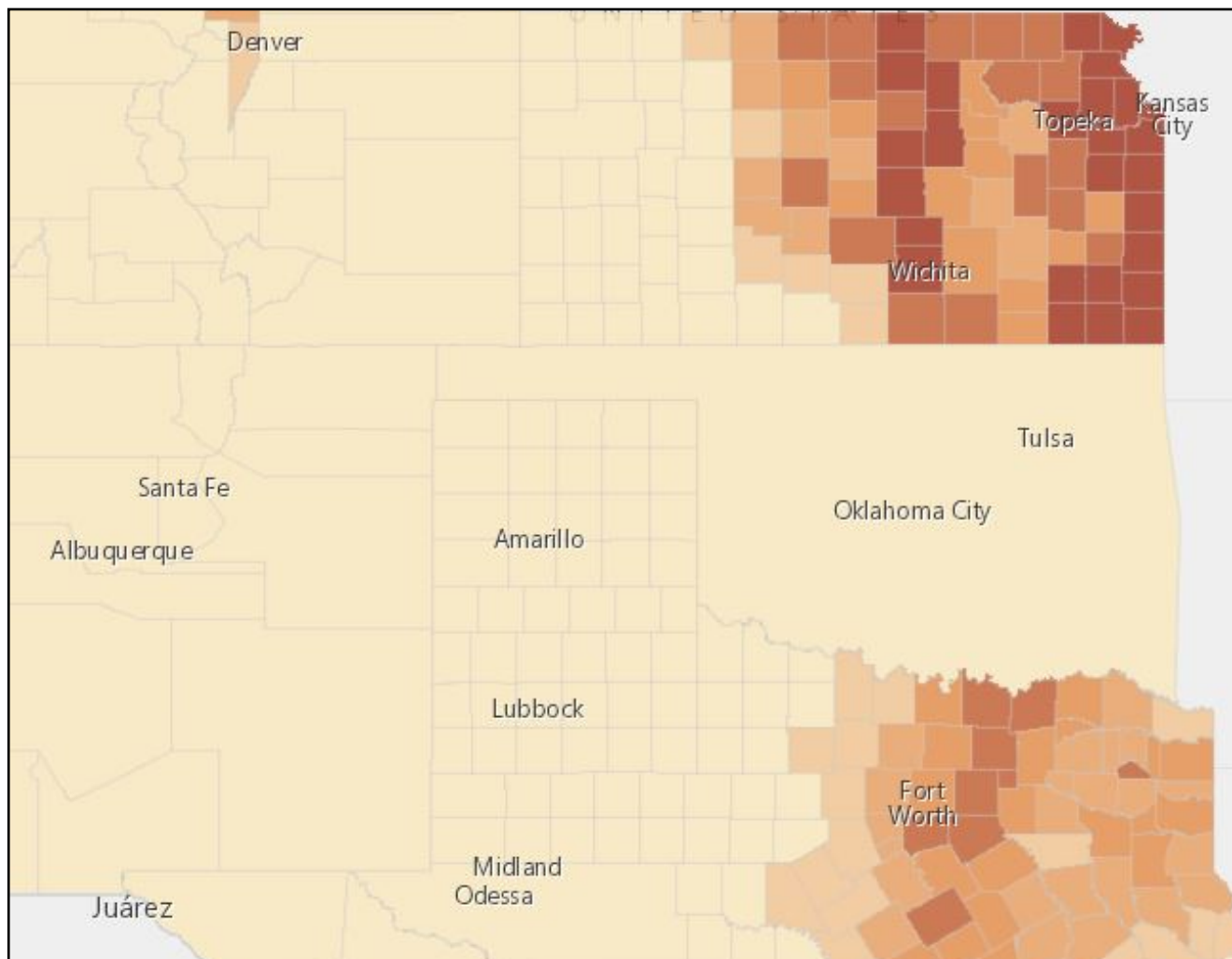# Intro to ArcGIS Online

Mapping The Dust Bowl

Introduction

Desktop GIS platforms revolutionized mapping in the 1980s. They facilitated the dissemination and democratization of cartography, and encouraged new types of questions and spatial analytical techniques once limited to a small class of professionals. The advent of browser-based, online mapping promises to amplify these gains. ArcGIS from the ESRI corporation is the industry standard for desktop (and now web) GIS. Today, you will use the most powerful (and intuitive) option available, ArcGIS Online, to produce basic choropleth maps that answer an historical question about the Dust Bowl.

Instructions:

Today, we will explore ArcGIS Online to produce correct and incorrect choropleth visualizations using agricultural census data from Geoff Cunfer's analysis of land use on the southern Plains. This dataset is associated with the ESRI publication *Placing History* (2008), which was itself drawn from the Inter-university Consortium for Political and Social Research (ICPSR) "Great Plains Population and Environment Data Series."

1. Create a new folder entitled "Week 9" on your computer. Go to the shared Google Drive folder for Week 9. Download and save the files to your computer. If you haven't already, you should bookmark the site. https://drive.google.com/drive/folders/1eUWCwXndkyQ7u7gXLQ1EhFpWqaiw23gY?usp=sharing

2. Open the directory of the 1880 file folder you just downloaded. You'll see a number of different files with different file extensions. So far, we haven't done much with these files except identify the ".shp" file extension, so you can add shapefiles to our QGIS maps. Actually, *they're all important*. The ".dbf" file is the "database" file that contains your attribute table. The .prj file refers to the "projection" of your map (the mathematical calculation that determines how a surface on the earth is stretched across a flat plane, i.e. your computer screen). The .shx file links the database to the polygons of the .shp (shapefile). There are other files with different file extensions as well. TWO files seem to be a shapefile (1880.shp), but if you look at the file extension, we realize one is a metadata file (.xml). Why is this important?? If we want to transfer our maps from QGIS to ArcGIS Online, we need to select the group of files we need using their extensions.

3. To import standalone shapefiles like these into ArcGIS online, we need to export this (1880) file folder into a format ArcGIS Online can read. To do so, you need to move four files into a **compressed .zip folder. It MUST include the .shp, .dbf, .shx,** and **.prj** files. If using a PC, highlight those four files, right click, "send to," then "compressed zipped folder." On a mac, select the files, right click them, click "compress." You've now created a folder that can be imported into ArcGIS Online. **The name of your zipped file MUST be the same as your individual file name. So, in this case, "1880.zip." Do NOT select the .qpg or .xml or .cpg files. ArcGIS Online cannot read them.**

4. Sign in to your ArcGIS Online account. Go to: http://www.arcgis.com/home/index.html and "sign in" at the top. Use your personal username and password.

5.Click on " Content" at the top of your ArcGIS homepage. On the next screen, look to the Folders area on the left. This is where you will save your work for this assignment. Just like for your practicums, it is important to keep everything organized (so you don't lose it). Keep

your files in this practicum separate from work in futures weeks, and from your final project work. Make a new folder. This first folder is where you will be saving

your work when you begin to import data into ArcGIS online. Give it a name (Week 9, for instance)

6. Once you're in your new folder, click the 'new item' button. You can either drag your zipped folder here, or select it from your computer after clicking "your device."

7. The next screen alerts you to the fact that you're adding a shapefile. It will add the .zip and "host" it (store it online) as a "feature layer." This means we can edit it. Click "next." On the following screen, give it a new title "1880_yourlastname. The tag should be "Week 9". Click save. Add 1880.zip and create a hosted feature layer."
Click "save."
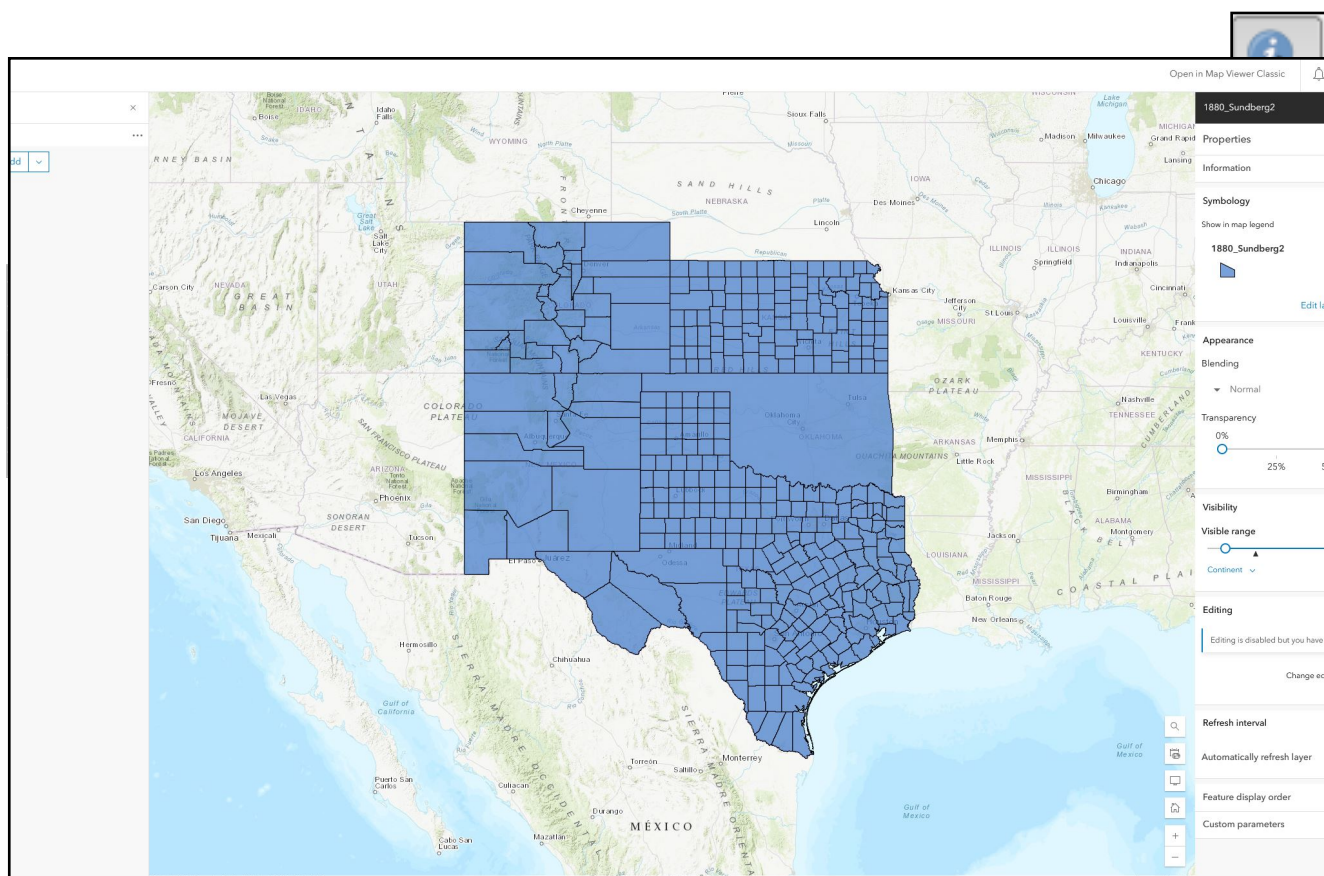
8. Next, click "open in Map Viewer." You should now see a basemap. You should also see the outlines of four states in the southern plains. The webmap will automatically zoom to it. ArcGIS online also "styles" your map as "single symbol" (remember this from QGIS) by default.

9. Just like with QGIS, when you add a new layer, you will likely have to change its style to suit your purposes. Before we add styling, its helpful to know what data is in our shapefile. To do this, look to the layer panel on the left. This is just like the layer panel in QGIS. Click the three elipses on the right and select "show table."

10. A spreadsheet pops up at the bottom of the screen. It looks like the spreadsheet you would see in QGIS, because its the same thing. You note that column headers include a variety of different attribute categories. *What do you see?*

11. Two important categories that may not be immediately recognizable to you are the first column "GISJOIN" and the 4th column "UNFIPS." Although it isn't apparent from the shapefile shared in the Google Drive, census data often does not arrive tied to county or state shapefiles (its just a spreadsheet). Census data in tabular formats need to be "**joined**" (sometimes called concatenated) to georeferenced administrative polygons (called "boundary files). The column "GISJOIN" contains numbers that refer to counties in a system employed by the National Historical GIS (NHGIS). To link the census **table** with its **boundary files,** you would use this "join field," since linking tables requires at least one shared column with similar information. "UNFIPS" is another join field, this one assigned by the US federal government and employed in modern census data (since 1970). This attribute table, in other words, give you two options to join data. (We will work more with joins later in the semester)
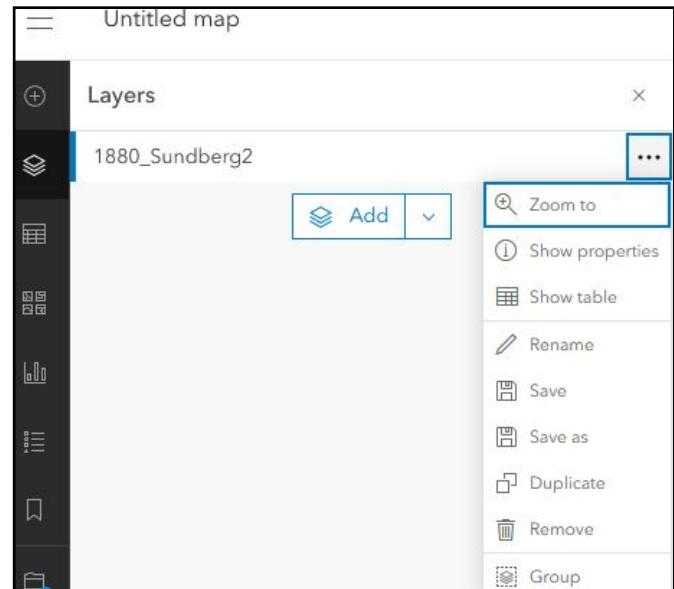
12. What are the other categories? "Name" refers to county (also an alternate spelling under "NHGISNAM"). STATENAM is state name, etc. Year is the year of the agricultural census (though it was added as an integer, not as a date, which is why it has a comma) and AREA is in km squared. *What would you assume the other categorizes mean?*
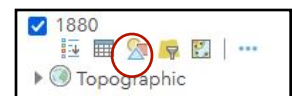
13. Each of these categories lists the area devoted to a given crop in that county in 1880. *How can you determine this based on the data in the table?* It is important at this point to acknowledge that this is raw data. Most crop data are **NOT** rates or percentages or a portion of total

acreage. In other words, they are not normalized data. There are two exceptions and we will deal with them shortly. *How should we visualize raw data like this?*

14. Let's test some styles. Look to the panel on the right this time. If it isn't there, click th elayer "1880_yourlast name" on the left, since this toggles the editing functions of the layers on and off. Under Symbology, click "Edit layer style."
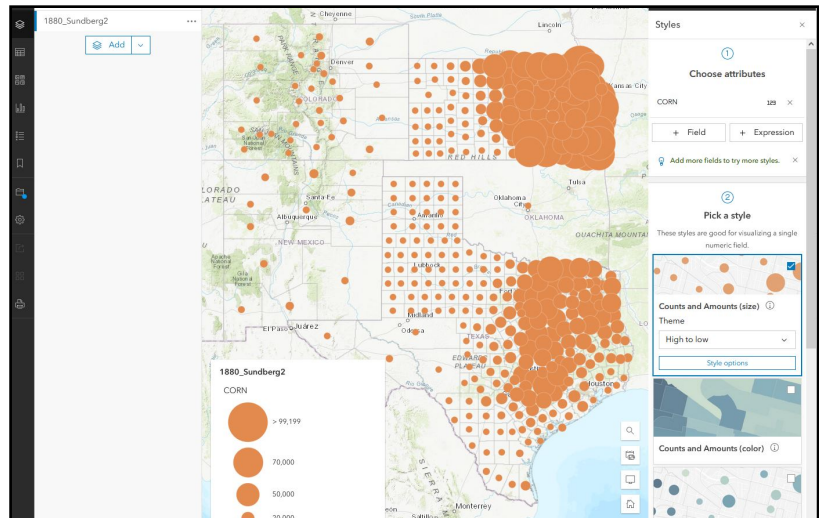
15. The default styling of your map is likely "Location (Single symbol). Let's try styling by attribute. What if we want to visualize the different states and give them a different color? Click "+ Field" under "choose attributes." Add "STATENAM" as the attribute we want to categorize. *What do you see?*
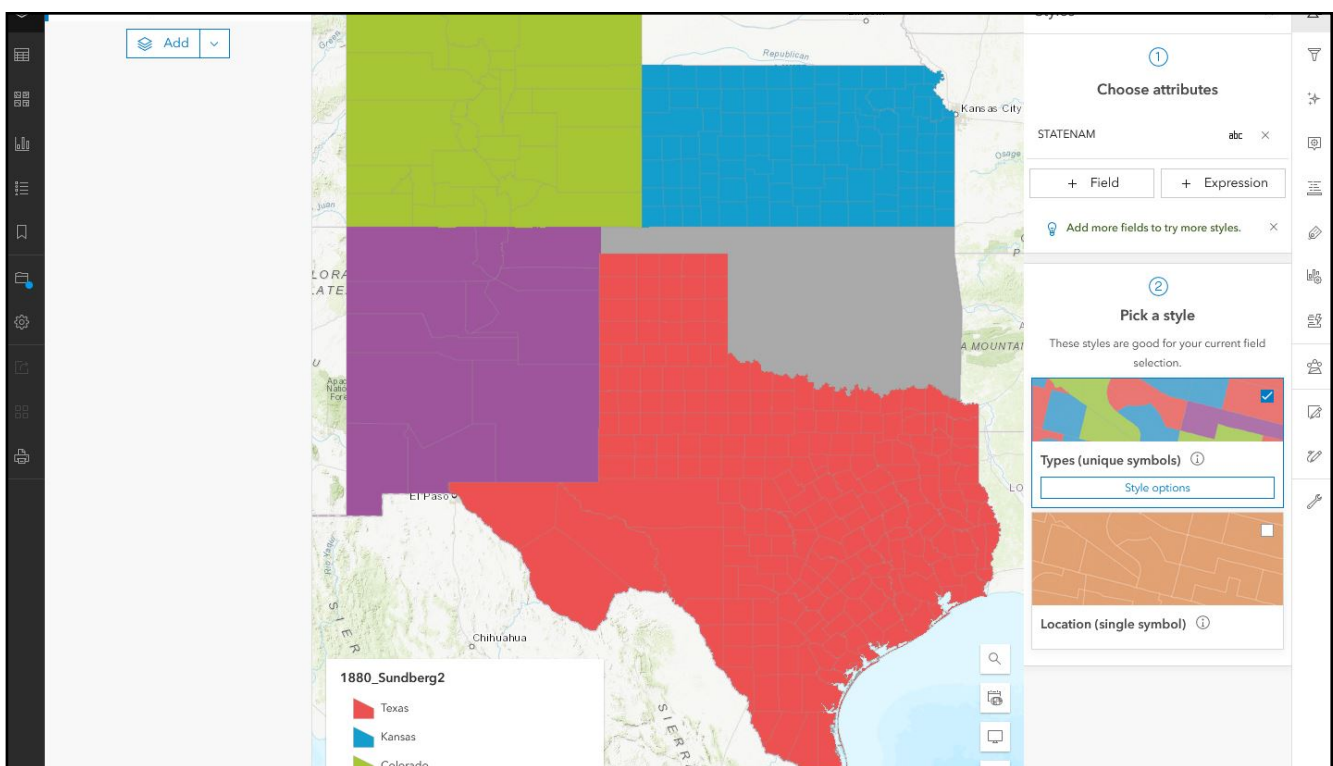
16. Well look at that. ArcGIS styled it automatically as categories. It also included a legend at the bottom. If you don't like the colors, you can "Pick a style" and select different "Style options." Already though, your map now shows different colors for different states.

17**.** This is a relatively simple, straightforward classification. *Are there any other attribute categories that would work well? Why would individual crops be poor choices for these categorized views? Why might PctCorn be a poor choice?* Which would be the best option then?

18. If we categorized an individual crop like corn as a choropleth map, initially, we would get a random assortment of colors with a huge assortment of classified values. Try it. Select "CORN" from the dropdown menu. ArcGIS assumes this is a raw value and automatically defaults to a proportional dot map (Counts and Amounts (Size)). This is cartographically sound, but it looks bad. We would probably want to change the styling further so that the circles overlap less. It also doesn't account for the size of a county. (Conceivably, large counties in the

east would produce more corn simply because there is more acreage. We want, therefore, to use a choropleth map. If you click on "Types (Unique Symbols)", this produces an even wonkier problem. Every county should get its own color, but because there are so many, Arc simply defaults to gray for most of them. There are too many different values to visualize all of them.

19. Let's do this right. Select "Counts and Amounts (Color)." This will produce a choropleth map that assigns a different color intensity to different values in the same column. It already looks better right? The problem is, this is still raw data, so we know we shouldn't be using it in a choropleth map. Look at Colorado and New Mexico. Several counties are light blue. This gives the false impression that more corn is produced there than some counties in Texas and Kansas (in many cases there isn't, they are just BIGGER COUNTIES).We need to visualize a different column, a percentage or a ratio.
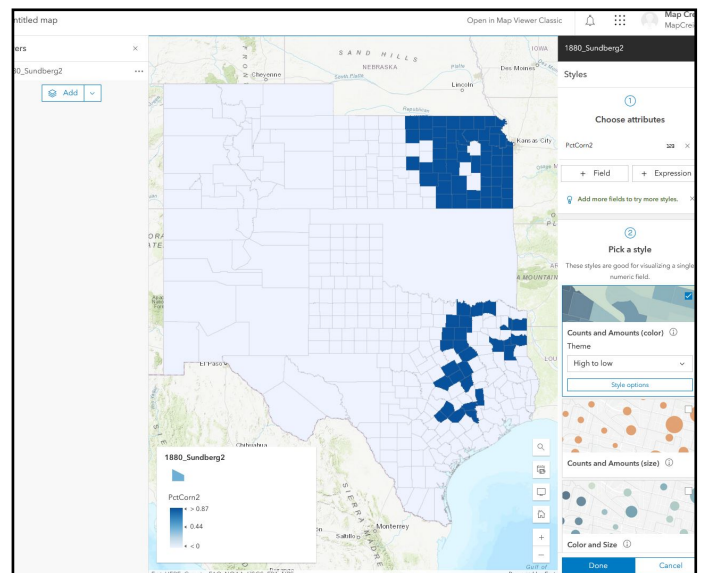
20. To do this, add PctCorn2 as your new field. Remove "Corn". Change it to a choropleth, like we did in Step 19. This looks somewhat different, right? Still, its not an accurate representation of the percent of acreage dedicated to corn

because it makes it look as if corn is only grown in a few places. We need to re-"classify" it (like we did in QGIS). To do so, click "Style Options" from Counts and Amounts (Color). Toggle the "Classify Data" button on. Natural breaks and "4 classes" is appropriate, but feel free to try out other classification schemes. If you click the symbol style icon on the right, you can change your color ramp. You can also change transparency at the bottom.

21. Now, large counties (with relatively small amounts of corn) aren't disproportionately represented. The values have now been rounded to the nearest percentage. In other words, they are normalized, making the differences more stark and the legend more manageable. Perhaps the result is less dramatic, but one could argue that it is much more accurate. After all, only one county in Kansas has 40% of its land area dedicated to corn production, but that county could never be identified in the former map.
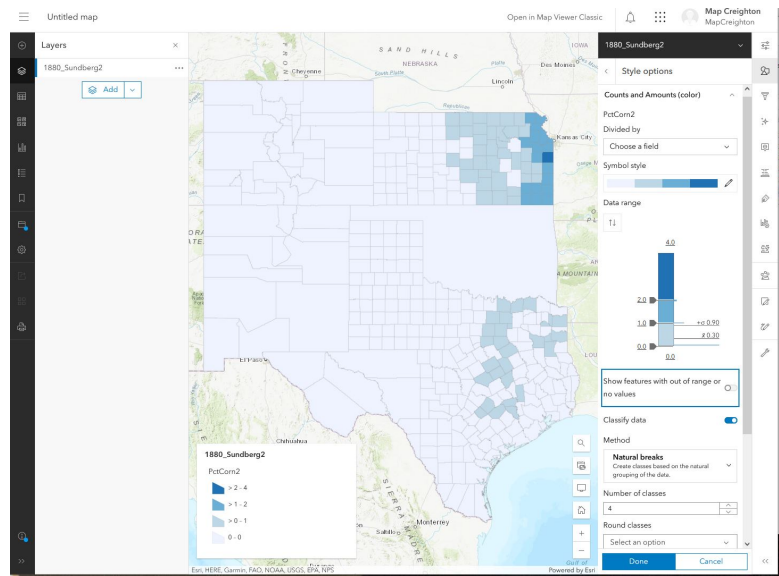

21. Now that we've explored the potential for using census data to produce choropleth maps according to various classifications, let's return to Cunfer's primary concern in his *On the Great Plains:* the amount of land that is (or isn't) cultivated. If you look at the attribute table for your 1880 layer again, there is a column that lists the percentage of land in cultivation - PctCult. Go ahead and style this appropriately. Most of the time, however, datasets you download will NOT have this type of normalized data, you will need to create them yourself. If you want to do this permanently, you can in QGIS AND ArcGIS online. Today, I will show you how to do so.

22. Before we do , however, we need to understand what we're trying to visualize. We need to visualize and/or create a new column that normalizes total cultivated acreage to total area. (i.e., the sum of all crop acreage). To do this, we need to calculate the total cultivation/area). Its important to note that we are making two big assumptions here. 1. that there were no other land uses that would have "plowed up" land area (others crops/roads/cities) 2. that our units are the same (Area = km2 and Corn = hectares or mi2, this wouldn't work). We could check this by returning to the metadata.

23. So how can we divide total cultivation by area? Open your attribute table again. First, we need a column for total cultivation. That doesn't currently exist. In fact, there's no way we can edit it! This is because we haven't enabled editing on this layer (like toggling on editing in QGIS). Before we toggle editing on, we need to save our map. On the left side of the screen, you should see an option to "save as." Entitle it "1880_yourlasname", make sure its saved in your correct folder, give it the tag "practicum", then click save.
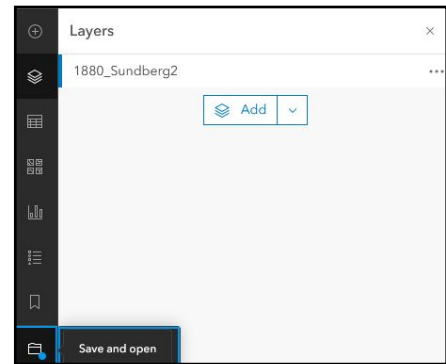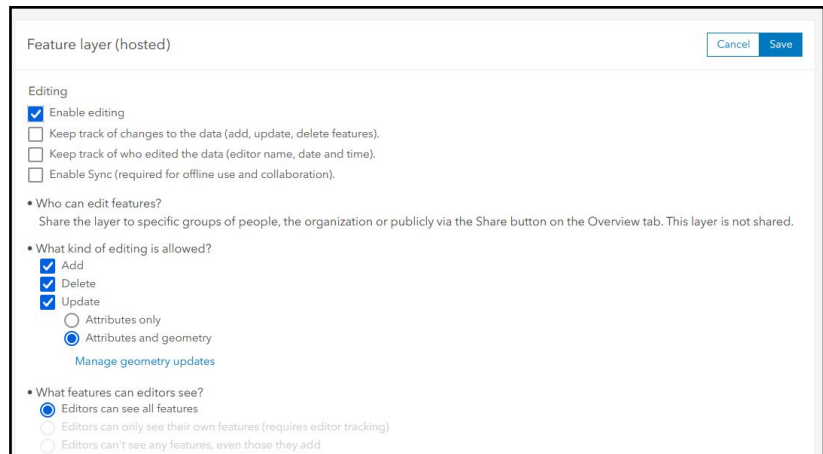
24. Now we need to go to "content". Click the three horizontal lines and click content. Then click "View details" beside your 1880_yourlast name layer. On the next screen, click "settings". Scroll down and click "enable editing." Then click "save."
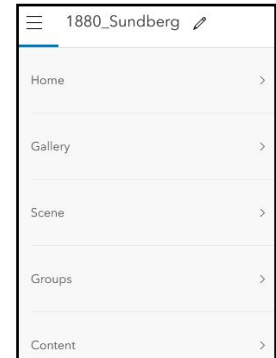
25. Now, we need to add our new column to our attribute table. Click the big blue Data button on the top, beside overview and visualization.

26. This is our attribute table. To add a column, click the three horizontal bars and select "add field." In the following screen, give the column a Field Name of "TotalCult" and also for the "Display name, "TotalCult." Make sure the "Type" is "Integer." Click add new field. It should now appear as the final column on the right.

| GISJOIN	NHGISNAM	STATENAM	UNFIPS	NAME	YEAR	AREA	CORN	WHEAT	HAY	
2000650	Graham	Kansas	20065	GRAHAM	1,880	574,164	4,925	1,013	2,370	Add Field
2000670	Grant	Kansas	20067	GRANT	1,880	365,360	0	0	0	Update Data
2000710	Greeley	Kansas	20071	GREELEY	1,880	513,217	0	0	0	Clear Selection
2000750	Hamilton	Kansas	20075	HAMILTON	1,880	639,189	0	0	0	Show/Hide Columns

27. We now have a new field, but its empty. We need to calculate total cultivation. To do this, click the Column Header (Total Cult). New options appear, including "Calculate." Click "calculate."

28. On the next screen, select "SQL" as your calculation language. This brings you to a familiar type of screen (based on your work in QGIS). To determine total cultivation, we simply add all the crop totals together. Click "calculate." It may take a few seconds, but when the calculation is complete, you have a newly populated total cultivation column. We now have a column for total cultivation!

29. Now, does it make sense how you would create a new PctCult column? You would follow steps 25-28 = except you would create a new column called PctCult, and create an equation that divides your cultivated acreage column by your AREA field.

30. There is also another option. Its temporary, but quicker. Go back to your content screen. That option is at the top of the page. Click your 1880_yourlastname webmap. A sliding layer appears and at the bottom you can open your webmap. This brings us back to the map. Click on the layer to make sure your new column is in the attribute table. It is right?

31. Return to your "Change Style menu." Add TotalCult as your field to symbolize. Select counts and amount (color). Then click style options. You're back at this familiar screen. Except this time, look at the first dropdown menu at the top. It says "Divided by." TotalCult should be divided by"Area" to obtain PctCult right? Select it. Classify it again with natural breaks and you're done. Save your map. If you want to visualize (but not make permanent) a simply division calculation, use this option. (which is fine for this assignment).
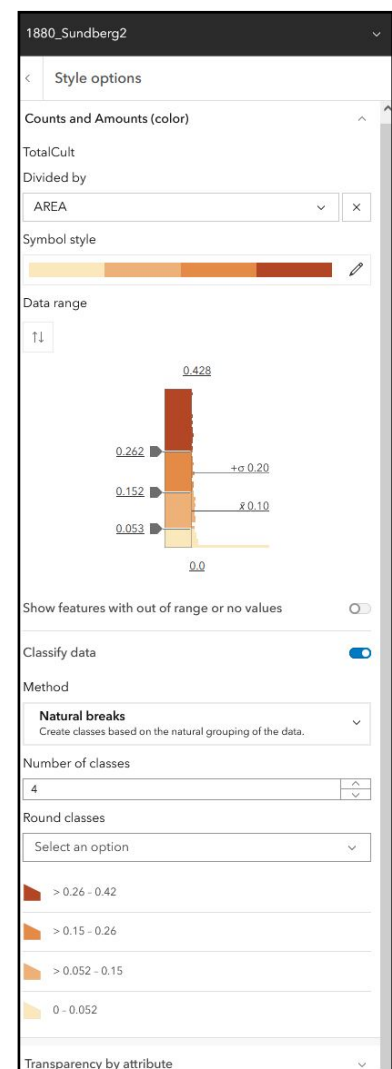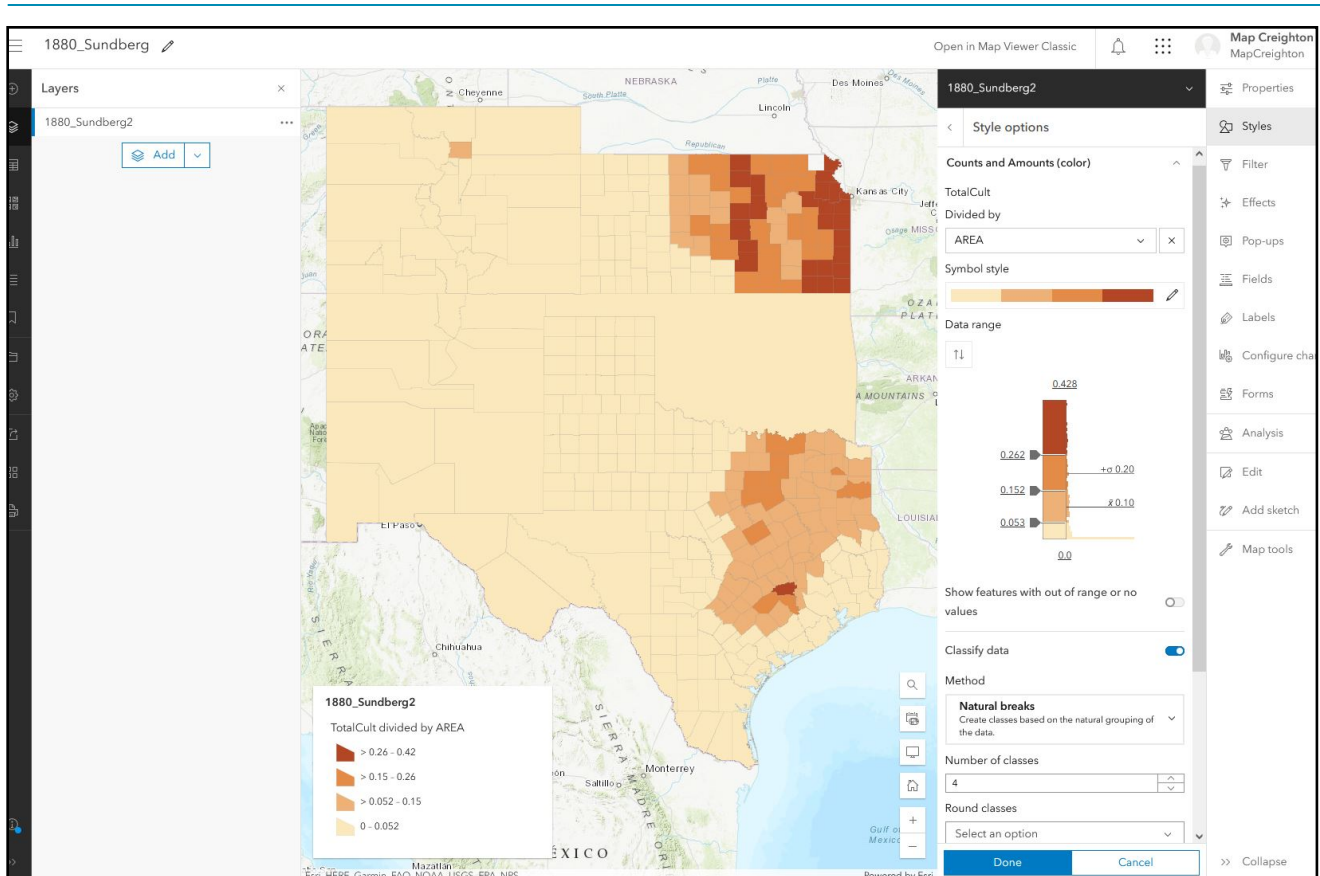
32. Cunfer's argument is about change over time. This is just 1880. Do the same choropleth styling to show changes in the percent of cultivated acreage for 1900 and 1940. Save yourself some time and toggle editing on to add your TotalCult field (with calculation) as soon as you create a hosted feature layer for 1900_youtrlastname. To save you time, I've already added it to 1940.

Post the three maps to the blog and note any key changes you observe between the years you've identified.