

MAPPING PIPELINES AND OIL SPILLS

The recent work water protectors and indigenous groups across the country are showing the importance of understanding our energy infrastructure, especially in relationship to water and sensitive coastal environments. Perhaps no place in the United States has seen more impacts, both in terms of built infrastructure and environmental degradation as the Gulf Coast.

The purpose of this map is to work through the process of moving between ArcGIS and Adobe Illustrator and to visualize the environmental impact of energy infrastructure in the Gulf Coast Region. This map will teach you techniques of creating texture between water and land, proper procedure for transferring vectors to Adobe Illustrator and Rasters/Images into Photoshop, and finally how to compile multiple layers together into a final product.

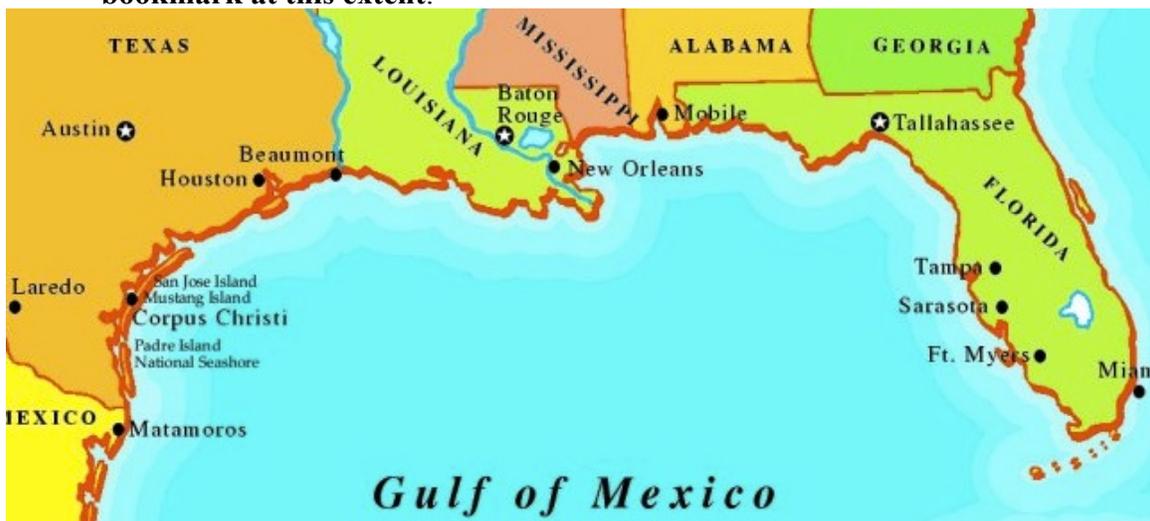
Data: US Census, Natural Earth, Pipeline and Hazard Material Safety Administration, Energy Information Administration

Tools: ArcGIS, AI

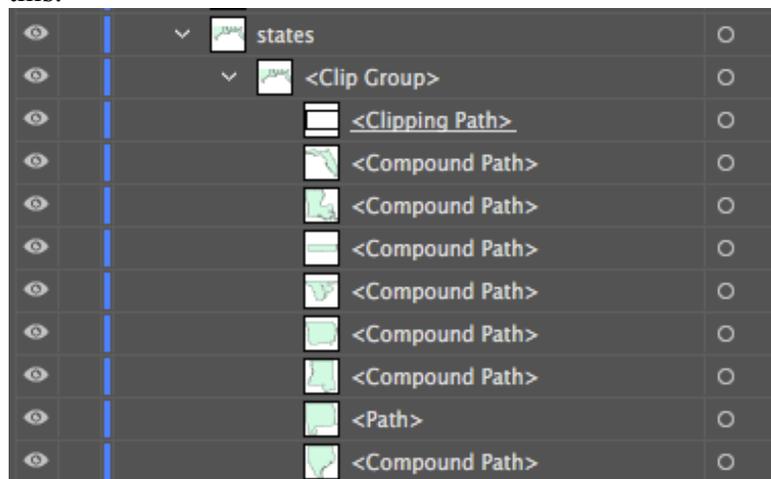
Output: Print

DIRECTIONS

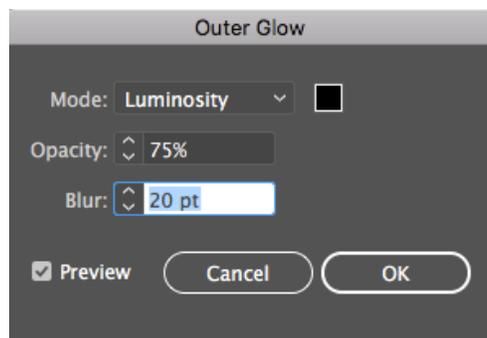
1. Go to the Census Bureau to access geographic boundaries. <https://www.census.gov/geo/maps-data/data/tiger-cart-boundary.html>
2. First add the states layer and set the geographic extent to be something similar to the map below. Change the projection to North America Albers Equal Area. **Set a bookmark at this extent.**



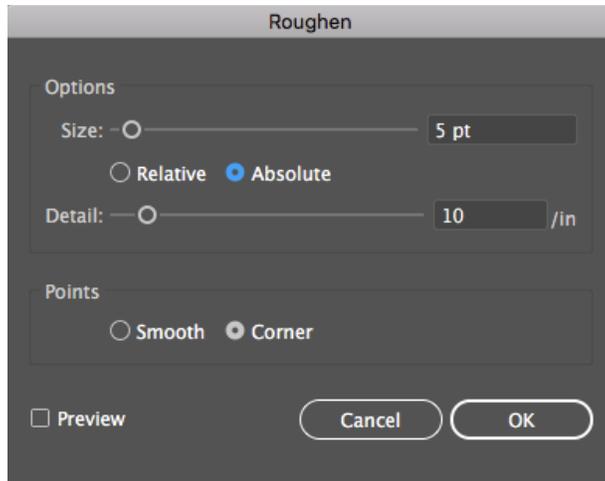
3. Download and add the US cities layer (<https://www.arcgis.com/home/item.html?id=4e02a13f5ec6412bb56bd8d3dadd59dd>) and select all cities over 200,000 and save the selected features as a new layer called lg_gulf_cities. If Dallas is in your map extent, it has like 8 suburbs over 200,000. You can reduce this down to Dallas and Ft Worth, or change your extent in AI later to exclude it completely. You can also generalize Miami's suburbs down to one.
4. Add the pipeline data. You should get the data for crude oil, refined petroleum, natural gas, hydrocarbon gas liquid and railroads http://www.eia.gov/maps/layer_info-m.php This is the best source I have found of our energy infrastructure. Add all the data and visualize each differently. This will be quite messy at first.
5. Next add the oil wells data. We will then add crude oil spills over 5 barrel. Let's symbolize this using graduated symbols on the unintentional spill. Try 4 classifications using jenks natural breaks. Make the sizes range from 8-30. Do the same with refined oil. Make sure you know how everything is classified. I like to take a screen shot with the data layers. Remember that once we bring this to AI we will lose the data associated with the vector layers. Save your map!
6. Now lets export. First, make sure all your layers are on and no layers have transparency. Make sure you are in data view and not layout view.
7. File->Export->File Type AI. Make sure the resolution is 300DPI, Color Mode is CMYK
8. Now open your AI file. You will see each of your active layers in Arc as a layer in AI. The first thing you need to do is clean up these layers. When you export from ArcGIS you get a whole bunch of groups and clipping mask. Let's get rid of all of them, one layer at a time. Lock up the layers you are not working on. Let's start with the layer called states.
 - a. Expand the states layer by clicking the small arrows until it looks like this.



- b. Select the clipping path and delete this selection with the small garbage can icon. Now you see these states are grouped together. Select all the states. Right-click and ungroup the objects.
 - c. Now each state is an individual object in the states folder. This means you can use the black arrow to select one object at a time. Repeat this with the rest of the layers.
9. Now create a new layer called background and place this on the bottom. This will be your ocean layer. Place a square object across the extent of your map and place this on the bottom.
10. Turn off all the layers except for states. Change these to a nice unsaturated color. Now give the states an outer glow that looks like this. This will give the states some texture above the ocean. You should fiddle with the setting until you get what you like



11. Now we want to position the pipeline where they are under the states and above the ocean backdrop. Make sure the railroads are on top of the states outline. Use Color Brewer or a similar color picking app to find 5 qualitative colors to change the pipelines to create a nice color scheme. Change the lines to a nice stroke width. Change the states to blending mode to multiply.
12. Now put a new layer on top and make this your label layer. Go ahead and label the state names.
13. Now let's visualize the oil spills as something more reflective of the phenomena. Select all the crude oil spills and refined oil spills. Turn the fill and stroke on these to black. Then select effects->distort and transform->roughen. Initially change the settings to match those below and see how it looks. Adjust as you see fit.



14. Now visualize and label the cities. Think about how you want to arrange the layers to highlight or minimize certain types of data. Create a legend and add a title. Be creative and think about what other type of information you want to include, decorative elements, etc.

Here is an example of my map

