Exercise
Vector Analysis

In this exercise you will learn how to:
- **Attribute Query of Vector Data**
- **Spatial Query of Vector Data**
- **Data Integration**

Estimated time: 45 minutes

The purpose of this exercise is to understand vector data analysis.
Data layer to use: "**LU_LC.shp**", "**soil.shp**", "**road.shp**"

Problem

To establish a factory, a land parcel is required which satisfy the following conditions.
1. **Land use category should be wastelands/rocky/shrubs**
2. **Soil category should not be severe erosion**
3. **Should be well connected with roads.**

Step 1: Load the data layers into QGIS

- Left click the **Add Vector Layer** icon from **Manage Layers** toolbar or navigate to menu **Layer** > **Add Layer** > **Add Vector Layer...** . Set the Source Type to **File** and Encoding to **Automatic** (this is the default)

## Step 2: Display attributes data

After loading all the three layers explore the attribute table of each layer.

- activate the layer by clicking on it in the **Layers Panel** for which attribute table is to be displayed

- Right click the activated layer in the **Layers** Panel and select **Open Attribute Table** option from the displayed menu. Alternatively, click on **Open Attribute Table** button of **Attributes Toolbar**

- Scroll through the attribute table of each layer to see attributes related to problem conditions are available

After ensuring that the relevant attributes are available in the layer table, start analysis .

Step 3: Query the Soil Layer

- Close all attribute tables, if displayed
- Activate **Soil** layer by clicking on it in the **Layers** panel
- Click on **Select By Expression...** tool on **Attributes Toolbar** as shown below
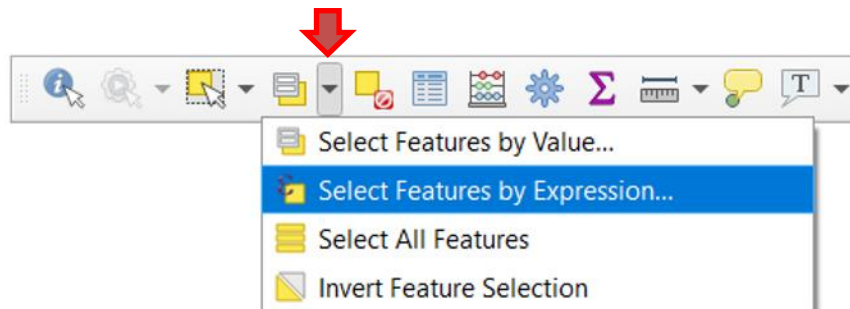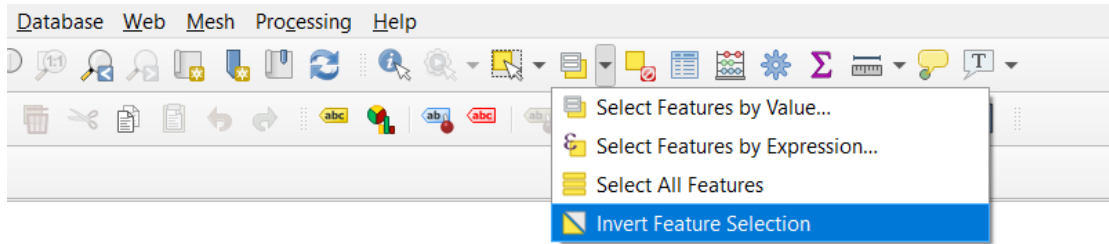

- **Select by Expression** window opens. Double click on **Fields and Values** item from the central column of the window. This makes to list out all attributes of the layer table
- Double click on ^{abc} **Land_degra** attribute from the expanded list
- Double click on = button from the operator buttons
- Click on **All Unique** button from the third column of the window. This displays all available attribute unique values for **Land_degra** attribute. Double click on **Severe erosion**
- Click on **Select Features** button at the bottom of the window
- Close the **Select by Expression** window by clicking on **Close** button at the bottom
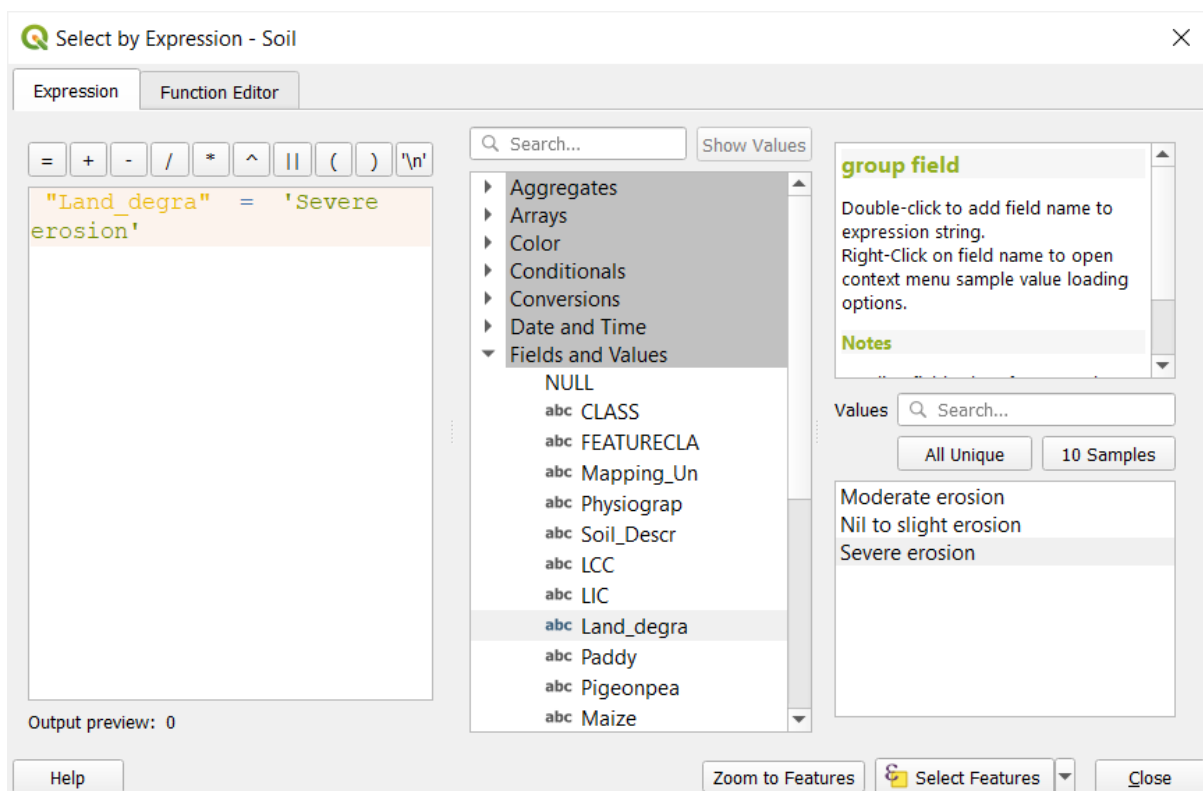
The selected polygons, as per defined criteria, are highlighted in yellow colour.
- Now invert the selection by selecting **Invert Feature Selection**

Another method is define the query statement as "Land_degra" <> 'Severe erosion' in **Select By Expression** window

Save these selected polygons as a separate layer

- Right click on the Soil in the **Layers** panel and select **Export > Save Selected Feature As…** **Save Vector Layer As…** window opens
- Type the file name **Sel_Soil** (see that the file is stored in shape file format in the working directory. For this, click on three dots at the right end of the file name box and navigate to your working directory)
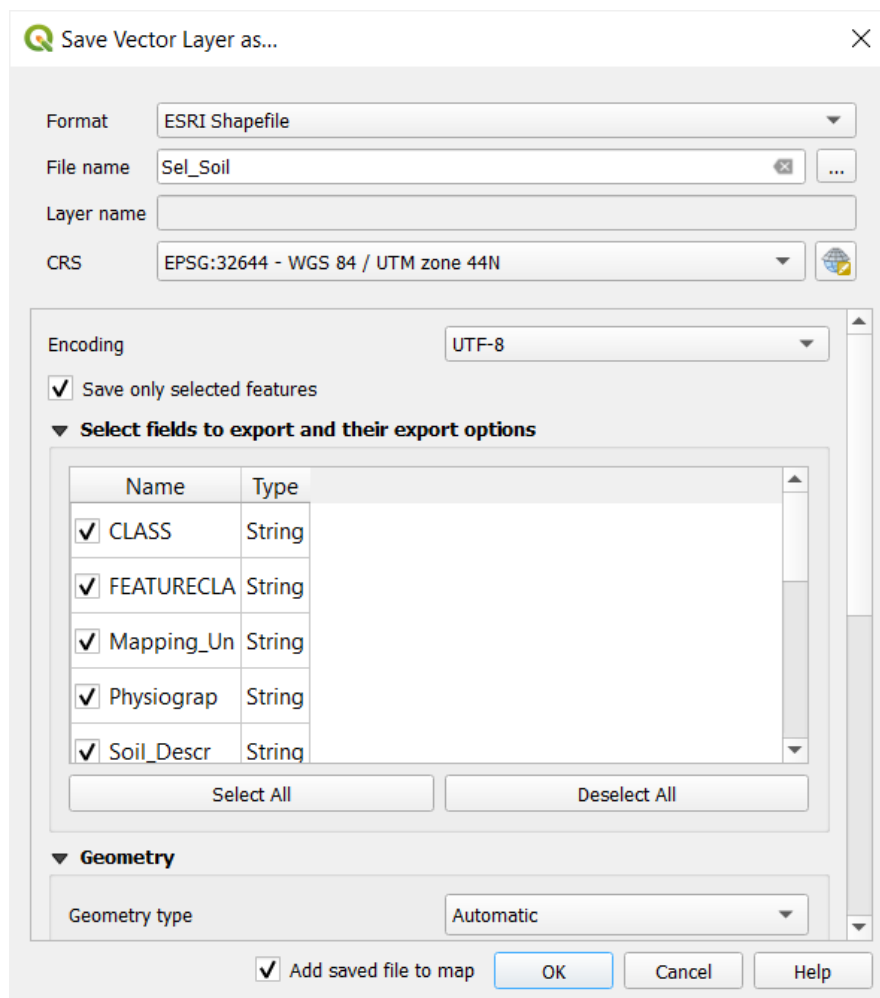
Step 4: Query the Land Use Layer

- Follow the same procedure of Step 3 with **LU_LC** layer for condition and save the selected land use polygons as **Sel_LU** in the working directory as shape file
- Here, a complex condition is used to select land use polygons. Condition in **Select By Expression** window should be defined as

"DESCRIPTIO" = 'Wastelands-Barren Rocky/Stony waste' OR "DESCRIPTIO" = 'Wastelands-Scrub land-Open scrub'

In order to add logical operator OR, double click on Operators and select OR from the operators listing. See the following figure.
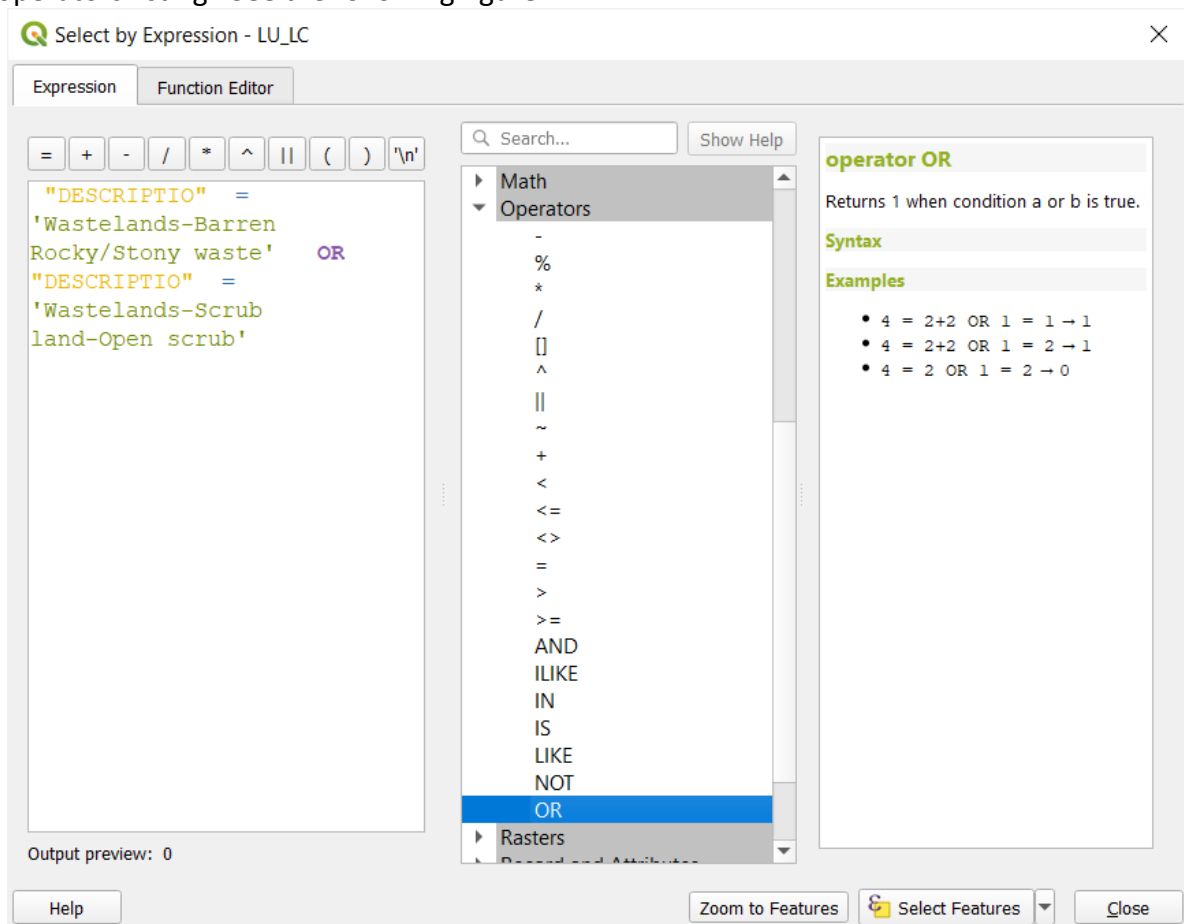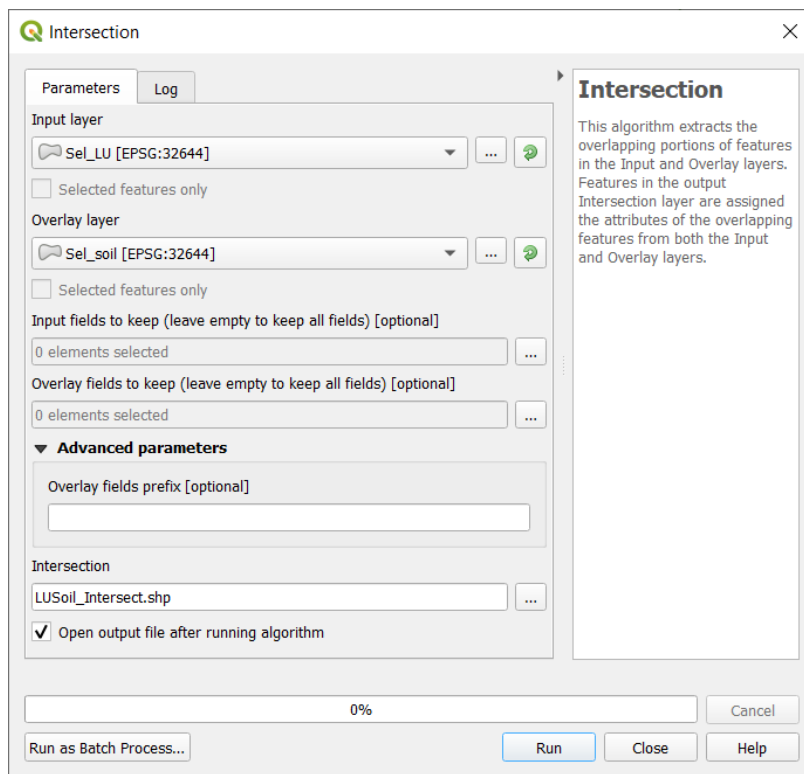

Step 5: Integrate the generated two layers

- To integrate the two layers, viz., **Sel_soil** and **Sel_LU**, use 'intersect' operation. Select menu **Vector > Geoprocessing Tools > Intersection…** Intersection window opens.
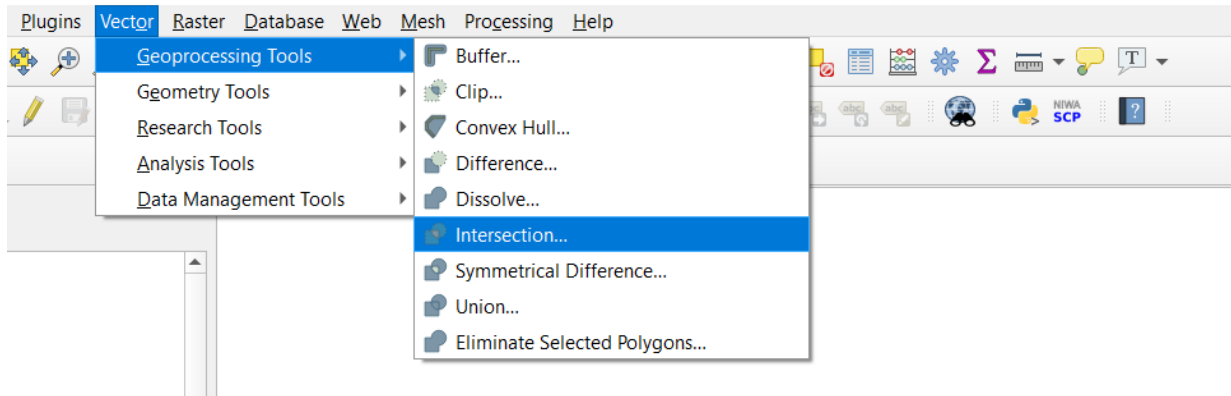
- In the **Intersection** window, select **Sel_LU** as input layer and **Sel_soil** as Overlay layer. Type in **LUSoil_Intersect** for Instersection layer (Output layer)


Step 6: Identify land parcels having road connectivity

Finally, to understand the road connectivity to the polygons of **LUSoil_intersect** layer, use 'Extract by location' tool

- To display the processing toolbox, select menu **Processing > Toolbox**. **Processing toolbox** is displayed on the right side of QGIS window.
- From the **Processing toolbox**, select **Vector selection > Extract by location** tool and double click on it.
- In the Extract by location window, select **LUSoil_Intersection** for **Extract features from** (Input 1)

- Select **Road** layer for **By comparing to the features from** (Input 2)
- Type in **Output** in Extracted (location) box
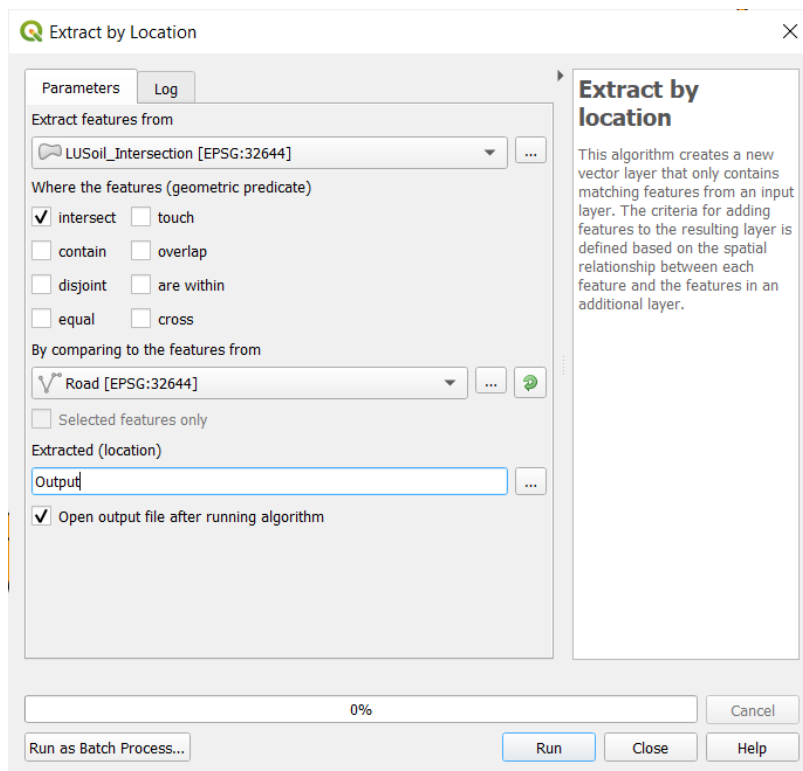
Final output should appear as below. Display the road layer and check the road connectivity these polygons

***