

BCIT

# Module 01

# Introduction

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GIST 8118 GIS Remote Sensing

Instructor:

**Mike Hill**

After completion of this module you should be able to:

1. Describe fundamental concepts of remote sensing
2. Use basic functions of standard image processing software
3. Display remotely sensed images
4. Describe the PCIDSK file format

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## Getting Started

### The Data

Your data for this course is on the 'out' drive. J:\shareout\GIST\8118

You need to create a folder on your working drive H:\ named GIST8118

Each week you need to copy the data for your exercises from 'out' to your working drive.

Please do not put spaces in your folder names or create long names. The software in this course sometimes has problems with long folder names and spaces.

- **Create the GIST8118 folder on your h:\ drive then copy MOD01 from j:\shreout to your h:\GIST8118 folder.**

## Section A – Reading

Readings are from The Canadian Centre for Remote Sensing "Fundamentals of Remote Sensing" tutorial found within the natural Resources Canada web site ([www.nrcan.gc.ca](http://www.nrcan.gc.ca))

The remote sensing tutorial can be found at :

<http://www.nrcan.gc.ca/earth-sciences/geography-boundary/remote-sensing/fundamentals/1430>

Note: readings can be done outside of lab time.

- **Open a web browser (Internet Explorer, Mozilla Firefox or...). Go to the Natural Resources Canada site, select your language. On the left menu click on Earth Sciences then *Geography and Boundaries* then *Remote Sensing*. You should see on the right Educational Resources click on this then Fundamental of Remote Sensing. At this point you should (in the main section ) see you can download a PDF version of the tutorial. I strongly suggest you do this. If you do not download you can follow the tutorial on the right of the webpage**

- Read **Section 1 Introduction – or Introduction.**

- Read through the entire introduction there are eight sections. This will give you a good background and reinforce the lab exercises for this week.

Pdf version	Web version
<b>1. Introduction</b> 1.1 What is Remote Sensing? 5 1.2 Electromagnetic Radiation 7 1.3 Electromagnetic Spectrum 9 1.4 Interactions with the Atmosphere 12 1.5 Radiation - Target 16 1.6 Passive vs. Active Sensing 19 1.7 Characteristics of Images 20 1.8 Endnotes 22 Did You Know 23 Whiz Quiz and Answers 27	• Fundamentals of Remote Sensing • <b>Introduction</b> • Electromagnetic Radiation • Electromagnetic Spectrum • Interactions with the Atmosphere • Radiation - Target Interactions • Passive vs. Active Sensing • Characteristics of Images • Endnotes

- Reading section 5 Applications would also be useful.

## Section B - Tutorial

- **Make sure to have a copy of *mod01* folder in your working directory (see the getting started section for instructions).**
- **Make sure you have the following files in your mod01 folder:**

<b>IRVINE.PIX</b>	<b>RADARSAT.PIX</b>
<b>ELTORO.PIX</b>	<b>L8_VANCOUVER.PIX</b>

### Focus Tutorial Exercises

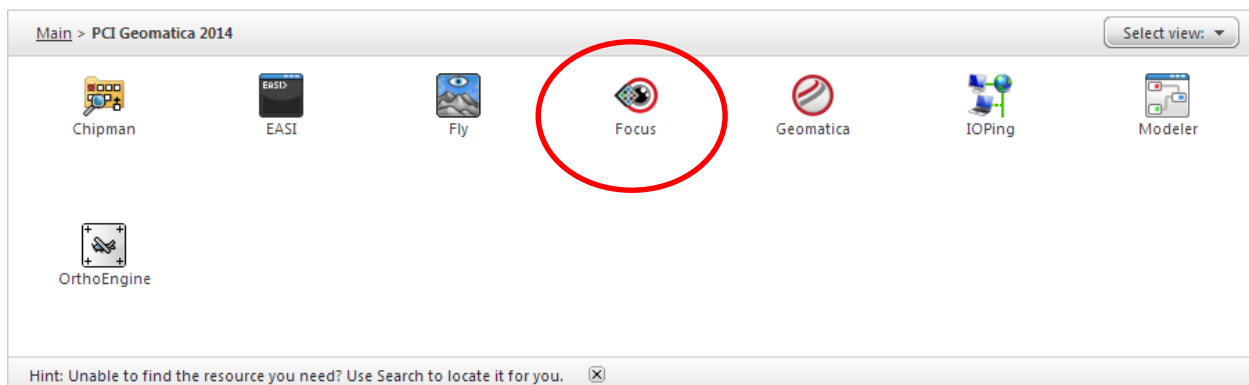
In the tutorial exercises that follow, you will work with the Focus application and carry out several common tasks using Focus. Your overall goal is to become familiar with displaying and navigating data with the Focus application of Geomatica2013 software ([www.pcigeomatics.com](http://www.pcigeomatics.com)) .

## A. Focus

The **Focus** application is designed to work with many data formats, for the majority of this course you will work with the PCIDSK file format. Files in the PCIDSK format have an extension of PIX e.g. irvine.pix.

### To Start Focus

- a. Use the CITRIX AppsAnywhere PCI software. Login to the CITRIX server (appsanywhere.bcit.ca). You should have a folder named PCI Geomatica 2015 click on the folder to open and note the applications available to you.



You should see: EASI, FLY, FOCUS, GEOMATICA, MODELER, and ORTHOENGINE, and some others.

- Click on FOCUS to start the Focus application. You may have a message requesting access – your choice.

In a moment Focus will open. You have three main areas of the interface. Tools and menu bars, the control panel and the Viewing area.

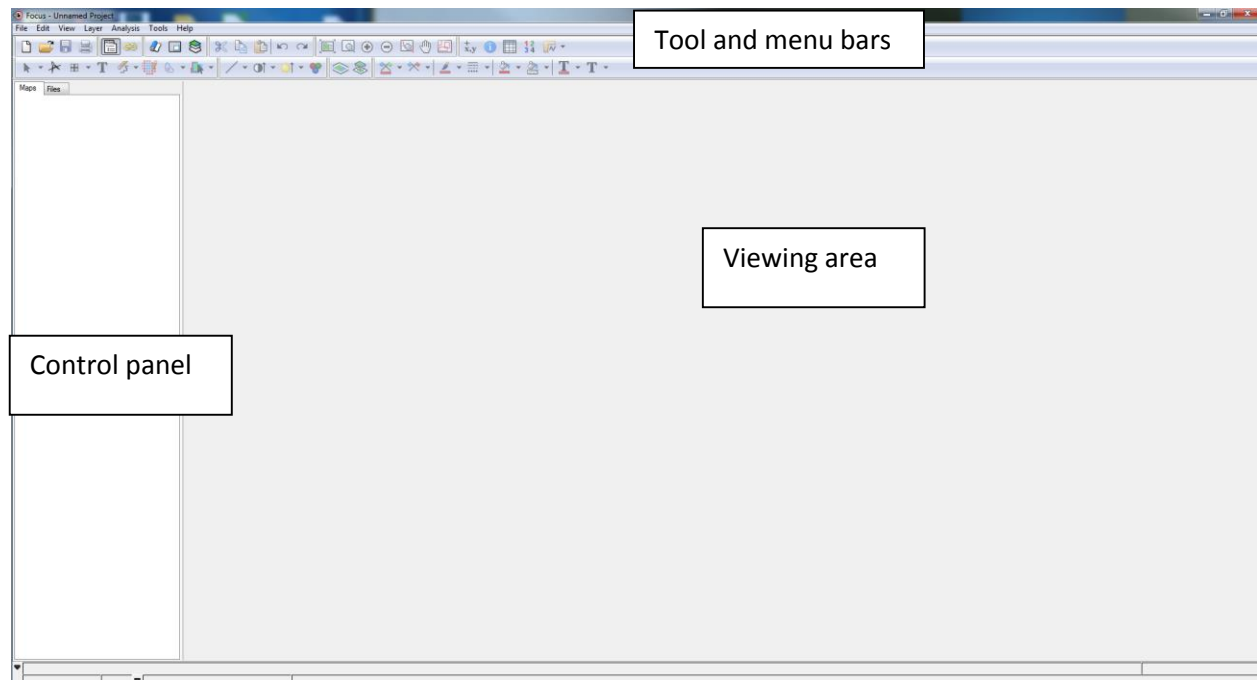


Figure 1 Focus Application



## B. Viewing Data

When you work with Focus, the control panel, on the left is used to navigate the *Maps tree* and the *Files tree*. The Maps tree lists the maps, areas, and layers that make up the **display** in the view area. Layers appearing in the Focus Maps tree are stored in your system memory. You can show or hide the items in the Maps tree by clicking the check box on the left of the item you want. You can also change the priority of a layer by dragging it up or down the Maps tree.

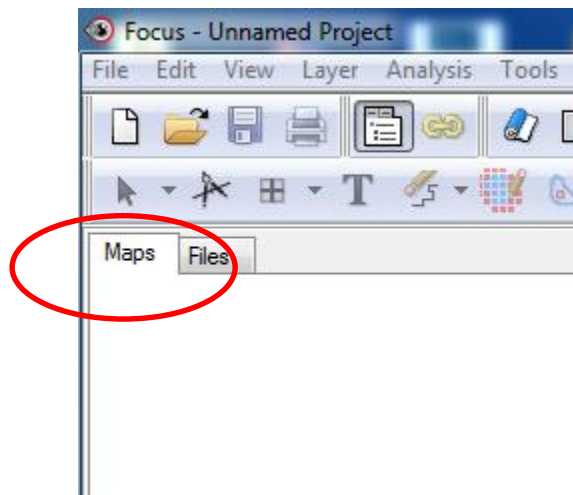


Figure 2 Content Tabs

You will now look at two of the features in Focus for viewing your data:

- ☐ adding and managing layers
- ☐ using zoom tools

At the end of this exercise, you will be able to navigate the Focus interface and view your data.

### B.1 Data Layers

- To begin, make sure Focus is running. AND make sure you have copied mod01 to your h:\ drive.

All data are stored in files. You must open the file in order to have access to the data.

### *To open a file in Focus:*

1. In the menu select File -> Open. The File Selector dialog opens.
- 2.

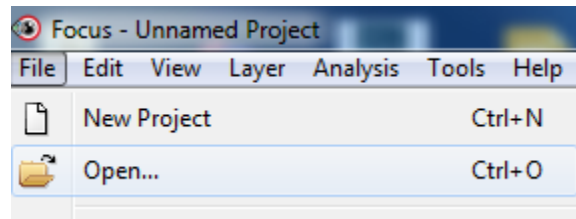


Figure 3 Open File

3. Navigate to your working folder.
4. In your working folder click **irvine.pix**.
5. Click Open.

In the control panel on the left of the Focus window an unnamed map with a new area and a RGB (red, green, blue) layer is automatically added.

The RGB layer displays a Landsat multispectral image of Irvine, California in the Focus view area.

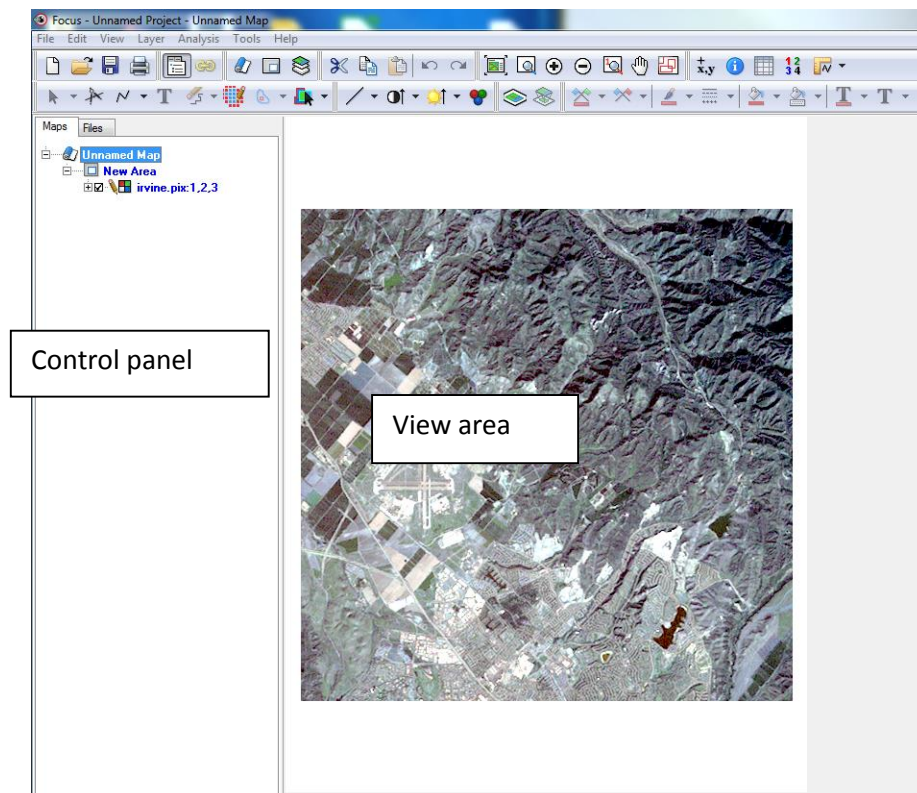


Figure 4 Focus with unnamed map displaying Irvine, CA

Geographic Data are displayed as layers.

### **To show or hide a layer:**

You can show or hide the items in the Maps tree by clicking the check box on the left of the item you want.



Figure 5 Layer Checkbox

1. Click on the check box on the left of the RGB *Irvine.pix:1,2,3* layer. Notice the check disappears - the layer is now hidden. The viewing area will be blank.
2. Click on the box again to show the layer.

The check indicates visibility of a layer – check = visible ; no check = not visible

### **To add a layer with the Add Layer Wizard:**

All geographic data are displayed as Layers. You can have multiple layers in a Map. Layers are added with the Add Layer Wizard. The Add Layer Wizard lets you display several types of data in your project.

1. Right click on the New Area icon in the Maps tree.
2. In the context menu select Add...

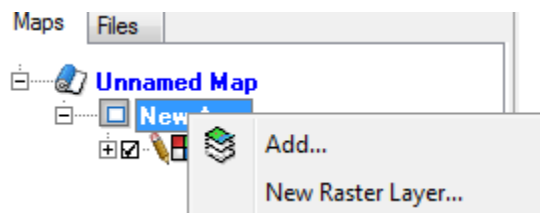
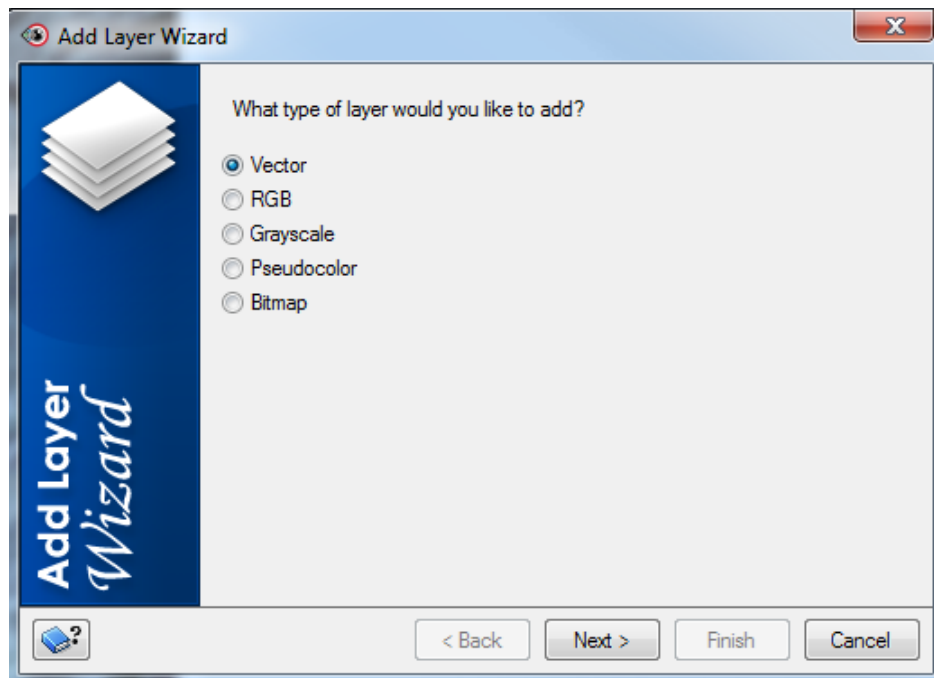


Figure 6 activate add layer wizard from context menu

The Add Layer Wizard opens.



**Figure 7 The Add Layer Wizard**

There are five (5) types of layers you can add and work with in Focus,

- **Vector**– point, line or polygon data,
- **RGB** – red, green and blue combinations of three raster data sets,
- **Grayscale** – a single raster data set displayed from black to white and shades of grey,
- **Pseudocolor** – a single raster data set displayed from black to white with color assigned with a pseudocolor table
- **Bitmap** – a single raster data set with values of 1 or 0, displayed with a predefined color.

3. In the Add Layer Wizard, select **Grayscale** for the type of layer you want to add.
4. Click **Next**.

The Add Layer Wizard shows the available channels, containing raster data, for the current open file (irvine.pix).

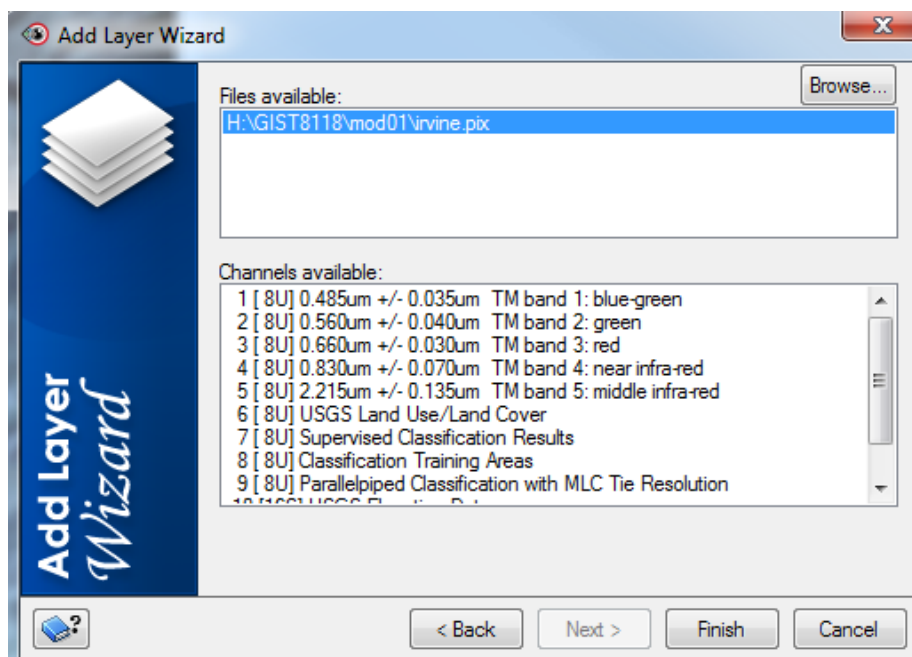


Figure 8 Add Layer data selection

5. In the Add Layer Wizard, click **Browse**.
6. In the file selector dialog, navigate to your working directory, locate and select **eltoro.pix**.
7. Click **Open**.

The eltoro.pix file is added to the available files list in the Add Layer Wizard and the raster data sets for the new file are shown in the available channels list.

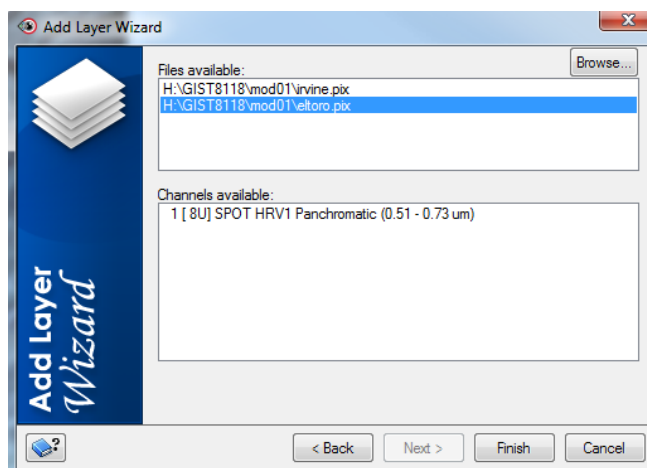


Figure 9 Add Layer multiple files

8. In the available channels list, click the only available channel which is ***SPOT HRV1 Panchromatic (0.51-0.73um)***.

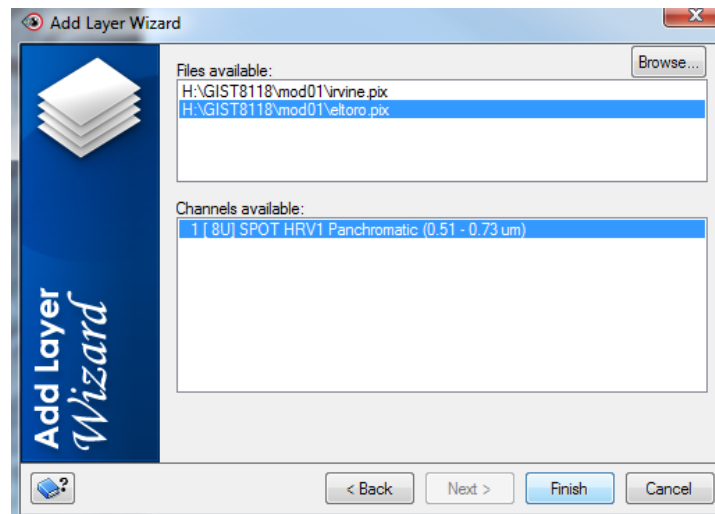


Figure 10 Add Layer Wizard with eltoro.pix

9. In the Add Layer Wizard, click **Finish**.

The SPOT HRV1 image displays as a Grayscale layer on top of the RGB irvine.pix:1,2,3 layer the Focus maps tree and is displayed on top in the RGB layer in the view area.

The **Maps tree** lists all the data *displayed* in the view area. The image listed at the top of the Maps tree is the top image layer in the viewer.

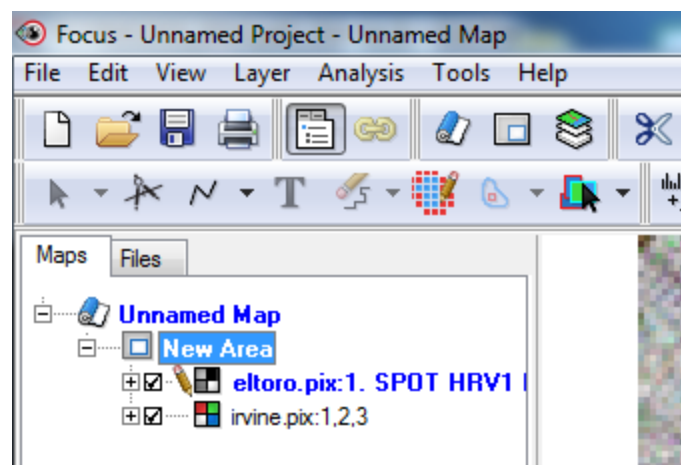


Figure 11 Maps Tree

10. Turn the eltoro.pix greyscale layer off and on to see the layer below (Irvine.pix:1,2,3) . Notice the eltoro image has more 'detail'.

## The Files Tree

When a file is open in Focus, a default layer is presented in the viewer and listed in the Maps tree, as you saw when you opened the irvine.pix file. Open files are listed in the **Files tree**. All data contained in the same PCIDSK database file are listed under the file in the **Files tree**.

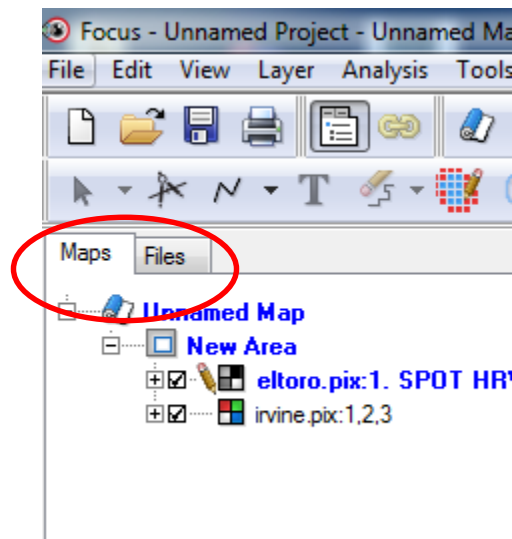
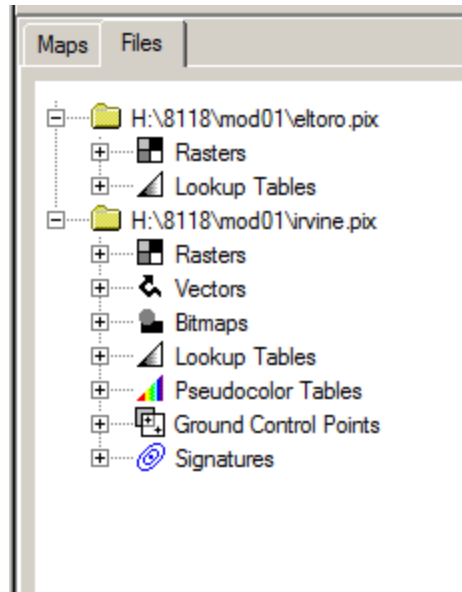


Figure 12 Control Panel tabs

1. Click on the Files tab in the control pane. You can now see the Files tree.

A list of available files – irvine.pix and eltoro.pix, and their components will be listed for both files.



**Figure 13 The eltoro.pix and irvine.pix file components appearing in the Files trees.**

The components listed will depend on the data available and processing that has occurred on the data. In the above example eltoro.pix contains rasters and look up tables, where Irvine.pix contains rasters, vectors, bitmaps, lookup tables, pseudocolor tables, ground control points and signatures.

It is possible to **load to the display** of these data into the viewer. The data displayed in the Files tab are the contents of the database stored on the hard drive. The data displayed in the viewer are a view of the data.

The files tree lists data from a file. Data are organized into different components depending on type, there are three types of data: raster, vector and auxiliary.

- Rasters are stored in **channels**. These are your images you will be working with during this course.
- Vectors are stored in **segments**. These are your geographic points, lines and polygons representing features e.g. a road.
- Bitmaps, Lookup Tables, Pseudocolor Tables, Ground Control Points and Signatures are also stored in **segments**, these are auxiliary data used to assist in interpretation and analysis.

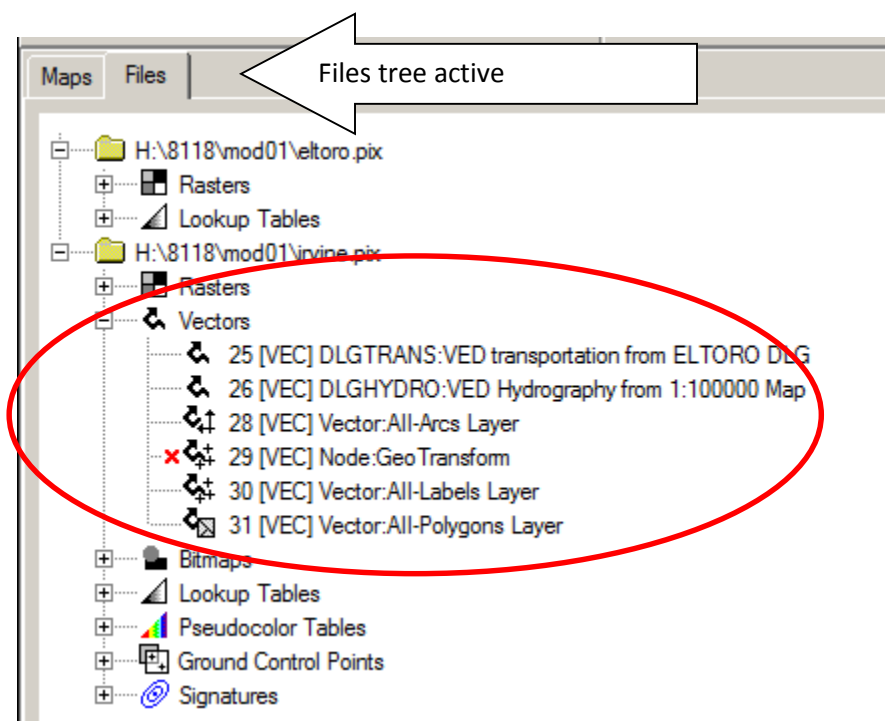
As the course progresses you will learn how to create and uses each component.



### *To Add a Layer to the view from the Files tree:*

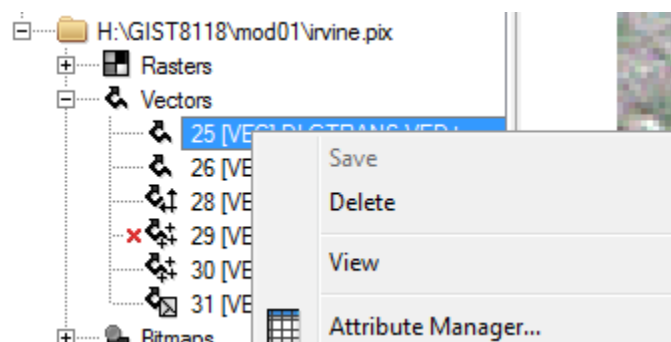
1. Expand the vectors component list from the irvine.pix file by clicking on the "+" beside it.

The available vector data are shown in the list. The vectors are organized in segments and all segments are numbered. In this file segments 25 to 31 (minus 27) contain vector data.



**Figure 14 Available vectors**

2. Right-click on the first segment, number 25, DLGTRANS:VED transportation..., and select **View** from the context menu .



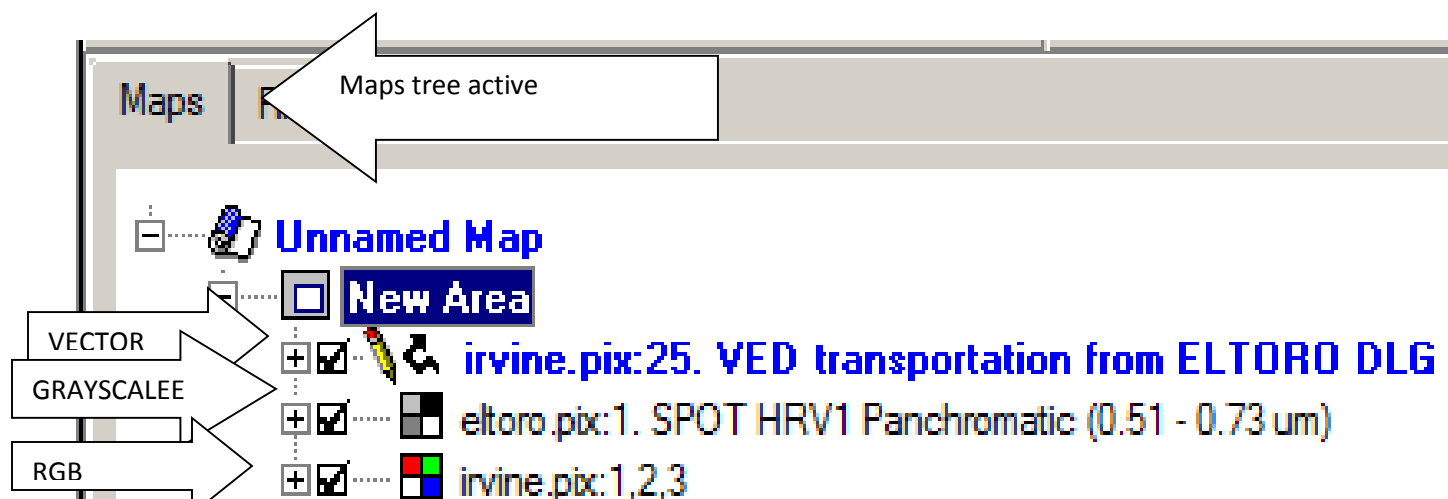
**Figure 15 Adding a layer to the Maps tree from the Files tree.**

The vector layer displaying transportation features will now appear in the Map tree as well as in the viewer.

3. Switch back to the Maps tree in the control pane by clicking on the Maps tab.

**You should now have three (3) layers listed under the new area of your unnamed map – 1 vector layer, 1 grayscale layer and 1 RGB layer.**

Notice the icons (symbols) next to each layer.

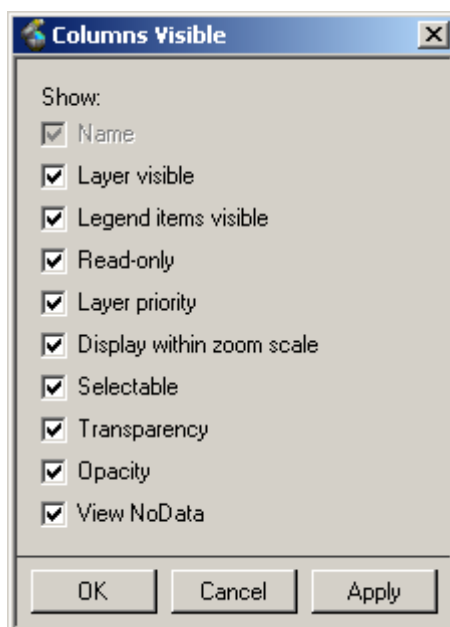


**Figure 16 Layers List icons**

## The Layer Manager

The Layer Manager manages all layer properties in a table format. The table shows the current properties of each object in the map, and the hierarchical structure including maps, areas, and layers. This tool is very useful for managing a large combination of data layers, both raster and vector, such as when making a map. Using the Layer Manager you are able to control what layers lay on top of one another to ensure that nothing gets covered up.

The layer manager allows manipulation of multiple properties for many layers in one dialog. The following properties are available for manipulation.



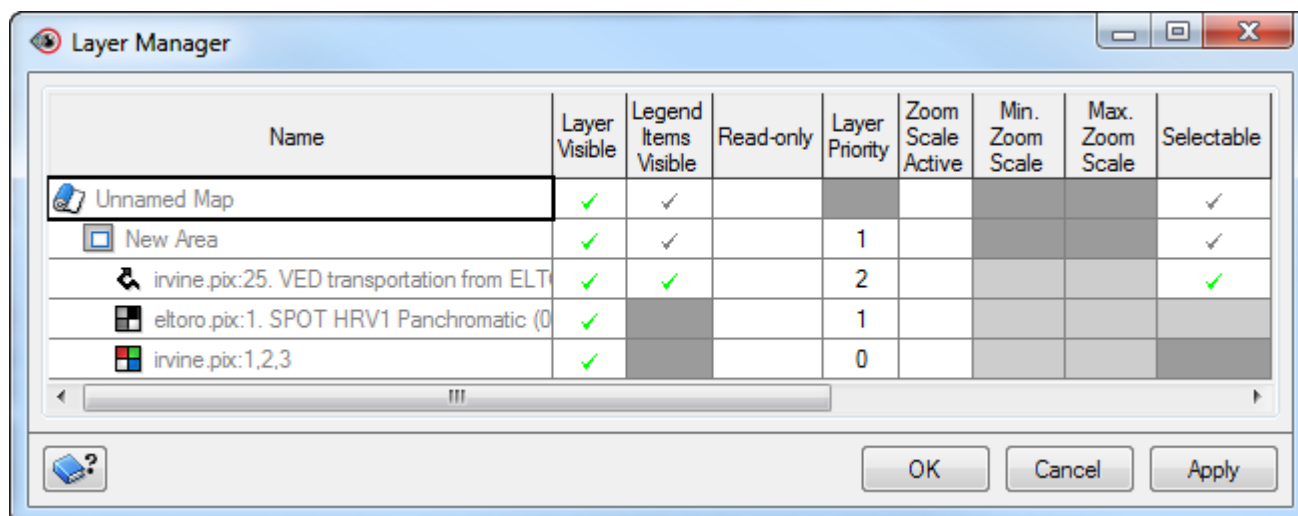
**Figure 17 Layer properties**

In the next exercise you will look at *Layer visible*.

### **To view the Layer Manager:**

1. From the **Layer** menu of the Focus menu bar, select **Layer Manager**. (at the bottom)

The Layer Manager window opens.



**Figure 18 The Layer Manager**

**Note:**

Each parameter set using the Layer Manager is also accessible by rt-click on the layer under the Maps tab and selecting Properties.

### Changing Layer Properties with the Layer Manager

In the Layer Manager table, object names are listed in the table rows. Object properties are listed in the table columns. Like the Focus Maps and Files trees, icons are shown beside each object in the Name column. Properties in the Layer Manager show the state of your layers in your current project. They can be changed according to the available edits for the specific layers you are using.

#### **To change Layer Visibility in the Layer Manager:**

1. In the Layer Visible Column, deselect the transportation and eltoro layers. Click on the green check mark – the check will disappear.
2. Click Ok.
3. The Layer Manager closes and the eltoro image and transportation layer are no longer displayed in the viewer.

**Note:**

Changes in the Layer Manager are shown in the Maps tree automatically when you click Ok or Apply. A layer must be open, and its Map must be active to make changes. The check box indicates active layers and maps.

### *Change the visibility of a layer from the Maps tree*

Changing the visibility of a layer is the same as showing and hiding the layer (exercise earlier in the tutorial)

1. Click on the box on the left of the transportation layer. This places a check in the box and the layer becomes visible or is 'turned on'.
2. Turn on the eltoro layer.
3. Practice turning on and off your three layers
4. End with all layers on.

### *Adjusting Layer Display priority in the Current View*

You can change the display priority of a layer by dragging it up or down the Maps tree.

#### *To move a layer in the Maps tree:*

1. Make sure the maps tree is active by clicking the **Maps** tab.
2. Click and hold on the Transportation layer, then Drag the **Transportation** layer to the bottom of the Maps tree. Notice the bar showing the current position of the layer. Let go when the bar is below the RGB layer.

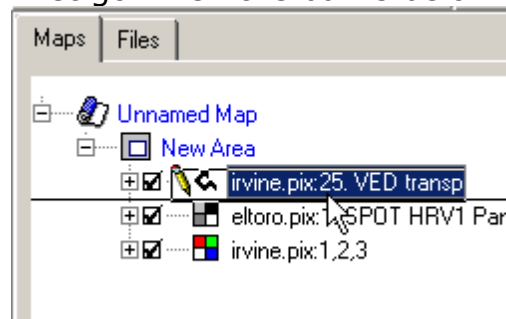


Figure 19 Moving a layer

3. The transportation vectors move below the imagery and are not visible in the View area as the raster RGB and Grayscale layers are on top of the vectors.
4. Drag the **Transportation** layer to the top of the Maps tree. The transportation vectors are now visible in the View area.

## B.2 Properties

### Layer Properties

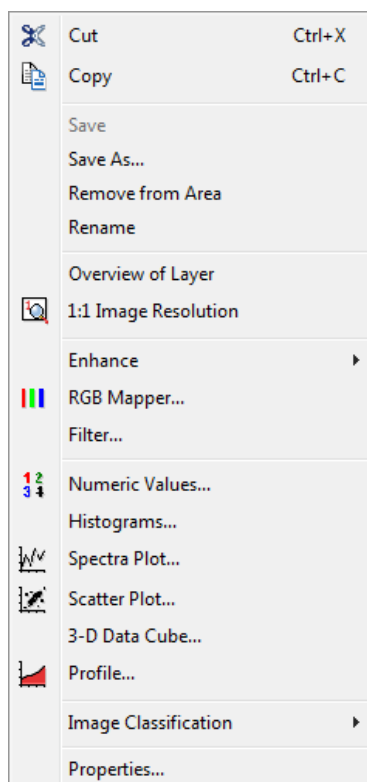
Properties dialogs have layer-specific settings so you can adjust the properties for any layer when you need to.

Layer Properties dialogs have tabs along the top of the panel that begin with General properties, such as the layer name, and priority. The remaining tabs differ depending on the layer type. When you click a properties dialog tab, you open attribute controls that are specific to your layer.

You can view and modify the properties for the five (5) layer types: RGB, Grayscale, Pseudocolor, Bitmap, and Vector.

#### *To View Layer Properties:*

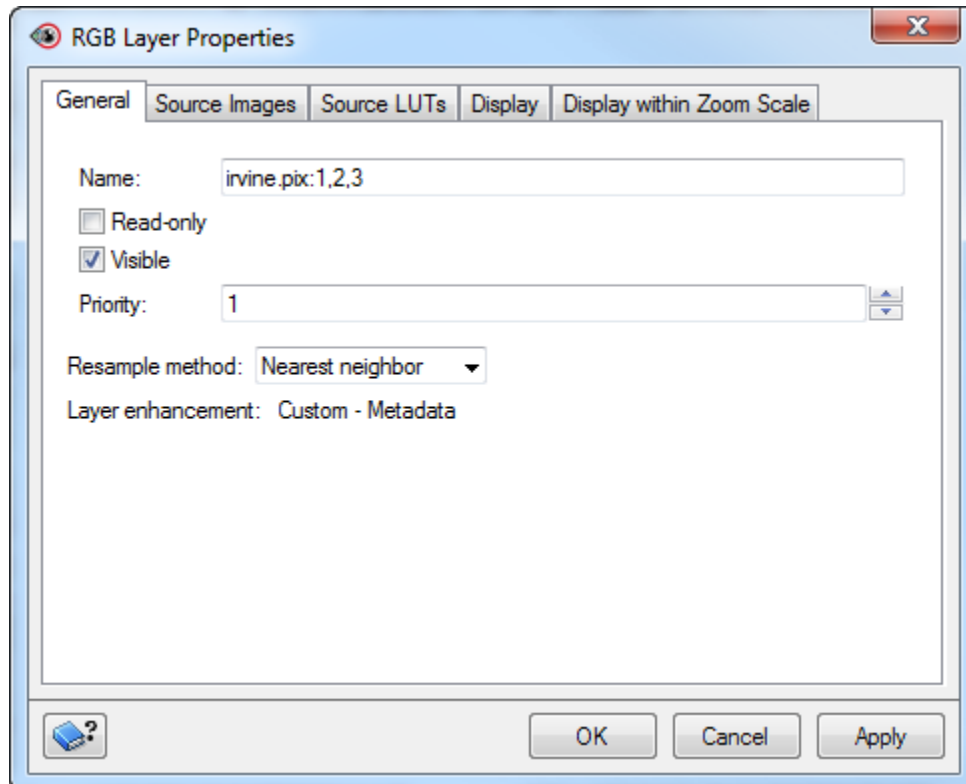
1. In the Maps tree, right-click on the RGB irvine.pix:1,2,3 layer. A context menu appears.



**Figure 20 Layer Properties selected from the Maps tree.**

2. Select Properties at the bottom.

The RGB Layer Properties window opens.



**Figure 21 RGB Layer Properties Dialog**

The Layer Properties window displays some of the details of that particular layer.

The **General** tab indicates the name of the layer, its priority, the resample method, and current enhancement for that layer.

The **Source Images** tab lists which raster data sets are displayed as RGB, and which file the data are from.

The **Source LUTs** tab displays available look up tables for each raster.

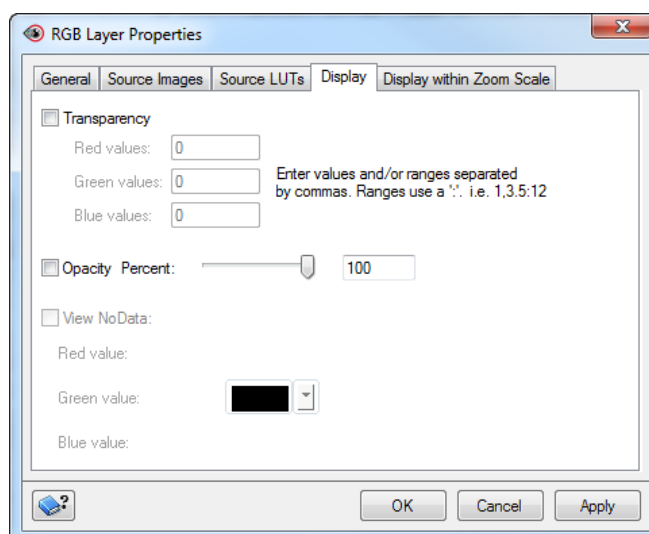
In the **Display** tab, you can alter transparency for each dataset and opacity for the layer.

Finally, the **Display within Zoom Scale** tab allows you to specify a zoom scale for the layer.

In this example, you will change the transparency of the RGB Irvine image layer.

- Click on the **Display** tab in the RGB Layer Properties window.

Layer display properties are displayed.

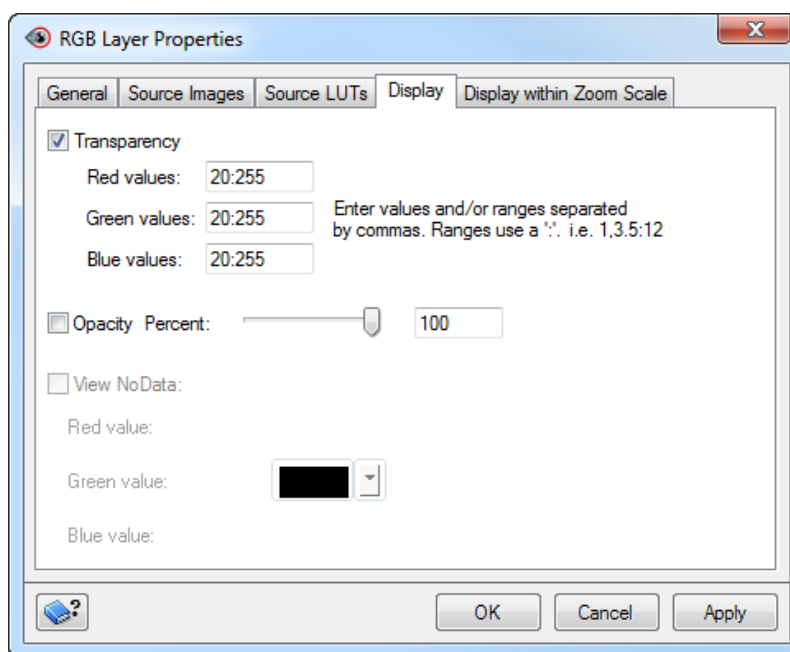


**Figure 22 Changing Transparency and Opacity**

- Select the Transparency option by clicking the in the white box beside it.

The Transparency section becomes active.

- Specify the values 20:255 in each of the three available boxes (Red Values, Green Values, and Blue Values). (image below/next page)



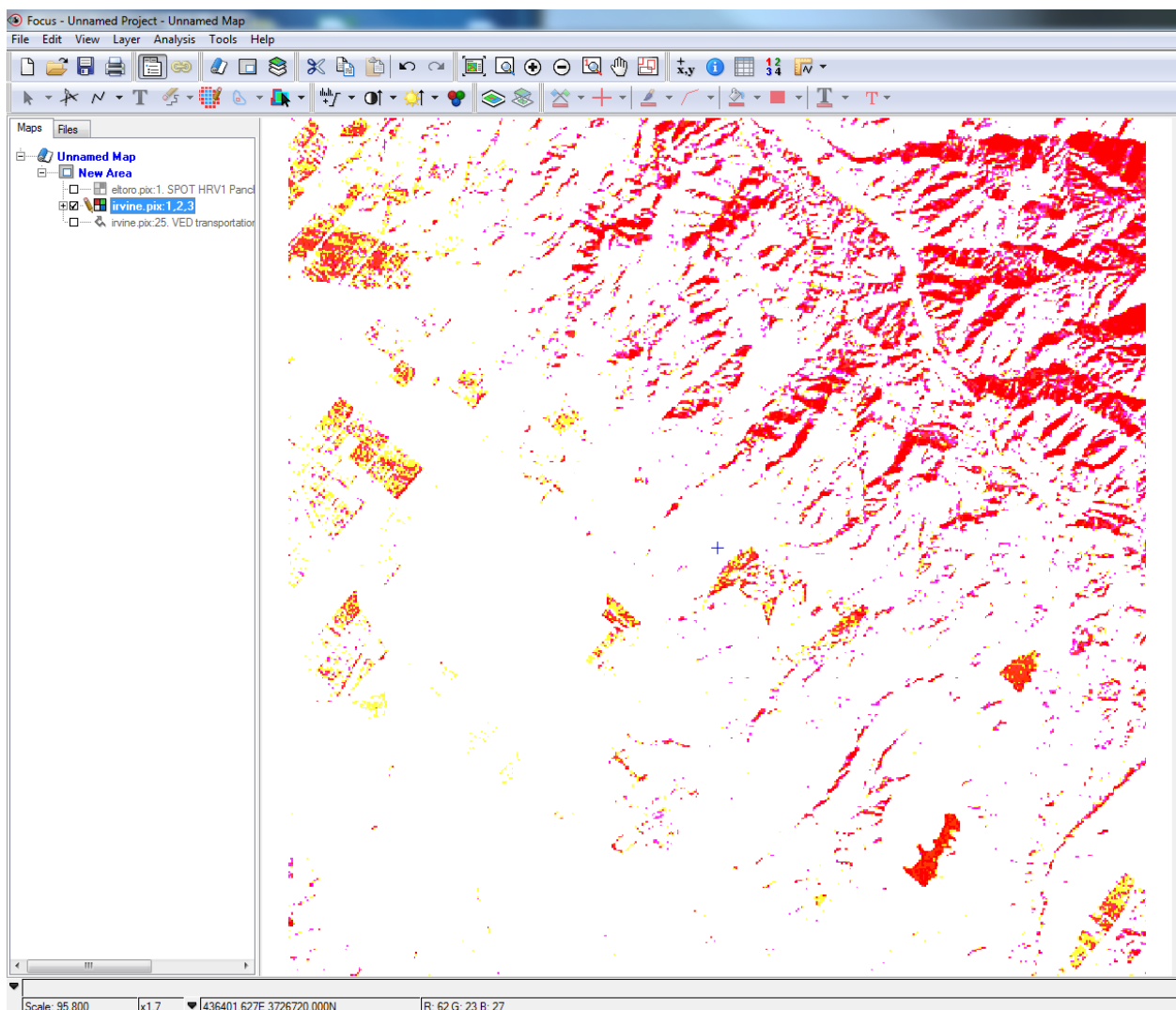
**Figure 23 Setting Transparency options**



6. Click **Apply**.
7. Turn off the vector and grayscale layers.

Changes take effect in the Focus viewer. You should see a lot of white, some red, yellow and maybe orange in the viewer.

The low pixel values 0-19 from each data set remain visible in the viewer while all other values (20-255) become transparent. This is useful for removing particular pixel value ranges in order to more easily visualize your data. This is in effect display a selection or sub-set of the data.



**Figure 24 Transparency results**

8. To return to normal display, **deselect** the transparency option. And click **Apply** then **OK** to close the RGB Layer Properties dialog.

## File Properties

File properties are details concerning the PCIDSK **file** in which data are stored rather than the data themselves or layer display in the Maps tree and viewer.

### To view File Properties:

1. In the Files tree (activate by clicking on the Files tab of the control pane), right-click on the Irvine.pix file.

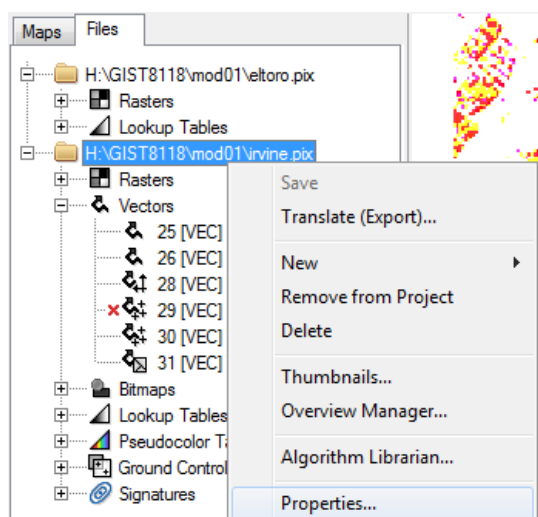


Figure 25 File Properties

2. Select Properties from the menu list. The File Properties panel opens. (image below/next page).

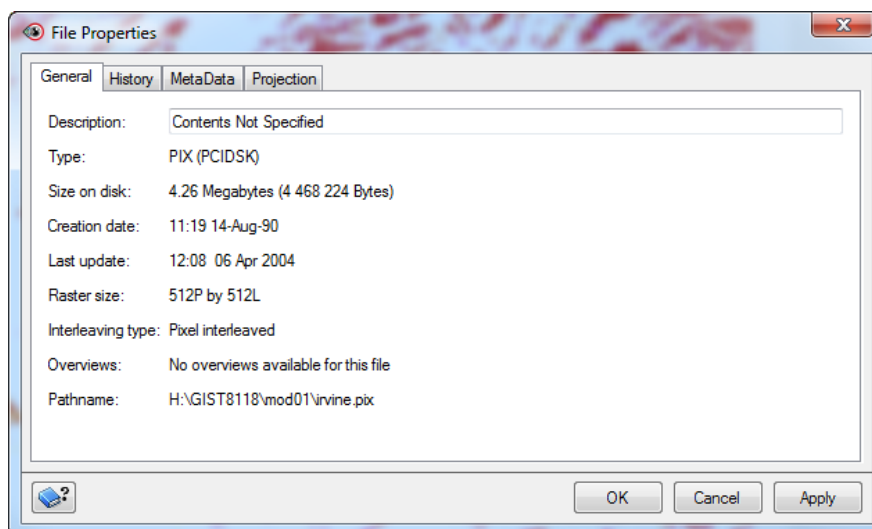
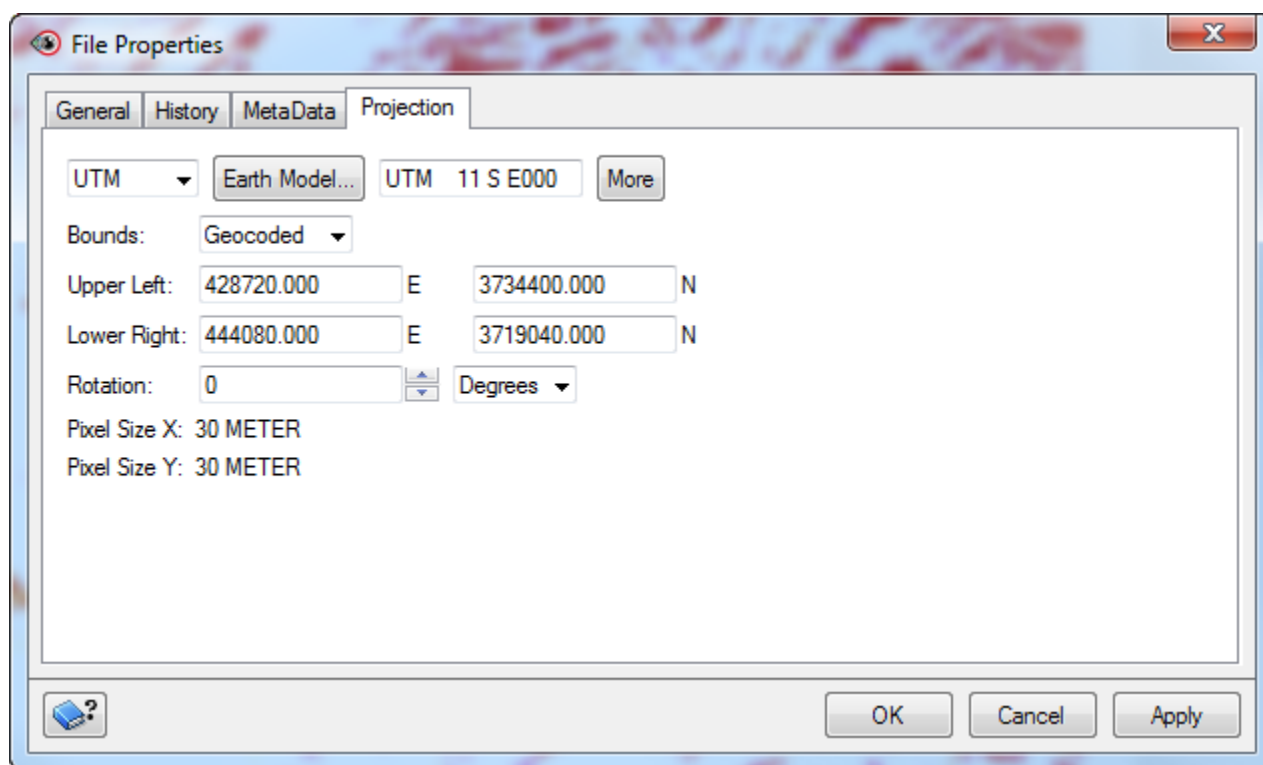


Figure 26 File Properties of irvine.pix

Within the File Properties dialog you will find important information such as file size, creation date, raster size, pathname, history, metadata, and projection information.

3. On the General pane notice the **Raster Size: 512P by 512L**. This means the Irvine file stores a raster as 512 pixels by 512 lines (columns and rows). Switch to the Projection tab and notice each pixel (Pixel Size X: 30 meters) in the 512X512 image is 30 meters in size. Also notice the spatial reference for the dataset. UTM 11 S E000.



**Figure 27 File properties Projection tab**

From this you can calculate the ground coverage of your data. 512 pixels multiplied by 30 meters equals a width of 15360 meters or 15.36 km.

4. Click OK to close the File Properties dialog.
5. Switch back to the maps tree.

## C Zoom and Pan Tools

When working with images in Focus, it is important to be able to navigate around the image effectively. The zoom and overview windows, panning, zooming, and creating named regions allow you to navigate quickly and efficiently.

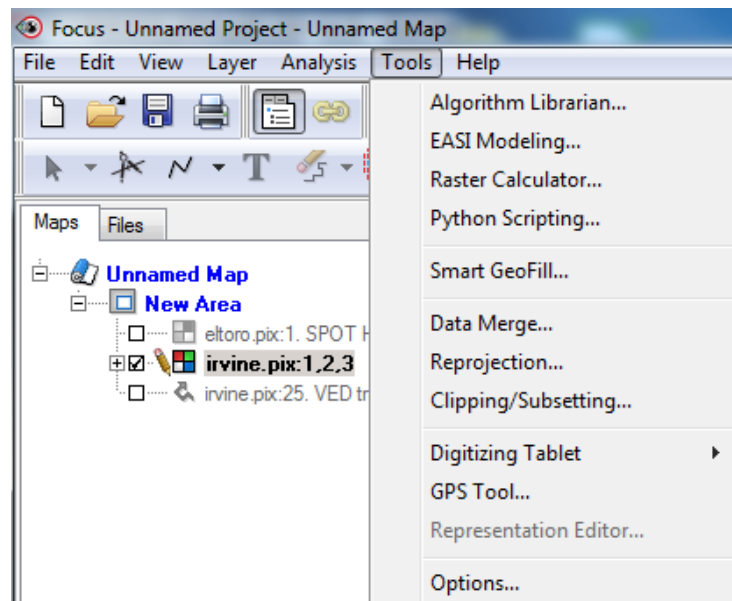
### C.1 The Overview Window

Overview Window shows a smaller version of the image in the Focus view area. The Overview window has a bounding outline that you can use to control the view in the view area. You can resize the bounding outline and zoom the view area image.

By default the Overview Window is turned off when you open Focus, so you will first turn it on.

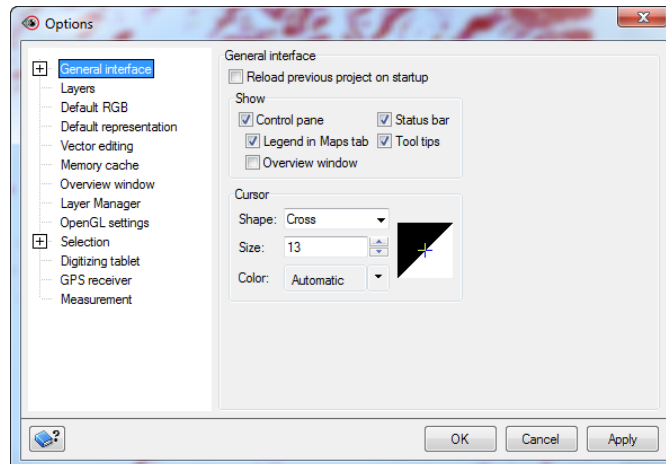
#### *To turn on the Overview Window:*

1. From the **Tools** pull-down menu in Focus, select **Options**



**Figure 28 Opening the options dialog**

The Options dialog opens



**Figure 29 Turning on the Overview Window**

2. From the list on the left, select **General Interface**.

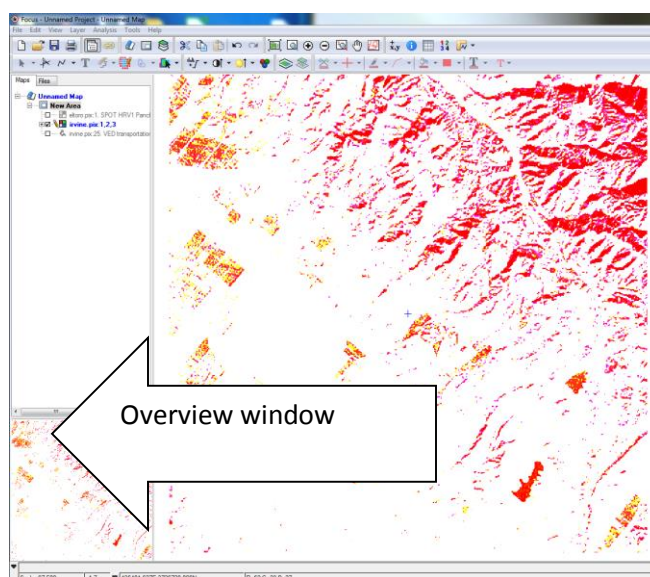
The General Interface options appear on the right of the window.

3. In the Show section, select the **Overview Window** box.

A check mark appears in the Overview Window box.

4. Click **Ok** in the bottom of the Options window.

The Options window closes and an Overview window appears in the bottom left corner of the Focus interface.

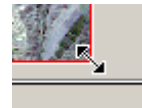


**Figure 30 Overview window open in Focus**

Notice the red box around the outer edge of the overview window. This is the box you will manipulate. Note: the red box will appear if you are zoomed in a bit, it does not appear at full extent.

### ***To zoom using the Overview window:***

1. Move your mouse pointer over a corner of the red bounding box in the overview window.



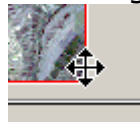
2. When your mouse pointer changes to a double-headed arrow, click and hold so you can drag the bounding box in from the corner.

The bounding outline resizes and the irvine.pix image in the view area zooms in or out relative to the area defined by the bounding outline.

3. Try resizing the box a few times. Notice the change in the view area.

When the bounding outline is smaller than the image in the Overview window, you can click inside it and pan through the image in the Focus view area.

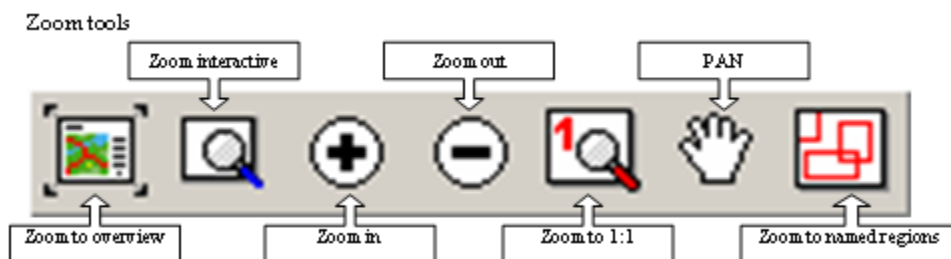
4. Resize the red bounding box then click and hold inside the box to pan the image. Your mouse pointer should change to a four-headed arrow.



Dragging the bounding outline in the Overview window moves the image in the Focus view area without changing the zoom level.

## **C.4 Zoom Tools**

There are several ways to zoom an image in the Focus viewer. You can zoom in or out to a particular location. The following Zoom tools are located on the Focus toolbar: Zoom to overview, Zoom Interactive, Zoom In, Zoom Out, and Zoom 1:1 Image Resolution



**Figure 31 Focus Zoom tools**

***To zoom an image:***

1. Click the Zoom to overview button to display the entire image in the focus view area.



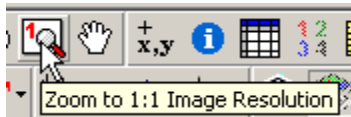
2. Click on or near the airport (t-shaped object) in the Focus view area.



**Figure 32 Airport in Irvine, CA**

The cursor moves to the location in the image you clicked.

3. On the Zoom tools toolbar, click the Zoom **1:1 Image Resolution** button.



The image zooms to 1:1 resolution. As indicated in the status bar on the bottom of the focus view window. (note: the scale display will be different)



4. On the Zoom tools toolbar, click the Zoom **IN** button. The image zooms in by a factor of 2. Indicated by an x2.0 in the status bar.
5. Zoom in again and once more. Notice once you zoom past the resolution of the data the display starts to become 'blurry' or blocky.
6. Now try the Zoom **out** button. The image zooms back by a factor of 2.
7. Zoom to 1:1 Image resolution.

The zoom interactive lets you select a specific region to zoom in to.



8. Select the zoom interactive button. Click and **hold** in the view window, move the mouse a little – notice the 'marquee' box – drag your mouse to the right to select an area to zoom to. Let go of the mouse. Notice the display changes to match your selected region.

## C.5 Pan Tool

When you have a very large image file open in Focus or when you have your image zoomed closer than overview you can pan around the image in the Focus view area. There are two ways to pan around images. You tried the first method with the overview window, the second method is to use the pan button on the zoom tools toolbar.



### *To Pan an image:*

1. In the Zoom tools toolbar, click the **Pan** button.
2. Click anywhere on the image in the Focus view area.

Your mouse pointer changes to a hand pointer.



3. To pan through your image, click, hold and drag the image in the direction you want.

**Note:**

*You can also scroll an image in Focus using the standard scroll bars along the horizontal and vertical edges of the Focus view area.*

## C.6 Named Regions

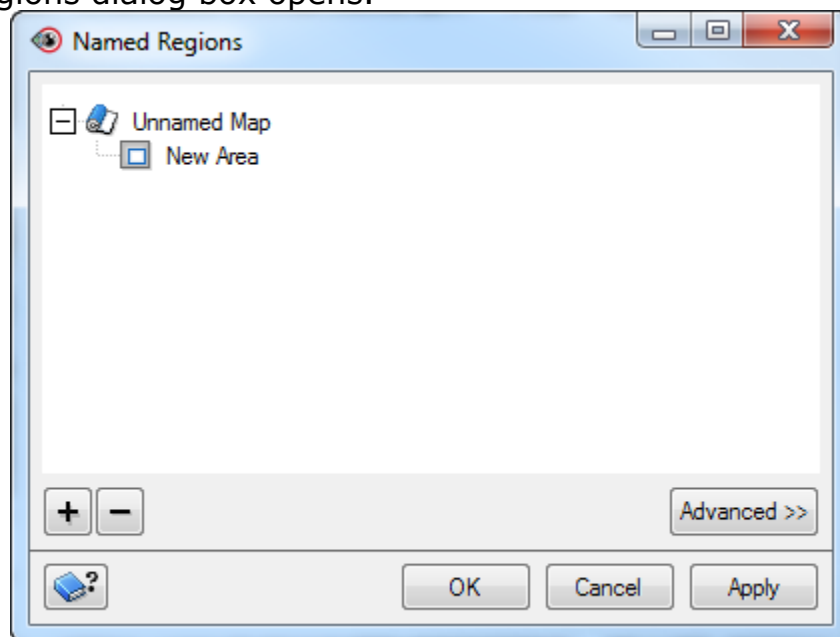
You can create a custom view of your map or image with the Named Regions tool. Upper left and lower right corner coordinates are used to define new named regions.

**To add a Named Region:**

1. Use the Zoom tools on the Focus toolbar, to zoom into the airport.
3. From the **View** menu, select **Named Regions**. Or click the Named Regions command button in the Focus toolbar.



The Named Regions dialog box opens.



**Figure 33 Named Regions dialog box.**

3. In the lower-left of the Named Regions dialog box, click the + button.

A new Named region is added to the Named Regions tree list. The new Named Region is automatically shown as Named Region 1.

4. If necessary, click the Named Region 1 to highlight it.
5. Click the Named Region 1 again to activate.
6. At the insertion point, type a new name for your region, in this case "Airport".
7. On your keyboard, press **Enter** or **Return**.
8. Repeat steps 1 through 7 to create another Named Region.

**Tip!**

*Click on the Advanced button to define your Named Region using exact coordinate information. Edit your coordinates by typing them directly into the Advanced Named Regions dialog box.*

**To display a Named Region in the Focus view area:**

1. On the Focus toolbar, click on the Zoom to Overview command button.

If you closed the Named Regions dialog box, reopen it, by clicking the Named Regions command button on the Focus toolbar.

2. In the Named Regions dialog box, click the **Airport** region.
3. Click **Apply**.

The Airport region is displayed in the viewer.

4. To close the Named Regions dialog box, click Ok.

**Tip!**

*Once you have created a Named Region, you can right-click in the Focus view area and select Named Region from the Zoom To submenu.*

**To remove a Named Region:**

1. Make sure the Named Region you want to remove is highlighted in the Named Regions tree list.

2. In the lower-left of the Named Regions dialog box, click Remove.

The Named Region is removed from the tree list.

**Note:**

*To save your Named Regions, you must save your current project.*

## C.7 Cursor control

You can determine the location of the cursor in the view pane.

The Cursor Control dialog box displays the cursor position in four different coordinate systems. You can move the cursor in any of the supported coordinate systems by changing the associated coordinates.

1. On the toolbar, click the Cursor Control icon. The cursor control information shows both the location on the map page and the georeferenced ground

location represented in the image. 

2. In the Pixel: box enter 128 and the Line: box enter 283 then press the TAB button. Make sure the Database: is set to IRVINE.PIX.

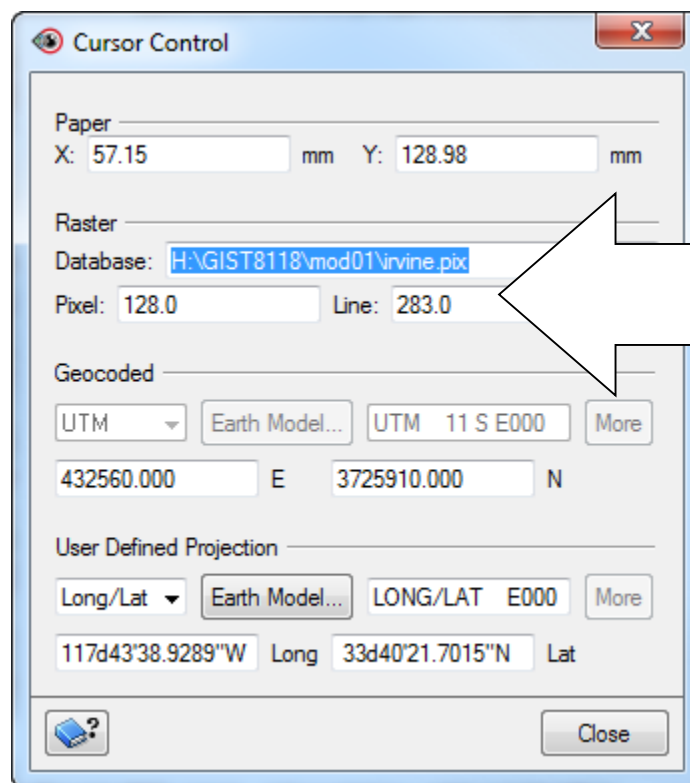


Figure 34 Cursor control

3. Notice the cursor will move to the airport.

- Next click on the lake in the lower right and notice the Pixel Line values have changed.

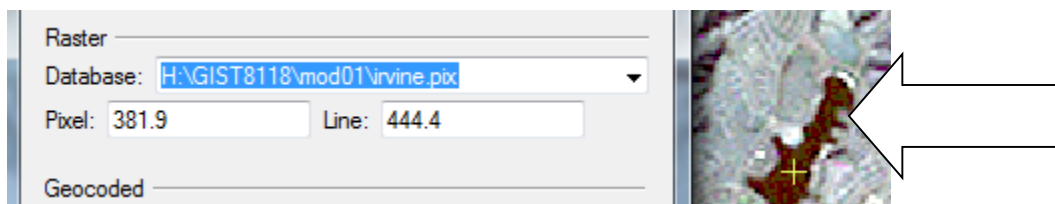


Figure 35 Cursor Control - pixel line settings

Cursor control can be used to move the cursor to a specific location.

End of Tutorial

## Section C – Project, maps, areas and layers

The following exercises will reinforce the basic concepts involved in using some of Focus's most commonly used features: Maps and Files trees, layers, and context menus.

The data for the following exercises can be found in the mod01 folder you copied earlier in the lab (irvine.pix and eltoro.pix)

### Exercise 1 Create a new Map

- Make sure Focus is running and start with a new project (File -> new project). Do not save project if you had one open.**

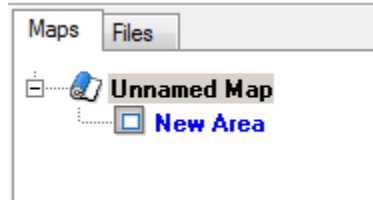


- On the Maps toolbar, select the New Map button to establish a map and area within the viewer.**



The Maps tree should have two entries: one for a map and one for an area within the map. Notice that each layer has a specific symbol attached to it.

Focus assigns a generic name to both the map (Unnamed map) and area (New Area).



*Symbols are used to help you quickly identify and distinguish between the many layers that may occupy your tree.*

## Exercise 2 Rename

You can change the default name Focus assigns by renaming.

You can rename the map and the area.

If you are working on a simple image, naming layers may not be necessary. However, when you start working with multiple maps, areas, and/or data layers, giving descriptive names to the layers helps to keep things organized.

**For this course I will expect appropriate names for the maps and areas when marking displays.**



### *Tip*

*When you start working with multiple Maps, Areas, and/or Layers, your map's tree may become quite long. Finding a specific Layer can then become time-consuming. To quickly locate a layer, area or map within the Maps tree, type the first few characters in the descriptive name. Be sure to click inside the Maps tree sheet before you type. (Note: Typing a single letter won't get you far if you have several layers starting with that same letter.)*

- **Rt-Click on the Unnamed Map, and select properties.**
- **In the Map Properties, in the Name: section of the General tab Change the name from Unnamed Map to "Irvine, California".**

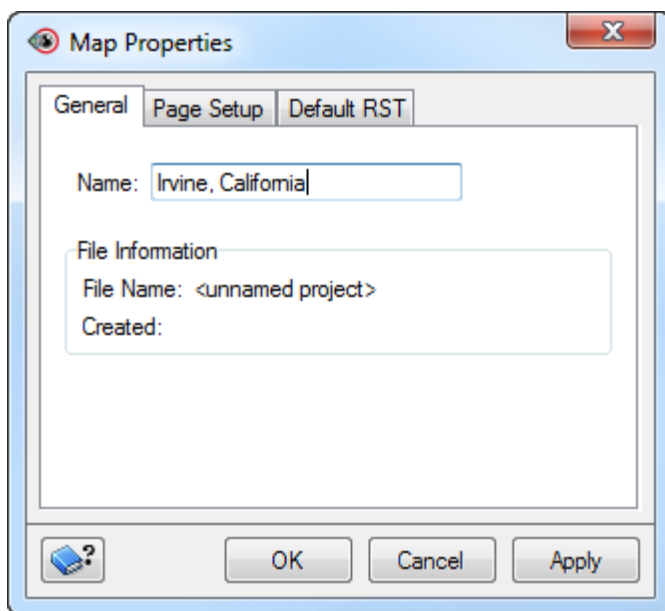


Figure 36 Map Properties

- **Click OK to close the dialog and apply the changes.**



---

*Tip*

*The Properties dialog box can be accessed automatically by double-clicking on a layer or through the context menu (rt-click on the layer).*

---

- **Double-click the new area layer to open the Area Properties dialog box. In the Name text field in the Generic section on the General tab enter the following text: "Color Infrared Composite". Click OK to accept the text change, and close the dialog box.**

Your maps tree should look like the image below.



Figure 37 Change name properties

Even though you have constructed a map and area, there is no data loaded yet. To do this, use the Add Layer toolbar button.

### Exercise 3 Add Data to a map



- On the maps toolbar, click the Add Layer button to open the Add Layer Wizard. Select the RGB option then click next>. Click Browse to locate and open irvine.pix from your working directory. Once opened, a list of all the available channels in irvine.pix will appear in the list box. Select (click once on) channels 5, 3 and 1 for the red, green and blue color guns, respectively. Click Finish.

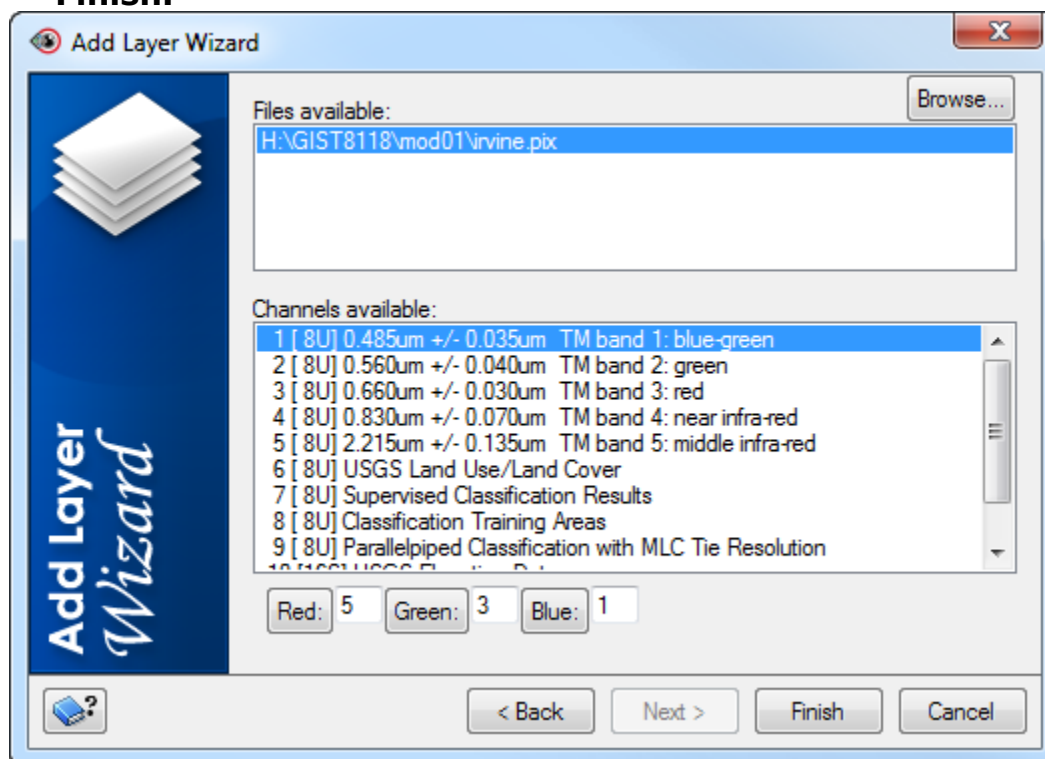


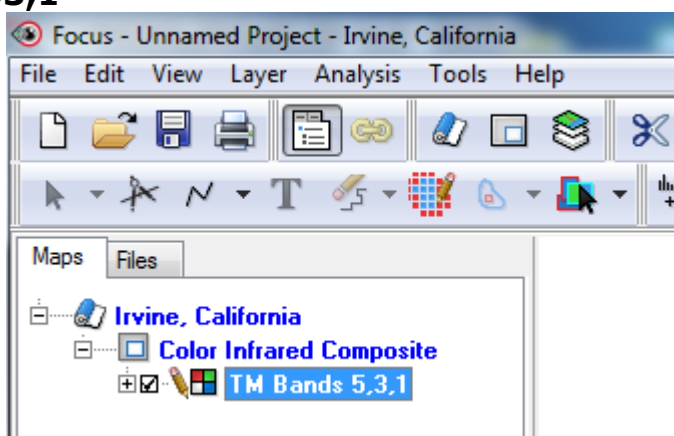
Figure 38 Add Layer wizard

You have now entered an RGB layer to the Color Infrared Composite area in the Maps tree.




The data has also been loaded into the viewer.

- **This layer has been assigned a default name. Use the steps outlined above to rename the layer to read: "TM Bands 5,3,1"**




- **Click the + next to the RGB layer to display the list of data that the layer is comprised of.**


**Notice the symbols in the Maps tree**




*RGB Layer*



*Currently selected Data Layer is write enabled.*

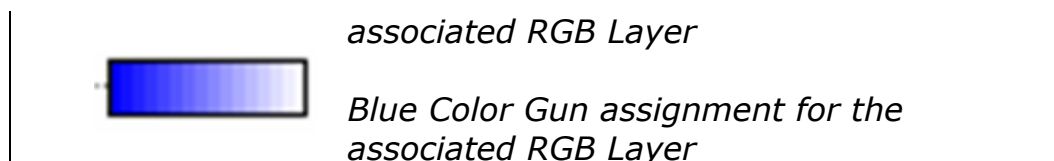


*Red Color Gun assignment for the associated RGB Layer*



*Green Color Gun assignment for the*





### Tip

When you start working with multiple maps, areas, and/or data layers, your Maps tree can get very long. To help keep things less cluttered, try collapsing all the color gun assignments such as those shown for the RGB Layer. This is done by clicking on the "minus" icon (-) located beside either an RGB Layer or a Grayscale Layer.

## Exercise 4 Add a second Area to the map



- On the Maps toolbar, click the **New Area** button in order to add a second area within the map.
- As before, by default, it will be labeled "New Area". Change this area's text to read: "LULC Classification".



- Select this newly created area (it will be highlighted) then on the maps toolbar, select the the **Add Layer Wizard** button.
- From the **Add Layer Wizard** select the **Pseudocolor** option then click **next>**. A list of all the available image channels in irvine.pix will appear in the list box. Select **channel 6 (USGS Land Use / Land Cover)**. Click **Finish**.



You have now entered a pseudo-colored layer to the LULC Classification area in the Irvine California Map displayed in the Maps tree. The symbol for this layer is shown accompanying the layer's tree entry. A pseudo-color layer is an image with different colors (red, green, blue etc) assigned to different digital numbers within the same image layer.

*Pseudo-color layers are used to display a thematic map.* The image you are displaying is a land use/ land cover thematic map for the Irvine area.

Your maps tree should look like the image below.

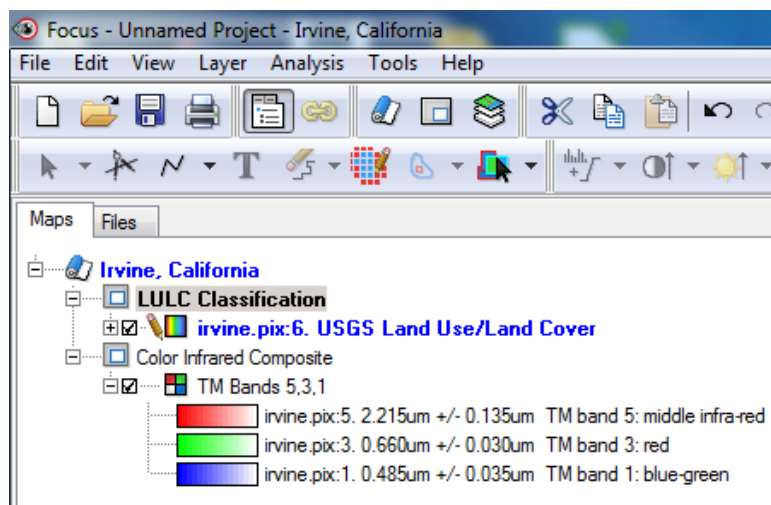


Figure 39 Map Layers

- Click on the plus next to the pseudo-color layer to view the legend. You should see a legend like the partial display below.

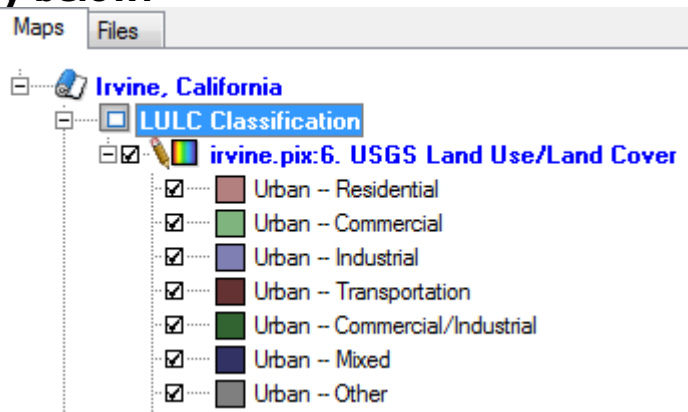


Figure 40 Thematic Legend

- Look at the image and the legend; notice the different colors for the different land use/land cover classifications.

You now have a display that you would like to keep. In the next exercise you will save your display to a project file.

---

## Exercise 5 Geomatica Project Files

Focus project files (GPR file extension) provide a way for you to organize the display of data for complex projects in one file. GPR files will store Maps, Areas, Layers, display settings and 'map' elements.

GPR files also include all path information to your data, your viewing preferences, such as the last zoom level you worked at, and all associated map elements.

The GPR file is also capable of including multiple Maps, Areas, and all associated Layer settings.

Project files DO NOT contain the actual data (rasters or vectors). They contain pointers to the data.

Project files are saved using the file name extension GPR.

*Project files are ASCII files and can be viewed with notepad.*

***They do not contain the data.*** When saving your work make sure to take the data (saved in PCIDSK files) and the project files (gpr files) with you.

- **From the File menu choose Save Project. The File selector dialog box opens. Choose your mod01 folder to store your project file.**
- **In the File selector dialog box, click inside the File name box and, type a name for your project, use displayexercise, as the name for your project. The GPR file extension appears in the Save as type field.**
- **Click Save.**

The dialog box closes and the file is saved with the GPR extension in the selected folder.

- **Use windows explorer to make sure the displayexercise.gpr file is in your mod01 folder (note the size is small compared to the 'data')**

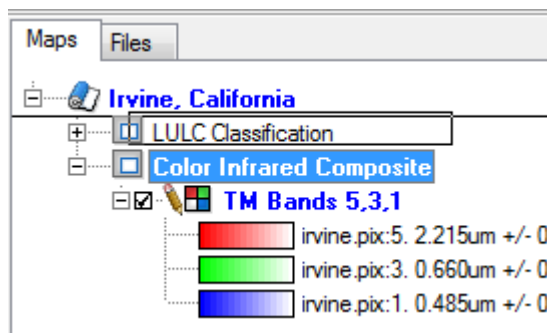
## files in pix format.)

### Note:

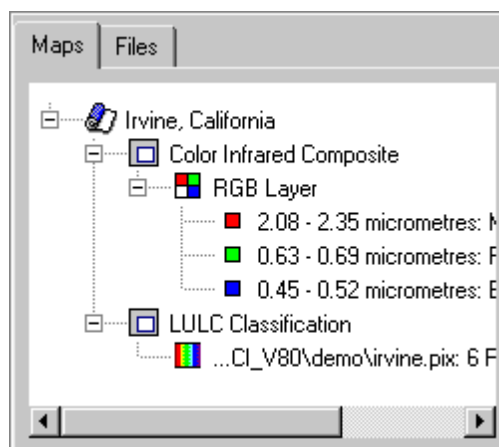
To save your project again while you are working, on the Focus toolbar, click Save or open the File menu again and choose Save Project.

## Exercise 6 Reorder map areas

- Click on the Color Infrared Composite area entry in the Maps tree.
- Keep holding the mouse button down while you drag the Color Infrared Composite area to the top of the Maps tree above the LULC Classification area entry.



(A black line will serve as an indicator of the area's position while you are dragging.) The RGB Layer (or TM Bands 5, 3, 1) should now be showing in the viewer.



### Exercise 7 Activate map areas

A map area is visible when it is active.

- **Click on the Color Infrared Composite area entry in the Maps tree.**

The RGB Layer (or TM Bands 5, 3, 1) should now be showing in the viewer.

- **Click on the LULC Classification area entry in the Maps tree.**

The pseudo color layer is now visible.

In Area view mode only one area is visible at a time.

### Exercise 8 Create a Map Layout

**Map View mode** allows you to view both areas at once and design a 'map'.

In the View menu, you will see a check mark beside the Area View mode entry. This indicates that the viewer and Maps tree are currently in Area View mode. You can also determine the current View Mode state by looking at the View Mode toolbar palette.

Currently, the View Mode palette is in Area View (image below):

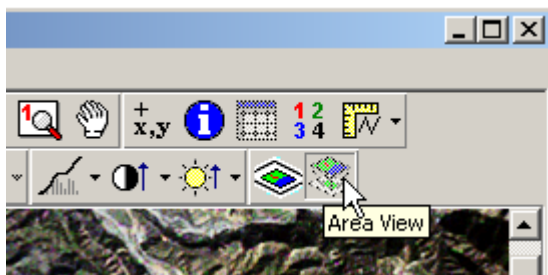


Figure 41 Area View Button

The Area View (on the right) is disabled, indicating that it is the current viewing state. In the next exercise you will use the map view mode.

- **Switch to Map View Mode.**
- **Click the Color Infrared (CIR) Composite area in the Maps tree.**

Notice that a frame with corner and side anchors appears around the CIR image in the viewer.

- Click and drag one of the corner anchors to resize (make smaller) the imagery. When you let go of the mouse button, the CIR composite will be smaller and the LULC classification will now be visible (but still behind the CIR image).

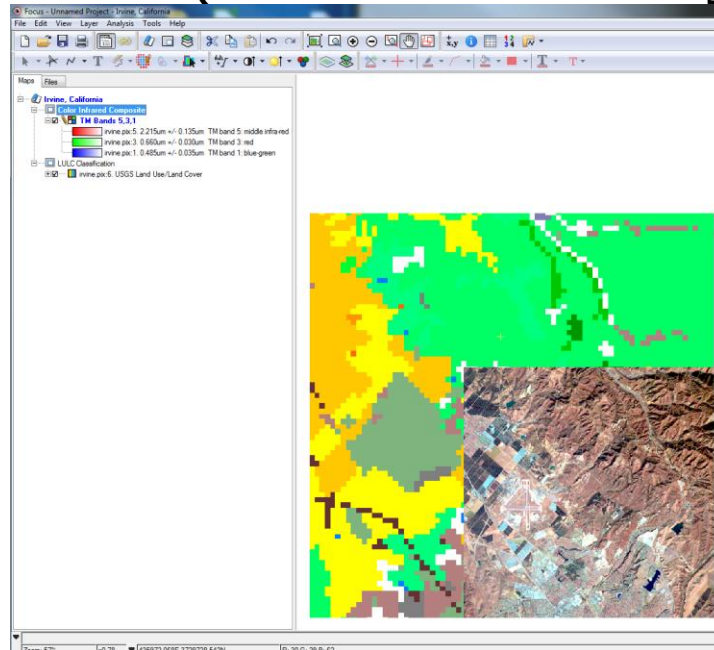


Figure 42 Resize area views

**Note:**

*The side anchors of the frame enable you to crop the imagery.*

- Repeat the above step for the LULC area making it the same size as the CIR one. You will notice that the LULC image is no longer visible.



Look at the Maps tree, the LULC Classification area is currently selected (highlighted).

- Move the mouse cursor to the edge of the frame surrounding the imagery in the viewer until its shape changes to the four-arrow cursor. Now click and drag the selected area to a new location in the viewer.
- Click on the Color Infrared Composite area in the Maps tree and repeat; moving the imagery within the map until both areas are completely visible (below).

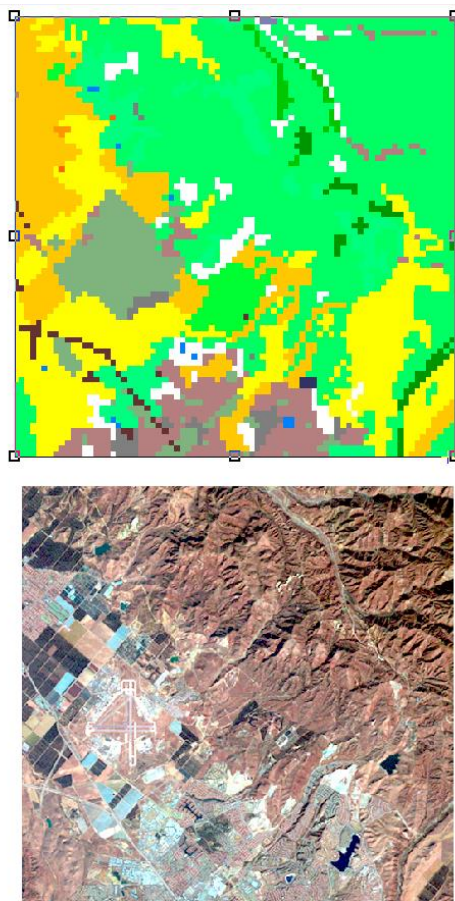


Figure 43 Example map with two area views visible

If you want to view one area at a time, then you must switch from Map View mode to Area View mode. If you check the View menu, you will see a check mark beside the Map View mode entry. This indicates that the viewer and Maps tree are currently in Map View mode. Select the View Area Mode option in the View menu.



#### Note

As mentioned before, you can also determine the current View Mode state by looking at the View Mode toolbar palette. Currently, the View Mode palette looks like this: The Map View (on the left) is disabled indicating that it is the current viewing state. Alternatively, you could have switched Viewing Mode by selecting the Area View toolbar icon (on the right).

Once you switched to Area View mode, the currently selected area filled the viewer (in this case, it would have been the CIR composite).

As just demonstrated, the data in the viewer can be displayed in one of

two states: Area View mode or Map View mode.

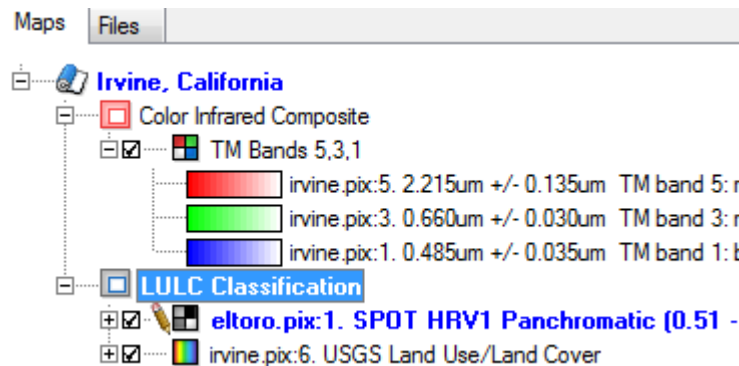
**Area View** mode is considered the “geographic” view. In Area View mode, you are restricted to “seeing” a single geographic area at a time (as selected in the Maps tree). Map surround information is not visible.

**Map View** mode is how the current map would look on a sheet of paper when printed. This is akin to the Print Preview mode in Microsoft Word. In Map View mode, you can see the paper and the relative positions of all the elements on your map. All processing operations (menu commands, toolbar functions and Algorithm librarian programs) are available, regardless of the current mode.

### Exercise 9 Copy, Paste and Remove a layer



- **Make sure you are in area view mode.**
- **Select (click on) the LULC Classification area (notice that it now occupies the viewer).**
- **On the Maps palette, choose the Add Layer button to open the Add Layer Wizard. Select the Grayscale option then click next>. Click Browse to locate and open the file eltoro.pix. Once opened, a list of all the available image channels in eltoro.pix will appear in the list box. Select channel 1, then click Finish.**



You have now entered a grayscale image layer to the LULC Classification area in the Maps tree. The symbol for this layer is shown accompanying the layer's tree entry. In the viewer, notice that the grayscale image automatically loaded in the correct geographic position with respect to the pre-existing LULC classification image.



We made a mistake by adding the grayscale image to the LULC Classification area. We really had intended to add it to the Color Infrared Composite area. No problem!

- **Select the Maps tree entry for the grayscale image of eltoro.pix (it will be highlighted).**



- **Rt- click and select Cut. OR select the CUT Button**



Notice that the eltoro.pix image has disappeared from both the viewer and the Maps tree.

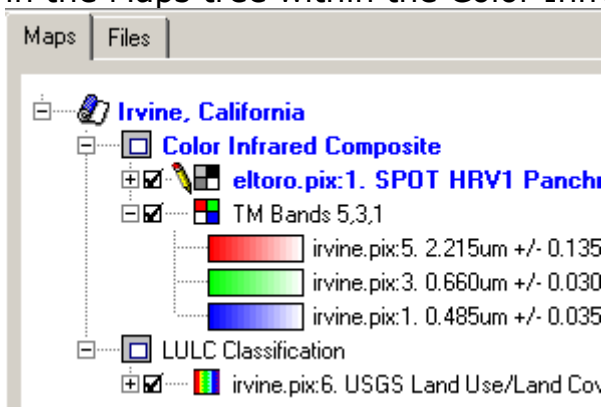
- **Next, select the Color Infrared Composite area (it will now be highlighted in yellow and it will now occupy the viewer).**



- **Then on the Clipboard palette, click Paste. (OR rt-click and select paste)**



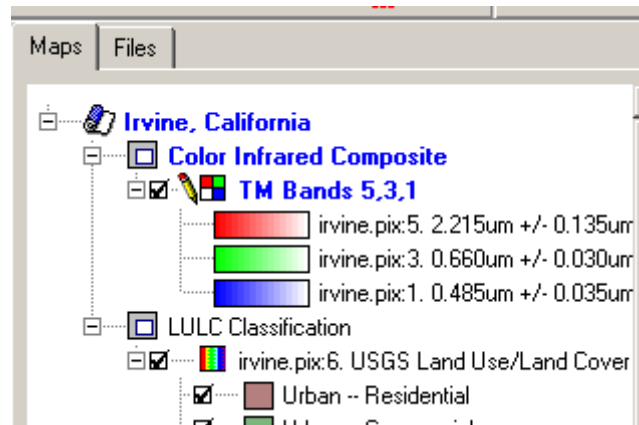
Notice that the grayscale image of eltoro.pix now appears properly positioned on top of the TM imagery. A corresponding entry also appears in the Maps tree within the Color Infrared Composite area.



Now you want to remove the greyscale layer you just added.

- **Right-click the grayscale layer. From the context menu, select the Remove option. The Maps tree entry and image**

**from the view area are both removed.**



Note: although the layer was removed from the display the eltoro.pix file is still open in your project. In order to close the file you must remove it from your project from the files tree.

- **Switch to the FILES TREE (click on files tab)**
- **RT-CLICK on the ELTORO file and REMOVE.**

This DOES NOT delete the file from the hard drive it 'closes' the file from your project.

- **Save your project.**
- **Make sure you have created a GPR file on your hard drive and the date/time stamp is your current date. Use the windows explorer for this.**

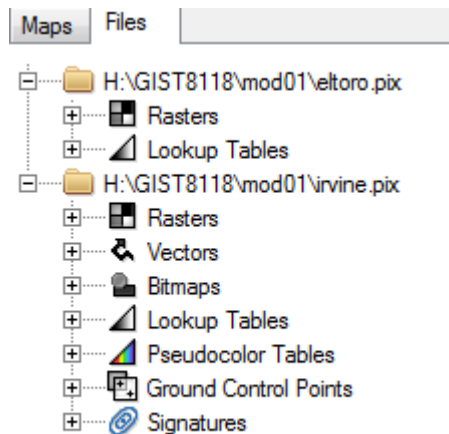
### Exercise 10 Explore the Files Tree

Files included in your project are listed in the Files tree in the Focus work area. All files and layers from open PIX database(s) are available for use in your project at any time. The maps tab displays views of the data contained in the open PCIDSK database (s). You can use any of the Focus viewing and editing options when working with a project (GPR) file. You can also manage RGB and Grayscale layers within your project files with context menus in the Maps and Files folders.

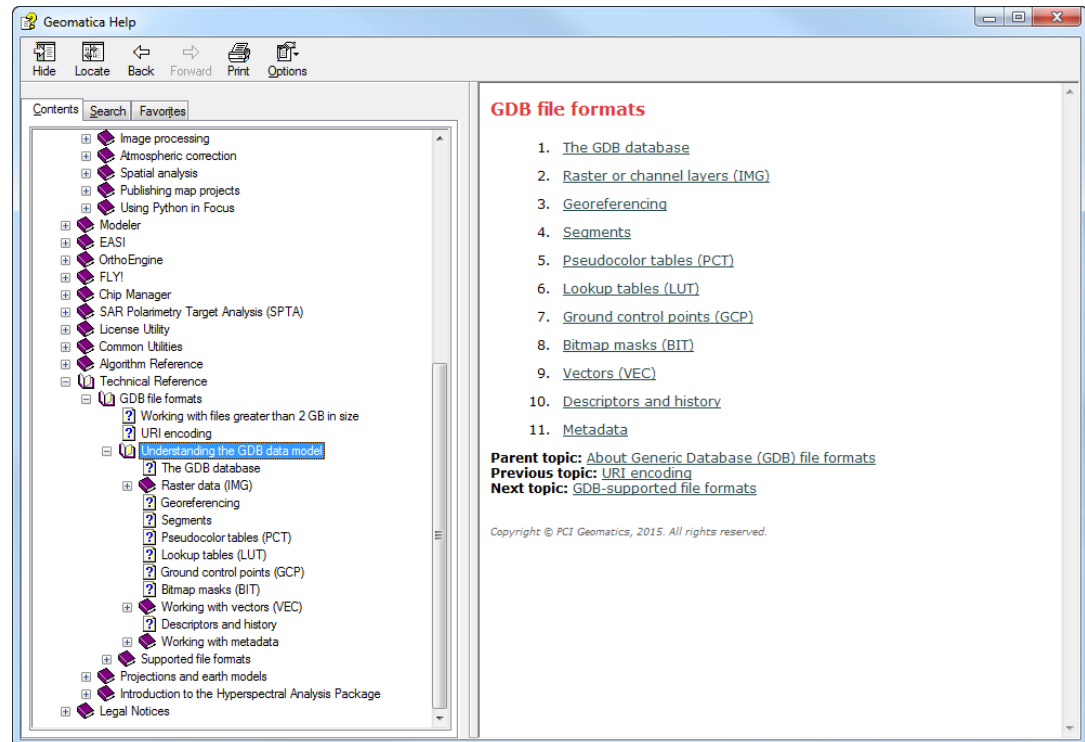
When you right-click an object in the Files tree, a context menu lists the available commands for working with that data type. For example, right-clicking a file folder icon opens a context menu listing several commands for managing files. Right-clicking an RGB or Grey scale layer opens a context menu listing commands for managing the layers as a data

file and for adjusting Attributes, statistical properties, and pyramids for that layer.

- **Select the Files tab. You should see a list of the currently open files in your project.**



- **If the file is a PCIDSK database you will also see the components available.**
- **Open HELP file (help -> general) in the contents tab navigate to the Technical Reference ->GDB file formats 'Understanding the GDB Data Model for a description of each component (rasters, vectors, bitmaps, look-up tables, pseudo-color tables...) READ THIS.....**



- **Back to Focus from the FILES tab using the IRVINE.PIX file. Click the plus next to each component to view what is available in each section.**
- **Save you project.**
- **Quit Focus**
- **Reopen your project. Make sure it reopens with the correct files, maps, layers, names, and views.**

## Summary

### DATA:

Data is stored in a PCIDSK file.

- PCIDSK is organized into Channels (for raster data) and Segments (for all other data).
- The PCIDSK file contents are listed in the FILES tree.
- The contents are organized into components depending on the type of data stored.

Data are displayed (viewed) as a layer.

- There are five types of layers used to display data display depends on the type of data.
- The display of data is organized into maps, areas, and layers.
- In order to keep your display you must save a project file.

PCIDSK database files have a PIX extension and PROJECT files have a GPR extension.

### Three ways of displaying your data

- Open the file – by default Focus will display the first data it finds in the file. If there are three channels it will display a RGB layer.
- From the Area context menu – rt-click and select ADD to open the Add layer Wizard
- Select the Add Layer button to open the add layer wizard

## Section D Assignment

For this assignment please refer to the quiz section of your D2L course. Under assignment 01 you have multiple choice questions, true/false questions and a paragraph you need to answer.

You also have a 'show me' question.

SUBMIT YOUR SCREEN CAPTURE TO THE MOD01 DROPBOX. Answer true once complete. I will assign/adjust your grade once I have reviewed the work.

You will use the data from module 01 and the web to answer the questions.