Computing Areas for NDVI and Land Cover Classification Images

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Zonal Statistics as Table

One useful option after performing an image classification (or other image data, such as NDVI) is to determine the area of a given land cover class or how much "vegetation" there is in a given image. In ArcGIS Pro, this data field is not present in the Raster Attribute Table.

Data Notes

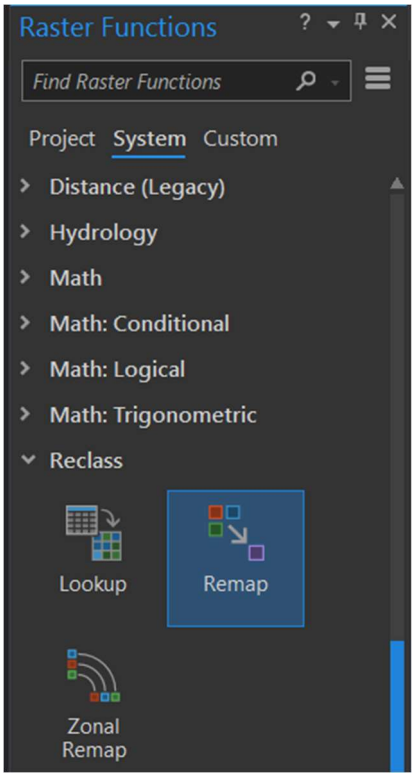
RasterZonalStats.ppkx – this pro package file contains the data shown below. The Landsat 8 image has been subset to create a smaller Pro package file. If the user attempts to recreate the steps using the data provided, the NDVI and remap values will likely be different. This is ok, since these instructions and data are intended as a guide.

Using Zonal Statistics as Table with a NDVI Image

A Normalized Difference Vegetation Index (NDVI) result normally contains values between -1.0 and +1.0 (provided an analyst does not rescale the data between 0 and 255 or by some other method. The NDVI image contains values of "continuous" distribution vs discreet, grouped values. Generally, the NDVI can be partitioned into areas such as non-vegetated (typically below 0.2), minimal/sparse (typically between 0.2 and 0.6), or high/significant/ (typically, greater than 0.6) healthy green vegetation. Although these groupings are arbitrary, the NDVI data can be "remapped" into integer values vs decimal values where the Zonal Statistics as Table routine can be used to "quantify" these (or other groupings) of NDVI pixels.

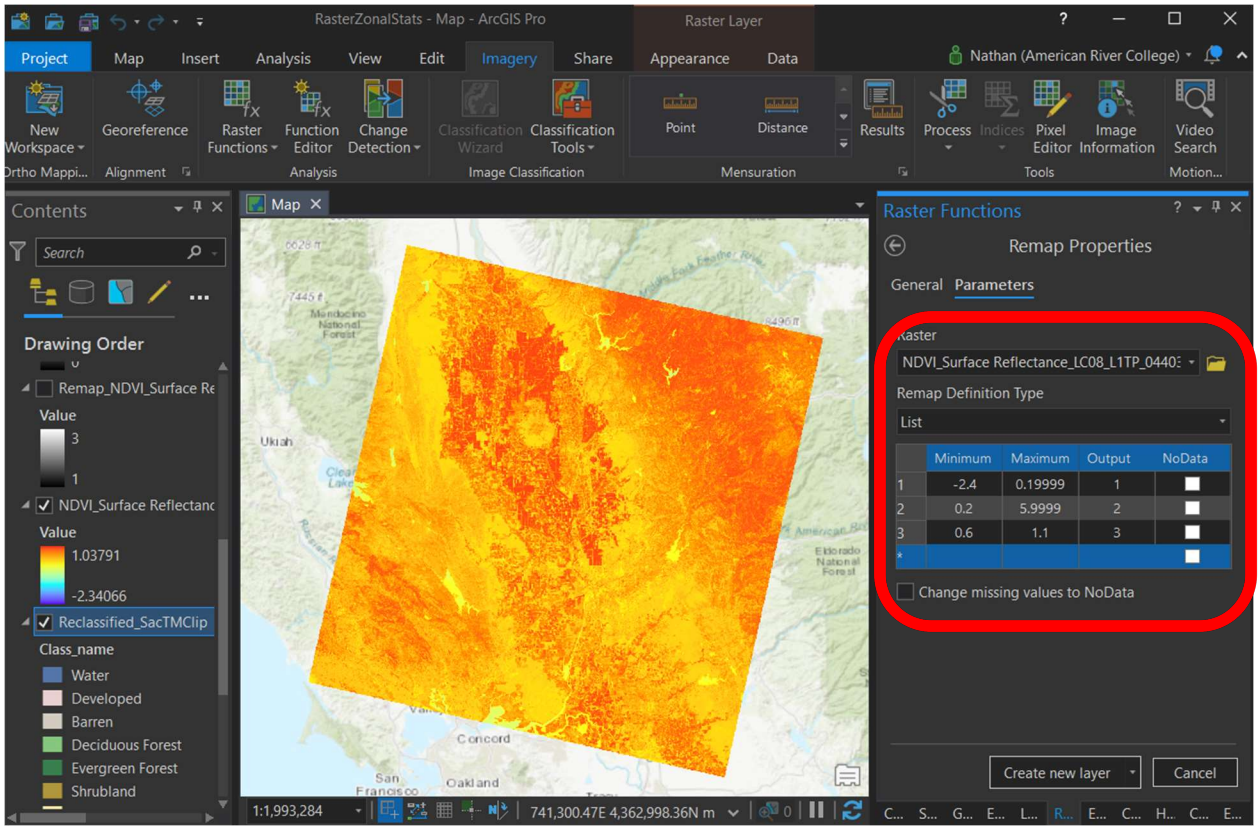
Remap NDVI Pixels

1. Within ArcGIS Pro, make sure the NDVI image is highlighted in the Table of Contents.
2. Choose the **Raster Functions**, then find the **Remap** tool under the **Reclass** group.

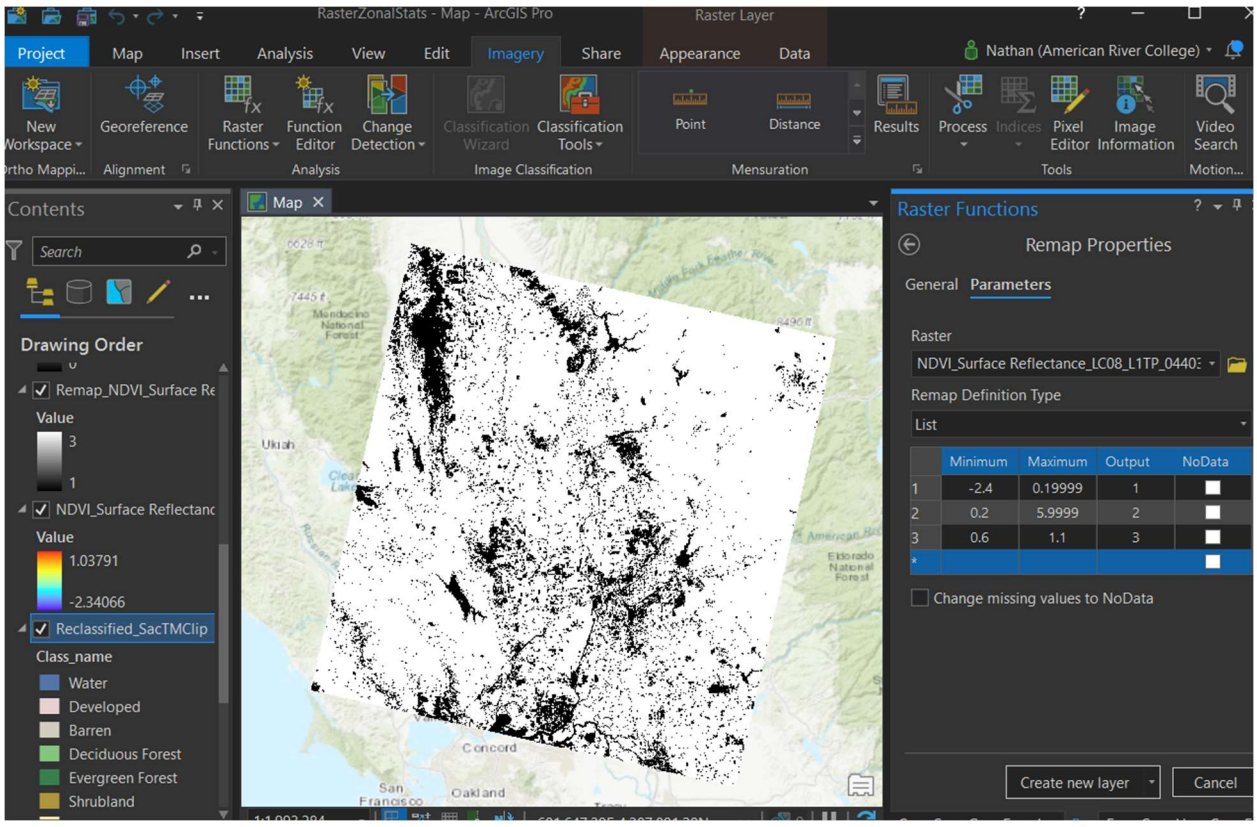


In the example below, the NDVI result shows a range of -2.3 – 1.0. NOTE: Other NDVI images will have different values, but generally will have a range of -1.0 to +1.0, but the range could vary a little.

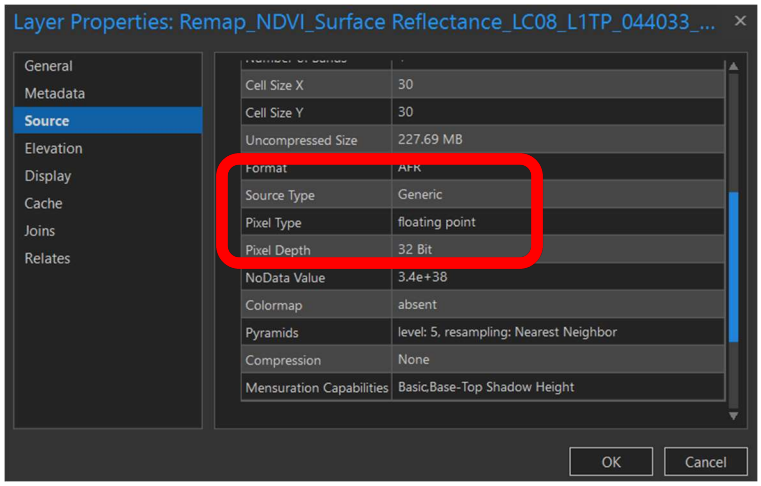
3. The NDVI image is used as the input and the various ranges are shown that will get remapped to integer values, 1, 2, and 3, respectively. Ranges in a different NDVI image will be different. One does not have to show 3 categories, 2 categories could be used (vegetation/non-vegetation), or even 3 or more different groups, each with different NDVI ranges, depending on the interest of the analyst.



4. Click create new layer and a new image will appear in the Table of Contents.

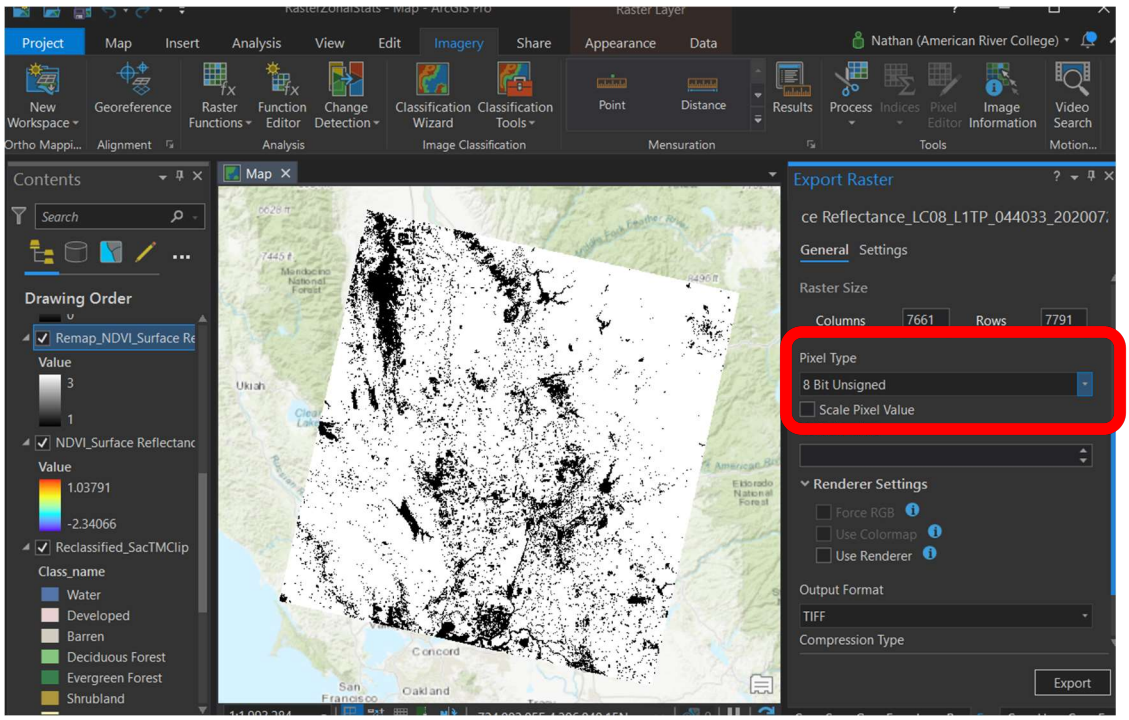


Checking the **Properties** of the "remapped" image, the data type shows a floating point (decimal) value.

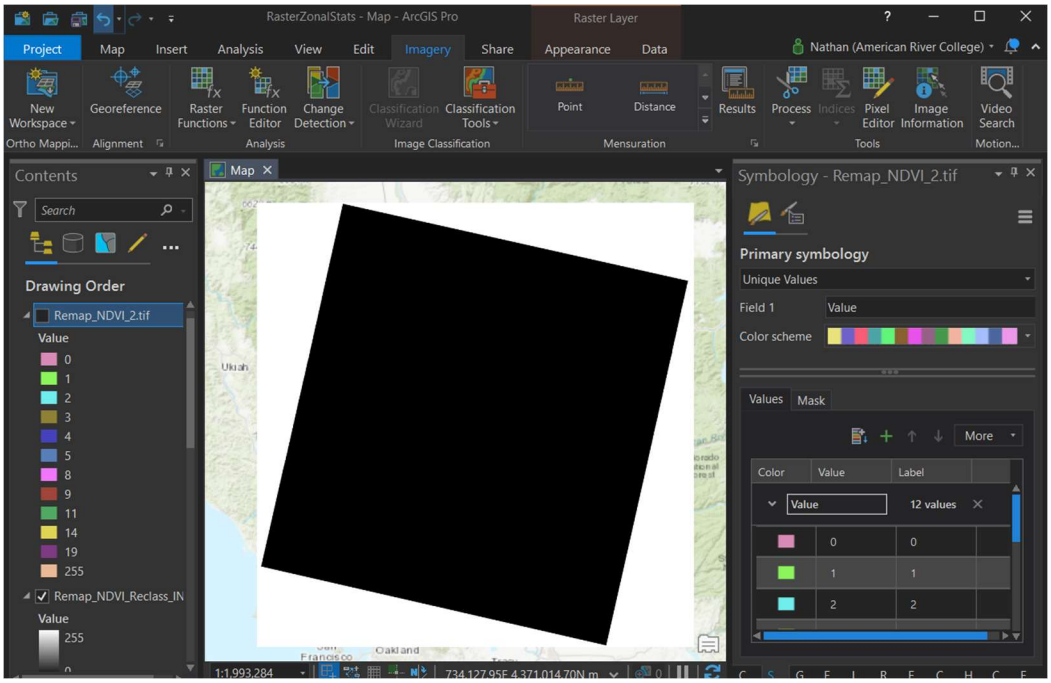


Export the image and choose 8-bit unsigned as the output data type.

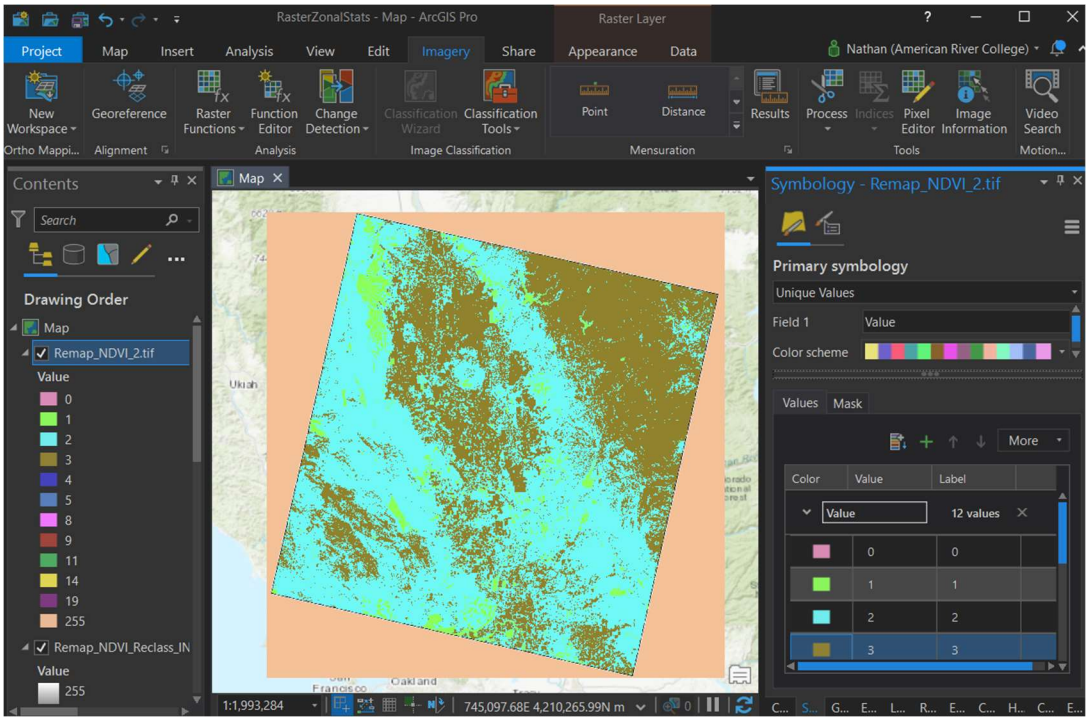
5. Right click on the remapped image and choose Data—Export Raster and make sure to set the data type to 8-bit unsigned (for positive only integer values). The default output image will likely be in a TIF format if the input is a TIF file. Change the output name as needed. Take the rest of the defaults in the Export Raster tool.



The result may look like this, below (since there are only values (1,2, and 3). The symbology can be changed to show unique color values.

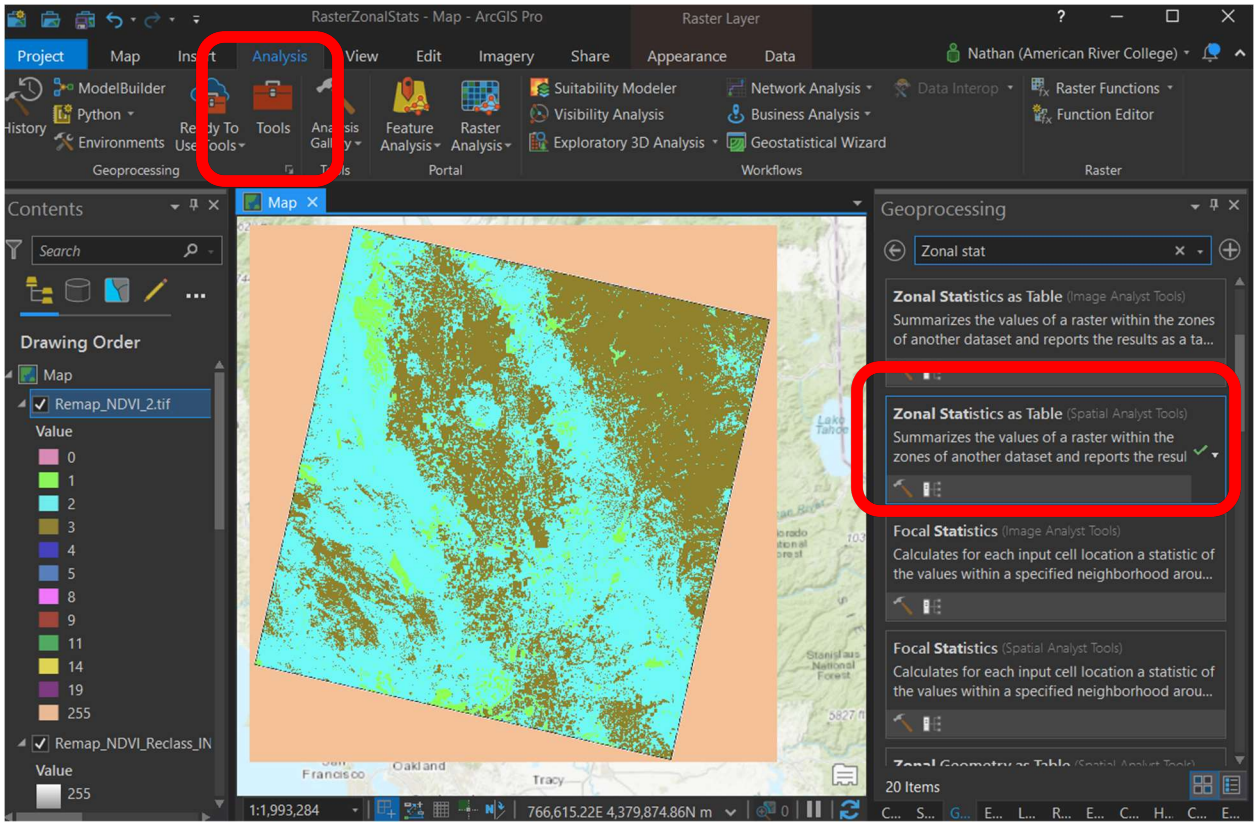


6. Right click on the “exported” raster from above and choose **Symbology**. Change the Display type to **Unique Values** using the **Values** field.

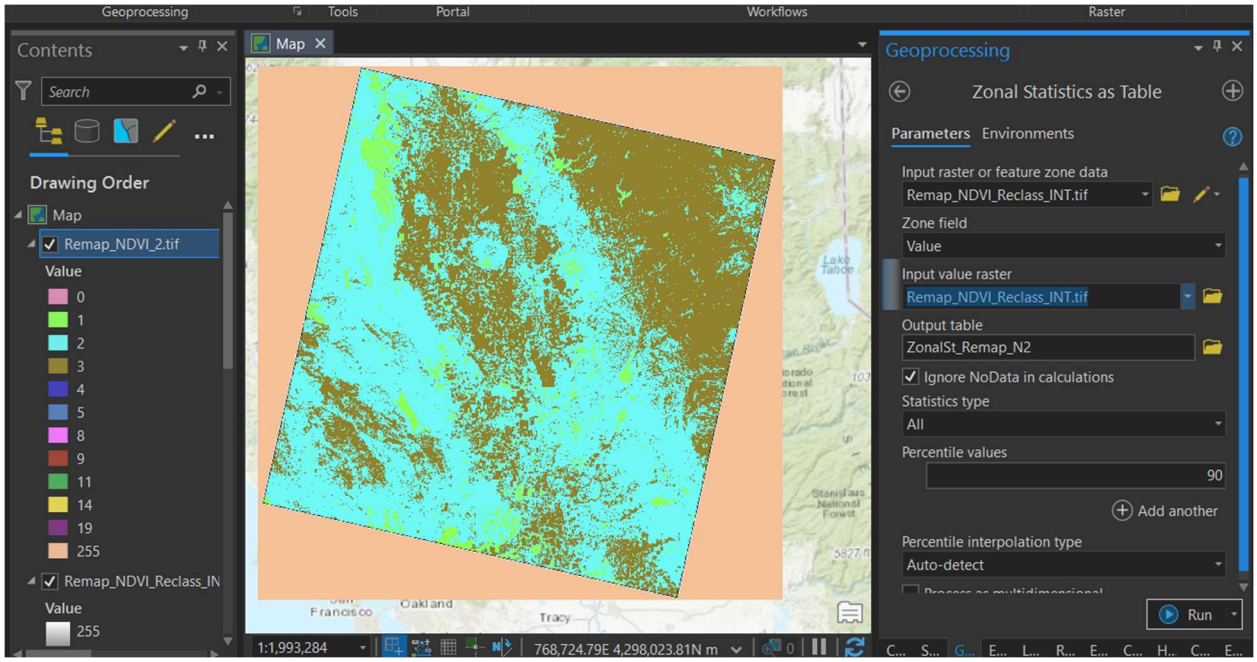


NOTE: Depending on how the NDVI values get remapped, one may see some “unique values” with a small number of pixels. This will not be a big concern and is likely resulting from rounding in the Min/Max columns of the Remap tool.

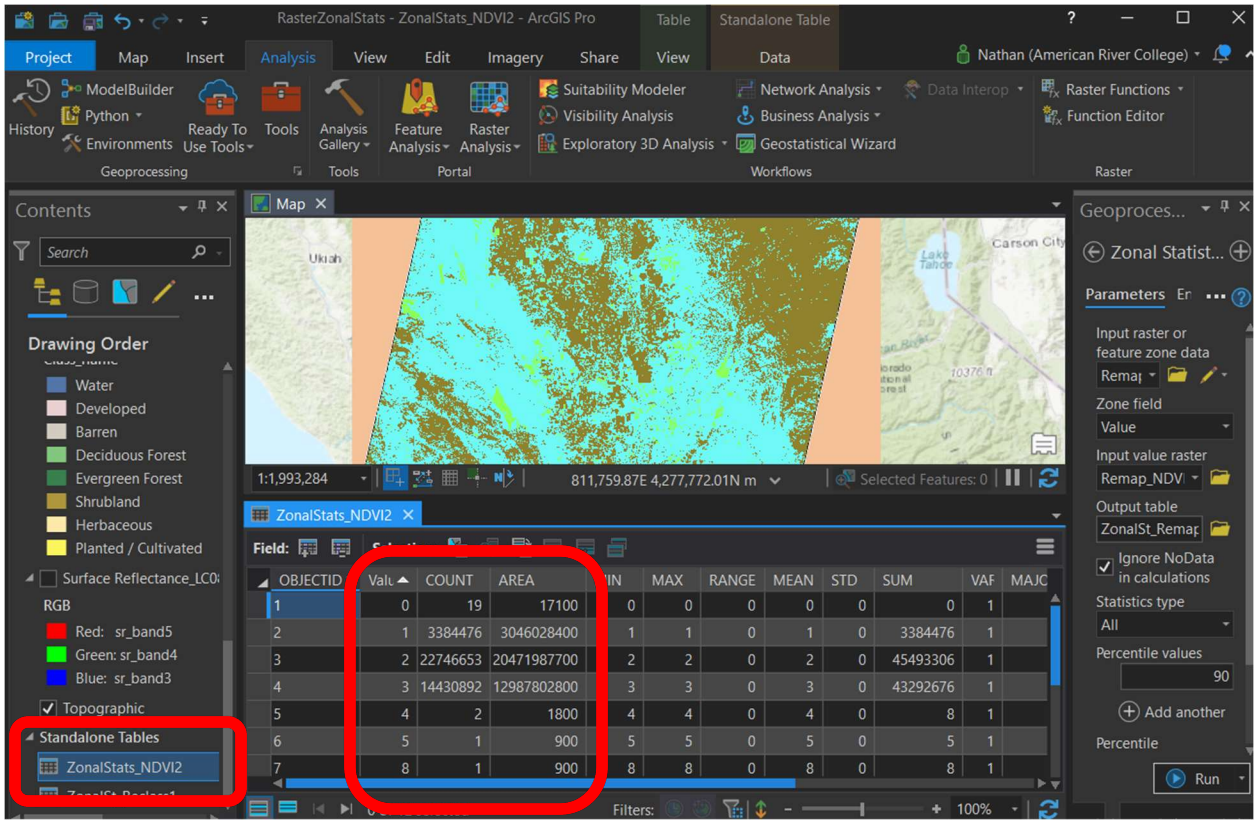
7. Use the Zonal Statistics as Table tool (Spatial Analyst) from the Analysis tools. NOTE: This tool is also available with the Image Analyst Extension. Most organizations purchase the Spatial Analyst Extension over the Image Analyst Extension. Either way, the tool functions the same within either extension.



Fill in the parameters with the “exported” **NDVI (integer – unsigned 8-bit image)** for both the **Input raster or feature zone data AND for the Input value raster**. Use the **Value** field as the field to compute the statistics on. Make sure the **Statistics type** is set to **“All.”** This option provides all available statistics **including a pixel count and Area value based on the square units** of the data set (in this example, square meters). Provide a useful Output table name that will be stored in the project file geodatabase.



Click Run to run the tool. A Stand-alone Table shows up at the bottom of the Table of Contents.



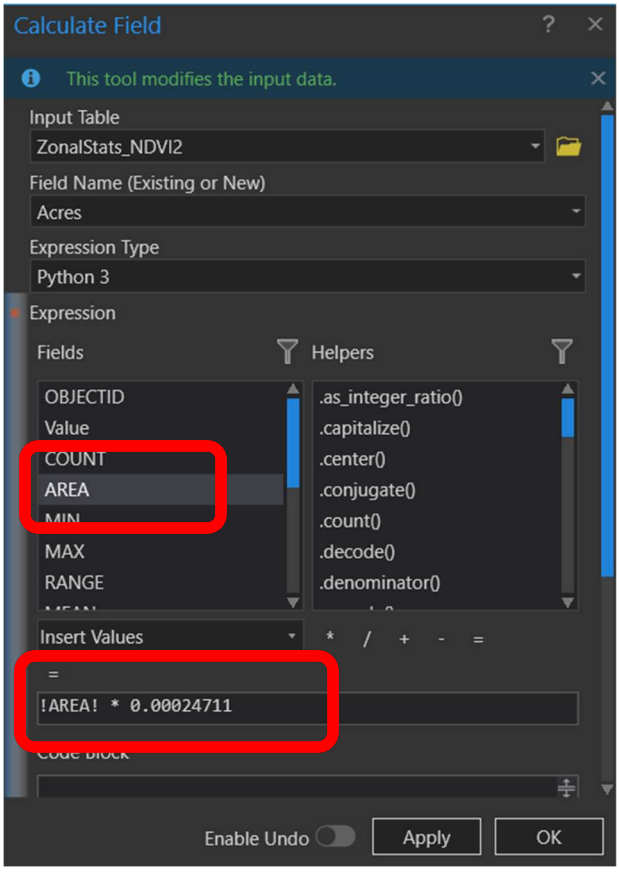
Note the Count and Area fields. Count is the number of pixels (yes, you will see some records with 1-2 pixels in them….these result from rounding in the Remap Categorization. The 0 (zero) value also results from this same issue. The values 1,2, and 3 are the most important to focus on. There will be/can be a

large number of pixels for 255 (which is the external part of the “rectangle” for the image. This value can be ignored, too.

If desired, **Add** a field called **Acres** (click on the **Add Field** button just at the top of the attribute table. Define Acres as a **double**.

A 30m pixel has an area of 900 sq meters. Area is already computed using the Count * the pixel square area. To get the Acres value the “multiplication factor is: **1 Sq. meter = 0.00024711 Acre**, so to compute acres do the following:

1. Right-click on the **Acres** field and choose **Calculate Field**.
2. When the pop up appears fill in the expression as shown below. Double click the **Area** field to fill in the “area field.” Type in the multiplication factor to convert sq meters to acres. Take the rest of the defaults.



The results will appear for all values in the attribute table for Acres. Remember, the very small values can be ignored.

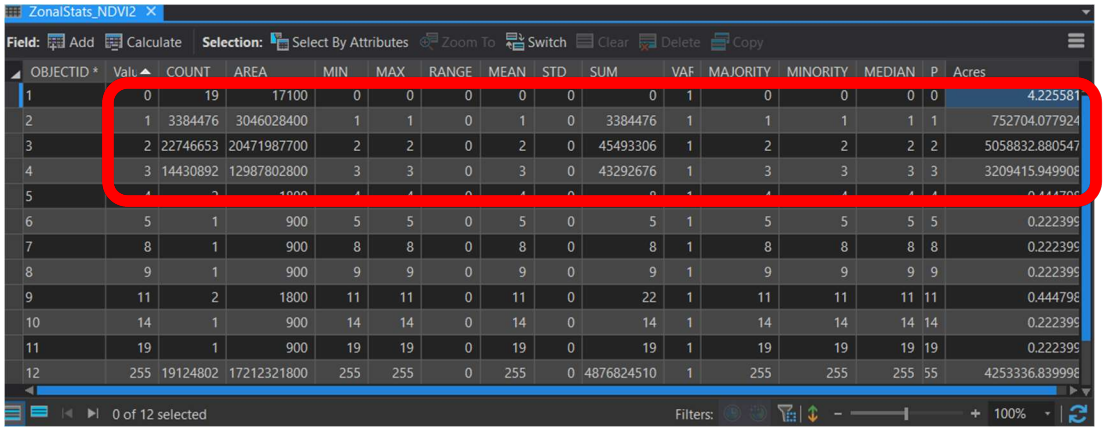


Table to Excel

If needed, use the Table to Excel tool to create an Excel spreadsheet that can be further manipulated in Excel.

Multiple Image Dates

Perform the same steps as above and export a separate spreadsheet. Within Excel the data from multiple dates/images can be manipulated to show a more informative quantitative analysis such as providing multiple tables of different dates showing categorical totals. The analyst can also compute categorical differences (subtract one date from the other for acreages) to show increases or decreases in categorical areas as well as computer the percent change (i.e. take (date 1/date 2) * 100).

Using Zonal Statistics as Table with a Land Cover Classification Image

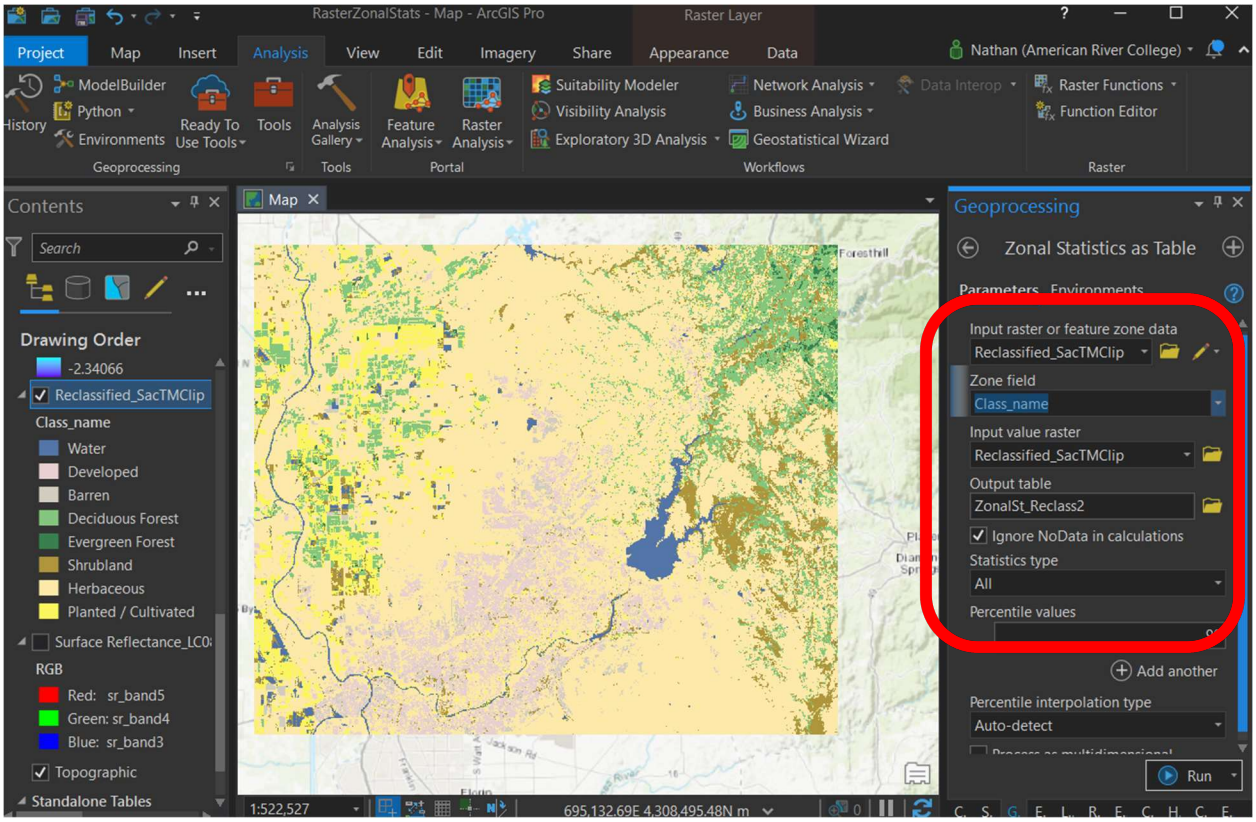
Computing the areas and acreages are simpler than the NDVI example. The land cover classification data is already in a discrete integer format. As such, on the Zonal Statistics as Table tool needs to be run.

1. Start the Zonal Statistics as Table routine as shown above.

The input raster or feature zone and the input raster will be the same image (in this case the Land Cover classification resulting image).

Shown below is an example classified image.

2. Note the input raster or feature zone data AND the Input value raster is the classified image.
3. Set the Zone field to Class Name.
4. Set Statistics Type to All
5. Provide a useful Output table name that will be stored in the project file geodatabase.
6. Click Run.



The result shows up in the Contents pane at the bottom.

Open the table to see the data columns.

Add the Acres field as shown above and compute the field (i.e. Calculate Field) using the same conversion factor. NOTE: Different units of measure will have different conversion factors. Search for the appropriate conversion factors online.

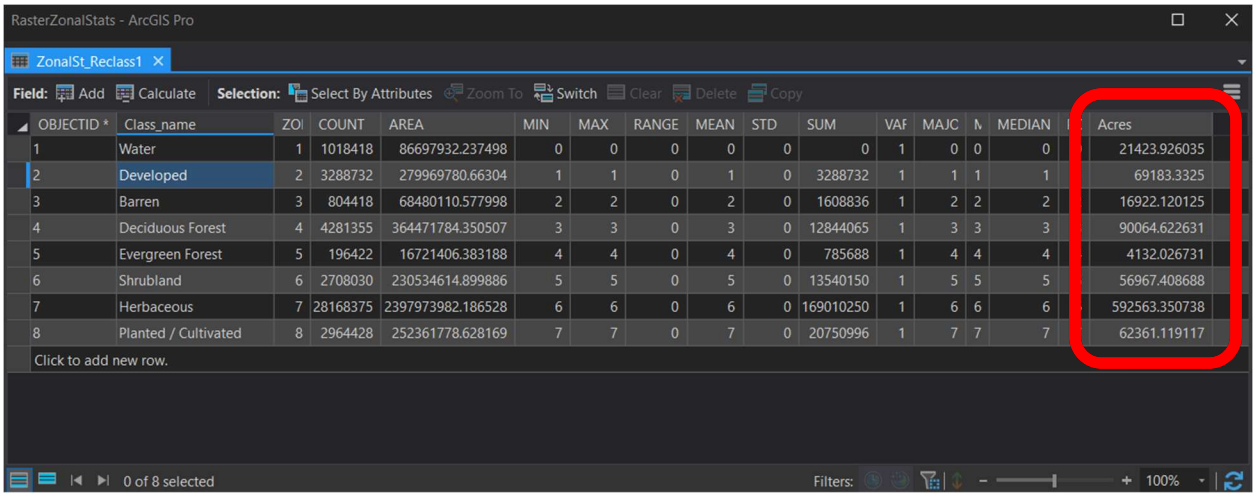


Table to Excel and Multiple Dates

The same processes as above for NDVI can be used for the Zonal Statistics for the land cover classification image.

Reference

https://www.usgs.gov/core-science-systems/eros/phenology/science/ndvi-foundation-remote-sensing-phenology?qt-science_center_objects=0#