Geospatial and Environmental Analysis: Final Project

UC DAVIS EXTENSION

You're a public health analyst with a nonprofit in the United States that is interested in the causes and impacts of air quality in California. For now, you're concerned with what causes the buildup of ozone, a chemical beneficial high up in the atmosphere but harmful to human health when in the air we breath. You are also interested in whether air with higher ozone concentrations disproportionately affects certain groups of people. In a real scenario, you would explore these connections across many variables, but for this analysis, you will explore the affects of elevation on ozone buildup and whether there is a connection between ozone buildup and household income.

Provided Data

1. Air quality station locations as a file geodatabase point feature class. (name: *air_quality_stations)*
2. Ozone data, with a site_id attribute for joining back to the air quality stations data (field *site*), as a file geodatabase table. The data is the average hourly ozone concentration for the combined years of 2010 and 2011. When joining, keep only the records that match (name: *ozone_averages*)
3. Census Tracts, with an attribute for average household income, as a file geodatabase polygon feature class. (name: *census_tracts_with_income*)
4. A 30 meter digital elevation model as a file geodatabase raster. (name: *dem_30m_ca*)

Form a hypothesis

To approach this like a true research question we'll want to form a hypothesis - a prediction or explanation for what we expect is occurring that we can test through data analysis. Again, for a true project, such as the capstone projects in this specialization, you'd evaluate all the data available to you to know what you can actually learn, and then form your hypothesis, collect the data, and analyze it to get your answer. In this case, we're providing you with elevation, ozone, and household income data, so form a hypothesis about those variables. What do you think the relationship between lower atmospheric ozone concentrations and elevation is? What do you think the relationship between ozone concentration and household income is? Are there any relationships at all? That's what you're going to investigate.

Throughout this process, consider its limitations - how our data might be shaping the answers we're getting, and what we'd need in an ideal world to get better answers, or determine if our data is limiting our analysis. You won't be graded on this, but it's important to practice.

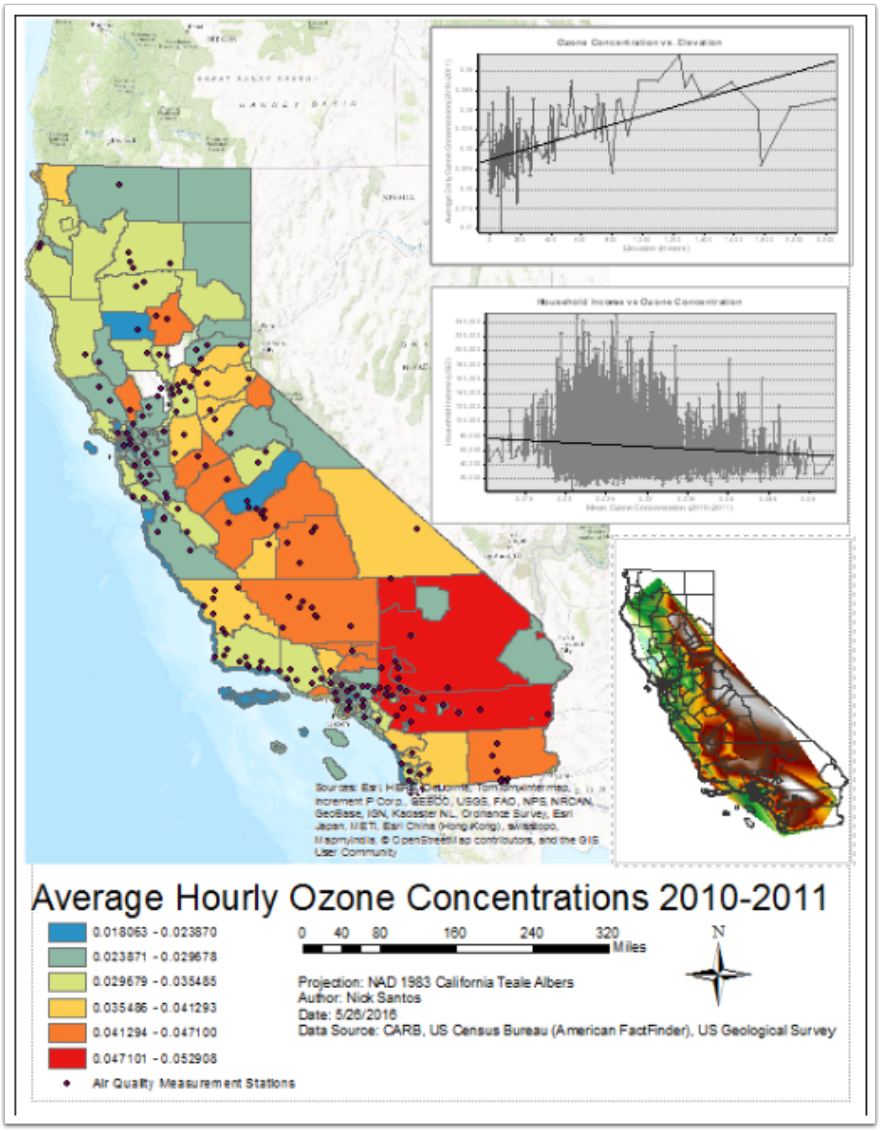
Objective

Your final product, which you will submit, will be a single pagePDF map of California, made in ArcGIS layout view, with the following:

- A graph of Ozone concentration (Y axis) vs Elevation (X axis) with a trend line. Since there are a few ways to do this, for this assignment, derive this graph from the *air_quality_locations* point feature class.
- A graph of Household income (Y axis) vs Ozone(X axis) with a trend line. Derive this graph from the census tracts.
- A primary, large map showing Census tracts, dissolved to the approximate county boundaries (use attribute block_id for the dissolve) and symbolized by ozone concentration (Use the equal interval symbol classifier with 6 classes, and the default breaks it chooses). Overlay the air quality station points on top.
- A secondary, smaller map showing your interpolated ozone surface as a raster.
- Appropriate map elements, such as a title, legend, north arrow, scale bar (for the primary map), date published, projection, and your name

Both graphs should have the axes labeled appropriately, and an appropriate title of their own that explains what the graph is showing. Where you place the graphs on the page is up to you, but the graphs should be on the same page as the map itself. A basemap is not required, but may help provide more context for the map - you won't be graded on that.

Keep notes on your general process or set of steps - you will be asked for a description of this when you submit your final map.



Procedure

For your analysis, you'll need to interpolate the ozone values at the air quality stations into a continuous surface, and extract the average (mean) values for each census tract to that surface. When creating your raster from the interpolation, set the cellsize to 30 (CELLSIZE 30 in the *Sampling Distance* field). Normally you'd assess what size is best, but for consistency of grading everyone will use 30m.

Separately, you will need to extract values from the elevation raster to the points in order to assess the relationship between elevation and ozone.

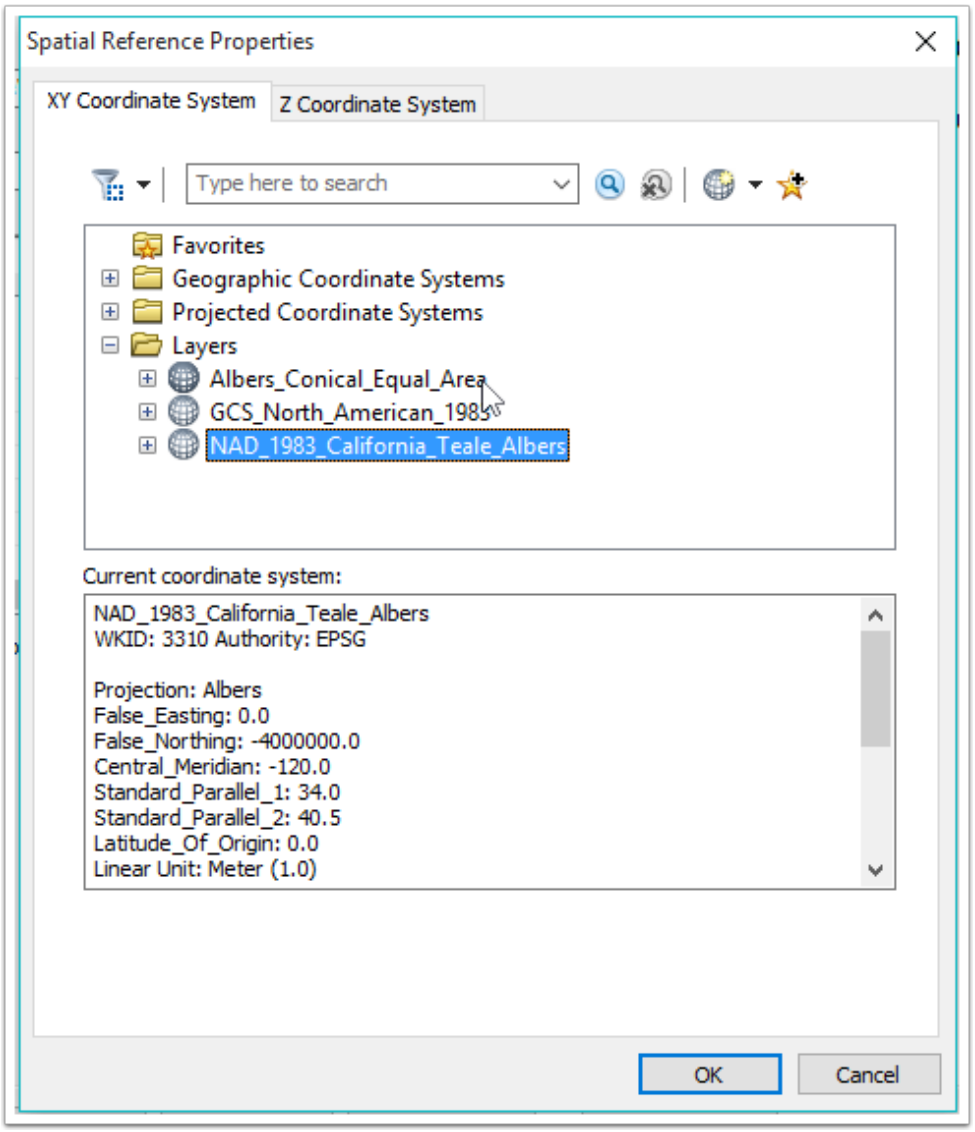
Things to keep in mind

When running Extract Multivalues to Points, don't select the option to interpolate values - there could be good arguments to do this for each of the rasters involved, but in this case don't do it so that we can get consistent results for grading.

When creating your join for the ozone data to the air quality stations, only keep matching records (the lower radio box) - this will remove air quality stations that don't have data from the layer.

When creating your TIN, use the *NAD_1983_California_Teale_Albers* Projection - you'll find it in the section for *Layers* that shows layers in your map document while in the Spatial Reference selection dialog (see screenshot below). Yours may not look exactly alike, but it will still have the *NAD_1983_California_Teale_Albers* projection because the provided features and raster are in that projection.

When creating your graphs, make sure to label the axes and give the graph a title. Also make sure the graphs are large enough for the primary text to be legible in your PDF.



Some tools you'll likely want to use

- Tools for joining data
- Zonal Statistics as Table
- Create TIN
- TIN to Raster
- Graphing tools in ArcMap
- Extract MultiValues to Points

