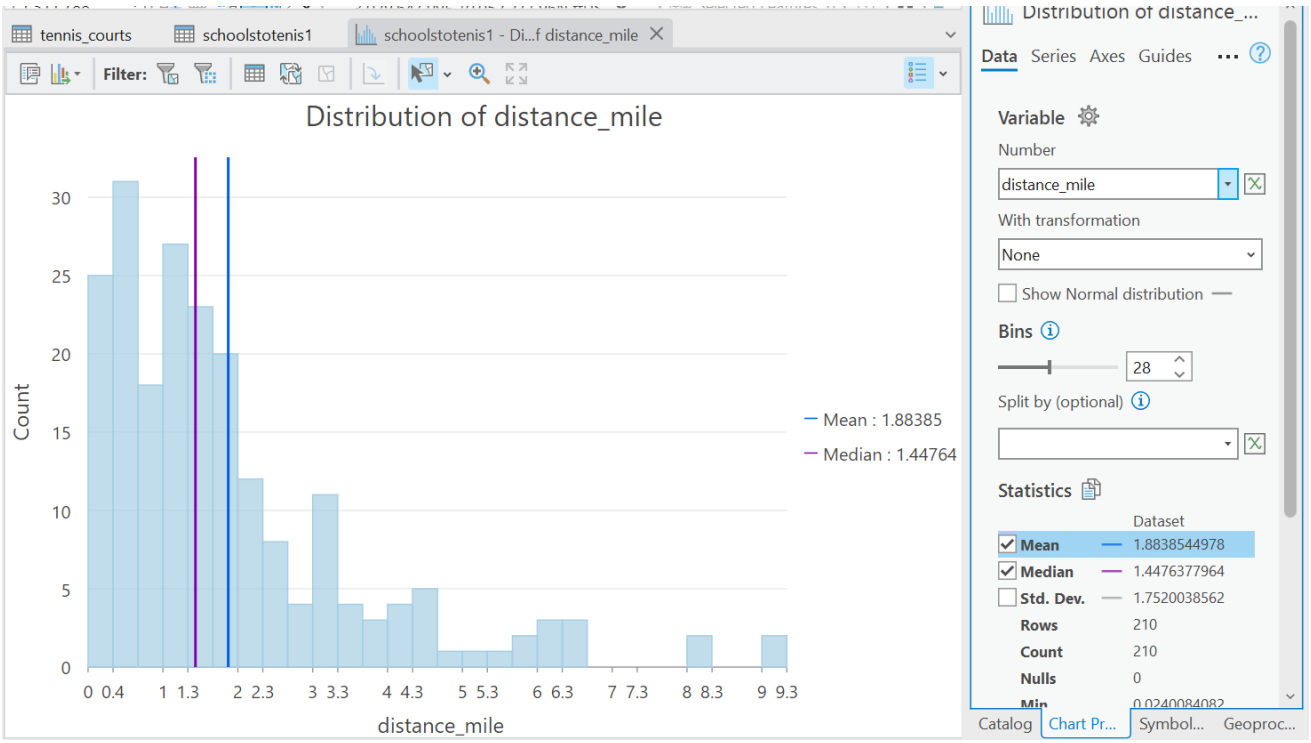
Spatial Analysis II:
Spatial Joins & Overlays

Use Spatial Joins to answer the following questions:

Question 1: A tennis club is implementing an after-school tennis program. Use a spatial join to determine the closest tennis court to each school. What is the average and median distance of schools to tennis courts, in miles? Create a histogram of distances (in miles). **Capture** your histogram and insert it here.

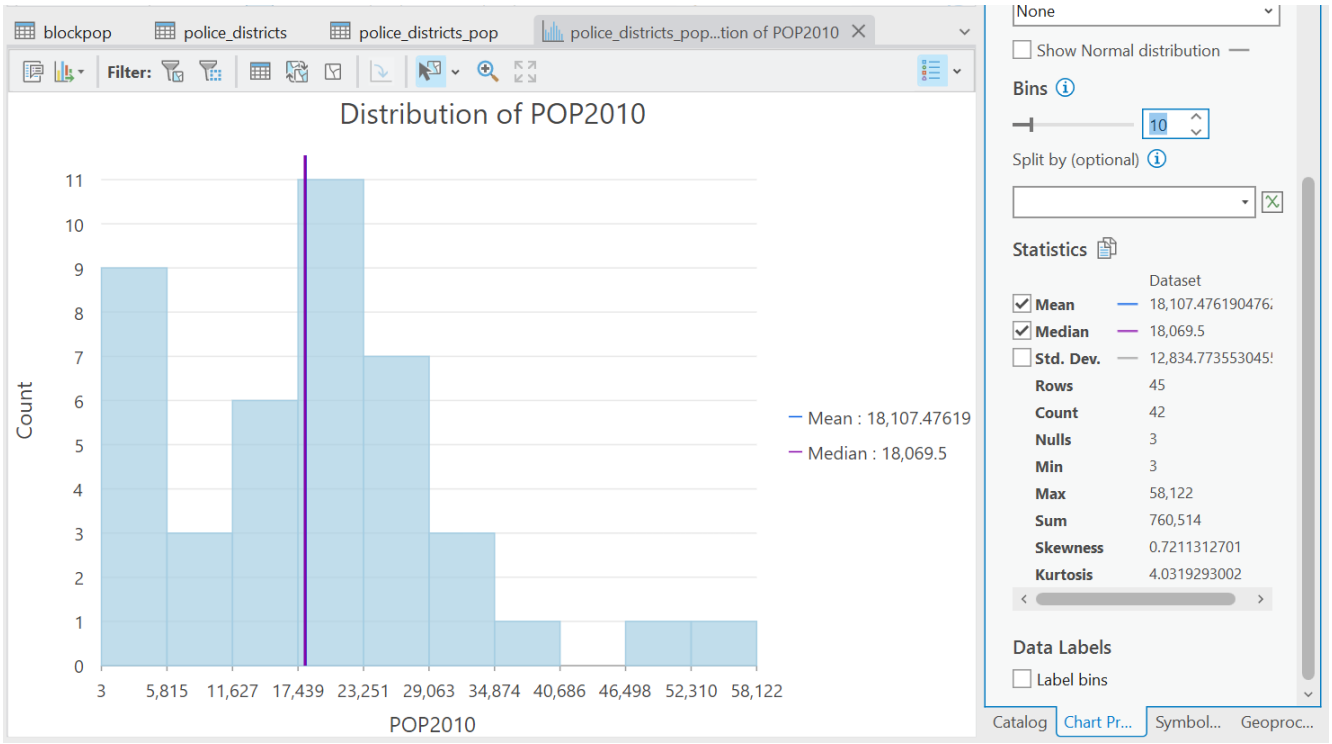
Average Distance: 1.88
Median Distance: 1.45

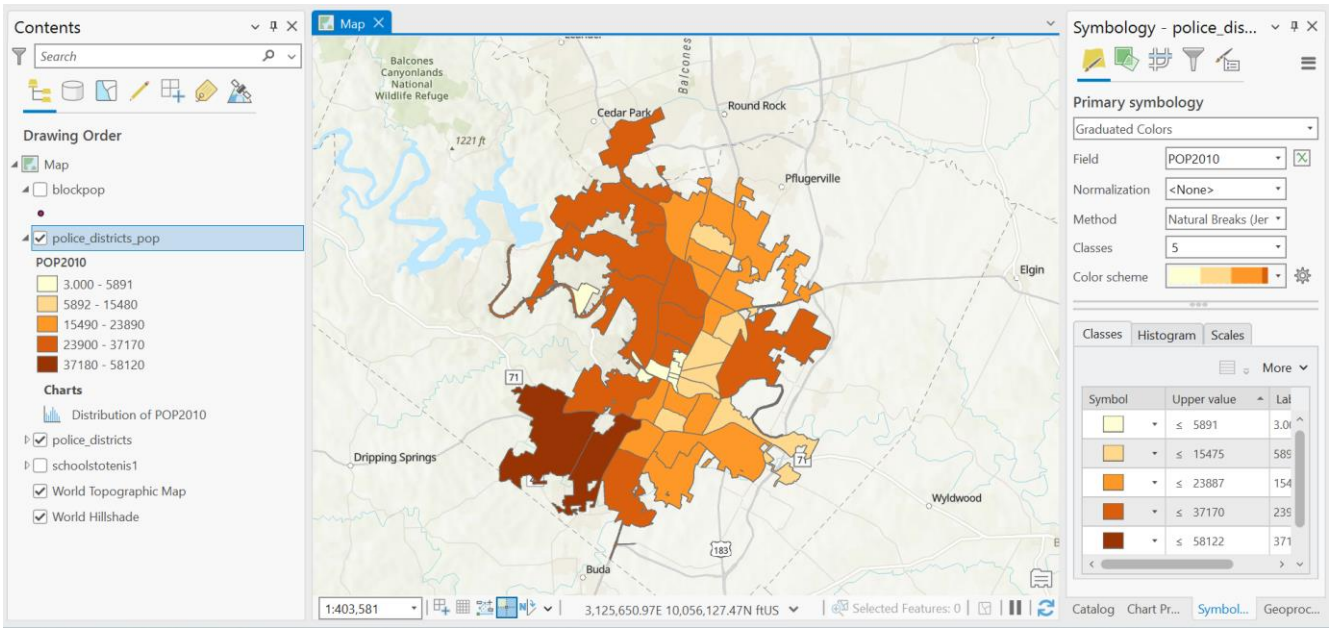


Question 2: A study is being done to evaluate staffing levels in the police districts. Determine the number of people (using the *blockpop* point feature class) living in each district. Calculate the minimum, maximum and median population for each district. Map and chart (histogram) the results (population per district). **Capture** your map (choropleth – 5 classes) and histogram (10 bins) and insert it here. Propose an explanation as to why some of the districts have such low populations compared to other districts (**HINT:** compare the *blockpop* points to a basemap).

Min. Pop: 3 [N.B. There are three sub-districts which have the null value]
Max. Pop: 58122

Median Pop: 18069.5





Looking at the maps, there seems to be a proportional relationship between the size of the district and its population. The bigger the size of the district, the higher the district's population. Additionally, three districts have no population because they are the sub-districts of a larger district, or sector.

Question 3: The University of Texas at Austin received a grant for water quality education. Each school will study aspects of the watershed in which it is located. Create a list of schools, each with its designated watershed. Sort the list alphabetically by school name. **Capture** the results (attribute table) for the first 10 schools, with the grade range and watershed name visible and insert here.

Which watershed has the most schools, and how many does it have?

Watershed: Walnut Creek
Number of schools: 26

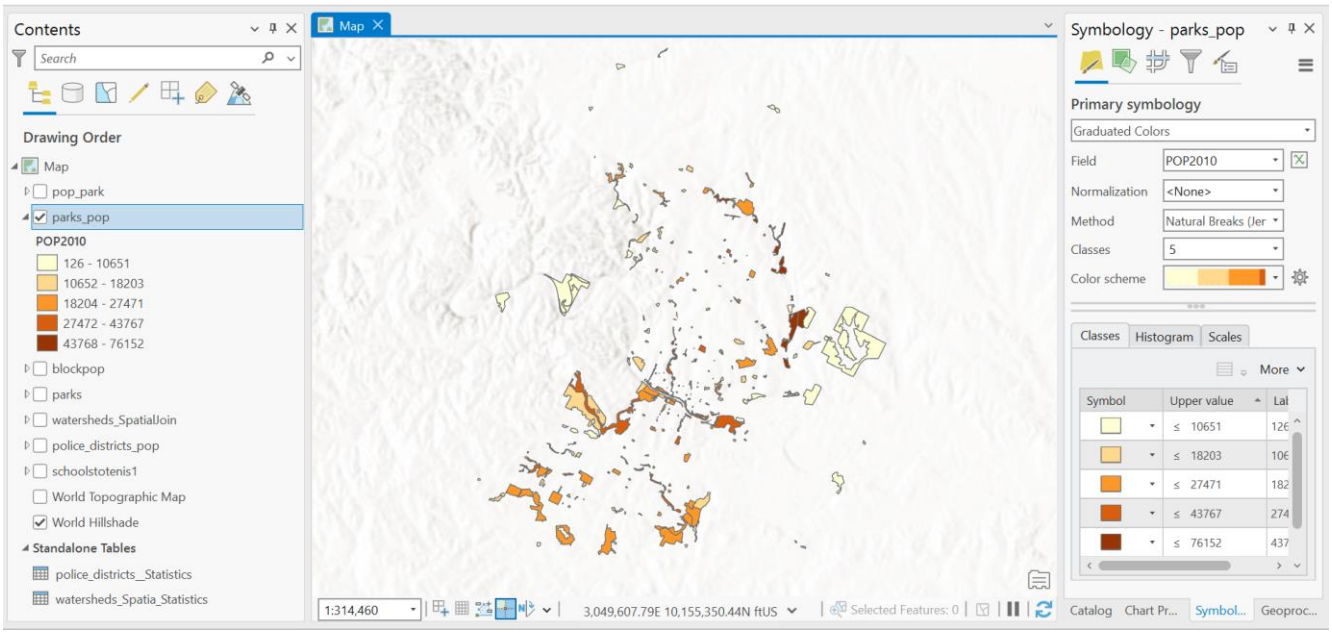
watersheds | watersheds_SpatialJoin

Field: Selection:

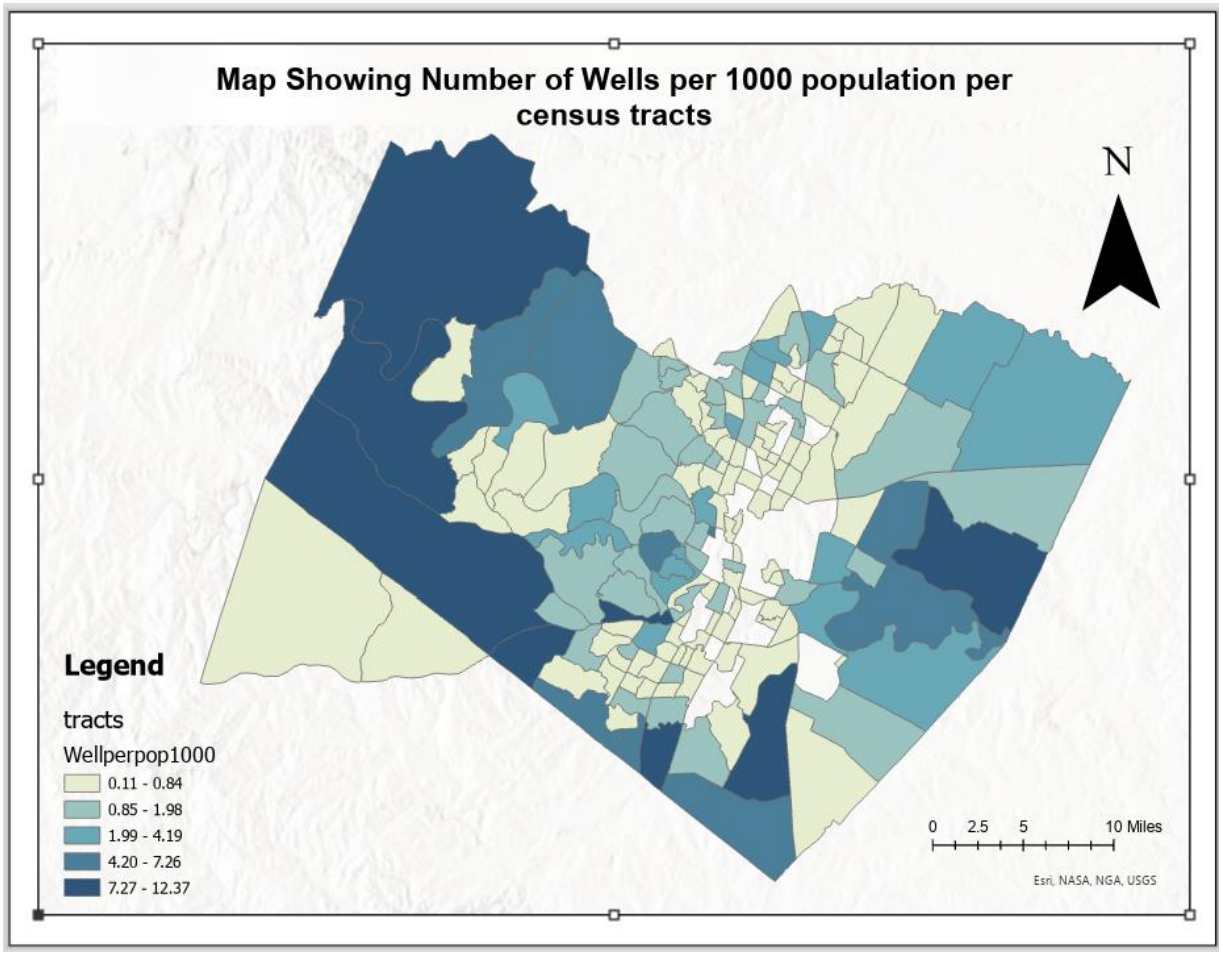
	CAMPNAME	GRADERANGE	DCM_NAME	RECV_WATER	WATERSHED_	RECV_WAT_1
1	AKINS H S	9-12	Slaughter Creek	Onion Creek	94	Colorado Rive
2	ALLAN EL	EE-5	Boggy Creek	Colorado River below L...	17	Colorado Rive
3	ALLISON EL	EE-6	Country Club East	Colorado River below L...	31	Colorado Rive
4	AMERICAN YOUTH W...	9-12	Town Lake	Colorado River below L...	5	Town Lake
5	AMERICAN YOUTHWO...	9-12	Williamson Creek	Onion Creek	113	Colorado Rive
6	ANDERSON H S	9-12	Shoal Creek	Town Lake	2	Town Lake
7	ANDERSON MILL EL	EE-5	Lake Creek	Brushy Creek	70	Brushy Creek
8	ANDREWS EL	EE-5	Little Walnut Creek	Walnut Creek	6	Colorado Rive
9	AUSTIN CAN ACADEM...	9-12	Harper's Branch	Town Lake	58	Town Lake
10	AUSTIN DISCOVERY S...	KG 01 02 03 04 05	Walnut Creek	Colorado River below L...	8	Colorado Rive
11	AUSTIN H S	9-12	Town Lake	Colorado River below L...	5	Town Lake
12	AUSTIN ST HOSPITAL	EE-12	Town Lake	Colorado River below L...	5	Town Lake
13	BAILEY MIDDLE	6-8	Slaughter Creek	Onion Creek	94	Colorado Rive
14	BARRINGTON EL	EE-6	Little Walnut Creek	Walnut Creek	6	Colorado Rive
15	BARTON CREEK EL	KG-5	Barton Creek	Town Lake	1	Town Lake
16	BARTON HILLS EL	EE-6	Barton Creek	Town Lake	1	Town Lake
17	BATY EL	EE-6	Country Club East	Colorado River below L...	31	Colorado Rive
18	BECKER EL	EE-5	West Bouldin Creek	Town Lake	109	Town Lake

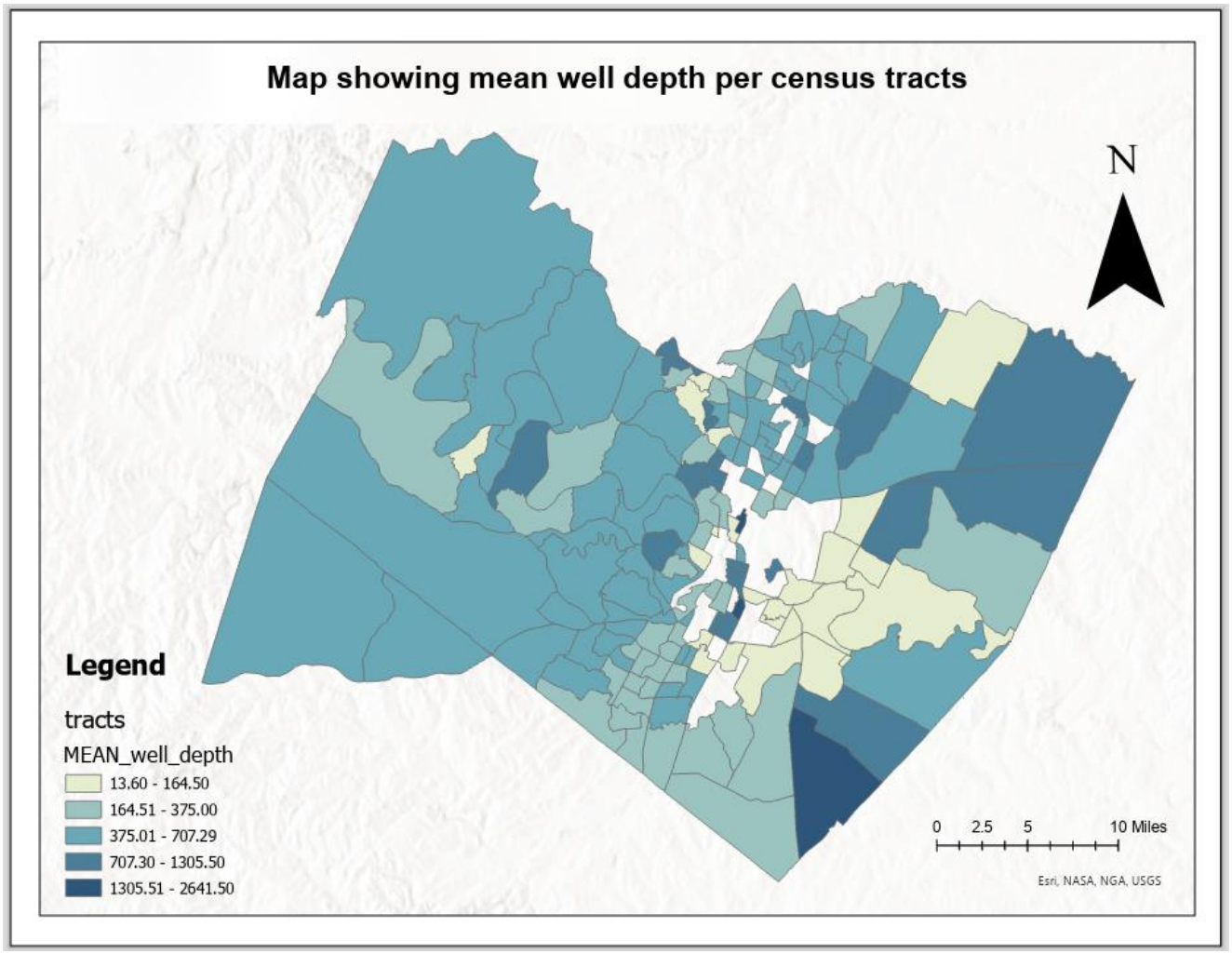
Question 4: A runner's club is analyzing access to parks in Austin. The assumption is that runners will go to the *closest park* and not run to parks more than *one mile away*. Determine the potential usage at each park based on the block population closer to that park than any other, but not more than 1 mile away. (**HINT:** determine the population per park) (**HINT**: Don't double count population). **Create** a map showing the parks in Austin with a symbology displaying the parks in 5 classes based upon potential runners (total population). **Capture** your map (with Table of Contents showing population classes) and insert here.
Which Park has the most potential runners and least potential runners?

Most runners (park name and population): Walnut Creek (76152)
Least runners (park name and potential runners): Onion Creek Wildlife Sanctuary (126)



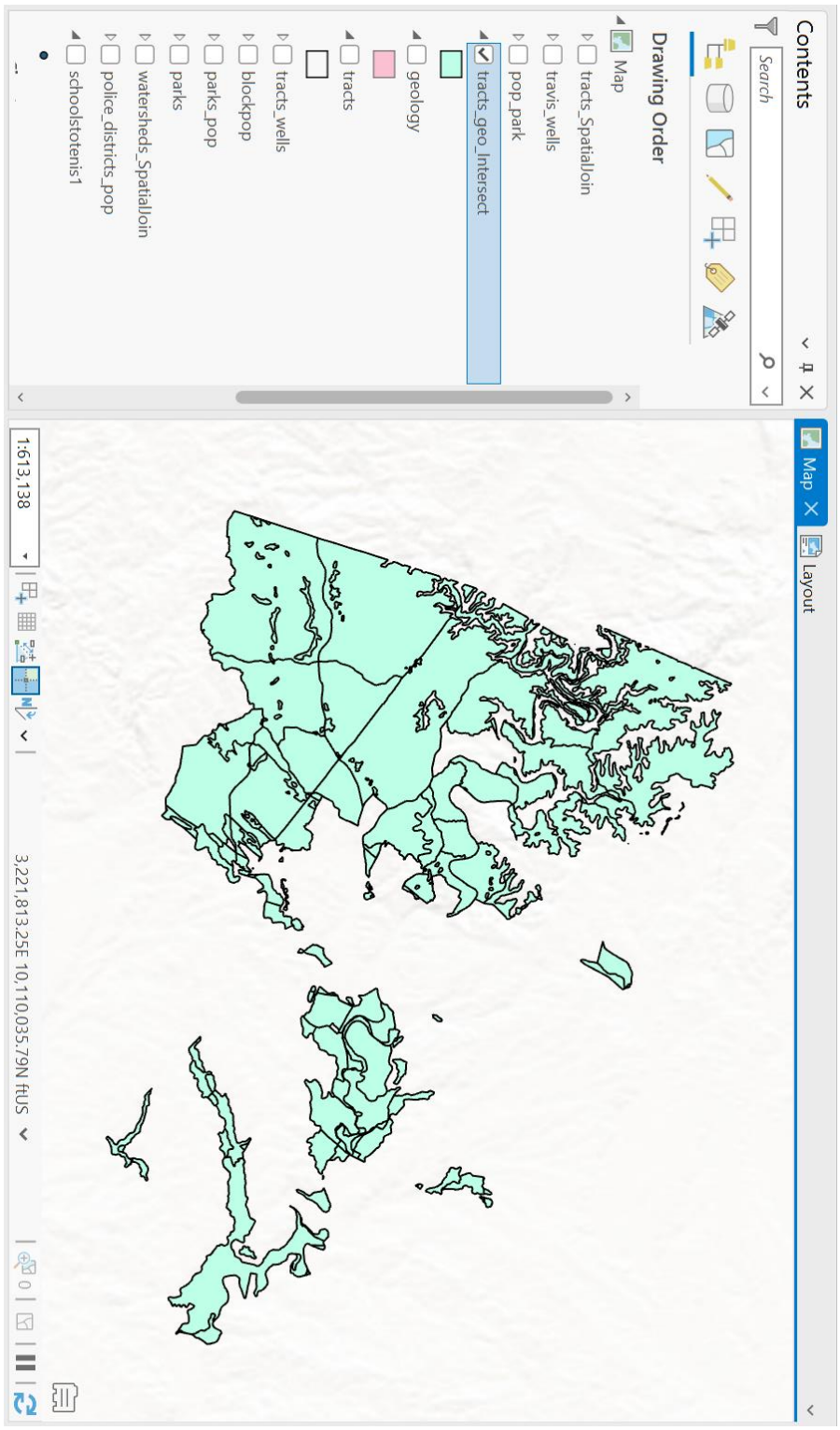
Question 5: Determine the number of wells situated within each census tract in Austin. **Create** a map showing the number of wells per 1000 people (5 classes). **Create** a map showing the mean well depth per census tract (5 classes). **Capture** each map and insert here (be sure that each map contains a title and legend)




Map showing mean well depth per census tracts
N
Legend
tracts
MEAN_well_depth
13.60 - 164.50
164.51 - 375.00
375.01 - 707.29
707.30 - 1305.50
1305.51 - 2641.50
0 2.5 5 10 Miles
Esri, NASA, NGA, USGS

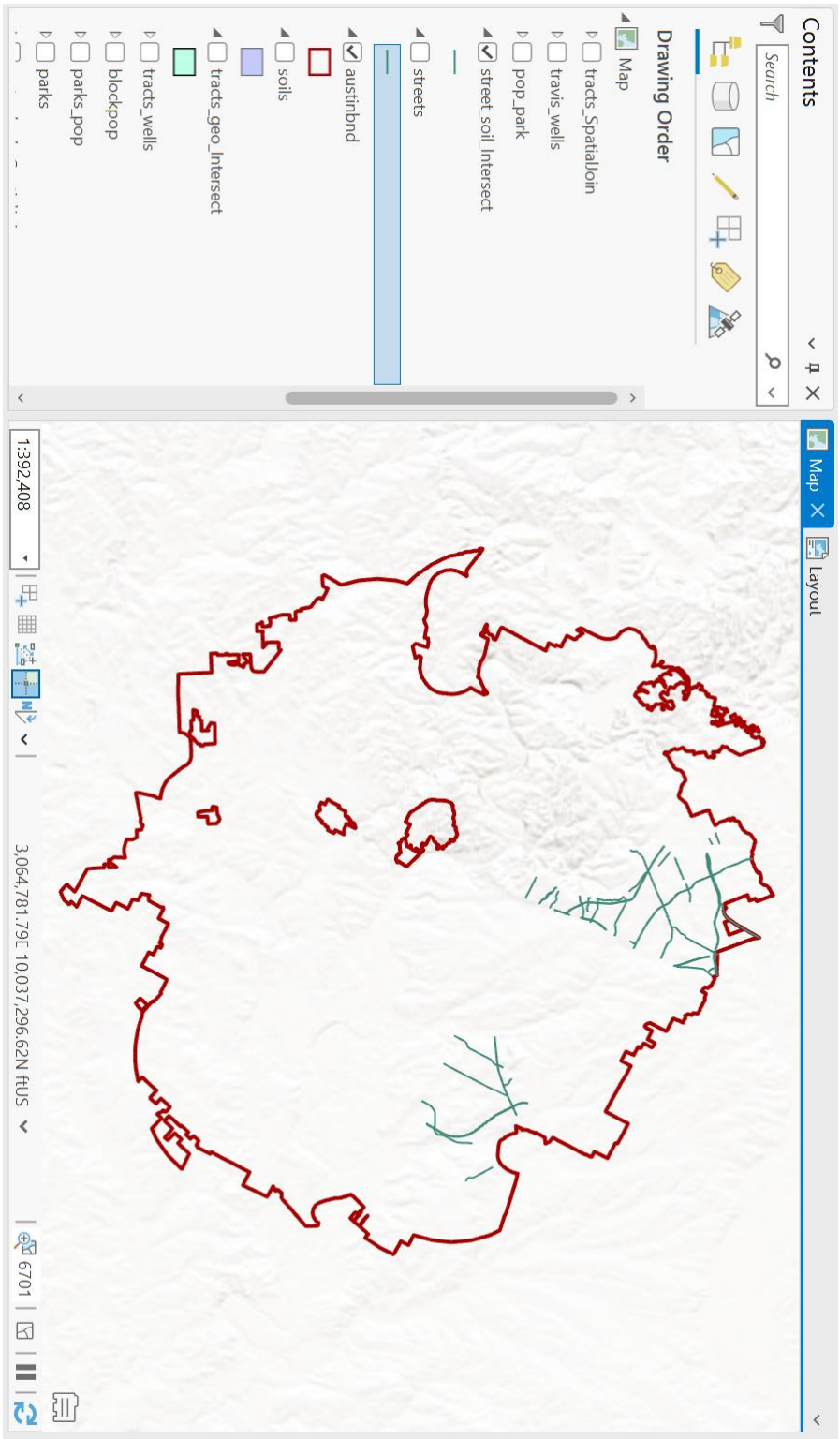
Use Map Overlays to answer the following questions:

Question 6: Septic systems are commonly used in low-density housing areas, but the impacts on aquifers may be of concern. Map the areas of Austin where the census tract population densities are less than 1000 people per square mile and where the geologic unit names contain *Limestone* or *Terrace* or *alluvium*. **Capture** your map and insert it here.



Question 7: The frequency of street repairs is influenced by several factors, including the clay fraction of soils and road usage. How many street miles in Austin have more than 50% clay in their soils and a road class of 5 or less? **Capture** a map showing these roads and insert it here (be sure to include the topographic base map for reference).

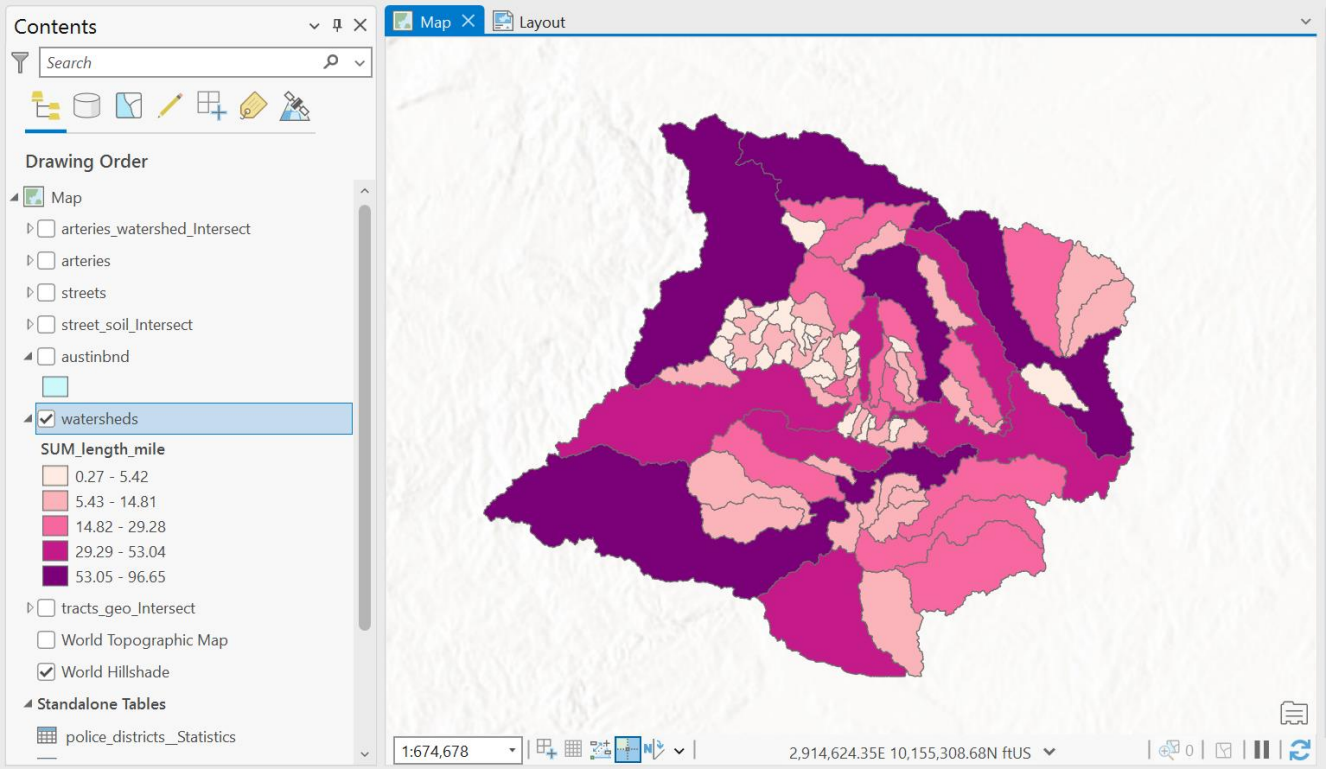
Total miles: 118.699746



Question 8: Water quality and risks of gasoline spills may be affected by the prevalence of road arteries in a watershed. Using the *arteries* feature class, determine the number of road miles in each watershed. Which three watersheds have the highest arteries mileage? **Create** a map showing all the watersheds, classified based upon arteries mileage. **Capture** the map (with the classification visible) and insert it here.

List top three watersheds and their arteries mileage:

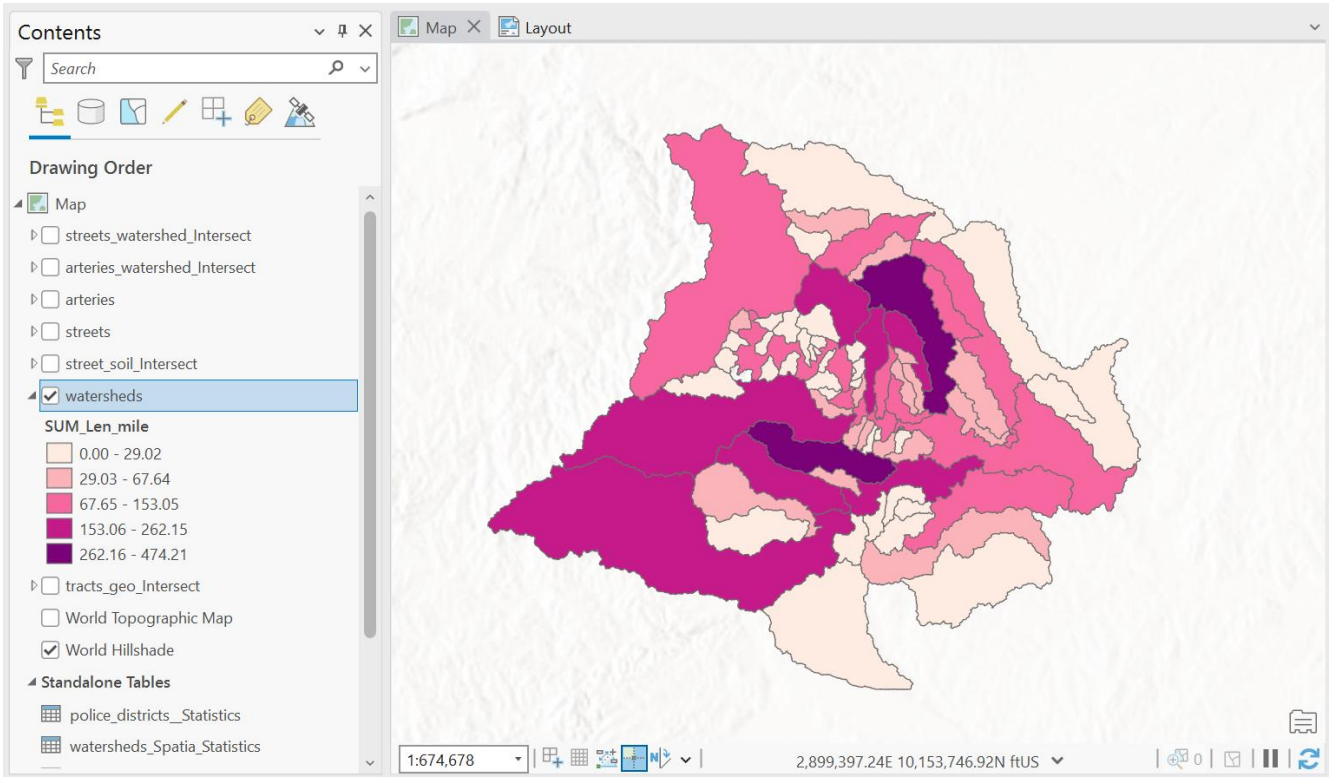
Onion Creek	**96.651942**
Walnut Creek	**74.000086**
Brushy Creek	**72.223498**



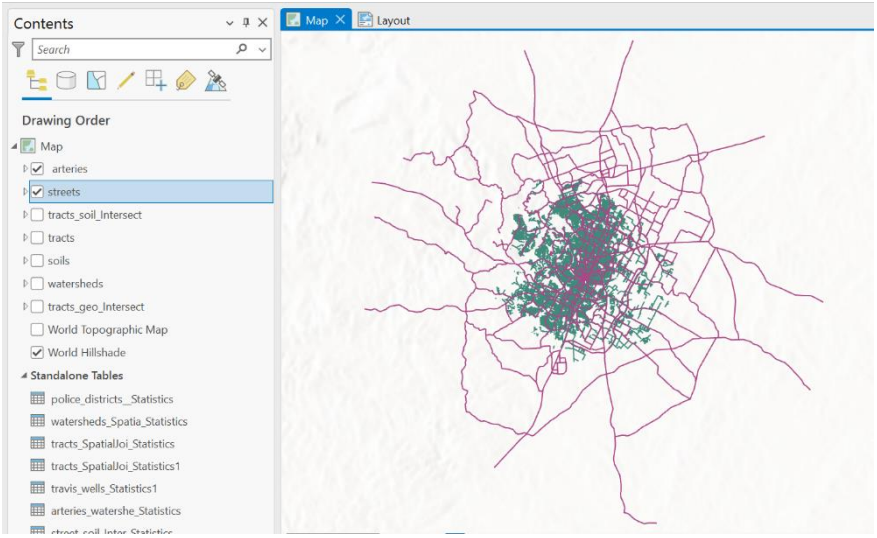
Question 9: Perhaps the total street miles is a better mileage than the arteries. Repeat the watershed analysis using the *streets* feature class and compare the results. List the three watersheds with the highest street mileage. **Create** a map showing all the watersheds, classified based upon street mileage. **Capture** the map (with the classification visible) and insert it here. Compare this map with the one for question 8. What significant issue impacts the quality of this map (question 9)? (**HINT:** Look at the different datasets (layers)).

List top three watersheds and their street mileage:

Walnut Creek	**474.211746**
Williamson Creek	**400.921909**
Slaughter Creek	**262.154562**



The results are different because of the layers (arteries and streets) used in the analysis. From the following map, it's clear that the arteries map covers a larger area than the street map. The street layer is concentrated in the center of the watershed map, which influences the classification of the watershed map.



As the classification is created based on the total mileage of the features within the watershed area, because of the dispersed nature of the arteries, high mileage is shown on the outer side of the watershed. On the contrary, because of the concentration in the center, the high mileage of the streets is almost in the center of the watershed area.

Question 10: The impact on flooding on Austin would depend on the flood frequency and the density of the population. Use the *tracts* and *soils* feature classes to calculate a flood impact index based on the population density times the flood frequency (*AFLDFREQ* field), scaled from 1-10. **Create** a map showing census tracts classified according to the Flood Impact Index (1-10). **Capture** your map (including the classification categories) and insert it here. What aspect of the input data most limits the applicability of this map?

Because of the negative value of flood frequency data, we get some negative values in the index which limits the applicability of this map.