

UA Libraries Data Cooperative Unit's

GIS TUTORIALS

RASTER DATA BASICS

QGIS

SOFTWARE USED

4

TUTORIAL NUMBER



DIFFICULTY LEVEL



LEVEL OF STOKE



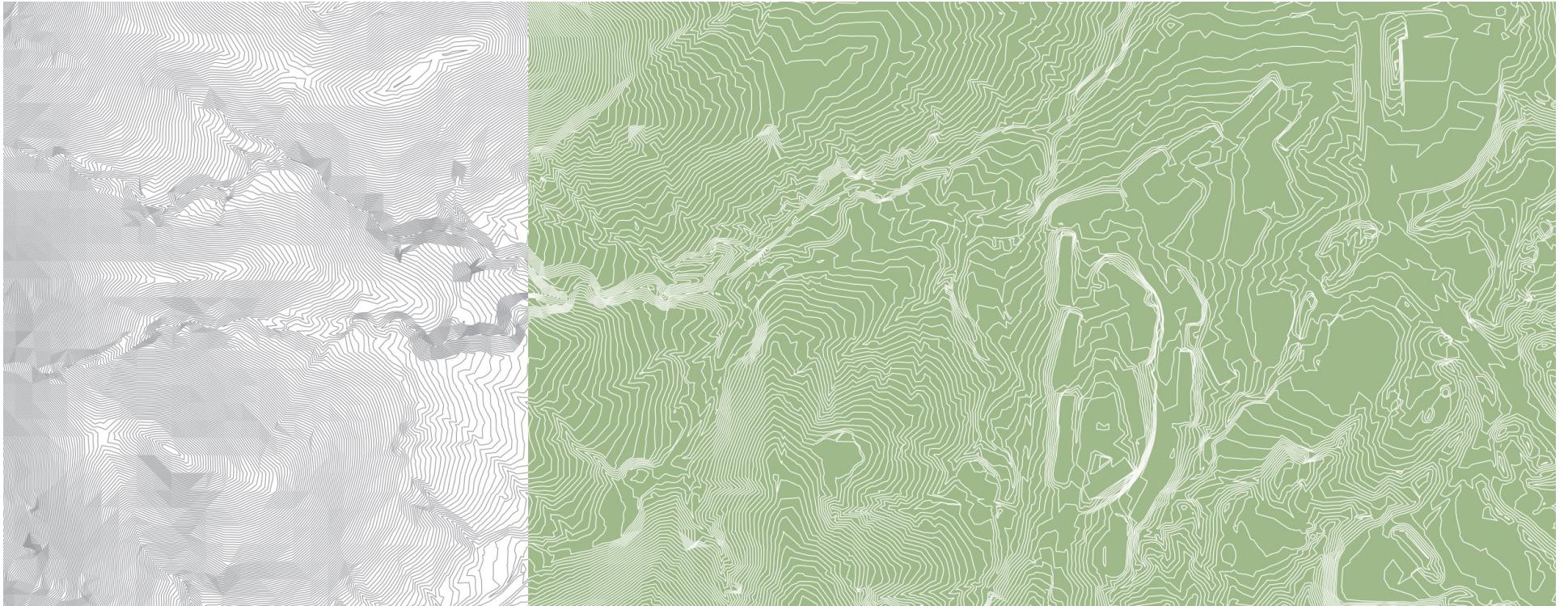
HARDWARE NEEDED:

desktop or laptop computer
running Windows, Mac, or
Linux

internet connection

SOFTWARE NEEDED:

QGIS



INTRODUCTION

4

The purpose of this tutorial is to introduce you to the basics of working with raster data in QGIS. While there are many different types of raster data that can be used in GIS projects, this tutorial will work with a DEM geotiff file.

Upon completion of this tutorial, you should be comfortable:

1. Loading and exploring raster data.
2. Extracting raster data using a vector feature layer.
3. Using a conditional statement to select raster cells with specific values.

STARTING A NEW PROJECT

Before opening QGIS, download the data that will be used in this tutorial from the following link:

[GIS RasterData.zip](#)

Please note: All of the data used in this tutorial is available from UA Enterprise GIS and the UA Library.

<https://egis.arizona.edu/>

<https://data.library.arizona.edu/geo/find-data/imagery-lidar>

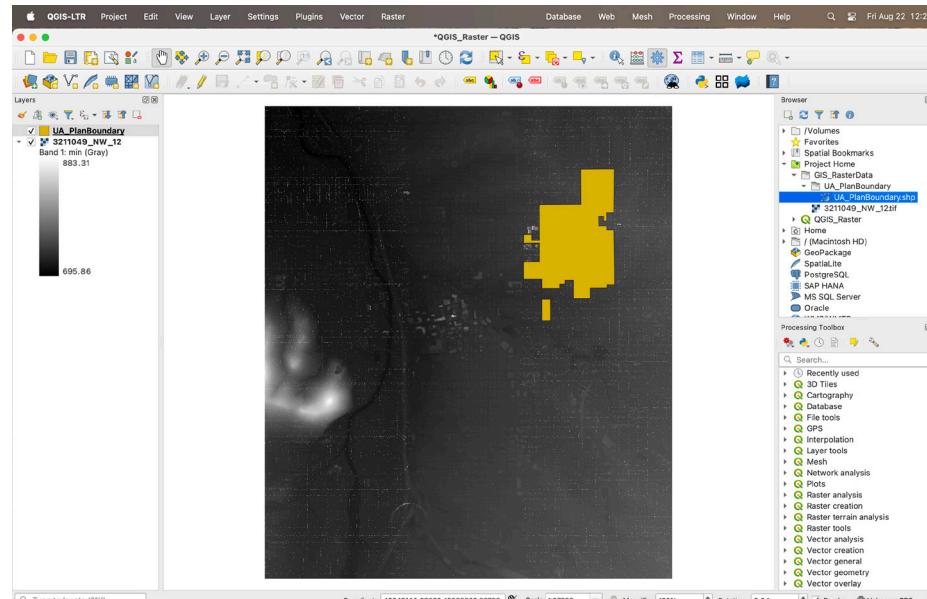
1. Start a new QGIS project.

Unzip the GIS_RasterData.zip folder and place it into your new QGIS project folder.

Add the UA_PlanBoundary.shp and 3211049_NW_12.tif files to your map.

GEOTIFF FILES:

A GoTIFF file is an image file format that includes embedded geospatial information allowing it to be georeferenced by a set of coordinates and projected on correctly on a map.



INSTALLING PLUG-INS

1. In the Menu Bar click on Plugins and then select Manage and Install Plugins.

In the Plugins window search for mapswipe tool.

Highlight the MapSwipe Tool plugin and click on Install Plugins.

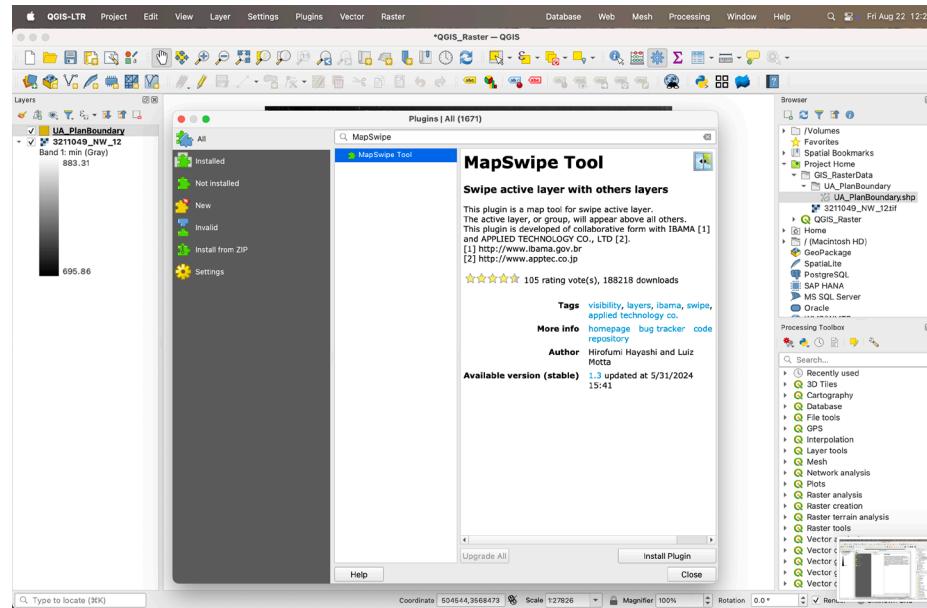
After the MapSwipe plugin is installed click on the Close button.

MAPSWIPE TOOL:

The MapSwipe Tool will allow you to swipe a layer either vertically or horizontally to review what is underneath that file.

PLUGINS:

Plugins in QGIS are written by QGIS and independent developers to extend the core functionality of QGIS. All plugins are validated by QGIS community members to ensure that they work correctly. Due to the open-sourced nature of QGIS there are a wide variety of plugins available for many different fields of study and/or applications in QGIS.



EXPLORING RASTER DATA

1. In the Tools toolbar click on the Basemaps icon to open the plugin.

In the Basemaps window select one of the Basemaps that is available.

Click Load to add the Basemap to the Map View window.

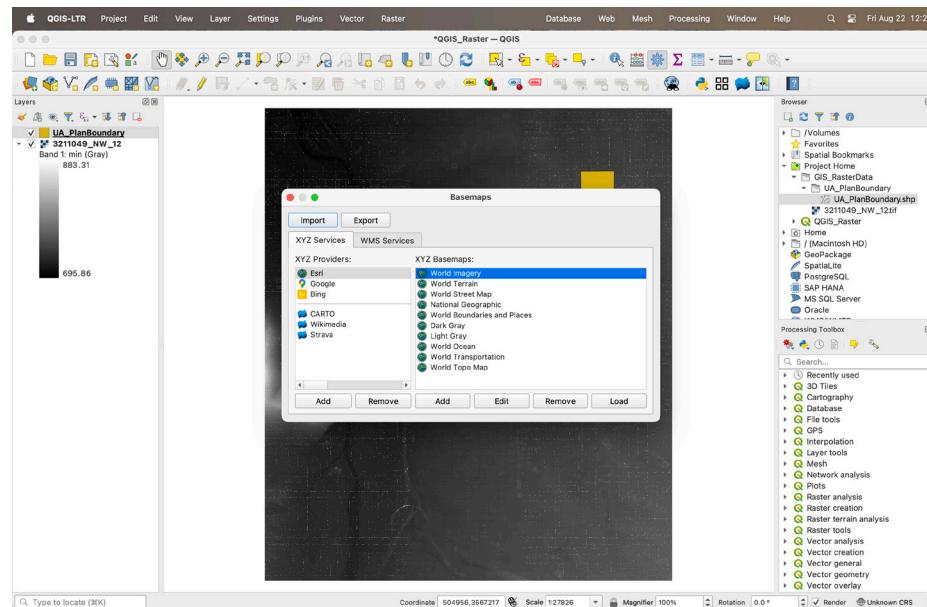
2. Drag the basemap that you selected to the bottom in the Layers window.

DEM:

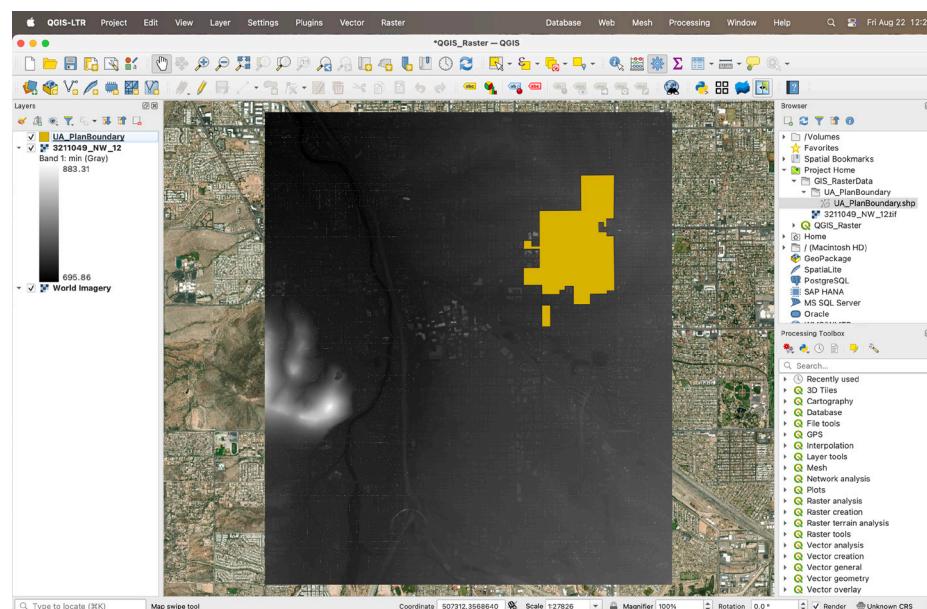
A Digital Elevation Model (DEM) is a raster-based geospatial file that serves as a continuous representation of the bare ground (bare earth) of a surface. Elevation values are calculated at the surface of the ground with all trees, buildings, and other surface objects being excluded from elevation calculation. The DEM is the most commonly used digital data file used to represent the shape of the Earth's surface.

HELPFUL HINT:

As with vector data (points, lines, and polygons) it is a good idea to make sure that your raster files are projected in the correct location. While raster files do not have location labels, one effective way to evaluate their geographic projection, especially as it relates to DEM files, is to find a natural feature on your basemap and follow it into the raster file. In this example you can follow the path of the Santa Cruz River, which is dark in the DEM because it has a low elevation value.



1



2

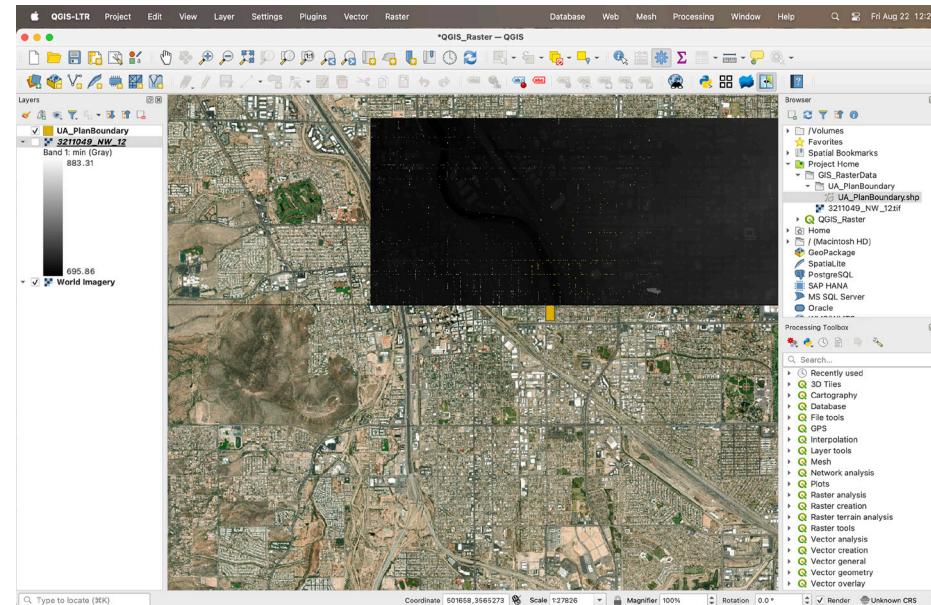
- 3.** In the Layers window highlight the .tif raster dataset.

In the Tools toolbar click on the Swipe icon to open the plugin.

In the Map window, with the .tif raster dataset highlighted in the Layers window, use the Swipe tool to swipe up and down or left and right to see what is underneath the raster file.

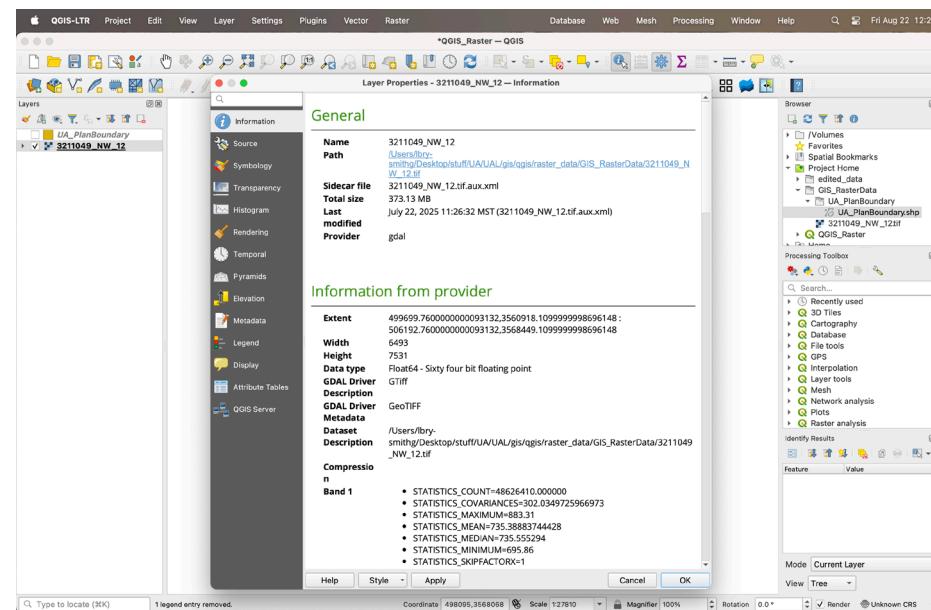
- 4.** In the Layers window right-click on the raster dataset and select Properties.

In the Properties window select Source from the side pane and expand Data Source, Raster information, and Spatial Reference.



LAYER PROPERTIES:

The Layer Properties window provides important information about the raster file. Of particular interest are the width and height (number of raster cells), number of bands (the number of cell values), pixel size (the real world size of each cell e.g. 1 meter by 1 meter = 2 m² for each cell in the file), and the Coordinate Reference System (CRS).

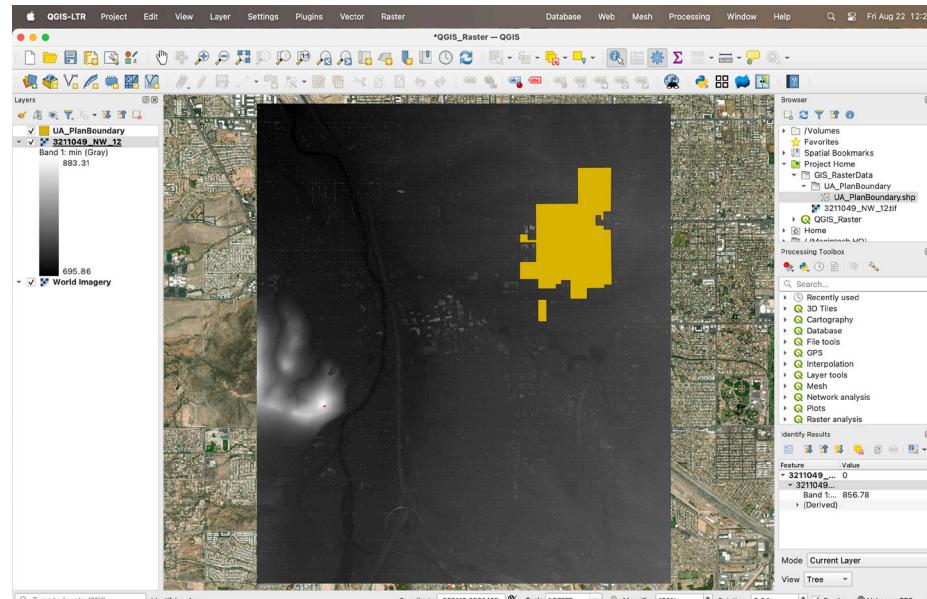


5. In the Tools toolbar click on the Identify Features tool.

Click anywhere on the raster dataset in the Map window. Once you click the Identify Results window located below the Browser window will appear. The red dot on the map is roughly located where the identify results value is derived from. In the Identify Results window you only see the elevation value (856.78 meters).

RASTER FILE VALUES:

Raster files are made of a grid of cells, each containing their own value. While it is possible for raster files to have attribute tables, in this case there is not a table but rather a single value for each of the cells.



EXTRACTING AND CREATING DATA

1. In the Menu Bar select Raster and then Clip Raster by Mask Layer.
2. In the Clip Raster by Mask Layer window match the following:

Input layer
32110049_NW_12.tif

Mask layer
UA_PlanBoundary

Clipped Mask

Use the options button to navigate to a location on your computer to save the file and give it an appropriate name.

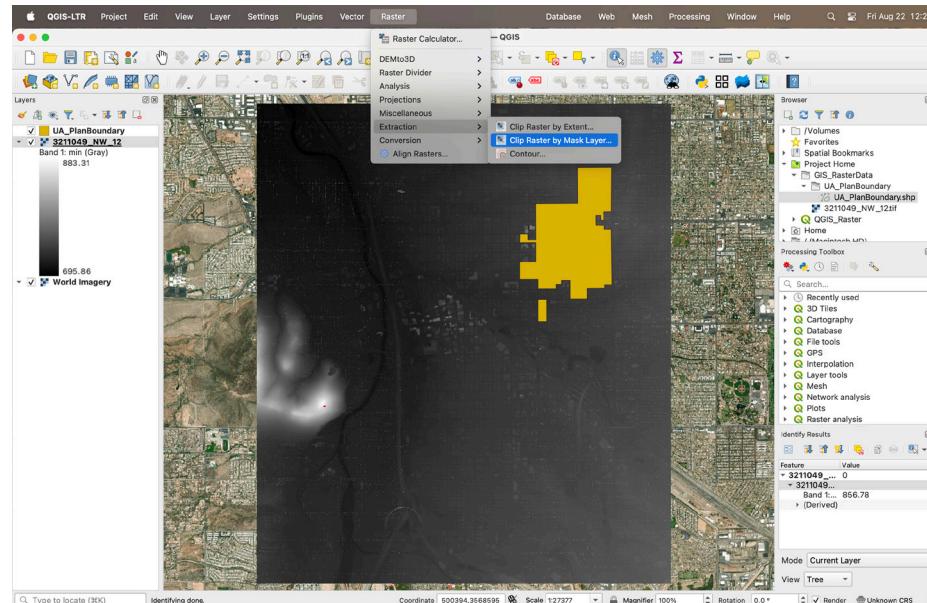
Click Run

GEOPROCESSING:

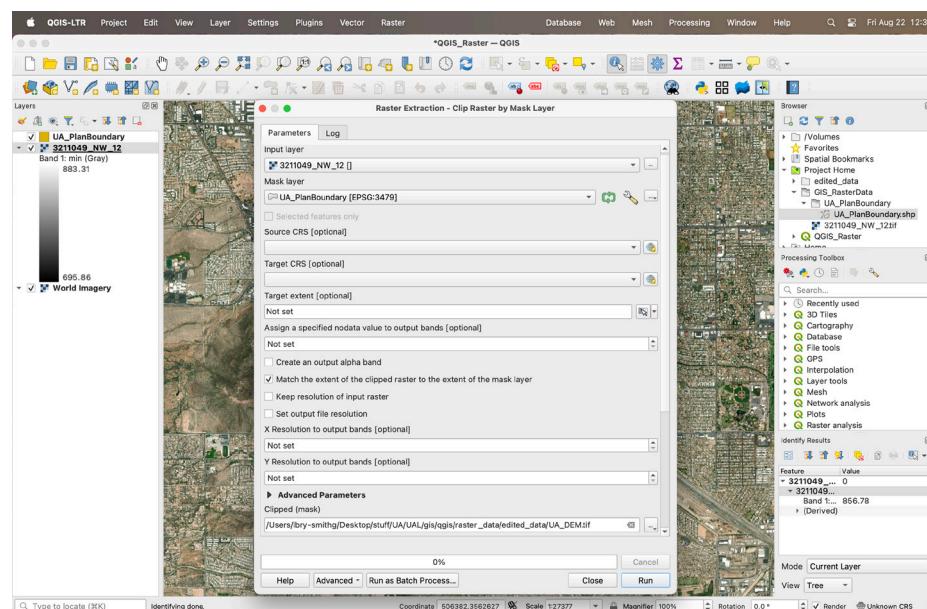
Geoprocessing is a framework and a set of tools that is used for processing spatial and related data. Generally a geoprocessing tool will perform some kind of operation on a dataset and then create a resulting dataset from that operation.

CLIP RASTER BY MASK LAYER:

The Extract by Mask tool extracts cells of a raster dataset based on a mask.

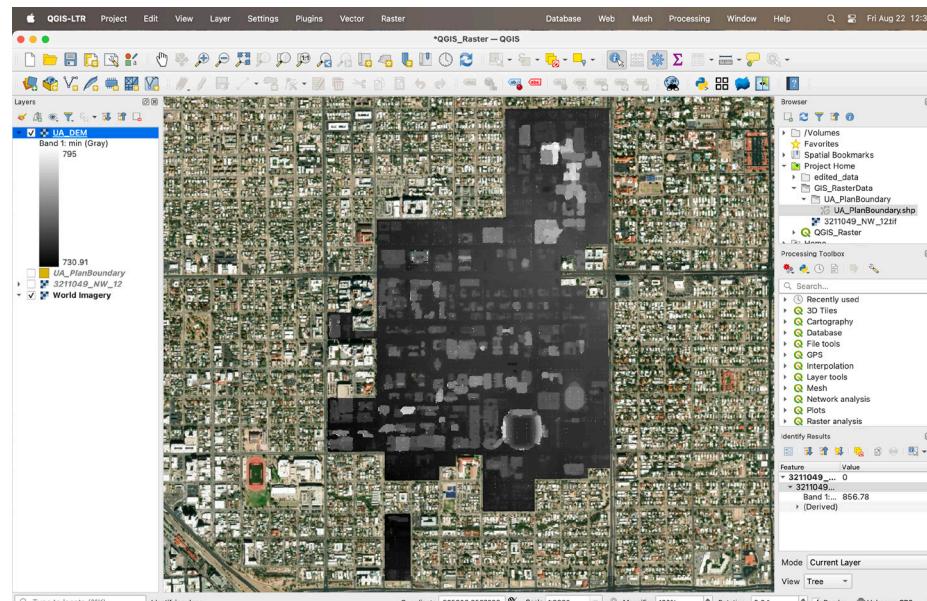


1



2

3. Zoom to the new raster dataset and use the swipe tool to explore the file.



3

SELECTING AND CREATING DATA

1. Remove the basemap.

In the Menu Bar select Raster and then Raster Calculator.

2. In the Raster Calculator window enter the following Raster Calculator Expression:

$(\text{your dem file} \geq 750) * \text{your dem file}$

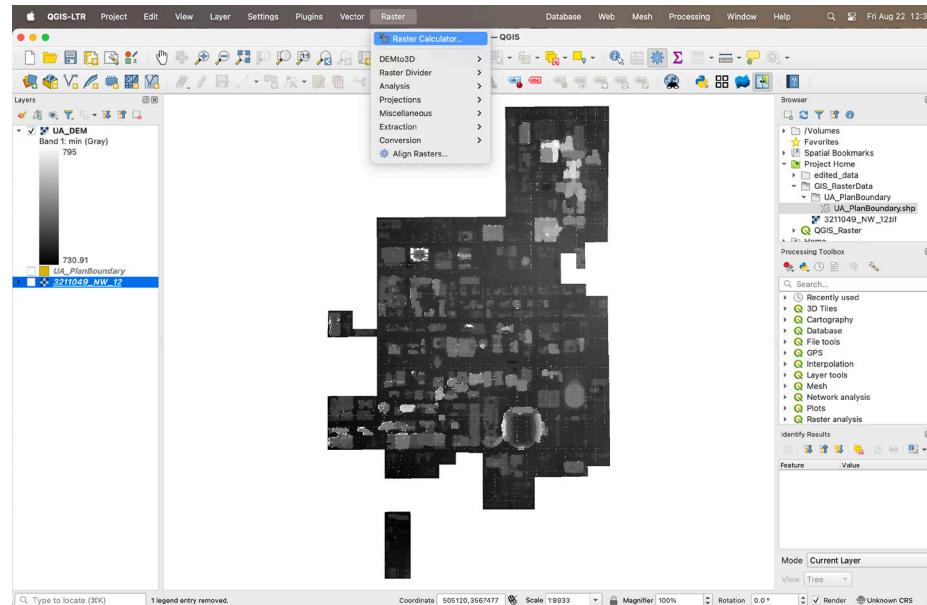
Navigate to a location on your computer to save the file and give it an appropriate name next to the Output layer option.

RASTER CALCULATOR:

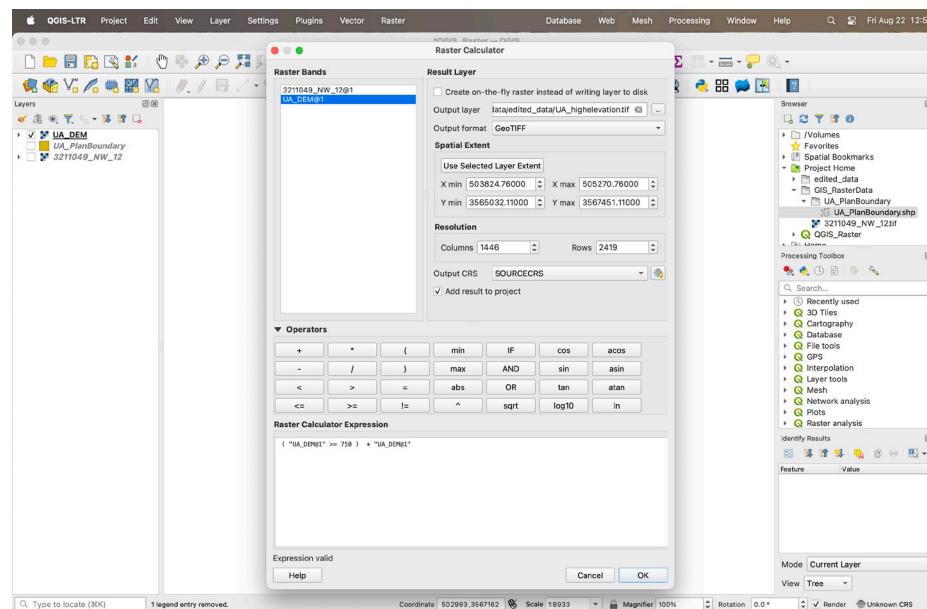
The Raster Calculator tool allows you to perform map algebra expressions to output a raster file based on the expression.

CONDITIONAL STATEMENT:

In the raster calculator expression that you are using in the Raster Calculator tool you are asking QGIS to look for cells values in your UA DEM raster dataset that meet certain conditions. The conditions are cells that have elevation values that are greater than or equal to 750 meters. You are multiplying your expression by the UA DEM raster dataset so the resulting DEM file will contain the true elevation values and not just 0s (not true) and 1s (true).

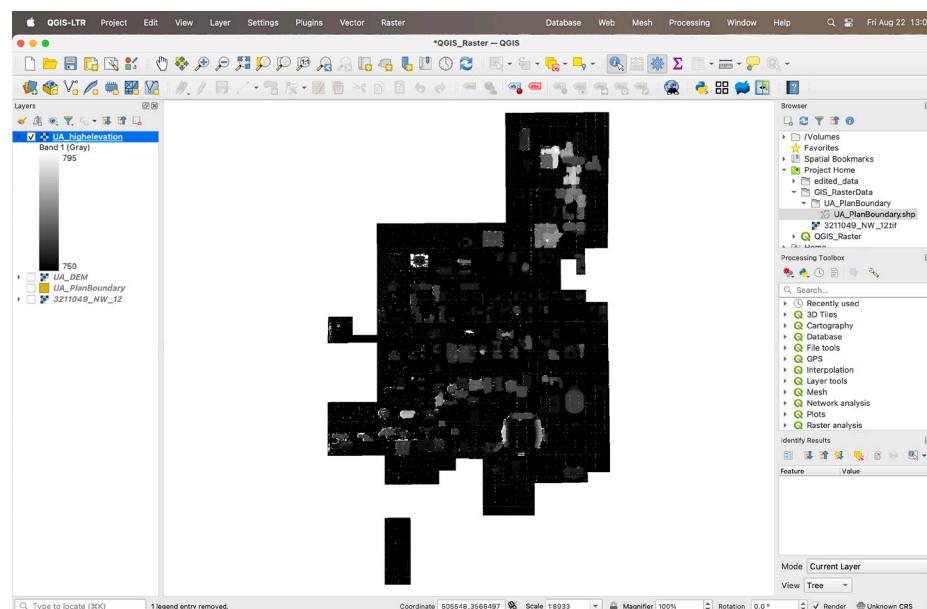
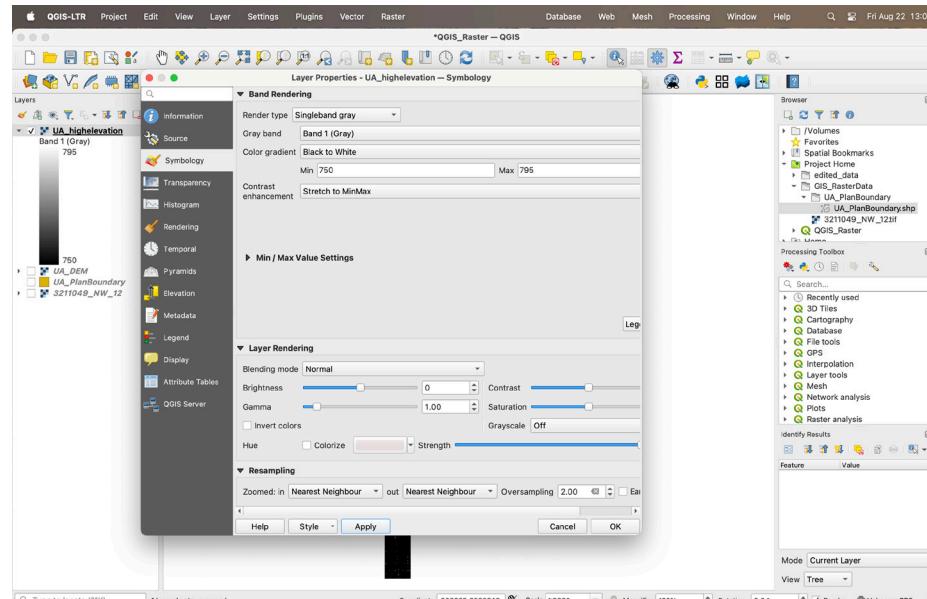


1



2

3. Open the Symbology window for the raster data-set you created in the previous step.
4. Choose an appropriate color ramp for the raster dataset and the UA boundary feature layer.



END