SOC 4650/5650: Lab-03 - Major Tornadoes in the St. Louis Area

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Directions

Using data from the `MOBoundary` and `MetroWx` data available in the `lecture-04` repository, create several maps using ArcGIS Pro. Your entire project folder system should be uploaded to GitHub by Monday, February 11th at 4:15pm.

Part 1: Analysis Development (Review from Lectures 01 and 02)

The goal of this section is to create a self contained project directory with all of the data, code, map documents, results, and documentation a project needs.

Download Data

a. **Clone** the `lecture-04` repository from GitHub using GitHub Desktop.[1]

Create a Project Folder System (Review)

b. Open ArcGIS Pro and choose `Map` under `New project`. Name the project `Lab-03`, un-check the option to create a new folder, and and select the `Labs/Lab-03` subdirectory of your assignment's repository.

c. Reduce ArcGIS Pro for a moment. On the Windows File Explorer app, add new folders named `data/` and `results/` to the project directory.

d. Drag tthe lab data from `lecture-03/data/lab-03/` into your ArcGIS Project's `data/` subdirectory. Verify using ArcGIS Pro that all of these data are accessible from within your project.

Part 1: Create a Mobile Home Map

The goal of this section is to be able to create a thematic map plotting the median age of housing in the St. Louis area to help planners

[1] If you are not sure where your GitHub Desktop data has download to on the computer, you can right click on the repo's entry in GitHub Desktop and have it take you to the repo in Windows File Explorer. By default, this should be within your `Documents/` directory.

identify neighborhoods must susceptible to damage due to the age of the housing stock.

1. In your ArcGIS project, add the `METRO_STRUCTURE_PctMobileHome.shp` data to a new map document.

2. Create a thematic choropleth map that shows the estimated percentage of mobile homes in each county (use the variable `MobileHome`. Select a basemap that compliments and does not distract from your selected color ramp.

3. Next, create a new map layout. Be sure to add all necessary map layouts including a theme, a title, a subtitle (including your name and the assignment number), a caption that includes the data source, and an appropriately titled legend.

4. Export the map as a `png` file at 500 dpi to your project's `results/` subdirectory.

Part 2: Map Tornadoes Before 2000

The goal of this section is the produce one of the map elements for a layout that features strong tornadoes in the St. Louis area that have occurred historically in St. Louis.

5. Create a new map named `Tornadoes Before 2000` and remove the basemap.

6. Add the following layers to `Contents`. Make sure they are added in the following order and that their hierarchy matches this order as well:

   (a) Tornado tracks from the `MetroWx` directory - leave symbol alone for now

   (b) Missouri state boundary from the `MOBoundary` directory - symbolize with no fill, just an outline for now

   (c) Metro county boundaries from the `MetroWx` directory - fill should be white

   (d) Illinois state boundary from the `MOBoundary` directory - symbolize as a ground layer

   (e) Missouri state boundary from the `MOBoundary` directory - symbolize as a ground layer

7. On the Missouri state boundary layer that is directly below the tornado tracks, use the `Symbology` pane to change the outline used. Choose "Boundary, National" from the `Gallery` and use a warm hue for the color.

8. In the Definition Query window under Layer Properties for the tornado tracks layer, execute a query to restrict the data view to tornadoes with an Enhanced Fujita scale (EF scale)[2] of 3 or greater and that occurred between 1950 and 1999. You'll need two clauses - `yr is less than 2000` and `mag is greater than or equal to 3`.

9. Symbolize the tornado paths using their magnitude categories - the EF-3 and EF-4 paths should have different hues with the hue for EF 4 being warmer and lower value (i.e. darker) than the hue for EF 3. Both lines should be thick with a width of 2.0. When you create the categories under the Symbology pane, make sure to remove "all other values".

10. Rename this layer `Severe Tornadoes`.

11. Add another copy of the tornado tracks layer *under* the current tornado tracks layer but above all the other layers on your map. Symbolize it as a ground layer. Restrict this layer to tornadoes that occurred between 1950 and 2000 as well with the following definition query - `yr is less than 2000`.

12. Rename this layer `Less Severe Tornadoes`.

13. Zoom to the metro area counties layer and create a new bookmark for this scale.

[2] The enhanced Fujita scale is the standard method of measuring the severity of a tornado. It is on a scale of 0 to 5 with 5 being the most damaging and destructive. An EF-0 tornado has a peak 3 second gust (in miles per hour) of between 65 and 80. An EF-1 has a peak gust between 86 and 110, an EF-2 has a peak gust between 111 and 135, an EF-3 has a peak guest between 136 and 165, and an EF-4 has a peak gust between 166 and 200. The most severe category, EF-5, has a peak 3 second gust greater than 200 miles per hour.

Part 3: Map Tornadoes 2000 and after

The goal of this section is the produce one of the map elements for your layout that features strong tornadoes in the St. Louis area that occurred recently.

14. Duplicate the map you made in the previous section and name the new copy `Tornadoes 2000 and After`. You can do this in the Catalog View by right-clicking on the original map and copy and pasting it in the `Maps/` folder. Ensure that the layers in the Table of Contents are ordered identically to the first map.

15. Alter the definition queries for both tornado layers so that they show tornado paths between 2000 and 2015 - `yr is greater than or equal to 2000`.

16. Zoom to the metro area counties layer and create a new bookmark for this scale.

Part 4: Construct the Inset Map

The goal of this section is to produce a small inset map that helps readers located where St. Louis is relative to Missouri and Illinois.

17. Create a third map named `Inset Map` that contains the state boundary layers (the bottom two layers in each data frame) along with the metro area counties layer.

18. Re-symbolize the metro area counties so that they use the "Rose" pre-set symbol.

19. Zoom to the full extent of the map and create a new bookmark for this scale.

Part 5: Construct the Map Layout

At this point you should have three maps - one with tornado tracks before 2000, one with tornado tracks between 2000 and 2015, and one highlighting the location of the metro area. The goal is to turn these three maps into a single page map layout.

20. Switch to the Layout View and create a well formatted map layout for an 8.5" by 11" printout in portrait orientation:

    (a) Add guides that create .5" margins around the page to help you construct your layout.

    (b) Add and then re-size your two main maps so that both of the tornado track maps are 7.5" wide and 4" tall. The pre-2000 data frame should be on the upper part of the layout and the post-2000 data frame should be below it. You may need to utilize your bookmarks to get the maps to appear at the correct scale.

    (c) Add text that serves as a subtitle for each of the two maps.

    (d) The inset map should be re-sized as well and should be positioned on the layout to give reference to where these data are located in a broader spatial context.

    (e) Include a legend that identifies what the different tornado tracks mean, a scale bar, a title, and a note about authorship. Also add detailed data about the primary source of these data - the National Weather Service.

    (f) Manually add state names to both maps so that you have complete control over where the labels are positioned. Use the halo effect as you normally would for map labels.

21. Export the map as a `png` file at 500 dpi to your project's `results/` subdirectory.