How to Reclassify Raster Datasets in ArcGIS for Desktop

This tutorial will show you how to reclassify raster datasets using ArcGIS for Desktop (may require Spatial Analyst extension).

When to Perform a Reclassification?

Reclassifying the set values of a raster dataset allows the user to simplify the information in their raster.

For instance, reclassifying cells for soil type and erosion characteristics can help simplify the data by grouping classifications or setting identified cell values to 'NoData', removing it from the analysis altogether.

A few other examples of when to reclassify your data include animal habitat assessments, search and rescue models, site location analysis, natural disaster prediction models, etc.

Tutorial Scenario

For this tutorial, we are tasked with a hypothetical scenario of locating a site for a potential vineyard in Garrett County, MD.

The site location requires a south facing (160-200°) with a moderate grade (8-12%). In order to locate this site we need to import a LIDAR Image Service from https://lidar.geodata.md.gov/imap/rest/services, apply raster functions (slope and aspect) to the service and export our AOI (area of interest) for local processing.

With a local copy of the data we can proceed with reclassifying the dataset and analyzing our results for locating a potential site for our project.

This tutorial consists of two methods for reclassifying raster datasets; the first of which requires Spatial Analyst extension, the second method utilizes the Image Analysis Window (no extensions required).

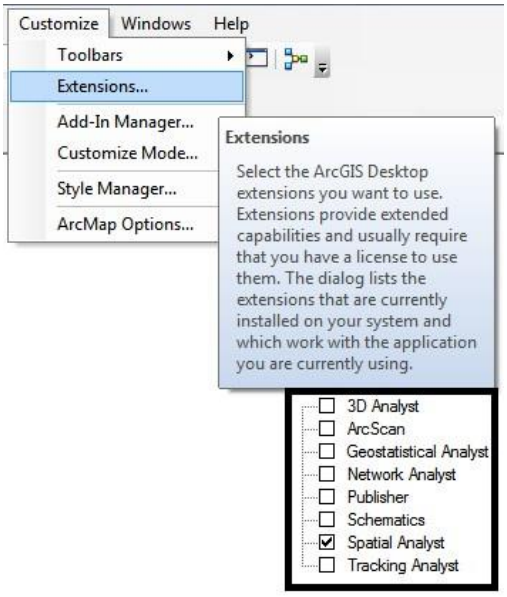
Method 1: Using Spatial Analyst Toolbox

This method uses geoprocessing tools in the Spatial Analyst toolbox. You will need an active Spatial Analyst extension to perform the following tasks. If you do not have Spatial Analyst, please proceed to Method 2: Using Image Analysis Window.

Reclassify Slope Data

1. Open ArcMap.

2. Check out Spatial Analyst Extension:



3. Add the desired Image Service to your map (MD_garrett_DEM_m). For more information on accessing Maryland LiDAR image services, please read How to Access Maryland LiDAR Image Services.
   Note: Raster functions are only available for the services within the [DEM_M] folder.

4. Apply the slope function to Garrett_DEM_m
   For more information on accessing image service functions, please read How to Access Image Service Functions in ArcGIS for Desktop.

5. *For this tutorial we are clipping a region from the NW corner of Garrett County >>>*

   Extract your AOI (area of interest) from the image service to allow for local data processing. For more information on the image service extraction process, please read How to Extract from Image Services in ArcGIS for Desktop.

6. Using the “Search” tool [ ], open the “Reclassify” (Spatial Analyst) tool.

   You can also locate “Reclass” in the Spatial Analyst toolbar within “ArcToolbox” [ ].

7. Select your “Input raster” *(Clipped export from step #4 above)*

   Select the “Reclass field”: Value *(when dealing with raster data, ‘Value’ is the recognized field for cell values)*

   Under “Reclassification” you should see a table with ‘Old Values’ and ‘New Values’. The classification method defaults to ‘Natural Breaks (Jenks)’.

   For our hypothetical scenario, we want to reclassify slope percentages between 8-12%. We can either reclassify values within our range (8-12) to a single value, or reclassify all values outside our range to equal ‘NoData’.

   For this example we will set all values within our range to (1).

8. Highlight all entries in the “Reclassification” table and click “Delete Entries” [Delete Entries]

   Click “Add Entry” [Add Entry] to add a row to the table.

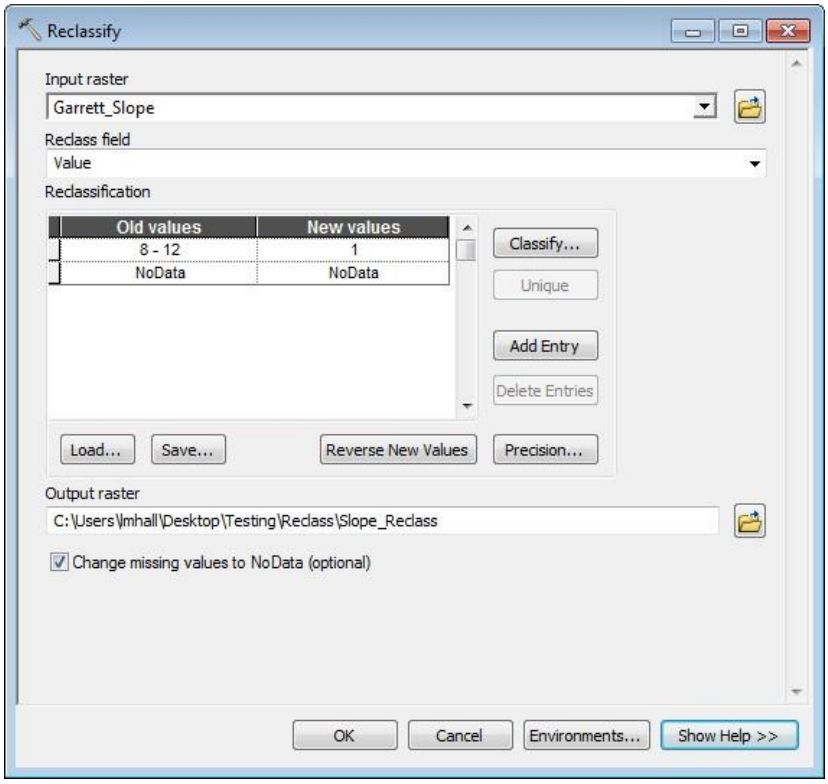
   Populate the cell under ‘Old values’: “8 – 12” *(Without quotations, ensuring there is a ‘space’ between the values and the hyphen ’–‘)*

   Populate the cell under ‘New values’: “1” *(Without quotations)*

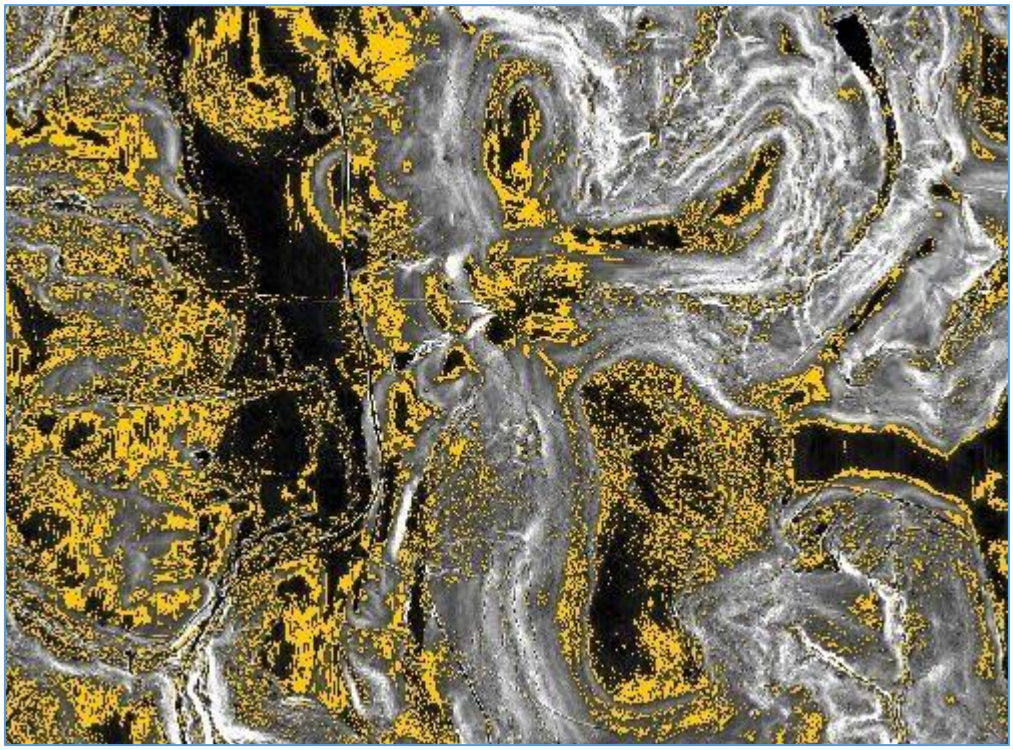
   Set your output raster location

   Check the box for “Change missing values to NoData”

   Click [OK]



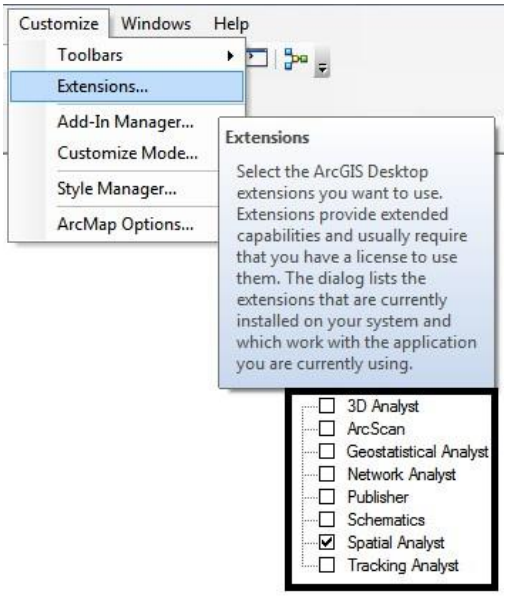
9. The cells remaining with a value of “1” are slopes between 8-12%
(represented by the orange color in the image below)



Notice how setting cell values outside of our range to NoData removed the data from our raster dataset. This reclassification is Boolean in nature: If the parameter is met, the cells are returned with a value of “1”, if the parameter is not met the cells are removed.

Continue on the next page to **Reclassify Aspect Data**

Reclassify Aspect Data



1. Open ArcMap.

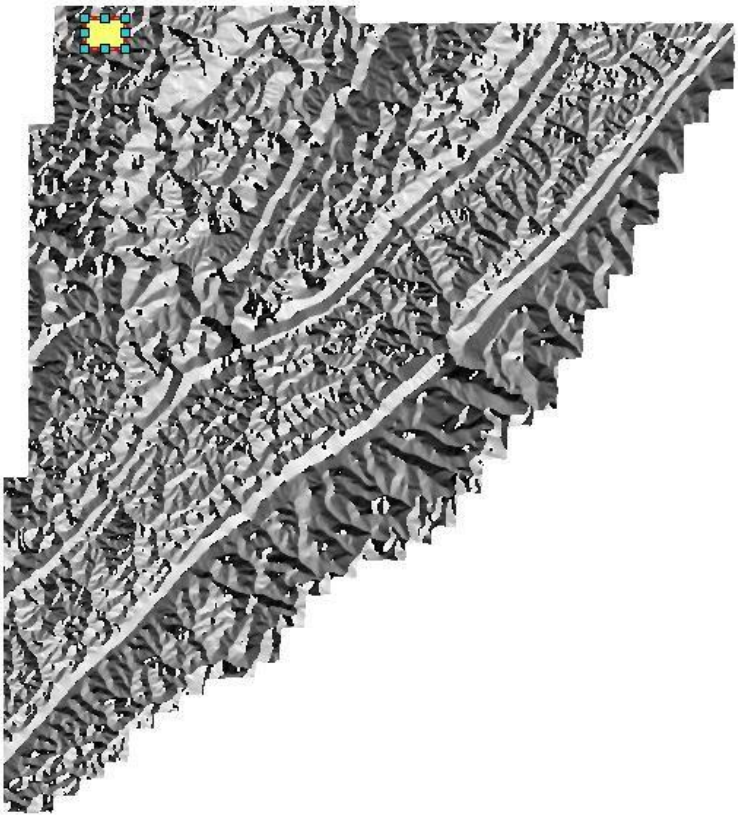
2. Check out Spatial Analyst Extension:

3. Add the desired Image Service to your map (MD_garrett_DEM_m). For more information on accessing Maryland LiDAR image services, please read How to Access Maryland LiDAR Image Services.
   Note: Raster functions are only available for the services within the [DEM_M] folder.

4. Apply the aspect function to Garrett_DEM_m
   For more information on accessing image service functions, please read How to Access Image Service Functions in ArcGIS for Desktop.

5. *For this tutorial we are clipping a region from the NW corner of Garrett County >>>*

   Extract your AOI (area of interest) from the image service to allow for local data processing. For more information on the image service extraction process, please read How to Extract from Image Services in ArcGIS for Desktop.



6. Using the “Search” tool [ ], open the “Reclassify” (Spatial Analyst) tool.

   You can also locate “Reclass” in the Spatial Analyst toolbar within “ArcToolbox” [ ].

7. Select your “Input raster” *(Clipped export from step #4 above)*

   Select the “Reclass field”: Value *(when dealing with raster data, ‘Value’ is the recognized field for cell values)*

   Under “Reclassification” you should see a table with ‘Old Values’ and ‘New Values’. The classification method defaults to ‘Natural Breaks (Jenks)’.

   For our hypothetical scenario, we want to reclassify aspect between 160-200°. We can either reclassify values within our range (160-200) to a single value, or reclassify all values outside our range to equal ‘NoData’.

   For this example we will set all values within our range to (10).

8. Highlight all entries in the “Reclassification” table and click “Delete Entries” [Delete Entries]

   Click “Add Entry” [Add Entry] to add a row to the table.

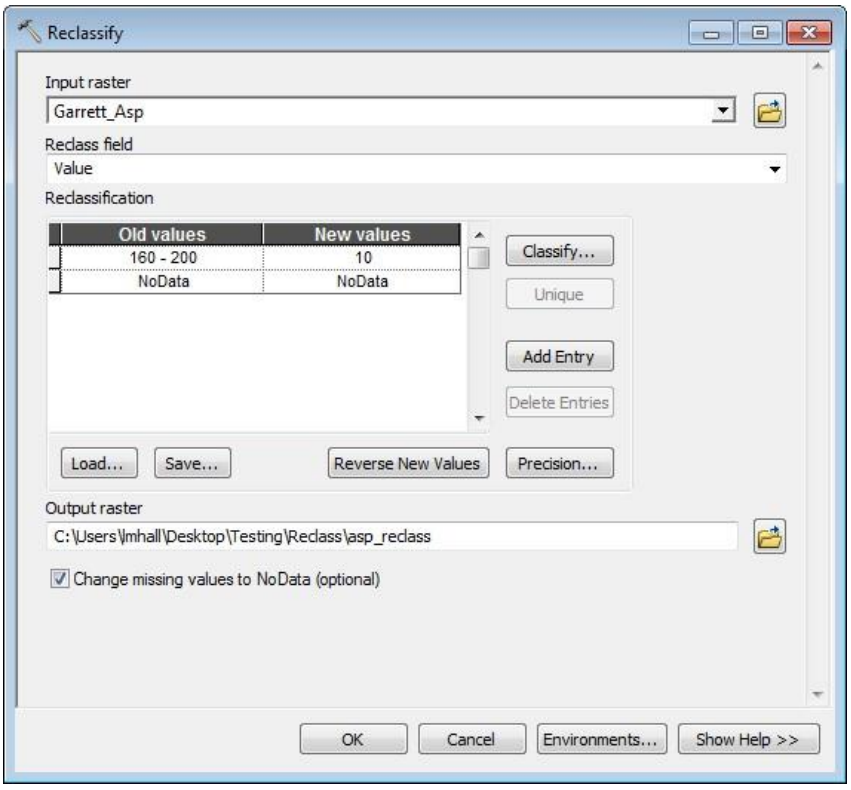
   Populate the cell under ‘Old values’: “160 – 200” *(Without quotations, ensuring there is a ‘space’ between the values and the hyphen ’–‘)*

   Populate the cell under ‘New values’: “10” *(Without quotations)*

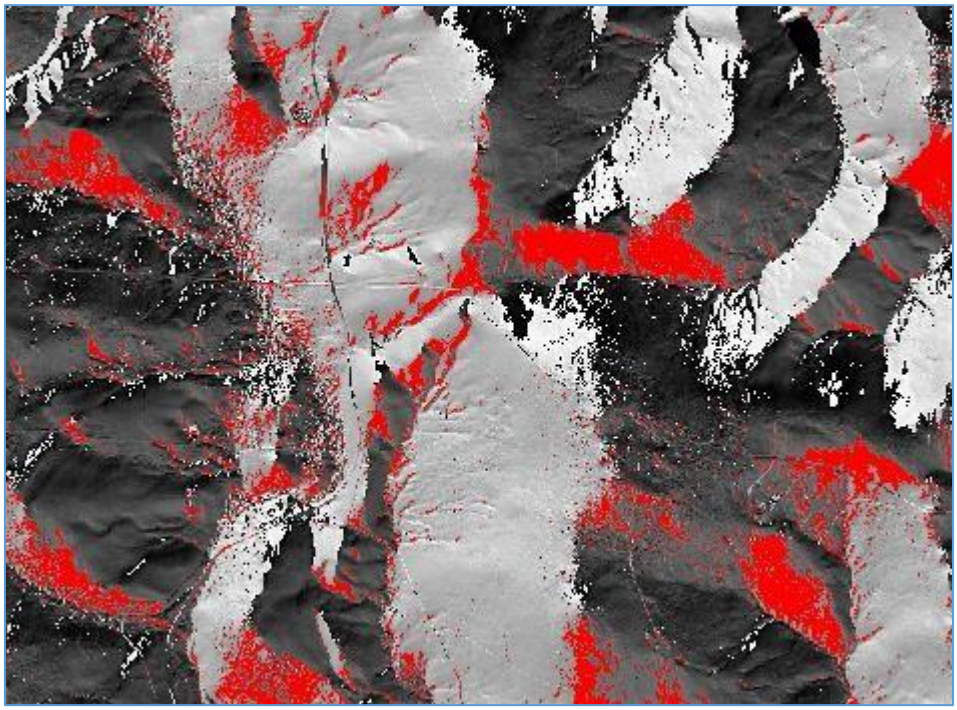
   Set your output raster location

   Check the box for “Change missing values to NoData”

   Click [OK]



9. The cells remaining with a value of “10” are aspect between 160-200°.
(represented by the red colors in the image below)



Notice how setting cell values outside of our range to NoData removed the data from our raster dataset. This reclassification is Boolean in nature: If the parameter is met, return the cell value set by the user, if the parameter is not met remove the data from the dataset.

Continue on the next page to **Merge Classifications for Analysis**

Merge Classifications for Analysis

1. Refer to the following sections of this tutorial if they have not yet been completed:
   Reclassify Slope Data
   Reclassify Aspect Data

2. With the slope and aspect reclassifications complete, we can calculate the rasters to return overlapping cells and help identify regions that are moderate grade (8-12% slope) as well as south facing (160-220 azimuth).

3. Open ArcMap

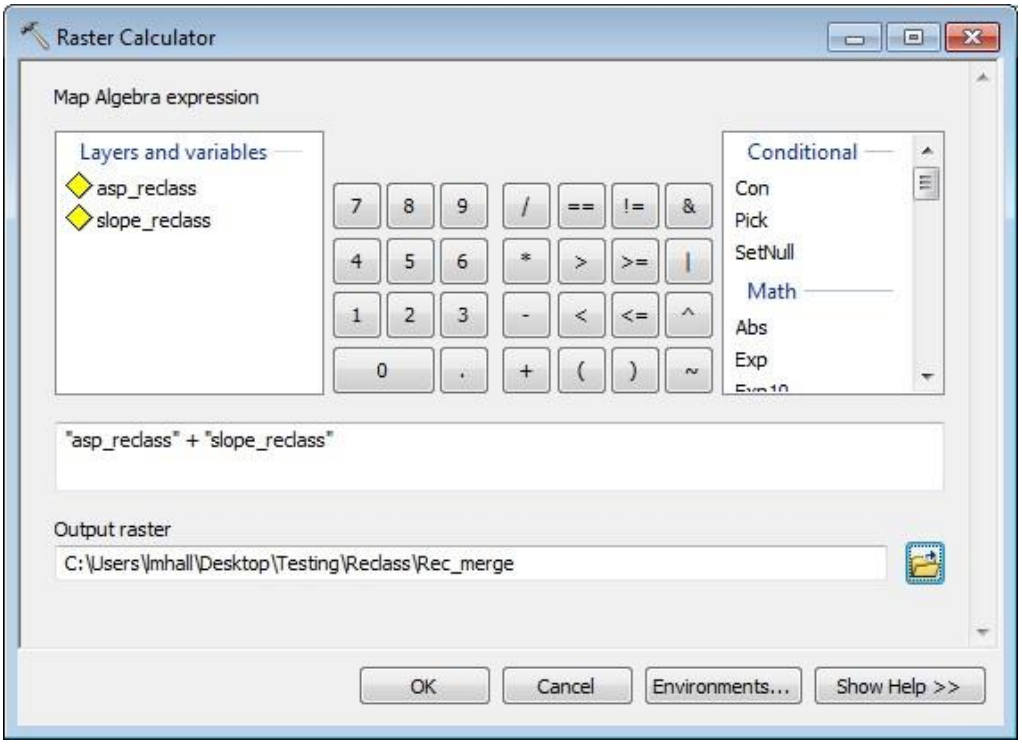
4. Add the reclassified slope and aspect data (see step 1).

5. Using the "Search" tool [ ], open the "Raster Calculator" (Spatial Analyst) tool.
   You can also locate "Raster Calculator" in the Spatial Analyst toolbar (Map Algebra) [ ].

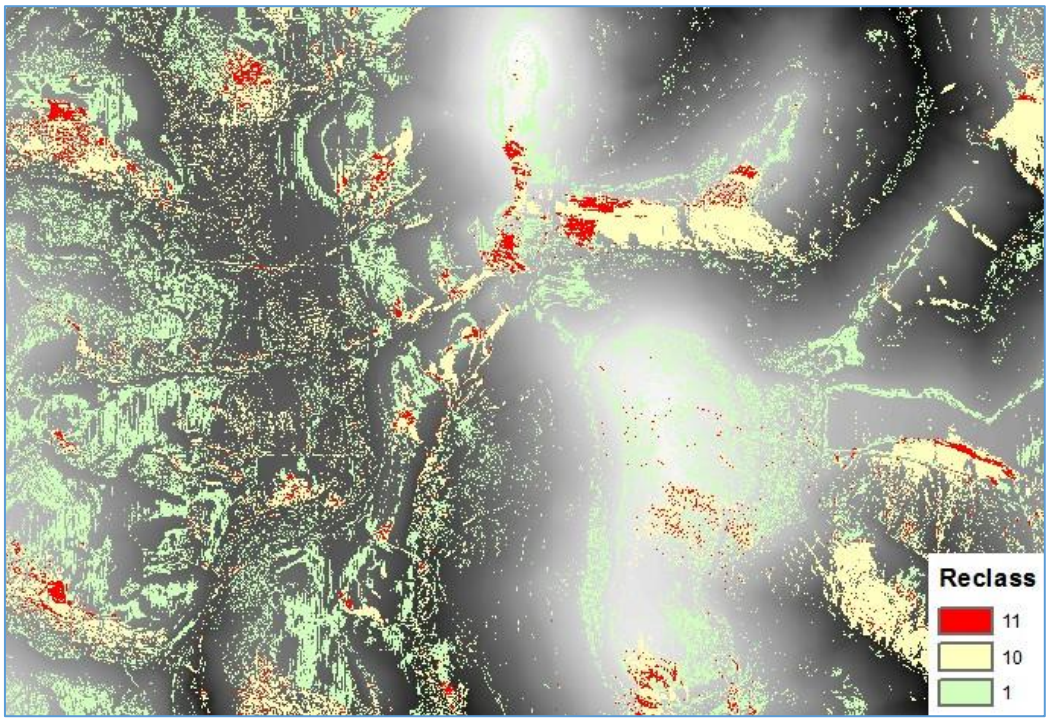
6. Double click your aspect dataset from the "Layers and variables" section of the tool to add it to the expression. Click the addition [ ] symbol from the tool calculator, followed by double clicking the slope dataset from the "Layers and variables" section of the tool to finish he expression.

   Set output raster.

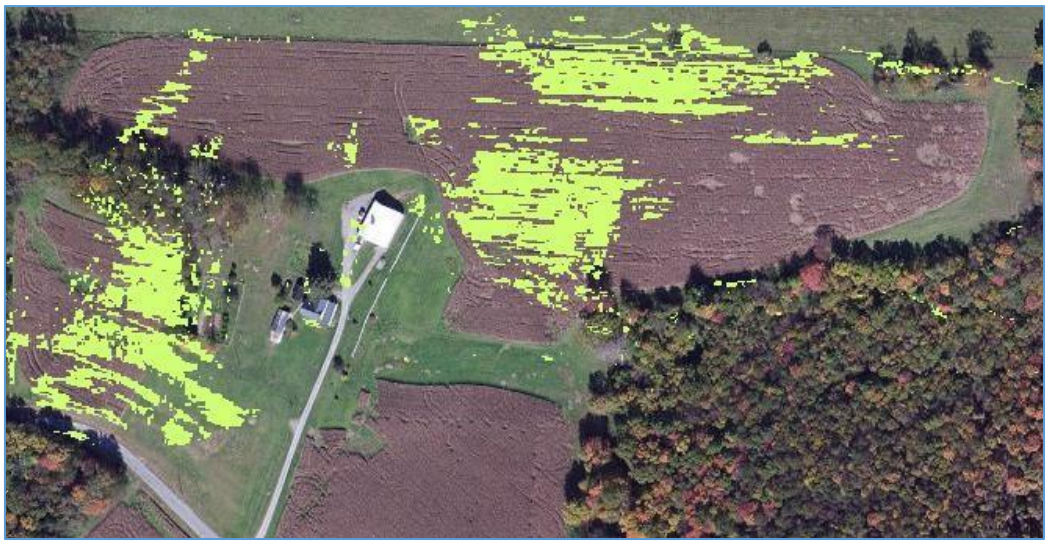
   Click [OK]



7. In the screen shot below, you will notice three different reclassifications:
   Cells with a value of 1 are slopes within 8-12% rise.
   Cells with a value of 10 are azimuth between 160-200°.
   Cells with a value of 11 are all south facing graded slopes. *(8-12% rise facing 160-200°)*



8. Reclassifying our datasets provided the necessary information for our hypothetical scenario. Now the investor can continue their soil analysis based on our results below:



Method 2: Using Image Analysis Window

This method uses the Image Analysis Window in ArcMap (version 10.2.2 or greater). The IAW (Image Analysis Window) allows for raster processing without any additional ArcGIS extensions necessary. Processing is done on-the-fly and creates temporary layers in the TOC (table of contents) as you work; selecting only the desired outputs for exporting. This method can save the user a considerable amount of time while processing.

Generate Slope and Aspect

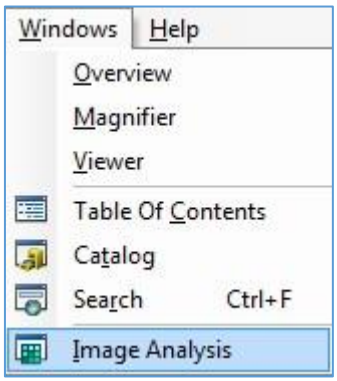
1. Open ArcMap.

2. Add the desired Image Service to your map (MD_garrett_DEM_m).
   For more information on accessing Maryland LiDAR image services, please read How to Access Maryland LiDAR Image Services.

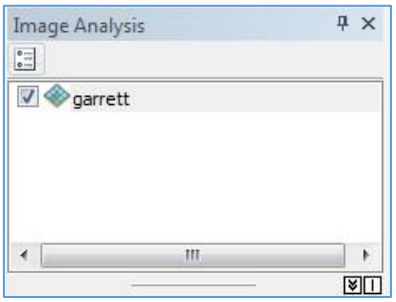
3. *For this tutorial we are clipping a region from the NW corner of Garrett County >>>*

   Extract your AOI (area of interest) from the image service to allow for local data processing. For more information on the image service extraction process, please read How to Extract from Image Services in ArcGIS for Desktop.

4. Open Image Analysis Window.

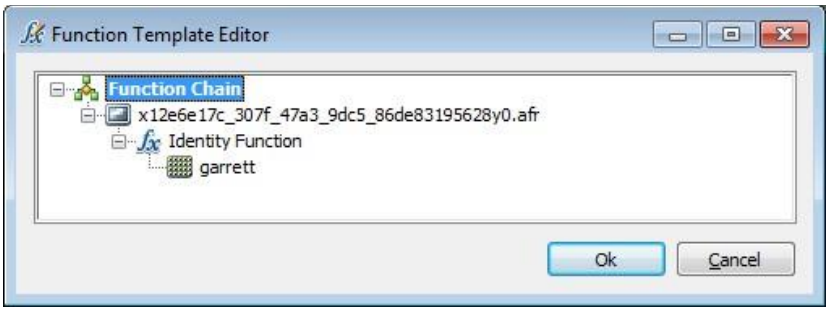


5. Single click your raster dataset in the “Layer List”:



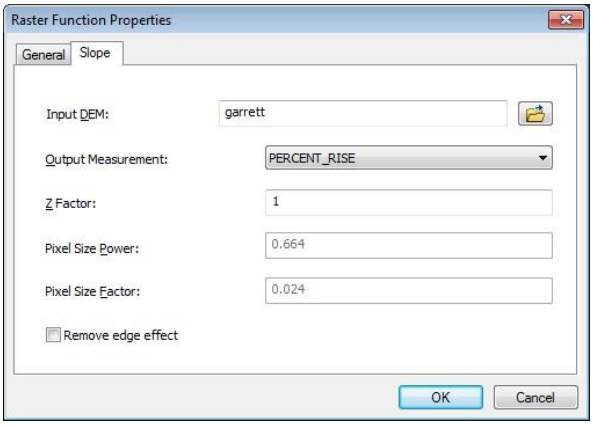
6. Click the Add Function button [ ] under “Processing”

7. The Function Template Editor allows us to create raster functions for on-the-fly processing in ArcMap. The outputs from the function template are temporary, however can be exported as raster datasets as well. The top line of the Function Chain, “***.afr” is the function chain itself. In ArcGIS 10.3.1 or later, the function can be saved as an .xml and shared for use.



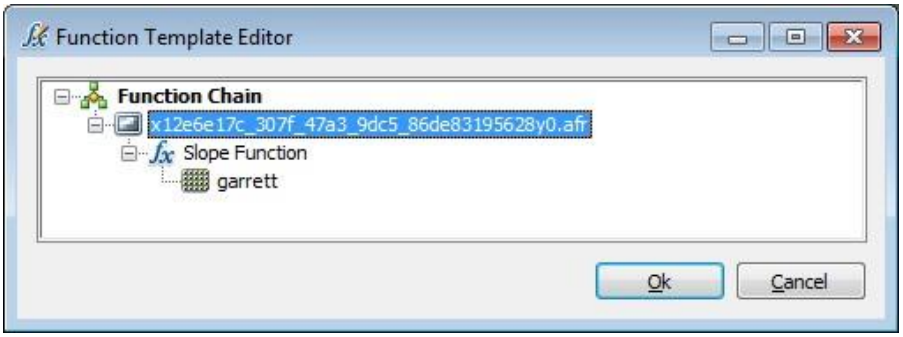
The second line in the Function Chain is the function applied to the raster dataset on the bottom line. To begin adding functions, right click the “Identity Function” and select “Insert Function” to access the full dropdown of available raster functions.

8. Add the Slope function to the Function Chain:
Change the Output Measurement to “PERCENT_RISE”.



Click [OK]

9. You should notice the “Identity Function” in our Function Chain is now replaced by the “Slope Function”:

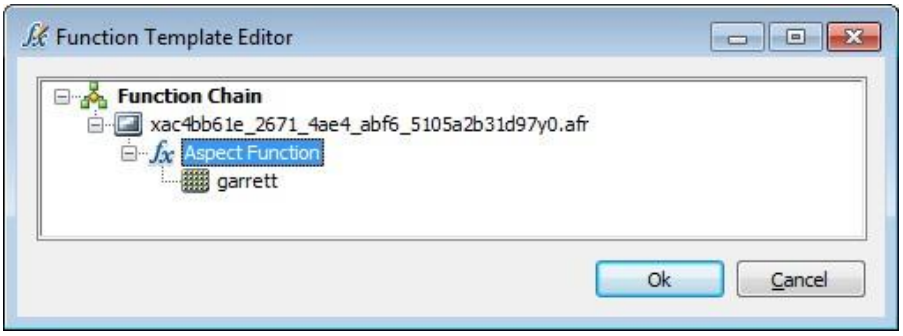


Click [OK]

10. A new layer will be added to the ArcMap TOC (table of contents). This new layer is temporary and will be deleted if ArcMap is closed without first exporting to a raster dataset. Before we export this layer, go back to the Image Analysis Window and re-select the original raster from step 5 above.

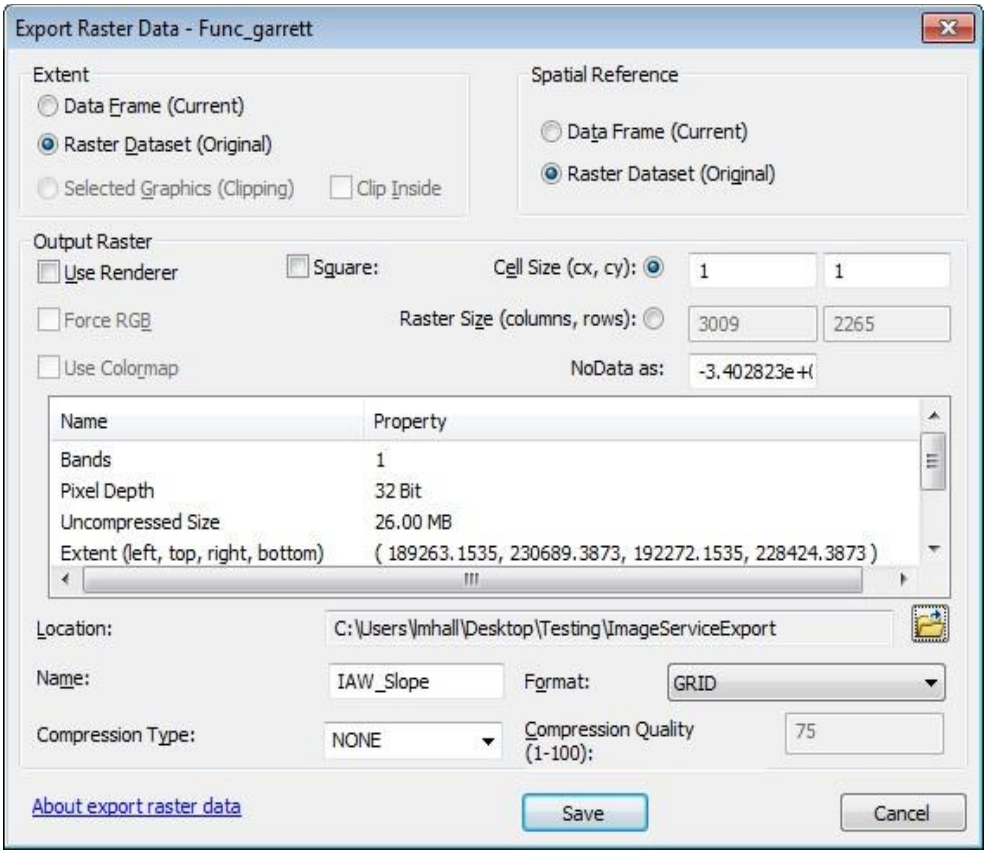
11. Click the Add Function button [ ] under “Processing”

12. Right click the “Identity Function” and select “Insert Function”.
Add the “Aspect” function to the Function Chain.
Click [OK]



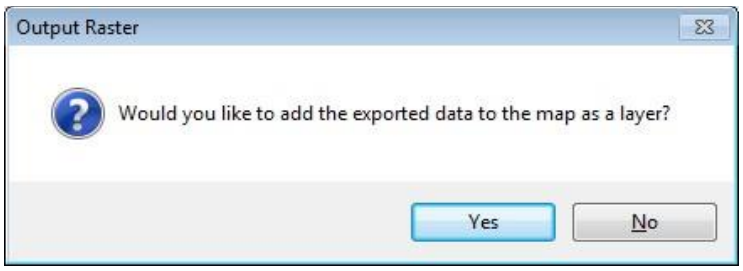
13. Click [OK] on the Function Template Editor window to create the temporary Aspect layer.

14. Highlight the temporary Slope layer from the Image Analysis Window's Layer List. Under "Processing" in the Image Analysis Window, click "Export" [ ].
Select an appropriate output workspace and file name, change the Format to "GRID" and click [Save].



15. Repeat step 14 for the temporary Aspect layer.

16. Add the exported data to the map as a layer and remove both temporary function layers form the TOC.



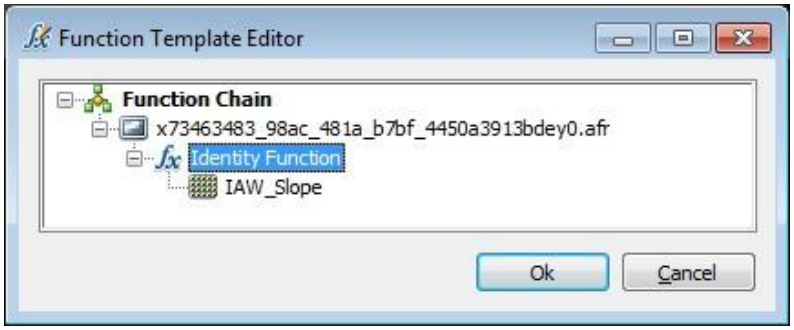
Reclassify Slope and Aspect

1. Open ArcMap

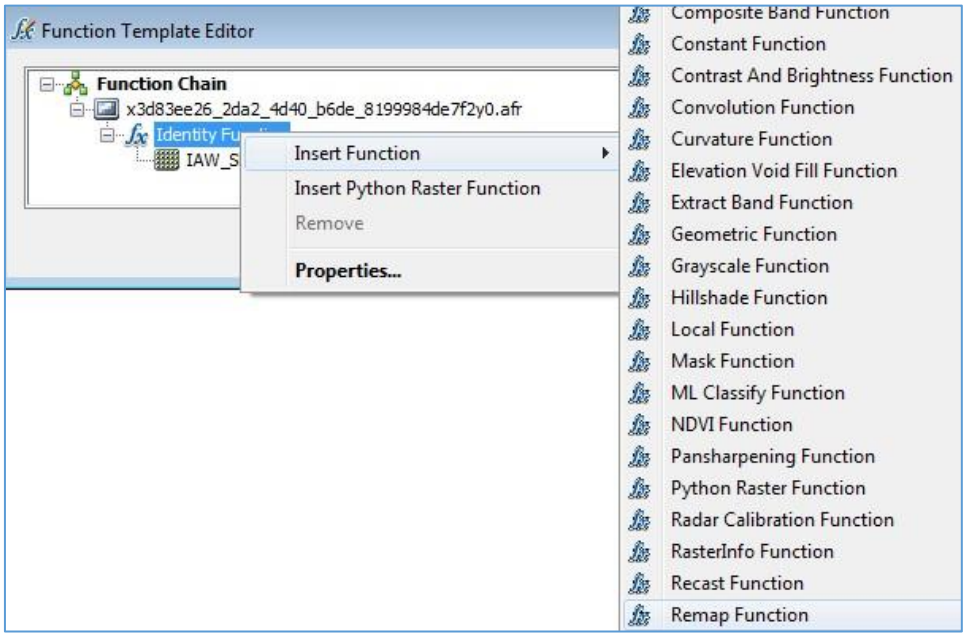
2. Add slope and aspect datasets to the TOC. If you have not created these datasets, please go back to the previous section to generate slope and aspect datasets.

3. Select the slope dataset from the IAW (Image Analysis Window) layer list.

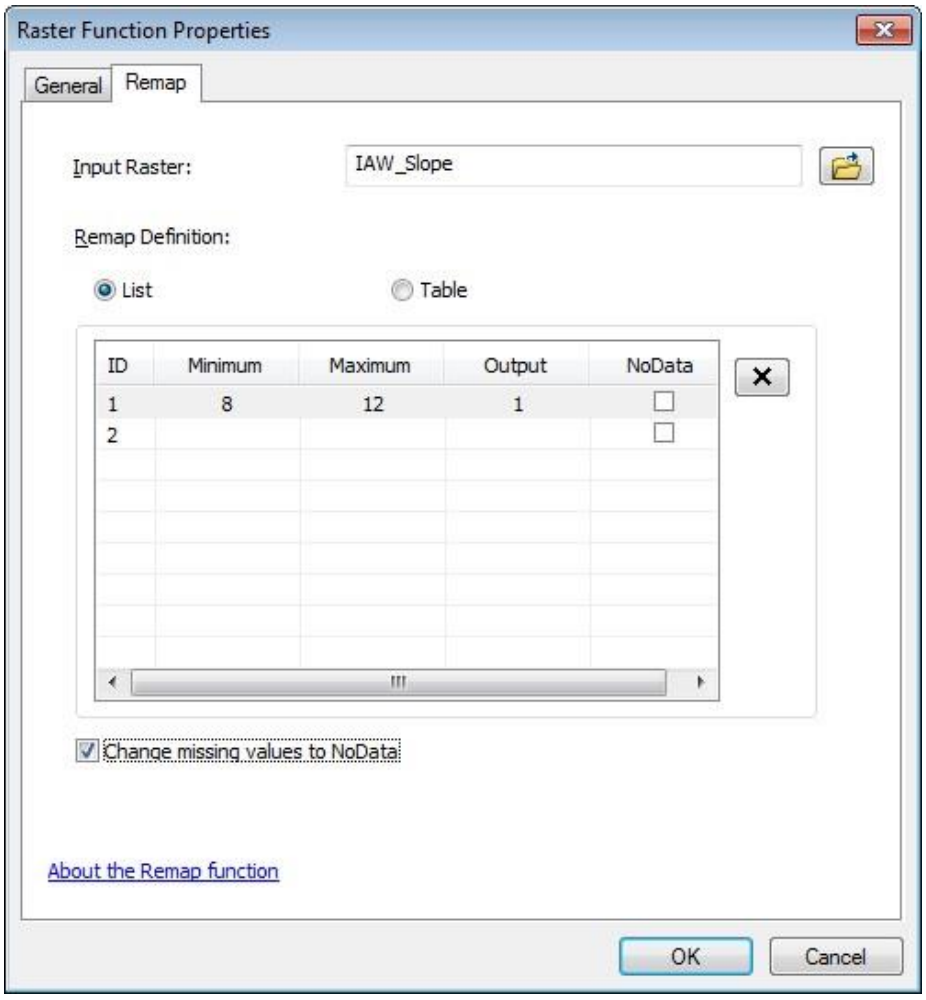
4. Click the Add Function button [ ] under "Processing" to open the Function Template Editor.



5. Right click "Identity Function" and hover the cursor over "Insert Function" to view the available functions in the dropdown menu. Select "Remap Function".



6. Setup the remap definition for our Slope reclassification: 8-12%
   Minimum: 8
   Maximum: 12
   Output: 1
   Check the box for “Change missing values to NoData”



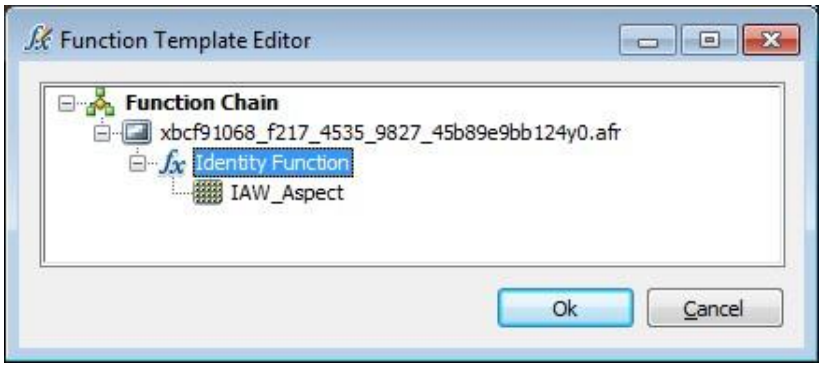
   Click [OK]

7. Click [OK] to run the function chain process:

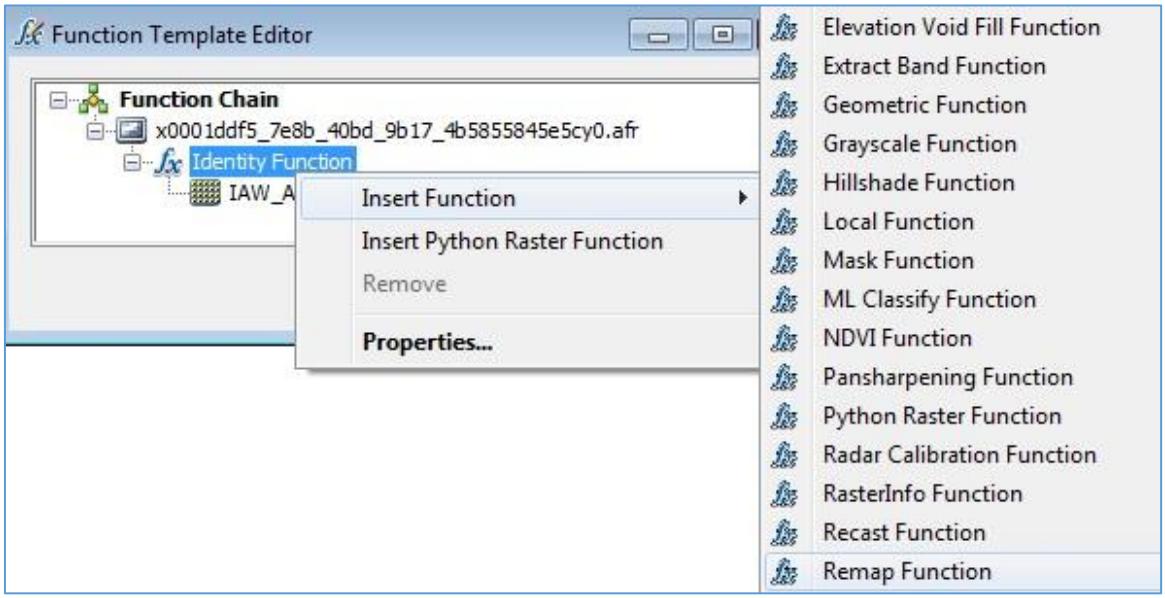
8. Highlight the newly added layer from the Image Analysis Window’s Layer List. Under “Processing” in the Image Analysis Window, click “Export” [ ].
   Select an appropriate output workspace and file name, change the Format to “GRID” and click [Save].

9. Now select the aspect dataset from the IAW (Image Analysis Window) layer list.

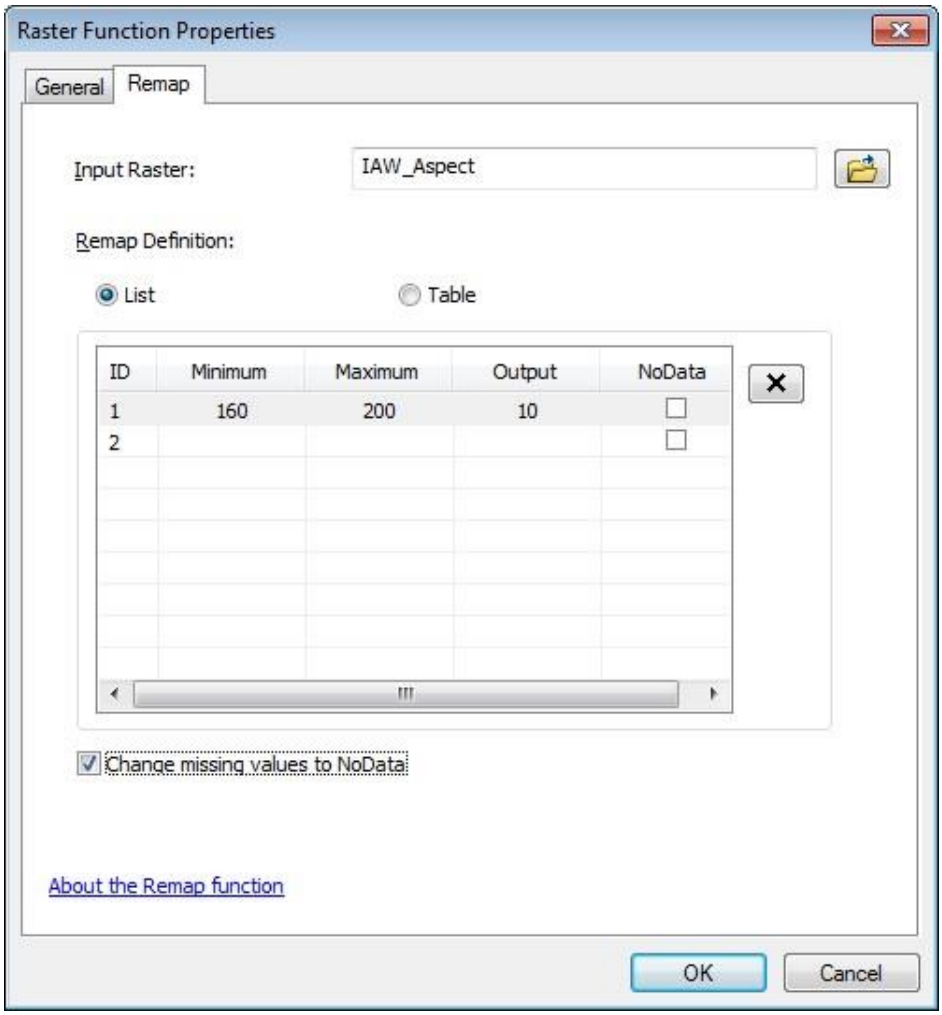
10. Click the Add Function button [ ] under “Processing” to open the Function Template Editor.



11. Right click “Identity Function” and hover the cursor over “Insert Function” to view the available functions in the dropdown menu. Select “Remap Function”.



12. Setup the remap definition for our Aspect reclassification: 160-200°
    Minimum: 160
    Maximum: 200
    Output: 10
    Check the box for “Change missing values to NoData”



    Click [OK]

13. Click [OK] to run the function chain process:

14. Highlight the newly added layer from the Image Analysis Window’s Layer List.
    Under “Processing” in the Image Analysis Window, click “Export” [ ].
    Select an appropriate output workspace and file name, change the Format to “GRID” and click [Save].

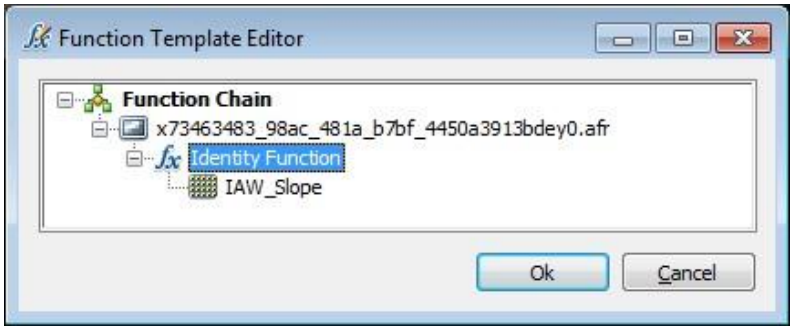
Merge Classifications for Analysis

1. Open ArcMap

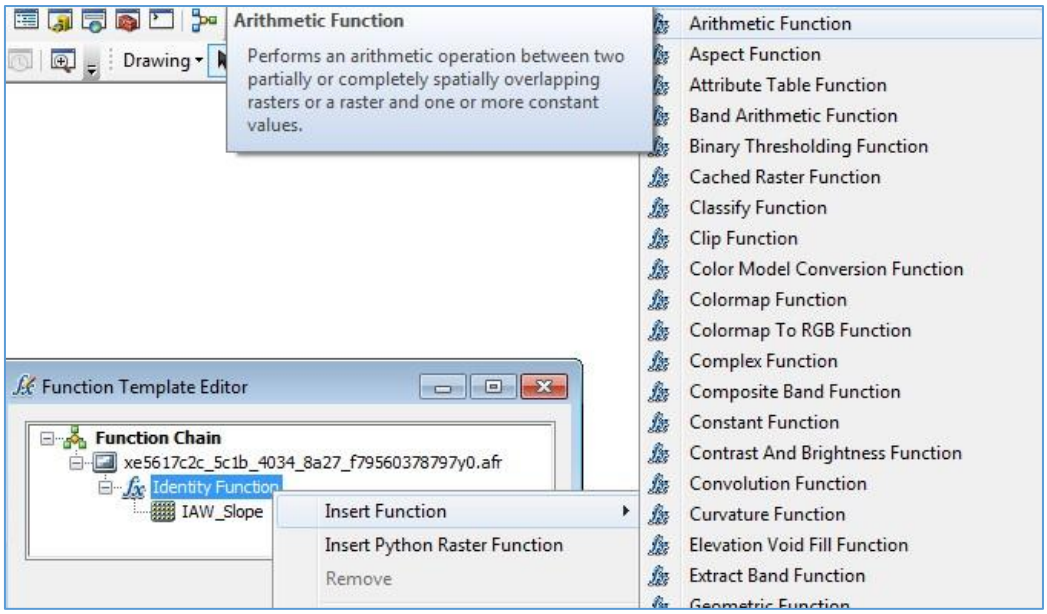
2. Add your reclassified datasets from the previous section to the TOC. If you have not created these datasets, please go back to the previous section to reclassify slope and aspect datasets.

3. Select the slope dataset from the IAW (Image Analysis Window) layer list.

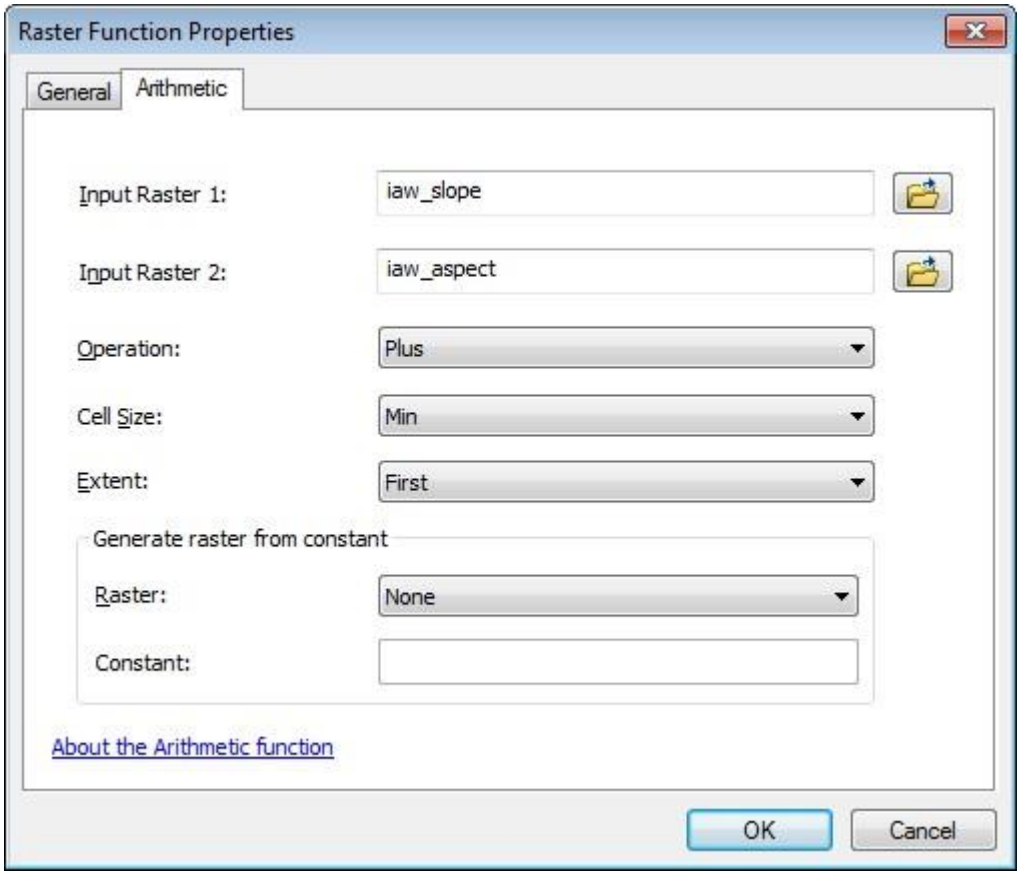
4. Click the Add Function button [ ] under "Processing" to open the Function Template Editor.



5. Right click "Identity Function" and hover the cursor over "Insert Function" to view the available functions in the dropdown menu. Select "Arithmetic Function".

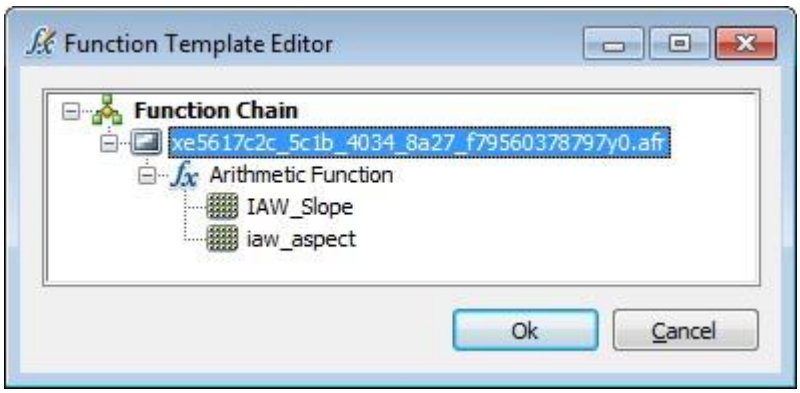


6. Input Raster 1: navigate to your saved reclassified slope data (8-12%).
   Input Raster 2: navigate to your saved reclassified aspect data (160-200°).
   Operation: Plus

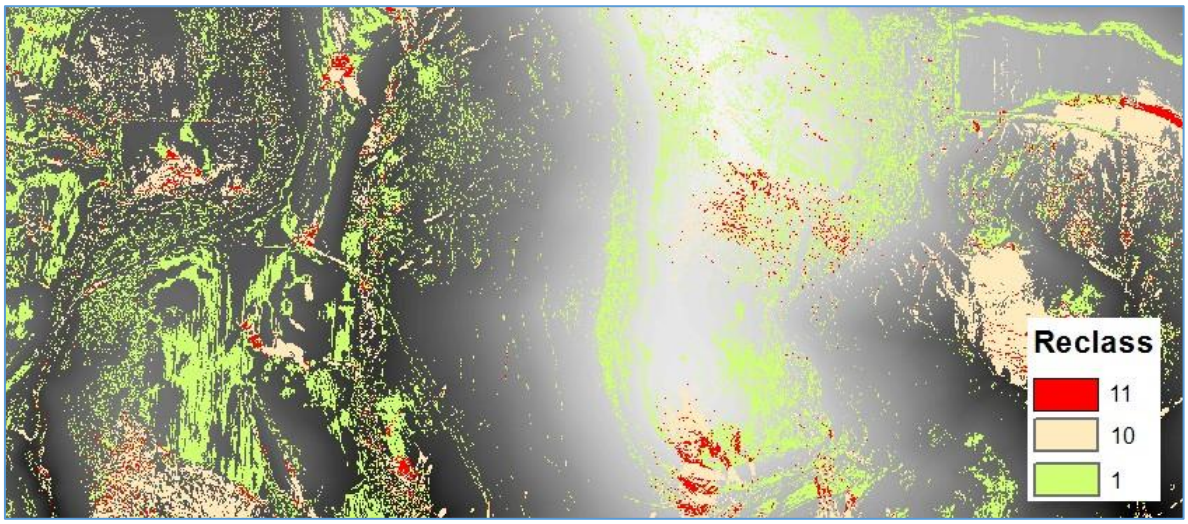


   Click [OK].

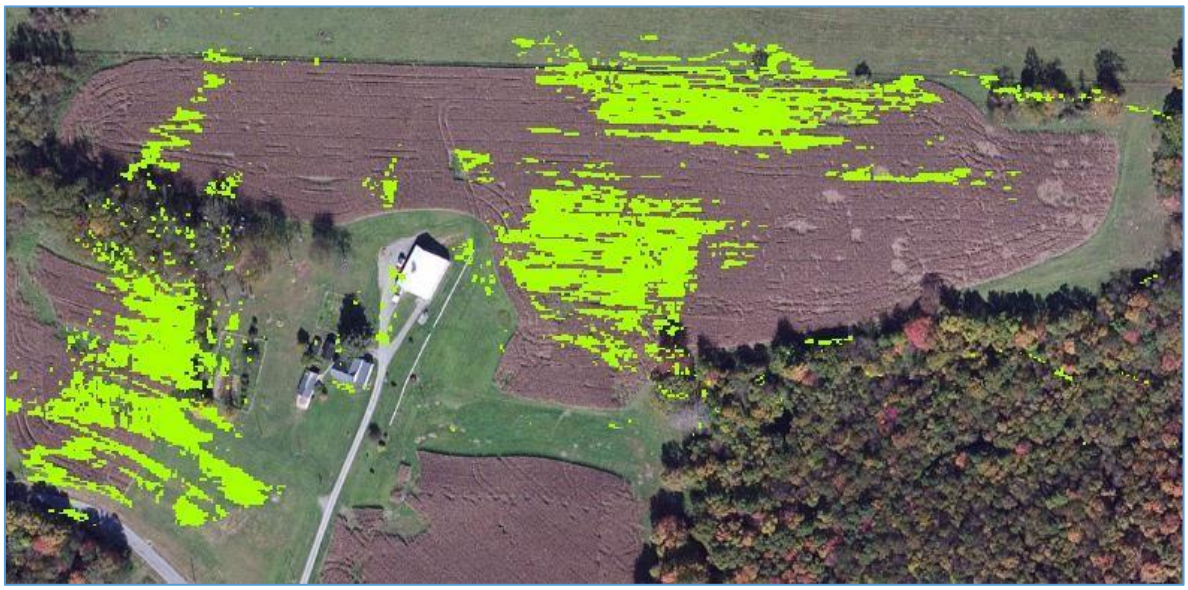
7. Click [OK] to run the function chain process.



8. In the screen shot below, you will notice three different reclassifications:
   Cells with a value of 1 are slopes within 8-12% rise.
   Cells with a value of 10 are azimuth between 160-200°.
   Cells with a value of 11 are all south facing graded slopes. *(8-12% rise facing 160-200°)*



9. Reclassifying our datasets provided the necessary information for our hypothetical scenario. Now the investor can continue their soil analysis based on our results below:



ADDITIONAL RESOURCES

For more information about Maryland LiDAR, please visit the Maryland LiDAR Overview page

For more information about additional training opportunities, please visit the MD iMAP Training Overview page, or contact Lisa Lowe, Senior GIS Analyst with the Maryland Department of Information Technology, Geographic Information Office at lisa.lowe@maryland.gov.

For additional MD iMAP datasets, please visit the GIS Data Catalog

For all other inquiries related to Maryland LiDAR, please contact the GIO Office at service.desk@maryland.gov.