

UA Libraries Data Cooperative Unit's

GIS TUTORIALS

RASTER DATA BASICS

ESRI

SOFTWARE USED

4

TUTORIAL NUMBER



DIFFICULTY LEVEL



LEVEL OF STOKE

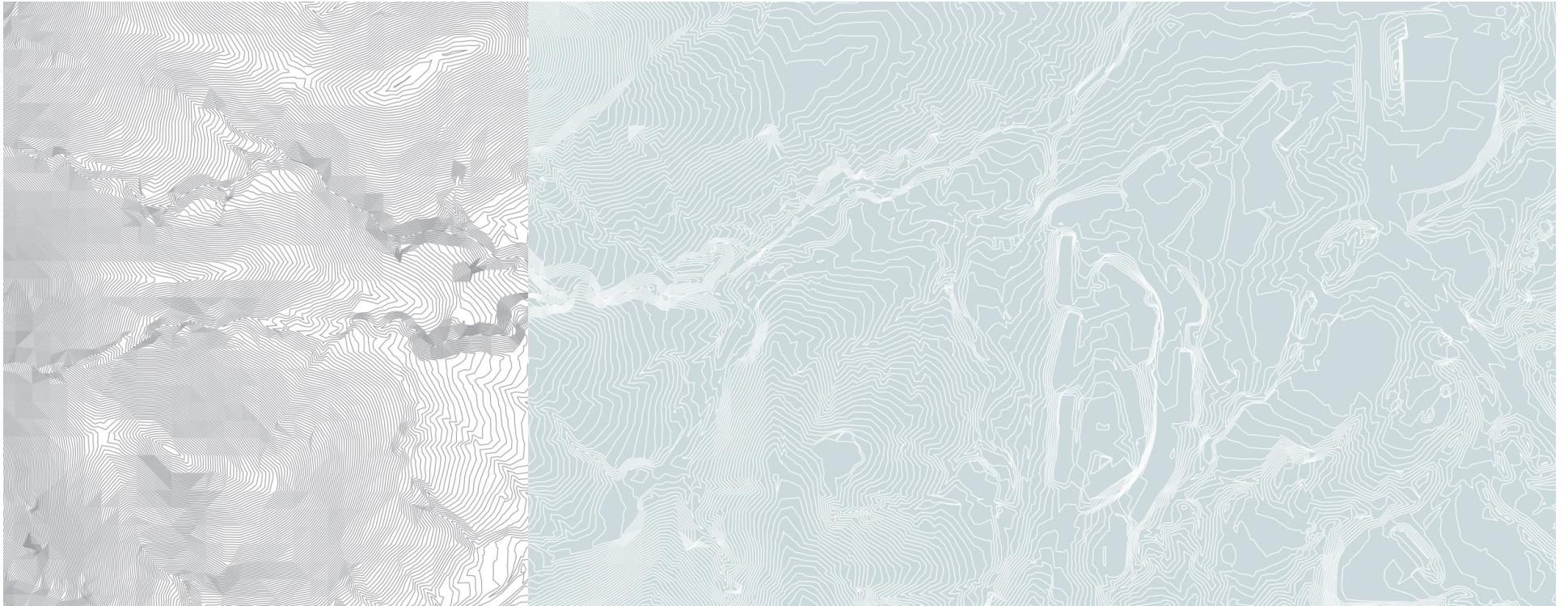


HARDWARE NEEDED:

desktop or laptop computer
running Windows
internet connection

SOFTWARE NEEDED:

ESRI ArcGIS Pro



INTRODUCTION

4

The purpose of this tutorial is to introduce you to the basics of working with raster data in ArcGIS Pro. 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 ArcGIS Pro, 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 ArcGIS project.

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

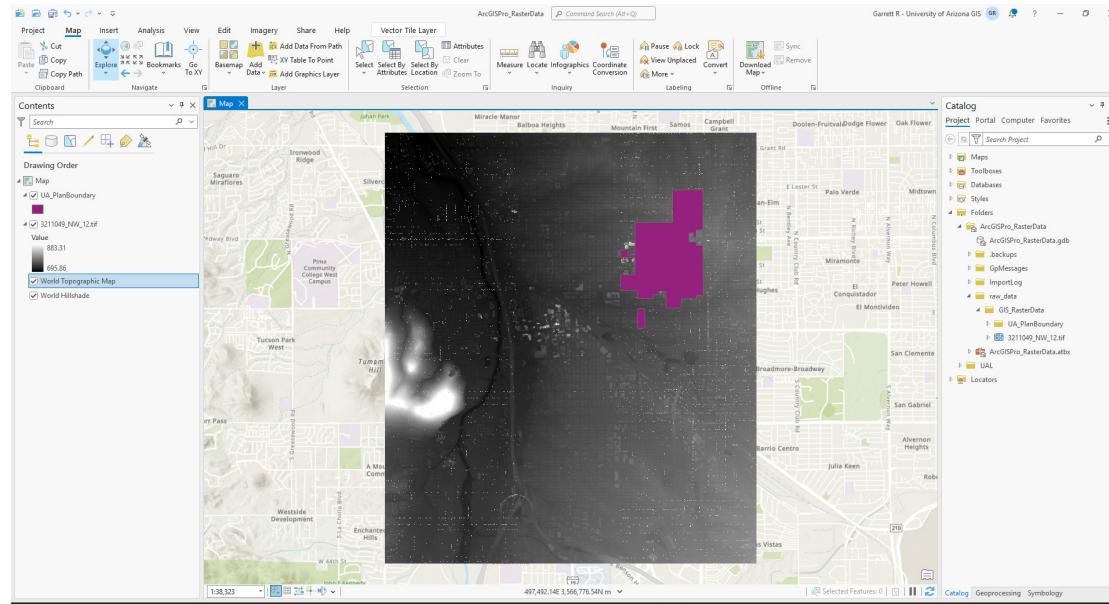
Add the UA_PlanBoundary.shp and 32110049_NW_12.tif files to your map.

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.

BUILDING PYRAMIDS:

When you add raster data to a map you may be prompted by a window asking if you would like to build pyramids. Pyramids are precalculated raster views at different scales that allow you to interact with the rasters at different zoom levels. You only need to build pyramids once.



EXPLORING RASTER DATA

1. In the Contents pane highlight the .tif raster dataset.

On the Raster Layer tab on the Ribbon click on Swipe.

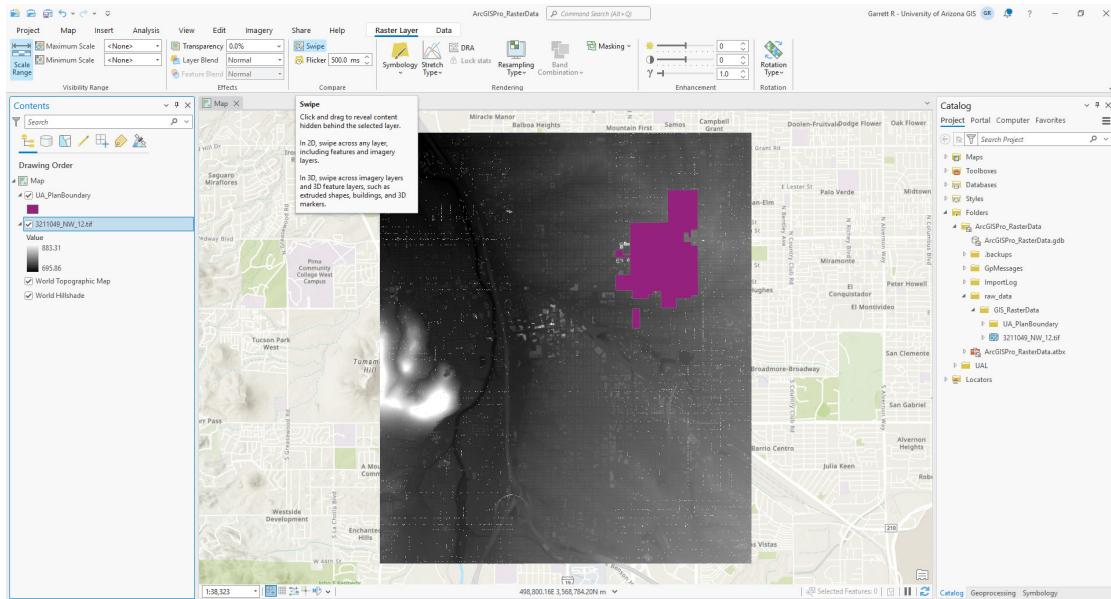
2. In the Map pane, with the .tif raster dataset highlighted in the Contents pane, use the Swipe tool to swipe up and down or left and right to see what is underneath the raster file.

DEM:

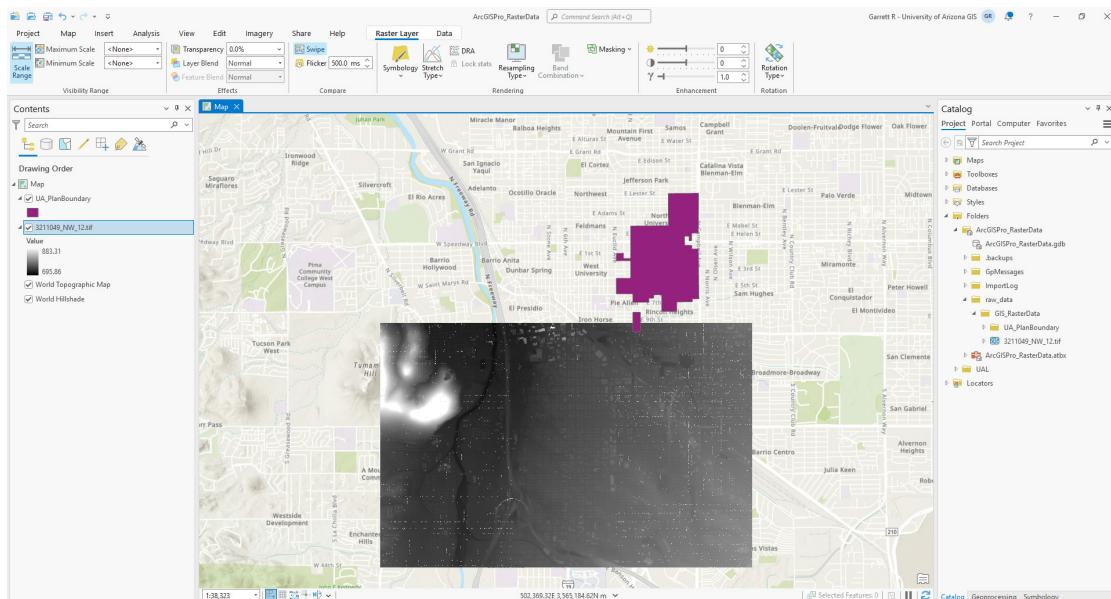
A Digital Elevation Model (DEM) is a raster-based geospatial file that serves as a continuous representation of the bare ground (bare earth) of a surface. Elevation values are calculated at the surface of the ground with all trees, buildings, and other surface objects being excluded from elevation calculation. 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.



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3. On the Map tab on the Ribbon click on Explore.

Click anywhere on the raster dataset in the Map pane to bring up the Pop-up window. The red dot on the map is roughly located where the pop-up is derived from. In the Pop-up window you only see the elevation value (841.47 meters).

4. In the Content pane right-click on the raster dataset and select Properties.

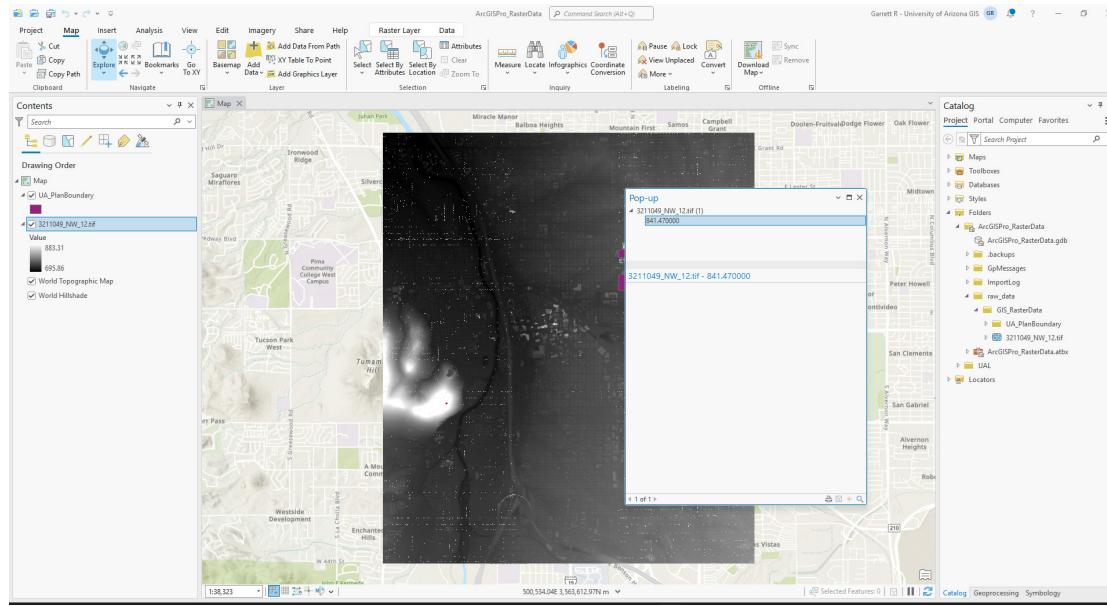
In the Properties window select Source from the side pane and expand Data Source, Raster information, and Spatial Reference.

RASTER FILE VALUES:

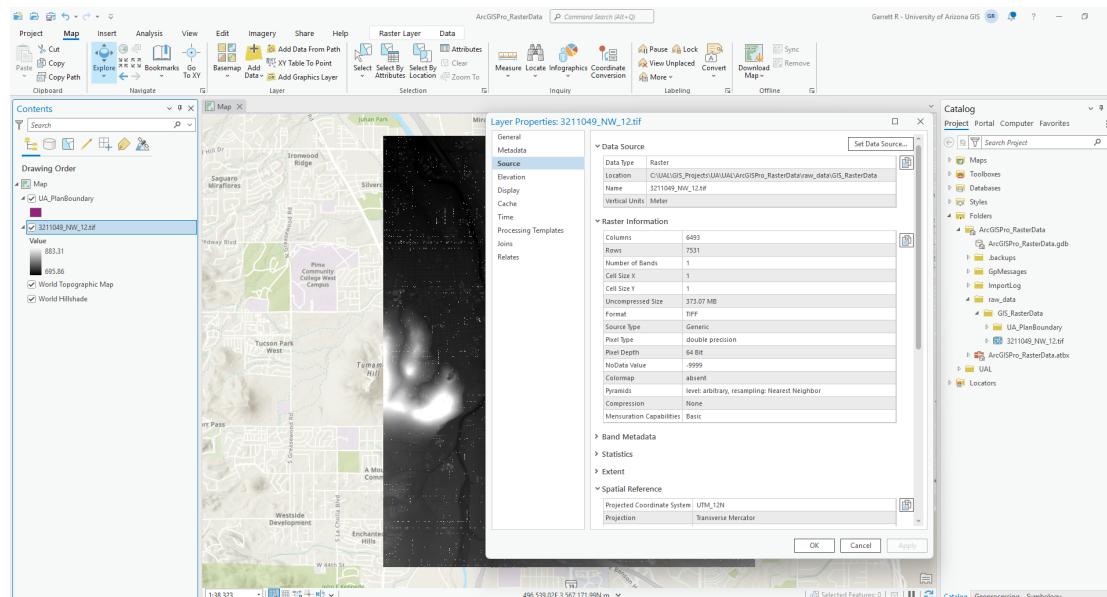
Raster files are made of a grid of cells, each containing their own value. While it is possible for raster files to have attribute tables, in this case there is not a table but rather a single value for each of the cells.

LAYER PROPERTIES:

The Layer Properties window provides important information about the raster file. Of particular interest are the columns and rows (number of raster cells), number of bands (the number of cell values), cell 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 Projected Coordinate System.



3



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EXTRACTING AND CREATING DATA

1. On the Analysis tab on the Ribbon click on Tools.
2. In the Geoprocessing pane search for the Extract by Mask tool.

Click on the Extract by Mask tool to open it.

TOOLS:

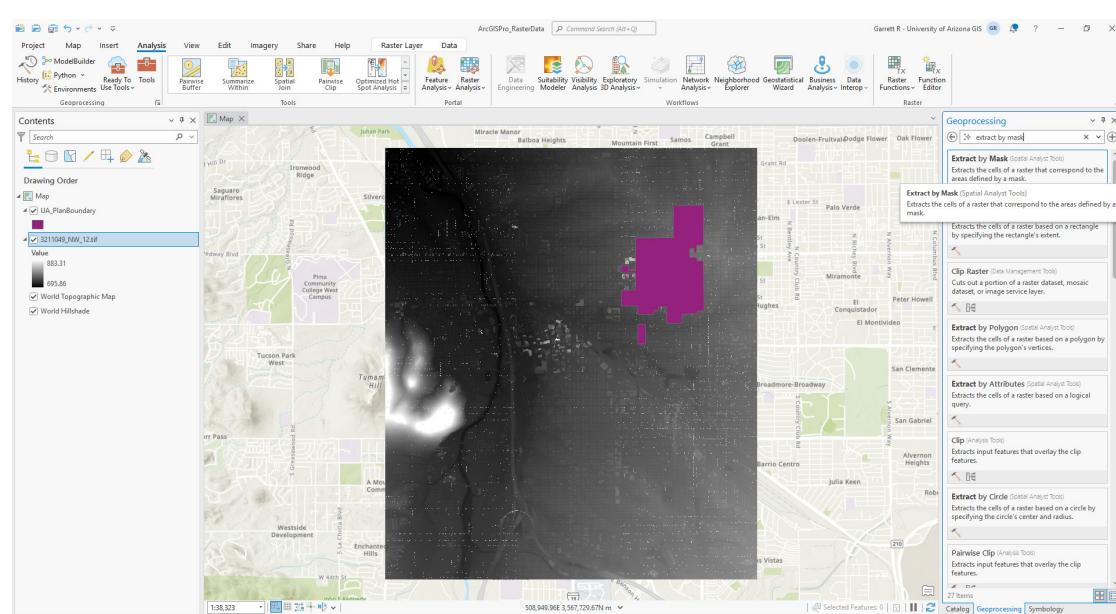
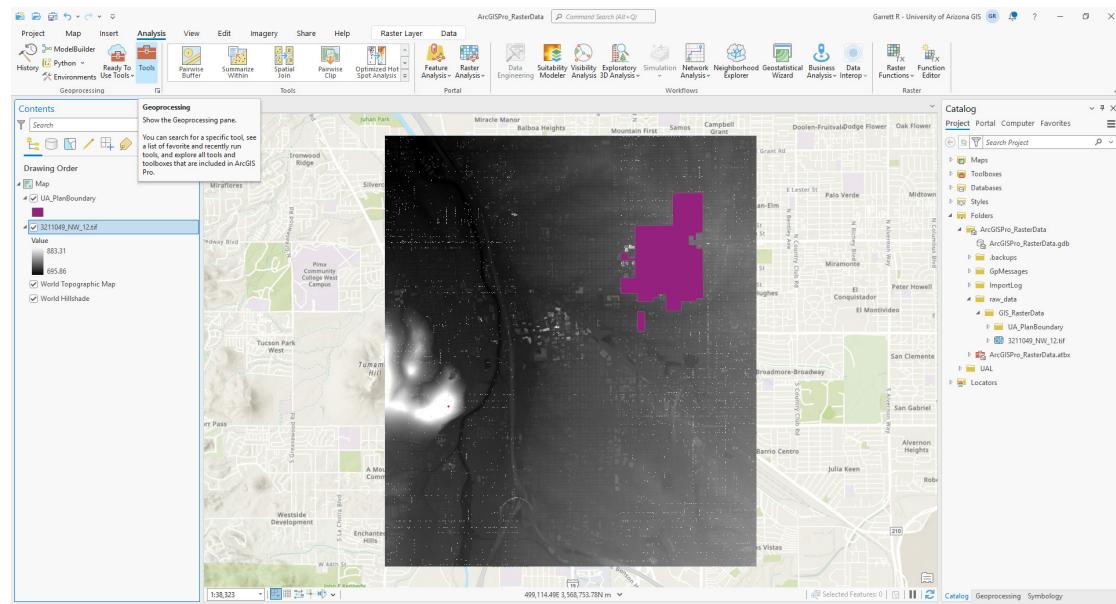
In ArcGIS Pro geoprocessing tools are organized in toolboxes. Each toolbox contains geoprocessing tools that are either designed for specific types of data or specific geospatial analysis tasks.

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.

EXTRACT BY MASK:

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



3. In the Extract by Mask pane match the following:

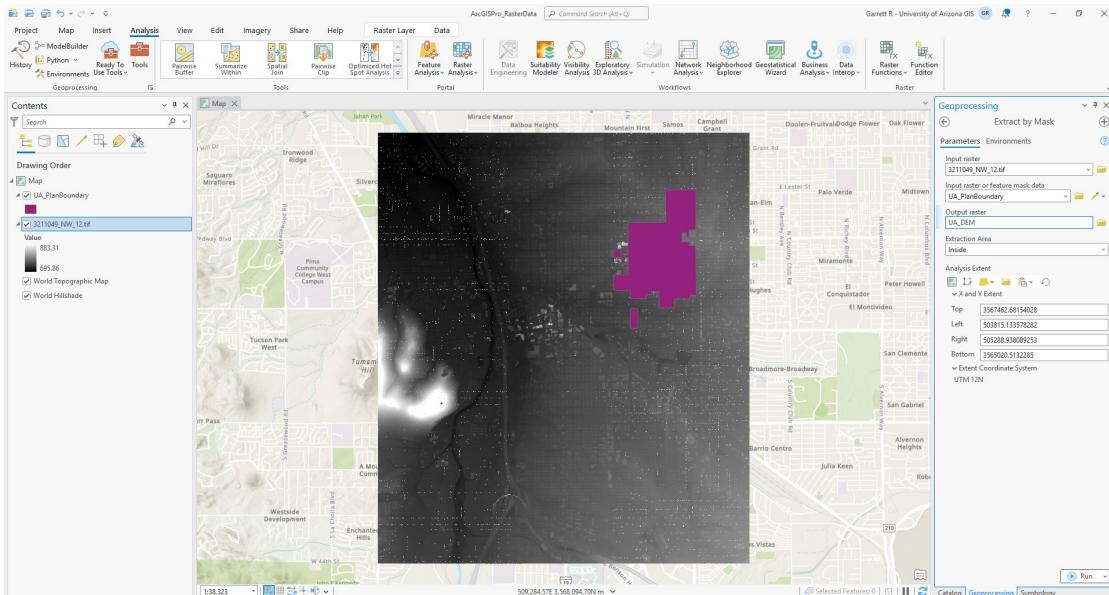
Input raster
32110049_NW_12.tif

Input raster or feature layer mask data
UA_PlanBoundary

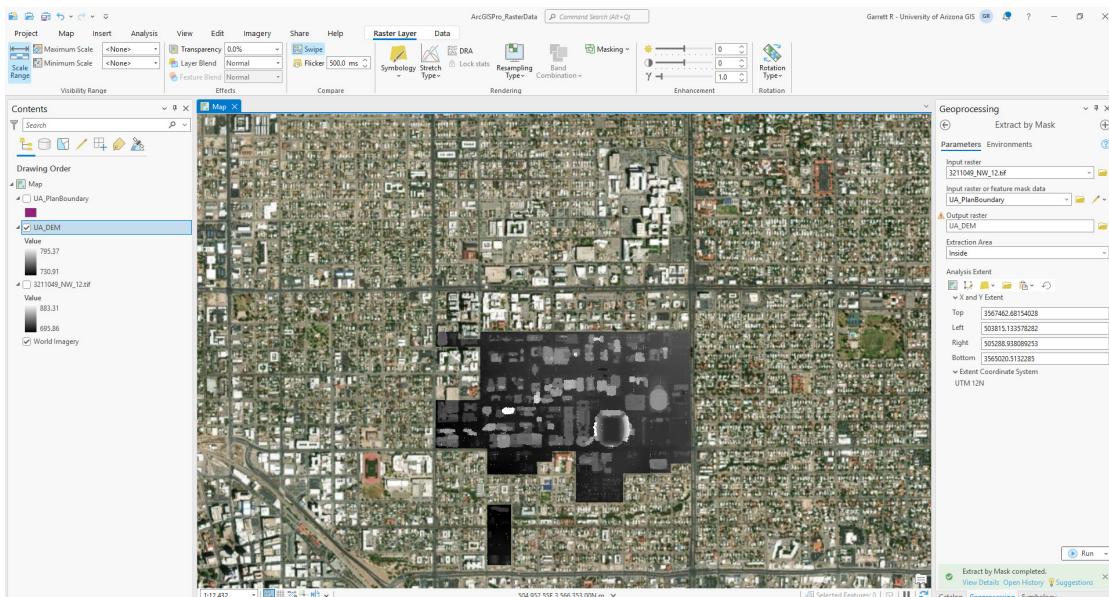
Output raster
Your choice

Extraction Area
Inside

Click Run



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SELECTING AND CREATING DATA

1. Remove the basemap.

In the Geoprocessing pane search for the Raster Calculator tool.

Click on the Raster Calculator (Spatial Analyst Tools) tool to open it.

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

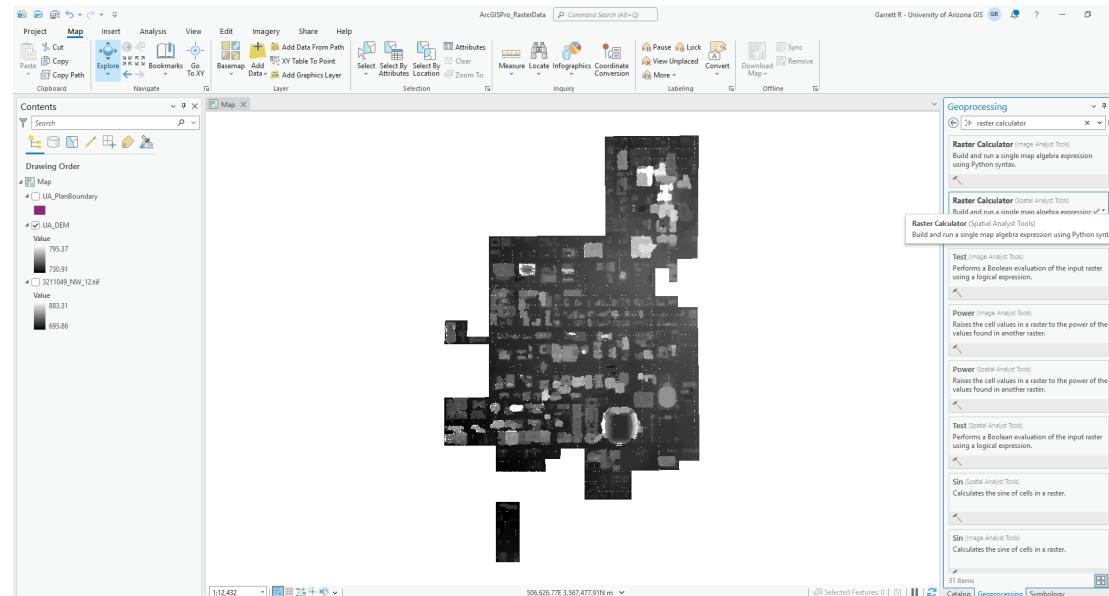
`Con(("your dem file" >= 750) &
("your dem file" <= 795.37),
"your dem file", 0)`

RASTER CALCULATOR:

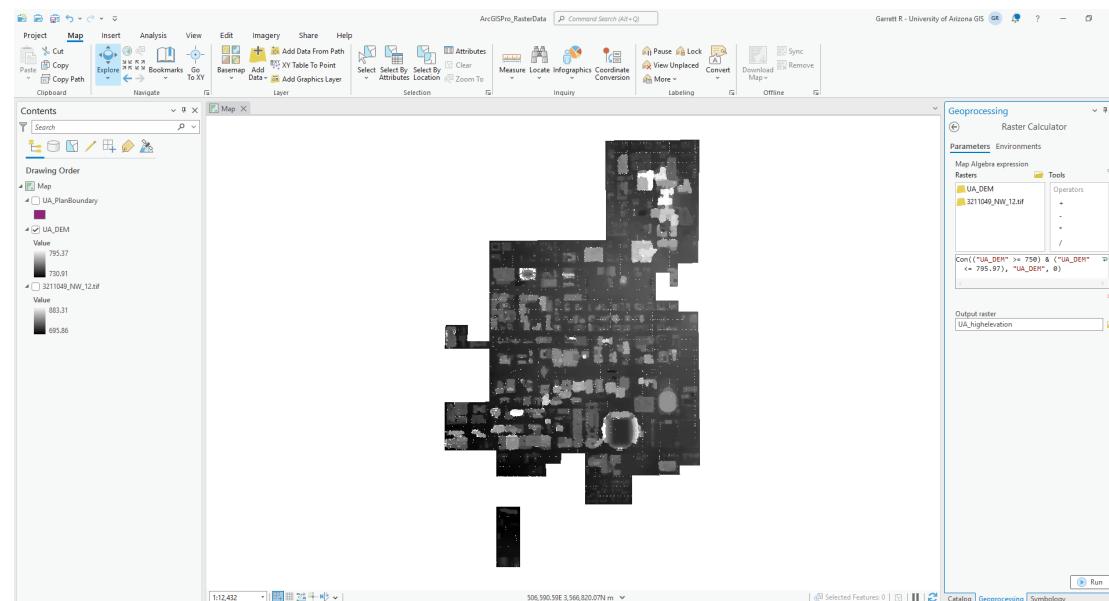
The Raster Calculator tool allows you to perform map algebra expressions to output a raster file based on the expression.

CONDITIONAL STATEMENT:

In the map algebra expression that you are using in the Raster Calculator tool you are asking ArcGIS Pro 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 and less than equal to 795.37 meters (the max height value). If a cell value does not meet this condition it is given a value of 0.



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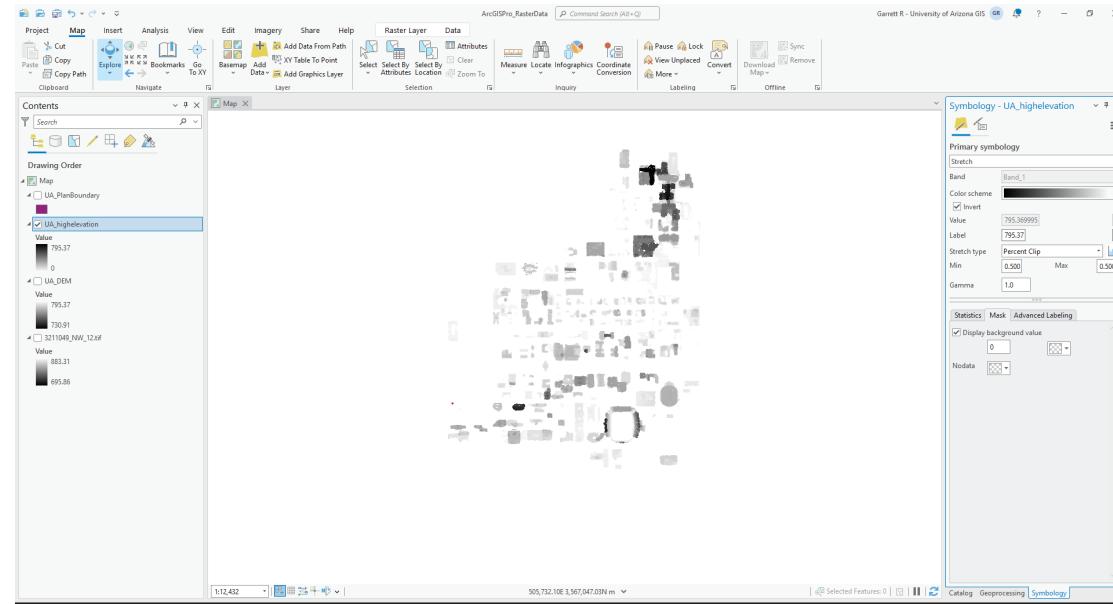


2

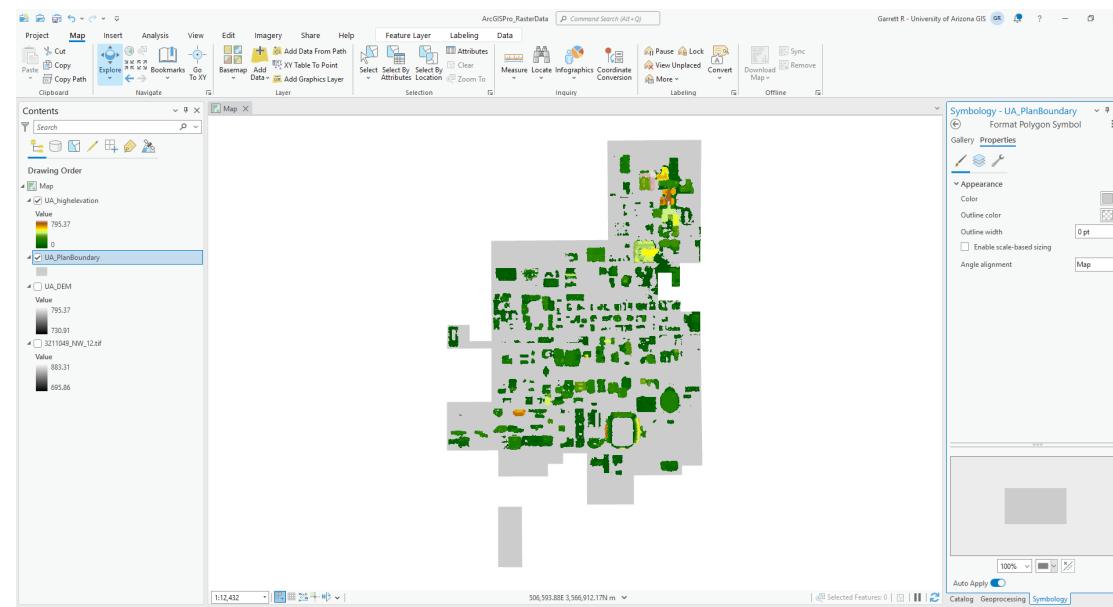
- 3.** Open the Symbology pane for the raster dataset you created in the previous step.

In the Mask tab in the Symbology pane place a check mark next to Display background value and change the color to No Color.

- 4.** Choose an appropriate color ramp for the raster dataset and the UA boundary feature layer.



3



4

END