



EXERCISE 1

eCognition Project Setup

Introduction

eCognition is a powerful object-based image processing software that offers the user tremendous control over the analysis options including things like segmentation and classification. In this first exercise you will begin by learning how to set up a new project using an image and a few other raster datasets; we will cover more complex processes in subsequent exercises. The project you create in Exercise 1 will be used in Exercise 2.

Objectives

- Learn how to set up a project in eCognition
- Become familiar with the eCognition interface

Required Data

- NAIP image: **mttaylor_naip_10m.img** (3 band, CIR, 10 m resolution)
- Derived vegetation index file: **mttaylor_ndvi_10m.img** (Normalized Difference Vegetation Index)
- Tri-shade image file: **mttaylor_trishade_10m.img** (aka fully-illuminated hillshade)

Prerequisites

- You have properly installed and licensed eCognition 9.x (latest version is 9.2.1),
- You have downloaded, unzipped, and extracted the course data





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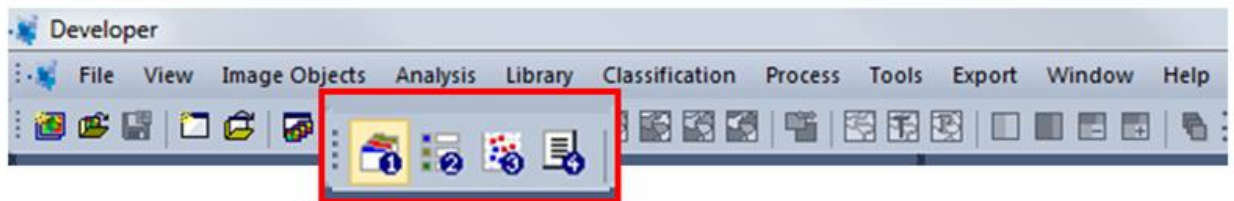
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Part 1: Launch eCognition Developer

A. Open eCognition

1. From the Start Menu, navigate to **All Programs, Trimble, eCognition Developer 9.2, eCognition Developer**. Or if you have a shortcut on your desktop, double-click the icon to open eCognition Developer.
2. From the **main toolbar** area of eCognition locate the **View Settings toolbar**. It looks like the following graphic. When eCognition opens, it loads in the **Load and Manage Data** Settings (setting 1 in image below).

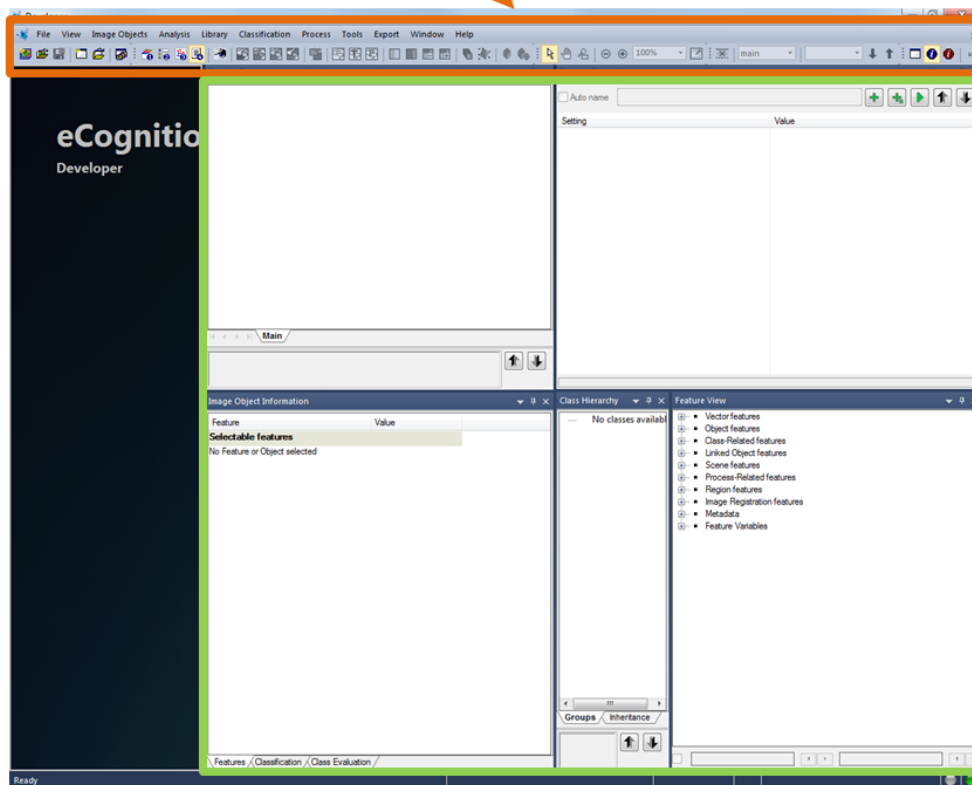


- i. Load and Manage Data (Workspace)
- ii. Configure Analysis (Analysis Builder)
- iii. Review Result
- iv. Develop Rulesets (e.g., Process Tree)

Note: This training is centered around writing rule sets, which organize and modify image analysis algorithms. **View 4 is where you will spend 95% of your time.** This is where you will build the rule set for your various analyses.

3. Click on each of the four views to see how it changes the eCognition interface. Leave the interface set to the **Develop Rulesets** view; it looks like the following graphic:

This is the main toolbar and main menu area of the Developer interface. In this first exercise this is where we will focus most of our attention.



This area is where the development of Rulesets and other advanced processes are formed.

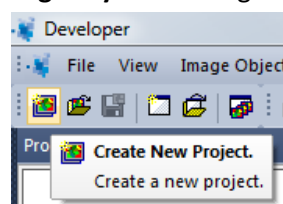
Note: Workspaces are at the top of the “hierarchical tree” in eCognition and are essentially containers for projects (*.dpr files). We will not be creating workspaces in this exercise; rather we will just be creating projects.

Part 2: Create a New Project

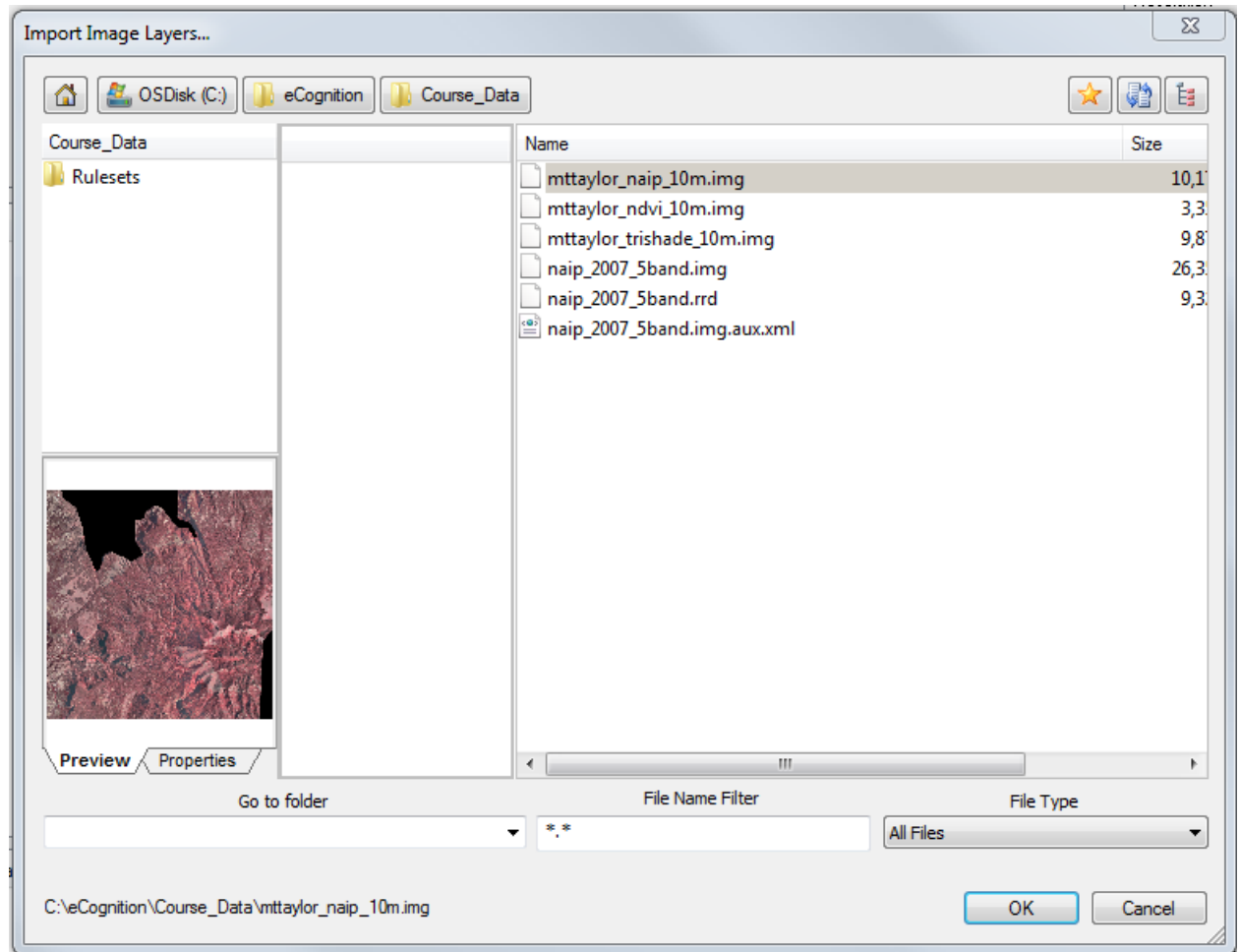
The next step is to create a new Project. This consists of loading your image file(s), and setting some other parameters in the Create Project dialog that affect how your image layers and project “look”.

A. Create a New Project

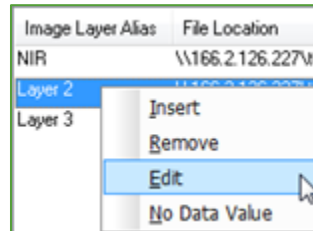
1. From the **eCognition Developer** (View 4) main menu, locate the **New Project** button (see the following graphic), or from the **File** menu select **New Project**. The **Create Project** dialog will open, and on top of it the **Import Image Layers...** dialog will open.



2. In the **Import Image Layers...** dialog, navigate to your course data using the folder structure window in the upper left of the dialog and select the file **mttaylor_naip_10m.img** Click OK. (see following graphic).



3. In the **Create Project** dialog you will see the information about your image —the coordinate system, resolution, pixel size, and the individual bands are listed mid-dialog. **Give your project a name**, e.g., mttaylor_stand_delin (this is in preparation for what we will do in Exercise 2).
 - i. Make note of the **Thematic Layer** and **Metadata** options. We will not use them at this time.
4. Once you have given the project a name, you will next edit your **Image Layers Alias** names to give them more intuitive names other than Layer 1, Layer 2, and Layer 3.
 - i. **Highlight** and **right-click** “Layer 1” and select **Edit** (shown in the graphic to the right) from the menu (or you may simply double click on Layer 1)



- ii. In the **Layer Properties** window that opens, change the **Layer Alias** to “NIR”
- iii. **Repeat** this process for the remaining Layers:
 - (a) Layer 2 = Red
 - (b) Layer 3 = Green
- iv. We have just named our layers, or bands, so they will be more intuitive to work with when building rulesets.

Note: Alias names are case sensitive – this is not that relevant to our workflow yet. However, as you begin developing more advanced rule sets, this will become important to remember.

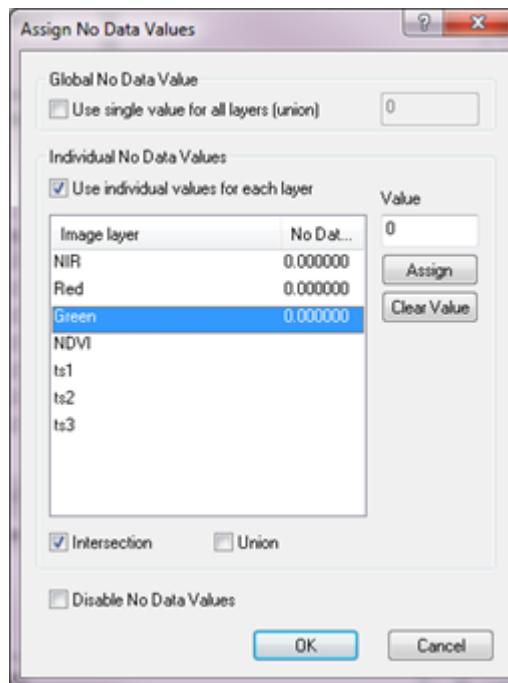
B. Add Additional Layers

1. With the Create Project dialog still open, click the **Insert** button next to the Image Layer section to add other image layers.
2. Select the **mttaylor_ndvi_10m.img** and the **mttaylor_trishade_10m.img** (navigating to the course data if necessary). HINT: hold the Ctrl button down and select both images.
 - i. You should now see 4 additional Image Layers. The NDVI layer is a single-band (it only contains the index), but the tri-shade layer is a 3-band stack of hillshades created with different illumination criteria (what we like to call “fully illuminated”).
3. Set the aliases of the additional layers (using the steps outlined above) to the following:
 - i. Layer 4 = NDVI
 - ii. Layer 5 = ts1
 - iii. Layer 6 = ts2
 - iv. Layer 7 = ts3

C. Set No Data Values

The data we are working with contain background data that should be ignored; we need to tell eCognition what the pixel values of these areas are so that they are not included in segmentation or analyses. This is done by specifying No Data values.

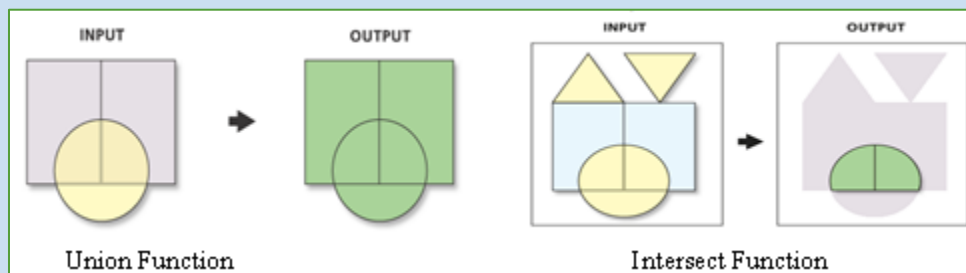
1. With the **Create Project** dialog still open, next to the Image Layer section find and click the **No Data** button. We will see the results of our handy-work in a bit.
2. In the **Assign No Data Values** dialog window (see following graphic) you will see your Image Layers (listed by their Aliases). Place a check mark next to “Use individual values for each layer”



3. Highlight the **NIR** layer and with the Value field set to 0, click the **Assign** button.

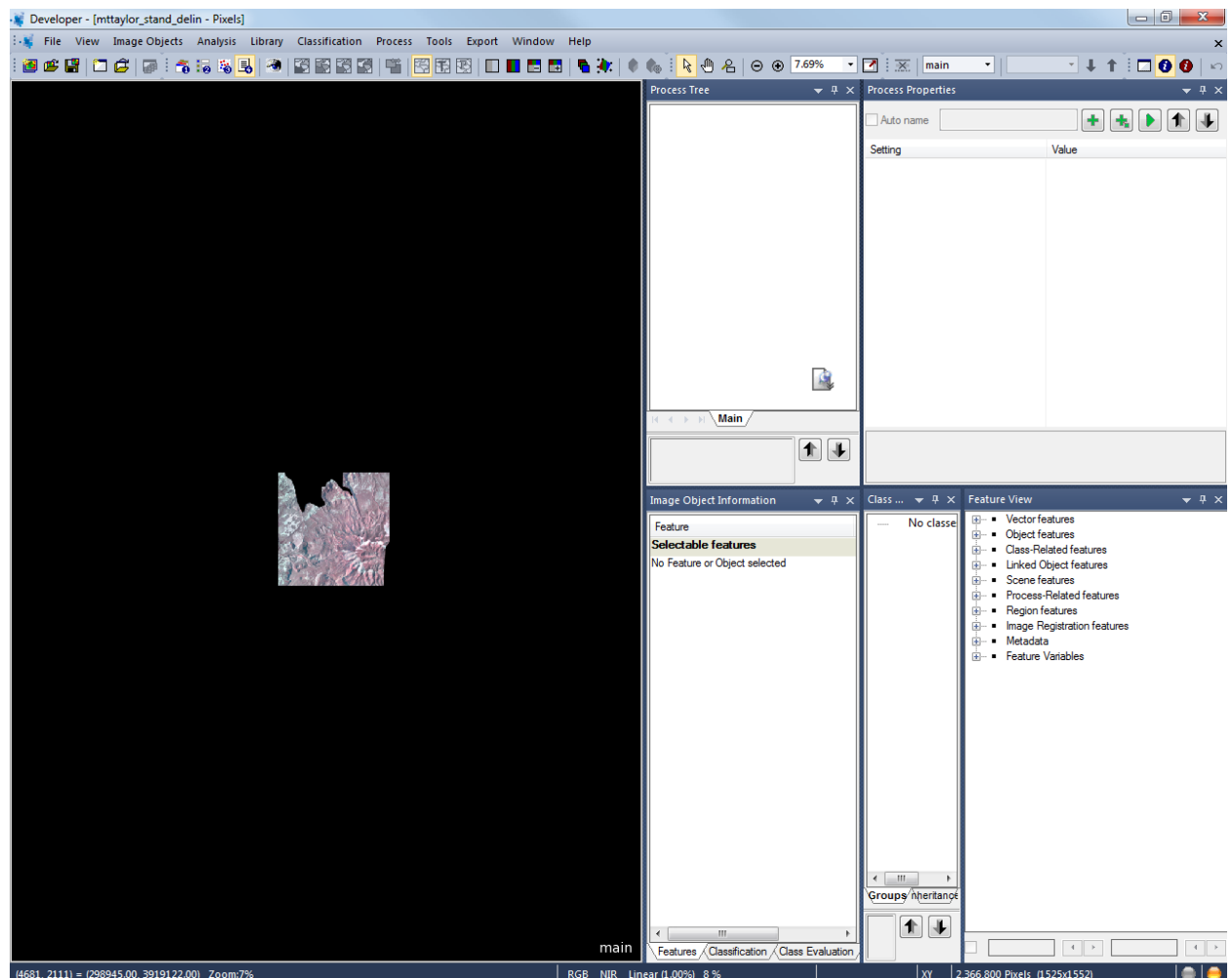
What is the difference between the Global No Data Value and the Individual No Data value?

When all your layers have the same value you wish to set to No Data, the Global No Data option seems most appropriate, however, the Global No Data option assesses the layers' No Data values using a Union function. The union function is a geometric unification of overlapping layers (as you can see in the graphic below)—this is problematic when the background value is 0 for most layers, but say one layer, such as the NDVI, has actual 0 values that are real values and not background values—these will be dropped out as No Data. By using the Intersection function we can assure that we are applying the No Data values on each layer individually and only taking those areas where we have real values. An intersection function combines only those areas that are geographically common between the layers (see following graphic) - it is less "all inclusive" than the Union function.

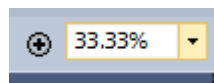


4. Repeat this for the **Red** and the **Green** layers. These data sets were all clipped down using the same boundary file, therefore the areas for the NIR, red and green layers that are "0" represent the same "background" area in all images that we want to be treated as No Data during the segmentation process.

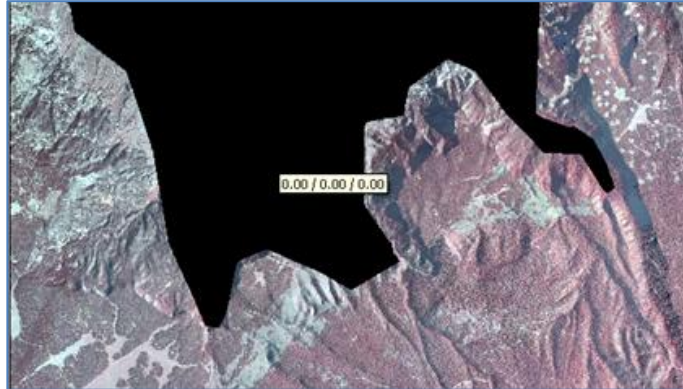
5. Lastly, change the option from Union to **Intersection** by placing a check mark in the box and click **OK**.
6. Click **OK** one more time in the **Create Project** dialog to apply the setup. You will then return to the main Developer window.
7. Now to see the imagery, we will need to resize the panels. Move your cursor to the left-hand border of the Process Tree panel until your pointer changes to “split arrow” cursor. Now click and drag the panel edge to the right.
8. Repeat with the Process Properties panel if necessary.



9. Zoom into your image by clicking on the **zoom icon** or setting the zoom to roughly 33%.



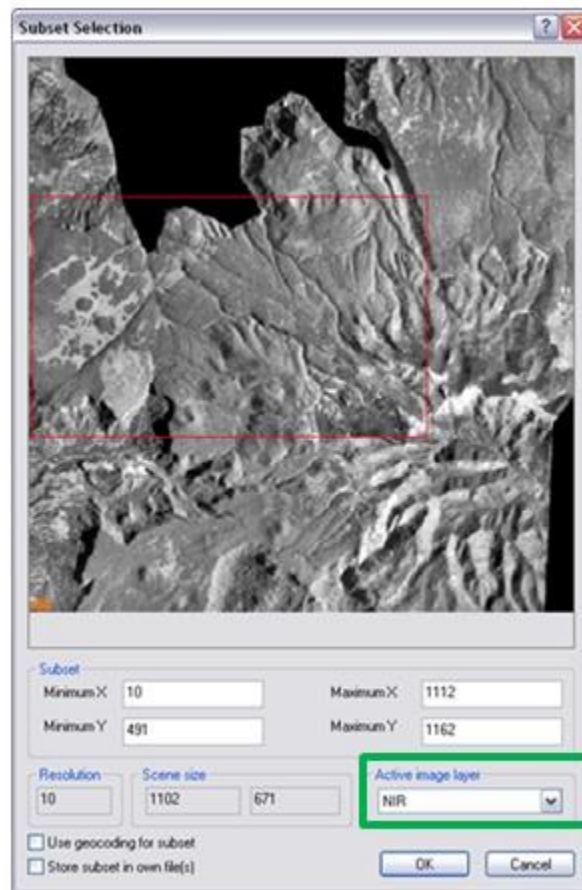
10. With your mouse, **hover over** the black background area of the NAIP image. A small pop up text box will show the pixel values for the 3 bands at that location. It should look similar to the following graphic. These are the background values (they happen to be “zeros”) that **we set to No Data** and won’t be included during segmentation or other analyses.



D. Create Subsets

You may want to define an image area subset within your eCognition project setup, which can be useful for developing and efficiently testing segmentation and classification processes when the image data sets are large and processing the entire dataset may be too time consuming. To create a subset, follow the steps below:

1. Make sure you have **Saved** your project before beginning!
2. Click the **File** menu and from the drop down locate and click **Modify Open Project** (near the bottom).
 - i. The Modify Project dialog opens. This is where you can change any of the project settings—aliases, project name, or even add more data.
3. From this dialog, locate and **click** the **Subset Selection** button (if button is greyed out, refer to note in blue box below).
 - i. In the **Subset Selection** dialog, click and drag to specify an area of interest in the image area to create a subset. You can also do this by specifying the X and Y coordinates.
 - ii. The **Active image layer** dropdown (outlined in green) allows you to change the gray scale image view by selecting a different band or layer to display—this can be useful for identifying where your subset will be (i.e. use one of the hillshades to help identify a topographic area of interest).
 - iii. Create a subset of the image that closely reflects the following graphic and click **OK**.

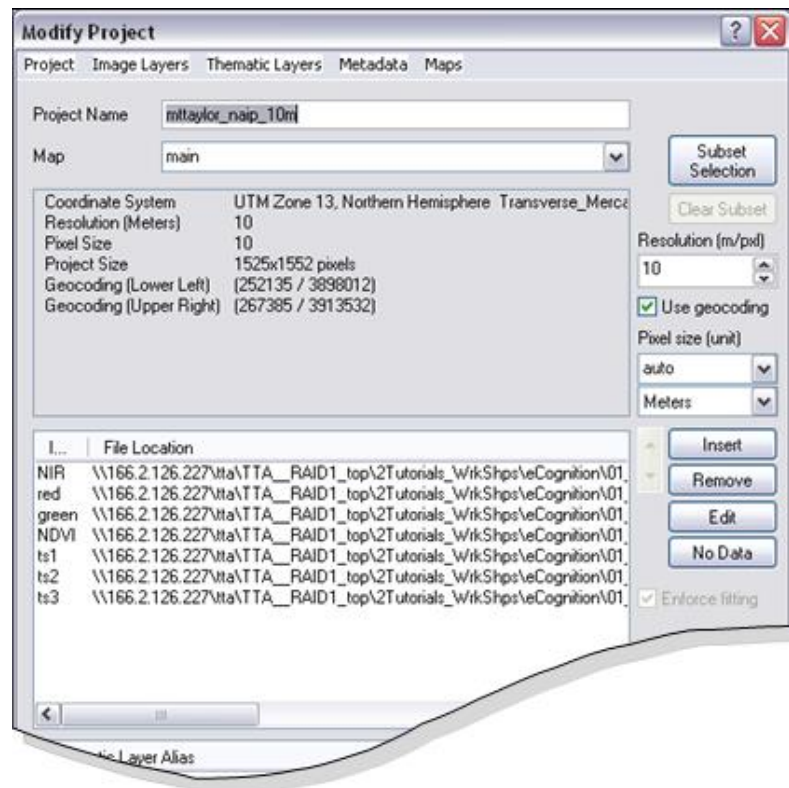


Note: The Subset Selection button will be greyed out if you already have created segments on your image. If you run into this problem, simply close the Modify Project dialog and delete the segments you have created—do this by clicking the **Delete Level** button (see following figure).



E. Check Image Information

1. One last thing to check in the **Modify Project** dialog is to verify that the coordinate system information has come through and the resolution and pixel size match expectations.
2. Check the **Pixel size** (unit) option on the right hand side of the dialog to ensure it is set to “auto”. Here you can also change the units for display from meters to feet or other unit options. This is useful when displaying the Scale bar.
3. Your **Modify Project** dialog should look very similar to the following graphic. Once you are done with these steps you can click **OK** to close the dialog and move on to Part 3.



Part 3: Navigating the Developer Interface

As with any new software, the toughest part can be learning how to move around within that software's interface. Let's take a moment and go over a few of the crucial parts of the eCognition Developer interface.

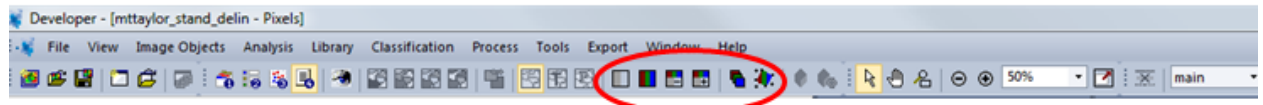
A. Change band Combination

An image often has valuable information about vegetation or land features that is not easily visible until viewed in the right way. For multi-layer images (e.g. 4-band or more) we can change the band combination to highlight certain characteristics of the image and make interpretation of various features easier (e.g. healthy vegetation versus dying vegetation). A band combination of Red, Green, and Blue (using the corresponding R, G, B color guns) is used to represent an image in natural color - it presents an appearance of a natural landscape as the human eye would see it.

B. Change Band Combination in eCognition 9.2.x

If you are using eCognition version in 9.2.x, the following directions will walk you through how to change band combinations. If you are using a newer version of eCognition such as 9.5.x, the next section will walk you through how to change band combinations.

1. From the main Toolbar, locate the section that is circled in red in the following graphic.



- i. This section allows you to change some of the view options. Hover over the 6 square blocks to see what they do. Feel free to click on them as well and see how it changes your view.

Tip: If you select the **Single Layer Grayscale** button (the furthest left in the series) you can view the individual layers (in their grayscale version); click the **Previous** (or minus) and **Next** (or plus) image layer buttons (third and fourth button from the left) to step through the layers without having to open the **Edit Image Layer Mixing** dialog. This can be useful when you are trying to assess the relative “brightness” of various parts of an image layer during segmentation development.

2. Next, click on the button that has the red, green, and blue stack (see following figure). This opens the Edit Image Layer Mixing dialog. Here you can choose the band combinations for viewing your data.



3. **Click** the red column for **ts1** and the green column for **ts2** and the blue column for **ts3** – note that the changes are instantly visible in the view behind the dialog.

Question: How do you keep the display from automatically updating the layer changes you are making?

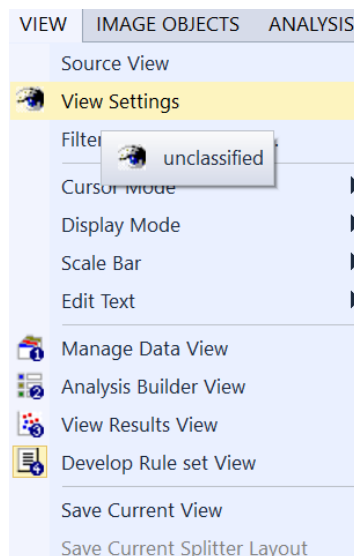
Answer: The **Auto Update** option (check box) is what actively shows the changes you are making in the **Edit Image Layer Mixing** dialog. You can uncheck that box; then the **Preview** option becomes available to preview the changes you have made.

4. Next, **unmark the ts1, ts2, and ts3** for the NIR, red and green layers. Simply click once on the circle corresponding to those layers to remove it. This will remove these layers as part of the “mixing”.
5. Lastly, locate the **Equalizing** and **Layer Mixing** drop down menus near the bottom of this **Edit Image Layer** dialog.
 - i. Try some different settings, such as the **Standard Deviations** stretch under Equalizing and then click the **Parameter button** to change the number of standard deviations from 3 to 2.
 - ii. Change the Layer Mixing from “three layer mix” to “one layer gray” and notice how the NIR, R, G are all set to one image layer (probably the NIR band).
6. Set the band combination back to a **Color Infrared combination** (i.e. NIR, red, green) or any other combination you would like. Once you have a mixing of the layers that you want to keep, click **OK** to close the dialog.

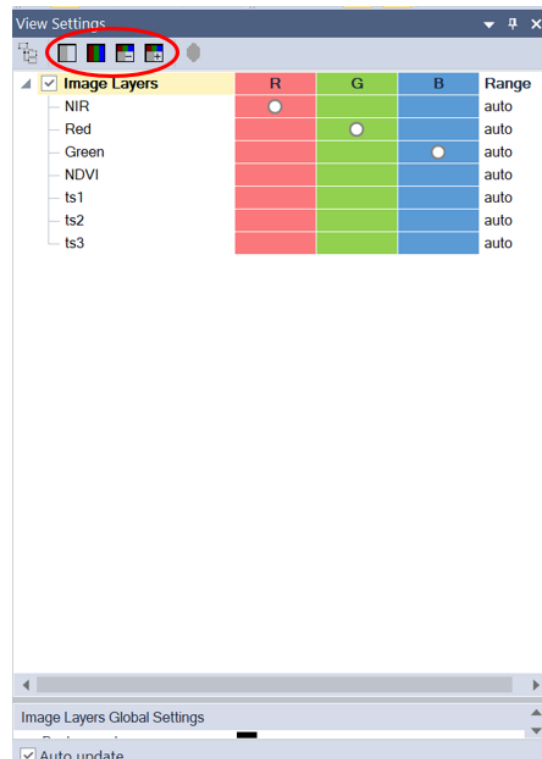
Tip: To add a Scale bar to the Image View, navigate from the main menu area to **View** and then **Scale bar** and select a quadrant location to make it visible in (e.g., Upper Left). This can be helpful when viewing and assessing image segments.

C. Change band combination in eCognition 9.5.x

1. To change band combinations in eCognition 9.5.x you will have to have the **View Settings** window open.
2. The View Settings window is typically open within the your eCognition window by default, but if it is not, navigate to **View** within the top selection window and select the View Settings option similar to the image below.



3. A new window should open up- hover over the 4 square blocks that are circled in the image below to see what they do. Feel free to click on them as well and see how it changes your view.



Tip: If you select the **Single Layer Grayscale** button (the furthest left in the series) you can view the individual layers (in their grayscale version); click the **Previous** (or minus) and **Next** (or plus) image layer buttons (third and fourth button from the left) to step through the layers.

4. Click the red column for **ts1** and the green column for **ts2** and the blue column for **ts3** – note that the changes are instantly visible in the view behind the dialog.

Question: How do you keep the display from automatically updating the layer changes you are making?

Answer: The **Auto Update** option (check box) is what actively shows the changes you are making in the **View Settings** window. You can uncheck that box; then the **Preview** option becomes available to preview the changes you have made.

5. Next, **unmark the ts1, ts2, and ts3** for the NIR, red and green layers. Simply click once on the circle corresponding to those layers to remove it. This will remove these layers as part of the “mixing”.
6. Lastly, locate the **Equalizing** and **Layer Mixing** drop down menus near the bottom of this **View Settings** window.
 - i. Try some different settings, such as the **Standard Deviations** stretch under Equalizing and then click the **Parameter** button to change the number of standard deviations from 3 to 2.
 - ii. Change the Layer Mixing from “three layer mix” to “one layer gray” and notice how the NIR, R, G are all set to one image layer (probably the NIR band).

7. Set the band combination back to a **Color Infrared combination** (i.e. NIR, red, green) or any other combination you would like. Once you have a mixing of the layers that you want to keep, click **OK** to close the dialog.

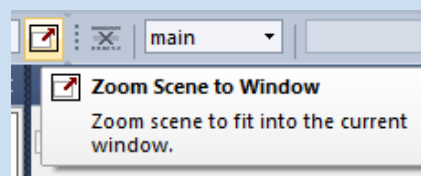
Tip: To add a Scale bar to the Image View, navigate from the main menu area to **View** and then **Scale bar** and select a quadrant location to make it visible in (e.g., Upper Left). This can be helpful when viewing and assessing image segments.

D. Split View Display

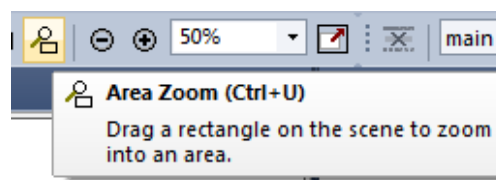
Once you begin working on segmentation and classification processes you will find the view settings covered in the next steps to be very useful. They offer quite a bit of functionality to help the user identify scene features of interest by interacting with more than one view of the data. For now, we will gain basic understanding of the View options.

1. From the **Window** menu option on the main toolbar, locate and click the **Split Horizontally** option from the dropdown. You will see your view split into two, and the new display will inherit the band combination of the main view—you can change the band combination of the new window.
 - i. By clicking once in the individual views you will see they become “active” which is indicated by the inset yellow outline box around the view. This is how you know it is active and ready to be “edited” or changed.

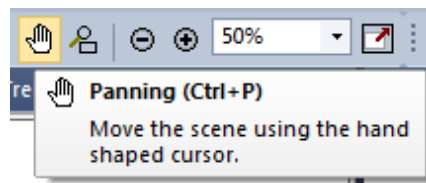
Hint: You can zoom in and out in a view using the scroll wheel on your mouse. Additionally, the **Zoom Scene to Window** button (see following graphic) will zoom you out to the full extent.



2. Activate the lower view and then open the **Edit Image Layer Mixing** and change the band combination to see how the two views work independently of each other.
 - i. Leave this view with a different band combination than the other view for the subsequent steps.
3. With the lower view still active, grab the **Area Zoom** or **Zoom in Center** tools (see following graphic), or use the scroll wheel to zoom in to this active viewer. Notice that it is independent from the top view.

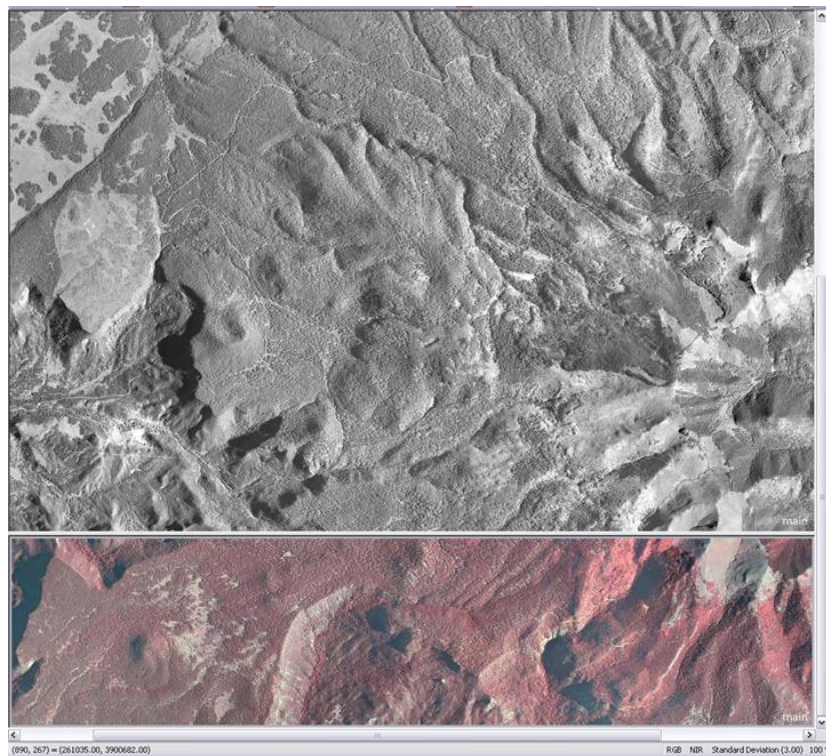


4. Additionally, grab the **Panning** tool (see following graphic) to pan around inside that view. Notice that it is also independent.



E. Side by Side and Swipe View Display

1. From the **Window** menu find and select the **Side by Side View** option. If your views were panned to different parts of the image, when you select this option you should notice one is altered (zoomed and panned) to match the location of the other. The two are now in side by side mode and when you pan and zoom in one view, the other will follow. (The non-active view follows the active view.)
2. Next, let's see how the **Swipe** function works. From the **Window** menu, find and select the **Swipe View** option.
3. Place your cursor over the **middle bar between the two views**—when you hover over it your cursor will change to the “split arrow” cursor.
4. Click and hold your **left mouse** button to “grab” this part of the view and swipe it up and down to see how the swipe function works (see following graphic—the top view has been swiped down on top of the bottom view).



5. In preparation for Exercise 2, change your window back to a Single image View (select **Window**, then **Split**), and the band combination to a Color Infrared display (NIR, red, and green layers set to R, G and B color guns).



6. **Save** your project one last time, as you will use it in Exercise 2.

Congratulations, you have successfully set up a project and learned how to use viewer tools. In the next exercise you will be doing some analysis.

