

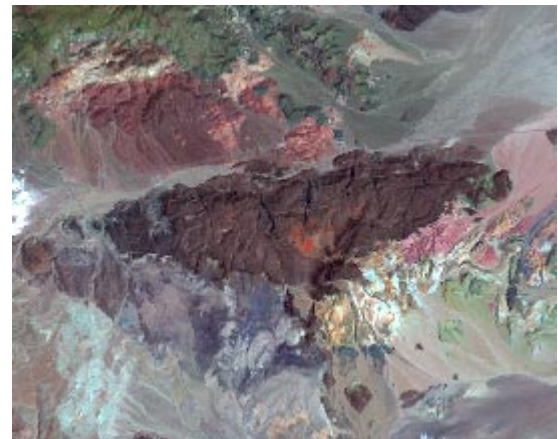
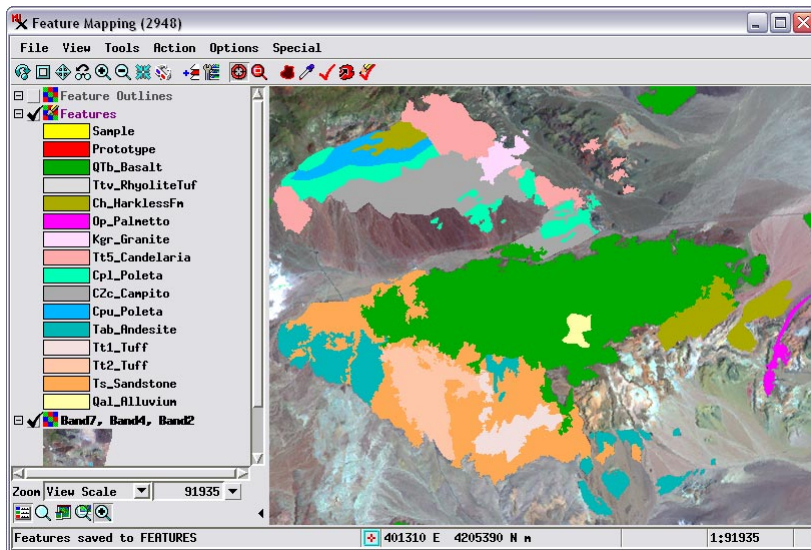
# Interactive Image Classification

Feature Mapping is a multispectral image classification process that couples your visual interpretive skills with automated image analysis methods. The goal of this interactive process (Image / Interpret / Feature Map) is to subdivide an image spatially into a set of spectral categories, or *feature classes*, that you define based on your visual analysis and knowledge of the image area. Using Feature Mapping's interactive tools, you indicate image locations that are representative of a particular feature class, then let the tool automatically find image cells

Feature Mapping provides three main methods for assigning image areas to feature classes: define samples and mark features, grow and mark features, and draw features. You can switch between these classification methods at any time.

 **Define Samples and**  **Mark Features**

Using the Define Samples tool, you can designate any number of sample cells that are representative of a single feature class, then run a Classify procedure that automatically finds unclassified cells with similar spectra throughout the image, producing a set of class prototypes. Sample cells

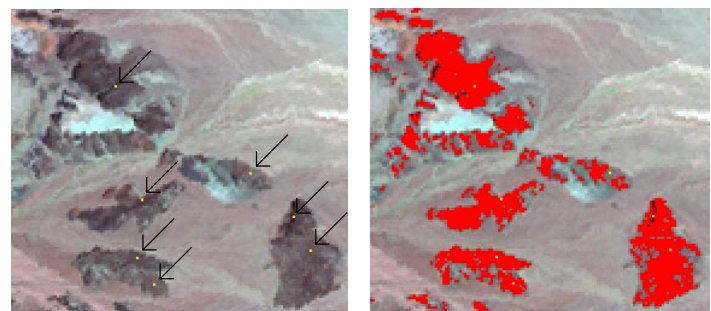


Feature Mapping window showing partial results of interactive analysis of a portion of a Landsat satellite image of an arid region in the southwestern United States. Surface exposures of different types of rocks are being mapped to create a geologic map. The feature classes (rock units in this example) are shown in different colors in a Features raster overlay in the view and in the feature legend in the window's sidebar. Six bands of the Landsat image are being analyzed, while the reference false-color image (shown by itself above right) shows bands 7, 4, and 2 as red, green, and blue, respectively.

that are spectrally similar. Your reference view of the image can be a single image band, an RGB color combination of three of the bands, or another color combination (HIS, CMYK, and others). While your visual interpretation is typically limited to a color combination of 3 bands, the automated analysis procedures in Feature Mapping can simultaneously process any number of image bands that you have selected for analysis. After any automated procedure, you have the choice whether or not to assign the identified cells (a *prototype* feature) to the designated class.

You can add feature classes at any time during your analysis, giving each a name and assigning it a color. The areas that you map and assign to a feature class are recorded in a Features raster that is displayed as an overlay on top of the reference image. Your feature class definitions and styles are saved automatically when you save the Features raster (File / Features / Save), and you can reload a saved Features raster in a later session along with the image bands if needed. You can use Feature Mapping to completely classify an image or to create a set of training areas to be used in the Automatic Classification process (Image / Interpret / Auto-Classify).

and prototypes are indicated temporarily in the Features overlay in unique colors. You can then examine the individual prototype cell clusters (as in the illustration below) and decide which ones to assign to the current feature class using the Mark Features tool. Unclassified "holes" in the prototypes also can be automatically "filled" (assigned to the feature class) during the marking step if you choose. This method is described further in the Technical Guide entitled *Feature Mapping: Define Samples and Mark Features*.



Above left, sample cells (yellow, indicated by arrows) placed with the Define Samples tool for a prospective feature class. Above right, class prototype patches (red) found by the Classify procedure. (over)

## Grow and Mark Features

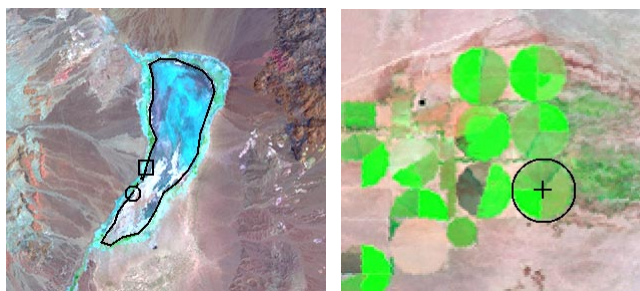
With the Grow and Mark Features tool, you left-click at a representative location within a prospective feature, and the tool attempts to grow a single prototype feature patch by finding a contiguous (connected) set of unclassified cells with similar spectra. You can vary the rate of growth of the prototype using the mouse wheel or icon buttons to control the size and spectral variability of the prototype produced, as illustrated below. You can then choose whether or not to add the prototype to the current feature class (mark the feature) and optionally fill holes in the prototype. This method is described in more detail in the TechGuide entitled *Feature Mapping: Grow Feature Prototypes*.



A feature prototype (red area) being defined with the Grow and Mark Features tool. The growth rate has been increased from left to right to produce a larger prototype. When you add the prototype to a feature class, the unclassified holes inside it can be automatically added to the class as well if you choose.

## Draw Features

In addition to the automated tools noted above, the Draw Features tool set allows you to manually add to or edit the set of features you are creating. Using these drawing tools (point, line, polygon, rectangle, and circle) you can draw and add individual features, draw prototypes for later assignment to features, and change all or part of an existing feature to another feature class (or to unclassified). You can also draw protected areas to be left unclassified by the automated classification procedures. These activities are described in more detail in the TechGuide entitled *Feature Mapping: Draw Features, Prototypes, and Protected Areas*.



Polygon tool (above left) and circle tool (above right) in the Draw Features tool set being used to outline areas to be added to feature classes.

## Region of Interest

You can use the Region of Interest tool to draw one or more

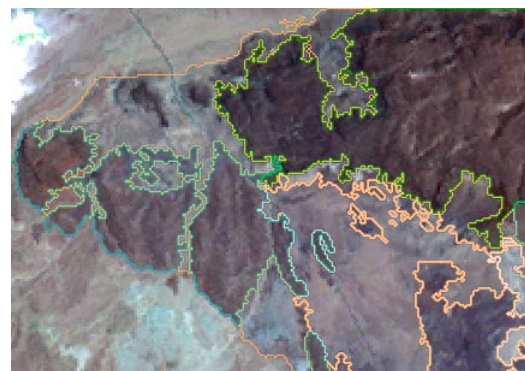


polygons to limit the spatial area to be analyzed by the automatic classification procedures. After drawing a polygon, you can use the Add or Remove icon buttons on the toolbar to add or remove the enclosed area from the Region of Interest. The Region of Interest is created as a temporary mask raster that shows excluded areas grayed-out in the view. You can clear excluded areas at any time by choosing File / Region of Interest / All. You can also save the Region of Interest as a raster object in a Project File for later re-use if needed (File / Region of Interest / Save).

## Other Feature Mapping Aids

The Features overlay uses solid colors to indicate different feature classes, so the areas of the image that you have already classified are obscured in the main view by this overlay. You can open an additional view window that shows the reference image with a Feature Outlines overlay, which has a one-cell-wide outline of each feature class rather than solid color fills. This Feature Outlines overlay is automatically created and updated from the Features raster as you work, so you can use the added View to refer more clearly to the reference image as your classification progresses (see the TechGuide entitled *View Features as Outlines* for more information).

Additional Feature Mapping view showing Feature Outlines to provide a clearer view of the reference image.



If you have a vector object with polygons outlining features pertinent to your classification, you can add the vector object as a Reference Vector and use any of its polygons to limit the area of prototypes created with the Define Samples classification procedure (see the TechGuide entitled *Feature Mapping: Using a Reference Vector*).

Although the main product of Feature Mapping is the Features raster, you also have the option to save the feature information as a vector object in a Project File, or as a KML file for 3D perspective viewing in Google Earth (see the TechGuide entitled *Feature Mapping: Save Features as Vector and KML*). You also have the option to create a text report that summarizes statistics for each feature patch, including the feature assignment, line and column number of the feature patch centroid, the number of cells, area covered, and boundary length.