Importing Digital Elevation Models into ArcGIS

ArcGIS Tutorial

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Contents

Introduction

This project was created by Dr. Les Kanat to attempt to use cost effective drone technology to capture images and use them to create models and pictures that can be placed and georeferenced in a mapping program like ArcGIS. The goal of this project was to import these models into ArcGIS in hopes to compare them to past DEM's to observe soil erosion in agricultural fields and rock chute movement at Smuggler's Notch.

Digital elevation models (DEM) are made using LiDAR, Aerial Photographs, and many other ways. The creation of a DEM was outlined in the *Building Digital Models from Imagery* paper written by Robert Ferullo (2018). This tutorial will outline the process of taking a DEM built from aerial images and importing it into ArcGIS. Being able to use these models and images in ArcGIS allows for calculations to be done with the data the drone collects and past DEM data from the state of Vermont. Volume loss and mass movement can be seen by comparing DEM's from different years.

Note: See http://kanat.jsc.vsc.edu/drone/ferulloPhotoscanTutorial2018.pdf for Robert Ferullo's method using Agisoft Photoscan to make DEMs.

Collect Data

A drone can be a valuable piece of technology to create digital elevation models (DEM). Drones can be used to capture photographs of a survey area, which are then converted into three-dimensional models. These models can be used to do analysis of an area's slope and elevation.

1. Chose a day to fly with calm wind and minimal cloud cover.
2. Use a drone with image capturing equipment, fly to a known elevation above the desired survey area.
3. Point the camera straight down and capture between 5-10 pictures.
4. Change the direction that the drone is facing and take another 5-10 pictures.
5. Change the elevation that the drone is flying at and take another 5-10 pictures.

Create a DEM

See *Building Digital Models from Imagery* by Robert Ferullo (2018) for instructions on using Agisoft Photoscan and creating a Dense Cloud. A DEM can be created using the three-dimensional models created in Robert Ferullo's tutorial.

While still in Agisoft Photoscan:

1. Open the .psx file created using Robert Ferullo's tutorial.
2. Use the Workflow tab and select "Build DEM".
3. Choose Geographic and NAD 83 as a default (Figure 1).
4. Click "ok".
5. Save the file as a .psx file.

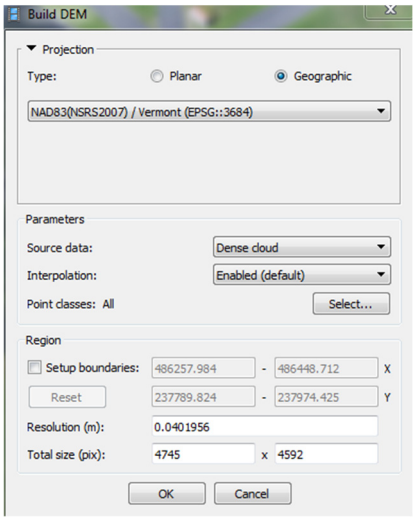

Figure 1. DEM tool

Import a DEM into ArcGIS

This model is a great way to see a digital representation of the area that has been photographed. To analyze this model, it will fist need to be imported into ArcGIS.

1. Open ArcMap.
2. Select “My Templates”.
3. Select “Blank Map”.
4. Click the Add Data icon.
5. Add one of the .tif files from Agisoft folder created in the previous step. The file will be shown as raster data with a symbol that looks like. 
6. If prompted to create pyramids, select “No”.

The DEM will show up in grey scale. By right-clicking the layer on the left of the screen and selecting “Properties”, then “Symbology”, the color ramp can be changed (Figure 2). This can be useful for a DEM that does not have much variance. A green to red color scale can show smaller elevation differences.

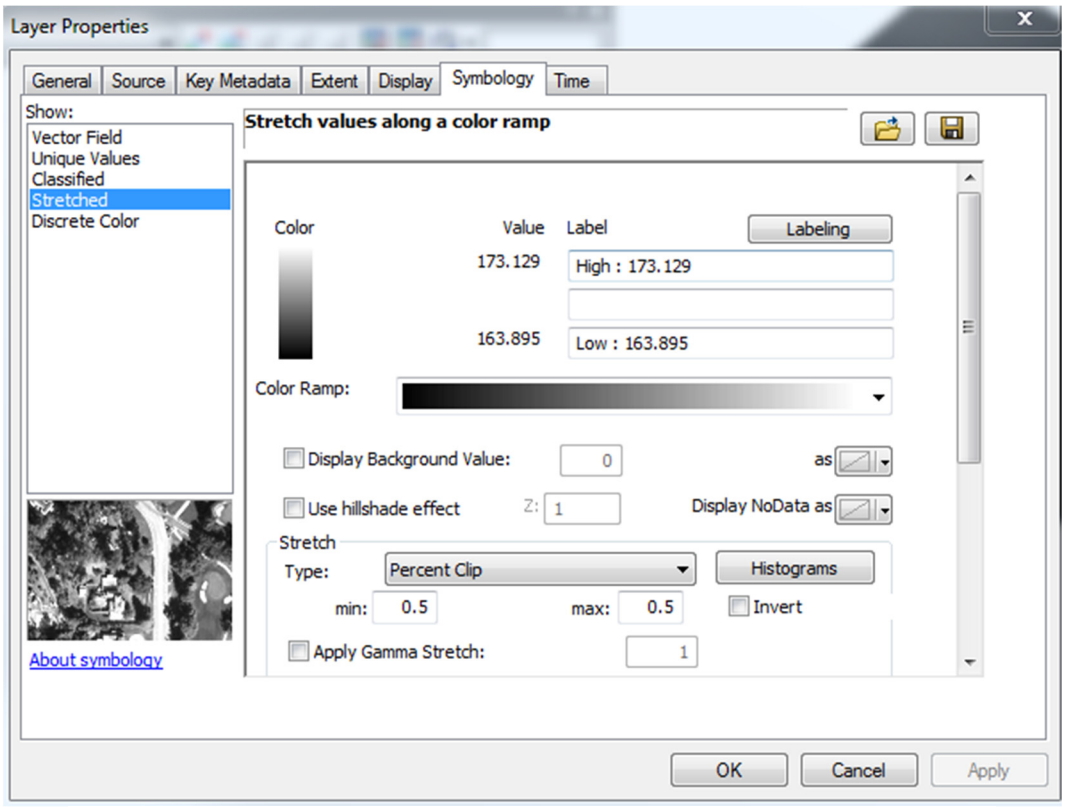

Figure 2. Layer Properties tab.

Use the DEM

Now that a DEM has been created and imported into ArcGIS, calculations can be done with this new layer. Slope is a tool that is useful to find the slope of an area using the DEM. This helps define the topography of the landscape.

1. Open up the ArcToolbox (Figure 3).
2. Open the "Spatial Analyst Tools".
3. Open the "Surface" tools.
4. Double Click Slope.
5. Enter the following into the tool window:

   Input raster: Select the DEM that was used previously.

   Output Raster: Use the file button and select a location and name the output layer.

   Output measurements: DEGREE

   Method: PLANAR
6. Click "ok".
7. The Slope raster will come up and look similar to Figure 3.

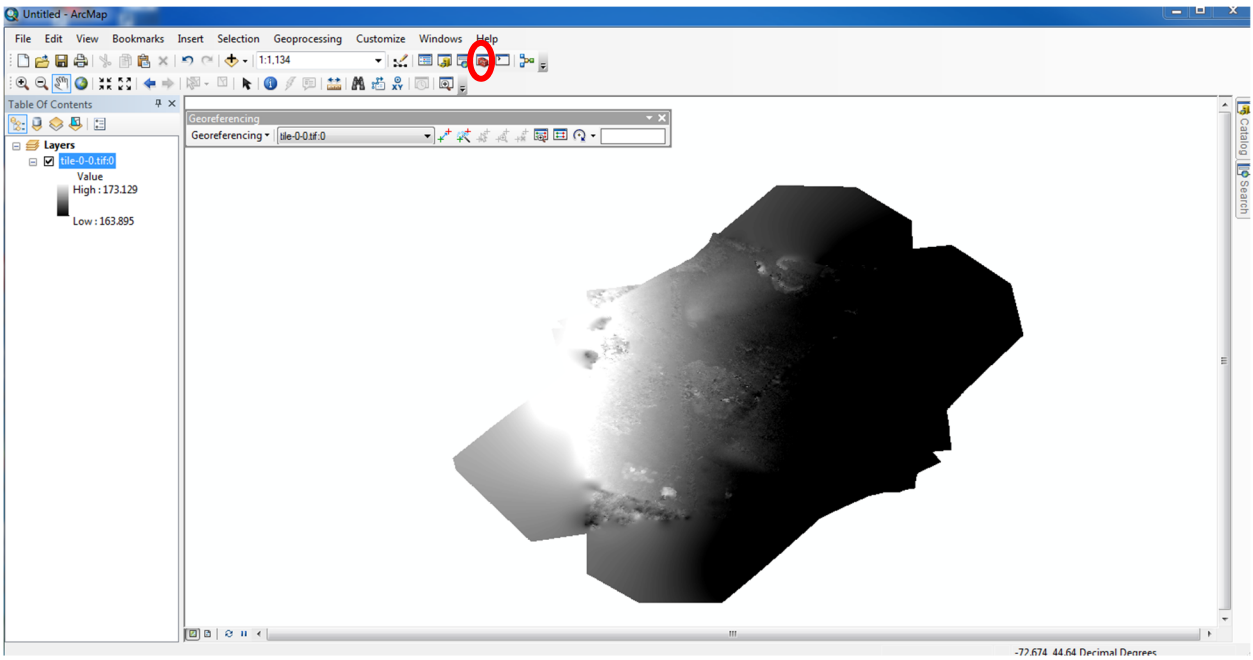

Figure 3. ArcToolbox button.

Finish the map

1. Add a north arrow by using the “Insert” button.
2. Click “North Arrow”.
3. Choose a north arrow.
4. Add a scale bar by using the “Insert” button.
5. Click “Scale Bar”.
6. Choose the scale bar (see Figure 4).

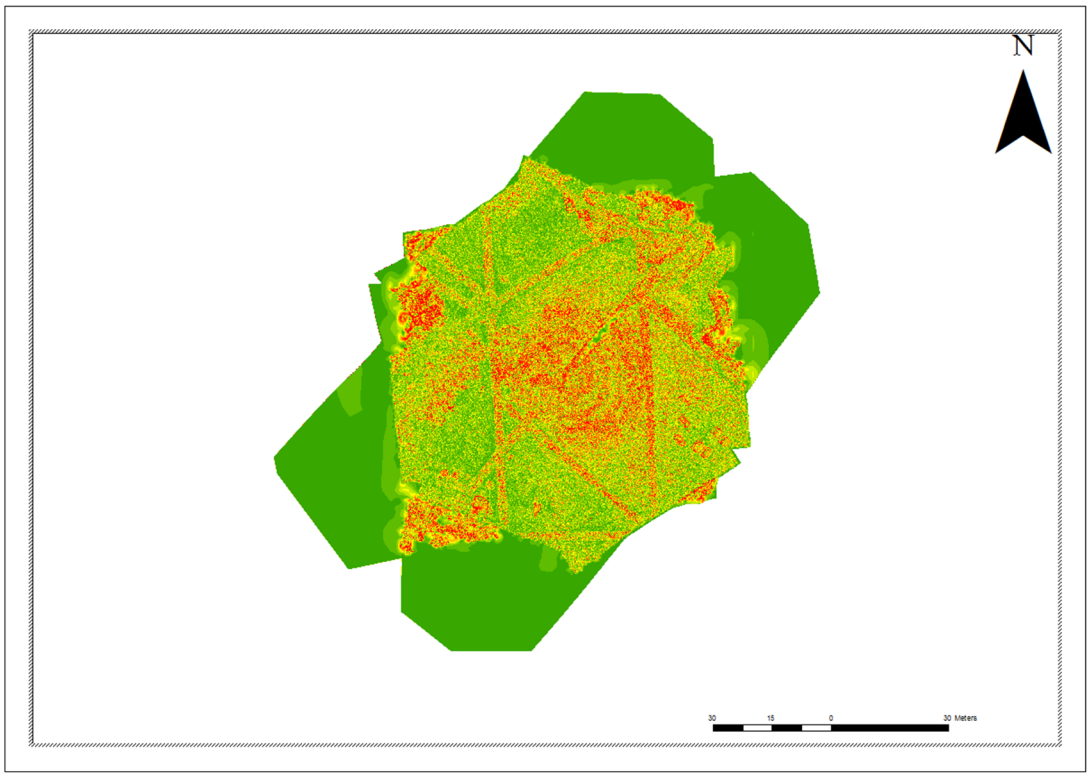

Figure 4. Final map.