Raster Analysis

These questions will require you to use the skills and information you learned in Tutorial 12 and the reading in Chapter 11. They involve working with raster data, which allows for many different types of analysis compared to vector data.

To answer the questions you will need to use the data in the following folders:

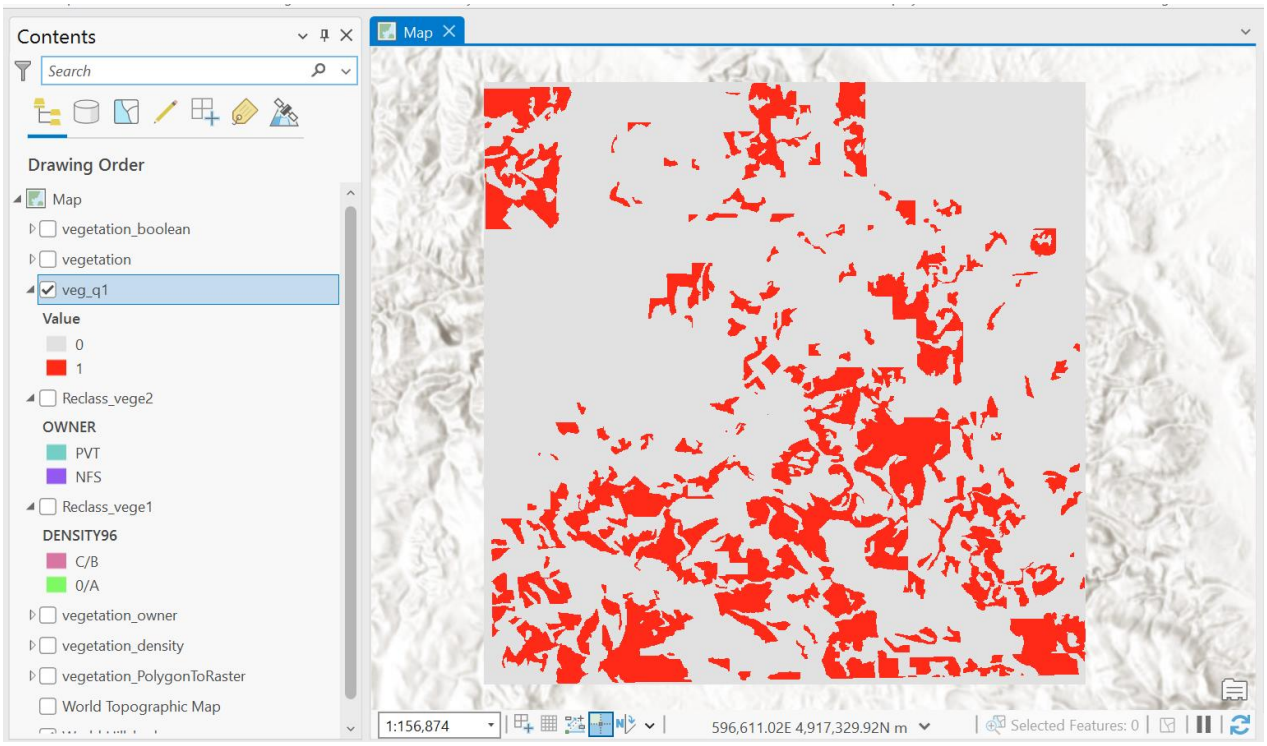
mgisdata\BlackHills

Note: For all raster outputs to questions, cells that are not of interest should have a value of 0 and be colored gray 10%.

Step 1: Create your own file geodatabase to store all of your output for the questions below. Name your geodatabase *Exercise11*.

Step 2: Set the Geoprocessing Environments to:
Workspace = *Exercise11* geodatabase
Cell size = 30m
Masks = off

Question 1: Create a Boolean raster showing areas where the density of vegetation is open (DENSITY96 is 0 or A) and the land is owned by the forest service (OWNER is NFS). **Capture** the map and Table of Contents (insert here). (**Remember:** in a raster, the areas of interest should have a value of 1 and the areas not of interest should have a value of 0. Color your 0 values gray 10%).

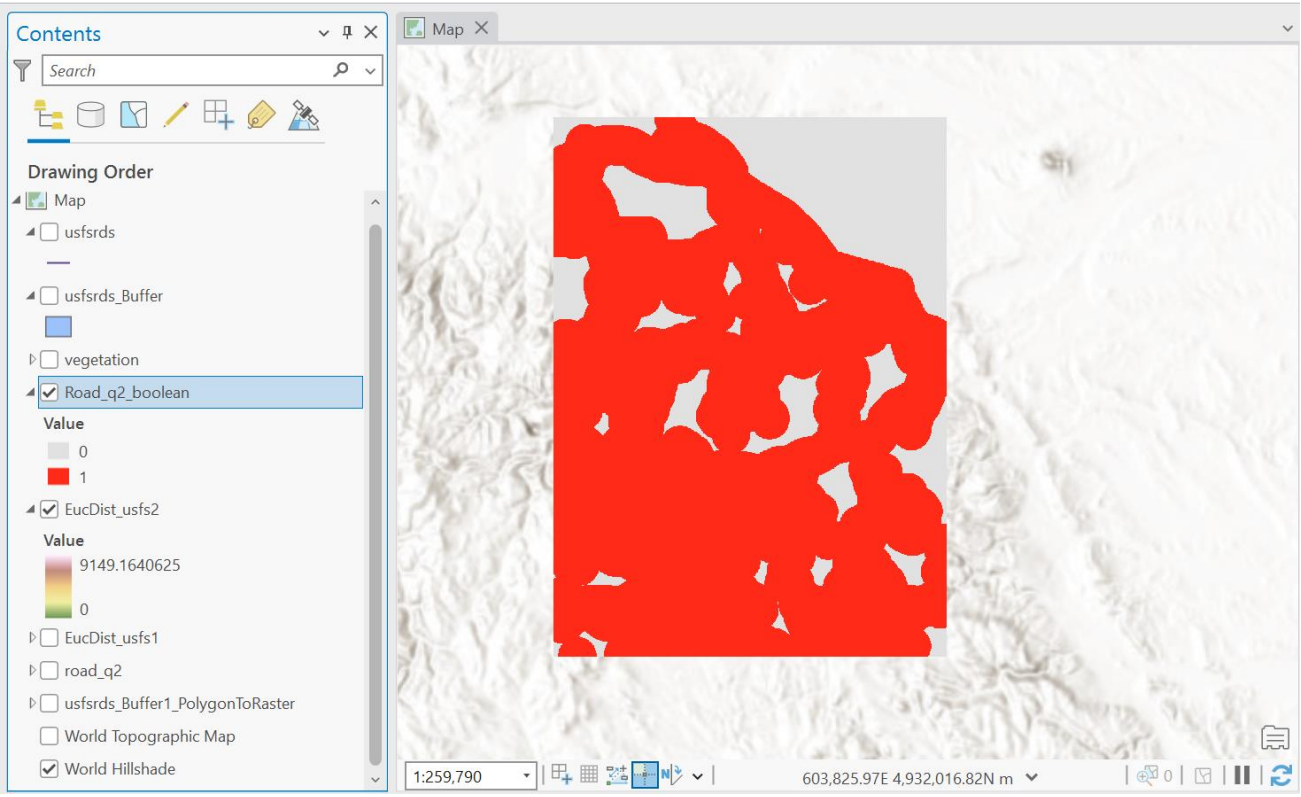


veg_q1

Field: Selection:

	OBJECTID *	Value	Count
1	1	0	360133
2	2	1	96167
	Click to add new row.		

Question 2: Create a Boolean raster showing the areas that are within 1000 meters of a primary or secondary road (TYPE = P or S). **Capture** your map and table of contents (insert here).

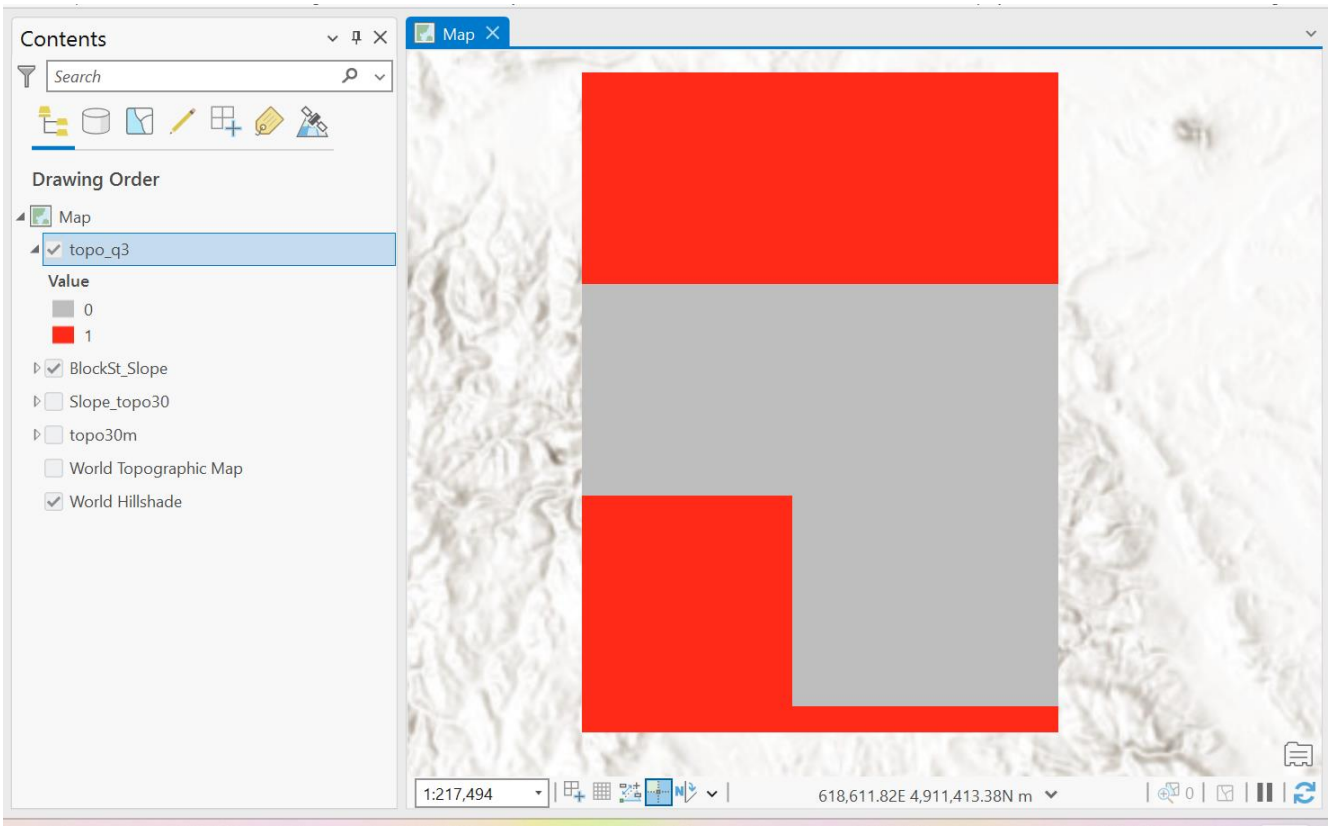


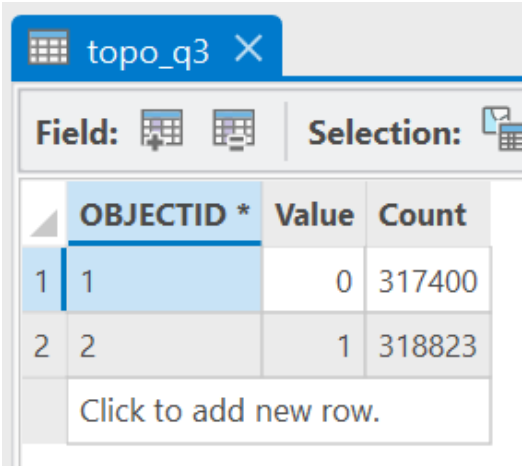
usfsrds Road_q2_boolean

Field: Selection:

	OBJECTID *	Value	Count
1	1	0	140796
2	2	1	489066
	Click to add new row.		

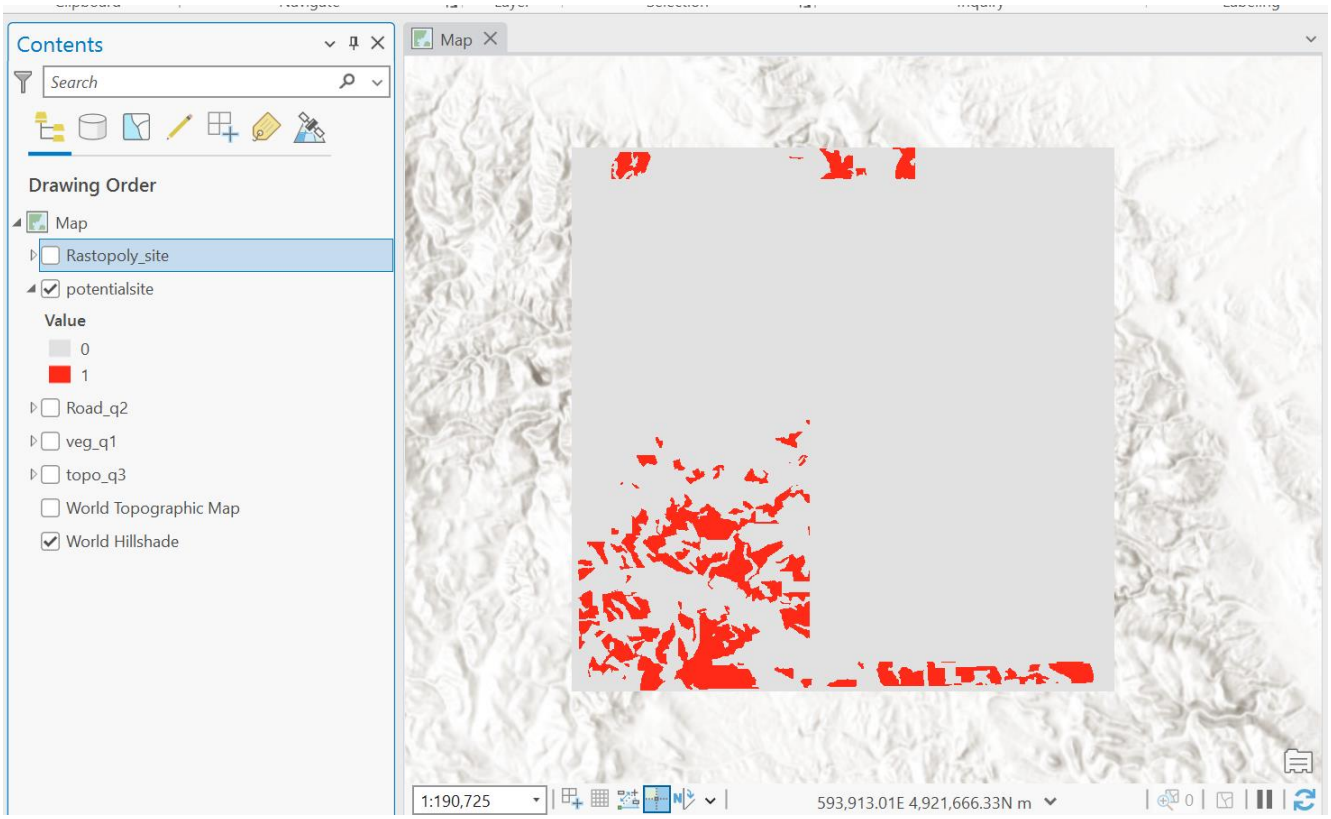
Question 3: Use Block statistics on the *slope30m* raster (created in the tutorial) to calculate average slopes over 300 x 300 meter areas. Then create a Boolean raster showing where the average slopes are <10 degrees. **Capture** your map and Table of Contents (insert here).





Question 4: Imagine that you are looking for a good landfill site. Use the rasters produced in Questions 1-3 (above) to create a Boolean raster showing the areas where all three conditions are met. What is the total area of these potential sites? **Capture** your map and Table of Contents (insert here).

The total area of these potential sites: **29837286.933437 sq.meter** (*if I convert the rater into polygon)
29939400 sq.meter (*direct raster area calculation)



potentialsite

Field: Selection:

	OBJECTID *	Value	Count	area_sqm
1	1	0	423034	380730600
2	2	1	33266	29939400
	Click to add new row.			

Rastopoly_site | Rastopoly_site_Statistics

Rastopoly_site

Selection:

	OBJECTID *	gridcode	FREQUENCY	SUM_Shape_Area
1	1	0	9	380832713.066526
2	2	1	75	29837286.933437
	Click to add new row.			

Question 5: The site must be at least 1 sq. km in area to be considered for the landfill. **Create** a helpful map (with Title, Legend, etc.) of the sites meeting this criterion, labeled with the site area in square kilometers and including helpful information, such as streams and roads, for the final selection. Save map as a **PDF**. How many potential sites meet the minimum area criterion? (**HINT**: Convert the sites to polygons).

There are a total of six potential sites which meet certain criteria.

Question 6: Which geologic unit has the highest average slope? Which has the lowest? What is the average slope for each one? **Capture** the table (insert here)

Trachytic intrusive rocks 19.82944 meters
Belle Fourche Shale 2.59998 meters

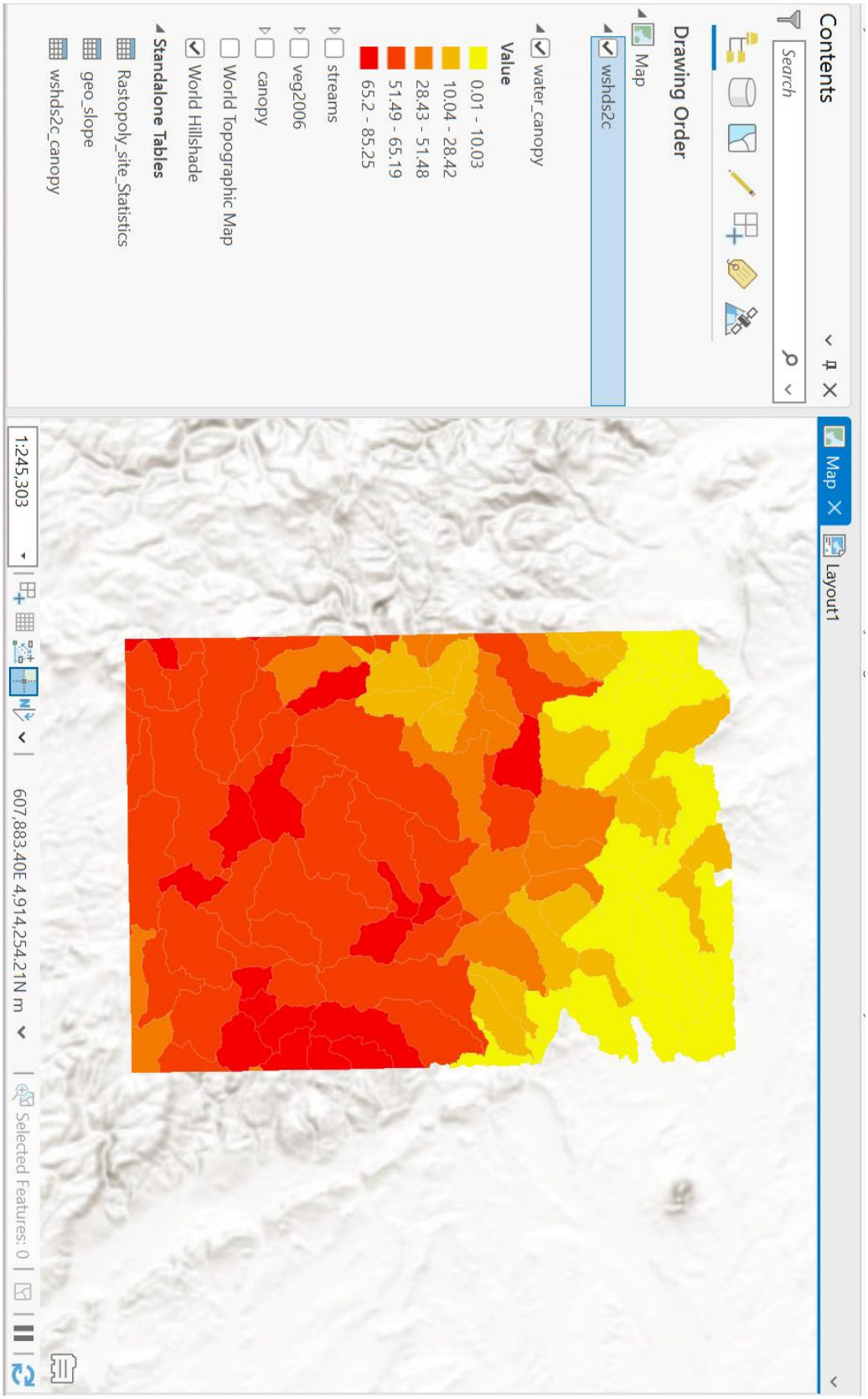
geo_slope

Field: Selection:

	OBJECTID *	UnitName	ZONE_CODE	MEAN	COUNT	AREA
1	6	Belle Fourche Shale	6	2.59998	2996	2696400
2	3	Mowry Shale	3	2.783146	25716	23144400
3	4	Terrace deposits	4	2.857641	11696	10526400
4	1	Alluvium	1	3.033259	28956	26060400
5	7	Spearfish Fm	7	4.763477	26757	24081300
6	25	Older metasedimentar...	25	5.147879	1004	903600
7	27	Granite	27	5.60112	354	318600
8	26	Iron formation	26	5.845898	194	174600
9	21	Metagraywacke	21	7.007696	25737	23163300
10	23	Metamorphosed carbo...	23	7.330358	5088	4579200
11	22	Metamorphosed black...	22	7.546236	6633	5969700
12	2	Inyan Kara Group	2	8.987257	43224	38901600
13	5	Morrison Fm	5	9.015412	31186	28067400
14	15	Metaquartzite	15	9.260675	3847	3462300
15	10	White River Group	10	9.357215	20625	18562500
16	8	Minnekhata Limestone...	8	9.633381	35352	31816800
17	24	Colluvium	24	10.141698	687	618300
18	11	Whitewood/Deadwood...	11	11.57618	65557	59001300
19	18	Metamorphosed shale	18	11.643103	25817	23235300
20	20	Metabasalt	20	11.691008	10286	9257400
21	12	Rhyolite instrusive rocks	12	12.092559	17264	15537600
22	9	Minnelusa Fm	9	13.030741	68316	61484400
23	17	Metamorphosed siltsto...	17	13.532725	15762	14185800
24	16	Landslide deposits	16	15.017323	54567	49110300
25	14	Pahasapa and LowerPz...	14	15.615672	67024	60321600
26	13	Madison Group	13	16.492949	10318	9286200
27	19	Trachytic intrusive rocks	19	19.82944	6536	5882400

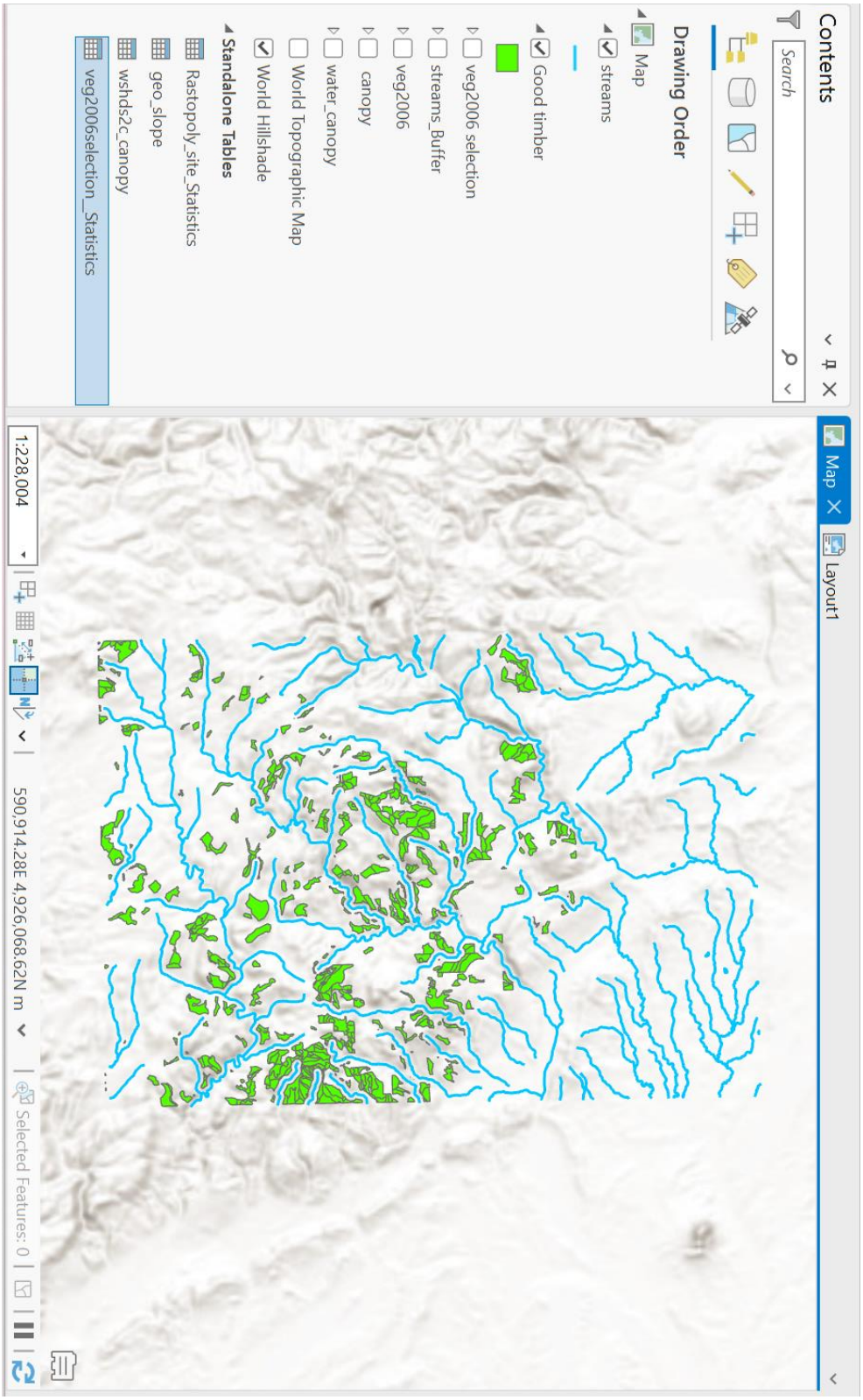
Click to add new row.

Question 7: The *canopy* raster contains the forest canopy percentage. Create a map of *wshds2c* showing the average canopy percentage for each watershed. **Capture** your map and Table of Contents (insert here).



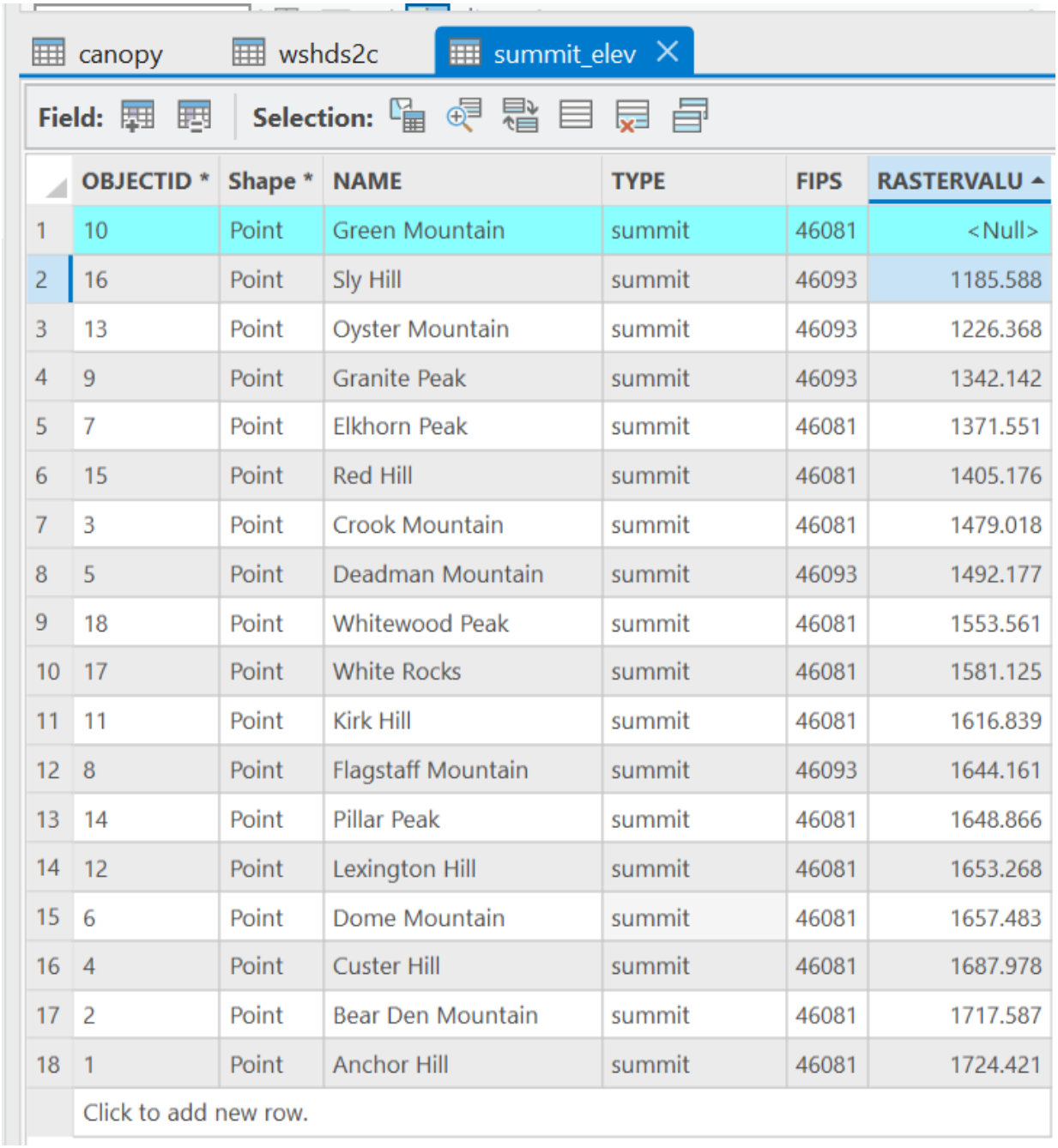
Question 8: Prime harvestable timber in the Black Hills has *SSTAGE96 = 4C or 5* and is more than 200 meters from a stream. How much good timber is available, in square kilometers? Create a map showing the timber and streams. **Capture** the map and Table of Contents (insert here).

Good timber: 41.368576 square kilometers



Question 9: Which of the summits has the highest elevation? Which has the lowest? What are their elevations?

Anchor Hill 1724.421 meters
Sly Hill 1185.588 meters



	OBJECTID *	Shape *	NAME	TYPE	FIPS	RASTERVALU
1	10	Point	Green Mountain	summit	46081	<Null>
2	16	Point	Sly Hill	summit	46093	1185.588
3	13	Point	Oyster Mountain	summit	46093	1226.368
4	9	Point	Granite Peak	summit	46093	1342.142
5	7	Point	Elkhorn Peak	summit	46081	1371.551
6	15	Point	Red Hill	summit	46081	1405.176
7	3	Point	Crook Mountain	summit	46081	1479.018
8	5	Point	Deadman Mountain	summit	46093	1492.177
9	18	Point	Whitewood Peak	summit	46081	1553.561
10	17	Point	White Rocks	summit	46081	1581.125
11	11	Point	Kirk Hill	summit	46081	1616.839
12	8	Point	Flagstaff Mountain	summit	46093	1644.161
13	14	Point	Pillar Peak	summit	46081	1648.866
14	12	Point	Lexington Hill	summit	46081	1653.268
15	6	Point	Dome Mountain	summit	46081	1657.483
16	4	Point	Custer Hill	summit	46081	1687.978
17	2	Point	Bear Den Mountain	summit	46081	1717.587
18	1	Point	Anchor Hill	summit	46081	1724.421
	Click to add new row.					

Question 10: Create a raster with an integer canopy index that ranges from 1 to 5. Create another raster with an integer slope index that ranges from 1 to 5. From these, produce a raster showing an erosion potential index based on canopy and slope (**Hint:** Use Reclassify). **Create** a helpful map (with Title, Legend, etc.) showing erosion potential. Include helpful information such as roads. Save map as a **PDF.**