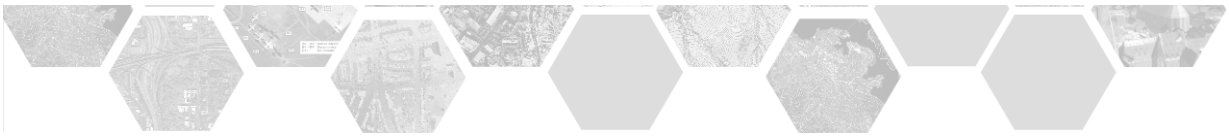


Table of Contents

Data Visualization and Manipulation

Printed in the United States of America.
cc12/06 Part No. 1871

Hexagon Geospatial
5051 Peachtree Corners Circle
Norcross, Georgia 30092-2500 USA

Phone: 770 / 776-3400
Fax: 770 / 776-3694

Support Services: 800 / 953-6643
Customer Education: 800 / 373-2713
Web: **www.hexagongeospatial.com**

Warning

About This Manual

This Introduction to ERDAS IMAGINE ® exercise manual is an instructional document, designed to be a part of the Introductory Courses offered by Hexagon Geospatial Trademarks

Acknowledgments

Some of the imagery and data provided in this Introductory Course and Exercise Manual are courtesy of SPOT Image Corporation (Reston, VA), and Space Imaging (Thornton, CO).

Using This Manual

Introduction

This manual contains step-by-step instructions on how to perform certain processes. You should be aware that each exercise provides a single path through ERDAS IMAGINE® tools. In most cases, there are various ways to maximize tool usage, depending on the individual project.

This exercise manual is provided to the student, along with all images and copies of the presentation slides used by the instructor. This provides the capability for recreating the processes performed in class at a later date, as well as the key points on any theory involved.

Exercise Conventions

Section Title Page	States the objective of the exercises and lists the application tools to be utilized within the various tasks.
Exercise Tasks	Each exercise is split into a set of tasks. After the course, these tasks will help you locate within the manual where you performed a certain set of steps.
Challenges	Challenges are extra exercises which are included as bonus exercises. If you finish an exercise early, please feel free to move ahead and tackle the Challenge.
Questions	These appear in a larger font with both bold and italic attributes. The instructor may quiz and/or review with you, following each exercise.
Class Notes	These pages follow the end of each exercise on which notes from your studies can be made.

Notational Conventions

Bold Italicized Text — Any text, which is bold, indicates a ***filename***, or **parameter** to be changed or selected.

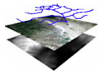
Graphics — To help you locate icons and objects used in the exercises, the icons will be next to the icon name in the text.

Insets — These italicized captions will appear in the outside margin of the page. They define terms or explain theory behind the steps you are being asked to perform.

Diagrams — These are an optional means to direct you in the usage of some of the application's tools.

The following graphics are also used for particular purposes:

This is a note or a quick tip. It gives additional relevant information, or describes other ways of using the software.

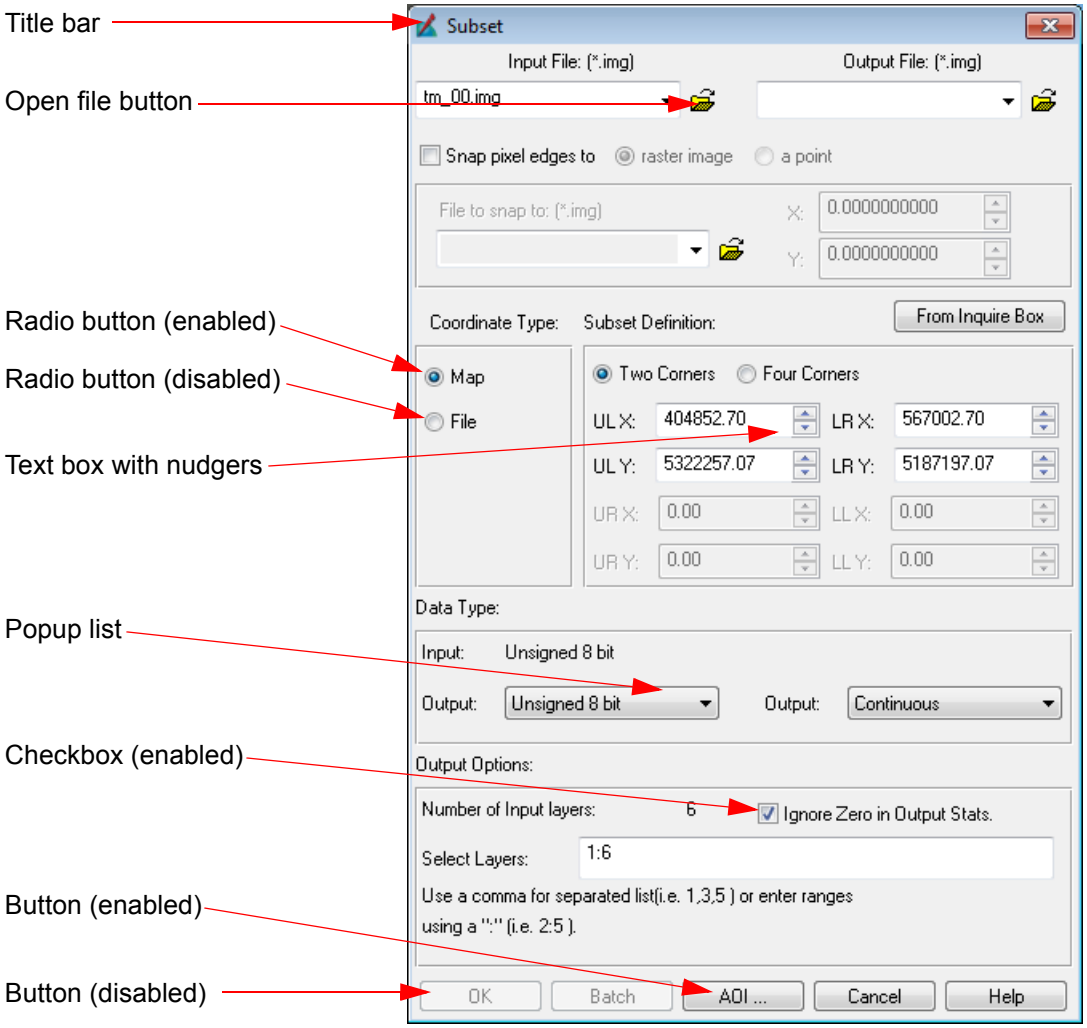


This is information relating to the application of the current tools.

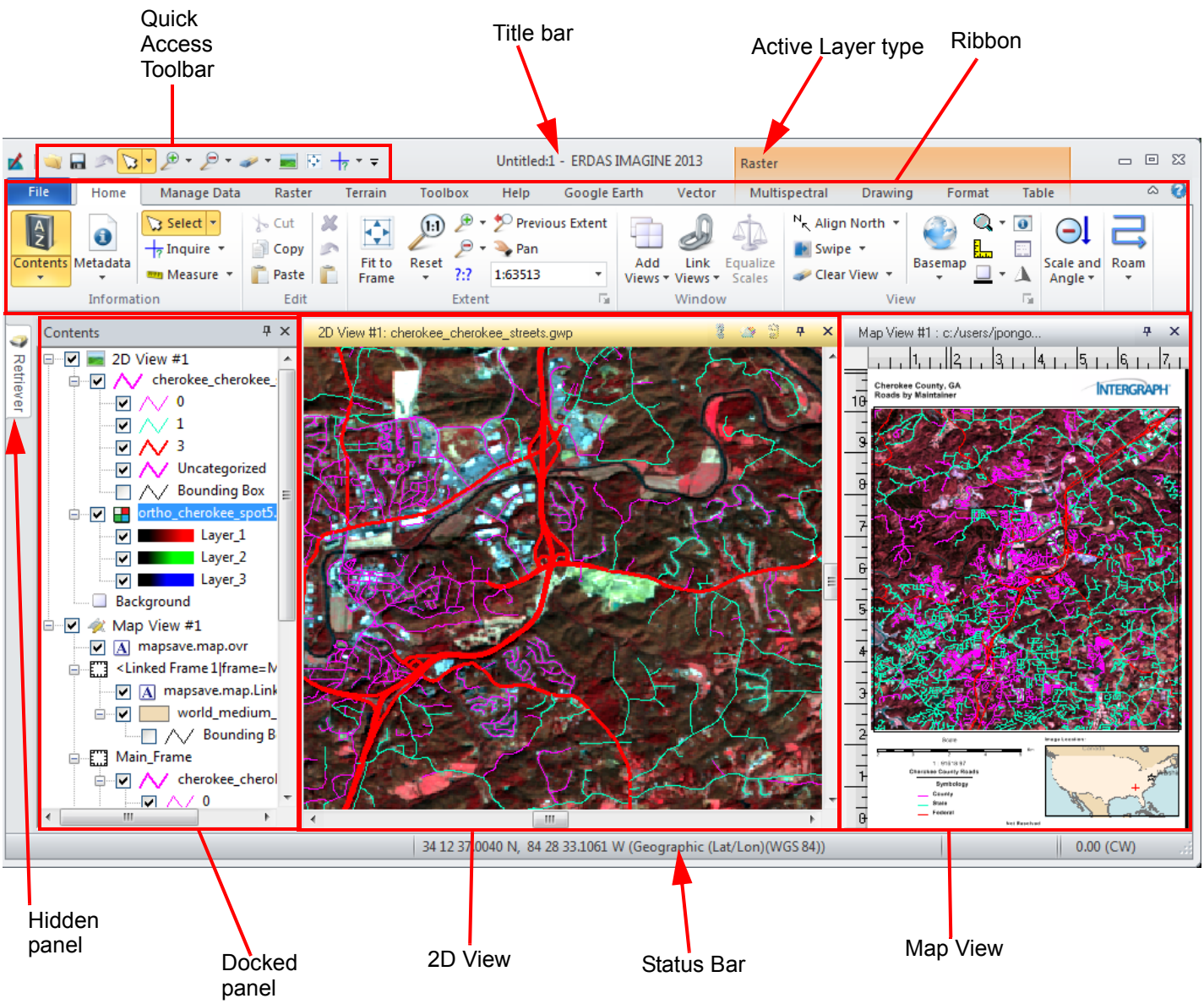
This is a reference. It provides additional theory or science that will help in using the tools.

This is a warning. It cautions you regarding potential pitfalls and how to avoid producing errors.

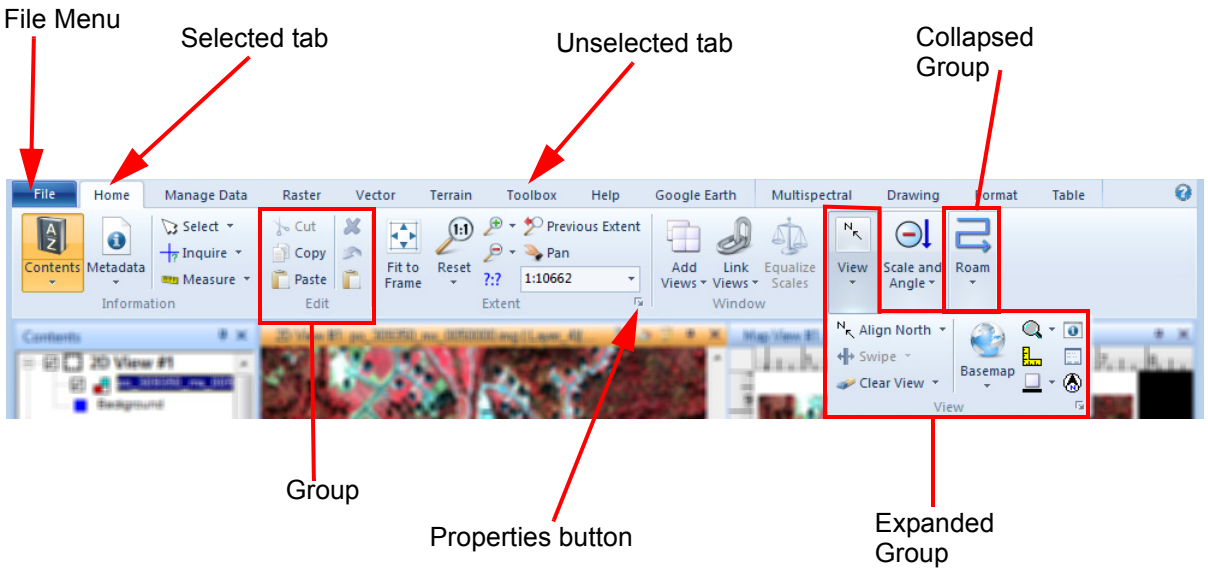
Windows Terminology



The eWorkspace



The Ribbon Explained



Section 1: Data Visualization and Manipulation

Objective

To use the ERDAS IMAGINE© Viewers for visualizing the various types of raster data and to manage vector coverages. The student will also execute the workflow to create an image mosaic and a map composition.

Tools Used

Viewer	Used to visualize data layers, zooming, inquiries, setting scales, and measuring.
Raster Options	Tools to manage display settings.
Attribute Editor	Tools to display and edit characteristics associated with raster and vector coverages.
Vector Viewing Properties	Tools used to change display settings associated with vector files.
Mosaic Pro	Provides a method of piecing together images in order to create a larger image.
Map Composer	Used to produce map compositions from imagery and any other information.

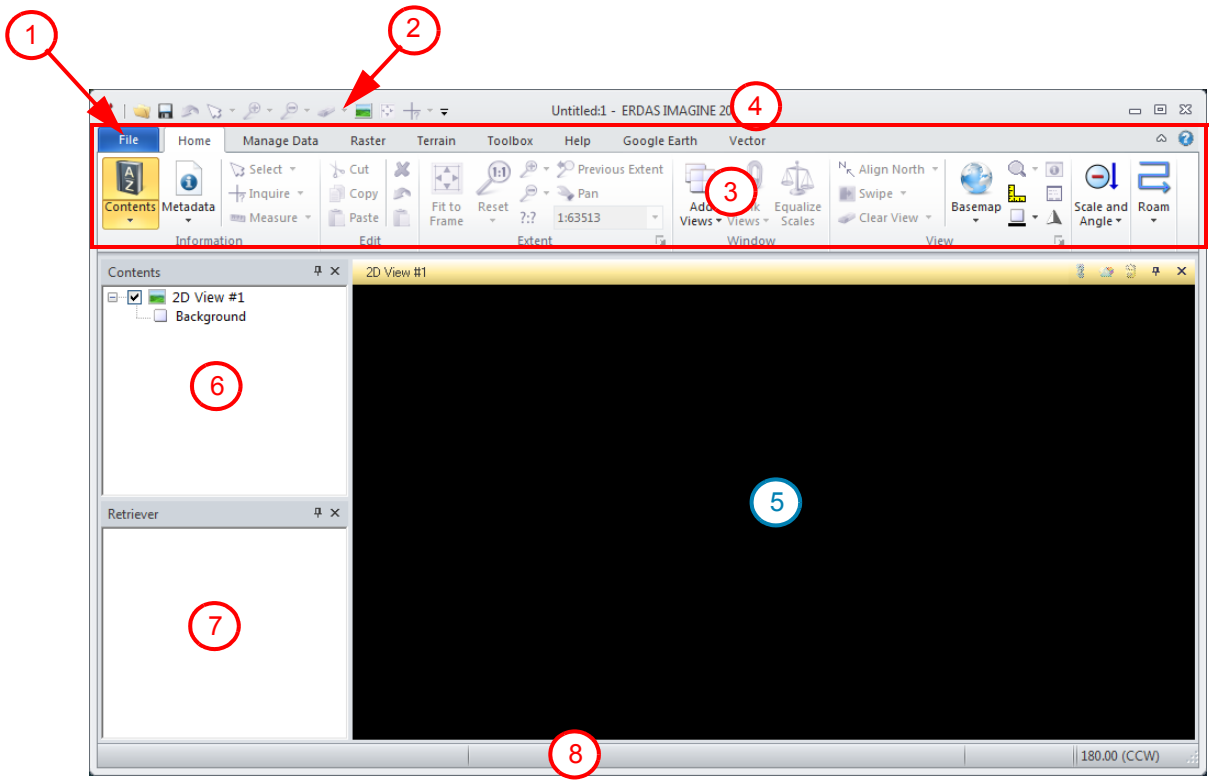
Exercise 1: The eWorkspace

Objective: Students will gain an understanding of large-scale data through the use of the eWorkspace. Students will use the Viewer in order to visualize raster data from different sensors, and overlay a vector coverage.

Task 1: Display Data in a Viewer

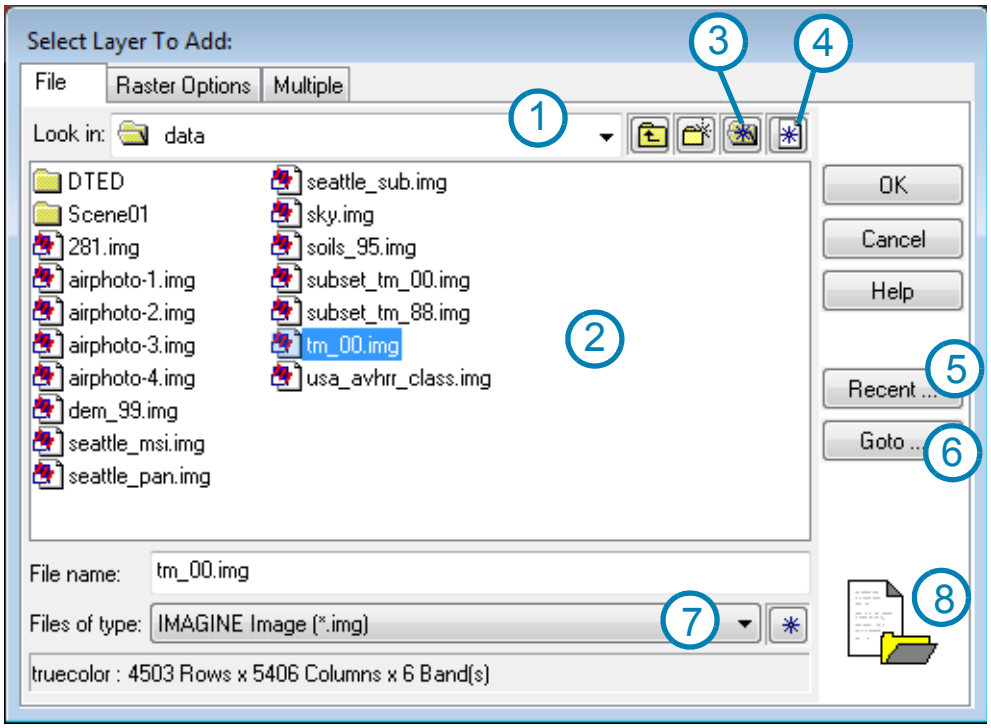
1. Start ERDAS IMAGINE©.

The ERDAS IMAGINE eWorkspace opens.



1) File Menu	*Access to New, Open, Save, View, Print, Session, Batch, Configuration, Preferences and Help.*
2) Quick Access Menu	*One-click access to commonly used functions. Customizable.*
3) Ribbon	*Access to IMAGINE functions, collected in tabs and groups*
4) Title bar	*Window Title, Window (Viewer) display icons: Minimize, Maximize, Close*
5) 2D View	*Main Viewing space. Can add multiple views, Map View, 3D View.*
6) Contents Pane	*Display and arrange all layers each View.*
7) Retriever	*Organizes easily-accessed shortcuts to your data and Web Services.*
8) Status Bar	*Cursor identification and image coordinates*

2. From the eWorkspace, click the File Menu. From the menu, select **Open** → **Raster Layer**. The Select Layer to Add dialog displays. This dialog is used throughout ERDAS IMAGINE.



1) Look in	*Changes the drive or directory.*
2) File Selection	*Area used to select individual files in current directory.*
3)Set Default Data Directory	*Save the current directory as the Default Data Directory in the ERDAS IMAGINE Preferences*
4)Set Default Output Directory	*Save the current directory as the Default Output Directory in the ERDAS IMAGINE Preferences*
5) Recent	*Lists the most recently used files.*
6) Goto	*Lists the most recently visited directories.*
7) Files of type	*Selects the type of file to be opened.*
8) Preview	*Previews the selected file, when available.*

Continuous data - quantitative data that have related, continuous values

Thematic data - qualitative data that is categorical

3. Ensure that **Files of type** is set to the default **IMAGINE Image (*.img)**. The icon next to the drop-down menu  allows you to change the default file type.

4. Navigate to the course data directory (e.g., ***c:\training\fundamentals1***) and click the  button on the upper-right hand corner of the dialog to save the current directory as the default input directory. This path is saved in your Preferences.

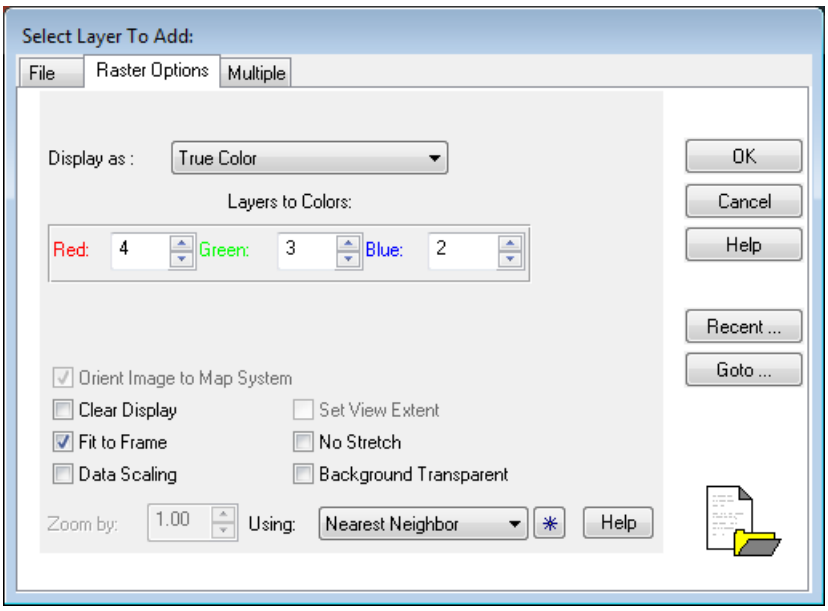
5. Locate and *single-click* on the continuous layer ***tm_00.img*** to highlight it in the File Chooser.

*Raster layers can either be raw/multiple layer **continuous data,** single layer panchromatic **continuous data,** or categorical/single layer **thematic data**.*

***Landsat Thematic Mapper (TM)** imagery contains 7 bands of multispectral imagery at 28.5 meter resolution. (The image you will view has been resampled to 30m and the Thermal band, band 6, has been removed.) The image bands range from the visible to the mid infrared. Imagery from Landsat 7 also contains a 15 meter panchromatic band.*

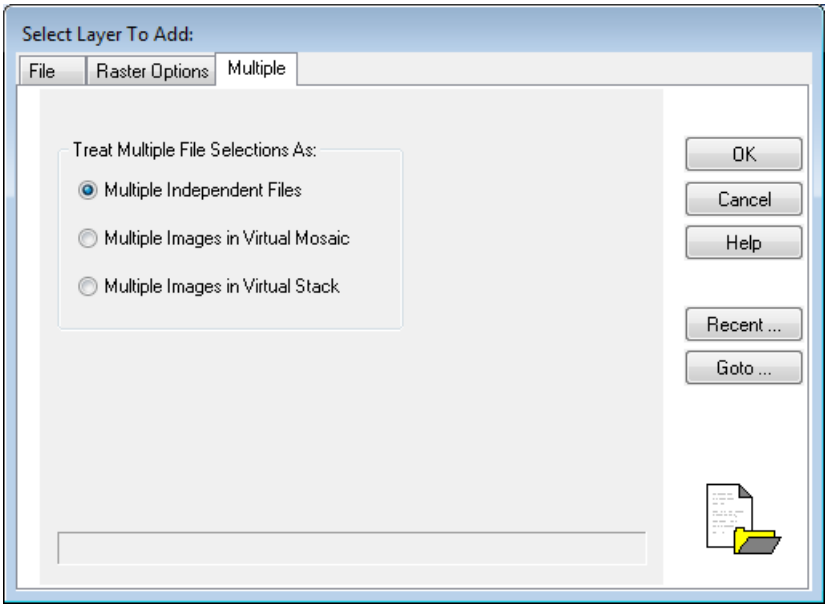
6. Click the **Raster Options** tab to examine the display parameters, and confirm that the **Display as** default is set to **Pseudo Color**.

If the desired option is not selected, click the pull-down arrow for Display as and select Pseudo Color. The choices are: True Color, Pseudo Color, Grayscale, Relief.



True Color	*Simultaneously displays continuous layers (or bands). Each layer is associated with the Red, Green, Blue color guns of the monitor. The intensity of each color is controlled by the values in each layer.*
Pseudo Color	*Displays thematic images (classified) by associating each class value with a color; single layer.*
Grayscale	*Displays one continuous layer (band). The band values are associated with a grayscale. Low values = dark; High values = bright.*
Relief	*Used to display elevation data. Requires extreme variations in pixel values.*

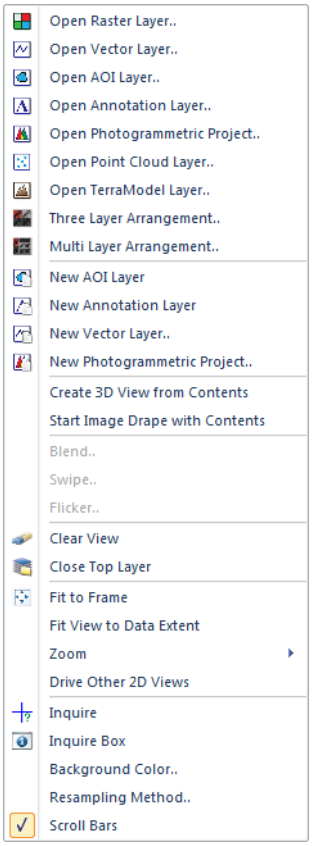
7. Click the **Multiple** files tab to examine the options for bringing in multiple files into a single Viewer.



Multiple Independent Files	*Brings in files, individually, as separate layers that can be arranged or deleted separately from the other files in the Viewer.*
Multiple Images in Virtual Mosaic	*Individual files are treated as a single logical file (or layer) in a single Viewer. Contrast options apply to all images in the Viewer.*
Multiple Images in Virtual Stack	*Allows you to bring in separate multispectral bands (i.e. LANDSAT 7 TM) without requiring you to have one image with multiple bands. With this option, the separate files can be selected and ERDAS IMAGINE will dynamically combine them in the view pane so that they can be manipulated as one single image.*

8. Click **OK** and the image displays in the Viewer.

9. To quickly display the Viewer options, right-click in Viewer #1 and select **Fit to Frame**.



This option can be selected in the Select Layer to Add dialog. When displaying an image, click the Raster Options tab and enable the  *checkbox before clicking OK.*

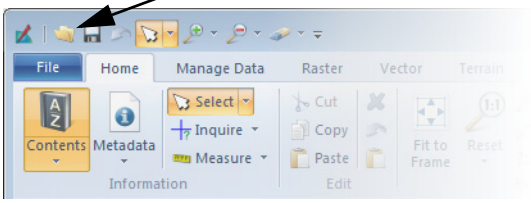
You can also select Fit to Frame button  *in the Extent group on the Home tab.*

Task 2: WorldView-2 Data

Next, we will examine WorldView-2 Data to determine which image will assist us the best in our study. The level of detail the WV-2 image is greater than the LAND-SAT, so we will open a WorldView-2 satellite image, which contains more detailed information.

WorldView 2 *imagery contains 8 bands of multispectral imagery at 1.66 meter resolution. The image bands range from the Coastal Blue, Blue, Green, Yellow, Red, Red Edge (on the edge of the visible red range), and two Near Infrared bands. Imagery from WorldView-2 also contains a 50cm panchromatic band.*

1. Click the **Open Layer** icon on the Quick Access menu.



2. In the File Chooser, navigate to your Input Data Directory and select ***seattle_wv-2.img***.

3. To zoom in to the image, position the cursor over the area you want to zoom in on, and scroll the mouse wheel up.

You can also select the desired layer in the Contents pane, right click and select Fit Layer to Window

4. To zoom out, scroll the mouse wheel down.

5. Use the **Interactive Zoom In** and **Interactive Zoom Out** tools to draw a box around the areas you want to view.

Additional Zooming tools are contained in the Zoom Tools menu. To access them, click the menu arrow and then select the tools you would like from the menu.

6. Click the  **Previous Extent** button. This icon will step you backwards to the last zoom level. You may undo all the way to the original zoom level used when the images were opened.

7. From the **Scale and Angle** group, use the **thumbwheel** to zoom out and back in to the image.

8. In the Viewer, click on the pull-down arrow from the icon panel and select a scale of **1:1000000**.

Besides using the variety of pre-selected scales and percentages, users can also type in a particular scale in the window.

9. In the Viewer, hold the middle mouse button down and pan through the image.

10. From the Viewer tool bar, click the  **Pan** button. Notice the pointer changes to a hand when in the Viewer.

11. Click in the Viewer while in **Pan** mode. This will change the icon to 4 arrows. 

12. Using the Virtual Roam capabilities of ERDAS IMAGINE, roam across the image to the State of Washington (in the northwest corner) by moving the mouse in that direction.

13. Left-click in the Viewer again to turn off the **Virtual Roam** mode.

Task 3: Add a Second Viewer

Open a second viewer to examine the WV-2 data in greater detail.

1. In the **Window** group on the **Home** tab, click the  **Add Views** button. Select **Display Two Views** from the Add Views menu.This will open a second View within the eWorkspace.

2. Select **View #2** by clicking inside the View, or by clicking on 2D View #2 in the Contents panel. Click the **Open Layer** icon  .

3. Click the **Goto** button and select your **Fundamentals** course data directory.

4. Change the **Files of type** to **All File-based Raster Formats** and select the ***seattle_wv-2.img*** image.

5. Click the **Raster Options** tab, enable the **Fit to Frame** and **Background Transparent** checkboxes.

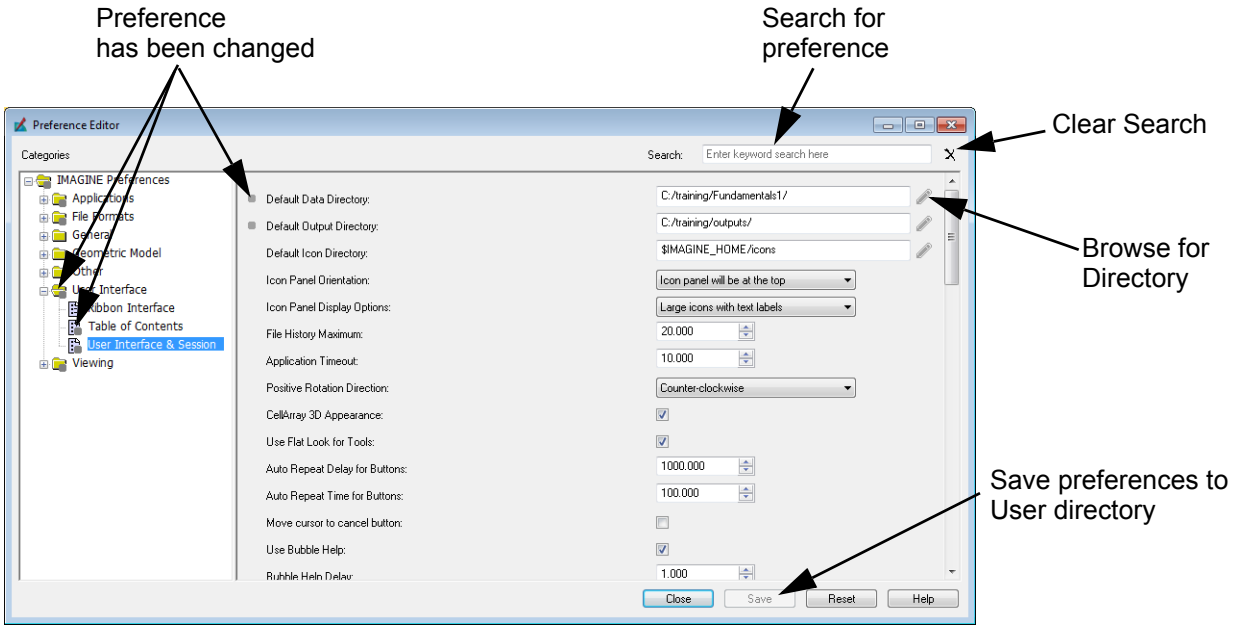
6. Click **OK**.

Is the image thematic or continuous?

Now, you will set Preferences for Default Directories and Raster Options.

7. Click the **File** button and click **Preferences**. The Preference Editor displays.

8. In the **Category** list, ensure **User Interface** is expanded and the **User Interface & Session** category is selected.



9. Ensure that the **Default Data Directory**, displays the path to where the course data is located. (Your Instructor will provide you with this information.)

10. In the option for the **Default Output Directory**, ensure that the path to where all images generated in the course will be saved. (Your Instructor will provide you with this information.)

Alternatively, in the Select Layer to Add dialog box, navigate to the directory you would like to set and click the default data icon  *or the default output icon*  *to record the current path in the Preference Editor.*

You will now set the Raster Option preferences so that Raster Options dialog displays with the Fit to Frame and Background Transparent options set as the default.

11. In the **Category** list, expand **Viewing** and select **Viewer**. The preferences for the Viewer display.

12. Scroll down (vertical scroll bar on the right side) to the **Clear Display**, **Fit to Frame**, and **Background Transparent** options.

By default, the Fit to Frame option is disabled.

13. Enable the **Fit to Frame** preference.

14. Click the **Save** button, then click **Close**.

15. Select the Viewer containing ***seattle_wv-2.img***, and then click the **Open Layer** icon  .

16. In the Select Layer to Add dialog, navigate to and select ***tm_00.img*** again, and then click the **Raster Options** tab.

17. Disable the **Fit to Frame** checkbox, and then click **OK**.

18. From the **2D View #2** group in the **Contents** panel, grab the **WorldView-2** image; drag and drop it to the top of the stack.

What is the purpose of the Background Transparent option?

19. Set the scale to **1:100000**.

Compare the TM to the WV-2 image. What features can be determined?

To determine the best image for identifying certain elements within an image, it is useful to change the band combinations for multi-band data (e.g., LANDSAT TM).

20. WIth 2D View #1 active, use the **Fit to Frame** tool from the Extent group and select tm_00.img in the contents list.

21. Click on the **Multispectral** tab to display the functions associated with this type of imagery.

22. From the **Bands** group, use the popup list to change the band combination to **Red: 5, Green: 4, Blue: 3**. This is also known as **5,4,3 (R,G,B)**, or a **TM False Natural Color** band combination.

What features does this combination enhance?

You can apply different band combinations until you can clearly identify all the important elements required. You may use different band combinations for different elements (e.g., vegetation and rivers). This will be covered in more detail later.

With regard to the TM data, which band combinations provide the best identification of: Clearcut areas? Rivers?

23. Change the TM Band Combination back to **4**, **3**, **2**.

24. Select the second (WV-2) View. From the **Multispectral** tab > **Bands** group, change the Sensor Type to **WorldView-2 Multispectral**.

25. Select **TM-Style False Color IR** from the Common Band Combinations list. The color combination of the WV-2 image should closely resemble the color combination of the TM image.

With regard to the WV-2 data, which band combinations provide the best identification of: Vegetation? Rivers?

26. Click **File** → **Save As** → **Session...**.The Save As dialog displays.

27. In the File name text box, type ***WV2_TM*** and press **Enter** (the *.ixs extension will automatically be added to the file name), then click **OK**.

28. Close **2D View #2** by clicking on the  in the upper right corner of the View.

29. Clear 2D View #1 by clicking the **Clear View** button in the **View** group of the **Home** tab.

*You can also clear the view by using the **Clear View** button on the Quick Access Menu at the top left of the eWorkspace.*

30. **Clear** any open Views.

Class Notes

Challenge 1: Creating and Using a ShoeBox

Objective: The student will create a ShoeBox and organize project data without physically moving it—which could have adverse effects on others trying to access the same files.

Task 1: Create a New Shoebox and Add Files

The ShoeBox is a small XML file that contains the Group names and absolute paths to the data.

1. In the **Retriever** pane, right-click and select **Add New ShoeBox**.
2. Right-click on the new group (currently named “Shoebox”) and select **Rename**.
3. Change the name of the ShoeBox to **Wynoochee Salmon Risk Assessment** and press Enter. We are ready to start adding files to the ShoeBox.
4. Display ***tm_00.img*** and ***seattle_sub.img*** in a 2D View. Make sure ***seattle_sub.img*** is the top-most layer in the **Contents** pane.
5. First we will create a group to hold the images. Right-click on the group and select **Add Group...** Rename the group **Seattle**.
6. Add another group and name it **Landsat TM**.
7. You can drag the top layer from the View directly into the shoebox. Drag the top image (***seattle_sub.img***) from the 2D View and drop it into the **Seattle** group.
8. Now select the ***tm_00.img*** file from the **Contents** pane and drag it into the **Landsat TM** group.
9. Now we are ready to add several files to the Shoebox at once. First we will create new groups to hold the data. Create a **Terrain** and a **Soils** group.

10. Right-click on the **Wynoochee Salmon Risk Assessment** group and select **Add File...**

The Shoebox will save the absolute paths to the files that you select here. If you want to share this ShoeBox with other people, you may want to browse to those files using UNC paths (or another means of accessing the files from other computers).

*For instance, instead of browsing to **C:/SharedFolder/Filename.img**, you should browse to **//ComputerName/SharedFolder/Filename.img**.*

11. Browse to your Fundamentals input directory and use Ctrl + click to select ***dem_99.img***, ***seattle_msi.img***, ***seattle_pan.img***, ***soils_95.img***, ***subset_tm_00.img***, and ***subset_tm_88.img***. Click **OK**. All of those files are added to the top-level group in the Shoebox.

12. Drag the ***dem_99.img*** file into the **Terrain** group and the ***soils_95.img*** file into the **Soils** group.

13. Rearrange the groups and continue organizing the data until you are satisfied.

Task 2: Adding Other File Types and Viewing the Data

1. Now we will add vector data to our ShoeBox. Right-click on the top-level group and add a **Hydrology** group.

2. Select the **Hydrology** group and then right-click on it. Select **Add File...**

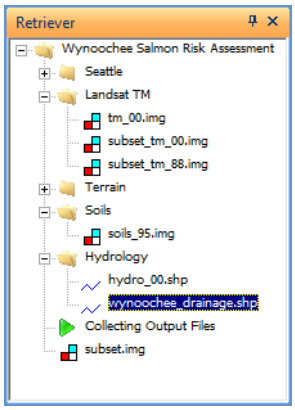
3. Change the **Files of Type** to **Shapefile (*.shp)**. Browse to the data directory and select ***hydro_00.shp*** and ***wynoochee_drainage.shp***. Click **OK** on the File Selector dialog. The vector files are added to the selected group.

4. Expand the **Terrain** group and drag the ***dem_99.img*** file into the 2D view. Drag other files into the 2D view.

5. Right-click on the Top-level group and select **Add New Outputs**.

The Outputs group will collect all of the files you create throughout the course and add them to the ShoeBox. You can then drag-and-drop the output files into their appropriate groups.

6. To save the ShoeBox, **right-click** on the top-level group and select **Save as ShoeBox file...** Browse to your Outputs directory, name the file ***wynoochee.ixp*** and click **OK**.



This ShoeBox contains most of the files that you will be using for the remainder of the class. Feel free to use it and add to it throughout the course.

7. **Clear** any open Views.

Class Notes

Exercise 2: Basic Change Detection Using the Swipe Tool

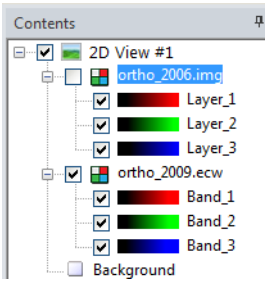
Objective: Students will perform visual change detection by loading multiple images into a View and use the swipe tool to view the underlying image.

Task 1: Using Swipe to Examine the Images

1. In a new View, open ***ortho_2006.img*** and ***ortho_2009.ecw***.Ensure that ***ortho_2006.img*** is on top in the Contents pane.

2. Zoom in a little so you can better see the empty lots.

3. Uncheck the box next to ***ortho_2006.img*** in the Content pane to undisplay that image and see ***ortho_2009.ecw*** beneath it.

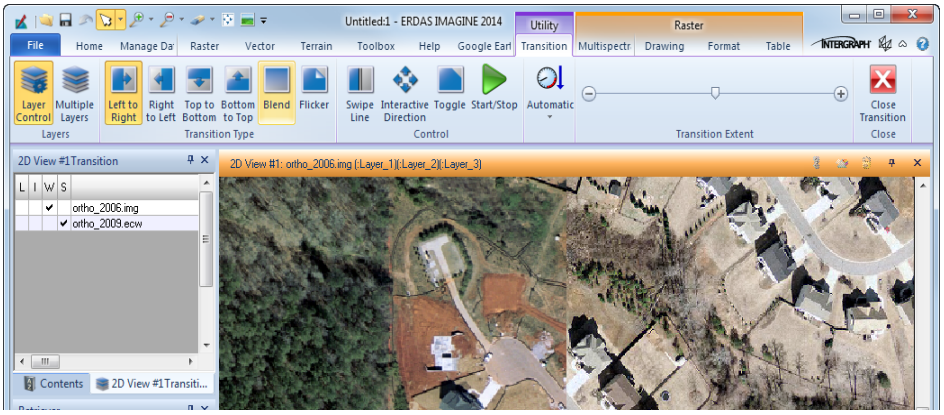


4. Use the checkbox to toggle the 2006 image on and off. When done, make sure that both images are displayed.

Now we will use the Swipe function to see the changes.

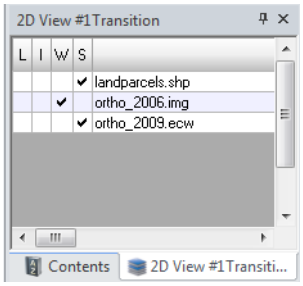
5. Start the Swipe Transition layer by clicking  **Swipe** button from the **View** group of the **Home** tab. The Transition tab is added to the ribbon and the Transition Pane is added to the left of the viewer.

You can also right-click in the 2D View and select Swipe from the Quick View functions. Blend and Flicker are also available options.



6. Use the slider in the Transition Extent group to swipe the top layer back and forth and examine the change.

7. Right-click in the View, select **Open Vector Layer**, and add ***landparcels.shp*** to the same View. You will now have three files and the Layer Control group updates accordingly.



L	Locked	The status of the selected image is locked. During a movie the status of the image remains unchanged.
I	Invisible	The selected image is always invisible.
W	Working	The selected image is visible and is affected by the Swipe status. There must be at least one working layer. The last layer in the list cannot be the working layer since there is no layer beneath it.
S	Static	The selected image is visible but it is unaffected by the Swipe status.

8. In the Layer Control, move the check for ***ortho_2006.img*** to the **W** column to make this a Working layer. Use the Transition Extent slider to swipe two layers.

9. Move the check for ***landparcels.shp*** to the **S** column to leave it displayed. Swipe only ***ortho_2006.img***.

10. Use this time to switch between modes, start / pause / stop the movie, and become familiar with the Swipe Multilayer functionality.

11. Zoom and pan around the imagery and analyze the difference between the datasets using Swipe.

12. **Close** the Transition  and **Clear** the View.

Now we are ready to examine additional data sets.

Class Notes

Exercise 3: Understanding Imagery

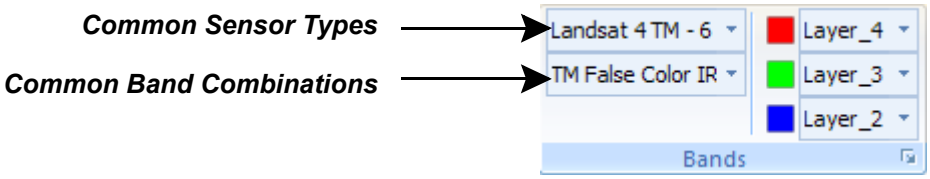
Objective: Students will become familiar with manipulating band combinations and working with image attributes.

Task 1: Display Selected Information

We will be utilizing the spectral reflectance characteristics of known features and the bands measured by LANDSAT Thematic Mapper to help identify features of interest.

1. In a View, display ***subset.img*** using the default band combination **(4, 3, 2)**.

2. Change the scale to **1:50000**.



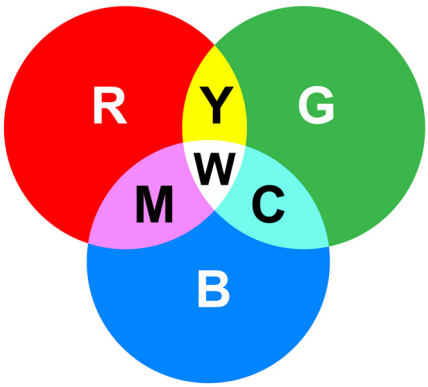
In this thematic image of soils, each color represents a different soil type.

3. In the **Bands** group under the **Multispectral** tab, notice that the **Common Sensor Types** pop-up list displays five options:
   - **Landsat 4 TM - 6 Bands**
   - **Landsat 7 Multispectral**
   - **Landsat 5 TM - 6 Bands**
   - **ASTER SWIR**
   - **Custom**

4. From the first pop-up list, select **Landsat 5 TM - 6 Bands**.

*This combination is called a **Near Infrared Color Composite** and is one of the most commonly used combinations. Features should appear as follows:*

Vegetation	Red
Crops	Pink to Red
Wetland	Dark Red
Water	Shades of Blue or Black
Urban Areas	Cyan to light Green
Bare Soil	Cyan to light Green



R = Red

G = Green

B = Blue

C = Cyan

Y = Yellow

M = Magenta

W = White

5. First, familiarize yourself with the area.

6. Within the Viewer, use the **Inquire Cursor** (on the **Home** tab) to navigate to:

47 13 40 N 123 36 58 W

7. At the coordinates defined above, you should see a distinct clearcut area. If necessary, use the **Zoom** tools to zoom in to this field. Around this area you should be able to distinguish a network of logging tracks.

Next, you will improve the appearance of these tracks for identification purposes, since they influence the rate of erosion in these areas.

8. From the **Bands** group of the Multispectral tab, change the band combination to **Red: 5, Green: 4, Blue: 3**.

In a Classic Viewer, band combinations can be changed by selecting Raster → Band Combinations.

*This is a **Short Wave Infrared Color Composite**. Features should appear as follows:*

Vegetation	Shades of Green
Crops	Shades of Green
Wetland	Shades of Green
Water	Dark Blue to Black
Urban Areas	Violet
Bare Soil	Magenta or pale Pink

Does this band combination improve your perception of these roads?

9. Now change the combination to **Red: 3, Green: 2, Blue: 1**.

*This is called a **True Color** image since we are associating the red color gun with the red band, the green color gun with the green band and the blue color gun with the blue band. This is similar to what the naked eye would see. Features should appear as follows:*

Vegetation	Olive Green
Crops	Medium to light Green
Wetland	Dark Green or Black
Water	Shades of Blue and Green
Urban Areas	White to light Gray

Bare Soil	Pinkish to light Brown

10. Use this tool to experiment and decide which band combination best displays:
    - Logging Tracks _____
    - Clearcuts _____

11. Individual bands can often provide sufficient information. Open a second View.

12. With the second View selected, click the **Open Layer** icon  . The Select Layers to Add dialog displays.

13. In the Select Layers to Add dialog, select ***subset.img*** image once more, click the **Raster Options** tab, change the **Display As** pull-down list to **Gray Scale**, change the **Display Layer** to **1**, and then click **OK**.

14. You have displayed Band 1 of this subset image in levels of gray. On the **Home** tab use the 

Link Views to Link this Viewer with the Viewer containing the subset displayed with 3 bands.

Does band 1 assist in the identification or enhancement task?

15. In the **Bands** group on the **Panchromatic** tab, change the **Show Layer** to layer **2**.

16. Try to determine whether this band helps in any way.

17. Try viewing each band separately, and determining which band(s) is of use in identifying the clearcuts.

18. Once finished, **Close** the View with the panchromatic image.

LANDSAT Thematic Mapper and the Electromagnetic spectrum.

Band 1, Blue, 0.45 - 0.52µm

- Mapping coastal water areas
- Forest types mapping
- Identifying cultural features

Band 2, Green, 0.52 – 0.60µm

- Distinguishing healthy vegetation
- Identifying cultural features

Band 3, Red, 0.63 – 0.69µm

- Discriminating different plant species
- Soil boundaries
- Geological boundaries
- Identifying cultural features

Band 4, NIR, 0.76 – 0.90µm

- Vegetation Biomass
- Crop identification
- Soil / Crop and land water contrasts

Band 6, LWIR, 10.4 – 12.4µm

- Thermal analysis

Band 5, SWIR, 1.55 – 1.74µm

Band 7, SWIR, 2.08 – 2.35µm

- Moisture content of plants & soil
- Crop drought studies
- Discrimination between clouds, snow, and ice
- Geologic rock types and soil boundaries

Task 2: Image Metadata and Histograms

1. On the **Home** tab, **Information** group, click the  **Metadata** button.

This opens the Image Metadata dialog which displays information about the image such as projection and spatial resolution.

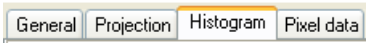
How many layers are in this image?

What is the projection information for this image?

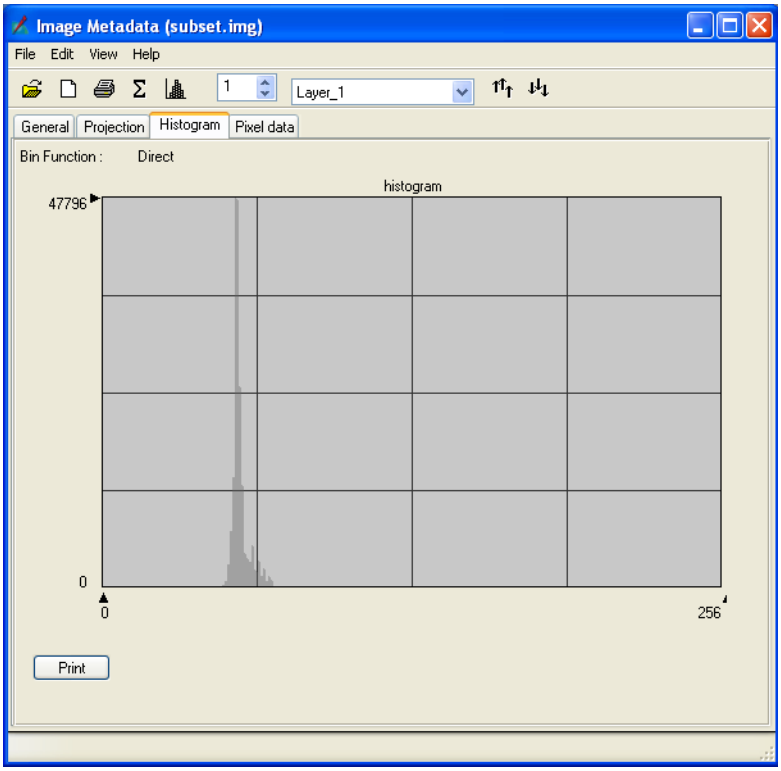
What is the spatial resolution (pixel size) for this file?

You can view a graphical histogram through the Image Metadata dialog. A histogram displays statistical information for each band in an image. There are three ways to access the histograms:

- Click the **Display the Layer Histogram** icon from the Image Metadata dialog.
- In the Image Metadata dialog, select **View →Histogram**.
- In the Metadata dialog, change to the **Histogram** tab.



2. Choose one of the three methods to open the graphic histogram display window.



The X-axis displays the range of possible brightness values. The Y-axis displays the number of pixels for any brightness values. If you change the layer in the Image Metadata dialog the histogram will update to reflect information for that layer.

What are the Minimum and Maximum values in this image? What is the Mean?

3. It is often desirable to print statistical information for an image to use as an aid when interpreting an image. You can do this by selecting **File** → **Print** or by clicking the **Print** button**. Do not print the statistics.** Click **Cancel.**

4. **Close** the open Image Metadata dialog and **Clear** the eWorkspace View.

Task 3: Changing Image Contrast

Often a feature cannot be extracted because it displays a similar color or gray scale to its surroundings. Though it may contain a different DN value, it looks similar. Adjusting the image contrast can enhance these features.

1. Click the **Open Layer** icon . In the Select Layers to Add dialog, select ***subset.img***, click the **Raster Options** tab, and enable the **No Stretch** checkbox, then click **OK**.

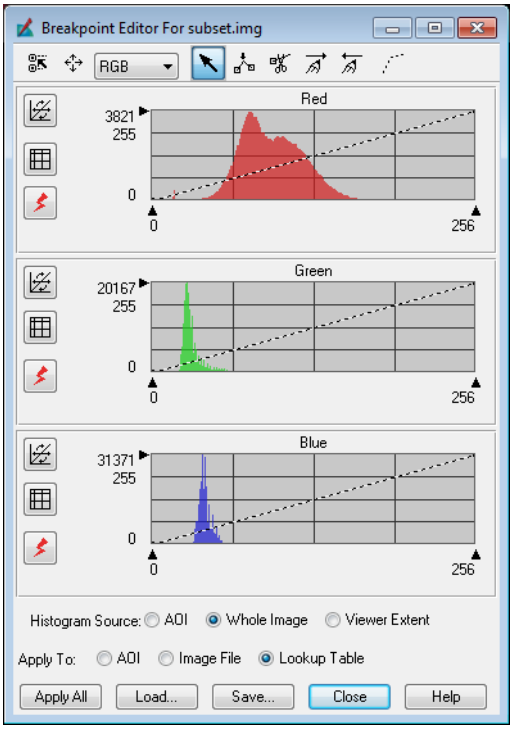
By default, ERDAS IMAGINE displays an image with a Percent Clip (Percentage LUT) stretch; this is how an image appears without that stretch. The capability of displaying imagery with or without a contrast stretch can be set in the preferences.

2. On the **Multispectral** tab, select **Adjust Radiometery.** From the Standard Streches thumbnails, find and select **Standard Deviation Stretch**.

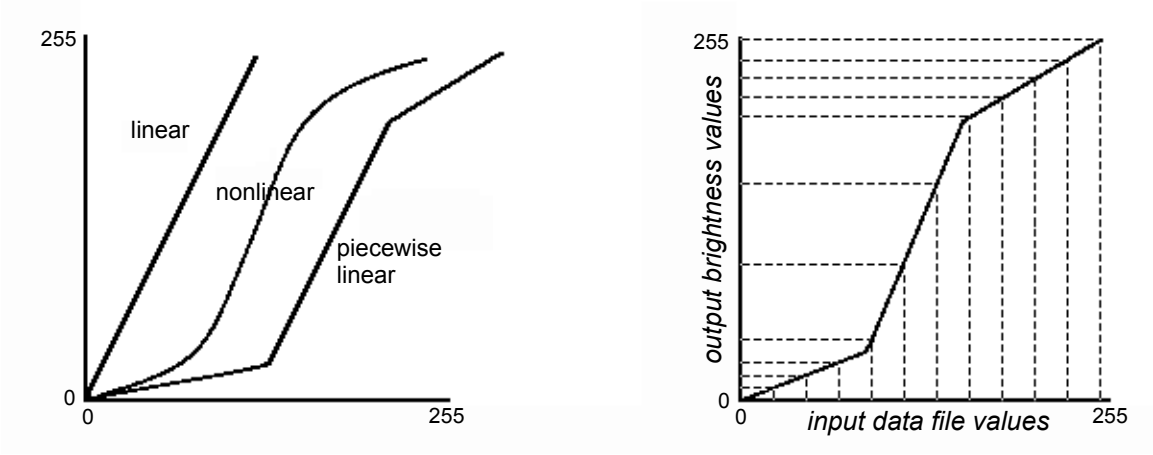
Why did the image first appear 'dark'?

3. Select **Undo** on the Quick Access toolbar.

4. To view the value changes that are occurring, select **Adjust Radiometry** → **Breakpoints**.



5. Redo the SD stretch (**Multispectral** tab → **Adjust Radiometry** → **Standard Deviation Stretch**). Click the **Apply All** button in the Breakpoint Editor.



Linear Contrast Stretch

A simple way to improve the visible contrast of an image. It is often necessary to contrast stretch raw image data, so that they can be seen on the display.

Nonlinear Contrast Stretch

A way to gradually increase or decrease contrast over a range, instead of applying the same amount of contrast (slope) across the entire image. Usually, nonlinear enhancements bring out the contrast in one range while decreasing the contrast in the other ranges.

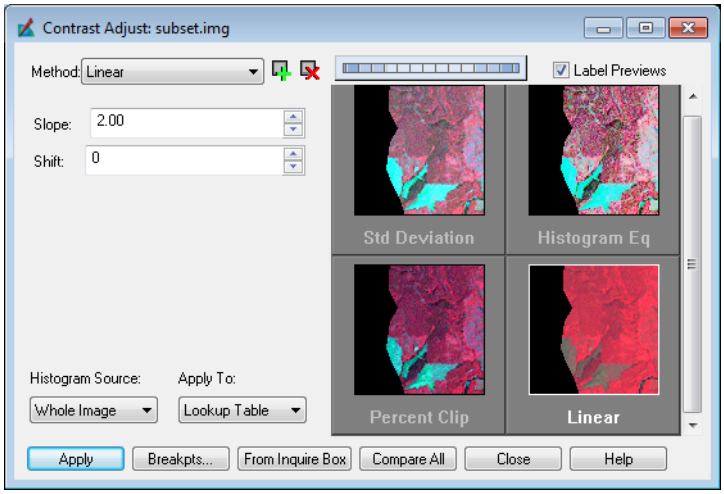
Piecewise Linear Contrast Stretch

A way to enhance a specific portion of data by dividing the lookup table into three sections: low, middle, and high. You can enhance the contrast or brightness of any section in a single color gun at a time. This technique is very useful for enhancing image areas in shadow or other areas of low contrast.

The Standard Deviation Stretch is what type of stretch (linear, nonlinear, piecewise linear)?

6. **Close** the Breakpoint Editor.

7. Click  **Adjust Radiometry**. This time, select **General Contrast**.



8. Change the Method to **Histogram Equalization**, change the Histogram Source to **Whole Image**, and look at the preview image.

What has this done to your image? What is highlighted? What is lost?

9. Change the Method to **Percentage LUT**. This is the default stretch in IMAGINE.

The Percent Clip (Percentage LUT) stretch allows you to set how much is clipped off of each end of the histogram.

By default, how much is clipped off of the left side of the histogram? The right side?

10. Adjust the thumbwheel at the top of the General Contrast Tool so that you can see previews of all of the contrast stretches you have selected.

11. Change the Method to **Linear**, and then set the Slope to **2.0**.

12. Click the **Breakpts** button.

13. In the Contrast Adjust Tool, click **Apply**.

What has the slope change altered in the Breakpoint Editor?

14. Set the Shift to **15** and click **Apply**. In the Breakpoint Editor, click **Apply All**.

What has this highlighted?

15. **Close** the Breakpoint Editor.

16. Reset the Slope to **1.0** and the Shift to **0**. Click **Apply** and **Close**.

17. Open a second Viewer and display ***tm_00.img***, using the **No Stretch** option.

18. Zoom in on the area we are studying. If necessary, link the two Views together in order to navigate back to that location.

19. From the **Extent** group of the **Home** tab, set the **Scale** to **1:50000**.

20. You can restrict the area to which a stretch is applied. From the **Insert Geometry** group on the **Drawing** tab, click the **Create Rectangle** icon  .

21. In the second Viewer and click and drag a rectangle over a clearcut area.

22. In the 2D View #2 group of the **Contents** pane, select ***tm_00.img***. On the **Multispectral** tab, select **Adjust Radiometry→ General Contrast**.

The Histogram Source and Apply To radio buttons are automatically set to AOI.

23. Change the Method to **Linear** and set the Slope to **2.0**, and the Shift to **15**, then click **Apply**. Click **OK** in the **Warning** dialog that appears.

Does this stretch improve the appearance of this area?

24. Try a few more contrast stretches and preview them in the contrast tool.

Which stretch best improved the appearance of the clearcut area?

25. **Close** the General Contrast tool and remove all images from the Viewers. Click **No** when asked to save changes before closing.

Class Notes

Class Notes

Exercise 4: Examining Raster and Vector Attributes

Objective: Students will examine raster attributes in a thematic image, and learn some of the techniques for manipulating these attributes.They will also review a stream coverage that was created for a study region in 1975. Using this vector coverage, you will visualize the sensitivity of the salmon populated streams to environmental changes.

Task 1: Display Raster Attributes

1. Open the image ***soils_95.img*** in a View. In this thematic image of soils, each color represents a different soil type.

2. To determine which color represents which soil, select the ***soils_95.img*** in the **Contents** pane and then click on the **Table** tab.This displays all of the functions that can be used with Tables in IMAGINE.

3. Click the  **Show Attributes** button. This displays the Raster Attributes Table below the imagery.

soils_95.img

Row	soil_type	id	Color	Red	Green	Blue	characteristics	Opacity	moist_reg	Histogram
4	I9b	4		0.81	0.69	0.55	Loam - forested	1	Udic	789254
5	S9c	5		1	1	0	Very Gravelly Sandy Loam - forestland	1	Udic	7591
6	G9f	6		0.24	0.87	0.8	Sandy Loam - forested	1	Udic to Xeric	40292
7	I9b	7		0.82	0.69	0.55	Loam - forested	1	Udic	108558
8	G9	8		0	0.88	0	Very Gravelly Sandy Loam	1	Udic	239052
9	I9b	9		0.82	0.69	0.55	Loam - forested	1	Udic	1019
10	I9b	10		0.82	0.69	0.55	Loam - forested	1	Udic	552
11	W	11		0	0	1	Water	1		66841
12	G8	12		0	0.61	0	Gravelly Silt Loam - forested	1	Xeric to Udic	102439
13	I9d	13		0.95	0.95	0.86	Fine - dark - humus rich	1	Udic	799016
14	W	14		0	0	1	Water	1		17577

4. Click on various locations within the Viewer and take note of which rows are highlighted in the CellArray™. Each row represents a different soil.

5. To view a particular soil in a Viewer, place the pointer over the specific **color** patch, click, and change the color to **chartreuse**. This particular soil type is now more obvious.

6. To undo the changes, click the Undo button on the Quick Access toolbar.

Task 2: Selecting Soils Based on a Criteria

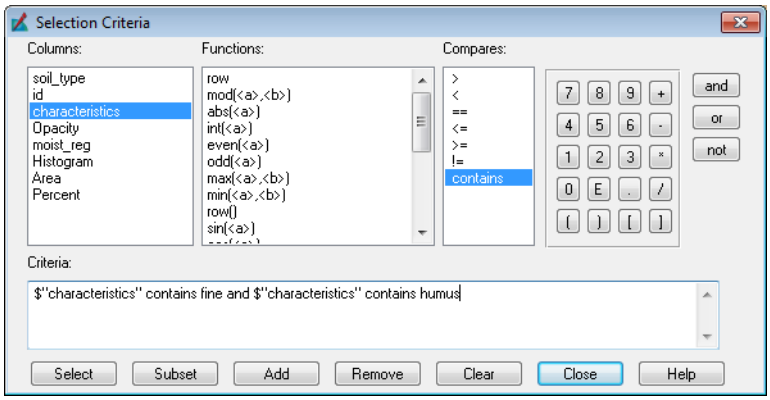
Now you will select the soils that are most sensitive to erosion.

1. In the **Row** group on the **Table** tab, click the **Criteria** button. The Selection Criteria dialog displays.

The Selection Criteria dialog is used to build a statement for selection. You will assume that soils that are humus-rich and fine in texture, have higher erosion potential.

$"characteristics" contains humus and $"characteristics" contains fine

2. To generate the above statement using the mouse:
   - Select **characteristics** from the **Columns** list
   - Select the **contains** operator from the **Compares** list
   - Type: **humus**
   - Click the **and** button
   - Select **characteristics** from the **Columns** list
   - Select the **contains** operator from the **Compares** list
   - Type: **fine**



3. When the statement is complete, click the **Select** button. All soils matching the criteria are selected in the CellArray. If the process was successful, you will notice that the CellArray has two rows highlighted in **light blue**.

If you were not successful, check and/or correct the syntax of the criteria statement then click the Select button again.

4. Click **Close** and in the Selection Criteria dialog.

As these are the targeted soils, you will want to mask out all others (remove the appearance of others from the screen).

5. Click the  **Invert Row Selection** button.

*You could also **right-click** in the Row column and select **Invert Selection**.*

6. Click on the **Opacity** column and then right-click on the same column. Select **Formula**. The Formula dialog displays.

7. Type **0** in the Formula textbox. Click **Apply** and **Close**.

8. Leave one remaining View open and click the **Clear View** icon  to clear it of all images.

9. When prompted to Save Changes, Click **No**

Task 3: Studying Previous Results

You will import results from a previous (circa 1975) study done in the same area, which are in an Shapefile format.

If the sensitivity = 1, then the river has high potential of sedimentation.

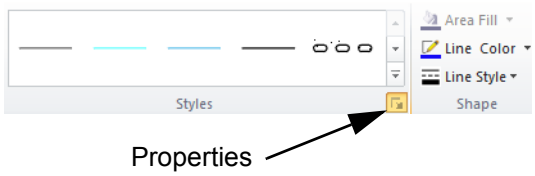
If the sensitivity index = 3, then the river has low potential of sedimentation.

10. In a single Viewer, display ***soils_95.img*** and ***hydro_75.shp***, making sure that ***hydro_75.shp*** is the topmost layer.

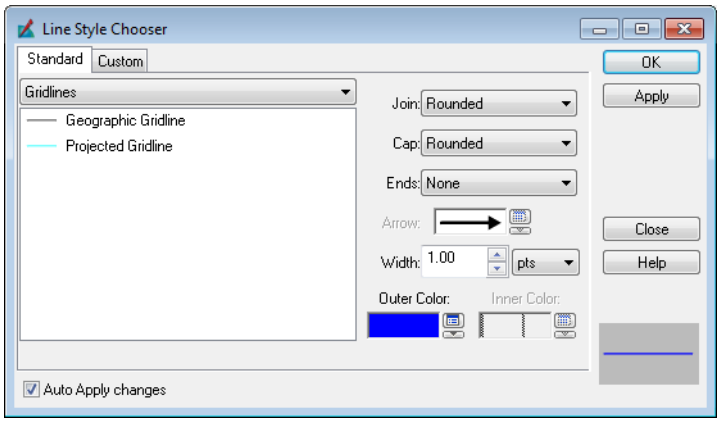
11. On the **Style** tab in the **Shape** group, click on the right part of the  **Line Color** button. Select the Blue color patch.

12. Click **Line Style** and change the **Line Thickness** to **2**.

13. To have greater control over the styles, click the Properties button= in the bottom right corner if the Styles group.



14. The Line style properties dialog is displayed. Change the **Width** to **1.5**.



15. In the Properties dialog, click **Close**. Select **No** when prompted to save the Symbology.

Can you see any differences among the various branches of the river?

16. On the **Table** tab, click the **Show Attributes** button. The Attributes for ***hydro_75*** dialog displays.

17. Click the **Criteria** button.

18. Use the mouse to create the following expression:

$"SEN_IDX" ==1 or $" SEN_IDX" ==2

19. Click **Select**.

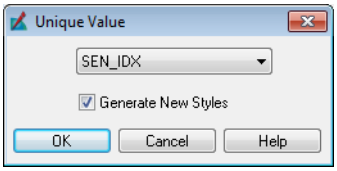
The selections will highlight as blue within the CellArray and yellow in the Viewer.

20. In the Rows group, click the  **Unselect Rows** button.

21. Click **Close** in the Selection Criteria dialog, then **close** the Attribute Panel.

It would be advantageous to distinguish between more sensitive streams. To do this, you will create different line types using Symbology.

22. On the **Style** tab, click the  **Unique Value** button. The Symbology dialog displays.



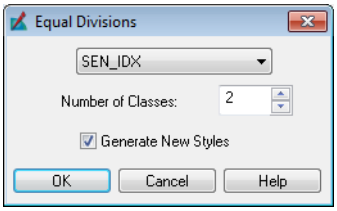
23. In the Unique Value box, click the pull-down arrow and select **SEN_IDX** from the list.

24. Enable the **Generate New Styles** checkbox, then click **OK**.

25. Click **Apply**.

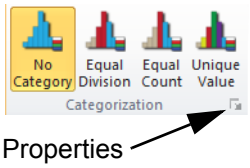
What do the different automatic options do? (Hint: See On-Line Help)

26. After reviewing the vector coverage on the screen, return to the **Categorization** group, and select  **Equal Divisions**.



27. In the dialog that displays, click the pull-down arrow and select **SEN_IDX**, change the **Number of Classes** value to **2**, and enable the **Generate New Styles** checkbox, then click **OK**.

28. To adjust the grouping, click the Properties button in the bottom right corner of the Categorization group.



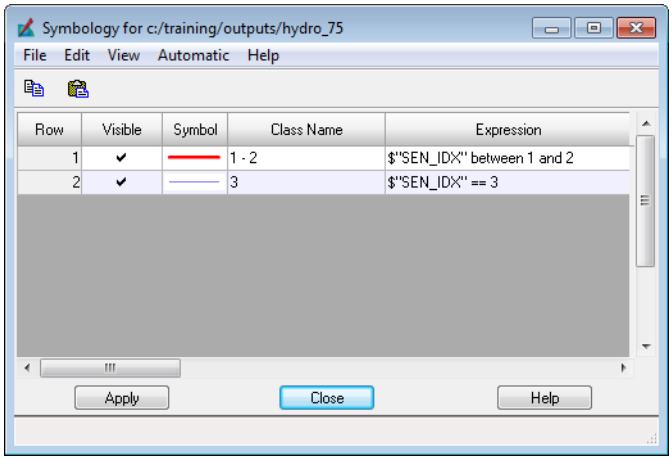
29. In the Symbology dialog, change the **Class Name** of the first entry to **1-2** and the second to **3**.

30. Change the expression of Row 1 to:

$"SEN_IDX" between 1 and 2

31. Change the expression of Row 2 to:

$"SEN_IDX" == 3



32. Click **Apply**.

33. To change the symbology of the different divisions, click on the **Symbol** patch for Row 1, and select **Other**.

34. Change the symbol to a **Red** line with a width of **2.0**.

35. For Row 2, change to **blue** with a width of **0.5**.

36. Click **Apply** and **Close** in the Symbology dialog. Answer **Yes** when prompted whether to save the Symbology file and type ***hydro_75.evs***. Press **Enter** and click **OK**.

37. **Clear** all open Views.

Class Notes

Class Notes

Exercise 5: Image Mosaic

Objective: Students will use two aerial photographs for analysis and mosaic them into a single image.

Task 1: Mosaicking Ortho Images

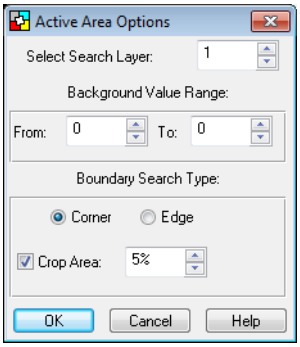
1. Display ***ortho_282.tif*** and ***ortho_281.img***.
2. From the Home tab, select  **Swipe** to examine the overlap between these images.
3. When finished, close the **Transition** tab.

What are the projections and resolutions of each of the input images?

4. Leave the images open in the Viewer.
5. From the **Raster** tab, select **Geometry** group →  **Mosaic** → **Mosaic Pro**. The Mosaic Pro Workstation is displayed.
6. From the MosaicPro toolbar, click the **Add Images** icon  .
7. From the Add Images dialog, select ***ortho_281.img***.
8. Click the **Image Area Options** tab.
9. Enable the **Compute Active Area** radio button.

What does the Compute Active Area radio button do?

10. Click the **Set** button and an Active Area Options dialog displays.



11. Specify that the **Boundary Search Type** is to be computed from the **Corners** of the image.

12. Select **Crop Area** and change it to **5%** in order to eliminate unnecessary fiducial marks on the edges and then click **OK**.

13. Click **OK** in the Add Images dialog.

14. In the Add Images dialog, click the **OK** button and a graphical outline representing your image displays in the Mosaic Tool.

15. Repeat the **Add Image** process for ***ortho_282.tif***, remembering to select the **Image Area Options** tab and setting **Compute Active Area** to **Corner** and ***deselecting*** the **Crop Area**.

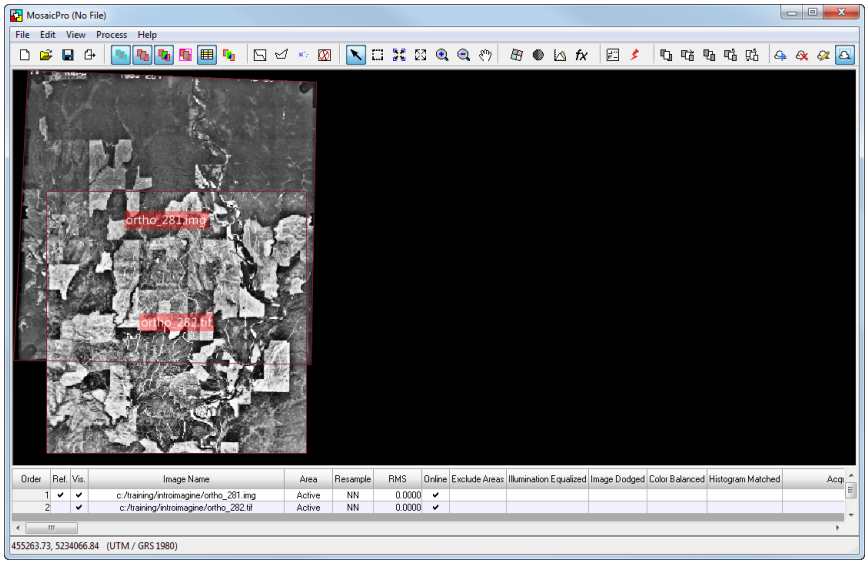
To delete an image from the Mosaic Tool, highlight the image in the CellArray, right-click in the Order column, and click Delete Selection.

Images could have been taken on different days, times or seasons. This will lead to images with different contrasting. To compensate this, the Mosaic Tool provides Contrast Matching options.

16. Click in each of the **Vis** cells to place checkmarks there.

17. Click the **Show Images** icon  to display all of the images in the workspace.

*Only those images that have a ✔ in the **Vis** column will be displayed.*



18. Click the **Color Corrections Options** icon  . A Color Corrections dialog displays.

19. Enable the **Use Histogram Matching** checkbox, then click **OK**.

Which image will be the reference in the histogram matching?

How can we change the reference image?

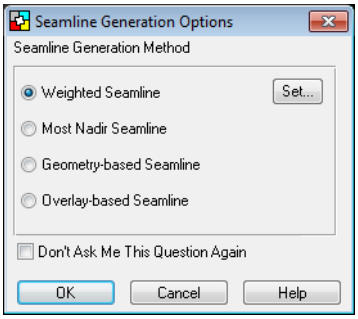
How does the reference image affect our output mosaic?

Task 2: Creating Seamlines

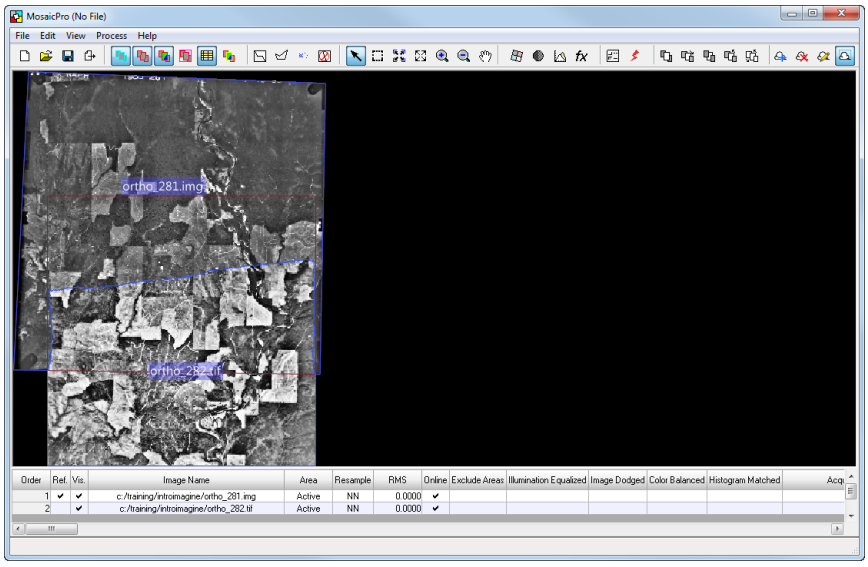
Seamlines are used to define where the seam between the images will be made.

1. Ensure that the Display Seam Polygons button  is toggled on.

2. Click the **Automatically Generate Seamlines** icon  .



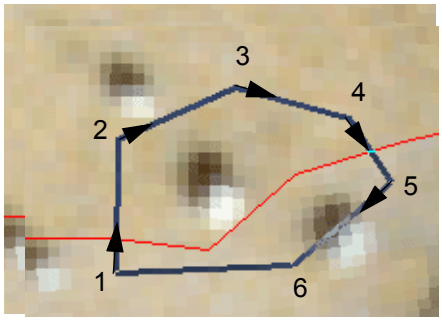
3. Enable the **Weighted Seamline** option and click **OK**.

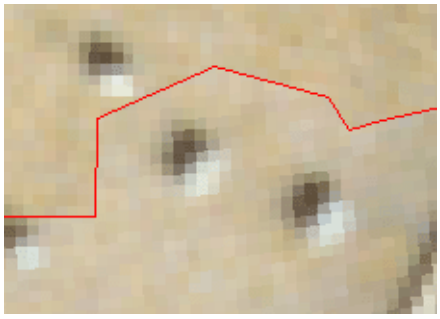


4. **Zoom** in on the seamline.

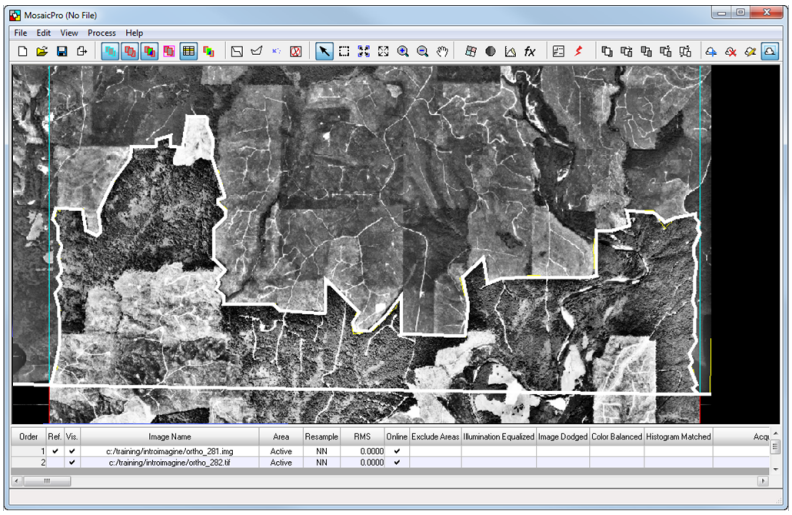
5. Click the **Edit seams polygon** icon  .

6. Digitize a polygon around a portion of the seamline. See below. The side of the seamline from which the polygon originated is the one that will increase in size when the polygon is completed.

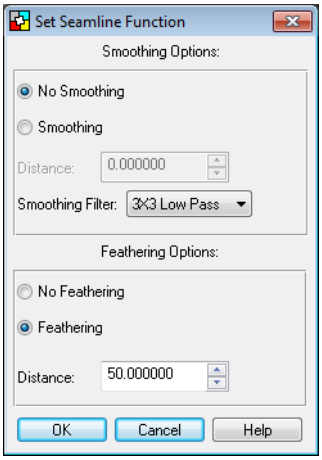




7. Move along the seamline and make any additional changes where necessary. The seamline will be displayed in the mosaic canvas.



8. From the Mosaic Pro Toolbar, click the **Set Seamline Function** icon  . This allows us to set the function used to handle the areas within the overlap.



9. Enable the **Feathering** radio button.

The feathering operation could be used to blend the transition between the two images. More feathering occurs at the seamline and its intensity decreases as you move away from the line.

10. Set the Distance to **50**.

11. Click **OK**.

Task 3: Defining the Output

The Mosaic Tool allows you to define the extent of your output through the use of an AOI. This can save disk space and eliminate the need for subsetting at a later stage.

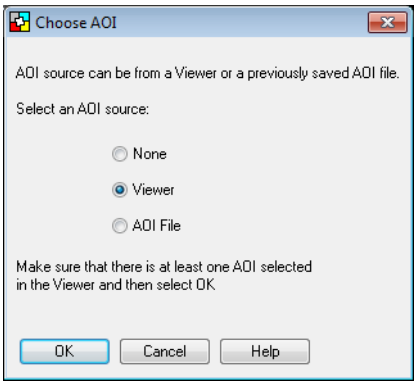
1. In the eWorkspace Viewer containing the images, click on the **Drawing** tab.

2. Click the **Create Polygon** icon . Create an AOI polygon encompassing the Wynoochee River, and a large percentage of the clearcuts on either side of the river.

The Wynoochee River meanders from top to bottom on the right side of the image.

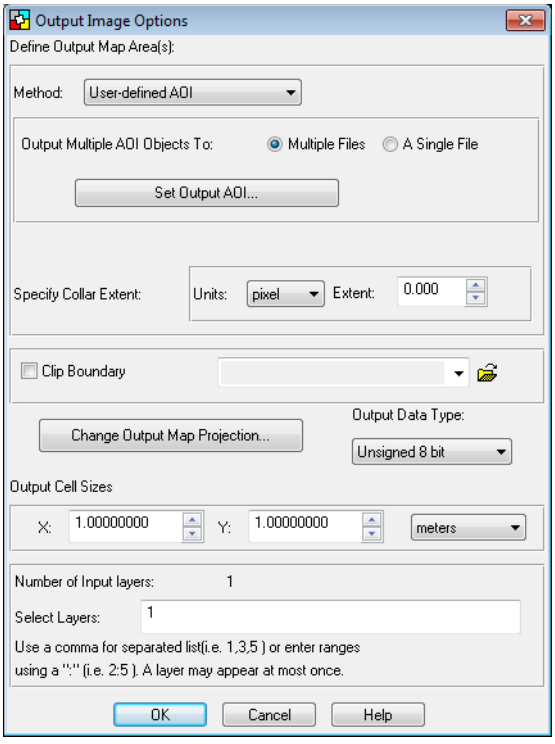
3. In the Mosaic Pro toolbar, click the **Set Output Options** icon . The Output Image Options dialog displays.

4. In the Output Image Options dialog, change the **Method** to **User-defined AOI**, then click the **Set Output AOI** button.



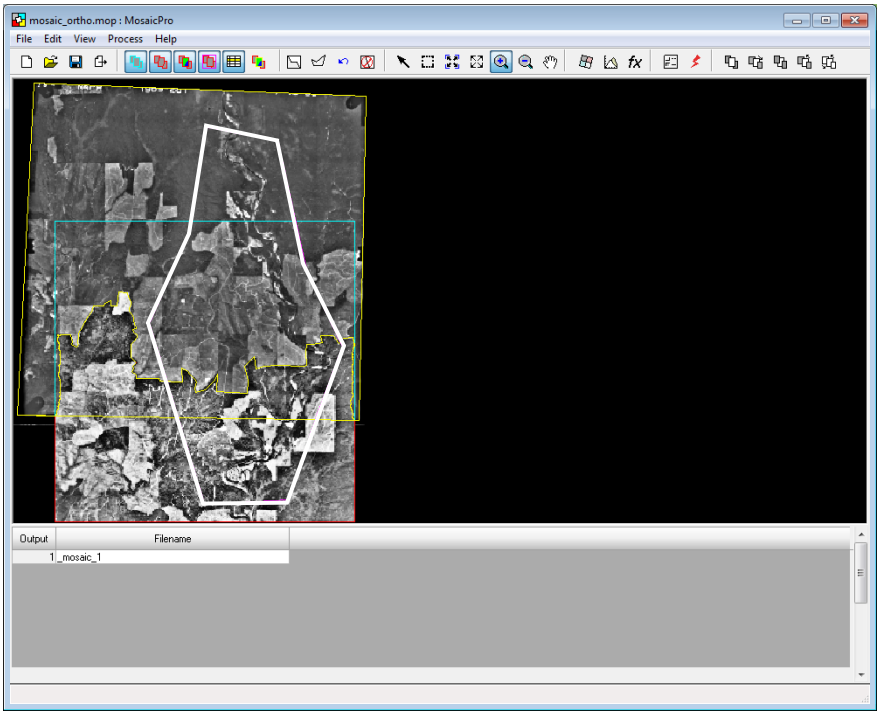
5. Select **Viewer** as the AOI Source, ensure that the AOI is selected in the Viewer (it has blue handles around it) and then click **OK**.

The Mosaic Pro Tool has (by default) adopted the projection of the reference image (first image in the mosaic list) for the output. If you need a different output projection, you can change this by using the Change Output Map Projection button.



6. Click **OK** in the Output Image Options dialog.

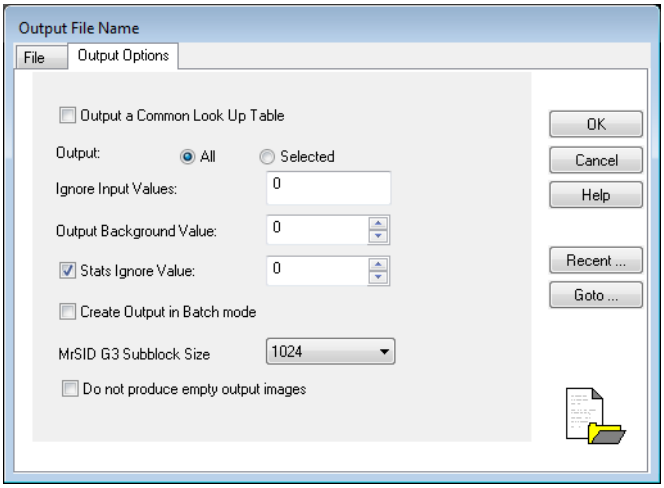
7. Click on the **Display Output Area Boundaries** button  . You will now see a magenta graphical outline that defines the extent of the output.



8. In the Mosaic Tool menu, select **Run Mosaic**  . This displays an Output File Name dialog.

9. In the **File Name** text box, type ***mosaic.img***.

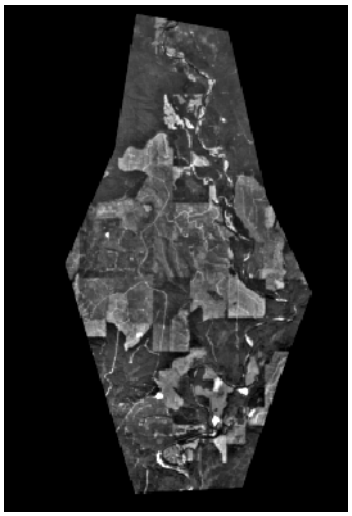
10. Click the **Output Options** tab and enable the **Stats Ignore Value** checkbox.



11. Click **OK**.

Ignoring zeros in the Stats calculations, prevents the background values from skewing the image histograms and causing the image to appear 'washed-out'.

12. When the Mosaic Job State reads **Done**, click **OK** to complete the process.

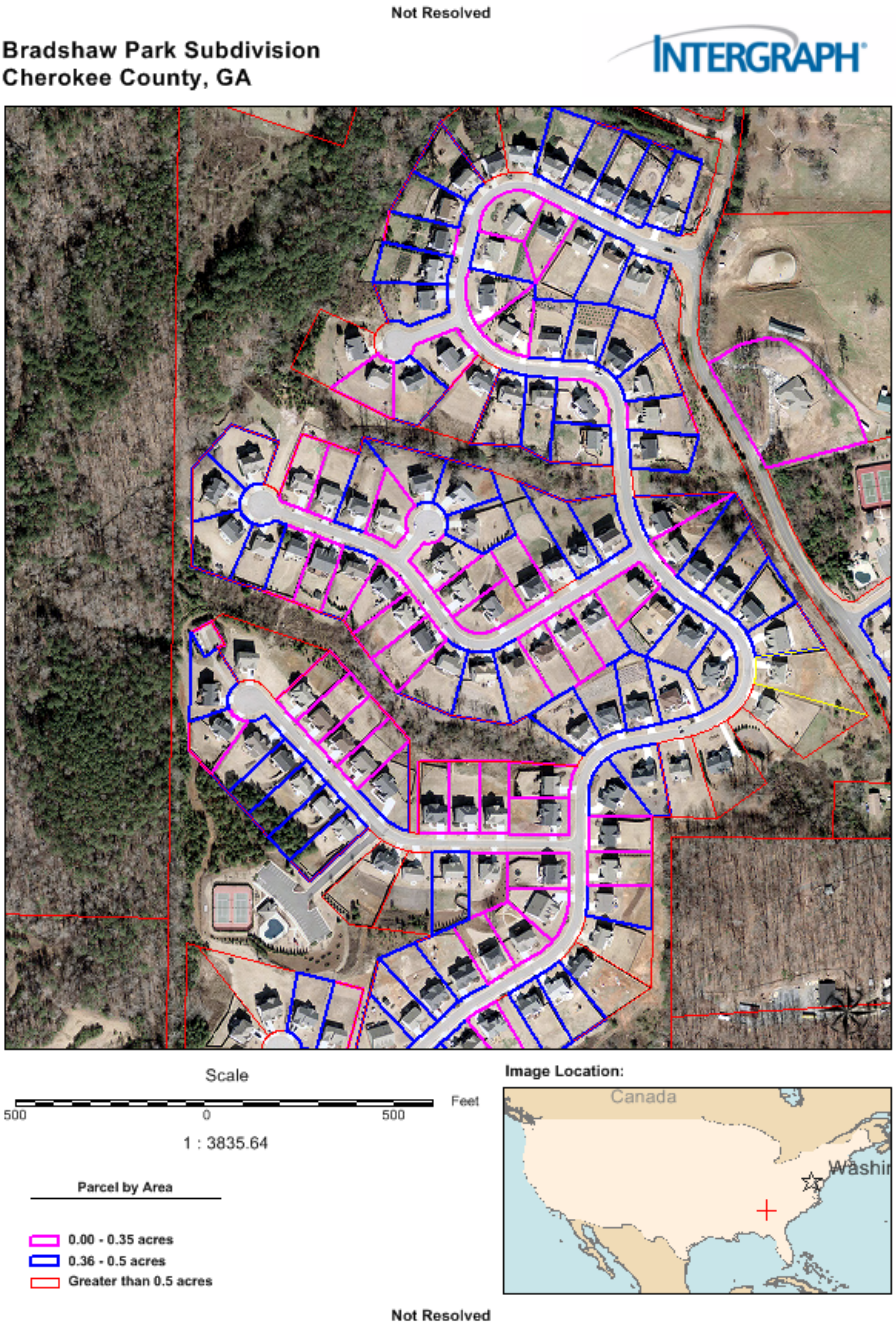


13. In a Viewer, display your output file. Use the **Interactive Zoom** tools to determine the accuracy and contrast matching of your mosaicked overlap area.

14. **Close** the Mosaic Pro Tool. Save the output Project file as ***mosaic_ortho.mop***.

15. **Close** any open Viewers.

We defined the output image area using an AOI. What are other ways of defining the output area?

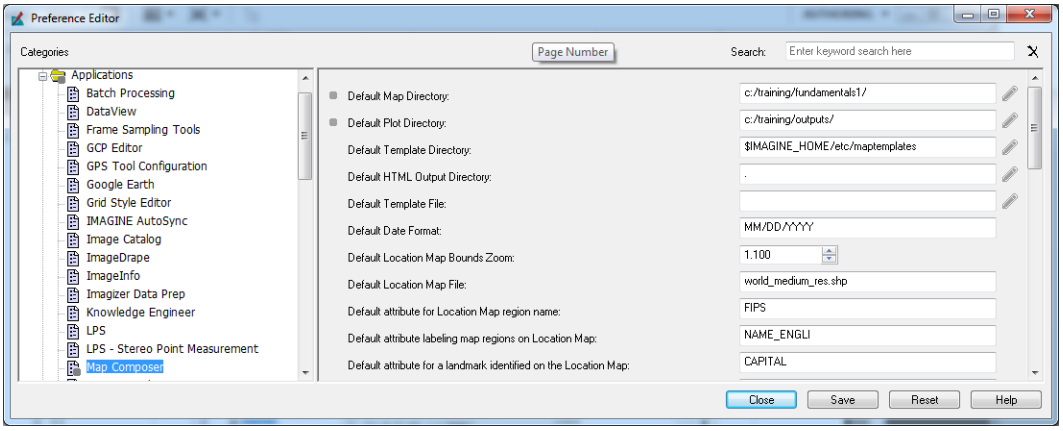

Not Resolved
Bradshaw Park Subdivision
Cherokee County, GA
INTERGRAPH
Scale
500
0
500
Feet
1 : 3835.64
Parcel by Area
0.00 - 0.35 acres
0.36 - 0.5 acres
Greater than 0.5 acres
Image Location:
Canada
Washi
Not Resolved

Challenge 2: Creating a Map Composition

Objective: Students will create and edit a map composition that will be part of a preliminary presentation to local politicians and business leaders.

Task 1: Setting Map Preferences

1. Open the Preference Editor by selecting **File** → **Preferences**.
2. Expand **Applications** and select **Map Composer**



3. Change the **Default Map Directory** to the Data directory.
4. Change the **Default Plot Directory** to the Outputs directory.
5. Click **Save** and **Close**.

Task 2: Prepare Data for Composition

1. In a View, display the image ***ortho_2009.ecw***. (You may need to change the Files of Type filter to ECW.)

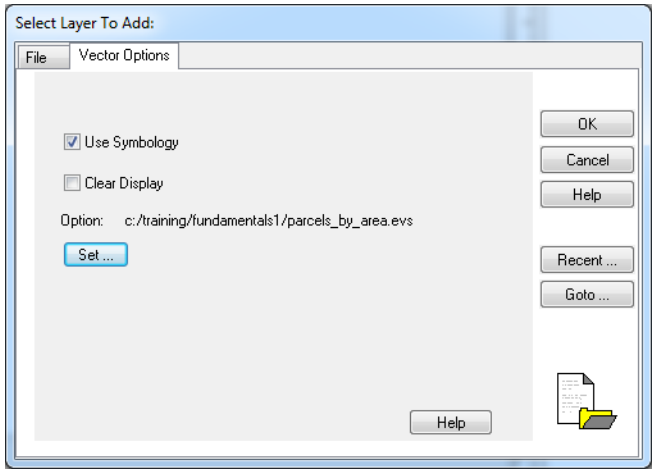
2. Right-click in the View and select **Fit to Frame**.

3. In the same View, select **File** → **Open** → **Vector Layer...**

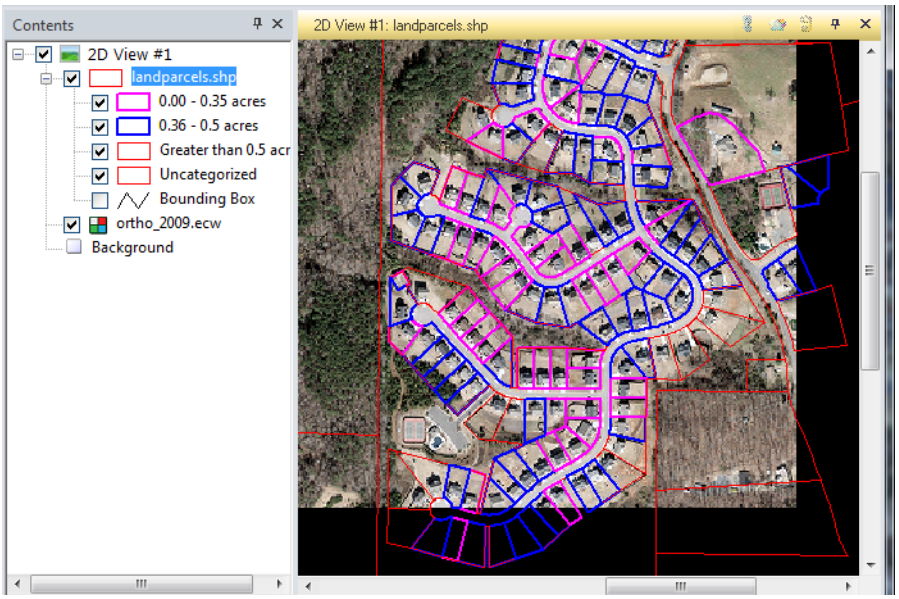
4. Browse to your default directory and select (*do NOT double click*!) ***landparcels.shp***.

5. Click the Vector Options tab and check **Use Symbology**. **Click Set...**

6. On the Choose Symbology button, select ***parcels_by_area.evs***. Click **OK**.

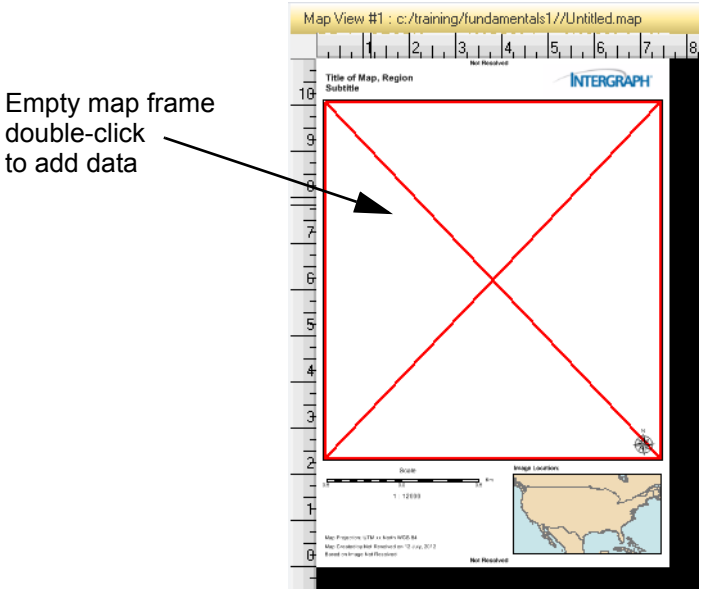


7. Click **OK** on the Select Layer to add dialog. The Vector Layer is displayed on top of the ortho raster with symbology already applied to it.



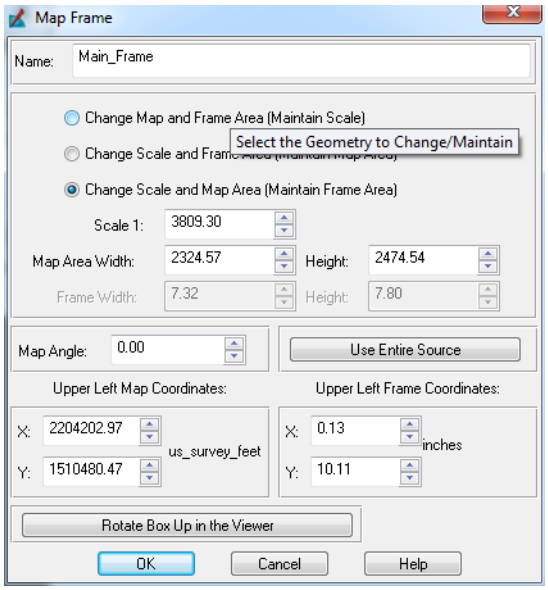
8. From the **Home** tab, click **Add Views** → **Create New Map View**. An empty map composition is created in the Map View.

9. On the **Layout** tab, in the **Map Template** group, select the **Geospatial Analysis** template.



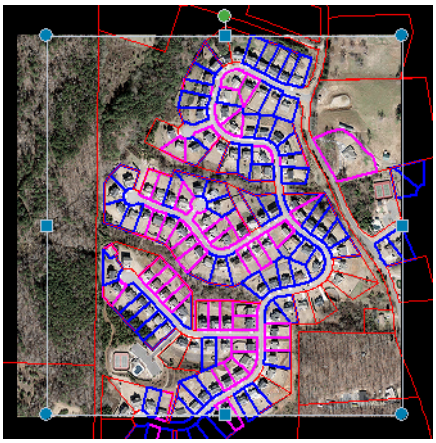
10. Double-click on the empty map frame (the area with the red X).

11. Click inside the View containing the data we want to load in the map. The Map Frame dialog is opened, along with a box indicating the portion of the data that will be loaded in the map frame with the default settings.



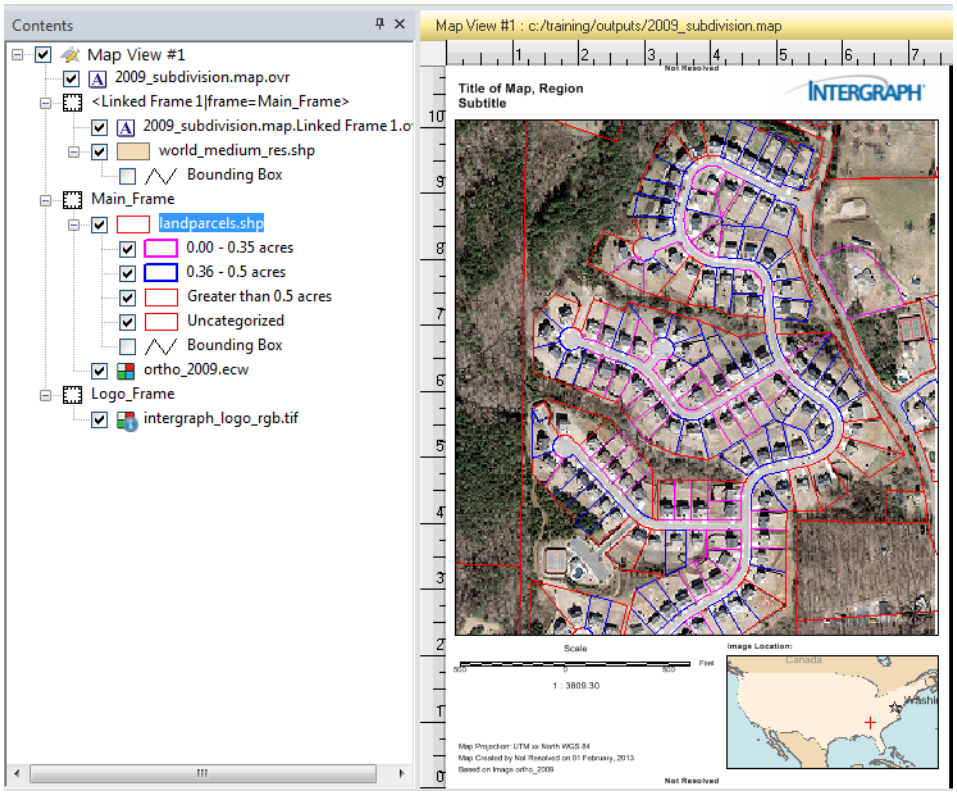
12. Select the **Change Scale and Map Area (Maintain Frame Area)** radio button.

13. Drag the box in the 2D View to encompass the majority of the image. Enlarge or shrink the box by dragging the corners. Some parcels will not be included.



14. When satisfied, click **OK** on the Map Frame dialog.

All of the data displayed in the 2D View is loaded into the map composition.



15. **Close** the 2D View.

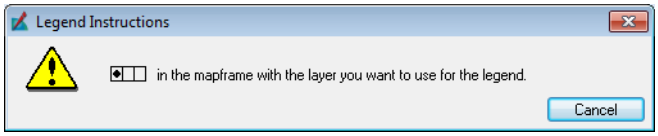
16. Save your map composition as ***2009_subdivision.map***.

Task 3: Adding a North Arrow, Legend, Grid Lines and Title

Next, you will create a map legend.

1. In the **Insert Map Element** group of the **Drawing** tab, click the  **Legend** button.

2. Click in the white space between the scale bar and the Image Location map.



3. Follow the prompt and select the main map frame that contains the ***landparcels.shp*** file. The Legend Properties dialog displays.

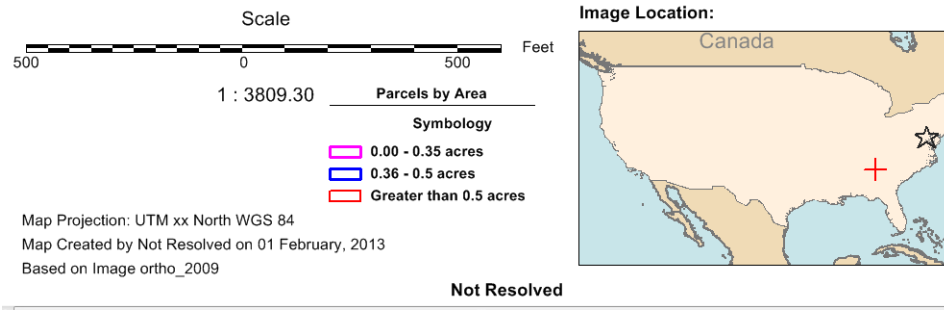
4. In the **Basic** tab, using **LMB + Shift**, select **Rows 2-4**.

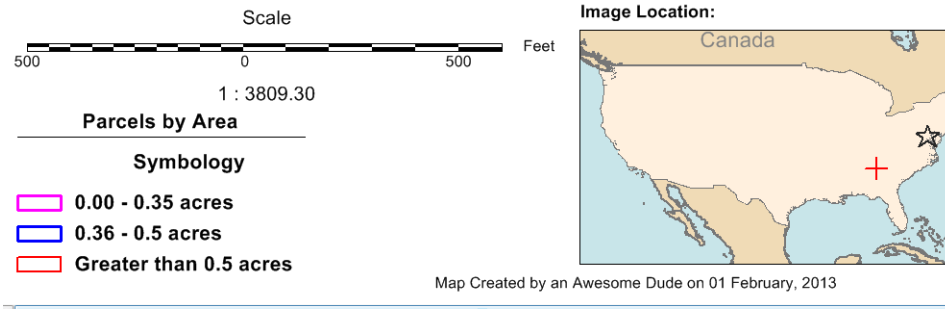
5. Select the **Title** tab and change the **Title** from **Legend** to **Parcels by Area**.

6. Click **Apply** and **Close**.

7. Click the newly created legend to select it. Resize and move the legend so that it fills in the available white space.

8. .Make room for the Legend by moving or deleting text from the bottom of the map canvas.



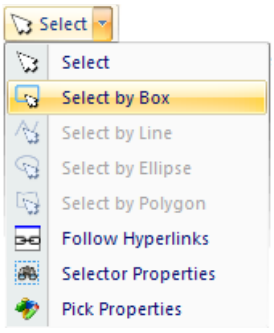


9. With the legend selected, in the **Arrange** group, select **Ungroup** twice.

10. Select only the word ***Symbology*** and click the **Delete** icon in the **Edit** group.

You can also remove the selected annotation by pressing the Delete key on the keyboard.

11. From the **Modify** group, click the **Select** menu button and choose **Select by Box**.



12. Draw a bounding box around the remaining legend parts.

13. Click the **Group** button in the **Arrange** group.

14. At the top of the map, click on the Title of Map, Region text to select it. **Delete** the existing text.

15. Click the **Create Text Annotation** icon A .

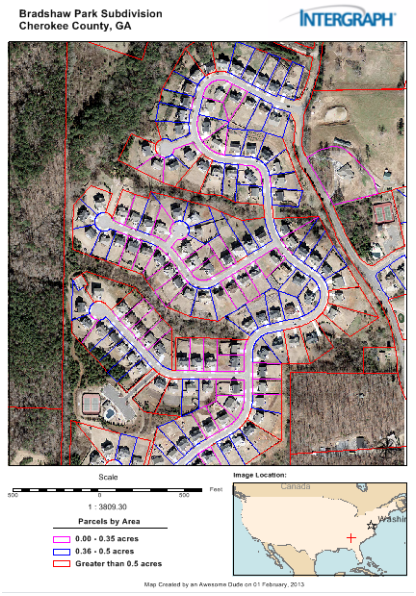
16. Click on the canvas where the text was deleted.

17. Type ***Bradshaw Park Subdivision***. Press Enter.

18. In the next line, type ***Cherokee County, GA***.

19. Use the tools in the **Font/Size** group to change the size, color, and style of the font.

20. Now that your map composition is finished, click the **Save** icon .



Task 4: Send map to a PowerPoint slide

Now we will send the map to a PowerPoint slide deck for our presentation.

1. From the **Manage Data** tab, select **Office Tools** → **Send to PowerPoint** → **New Presentation**.

2. Click **Yes** if you see a dialog asking to Save All Layers.

A new PowerPoint presentation is created with the map inserted into the first slide.

3. **Clear** any open Views and dialogs.

Class Notes

Class Notes