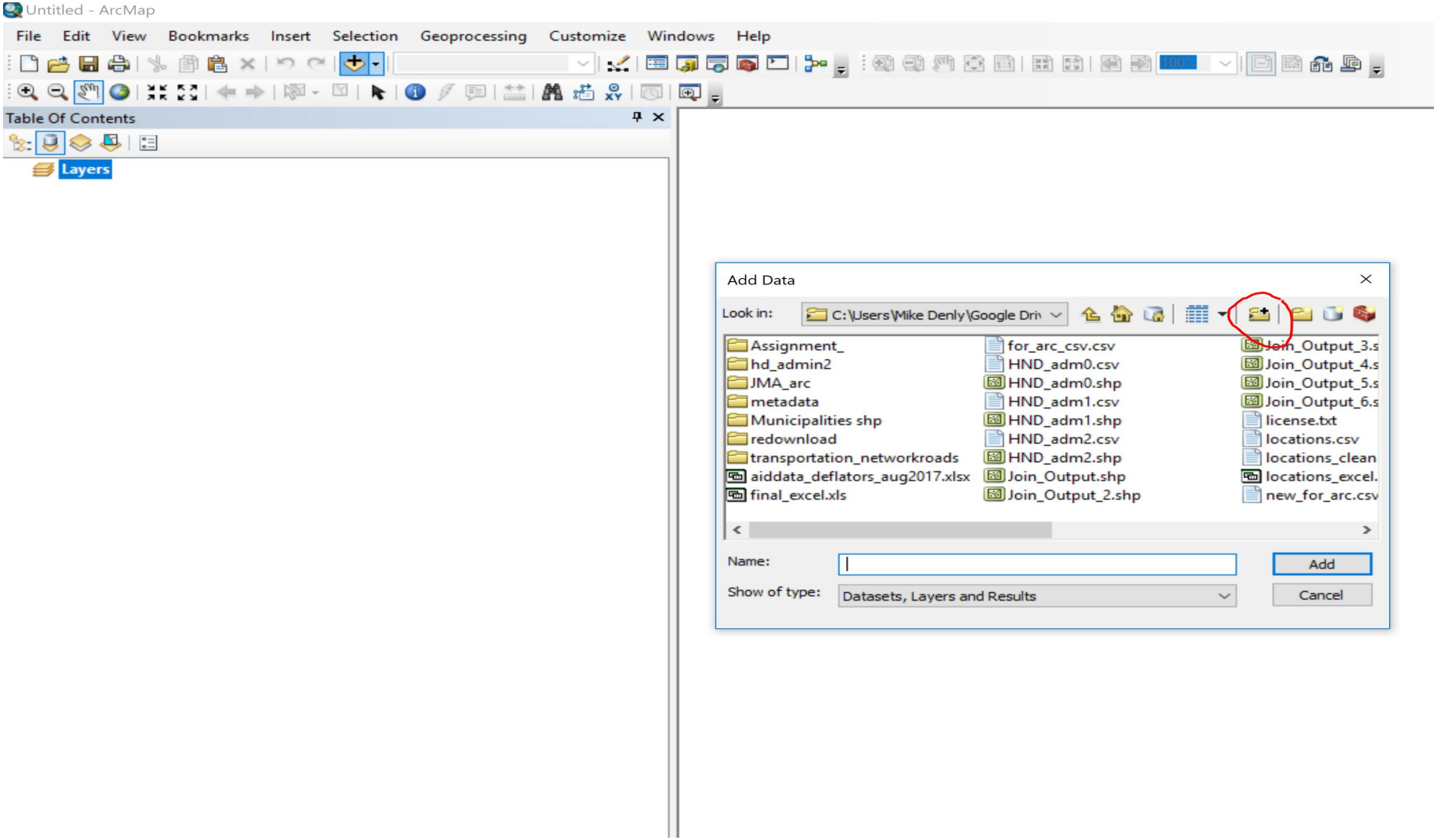


Step 2: Add your Data



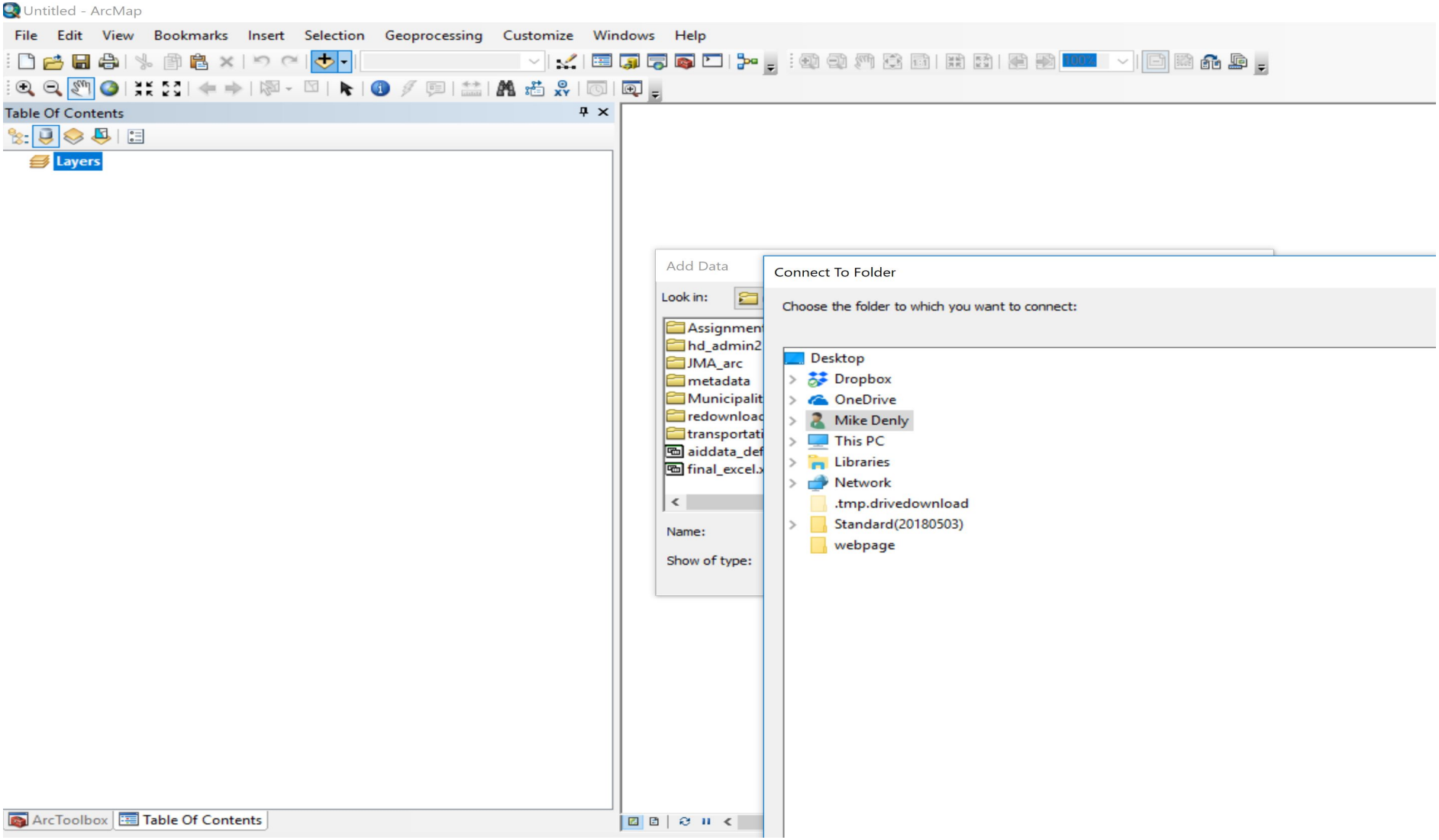
Step 3: Connect to Folder with Your Data and Shapefile

Click on the circled folder



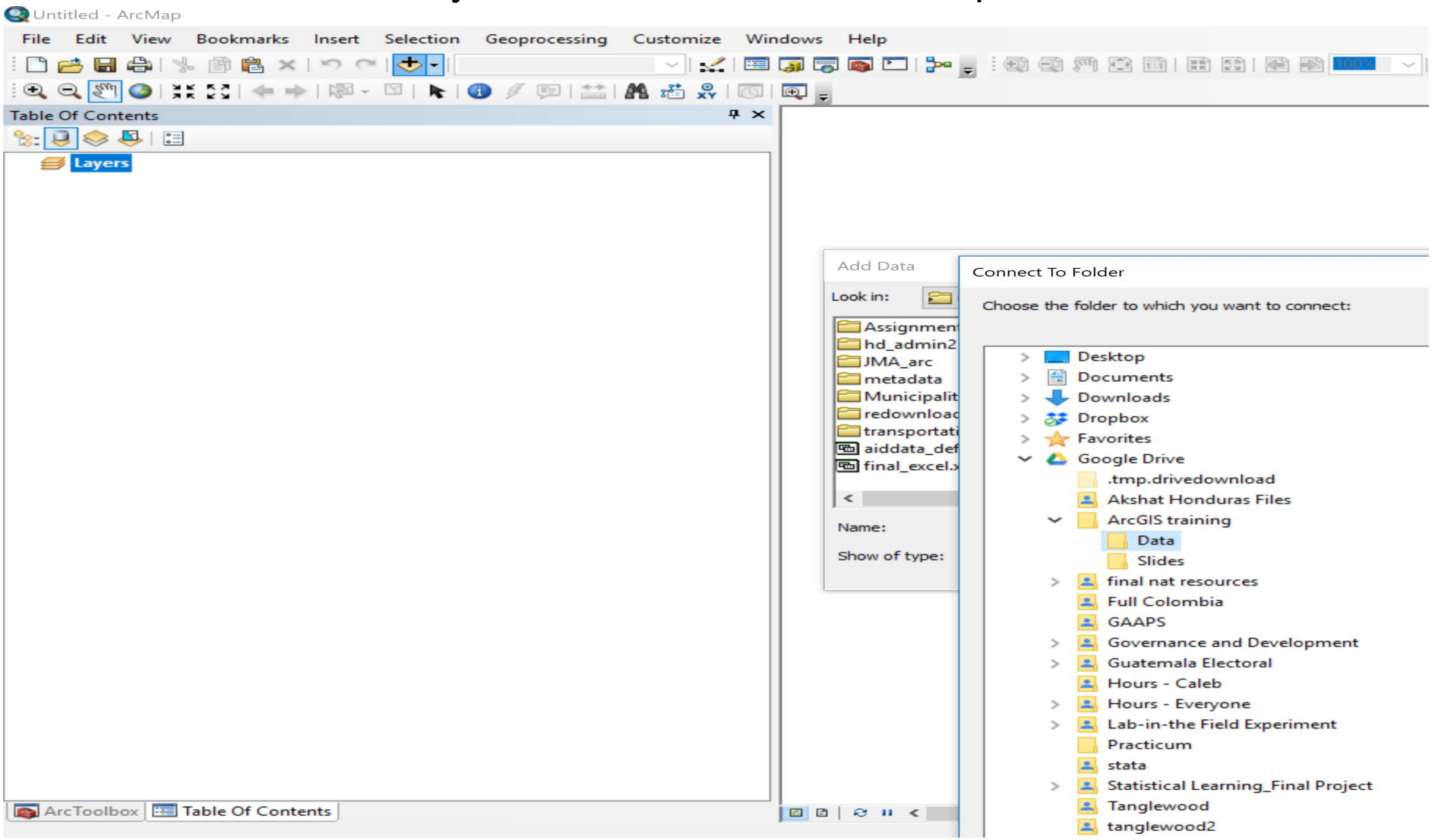
Step 4a: Select Your Folder with the Data

Go to the folder where you saved the data and shapefile



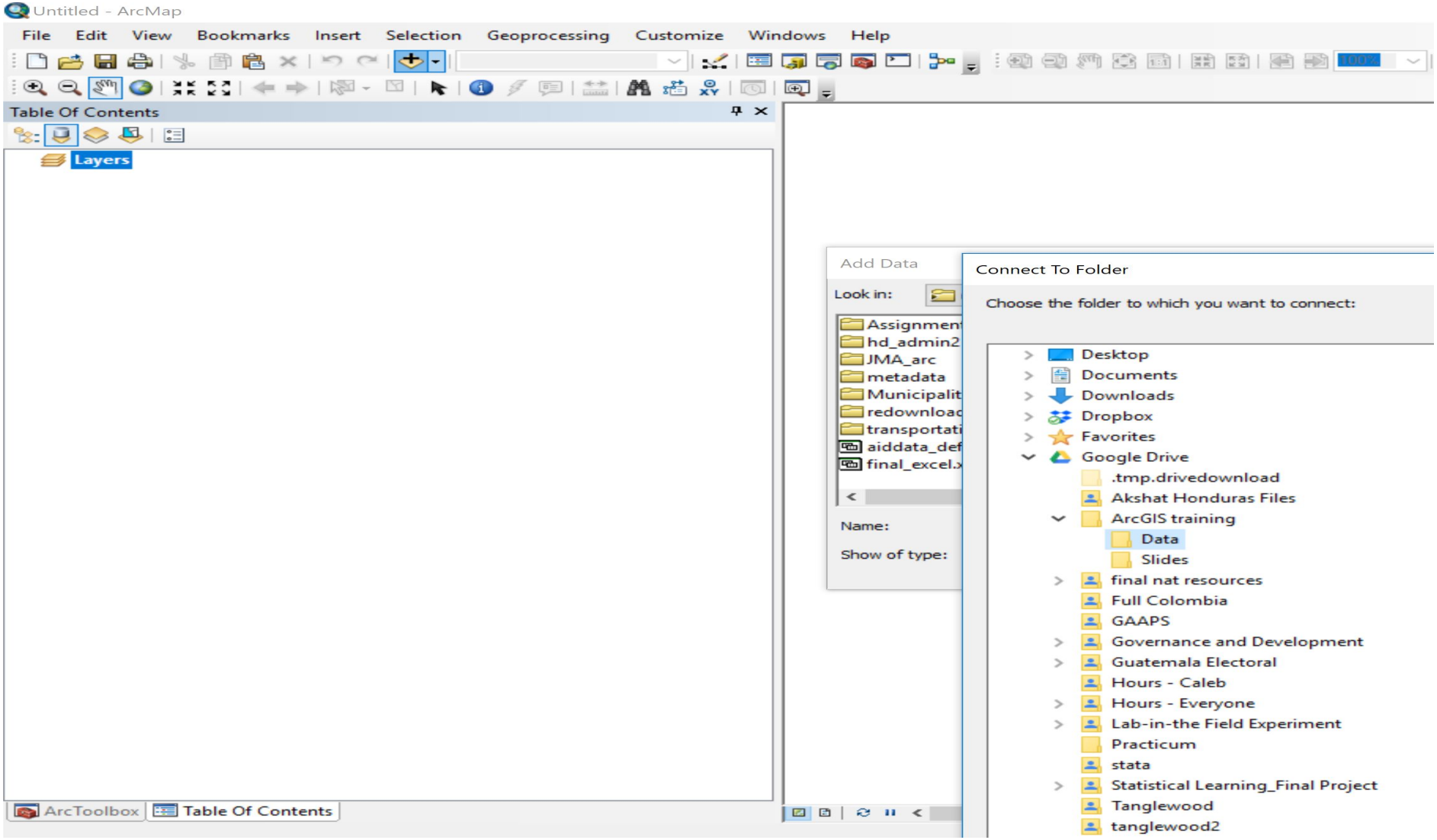
Step 4b: Select Your Folder with the Data

Go to the folder where you saved the data and shapefile



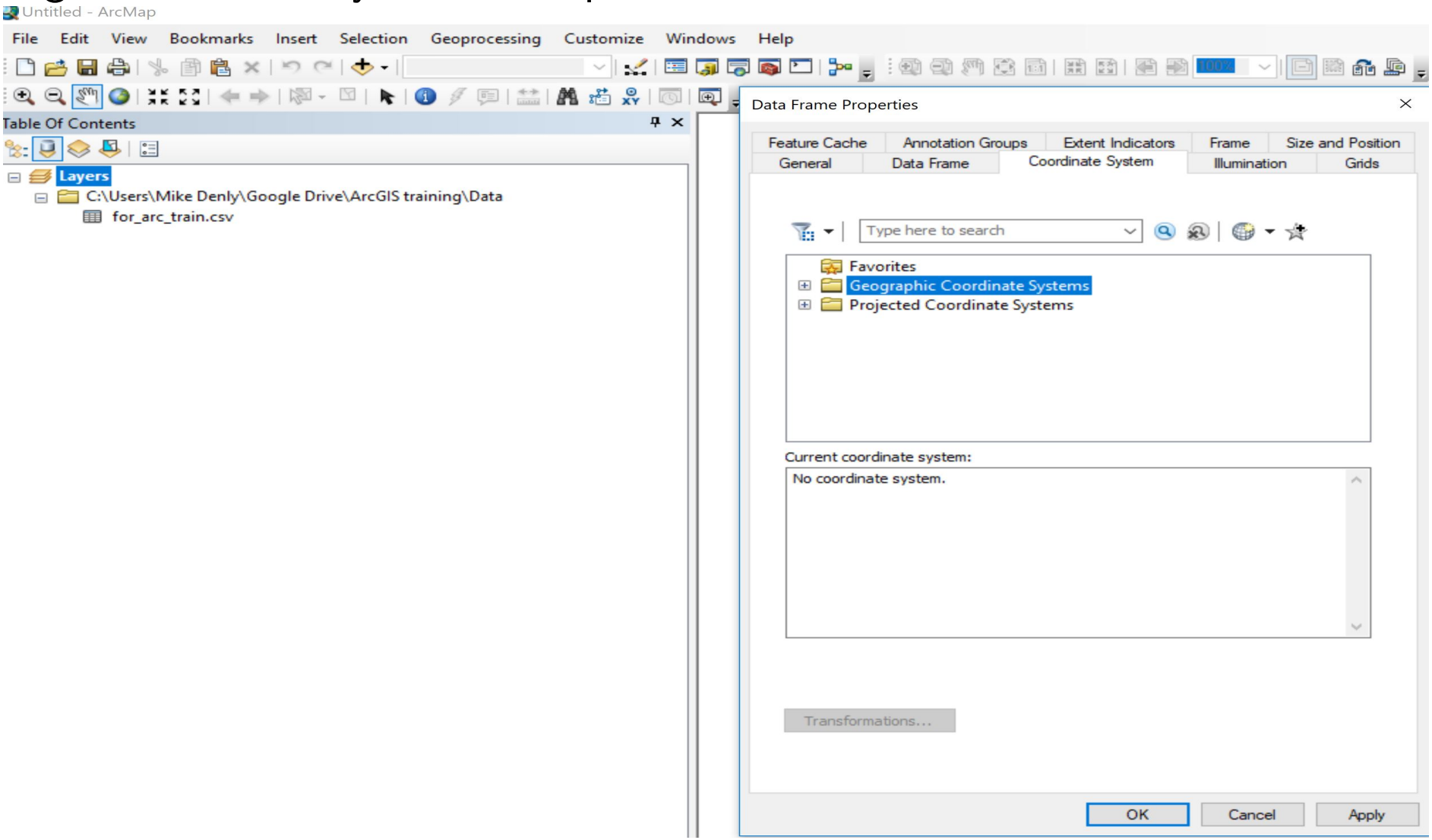
Step 4c: Select Your Folder with the Data

Select the CSV file



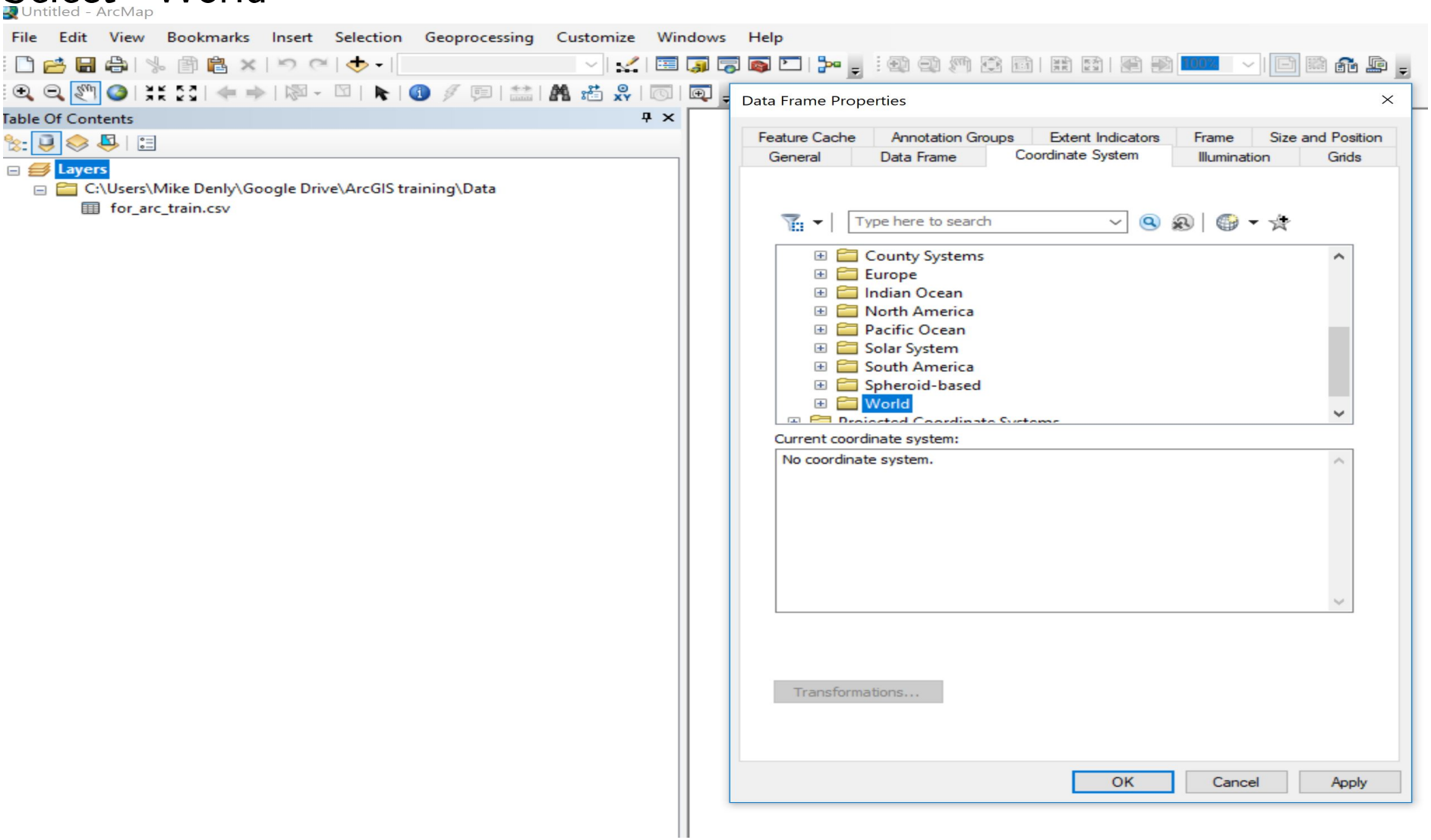
Step 5a: Indicate the Coordinate System

Right-click on “Layers” - “Properties”



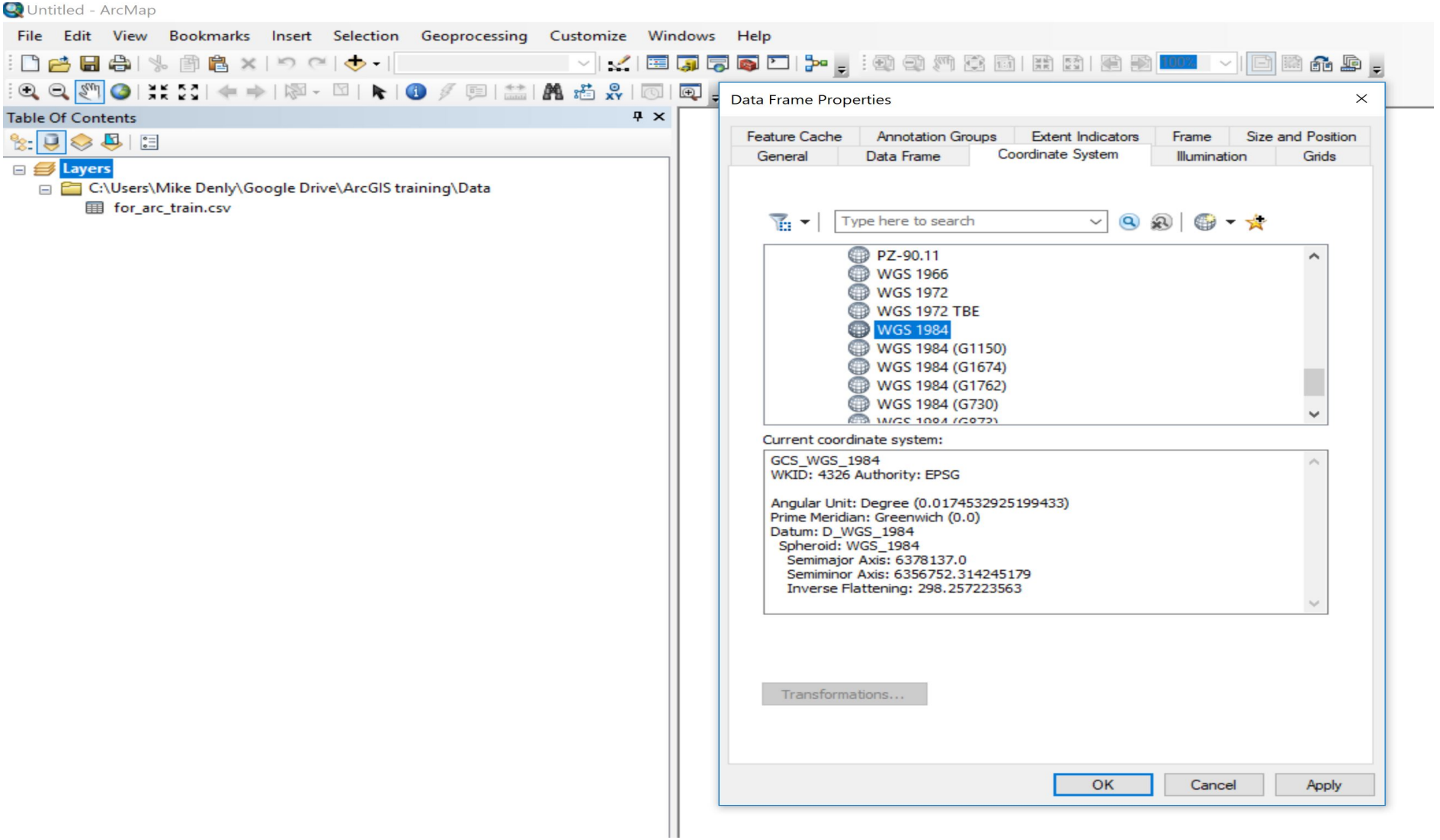
Step 5b: Indicate the Coordinate System

Select "World"



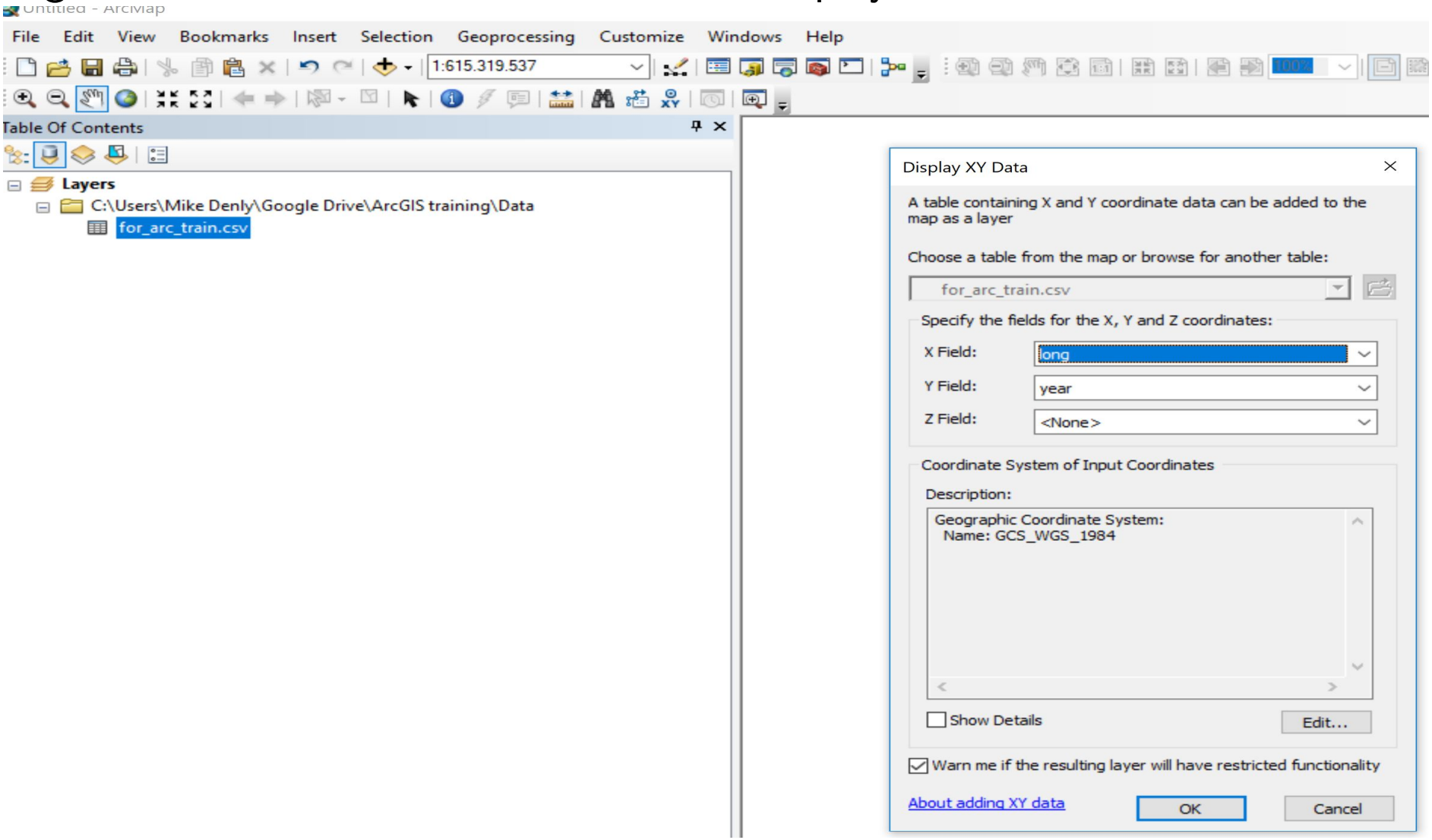
Step 5c: Indicate the Coordinate System

Select "WGS84"



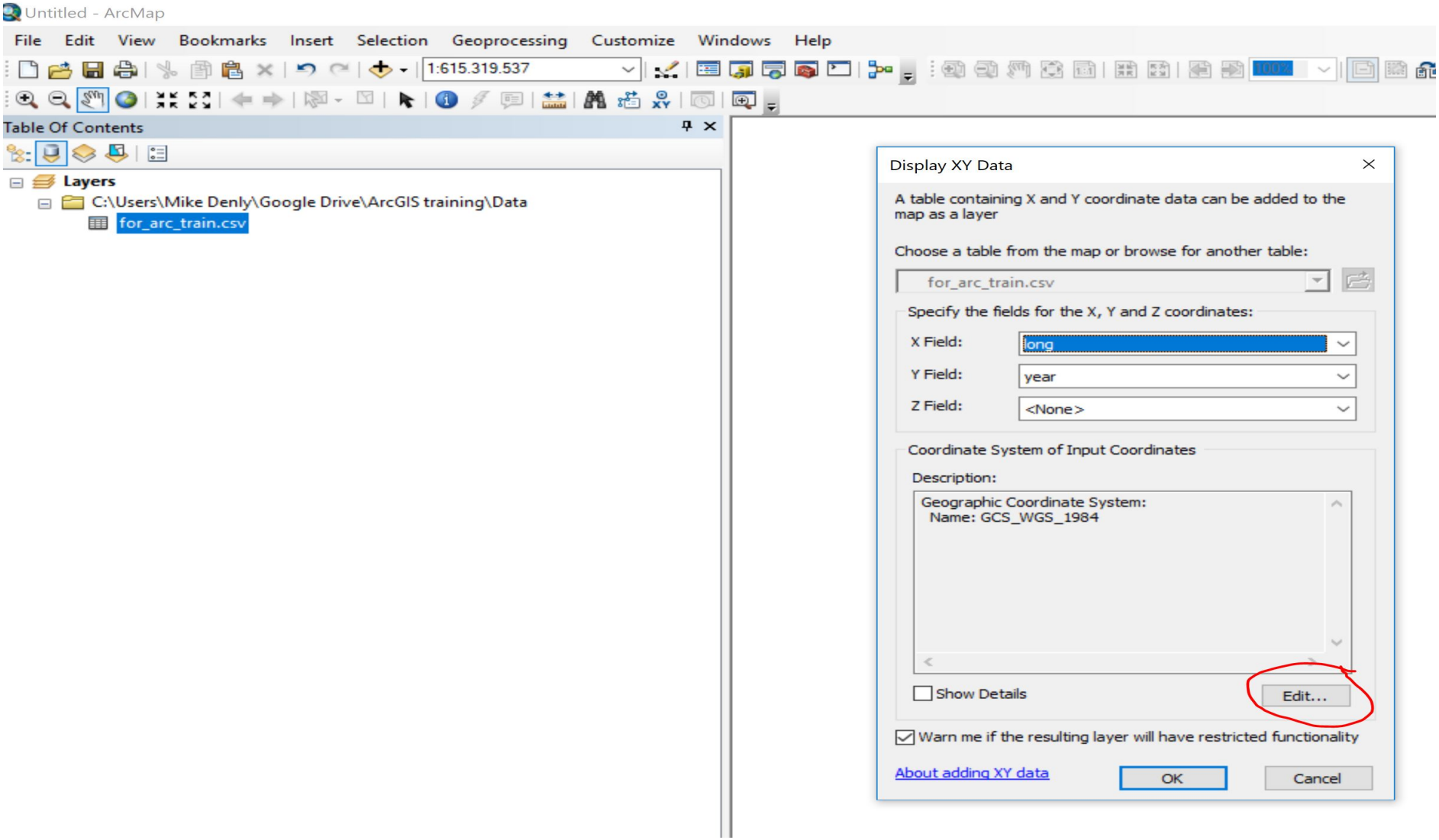
Step 6a: Indicate the Coordinate System for your Data

Right-click on "for_arc_train.csv" and "Display XY data"



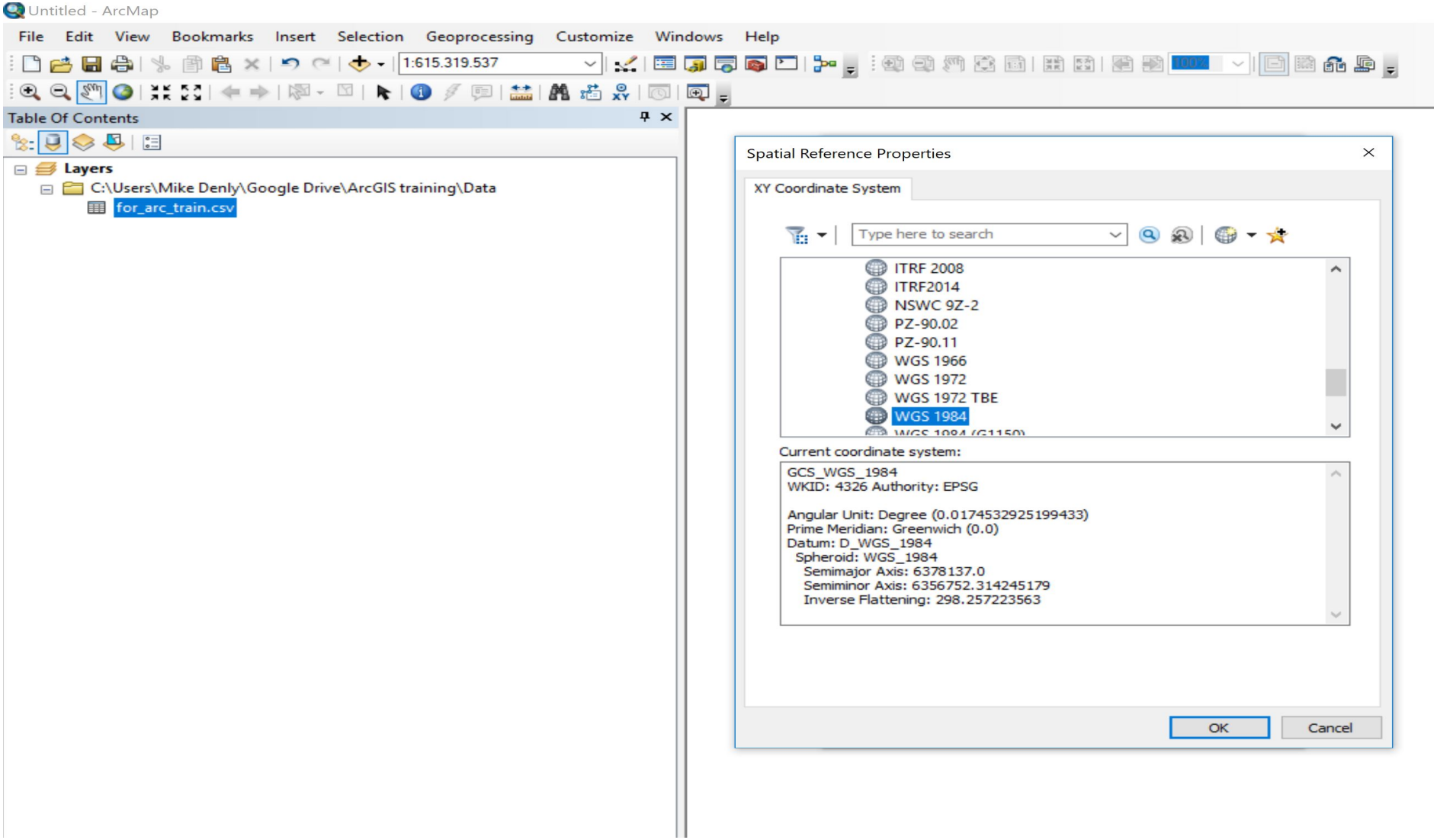
Step 6b: Indicate the Coordinate System for your Data

Click "Edit"



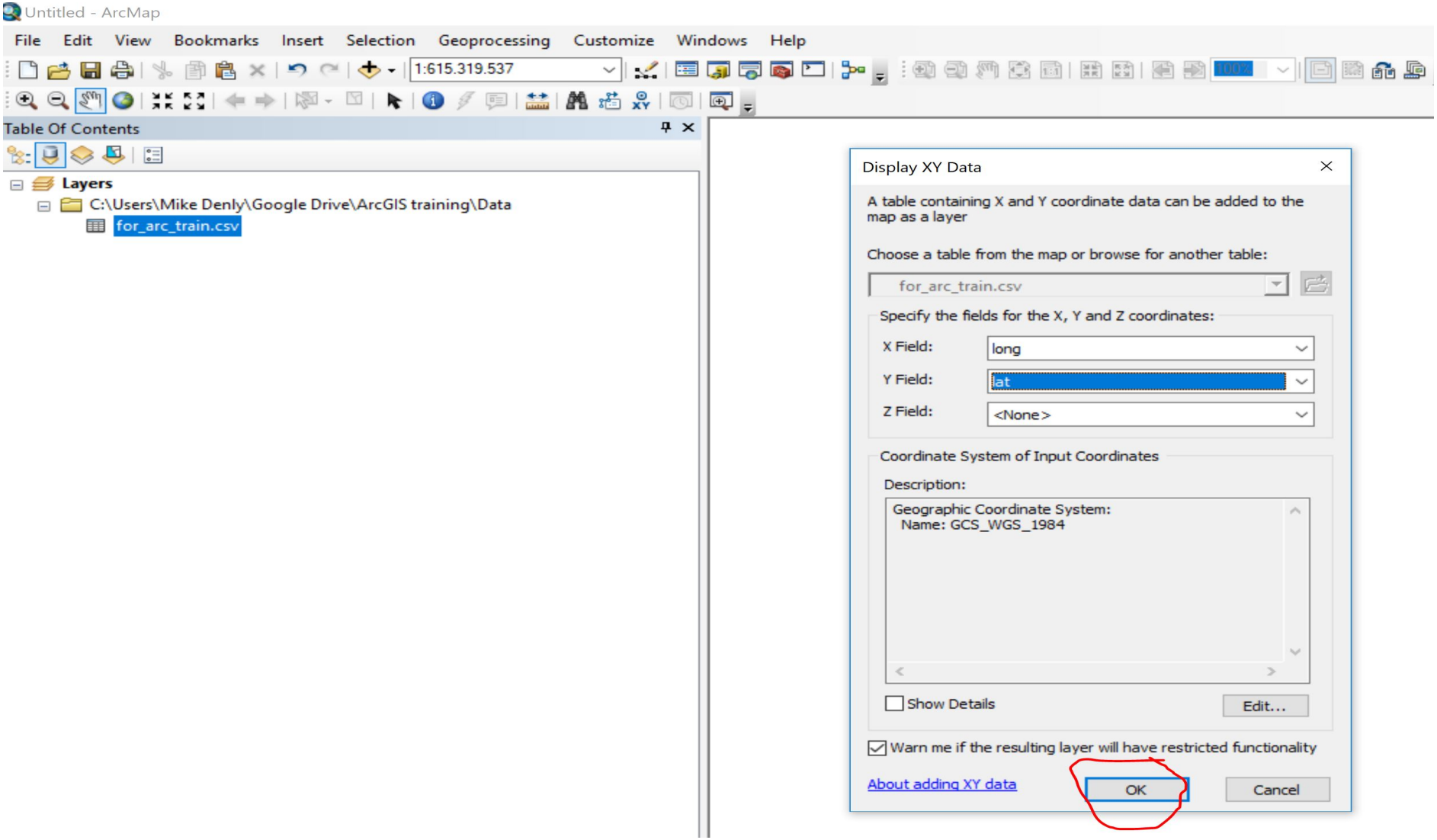
Step 6c: Indicate the Coordinate System for your Data

Click "Edit"



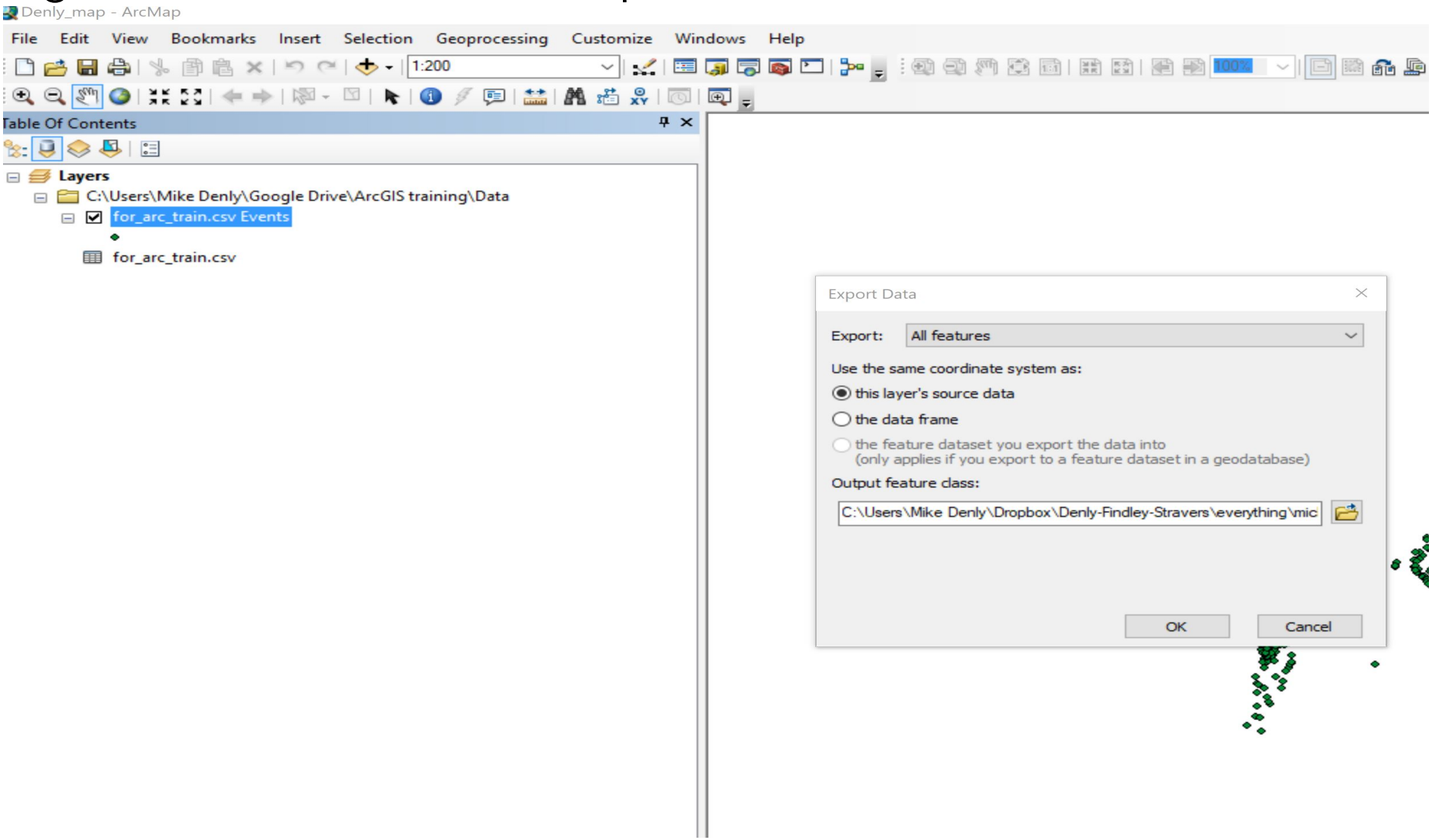
Step 7: Indicate your Latitude and Longitude

Click "OK"



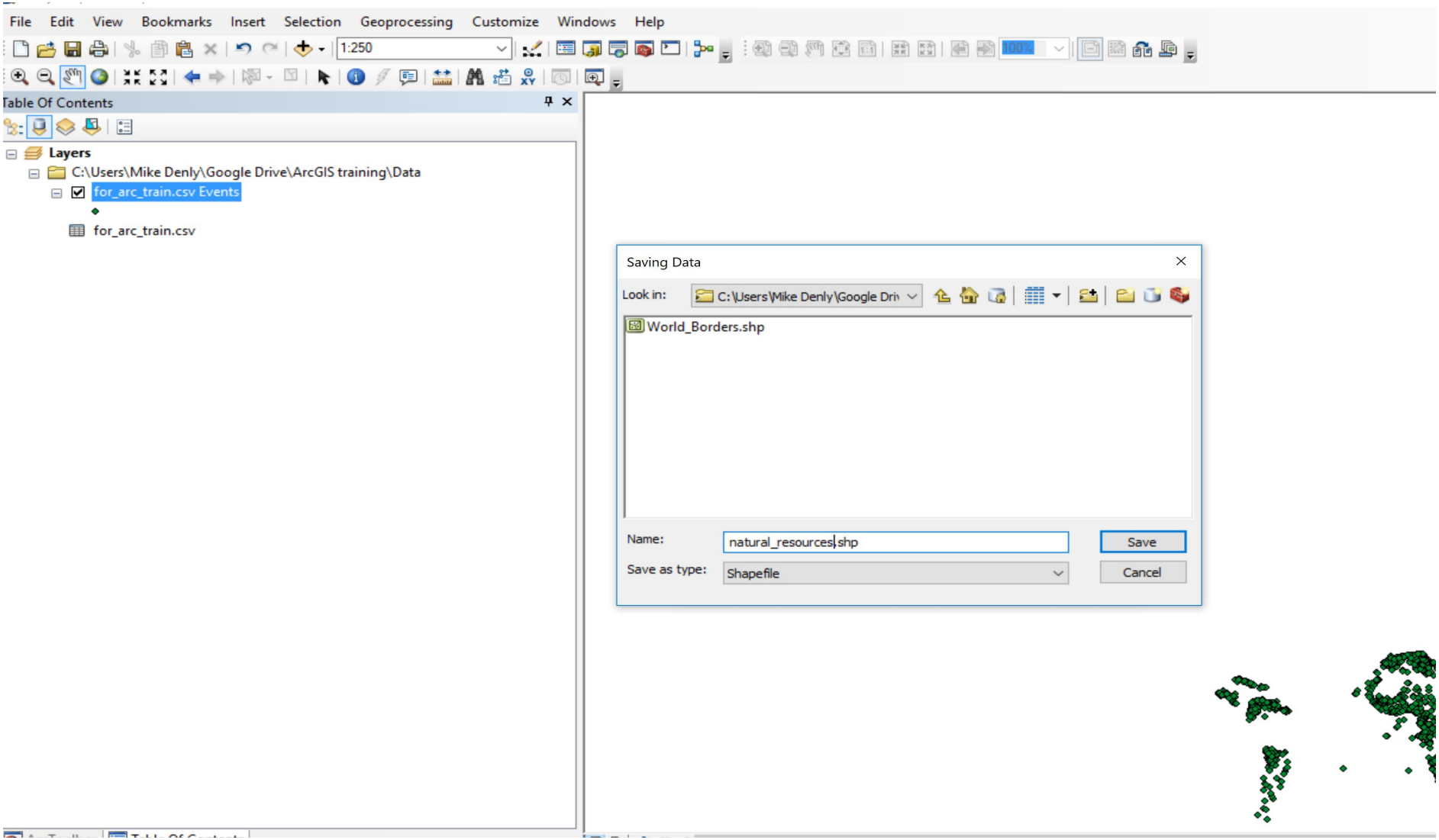
Step 8a: Save Events Data as a Shapefile

Right-click on events - data - export data



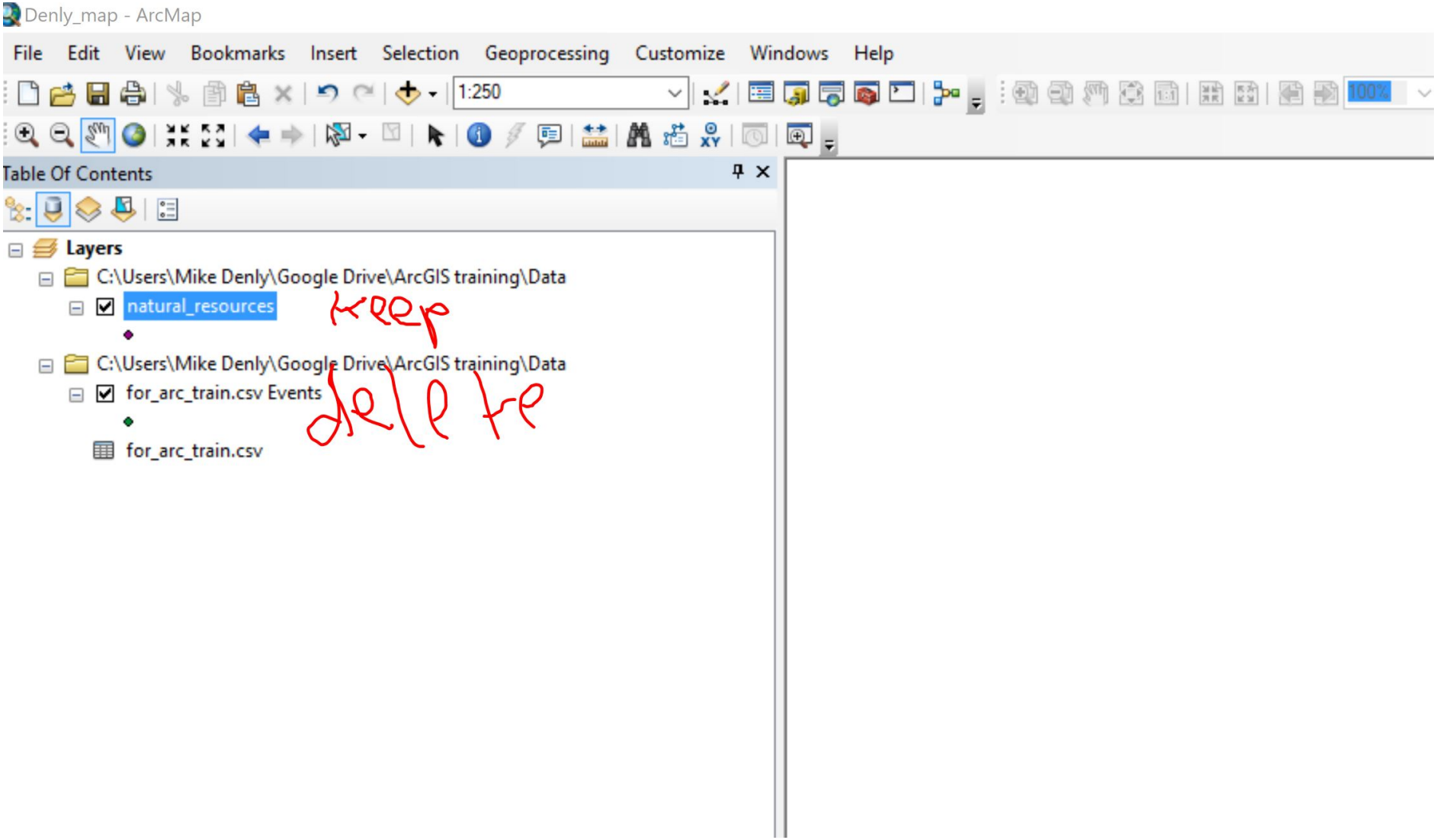
Step 8b: Save Events Data as a Shapefile

Go to connected folder and save it as a shapefile natural_resources

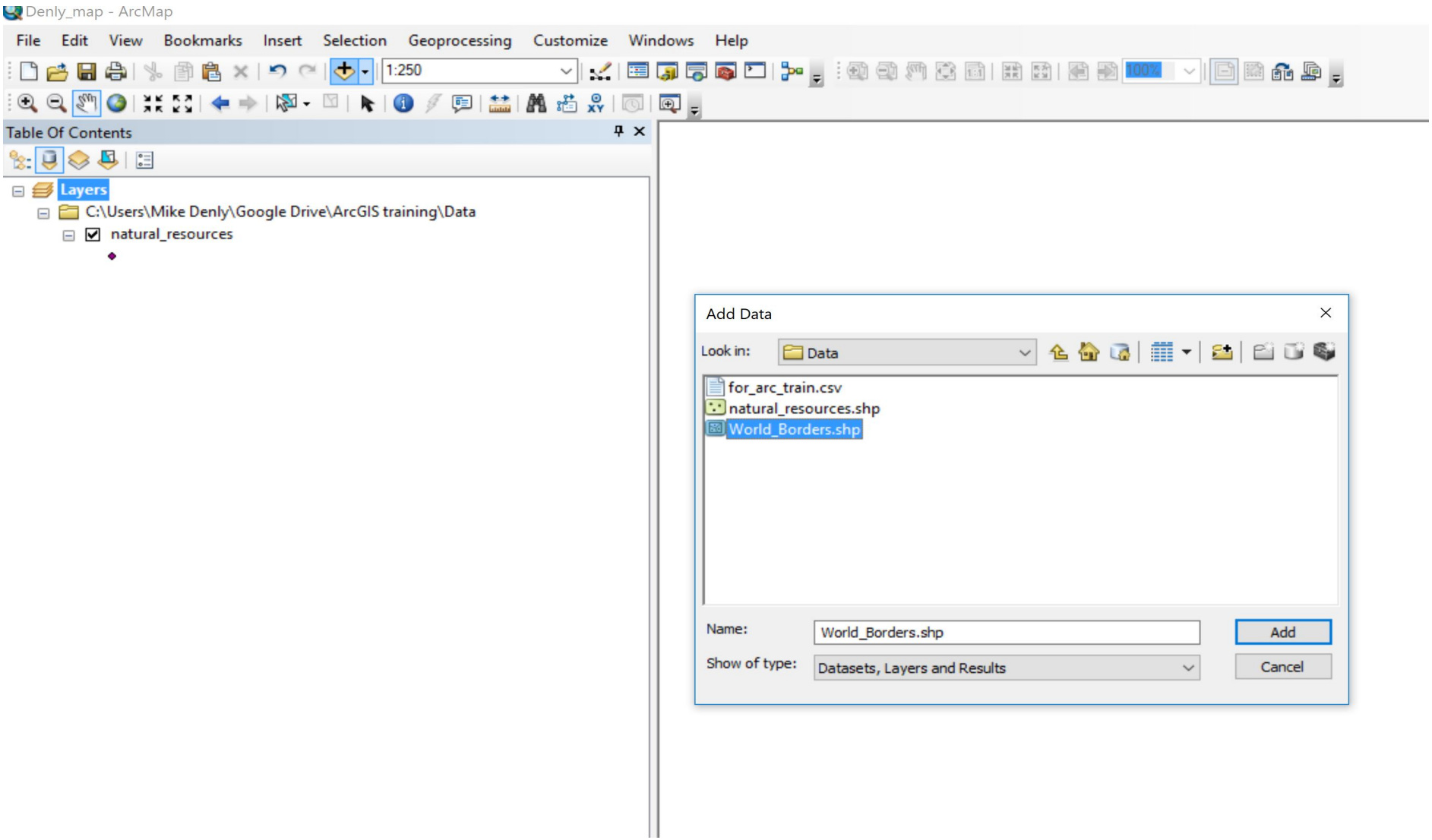


Step 8c: Save Events Data as a Shapefile

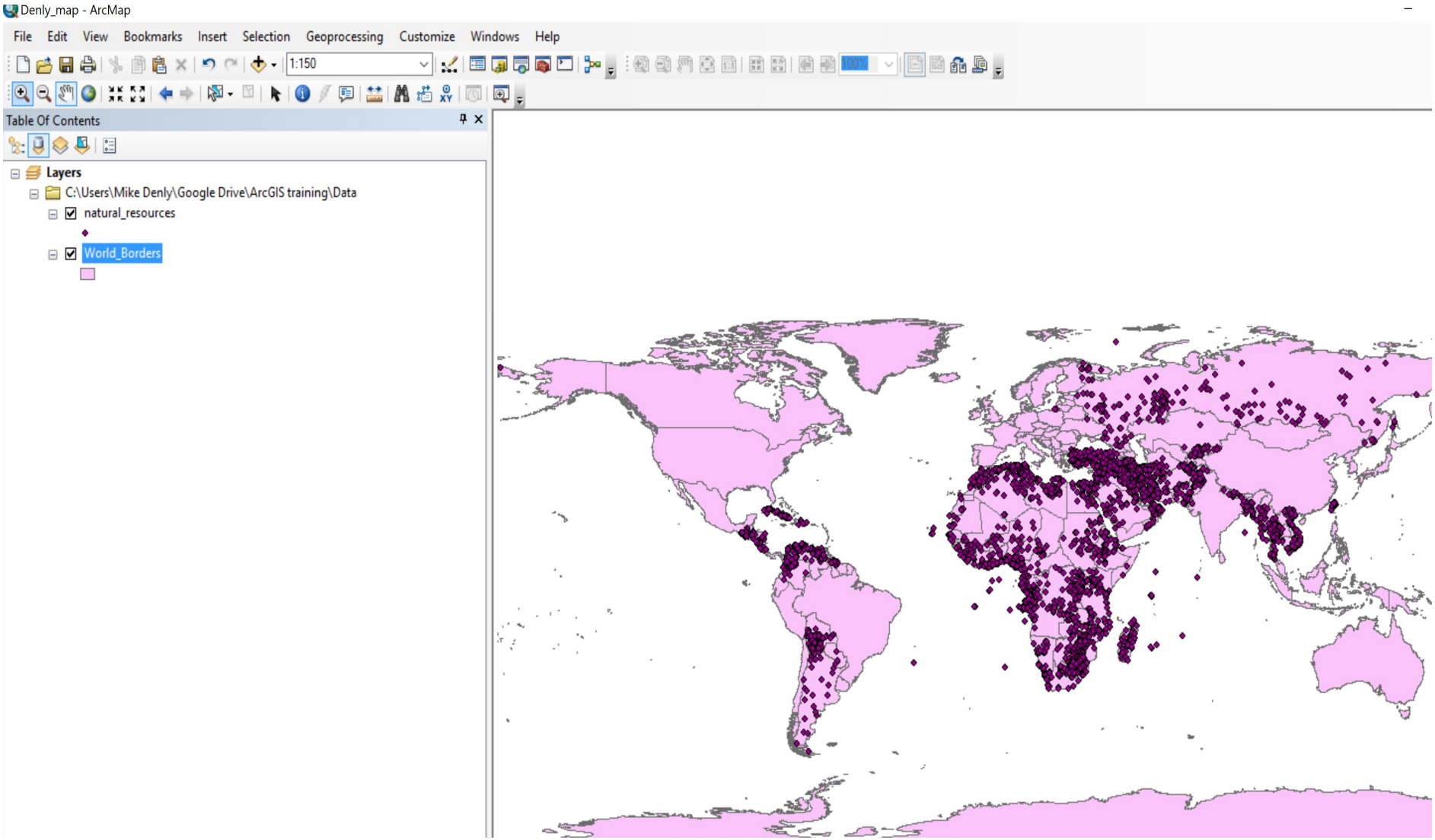
Delete the events and csv entries



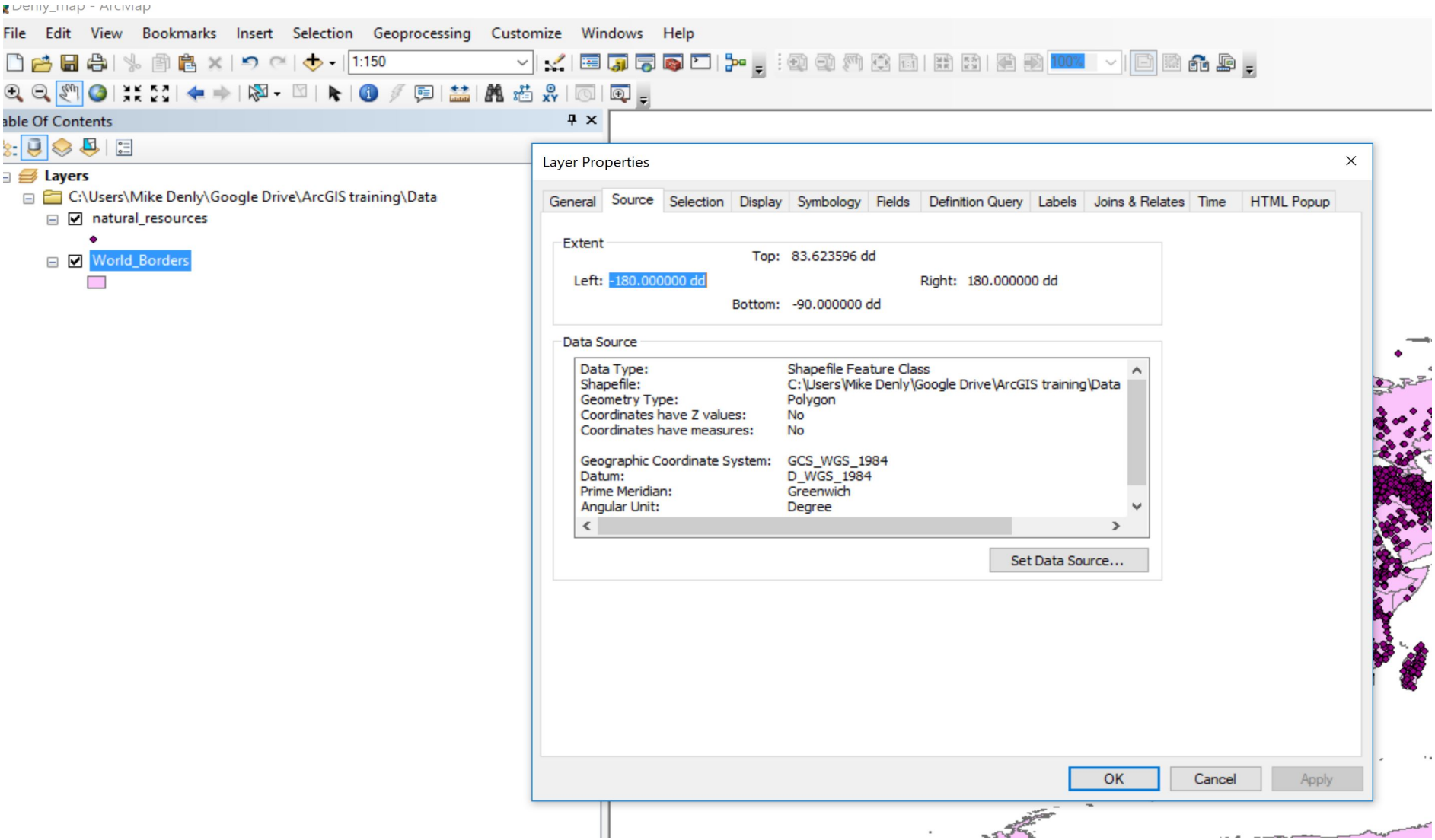
Step 9a: Add Your World Borders Shapefile as a Layer



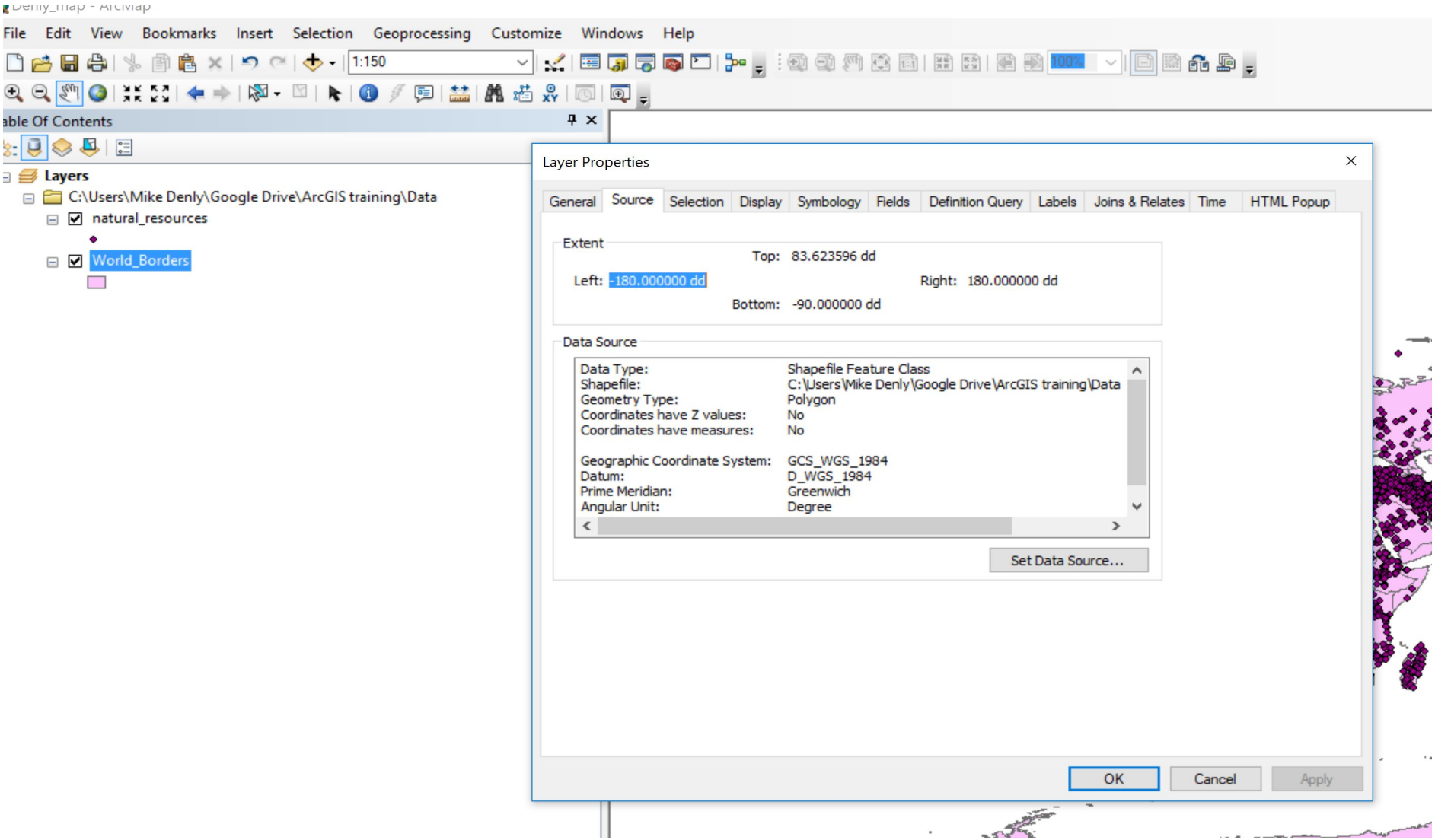
Step 9b: Add Your World Borders Shapefile as a Layer



Step 10: Check Projection on World Borders

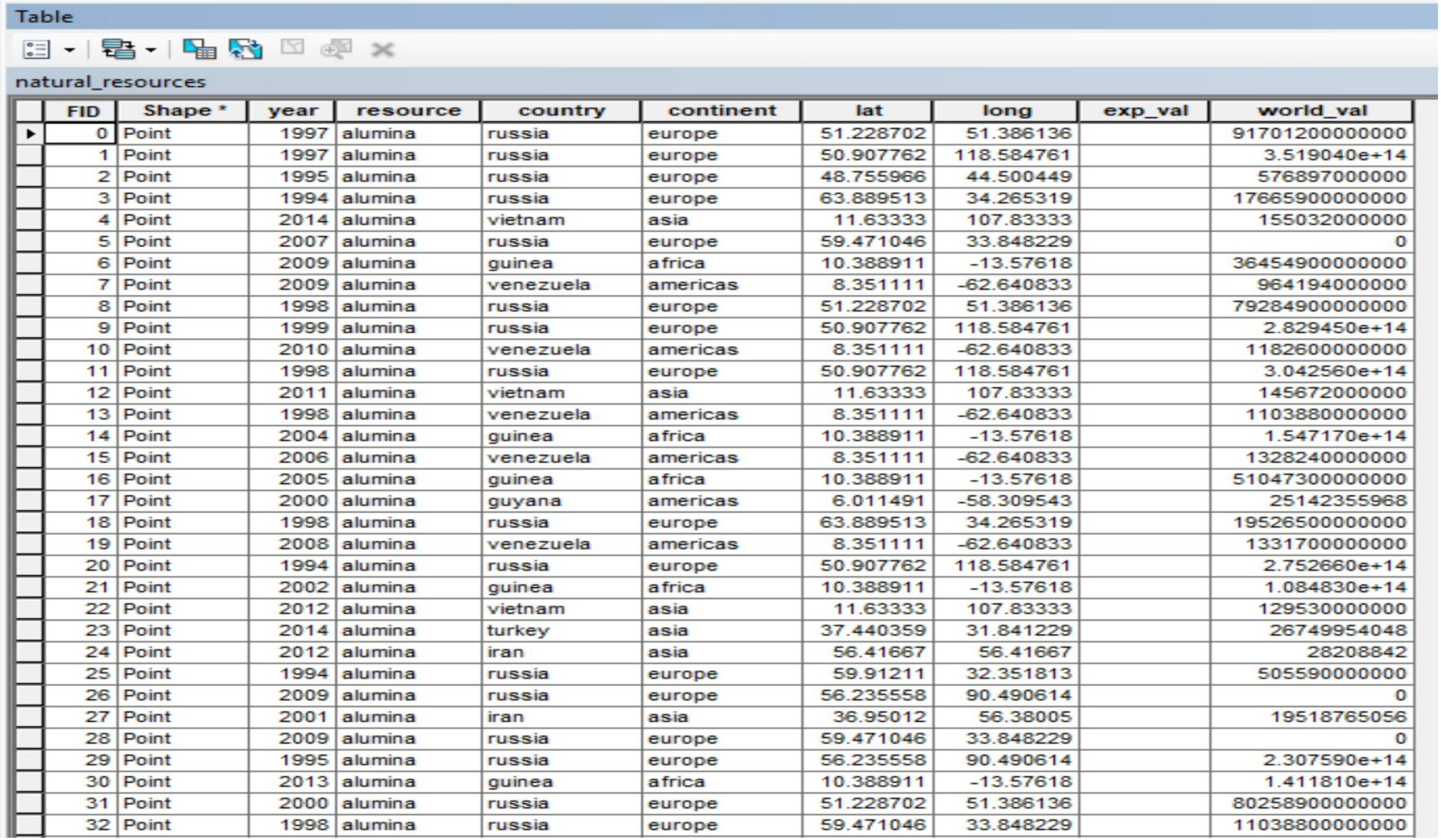


Step 11: Check Projection on World Borders



Step 12: Attribute Table

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



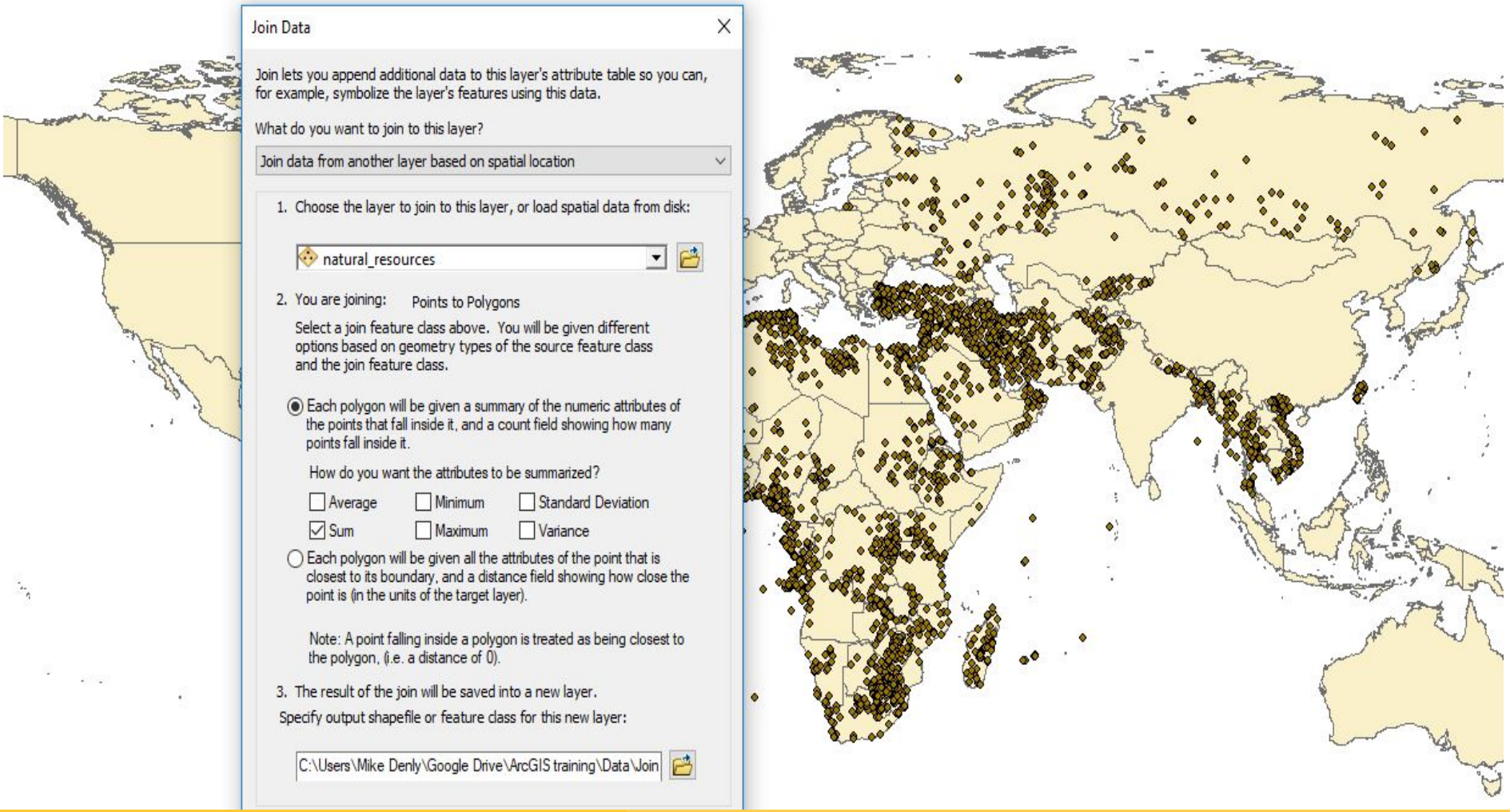
Table

natural_resources

FID	Shape *	year	resource	country	continent	lat	long	exp_val	world_val
0	Point	1997	alumina	russia	europe	51.228702	51.386136		91701200000000
1	Point	1997	alumina	russia	europe	50.907762	118.584761		3.519040e+14
2	Point	1995	alumina	russia	europe	48.755966	44.500449		576897000000
3	Point	1994	alumina	russia	europe	63.889513	34.265319		17665900000000
4	Point	2014	alumina	vietnam	asia	11.63333	107.83333		155032000000
5	Point	2007	alumina	russia	europe	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	russia	europe	51.228702	51.386136		79284900000000
9	Point	1999	alumina	russia	europe	50.907762	118.584761		2.829450e+14
10	Point	2010	alumina	venezuela	americas	8.351111	-62.640833		1182600000000
11	Point	1998	alumina	russia	europe	50.907762	118.584761		3.042560e+14
12	Point	2011	alumina	vietnam	asia	11.63333	107.83333		145672000000
13	Point	1998	alumina	venezuela	americas	8.351111	-62.640833		1103880000000
14	Point	2004	alumina	guinea	africa	10.388911	-13.57618		1.547170e+14
15	Point	2006	alumina	venezuela	americas	8.351111	-62.640833		1328240000000
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	russia	europe	63.889513	34.265319		19526500000000
19	Point	2008	alumina	venezuela	americas	8.351111	-62.640833		1331700000000
20	Point	1994	alumina	russia	europe	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	11.63333	107.83333		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	russia	europe	59.91211	32.351813		505590000000
26	Point	2009	alumina	russia	europe	56.235558	90.490614		0
27	Point	2001	alumina	iran	asia	36.95012	56.38005		19518765056
28	Point	2009	alumina	russia	europe	59.471046	33.848229		0
29	Point	1995	alumina	russia	europe	56.235558	90.490614		2.307590e+14
30	Point	2013	alumina	guinea	africa	10.388911	-13.57618		1.411810e+14
31	Point	2000	alumina	russia	europe	51.228702	51.386136		80258900000000
32	Point	1998	alumina	russia	europe	59.471046	33.848229		11038800000000

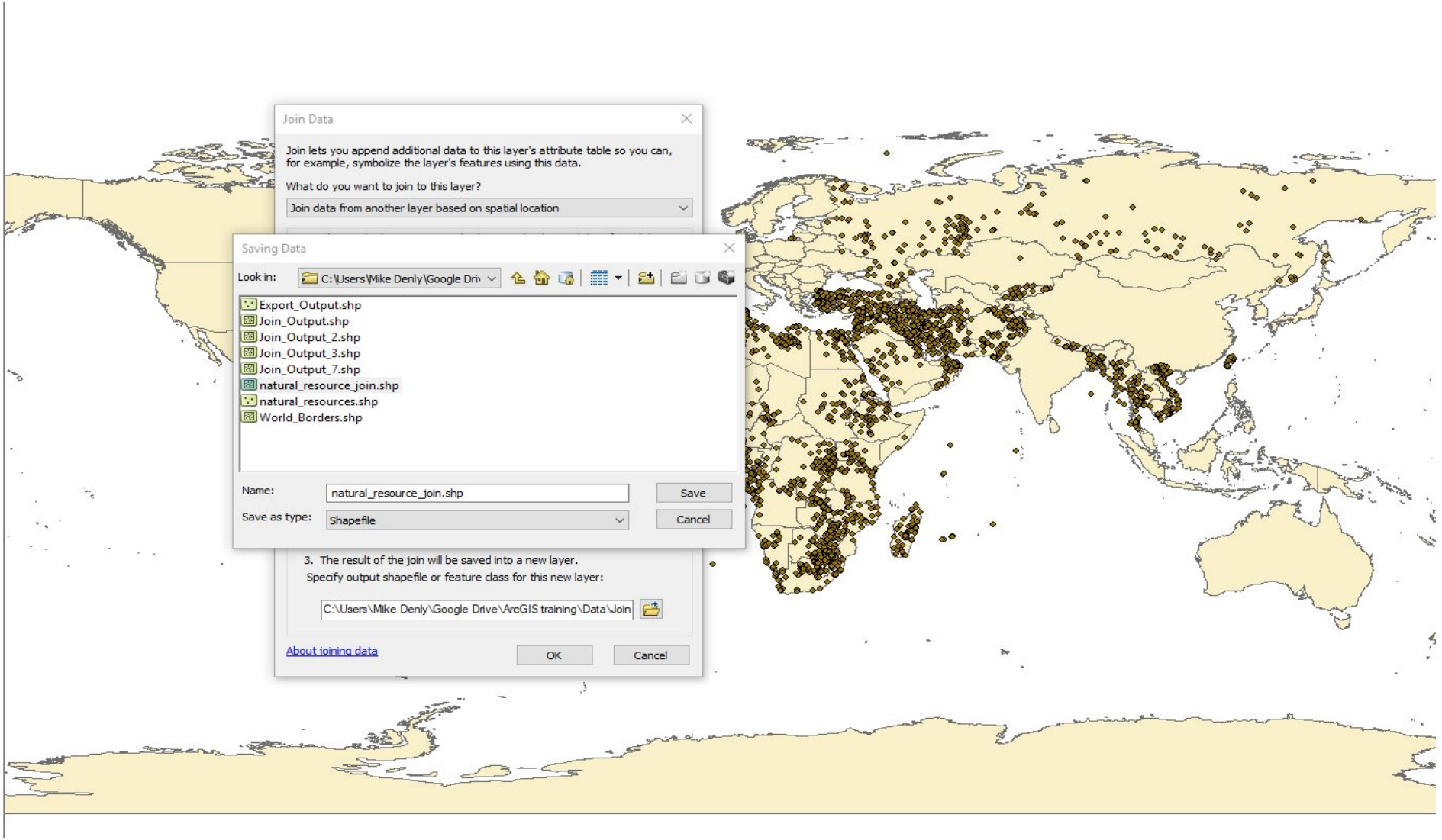
Step 13a: Join Your Layers

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



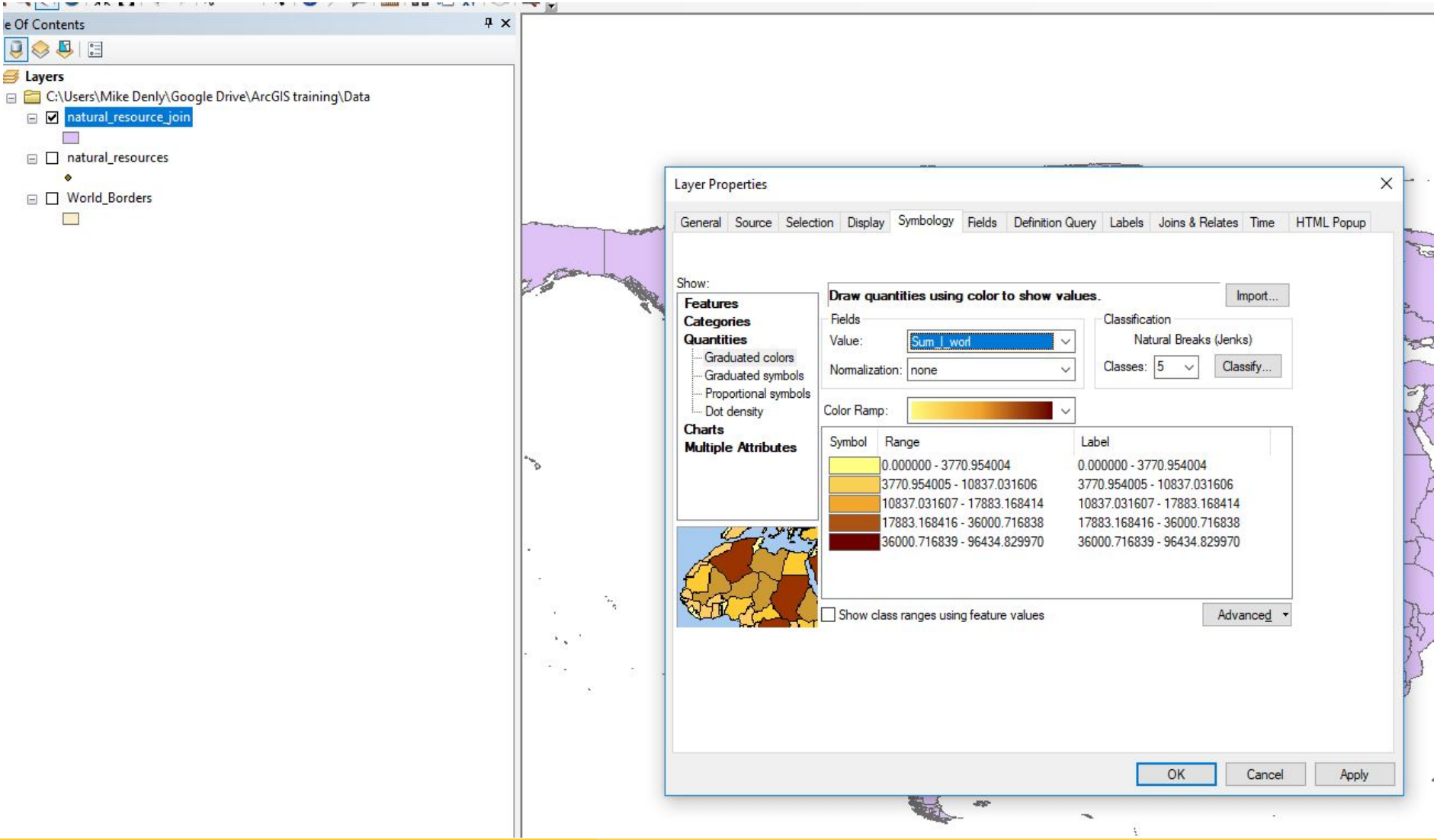
Step 13b: Join Your Layers

Name your layer “natural_resource_join”

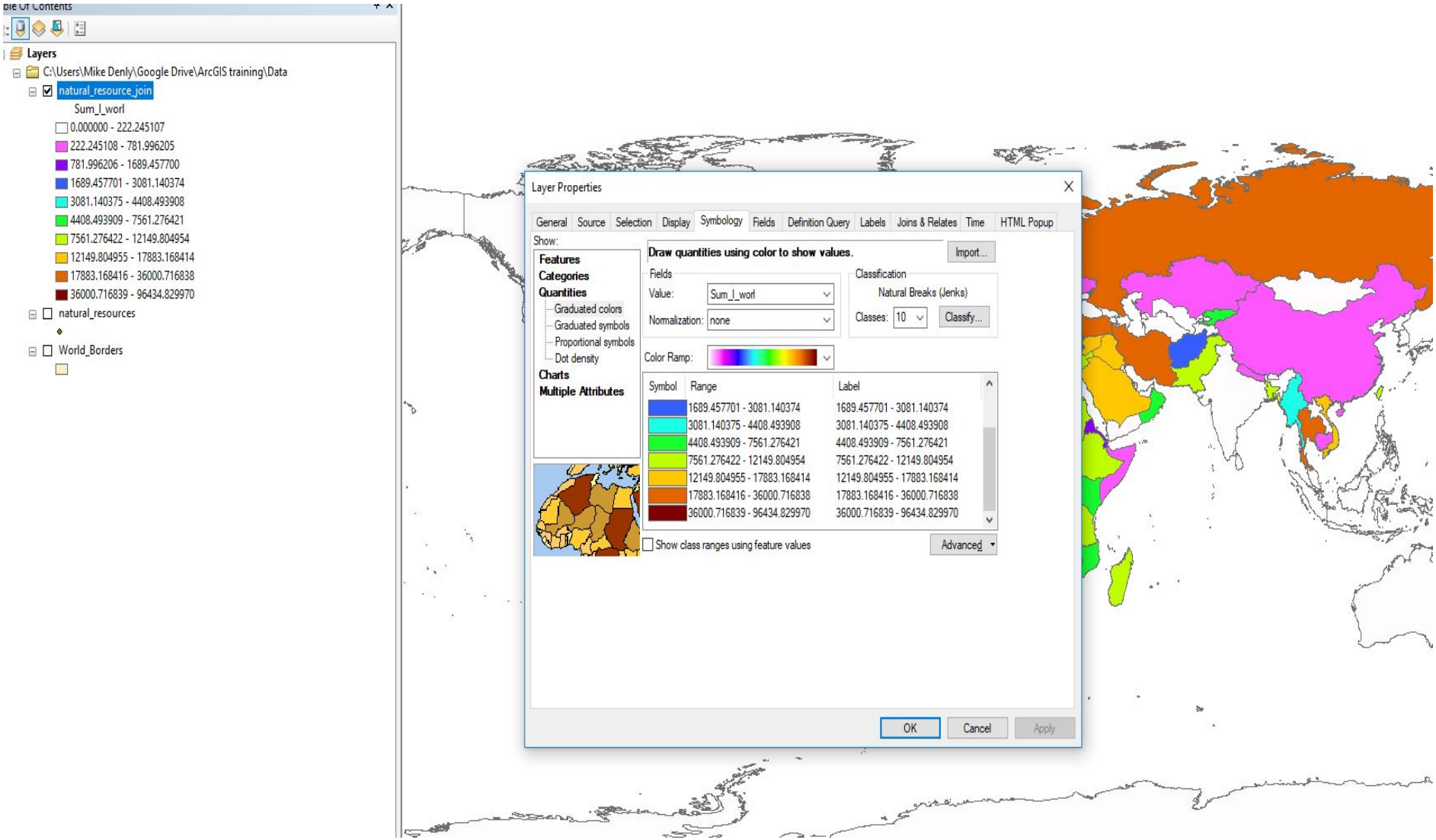


Step 14a: Add Symbology

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



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



15a: Label Your Map According to Conventions

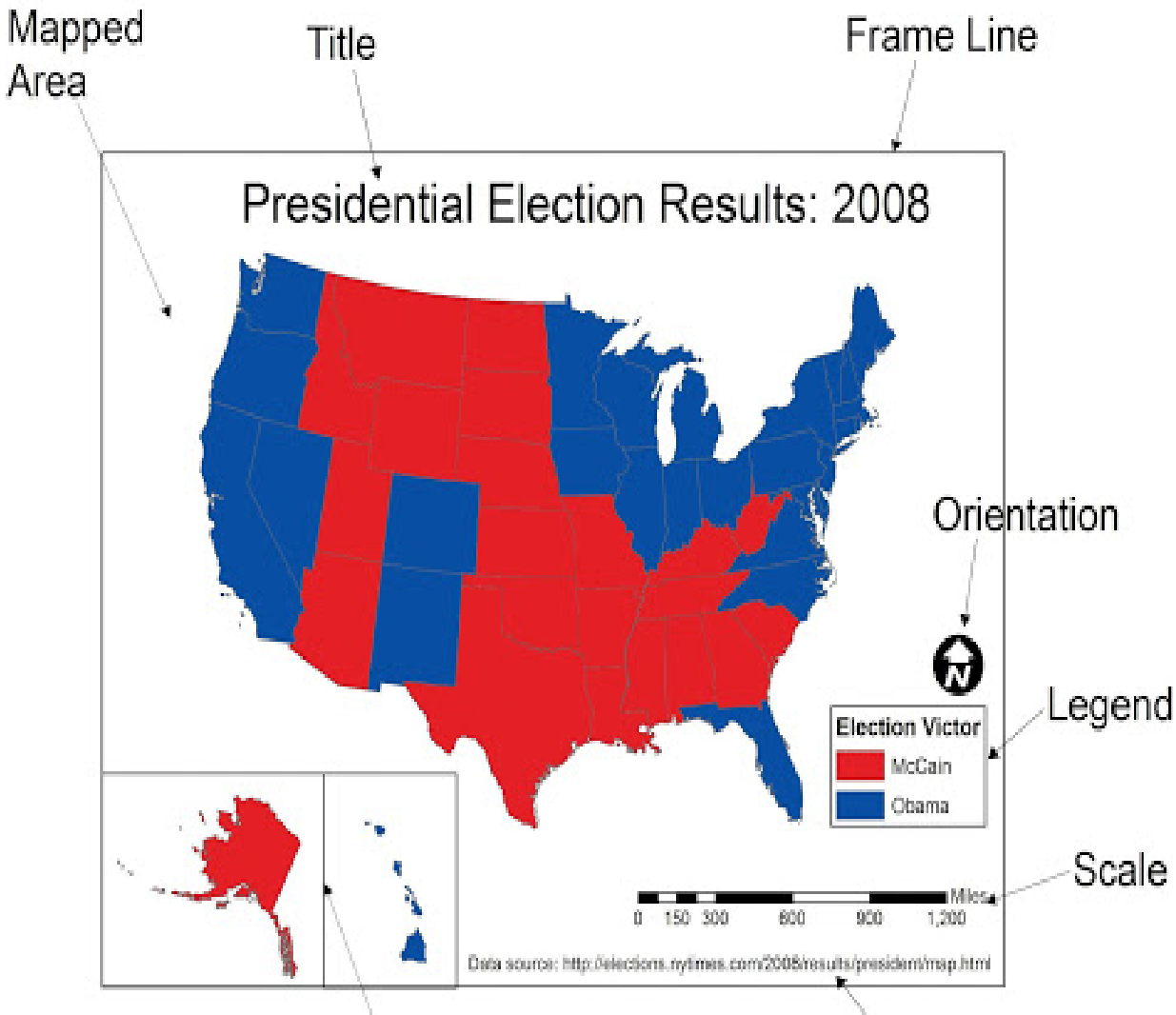
Remember?

Required

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

Optional

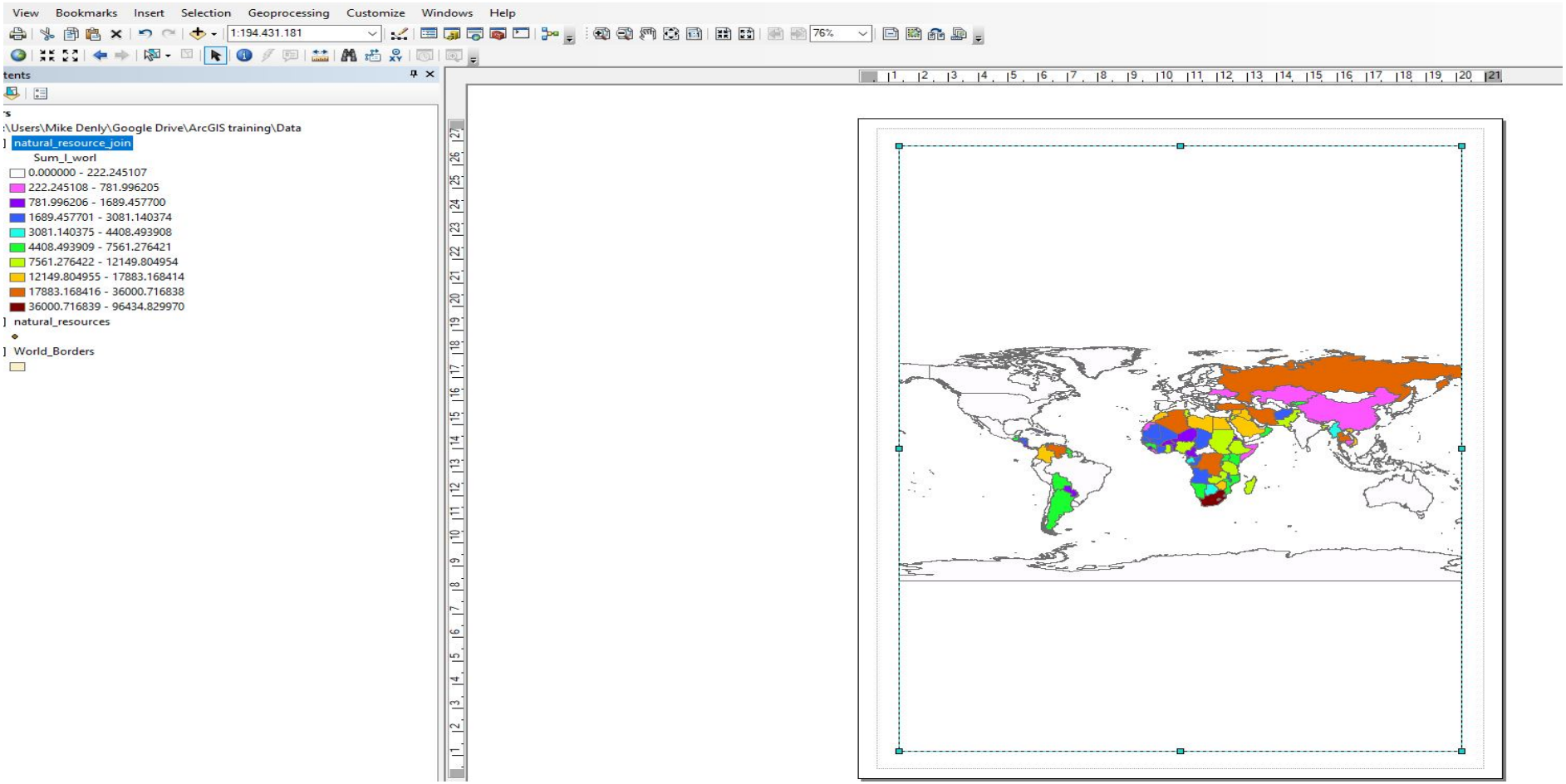
- Frame line
- Neat line



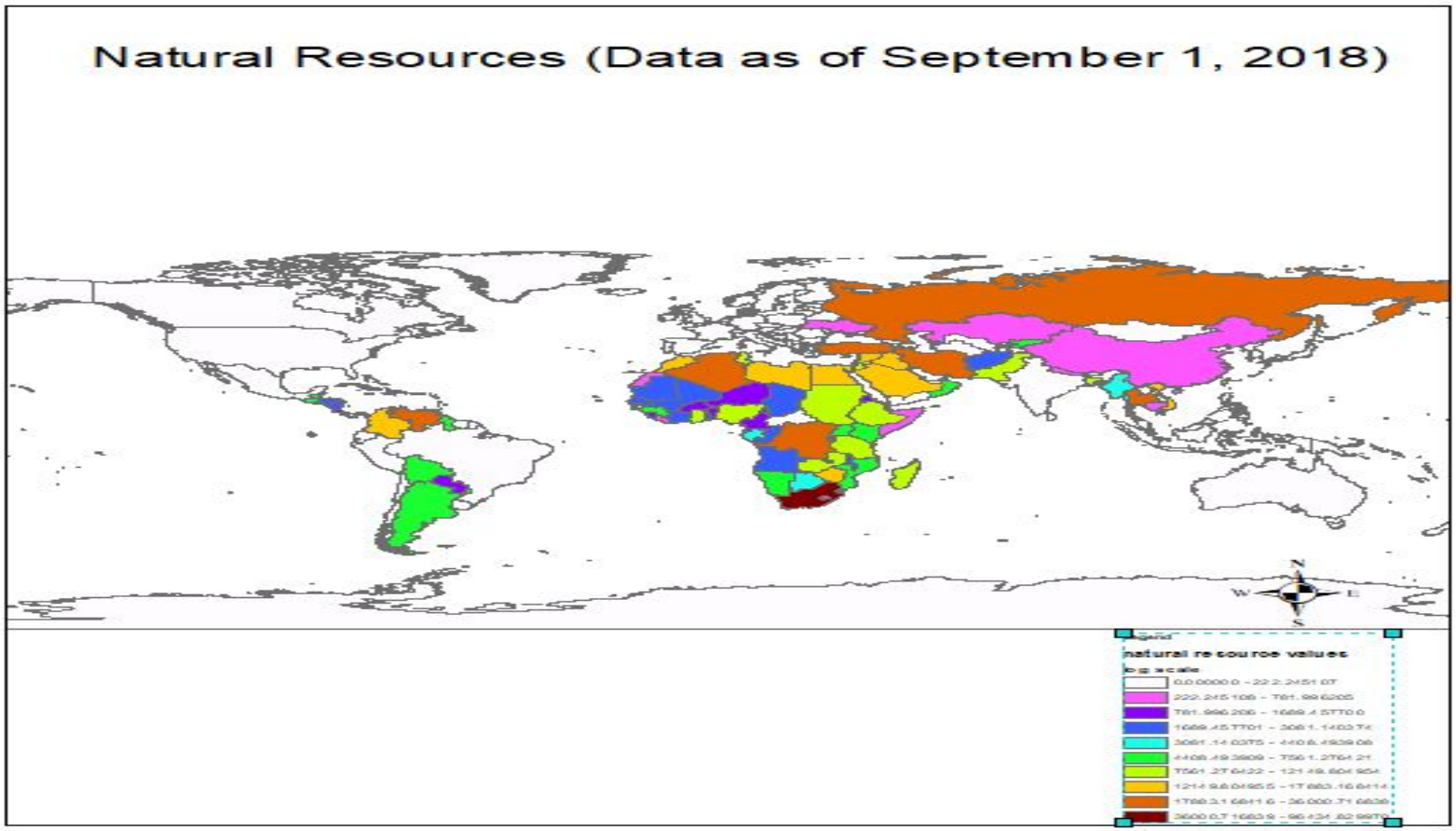
Step 15b: Label Your Map According to Convention

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_ atttribute