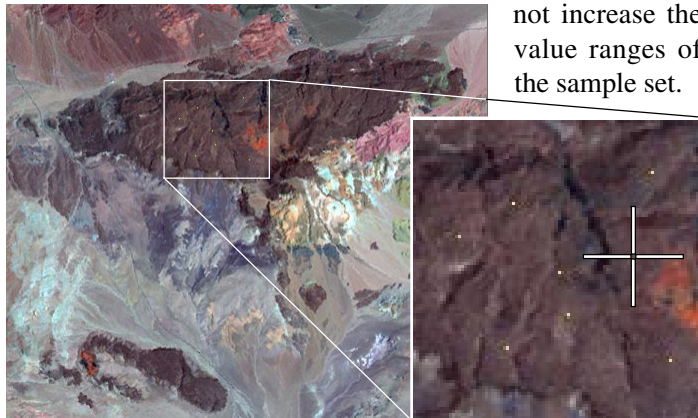# Define Samples and Mark Features

Feature Mapping, the interactive image classification process in TNTmips, provides several tools that let you guide your computer in identifying areas to assign to different spectral feature classes. You can use the Grow and Mark Features tool to click within a feature area and automatically find contiguous cells with similar spectra (see the Technical Guide entitled *Feature Mapping: Grow Feature Prototypes*). In contrast, with the Define Samples tool you identify a number of sample cells for a feature, automatically find cells with similar spectra throughout the image (a class prototype), then decide which prototype cell clusters to assign to the feature class using the Mark Features tool.
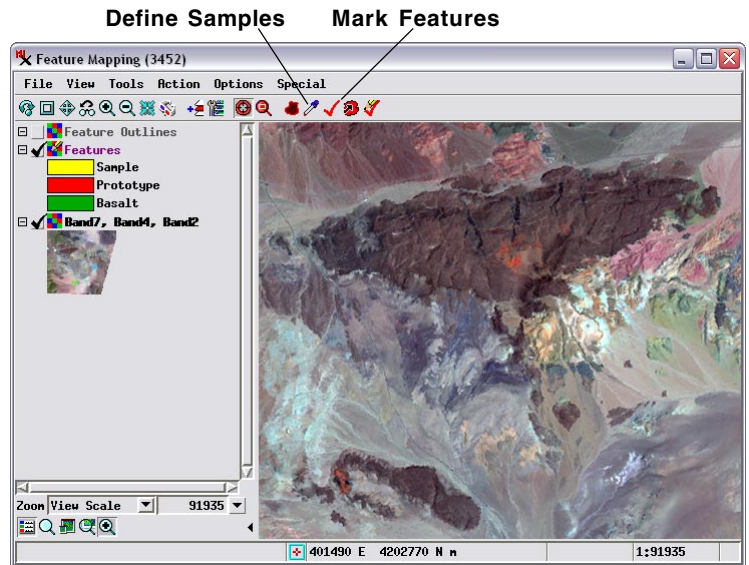
Define Samples and Classify

After activating the Define Samples tool, left-click at one or more locations in the image that you think are representative of a single feature class. Each image cell you click on becomes a *sample* that is shown in color in the Features overlay, and whose cell values in each analyzed band are recorded. (You can remove a sample with a shift-click or control-click.) Choose Options / Show Values to open a Sample Values window that shows the current minimum and maximum cell value in each band for the sample set. The Cursor column in the Sample Values window also shows the cell values for the current cursor location as you move the cursor over the image. Any values in this column that are outside the current ranges of the sample set are also highlighted in red, so you can easily detect when adding a particular cell to the sample set will expand the ranges. If all the Cursor cell values are shown in black, then adding that cell will not increase the value ranges of the sample set.

Define Samples   **Mark Features**

Feature Mapping window being used to classify a portion of a Landsat satellite scene in an arid region with little vegetation in the southwestern United States. Six spectral bands are used in the analysis. The reference false-color image uses bands 7, 4, and 2 as Red, Green, and Blue, respectively.

Once you have designated one or more samples for a prospective feature class, you can automatically identify similar cells in the image by running the *Classify* procedure. Press the Classify icon button on the Feature Mapping toolbar (illustrated above) or simply right-click in the Feature Mapping view. The process analyzes all cells in the image (not just those in the current view area) and identifies all cells whose values fall within the sample set value ranges. These *prototype* feature class cells are shown in color in the Features overlay. (The default colors for sample cells and prototypes are yellow and red, respectively, but you can choose alternate colors at any time by selecting the Colors item from the Options menu. You can also have the Classify procedure find only cells that exactly match any of the sample cells using the Options / Classification rule menu.)

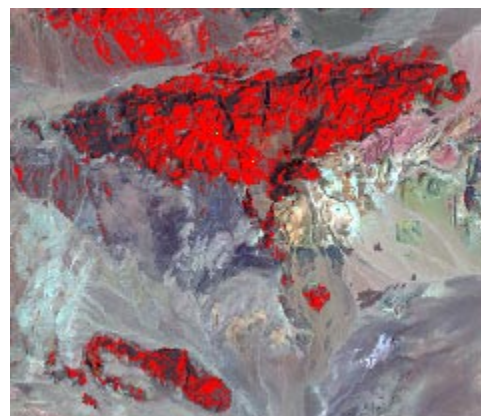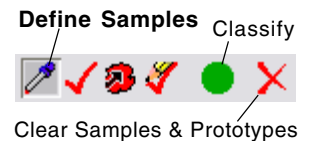**Define Samples**   Classify

Clear Samples & Prototypes

Above, a number of sample cells (indicated in yellow) have been created using the Define Samples tool in an area of dark volcanic bedrock (basalt). The Sample Values window (right) shows the minimum and maximum cell values for the current sample set as well as the values at the cursor location, with values outside the current sample set range highlighted in red.

| Image Band	Minimum	Maximum	Cursor
Band1	88	97	97
Band2	78	84	88
Band3	87	97	100
Band4	46	53	55
Band5	83	103	93
Band7	72	90	84

Prototype feature class cells (red) found using the initial sample set. A number of darker portions of the basalt outcrop were not represented in the sample set and thus are not included in the prototype set.

(over)

If all portions of your prospective feature are not covered by the prototype, you can continue to designate sample cells in the uncovered areas and run the Classify procedure again until all desired areas (except for local holes; see below) are covered. It is likely that cells outside the areas you want to assign to the current feature class are also included in the prototype set, but you can deal with this situation in the next phase, which is marking features. (You can also choose to abandon the current samples and prototypes at any time by pressing the Clear Samples and Prototypes icon button on the Feature Mapping toolbar).
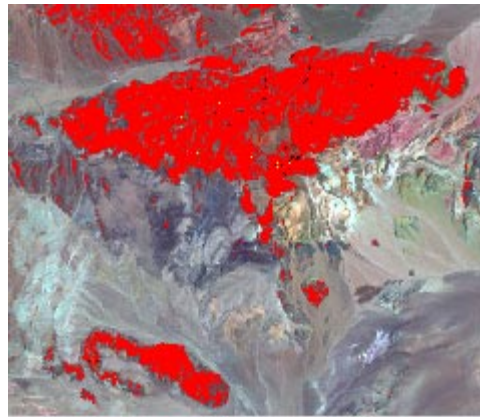
Feature Mapping view after additional sample cells were added in darker basalt areas and Classify procedure was run again to create an expanded prototype set. A number of spatially separated areas have been included within the prototype set.
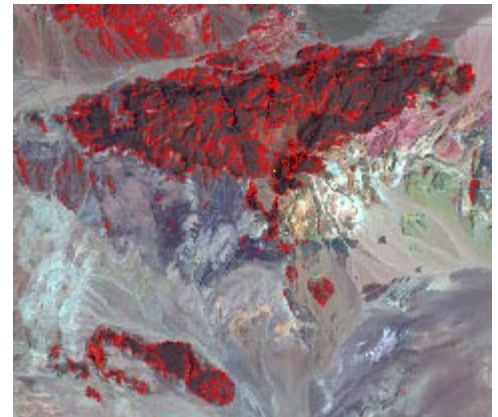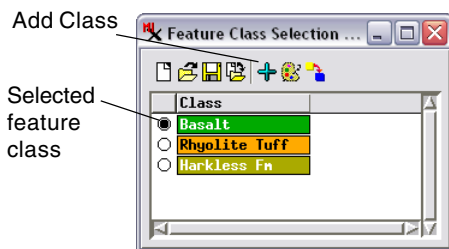

You can open another Feature Mapping view which by default shows only the outlines of prototype and feature class areas. This second view can help you visually evaluate prototype areas and decide whether to assign them to the current feature class.

Mark Features

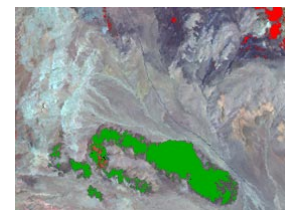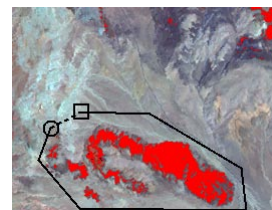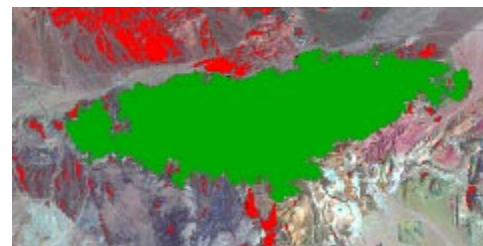*Marking* is the procedure of assigning prototype features (individual areas of contiguous prototype cells) to a feature class. When you turn on the Mark Features tool set, a Feature Class Selection window also opens, allowing you to name and assign a color to each feature class, and to choose which of the feature classes you are currently working with. You can create feature classes with this dialog at any time as you classify an image.

Mark Single Feature   Mark All

Mark Features   Mark by Polygon

Add Class

Selected feature class
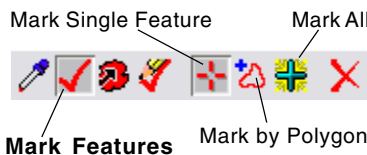
Use the Mark Single Feature tool to click on a contiguous set of prototype cells (above at left) to assign it to the current feature class (below at left, green area). With the Hole Filling option turned on, all holes of any size within the protype area are also assigned to the feature class.

At this stage you use your own interpretive skills to evaluate each prototype area and decide whether it should be assigned to the current feature class. To help in this activity you can open an additional view window (View / Open Additional View) that by default shows only the outlines of prototype and feature class areas (see the Technical Guide entitled *Feature Mapping: View Features as Outlines*) over the reference image, as shown in the top right illustration.

The Mark Features tool set provides a point tool (Mark Single Feature: click on a feature area to assign) and a polygon tool (Mark by Polygon: draw polygon around the prototype areas to assign). With each tool, only the designated prototype areas are assigned to the feature class.

When you mark features, you have the option (on by default) to have "holes" in a prototype area (unclassified areas continuously surrounded by prototype cells) automatically "filled" (included with the feature class) when the prototype is marked.

With the Mark by Polygon tool, you draw a polygon around the desired prototype features (above left), then right-click to assign them to the currently selected feature class (result above right).

This option can be toggled on or off at any time using the Options menu on the Feature Mapping window.

Feature class areas are recorded in a Features raster that is shown as an overlay in the Feature Mapping window. When you are finished with a mapping session, be sure to choose File / Features / Save (or Save As) to save the Features raster along with your feature class definitions. In later sessions you can reload the saved Features raster along with your image bands.