GEOG 482/582 | GIScience II | FALL 2015

ASSIGNMENT 1: GIS REVIEW

Objective: In this lab you will review the concepts of data projections and classification and practice some basic GIS tasks in ArcMap. As you complete the tasks, you will gain a greater appreciation for the following:

- The difference between geographic and projected coordinate systems
- The different characteristics which are preserved or distorted by different projections
- The theoretical/computational basis of different data classification schemes

Learning Outcome: At the end of this lab you should be comfortable performing the following tasks:

- Downloading and extracting data from the internet
- Bringing data into ArcMap
- Changing the display projection of the data frame
- Reprojecting data
- Creating thematic maps
- Classifying data
- Exporting maps as images
- Uploading maps to Wordpress

Deliverables:

- 4 maps of the contiguous United States in different projections
- 3 thematic maps of the contiguous United States with different classification schemes
- Answers to lab questions

In this course you will be submitting all your assignments through your personal website that you will create using the University of Oregon's WordPress license. This week you will learn how to create this website that will host a different page for each of the course's assignments and exercises.

INSTRUCTIONS

PART 1: ACQUIRING DATA

To start this lab you want to collect GIS data that displays the state boundaries of the US. The US Census collects a wide range of data and is a good source both for spatially explicit demographic data and also has boundary shapefiles available for download.

- Go to the US Census website at https://www.census.gov/geo/maps-data/data/cbf/cbf_state.html and download the 1:500,000 state shapefile: cb_2014_us_state_500k.zip
- Create a Lab_1 folder in your personal folder on the server. Within this folder, create a Data folder and extract the files you downloaded here
- Bring your data into ArcMap. Open ArcMap and add your data. View the Source Tab in the Properties menu of the dataset.

Q1: ***What information does the Source tab provide?***

Q2: ***In what coordinate system is this layer?***

- For this lab, you only want to display the lower 48 states. Use the Select by Rectangle tool in the toolbar to draw a rectangle over the lower 48 states.
- Those states should now be highlighted in blue. Right click on the states layer in the table of contents, go to Data and then Export Data.
- Make sure that "Selected Features" is chosen from the Export dropdown menu. Save the new states layer as CONUS.shp in your Lab_1/Data folder.
- Add your new CONUS layer to the map. Right click the old layer and Remove it.

PART 2: PROJECTIONS AND COORDINATE SYSTEMS

Use the US States layer to explore the way different projections result in different distortions.

- Create three additional data frames (Insert → Data Frame). Title your four data frames: Albers Equal Area Conic, Mercator, Plate Carree, and Robinson.
- To move between data frames, right click the data frame name and click "Activate".
- Add the continental US States layer to each data frame.
- To change the projection of your data frame, right click on the data frame title and go to Properties.
- In the Coordinate System tab, set the projected coordinate system for each data frame as whichever projection you named that data frame. The Mercator, Robinson and Plate Carree projections can be found in Projected Coordinate Systems → World, while the

Note: When you change the projection of the data frame, ArcMap reprojects the feature layers in your data frame "on the fly." This means that the display projection of the layers is changed, but the projection of the data itself remains the same. You can change the projection of the data layer itself in ArcToolbox using Data Management Tools → Projections and Transformations → Feature

Albers Equal Area Conic can be found in Projected Coordinate Systems → Continental → North America. For the Albers projection use the **USA Contiguous Albers Equal Area Conic.**

Q3: ***Compare the different projections. How does the shape of the continental US change with each projection?***

- From the Class Data/Lab_1 folder, add the MajorCities layer to each data frame.
- Toggle between data frames.

Q4: ***How does the position of the cities in relation to each other appear to change between projections?***

Q5: ***What properties does each projection distort?***

Q6: ***Use the measure tool to measure the planar distance between cities. How does this distance change between projections?***

PART 3: DISPLAYING MAPS

Create a layout of four maps that you will upload to your Wordpress site.

- Switch to layout view. Change the orientation of your page layout to landscape and resize your four data frames so that they all fit on the page.
- Make sure to give each map a title including the projection used.
- Set the map scale for each data frame to 1:60,000,000.
- Go to File → Export Map and export your map as a JPEG, making sure the resolution is set to at least 300 dpi.

Map Elements Checklist

- Title
- Data citations
- Scale bar or text
- North arrow
- Legend
- Cartographer
- Projection

Uploading your image to Wordpress

- Go to http://blogs.uoregon.edu/ and log in using your Duck ID.
- From the My Sites tab navigate to the dashboard of your GIS 482 blog.
- Create a new page called Lab 1.
- Using the Add Media button, upload your projection maps.

PART 4: THEMATIC MAPPING AND DATA CLASSIFICATION

Use the Albers Equal Area projected map to create a thematic map about a topic of interest to you.

- Activate the Albers Equal Area data frame.

Whenever you add data to a map project, it is useful to open up the attribute table to get a sense of what the information the data contains.

Q7: *What variables does this dataset contain?*

As you can see, there's not a lot of interesting information associated with your states layer. To make a more interesting map, one which you could use to make a geographic argument about some phenomena, you're going to need to add some additional data.

- Collect data that contains a variable you want to map. The data you find must be:
    - At the state level (and available for most/all of the CONUS)
    - Quantitative
    - From a reputable source

Once you have your data, you will join this to your CONUS dataset. The key to performing a table join is to make sure the two tables you are joining have a common field (in this case, probably the names of the states) that is in the same data format (in this case text or string).

- If you found data already in a table, open it up and make sure that it has a common attribute to join to your states layer, and that the data type of this attribute is formatted the same
- If the table you found is an .xls file, save it in your Lab_1/Data folder as a .csv file.
- If you found data not in tabular format, create a .csv file with a column containing state names and enter your data in. Save this in your Lab_1/Data folder as a .csv file.
- Return to your ArcMap document and add your table to the map.
- Right click on your states layer in the table of contents and go to Join and Relates → Join.

- Set up your join to “Join attributes from a table” using the common fields from the states layer and your table.
- Once you have performed the join, open up the attribute table for your states layer and make sure that you see the data from your table appended there.

> **Note:** Joining data does not alter the layer to which data is being joined, it simply establishes a relationship between different data tables. To make a join a permanent part of a layer, export the data as a new layer by right clicking on the layer and selecting Data → Export Data.

Once your data has been joined you can start visualizing it by changing the symbology of your map.

- In the Properties menu of your states layer go to the Symbology tab.
- In the Show side bar select Quantities and Graduated Colors.
- In the Value field, select the attribute you wish to map (You will probably also want to change the default color ramp).
- Click the Classification button to open up the advanced classification settings.

In this menu you can change the number of classes your data is broken into, set class break values, change the method by which your data is classified and view a histogram and other statistics of your data. The way in which you classify your data changes the way your choropleth maps looks and can thus alter the way that a viewer interprets your map. As with map projections, it is extremely important to understand how and why your data is classified the way it is and what are the trade-offs between different classification methods.

- Create and export three choropleth maps of your chosen variable using three different classification schemes (for this you do not need to create a new data frame for each map).
- Make sure to include all relevant map elements.
- Upload your maps to your blog.

Q8: ***What classification methods did you use? How does each classification method bias the interpretation of the data?***

GRADING

You will be graded based on the following criteria:

• 4 maps with different projections	**8 POINTS**
• 3 maps with different classification schemes	**7 POINTS**
• Answers to questions	**10 POINTS**
• Presentation of your work in WordPress	**5 POINTS**
TOTAL	**30 POINTS**

DUE DATE:

Monday Lab: October 5th @10:00 am

Tuesday Lab: October 6th @10:00 am

*Late submissions will be penalized 5% per day.