Week 11: Projecting Protected Areas

Imagine that you are an intern working for the International Union for the Conservation of Nature (IUCN) and you've been asked to prepare maps of globally significant wetlands vulnerable to climate change in preparation for the UNFCCC Conference of Parties in Paris this (past) December. Your immediate task is to plan out which map projections you'll use for each of the following protected wetland areas. You've been provided with ConsvAreas.gdb, containing a subset of the IUCN's global database of protected areas, Protected Planet (http://www.protectedplanet.net/), downloaded in February 2014. The geodatabase contains a feature class of areas protected under the Ramsar Convention on Wetlands (1971) as well as a polygon outlining the Caribbean region.

First, for each protected wetland or set of wetlands below, please identify the best pre-existing projection to map each wetland. You may choose from a state plane zone, UTM zone, or other predefined projection. Reference information for these zones can be found on Splinter (see hints on next page.) Now, if you think the pre-existing projections would have too much distortion for each of the specified wetlands, please identify what type of custom projection you would use to minimize distortion. Which projection family (cylindrical, conic, or azimuthal) would you use and which map properties (area, shape, distance, direction) would you preserve?

List of selected wetlands:

1. Everglades National Park
2. Pacaya Samiria
3. Delaware Bay Estuary and Chesapeake Bay Estuarine Complex
4. Upper Mississippi River Floodplain
5. Wetlands surrounding the Caribbean Sea (Use the Caribbean feature class to select all the wetlands in the Caribbean Sea).

Please check in with an instructor to explain your choices before moving to the next section.

Second, experiment with projections for the Caribbean Sea wetlands.

1. Please project the Caribbean Sea wetlands into the best possible UTM zone and calculate areas in square kilometers. What is the total area of these wetlands?
2. Please create the best custom projection for the Caribbean Sea wetlands, and project the feature class into that custom projection. Then recalculate the areas in square kilometers. What is the total area of the Caribbean Sea wetlands now?
3. Calculate the *percentage error* between the area calculated using the UTM zone and the area calculated using your custom projection. To do this, join the two results and export to a new feature class. Then calculate percentage error with this formula: (UTM area – Custom area) / Custom area. Finally, make a choropleth map of this percentage error. Can you explain the pattern of error?

Please try to finish the third question, but if you run out of time, we will discuss this in lecture on Thursday.

Hints:

- To see countries, state plane zones, and UTM zones:
    - Countries are available in \\splinter\data\Worldwide\Administrative (World Countries.lyr)
    - State plane zones are available in \\splinter\data\USA\Countrywide\Reference (USA State Plane Zones.lyr)
    - UTM zones and latitude/longitude graticules are available in \\splinter\data\worldwide\Reference (World UTM Grid.lyr)
- To see coordinates: look at the coordinates in the status bar on the lower right of the screen. If the units you see there are not in degrees, go to the data frame properties > General > Units > Display and select Decimal Degrees from the drop-down menu.
- To see extents: look at the *source* tab of a layer's properties to see the full extent of a feature class.
- The equal area form of an azimuthal projection is "Lambert Azimuthal Equal Area" and the equal area form of a conic projection is "Albers Equal Area Conic" or just "Albers." Although it is not strictly an equal area projection, "Transverse Mercator" is a common cylindrical projection with fairly accurate areas within the zone.
- The Albers Conic projection requires you to define two standard parallels. ArcGIS Help offers this advice on the Albers Equal Area Conic projection: "One method to calculate the standard parallels is by determining the range in latitude in degrees north to south and dividing this range by six. The "one-sixth rule" places the first standard parallel at one-sixth the range above the southern boundary and the second standard parallel minus one-sixth the range below the northern limit. There are other possible approaches."
- To quickly calculate the total area of all rows (or a selection of rows) in a table, right click on the column name and choose Statistics. You can also use the Summary Statistics (Analysis) tool to generate a separate table.