

EXERCISE

Prepare Raster for Processing using Raster Functions



Introduction

Raster functions are a set of tools available in ArcPro that allow a user to process raster data quickly without generating new layers or files. In this exercise we will mosaic two raster's but before we can do that, we need to make sure they share the same projections. Projections are VERY important when working with any GIS or geospatial dataset because they determine the way our data is portrayed on a curved surface i.e. Earth.

Objectives

- Learn how to use Raster Functions to prepare data
- Learn how to project, mosaic, and clip a raster to a given area using Raster Functions

Required Data:

- **Btm_Dall_Island_UTM.tif** - Multiband Sentinel imagery
- **Top_Dall_Island_UTM.tif** – Multiband Sentinel imagery
- **Clip_Dall_Island.shp** – shapefile used to clip a section of the mosaiced imagery

Prerequisites

- Install Esri ArcGIS Pro on computer
- Have Spatial Analyst and/or Image Analyst Extension



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Table of Contents

Part 1: Create Project and Load Data.....	4
Part 2: Reproject Rasters	5
Part 3: Mosaic Rasters	6
Part 4: Clip Mosaiced Raster	7

Part 1: Create Project and Load Data

Quickly set up your project in ArcPro and load all necessary data for this exercise.

A. Create ArcPro Project

1. **Open** ArcPro
2. **Select Map** under Blank Templates
 - i. Label the project RasterFunctions_Exercises
 - ii. Choose your project location
 - iii. You can create a new folder if you want
3. Click **OK**
4. Click the **Add Data** button from the Map Tab in the Layer Group and navigate to where you placed the course material.
5. In the RasterPrep_Exercise folder select **Btm_Dall_Island_UTM.tif**, **Top_Dall_Island_UTM.tif**, **Clip_Dall_Island.shp** and click **OK**.
6. In the Contents Pane, highlight **Top_Dall_Island.tif** then in the Appearance tab, in the Rendering Group, click **Stretch Type** and select **None**
 - i. **Repeat** for Btm_Dall_Island.tif

Note: These are Sentinel-2 images of Dall Island which is a part of the Prince of Whales Island (PoW) in Alaska. PoW is the 4th largest island in the U.S. and 97th in the world. It is slightly larger than Delaware and the majority of the landscape is in the Tongass National Forest, the largest National Forest in the nation.

Dall Island is the 28th largest island in the United States and as of the 2000 census there were 20 people living on the island. It is 254 square miles and is used economically for fishing and limestone quarrying.

B. Load the reference image

1. **Add** World Imagery basemap without labels from the **Map tab** in the **Layer Group** select **Imagery** from the Basemap dropdown

Part 2: Reproject Raster's

The Reproject Raster Function can modify the projection of a raster dataset or mosaic dataset. It can also modify a projection of a single item in a mosaic dataset. If you want to resample the data into a new cell size and define an origin for the data, this can also be done while using this tool.

The Tongass National Forest commonly uses the state plane coordinate system for their datasets and if we wanted to use our imagery with other forest data it is important that they have the same projection.

A. Image Properties

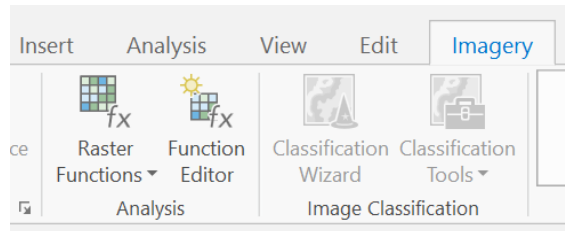
1. In the table of contents, right click Top_Dall_Island_UTM.tif and **select Properties**
2. In the **Source** tab expand **Raster Information** and note the Cell Size, Pixel Type and Pixel Depth.
Next, expand the **Spatial Reference** and notice the Projected Coordinate System is WGS 1984 UTM Zone 8N.
3. Check to see that Btm_Dall_Island_UTM.tif has the same information

Note: The Pixel Depth is the radiometric resolution for your mosaic i.e. the amount of detail each pixel has. To better understand this check out Introduction to Raster Geoprocessing course.

The Pixel Type is unsigned meaning your pixels will have no negative numbers (0 to 255) whereas signed pixels can have negative values.

B. Reproject Raster Function

1. In the Contents pane **highlight** Top_Dall_Island_UTM.tif
2. From the Imagery tab, in Analysis group, **click Raster Functions**



3. In the Raster Functions Pane **select** the **Systems** tab
4. Search for **Reproject** or scroll down to the Data Management section and click to open the tool
5. On the **General Tab** under the Output Pixel Type dropdown select **8 bit unsigned**
6. In the Parameters tab **add** Top_Dall_Island_UTM.tif in the Raster box
7. Click the **globe** next to Spatial Reference
 - i. Expand the Projected Coordinate System → State Plane → NAD_1983 (2011) Meters → NAD 1983 (2011) State Plane Alaska 1 FIPS 5001 (Meters)
 - ii. Click **OK**

Note: If you wanted to adjust the cell size of your raster you can fill in the X and Y Cell size boxes. For this exercise you do not need to fill this in.

8. Click Create new Layer
 - i. When you create a new layer remember that you are NOT actually creating a new tiff file that can be used in a different project rather you are making a temporary layer that will processes faster.
9. Open File Explorer and navigate to the folder where the course data is held. Notice that there is no new file in this location. This means that unless you are in this ArcPro Project you will not be able to access the State Plane projected raster

Note: If you wanted to make this process permanent so you can use the State Plane projected raster in future projects or processing you can click on the pull down beside the Create new layer button and save the projected raster OR use the Project Raster Geoprocessing tool.

10. A new layer is added to the Contents pane, but it doesn't look like a natural color image. This is because the image come is stretched as Percent Clip to change this.
 - i. **Highlight** the Reproject_Top_Dall_Island_UTM.tif
 - ii. Under the **Appearance tab**, in the **Rendering Group**, select **Stretch Type** dropdown and select **None**.
11. Repeat steps 1-8 for Btm_Dall_Island_UTM.tif to reproject it to NAD 1983 (2011)State Plane Alaska 1 FIPS 5001 (Meters),

Part 3: Part 3: Mosaic Raster's

To get a single image of Dall Island we will need to mosaic them together so they can be used as one dataset.

A. Mosaic Raster

1. In the Raster Functions pane, select System and search for Mosaic Raster
2. Click on the **General tab**
 - i. Under multidimensional rules there are a few different options you can edit here. We are not worried about this since we are not working with a multidimensional dataset. Therefore, leave it as is.
3. Choose **8 bit Unsigned** for the Output Pixel Type
4. Click on the **Parameters tab**
5. Add both **Reproject** images

Because we have slight overlap between our images, we need to decide what type of mosaic operation will be performed. To understand the different options, visit the [help page](#) for this tool.

6. In the **Operation** drop down select **Blend**

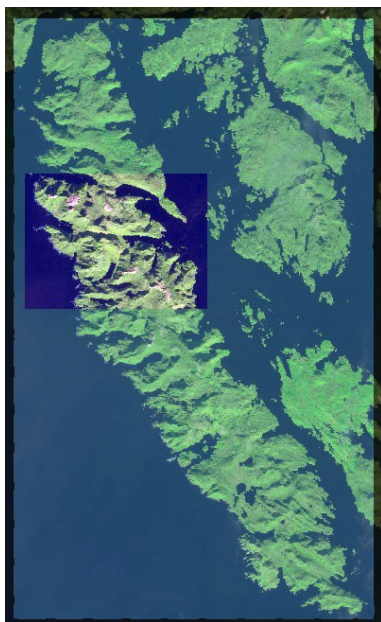
- i. Blend will calculate and display an average of the overlapping pixels by giving more weight to pixels that are closer to neighboring images, so the output is a smoother image. This is the default.
7. Click **Create new layer**
8. Adjust the appearance of the new layer by changing the **Stretch Type** to **None**
9. **Change** the new layer name to something shorter by highlighting the layer and pressing **F2**
10. Mosaic_Dall_Island_StatePlane
11. Remove any layers in your Context pane except this layer and the Clip_Dall_Island shapefile

Part 4: Clip Mosaiced Raster

Now we will clip this mosaiced raster to a smaller area to get practice with the Clip Raster Function. A clip can be used if you want to do a quick visualization on a section of your imagery.

A. A. Clip Raster

1. If not already added, Add the Clip_Dall_Island.shp to your map
2. In the **Raster Functions** pane search for **Clip** and open the tool
3. In **General tab** Select **8 bit unsigned** for the Output Pixel Type
4. In **Parameters tab**, select the **Mosaic_Rasters_Reproject** in the Raster box
5. **Clipping Type** should be **Outside**
 - i. Inside would remove this piece and leave the greater mosaic like a donut hole
6. Select **Clip_Dall_Island** for the Clipping Geometry/ Raster box
7. Click **Create new layer**
8. Adjust the appearance of the new layer by changing the **Stretch Type** to **None**
9. Turn off or remove the Mosaic_Dall_Island_StatePlane and examine your clipped file. Remember this layer IS NOT permanent.





Congratulations! You have successfully completed this exercise. You now know how to use Reproject, mosaic, and clip raster functions and you didn't even clog up your computer with multiple different files.