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Software: ArcGIS version 10

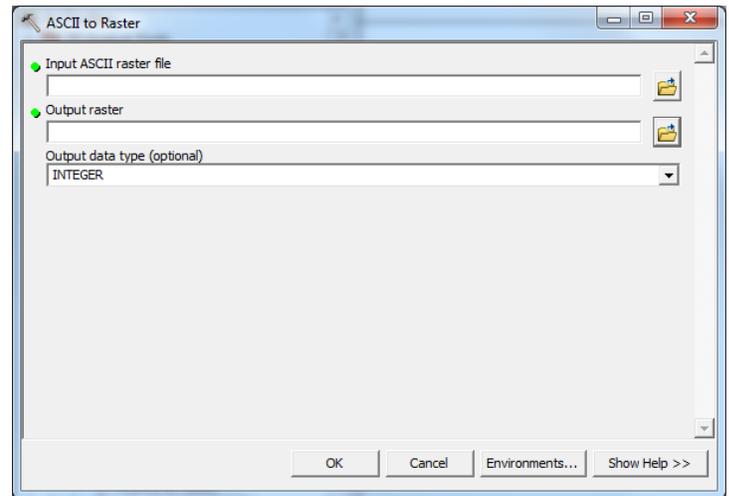
Identifying Niche Overlap from Maxent Model Predications

This tutorial begins with the premise that a model has already been completed for two different species and that the ASCII output files of Maxent are in a known location within the same workspace.

Step 1: Convert Maxent average ASCII results to grid rasters

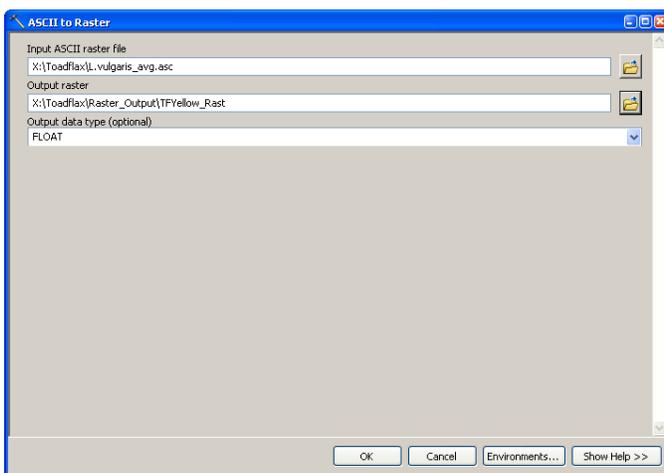
Before you begin, you will want to create a new folder to store the final rasters. In your workspace, create a new folder called **Raster_Output**.

Open ArcMap and select **A blank map** and click **OK**. Next, Open the **Toolbox** window by clicking on the toolbox icon . In the Toolbox window, double click **Conversion Tools** then double click **To Raster** then double click the tool **ASCII to Raster**.



For the **Input ASCII Raster File** window to browse to the average ASCII file created by MaxEnt. Be sure to select **File (*.ASC)** in **File of Type** when navigating to the ASCII file; otherwise, you won't be able to see the file. In our case, the file is in the folder **Toadflax** and the file is labeled **L.vulgaris_avg.asc**. Select this file then click **Open**.

For the **Output Raster**, you will want to navigate to the folder you created earlier called **Raster_Output**. Save the raster in the folder and call it **TFYellow_Rast**. Once you have named your raster, click **Save**.

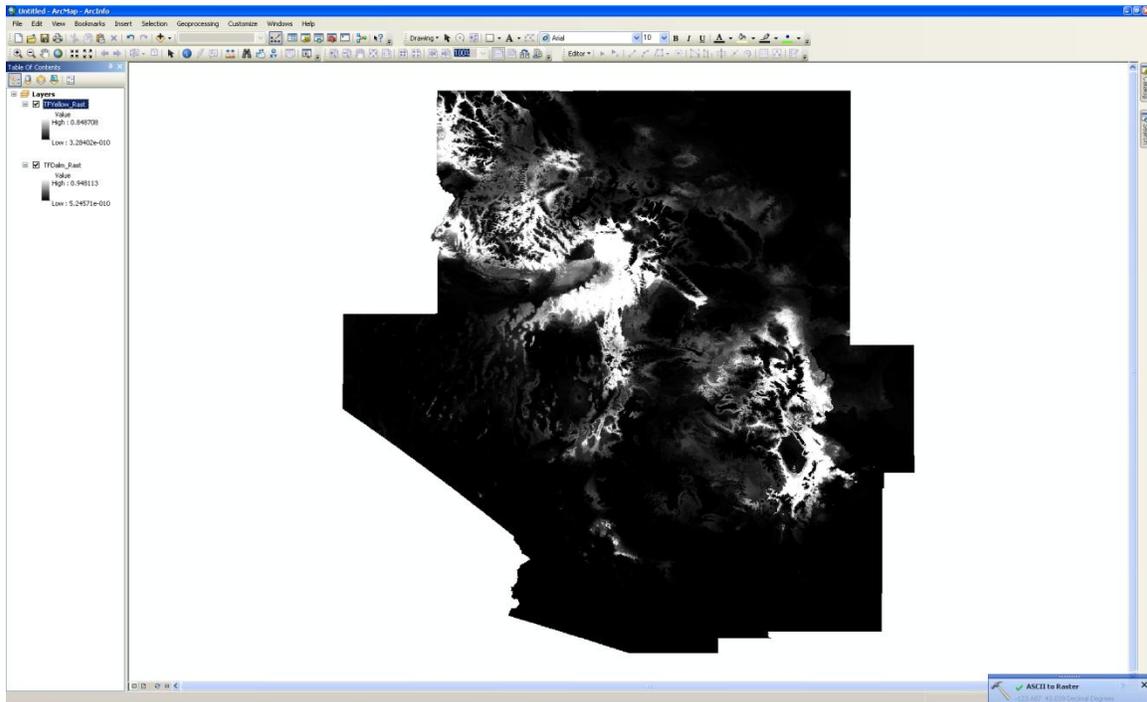


Now you will want to change the **Output Data Type** from **INTEGER** to **FLOAT**. We want to do this because the values in the ASCII output are much smaller than 1.0 and will be converted to 0 unless we select **FLOAT** data type.

Now your ASCII to Raster window should look like the one to the left. Now click **OK**.

This process may take a long time (possibly up to ten minutes or more), so be patient. In the lower right-hand corner of ArcMap a scrolling text will begin to move indicating the current task.

When the task is complete, the raster will appear in your Table of Contents (TOC) as well as in the display like shown here:



Repeat the above steps for the other model ASCII average output ([L.dalmatica_avg.asc](#)).

Once you have both species' ASCII files converted to the raster format within the **Raster_Output** folder, move on to Step 2.

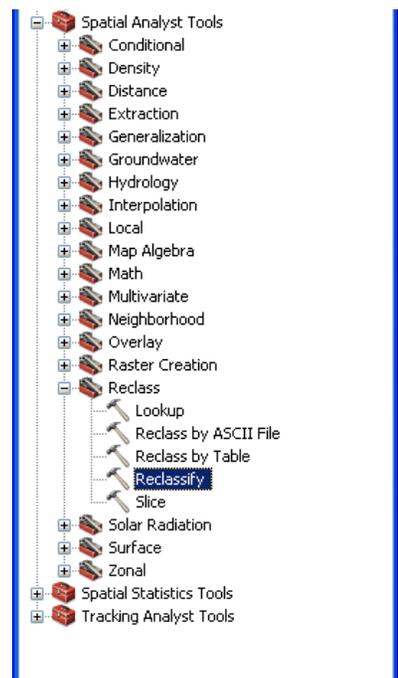
Step 2: Reclassify model results to threshold binary maps

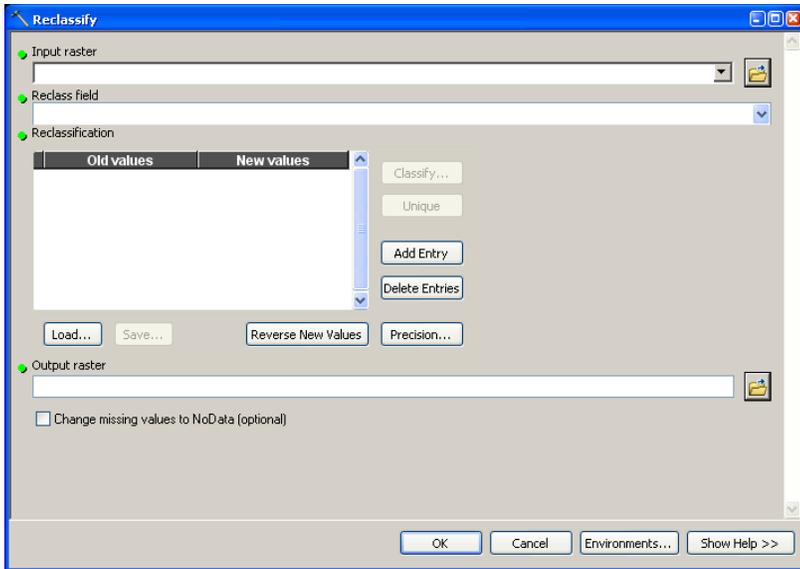
In order to reclassify your newly created rasters into binary maps, you will first need to locate the threshold values you wish to use to separate your suitable habitat. These can be found within the [maxentresults.csv](#) file. Be sure to research which threshold values will serve your purpose best. For the purpose of this tutorial, the following thresholds will be used for Toadflax:

Dalmatian: 0.2414

Yellow: 0.3314

These represent the 10% minimum training logistic threshold. Navigate to the **Reclassify** tool under **Spatial Analyst** then **Reclass**.





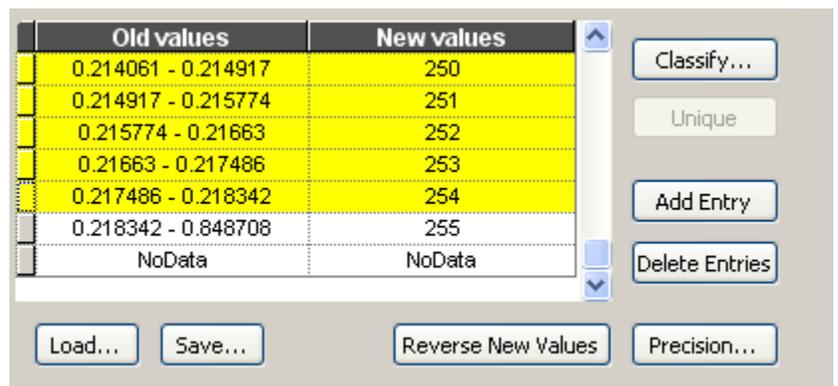
The window will look like the one to the left.

For the **Input Raster**, use the drop down arrow to select the raster you created named **TFYellow_Rast**.

When you select this raster, a table of values will appear in the window.

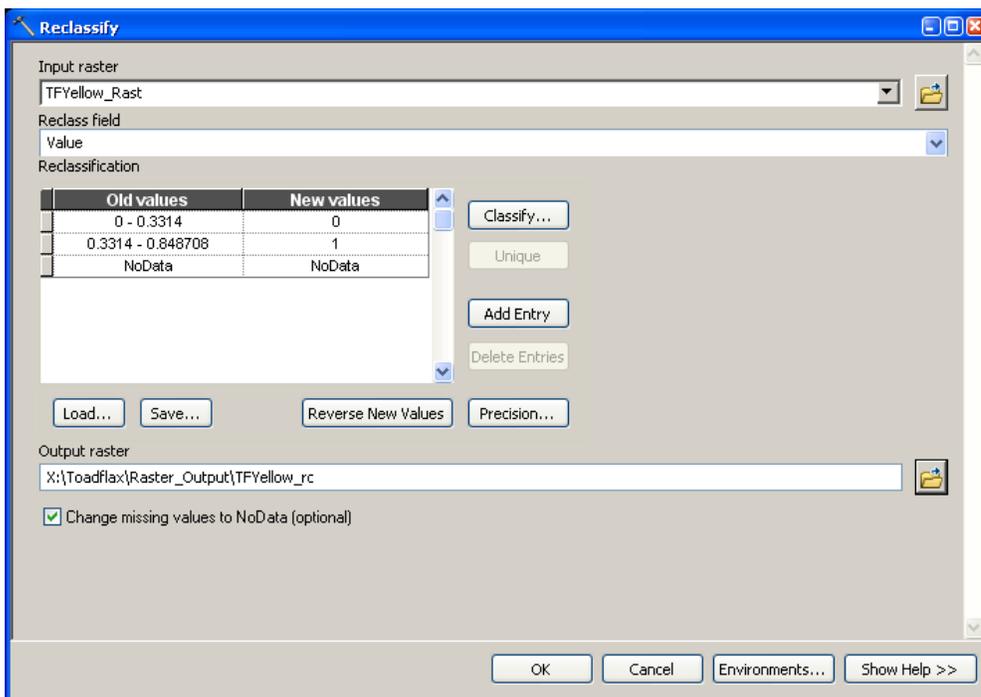
Make sure the **Reclass Field** is selected to **Value**.

Next, within the window of values, use the mouse to select all values **EXCEPT** the first entry (the line that starts with the value of 0) and the last entry before the NoData line. Once they are selected, click **Delete Entries** to the right of the window.



There should now be only two entries besides the NoData line.

Edit the **Old values** to read **0-threshold value** (0-0.3314 for this example) and give it a **New value** of **0**. For the next entry edit the **Old values** to be **threshold value-maximum** (0.3314-0.848708 for this example) and give it a **New value** of **1**.



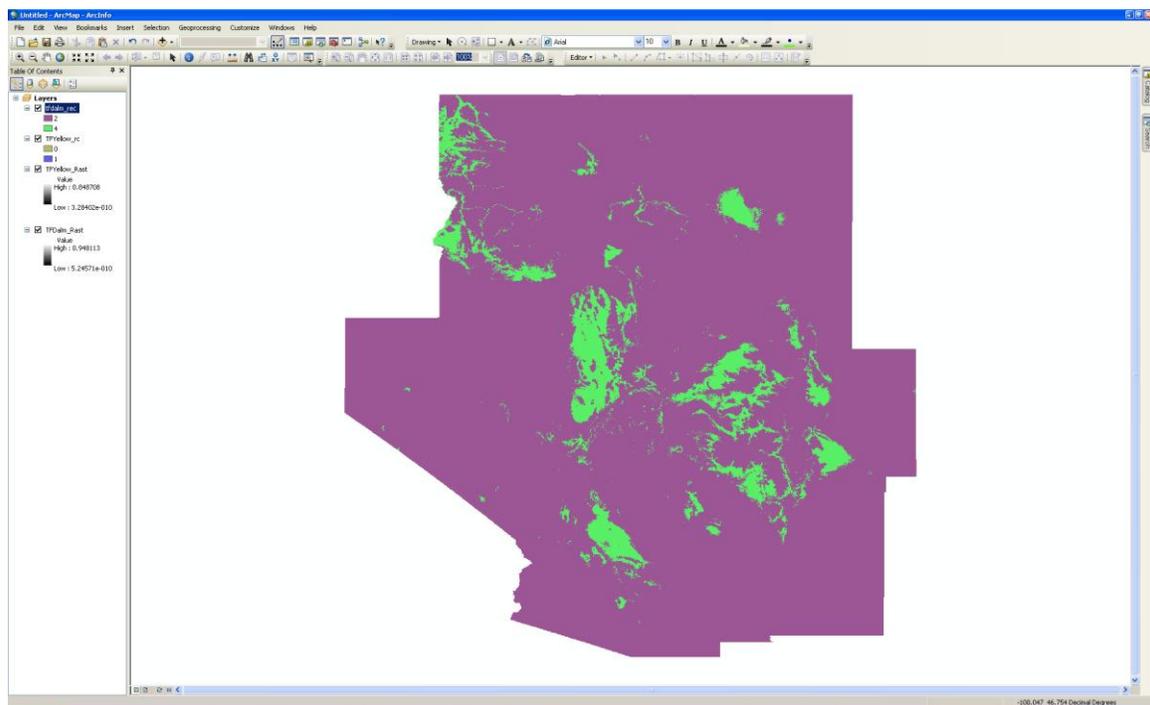
Next, for the **Output raster**, browse to your **Raster_Output** folder and save the raster as **TFYellow_rc**.

By the end, the window should look like the one shown here:

Repeat the same steps for your **TFDalm_Rast** in the **Reclassify** tool only use the appropriate threshold value and instead of assigning values 0 and 1, assign values of **2 and 4**. The values window will look like the one to the right.

Old values	New values
0 - 0.2414	2
0.2414 - 0.948113	4
NoData	NoData

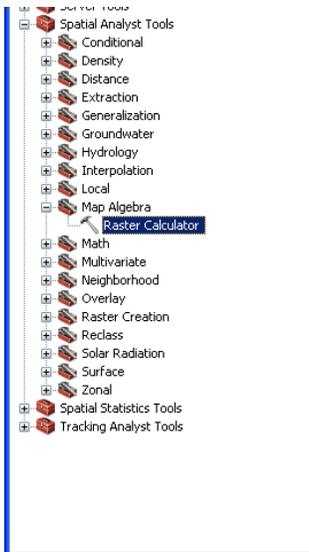
The resulting rasters will look similar to the one below:



To Identify the Niche Overlap

Step 3: Add Binary Maps together

In order to obtain a raster that contains the suitable habitat classes for both species, you will need to add together the two reclassified rasters you just created.



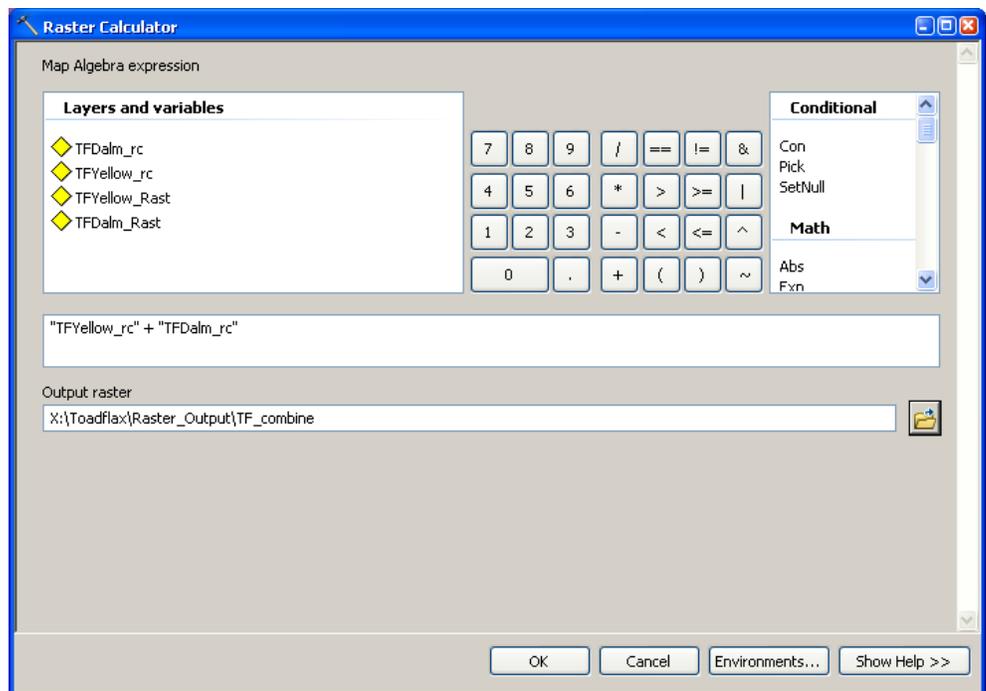
To do this, open up the toolbox  and go to **Spatial Analyst Tools**. Within that toolbox go to **Map Algebra** and click on **Raster Calculator**.

Within the calculator window, enter the following equation:

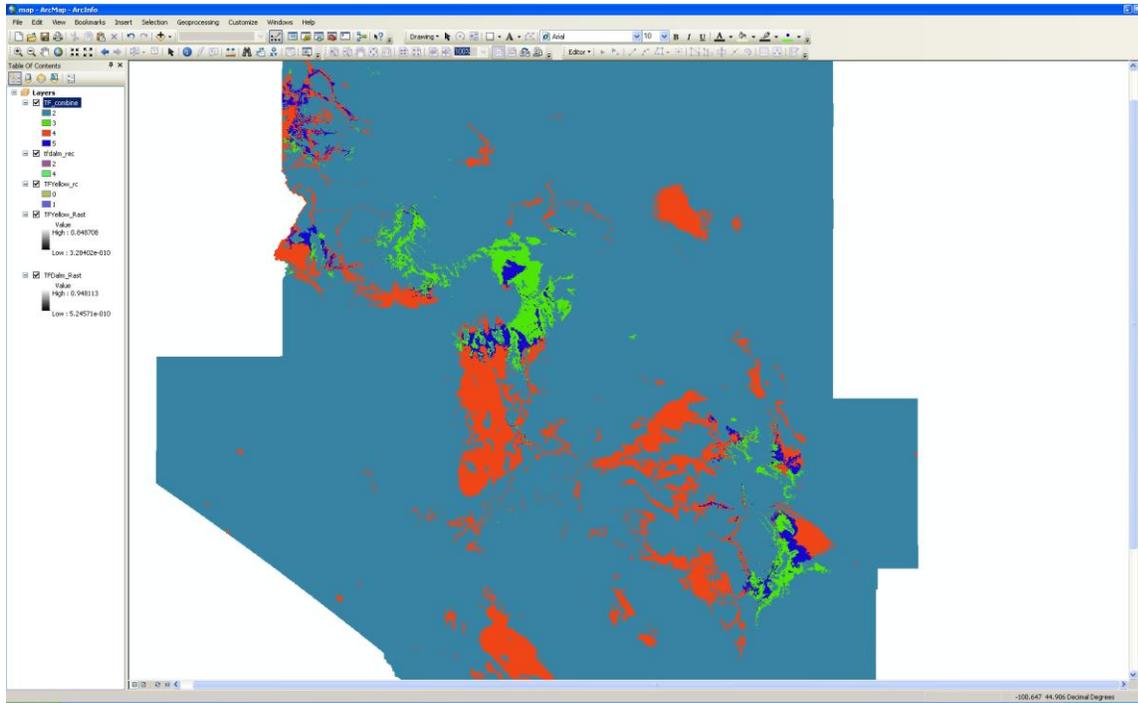
$$\text{"TFYellow_rc"} + \text{"TFDalm_rc"}$$

Save the output raster to your **Raster_Output** folder and name it **TF_combine**.

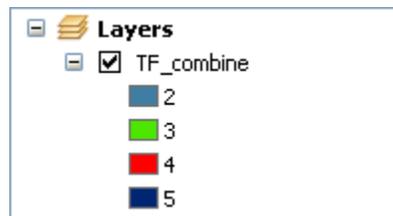
The raster calculator window should look similar to this before you click **OK**:



After the raster calculator has completed the addition, the raster will appear in the display looking somethin like the one below only with a different color scheme.



Use the image above and the color scheme to below to assist in the interpretation of the classes within Step 4.



Step 4: Interpretation

Before we finalize the map and label the classes, it is best to understand what each classification represents. If you recall, the Yellow Toadflax was classified with values of 0 and 1, and the Dalmatian Toadflax was classified with values of 2 and 4 before they were added together.

In Step 3, the addition of these two reclassified rasters allows us to interpret potential suitable habitat for each species along with potential suitable habitat for both species (where they could both be present). Recall that any data values below the threshold is classified at unsuitable habitat and anything above is considered suitable habitat. Therefore for Yellow Toadflax, anything with a 0 was considered unsuitable habitat and anything classified as a 1 was suitable. For Dalmatian Toadflax, anything unsuitable was classified as a 2 and any habitat that was suitable was classified as a 4.

The following table shows how to interpret the combined classes after the addition takes place in Step 3. Use the figure and color scheme at the end of Step 3 to assist you:

Yellow Toadflax Value	Dalmatian Toadflax Value	Addition from Step 3	Combined Class	Habitat Label
0	2	$0 + 2 =$	2	Unsuitable for both species
0	4	$0 + 4 =$	4	Suitable for Dalmatian Toadflax Only
1	2	$1 + 2 =$	3	Suitable for Yellow Toadflax Only
1	4	$1 + 4 =$	5	Suitable for Both Species

Be sure to take notice of the areas that are classified as a **5**. These areas are where the potential suitable habitat overlap for the two species of toadflax.

You can now re-label the classes within your layer named **TF_combine** by clicking on each class label and assigning the appropriate habitat label from the table above.



Well Done! You now have a raster displaying potential suitable habitat for two separate species and the areas where there is overlapping suitable habitat.