Assignment 4. Geodatabase: Creating a Shapefile, Editing Features, & Union Overlay

Preliminary

- Review Gorr/Kurland, Tutorial 4 (‘Geodatabases’), Tutorial 5 (‘Importing Spatial and Attribute Data’), Tutorial 6 (‘Digitizing’), & Tutorial 8 (‘Spatial Data Processing’).
- Review Longley et al., Geographic Information Systems and Science, pages 115-123, on geographic coordinate systems and projections.

Assignment Objective

Let’s say that you want to display an ocean for Miami-Dade County but you don’t have and can’t obtain an ocean shapefile (i.e. feature class). How could you create an ocean shapefile? Here’s one way. In creating the shapefile, you’ll create a geodatabase and edit features.

- This exercise uses mdtgr2 (which you created in Assignment #1) and a shapefile (‘Ocean’) that you will create and edit. Both of these will become part of a geodatabase that you will create and name ‘Miami-Dade Shapes’.

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- In ArcCatalog, click Preview>Geography to display mdtgr2. Click Preview>Table to inspect its table. And click Metadata>Spatial Reference Information to inspect its coordinate system and its spatial extent.
- In ArcCatalog’s catalog tree, right-click mdtgr2. Then—as another way of checking its spatial reference information.inspect its coordinate system and spatial extent by clicking Properties>gray box to left of ‘Shape’>Spatial Reference>XY Domain.
  - How are latitude and longitude measured, and why? What is a geographic coordinate system and projected coordinate system, what is the difference between them (see Ormsby et al., chapter 13; Longley et al., 115-123)?
    - What’s the Cartesian coordinate system? What are easting and northing?
    - What’s a datum?
    - What are the three principal components of a projected coordinate system?
    - What are the conformal and area properties?
    - What are the cylindrical, planar (azimuth), and conic projections?
    - What’s a projection’s extent?
    - What’s a graticule?
  - What projections could be used for Miami-Dade County? What are the ranges of Miami-Dade’s latitudes (Y) and longitudes (X)?
  - On specifying a projection in ArcGIS, see Ormsby et al., chapter 13.
- Create a geodatabase in ArcCatalog:
  - In ArcCatalog, create a new geodatabase named 'Miami-Dade Shapes'.
  - Import (or export) into it mdtgr2. In the new geodatabase create a new, empty shapefile ('Feature Class') named 'Ocean' and import the coordinate system from mdtgr2.

- Activate ArcMap:
  - In ArcMap, set to store relative path names, set the appropriate coordinate system, and check the map display units.
  - 'Add data': first mdtgr2 and then Ocean (which is empty at this point).
  - Rename mdtgr2 'Miami-Dade County'.

- Editing session:
  - Start an editing session by clicking Editor>Start Editing>Target ('Ocean')>Task ('Create New Feature').
  - If you wish, click Editor>Options and click the Snapping options for Miami-Dade County. Click the Pencil tool and draw a large rectangle that covers as much as possible of the entire map display extent, from which you'll extract an ocean shapefile.
  - Click Editor>Save Edits>Stop Editing to end the editing session.
  - Perhaps position Ocean above Miami-Dade County in the table of contents. If you do this, set 'Ocean' to display at, say, 30%, so that you can see through the Ocean polygon to Miami-Dade County.
  - Click ArcToolBox>Analysis Tools>Overlay>Union, and union Ocean with Miami-Dade County, naming the output feature 'Miami-Dade_Ocean_union'.
    - Recall the difference between union overlay and intersect overlay.
    - Uncheck Miami-Dade County and Ocean so that only the union-based polygon 'Miami-Dade_Ocean_union' displays. Click Selection>Set selectable layers>Miami-Dade_Ocean_union.

- How to select the polygon's ocean feature:
  - Inspect the attribute table for 'Miami-Dade_Ocean-union', exploring how you might be able to select the polygon's ocean feature. Click the appropriate records (in the left-hand gray box) to see how they link to the map.
  - Click 'Options' at the bottom of the attribute table>Select by Attributes>‘fid_ocean feature’. In the opened attribute table click Options>Show>Selected. Close.
  - Click Selection>Create layer from selected features, and name the layer 'Miami-Dade_Ocean'. To save it, right-click the layer in the table of
contents and click Data>Export data>Geodatabase, saving the 'Miami-Dade_Ocean' in the 'Miami_Shapes' geodatabase.
  o In the table of contents, position Miami-Dade County above Miami-Dade Ocean and turn off any other layers. Check the coordinate system and spatial extent of each layer. Adjust the colors as you wish.

III

- Go to ArcCatalog and inspect the new geodatabase (perhaps clicking View>Refresh).
- Examine Miami-Dade Shapes and Miami-Dade_Ocean in Preview and Table.
- Inspect each shapefile’s coordinate system and spatial extent, first in Metadata and then in each shapefile’s attributes table.