Exercise 3 –Map Symbology and Cartography in ArcGIS
45 Points

Introduction

The objective of this exercise is to develop your understanding of cartographic symbology and map design within ArcGIS. You will be working with three different datasets.

1. A shapefile point map of locations where snowfall is measured throughout the Great Lakes region (Greatlakesnow). The attribute file contains average winter snowfall for each point.

2. A shapefile line map showing air flow back trajectories for every day in July 2011 for Syracuse NY (Backtrajectories). Each trajectory is associated with the ozone and sulfur dioxide concentration for that day.

3. A raster grid showing the average maximum July temperature for the contiguous United States (JulyMaxT).

These files are included in the Zip archive that you used for the tutorial.

Part 1 – Mapping Great Lake Snowfall

1. Open a new map and add the GreatLakesSnow shapefile. You will see that this is a point shapefile containing 253 sites.

2. You should also add the United States shapefile in order to provide a visual reference for the locations of the 253 sites. You may want to add a Canadian map for reference.

3. The attribute table contains a variable called *AveSnow*. This is the average total Oct-Apr snowfall (cm) for each site during 1951-2004.

*Create, print, and submit a color map that communicates the spatial distribution of snowfall across the Great Lakes region. You need to think about the best way to symbolize these point data. Make sure the map is well-designed and contains the appropriate map elements. Consider an appropriate projection. On a separate sheet, please comment of the pattern of snowfall shown in your map in 150 words or less. For example, is snowfall roughly the same everywhere and is there a spatial pattern to its distribution**?** (10 pts for map, 5 for write-up)*

Data Sources: National Climate Data Center and Environment Canada

Helpful Information: How to Add Symbols (including the °) to a map. Go to Windows Start Menu |Accessories|System Tools|Character Map, then copy and paste.

Part 2 – Air flow and pollution

1. Open a new blank map window and add the Backtrajectories shapefile. You will see a bunch of squiggly lines all joined to one point. Add the States and Canada map for reference and you will see that the lines all join in Syracuse, NY.

2. Each of these lines shows the air flow into Syracuse (over the previous 48 hours) for each day during July 2011. In other words, each line tells you the geographic history of the air for each day – where the air came from. We call such lines "back trajectories" and we calculate them using numerical models.

3. When you open the attribute table, you will see that each trajectory has data for the ozone (O3ppm) and sulfur dioxide concentration (SO2ppb) as measure in Syracuse for that day. Note that ozone is measured in parts per million and sulfur dioxide in parts per billion.

Your job is to select one of these pollutants and symbolize the trajectories such that we can see if certain trajectories are "cleaner" or "dirtier" than others. Please create, print, and submit your map. Comment on any spatial patterns you see and how you might explain them in 150 words or less. (10 pts for map, 5 for write-up)

Helpful Information: You can emphasize symbols in many ways. One interesting way is to copy the layer in the Table OC, paste it beneath the original symbol, and symbolize the copy in a larger font/size and in a contrasting color.

Data Sources: HySPLIT Trajectory Model and the US Environmental Protection Agency.

Part 3 – US July Maximum Temperature

Open a new blank map and add the julymaxt data. This raster map contains maximum July temperature values in hundredth of degrees Celsius. In other words a value of 4651 equals 46.51℃. You might ask the question of why the data are encoded this way.

Your task is to create, print, and submit a map that conveys July maximum temperatures. Please comment on the general temperature pattern. Besides the "warmer in the south and colder in the north" observation, do you see any other patterns? (10 pts for map, 5 for write-up)

Data Source: PRISM Climate Project. (These data are recorded for grid cells that cover the entire USA. The size of each grid cell is 0.0083 deg of latitude by 0.0083 deg of latitude. Because the size of a degree of longitude changes as you move poleward, each grid cell has a different area. In the case of latitude, the distance of a degree does not change and 0.0083 degrees is approximately 0.57 miles.)