CE203: Geospatial Engineering

Assignment 5: Geoprocessing

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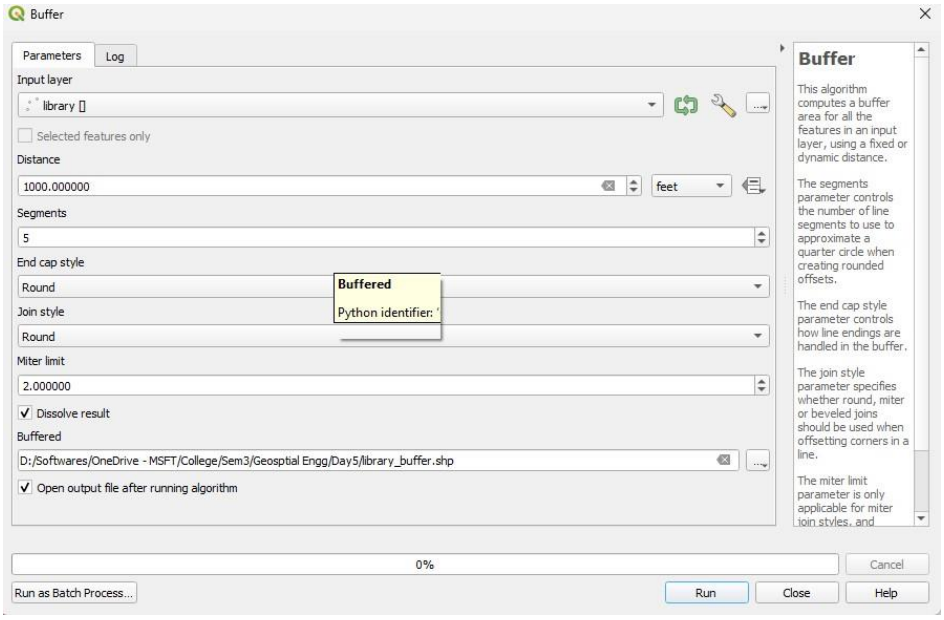
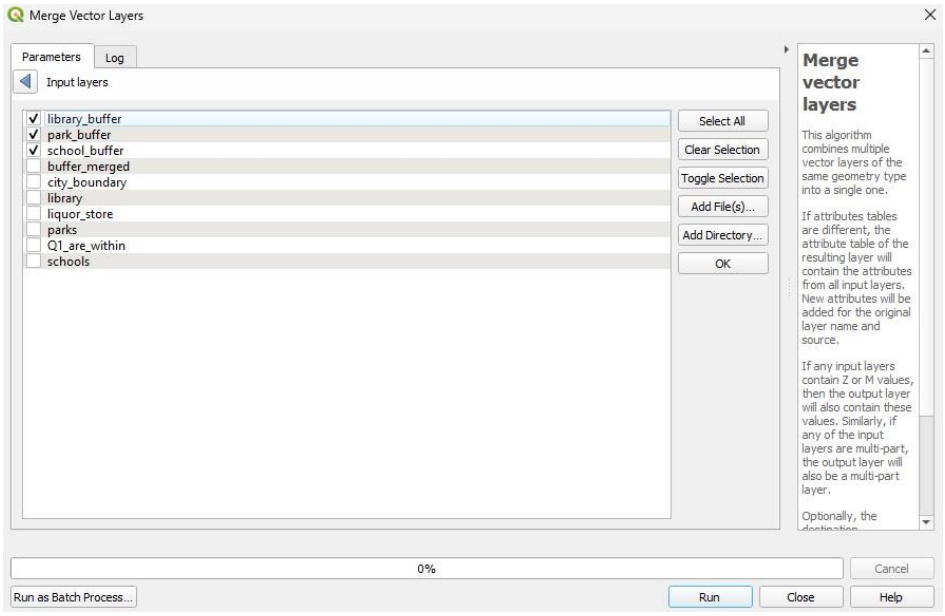
1. **Too many liquor stores**
   As a GIS analyst, you have been tasked with assisting the city council in addressing concerns about the high number of liquor stores and related issues in the city. Using QGIS, you need to perform the following tasks, which will play a crucial role in building support for the new ordinance and making informed decisions for the city's future.

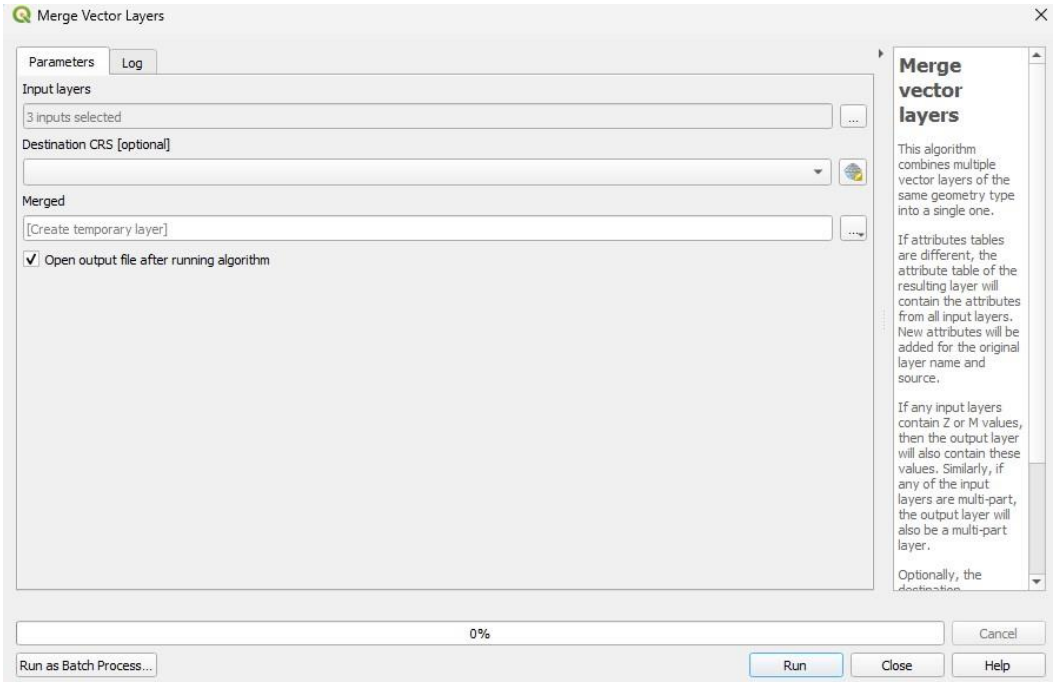
   a) Analyze the existing liquor stores and identify how many liquor stores are within 1,000 feet of schools, libraries, and parks.

   First, we'll create buffer of 1000 feet for schools, libraries and parks.

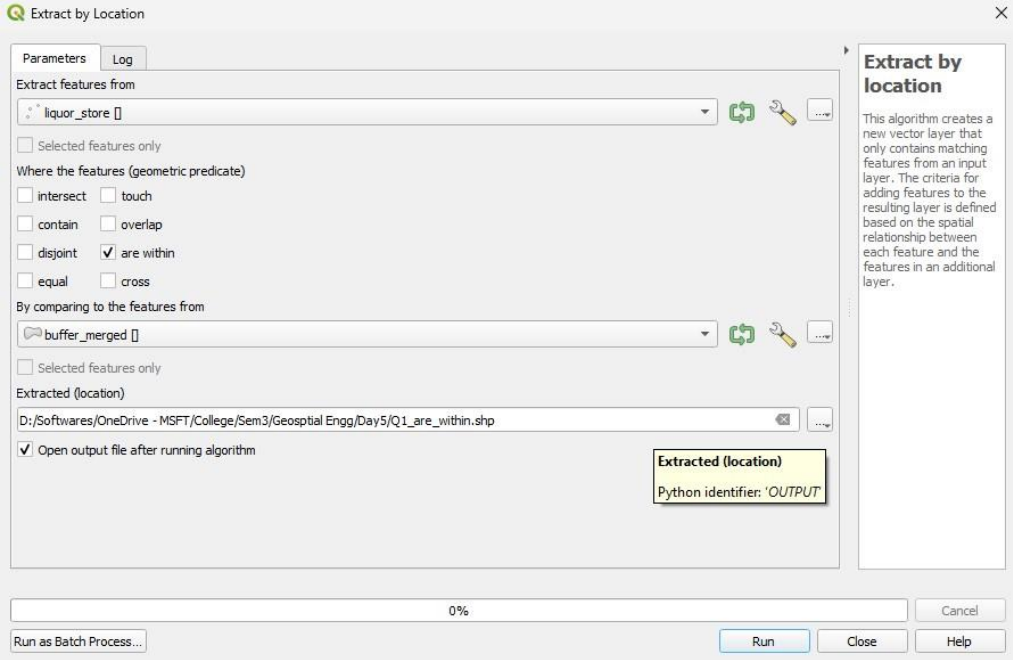


   Next, we will use the *Merge Vector Layers* tool to combine all the buffered layers.

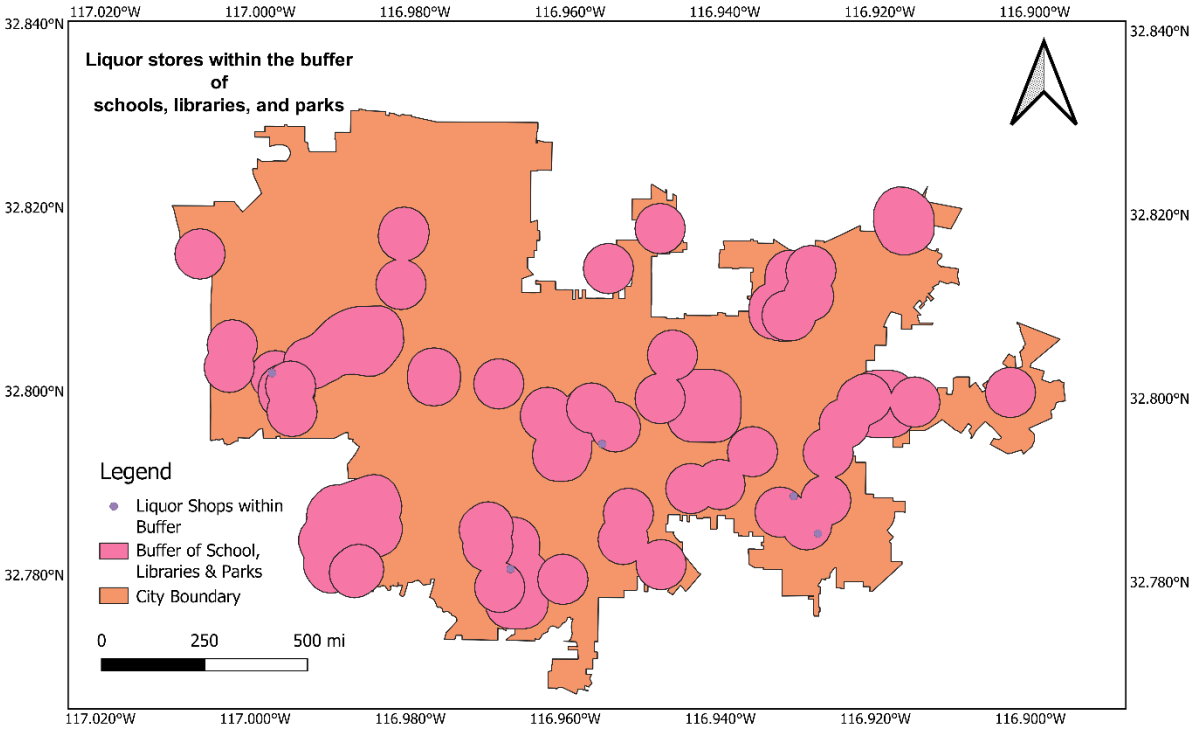




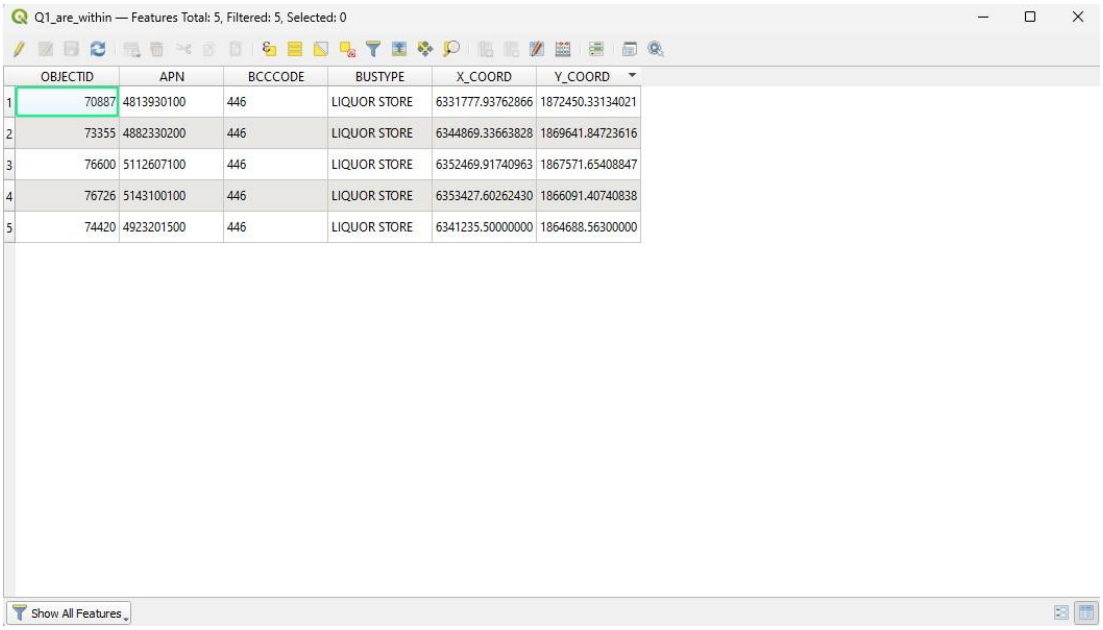
It will give a merged layer, then we will use *Extract by Location* to extract the data of Liquor shops in the buffered region.



Below is the map showing the liquor shops in the 1000 feet of Schools, Libraries and parks,



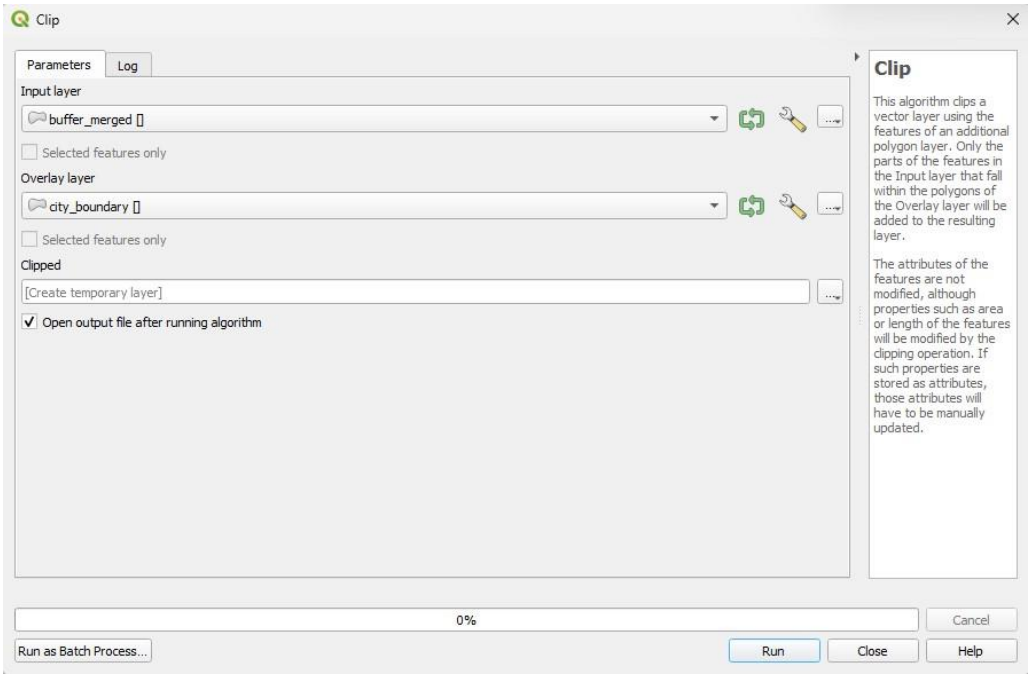
So, there are **5** liquor stores are within 1,000 feet of schools, libraries, and parks, as verified from the attribute table.



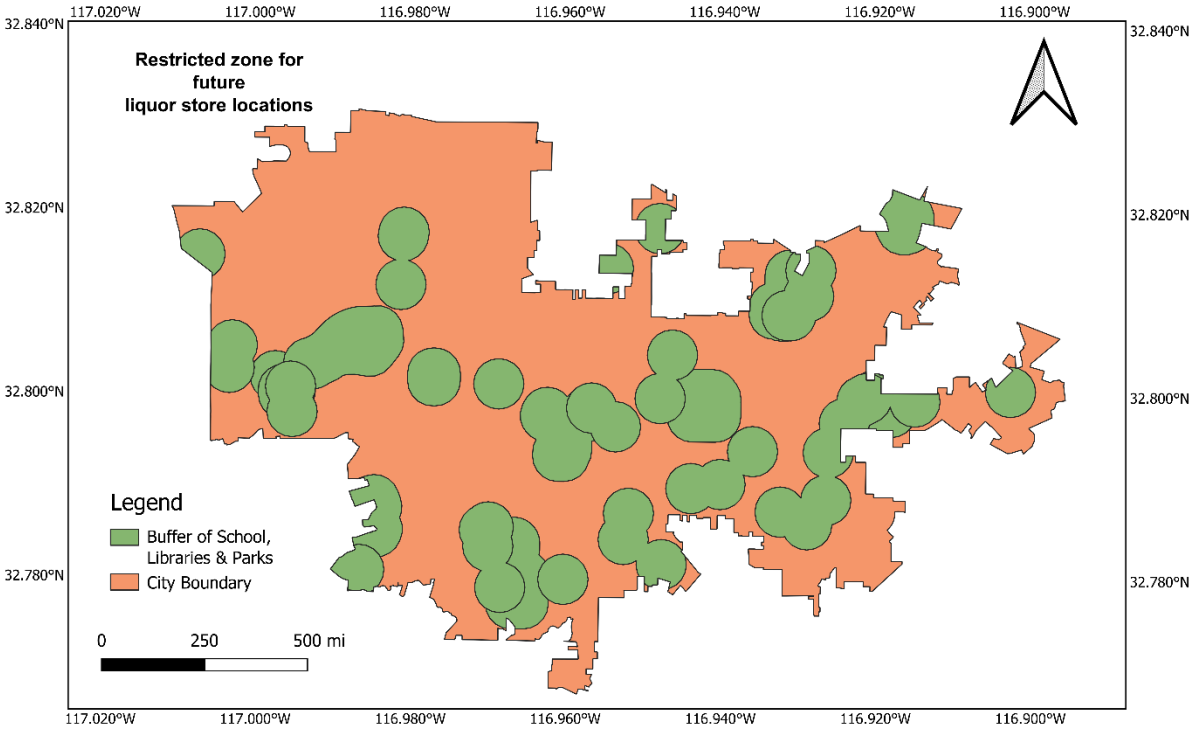
	OBJECTID	APN	BCCCODE	BUSTYPE	X_COORD	Y_COORD
1	70887	4813930100	446	LIQUOR STORE	6331777.93762866	1872450.33134021
2	73355	4882330200	446	LIQUOR STORE	6344869.33663828	1869641.84723616
3	76600	5112607100	446	LIQUOR STORE	6352469.91740963	1867571.65408847
4	76726	5143100100	446	LIQUOR STORE	6353427.60262430	1866091.40740838
5	74420	4923201500	446	LIQUOR STORE	6341235.50000000	1864688.56300000

b) Create a map showing the restricted zone for future liquor store locations, considering the 1,000-foot buffers around schools, libraries, and parks.

In part (a) we have already created a buffer around schools, libraries, and parks. Some parts of the buffered area extended beyond the city boundary. Therefore, we used the *Clip* tool from the *Geoprocessing* menu to create a map of the restricted zone for future liquor store locations.

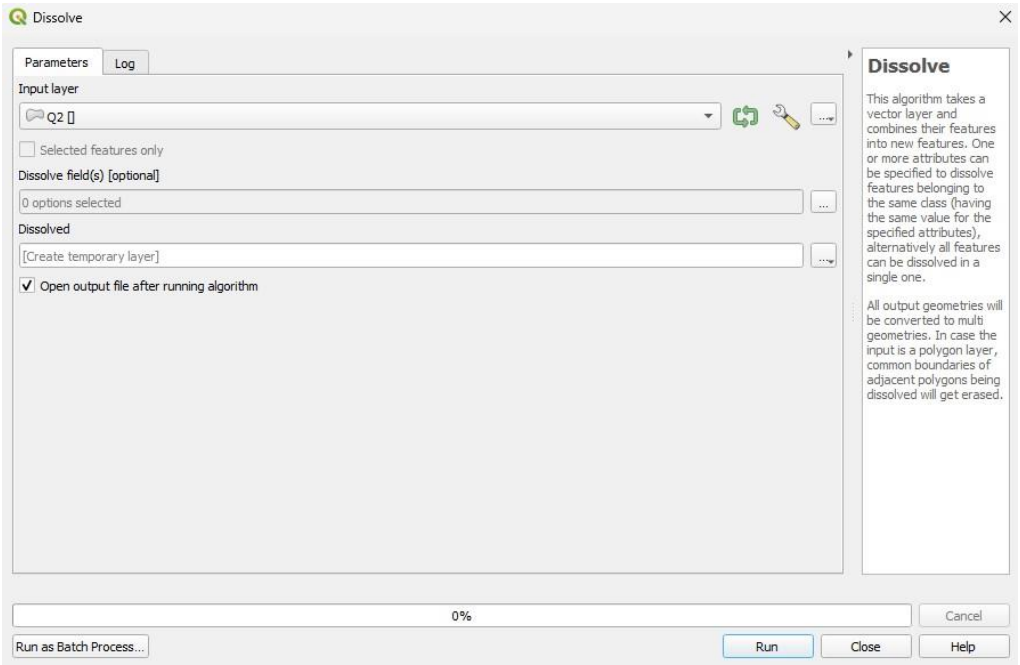


Here the map showing the restricted zone for future liquor store locations,

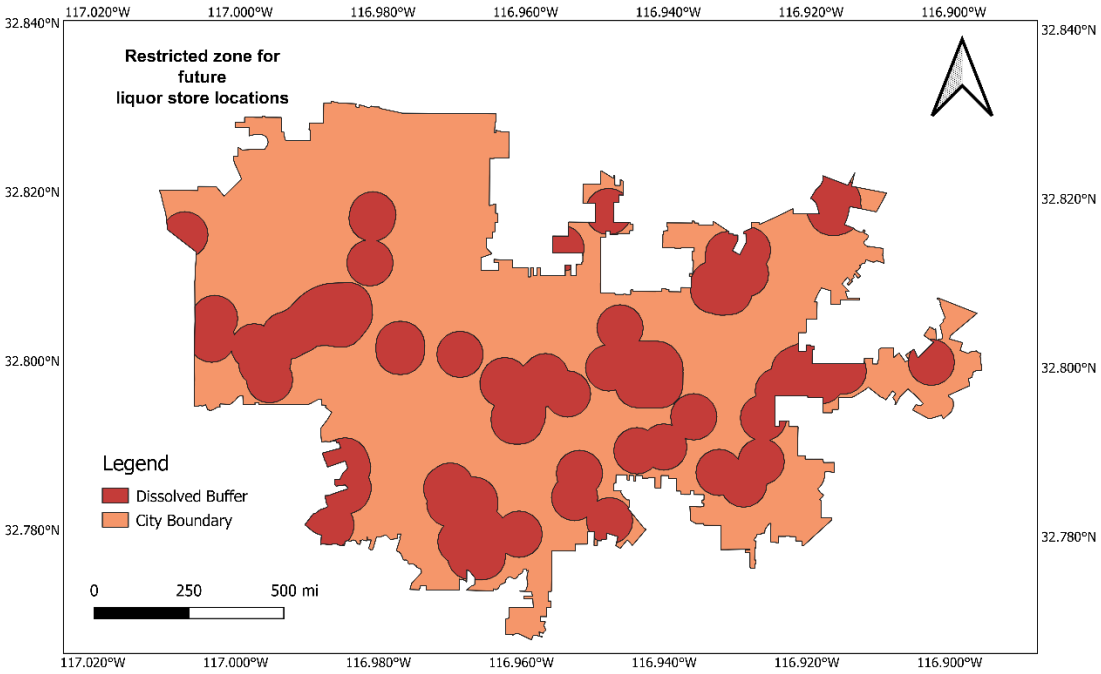


c) Calculate the area of the city that falls within the restricted zone and determine the portion of the city outside the zone.

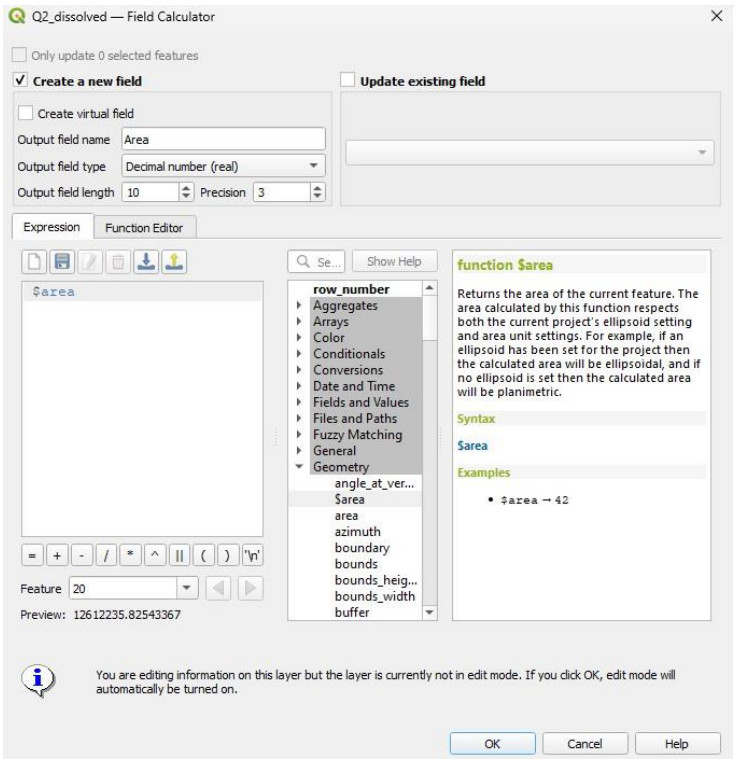
First, we will use the *Dissolve* tool on the merged buffer layer to calculate the total area as a single attribute, instead of summing the individual areas of the school, library, and park buffers.



Here is how the dissolved layer looks like,



Now, we head to the *Attribute Table* and use *Field Calculator* to calculate the area of the restricted zone for future liquor store locations.



Q2_dissolved — Features Total: 1, Filtered: 1, Selected: 0

	ID_1	TYPE	PARKID	SHAPE_Leng	SHAPE_Area	CDS_CODE	SCH_TYPE	GRD_TYPE	layer	path	Area
1	20	Public	NULL	NULL	NULL	NULL	NULL	NULL	library_buffer	D:/Softwares/O...	12612235.820

Since the Project CRS is set such that, it gives area in square metres. So, we can convert it to square Kilometres to ease the comparison. The area of the restricted zone comes out to be **12.61 Km^2**.
To determine the area of portion outside the zone we subtract the area of the restricted zone from the city area.

city_boundary — Features Total: 1, Filtered: 1, Selected: 0

	OBJECTID	SHAPE_LENG	SHAPE_AREA
1	5	238839.94773400	404308695.74599999189

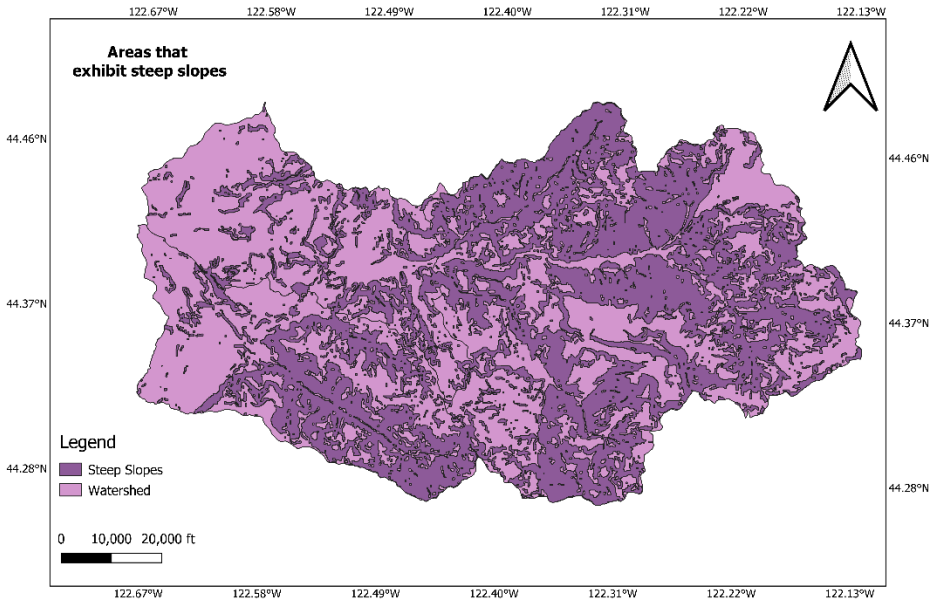
Since the given area is in square feet, we'll first convert it to square kilometres. The area comes out to be **37.56 Km^2**.
Hence the area of portion outside the zone is $\mathbf{37.56 - 12.61 = 24.95}$ **Km^2**.

2. Suitable cougar habitats

You have been tasked with conducting a study on cougar populations in a state park and the surrounding regions. The goal is to identify and map potential cougar habitats to ensure visitor safety without causing unnecessary alarm among potential visitors. Using QGIS tools, select the potential cougar habitation areas based on the following criteria:

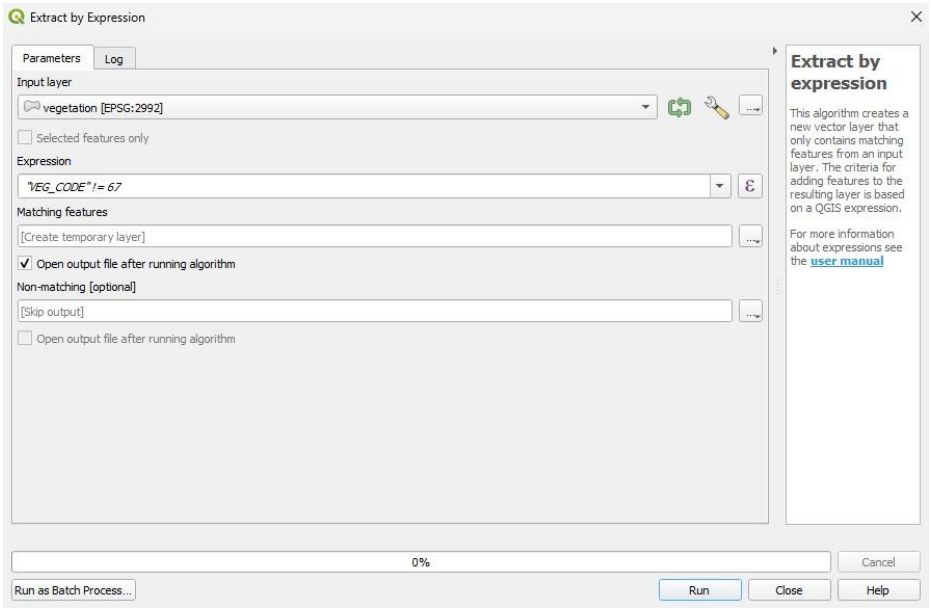
a) The selected areas should exhibit steep slopes.

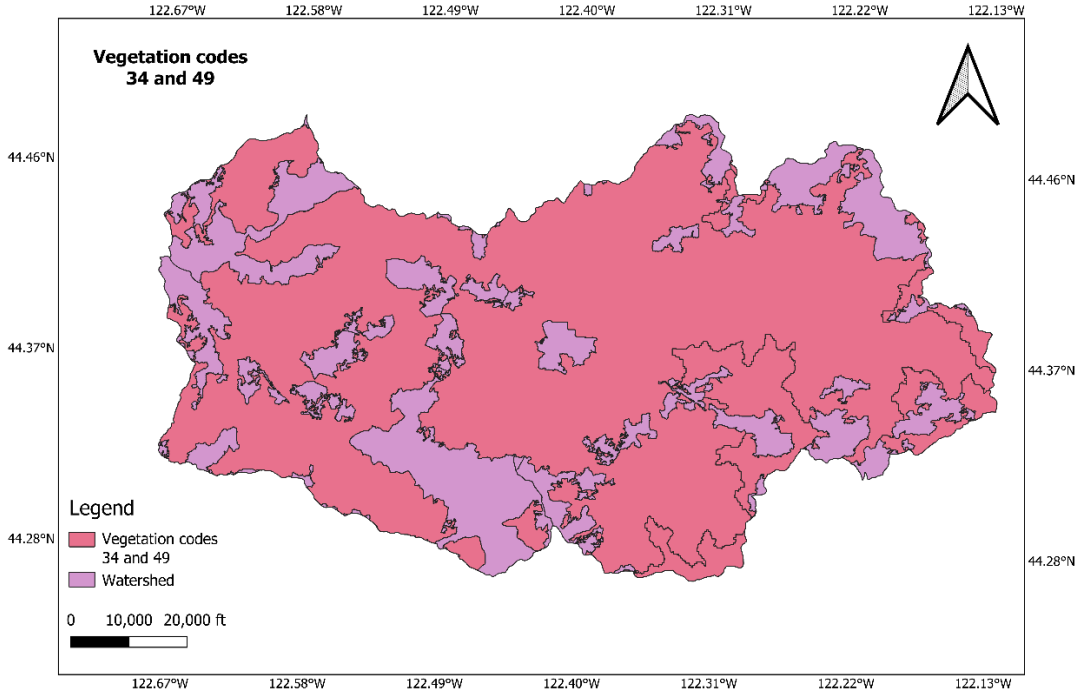
We simply imported the Slope (Steep) layer and the watershed (base layer) layer,



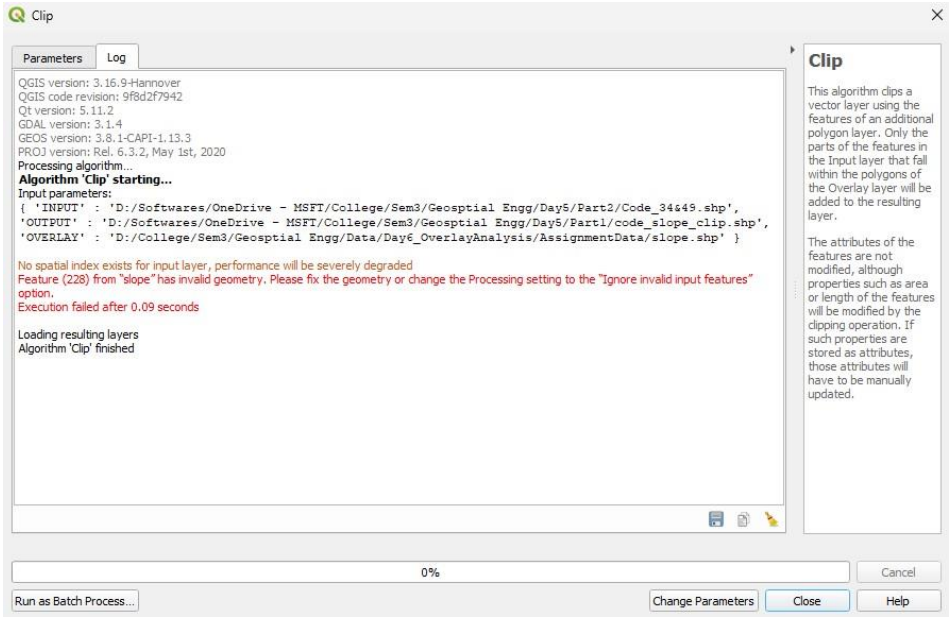
b) The presence of forested land is essential, with vegetation codes 34 and 49 being the key indicators of suitable habitat.

We'll start by importing the vegetation layer and then use *Extract by Expression*. Use the expression "$\boldsymbol{VEG\_CODE}$" ! = **67** we need to select codes 34 and 49 (out of 34,49 and 67).

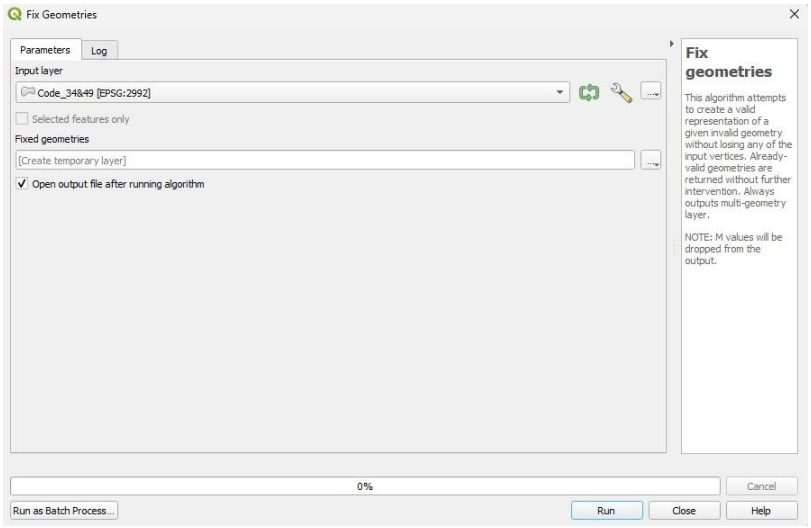




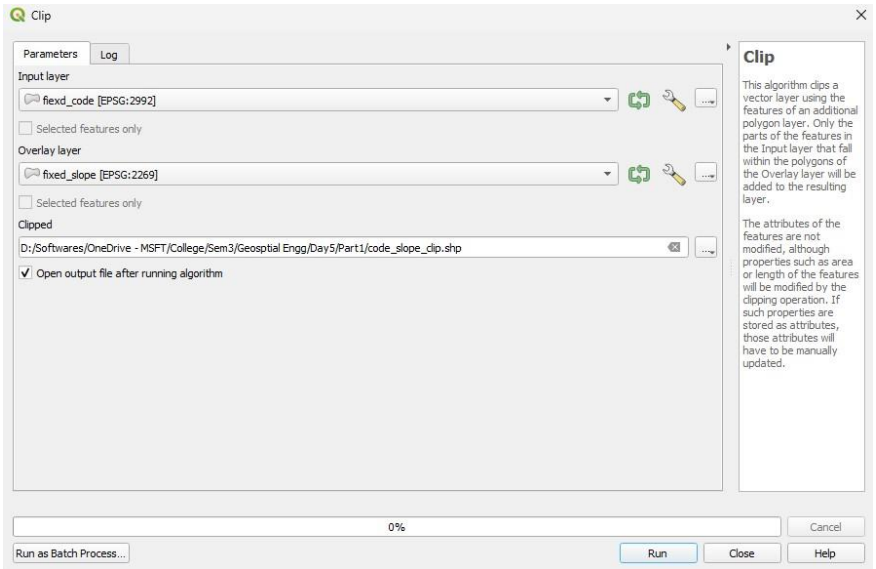
Now we need to clip the vegetation layer (code 34 and 49) with the slope layer. But we get some error while doing so,

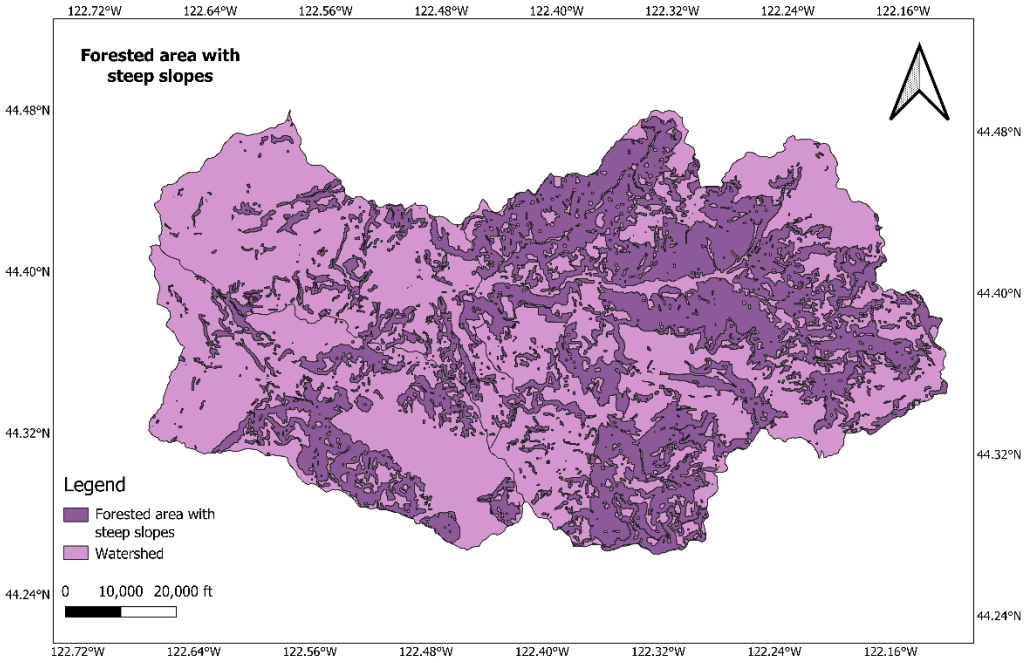


From the error we learn that we need to fix geometries of both the layer. We'll use *Fix geometries* option.



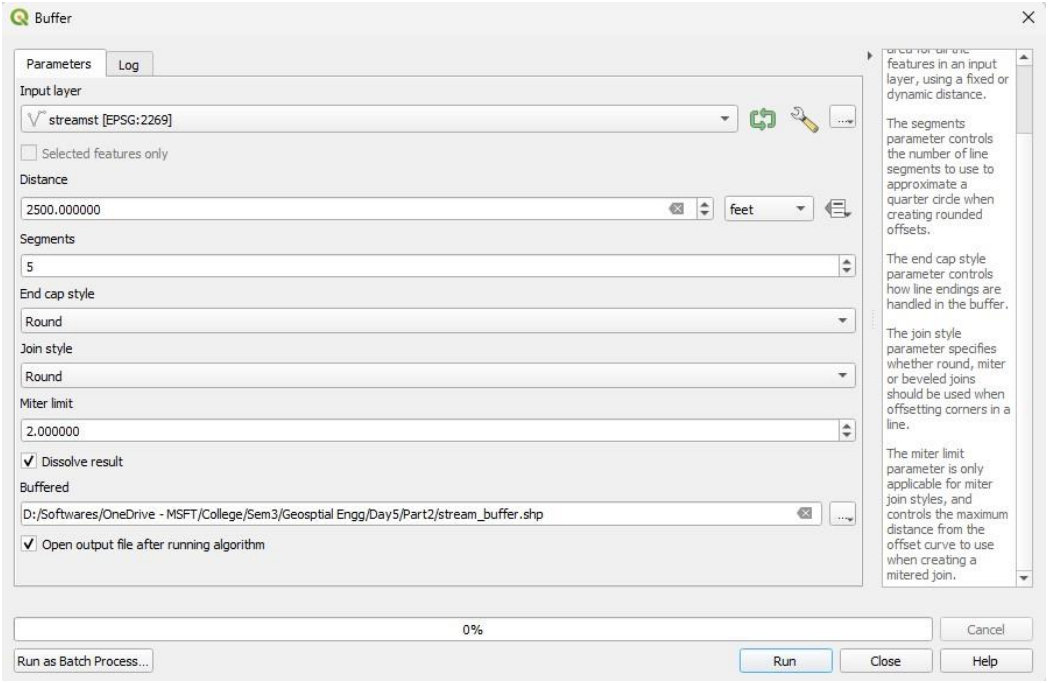
Then, we'll attempt clip operation again,

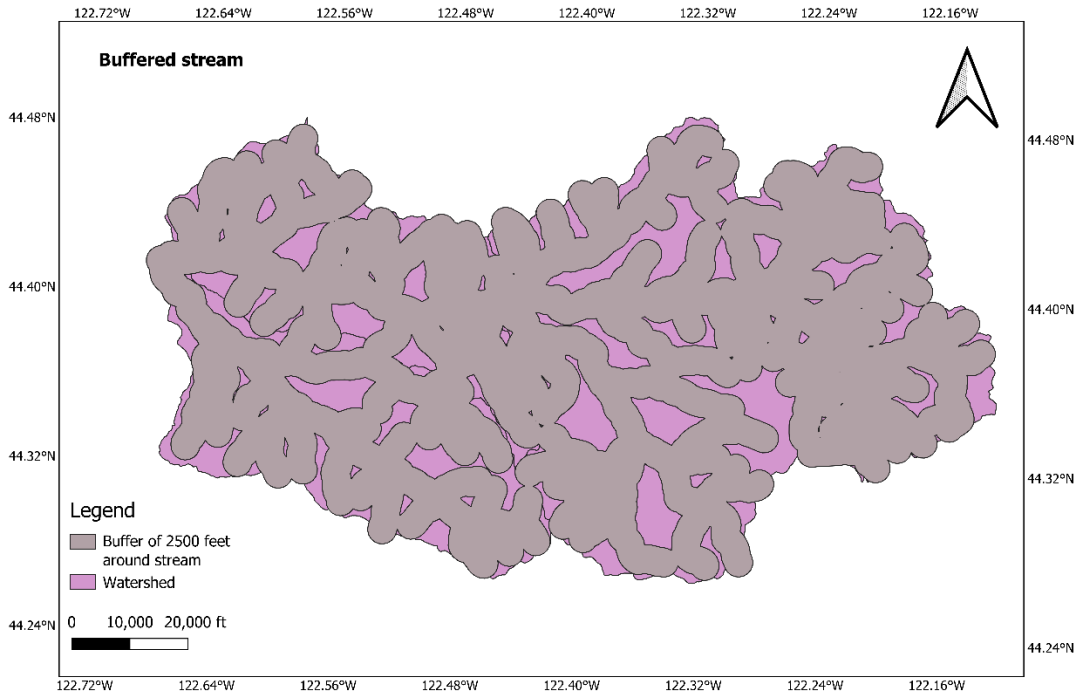




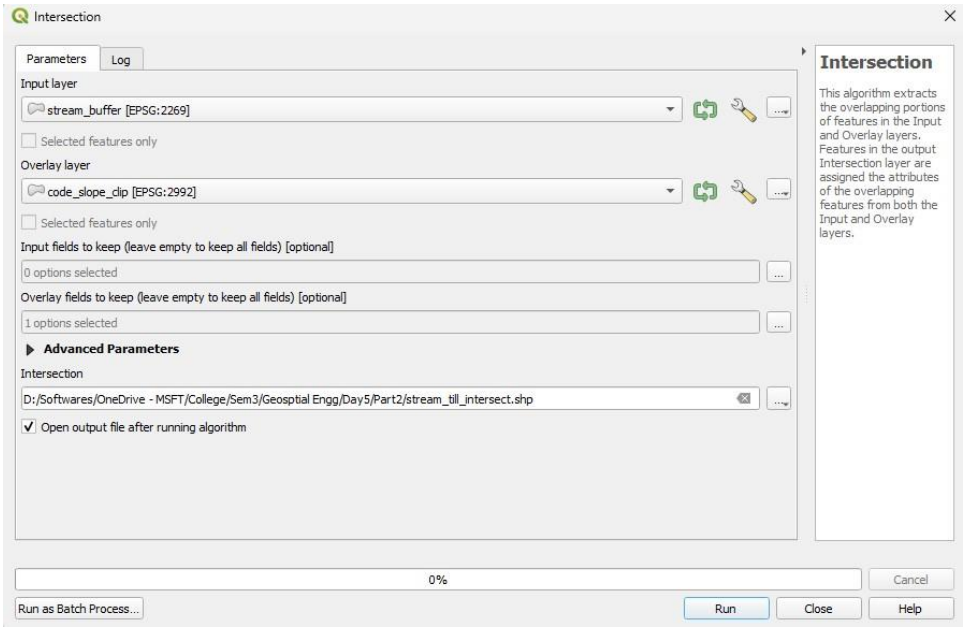
c) The identified regions must be located within 2500 feet from streams.

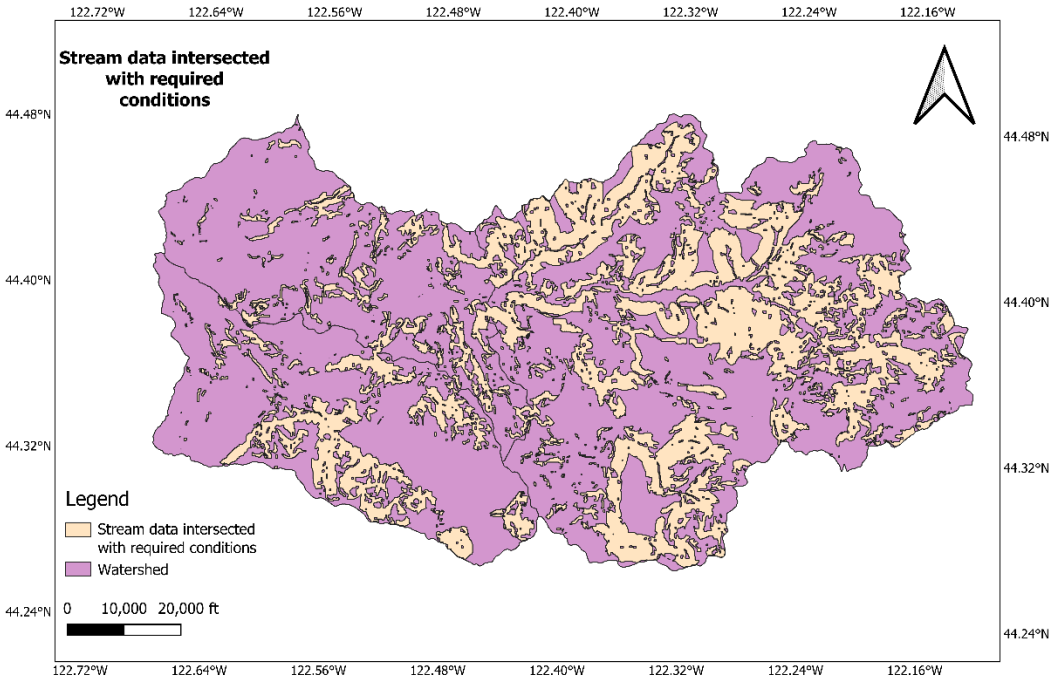
We'll begin with creating a buffer of 2500 feet around the stream.





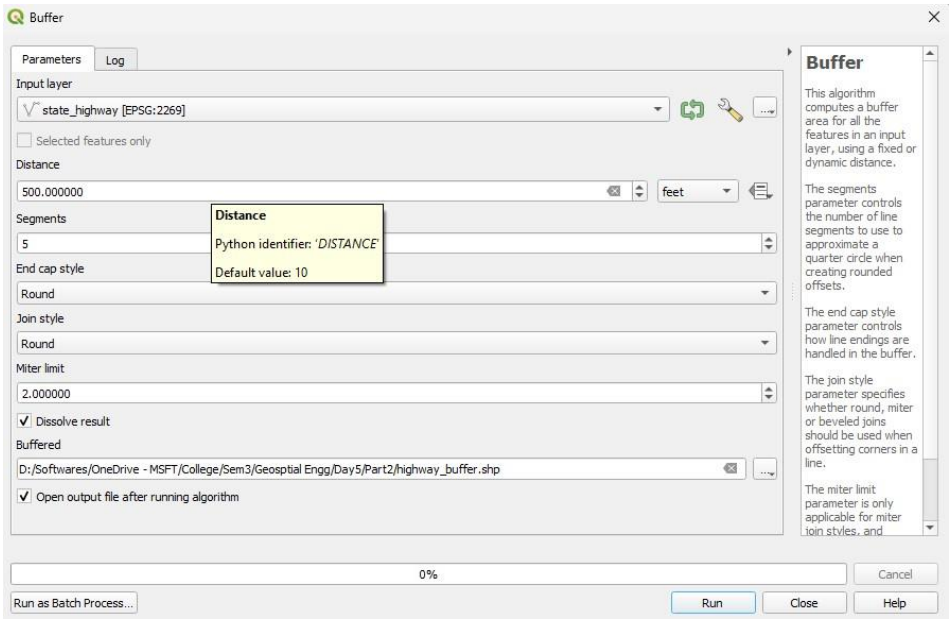
We will take intersection stream data with intersection of slope and forested area.

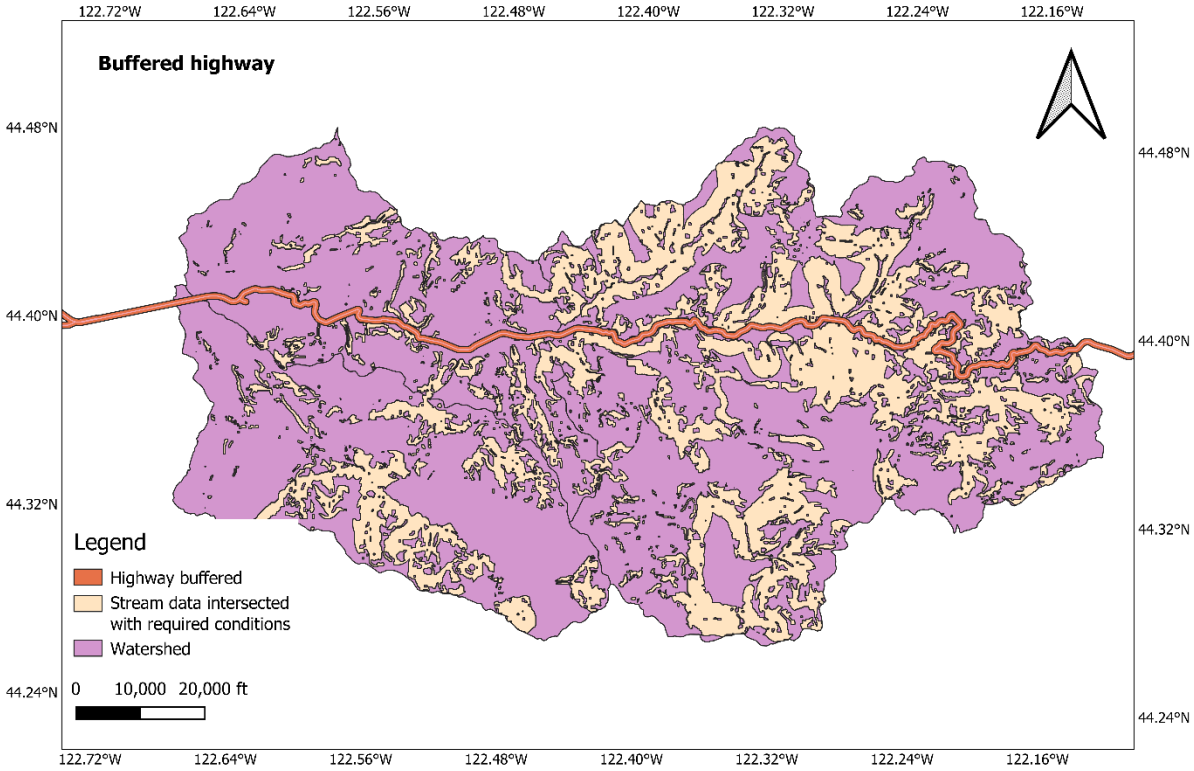




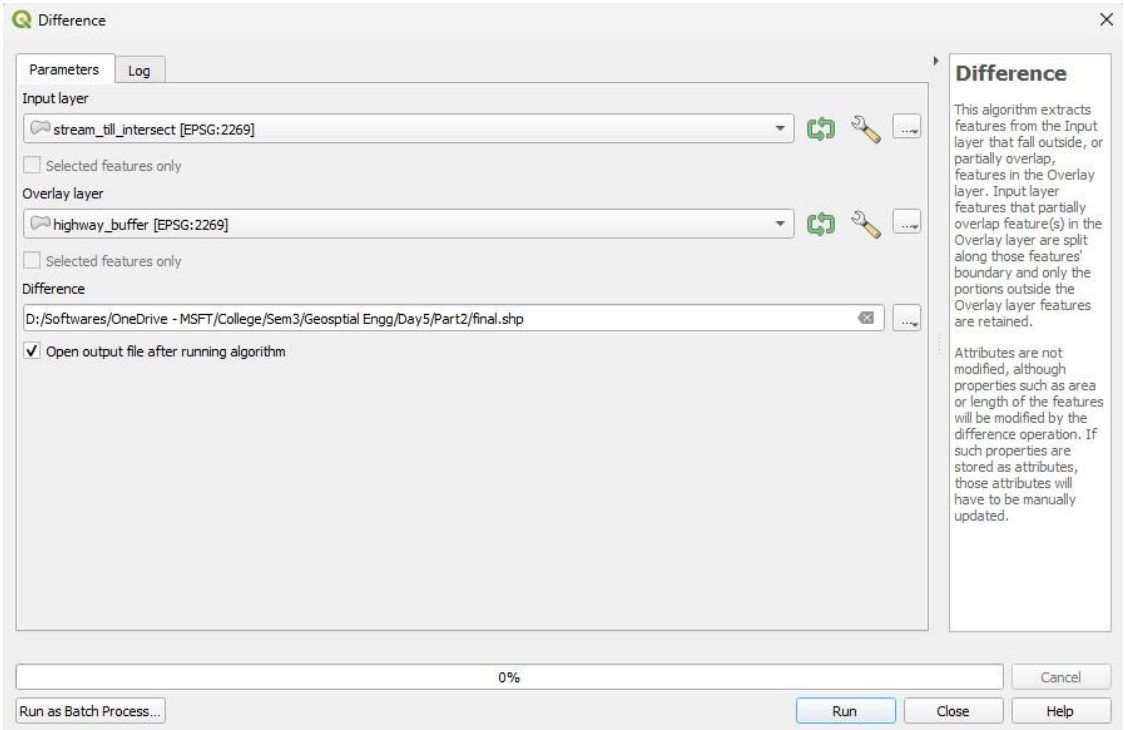
d) Furthermore, the chosen areas should be situated at a distance greater than 500 feet away from highways.

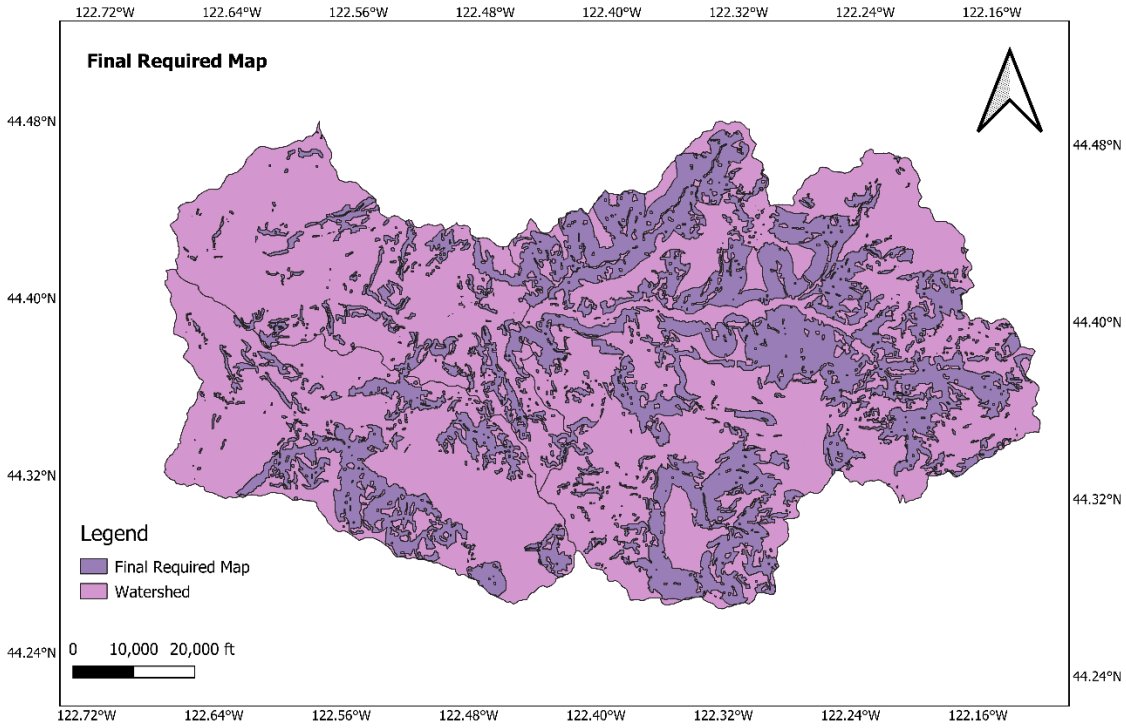
Firstly, we'll create a buffer around the state highway layer.





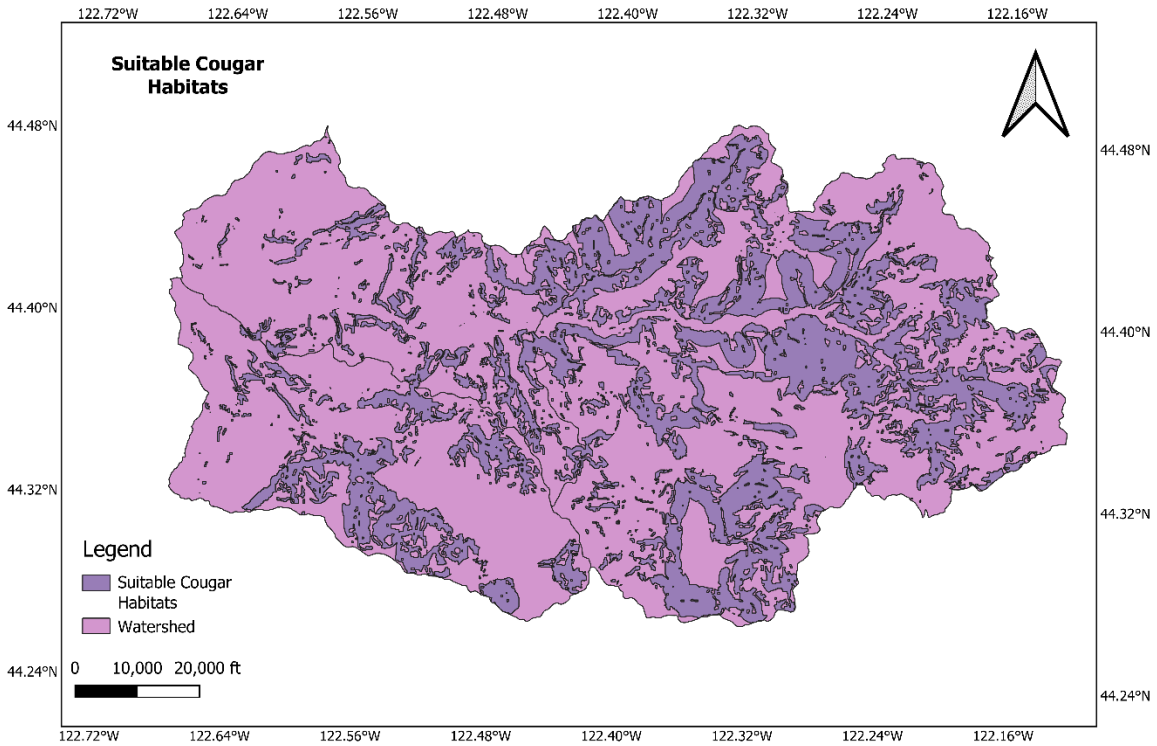
We'll use *Difference* operation to choose areas which are situated at a distance greater than 500 feet away from highways.



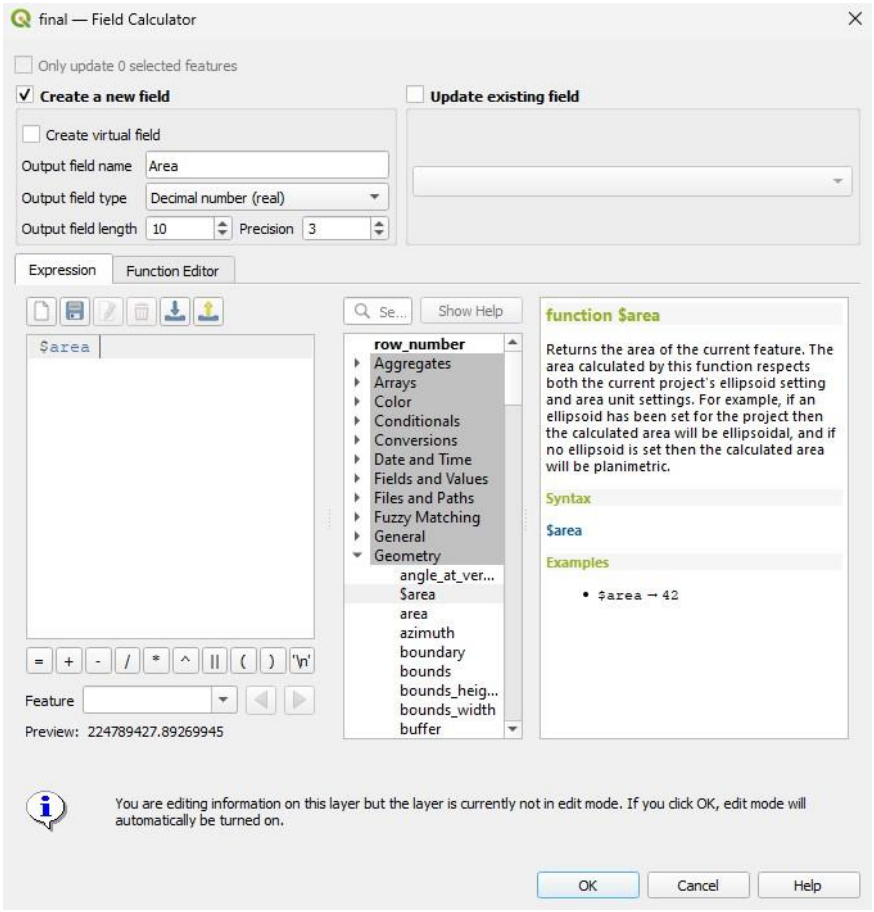


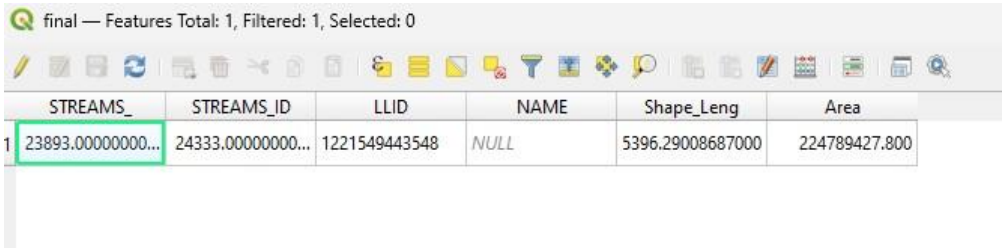
e) Prepare the final map highlighting the suitable cougar habitats (20) and find its area in ha.

Here is the final map highlighting the suitable cougar habitats,



We used the attribute table to calculate the total area of the identified cougar habitats,





Converting the obtained area from square Metre to Hectare, we get **22478.9 Ha**.