

HEXBIN DROUGHT MAP

Hexbins is a technique that allows for the transformation of continuous data into discrete polygons that are not tied to political boundaries. Hexbins allow you to perform all sorts of zonal statistics and increase the legibility of complex data. In this map we will make a map that compiles a year worth of drought monitor data into a single representation to understand the impacts of droughts across specific regions in the United States. The distribution of drought in the United States changes each year, so spend some time thinking about what year/years you want to focus on. The drought data is broken up by week, so keep that in mind as you think your date range for analysis.

This lab is adapted from John Nelson's American Southeast Drought Map

Data: United States Drought Monitor

Tools: ArcGIS, AI, Photoshop

Points: 30

Due Date: 4/3/18

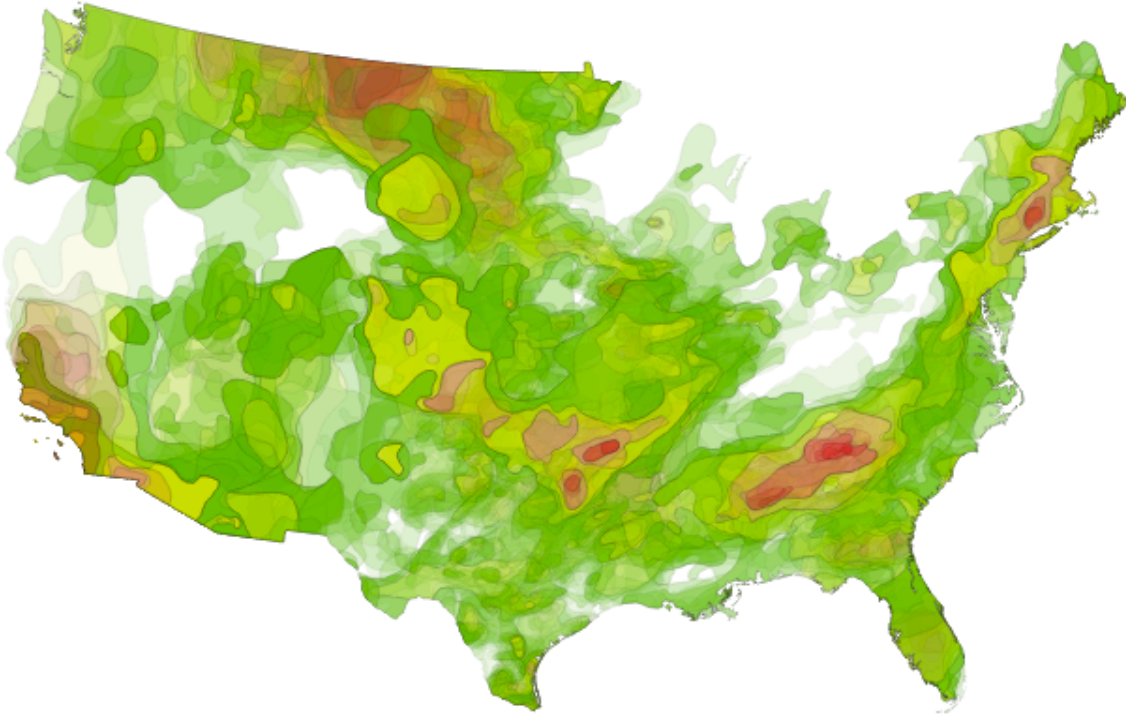
1. Drought Data Download: **<http://droughtmonitor.unl.edu/Data/GISData.aspx>**
The US Drought Monitor website is incredibly accommodating of GIS analysts. Weekly drought perimeter shapefiles are archived going back years. Weeks can be downloaded individually, or in bulk per year. I downloaded the full 2017 packet.
2. After a bulk un-zip job (I used 7-Zip to extract all 52 zip files of the weeks in one go). Open ArcGIS and add the state shapefiles from the Census.
<https://www.census.gov/geo/maps-data/data/tiger-cart-boundary.html>

Load all the drought shapefiles (52) into your data frame.

3. Save your work. Merge the 52 shapefiles into a single layer. Turn the fill to transparent to make sure the data looks like a complicated mess.



4. Classify the merged layer by the attribute field DM, give the data a sensible color ramp going from 0 (abnormally dry) to 4 (extreme drought) and make the transparency of each class 90%. This should give you a good sense of the overlapping data and the areas with severe drought.



5. Download, unzip, and add the grid300 shapefile from <https://canvas.humboldt.edu/courses/15623/files/661515/download?verifier=AgyRzQKAaS55OfKKfJDKAtPMQifNCESnPr6o9H8S&wrap=1>. Now we have a huge pile of heavily overlapping weekly drought polygons, and a beautiful mesh of hexagons. We want to perform a spatial join to sum up the values from the drought index into discrete units. For this, the target layer is the *grid100*; the join layer is the *merged drought layer*, the geometric operation is *intersect*, and the attributes should be *summed*. Call this layer *grid_join*
6. Lets just worry about the lower 48 for this map. Create a new layer for just the lower 48 states and clip the *grid_join* layer by the lower 48. Call this layer *grid_join_lower48*. Project into Albers Equal Area Conic if you have not already done so. It's important to clip and project after the join in order to accurately do the spatial join operation.
7. First, let's look at the frequency of the droughts. Classify the variable count into 5 classes using natural breaks. We want to make a new shapefile for each of these classes. Use select by attribute and export data to create 5 classes names 1,2,3,4, and 5 from lowest

class to highest. After separating the grid into 5 unique shapefiles, make sure they have full coverage over the entire US.

8. Now visualize the intensity of the drought data. Classify the Sum_DM attribute in the grid_join_lower48 shapefile using natural breaks. Once the symbology is set, save as a layer file. Now import this layer symbology to each to the 1-5 shapefiles. This will make so each of frequency class has the same classification and symbology as the whole country dataset.
9. Save and add a basemap if you like. Turn references off on basemap. Export to AI. Export the basemap, if you use one, to a .png with 300 DPI
10. Open the AI file and remove the clipping mask and ungroup the objects within each layer. Make sure the layers are not under a parent layer in your AI file structure.
11. Now we want to create the bivariate representation of the data. We want to change the size of the hexbins to match the frequency of drought. To do so, we will change the size of the hexbins for each classification. Use the transform each function to change class 4 to 85%, class 3 to 70%, class 2 to 55%, and class 1 to 40%. This should give you a nice bivariate map that shows the frequency and intensity of droughts across the US.

Download and add the US cities layer (<https://www.arcgis.com/home/item.html?id=4e02a13f5ec6412bb56bd8d3dadd59dd>). Create a selection query to set a threshold of cities to show on your map. Your final map should look something like this with cities added.

