

SUPERVISED CLASSIFICATION USING ARCGIS 10

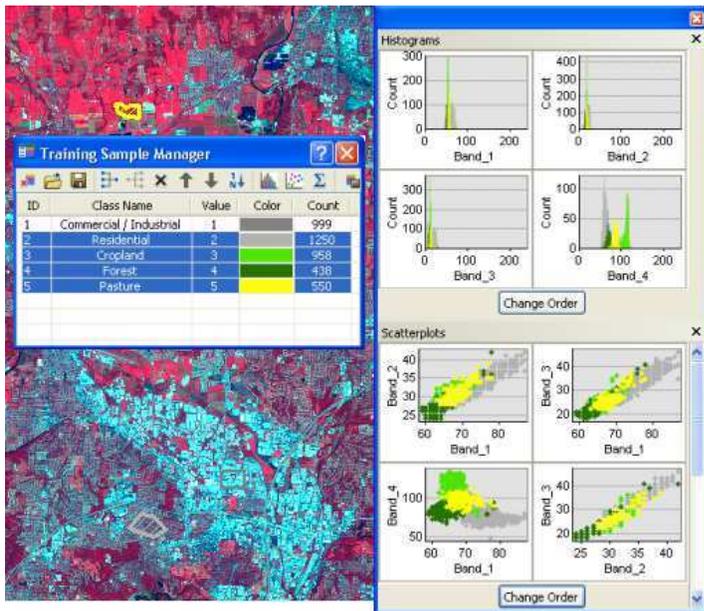


Image classification refers to the task of extracting information classes from a multiband raster image. The resulting raster from image classification can be used to create thematic maps. Depending on the interaction between the analyst and the computer during classification, there are two types of classification: supervised and unsupervised.

In ArcGIS Spatial Analyst, there is a full suite of tools in the Multivariate toolset to perform supervised and unsupervised classification. The classification process is a multi-step workflow, therefore, the Image Classification toolbar has been developed to provide an integrated environment to perform classifications with the tools. Not only does the toolbar help with the workflow for performing unsupervised and supervised classification, it also contains additional functionality for analyzing input data, creating training samples and signature files, and determining the quality of the training samples and signature files. The recommended way to perform classification and multivariate analysis is through the Image Classification toolbar.

Supervised classification

Supervised classification uses the spectral signatures obtained from training samples to classify an image. With the assistance of the Image Classification toolbar, you can easily create training samples to represent the classes you want to extract. You can also easily create a signature file from the training samples, which is then used by the Spatial Analyst multivariate classification tools to classify the image.

Adding the Image Classification toolbar

After enabling the Spatial Analyst extension, you can add the Image Classification toolbar and begin to use its tools to work with your data.

Steps:

1. Click the Customize menu in ArcMap.
2. Click Toolbars > Image Classification.

The toolbar is added in ArcMap.

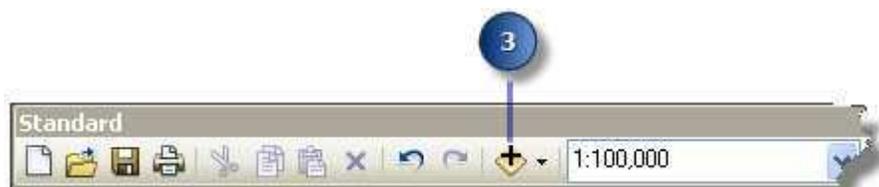
Adding a multiband image for the classification

The Image Classification toolbar allows you to classify a multiband raster. A multiband satellite image is a typical example of a multiband raster.

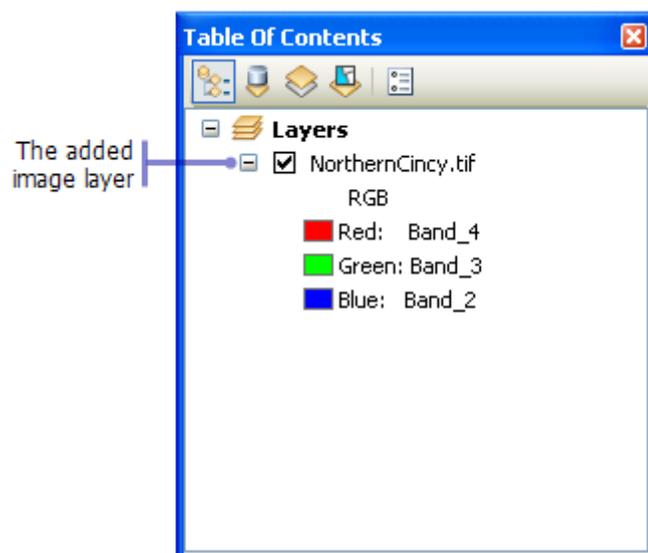
To specify a source image for the classification analysis, add the image to ArcMap. Then choose the image layer in the Layer drop-down list on the Image Classification toolbar.

Steps:

- Start ArcMap.
- Add the Image Classification toolbar to ArcMap. Refer to the topic Adding the Image Classification toolbar for how to add it.
- On the Standard toolbar, click the Add Data button.



- On the Add Data dialog box, browse to the image on the disk and click Add.
- The image is added as a layer in the table of contents. The layer points to all the bands on the disk.



- On the Image Classification toolbar, click the Layer arrow and click the image layer you just added.



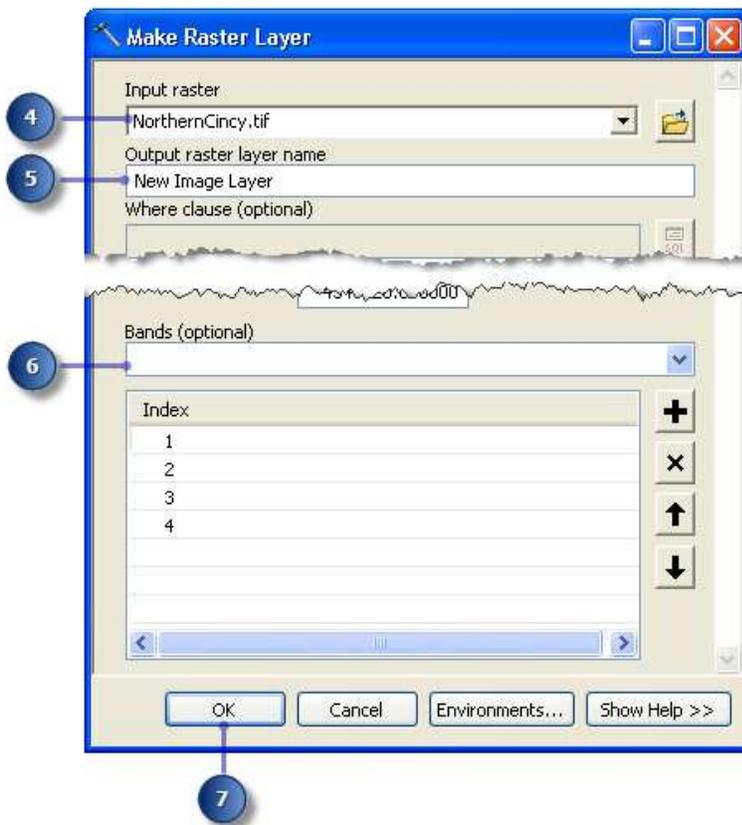
- This specifies the source image for all the subsequent image classification tasks. All the bands associated with the image layer are used in the classification analysis.

Creating a subset of bands for the classification

Sometimes you do not want to use all the bands from an image dataset in classification analysis. Under such circumstances, you can create a subset of bands for the classification without creating a new raster dataset. To do so, use the Make Raster Layer tool to create a new image layer with the desired band composition. Then select the new image layer on the Image Classification toolbar.

Steps:

- On the Standard toolbar, click the Search window button to open the Search window.
- Type Make Raster Layer and click the Search button. The Make Raster Layer tool is displayed in the search results.
- Click the Make Raster Layer item in the search results to activate the Make Raster Layer tool.
- On the Make Raster Layer tool dialog box, choose an image layer or a dataset on the disk for the Input raster parameter.
- Specify a name for the new raster layer in the Output raster layer name parameter. Select the bands that you want to include in the new raster layer in the Bands parameter.



- Click OK to run the tool. A new image layer with the specified subset of bands from the original image dataset is created.
- On the Image Classification toolbar, click the Layer arrow and choose the new image layer that you just created.

The new image layer is set as the source image of the classification analysis. Whatever bands it is made with are used in the classification analysis.

Creating training samples

To create training samples, use the training sample drawing tools on the Image Classification toolbar.

Steps:

The steps below show how to create training samples with the Image Classification toolbar:

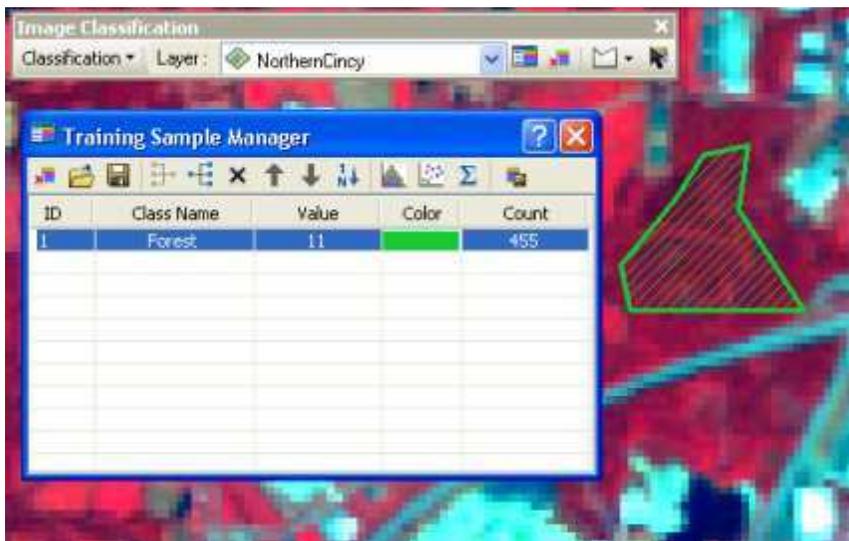
- On the Image Classification toolbar, choose an appropriate image layer in the Layer list.



- Click one of the drawing tools on the Image Classification toolbar. Notice that there are three drawing tools available, for drawing polygons, circles, and rectangles.



- In ArcMap, identify an area that belongs to a known class. Draw a training sample to enclose it. The following image shows a polygon training sample in ArcMap:



- Once you finish drawing the training sample, a new class is created in Training Sample Manager with a default name, value, and color. Open Training Sample Manager and change the class name, value, and color if desired.
- Repeat steps 2 to 4 to create a few more training samples to represent the rest of the classes on the image. The following is what Training Sample Manager looks like after five classes are created:

Evaluating training samples

To make sure that the classes represented by the training samples are distinguishable, their spectral characteristics need to be checked and compared. Use the Histograms window, the Scatterplots window, or the Statistics window to check the spectral characteristics of the training samples.

Steps:

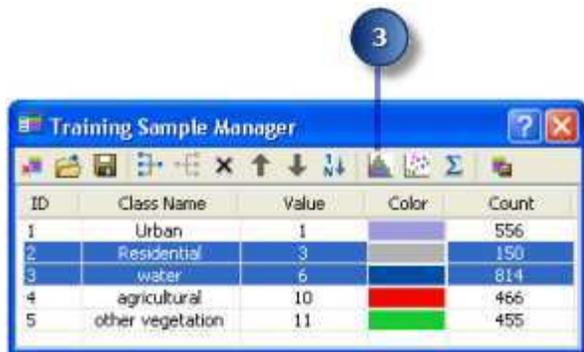
- Click the Training Sample Manager button on the Image Classification toolbar.



- The Training Sample Manager opens.
- In Training Sample Manager, choose one or more training samples to evaluate.



- In the dialog, click the Histograms button to open the Histograms evaluation window.



Note: The Histograms tool works for integer images only. If the pixel values are stored as floating point, this button is unavailable.

- The histograms for the selected classes are displayed in the Histograms window.
- Examine the histograms for each class on all the bands available. Use the vertical scrollbar to show more graphs when more than four bands are available. The histograms of different classes should not overlap. If they do overlap, you need to remove or merge some of the classes.
- Follow the same procedure in steps 3 and 4 but instead click on the Scatterplots button  and the Statistics button  button to open their respective windows. Examine the scatterplots and statistics for different classes. They should not overlap with each other on all the band combinations. If you removed old training samples and created new ones, repeat steps 1 to 5 to evaluate the new training samples. This process is iterative and should be repeated until you are satisfied with the training sample set.

Note: The color of the histogram or the scatterplot for a class matches the color of the class in Training Sample Manager.

If a class is hidden in the background in the histograms or scatterplots, click the Change Order button at the bottom of the window to bring it to the foreground.

In the Statistics window, you can copy the text to the Windows clipboard by pressing Ctrl+C.

Managing training samples

During the process of creating and evaluating training samples, you will need to use the tools on the Training Sample Manager to maintain the list of classes. For example, you may need to change the class name, value, and color. Also, classes may need to be merged, deleted, reorganized, and so on. See the following on how to perform some common training sample management tasks.



ID	Class Name	Value	Color	Count
1	Urban	1		70
2	Residential	2		51
3	Cropland	3		90
4	Forest	4		132
5	Pasture	5		66

Managing training samples

The first three tools on the toolbar are used for managing the training samples.

Clearing all training samples

- In the Training Sample Manager, click the Clear Training Samples button .

Loading training samples

- In the Training Sample Manager, click the Load button . A file browser dialog box appears.
- In the file browser dialog box, select a training sample feature class and click Add.

Saving training samples

- In the Training Sample Manager, click the Save button . A file browser dialog box appears.
- In the file browser dialog box, navigate to the desired location and specify a name for the feature class or shapefile, then click Save.

Managing classes

Other tools on the toolbar are used for managing the classes.

Merging classes

- In the Training Sample Manager, select two or more classes that you want to merge.
- Click the Merge button .

Deleting classes

- In the manager, select the classes you want to delete.
- Click the Delete button .

Moving a class up or down

- In the manager, select the class you want to move.
- Click the appropriate Up button  or Down button .

Reorder all classes in ascending order

In the manager, click the Reset class values button .

Reorder an individual class

- In the manager, click in the Value cell of a row. The cell becomes editable.
- Type the new integer value and press Enter.

Rename a class

- In the manager, click in the Class Name cell of a row. The cell becomes editable.
- Type a new name and press Enter.

Changing the display color

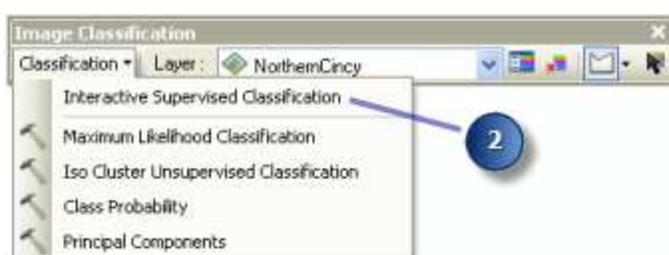
- In the manager, click in the Color cell of a class. A color selector is shown.
- Pick a color from the color selector. The color of the training sample is updated in the ArcMap display area and any opened evaluation window.

Executing the Interactive Supervised Classification tool

Once the training samples are created, the Interactive Supervised Classification tool allows you to perform a supervised classification without explicitly creating a signature file. Also, this tool accelerates the speed of the classification. Internally, it calls the Maximum Likelihood Classification tool with default parameters. During the classification, it makes use of all the bands available in the selected image layer.

Steps:

- Create a few training samples if you have not done so already. Refer to the topic Creating training samples to learn how to create them.



- A classification is performed using all the bands of the selected image layer in the Layer list. The result is added to the ArcMap table of contents as a temporary classification layer.
- To save the classified image to disk, right-click the temporary classification layer. In the shortcut menu, click Data > Export Data. Specify the location and name for the output raster. Change the cell size and extent for the output raster in the Export Raster Data window if necessary. Then click Save.

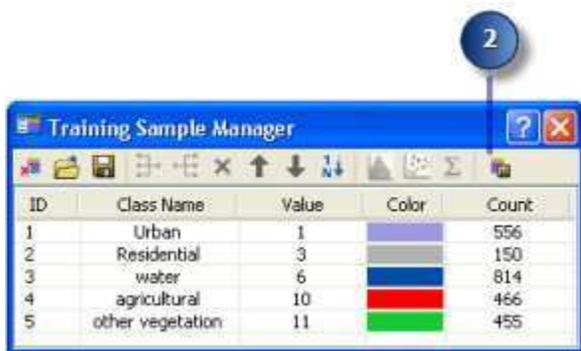
Creating a signature file

A signature file is required when you use the geoprocessing tool Maximum Likelihood Classification to classify an image. To create a signature file, you can use the Create Signature File tool  on the Training Sample Manager.

This task assumes that training samples have already been created. If they have not been created, go back to the Creating training samples step to create them.

Steps:

- Open Training Sample Manager from the Image Classification toolbar.
- Click the Create Signature File button.



- A file browser dialog box appears.
- On the file browser dialog box, pick a location and specify a name for the signature file. Then click OK to save the file.
- A signature file is created and saved on disk.

Executing the Maximum Likelihood Classification tool

When you have a signature file ready, you can use the Maximum Likelihood Classification tool to classify the input image.

Steps:

- Create training samples if no training samples have been created. Refer to the topic Creating training samples on how to create training samples.
- Create a signature file for the training samples if it has not been created already.

Refer to the topic [Creating a signature file](#) on how to create a signature file.

- On the Image Classification toolbar, click Classification > Maximum Likelihood Classification to open the Maximum Likelihood Classification tool.
- In the tool dialog box, specify values for the three required parameters —Input raster bands, Input signature file, and Output classified raster. Accept the default values for other parameters.
- Click OK to run the tool.

The output classified raster will be automatically added to ArcMap when the tool finishes.