ERDAS IMAGINE ® Tour Guides™



- when it has to be right

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ERDAS IMAGINE Tour Guides

Preface

About This Manual

The *ERDAS IMAGINE Tour Guides*[™] manual is a compilation of tutorials designed to help you learn how to use ERDAS IMAGINE[®] software. This is a comprehensive manual, representing ERDAS IMAGINE and its add-on modules. Each guide takes you step-by-step through an entire process. The tour guides are not intended to tell you everything there is to know about any one topic, but to show you how to use some of the basic tools you need to get started.

This manual serves as a handy reference that you can refer to while using ERDAS IMAGINE for your own projects. Included is a comprehensive index, so that you can reference particular information later.

There are several sections to this manual. These sections are based upon the way in which ERDAS IMAGINE is packaged. The following sections are composed of the tour guides you go through in a step by step fashion to learn detailed information about the various ERDAS IMAGINE functions.

- Section I—IMAGINE Essentials™
- Section II—IMAGINE Advantage™
- Section III—IMAGINE Professional[™]
- Section IV—IMAGINE Radar Interpreter[™]
- Section V—IMAGINE Vector™

Example Data

Data sets are provided with the software so that your results match those in the tour guides. The data used in the tour guides are in the <IMAGINE_HOME>/examples directory. <IMAGINE_HOME> is the variable name of the directory where ERDAS IMAGINE resides. When accessing data files, you must replace <IMAGINE_HOME> with the name of the directory where ERDAS IMAGINE is loaded on your system.

Time Required

Each individual tour guide takes a different amount of time to complete, depending upon the options you choose and the length of the tour guide. The approximate completion time is stated in the introduction to each tour guide.

Documentation

Digital Hardcopy Documentation This manual is part of a suite of on-line documentation that you receive with ERDAS IMAGINE software. There are two basic types of documents, digital hardcopy documents which are delivered as PDF files suitable for printing or on-line viewing, and On-Line Help Documentation, delivered as HTML files.

The ERDAS IMAGINE Digital Hardcopy Documentation is designed to provide comprehensive information about a particular concept or to walk you through complicated steps in a process like the Installation of IMAGINE or Advanced Classification. The Digital Hardcopy Documentation also contains programming reference material, such as the ERDAS Macro Language Reference Manual which helps you design your own IMAGINE dialogs. These documents may be found in the <IMAGINE_HOME>/help/hardcopy folder.

1

To read the IMAGINE Digital Hardcopy Documentation, you must install Adobe Acrobat Reader 4.0 or higher and follow all installation instructions provided by the software, especially those regarding internet browser and Acrobat integration.

Following is a list of Digital Hardcopy Documentation that is available with ERDAS IMAGINE software:

- ERDAS Field Guide™ (FieldGuide.pdf)
- ERDAS IMAGINE Configuration Guides (Unix_ConfigGuide.pdf, Win_ConfigGuide, and LPS_ConfigGuide)
- ERDAS IMAGINE Tour Guides™ (TourGuide.pdf)
- ERDAS Macro Language Reference Manual (EML.pdf)
- ERDAS Spatial Modeler Language Reference Manual (SML.pdf)
- ERDAS IMAGINE Read Me First document
- ERDAS IMAGINE Release Notes
- FLEXIm End Users Guide (enduser.pdf)
- What's New in ERDAS IMAGINE

On-Line Help Documentation

The IMAGINE On-Line Help Documentation is set up as a network of HTML files that are displayed in your default internet browser and provide quick, informative chunks of information on all of the IMAGINE dialogs, as well as additional explanatory notes and diagrams. This HTML database includes JavaScript applets that provide an expanding and collapsing Table of Contents, Index, and Full Text Search utilities. To use these applets you must have installed a compliant browser (Netscape 4.7 or Internet Explorer 5.5 or higher are greatly recommended) and that you enable Java scripting in your browser properties.

Following is a list of on-line manuals that can be found in the On-Line Help in ERDAS IMAGINE software. This list may change depending on your software package and add-on modules you have purchased:

- ERDAS IMAGINE
 - Introduction
 - Annotation
 - AOI (Area of Interest)
 - Classification
 - DPPDB (Digital Point Positioning Database) Workstation
 - Expert Classifier
 - HyperSpectral
 - Image Catalog
 - Image Interpreter
 - IMAGINE Interface
 - Imagizer
 - Import/Export
 - Importing Native Formats
 - Map Composer
 - Mosaic Tool
 - NITF
 - Preferences
 - Radar Mapping Suite
 - Rectification
 - Session
 - Spatial Modeler
 - Spectral Analysis
 - Tools and Utilities
 - Vector
 - Viewer
 - Viewer Raster Tools
 - VirtualGIS
 - Appendices
- Leica Photogrammetry Suite

- LPS Project Manager
- LPS Automatic Terrain Extraction
- Stereo Analyst
- Terrain Editor
- Viewplex
- ImageEqualizer

Documentation Functions

The following table depicts the different types of information you can extract from ERDAS IMAGINE documentation.

If you want to	Read
Install ERDAS IMAGINE	ERDAS IMAGINE Release Notes, then ERDAS IMAGINE Configuration Guides
Set up hardware for use with ERDAS IMAGINE	ERDAS IMAGINE Configuration Guides
Learn to use ERDAS IMAGINE	ERDAS IMAGINE Tour Guides
Learn about GIS and image processing theory	ERDAS Field Guide
See what a particular dialog does	On-Line Help
Get quick information for a button or function	On-Line Help or Status Bar Help
Learn how to most effectively use the On-Line Help system	Introduction to On-Line Help in the On-Line Help
Learn more about the Image Interpreter functions	ERDAS IMAGINE Tour Guides
Use the Spatial Modeler Language to write models	ERDAS Spatial Modeler Language Reference Manual
Customize the ERDAS IMAGINE graphical user interface (GUI)	ERDAS Macro Language Reference Manual
Write custom application programs within ERDAS IMAGINE	ERDAS Developers' Toolkit On-Line Manual

Conventions Used

In ERDAS IMAGINE, the names of menus, menu options, buttons, and other components of the interface are shown in bold type. For example:

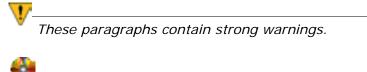
"In the Select Layer To Add dialog, select the Fit to Frame option."

When asked to use the mouse, you are directed to click, Shift-click, middle-click, right-click, hold, drag, etc.

• click—designates clicking with the left mouse button.

- Shift-click—designates holding the Shift key down on your keyboard and simultaneously clicking with the left mouse button.
- middle-click—designates clicking with the middle mouse button.
- right-click—designates clicking with the right mouse button.
- hold—designates holding down the left (or right, as noted) mouse button.
- drag—designates dragging the mouse while holding down the left mouse button.

The following paragraphs are used throughout the ERDAS IMAGINE documentation:



These paragraphs provide software-specific information.

These paragraphs contain important tips.



These paragraphs lead you to other areas of this book or other ERDAS[®] manuals for additional information.

NOTE: Notes give additional instruction.

Shaded Boxes

Shaded boxes contain supplemental information that is not required to execute the steps of a tour guide, but is noteworthy. Generally, this is technical information.

Getting Started	To start ERDAS IMAGINE, type the following in a UNIX command window: imagine , or select ERDAS IMAGINE from the Start menu. ERDAS IMAGINE begins running; the icon panel automatically opens.
ERDAS IMAGINE Icon Panel	The ERDAS IMAGINE icon panel contains icons and menus for accessing ERDAS IMAGINE functions. You have the option (through the Session -> Preferences menu) to display the icon panel horizontally across the top of the screen or vertically down the left side of the screen. The default is a horizontal display.

The icon panel that displays on your screen looks similar to the following:



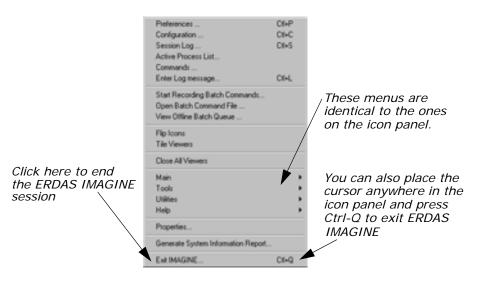
The various icons that are present on your icon panel depend on the components and add-on modules you have purchased with your system.

ERDAS IMAGINE MenuThe menus on the ERDAS IMAGINE menu bar are: Session, Main,
Tools, Utilities, and Help. These menus are described in this
section.

NOTE: Any items which are unavailable in these menus are shaded and inactive.

Session Menu

1. Click the word **Session** in the upper left corner of the ERDAS IMAGINE menu bar. The Session menu opens:



The following table contains the **Session** menu selections and their functionalities:

	-
Selection	Functionality
Preferences	Set individual or global default options for many ERDAS IMAGINE functions (Viewer, Map Composer, Spatial Modeler, etc.).
Configuration	Configure peripheral devices for ERDAS IMAGINE.
Session Log	View a real-time record of ERDAS IMAGINE messages and commands, and to issue commands.
Active Process List	View and cancel currently active processes running in ERDAS IMAGINE.
Commands	Open a command shell, in which you can enter commands to activate or cancel processes.
Enter Log Message	Insert text into the Session Log.
Start Recording Batch Commands	Open the Batch Wizard. Collect commands as they are generated by clicking the Batch button that is available on many ERDAS IMAGINE dialogs.
Open Batch Command File	Open a Batch Command File (*.bcf) you have saved previously.
View Offline Batch Queue	Open the Scheduled Batch Job list dialog, which gives information about pending batch jobs.
Flip Icons	Specify horizontal or vertical icon panel display.
Tile Viewers	Rearrange two or more Viewers on the screen so that they do not overlap.
Close All Viewers	Close all Viewers that are currently open.
Main	Access a menu of tools that corresponds to the icons along the ERDAS IMAGINE icon bar.
Tools	Access a menu of tools that allow you to view and edit various text and image files.
Utilities	Access a menu of utility items that allow you to perform general tasks in ERDAS IMAGINE.
НеІр	Access the ERDAS IMAGINE On-Line Help.

Table 1: Session Menu Options

Selection	Functionality
Properties	Display the ERDAS IMAGINE Properties dialog where system, environment and licensing information is available.
Generate System Information Report	Provides a mechanism for printing essential IMAGINE operating system parameters.
Exit IMAGINE	Exit the ERDAS IMAGINE session (keyboard shortcut: Ctrl-Q).

Table 1: Session Menu Options (Continued)

Main Menu

.

2. Click the word **Main** in the ERDAS IMAGINE menu bar. The **Main** menu opens

Stat IMAGINE Viewer
Import/Export
Data Preparation
Map Composet
Image Interpreter
Image Catalog
Image Classification
Spatial Modeler
Vector
Rada
Virtual GIS
OrthoBASE
Stereo Analyst

The following table contains the **Main** menu selections and their functionalities:

Selection	Functionality
Start IMAGINE Viewer	Start an empty Viewer.
Import/Export	Open the Import/Export dialog.
Data Preparation	Open the Data Preparation menu.
Map Composer	Open the Map Composer menu.
Image Interpreter	Open the Image Interpreter menu.
Image Catalog	Open the Image Catalog dialog.
Image Classification	Open the Classification menu.
Spatial Modeler	Open the Spatial Modeler menu.
Vector	Open the Vector Utilities menu.

Table 2: Main Menu Options (Continued)

Selection	Functionality
Radar	Open the Radar menu.
VirtualGIS	Open the VirtualGIS menu.
LPS Project Manager	Open the LPS Project Manager Startup dialog.
Stereo Analyst	Open the Stereo Analyst Workspace.

Tools Menu

3. Click the word **Tools** in the ERDAS IMAGINE menu bar. The **Tools** menu opens:



The following table contains the **Tools** menu selections and their functionalities:

Table 3: Tools Menu Options

Selection	Functionality
Edit Text Files	Create and edit ASCII text files.
Edit Raster Attributes	Edit raster attribute data.
View Binary Data	View the contents of binary files in a number of different ways.
View IMAGINE HFA File Structure	View the contents of the ERDAS IMAGINE hierarchical files.
Annotation Information	View information for annotation files, including number of elements and projection information.
Image Information	Obtain full image information for a selected ERDAS IMAGINE raster image.
Vector Information	Obtain full image information for a selected ERDAS IMAGINE vector coverage.
Image Command Tool	Open the Image Command dialog.

Selection	Functionality
Coordinate Calculator	Transform coordinates from one spheroid or datum to another.
Create/Display Movie Sequences	View a series of images in rapid succession.
Create/Display Viewer Sequences	View a series of images saved from the Viewer.
Image Drape	Create a perspective view by draping imagery over a terrain DEM.
DPPDB Workstation	Start the Digital Point Positioning DataBase Workstation (if installed).
View EML ScriptFiles ^a	Open the EML View dialog, which enables you to view, edit, and print ERDAS IMAGINE dialogs.

Table 3: Tools Menu Options (Continued)

a. UNIX only.

Utilities Menu

4. Click Utilities on the ERDAS IMAGINE menu bar. The Utilities menu opens:



The following table contains the **Utilities** menu selections and their functionalities:

Selection	Functionality		
JPEG Compress Images	Compress raster images using the JPEC compression technique and save them in an ERDAS IMAGINE format.		
Decompress JPEG Images	Decompress images compressed using the JPEG Compress Images utility.		
Convert Pixels to ASCII	Output raster data file values to an ASCII file.		
Convert ASCII to Pixels	Create an image from an ASCII file.		
Convert Images to Annotation	Convert a raster image to polygons saved as ERDAS IMAGINE annotation (.ovr).		
Convert Annotation to Raster	Convert an annotation file containing vector graphics to a raster image file.		
Create/Update Image Chips	Provide a direct means of creating chips for one or more images.		
Mount/Unmount CD-ROM ^a	Mount and unmount a CD-ROM drive.		
Create Lowercase Parallel Links ^a	Make a set of links to items on CD for systems that convert CD paths to uppercase.		
Create Font Tables	Create a map of characters in a particular font.		
Font to Symbol	Create a symbol library to use as annotation characters from an existing font.		
Compare Images	Open Image Compare dialog. Compare layers, raster, map info, etc.		
Reconfigure Raster Formats	Start a DLL to reconfigure raster formats.		
Reconfigure Vector Formats	Start a DLL to reconfigure vector formats.		
Reconfigure Resample Methods	Start a DLL to reconfigure resampling methods.		
Reconfigure Geometric Models	Start a DLL to reconfigure the geometric models.		

Table 4: Utility Menu Options

a. UNIX only.

Help Menu

5. Select **Help** from the ERDAS IMAGINE menu bar. The **Help** menu opens.



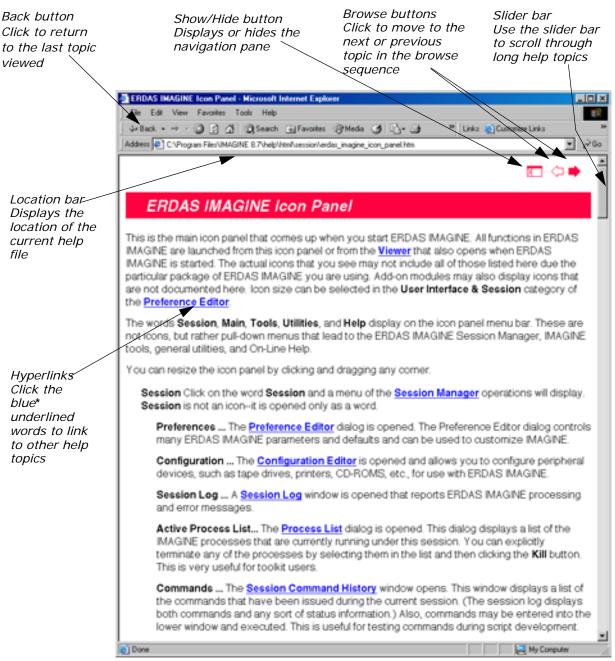
NOTE: The Help menu is also available from the Session menu.

The following table contains the **Help** menu selections and their functionalities:

Table 5: Help Menu Options

Selection	Functionality
Help for Icon Panel	View the On-Line Help for the ERDAS IMAGINE icon panel.
IMAGINE Online Documentation	Access the root of the On-Line Help tree.
IMAGINE Version	View which version of ERDAS IMAGINE you are running.
IMAGINE DLL Information	Display and edit DLL class information and DLL instance information.
About ERDAS IMAGINE	Open ERDAS IMAGINE Credits.

6. From the **Help** menu, select **Help for I con Panel**. The following Help page displays in your default internet browser:



* blue is the default link color; your system may be different

The ERDAS IMAGINE On-Line Help (OLH) system is a collection of on-line manuals that functions just like an internet website. The OLH system includes help for all of the dialogs in ERDAS IMAGINE, as well as in-depth Help files that provide more details about a process. Each manual covers a specific topic. These manuals can be printed for convenience. The individual html files may also be bookmarked for quick reference.

Search Show/Hide button Index Contents Click this tab to Displays or hides the Click this tab to Click this tab to look perform a Full Text navigation pane up help topics by view the Table Search for a word or keyword of Contents phrase ERDAS IMAGINE 8.7 On Line Help Manual - Microsoft Internet Expl Edit View Favorites Tools Help File . C. v. ale 📊 Favorites @ Media 🎯 🕓- 🌒 C C G Search » Links 🔊 Customic iddress 📮 file:/// Program%20Files/MV/SINE%208.7/help/html/help.html#session/erdas_imagine_icon_panel.htm -260 Use the slider ontents In Search bars to scroll EFIDAS IMAGINE through the_ Introduction navigation Association ERDAS IMAGINE Icon Panel E 😴 Ann pane 🗉 🏟 Classification DPPD8 Workstation 10 This is the main icon panel that comes up when you start 🏟 Expert Classifier Click the + to æ ERDAS IMAGINE. All functions in ERDAS IMAGINE are launched HyperSpectral 60 open a book and from this icon panel or from the Viewer that also opens when æ 🌸 Image Catalog browse its topics ii) 🔶 Image Interpreter ERDAS IMAGINE is started. The actual icons that you see may E 🏟 IMAGINE Interface not include all of those listed here due the particular package of Inagizer
 Import/Export ERDAS IMAGINE you are using. Add-on modules may also display icons that are not documented here. Icon size can be Importing Native Formats 60 Click the - to selected in the User Interface & Session category of the Map Compose 142 Preference Editor. close a book and hide its topics The words Session, Main, Tools, Utilities, and Help display on Preferences the icon panel menu bar. These are not icons, but rather pull-🏟 Rədər Məpping Suite æ Rectification down menus that lead to the ERDAS IMAGINE Session 🗄 🚺 Section Manager, IMAGINE tools, general utilities, and On-Line Help. PERDAS IMAGINE I Preference Editor You can resize the icon panel by clicking and dragging any Click to select a 2 Preference Editor (Dkl) comer. topic. Double-click 2 CD-ROM Preferences Host Preferences Printer Preferences Printer Connection CalComp Techiet In to open a topic. The Session Click on the word Session and a menu of the currently displayed Session Manager operations will display. Session is not an topic is highlighted icon--it is opened only as a word. CalComp Techiet Inkjet Plotter in the Table of PostScript Printers Preferences ... The Preference Editor dialog is opened. Contents. Tape Drive Preferences Configuration Editor The Preference Editor dialog controls many ERDAS IMAGINE parameters and defaults and can be used to Create new device Create Print Queues customize MAGINE. Color Balance Calibration Table Configuration ... The Configuration Editor is opened and allows you to configure peripheral devices, such as CMYK Breakpoint Numerical Tat Breakpoints tape drives, printers, CD-ROMS, etc., for use with ERDAS MAGINE. CMY Breakpoint Numerical Table
 Session Manager Session Log ... A Session Log window is opened that 1 Session Log эE reports ERDAS IMAGINE processing and error My Computer Done

7. Click the

8. Click the + beside the **Viewer On-Line Manual** in the **Contents** tab to view all of the topics in the Viewer manual.

button at the upper right corner of the help topic.

The Navigation Pane displays in the left portion of your browser.

9. Double-click the Viewer topic.

10. The first page of the Viewer Manual displays. Use the 🖉 and

browse buttons to jump from topic to topic and the scroll bars to page through a topic. Click any hyperlinked text to jump to that topic. Click the **Back** button to return to the point from which you jumped.

- **11.** Use the **Contents**, **Index**, and **Search** tabs when looking for a specific title, subject, or word or phrase.
- Select File -> ERDAS IMAGINE Tour Guides Exit from the On-Line Help file menu bar when you are finished reading On-Line Help. The Help window is closed.

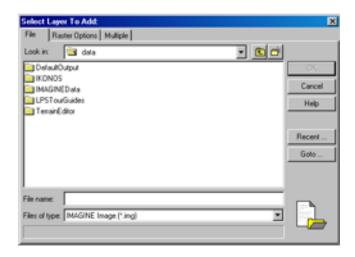
A dialog is a window in which you enter file names, set parameters, and execute processes. In most dialogs, there is very little typing required—simply use the mouse to click the options you want to use.

Most of the dialogs used throughout the tour guides are reproduced from the software, with arrows showing you where to click. These instructions are for reference only. Follow the numbered steps to actually select dialog options.

For On-Line Help with a particular dialog, click the **Help** button in that dialog.

All of the dialogs that accompany the raster and vector editing tools, as well as the Select Layer To Add dialog, contain a Preview window, which enables you to view the changes you make to the Viewer image before you click **Apply**.

Most of the functions in ERDAS IMAGINE are accessible through dialogs similar to the one below:





Dialogs

As you go through the tour guides, or as you work with ERDAS IMAGINE on your own, there are several ways to obtain more information regarding dialogs, tools, or menus, as described below.

On-Line Help

There are two main ways you can access On-Line Help in ERDAS IMAGINE:

- select the **Help** option from a menu bar
- click the **Help** button on any dialog.

Status Bar Help

The status bar at the bottom of the Viewer displays a quick explanation for buttons when the mouse cursor is placed over the button. It is a good idea to keep an eye on this status bar, since helpful information displays here, even for other dialogs.

Bubble Help

The User Interface and Session category of the Preference Editor enables you to turn on Bubble Help, so that the single-line Help displays directly below your cursor when your cursor rests on a button or frame part. This is helpful if the status bar is obscured by other windows.

IMAGINE Essentials[™]

ERDAS IMAGINE Tour Guides

Viewer & Geospatial Light Table

Introduction

In this tour guide, you can learn how to:

- set Preferences
- display an image
- query for pixel information
- arrange layers
- adjust image contrast
- link Viewers
- use the Area of Interest (AOI) function
- use the **Raster** menu functions (Raster Attribute Editor, Measurement tools, and so on)
- use the geospatial light table



Check Band-to-Color Gun Assignments ERDAS IMAGINE allows you to set up default band-to-color gun assignments for Landsat MSS, Landsat TM, SPOT, and AVHRR data in the Preference Editor.

Approximate completion time for this tour guide is 45 minutes.

ERDAS IMAGINE should be running and a Viewer should be open.

- 1. Click the word **Session** in the upper left corner of the ERDAS IMAGINE menu bar.
- 2. From the Session menu, click Preferences.

The Preference Editor opens.

	M Preference Editor			LO X	
Click here to select the preference categories	Calegory Academics Academics Academics Batch Processing Counter Tool DataView DDM Exporter DDM Exporter DDQ Exporter Exporter DDQ Exporter Exporter DDQ Exporter DDQ Exporter Exporter Exporter DDQ Exporter Exporter DDQ Exporter Exporter Exporter Exporter DDQ Exporter E	Annotation Test Units Annotation Test Height Test Fill Oxder Mitre Limit Annotation Symbol Size Annotation Symbol Units Enable Labeling All Grid/Ticks	Points V 10.000 3 F8-Fest V 3.000 3 10.000 3 Points V Points V		Click h
Click here					to see help f
to see on-line help for this					
category]			lte	

 Drag the scroll bar on the right side of the dialog down to see all of the User Interface & Session preferences (User Interface & Session is the default under Category).

You may change these or any other preferences at any time by selecting the preference category (click the list below **Category**) and then editing the text in the text entry fields.

4. Under the User Interface & Session category in the Preference Editor, locate the preferences for the 3-Band Image Red Channel default, 3-Band Image Green Channel default, 3-Band Image BlueChannel default, 4-Band Image Red Channel default, 4-Band Image Green Channel default, 4-Band Image Blue Channel Default, 5-Band Image Red Channel default, 5-Band Image Green Channel default, 5-Band Image Blue Channel Default, 6-or-greater-Band Image Red Channel default, 6-orgreater-Band Image Green Channel default, and 6-orgreater-Band Image Blue Channel Defaults.

The number that is entered for these defaults shows the band that is used for the Red, Green, and Blue color guns in your display. You may change these defaults. These are the band assignments that display in the **Layers to Colors** section of the Select Layer To Add dialog when it opens. These assignments can also be changed in the Select Layer To Add dialog for specific files.

Check Viewer Preferences

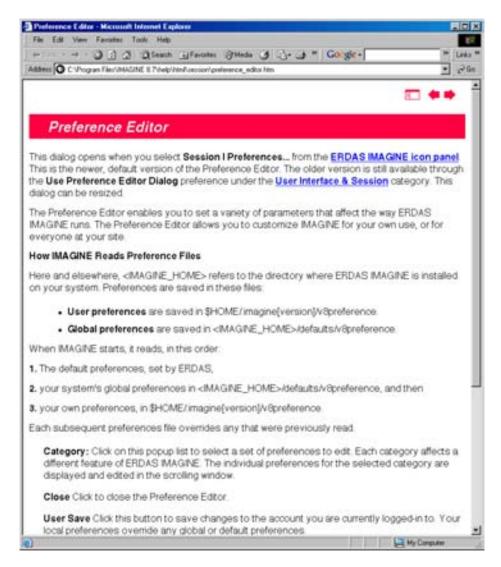
1. With the Preference Editor still open, click the **Category** list and select **Viewer**.

The Viewer preferences display.

2. Drag the scroll bar on the right of the dialog down to see all of the **Viewer** preferences.

These preferences control the way the Viewer automatically displays and responds each time it opens. Check Preference Editor Help

> Click Help in the lower right corner of the dialog. The On-Line Help for the Preference Editor opens.

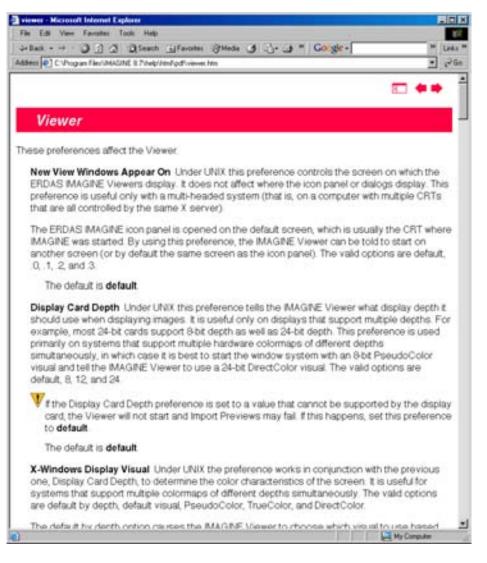


 When you are through studying the Preference Editor help file, select File -> Exit from the On-Line Help file menu bar.

The On-Line Help file closes.

View Category Help

 Click the Category Help button on the Preference Editor. The On-Line Help for this category, Viewer, opens.



- When you are through studying the Viewer preferences help file, select File -> Exit from the On-line Help file menu bar.
- 3. Click the Close button on the Preference Editor.

NOTE: If you have changed any preferences, you can save them at this time by clicking the **User Save** or **Global Save** buttons on the Preference Editor dialog.

Display an Image

Next, you display a Landsat Thematic Mapper (TM) image of Gainesville, Georgia in a Viewer.

Since the data files in the <IMAGINE_HOME>/examples directory are read-only, you may want to copy them to a new directory and change the file permissions. Remember, <IMAGINE_HOME> is the variable name for the directory where ERDAS IMAGINE resides.

1. In the Viewer menu bar, select File -> Open -> Raster Layer.

You can also open this dialog using either of these two methods:

- use the keyboard shortcut, Ctrl-r

— click this icon 📂 in the Viewer toolbar.

The Select Layer To Add dialog opens.

	Select Layer To Add:			×	
	File Raster Options Multiple				
	Look in: 📴 examples		- 🖻 🖻		
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		a server may	C Charlen		
Click here	<u> </u>				
to select file	File name: lanier.ing			12 al	A preview of the
	Files of type: MAGINE Image (*.img))			image displays here
	truecolor : 512 Rows x 512 Columns	x 7 Band(s)		1000	

2. In the Select Layer To Add dialog, click the Recent button.

A dialog with a listing of the most recent files you have opened displays. You can individually select these files and then click **OK** to display them quickly in the Select Layer To Add dialog.

- 3. Click **Cancel** in the List of Recent Filenames dialog.
- 4. In the Select Layer To Add dialog, click the Goto button.

A dialog with a listing of the most recent directories you have opened displays. You can individually select these directories, or enter the name of a new directory, and then click **OK** to display that directory quickly in the Select Layer To Add dialog.

5. Click Cancel in the Select a Directory dialog.

NOTE: The **Recent** and **Goto** buttons in the Select Layer To Add dialog are helpful for quickly locating and displaying a file or directory you work with often.

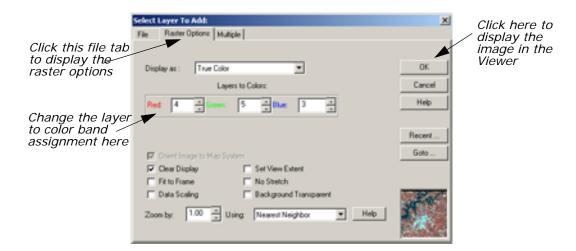
File Name Part

The framepart under **Filename** is called a file name part. A file name part is a tool used to select specific files for use in an ERDAS IMAGINE function. A file name part consists of:

- a text field—for entering the file name by typing it in, or clicking on, the file from the scroll list.
- a scrolling list—shows the name of all files with the default extension in the selected directory. Files can be selected by clicking on the name in the list.
- 6. In the file name part of the Select Layer To Add dialog, click the file **lanier.img**.

This is a Landsat TM image of the Gainesville, Georgia area, including Lake Lanier. Information about this file is reported in the bottom, left corner of the Select Layer To Add dialog. This true color image has seven bands, 512 columns, and 512 rows.

7. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.



The Raster Options display.

8. Under Layers to Colors, display band 4 in the Red color gun, band
5 in the Green color gun, and band 3 in the Blue color gun.

Display Options

1. Note the display options in the Select Layer To Add dialog.

Display Options Defaults

The default settings of the Raster Options tab are briefly described below:

- Orient Image to Map System—This checkbox is enabled if calibration is saved to the image file. If there is no calibration, this option is disabled. When enabled, the image displays using calibration. Otherwise, the calibration is ignored.
- **Clear Display**—When this checkbox is enabled, and a new image is loaded, the image currently displayed in the Viewer is removed. Disable this checkbox to overlay images.
- Fit to Frame—If this checkbox is enabled, the image is magnified or reduced to fit the Viewer window at its current size.
- **Data Scaling**—The Viewer performs a two standard deviation stretch by default. Click this checkbox to select an alternate data range to stretch.

If you want to save the contrast stretched values with the image, you can use the **Radiometric Enhance -> LUT Stretch** option of Image Interpreter.

- **Zoom by**—If **Fit to Frame** is disabled, then you can enter the zoom ratio for the data in this data field.
- Set View Extent—Allows you to specify the upper left and lower right coordinates of the portion of the image to display.

27 ne	w Extent			
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ULY:	3007070.0000	LRC	3791740.0000	-
	C File Co	ords 🤄 Map (Coords	
	OK I	Cancel	Help	

The coordinates in this dialog set the area of the image to display in the Viewer. This is useful if you have an image that is larger than the Viewer window, or if you want only a specific portion of a large image to display in the Viewer. You can also select **View -> Scale -> Extent** from the Viewer menu bar.

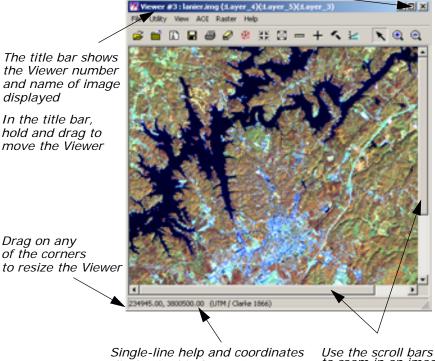
• **No Stretch**—Click to display data without applying the normal two standard deviation stretch.

Display Options Defaults, Continued

- Background Transparent—Click to make the background of grayscale, pseudocolor, and true color areas transparent-the layer underneath shows through. Background areas are automatically transparent in thematic layers.
- **Using**—Resampling is appropriate if the image is magnified (a magnification factor greater than one). Use one of the following resampling methods: Nearest Neighbor, Bilinear Interpolation, Cubic Convolution, and Bicubic Spline.
- 2. Click **OK** in the Select Layer To Add dialog to display the file.

The file **lanier.img** displays in the Viewer. The name of the file and the layers selected are written in the Viewer title bar.

Click here to minimize the window



display in this Status Bar

Use the scroll bars to roam in an image

Utility Menu Options

The **Utility** menu on the Viewer enables you to access four separate groups of functions:

- inquiry functions
- measurement tool

- layer viewing
- information

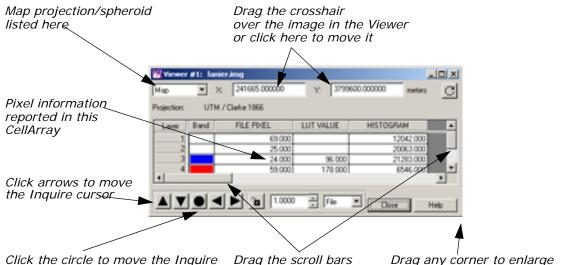
Each function group is separated by a line in the dropdown menu.

You can query a displayed image for information about each pixel using the inquiry functions.

The file **lanier.img** must be displayed in a Viewer.

1. Select **Utility -> Inquire Cursor** from the Viewer menu bar.

A white crosshair displays in the Viewer and the Inquire Cursor dialog opens.



Click the circle to move the Inquire Drag the scroll bars Drag any corner to enlarge cursor to the center of the image for more details the CellArray for more information

You can move the Inquire Cursor in the Viewer using any of these methods:

- Drag the white crosshair over the image.
- Enter new coordinates into the CellArray[™] of the Inquire Cursor dialog. The Inquire Cursor moves when you move the mouse cursor back into the Viewer.
- Click the black arrows at the bottom of the Inquire Cursor dialog.

As the crosshair is moved, the information in the Inquire Cursor dialog automatically updates.

2. The CellArray in the Inquire Cursor dialog reports a variety of pixel information. Drag on the horizontal scroll bar (or enlarge the Inquire Cursor dialog by dragging any corner) to show all of the pixel information available in the CellArray.

Change Inquire CursorYou can change the color and shape of the Inquire Cursor to make it
more visible in the Viewer.

Use Inquiry Functions

 To change the color of the Inquire Cursor, select Utility -> Inquire Color from the Viewer menu bar.

The Inquire Color dialog opens.

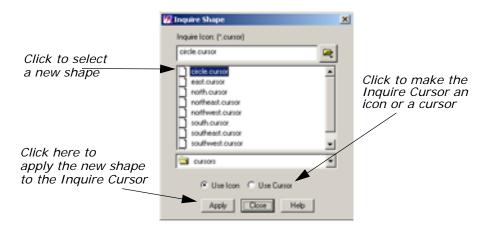


- 2. Select a new color for the Inquire Cursor by holding on the **Inquire Color** dropdown list and dragging to select the desired color.
- 3. Click **OK** in the Inquire Color dialog.

The Inquire Cursor changes color.

 To change the shape of the Inquire Cursor, select Utility -> Inquire Shape from the Viewer menu bar.

The Inquire Shape dialog opens.

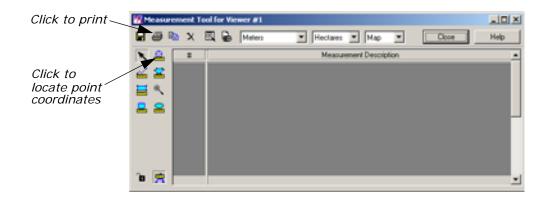


- Click circle.cursor in the scroll list that displays, then click Apply. The Inquire Cursor becomes a circle.
- 6. In the Inquire Shape dialog, click the **Use Cursor** button, then **Apply** to return the Inquire Cursor to the original crosshair shape.
- Click Close in the Inquire Shape and the Inquire Cursor dialogs.
 The Inquire Cursor is cleared from the Viewer.

 Take Measurements
 The Measurement tool enables you to measure points, line

- The Measurement tool enables you to measure points, lines, polygons, rectangles and ellipses in the displayed layer. Both distance and area are reported in the units you select.
 - Click the Measurement icon in the Viewer toolbar or select Utility -> Measure from the Viewer menu bar.

The Measurement Tool viewer opens.



- Click the Measure Positions icon in the Measurement toolbar. This tool gives the individual point coordinates (x, y) in the image.
- 3. Move the cursor into the Viewer and click anywhere.

In the Measurement Tool viewer, the location of the point displays in the type of units in which the file is saved. You may select different display units from the dropdown lists in the top toolbar.

- Next, click the Polyline icon in the Measurement Tool viewer toolbar.
- 5. Move the cursor into the Viewer and click once at the beginning of a line feature then drag the mouse to extend the line along the feature. Click to add a vertex at each point. Middle-click (or double-click, depending on how your Preferences are set) to end the measurement.

The length displays in the Measurement Tool CellArray.

The Measurement Tool

帇

The Measurement Tool can create a new annotation layer on top of your image. Simply click the Annotation tool and a new layer is automatically created. While this tool is enabled, the measurement features (points, polylines, polygons, rectangles, ellipses, etc.) are added to the annotation layer as well as a text box containing the measured values. Click the tool again to turn this feature off.

The annotation layer may be saved and used with other images with the same geographic area.

NOTE: These annotation objects may be moved and resized, but the measured values in the text boxes are not updated.

 Click the Print icon it to print and a Print dialog opens, which allows you to enter or select the printer to be used.

- 7. Select the **Printer** and click **Print** (or **OK**) in the Print dialog. If you do not wish to print, click **Cancel**.
- 8. Experiment with the other measurement tools if you like, and when you are done, click the **Close** button in the top toolbar.

You are asked if you want to save the measurements. Save them if

you like. You can click the Save icon **H** at any time to save your measurements.



Click the **Help** button to view the On-Line Help for the measurement tools.



Arrange Layers	ERDAS IMAGINE should be running, and lanier.img should be displayed in a Viewer.
1.	In the Viewer toolbar, click the Open icon 🗾 to open another layer on top of lanier.img . The Select Layer To Add dialog opens.
2.	In the Select Layer To Add dialog under File name , click Insoils.img . This is a thematic soils file of the Gainesville, Georgia area.
3.	Click the Raster Options tab at the top of the Select Layer To Add dialog.
4.	Check to be sure that the Clear Display checkbox is disabled (not selected), so that lanier.img is not cleared from the Viewer when Insoils.img displays.
5.	Click OK in the Select Layer To Add dialog to display the file.
	Now, both lanier.img and Insoils.img are displayed in the same Viewer, with Insoils.img on top.
6.	To bring lanier.img to the top of the Viewer, select View -> Arrange Layers from the Viewer menu bar.
	The Arrange Layers dialog opens.

Click and drag this box to the top to change the order of the displayed layers	Arrange Loyers Viewer 21 Image Loyers Viewer 21 X Image Loyer 10 Image Loyer 10 Image Loyer 11 Image Loyer 10 Image Loyer
Click here to redisplay layers in the new order	Acopy Reset Up Cose Help

7. In the Arrange Layers dialog, drag the **lanier.img** box above the **Insoils.img** box, as illustrated above.

When you release the mouse button, the layers are rearranged in the Arrange Layers dialog so that the **lanier.img** box is first.

8. Click **Apply** in the Arrange Layers dialog to redisplay the layers in their new order in the Viewer.

The layers are now reversed.

9. Click Close in the Arrange Layers dialog.

In this section, you zoom in by a factor of 2 and create a magnifier window. Once the image enlarges, you can roam through it.

lanier.img should be displayed on top of **Insoils.img** in a Viewer at a magnification of 1 (this is the case if you have been following through this tour guide from the beginning).

1. Select View -> Zoom -> In by 2 from the Viewer menu bar.

The images are redisplayed at a magnification factor of 2.



The Zoom options are also available from:

— the Quick View menu (right-hold on the Viewer image) under Zoom -> Zoom In by 2

— the Viewer toolbar by clicking this icon $\frac{34}{16}$.

2. Move the scroll bars on the bottom and side of the Viewer window to view other parts of the image.

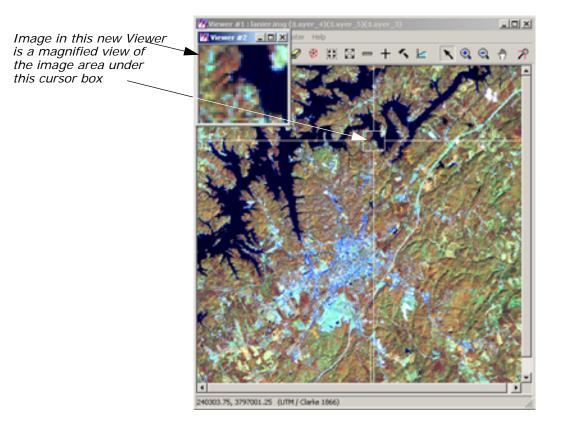
To move by small increments, you can click the small triangles at either end of the scroll bars. To move by larger increments, drag the scroll bars.

Zoom

You can also enlarge the Viewer window by dragging any corner.

3. Select View -> Create Magnifier from the Viewer menu bar.

A white cursor box opens in the center of the image. This area displays in a small magnifier window that opens over the top corner of the Viewer.



4. With your pointer inside the white cursor box, hold and drag the box around the image.

The data in the magnifier window changes as the cursor box is moved over the image. This technique is called chip extraction, which is used in the Rectification tools to help you precisely identify ground control points (GCPs).

5. In the Viewer menu bar, select **File -> Close Other Viewers** to close the magnifier window.

Magnifying Areas
There are four ways to change the size of the area magnified:
• With the cursor on any corner (or side) of the cursor box, drag the box until it is the desired size.
Place the cursor on the lower right corner of the magnifier window and drag the magnifier window until it is the desired size.
Press the space bar to enter precise positioning coordinates in the inquire box dialog.
 Use the Quick View menu (from the right mouse button) or the View menu (from the Viewer menu bar) to zoom in either Viewer.
As you try these methods, you notice that each change in size is reflected in the other window. As the cursor box is adjusted, the magnification in the magnifier window is adjusted to accommodate the new area. Likewise, as the magnifier window is adjusted, the cursor box changes to reflect the new size and proportion.
Other methods of zooming in and out of imagery are Animated Zoom, Box Zoom, and Real-time Zoom.
Animated Zoom enables you to zoom in and out of the Viewer's image in a series of steps that are similar to animation. The image is resampled after it is magnified or reduced.
Display lanier.img in the Viewer.
Select Session -> Preferences.
In the Preference Editor dialog, select Viewer from the Category list.
Click the checkbox for Enable Animated Zoom.
Click User Save then Close in dialog, and go back to the Viewer.
Click the Zoom In By Two icon 👯 .
The Viewer zooms into the image in a simulated animation by a factor of 2. The Viewer center is maintained.
Click the Zoom Out By Two icon 🚺 .
The Viewer zooms out of the image in a simulated animation by a factor of 2. The Viewer center is maintained.

	7.	Click either the Interactive Zoom In 💽 or the Interactive Zoom Out
		icon 🤤 .
	8.	Click a location on the image.
		The Viewer recenters the image to that location and zooms in or out in a simulated animation by a factor of 2.
		Animated zoom also works with View -> Zoom -> In by X and Out by X.
Box Zoom		Box Zoom is used to select a boxed area in the image. When zooming in or out by using the zoom recentering icons, the boxed image enlarges or reduces within the Viewer.
		Display lanier.img in the Viewer.
	1.	Select Session ->Preferences.
	2.	In the Preference Editor dialog, select Viewer from the Category list.
	3.	Click to select Enable Box Zoom.
	4.	Click User Save then Close in dialog, and go back to the Viewer.
	5.	Click the Interactive Zoom In icon.
	6.	Click and drag a box in the image.
		The selected area of the image is magnified to fit the Viewer.
	7.	Select the Interactive Zoom Out icon.
	8.	Click and drag a box in the image.
		The area displayed in the Viewer is reduced to fit in the box. Space surrounding the reduced image is populated with available imagery.
Real-time Zoom		When you select either of the Interactive Zoom tools, you can to zoom into and out of images in real time by holding the middle mouse button and moving the mouse upward and downward over the image.
		NOTE: You can also hold down the Control key and press on the left mouse button to zoom in real time.
		Display lanier.img in the Viewer. There is no need to set up a preference for this feature.
	1.	Select either of the Interactive Zoom icons.
	2.	Position the cursor in the Viewer, and hold the middle mouse button.
	3.	Move the mouse forward to zoom in on the image.

The image magnifies at a constant rate, depending on how far forward you move the mouse.

4. Hold the middle mouse button and move the mouse backward.

The image reduces at a constant rate, depending on how far downward on the image you move the mouse.

Display Two Images Two or more Viewers can be geographically or spectrally linked so that when you roam in one image, that area is simultaneously displayed in the linked Viewer(s).

Types of Linking

- Geographically linked—the same image area displays in all linked Viewers.
- Spectrally linked—enhancements made to an image are also made in other Viewers if that same image, or portions of it, are displayed in other Viewers.

The file **lanier.img** should be displayed on top of **lnsoils.img** in a Viewer window, at a magnification of 2.

- 1. Drag on a lower corner of the Viewer so that it occupies the entire left half of the screen.
- In the Viewer menu bar, select View -> Split -> Split Horizontal. The Viewer is divided in half, horizontally, to form two Viewers.
- 3. In the toolbar of the new Viewer, click the Open icon 📂 .

The Select Layer To Add dialog opens.

- In the Select Layer To Add dialog under File name, click the file Insoils.img.
- 5. Click the Raster Options tab at the top of the dialog.
- 6. Confirm that **Zoom by** is set to **1.00**.
- Click OK in the Select Layer To Add dialog.
 The file Insoils.img displays in the second Viewer.

Link Viewers

 In the first Viewer, select View -> Link/Unlink Viewers -> Geographical.

The Link/Unlink Instructions display.

2. Move your pointer to the second Viewer.

The pointer becomes a Link symbol 362.

3. Move the pointer to the first Viewer.

The No Link symbol displays as the cursor in the first Viewer. Clicking in this Viewer discontinues the link operation.

4. To link the Viewers, click anywhere in the second Viewer.

The two Viewers are now linked. A white cursor box opens over the image in the second Viewer, indicating the image area displayed in the first Viewer.

You can move and resize this cursor box as desired, and the image area in the first Viewer reflects each change. This is similar to the magnification box you used earlier.

Compare Images

- 1. Drag the cursor box in the second Viewer to a new location. The image area selected in the second Viewer displays in the first Viewer.
- 2. Drag the scroll bars in the first Viewer to roam in the image.

The white cursor box in the second Viewer moves as the image area in the first Viewer changes.

You could also use the Roam icon in the Viewer toolbar to roam over the image. Just move the hand across the Viewer image to change the view.

Unlink Viewers

 In either Viewer, select View -> Link/Unlink Viewers -> Geographical to unlink the Viewers.

The Link/Unlink Instructions display.

2. Move the pointer to the other Viewer.

The unlink cursor $\sum_{n=1}^{NQ} O_n$ displays.

- 3. Click anywhere inside the Viewer to unlink the Viewers.
- In the menu bar of the second Viewer, select File -> Close.
 The second Viewer closes.
- 5. In the first Viewer, select File -> Clear to clear the Viewer.

Raster Menu Options

Create an AOI Layer

These options allow you to define an AOI in the image, excluding other parts of the image. Specific processes can be applied to this AOI only, which can save considerable time and disk space. The option to use a specified AOI for processing is available from many dialogs throughout ERDAS IMAGINE.

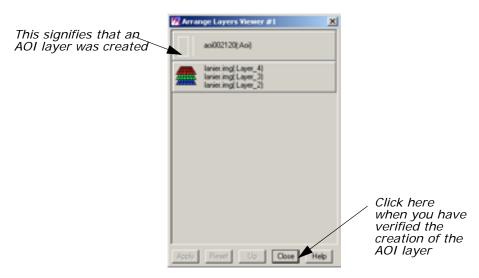
This exercise tells you how to create an AOI layer that can be saved as a file and recalled for later use.

NOTE: Each Viewer can display only one AOI layer at a time.

Display **lanier.img** in a Viewer. You *must* have an image displayed in the Viewer to create an AOI layer.

- Select File -> New -> AOI Layer from the Viewer menu bar. ERDAS IMAGINE creates an AOI layer.
- 2. Select **View -> Arrange Layers** from the Viewer menu bar to verify that the AOI layer has been created.

The Arrange Layers dialog opens, and should look similar to the following example:



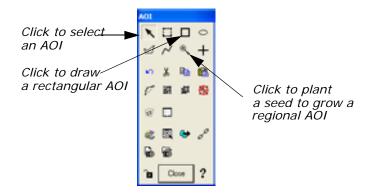
3. After verifying the creation of the AOI layer, click **Close** in the Arrange Layers dialog.

Later, you are asked to name the layer and save it to a file.

Open AOI Tools

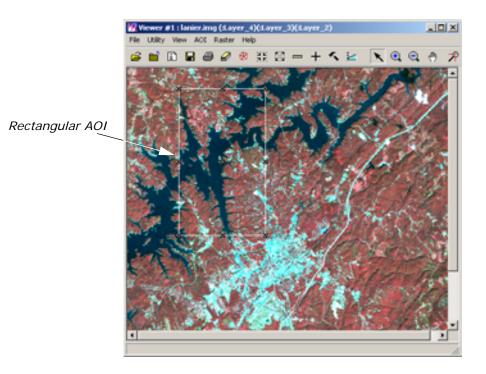
Select AOI -> Tools from the Viewer menu bar (or click the Tools icon on the toolbar).

The AOI tool palette displays.



- 2. Click the Rectangle icon in the AOI tool palette \square .
- **3.** Move the cursor into the Viewer window. Drag and then release to draw a rectangle over the AOI. Include a portion of the water when designating the AOI.

A rectangular AOI displays in the Viewer.



Selecting AOIs

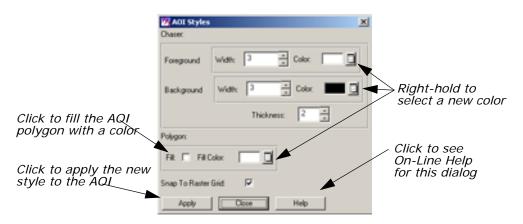
Following are some tips regarding the selection of the AOI:

- You can move the AOI by dragging the AOI to a new location.
- You can resize the AOI by dragging any of the handles at the corners and sides of the bounding box, or by pressing the space bar to enter precise coordinates.
- The **x** in the center of the bounding box marks the center coordinate of the AOI.

Select Styles

1. Select AOI -> Styles from the Viewer menu bar.

The AOI Styles dialog opens.



This dialog enables you to change the style of the AOI display.

- **2.** Experiment in the AOI Styles dialog with the line widths and colors to find a style that looks best on the displayed image.
- 3. When you are finished, click **Close** in the AOI Styles dialog.

Set Seed Properties

 Next, select AOI -> Seed Properties from the Viewer menu bar. The Region Growing Properties dialog opens.

🙀 Region Growin	g Properties	×
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	Distance: 0.00 pixels	\nearrow
Spectra	Euclidean Distance: 1.00	
Grow at Inquire	Set Constraint ADL.	řů
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This dialog enables you to define the region that grows from the seed.

- 2. In the Region Growing Properties dialog, change the **Spectral Euclidean Distance** to **5.00**.
- Click Set Constraint AOI in the Region Growing Properties dialog. The Choose AOI dialog opens.
- 4. In the Choose AOI dialog, select **Viewer** under **AOI Source** and then click **OK**.
- 5. Click the Region Grow AOI icon 🌯 in the AOI tool palette.

Click this tool to plant seeds, or points in the Viewer, from which to grow a regional AOI. The region grows in the Viewer as an AOI that can be selected.

6. Move the cursor into the Viewer window and click the water inside the rectangular AOI to indicate where you want the region growing to take place.

A status meter displays in the status bar of the Viewer. You may click **Cancel** to terminate the region grow process. The meter dismisses when the region growing process is complete. The area you selected in the Viewer is surrounded by a second bounding box and chaser lights.

7. Click **Close** in the Region Growing Properties dialog.

Save AOI

1. Select File -> Save -> AOI Layer As from the Viewer menu bar.

The Save AOI As dialog opens. This dialog allows you to save the selected AOIs as a layer (.aoi extension) that can be used again for other functions.

2. Enter a name for the AOI layer under **Save AOI as** (the .aoi extension is added automatically). Pay special attention to the directory where the file is saved, so you can find the layer later.



If you wanted to save specific AOIs only, you could turn on the **Selected Only** checkbox in the Save AOI As dialog, and only selected AOIs would be saved to a file.

3. Click OK in the Save AOI As dialog.

This layer can now be used in any dialog where a function can be applied to a specific AOI layer. You can also edit this layer at any time, adding or deleting areas.

Arrange Layers

1. Select View -> Arrange Layers from the Viewer menu bar.

The Arrange Layers dialog opens.

- 2. In the Arrange Layers dialog, right-hold over the AOI Layer and select **Delete Layer** from the **AOI Options** menu.
- 3. Click Apply and then Close in the Arrange Layers dialog.

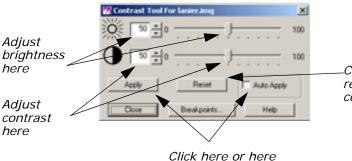
The file **lanier.img** is redisplayed in the Viewer without the AOI layer.

Adjust Image Contrast When images are displayed in ERDAS IMAGINE, a linear contrast stretch is applied to the data file values, but you can further enhance the image using a variety of techniques.

The file **lanier.img** should be displayed in a Viewer.

 In the Viewer menu bar, select Raster -> Contrast -> Brightness/Contrast.

The Contrast Tool dialog opens.



Click here to reset to original contrast

Click here or here to apply changes

2. In the Contrast Tool dialog, change the numbers and/or use the slider bars to adjust the image brightness and contrast.

3. Click Apply.

The image in the Viewer is redisplayed with new brightness values.

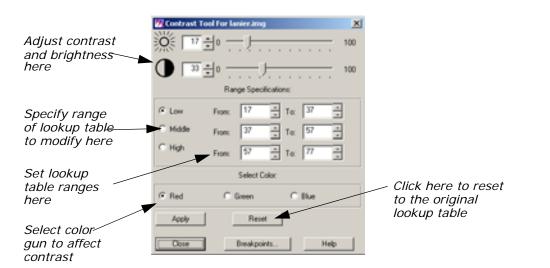
4. Click **Reset** and **Apply** in the Contrast Tool dialog to undo any changes made to the Viewer image.

5. Click **Close** in the Contrast Tool dialog.

Use Piecewise Linear Stretches

1. In the Viewer menu bar, select **Raster -> Contrast -> Piecewise** Contrast.

The Contrast Tool dialog for piecewise contrast opens.



The Contrast Tool

This tool enables you to enhance a particular portion of an image by dividing the lookup table into three sections: low, middle, and high. You can enhance the contrast or brightness of any section using 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 brightness value for each range represents the midpoint of the total range of brightness values occupied by that range.

The contrast value for each range represents the percent of the available output range that particular range occupies.

As one slider bar is moved, the other is automatically adjusted, so that there is no gap in the lookup table. This tool is set up so that there are always pixels in each data file value from 0 to 255. You can manipulate the percentage of pixels in a particular range, but you cannot eliminate a range of data file values.

 With your pointer over the image in the Viewer, right-hold Quick View -> Inquire Cursor.

The Inquire Cursor dialog opens and an Inquire Cursor is placed in the Viewer.

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4					<u> </u>
		b 1 1000	∴ Fie	Close	Help

3. In the Viewer, drag the intersection of the Inquire Cursor to the lake. Move the Inquire Cursor over the water while keeping an eye on the lookup table values in the blue color gun, as reported in the Inquire Cursor dialog.

This gives you an idea of the range of data file values in the water. You can stretch this range to bring out more detail in the water.

- 4. In the Contrast Tool dialog, click **Blue** under **Select Color**.
- 5. Under **Range Specifications**, set the **Low** range **From 34 To 55** and press Enter on your keyboard.
- 6. Drag the Brightness slider bar (the top slider bar) to 50.
- 7. Click Apply in the Contrast Tool dialog.

The water now has more contrast and shows more detail.

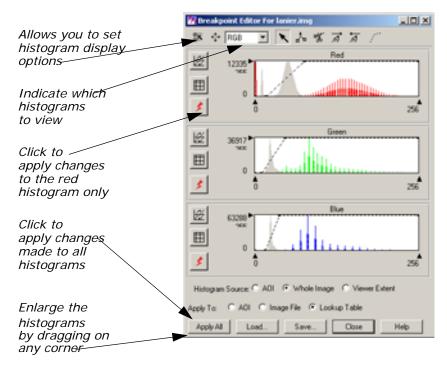
If your image is at a magnification of 1, this new detail may be difficult to see. You can zoom in to a magnification of 2 using the **Quick View** menu in the Viewer.

- 8. In the Contrast Tool dialog, click **Reset** and then **Apply** to return the image to the original lookup table values.
- 9. Click Close in the Contrast Tool dialog.
- 10. Click Close in the Inquire Cursor dialog.

Manipulate Histogram

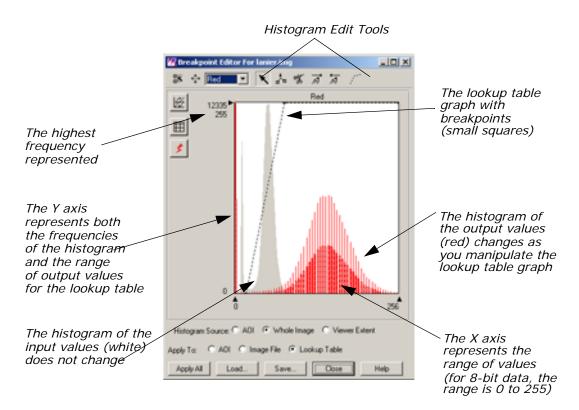
 In the Viewer menu bar, select Raster -> Contrast -> Breakpoints.

The Breakpoint Editor opens.



2. Click the dropdown list at the top of the Breakpoint Editor and select **Red**.

Each of the three histogram graphics in the Breakpoint Editor can be expanded up to full size by selecting the appropriate histogram from the dropdown list at the top of the Break Point Editor. The parts of the histogram graphic are described in the following illustration.

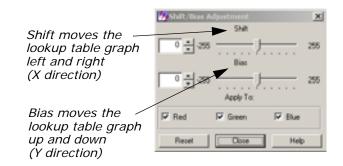


3. Click the dropdown list at the top of the Breakpoint Editor and select **RGB**.

All three histograms redisplay in the Breakpoint Editor.

- 4. Experiment by dragging the breakpoints of the lookup table graphs in the different color guns (**Red**, **Green**, and **Blue**).
- 5. Click **Apply All** in the Breakpoint Editor to view the results of your changes in the image.
- 6. To undo the edits you just made, select **Raster -> Undo** from the Viewer menu bar.

Adjust Shift/Bias



The lookup table graph and the output histogram are updated in the Histogram Tool dialog as you manipulate the information in the Shift/Bias Adjustment dialog.

2. In the Shift/Bias Adjustment dialog, drag the **Shift** slider bar to the right.

Notice that the value in the number field to the left increases as you move the slider bar. This is the number of pixels that the lookup table graph is moved.

- In the Shift/Bias Adjustment dialog, double-click the number in the Shift number field and change the number field to 20. Press Enter on your keyboard.
- 4. In the Breakpoint Editor, click Apply All.

The image is redisplayed using the new lookup table. It is very dark.

- 5. In the Shift/Bias Adjustment dialog, return the Shift value to 0.
- 6. In the Breakpoint Editor, click **Apply All** to return the image to its original contrast.
- 7. Repeat step 2 through step 6 using the **Bias** option.
- 8. When you are finished, click **Close** in the Shift/Bias Adjustment dialog.

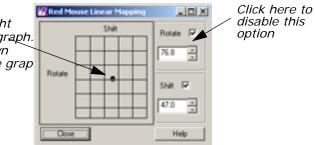
Use Mouse Linear Mapping

1. In the Breakpoint Editor, click the Red Mouse Linear Mapping icon

, which is located on the left border of the **Red** histogram.

The Red Mouse Linear Mapping dialog opens.

Move this dot left and right to shift the lookup table graph. Move the dot up and down to rotate the lookup table grap



- 2. In the Red Mouse Linear Mapping dialog, click the **Rotate** button to disable the rotate option.
- **3.** Drag the dot in the center of the grid left or right to shift the red lookup table graph.
- 4. In the Breakpoint Editor, click the Run icon *for the red histogram* to update the image in the Viewer.
- 5. In the Red Mouse Linear Mapping dialog, click the **Rotate** button to turn it on and the **Shift** button to turn it off.
- 6. Drag the dot in the grid up or down to change the slope of the lookup table graph.
- 7. Click the Run icon for the red histogram to update the Viewer image.
- 8. Click Close in the Red Mouse Linear Mapping dialog.
- With your cursor over the red histogram graph, right-hold Graph Options -> Undo All Edits.
- **10.** Click **Apply All** in the Breakpoint Editor to return the Viewer image to its original contrast.
- 11. Click Close in the Breakpoint Editor.
- 12. Select File -> Clear from the Viewer menu bar.

Linear Mapping

Moving the dot in the center of the grid left and right shifts the lookup table graph in the histogram graphic left or right. Moving the dot up and down rotates the lookup table graph, changing the slope. Up rotates the graph counterclockwise and down rotates the graph clockwise.

As the dot is moved, the numbers on the right side of the dialog are automatically updated. The **Rotate** number reports the angle of the rotation ramp, with 180 being a straight horizontal line and 90 being a straight vertical line. The **Shift** number reports the pixel value at the center of the lookup table graph.



The Raster Editor enables you to edit portions of the displayed image using various tools in the Viewer **Raster** menu. When a specific raster editing tool is in use, that tool locks the Viewer, therefore, work with one tool must be completed before opening another one.

All of the dialogs that accompany the raster editing tools contain a preview window, which enables you to view the changes you make to the Viewer image before you click **Apply**.

Prepare (UNIX)

You must have a writable file displayed to use this function. Follow the steps below to create a writable file to work with.

1. In a command window, copy **Indem.img** to **testdem.img** by typing the following (without a carriage return):

cp \$IMAGINE_HOME/examples/lndem.img <your directory
path>/testdem.img

Press Enter on your keyboard.

2. Change read/write permissions by typing the following in the command window:

chmod 644 testdem.img

Press Enter on your keyboard and close the command window.

Prepare (PC)

- 1. Open the Explorer.
- 2. Copy **Indem.img** from the <IMAGINE_HOME>/examples directory to the directory of your choice.
- 3. Right-click and select **Rename** to rename the file **testdem.img**.
- 4. Right-click the file, and select **Properties**.
- 5. In the **Attributes** section of the **General** tab, make sure **Read-only** is not checked.
- 6. Click **OK** in the Properties dialog.

Open the Image

1. Open testdem.img in the Viewer.

This is a DEM file of the Gainesville, Georgia area, corresponding to the **lanier.img** data you have been using.

2. If it is not already displayed, select **AOI** -> **Tools** from the Viewer menu bar to open the AOI tool palette.

The AOI tool palette displays. The AOI tools are used to define the area(s) to be edited.

3. Click the Ellipse icon in the AOI tool palette and then drag near the center of the Viewer image to draw an elliptical AOI, measuring about 1" to 2" in diameter.

When the mouse button is released, the AOI is surrounded by chaser lights and a bounding box.

Interpolate

 In the Viewer menu bar, select Raster -> Interpolate. The Interpolate dialog opens.

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	Apply	Close	Help	J

Digitize Points

Digitizing points helps you to control the overall surface generated by the raster editing function. However, you should digitize points only when you know the general areas in the AOI that are bad. The Interpolation function uses the data values of the digitized points and the boundary of the AOI to generate a new surface.

1. Click the Digitize Points icon + in the Interpolate dialog, then click

the Lock icon $f_{\mbox{\scriptsize l}}$,which changes to $f_{\mbox{\scriptsize l}}$.

- Click at least 12 times in the AOI in the Viewer to digitize 12 points. The point coordinates display in the CellArray in the Interpolate dialog.
- **3.** When you are finished digitizing points, click the Lock icon in the Interpolate dialog again to disable it.

- 4. In the Interpolate dialog under **Buffer Points**, enter **25** to allow up to 25 points in the computation.
- 5. In the Interpolate dialog under **Polynomial Order**, enter **3** to increase the polynomial order of interpolation.
- 6. Click **Apply** in the Interpolate dialog.
- **7.** An Attention box displays, asking if you want to remove the data stretch lookup table. Click **Yes**.
- 8. A Warning box displays, suggesting that you recalculate the statistics. Click **OK**.

The new surface displays inside the AOI.

9. Observe the changes in the AOI and then select **Raster -> Undo** from the Viewer menu bar.

The data values return to the original values. This lets you undo the edit without changing the original data values.

NOTE: Undo works only for the last edit applied.

10. Click **Close** in the Interpolate dialog.

Fill with Constant Value If the area to be edited is a flat surface, you may use a constant value to replace the bad data values.

1. Select **Raster -> Fill** from the Viewer menu bar.

The Area Fill dialog opens.

FillWith 0.000	Click here to apply the specified area fill
Exclude Value:	Preview Window displays What the AOI fill looks like

2. In the Area Fill dialog, click **Apply** to accept the Constant function and its defaults.

The AOI is replaced with a Constant value of zero—the area is black.

3. Select **Raster -> Undo** from the Viewer menu bar.

The image returns to the original values.

4. In the Area Fill dialog, enter **1500** in the **Fill With** number field and click **Apply**.

Now the AOI fill area is white.

5. Select Raster -> Undo from the Viewer menu bar.

The image returns to the original values.

Set Global Value

1. In the Area Fill dialog, click the **Function** dropdown list and select **Majority**.

This option uses the majority of the pixel values in the AOI to replace all values in the AOI.

2. Click **Apply** in the Area Fill dialog.

The AOI displays the newly generated surface.

- 3. After observing the changes, select **Raster -> Undo** from the Viewer menu bar.
- 4. Click Close in the Area Fill dialog.
- Select File -> Clear from the Viewer menu bar. Save the AOI layer in the Viewer if you like.

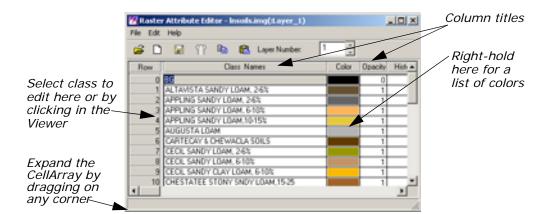
Raster Attribute Editor

You can easily change the class colors in a thematic file. Here, you change the colors in **Insoils.img**.

Change Color Attribute

Display Insoils.img in a Viewer.

 In the Viewer menu bar, select Raster -> Attributes. The Raster Attribute Editor opens.



The CellArray in the Raster Attribute Editor is for manipulating the raster attributes and selecting classes to edit. To change the color of a class, you can select that class in two ways:

with your cursor in the Viewer, click the class you want to edit, or

 with your cursor in the Row column of the Raster Attribute Editor CellArray, click the class to edit.

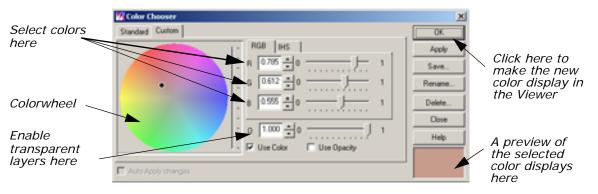
You use both methods in the following examples.

2. Move your cursor inside the Viewer and click an area.

That class is highlighted in yellow in the Raster Attribute Editor CellArray, and the current color assigned to that class is shown in the bar underneath the **Color** column.

3. In the CellArray, right-hold with your cursor over the **Color** patch for the selected class and select **Other**.

The Color Chooser dialog opens.



A dot is present on the colorwheel itself, indicating the current color of the selected class. This color is also shown in the preview window in the lower, right corner of the dialog.

4. In the Color Chooser dialog, change the color of the selected class by dragging the dot on the colorwheel to another spot on the colorwheel. Then, click the **Apply** button.

The selected class changes color in both the Viewer image and the Raster Attribute Editor CellArray.

8 -

You can also change the class color using any of these methods:

a) enter RGB (red, green, blue) or IHS (intensity, hue, saturation) values in the Color Selector number fields in the Color Chooser dialog, or

b) click the **Standard** *tab in the Color Chooser dialog to select from a list of predefined colors, or*

c) move the slider bars in the Color Chooser dialog

- In the Raster Attribute Editor, select Edit -> Undo Last Edit.
 The change you made in step 4 is undone.
- 6. Click **Close** in the Color Chooser dialog.

7. Select File -> Close from the Raster Attribute Editor.

Make Layers Transparent

If you have more than one file displayed in a Viewer, you can make specific classes or entire files transparent. In this example, you make the overlaid soils partially transparent so that the Landsat TM information shows through.

- Display lanier.img over Insoils.img in a Viewer. Be sure that the Clear Display checkbox is disabled under Raster Options when you are in the Select Layer To Add dialog.
- 2. In the Viewer menu bar, select View -> Arrange Layers.

The Arrange Layers dialog opens.

- 3. In the Arrange Layers dialog, drag the **Insoils.img** box on top of the **lanier.img** box.
- 4. Click **Apply**, then **Close** in the Arrange Layers dialog.

Edit Raster Attributes

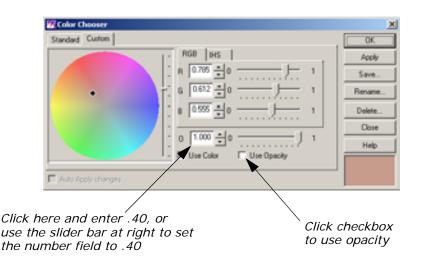
1. Select **Raster -> Attributes** from the Viewer menu bar.

The Raster Attribute Editor displays.

The objective is to select a class that covers a section of **lanier.img** that you would like to see through **Insoil.img**. Then, you can make that class transparent.

- 2. Select the class to become transparent, either by clicking in the Viewer or in the **Row** column of the CellArray.
- In the Raster Attribute Editor CellArray, right-hold on the color button in the Color column of the selected class and drag to select Other from the popup list.

The Color Chooser dialog opens.



4. In the Color Chooser dialog, click the Use Opacity checkbox.

- 5. At **O** (which stands for Opacity), change the number to **.40** (opacity percentage of 40) using either the number field or the slider bar.
- 6. Click Apply in the Color Chooser dialog.

The selected color becomes partially transparent, allowing you to see **lanier.img** underneath.

- 7. Experiment with different ways to change class color and opacity.
- 8. When you are finished, click **Close** in the Color Chooser dialog.

Manipulate CellArray

- 1. With your cursor in the title bar of the Raster Attribute Editor, drag it to the top of your screen.
- Drag one of the bottom corners of the Raster Attribute Editor down until all rows of the CellArray are visible.
- **3.** Drag the corners of the Raster Attribute Editor horizontally until all columns are visible.

NOTE: The CellArray probably occupies most of your screen.

Select Rows

To select one row, simply click in the **Row** column of the desired row. That row is highlighted in yellow. You can select sequential rows by middle-clicking in additional rows. Shift-click in a selected row to deselect a row. You can also select rows using the **Row Selection** menu that opens when you right-hold in the **Row** column.

Select Columns

To select one column, click in the title box of the desired column. That column is highlighted in blue. You can select multiple columns by middle-clicking in the title bar of additional columns. Shift-click in a selected column to deselect it.

Choose Column Options

Many column options are available from the **Column Options** menu, which opens when you right-hold in a column title bar. You can have multiple columns and rows selected at the same time.

You use many of these features in the following steps.

Resize Columns

You can make each column in the CellArray narrower and then reduce the width of the entire dialog, so that it takes up less room.

 Click the Column icon in the Raster Attribute Editor. The Column Properties dialog opens.

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	Top Bottom	Units:			
	New Delete	OK.	Cancel Help		

- 2. In the Column Properties dialog, select **Color** under **Columns** and activate the **Show RGB** checkbox.
- 3. Click **OK** in the Column Properties dialog.
- 4. In the Raster Attribute Editor, place your cursor on the column separator in the header row between the **Color** and **Red** columns.

The cursor changes from the regular arrow to a double-headed arrow. You can now change the size of the **Color** column.

- **5.** Drag the double-headed arrow to the right to make the **Color** column wider.
- 6. Repeat this procedure, dragging the double-headed arrow to the left, to narrow the other columns.

Generate Statistics

 In the Raster Attribute Editor CellArray, select the entire Red column by clicking in the Red title box.

The entire column is highlighted in blue.

With your cursor in the Red title box, right-hold Column Options Compute Stats.

The Statistics dialog opens.

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statistics	Stddev	0.31	
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The Statistics for the column selected are reported.

Column Statistics

These statistics include:

- Count—number of classes selected
- Total—sum of column figures (in this example, total area)
- Min—minimum value represented in the column
- Max—maximum value represented in the column
- Mean—average value represented (Total/Count)
- Stddev—standard deviation
- 3. Click **Close** in the Statistics dialog.

Select Criteria

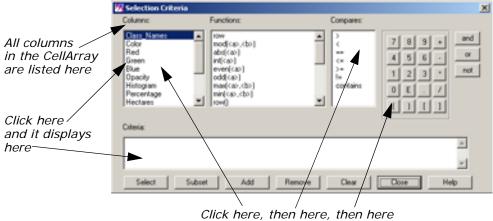
1. In the Raster Attribute Editor CellArray, select the Class_Names column by shift-clicking in the Class_Names title box.

Now the **Class_Names** and **Red** columns are both selected; both columns are highlighted in blue.

Next, you generate a report that lists all of the classes and the area covered by each. You do not include classes with an area of 0 (zero).

2. With your cursor in the **Row** column (not the header row of the **Row** column), right-hold **Row Selection -> Criteria**.

The Selection Criteria dialog opens.



Click here, then here, then here to define the criteria (automatically written to the Criteria definition box)

3. In the Selection Criteria dialog under Columns, click Red.

\$iRedî is written in the Criteria definition box at the bottom of the dialog.

- 4. Under Compares, click >.
- 5. In the calculator, click **O**.

The Criteria should now read:

\$ iRedî > 0

This criteria selects all classes in the CellArray with an area that is greater than 0.

6. Click **Select** in the Selection Criteria dialog to select these rows in the CellArray.

All rows except 0, 12, and 34 are selected (that is, highlighted in yellow). These rows are not selected because the opacity for each of these categories is 0.

7. Click Close in the Selection Criteria dialog.

Generate Report

 With your cursor in a Class_Names title box, right-hold Column Options -> Report.

The Report Format Definition dialog opens.

	Report Format Definition	×		
Enter report title	Raster Attribute Editor			
and header here	Header:			
Enter text to	Paster Attibute Editor Footer:			
precede the page number on the bottom	Page			
of the report	Page Size:	Margina:		
	Width 00	Widtx 5		
Specify statistics	Stafe	ifes:		
	Count T Minimum	T Mean		
Click here to	Total T Maximum	T Standard Deviation		
generate a report	OK Ca	ncel Help		

- 2. In the Report Format Definition dialog under **Title**, add **for Insoils.img** to the default text string.
- 3. Under Header, add for Insoils.img to the default text string.
- 4. Under **Statistics**, click each checkbox to include all available statistics in the report.
- 5. Click **OK** in the Report Format Definition dialog to generate the report.

A Job Status dialog opens, indicating the progress of the function. When the function is complete, the report displays in an IMAGINE Text Editor.

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Use these menu	File I	Edit V	New P	ind Helj	(p	
bar and toolbar \leq	2			X	💁 🛍 🖟	
items to save and		_	_		Raster Attribute Editor for Insoils.ing	-
edit report		3	Row		Class_Names	
			111111111111122222222222222222222222222	ALTA AFPEL APPL APPL APPL CCRCI CCRC	<pre>VISTA SANDY LOAM. 2-6% ING SANDY LOAM. 2-6% ING SANDY LOAM. 6-10% ING SANDY LOAM. 10-15% ISTA LOAM TECAY & CHEVACLA SOILS L SANDY LOAM. 6-10% L SANDY LOAM. 6-10% L SANDY CLAY LOAM. 6-10% INT TCLESTONY SNDY LOAM. 15-25 FACLA LOAM. FRED. FLOODED MCLA-WENADKEE COMPLEX INETT CLAY LOAM. 6-10%, ERODED INETT CLAY LOAM. 10-25%, ERODE SSEE LOAM. 6-10% ISSEE SANDY LOAM. 10-15% ISON SANDY LOAM. 6-10%,E ISON SANDY LOAM. 6-10%,E ISON SANDY LOAM. 10-15% ISON SANDY LOAM. 10-15% ISON SANDY LOAM. 10-15% ISON SANDY LOAM. 10-15% ILLA COBBLY CLAY LOAM. 6-10%,E ILLA COBBLY CLAY LOAM. 6-15% ILLA COBBLY CLAY LOAM. 15-35% ILLA COBBLY CLAY LOAM. 15-35% I</pre>	
	L	Tot		N~A		۲.
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	1					lh.

 To save the report, in the Text Editor menu bar, select File -> Save As.

The Save As dialog opens.

- 7. Enter a name for the report, such as **soilsreport.txt**.
- Click OK in the Save As dialog.
 The file name is written in the title bar of the Text Editor window.
- 9. In the Text Editor menu bar, select File -> Close.
- 10. Select File -> Close from the Raster Attribute Editor.Save your changes to the Raster Attribute Editor if you like.
- **11.** In the Viewer toolbar, click the Clear Viewer icon *o* to clear the window.

Profile Tools		The spectral profile display is fundamental to the analysis of hyperspectral data sets. As the number of bands increases and the band widths decrease, the remote sensor is evolving toward the visible/infrared spectrometer. The reflectance (DN) of each band within one (spatial) pixel can be plotted to provide a curve approximating the profile generated by a laboratory scanning spectrometer. This allows estimates of the chemical composition of the material in the pixel. To use this tool, follow the steps below.
Prepare		ERDAS IMAGINE should be running and a Viewer should be open.
Display Spectral Profile		
	1.	In the Viewer menu bar, select File -> Open -> Raster Layer.
		The Select Layer To Add dialog opens.
	2.	In the Select Layer To Add dialog, select hyperspectral.img under Filename .
	3.	Click the Raster Options tab at the top of the dialog.
	4.	In the Raster Options , click the Fit to Frame checkbox to activate

4. In the **Raster Options**, click the **Fit to Frame** checkbox to activate it and then click **OK**.

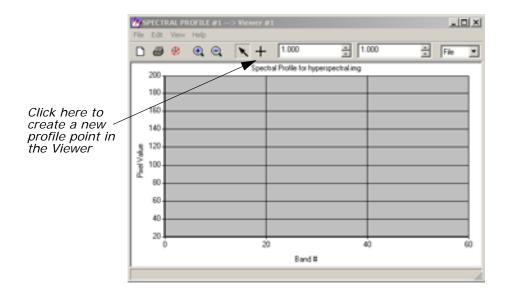
The file **hyperspectral.img** displays in the Viewer.

In the Viewer menu bar, select Raster -> Profile Tools.
 The Select Profile Tool dialog opens.

Select Profile Tool Select Profile:	×
G Spectral C Spatial C Surface	
OK Cancel Help	

6. Accept the **Spectral** default and click **OK** in the Select Profile Tool dialog.

The Spectral Profile viewer opens.



7. In the Spectral Profile viewer, click the Create icon <u>+</u> and then select a pixel of interest by clicking it in the Viewer image.
 The data for the selected pixel are displayed in the Spectral Profile viewer.

NOTE: The pixel can be moved around the displayed image by dragging it.

Analyze Data

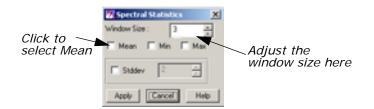
 In the Spectral Profile viewer menu bar, select Edit -> Chart Options.

The Chart Options dialog opens.

Chart Options General X Axis Y Axis Axis Title: Spectral Profile for hyperspectraling Legend Plot Background: Write Frame Fall Wite: C Gray Level Stoe C Sold Color:	Acoly Dose Help	— Click this tab to view the options for the Y axis
C Sold Color:		

- 2. In the Chart Options dialog, click the **Y** Axis tab at the top of the dialog.
- 3. Set Min to 20 and Max to 180 to control the numerical range.

- Click Apply and then Close in the Chart Options dialog.
 The selected range is shown in detail in the Spectral Profile viewer.
- In the Spectral Profile viewer menu bar, select Edit -> Plot Stats. The Spectral Statistics dialog opens.



- 6. In the Spectral Statistics dialog, change the Window Size to 7.
- 7. Select Mean and click Apply.

The mean (within the selected window) of Profile 1 is depicted on the graph.

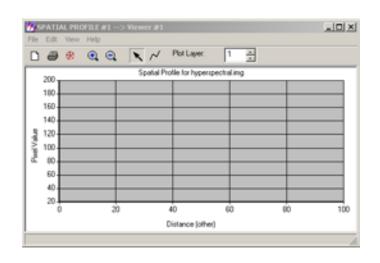
- 8. Click Cancel in the Spectral Statistics dialog.
- 9. Select File -> Close from the Spectral Profile viewer.

Wavelength Axis

	Data tapes containing hyperspectral imagery commonly designate the bands as a simple numerical sequence. When plotted using the profile tools, this yields an x-axis labeled as 1, 2, 3, 4, etc. Elsewhere on the tape or in the accompanying documentation is a file which lists the center frequency and width of each band. This information should be linked to the image intensity values for accurate analysis or comparison to other spectra, such as the Spectra Libraries.
	To do this, the band position information must be entered into a linkable format, which is an .saf file. An example of this format can be seen by using a texteditor or vi command to view one of the .saf files in <imagine_home>/etc. Once this file is created, it can be linked with the Spectral Profile by using the Edit -> Use Sensor Attributes option.</imagine_home>
Display Spatial Profile	The Spatial Profile display function allows the analyst to view the reflectance(s) of the pixels along a user-defined polyline. The display can be viewed in either two-dimensional (one band) or perspective three-dimensional (multiple bands) mode. To use this tool, follow the steps below.
	The file hyperspectral.img should be displayed in a Viewer, with the Fit to Frame checkbox activated.
1.	In the Viewer menu bar, select Raster -> Profile Tools.
	The Select Profile Tool dialog opens.

2. Click the **Spatial** button in the Select Profile Tool dialog and then click **OK**.

The Spatial Profile viewer opens.



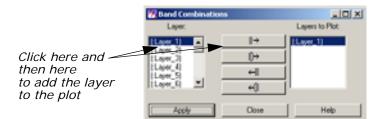
3. Click the Polyline icon \swarrow in the Spatial Profile viewer toolbar and then draw a polyline on the image in the Viewer. Click to set vertices and middle-click to set an endpoint.

The spatial profile

in the Spatial Profile viewer.

Analyze Data

 Select Edit -> Plot Layers from the Spatial Profile viewer menu bar. The Band Combinations dialog opens.



- Add Layers 2 and 3 to the Layers to Plot column by individually selecting them under Layer and clicking the Add Selected Layer icon
 .
- 3. Click **Apply** and then **Close** in the Band Combinations dialog.

Layers 1, 2, and 3 are plotted in the Spatial Profile viewer.

NOTE: Moving the cursor around in the Spatial Profile viewer gives you the pixel values for the x and y coordinates of the layers.

- 4. In the **Plot Layer** box to the right of the toolbar in the Spatial Profile viewer, click the up arrow to view layers **4** and **5**.
- 5. Select **Edit -> Plot Layers** from the Spatial Profile viewer to again bring up the Band Combinations dialog.
- 6. In the Band Combinations dialog, click the Add All icon \leftarrow
- 7. Click Apply and Close.

As in the Spectral Profile viewer, you can select **Edit -> Chart Options** to optimize the display.

- 8. Select File -> Close from the Spatial Profile viewer menu bar.
- View Surface Profile The Surface Profile can be used to view any layer (band) or subset in the data cube as a relief surface. To use this tool, follow the steps below.

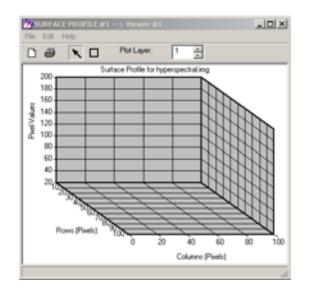
The file **hyperspectral.img** should be displayed in a Viewer with the **Fit to Frame** checkbox activated.

1. In the Viewer menu bar, select **Raster -> Profile Tools**.

The Select Profile Tool dialog opens.

2. In the Select Profile Tool dialog, click the **Surface** button and then click **OK**.

The Surface Profile viewer opens.



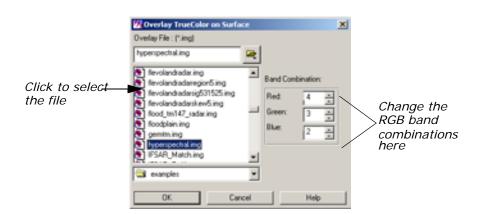
3. Click the Rectangle icon in the Surface Profile viewer and then select an AOI in the Viewer by dragging to create a box around it.

When the mouse button is released, the surface profile for the selected area displays in the Surface Profile viewer. As with all of the profile tools, selecting **Edit -> Chart Options** allows you to optimize the display.

Analyze Data

It may be desirable to overlay a thematic layer onto this surface. For example, a vegetation map could be overlaid onto a DEM surface, or an iron oxide map (Landsat TM3/TM1) onto a kaolinite peak (1.40 μ m) layer. In this example, you overlay a true color image.

 In the Surface Profile viewer, select Edit -> Overlay True Color. The Overlay TrueColor on Surface dialog opens.



- 2. In the Overlay TrueColor on Surface dialog, select hyperspectral.img under Overlay File.
- 3. Under Band Combination, enter 55 for Red, 34 for Green, and 2 for Blue.
- 4. Click **OK** in the Overlay TrueColor on Surface dialog.
- 5. When you are finished analyzing the data, select **File -> Close** from the Spatial Profile viewer menu bar.

For more information on Hyperspectral Image Processing or the Hyperspectral Profile Tools, see the chapter Enhancement in the <u>ERDAS Field Guide</u>.



It is possible to access the Image Drape utility either through the **Tools** menu in the ERDAS IMAGINE menu bar or through the Viewer. Here, you access the Image Drape utility via the Viewer.

ERDAS IMAGINE should be running and a Viewer should be open.

Click the Open icon 📂 in the Viewer toolbar.

The Select Layer To Add dialog opens.

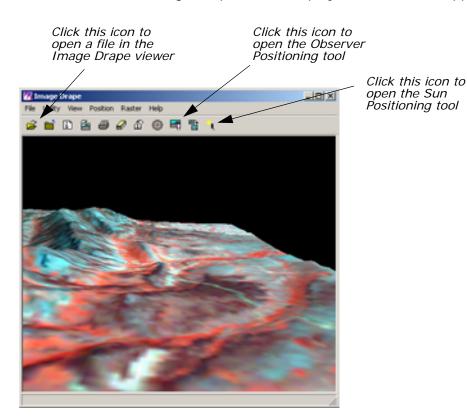
 In the Select Layer To Add dialog under File name, select the file eldodem.img.

- Click OK in the Select Layer To Add dialog.
 The file eldodem.img displays in the Viewer.
- Click the Open icon again in the Viewer toolbar. The Select Layer To Add dialog reopens.
- In the Select Layer To Add dialog under File name, select the file eldoatm.img.
- 6. Click the Raster Options tab at the top of the dialog.
- 7. In the Raster Options, click the **Clear Display** checkbox to turn it off. This allows **eldoatm.img** to display on top of **eldodem.img**.
- 8. Click **OK** in the Select Layer To Add dialog.

Now, both **eldodem.img** and **eldoatm.img** are displayed in the same Viewer, with the **eldoatm.img** layer on top.

9. Select Utility -> Image Drape from the Viewer menu bar.

An Image Drape viewer displays, with the overlapping images in it.



Change Options

 Select Utility -> Options from the Image Drape viewer menu bar. The Options dialog opens.

DEM Fog Background		×	— Click this tab to edit background options
Exaggeration	1.000 -		
Terrain Color			
☐ Viewing Bange	27600.000 ÷		Click to apply your
Elevation Units	Melers		 changes and close this dialog
Render Back Side			3
			Click to apply no changes and close this dialog
			and close this dialog
Apply Close	Help		

- 2. Click the **Background** tab in the Options dialog.
- 3. In the Background options, hold on the dropdown list next to **Background Color** and select **Gold**.
- 4. Click Apply in the Options dialog.

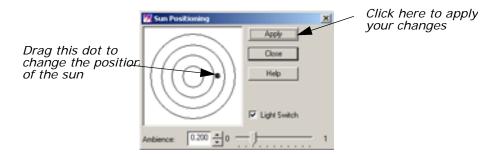
The background of the image in the Image Drape viewer is now gold.

5. Click Close in the Options dialog.

Change Sun Position

 Select View -> Sun Positioning from the Image Drape viewer menu bar.

The Sun Positioning dialog opens.



- 2. In the Sun Positioning dialog, drag the dot to another position on the target. The center of the target indicates the sun position at high noon.
- 3. Click **Apply** and then **Close** in the Sun Positioning dialog.

Note how the shadows across the image change to reflect the different sun position you have selected.

Dump Contents to Viewer

 Select Utility -> Dump Contents to Viewer from the Image Drape viewer menu bar.

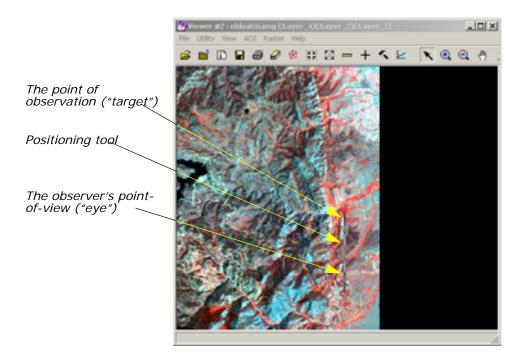
A second Viewer opens, displaying another view of the image in the Image Drape viewer.

- 2. Select File -> Close in the first Viewer to clear it from the screen.
- 3. Select View -> Link/Unlink with Viewer from the Image Drape viewer menu bar.

An instructions box opens, directing you to click in the Viewer to which you want the Image Drape viewer to be linked.

4. Click in the Viewer you just created.

The viewers are now linked and a Positioning tool displays in the Viewer.

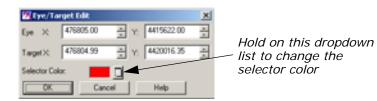


NOTE: The bounding box in the Viewer image pictured above is for visual purposes only, and does not actually appear in the Viewer window.

Start Eye/Target

 To make the Positioning tool easier to see in the Viewer, select Utility -> Selector Properties from the Viewer menu bar.

The Eye/Target Edit dialog opens.



2. In the Eye/Target Edit dialog, hold on the **Selector Color** dropdown list and select a color that displays well in the Viewer image (for example, Yellow).

3. Click **OK** in the Eye/Target Edit dialog.

The dialog closes and the color of the Positioning tool is updated to the designated color.

Manipulate the Observer
and Field of ViewYou can manipulate the observer and the observer's field of view in
several ways. See step 1 through step 3 below to learn how to obtain
different views using the Positioning tool and the Position Parameters
dialog.

Use the Positioning Tool

 Click the Observer Positioning icon in the Image Drape viewer toolbar.

	19 Position Parameters			JO X
	Position	Direction	Profile:	
Control ground level positioning	× 476805.0000 meters	FOV: 50 *		7
here	Y: 4415622.0000 meters	Pitch: 15 x		
Control sea	AGL: 009 - neters	Azimufi: 0 🛨		
level positioning here	ASL: 240 - meters	Rok 0 ÷		
Manipulate the Field of View here	Apply Close +	leip		

The Position Parameters dialog opens.

2. Drag on the **Eye** marker of the Positioning tool to change the observer's point of view in the Image Drape viewer.

The data in the Position Parameters dialog updates to reflect the changes in the observer's position. The view in the Image Drape viewer is also updated.

V

If the image in the Image Drape viewer does not completely refresh when the mouse button is released, click the Update icon

3. Next, drag on the **Target** marker of the Positioning tool to change the point of observation in the Image Drape viewer.

The data in the Position Parameters dialog updates to reflect the changes in the point of observation. The view in the Image Drape viewer is also updated.

4. Change the position of both the observer and the target at once by dragging on the line that connects them in the Viewer.

The data in the Position Parameters dialog and the Image Drape viewer is updated.

In the Image Drape viewer, click the Goto icon original position of the observer and the target.

The image and the Positioning tool in the Viewer are updated to their original position. The Position Parameters dialog is also updated.

Use the Position Parameters Dialog

1. In the Position Parameters dialog, change the **FOV** to **90** and the **Roll** to **45**, then click **Apply**.

The image in the Image Drape viewer is updated to reflect this change.

- In the Position Parameters dialog under Observer Position, enter 3000 in the AGL (Above Ground Level) number field.
- 3. Click **Apply** and then **Close** in the Position Parameters dialog.

GLT Viewer

The Geospatial Light Table is the optional Viewer available with IMAGINE. The GLT Viewer has a Geospatial Tools palette that can be displayed and hidden as needed. The Geospatial Tools palette aids the visual analyst by providing multiple viewing windows and placing at the fingertips many of the most frequently used geospatial tools. The Geospatial Tools palette also provides enhanced functionality in the status bar below the view panes.

Geospatial Tools Palette

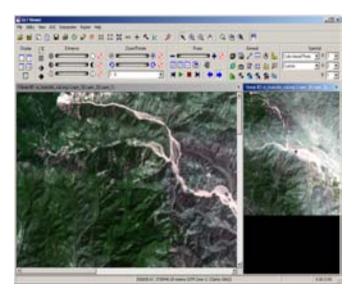
	Rom + @ • • • • • • • • • • • • • • • • • • •	50728L 50804P 153538	iner A State Constant A State A State
<i>Geospatial Tools Palette</i> The Geospatial Tools Palette cor	sists of six Fu	nctional grou	JDS:

- Display—The four Layout Control icons in this functional group allow you to set the number of viewing panes in the viewer.
- **Enhance**—This functional group provides access to brightness, contrast, and sharpness adjustments.
- **Zoom/Rotate**—This functional group consists of a zoom control, a rotation control, and a scale tool.
- **Roam**—This group consists of a roaming speed control, autoroaming controls, and the snail trail recorder.
- **General**—This palette of tools provides fast access to many tools that are also available through the menus. In addition, there are several tools that are specific to geospatial light table use.
- **Spectral**—The Spectral Selector allows you to select from a list of named band combinations that are applicable to a specific sensor. The Sensor List is built dynamically from installed sensor attribute files (.saf) based upon the number of data bands in the input image.

Display Function

This group sets the number of viewing panes in the Viewer. Display the file **XS_truecolor_sub.img** in a Viewer.

- 1. Click the Two Viewer icon under the **Display** option to bring up a second Viewer.
- **2.** Hold the left mouse button to drag and drop the top layer in the second pane.
- Hold the right mouse button and select Fit Image to Window.
 The two Viewers display the image.

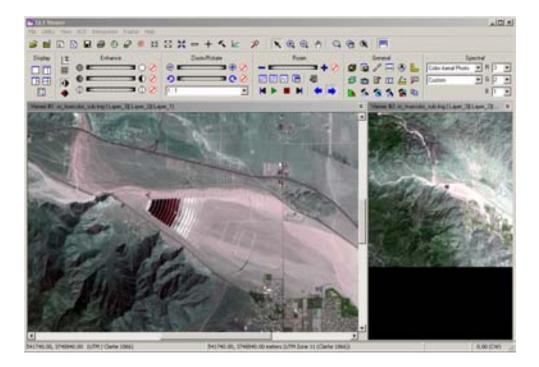


Dynamic Range Adjustment

This feature ensures the brightness and contrast is automatically adjusted to optimum as you roam the image. During autoroaming, however, the adjustment is not made until roaming is paused.

- 1. In the first Viewer, navigate to the urban area of the image.
- Click the Dynamic Range Adjustment icon
 to enhance and brighten features in the image.

The image displayed with the dynamic range adjustment turned on.



The dynamic range adjustment function is most useful with larger images to enhance features that might appear dark or washed out. This feature adjusts your range as you move around the image and locate details you might otherwise miss. The dynamic range adjustment freeze gives the added advantage of freezing a particular section and allowing you to continue roaming as you adjust new areas to the dynamic range adjustment option. This feature overrides any other contrast or brightness settings.

- 3. Click the Horizontal Path icon 📄 to roam using the left to right scan pattern.
- **4.** Click the Start icon **b** to begin the roam pattern.

Turning on the Dynamic Range Adjustment function slows down the roaming pattern. To resume the speed, turn off the feature.

While roaming, if you observe an area you want to freeze with a particular contrast and brightness setting, use the Dynamic Range Adjustment Freeze. This allows you to lock in the settings used at that moment.

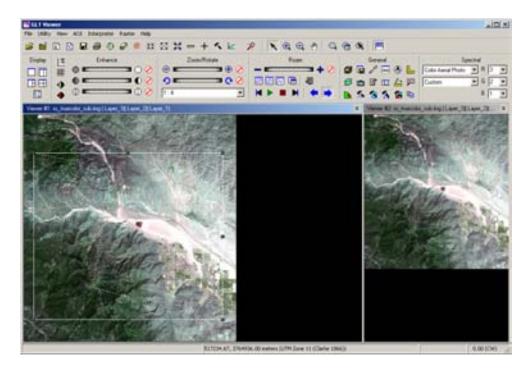
5. Click the Dynamic Range Adjustment Freeze button to freeze any areas of interest, then continue roaming. Once you are satisfied with the results you may turn off the Dynamic Range Adjustment buttons.

Digitizing a Roam Path

Digitizing a roam path on the image that the GLT automatically roams can be used to follow features like roads and rivers.

- In the first viewer, click the Resize Image to Viewer Size icon in the GLT toolbar.
- Click the Follow User-Defined Path icon in the Roam section of the GLT toolbar, the AOI Tools palette opens.
- **3.** Click the polyline tool \swarrow on the AOI Tools palette.
- Digitize each vertex of the custom roam path in the active view pane. Double-click to place the last vertex (the end point).

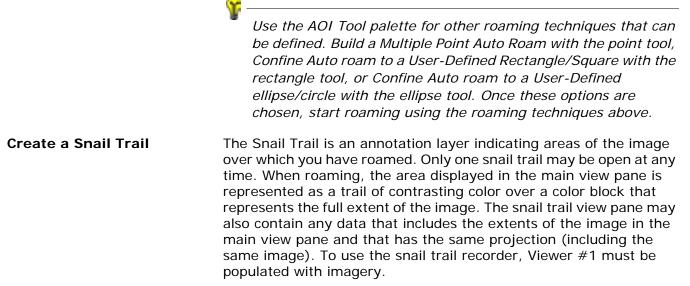
The digitized image displays.



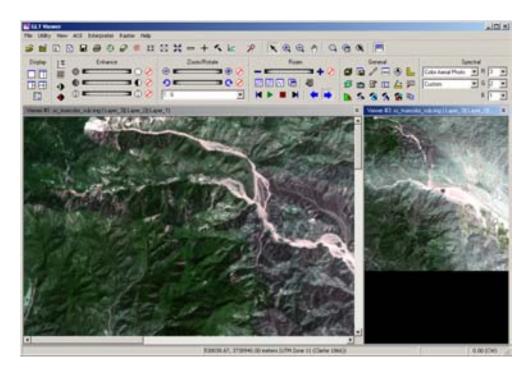
Roaming Technique

- 1. Click the Start \blacktriangleright / Pause II Roam icon. Roaming begins at the first digitized point of the first polyline or where it left off when you clicked the pause icon.
- 2. Click the Stop Roam icon 📕 .
- 3. Click the Roaming Preferences icon 🚡 , the Roaming Properties dialog opens.
- 4. Change the Roam Speed to 2.

- 5. Click **OK** to Close the Roaming Properties dialog.
- 6. Click the Go to Start icon 📕 and click Start again to roam.



The two Viewers should display the file **XS_truecolor_sub.img**.



- 1. Select the second Viewer to record the snail trail.
- Click the Record Snail Trail icon in the Roam section of the Geospatial Tool Palette to create a new snail trail. The Snail Trail Menu is added to the GLT Viewer.



 Select Snail Trail -> Properties from the GLT Viewer menu. The Snail Trail Properties menu opens.

🥂 Snall Trail Properties		×
Seen Color:		
Unseen Color:	d I	
🔽 Make Unseen Color Opt	ional	
Pixel Ratio Threshold	3.000	Å
Current Pixel Ratio:	1.000	
Auto Apply		
OK Cancel	Help	

4. Click the dropdown list and change the Seen Color to Red.

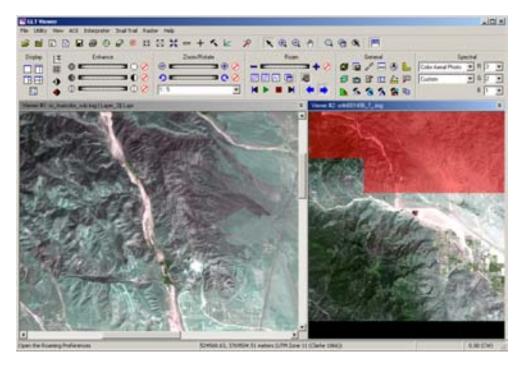
The current screen to file pixel ratio must be below the threshold set in the Snail Trail Properties dialog.

- 5. Click **OK** to close the Snail Trail Properties dialog.
- 6. Select the main view pane.

VI.

- 7. Click the Horizontal Path roaming technique.
- 8. Click **Play** to observe the path left in the snail trail pane (second Viewer).
- 9. Pause the path of the snail trail by clicking the **Pause** button. To start again, click the **Play** button.

The snail trail pauses in the second Viewer.



10. Click the snail trail view pane to activate it.

11. Click the Save icon **I** to save the snail trail path.

ERDAS IMAGINE Tour Guides

Image Catalog

Introduction

In this tour guide, you can learn how to:

- set catalog preferences
- create an Image Catalog
- add information to a catalog
- perform queries
- view the information in a catalog
- modify the views/information
- save and restore a specific area of coverage
- archive data

¥.

add custom maps

Approximate completion time for this tour guide is 15 minutes.

Set Catalog Preferences

ERDAS IMAGINE should be running. It is not necessary to have a Viewer open.

- In the ERDAS IMAGINE menu bar, select Session -> Preferences. The Preference Editor opens.
- 2. In the Preference Editor under the Category list, select Image Catalog.

The default preferences for the Image Catalog display.

	10 Preference Editor			
Click this category	Cettegory Annotation ASRP./ADRG/USRP Exporter: Batch Processing Counter Tool Dady/ww DEM Exporter DOQ Exporter - Keyword Head RT False Frame Sampling Tools GCP Editor GPS Tool Configuration GRID Image Files Image Files [Seneral] Image Files [Seneral]	Catalog Directory Default Catalog Canvas Backdrop Archive Media Water Color Land Color Border Color Line Style Cloce	SHOME default.ict GINE_HOME/etc/back.drops/wold Tape_Smin User Save Global Save Category Help	> Help

The following table lists and describes the various catalog preferences.

Table 6: Image Catalog Preferences

Preference	Function
Catalog Directory	The default directory that the catalog uses to save and open catalogs.
Default Catalog	The name of the catalog that opens by default when the Image Catalog starts.
Canvas Backdrop	The backdrop file (ArcInfo coverage) that displays when the Graphical Query viewer initially displays. This must be one of the files named in catalog.cov.
Archive Media	The name of the default media used by the archive function of the catalog.
Water Color	The default color used for all of the area outside of the polygons in a coverage, which is assumed to be water.
Land Color	The default color used to fill the polygons in an area coverage.
Border Color	The default color used to draw the border around each of the polygons in an area coverage.
Line Style	The default style used for lines in a line coverage.
Point Symbol	The default symbol used for points in a point coverage.
Symbol Color	The default color used for point symbols in a point coverage.
Symbol Size	The default size of point symbols (in points) in a point coverage.
Footprint Color	The default color used for image footprints.
Footprint Selected Color	The default color used for selected image footprints.
Footprint Fill Style	The default style used to fill image footprints.
Show Map Grid	Used to control the display of the map grid at startup.
Grid Color	The default color used for the Lat/Lon grid.

Show Grid Labels	Used to control the display of the text grid labels.
Grid Label Color	The default color used for the map grid text labels.
Level of Detail	Maximum level of detail to use when displaying maps (for example, local, global).
Show Map Outlines	Enable to display the map outlines at startup.
Map Outline Color	The default color used to display the map outlines.
Map Outline Style	The default line style used for the map outlines (for example, solid, dashed).
Restore Directory	The default destination directory for restoring an image.

Table 6: Image Catalog Preferences (Continued)

- **3.** Make any changes you wish to the catalog preferences by entering the new information in the fields and pressing Enter on your keyboard.
- 4. To save your changes and accept them as the new defaults, click User Save.
- 5. Click **Close** on the Preference Editor dialog to close the Preference Editor.

Create an Image Catalog

ERDAS IMAGINE should be running.

1. Click the Catalog icon on the ERDAS IMAGINE icon panel.



The default Image Catalog opens.

	Vew Help	ia 💷 Ö				
Record	Filename	Layers	Rows	Cols	Type	Pixel
1	ColorBlock.s.img	3	500	490	athematic	unsigned 8-bit
2	Kion_TM.img	6	509	650	athematic	unsigned 8-bit
3	TM_striped.img	3	1001	801	athematic	unsigned 8-bit
4	airphoto 1 ing	1	1110	1100	athematic	unsigned 8-bit
5	air photo-2 img	1	1096	1090	athematic	unsigned 8-bit
6	badines.ing	1	512	512	athematic	unsigned 8-bit
7	dntm.ing	7	591	581	athematic	unsigned 8-bit
	eldoatm img	4	461	355	athematic	unsigned 8-bit
9	eldodem.ing	1	461	355	athematic	unsigned 16-bi
10	floodplain.img	1	591	591	thematic	unsigned 4-bit
11	gemtn.ing	8	1024	1024	athematic	unsigned 8-bit
12	hyperspectraling	55	51	51	athematic	unsigned 8-bit
13	landcover.ing	1	556	563	thematic	unsigned 4-bit
14	lanier.ing	7	512	512	athematic	unsigned 8-bit
15	Inaspect ing	1	512	512	thematic	unsigned 16-bi
16	Inclump.ing	1	512	512	thematic	unsigned 32-bi
17	Indem.ing	1	512	512	athematic	unsigned 16-bi

NOTE: You can specify a default catalog via **Session -> Preferences**. More information on how to do this is located in "Set Catalog Preferences".

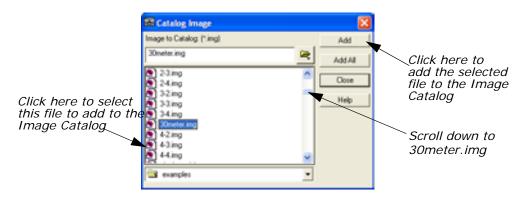
For the following example, you use the default catalog which is distributed with ERDAS IMAGINE.

Add Information

1. In the Image Catalog dialog, select **Edit -> Catalog Image**, or click

the Add Image icon **b** on the Image Catalog toolbar.

The Catalog Image dialog opens.



- In the Catalog Image dialog file list, scroll down the list and select 30meter.img.
- Click Add, and then Close in the Catalog Image dialog.
 The file 30meter.img is the last file recorded in the Image Catalog.

	vew Help 100 BE ⊕ Do 1a 1a						
Record	Filename	Layers	Rows	Cols	Type	Pixel	^
2	Inputing ing	1	512	512	thematic	unsigned 4 bit	
2	Inslope.ing	1	512	512	thematic	unsigned 8-bit	
2:	Insols ing	1	512	512	thematic	unsigned 8-bit	
24	mobbay img	- 4	512	512	athematic	unsigned 8-bit	
25	modeler_output.img	1	1024	952	thematic	unsigned 8-bit	
28	mendata ing	- 4	512	512	athematic	unsigned 8-bit	
2	panAfanta.ing	1	1301	1401	athematic	unsigned 8-bit	
2	ps_dem.ing	1	928	775	athematic	floating 32-bit	
2	slope.ing	1	564	481	thematic	unsigned 4-bit	
ж. ж	spots.ing	1	1024	1024	athematic	unsigned 8-bit	
31	spots.ing	3	467	477	athematic	unsigned 8-bit	
file is added	bryAdanta.img	6	512	512	athematic	unsigned 8-bit	
e file is added	venezuelaing	5	400	400	athematic	unsigned 16-bi	
the bottom of	wasia1_mos.ing	3	1143	1171	athematic	unsigned 8-bit	
e list of files	wasis2_mos.ing	3	1129	1158	athematic	unsigned 8-bit	
	wasia]_tm.ing	3	1142	1168	athematic	unsigned 8-bit	
3	30meter.ing	1	479	737	athematic	signed 16-bit	Y

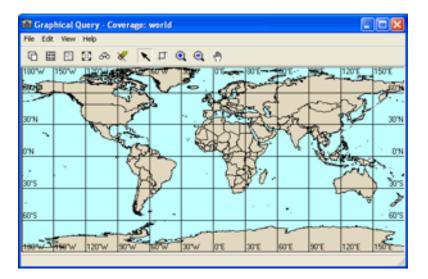
NOTE: If you were to select **30meter.img** and then select **Add All**, all files with an .img extension would be added to the Image Catalog.

Perform Graphical First, select an area of the map in which you want to query the images, and then run the query. Queries The Image Catalog should be open and it should contain the images in the <IMAGINE_HOME>/examples directory.

1. Select View -> Graphical Query Viewer, or click the Visual Query

icon 🚯 on the Image Catalog toolbar.

The Graphical Query dialog opens.



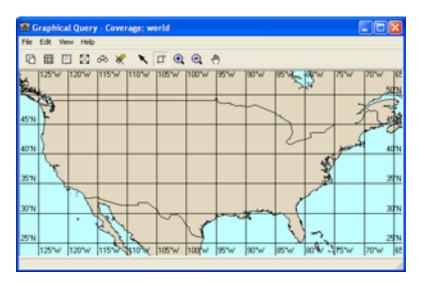
Select Area

2. Click the Select Area for Zooming icon

The pointer becomes a crosshair.

3. With the crosshair, draw a bounding box that covers the entire continental United States.

When the mouse button is released, the United States is magnified in the Graphical Query viewer. Note that more detail is presented as the backdrop is zoomed.



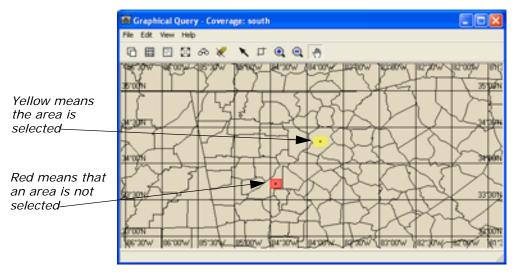
Run Query

1. Click the Query icon \mathcal{B} on the Graphical Query toolbar.

The files of images located within the designated query area (the continental US) are highlighted in yellow in the Image Catalog. Tiny rectangles on the map in the Graphical Query viewer mark the location of these images.

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Record	Filename	Laveti	Rows	Cols	Type	Puel	-
	Kion_TM.ing	6	509	850	athematic	unogred 8-bit	
3	TM_stiped.ing	3	1001	001	shenatic	unsigned 9-bit	
	an photo-1 img	1	1110	1108	athematic	unsigned 9-bit	ł.
	arphoto 2 ing	1	1096	1096	athematic	unsigned 8-bit	l.
6	badines ing	1	512	512	athematic	unsigned 8-bit	1
hteo ,	dritm ing	7	591	591	athematic	unsigned 8-bit	1
are	eldseming	4	461	365	attenutic	unsigned 8-bit	1
he	eldodem ing	1	461	355	attenatic	unsigned 16-b	Į.
10	floodplain.img	1	591	531	thematic	unsigned 4-bit	
ntal 🛝 🔼	gemin.ing	£	1024	1024	athematic	unsigned 8-bit	
ich you 🔪 🛛 🗤	hyperspectraling	55	51	51	athenatic	unsigned 8-bit	
to in		1	556	563	thematic	unsigned 4-bit	
	larver img	7	512	512	attenatic	unsigned 8-bit	
phical	Inaspecting	1	512	512	thematic	unsigned 16-b	
iew	Inclump img	1	512		Evenuatic	unsigned 32-b	
A CONTRACTOR OF A CONTRACTOR	Indem ing	1	512	512	attenatic	unsigned 16-b	
1 million ()	Pringelia ing		512		thematic	unsigned 4-bit	110

- 2. Click the Zoom In icon 👰 on the Graphical Query toolbar.
- 3. Place the Zoom In tool over one of the black dots in the map in the Graphical Query view and click until the dot is magnified to a yellow box. The image in the view shifts depending on where you click.
- 4. Click the Select icon 🔪 on the Graphical Query toolbar.
- 5. With the Select tool, click the yellow box you just magnified. Note that all of the other images located in the Graphical Query viewer are characterized by red boxes.

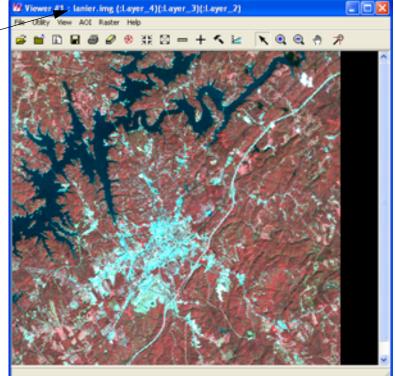


The file name corresponding to the point you selected in the Graphical Query view highlights in the Image Catalog.

	s 🗆	00 H 0 1 's	'e 🗉 Ϊ				
	Record	Filename	Lavets	Rows	Cols	Type	Pael
	2	Kion_TM.mp	5	509	650	athematic	unsgred 8-bit
	3	TM_streed.ing	3	1001	801	athematic	unsgred 8-bit
	- 4	arphoto1 ing	1	1110	1100	athematic	unsigned 8-bit
	5	arphoto-2 mg	1	1096	10%	athematic	unsigned 8-bit
	6	badines ing	1	512	512	athematic	unsigned 8-bit
	7	drittn ing	7	591	591	athematic	unsigned 8-bit
	8	eldoam ing	4	461	355	athematic	unsigned 8-bit
		eldodem ing	1	461	355	athematic	unsigned 16-bi
	10	floodplain.ing	1	591	581	thematic	unsigned 4-bit
	11	gemin.ing	6	1024	1024	athematic	unsigned 8-bit
	12	hypeispectral ing	55	51	51	athematic	unsigned 8-bit
s file	13	landcover.ing	1	556	563	thematic	unsigned 4-bit
responds		larver imp	7	512	512	attenatic	unsigned 8-bit
	15	inaspecting	1	512	512	thematic:	unsigned 16-bi
the point	16	Inclump ang	1	512	512	thematic	unsigned 32-bi
ı clicked in 📗	17	Indem ing	1	512	512	athematic	unsigned 16-bi
Graphical	10	Whydia ing	1	512	512	thematic	unsigned 4-bit

6. Click the Display Single Viewer icon 🔲 on the Image Catalog toolbar.

The selected image, in this example **lanier.img**, displays in a Viewer.



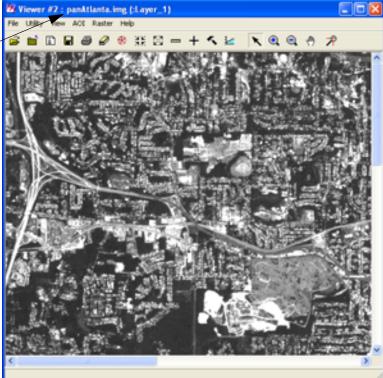
 Repeat step 2 through step 6, but select a red box on the map to display another image. Note that when the box is selected, it turns yellow.

This is the file you selected in the Graphical Query view, which was also highlighted in the Image Catalog If necessary, click the Roam icon not the Graphical Query toolbar, and then drag the image in the Graphical Query view to change the position of the image in the view. (If you reset the display, be prepared to start back at step 2.)

NOTE: Magnified boxes that are deselected are red in color; selected boxes are yellow.

8. In the Image Catalog toolbar, click the Display Another Viewer icon

to display the image you selected in step 7 in a second Viewer.



In this example, the second point selected corresponds to the file named panAtlanta.img

View Information

 To view all of the information for the image in your first Viewer in one convenient form, highlight that file in the Image Catalog by clicking on the **Record** number of that file.

The file is highlighted in yellow.

2. In the Image Catalog dialog, select View -> Form View, or click the

Catalog Default icon 🔝

The Form View dialog opens, listing the characteristics of the file you selected.

	🔠 Form View			×
The image is	File Data			
identified here	Image: Type: Projection: Status: Usec: Upper Left: X: Lower Right: X: Units: Pafrs:	anier.ing anier.ing UTM ONLINE bin -63.90 -63.73 -7: [34.37 -63.73 -7: [34.37 -63.73 -7: [34.24 dd gtMAGINE_HOME/examples/	Rows: Cols: Layers: Bits: Date:	512 512 7 unsigned 8-bit 938613857
You can scroll through all of the images in the catalog using these arrows	Archive Data Labet File Size: File Pos: Location:	lose Help	Medix By: Date:	

- In the bottom left corner of the Form View dialog, there is an Up Arrow icon and a Down Arrow icon . Click twice on the Down Arrow icon, noting that the information in the Form View dialog corresponds with the highlighted file in the Image Catalog.
- 4. Click **Close** to close the Form View dialog.
- Another way to view information about individual files is to use the ImageInfo dialog. Select View -> Image Info from the Image Catalog, or click the ImageInfo icon 1.

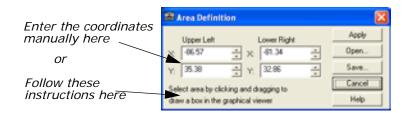
The ImageInfo dialog opens.

File Edit View He	vier.img) No						Ŀ	
				•	1 ⁴ 1 ¹			
File Info:	Layer Name: Last Modified:		-				PERT.	7
		512 64 None	Height Block Height	512 64	Data Type: Data Order:			
	Mir: Median	52 66	Max Mode:	255 64	Me			
Statutics Into:	Last Modified:	Thu	Skip Factor X far 12 00:14:21 19	1 192	Skip Factor's	ć	1	
Map Info:	Lower Rig Pixel Siz	ha≫ 24 ne≫ 30	0415.0 .0		Lower Right Y: 37 Pixel Size Y: 30	91740. 0	0	
Projection Info:	Spheroid C	lake 10	66					
	General Projection File Info Layer Info Statistics Info Map Info [File]	General Projection Histogram Prior File Info Layer Name: Last Modified Width: Block Width: Block Width: Dlock Width: Compression: Pyramid Layer Alg Statistics Info Min: Median: Last Modified Map Info: Upper Le Lower Rig Projection Info: Projection Info: Projection U Spheroid C	General Projection Histogram Pixel data File Info: Laper Name: Laper Lat Modified Thu M Laper Info: Wdth: 512 Block Width: 64 Laper Info: Wdth: 64 Compression: None Statistics Info: Min: 52 Median: 66 Last Modified Thu M Map Info: Upper Left X: 23 Lower Right X: 24 Pixel Size X: 30 Unit: me Projection Info: Projector: UTM.20	File Info Last Modified: Thu Mar 12 00:14:16:19 Width: 51:2 Height: Diock Width: 64 Block Height: Compression: None Pyramid Layer Algorithm: No pyrami Min: 52 Max: Median: 66 Mode: Ship Factor X: Last Modified: Thu Mar 12 00:14:21:15 Map Info: [File] Upper Left X: 2300(5:0) Lower Right X: 240(415:0) Pixel Size X: 30.0 Unit: meters Projection: UTM, Zone 17	General Projection Histogram Prief data File Info: Laper Name: Layer_1 File Type: Layer Info: Width: 512 Height: 512 Layer Info: Width: 512 Height: 512 Layer Info: Width: 512 Height: 64 Compression: None Ppramid Layer Algorithm: No paramid layer Min: 52 Max: 255 Statistics Info: Min: 52 Max: 255 Median: 66 Mode: 64 Map Info: Upper Left X: 20005.0 Lower Right X: 240415.0 Piel Size X: 30.0 Unit: meters Projection: UTM, Zane 17 Spheroid: Clarke 1066 Spheroid: Clarke 1066	General Projection Histogram Pixel data File Info Laper Name: Layer_1 File Type: IMAGINE Imag Number Laper Name: Layer_1 File Type: IMAGINE Imag Number Laper Info Wdth: 512 Height: 512 Type: Layer Info Wdth: 512 Height: 512 Type: Block Width: 64 Block Height: 64 Data Type: Compression: None Data Order: Pyramid Layer Algorithm: No pyramid layers present Min: 52 Max: 25 Me Statistics Info: Min: 52 Max: 25 Statistics Info: Min: 52 Max: 25 Me Median: 66 Mode:: 64 Std. De Statistics Info: Upper Left: 20014.2111992 Me Map Info: Upper Left: 20015.0 Upper Left 'Y: 30 Last Modified Thu Mar 12 00.14.21 11992 Unit: meters Geo. Modet: Me <td>General Projection Histogram Psel data File Info Layer Name: Layer_1 File Type: IMAGINE Image Last Modified: Thu Mar 12 00:14:16 1992 Number of Lage Number of Lage Layer Info Width: 512 Height: 512 Type: Contie Layer Info Width: 64 Block Height: 64 Data Type: Unsig Compression: None Data Order: BL Pyramid Layer Algorithm: No pyramid layers present Min: 52 Max: 255 Mean: Skip Factor X: 1 Skip Factor Y: Last Modified: Thu Mar 12 00:14:21 1932 Map Info: Upper Left X: 20005:0 Upper Left Y: 3007070 Lower Right Y: 3017400 Pixel Size X: 30.0 Pixel Size Y: 30.0 Unit: meters Gen. Model: Map Info Fright Fright X: 20005:0 Upper Left Y: 3007070 Unit: meters Gen. Model: Map Info Fright X: 20005:0 Upper Left Y: 30:0 Pixel Size X: 30.0 Pixel Size Y: 30.0 Unit: meters Gen. Model: Map Info Projection: UT</td> <td>Beneral Projection Histogram Pixel data File Info Layer Name: Layer_1 File Type: IMAGINE Image File Info Layer Marke: Layer_1 File Type: IMAGINE Image Layer Info Width: 512 Height: 512 Type: Continuous Block Width: 64 Block Height: 64 Data Type: Unsigned 8-bit Layer Info Block Width: 64 Block Height: 64 Data Type: Unsigned 8-bit Pixamid Layer Algorithm: Nore Data Order: Bit Bit Bit Min: 52 Max: 255 Mean: 60.043 Median: 66 Mode: 64 Std Dev: 9515 Stap Factor X: 1 Skip Factor Y: 1 Last Modified: Thu Mar 12:00:14:21 1992 Map Info: Upper Left X: 20005:0 Upper Left Y: 3007070:0 Lower Right Y: 3791740:0 File [File] Upper Left X: 20005:0 Lower Right Y: 30:0 Unit: meters Geo. Mode! Map Info<!--</td--></td>	General Projection Histogram Psel data File Info Layer Name: Layer_1 File Type: IMAGINE Image Last Modified: Thu Mar 12 00:14:16 1992 Number of Lage Number of Lage Layer Info Width: 512 Height: 512 Type: Contie Layer Info Width: 64 Block Height: 64 Data Type: Unsig Compression: None Data Order: BL Pyramid Layer Algorithm: No pyramid layers present Min: 52 Max: 255 Mean: Skip Factor X: 1 Skip Factor Y: Last Modified: Thu Mar 12 00:14:21 1932 Map Info: Upper Left X: 20005:0 Upper Left Y: 3007070 Lower Right Y: 3017400 Pixel Size X: 30.0 Pixel Size Y: 30.0 Unit: meters Gen. Model: Map Info Fright Fright X: 20005:0 Upper Left Y: 3007070 Unit: meters Gen. Model: Map Info Fright X: 20005:0 Upper Left Y: 30:0 Pixel Size X: 30.0 Pixel Size Y: 30.0 Unit: meters Gen. Model: Map Info Projection: UT	Beneral Projection Histogram Pixel data File Info Layer Name: Layer_1 File Type: IMAGINE Image File Info Layer Marke: Layer_1 File Type: IMAGINE Image Layer Info Width: 512 Height: 512 Type: Continuous Block Width: 64 Block Height: 64 Data Type: Unsigned 8-bit Layer Info Block Width: 64 Block Height: 64 Data Type: Unsigned 8-bit Pixamid Layer Algorithm: Nore Data Order: Bit Bit Bit Min: 52 Max: 255 Mean: 60.043 Median: 66 Mode: 64 Std Dev: 9515 Stap Factor X: 1 Skip Factor Y: 1 Last Modified: Thu Mar 12:00:14:21 1992 Map Info: Upper Left X: 20005:0 Upper Left Y: 3007070:0 Lower Right Y: 3791740:0 File [File] Upper Left X: 20005:0 Lower Right Y: 30:0 Unit: meters Geo. Mode! Map Info </td

6. Select File -> Close on the ImageInfo dialog.

Modify Views

 In the Graphical Query viewer, select File -> Area Definition. The Area Definition dialog opens.



The Area Definition dialog lets you store the extent of particular areas of interest for quick retrieval. For example, if your study area covers the states of North and South Dakota, you could save a view of just that area. You can either enter the coordinates manually into the Area Definition dialog, or you can select an area by drawing a box in the Graphical Query view.

The upper-left and lower-right coordinates are the coordinates of the area currently viewed in the Graphical Query view. You can save these coordinates to a bounding box file (.bbox).

2. Click Save in the Area Definition dialog.

The Defined Areas file selector dialog opens.

	Defined Areas:	×
Enter the directory here and file name here	Look in kouny kouny kouny kouny kouny kouny kouny kouny	OK Cancel Help
	NetHood PrintHood Recent	Goto
	File name: Ustabbox Files of type: Catalog Area Definition File (*.bbox)	

- In the Defined Areas dialog under File name, enter the name usa in the directory of your choice, then press Enter on your keyboard. Then click OK.
- 4. Click Cancel in the Area Definition dialog to close it.
- 5. In the Graphical Query view, click the Roam icon Mana and then drag on the image to view a different area.
- In order to recall the area you saved as usa.bbox, select File -> Area Definition in the Graphical Query view, and then click Open in the Area Definition dialog.

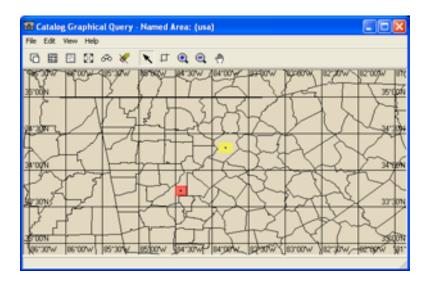
The Defined Areas dialog opens.

- 7. Navigate to the location where you saved the file in the Defined Areas file selector dialog and select **usa.bbox**.
- 8. Click **OK** in the Defined Areas file selector dialog.

The Defined Areas dialog closes and the coordinates in the Area Definition dialog change.

9. Click **Apply** and then **Cancel** in the Area Definition dialog.

The Graphical Query view redisplays the view you saved as **usa.bbox**.



Archive Data

The following steps detail how data are archived.



You must have a non-rewinding tape device already configured in order to archive data.

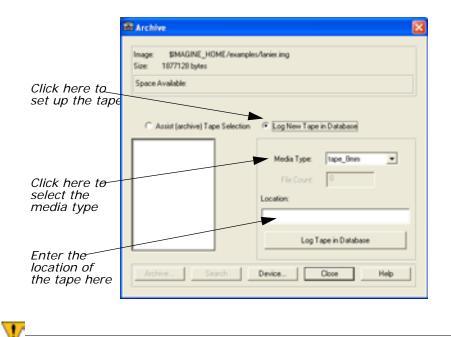
 Select the image in the Viewer by clicking on its **Record** number in the Image Catalog CellArray.

The file is highlighted in yellow.

2. In the Image Catalog, select File -> Archive, or click the Archive

icon 🍙 in the toolbar.

The Archive dialog opens.



Follow step 3 through step 6 for initial setup only.

- 3. In the Archive dialog, click Log New Tape in Database to set up the tape to be used.
- 4. Click the **Media Type** dropdown list and select one of the options such as **tape_8mm** or **tape_exabyte**.
- 5. Enter the **Location** of the tape. This is simply a note to yourself, indicating where you store the tape or which tape you are using (for example, tape #16).
- 6. Click Log Tape in Database to add this tape to the list of available tapes. A message displays with the identification number that should be placed on the tape for later retrieval. The new tape number displays in the scrolling list of available tapes.

III Me	ssage	×
Ф	Please label Media: [T8-0000001]	
	OK to All	

- 7. Click to select the tape from the list.
- 8. Click **Device** to select the actual tape device to which you archive. A list of configured tape devices displays.
- **9.** In the Select Configured Devices dialog, click the device to which you archive. It must be configured as a non-rewinding device.
- 10. Click Select to select the device.

- **11.** In the Archive dialog, click **Archive** to archive the selected image.
- **12.** You are instructed to place the selected tape in the selected device. Click **Continue** when the tape is loaded. You are informed when the process is complete.

NOTE: For subsequent images, omit step 3 through step 6.

ERDAS IMAGINE Tour Guides

Map Composer

The ERDAS IMAGINE Map Composer is an editor for creating cartographic-quality maps and presentation graphics. Maps can include single or multiple continuous raster layers, thematic (GIS) layers, vector layers, and annotation layers.

Map Composer's extensive annotation capabilities allow you to automatically generate text, legends, scale bars, grid lines, tick marks, borders, symbols, and more. You can select from over 16 million colors, multiple line styles, and over 60 text fonts.



Approximate completion time for this tour guide is 40 minutes.



Introduction

In this tutorial, you create a map using the file **modeler_output.img** in the <IMAGINE_HOME>/examples directory. This file contains SPOT panchromatic data overlaid with an environmental sensitivity analysis file.

In creating this map, you use these basic steps:

- plan the map
- start Map Composer
- prepare the data layers
- draw the map frame
- · add a neatline and tick marks
- make scale bars
- create a legend
- add a map title
- place a north arrow
- write descriptive text
- print the map

This tour guide also contains information about editing map frames, deleting map frames, and editing map compositions.

Start Map Composer

You must have ERDAS IMAGINE running.

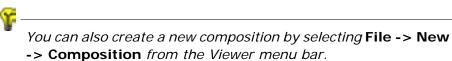
1. Start Map Composer by clicking the Composer icon on the ERDAS IMAGINE icon panel.



The Map Composer menu displays.



2. In the **Map Composer** menu, select **New Map Composition** to create a new map composition.



The New Map Composition dialog opens.

	💯 New Map Composition		X	
	New Name: (*.map)	Map size does not in	clude printer margins.	
Type a name for your map		Map Width:	8.00	- Specify map
ner e		Map Height:	800	size here in meters
		Display Scale 1:	1.00	or in inches
		Units:	inches 💌	
Click here		Background	White	
to make — a new map	inagine_temp	Г	Use Template	
	ОК	Cancel	Help	

- 3. In the New Map Composition dialog under **New Name**, type a unique name for your map (such as **tour.map**). Be sure that you have write permission in the directory where you are creating the new map.
- 4. Drag across the value in Map Width to select it.

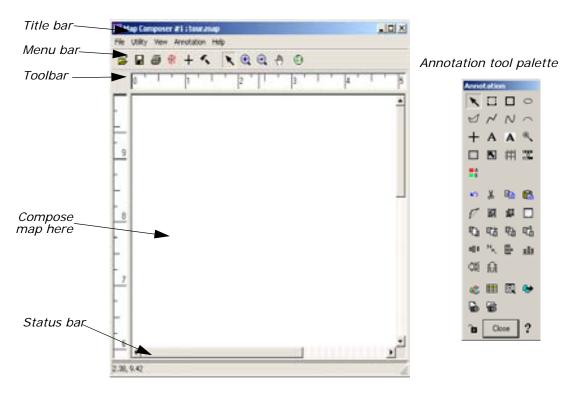
- 5. Type **7.5** and then press the Enter key on your keyboard.
- 6. Drag across the value in Map Height to select it.
- 7. Type **10.0** and then press the Enter key on your keyboard.

Most printers have a small margin on all sides of a sheet that are unprintable. Therefore, even though you output your map to $8.5" \times 11.0"$ paper, you must specify a smaller size here for the actual live area of the map. This ensures that no part of the map occupies that unprintable area, and it leaves a margin around the edge of the composition.

- 8. Accept the Display Scale 1 of 1.00 and inches for the Units.
- 9. Click **OK** in the New Map Composition dialog.

A blank Map Composer viewer displays along with the Annotation tool palette.

NOTE: The tool palette that displays on your screen may look different from the following one, depending upon your ERDAS IMAGINE preferences.



 With your cursor in the Map Composer viewer, right-hold Fit Map To Window from the Quick View menu so that you can see the entire map composition page.

Prepare the Data Layers

You must determine what data layer(s) you are going to use in your composition and then display the layer(s) in a Viewer window. In this exercise, you use **modeler_output.img** from the <IMAGINE_HOME>/examples directory.

ERDAS IMAGINE must be running, and you must have a Viewer and a Map Composer viewer open.

In the Viewer, click the Open icon icon on the toolbar or select File > Open -> Raster Layer from the menu bar.

Second, click here to display the Raster Options ct Layer To Add: X Raster Options Multiple a examples C First, click 🛃 mason_ap.ing radar_glacier.ing 🕭 shine6.ing OK. here to mobbay imp 🔊 shine7.ing oads ing Cancel odeler_output select the file eattle.ing shinelling shine3.ing 🐑 moodata ing seattle_dem.imp Help neighborhood_test_file.ing shine0.img]sky.ing neighborhood_test_file_2.ing 🔊 shine1.img slope.ing lotho ino Shine2ima Ispots inc Recent panManta ing shine3.ing spotus ima Goto ps_dem.img shine4.ing StereoSAR chine5.img Dic_napp.ing (Advance) A preview . . of the image File name: modeler output imp The file type displays Files of type: [MAGINE Image (*.ing) should be ٠ here .img pseudocolor : 1024 Rows x 952 Columns x 1 Band(s)

The Select Layer To Add dialog opens.

- In the Select Layer To Add dialog under Filename, click modeler_output.img. Be sure that the source directory is <IMAGINE_HOME/examples> (the default).
- 3. Click the **Raster Options** tab and then select the **Fit to Frame** option so that you can see the entire file and can more easily select the area to include in the map.
- 4. Click **OK** in the Select Layer To Add dialog.

Draw the Map Frame

You can now begin creating your map composition. The first step in creating your map is to define the map frame.

What is a Map Frame?

A map frame is drawn, resized, and selected like other annotation elements, but a map frame works like a Viewer. Map frames can contain raster, vector, and annotation layers that you want to include in your composition.

Although map frames display the layer(s) you want to include in a map composition, the data in a map frame are not copied, but are referenced. When you create a map frame, simply click in the Viewer where the layers you want to use in the map are displayed.

Map Frame Dimensions

There are three ways to select the dimensions of a map frame. You use different options depending on the image area you want in the final map composition. The dimensions of a map frame are expressed in the following ways:

- The map area is the area in the Viewer that displays in the map frame in the map composition. It corresponds to the dimensions of the area on the ground in map units.
- The frame area is the area used by the map frame in the map composition. It is the area on the page occupied by a particular image. It is defined in page units.
- The scale (like the scale used in geometric correction) is the ratio of distance in the map frame to the distance that is represented on the ground. For example, you can define an area showing a scale of 1:24,000.

A Viewer must be open, with the data layer you want to use in your composition displayed in it. You must also have an open Map Composer viewer.

- From the Annotation tool palette, click the Map Frame icon it to draw the boundary of the map frame.
- 2. Near the top of the Map Composer viewer, Shift-drag your cursor downward at an angle to draw the map frame. You position and size the map frame later.

NOTE: Pressing the Shift key while drawing the map frame allows you to draw a perfect square.

When the mouse is released, the Map Frame Data Source dialog opens.

Map Frame Data Source		
Fill hame with data from:		
Viewer Imported data		
Cancel Help		

3. In the Map Frame Data Source dialog, click the **Viewer** button to select the source image from the Viewer.

The Create Frame Instructions dialog displays.

	Now 🗷	in the Viewer from which to copy. Th	
	NOW CA	in the viewer from which to copy. Th	e cursor will
	appear in (one of three forms:	
A	Q	OK to copy from this Viewer	
	6		
<u> </u>	~	Carrier copy non-one remain	CTTD.
	Then posit	ion and size the selector boxes and	ELL OK in the

4. Click anywhere in the image in the Viewer to reference the displayed image to the new map frame.

The Map Frame dialog opens, giving you options for sizing, scaling, and positioning the map frame.

	🕂 Map Frame	×
Click here to adjust	Name: MapFramemodeler_output.ing	
the size of the map	C Dhange Map and Frame Area (Maintain Scale)	
Click here to adjust	C Change Scale and Frame Area (Maintain Map Area)	
the position of the	Change Scale and Map Area (Maintain Frame Area)	
map frame	Scale 1: 40096 01 -	
	Map Area Widty 30267.23 + Height 30267.23 +	
Click here to enter the scale of the data	France Justiti 106 - Regite 106 -	
in the map frame	Hap Angle 0.00 - Use Entire Source	J
Click here to enter	Upper Left Map Coordinates: Upper Left Frame Coordinates:	
map frame height and width in inches	× 1690320.08 ×	
and width in inches	Y: 301873.47 2 Y: 9.73 2	
Click here to enter	OK Cancel Help	
map frame X and Y coordinates		

A cursor box also displays in the Viewer. This cursor box allows you to select the area you want to use in the map composition.

Adjust the Size of the Map Frame

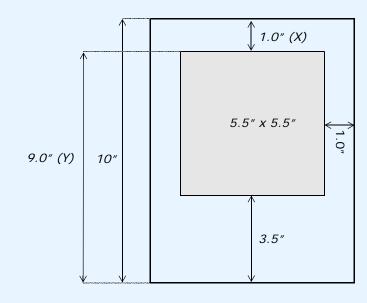
Moving and Adjusting the Map Frame

You can move the map frame in the Map Composer viewer window and the cursor box in the Viewer by dragging and resizing them with the mouse, or you can move one or both boxes by manipulating the information in the Map Frame dialog. You can also rotate the box in the Viewer if you want to change the orientation.

Next, you move the map frame by setting parameters in the Map Frame dialog. Then you can select the image area you like by using the mouse to move the cursor box in the Viewer.

The three buttons at the top of the Map Frame dialog allow you to adjust two parameters while keeping the other frozen. Start by selecting the size of the map frame (**Change Scale and Frame Area**), and then freeze that option to select the scale and position of the map frame (**Change Scale and Map Area**).

Your map frame is positioned according to the following illustration:



NOTE: The origin of the Map Composer viewer is the lower left corner.

- 1. In the Map Frame dialog, click the **Change Map and Frame Area** (Maintain Scale) option so that you can accurately size the map frame in the Map Composer viewer window.
- 2. In the Map Frame dialog, double-click the value in **Frame Width** to select it.
- **3.** Type **5.5** for the width of the map frame and then press the Enter key on your keyboard.

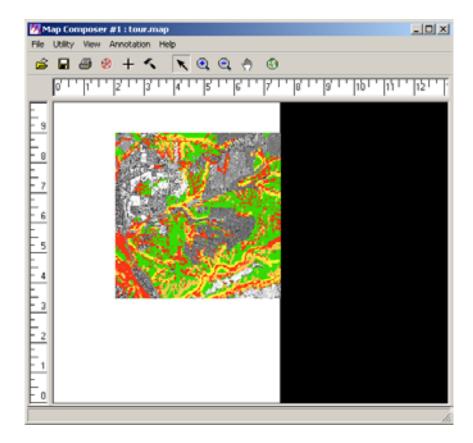
- Double-click the value in the frame Height (to the right of Frame Width) to select it.
- 5. Type **5.5** for the height of the map frame and then press the Enter key on your keyboard.

Adjust the Position of the Map Frame

- In the Map Frame dialog, click the Change Scale and Map Area (Maintain Frame Area) option so that you can select a map area in the Viewer without losing the dimensions of the map frame in the Map Composer viewer.
- 2. In the Map Frame dialog, under **Upper Left Frame Coordinates**, change the **Y** value to **9.0**. Press Enter on your keyboard.
- **3.** Double-click the value in **Scale 1** to select it. Type **50000**. Press Enter on your keyboard.
- **4.** With your cursor inside the cursor box in the Viewer, drag the cursor box to the area you want to display in the map composition.
- 5. When the cursor box is positioned to your satisfaction, click **OK** in the Map Frame dialog to reference that portion of the image to the map composition.

The image area that you selected in the Viewer is now displayed in the map frame in the Map Composer viewer.

6. To enlarge the image in the Map Composer viewer, drag on the corners of the Map Composer viewer to enlarge it, and the right-hold to select **Fit Map To Window** from the **Quick View** menu.



7. You are now finished with the Viewer, so select **File -> Close** from the Viewer menu bar to close it.

Choose Your Path

- If you are satisfied with your map frame and the image area you have selected, proceed to "Add a Neatline and Tick Marks".
- If you want to edit your map frame or change the image area you selected, proceed to "Edit the Map Frame".

The Map Composer is very flexible in allowing you to place a map frame in a composition based on scale, image area, etc. Once you have placed a map frame in a composition, you can move it, change the size of it, and change the image area within it.

12

If you want to change the image you are using, you must delete the map frame and redraw it or edit the .map file.

Choose Your Path

Edit the Map

Frame

- To edit the map frame, proceed with this section.
- To delete the map frame, proceed to "Delete the Map Frame".

- To edit the .map file, proceed to "Edit Composition Paths".
- 1. To edit a map frame, click the Select Map Frame icon in the Annotation tool palette.
- 2. Click in the map frame you want to edit to select it.
- In the Map Composer viewer, select Annotation -> Element Properties or double-click in the map frame.

A new Viewer opens, with the image you are using displayed. A white cursor box indicates the area currently in the map frame. The Map Frame dialog also opens, displaying the settings you originally entered to position and size the map frame.

- **4.** Change the information in the Map Frame dialog and/or move the cursor box in the Viewer.
- 5. Click **OK** in the Map Frame dialog when you are satisfied with the map frame.
- 6. Select File -> Close from the Viewer menu bar.



If you want to delete the map frame altogether, follow the next series of steps.

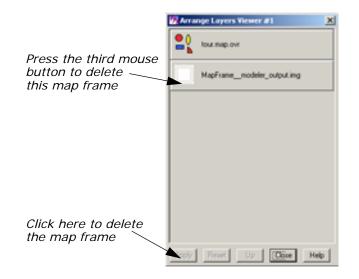


Deleting a map frame cannot be undone.

You must have your map composition open.

 In the Map Composer viewer menu bar, select View -> Arrange Layers.

The Arrange Layers dialog opens.



- In the Arrange Layers dialog, move your pointer to the box titled MapFrame___modeler_output.img and right-hold to select Delete Layer from the Frame Options dropdown list.
- 3. In the Arrange Layers dialog, click **Apply** to delete the map frame.
- 4. Click **Close** in the Arrange Layers dialog.

You are now ready to redraw the map frame. Return to "Draw the Map Frame".

Add a Neatline and Tick Marks

Now, add a neatline and labeled tick marks around the image in the map composition.

Neatlines and Tick Marks

- A neatline is a rectangular border around a map frame.
- Tick marks are small lines along the edge of the map frame or neatline that indicate regular intervals of distance. Tick marks are usually labeled in meters, feet, or other units.

The Map Composer allows you to generate a neatline and labeled tick marks at the same time. A set of these elements for a map frame is actually a group of line and text elements that is automatically generated to your specifications. (You can also generate grid lines in the same step, but grid lines are not included in this map.)

You must have a Map Composer viewer open containing a map frame referenced to a georeferenced image in order to generate georeferenced tick marks. The Annotation tool palette must also be open.

- 1. If you have not already done so, right-hold **Fit Map To Window** in the Map Composer viewer so that you can see the entire map composition page.
- 2. Click the Grid/Tick icon 🗰 on the Annotation tool palette.
- **3.** Click the image inside the map frame on which you want to place the neatline and tick marks.

The Set Grid/Tick Info dialog opens.

	Set Grid/Tick Info
Specify neatline here	Name: Descriptions
	Geographic Ticks 🔽 🔽 Neat line Margin: 0.000 🚠 linches 💌
	Map Units:
Enter tick mark	C Meters C Feet C Other Holzontal Avis Ventical Avis
information here for the horizontal axis	Length Dutside: 0.000
	Length Intersect 0.000 = in 3 1720000 Starting at 1700000 = feet
	Spacing 10000 + feet
Click here to copy horizontal tick information to	Copy to Vertical Use Full Grid Number of lines: 3
the vertical axis	Apply Redo Close Help

- 4. Accept the default of **Neat line** to put a neatline around the map and leave the **Margin** at **O** so that the neatline fits to the edge of the map frame.
- 5. In the Horizontal Axis options, drag across the Length Outside field to select it.
- 6. Type a tick length of **0.06**. Press Enter on your keyboard.

Tick marks extend 0.06" outside of the map frame.

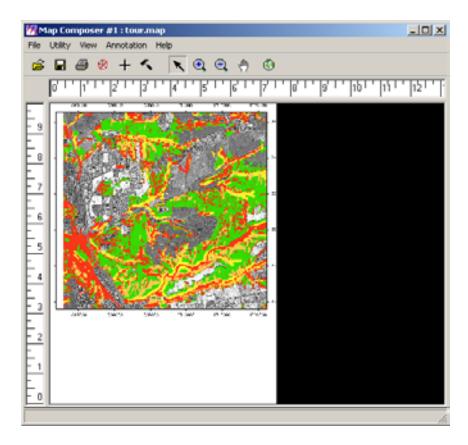
- 7. Drag across the **Spacing** field to select it.
- 8. Type 5000. Press Enter on your keyboard.

The **Number of lines** is about **4**, indicating that there are 4 horizontal tick marks (depending on the actual image area you selected).

9. Click the **Copy to Vertical** option to apply these settings to the vertical axis.

The same settings are applied to the vertical axis.

- **10**. Click the **Vertical Axis** tab to verify neatline and label information for the vertical axis.
- **11.** Click **Apply** in the Set Grid/Tick Info dialog to place the neatline and tick marks on the map.
- 12. If you are satisfied with the appearance of the neatline, click Close in the Set Grid/Tick Info dialog. Otherwise, you may make adjustments in the Set Grid/Tick Info dialog and click Redo to apply them. Your map should look similar to the following:



Change Text/Line Styles

The text and line styles used for neatlines, tick marks, and grid lines depend on the default settings in the Styles dialog. You can either set the styles before adding this annotation to your map, or you can change the styles once they are placed in the map.

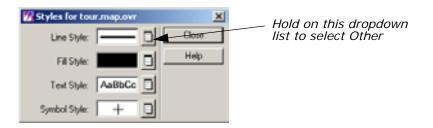
Next, set the line style to 1 point for the neatline and tick marks, and the text size to 10 points for the tick labels.

1. Select the group of ticks, tick labels, and the neatline by clicking on any of the number labels outside of the map frame.

A selection box displays around the entire group.

 From the Map Composer viewer menu bar, select Annotation -> Styles.

The Styles dialog opens.



3. In the Styles dialog, hold on the dropdown list next to Line Style and select Other.

The Line Style Chooser dialog opens.

Cline Style Chooser Standard Custom		<u>×</u>	
Menu Sold black Do Dashed White on Black Ulack With Anow Ulack Rahoad Sold White Sold Red Sold Blue Sold Blue Sold Dyan	Join Rounded Cap Rounded Ends None Anow Width 200 pts Outer Color:	Aqoly Dore Heb	Change the line width here

- 4. In the Line Style Chooser dialog next to **Width**, enter **1.00** to change the width in points.
- Click Apply and then Close in the Line Style Chooser dialog. The group redraws with the new line width.
- 6. In the Styles dialog, hold on the dropdown list next to **Text Style** and select **Other**.

The Text Style Chooser dialog opens.

V Text Style Chooser Standard Custon	Size	10.00		Verify that the — text size is 10 points
aBbC Eleck Galary			· · · · · · · · · · · · · · · · · · ·	,
aBbC [lack Galary Bold	Units:	paper 💌 pts	-	
Elack Galaxy Outlined				
aBbC Elack Galaxy Italic				
aBbC Elack Galaxy Shadow			Close	
aBbC White Galaxy Dutined			Help	
alRoC Elack Baskerville				
aBbC Elack Easkerville Dold				
Elack Baskerville Outlined	×1			
			AaBbCc	
Auto Apply changes				

- 7. In the Text Style Chooser dialog, verify that the Size is 10.00.
- 8. Click **Apply** and then **Close** in the Text Style Chooser dialog.
- **9.** Deselect this annotation group by clicking anywhere in the map composition window outside of the selection box.
- 10. Click Close in the Styles dialog.



A scale bar indicates the scale of the image on the map. You can create one scale bar, or several, showing the scale in different units. A scale bar is actually a group of elements that is automatically generated to your specifications.

In this section, place two scale bars in your map composition, showing scale in kilometers and miles. Then center them under the map frame.



You can create scale bars only for map frames containing georeferenced data.

You must have a map composition open and it must contain georeferenced data. The Annotation tool palette must also be open.

- 1. To place scale bars, select the Scale Bar tool **m** from the Annotation tool palette.
- **2.** Move the cursor into the Map Composer viewer and the cursor changes to the scale bar positioning cursor.
- **3.** Drag the mouse to draw a box under the right corner of the map frame in the Map Composer viewer, outlining the length and location of the scale bar(s).

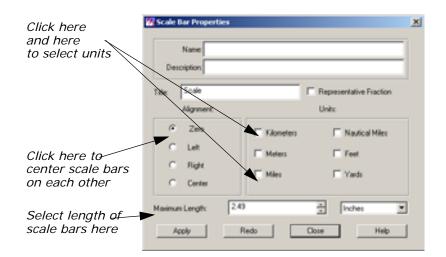
You can change the size (length) and location later, if needed.

When you release the mouse button, the Scale Bar Instructions dialog is activated.

🙀 Scale Ba	r Instructions	×
	In the maphame with the scale you want to use for the scale bar.	
		Cancel

4. Follow the instructions in the Scale Bar Instructions dialog by clicking in the map frame to indicate that this is the image's scale you are showing.

The Scale Bar Properties dialog opens.



- 5. In the Scale Bar Properties dialog under **Units**, select **Kilometers** and **Miles** by clicking the appropriate checkboxes.
- 6. Set the Maximum Length to 2.0 inches. Press Enter on your keyboard.
- 7. Click Apply in the Scale Bar Properties dialog.

The scale bars display where you drew the box in the Map Composer viewer.

8. If you are satisfied with the appearance of the scale bar, click **Close** in the Scale Bar Properties dialog. Otherwise, you may make adjustments in the Scale Bar Properties dialog and click **Redo** to apply them.

Reposition Scale Bars

 If you need to move the scale bars, first select them by clicking on one of the scale bars. To move, simply drag the selection box to the desired position. Remember to click outside the selection box to deselect the scale bars.

Create a Legend

A legend is a key to the colors that are used in a map. Legends created in the Map Composer are actually groups of elements that are generated automatically to your specifications.

Next, you create a legend explaining the four colors used in the overlaid environmental sensitivity analysis.

You must have a map composition open that contains thematic data. The Annotation tool palette should also be open.

1. Click the Legend icon 📑 in the Annotation tool palette.

- 2. Move the cursor into the Map Composer viewer and the cursor changes to the legend positioning cursor.
- **3.** Click in the Map Composer viewer under the left side of the map frame to indicate the position of the upper left corner of the legend.
- **4.** Click in the map frame to indicate that this is the image you want to use to create the legend. You are reminded to do this with the following dialog:

🙀 Legend I	Instructions	×
	In the maphane with the layer you want to use for the legend.	
		Cancel

The Legend Properties dialog opens, with the **Basic** properties displayed. The class names are listed under **Legend Layout**.

	🕅 Legend Properties	×
	Basic Title Columns Color Patches	Acoly
Click here for	Name	Redo
title properties	Description	Close
	Laper: d./examples/modeler_output.ing(Laper_1)	Help
	Legend Layout	Add Descriptor.
	Bow Class Names	Custom
	1 Class_0 2 Undeveloped Land	Histogram Value
Middle-click here	Floodplain	Area Red
to select multiple	> 25 Percent Stope	Green
rows	Ripaian and Weffands SPOT Pancromatic	Uke Overlay
	Class_6	
	8 Date,7	Delete Last
Click here to		
change the class name to SPOT		
Panchromatic	Legend Units: Points	

- 5. Under Legend Layout, click in the Class_Names field (entitled Class_5) of Row number 6.
- 6. Type SPOT Panchromatic. Press Enter on your keyboard.
- Under Legend Layout, move your cursor to the Row column and click Row 2, then middle-click Row 6 to select the classes to display in the legend.

Rows **2** and **6**, and the rows in between them are highlighted in yellow. These are the only entries that are used in the legend.

8. In the Legend Properties dialog, click the **Title** tab at the top of the dialog.

Click this tab to view title properties	Vegend Properties Tasic Legend Title:		
	🖓 Underine Title	Help	
	Title-Underline Gap 2 000		
	Title/Legend Gap 12 000 * points		
	Title Alignment, Centered		
Click this dropdown list tc specify alignme			
	Legend Units		

- 9. Click the Title Alignment dropdown list and select Left-Justified.
- **10.** In the Legend Properties dialog, click **Apply**.

The legend is drawn in the Map Composer viewer.

- If you are not satisfied with the appearance of your legend, you may make adjustments in the Legend Properties dialog and click **Apply** or **Redo** to apply them.
- **12.** Click **Close** in the Legend Properties dialog when finished.

Reposition Legend

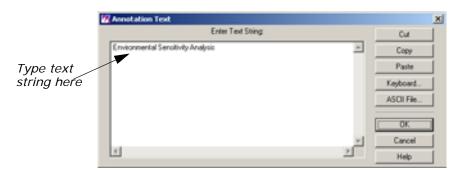
 If you wish to reposition the legend, click any of the color patches or text strings in the legend to select it. To move, hold and drag the selection box to the desired position. Remember to click outside the selection box to deselect the legend.

Add a Map Title

You must have a map composition and the Annotation tool palette open.

- 1. Click the Text icon A in the Annotation tool palette.
- **3.** Click where you want to place the text. The spot where you click is the bottom left corner of your text string.

The Annotation Text dialog opens.



- **4.** Move your pointer into the **Enter Text String** area in the Annotation Text dialog.
- 5. Type Environmental Sensitivity Analysis in the text field.
- 6. Click **OK** in the Annotation Text dialog to place the text in the map composition.

The text string is now displayed in the map composition.

Change Text Style

- 1. Click the text string in the Map Composer viewer to select it.
- From the Map Composer menu bar, select Annotation -> Styles. The Styles dialog opens.
- 3. In the Styles dialog, hold on the dropdown list next to **Text Style** and select **Other**.

The Text Style Chooser dialog opens.

- In the Text Style Chooser dialog, change the text Size to 20 points. The preview window at the bottom right corner of the Text Style Chooser dialog illustrates the change in point size.
- 5. In the Text Style Chooser dialog, click the **Custom** tab.
- 6. In the scrolling list of font names, scroll to the top of the list and select **Antique-Olive**. The preview window at the bottom right corner of the dialog illustrates the selected font.
- **7.** Click **Apply** in the Text Style Chooser dialog to change the selected text in the map composition.
- 8. Click **Close** in the Text Style Chooser dialog if you are satisfied with your changes.

Position Text

1. Double-click the text string you just edited. The Text Properties dialog opens, which allows you to edit, position, and align the text.

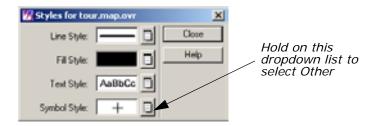
	🚧 Text Properties			x
	Name: Element_450			
	Description			
Edit text		Text	Cut	
string here 🔺	Environmental Sensitivity Analys	is .	Copy	
			Paste	
	×		> Keyboard	
Enter text		Position	Algement:	Specify
string X,Y	Type: Map	Units: Inches	Vertical	horizontal
position nore	× 175	관 🔺 👔 🤋 50	C Top	🖌 alignment
		1		here
	Ander 0.000000 -2		@ Bottom	
	Angle: 0.000000 2	Units: Radians	Hoizontak	
		Type: Paper	C Let	
	Size: 20.00	Units: Points	Center	
			C Right	
	Apply	Close Help		

- 2. In the Text Properties dialog, under **Position**, drag across the **X** value to select it.
- 3. Type **7.5/2** to calculate the center of the map. Press Enter. The value **3.75** is returned.
- 4. Change the Y value to 9.5 and press Enter on the keyboard.
- Under Alignment, the Vertical default should be Bottom. Click the Center radio button under Horizontal. This indicates that position 3.75 × 9.5 (that you just entered) is to be the bottom center of the text string.
- 6. Click **Apply** in the Text Properties dialog to center the text.
- 7. Click **Close** in the Text Properties dialog.
- **8.** Deselect the text by clicking elsewhere in the background of the Map Composer viewer.

Place a North Arrow		Map Composer contains many symbols, including north arrows. These symbols are predrawn groups of elements that are stored in a library. Other symbols include school, church, marsh, landmark, and many others.
		You must have a map composition and the Annotation tool palette open.
	1	If the Styles dialog is not currently open select Apportation ->

 If the Styles dialog is not currently open, select Annotation -> Styles from the Map Composer menu bar.

The Styles dialog opens.



2. In the Styles dialog, hold the dropdown list next to **Symbol Style** and select **Other**.

5 Symbol Choosev Standard Custom Click here to select from a Acok North Anows * list of north . north arrow 1 F Use Color Change the arrows north arrow 2 size here north arrow 3 36.00 Sine paper · pha . Unity Close north arrow? Select this north arrow 6 Help north arrow north anow 7 -Auto Apply changes

The Symbol Chooser dialog opens.

- **3.** In the Symbol Chooser dialog, click the dropdown list and select **North Arrows**.
- 4. Select north arrow 4 from the North Arrows list.

The preview window at the bottom right corner of the Symbol Chooser dialog displays **north arrow 4**.

5. In the Symbol Chooser dialog, change the **Size** to **36** points (a size of 72 points is equal to one inch), and press Enter on the keyboard.

The preview window at the bottom right corner of the Symbol Chooser dialog displays the north arrow as it looks in the map composition.

6. Click **Apply** and then **Close** in the Symbol Chooser dialog to make this the default symbol.

Note that the **North Arrow** is now the default symbol for **Symbol Style** in the Styles dialog.

- 7. Select the Symbol tool + from the Annotation tool palette.
- **8.** In the Map Composer viewer, click under the map image, between the legend and the scale bars.

The north arrow is placed on your composition. You can reposition it by clicking on it to select it, then dragging it to the new position.

You can also double-click a selected symbol to bring up the Symbol Properties dialog. Here, you can enter size and positioning measurements.

Write Descriptive

You can add descriptive text to your map to provide more information. The steps below include the instructions for adding two lines of text. However, you may add more if you like.

You must have a map composition and the Annotation tool palette open.

 If the Styles dialog is not currently open, select Annotation -> Styles from the Map Composer menu bar.

The Styles dialog opens.

 In the Styles dialog, hold on the Text Style dropdown list and select Other.

The Text Style Chooser dialog opens.

- 3. In the Text Style Chooser dialog, change the text Size to 10 points.
- 4. Click the **Custom** tab at the top of the Text Style Chooser dialog.
- 5. Check to be sure that Fill Style is set to solid black.
- 6. Click Apply to change the defaults.
- 7. Click **Close** in the Text Style Chooser dialog and in the Styles dialog.

Place Text

- 1. Click the Text icon A in the Annotation tool palette to use the text option to write descriptive text.
- 2. Click in the bottom right side of the map composition to indicate where you want to place the text.

The Annotation Text dialog opens.

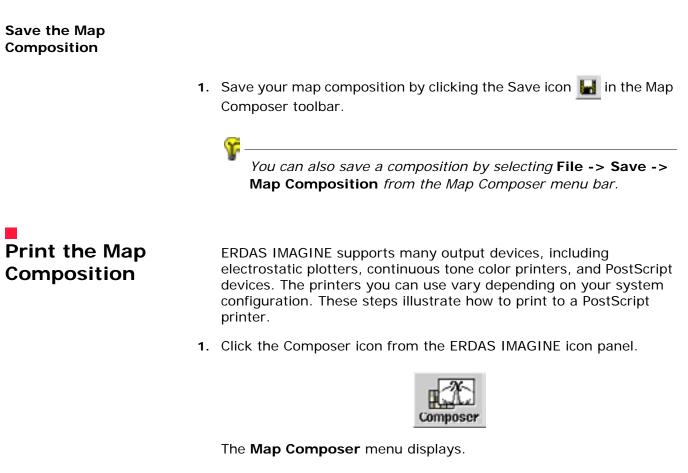
3. Move your pointer into the Annotation Text dialog and type the following lines under **Enter Text String**. At the end of the first line, press Enter to left-align the text.

San Diego, California<return> Environmental Sensitivity Analysis



You may click the **ASCII File** button to import the text from an existing ASCII text file.

 Click OK in the Annotation Text dialog to place the text. The Annotation Text dialog automatically closes.



 Select Print Map Composition from the Map Composer menu, or select File -> Print from the Map Composer viewer menu bar.

Click here to print the map Click the - 00 map name 🤤 inagine_temp Look in here Ttour map Cancel Help Recent Goto File name Files of type: Map Composition (*.map) 3 Files, 0 Subdirectories, 1 Matches, 1056760k Bytes Free

The Compositions dialog opens.

- 3. Under Filename, click the name of the map you previously created.
- 4. Click **OK** in the Compositions dialog.

The Print Map Composition dialog opens.

Select printer destination here	Print Map Composition c /hemp/magine_temp/tour.map Printer Page Setup Options Preview	×	Click here to print the map
	Print Destination: Image File	OK Batch Cancel Help	

5. Click the **Print Destination** dropdown list to select the printer you want to use.

If you do not have any output devices configured, you can output your map to an ERDAS IMAGINE image file (.img extension), and display it in a Viewer. When displaying maps converted to image format, assign bands 1, 2, 3 to R, G, B, respectively, in the Select Layer To Add dialog. This gives you an idea of what the map looks like if it is printed.

- 6. For this exercise, select **EPS File** in the **Print Destination** dropdown list to create an encapsulated PostScript file. This file can be sent to a PostScript printer using the standard file print command for your platform.
- 7. Click **OK** to print the map composition.

Edit Composition Paths

This section describes how to edit a map composition when you want to use another image in an existing map frame, or if the original image you used has been moved to another directory.

.map File

When you create a map or a graphic using Map Composer, a file is created with the .map extension. This file contains all of the specifications for your composition, such as size, position of the image, name of the image, annotation, etc. When you display or print a map composition, the software reads this .map file and recreates the map you originally composed.

So, although you place an image in a composition, you are actually only referencing it. The name of the image you are using is listed in the .map file. Therefore, when that image is enhanced or changed in any way, the image in the map composition also changes because it is the same image.

It is necessary to edit a .map file if you wish to move an image that has been used in a map composition to a new directory.

Editing Annotation

The annotation in a map composition can be edited interactively with the Annotation tools in the Annotation tool palette, using the same methods you used to place the annotation when you originally created the map.

You must have a saved map composition (.map file).

1. Click the Composer icon on the ERDAS IMAGINE icon panel.



The Map Composer menu displays.

E	Map Composer
	New Map Composition.
6	Open Map Composition
	Print Map Composition
	Edit Composition Paths
here to the composition	Map Series Tool
ne composition	Map Database Tool

- In the Map Composer menu, select Edit Composition Paths. The Map Path Editor displays.
- In the Map Path Editor, select File -> Open or click the Open icon
 .

The Compositions dialog opens.

- 4. In the Compositions dialog under **Filename**, select the map file you wish to edit (for example, **tour.map**).
- 5. Click **OK** in the Compositions dialog.

The information for the selected map file displays in the Map Path Editor.

Map Path Editor			aloi x
rie Heb			
Map: c:/emp/inagine_temp/to.	(map :		
Frane	Layer	Layer Information	
0 Europoston 1 MapFrank_modelet_output.m	9	Name [p/magne_temp/tour.map.ov//Av	notation)
			Reast

6. In the Map Path Editor under Frame, click MapFrame_modeler_output.img.

The type of **Layer** and **Layer Information** displays for the image. Note the path name for this image (located under **Layer Information** in the **Name** section).

- 7. Under Frame, click Composition.
- 8. Under Layer Information, type the new file name or directory name in the Name text entry field.
- 9. Click Apply in the Map Path Editor.

The changes you made are applied to the map composition.



After you make each individual edit to each frame or layer, you must click **Apply**.

- **10.** If you do not want the changes you have just made, click the **Reset** button.
- 11. When you are satisfied with your changes, save the file by selectingFile -> Save from the Map Path Editor menu bar.



For more information about cartography, see the chapter "Cartography" in the <u>ERDAS Field Guide</u>.

Vector Querying and Editing

Introduction

The IMAGINE Vector capabilities are designed to provide you with an integrated GIS package for raster and vector processing. The Vector tools in ERDAS IMAGINE are based on the ESRI data models, therefore ArcInfo vector coverages, ESRI shapefiles, and ESRI SDE vectors can be used in ERDAS IMAGINE with no conversion.

This tour guide explains how to edit vector layers

The data used in this tour guide are in the <IMAGINE_HOME>/examples directory. Replace <IMAGINE_HOME> with the directory where ERDAS IMAGINE is installed on your system (for example, /usr/imagine/880).



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A Digitizing Template is supplied in the information packet for ERDAS IMAGINE.

(12)

For more information about IMAGINE Vector, see "IMAGINE Vector™" on page 697.

This tour guide covers the following topics:

- creating new vector layers
- changing vector properties
- creating attributes

Approximate completion time for this tour guide is 55 minutes.

Query Vector Data	NOTE: The following section covers only the native Vector functionalities in ERDAS IMAGINE. If you have the IMAGINE Vector module, please see "IMAGINE Vector™".
Copy Vector Data	Move to the directory where you want to create your workspace. Start ERDAS IMAGINE from this directory. Make sure this is a directory in which you have read/write permission.
1.	Click the Vector icon on the ERDAS IMAGINE icon panel.



The Vector Utilities menu opens.

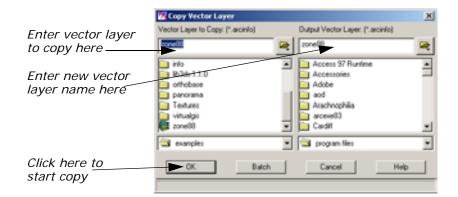
	Wector Utilities	×
	Clean Vector L	Ner
Click here to	Build Vector Layer 1	opology
copy sample	Copy Vector Lo	фи
vector layer	External Vector I	ayer
	Rename Vector	Laper
	Delete Vector L	ayer
	Display Vector Las	er Info
	Subset Vector L	ayet
	Mosaic Polygon L	ayers
	Transform Vector	Layer
	Create Polygon L	abels
	Raster to Vec	tor
	Vector to Rad	ler
	Start Table To	ol
	Zonal Attributes ASCII to Point Vector Layer	
	Recalculate Elevatio	n Values
	Close	Help

The vector utilities in this menu should NOT be run on open vector layers. Close the layer you are using before running the utility, and do NOT attempt to open the layer until the process is complete.

2. In the Vector Utilities menu, select Copy Vector Layer.

The Copy Vector Layer dialog opens.

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3. In the Copy Vector Layer dialog under **Vector Layer to Copy**, select the file named **zone88**.

- 4. Under **Output Vector Layer**, enter **zone88** in the directory of your choice. This should be the directory from which you started ERDAS IMAGINE.
- 5. Click **OK** in the Copy Vector Layer dialog.

A Job Status dialog displays to track the progress of the function. When the Copy ArcInfo coverage process is complete, the files are copied and you are ready to proceed with this tour guide.

6. Click Close in the Vector Utilities menu to dismiss it.

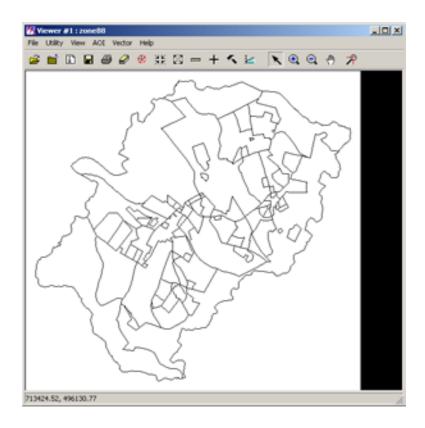
Display Vector Layers ERDAS IMAGINE should be running and a Viewer should be open. You must have completed the section, "Copy Vector Data".

> In the Viewer menu bar select File -> Open -> Vector Layer. The Select Layer To Add dialog opens.

	Select Layer To Add: File Vector Options Look in: examples file wamples file grutinelb file gr	OK Cancel Help Recent Goto	Confirm that the directory listed here is the directory in which you copied zone88 Click here to display the
Enter vector layer to display here.	Texture:		vector layer

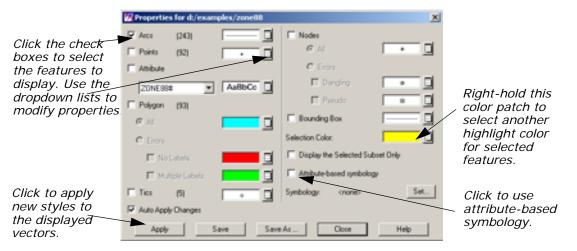
- 2. Under **Filename** select **zone88** from the directory in which you saved it in the last section.
- 3. Click **OK** to display the layer in the Viewer.

The **zone88** polygon layer displays in the Viewer, similar to the following example:



Change Vector Properties

 Select Vector -> Viewing Properties from the Viewer menu bar. The Properties dialog opens.



This dialog allows you to determine how and which vector features (lines, points, attributes, polygons, tics, and nodes) are displayed. You can also select the color to use for selected features.

In this example, the lines are currently displayed in the Viewer using the default styles shown in the Properties dialog.

- 2. In the Properties dialog, click to turn off the **Arcs** checkbox, then click to turn on **Points**.
- 3. Click **Apply** in the Properties dialog.

Now, points are displayed in the Viewer and lines are not. These are the polygon label points.

- 4. In the Properties dialog, click **Points**, **Arcs**, **Polygon**, and then **Apply**, so that lines and polygons are displayed and points are not.
- Left-hold (for UNIX) or left-click (for PC) on the dropdown list next to Arcs and select Other to change the line style used.

The Line Style Chooser dialog opens.

Une Style Chooser	<u>×</u>	
Standard Custom	, OK	,Change line
Menu	Jain Rounded	width here
- Sold black		
Dached White on Elack	Cap Rounded	
> Elack With Arrow	Ends None	Changa lina
H Black Ralcad		Change line ~color here
Solid White	Anow Dose	color here
- Solid Red	Width 0.50 Tota Help	
Solid Green		Current line
- Solid Blue	Outer Color: Inner Color:	style is
- Solid Cyan 💌		shown here
P Auto Apply changes		

- 6. In the Line Style Chooser dialog, change the **Width** to **2.00** points.
- Left-hold (UNIX) or left-click (PC) on the Outer Color dropdown list and select Red.
- 8. Click Apply and then Close in the Line Style Chooser dialog.

The Line Style Chooser dialog closes. The new line style is reflected in the Properties dialog.

9. Click **Apply** in the Properties dialog to change the displayed vectors in the Viewer.

The vectors are redrawn in the Viewer as thick, red lines.

- **10.** In the Properties dialog, right-hold on the popup list next to **Arcs** and select **Other** again. The Line Style Chooser dialog opens.
- Change the Outer Color back to Black and the Width back to 0.500 points, then click Apply.
- **12.** Click **Close** in the Line Style Chooser dialog and then click **Apply** in the Properties dialog. The lines are redisplayed in black.

Display Attributes in the Viewer

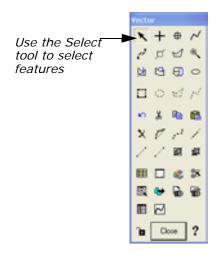
- 1. In the Properties dialog, click the **Points** and **Attribute** checkboxes, then click the dropdown list under **Attribute** and select **ZONING**.
- Click Apply in the Properties dialog.
 The polygon label points and zone numbers display in the Viewer.
- **3.** In the Properties dialog, click the **Attribute** checkbox to deselect it, and then click **Apply**.
- 4. Click **Close** in the Properties dialog.
- **5.** An Attention dialog displays, asking if you want to save these styles in a symbology file. Click **No**.

The Properties dialog closes.

View Attributes

 In the Viewer toolbar, click the Tools icon (or select Vector -> Tools from the Viewer menu bar).

The Vector tool palette displays



NOTE: Depending on the package you have, your tool palette may include more icons than the one pictured above. If you have the IMAGINE Vector module, please see "IMAGINE Vector™" for a description of the entire Vector tool palette.

2. With your cursor in the Viewer, click a polygon to select it (the Select tool is enabled by default in the Vector tool palette).

The selected polygon is highlighted in yellow.

 Shift-click another polygon to add to the selection. Now two polygons are highlighted in yellow.

- **4.** Click outside of the polygons (within the Viewer) to deselect everything.
- 5. In the Viewer menu bar, select **Vector -> Attributes**.

The Attributes dialog displays, as in the following example:

se the menu 🔻	File Edit Vev	r Help				
ar items to	Record	AREA	PERIMETER	ZONE88#	20NE884D	ZONING
dit attributes	1	-470535232.000	120641.367	1	0	0
in allindules	2	10165996.000	22991.404	2	1	3
	3	20490174.000	30434.029	3	2	2
	4	39706940.000	40641.965	4	3	23
	5	55370643.000	47900.059	5	4	15
	6	3267097.500	10300.367	6	5	1
	7	2791427.000	7177.106	7	6	1
	8	12369503.000	20993.100	0	7	4
		4202443.500	10005.434	9	0	0
tributes for	10	9044407.000	24284.061	10	9	7
	11	70444104.000	106172.047	11	10	4
e displayed	12	72101.367	1212.358	12	11	21
/er are	13	2407014.250	6807.226	13	12	22
own here	14	567419.125	3070.611	14	13	13
ownmene	15	625020.075	3926.702	15	14	16

Polygon attributes are displayed in a CellArray. Therefore, you have access to the same tools that you use in other CellArrays.

6. In the Viewer, click another polygon to select it.

The polygon is highlighted in yellow in the Viewer, and the corresponding record in the Attributes CellArray is also highlighted.

7. Click a record number under **Record** in the Attributes CellArray to select it.

That record is highlighted in the CellArray and the corresponding polygon is highlighted in the Viewer.

8. With your cursor in the **Record** column of the Attributes CellArray, right-hold **Row Selection -> Select All**.

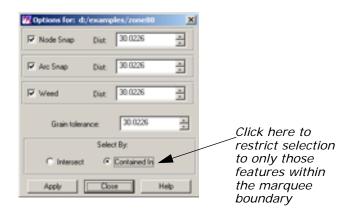
All features in both the CellArray and the Viewer are selected.

 With your cursor in the Record column of the Attributes CellArray, right-hold Row Selection -> Select None to deselect all features.

Use the Marquee Tools to Select Features

The marquee tool allows you to select a group of objects by dragging a box to contain them.

 In the Viewer menu bar, select Vector -> Options. The Options dialog opens.



- 2. In the Options dialog under **Select By**, click the **Contained In** checkbox.
- 3. Click **Apply** in the Options dialog.

When you use the marquee tools in the Vector tool palette now, only the features completely contained within the boundary of the marquee are selected.

- 4. Click the Marquee icon [] on the Vector tool palette.
- 5. Drag to draw a rectangle in the Viewer.

When you release the mouse button, the polygons and lines contained within the rectangle are selected (outlined in yellow). The corresponding attributes are selected in the Attribute CellArray.

- 6. In the Viewer, click outside of the polygons to deselect all features.
- 7. Click the Line Selection icon 🕫 on the Vector tool palette.
- 8. In the Viewer, click to start drawing a line over the vectors and either double-click or middle-click once (depending on how your Preferences are set) to terminate the line.

The features that intersect the line are selected in the Viewer and in the Attribute CellArray.

- 9. In the Viewer, click outside of the polygons to deselect everything.
- 10. Click **Close** in the Options dialog.
- **Use the Criteria Function** This function allows you to specify the criteria upon which the automatic selection of CellArray rows is based.
 - With your cursor in the **Record** column of the Attributes CellArray, right-hold **Row Selection -> Criteria**.

The Selection Criteria dialog opens.

	Selection Criteria			×
	Columna:	Functions:	Compares:	
Select items here to create criteria statement here	AREA P(F)IM(TCP) 20NE88# 20NE0HD 20NENG	10w mod(cas,cbo) abs(cao) inf(cao) ever((cao) odd(cao) mad(cao,cbo) ma(cao,cbo) inf(cao,cbo) tow() ver()	3 7 8 9 and 4 5 6 or 5 1 2 3 not contains 0 0 7	
\backslash	Conena			
Ň			ے ۲	
	Select Subse	t Add Remove	Clear Close Help	

Next, you create a criteria statement to select only those polygons that have an area greater than 5,000,000 square feet.

2. In the Selection Criteria dialog, click **AREA** under **Columns**.

\$"AREA" is now written in the Criteria statement box at the bottom of the Selection Criteria dialog.

3. Under Compares, click >.

The greater than symbol displays in the Criteria statement.

4. Use the numeric keypad to enter the number **5000000**.

The Criteria statement now reads:

\$îAREAî > 500000

5. Click **Select** to compare the attributes in the Attributes CellArray against this criteria statement.

Only those records that meet the criteria are selected and highlighted in the Viewer and Attributes CellArray.

Now, you further refine the criteria by limiting the selection to only those polygons that are both greater than 5,000,000 square feet and in zone 4.

- 6. In the Selection Criteria dialog, click the and button.
- 7. Under Columns, click ZONING.
- 8. Under Compares, click ==.
- 9. In the numeric keypad, click 4.

The Criteria statement now reads:

 $\hat{s}_{AREA1} > 5000000$ and $\hat{s}_{ZONING1} == 4$

10. Click **Select** in the Selection Criteria dialog.

All polygons greater the 5,000,000 square feet and in zone 4 are selected in the Viewer and in the Attribute CellArray.

11. Click Close in the Selection Criteria dialog.

- **12.** In the Viewer, click outside of the polygons (within the Viewer) to deselect everything.
- 13. Click **Close** in the Vector tool palette.
- 14. Select File -> Close from the Attributes dialog.
- 15. Select File -> Clear from the Viewer.

Edit Vector Layers For this section, display a Landsat TM raster layer, then overlay the vector layer you have been using. ERDAS IMAGINE should be running and you should have a Viewer open. 1. Select File -> Open -> Raster Layer from the Viewer menu bar or click the Open icon 🧭 on the toolbar. The Select Layer To Add dialog opens. 2. In the Select Layer To Add dialog under Filename, select germtm.img from the file list. 3. Click the **Raster Options** tab at the top of the dialog, and then click the Fit to Frame option so that the entire layer is visible in the Viewer. 4. Click **OK** in the Select Layer To Add dialog. The file germtm.img displays in the Viewer. 5. In the Viewer menu bar, select File -> Open -> Vector Layer. The Select Layer To Add dialog opens. 6. In the Select Layer To Add dialog under Filename, select zone88. NOTE: If zone88 does not appear in the file list, click the dropdown *list next to* File Type *and select* Arc Coverage. 7. Click the Vector Options tab at the top of the dialog, and then confirm that the Use Symbology checkbox is turned off. Also, make sure that the Clear Display checkbox is turned off, so that the raster layer remains in the Viewer. 8. Click **OK** in the Select Layer To Add dialog. The vector layer displays over the raster layer. Since the vectors are black, they may not be easily visible.

 With your cursor in the Viewer, right-hold Quick View -> Zoom -> Rotate and Magnify Area.

A white rotation box displays in the Viewer and a Rotate/Magnify Instructions box also displays. **10.** Drag the white rotation box so that it is positioned over the vector layer in the Viewer. Make it just big enough to cover the vectors, then double-click within the rotation box to magnify that area.

The Rotate/Magnify Instructions box dismisses and both the raster and vector layers are magnified in the Viewer.



For other methods of zooming into an area of interest, see "Animated Zoom", "Box Zoom", and "Real-time Zoom".

Change Viewing Properties

 In the Viewer menu bar, select Vector -> Viewing Properties. The Properties dialog opens.

Hold on this dropdow	Properties for d:/example:	s/zone00		*	Click here and then hold
list to select Other	I Aecs (243)		□ Nodes		here to edit the
	Points (32)	· 0	G 14	I • 🔲	nodes
	T Attribute		C Engra		
	20NE88# * 4	uBbCc	🗖 Danging	· ·]	
	Polygon (M)	_	🗖 Paeudo		
	G // [E Bounding Box		
Click here to display points in the vector /	C Entra	_	Selection Color:		
layer, then hold here	🗖 No Labela		Display the Selected Subs	et Only	
to edit the point style	🗖 Multiple Labels		Attribute-based symbology	,	
	Tics (5)	• 0	Symbology: choneo	Set	
	Auto Apply Changes	_			
	Apply Save	Save.	As Close	Help	

2. In the Properties dialog, hold on the dropdown list next to **Arcs** and select **Other**.

The Line Style Chooser dialog opens.

- 3. In the Line Style Chooser dialog, change the **Width** to **2.00** points, and hold on the **Outer Color** dropdown list to select **White**.
- 4. Click **Apply** and then **Close** in the Line Style Chooser dialog.
- 5. Click **Points** in the Properties dialog to display points.
- 6. Hold on the dropdown list next to **Points** and select **Other** to change the style of the points so that they are more visible.

The Symbol Chooser dialog opens.

	Symbol Chooser Standard Custon		X	
Select symbol	Menu - Hack Crosshair	V Use Color	Apply	Select symbol color here
to use here		Size: 200		
	White Costsheir + Red Costsheir + Green Crostheir	Units paper 🗶 pis 💌	Close Help	A preview of the selected symbol displays here
	P Auto Apply changes			aloplays here

- 7. In the Symbol Chooser dialog under Menu, click Black Filled Circle.
- 8. Hold on the Use Color dropdown list and select White.
- 9. Change the Size to 4.00 points.
- 10. Click Apply and then Close in the Symbol Chooser dialog.

The new style is reflected in the Properties dialog (although you cannot see it because it is a white symbol against a white background).

11. In the Properties dialog, click **Nodes**, then hold on the dropdown list next to **All** and select **Other** to change the style of nodes.

The Symbol Chooser dialog opens.

- 12. Change the Size of the symbol to 6.00 points.
- Hold on the Use Color dropdown list and change the color of the symbol to something that is visible over germtm.img, such as Magenta.
- 14. When you have selected a color, click **Apply** and then **Close** in the Symbol Chooser dialog.
- 15. Click Apply in the Properties dialog.

The vectors and points are drawn in white, and the nodes appear in the color you selected in step 13.

- 16. Click Close in the Properties dialog.
- **17.** An Attention dialog displays, asking if you want to save your changes to a symbology file. Click **No**.

Use Editing Tools and Commands

 In the Viewer menu bar, select Vector -> Tools. The Vector tool palette displays.



- 2. In the Vector tool palette, move the selector over each of the icons to view the single-line help that describes them in the lower portion of the Viewer.
- 3. In the Viewer menu bar, select Vector -> Enable Editing.
- 4. In the Viewer, click a line that you want to edit.

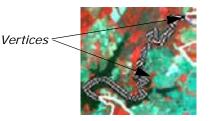
The selected line is highlighted in yellow and it is enclosed in a rotation box. You can simply hold and drag the entire box to move the line. You can hold and drag any of the handles on the box to enlarge or reduce the size of the line, or you can rotate the box.

5. In the Vector tool palette, click the Split icon 📈 .

Your pointer is now a white crosshair when you move it back into the Viewer.

- Click somewhere on the selected line to split it into two lines.
 A node is placed where you clicked.
- 7. Click again on the line you split.Only that part of the line is selected, since it is now two lines.
- Shift-click the other part of the split line. Now both parts of the line are selected.
- 9. In the Viewer menu bar, select Vector -> Join.The node is removed, and the two lines form a single line again.
- With the line still selected, select Vector -> Reshape from the Viewer menu bar.

The vertices of the line display, similar to the following example.



Each vertex is marked by a black dot in the example above.

- **11.** Drag one of the vertices to a new location to reshape the line.
- 12. Select Vector -> Undo from the Viewer menu bar to undo this edit. The line is restored to its original shape and it is deselected.

NOTE: To delete a vertex, you can Shift-middle click. To add a vertex, middle-click.

Create New Vector Layer

1. Click the **Viewer** icon on the ERDAS IMAGINE icon panel.



A new Viewer opens.

 In the new Viewer (Viewer #2) select File -> Open -> Raster Layer.

The Select Layer To Add dialog opens.

- 3. In the Select Layer To Add dialog, select **IMAGINE Image** from the **File Type** dropdown list.
- 4. Under Filename, click the file germtm.img.
- 5. Click the **Raster Options** tab at the top of the dialog and confirm that the **Fit to Frame** option is enabled.
- 6. Click **OK** in the Select Layer To Add dialog.

The file germtm.img displays in the Viewer.

- In the Viewer #2 menu bar, select File -> New -> Vector Layer.
 The New Vector Layer dialog opens.
- 8. In the New Vector Layer dialog under **Vector Layer**, enter a name for the new layer, such as **zone88subset**, in the directory of your choice.

ò-

Vector coverages include Arc Coverage, SDE Vector Layer, and Shapefile.

9. Click **OK** in the New Vector Layer dialog.

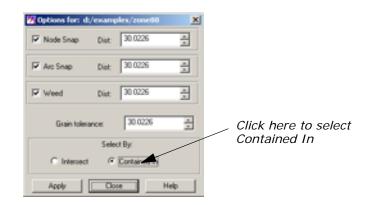
The New Arc Coverage Layer Option dialog opens.

10 New Arc Coverage Layer Option	×
New Coverage Precision	
G Single Precision	
C Double Precision	
OK Cancel Help	

- 10. Confirm that Single Precision is selected.
- 11. Click OK in the New Arc Coverage Layer Option dialog.

The title bar in Viewer #2 reflects the name of the new vector layer you are creating.

12. In the menu bar of Viewer #1, select Vector -> Options.The Options dialog opens.



- 13. In the Options dialog under **Select By**, click **Contained In**.
- 14. Click Apply and then Close in the Options dialog.
- 15. In the menu bar of Viewer #1, select Vector -> Attributes. The Attributes dialog opens.

82.0	Attributes for	d:/examples/zone88				
File	Edt Vew	Help				
G.	R					
Click here to be	cord	AREA	PERIMETER	ZONE88#	ZDNE884D	ZONING .
sure that Point	1	-470535232.000	120641.367	1	0	0
Attributes is	2	10165996.000	22991.404	2	1	3
selected	3	20490174.000	30434.029	3	2	2
	4	39706940.000	40641.965	4	3	23
	5	55370640.000	47900.059	5	4	15
	6	3267097.500	10300.367	6	5	1
	7	2791427.000	7177.106	7	6	1
	8	12369503.000	20990.100	0	7	4
	9	4202443.500	10005.434	9	0	0
	10	9044407.000	24204.061	10	9	7
	11	70444104.000	106172.047	11	10	4
	12	72101.367	1212.350	12	11	21
	13	2407014.250	6807.226	13	12	22
	14	567419.125	3070.611	14	13	13
	15	625020.075	3926.702	15	14	16
•						<u> </u>

16. In the Attributes dialog menu bar, click **View** and make sure that **Point Attributes** is selected.

17. In Viewer #1, click the Zoom Out by 2 icon 🚺 .

Export Zoning Attributes

- 1. Click the Ellipse Marquee icon \bigcirc on the Vector tool palette.
- 2. Shift-drag to draw a circle over the vector layer in Viewer #1.

The lines and points completely contained within the circle are selected in the Viewer and in the Attributes CellArray. You are going to export the **ZONING** attributes for the selected rows and import them into the new vector layer you are creating in Viewer #2.

 Click the ZONING column header in the Attributes CellArray to select that column (use the bottom scroll bar to view the ZONING column).

The **ZONING** column is highlighted in green.

4. With your cursor in a column header of the Attributes CellArray, right-hold **Column Options -> Export**.

The Export Column Data dialog opens.

	Coport Column Data Export To (*.dat)	OK.	
Enter a name for the ASCU file here	into cone38subset	Cancel Help	Click here to export data to an ASCII file

- **5.** In the Export Column Data dialog, enter a name for the ASCII file you are creating, such as **zoning**. The .dat extension is added automatically.
- 6. Click **OK** in the Export Column Data dialog.
- 7. Select **Vector -> Copy** from the Viewer #1 menu bar.

The selected lines and points are copied into the paste buffer.

 Click anywhere in Viewer #2, then select Vector -> Paste from the Viewer #2 menu bar.

The selected vectors are displayed in Viewer #2.

- **9.** In Viewer #2, click outside of all lines and points of the vector layer to deselect everything.
- 10. In the Attributes dialog, select File -> Close.
- 11. In the menu bar of Viewer #2, select File -> Save -> Top Layer.
- **12.** In the menu bar of Viewer #2, select **Vector -> Attributes**.

The Attributes dialog displays, but it is empty because this new layer has no attribute data. It must be cleaned or built. You can also create attributes using the **Edit -> Create Attributes** option of the Attributes dialog. Use this method now, then run Build later.

Create Attributes

- In the Attributes dialog, select View -> Point Attributes to select point attributes for display.
- 2. In the Attributes dialog, select Edit -> Create Attributes.

The Attributes CellArray fills with the basic point attributes.

Next, you create a new column in the Attributes CellArray for the **ZONING** attribute that you exported from the original Attributes CellArray.

In the Attributes dialog, select Edit -> Column Attributes.
 The Column Attributes dialog opens.

	🙀 Column Attributes			×	
	Columns: POINT_X POINT_Y	Title	Zoning		Specify columnparameters here
	AREA PERIMETER ZONE88SUBSET#	Туре	Integer 💌		
	20NE00SUBSET-ID Zoning	Precision	Single		
		Decimal Places	2 -		
Click here to		Display Width	12 2		
create a new column	New Delete		Cancel Help	<u>`</u>	

4. In the Column Attributes dialog, click **New** to add a new column to the CellArray.

The options on the right side of the dialog are now enabled, so that you can define the parameters of the new column.

- 5. For the column Title, enter ZONING. Press Enter on your keyboard.
- 6. For Type, click the dropdown list and select Integer.
- 7. For Precision, click the dropdown list and select Single.
- 8. For Display Width, accept the default of 12.
- 9. Click **OK** in the Column Attributes dialog to create the new column.

The Attributes CellArray now has a new column called **ZONING**. This new column is placed to the right of the last column.

10. Click in the header of this new column (ZONING) to select it.

The column is highlighted in blue.

- 11. With your cursor in the **Record** column, right-hold **Row Selection** -> Select All.
- 12. With your cursor in a column header, right-hold Column Options > Import.

The Import Column Data dialog opens.

	💯 Import Column Data	×
	Import From (*)	OK.
Enter ASCII		View
file namé here	info zone88subset	Options
nere	tour.map tour.map.ovr	Cancel
	aning dat	Help
	inagine_temp	

- In the Import Column Data dialog, enter the name of the ASCII file that you created in the Export Column Data dialog in step 5 (that is, zoning.dat).
- 14. Click OK.

The Attributes CellArray now has the same **ZONING** column and attributes as the original Attributes CellArray.

15. Select **File -> Close** from the menu bar of Viewer #2. When asked if you would like to save changes, click **Yes**.

The Attributes dialog automatically closes.

Create a Simple Shapefile Layer

1. Click the Viewer icon on the ERDAS IMAGINE icon panel.



A new Viewer opens.

 In the new Viewer (Viewer #2) select File -> Open -> Raster Layer.

The Select Layer To Add dialog opens.

- In the Select Layer To Add dialog, select IMAGINE Image from the File Type dropdown list.
- 4. Under Filename, click the file germtm.img.
- 5. Click the **Raster Options** tab at the top of the dialog and confirm that the **Fit to Frame** option is enabled.
- 6. Click OK in the Select Layer To Add dialog.

The file germtm.img displays in the Viewer.

 With your cursor in the Viewer, right-hold Quick View -> Zoom -> Rotate and Magnify Area.

A white rotation box displays in the Viewer and a Rotate/Magnify Instructions box also displays.

8. Drag the white rotation box so that it is positioned over the same area that was covered by the zone88 vector coverage. Double-click within the rotation box to magnify that area.

The Rotate/Magnify Instructions box dismisses and the raster layer is magnified in the Viewer.

C C

For other methods of zooming into an area of interest, see "Animated Zoom", "Box Zoom", and "Real-time Zoom".

- In the Viewer #2 menu bar, select File -> New -> Vector Layer. The New Vector Layer dialog opens.
- Under File of Type, select Shapefile (*.shp) from the dropdown list.
- In the New Vector Layer dialog under Vector Layer, enter a name for the new layer, such as zone88shapefile, in the directory of your choice.

0

Vector coverages include Arc Coverage, SDE Vector Layer, and Shapefile.

12. Click OK in the New Vector Layer dialog.

The New Shapefile Layer Option dialog opens.

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1

- 13. Select Polygon Shape from the dropdown list.
- 14. Click OK in the New Shapefile Layer Options dialog.

Create a Shapefile Coverage

In the Viewer toolbar, click the Tools icon (or select Vector -> Tools from the Viewer menu bar).

The Vector tool palette displays.

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ъ	Ck	0.00	?	

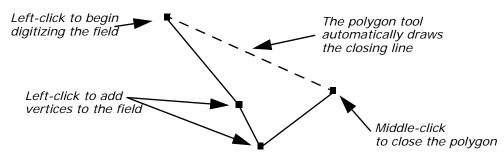
2. In the Vector tool palette, click the Polygon icon 🗹 .





For more information on using the Shapefile editing tools, see the Vector Tools Diagram page in the Vector On-Line Manual.

- **3.** Using the Inquire Cursor, find the triangular field at X: 726102.951800, Y: 497901.936911.
- 4. Left-click at the north end of the field and begin digitizing a shapefile coverage of the field.



Your polygon should look something like this:

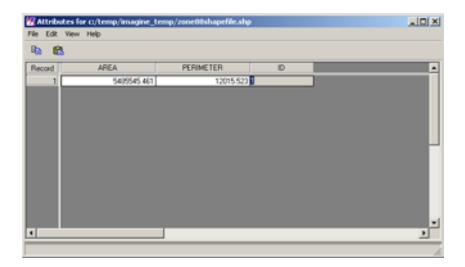


NOTE: The raster layer of these images has been washed out for the purposes of illustration.

5. Open the Vector Attributes table by selecting Vector -> Attributes from the Viewer menu bar, or by clicking on the Vector Attributes

icon 🗰 on the Vector Tool palette.

The Vector Attributes table displays.



Editing the Shapefile Layer

- 1. To divide this polygon into two polygons, select the Polygon Split icon
 - on the Vector Tools palette.
- 2. Left-click once just outside the left side of the polygon. Move your cursor across the middle and outside of the right side of the polygon so that the split line divide the polygon into no more than two parts. It should look similar to this:



3. Middle-click to end the split line. The polygon has split into two polygons and should look like this:



4. Notice that the Area and Perimeter columns were automatically updated in the Vector Attributes table:

6 6	v Help			
lecord	AREA	PERIMETER	10	
1	1575733.045	(505.24)		
2	3909012.417	0057.914	1	

- Next you create a new polygon that shares a common border with an existing polygon. To do this, select the Append Polygon icon icon on the Vector tools palette.
- 6. To begin digitizing the field below the original polygon, left-click *inside* of the existing polygon. Continue to left-click to add vertices until you have digitized the entire field. Your line should end up within the same polygon in which you started and look like this:



7. Double-click to close the polygon. The new polygon should look like this:



8. Again note that the columns in the Vector Attributes Table update to show the area and perimeter of the new polygon.

lecord	AREA	PERIMETER	0	
1	1575733.045	(505.24)		
2	3909012.417	057.914	1	
3	3724674.006	12520.249	4	

- 9. Next you reshape this polygon so that it contains more of the field.
 To do this, you need to select the Replace Polygon icon on the Vector tools palette.
- **10.** Again, start your digitizing by left-clicking inside of the polygon you want to reshape. Continue left-clicking to add vertices to the polygon. Your line should end up within the same polygon in which you started and look similar to this:



11. Double-click inside of the starting polygon to reshape the existing polygon to include the newly digitized area. Your new polygon should look like this:



12. The Area and Perimeter values in the Vector Attributes table reflect the dimensions of the polygon:

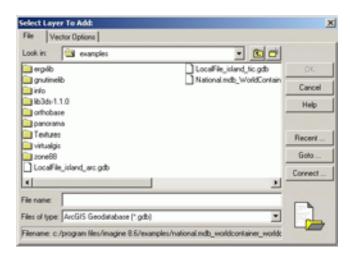
Record	AREA	PERIMETER	0	
1	1575733.045	6505.240	1	
2	3909012.417	0357.914	1	
3	10083540.304	16619.909	4	

 Click File -> Close from the Viewer menu bar. When asked if you would like to save your changes, click Yes.

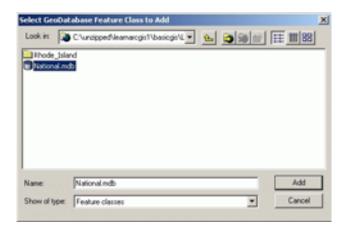
The Attributes dialog automatically closes.

Open a Personal Geodatabase

- 1. In a new viewer, click the **Open Layer** button and select ArcGIS Geodatabase (*.gdb) from the pull down menu in **Files of Type**.
- 2. Click the **Connect** button that appears in the Select Layer To Add dialog to connect to the geodatabase.



The Select GeoDatabase Feature Class to Add dialog opens.



- Select the directory where your personal geodatabase is stored. Select the .mdb file you wish to use and click Add.
- 4. The list of feature data sets appears in the dialog. Select the data set you wish to use and click **Add**.



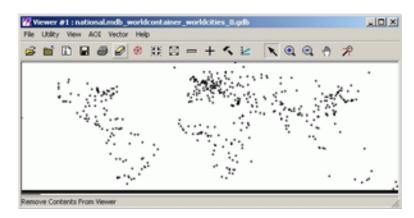
5. Next, a list of feature classes displays. Choose the one you want to add and click **Add**.

Select Ge	oDat	abase Feature	Class to Add				×
Look in:	3	WoldContainer		6 8		EE m 88	
Count	ries94	1		 			-
S World							
L							
Name:		WorldCities			_	Add	1
					_		-
Show of t	ibe:	Feature classes			-	Cancel	

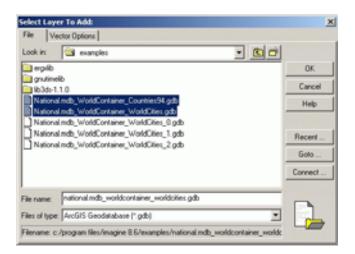
6. This connection is mapped for you to the proxy file, and you are brought back to the Select Layer To Add dialog where it is listed in a directory with any other mapped connections.

Select Layer To Add:	X
File Vector Options	
Look in: 🔄 examples 🔹 💽 🗂	
🛄 ergelo	OK
grutinelb bldc-1.1.0	Cancel
National.mdb_WorldContainer_WorldCities.gdb	Help
National mdb_WoldContainer_WoldCities_0 gdb	
	Recent
	Goto
	Connect
File name: national.mdb_worldcontainer_worldcities_0 gdb	
Files of type: ArcGIS Geodatabase (*.gdb)	
Filename: c:/program files/imagine 8.6/examples/national.mdb_worldcontainer_worldc	

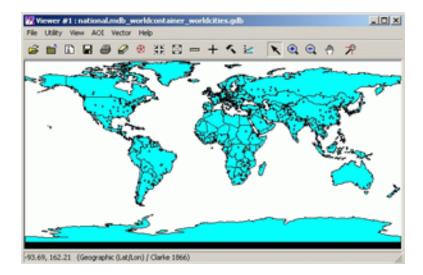
7. Select the .gdb file you want to view. From this point on you can treat this like any other vector layer. You can access it and edit it just like any other vector data. You may also rename the file by right-clicking on the file name and selecting **rename**. Click **OK** in the dialog to display the information in a Viewer.



You can also choose several mapped layers at once to display in a Viewer by using your Ctrl (control) key to select more than one feature class.



After selecting two or more layers and clicking \mathbf{OK} , all selected layers display in the Viewer:



Open An Enterprise Geodatabase

- 1. Click the Open Layer icon in a new Viewer. In the Files of Type dropdown menu, choose ArcGIS Geodatabase .gdb as your file type.
- 2. Notice that this adds a **Connect** button to the dialog. Click **Connect**, and in the **Look in** dropdown menu, select **Database Connections**.



3. Choose Add Spatial Database Connection and click Add.

-	abase Feature Class to Add			; (11) (11) (11) (11) (11) (11) (11) (11)
	·		3 30 (11)	EE 111 88
	Connection Database Connection			
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Connection				
Connection	to morticia.sde			
e ou vo ca	TRUCT OR			
Name	Date called a comp			Add
Name:	Add Spatial Database Connect	tion		///30
Show of type:	Feature classes		*	Cancel
			_	

4. The Spatial Database Connection dialog opens.

Spatial Database C	onnection	<u> 위 ×</u>
Server.	morticia	
Service:	esi_sde	
Database:	[
	(If supported by your DBMS)	
Account		
User Name:	1de	
Password		
	R Save Name/Password	Test Connection
Version		
Save Version		
sde.DEFAULT		Change
	OK.	Cancel

You should ask your System Administrator to find out exactly what you should use as your server, service, database, and account information. The information used here is for instructional purposes only.

- 5. Click **OK** in the Spatial Database Connection dialog.
- 6. You are brought back to the Select Geodatabase Feature Class to Add dialog, and a connection to the server displays. Select this connection and click **Add**.

Select GeoDat	abase Feature Class to Add						x
Look in:	Database Connections	٠	8	3 56 m		111 88	
Add Spatial Connection Connection Connection Connection	to morticia (2).sde to morticia (3).sde to morticia.sde						
Name:	Connection to moticia.sde					Add	1
Show of type:	Feature classes				_	Cancel	

You are connected to the database where you can select a feature to create a proxy file that serves as a connection to the server and feature classes. This proxy file resides in the directory where your file chooser is located. If you wish to rename the file, right-click and select **rename**. To access the feature classes in the database, simply double-click the proxy file name.

Classification

Introduction

Classification is the process of sorting pixels into a finite number of individual classes, or categories of data based on their data file values. If a pixel satisfies a certain set of criteria, then the pixel is assigned to the class that corresponds to that criteria.

In this tour guide, you perform a basic unsupervised classification of an image file (.img).

1/

All of the data used in this tour guide are in the <IMAGINE_HOME>/examples directory. You should copy the germtm.img file to a different directory so that you can have write permission to this file.

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For more detailed information on Classification techniques, please see "Advanced Classification".

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Approximate completion time for this tour guide is 20 minutes.

Use Unsupervised Classification

This section shows you how to create a thematic raster layer by letting the software identify statistical patterns in the data without using any ground truth data.

ISODATA Classifier

ERDAS IMAGINE uses the ISODATA algorithm to perform an unsupervised classification. The ISODATA clustering method uses the minimum spectral distance formula to form clusters. It begins with either arbitrary cluster means or means of an existing signature set. Each time the clustering repeats, the means of these clusters are shifted. The new cluster means are used for the next iteration.

The ISODATA utility repeats the clustering of the image until either a maximum number of iterations has been performed, or a maximum percentage of unchanged pixel assignments has been reached between two iterations.

Performing an unsupervised classification is simpler than a supervised classification because the signatures are automatically generated by the ISODATA algorithm.

In this example, you generate a thematic raster layer using the ISODATA algorithm.

You must have ERDAS IMAGINE running.

1. Click the DataPrep icon on the ERDAS IMAGINE icon panel.



The Data Preparation menu opens.

	🕼 Data Preparation 🛛 🛛 🔀				
	Create New Image				
	Create Surface				
	Subset Image				
Click here to start	Dice Image				
the Unsupervised	Image Geometric Correction				
Classification utility	Mosaic Images				
	Unsupervised Classification				
	Reproject Images				
	Recalculate Elevation Values				
	Imagizer Data Prep				
	Make RPF TOC				
	Close Help				

Generate Thematic Raster Layer

> 1. Select **Unsupervised Classification** from the **Data Preparation** menu to perform an unsupervised classification using the ISODATA algorithm.

The Unsupervised Classification (Isodata) dialog opens.

	29 Unsupervised Classificati	ion (isodata) 🛛 🔀	
Enter germtm.img here	Input Raster File. (*.ing) penith.ing	Output File (* ing) gemitin_icodeta.ing Options:	Enter germtm_isodata.img
Enter 24 for the maximum number	Number of Classes:	10 -	here
of times the process runs	Initializing Options	Color Scheme Options	Enter 10 here to
This should be set to .950	Processing Maximum Iterations:	Skip Factor: * 1 2 950 2	generate 10 classes (that is, signatures)
Click here to start the process	Classity zeros OK Batch ADI Help for Isodata	Y: 1 📩	

- 2. Click Close in the Data Preparation menu to clear it from the screen.
- 3. In the Unsupervised Classification dialog under Input Raster File, enter germtm.img. This is the image file that is classified.
- 4. Under **Output File**, enter **germtm_isodata.img** in the directory of your choice.

This is the name for the output thematic raster layer.

Set Initial Cluster Options

The Clustering Options allow you to define how the initial clusters are generated.

5. Under Clustering Options, enter 10 in the Number of Classes field.

Choose ProcessingThe Processing Options allow you to specify how the process is
performed.

1. Enter 24 in the Maximum Iterations number field under Processing Options.

This is the maximum number of times that the ISODATA utility reclusters the data. It prevents this utility from running too long, or from potentially getting stuck in a cycle without reaching the convergence threshold.

2. Confirm that the **Convergence Threshold** number field is set to **.950**.

Convergence Threshold

The convergence threshold is the maximum percentage of pixels whose cluster assignments can go unchanged between iterations. This threshold prevents the ISODATA utility from running indefinitely.

By specifying a convergence threshold of .95, you are specifying that as soon as 95% or more of the pixels stay in the same cluster between one iteration and the next, the utility should stop processing. In other words, as soon as 5% or fewer of the pixels change clusters between iterations, the utility stops processing.

3. Click **OK** in the Unsupervised Classification dialog to start the classification process. The Unsupervised Classification dialog closes automatically.

A Job Status dialog displays, indicating the progress of the function.

NOTE: This process could take up to 15 minutes, depending upon your hardware capabilities.

- **4.** In the Job Status dialog, click **OK** when the process is 100% complete.
- **5.** Proceed to the "Evaluate Classification" section to analyze the classes, so that you can identify and assign class names and colors.

Evaluate Classification

Create Classification Overlay After a classification is performed, you can use a classification overlay or recode the classes to evaluate and test the accuracy of the classification.

In this example, you use the Raster Attribute Editor to compare the original image data with the individual classes of the thematic raster layer that was created from the unsupervised classification (germtm_isodata.img). This process helps identify the classes in the thematic raster layer. You may also use this process to evaluate the classes of a thematic layer that was generated from a supervised classification.

ERDAS IMAGINE should be running and you should have a Viewer open.

Display Files

 Select File -> Open -> Raster Layer from the Viewer menu bar to display the germtm.img continuous raster layer.

The Select Layer To Add dialog opens.

Click to set—	Select Layer To Add: File Rester Options Multiple	1		×
Layers to Colors	Look in: A search of the searc	IFSAR_USGS_DEM.ing Image-dodge-bright-spotting Klon_TM.ing Iandcover.ing Ianier.ing Ianspect.ing	Real of the second	OK Cancel Help
Select germtm.img	Portfolion Pyperspectraling FIFSAR_Matching FIFSAR_Reting	 Jickurping Jirdening Jirlydoing Jirlydoing Jirlydoing 	budoun_ic budoun_in budoun_in budoun_in	Recent
	File name: gemtm.ing Files of type: [MAGINE Image (* in [muecolor : 1024 Rows x 1024 Colu		×	

- In the Select Layer To Add dialog under Filename, select germtm.img.
- **3.** Click the Raster Options tab at the top of the Select Layer To Add dialog.
- 4. Set Layers to Colors at 4, 5, and 3, respectively.
- 5. Click **OK** in the Select Layer To Add dialog to display the image file.
- Select File -> Open -> Raster Layer from the Viewer menu bar to display the thematic raster layer, germtm_isodata.img, over the germtm.img file.

The Select Layer To Add dialog opens.

- 7. Under Filename, open the directory in which you previously saved germtm_isodata.img by entering the directory path name in the text entry field and pressing the Enter key on your keyboard.
- 8. Select the file germtm_isodata.img from the list of files in the directory.

You are going to evaluate/identify the classes in this file.

- **9.** Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 10. Click Clear Display to turn off this checkbox.
- **11.** Click **OK** in the Select Layer To Add dialog to display the image file.

Open Raster Attribute Editor

 Select Raster -> Attributes from the Viewer menu bar. The Raster Attribute Editor displays. In the Raster Attribute Editor, select Edit -> Column Properties to rearrange the columns in the CellArray so that they are easier to view.

29 Column Properties Columns: Opacity F Ediable Title Histogram E Show RG8 Rea Dolo Тури led Green Click here to move Right . llue Alignment this column

Format

Display Widty

DK

Units

The Column Properties dialog opens.

Class_Names

Up

Top

New

Down

Boltom

Click here to move

the selected column up

Click here to rearrange the

columns

3. In the Column Properties dialog under Columns, select Opacity, then click Up to move Opacity so that it is under Histogram.

Cancel

7.0

@ Default only C Apply on OK.

÷

Help

- 4. Select Class_Names, then click Up to move Class_Names so that it is under Color.
- 5. Click **OK** in the Column Properties dialog to rearrange the columns in the Raster Attribute Editor.

The Column Properties dialog closes.

The data in the Raster Attribute Editor CellArray should appear similar to the following example:

le Edit H	telp				
2 D	🖬 🍸 🐚	🔂 Laper Numb	ec 1	2	
Row	Histogram	Opacity	Color		2
0	0			Unclassified	
1	13015	1		Class 1	
2	249057	1		Class 2	
3	112409	1		Class 3	
- 4	80585	1		Clace 4	
5	102708	1		Clace 5	
6	121459	1		Clace 6	
7	66616	1		Clacs 7	_
0	140930	1		Clace 8	_
9	110051	1		Clace 9	-
10	50566	1		Class 10	-

Analyze Individual Classes

Before you can begin to analyze the classes individually, you need to set the opacity for all of the classes to zero.

More ...

More

C Auto-Apply

- In the Raster Attribute Editor, click the word **Opacity** at the top of the **Opacity** column to select all of the classes.
- In the Raster Attribute Editor, right-hold on the word Opacity at the top of the Opacity column and select Formula from the Column Options menu.

The Formula dialog opens.

Columna: Histogram Opacity Color	Functions:	Formats:	7 8 9 4 5 6	-
Dass_Names Red Green Due	abd(<ao) int(<ao) even(<ao) odd(<ao) mad(<ao,<bo) min(<ao,<bo)< td=""><td>#,##0 #,##0.00 0% 0.00% 0.00% 0.00E=00 m/d/yy</td><td></td><td></td></ao,<bo)<></ao,<bo) </ao) </ao) </ao) </ao) 	#,##0 #,##0.00 0% 0.00% 0.00% 0.00E=00 m/d/yy		
formula:				< <u>></u>
19	ply Clear	Close	Help	<u> </u>

Click here to apply a 0 Click here to close Click here to enter a 0 value to the Opacity column this dialog

3. In the Formula dialog, click **0** in the number pad.

A **0** is placed in the **Formula** field.

- 4. In the Formula dialog, click **Apply** to change all of the values in the **Opacity** column to **O**, and then click **Close**.
- In the Raster Attribute Editor, click and hold on the color patch under Color for Class 1 in the CellArray and change the color to Yellow. This provides better visibility in the Viewer.
- 6. Verify the **Opacity** for **Class 1** in the CellArray is set to **1**.

This class is shown in the Viewer.

 In the Viewer menu bar, select Utility -> Flicker to analyze which pixels are assigned to this class.

The Viewer Flicker dialog opens.

8. Turn on the **Auto Mode** in the Viewer Flicker dialog by clicking on the checkbox.

The flashing black pixels in the **germtm.img** file are the pixels of this class. These areas are water.

 In the Raster Attribute Editor, click inside the Class_Names column for Class 1. (You may need to double-click in the column.) Change this name to Water and then press Enter on the keyboard.

- In the Raster Attribute Editor, click and hold on the Color patch for Water and select Blue from the dropdown list. (You may need to select the entire row for this class first.)
- After you are finished analyzing this class, click Cancel in the Viewer Flicker dialog and set the Opacity for Water back to 0 in the Raster Attribute Editor. Press Enter on the keyboard.
- 12. Change the **Color** for **Class 2** in the CellArray to **Yellow** for better visibility in the Viewer.
- **13**. Change the **Opacity** for **Class 2** to **1** and press Enter on the keyboard.

This class is shown in the Viewer.

14. In the Viewer menu bar, select **Utility -> Flicker** to analyze which pixels are assigned to this class.

The Viewer Flicker dialog opens.

15. Turn on the **Auto Mode** in the Viewer Flicker dialog.

The flashing yellow pixels in the **germtm.img** file should be the pixels of this class. These are forest areas.

- In the Raster Attribute Editor, click inside the Class_Names column for Class 2. (You may need to double-click in the column.) Change this name to Forest, then press Enter on the keyboard.
- In the Raster Attribute Editor, click and hold on the Color patch for Forest and select Pink from the dropdown list. (You may need to select the entire row for this class first.)
- After you are finished analyzing this class, click Cancel in the Viewer Flicker dialog and set the Opacity for Forest back to 0. Press Enter on the keyboard.
- **19.** Repeat these steps with each class so that you can see how the pixels are assigned to each class. You may also try selecting more than one class at a time.
- **20.** Continue assigning names and colors for the remaining classes in the Raster Attribute Editor CellArray.
- **21.** In the Raster Attribute Editor, select **File -> Save** to save the data in the CellArray.
- 22. Select File -> Close from the Raster Attribute Editor menu bar.
- 23. Select File -> Clear from the Viewer menu bar.

Image Commands

Introduction

ERDAS IMAGINE gives you access to a tool called the Image Commands tool. With it, you can take any file supported by ERDAS IMAGINE and perform many types of operations. One such operation is using the Image Commands tool to create a world file. You can then use the world file with other software packages, such as ESRI's ArcView.

In this tour guide, you can learn how to:

- access the Image Commands tool
- create a world file from a .tif file



Approximate completion time for this tour guide is 15 minutes.



With the Image Commands tool, you can make many changes to your files.

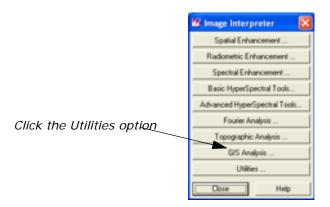
Use Image Interpreter Utilities

ERDAS IMAGINE must be running.

1. Click the Interpreter icon on the ERDAS IMAGINE icon panel.



The Image Interpreter menu opens.



2. Click Utilities in the Image Interpreter menu.

The Utilities menu opens.

	10 Utilities	×	
	Change Detection		
	Functions		
	Operators		
	RGB Clustering		
	Adv. RG8 Clustering		
Select the Subset option of create a .tif file.	Random Class Colors		
	Layer Stack		
	Subset		
	Create File		
	Rescale		
	Mack		
	Degrade		
	Replace Bad Lines		
	Vector To Raster		
	Reproject		
	Aggie		
	Thematic to RGB		
	Morphological		
	Close Help		

Use the Subset Function

1. In the Utilities menu, select Subset.

The Subset dialog opens.

	🛛 Subset 🛛 🗙						
	Input File: (*.img)		Output File:				
	gemth ing		gernitm, të				
Type the input file here, then select the	Cooldnate Type:	Subset Definition:		From Inquire	Bax		
.tif file type for the	€ Map	Two Corners C I	our Comers				
output file	C Fie	ULX 695764.00	₹ URX	777604.00	÷		
		ULY: 523063.50	₹ URY:	442023.50	÷		
		URX: 0.00	÷ ux	0.00	÷		
		UR Y: 0.00	÷ uv	0.00	-		
	D ata Type:						
	Input: Unsigne	18 bit					
	Output: Unsigne	d8bk 💌 0	Dutput: Cont	inuous	٠		
	Output Options:						
	Number of Input layers: 6 🔲 Ignore Zero in Output Stats.						
	Select Layers: 1.6						
	Use a comma for separated list(i.e. 1.3.5.) or enter ranges using a """ (i.e. 2.5.).						
	OK.	Batch AOI	Cano	el He	Þ		
					_		

- 2. In the Subset dialog, click the Open icon 😹 below Input File.
- In the Input File dialog, navigate to the <IMAGINE_HOME>/examples directory, and select the file germtm.img.
- 4. Click **OK** in the Input File dialog to transfer **germtm.img** to the Subset dialog.
- 5. Click the Open icon under Output File.
- **6.** In the Output File dialog, navigate to a directory where you have write permission.
- 7. Click the File Type dropdown list and choose TIFF.
- 8. Type the name **germtm** in the **Filename** window, then press Enter on your keyboard.

The .tif extension is automatically added. By using the Subset utility in this fashion, you can quickly create a TIFF image from an image file.

9. Click OK in the Output File dialog.

The Subset file updates accordingly.

10. Click OK in the Subset dialog to generate germtm.tif.

A Job Status dialog opens, tracking the progress of the function.

11. When the Job is complete, click **OK** in the Job Status dialog.



You can set a preference in the **User Interface & Session** category to automatically dismiss the Job Status dialog once a job is complete.

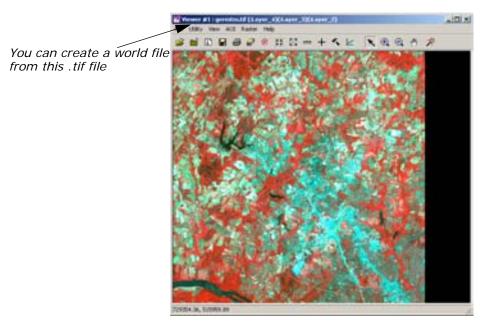
Check the TIFF file

1. Click the Viewer icon on the ERDAS IMAGINE icon panel.



- Click the Open icon, and click the **Recent** button in the Select Layer To Add dialog.
- 3. Select the file you just created, germtm.tif.
- 4. Click the Raster Options tab, and select Fit to Frame.
- 5. Click **OK** in the Select Layer to Add dialog.

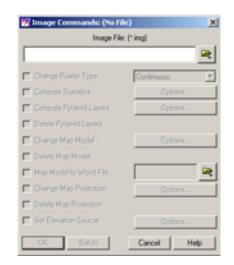
The TIFF image displays in the Viewer. Notice that it is in the State Plane projection, indicated in the status area of the Viewer.



Now, you can take the file **germtm.tif** and create a world file using the Image Command Tool.

Start the Image Command Tool

1. From the **Tools** menu of ERDAS IMAGINE, select **Image Command Tool**.

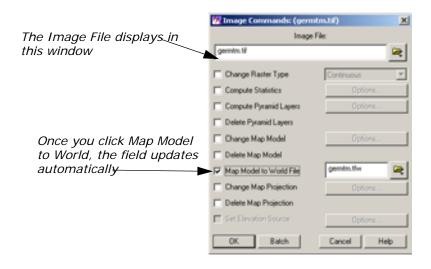


In the Image Commands dialog, click the Open icon
 The Image File dialog opens.

	Triage Files File Multiple	X
<i>Select the file germtm.tif</i>	Look in: insgine_temp Control info Control	OK Cancel Help Recent Goto
	File name: gemtin. If Files of type: TIFF Intecolor : 1024 Rows x 1024 Columns x 6 Band(s)	

- **3.** Navigate to the directory in which you saved the file, and select the file **germtm.tif**.
- **4.** Click **OK** in the Image File dialog to transfer the information to the Image Commands dialog.

The Image Commands dialog updates accordingly, and the **Map Model to World** option is activated.



5. Click the checkbox next to Map Model to World.

By default, the Image Commands tool assigns the same name to the output file, but with the .tfw extension. In this case, the file name is **germtm.tfw**. The world file is saved in the same directory as the image you create it from.

If you wish, click the Open icon icon icon, and navigate to a different directory in which you want to save the world file. If not, proceed to step 9.

The File Selector dialog opens.

- 7. Type the name **germtm.tfw** in the **Filename** window, then press Enter on your keyboard.
- 8. Click **OK** in the File Selector dialog.
- 9. Click **OK** in the Image Commands dialog to start the process.
 - A Job Status dialog opens, which tracks the progress of the function.

🌆 ImageCom	mand				×
Job State:	Done				
Percent Done:	100% 0		1111	100	
	OK I	Cancel	Help		

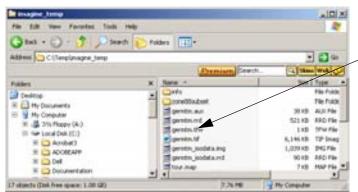
10. When the job is complete, click **OK** in the Job Status dialog.



You can set a preference in the User Interface & Session Category of the Preference Editor, Keep Job Status Box, which allows the Job Status box to close automatically upon completion of a job.

Check for .tfw file

- Using a UNIX shell or the Microsoft Explorer, navigate to the directory in which you created germtm.tif, and generated germtm.tfw.
- 2. Note the presence of the file in that directory.



The .tfw file resides in the same directory as the .tif file

Now, you can use the .tfw file to supply georeferencing information to other software packages, such as ArcView. Georeferencing information includes coordinate information.

Polynomial Rectification

16



Rectification is the process of projecting the data onto a plane and making it conform to a map projection system. Assigning map coordinates to the image data is called georeferencing. Since all map projection systems are associated with map coordinates, rectification involves georeferencing.

Approximate completion time for this tour guide is 1 hour.

Rectify a Landsat

Perform Image to Image Rectification In this tour guide, you rectify a Landsat TM image of Atlanta, Georgia, using a georeferenced SPOT panchromatic image of the same area. The SPOT image is rectified to the State Plane map projection.

In rectifying the Landsat image, you use these basic steps:

- display files
- start Geometric Correction Tool
- record GCPs
- compute a transformation matrix
- resample the image
- · verify the rectification process

Display Files

First, you display the image to be rectified and an image that is already georeferenced.

ERDAS IMAGINE must be running and a Viewer open.

1. Click the Viewer icon on the ERDAS IMAGINE icon panel to open a second Viewer.

d D	
Viewer	

The second Viewer displays on top of the first Viewer.

- 2. In the ERDAS IMAGINE menu bar, select **Session -> Tile Viewers** to position the Viewers side by side.
- In the first Viewer's toolbar, click the Open icon icon (or select File > Open -> Raster Layer).

The Select Layer To Add dialog opens.

	Select Layer To Add: X	
Click here to	File Raster Ontiona Multiple	
select Raster	Look in: 🔄 examples 💌 💽 🗂	
Options	Shine6.ing Dupenizeding DS_truecol OK	
	Shine7ing TM_1ing Cancel	
	Advised in a straight of the s	
	thine9 ing TM_striped ing Help	
	skpe ing verezuela ing	
Select the	Pupeting Ovgi_30_netering Recent	
tmAtlanta fi le	StereoSAR_Match ing Wasia2_mos.ing Goto	
	StereoSAR_Match img Swasia2_mss.img Goto	
		, ,
		A preview
	File name: Imataria ing	/ the image
	Files of type: MAGINE Image (*.ing)	displays he
	truecolor : 512 Rows x 512 Columns x 6 Band(s)	

 In the Select Layer To Add dialog under Filename, click the file tmAtlanta.img.

This file is a Landsat TM image of Atlanta. This image has *not* been rectified.

5. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.

The Raster Options display in the Select Layer To Add dialog.

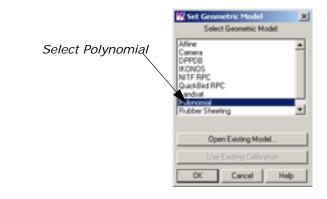
Click this dropdown list to select Gray Scale	Select Layer To Add: File Roster Options Multiple	Click OK when finished
	Display as : Gray Scale	OK
	Display Layer:	Cancel
	Laver 2 x	Help
Display layer 2		Recent
	Chiert Image to Map System	Goto
	T Clear Display T Set View Extent	
	Fit to Frame TNo Stretch	The preview
Click	Data Scaling Background Transparent	image is
Fit to Frame	Zoom by 1.00 - Using Nearest Neighbor V Help	displayed in grayscale
		gi uj couro

- 6. Click the **Display as** dropdown list and select **Gray Scale**.
- 7. Under Display Layer, enter 2.

Depending upon your application, it may be easier to select GCPs from a single band of imagery. The image **tmAtlanta.img** displays in True Color by default. 8. Click Fit to Frame, so that the entire image is visible in the Viewer. 9. Click **OK** in the Select Layer To Add dialog. The file tmAtlanta.img displays in the first Viewer. 10. In the second Viewer toolbar, click the Open icon (or select File -> Open -> Raster Layer). The Select Layer To Add dialog opens. 11. In the Select Layer To Add dialog, click the file panAtlanta.img. This file is a SPOT panchromatic image of Atlanta. This image has been georeferenced to the State Plane map projection. 12. Click OK in the Select Layer To Add dialog. The file **panAtlanta.img** displays in the second Viewer. You start the Geometric Correction Tool from the first Viewer-the Start GCP Tool Viewer displaying the file to be rectified (tmAtlanta.img). 1. Select Raster -> Geometric Correction from the first Viewer's

 Select Raster -> Geometric Correction from the first Viewer's menu bar.

The Set Geometric Model dialog opens.



In the Set Geometric Model dialog, select Polynomial and then click OK.

The Geo Correction Tools open, along with the Polynomial Model Properties dialog.

Geo Correction Tools	2 Polynomial Model Properties (No File)	LO X
🗉 🕀 🦣 🚥	Parameters Transformation Projection	Apply
Exit Help	Polynomial Order:	Reset
Click Close—	Load OFF File	Save As Dose Help
	Status: Model has no solution. Save a Polynomial Model as New File to Disk.	

3. Click **Close** in the Polynomial Model Properties dialog to close it for now. You select these parameters later.

The GCP Tool Reference Setup dialog opens.

	GCP Tool Reference Setup			
	Collect Reference Points From			
	C Existing Viewer			
	C Image Layer (New Viewer)			
	C Vector Layer (New Viewer)			
	C Annotation Layer (New Viewer)			
	C GCP File (gcc)			
	C ASDI File			
	C Digitizing Tablet (Current Configuration)			
Click OK to	C Digitizing Tablet (New Configuration)			
accept the default	C Keyboard Only			
	OK Cancel Help			

4. Accept the default of **Existing Viewer** in the GCP Tool Reference Setup dialog by clicking **OK**.

The GCP Tool Reference Setup dialog closes and a Viewer Selection Instructions box opens, directing you to click in a Viewer to select for reference coordinates.

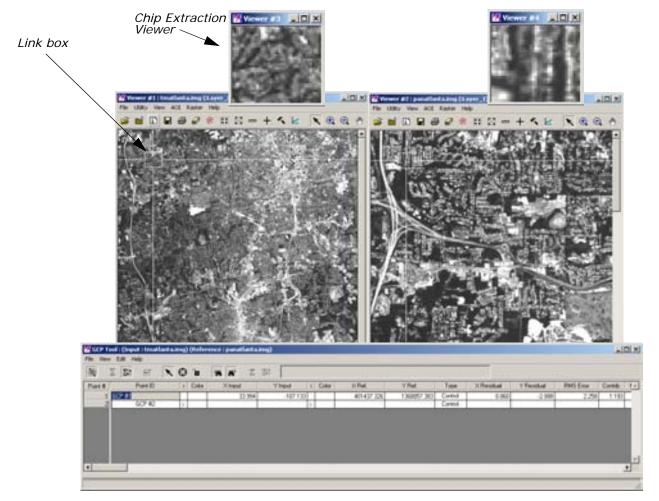
5. Click in the second Viewer, which displays panAtlanta.img.

The Reference Map Information dialog opens showing the map information for the georeferenced image. The information in this dialog is not editable.

	ce Map Information urent Reference Map F	
Projection: Spheroid: Zone Numbe Datum: N	к. 3676	
Map Units	Feet	2
OK.	Cancel	Help

6. Click **OK** in the Reference Map Information dialog.

The Chip Extraction Viewers (Viewers #3 and #4), link boxes, and the GCP Tool open. The link boxes and GCP Tool are automatically arranged on the screen (you can turn off this option in the ERDAS IMAGINE Preferences). You may want to resize and move the link boxes so that they are easier to see.

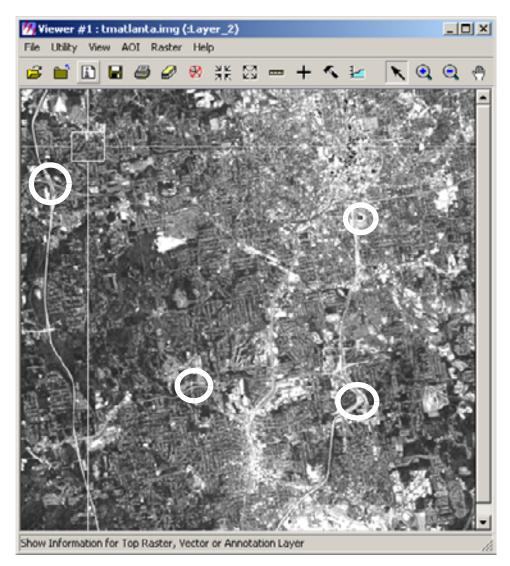


In this tour guide, you are going to rectify **tmAtlanta.img** in the first Viewer to **panAtlanta.img** in the second Viewer.

When the GCP Tool is started, the tool is set in Automatic GCP Editing mode by default.

The following icon Σ is active, indicating that this is the case.

1. In the first Viewer, select one of the areas shown in the following picture by clicking on that area. The circled areas are locations for GCPs. You should choose points that are easily identifiable in both images, such as road intersections and landmarks.



The point you have selected is marked as GCP #1 in the Viewer and its X and Y inputs are listed in the GCP Tool CellArray.

- 2. In order to make GCP #1 easier to see, right-hold in the **Color** column to the right of GCP #1 in the GCP Tool CellArray and select the color **Yellow**.
- **3.** In Viewer #3 (the Chip Extraction Viewer associated with the first Viewer), drag the GCP to the exact location you would like it to be.



NOTE: (UNIX only) To view the GCP while you are dragging it, turn off the Use Fast Selectors checkbox in the Viewer category under **Session -> Preferences** (this change does not take effect until the Viewer is restarted).

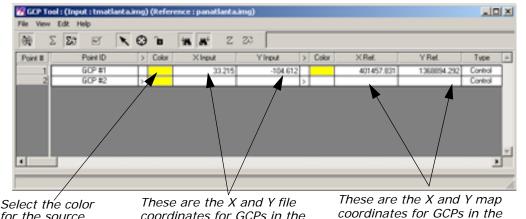
- 4. In the GCP Tool, click the Create GCP icon 💮
- 5. In the second Viewer, click in the same area that is covered in the source Chip Extraction Viewer (Viewer #3).

The point you have selected is marked as GCP #1 in the Viewer, and its X and Y coordinates are listed in the GCP Tool CellArray.



6. In order to make GCP #1 easier to see in the second Viewer, righthold in the Color column to the left of the X reference for GCP #1 in the GCP Tool CellArray and select the color **Black**.

The GCP Tool should now look similar to the following:



for the source GCP here

coordinates for GCPs in the input image (tmAtlanta.img) reference image (panAtlanta.img)

7. In Viewer #4 (the Chip Extraction Viewer associated with the second Viewer), drag the GCP to the same location you moved it to in Viewer #3.

- 8. Click the Create GCP icon in the GCP toolbar.
- **9.** Return to the source Viewer (the first Viewer) and click to digitize another GCP.
- **10.** In order to make GCP #2 easier to see, right-hold in the **Color** column to the right of GCP #2 in the GCP Tool CellArray and select the color **Magenta**.
- **11.** In Viewer #3, drag the new GCP (GCP #2) to the exact location you would like it to be.
- **12.** Repeat step 4 and step 5 to digitize the same point in the second Viewer.
- **13.** As in step 10, you can change the color of the GCP marker to make it easier to see.
- 14. Digitize at least two more GCPs in each Viewer (on tmAtlanta.img in the first Viewer and panAtlanta.img in the second Viewer) by repeating the above steps. The GCPs you digitize should be spread out across the image to form a large triangle (that is, they should not form a line).
- **15.** Choose colors that enable you to see the GCPs in the Viewers.

After you digitize the fourth GCP in the first Viewer, note that the GCP is automatically matched in the second Viewer. This occurs with all subsequent GCPs that you digitize.

After you digitize GCPs in the Viewers, the GCP Tool CellArray should look similar to the following example:

00 S	20 22	10	a l	18 A 2	22 Kontok Po	et f	Sear \$40.	1702 (1)0.2049	(Total) 0.2564	
Point #	Point ID		Color	Xinput	Yinput	1	Color	XRel	YRel	Type
1	GCP #1			23.215	104 612			401457.831	1368894.292	Control
2	60P #2			381.841	-143.852			409967.406	1369579.159	Control
3	GCP #3			362,099	-352.225		1	429061.661	1341626.744	Control
4	GCP #4			191.449	-337.416			424952.008	1340445.656	Control
5	GCP #5									Control

Selecting GCPs

Selecting GCPs is useful for moving GCPs graphically or deleting them. You can select GCPs graphically (in the Viewer) or in the GCP CellArray.

To select a GCP graphically in the Viewer, use the Select icon
 .

Select it as you would an annotation element. When a GCP is selected, you can drag it to move it to the desired location.

You can also click any GCP coordinate in the CellArray to enter new coordinates.

• To select GCPs in the CellArray, click in the **Point** # column, or use any of the CellArray selection options in the right mouse button menu (right-hold in the **Point** # column).

Deleting a GCP

To delete a GCP, select the GCP in the CellArray in the GCP Tool and then right-hold in the **Point** # column to select **Delete Selection**.

Compute Transformation Matrix

A transformation matrix is a set of numbers that can be plugged into polynomial equations. These numbers are called the transformation coefficients. The polynomial equations are used to transform the coordinates from one system to another.

The **Transformation** tab in the Polynomial Model Properties dialog shows you a scrolling list of the transformation coefficients arranged in the transformation matrix. To access the Polynomial Model Properties dialog and the **Transformation** tab, click the

Display Model Properties icon 📃 in the Geo Correction Tools.

The coefficients are placed in the transform editor in two ways:

- The **Transformation** tab CellArray is automatically populated when the model is solved in the GCP Tool.
- Using the CellArray located in the GCP tool to enter them directly from the keyboard.

In this tour guide, the transformation coefficients are calculated from the GCP Tool, and are automatically recorded in the **Transformation** tab.

Preparation

A minimum number of GCPs is necessary to calculate the transformation, depending on the order of the transformation. This number of points is:

$$\frac{(t+1)(t+2)}{2}$$

Where *t* is the order of the transformation.

If the minimum number of points is not satisfied, then a message displays notifying you of that condition, and the RMS errors and residuals are blank. At this point, you are not allowed to resample the data.

Change Order of Transformation

To change the order of the transformation, use the Polynomial Model Properties dialog (available from the Geo Correction Tools). Using this dialog, select the **Parameters** tab at the top of the dialog. This tab allows the polynomial order to be altered.

Calculate TransformationThe Auto Calculation function is enabled by default in the GCP Tool.Matrix from GCPsThe Auto Calculation function computes the transformation in real
time as you edit the GCPs or change the selection in the CellArray.

With the Automatic Transform Calculation tool activated, you can move a GCP in the Viewer while watching the transformation coefficients and errors change at the top of the GCP Tool. You may want to turn off the Auto Calculation function if your system or computation is taking too long.

NOTE: Some models do not support Auto Calculation. If this is the case, the function is disabled.

 If your model does not support Auto Calculation, click the Calculate icon
 <u>on the GCP Tool toolbar</u>.

NOTE: The transformation matrix contains the coefficients for transforming the reference coordinate system to the input coordinate system. Therefore, the units of the residuals and RMS errors are the units of the input coordinate system. In this tour guide, the input coordinate system is pixels.

Digitize Check Points Check points are useful in independently checking the accuracy of your transformation.

- In the GCP Tool, turn all of the GCPs to yellow by right-holding Select All in the Point # column and then right-holding Yellow in each of the two Color columns.
- **3.** Right-hold **Select None** in the **Point #** column of the GCP Tool CellArray to deselect the GCPs.
- 4. In the last row of the CellArray, right-hold in each of the two **Color** columns and select **Magenta**.

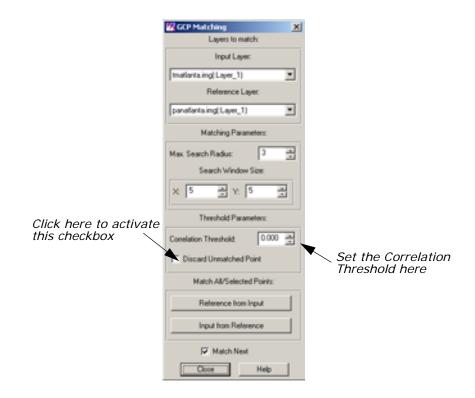
All of the check points you add in the next steps are Magenta, which distinguishes them from the GCPs.

- 5. Select the last row of the CellArray by clicking in the **Point** # column next to that row.
- Select Edit -> Set Point Type -> Check from the GCP Tool menu bar.

All of the points you add in the next steps are classified as check points.

7. Select Edit -> Point Matching from the GCP Tool menu bar.

The GCP Matching dialog opens.



- 8. In the GCP Matching dialog under **Threshold Parameters**, change the **Correlation Threshold** to **.8**, and then press the Enter key on your keyboard.
- 9. Click the Discard Unmatched Point checkbox to activate it.
- 10. Click Close in the GCP Matching dialog.
- **11.** In the GCP Tool, click the Create GCP icon and then the Lock icon.
- **12.** Create five check points in each of the two Viewers, just as you did for the GCPs.

NOTE: If the previously input points were not accurate, then the check points you designate may go unmatched and be automatically discarded.

- **13.** When the five check points have been created, click the Lock icon in the GCP Tool to unlock the Create GCP function.
- **14.** Click the Compute Error icon **Solution** on the GCP Tool to compute the error for the check points.

The **Check Point Error** displays at the top of the GCP Tool. A total error of less than 1 pixel error would make it a reasonable resampling.

15. To view the polynomial coefficients, click the Model Properties icon

in the Geo Correction Tools.

The Polynomial Model Properties dialog opens.

16. Once you have checked the tabs of the Polynomial Model Properties dialog, click **Close** in the Polynomial Properties dialog.

Resample the Image Resampling is the process of calculating the file values for the rectified image and creating the new file. All of the raster data layers in the source file are resampled. The output image has as many layers as the input image.

ERDAS IMAGINE provides these widely-known resampling algorithms: Nearest Neighbor, Bilinear Interpolation, Cubic Convolution, and Bicubic Spline.

Resampling requires an input file and a transformation matrix by which to create the new pixel grid.

1. Click the Resample icon 🌆 in the Geo Correction Tools.

	19 Resample	×	
	Output File: (*.img) Resample Method.		
Enter file name	Imatianta_georet.ing 😪 Dilnear Interpolation		
for the new georeferenced	Output Map Information:		
image file	Projection: State Plane		
Output map	Number rows: 729 Number columns: 511		Click here to select the Bilinear Interpolation
projection should	Output Corners:		resampling method
be State Plane	UDC 391364.000000 + L/BC 445424.000000	3	
	ULY: 1391034.000000 × LRY: 1313866.000000	2	Click here to exclude
	From Inquire Box		zero file values in statistics
	Output Cell Sizes:		for output file
	× 106.00000 = Y 106.00000 =		
	Recalculate Output Defaults		
	OK Batch Cancel Help		

The Resample dialog opens.

 In the Resample dialog under Output File, enter the name tmAtlanta_georef.img for the new resampled data file. This is the output file from rectifying the tmAtlanta.img file to the coordinate system of the panAtlanta.img file.

NOTE: Be sure to enter the output file in a directory where you have write permission and at least 25 Mb of free disk space.

- 3. Under **Resample Method**, click the dropdown list and select **Bilinear Interpolation**.
- 4. Click **Ignore Zero in Stats.**, so that pixels with zero file values are excluded when statistics are calculated for the output file.
- 5. Click **OK** in the Resample dialog to start the resampling process.

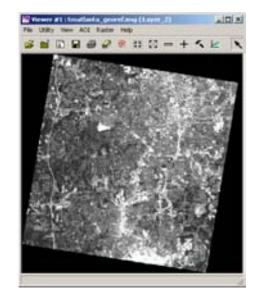
A Job Status dialog opens to let you know when the processes complete.

6. Click **OK** in the Job Status dialog when the job is 100% complete.

Verify the Rectification Process

One way to verify that the input image (**tmAtlanta.img**) has been correctly rectified to the reference image (**panAtlanta.img**) is to display the resampled image (**tmAtlanta_georef.img**) and the reference image and then visually check that they conform to each other.

 Display the resampled image (tmAtlanta_georef.img) in the first Viewer. Use the Clear Display option in the Select Layer To Add dialog to remove tmAtlanta.img from the Viewer before the resampled image opens.



2. When **tmAtlanta.img** closes in the first Viewer, you are asked if you want to save your changes. Click **No** in all of the Save Changes dialogs.

The Geometric Correction Tool exits.

- 3. Right-hold **Geo. Link/Unlink** under the **Quick View** menu in the first Viewer.
- 4. Click in the second Viewer to link the Viewers together.
- 5. Right-hold **Inquire Cursor** under the **Quick View** menu in the first Viewer.

The inquire cursor (a crosshair) is placed in both Viewers. An Inquire Cursor dialog also opens.

6. Drag the inquire cursor around to verify that it is in approximately the same place in both Viewers. Notice that, as the inquire cursor is moved, the data in the Inquire Cursor dialog are updated.

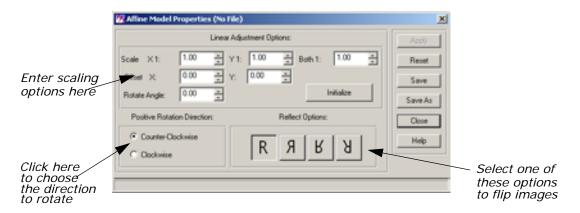
7. When you are finished, click **Close** in the Inquire Cursor dialog.

Rotate, Flip, or Stretch Images

It is often necessary to perform a first-order rectification to a layer displayed in the Viewer. You may need to rotate, flip, or stretch the image so that North is up.

Choose Model Properties

- 1. Display the file tmAtlanta.img in a Viewer.
- In the Viewer, select Raster -> Geometric Correction.
 The Set Geometric Model dialog opens.
- In the Set Geometric Model dialog, click Affine and then OK.
 The Geo Correction Tools open, along with the Affine Model Properties dialog.



- 4. Change the Rotate Angle to 25.
- 5. Select the desired **Reflect Option** in the Affine Model Properties dialog, then click **Apply** and **Close**.
- **6.** Click the Resample icon <u>IB</u> in the Geo Correction Tools.

The Resample dialog opens.

Enter file name for the new georeferenced image file	U Resumple Output File: (*.ing) Imatianta_rotate ing Output Ma	Resample Method:	Click here to select the Bilinear Interpolation resampling method
Output map	ULX: 45.00000 2	Number columns: 681 Corners: UPoc 595.000000 2 URV: 595.000000 2 2 URV: 595.000000 2 2 From Inquire Box E 2 2 Cell Sizes: 2 2 2 D0000 2 2 2 2 Cancel Help 4 4	<i>Click here to exclude</i>
projection is	ULY: 84.00000 2		zero file values in statistics
Unknown	ULY: 0.4px		for output file

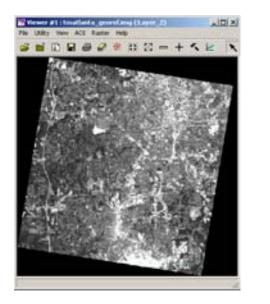
- 7. In the Resample dialog under **Output File**, enter the name **tmAtlanta_rotate.img**.
- 8. Under **Resample Method**, click the dropdown list and select **Bilinear Interpolation**.
- **9.** Click **Ignore Zero in Stats.**, so that pixels with zero file values are excluded when statistics are calculated for the output file.
- 10. Click **OK** in the Resample dialog to start the resampling process.

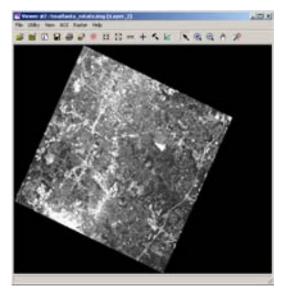
A Job Status dialog opens to let you know when the processes complete.

11. Click **OK** in the Job Status dialog when the job is 100% complete.

Check Results

- 1. Open a new Viewer.
- 2. Click the Open icon, then select **tmAtlanta_rotate.img** from the directory in which you saved it.
- 3. Click the **Raster Options** tab, and click the **Display as** dropdown list to select **Gray Scale**.
- 4. In the Display Layer section, select Layer 2.
- 5. Click **Orient Image to Map System** to make sure it is not selected. If this option is selected, the rotation will not appear.
- 6. Click OK in the Select Layer To Add dialog.
- 7. Compare tmAtlanta_georef.img and tmAtlanta_rotate.img side-by-side.





Subpixel Coregistration

Coregistration is sometimes inherent in the data set, for example Landsat 7 TM data. If the data is not coregistered, a greatly overdefined second order polynomial transform should be used to resample one image to the other.

When doing a coregistration, you should register the lower resolution image to the higher resolution image so that the high resolution image is used as the reference image.

For this tour you use the **tmatlanta.img** and **panatlanta.img** files.

1. Open a new viewer by clicking the Viewer icon on the IMAGINE toolbar.



2. In the Viewer, click the Open icon and select **tmatlanta.img** from the example data.

Examples	Select Layer To Add: File Raster Options Multiple Look in: Reserves	le]	- 60	×	– Choose the Raster Options tab for
directory	thire5 ing thire6 ing thire7 ing thire8 ing thire8 ing dp. ing	StereoSAR_Reting superviseding TM_Ling TM_S60516.ing TM_stipeding	tivecia]_tm tipS_truecol	OK Cancel Help	different options regarding your image
Specific file to add	tope.mg upots.ing spots.ing StereoSAR_Match.ing	Venezuela ing Vejis_20_meter.ing Wessia1_most.ing Wessia2_most.ing		Recent Goto	
			<u> </u>		
	File name: Imatiantia img Files of type: IMAGINE Image (*				
	truecolor : 512 Rows x 512 Colum	nns x 6 Band(s)			

 Before clicking OK in the Select Layer To Add dialog, click the Raster Options tab, and select Gray Scale to display the image and Layer
 Also check Fit to Frame, and click OK.

	Select Layer To Add: File Rater Options Multiple	X
Click the dropdown arrow to see display options	Display as : Gray Scale Display Layer: Layer: 1	OK Cancel Help
Check Fit to Frame so the image fits entirely in the Viewer	Overt Image to Map System Overt Image to Map System Overt Dear Display Fit to Frame Data Scaling Background Transparent Zoom by: 100 Using Nearest Neighbor Heb	<u>Goto</u>

The image **tmatlanta.img** displays as grayscale in the Viewer.



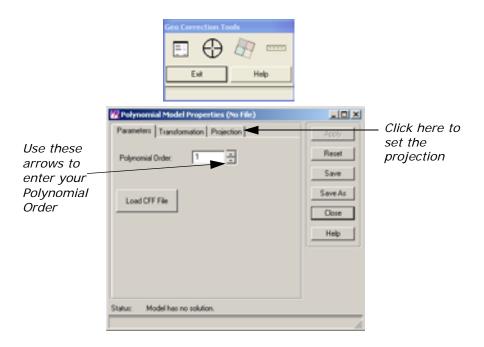
4. In the Viewer, click Raster -> Geometric Correction.

The IMAGINE Application Setup bar displays saying Starting warptool. The Set Geometric Model dialog opens.

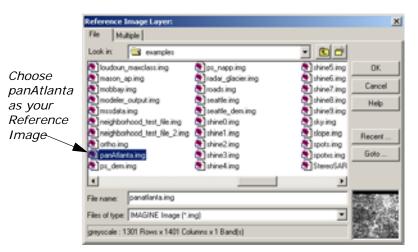
Set Geon Selec	retric Model I Geometric M				
Affine Camera DPPDB IKONOS NITE RPC QuackBied RP Landbat Potnomial Rubber Shee	-	×			
Ope	Open Existing Model				
Use	Existing Calibr	tion			
OK.	Cancel	Help			

5. Choose **Polynomial** as the Geometric Model in the Set Geometric Model dialog, and click **OK**.

The Geo Correction Tools and the Polynomial Model Properties dialogs open.



- 6. Type or click the arrows to input **2** as the Polynomial Order.
- Click the Projection tab in the Polynomial Model Properties dialog, and click Set Projection from GCP Tool near the bottom of the dialog.
- 8. The GCP Tool Reference Setup dialog opens. Choose Image Layer (New Viewer) and click OK.
- 9. In the Reference Image Layer dialog, navigate to your example data, and choose **panAtlanta.img.** Click **OK**.

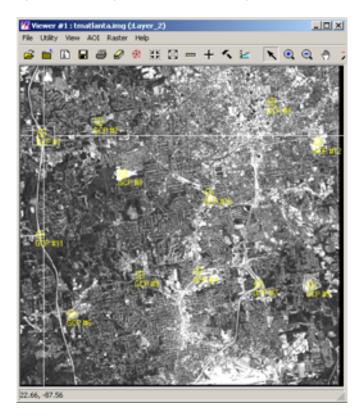


10. Click **OK** in the Reference Map Information dialog after looking over the Reference Map Projection.

The GCP Tool and three new viewers open automatically. Viewers 3 and 4 are small in order to highlight certain GCPs that you choose.

After the GCP Tool opens, it is set in Automatic GCP Editing mode by default. Check the following icon Σ to make sure it is active.

- 2. The GCPs need to be very precise so that the images match properly. Place the GCPs in specific locations such as intersections, large buildings, and distinct shapes. Make sure you scatter your GCPs around the image so they are not all concentrated in one place. Look at the image below for guidance in selecting the points.



- After placing six GCPs, turn on the Toggle Fully Automatic GCP
 Editing Mode icon is so you can see the points and where they fall in panAtlanta.img in the second Viewer.
- **4.** Select your seventh point. Notice how it falls very close to where it should in the panAtlanta.img image. This is the sign of a good registration transform. You can move the point slightly to give it the exact location between the two images.
- 5. Keep adding points until you have at least twelve. In the second image, panAtlanta.img, your points should be falling exactly where you are placing them in tmAtlanta.img. When this accuracy is achieved, you can resample the image.

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Resample and Evaluate the Coregistered Image

 Click the Resample icon B on the Geo Correction Tools dialog that opened with the Polynomial Model Properties dialog. The Resample dialog opens.

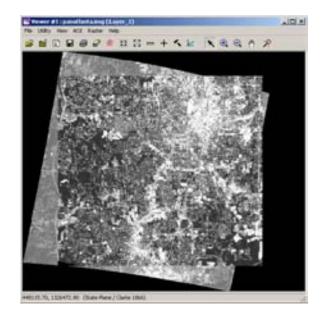
Browse to the directory where —— you want to store	Output File: (".img)	Resample Method Nearest Neighbor	Choose the Resample Method you want to use
the output file, and	Projection: State Plane		-
type the name	Units: feet		
	Number rows: 511	Number columns: 528	
	Output	t Corners:	
	UDC 391441.000000	LFDC 446776.000000	
	ULY: 1380017.000000 ×	LRY: 1326457.000000 *	
		From Inquire Box	
	Output	Cell Sizes:	
	× 105.000000 ÷ v. 10	5.000000 - Nominal.	
	Recalculate Output Defaults		
	OK. Batch	Cancel Help	

2. Browse to the directory where you want to store your new Output File. Type the name of the file in the Output File dialog and click **OK**.

In some cases you may want to change the **Resample Method**, but for this tutorial leave it set to **Nearest Neighbor**.

- **3.** In the Resample dialog, click **OK** to perform the resampling. A job status box displays stating that you are resampling **tmAtlanta.img** to whatever you have named your new Output File. When it is 100% done, click **OK**.
- Open a Viewer and display panAtlanta.img. Make sure you go to Raster Options and click Fit to Frame. Also click Clear Display if it is checked to turn it off.
- In the same Viewer, display your resampled image. Make sure you go to Raster Options and choose Gray Scale as the Display Option as well as Fit to Frame and turn off Clear Display.

Both images appear in the Viewer.



6. Click Utility and choose Swipe. The Viewer Swipe dialog opens.

Use the slide to swipe over the images	Swpe Poston:		Use Auto Mode and Speed to watch the images
	Direction	Automatic Swipe:	being swiped at
Choose either	C Vertical C Horizontal	C data Marke Screet 300 -	a rate you choose
horizontal		- rest upon the -	
or vertical	Cancel	Heb	

 Check Auto Mode in the Viewer Swipe dialog, and type 500 for the Speed. You can watch as the swipe tool slowly works its way over the images allowing you to evaluate the quality of the coregistration. Experiment with both Vertical and Horizontal direction and different speeds.

Easytrace

Introduction

MAGINE Easytrace adds assisted feature extraction capabilities to the existing vector, AOI and annotation editing tools of ERDAS IMAGINE. Assisted Feature Extraction is a means of reducing the number of mouse button clicks that you must perform, in order to capture vector information from a digital source such as satellite imagery or aerial photography, through automation of the extraction of features in the vicinity of the mouse clicks. The most prevalent example is the capture of roads from imagery. The traditional "heads-up" digitizing requires you to place vertices frequently along a winding road in order to adequately capture the detail represented in the imagery, whereas assisted feature extraction minimizes the number of manually measured vertices by automatically tracing the path of the feature between the positions you digitize. By minimizing the number of mouse clicks the linear feature capture process becomes more efficient, therefore faster.

In this tour guide, we will demonstrate the IMAGINE Easytrace tool by digitizing roads and boundaries (land areas) with a minimum number of measured vertices.



IMAGINE Easytrace tool requires a license to run. If you don't have a license you will receive this warning message.

IMAGINE Easytrace security checking failed. Please make sure you have the license to run it.

- Fast response extraction results can be displayed in real time;
- Capable of processing any raster image displayed in the viewer;
- In most cases, it is not necessary to do data pre-processing;
- Integrated with manual digitizing minimizes learning curve and makes it easy-to use;
- Different tracing modes deliver high flexibility to different data type and image scene complexities;
- Hot keys enable you to quickly switch between various digitizing modes

IMAGINE Easytrace Features

Hot Keys

Shift	Manual mode (switch back to manual mode)
А	Rubber band mode
S	Streaming mode (only effective for boundary extraction)
D	Discrete mode
Z or Back- space	Undo current segment of extraction
С	Hold this key to close a polygon (feature between the current cursor and start point will be traced)



Hot Keys, except Undo (Z or Backspace) are not available when Easy Tracing is unchecked.

IMAGINE Easytrace Matrix

Tracing Mode	Feature Type		
	Boundary	Centerline	Ribbon
Rubber Band	1	1	1
Streaming	1		
Discrete	1	>	>
Manual	1	1	1

1-

Checking the Reuse Template box saves you time, you won't have to specify the template each time when digitizing centerline or ribbon on multiple features with similar width and texture.

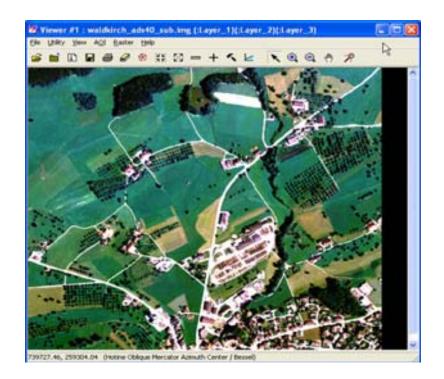
Starting IMAGINE Easytrace from Vector Tools

In this section, you will open a raster image, waldkirch_ads40_sub.img in the Viewer, then open the IMAGINE Easytrace tool from the Vector tool palette.

9

The IMAGINE *Easytrace tool can be started from the Vector, Annotation, or AOI tools menu.*

 In an IMAGINE Viewer select File | Open | Raster Layer..., the Select Layer to Add dialog is opened. From the examples folder, select waldkirch_ads40_sub.img.



 In the Viewer, select File | New | Vector Layer..., the Create a New Vector Layer dialog is opened. Type tour_trace in the file name box.

Create a New Vector Layer:		×
File Vector Options		
Look in: 🔁 Easyltace	- 🗈 🖻	🕲 💽
🖬 info		OK.
		Cancel
		Help
		Recent
		Goto
File name: tou_bace		
Files of type: Arc Coverage	* *	
1 Files, 1 Subdirectories, 0 Matches, 20516480k Bytes Free		

3. Click **OK** to create the new vector layer.

The New Arc Coverage Layer Option dialog is opened.



 Click **OK** to create a single precision layer. The Vector tools dialog is opened.

Vecto	۹F		
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c^{\prime}	Д	I	θ,
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- Click the Easytrace Tool icon to access the tool and its feature extracting options for digitizing.
- 6. Check the **Easy Tracing** box to enable Feature Type and Tracing Mode options.



Digitizing using IMAGINE Easytrace

In this section, we will use the IMAGINE Easytrace tool to digitize different feature types using different tracing modes.

Centerline with Rubber Band Mode

- 1. Click the **Centerline** radio button to select it as the feature type.
- 2. Click the **Rubber Band** radio button to select it as the tracing mode.
- 3. Click the Advan. Settings, the Advanced Easytrace Settings dialog is opened. Change the Smoothness to 86, Straightness to 66 and the Image Feature to 30.

The default is 50, but we're adding more smoothness and straightness, and decreasing the Image Feature. Since the curve of the road is fairly smooth, this will produce a smoother result.

- 4. Make sure the Color Band for Easy Tracing is set for All.
- 5. Click **OK** to apply the weighting factors changes and close the Advanced Easytrace Settings dialog.

🕼 Advanced Easytrace Settings 🛛 🛛 🔀		
Weighting Factors		
Smoothness 86 - 0 100		
Straightness 66 ± 0 100		
Image Feature 10 100		
Color Band For Easy Tracing		
IF All ⊂ Red ⊂ Green ⊂ Blue		
Generalization Tolerance (in pixels): 1.000 +		
OK Cancel Reset Help		

- **6.** Zoom in **(a)** to an area in the image with a winding road.
- Click the polyline icon *¹* to trace a line feature, the pointer becomes a cross in the image.
- Using the left mouse button, make two clicks (using the center of the cross as guide), one on each side of the road to get a measurement for the template of the road cross-section.

The template is specified by two mouse clicks on the boundary of the ribbon (for example, roads) you are going to digitize. These clicks should be as close to the edge as possible and the line segment of the two points should be perpendicular to the ribbon. The purpose of specifying the template is to specify width of the linear feature and get the texture of the linear feature.

NOTE: When using the centerline or ribbon modes on narrow linear features and having difficulty in specifying the template at the zoom level you want to digitize; zoom in to your desired zoom level, specify the template, using the context menu (click the right mouse button), then zoom out and start digitizing.

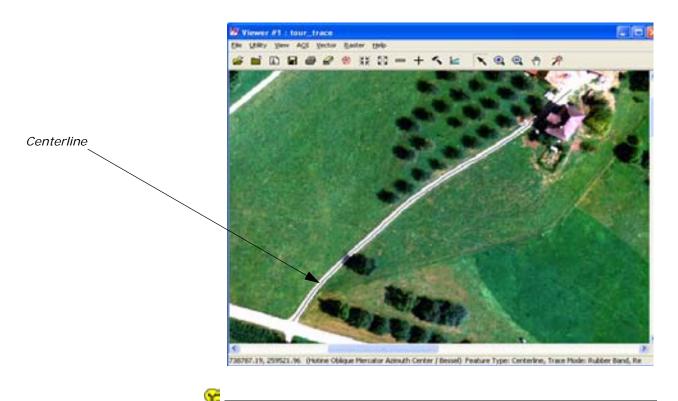
- **9.** Then start **tracing**, the IMAGINE Easytrace tool will follow the road and automatically generate points as needed.
- **10.** When you feel that the results are **OK**, click the left mouse button to confirm the segment and go on.

You can switch tracing modes while digitizing by using the Hot Keys. Switching modes may be helpful when moving through a particular area, for example switching to manual to continue to digitize the feature when IMAGINE Easytrace does not work well.

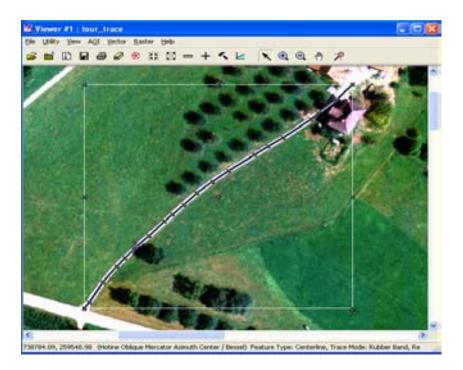
11. Double-click to end the digitization of the line..



If you make a mistake or see undesired vertices while digitizing, press Z to erase the last set of vertices.



To correct specific vertices, select that line and click the reshape icon on the Vector tool palette and click outside the selected line when done.



Changing the Appearance of the Tracing Results

You may want to change the color and or width of the tracing results. If this is necessary, use the following steps.

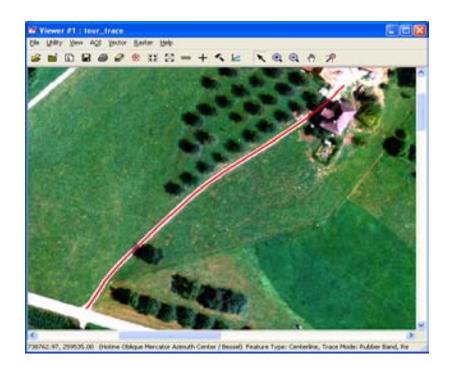
Select the Properties icon on the Vector Tools palette.
 The properties for tour_trace is displayed.

Properties for e:/temp/easytrace/tour_trace		
₽ Arcs (1)	☐ Nodes	
- Points (0)	e Al 🛛 🗾	
C Athibute	C Errora	
POINT X AddbCc	🗖 Danding 💿 💿	
F Polygon (0)	E Pieudo 🛛 🔳 🔲	
е н	Eounding Box	
C Eron	Selection Color:	
🗖 No Labels 🔤 🖬	Display the Selected Subset Only	
🗖 Multple Labels 🛛 🗖	T Attribute-based symbology	
□ Tics (2) • □	Symbology: (none) Set.,	
Auto Apply Changes		
Apply Save Save As Dicce Help		

- 2. Click the button to the right of Arcs.
- 3. Select **Other**, the Line Style Chooser dialog is displayed.
- 4. Type 2 in the width window.
- 5. Change the Outer Color to red.
- 6. Click Apply and Close in the Line Style Chooser dialog.
- 7. Click **Close** in the Properties dialog.

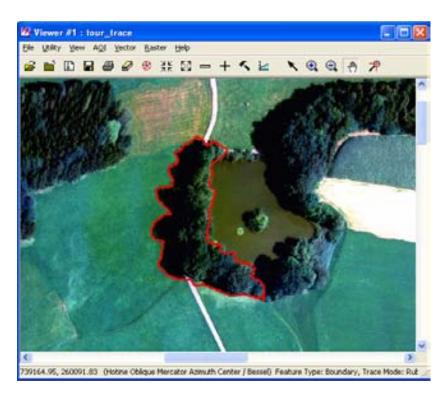
NOTE: An Attention dialog will display and ask if you want to save changes to a symbology file.

8. Click No in the Attention dialog.



Boundary with Rubber Band Mode

- 1. Click the **Boundary** radio button to select it as the feature type.
- 2. Click the **Rubber Band** radio button to select it as the tracing mode.
- Click the Advan. Settings button, the Advanced Easytrace Settings dialog is opened. Click the Reset button to return to the default settings.
- 4. Change the Image Feature to 90.
- 5. Click **OK** to apply the weighting factors changes and close the Advanced Easytrace Settings dialog.
- 6. Select the polygon icon digitize the cluster of trees surronding a stream of water.
- **7.** Double-click to end the digitization of the line.



8. Save the single precision coverage file and close the Viewer.

Import/Export

Introduction

The ERDAS IMAGINE Import function allows you to import a wide variety of data types for use in ERDAS IMAGINE. The Export function lets you convert image (ERDAS IMAGINE .img file format) files into one of several data formats.

In this tour guide, you can learn how to:

- import SPOT data from CD
- import ERDAS 7.x GIS and Generic Binary Data files
- export an image file in the ERDAS 7.x LAN format
- create a TIFF file
- view raw data values using the Data View option
- view image data information using the ImageInfo utility

Approximate completion time for this tour guide varies depending upon the data you are importing or exporting.

Import a SPOT Scene

Before you can import data from a peripheral device, such as a tape drive or a CD-ROM drive, you must configure the device in ERDAS IMAGINE.

œ

Refer to the current ERDAS IMAGINE Installation Guide for configuration instructions.

1/

This section takes you through the steps to import SPOT data. Since each individual has different types of SPOT data, these steps are only an example.

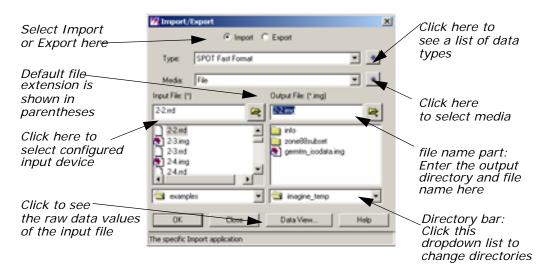
 If your Session Log is not already open, select Session -> Session Log from the ERDAS IMAGINE menu bar.

The Session Log displays real-time messages about what is happening throughout the import process. Following these messages closely helps you understand what is happening.

2. Click the Import icon on the ERDAS IMAGINE icon panel.



The Import/Export dialog opens:



The **Import** button is enabled when the dialog first opens, so that all of the prompts that display in the dialog are for importing data. When you click the **Export** button, the prompts change to options for exporting data.

- 3. Click the **Type** dropdown list to select **SPOT** from the list of available importers.
- 4. Confirm that the Media defaults to CD ROM.

Displayed under **Input CDROM** is a list of configured CD-ROM drives.

5. Click to select the device from which you want to import data.



If it is necessary to configure a new device, see the current <u>ERDAS IMAGINE Installation Guide</u>.

- 6. Under **Output File**, enter a name for the output file in the directory of your choice. You can click the directory bar dropdown list or enter the directory name in the file name part to select a different directory.
- 7. Click **OK** in the Import/Export dialog.
- **8**. Watch the Session Log to see a report of the activities of the import process.

The Import SPOT dialog opens:

Shows information about the selected image	Mimport S	POT (JEXE)cspot_testJin SPOT I	io nformation		×
	Image II	1 of 1			
	Name: scr	ne01	Media	CD/File	
	Level 1A		Format:	Standard SPOT	
	Country.	FRANCE	Bands:	1	
Shows map projection	Lab: SP01	IM.	Rows:	6000	
information, if available	Facility: 0	AP-T	Columns	6000	
		Map Project	ion Informa	tion	
	Projection	Unknown			
	Units: N/V	λ			
Click to go to the next	UDC N/A		ULY: N	L/A	
image on CD, if a multi-image CD	LFDC NUM		LINC N	L/A	
man mage eb	1	hevious Image		Next Image	
/	Colorate I	nage			
Click to go to the previous	OK.	Preview Options		Preview	Help
image on CD, if a multi-image CD	Cancel	Import Options .	- 1	QuickLow	Batch
5	/				
Click here to def options for the p image		Click here to a preview in importing th	nage l		

Check Preview Options

1. Click **Preview Options** and the following dialog opens:

Freview Option	Decimation: Nearest Neighbor
	Preview Bands:
Red 1	a Green 2 a Blue 3 a
Coordinate Type:	Subset Definition:
€ Fie	ULX 0.00 = URX 2999.00 =
C Hap	ULY: 0.00 × URY: 2999.00 ×
OK.	Cancel From Inquire Box Help

Preview Options Dialog

The Preview Options allow you to import a decimated (that is, reduced) version of the image file. You can view the image before importing to be sure that this is the image you want, or to define a subset area of the image to import.

The Preview Options dialog is the same for all importers. For example, if you were importing a Landsat TM scene and you wanted to preview the image, the Preview Options dialog would be identical to the one in "Check Preview Options".

In the Preview Options dialog, you can set:

- Size of the displayed image—up to 512×512 or 1024×1024 .
- **Decimation—Nearest Neighbor** (provides a faster preview image, although it may appear blocky) or **Average Pixel** (averages groups of pixels, which provides a smooth image but may take longer, especially with large images).
- **Preview Bands**—the bands that are assigned the red, green, and blue colors in the previewed image (this option may not be applicable to some data).
- Coordinate Type—the type of coordinates used to define the subset. If there is no map information in the source image, only File coordinates are available.
- **Subset Definition**—define a subset area for previewing or importing.
- 2. Click **OK** in the Preview Options dialog.
- 3. Click **Preview** in the Import SPOT dialog.

A Job Status dialog displays, indicating the progress of the function.

Mimport SPC	DT (.EXI)simag_03.img	×
Job State:	Previewing level 1A from //wdarap/dexlb/taster/satellite/	spot/11*
Percent Done:	22% 0	
	OK Cancel Help	

When the Job Status bar shows 100 (indicating that the job is 100% done), the dialog automatically closes. A Viewer window similar to the following opens and displays the preview image:



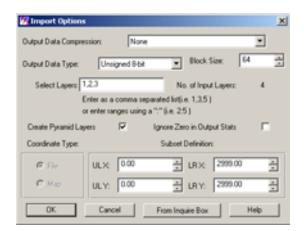
V-

Preview images have a .preview.img file extension. Because the preview image is decimated, it is not suitable for image processing.

Check Import Options

1. In the Import SPOT dialog, click Import Options.

The Import Options dialog opens. This dialog is similar to the Preview Options dialog.



NOTE: Like the Preview Options dialog, the Import Options dialog is the same for every type of importer.

2. Select Utility -> Inquire Box from the SPOT_test.preview.img Viewer menu bar.

The Inquire Box Coordinates dialog opens and a rectangular box (the Inquire Box) displays in the center of the Viewer.



Subset an Area

You can select a subset area to be imported by moving and resizing the Inquire Box in the Viewer:

- to resize the Inquire Box, hold and drag on the sides or corners of the box
- to move the Inquire Box, hold and drag in the center of the box

The coordinates update in the Inquire Box dialog as you move and/or resize the Inquire Box.

3. When you have selected the subset area to import, click **From Inquire Box** in the Import Options dialog.

The coordinates for the subset area display in the Import Options dialog.

Sometimes, when map coordinate information is not available in the source image, there are apparent differences between the Inquire Box coordinates and those transferred to the Import Options dialog. However, the imported image subset matches the area bounded by the inquire box.

- 4. Click **OK** in the Import Options dialog.
- 5. Click **OK** in the Import SPOT dialog.

A Job Status dialog displays, indicating the progress of the import process:

Depending on your eml **Preferences**, when the Job Status bar shows 100 (indicating that the job is 100% done), you must either click **OK** to close the dialog or the dialog closes automatically.

6. Open a Viewer window and display the output file.





See the chapter "Raster and Vector Data Sources" in the <u>ERDAS</u> <u>Field Guide</u> for more information on importing data.



In this section, you export one of the image example files to an ERDAS Version 7.x LAN file.

Choose Export Options

ERDAS IMAGINE should be running and the Import/Export dialog should be open.

- 1. In the Import/Export dialog, click Export.
- 2. Click the Type dropdown list to see a list of available exporters.
- 3. Click to select LAN (Erdas 7.x) from the Type dropdown list.
- 4. Confirm that the Media lists File.
- 5. Enter lanier.img under Input File.
- 6. In the Import/Export dialog, ERDAS IMAGINE automatically enters **lanier.lan** as the output file. You may change this name if you want.

C Inport/Export	Export
Type: LAN (Erder 7.x) Media: File	•
Input File: (* ing) Input File: (* ing) Insige-dodge-bright-spot.ing Kion_TM ing Indoover.ing Indoover.ing	Output File: (*.lan) Ianies Ian into 2 one88suboet
Ranier ing haspect ing	Dita View Help

7. Click **OK** in the Import/Export dialog.

The Export ERDAS 7.5 LAN Data dialog opens:

Input File:	lanier.ing				
Dutput File:	lanier.lan				
II Rows:	512	II Colo	512	II Bands	7
ОК		Export Opt	ions	Не	þ
Close	-			Bat	ch

Click OK in the Export ERDAS 7.5 LAN Data dialog.
 A Job Status dialog displays.

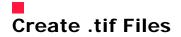
The file lanier.lan now resides in the selected directory.

Creating LAN Data

ERDAS IMAGINE also creates two other files when it exports the LAN data:

- **lanier.pro**—contains map projection information
- lanier.sta—contains file statistics

These file formats are used in ERDAS 7.5 software. In ERDAS IMAGINE, map projection and file statistics are included in the image file format. You may delete the files **lanier.pro** and **lanier.sta** if desired, since they are not used in this exercise.



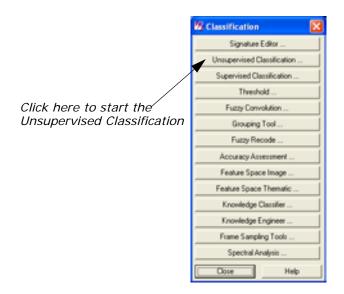
In this section, run an ERDAS IMAGINE process, producing a .tif file instead of an image file.

NOTE: Since the input image is georeferenced, the output TIFF image has geotiff tags. If you wish to produce a TIFF World file, select the Write option in the TIFF image file category of the Preference Editor.

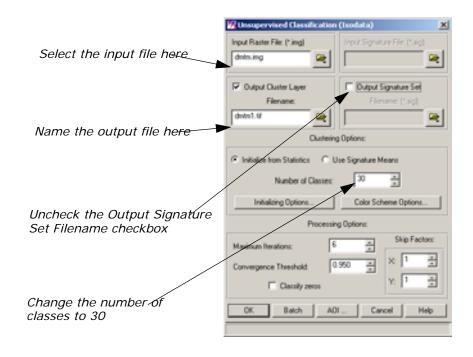
1. Click the Classifier icon on the ERDAS IMAGINE icon panel.



The **Classification** menu opens.



 Click Unsupervised Classification from the Classification menu. The Unsupervised Classification (Isodata) dialog opens.



3. Click the Open icon 🝰 by Input Raster File.

The Input Raster File dialog opens.

4. In the Input Raster File dialog, click dmtm.img, then click OK.

The raster file, **dmtm.img***, is located in the <IMAGINE_HOME>/examples directory.*

- Click the Open icon next to Output Cluster Layer Filename. The Filename dialog opens.
- 6. Navigate to a directory where you have write permission.
- 7. Click the File Type dropdown list, and select TIFF (*.tif).
- 8. Type in dmtm1.tif in the Filename field, and then click OK.
- **9.** Change the **Number of Classes** to **30**. This tells the classifier how many classes to create.
- 10. Deselect the Output Signature Set Filename checkbox.
- 11. Click OK at the bottom of the Unsupervised Classification dialog.A job status dialog displays the progress of the classification of the file.

👯 Tsodata dn	itm.img to dm	tm1.tif	×	đ
Job State:	Iteration: 3	Convergence: 0.5	51	
Percent Done:	0% 0		100	
	OK I	Cancel	Help	

The resulting classification is created in the .tif format.

Check the Classification

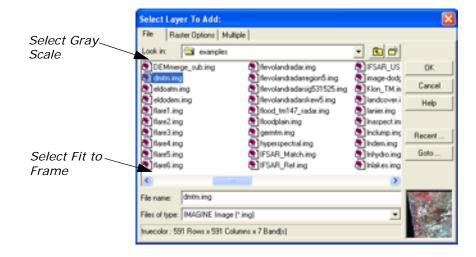
1. Click the Viewer icon to open a Viewer.



- From the Viewer toolbar, click the Open icon 📂 .
- 3. In the Select Layer To Add dialog, click the Recent button.
- 4. Select the file dmtm1.tif from the top of the list.

Select dmtm1.tif from the top	List of Recent Filenames Recent	X
	Criterophraspines templifier in a d. Aexamples/Anten. Img c. Arenp/imagine, temp/lapot_last d. Aexamples/Anten. temp/lapot_test c. Arenp/imagine, temp/lapot_test c. Arenp/imagine, temp/lapot_test c. Arenp/imagine, temp/lapot_est d. Aexamples/22.img d. Aexamples/Arpts.dat	-
	OK Dear Cancel H	ND

- 5. Click OK in the List of Recent Files dialog.
- 6. Click the Raster Options tab of the Select Layer to Add dialog.



- 7. Click the **Display as** dropdown list and select **Gray Scale**.
- 8. Click the Fit to Frame checkbox.
- 9. Click **OK** in the Select Layer To Add dialog.

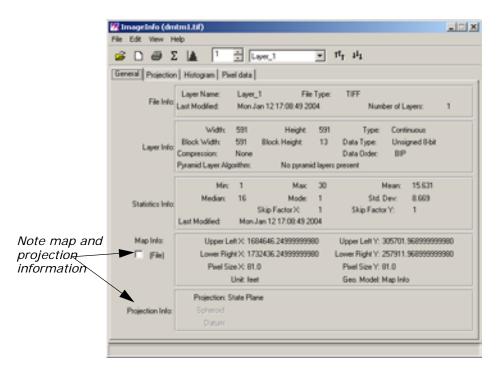
The file **dmtm1.tif** displays in the Viewer. The various shades of gray denote different classes of land cover.



Check Map Information

1. Click the ImageInfo icon 🔝 on the Viewer toolbar.

The ImageInfo dialog for **dmtm1.tif** opens.



Note the information in the **Map Info** section and that the **Projection Info** section shows that the map is georeferenced to **State Plane**.

- 2. When you are finished, click File -> Close in the ImageInfo dialog.
- 3. Click File -> Close in the Viewer containing dmtm1.tif.

Import Generic Binary Data

In this section, you import the **lanier.lan** file that you just exported. This file could be imported using the ERDAS 7.x LAN import function. However, you are using this file to learn how the Generic Binary Data dialog works.

This function is designed for importing data types for which there are currently no specific ERDAS IMAGINE importers.

- 1. In the Import/Export dialog, click Import.
- 2. Click the Type dropdown list and select Generic Binary.
- 3. Select File from the Media dropdown list.
- 4. Under Input File, select lanier.lan. Change directories if needed by clicking on the directory bar.

ERDAS IMAGINE automatically enters this output file name with	Import/Taport C Import C Export Type: Generic Dinay	*
.img extension	Medax Fie	*
Click here to select input file	Input File (*) Dutput File (*) Inier.lan Inier	Click here to see raw data values and header information
Directory bar: Click this dropdown list to change directories	OK Close Data Vev. He	

- Under Output File, ERDAS IMAGINE automatically enters lanier.img as the file name. If you try to save the file in the <IMAGINE_HOME>/examples directory, an Attention message warns you that lanier.img already exists.
- 6. If the Attention dialog displays, click No.

This prevents the original **lanier.img** file from being overwritten.

- 7. In the Import/Export dialog, enter **lanier2.img** as the **Output File** in the directory of your choice.
- 8. In the Import/Export dialog, click OK.

The Import Generic Binary Data dialog opens.

This dialog requires you make many inputs that define the data structure for ERDAS IMAGINE. In some cases, you can get the information for these inputs from the header data of the file (using the **Data View** option from the Import/Export dialog), but you may have to rely on prior knowledge or assumption for the information.



You must enter the correct inputs for the data you are importing. The defaults for this dialog are not acceptable for importing.

Data View

1. Click the Data View button in the Import/Export dialog.

The DataView dialog opens. The data, as initially displayed, may not appear to be very useful. The following steps result in a display from which you can extract the information needed to complete the generic import.

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Data View is also available from the **Utility** menu on the ERDAS IMAGINE menu bar.

LAN File Format

The LAN format has the following characteristics:

- the first 128 bytes of the file are header data
- the number of bands is stored as a 16-bit integer in bytes 9 and 10
- the number of columns is stored as a 32-bit integer in bytes 17-20
- the number of rows is stored as a 32-bit integer in rows 21-24

With this knowledge, you can look at the data values in these bytes to obtain the information needed to import the file as generic binary data.

- 2. In the DataView dialog, click **Data Type** and select **Unsigned 16 bit**.
- 3. In the DataView dialog, click **Byte Order** and select **Intel**.
- Set the Offset to 8 and check that the Format is Decimal. The DataView dialog is updated to look like the following:

	He Edt Help	mp,/imagin	e_temp/k	anier Jan						TO X
Unsigned 16 bit data	Tape/File Structure: File: c:/temp/mag Size: 1839520 Byti Last Modified: Mor	ne_temp/lank					0	fset e	auals	8 because
selected because number of bands is two bytes	Re. 1	Record	1	- 곳 Rec	ord Size:	256	nı		of bai	nds begins
Number	Data Type: Uni	igned 16 bit		Format	Decimal	1	Byte C		Intel	*
Data field displays actual data values	000000000000 000000040 000000040 0000000	7 0 0 0 1 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0	16880 17991 172166 164566 16702	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 16880 17222 164529 16703 167739	512 0 0 40768 167988 16704 16194 16299 16707 18496	0 0 0 10531 19786 16708 16963 10240 16706 19270	512 0 0 23928 21069 17218 18499 16192 20044	0 0 0 19040 20306 17476 17481 19578 20045	- -

- In the DataView dialog, click Data Type and select Unsigned 32 bit.
- 6. In the DataView dialog, click Byte Order and select Intel.

 Set the Offset to 16 and check that the Format is Decimal. The DataView dialog updates.

	Dataniew c/temp/imagine_temp/lanier.lan File Edit Heip	- O X
Unsigned 32-bit data is selected		
because the number of columns and rows are four bytes each	File: c-Aemp/Imagine_temp/Innies.tem Sam: 1835520 Bytes Last Modified: Mon Jan 12 16:50:50 2004 I I I I I I I I I I I I I I I I I I	ause begins
Number	Fire: 1 Record: 1 Record Size: 256 Citizet 16 Auto Data Type: Unsigned 32 bit Format: Decimal Record Size: Intel	Scan
of columns		-
Number of rows	000000000000000000000000000000000000	_

Enter Image Dimensions

1. In the Import Generic Binary Data dialog, next to File Header Bytes, enter 128.

This is the number of bytes in the header, before the actual data values begin.

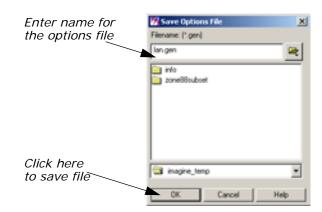
- 2. Under Image Dimensions, for # Rows, enter 512.
- 3. Under Image Dimensions, for # Cols, enter 512.
- 4. Under Image Dimensions, for # Bands, enter 7. The Import Generic Binary Data dialog updates.

	10 Import Generic Binary Data	
	Data Description	Tape/File Options
Enter number	Data Format: III.	Stip 0 - Files
bytes here	Data Type: Unsigned 8 Bit	Blocking Factor: 1 🚊
	🗖 Swap Bytes	File Header Bytes: 128 *
	Image Dimensions	BSQ Options
Enter image dimensions and number of bands here	Image Record Length: 0 = 2 Line Header Bytes: 0 = 2 # Rows 512 = # Bare 7 = 2 # Cols 512 = 2	E Bands in Multiple Files Band Header Bytes: 0 = 2 Band Trailer Bytes: 0 = 2
Click here to see a preview	Load Options	Save Options
of the image	OK. Preview Options	Preview Help
-	Close Import Options	Batch

Save Options

1. Click Save Options.

The Save Options File dialog opens.



This dialog allows you to save the inputs you have entered to a .gen file. It can be recalled and loaded into the Import Generic Data dialog whenever you are importing data with this structure. This keeps you from having to find and enter the necessary inputs again.

2. Under File name, enter LAN and move the cursor out of the text field.

ERDAS IMAGINE automatically appends the default .gen file extension. Use a descriptive name that helps you to recognize the type of inputs saved in the file.

3. Click OK in the Save Options File dialog.

These inputs are now saved and can be used again, when appropriate.

To load the .gen file at a later time, click the **Load Options** button in the Import Generic Binary Data dialog.

Preview the Image

1. In the Import Generic Binary Data dialog, click **Preview**.

A Job Status dialog displays. When the Job Status bar shows 100 (indicating that the job is 100% done), the dialog closes automatically.

A Viewer automatically opens and displays the file **lanier2.preview.img**. The .preview file extension is added to indicate that this is a decimated preview file (not suitable for processing).

2. Open another Viewer window and display the file lanier.img.

You see that the two files are similar in appearance. The difference in these files is that **lanier.img** has map projection information and **lanier2.preview.img** does not. This is because when **lanier.img** was exported to a .lan file, the map information was exported to **lanier.pro**, which is a format used in ERDAS 7.5. The map projection data in **lanier.pro** was not imported with the Generic Binary Data importer.

However, the imported image does contain statistics (similar to the statistics exported to **lanier.sta**), because statistics are recalculated after a raster file is imported.

 In the ERDAS IMAGINE menu bar, select Session -> Close All Viewers.

Get Image

The ImageInfo utility is a function that gives you information about ERDAS IMAGINE image files. With this function you can access any image file and see the:

- date of last modification
- number of Layers
- layer information: Width, Height, Type, Block Width, Block Height, Data Type, Compression, and Pyramid Layer status for each layer in the file
- calculated statistics
- map coordinates, when available
- map projection information, when available

NOTE: **ImageInfo** *can only be used for image files. Use* **Vector Info** *for vector coverages.*

Edit Image Information

In image files that have write permission, you can edit file information or perform the following operations using the ImageInfo dialog:

- change layer name
- compute statistics
- add, change, or delete map information
- add, change, or delete map projection
- delete calibration
- access the Raster Attribute Editor to change file attributes, such as color, histogram values, etc.

View Image Information In this section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the Inthis section, you use the ImageInfo utility to learn more about the ImageInfo utility to ImageInfo utility

1. Select **Tools -> Image Information** from the ERDAS IMAGINE menu bar.

The ImageInfo dialog opens.

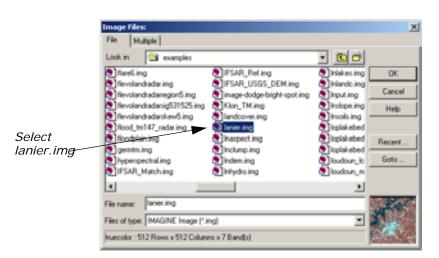
ē —

This option is also accessible from **Session -> Tools -> Image Information** on the ERDAS IMAGINE menu bar.

2. Select File -> Open from the ImageInfo menu bar, or click the Open

icon 🧭 on the toolbar.

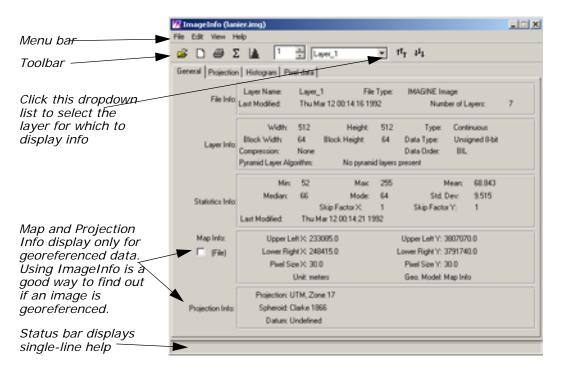
The Image Files dialog opens. This dialog allows you to select a file for which information displays in the ImageInfo dialog.



3. Under Filename, select lanier.img.

4. Click **OK** in the Image Files dialog.

The information for **lanier.img** displays in the ImageInfo dialog.



5. Look over the information listed in the dialog.



The functions in the ImageInfo menu bar in the toolbar are described in the On-Line Help.

Since this is a write-protected file, none of these values can be changed. If you want to practice editing image information with this dialog, you can copy **lanier.img** to the directory of your choice and change the write protections. Then open the writable file in the ImageInfo dialog and click **Edit** to use the editing functions.

6. Select **File -> Close** from the ImageInfo menu bar when you have read the information in the dialog.

Batch Processing

Introduction

The ERDAS IMAGINE Batch Wizard allows you to process one or more files with one or more commands at any time, from

immediately to many years in the future.¹ This is useful if you have a process that requires a long time to run and you want to run it when your system is at minimum utilization (for example, during the night). It is also useful if you wish to run a repetitive task many times, such as executing the reprojection command to reproject hundreds of images.

Some of the ERDAS IMAGINE functions that can be included in a Batch job are: classification, rectification, radar processing, Image Interpreter, import/export, and reproject.

Most of the processing dialogs in ERDAS IMAGINE, such as Importers, Exporters, Image Interpreter functions, Data Preparation functions, and others have a **Batch** button. This button is used to place the command in the Batch queue instead of actually performing the operation. Off-line processing allows unattended operation, enabling you to log off if you wish.

1

The Batch wizard is distributed as part of the IMAGINE Essentials module, but can be used with functions from other modules. Consequently, some portions of this chapter may not compute successfully unless you also have an IMAGINE Advantage license, because functions from that module are used in the examples.

1

On systems where off-line processing is not available, the options for processing at a later time are not available.

1

On Microsoft Windows NT, your account must have administrator privilege to schedule jobs at a later time.

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Approximate completion time for this tour guide varies, depending upon the data you select for Batch processing.

^{1.} Under Windows NT, a job cannot be scheduled beyond the end of the current month.

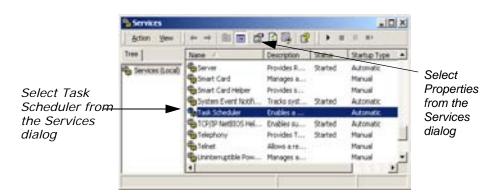
Set up/Start the Task Scheduler on NT and 2000

Before you can use the Batch Wizard to schedule jobs to run at a later time on Windows NT systems, you must set up and run the Scheduler. This requirement means that the account that starts Scheduler must remain logged-in for the scheduled job to run. You must log in as an administrator or as a person with administrator privileges to set up and start the Task Scheduler. Once started, you no longer need to have administrator privileges to submit jobs.

There are two ways to determine if Task Scheduler is installed on your system. If the Explorer shows a folder called "Scheduled Tasks" under "My Computer", then Task Scheduler is installed. If there is an entry called Task Scheduler under the "Services" control panel, then Task Scheduler is installed.

If Task Scheduler is installed, there is an additional panel at the end of the Batch Wizard which collects username and password information required by the Task Scheduler. The **Finish** button is disabled and the **Next** button is enabled. Once the information has been entered, it is remembered for the session and does not have to be entered again. The information is not saved, so when you exit ERDAS IMAGINE, it is forgotten and will have to be reentered during the next session. Saving username and password information in a file might pose a security problem.

- 1. From the Start menu, select Settings -> Control Panel.
- 2. On the Control Panel, select **Administrative Tools**, then choose **Services**.



3. Scroll through the Services dialog and select **Task Scheduler**, then click the **Properties** button on the Services menu to startup and open the Task Scheduler Properties dialog.



Read the help for the services control panel when using it for the first time. The help button is located on the Services menu bar.

	Task Scheduler Pr	roperties (Local Computer)	1×
	General Log On	Recovery Dependencies	
	Service name:	Schedule	
	Display name:	Task Scheduler	- 1
	Description: Enables a program to run at a designated time.		- 1
	Path to executab		
	C:\WINNT\ayote	em32MSTack.exe	
Soloct Automatic	Statup type:	Automatic	•
Select Automat ic	Service status:	Automotic Manual Deubled Stopper	
	Start	Stop Pause Resume	
	from here.	the start parameters that apply when you start the serv	íce
	Start parameters:		
		OK Cancel A	coly

 In the Task Scheduler Properties dialog, select Automatic as the Startup Type in the General menu, then click the This Account checkbox in the Log On menu. Enter your account name and password, confirm your password, and then click OK.

Action Yew	+ + = = =		1	11	_
Tree	None /	Description	Status	Startup Type	
Services (Local)	Server Shart Card Shart Card Helper	Provides R Manages a Provides s		Autonatic Manual Manual	
	System Event Notifi	Englies a		Automatic	í
	Tory NetStos Hel Telephony	Enables su Provides T Allows ant	Rated	Autonatic Manual Manual	
	Uninterruptble Pow	Manages a		Manual ,	ĉ

— Click the Start icon to start the Scheduler

5. Click the Start button in the Services dialog.

NOTE: The ability to run Batch at a later time is built using the Windows scheduler, which is part of the **at** command. Refer to the Windows help to learn more about the use of the **at** command.

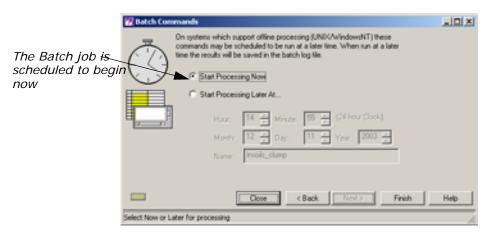
(Microsoft Windows NT) If you are submitting jobs for processing later and you are using mapped network drives, then you need to ensure that these maps are in place when the Batch job runs. Typically, a mapped drive is only available to the current user unless the **Reconnect at Logon** option was checked on the Map Network Drive dialog when the drive was mapped.

		If this option is not checked, then when the Batch process is run by the Scheduler, it is not able to find the drive. This is one of the reasons to make sure that the Schedule service runs as your account name. This ensures that remembered network drive maps are reestablished when the Batch process runs.
Use Batch with a UNIX System		Unlike the Scheduler on NT, you do not have to be an administrator or a person with administrator privileges to set up Batch to run on a UNIX system.
		On UNIX, the ability to run Batch at a later time is built using the UNIX cron system. See the man pages for more information about cron and the at command on UNIX.
Execute a Single File/Single Command		This operation is very useful for performing lengthy processes on large files.
	1.	From the ERDAS IMAGINE icon bar, click the Interpreter icon and then select GIS Analysis -> Clump to open the Clump dialog.
	2.	In the Clump dialog, select <imagine_home>/examples/Insoils.img for the Input File name and <your_workspace>/Insoils_clump.img for the Output File name.</your_workspace></imagine_home>
		Where <your_workspace> is the Default Output Directory specified in the User Interface & Session category in the Preference Editor, and <imagine_home> is the directory where ERDAS IMAGINE is installed.</imagine_home></your_workspace>
	3.	In the Clump dialog, click the Batch button. The Batch Wizard opens with the Select Type of Command Processing panel displayed. The

Use commands as they are radio button is already selected.

	🖗 Batch Commands	
Use commands as they are i s already selected for you	You may use the "Use commands as they are" option to sun the batch commands now or schedule them to sun later. Use the "Modily commands manualy" or "Modily commands automaticaly" options to make further charges to the commands or nun the commands on multiple files. Automatic modification makes intelligent choices in substituting variables for inputs	
	Close (Back Next) Finish	Help
		4

 Click the Next > button. The Select When to Process Commands panel displays. The Start Processing Now button is already selected. If you wish to process the file immediately, go to step 6.



- If you wish to process the file at a later time, click the Start Processing Later At... option, and set the time you wish it to begin processing.
- 6. Click the **Finish** button in the Select When to Process Commands panel to begin processing. A Job Status dialog opens showing the progress of each individual file along with progress of the overall job. When the job is complete, the **OK** button is enabled.

	Modeler - running model: clump.pmdl	x
This meter tracks the	Processing Batch Job	
progress of an individual file	All commands were run.	
	Commands: 100% 0	100
This meter tracks the	File:: 100% 0	100
progress of all the files in the Batch job	Cancel Cancel Al Help	

7. Click OK to close the status meter.

The clump operation is complete. If you wish, you can open a Viewer and check the file.

Execute Multiple Files/Single Command—Run Now

The ability to execute a command on multiple files is very useful. In the following example, the Batch Wizard is used to compute statistics for several TIFF images.

NOTE: You must provide your own TIFF files for this exercise.

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See "Image Commands" on page 143 for instructions on how to use Image Interpreter utilities to create TIFF images from image files.

1/

It is important to note that some processes depend upon the physical extents of the imagery, or the number of bands, or data types, or the projection parameters, and so on. You must be aware of both the requirements of the processes (commands) as well as the differences between the file types to be processed. In many cases, the data sets provided to multifile processing jobs must share common physical and ephemeral aspects.

Set TIFF Image File Preferences

 Select Session -> Preferences from the ERDAS IMAGINE menu bar to open the Preference Editor dialog, and select the TIFF Image Files category.

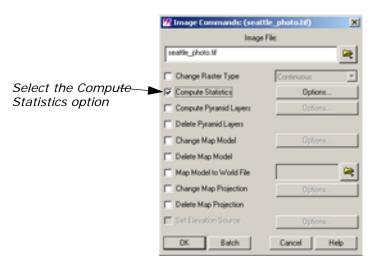
Preference Editor			
Category NITE Static In Ortho[A/S] Profile Racter Incont (General) Racter Processing RVW Image Files RPF Exporter Parameters RPF Image Files SDTS Racter Exporter Spatch / Analysis Spatch / Analysis	1-bit Image Compression 8-bit Image Compression Other Image Compression Use JPEG Compression When Possible JPEG Compression Quality	None None None	*
Stereo Analyst Feature Collecti Stereo Analyst Options User Interface & Session	Edits Allowed Create Tiled Images		3 _
1 1	Tile width	64.000	2.
	Close Close Save	Global Save Co	Alegory Help Help

Make sure that edits are allowed

 Ensure that the Edits Allowed option is enabled (checkbox checked). If you want this to be the default, click User Save. Click Close.

Now you are ready to start the Image Command Tool, which interactively provides Batch access to many of the functions that the Image Information tool provides. Start the Image Command Tool

- 1. Select **Tools -> Image Command Tool** from the ERDAS IMAGINE menu bar to open the Image Commands dialog.
- Click the File Open icon on the Image Commands dialog. In the file selector, click the Files of Type dropdown list and select TIFF. Select a TIFF file and click OK. The options on the Image Commands dialog are now enabled.



3. Check the **Compute Statistics** checkbox on the Image Commands dialog.

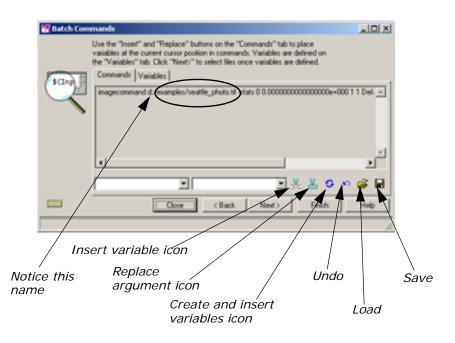
Start the Batch Wizard

1. Click the **Batch** button in the Image Commands dialog.

The Batch Wizard starts, and the Batch Commands panel displays. If you click the **Finish** button now, the job runs on the selected file. However, it is more useful to automate the process to run on several files.

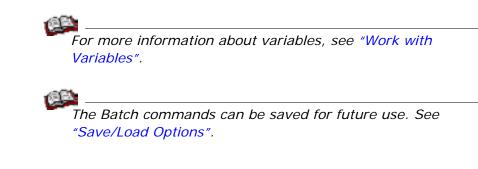
- 2. Select the **Modify commands manually** option in the Batch Commands panel.
- 3. Click the **Next** > button to display the **Commands and Variables** tabs.

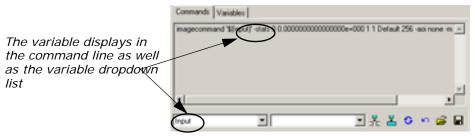
Notice that the command, visible in the window, contains the full path of the selected file. In order for the software to be able to make file name substitutions from a list, there must be a variable into which the substitution is made. This is done in the following step.



4. Click the Create and Insert Variables icon 🚯 to create variables.

This tool examines the command for file names and replaces them with variables. In this case, one variable called **Input** is created and replaces a specific file and path.





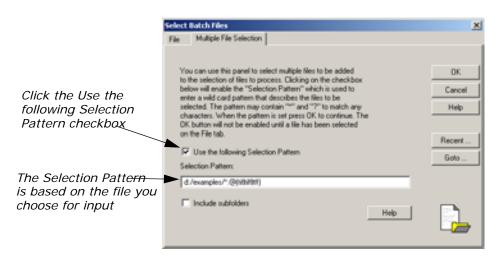
5. Click the **Next** > button to display the Select Files to Process panel.

	🙀 Batch Con	mands																																								5	1	١	×
		Use the pop add files to from the list	o the	h	th	h	-	è	ė	6	1	ł	1	h	st.	Т	he	0)el	ieł,	e I	bu	Al.	m	ca	m	ь	-	æ	51	5 M	en	ove	1 24	ée:	fier (d no	219							
			JL.																				1	Ing	puł	1																		Ŀ	
	- 1 5	1	1	÷	l	1	ę.	14	ł	e	•		•	aî	nk;	U	ph	o)	ą,	ű																								l	L
																																												l	L
Add files to the Inpu	It																															Ľ	1												
list by clicking this																																												L	
icon																																												L	
			+	-	+	-	-	-	-	-			-	_	_	_	_	_	_	_																								÷	1
		Input																		-	1		E	8	1	x	1	1	sh	KON	1	u	Pa	ħ								é		۲	4
																l	[1	a	00	,		1	ļ		<	8.8	ck.		I,		N	ext	>		l	1	Finid	•	J,	_	н	ek	>	
																																													1

Select the Add Files icon in this opens a file selector. Click the File Type dropdown list and select TIFF.

NOTE: If you are working on the Windows platform, files can be added to the input list by dragging and dropping them from Explorer to the input list.

- **7.** Select another TIFF file, and then click the **Multiple Files Selection** tab.
- 8. Click the **Use the following Selection Pattern** checkbox. The default wild card displayed in the **Selection Pattern** field selects all TIFF files in the specified directory. You may modify the wild card as needed.



 Click the OK button on in the Multiple File Selection tab. The specified TIFF files are added to the list in the Select Files to Process panel in the Input column.

NOTE: You can repeat step 6 through step 8 to choose TIFF files from other directories.

	🚧 Batch Com	mands		JO X
		add files to	pup list to select the column to modify. Use the "Select" button to the list. The Delete button can be used to remove selected rows . There must be at least one name in the list below to proceed.	
This row is selected	1, `_		Input	*
indicated by the	- 17 -	1	seattle_photo.td	
yellow highlight	Ē	┝ .	Revolandradar.M	
			(Security) (B	
		Input	💌 🚇 🔯 🗆 Show Full Path	i 🖉 🖉
			Close (Back Next) Finish	Help
				li.

NOTE: Entries in the list may be selected by clicking in the number column as shown above, and then removed from the list by clicking the Delete icon \aleph .

10. Click Finish to start computing statistics on the listed images immediately. A Job Status dialog displays showing the progress of each individual file along with progress of the total job. When the job is complete, the OK button is enabled. Click OK to close the Job Status dialog.

Execute Multiple Files/Single Command—Run Later

In the following example, you are going to perform reprojection on all of the Lake Lanier-related files in the ERDAS IMAGINE examples directory.

NOTE: For Windows NT users, you must be an administrator or a person with administrator privileges to run a Batch process at a later time.

- 1. From the ERDAS IMAGINE icon bar, click the **DataPrep** icon, and then select **Reproject Images** to open the Reproject Images dialog.
- Select lanier.img as the Input File and lanier_reproj.img as the Output File. Select UTM WGS 84 South from the Categories dropdown list. Select UTM Zone 25 from the Projection dropdown list.

NOTE: If you are creating projections of your own, do not include a slash (/ or \) in the name. The Batch processor uses the presence of a slash in a name to decide if it is an argument to be converted to a variable.

Reproject Images	Save the Output File in
Input File: (*.ing) Uutput File: (*.ing) Isriet_ing Isriet_reproj ing	Save the Output File in the directory of your choice
Output Projection	
Categories:	
UTM WGS 84 South	Set the projection
Projection	here
UTM Zone 25 (Range 36W - 30W)	
Units: Meters 💌 🗖 Ignore Zero in Stats.	
Output Cell Sizes:	
× 30.00000 × Y. 30.00000 ×	
Resample Method: Nearest Neighbor	
C Rigorous Transformation @ Polynomial Approximation:	
Maximum poly order: 3 - Tolerance (pixels): 0.100 -	
If tolerance exceeded.	Click the Batch
🤄 Continue Approximation 🗧 Rigorous Transformation	button
OK Batch Cancel Help	1

- Click the Batch button. The Batch Commands dialog opens with the options for selecting different commands. Select the Modify commands automatically option.
- 4. In the Batch Commands dialog, click the Next > button to open the Commands/Variables panel. Ensure the Commands tab is selected. Using the horizontal scroll bar, scroll about 2/3 to the left and observe that Input and Output variables have already been created in the command line.

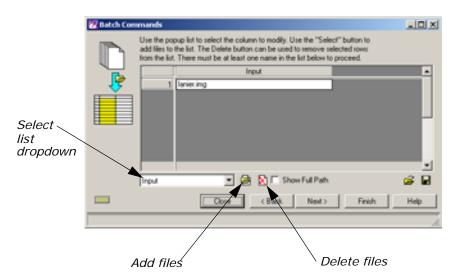




For more information about variables, see "Work with Variables".

5. Click the **Next** > button. The Select Files to Process panel opens with the selected input file displayed.

The dropdown list in the Select Files to Process panel determines which variable is populated when you click the **Add Files** button. In this example, there is only an **Input** variable.



By default, there is always an **Input** column in the list, which corresponds to the default **Input** variable.

Add Multiple Files

- 1. Click the Add Files icon 🔯 . The Select Batch Files dialog opens.
- Select Inaspect.img from the Select Batch Files dialog. Click the Multiple File Selection tab and click the Use the following Selection Pattern checkbox. Edit the Selection Pattern field to insert In before the asterisk. It should look like this:

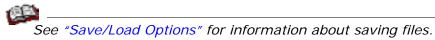
<IMAGINE_HOME>/examples/ln*.img

Where <IMAGINE_HOME> represents the installation directory of ERDAS IMAGINE on your system.

	Select Batch Files	×
The Selection Pattern has been changed to include all	File Multiple File Selection You can use this panel to select multiple files to be added to the selection of files to process. Dicking on the checkbox below will enable the "Selection Pattern" which is used to enter a wild card pattern that describes the files to be selected. The pattern may contain "and "?" to match any characters. When the pattern is set press OK to continue. The OK button will not be enabled until a file has been selected on the File tab.	OK Cancel Help Recent Goto
files that start with In	d./examples/hr/ing	

3. Click the **OK** button in the Select Batch Files dialog.

The input files display under the **Input** column. Select and delete any duplicate or unwanted files by clicking in the numbered column next to the file name and then clicking the Delete Files icon. This list of input files may be saved for future use.



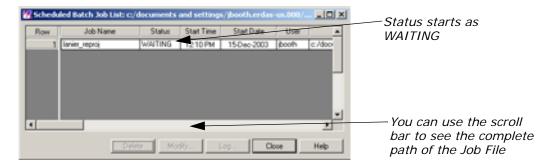
🚧 Batch Commands Use the popup list to select the column to modify. Use the "Select" button to add files to the list. The Delete button can be used to remove selected rows from the list. There must be at least one name in the list below to proceed. Input . lanier.ing haspecting These are all the Inclump.img Indem.ing files that begin with inhydro imp In located in the Inlakes.ing Inlandc.imp directory identified Input ing in the Selection -Pattern window 💌 🚑 🏹 🗐 Show Full Path Input 2 Close (Back Next) Finish Help

> Click the Next > button to open the Select When to Process Commands panel. Click the Start Processing Later At checkbox. Use the default time of the next available minute.

This Batch file begins on 15 December 2003 at 11:59 AM	C Start Processing Now	
When you schedule Batch jobs later, a Name is assigned. Names cannot contain certain characters or spaces. Batch renames the job accordingly.	Start Processing Later At.	Hop

The following characters are converted to a - (dash) when present in the **Name** field of the Select When to Process Commands panel: \backslash , /, *, ?, ->, <, and >. Spaces and tabs are converted to an _ (underscore).

5. Click the **Finish** button to begin processing. The Scheduled Batch Job List dialog opens, displaying all current Batch jobs. This is the place where the Task Scheduler may appear as discussed in the introduction to this Tour Guide chapter.



The Scheduled Batch Job List dialog may be opened any time by selecting **Session -> View Off-line Batch Queue** from the ERDAS IMAGINE menu bar.

When the job begins, the **Status** changes from **WAITING** to **ACTIVE**. When the job has finished, the **Status** changes from **ACTIVE** to **DONE**.

When the job is done, the log file can be viewed by first selecting the job in the Scheduled Batch Job list dialog, and then clicking the **Log** button. This is useful for checking to see if your Batch command ran successfully on all of the input files.

The log displays in a	W Mice Lever, equal 3 And Deck Mice and and antibase the short and a set of a set.
text editor	SCRAI BEA
	12/15/2003 12 45 06 c uprogram filestimagine 0.7-bintat004 reproject RME error 0.000031 pixels with polynomial order 2 and 216 maple pr Reprojections 0. Reprojection 1. Reproject Anier imp Reprojections 0. Reprojection 1. Reprojections 2. Reprojections 3. Reprojections 12/15/2003 12 45 12 reprojectprocess completed with status 0 12/15/2003 12 45 12 reprojectprocess completed with status 0
	12/15/2003 12:45:34 c:\program files\imagine 0.7\bis\stable\imposing RMS error 0.000031 pixels with polynomial order 2 and 256 maple pr Reprojections-0.Reprojection-1.Reprojection-2.Reprojection-3.Reproje con-54.Reprojection-55.Reprojection-16.Reprojection-2.Reprojection- 12/15/2003 12:45:41 reprojectprocess cmapleted with status 0
	12/15/2003 12 45 41 c progress files/insgine 0.7-bis/stabl/reprojes RME error 0.00003 pixels with polynomial order 2 and 216 smaple pr Reprojectioned Researching image d escalation foliance ing Reprojectioned Reprojection*3 Reprojection*2 Reprojection*7. Reproje con*64 Reprojection*65 Reprojection*67. Reprojection*7. Reprojection 12/17/2003 12 45 16 reprojectprocess completed with status 0
	12/15/2003 12 45 50 c program files imagine 8.7-bis/ats86 propojet RMS error 0.000033 pixels with polynomial order 2 and 256 maple pr Reprojectione-0.Researching image d'examples/indem.image Reprojectione-0.Reprojection-1.Reprojection=2.Reprojection-3.Reproje cm=64.Reprojection=65.Reprojection=64.Reprojection=67.Reprojection= 12/15/2003 12 45 77 reprojectprocess completed with status 0
	12/15/2003 12:45 58 c \program files\imagine 8.7\bin\atx85\propose RMS error 0.000033 pixels with polynomial order 2 and 216 sample po Reprojections-8 Remanpling image d \remanples\interfactors as Reprojections-0 Reprojection-1. Reprojection-2. Reprojection-3. Reproje cn=64. Reprojection-65. Reprojection-66. Reprojection-67. Reprojection- 12/11/2003 12:46 04 reprojectprocess completed with status 0
	12/15/2003 12 46 04 c program files imagine 8 7-bis stably reproject RES error 0.00003 pixels with polynomial order 2 and 256 mapple pr Reprojection*0.Reprojection*1.Reprojection*2.Reprojection*3.Reprojection 64.Reprojection*65.Reprojection*65.Reprojection*67.Reprojection 12/15/2003 12 46 11 reprojection*65.Reprojection*10 and 0 a
	13/15/2003 12/48 11 c program files/imagine 0 7/bis/staBi/reprojet EMS error 0 000033 pixels with polynomial order 2 and 216 mample pr

Execute Multiple Files/Multiple Commands

This procedure is most useful for very complex operations on multiple files involving many commands where the output from one command becomes the input to a succeeding command. In the following example, you are going to perform three operations on each of the Lake Lanier-related files in the ERDAS IMAGINE examples directory.

Some processes depend upon the physical extents of the imagery, or the number of bands, or data types, and so on. You must be aware of both the requirements of the processes (commands) as well as the differences between the file types to be processed. In many cases, the data sets provided to multifile processing jobs must share common physical and ephemeral aspects.

 Select Session -> Preferences from the ERDAS IMAGINE menu bar to open the Preference Editor dialog, and select the Batch Processing category.

💯 Preference Editor			
Preference Editor Category Amotation ASRP.MDPRG.AUSPIP Exporter Batch Processors Douglesporter DOUGLeporter DOUGLeporter DOUGLeporter DOUGLeporter Supple Supple	Run Batch Commands in Record Mode Line Termination for Output Batch Files View Batch Queue Update Interval Show Status Bar On Batch Queue Dialog Batch-Job Directory Show Status Bar On Batch Wicard		
Image Catalog Image File: [Seneral]	Startup Batch Command File Show jobs in Scheduled Tasks folder Close User Save	Global Save Category Help	- -
			l.

Batch commands should run in record mode

2. Ensure that the **Run Batch Commands in Record Mode** option is enabled (checkbox checked).

This preference tells ERDAS IMAGINE to run the commands and record them simultaneously. When running in Record Mode, you are typically collecting a series of commands to automate. Since the first command typically produces input for the next command, it is best to have the command run as soon as it is placed into the current list of commands.

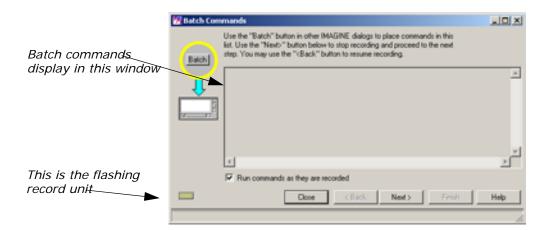
Set Up

Once the command has completed, the resulting file is available to be selected as input to the next command. In this case, the **Create and Insert Variables** button can be used to identify and replace intermediary files with temporary file variables, so that only the final output file is left on disk—not all of the intermediate steps.

Optionally, you can select the **Run commands as they are recorded** checkbox on the Record Commands for Automation panel. This sets the preference for the current session without changing your general preferences.

- 3. In the Preference Editor, click the Image Files (General) category, then click to deselect the Compute Pyramid Layers option. You do not want pyramid layers to be generated for the temporary files. Instead, you can run the Image Command Tool as a Batch process to create pyramid layers for the output files only.
- 4. Click User Save in the Preference Editor, then click Close.
- 5. Select **Session -> Start Recording Batch Commands** from the ERDAS IMAGINE menu bar to open the Batch Commands dialog. The Batch Commands dialog with the recording panel displays.

Note that the flashing record light, located in the lower-left corner of the Batch Commands dialog, has been activated.



Run First Command

- From the ERDAS IMAGINE icon bar, click the Interpreter icon and then select Radiometric Enhancement -> Histogram Equalization to open the Histogram Equalization dialog.
- Select <IMAGINE_HOME>/examples/lanier.img for the Input File name and <your_workspace>/image1.img for the Output File name.

Where <your_workspace> is the **Default Output Directory** specified in the **User Interface & Session** category in the Preference Editor and <IMAGINE_HOME> is the directory where ERDAS IMAGINE is installed.

🙀 Histogram Equ	alization	×	
Input File	r (".img) Outp	ut.File: (*.ing)	
lanier.ing	inage1.ing		—— Save the Output File
Coordinate Type:	Subset Definition:	From Inquire Box	in the directory of your choice
€ Map	ULX 233085.00 × URX	248415.00 *	
C Fie	ULY: 3807070.00 🚊 LRY:	3791740.00 🙁	
Number of Bins:	256 🚊 🗆 Ignore Zero		
	OK. Batch	Click the Batch button to add the	
	ancel View	Help	command to the Batch Commands
Select output file.			Daten commanus

3. Click the **Batch** button in the Histogram Equalization dialog. The command to perform histogram equalization is added to the Record Commands for Automation panel. The histogram equalization process starts, and a Job Status dialog displays. When the process is done, click **OK**.

Run Next Command

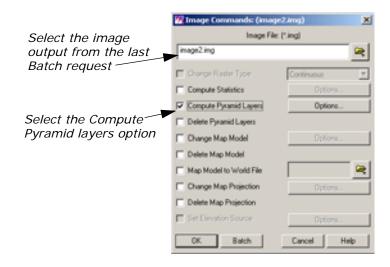
- To open the Brightness Inversion dialog, select Brightness Inversion from the Radiometric Enhancement menu you opened in the first command.
- Select <your_workspace>/image1.img for the Input File name and <your_workspace>/image2.img for the Output File name. The Batch option is now enabled.

	💯 Brightness Inversion				x		
	Input File	: (".img)	Outpo	A File: (*.img)			
	image1.ing	2	inage2.ing		-		
	Coordinate Type:	Subset Definition:	. 관unx	From Inquire I		The output from the first Batch command is used to create the output for the	
This is the output file from the first Batch	C Fie	ULY: 38070701		3791740.00	A A		
command	Data Type:		Output Options:			second Batch command	
	Input: Unsigner Output: Float Sir		F Stretch to U	in Stats.		command	
	OK Batch ADI Cancel View Help				- Click the Batch button to add the second Batch command to the list		

3. Click the **Batch** button. The command to perform Brightness Inversion is added to the Record Commands for Automation panel. The histogram Brightness Inversion starts, and a Job Status dialog displays. When the process is done, click **OK**.

	19 Batch Commands		
These are the Batch commands you created. Note the exact files involved are specified	Eatch	mands Use the "Batch" button in other IMAGINE dalogs to place commands in this list. Use the "Nexto" button below to stop recording and proceed to the next step. You may use the "VEack" button to resume recording modeler rq \$IMAGINE_HOME/etc/models/historg.pndl meter -state "d/examples/farrier.im modeler rq \$IMAGINE_HOME/etc/models/inverse.pndl meter -state "c./temp/magine_tem	
	Run commands as they	are recorded	
	C	e (Back: Next) Finish	Help
			ll.

- **Run Another Command** You can also use Batch to create pyramid layers of your data. Next, you instruct the Image Command Tool to create pyramid layers for the output files only.
 - 1. From the **Tools** menu of the ERDAS IMAGINE menu bar, select **Image Command Tool**. In the **Image File** window of the Image Commands dialog, select the file you generated in the last example, **image2.img**.



- 2. Click the **Compute Pyramid Layers** checkbox, then click the **Options** button next to **Compute Pyramid Layers** to open the Pyramid Layers Options dialog.
- Notice the Kernel Size, and whether or not the External File box is checked. You want the output file to contain internal pyramid layers rather than having the pyramid layers stored in an external .rrd file. Make sure the External File box is not checked. Click OK in the Pyramid Layers Options dialog.

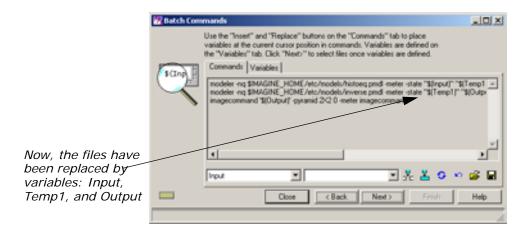
	Pyramid Layers Options X
Click OK	Pyramid Layer Creation Profile © Dustom © For use with OrthoBASE
	Kemel Size 22
	OK Cancel Help

Click the Batch button in the Image Commands dialog. The command to create pyramid layers is added to the Batch Commands dialog. The pyramid layer generation starts and a Job Status dialog displays. When the process is done, click OK.

If you examine the contents of the Batch Commands dialog recording panel at this time, you notice that the commands explicitly name the input and output files. The next procedure converts the input and output file names into variables so that these commands may be applied to a larger set of input files.

Create Variables

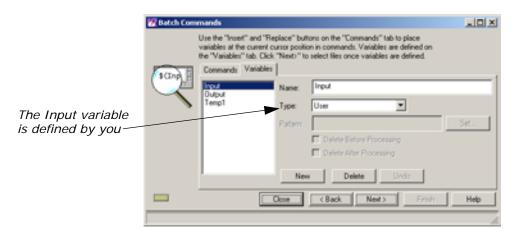
- On the recording panel of the Batch Commands dialog, click the Next > button. The panel for selecting the type of command you want to use displays in the Batch Commands dialog. Select the Modify commands automatically option.
- On the command selection panel, click the Next > button. The Commands/Variables panel displays.



Modify Variables

This procedure creates an intermediate file that is used to pass the output of the first process to the input of the second. There is no need to keep this file and use disk space. Also, you might want the output file name to be a little more meaningful than **image2**. The following steps tell you how to modify variables.

1. Click the Variables tab to view the variable editing tools.



The **Input** variable has the type **User**. This means that you provide the names of the input files.

2. Select the Temp1 variable. This represents the intermediate files that are not needed after processing. The Delete Before Processing checkbox is automatically selected to remove these files before processing begins. This prevents problems arising from the existence of an old file. The Delete After Processing checkbox is also automatically selected to remove these temporary files when processing finishes.

	🗑 Batch Com	mands			
		variables at the o	ab. Click "Next" to	tons on the "Commands" tab to p on in commands. Variables are d o select files once variables are d	efined on
The Temp1 variable is automatically generated	(Ing)	Input Dutput Temp1	Name: Type:	Temp1	
			Pattern	/magine_temp/\$[input.toot]_i	mage1.ing Set
Temp1 is deleted both				Delete Before Processing Delete After Processing	
processing		1	New	v Delete Unit	ia.
			Close	CBack Next>	Finiti Help
					li.

3. Select the **Output** variable. This represents the name of the final output file. The **Delete Before Processing** checkbox is checked automatically to remove these files before processing begins. This prevents problems arising from the existence of an old file.

	🙀 Batch Com	mands					LO X
		variables at the	e current cu	sor positio		ands" tab to place alables are defined on alables are defined.	
The Output file is	Sang F	Commands	Variables				
also automatically	E	Input Dubut	_	Name:	Output		
generated		Temp1		Туре:	Auto		
				Patient	/magine_temp/\$	[Input.root_image2 ing	Set.
					P Delete Before	Processing	
Use the Set button to					Delete After P	locessing	
edit the replacement				New	Delete	Undo	
pattern, and give the Output a different				coe	C Back	Next Frish	Help
name							li.

Notice that the **Output** variable as well as the **Temp1** variable are set to the **Type** called **Auto**. This means the software creates the file names that are substituted for the variables at run time.

By default, the software uses the output directory that you specified in step 2 under "Run Next Command". For the file name, it uses a combination of the root name of the input file and the last specified output file (in this example, **image2**).

4. Click the **Set** button. Click in the **Pattern** window and edit the text string to change **image2** to **inverse**, and then click **OK**.

	💯 Edit Replacement Patter	n <u>X</u>
	Templates:	Functions:
	\$[cvariable0] \$[cvariable0.chunction0]	BandCount CellHeight CellHeight CellWidth
	Variables:	ColumiCount DotaType Ext FielDoton FieLeft
Change this portion of the	Tenp1	FileNumber 💌
Pattern to the new name: inverse	Patient	
	c./temp/imagine_temp/\$(input	voot]_image2.ing
	OK Clear	Cancel Help

NOTE: If your input files have the same root name (for example, **03807701.nec**, **03807701.nwc**) change **Input.root** to **Input.name** in the **Pattern** window. This includes the extension and thus preserves the uniqueness of the file name.

Select Input Files

- Click the Next > button to open the Select Files to Process panel. The original input file is listed in the Input column.
- 2. Click the Add Files icon 🔯 . The Select Batch Files dialog opens.

3. Select **Inaspect.img** from the Select Batch Files dialog. Click the Multiple File Selection tab and click the Use the following Selection Pattern checkbox. Edit the Selection Pattern field to insert **In** before the asterisk. It should look like this:

<IMAGINE_HOME>/examples/ln*.img

Where <IMAGINE_HOME> represents the ERDAS IMAGINE installation directory.

4. Click the **OK** button on the Select Batch Files dialog.

The input files display under the **Input** column. Select and delete any duplicate or unwanted files by clicking in the numbered column next to the file name and then clicking the Delete Files icon. This list of input files may be saved for future use.



See "Save/Load Options" for details on how to save lists of input files.

Set Start Time

- 1. Click the **Next** > button to open the Select When to Process Commands panel. Click the Start Processing Later At checkbox. Use the default time of the next minute.
- 2. Click the **Finish** button to begin processing. The Scheduled Batch Job List dialog opens, displaying all current Batch jobs.

	19 Sched	iled Batch Job	List: c:/docu	ments a	nd setting	s/jbooth.erda	- un.000/	
	Row	Job Nan	ve S	Hatus	Start Time	Stat Date	User	
	1	larvier_reproj	ACT		1210 PM	15Dec-2003	(booth	c./doci
The Status of the Batch job is still WAITING		Inage_commar	d with	ITING	02:45 PM	150ec-200	booth	<u> c./doo</u>
	4							•
			Delete	Mode	¥-	.og	looe	Help

When the job begins, the **Status** changes from **WAITING** to **ACTIVE**. When the job has finished, the **Status** changes from **ACTIVE** to **DONE**.

When the job is done, the log file can be viewed by first selecting the job and then clicking the **Log** button in the Scheduled Batch Job List dialog.

The Scheduled Batch Job List dialog may be opened any time by selecting **Session -> View Off-line Batch Queue** from the ERDAS IMAGINE menu bar.

3. When the Batch jobs are finished, indicated by **DONE** in the **Status** column, click **Close** in the Scheduled Batch Job List dialog.

If you like, you can check the files you just generated in a Viewer.

NOTE: You may also want to change your preferences back to the default of **Compute Pyramid Layers** *in the* **Image Files (General)** *category of the Preference Editor.*

Work with Variables	This section deals with modification of automatically created variables for the purpose of generalizing a command file.
Create a New Variable	A new variable is helpful in the case of an application requiring multiple inputs. The automatically created variables always consist of a single Input , a single Output , and as many Temp variables as necessary. If you are creating a Batch command file that can be used by others, it is much more readable if the Temp variables are replaced by variable names that are meaningful.
	When creating variables, it is important to know the distinction between User variables and Auto variables. The value of a User variable is derived from the Select Files to Process panel. You must provide the appropriate value for each User variable in the CellArray.

The value of an **Auto** variable is generated by the software from parameters specified in the pattern window of the **Set** dialog. If you recall, you worked with the dialog generated by pressing the **Set** button, the Edit Replacement Pattern dialog in "Modify Variables".

In the following example, you are going to create a variable, **OutputDir**, which enables another person to enter an output directory of his or her choice for files processed by Batch. For this exercise, you select a number of files that you want to reproject.

Prepare

First, you have to start the application from which you launch the Batch Wizard.

ERDAS IMAGINE must be running.

1. Click the Interpreter icon. From the **Image Interpreter** menu, select **Utilities**. From the **Utilities** menu, select **Subset**.

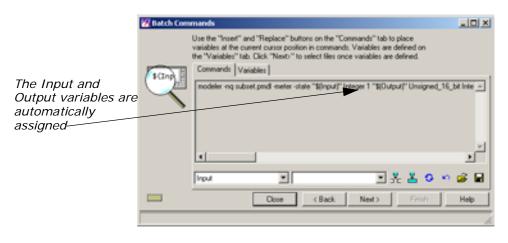
	5 Subset		X				
_	Input File	r (*.ing)	Output File:	_ You can use the			
Select Inaspect.img as the Input File	Coordin d./example	_	From Inquire Box	Subset dialog to generate TIFF files			
		🕫 Two Corners 🕤 Four Corne	rs	mes			
	C Fie	ULX 233005.00 - U	Rice 240415.00 -				
		ULY: 3007070.00 - U	RY: 3791740.00 -				
		URX 0.00 🚊 U	× 0.00 ÷				
		UR Y; 0.00 🚊 L	Y; 0.00 ÷				
	Data Type:						
	Input: Unsigned	116 bit					
	Output: Unsigne	d 16 bit 💌 Output:	Thenatic 💌				
	Output Options:						
	Number of Input laye	ns: 1 ⊏ Ignore3	Sero in Output Stats.				
	Select Layers:	1					
	Use a comma for separated list(i.e. 1.3.5.) or enter ranges using a "." (i.e. 2.5.)						
	OK	Batch AOL.	Cancel Help				
	Select the input file.						

The Subset dialog opens.

- In the Subset dialog, click the Open icon underneath Input File. In the Input File dialog, navigate to the <IMAGINE_HOME>/examples directory. Choose the file Inaspect.img from the /examples directory. Click OK in the Input File dialog to transfer the file to the Subset dialog.
- 3. Click the Open icon underneath Output File. In the Output File dialog, navigate to the directory of your choice. Click the File Type dropdown list and select TIFF. In the Filename window, type Inaspect, then press Enter on your keyboard. The .tif extension is appended automatically. Click OK in the Output File dialog.

- 1. Click the **Batch** button in the Subset dialog.
- 2. In the command types panel of the Batch Commands dialog, click the Modify commands automatically checkbox. Then, click Next >.

The Commands/Variables panel of the Batch Commands dialog displays.



3. Click the Variables tab on the Commands/Variables panel. Click the Output variable to view its properties.

	🗑 Batch Come	mands			LIDI XI
Click the Output variable to observe its properties		variables at the current the "Variables" tab. Dic Commands Variable	cursor position for the formation of the	tons on the "Commands" tab to place on in commands. Variables are defined on o select files once variables are defined.	
		Input Dutout	Name:	5 tupt	
	<u> </u>		Туре:	Auto	
			Paterx	c:/temp/imagine_temp/\$(input roof).til	Set
				Delete Before Processing Delete After Processing	
			Nev	v Delete Undo	
	-		Close	CBack Next> Finish	Help
					1.

Notice in the **Pattern** window of the **Variables** tab that the path to the **Output** file is very long. This directory can be replaced with a new variable called **OutputDir**. You can set the **Pattern** of the OutputDir variable to any directory you choose. This makes your command line shorter.

Create a New Variable Since you know that you want your new variable to be named **OutputDir**, and you know you want it to replace the current path in the Pattern of the Output variable with it, you can begin editing there.

> 1. Make sure that the Variables tab displays the details of the Output variable.

2. Click in the **Pattern** window and remove the entire directory structure you want to replace. Once you have eliminated it, type in the following:

\$(OutputDir)

The contents of the **Pattern** window then look like the following:

	报 Batch Commands	LIDI XI
Replace the original path with the new	Use the "Insert" and "Replace" buttom on the "Commands" tab to place variables at the current cursor position in commands. Variables are defined on the "Variables" tab. Dick "Nexo" to select files once variables are defined. Commands Variables Commands Variables Commands Variables Commands Variables Commands Variables Commands Variables Commands Comman	Set
	New Delete Undo	Help
		li.

You have to create the new variable, **OutputDir**, so that the variable **Output** does not generate errors in your Batch script, and output files are placed in the correct location.

3. In the **Variables** tab of the Commands/Variables panel, click the **New** button.

The Variables tab changes to accommodate a new variable.

	🗑 Batch Com	mands			LO X
The new variable is added to the list; now you supply properties		Use the "Inset" and "Re variables at the current or	ator positie	Ions on the "Commands" tab to place on in commands. Variables are defined on select files once variables are defined. NEW_WARMOLE User	se.
	-		Nev	Delete Undo CBack Next > Frish	Help

- 4. In the Name section of the Variables tab, type the name OutputDir.
- 5. Click the Type dropdown list and choose Auto.
- 6. In the **Pattern** window, type the path to the directory and folder where you want generated files to be saved.

Your Variables tab looks like the following:

	🙀 Batch Com	mands	LO X
	SCING	Commands Variables Input Unput Dutput Dutput Type: Auto	
All output files are going to be stored in the output directory you designate		Pattern Celete Before Processing Delete After Processing	Set
		New Delete Undo	
	-	Close (Back Next) Frish	Help
]		h.

Add Additional Files to the Batch Job

- 1. Click **Next >** in the Commands/Variables panel.
- In the Select Files to Process panel of the Batch Commands dialog, click the Select Files to Add icon, and add all files within the <IMAGINE_HOME>/examples directory that start with the letters In using the Multiple File Selection tab.

12

If you need to review how to add multiple files, see "Add Multiple Files".

	📆 Batch Con	mands	LID X
These are all the		Use the popup list to select the column to modify. Use the "Select" button to add files to the list. The Delete button can be used to remove selected rows from the list. There must be at least one name in the list below to proceed.	
		Input	-
		1 haspecting	
		2 Inclump imp	
files that begin with		3 Indem.ing 4 Inhudo.ing	
In and are located in the directory identified in the Selection Pattern window		5 historing	
		6 Inlands ing	
		7 hputing	
		8 Instope img	
			-
		Input 💌 😹 🕅 🗂 Show Full Path	i 🔓 🖬
		Close (Back Next) Finish	Help
			li.

Start Processing

- 1. Click the **Next** > button to open the Select When to Process Commands panel.
- Make sure the Start Processing Now option is selected, then click Finish to start the Batch job with the new variable.

The Job Status dialog opens.

💯 Modeler - running model: subset.pmdl		
Waiking on: Inaspect.ing (1 of 9)		
All done		
Commands: 0% 0	100	
Files: 11% 0	100	
Cancel Cancel All Help		

3. When the process completes, click **OK** in the Job Status dialog.

Now, you can check the output directory to see the files that have been stored there. In this example, the directory holds TIFF files you created from image files using the Subset utility of Image Interpreter.

- **1.** Using a UNIX shell or Microsoft Explorer, navigate to the directory you specified as the Output Directory.
- 2. Check for the new TIFF files created from all files starting with **In** in the <IMAGINE_HOME>/examples directory.

Additional Information			
Save/Load Options	The Commands/Variables and the Select Files to Process panels of the Batch Commands dialog provide methods for saving and loading the Batch Commands and input file lists, respectively.		
Save			
	Click the Save icon is to save the commands in the Commands/Variables panel to a text (.bcf) file, and the input file list in the Select Files to Process panel to a text (.bls) file for later use. The Save Batch Commands dialog opens, where you may enter a new file name.		
Load			
	Click the Load icon is to load a previously saved command (.bcf) file or input file list (.bls) file. A Load Batch Commands dialog opens, allowing you to select from a previously saved list of files. These files are text files that may be created outside of ERDAS IMAGINE.		
Batch Job Files	Several files are created for each Batch job that runs at a later time. The default file name root is batch_job . The file name can be seen in the Name field of the Select When to Process Commands panel. File names for each Batch job are listed in the Scheduled Batch Job List dialog.		

Check the Output

Directory

PC Version

The following are PC versions of Batch job files that are located in the Batch job directory. The default Batch job directory is **\$PERSONAL/batch**, and you can go to **Session -> Preferences - > Batch Processing** to change the **Batch Job Directory**.

- batch_job.bat—This is an MS-DOS Batch file. This file sets up the environment for the ERDAS IMAGINE applications and runs "batchprocess," which runs the commands found in the batch_job.bcf file.
- **batch_job.bcf**—These are ERDAS IMAGINE Batch command files. These files hold the variable definitions and issue the ERDAS IMAGINE commands to perform the step, or steps, required to complete a job.
- **batch_job.bls**—These files contain lists of input files.
- **batch_job.id**—This file contains a job number assigned by the system. This file is deleted automatically to indicate completion of the job.
- batch_job.lck—This is an empty file that is created when the job actually starts running. This indicates the job is ACTIVE. When the job is done, it is deleted.
- **batch_job.log**—This file contains the results of the Batch job.

UNIX Version

These are UNIX versions of Batch job files:

- **batch_job.bcf**—These are ERDAS IMAGINE Batch command files. These files hold the variable definitions and issue the ERDAS IMAGINE commands to perform the step, or steps, required to complete a job.
- **batch_job.bls**—These files contain lists of input files.
- **batch_job.id**—This file contains a job number assigned by the system. This file is deleted automatically to indicate completion of the job.
- batch_job.job—This is a UNIX shell script. This file sets up the environment for the ERDAS IMAGINE applications and runs "batchprocess," which runs the commands found in the batch_job.bcf file.
- **batch_job.lck**—This is an empty file that is created when the job actually starts running. This indicates the job is **ACTIVE**. When the job is done, it is deleted.
- **batch_job.log**—This file contains the results of the Batch job.

ERDAS IMAGINE Tour Guides

IMAGINE Advantage[™]

ERDAS IMAGINE Tour Guides

Fourier Transform Editor

Introduction

In this tour guide, you enhance and destripe a 512×512 subset of a Landsat Thematic Mapper image using both interactive and automatic methods available in the ERDAS IMAGINE Fourier Analysis tools.

Not all of the edits in this tour guide necessarily enhance the image. Many exercises are performed simply to show you how they affect the image. When you use these techniques on other data sets, you may want to experiment with different methods, or combinations of methods, to find the techniques that work best.

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We highly recommend that you read the section Fourier Analysis section, in the "Enhancement" chapter in the <u>ERDAS Field Guide</u>, before going through this tour guide.

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If you are new to ERDAS IMAGINE, we recommend that you go through the tour guide "Viewer & Geospatial Light Table" before using the Fourier Transform Editor.

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Approximate completion time for this tour guide is 45 minutes.

Create an .fft In order to use Fourier Transfo

Display Source File

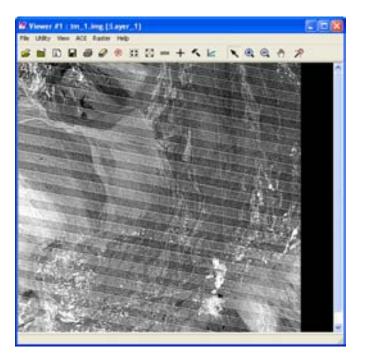
In order to use the Fourier Transform Editor, you must first create a Fourier Transform (.fft) layer from the input image.

ERDAS IMAGINE must be running and you must have a Viewer open.

 Select File -> Open -> Raster Layer from the Viewer menu bar. The Select Layer To Add dialog opens.

Click here to view the raster options	Select Layer To Add: File Haster Options Multiple Look in: Generatives	× •••	
Click here to select the file TM_1.img	shire6 ing tupervised ing shire7 ing IN_ID0 shire8 ing IN_ID0 shire8 ing ItM_stiped ing shire9 ing ItM_stiped ing stopts ing ItM_stiped ing StereoSAP_Match ing ItMesia_ms ing StereoSAP_Ret ing ItM issia_ms	Cancel Help Recent Goto	Click here to display the file
	C File name: Im_1ing	20.000	
	Files of type: [MAGINE Image (* img) files of type: [MAGINE Image (* img) inuecolor : 512 Rows x 512 Columns x 7 Band(s)	• <u>•</u>	

- 2. In the Select Layer To Add dialog under Filename, click TM_1.img.
- 3. Click the **Raster Options** tab at the top of the dialog and then select **Gray Scale** from the **Display as** dropdown list.
- 4. The **Display Layer** section updates so that you can select which layer of the file to display. Accept the default of **Layer 1**.
- 5. Click **OK** to display the image file in the Viewer.



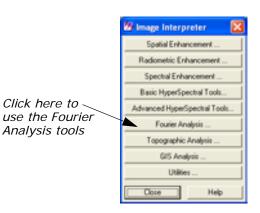
NOTE: You do not have to display a file before computing the .fft layer. This step is included to show you the image before any Fourier editing is performed.

Create FFT Output File

1. Click the Image Interpreter icon on the ERDAS IMAGINE icon panel.



The Image Interpreter menu displays.



 Select Fourier Analysis from the Image Interpreter menu. The Fourier Analysis menu opens.



 Select Fourier Transform from the Fourier Analysis menu. The Fourier Transform dialog opens.

Enter input	10 Fourier Transform			
image file name here	Input File: (".ing)	Output File (*.81)	-	- Enter output .fft file name
	Number of Rows: 51 Select Layers:	2 Number of Columns: 512	2	here
Select layers— to use here	OK Bald	Cancel Help		

4. In the Fourier Transform dialog under Input File, type TM_1.img.

Layer 1 of this file is badly striped. In this example, you work with only one layer to make the processing go faster. However, the techniques you use are applicable to multiple layers.

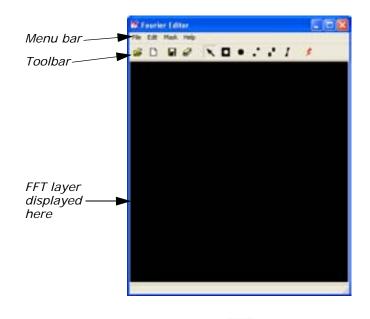
- The name for the Output File, TM_1.fft, is automatically generated. Make sure it is in a directory in which you have write permission. The default is your default data directory set by Session -> Preferences.
- 6. Enter 1:1 in the Select Layers field.
- 7. Click **OK** in the Fourier Transform dialog to create the new file.

A Job Status dialog displays, showing the progress of the function. When the process is 100 percent complete, click **OK**.

Start the Fourier Transform Editor

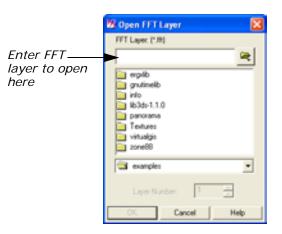
With the .fft file created, you are ready to begin using the Fourier Transform Editor.

 In the Fourier Analysis menu, select Fourier Transform Editor. The Fourier Editor opens.



In the Fourier Editor, click the Open icon icon on the toolbar, or select
 File -> Open from the menu bar.

The Open FFT Layer dialog opens.

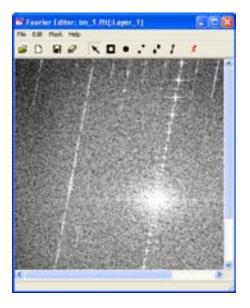


 In the Open FFT Layer dialog under FFT Layer, enter the path and name of the .fft layer you created in step 4 through step 5 (for example, TM_1.fft).

Since this file contains only one layer, the **Layer Number** defaults to **1**. However, if the file contained more than one layer, you could choose the layer to edit here. Edits performed on one layer can be applied to all layers of the .fft file using the **File -> Save All** option on the Fourier Editor menu bar.

4. Click **OK** to display the selected file in the Fourier Editor.

A status meter opens as the layer is read. Then the layer displays.

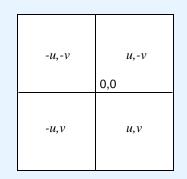


You can resize the Fourier Editor window to see the entire file.

5. Click any point inside the Fourier Editor and the coordinates of that point are shown in the status bar. Hold and drag to dynamically update the coordinates.

Fourier Editor Coordinates

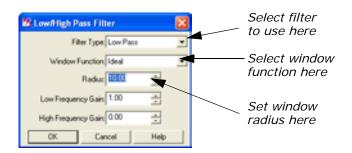
The coordinates are referred to as (u, v) with the origin (u, v = 0, 0) at the center of the image. See the illustration below.



Since Fourier images are symmetrical, a point in one quadrant is exactly the same as the corresponding point in the opposite quadrant. For example, point (64,170) is the same as point (-64,-170). For this reason, all edits are automatically performed on both halves of the image at the same time.

Edit Using Menu Options As previously stated, the menu bar and mouse-driven tools offer the same techniques and kinds of edits, only the method is different. In the menu bar options, you enter all parameters into dialogs. In many cases you want to use the mouse to view the coordinates of the .fft layer, so that you know what information to enter into the dialogs. In the next series of steps, you use some of the menu bar editing options. Then, in the next section, you perform many of those same edits using the mouse-driven tools.

- Use Low-Pass Filtering Low-pass filtering allows you to attenuate the high-frequency components of the image, but allows the low-frequency components to pass through.
 - Select Mask -> Filters from the Fourier Editor menu bar. The Low/High Pass Filter dialog opens.



Filter Types

When the **Filter Type** is set to **Low Pass**, its function is the same

as the Low Pass Filter icon **O** on the toolbar.

When the Filter Type is set to High Pass, its function is the same

as the High Pass Filter icon 🕚 on the toolbar.

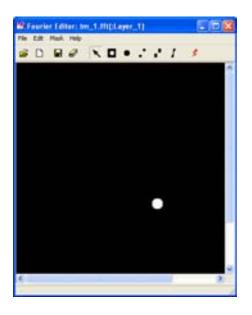
You use these mouse-driven tools later in this tour guide.

2. In the Low/High Pass Filter dialog, click the **Window Function** dropdown list and select **Ideal**.

An ideal window function produces a sharp transition at the edge of the filter.

- 3. Change the Radius to 10.00.
- 4. Leave all other parameters as they are and click **OK**.

A low-pass filter is applied to all values outside of the radius of 10.00. Therefore, the image is black, except for a small white circle in the center.



Removing this much of the layer removes much of the content of the image, so you may want to undo this edit and try again.

5. Select Edit -> Undo from the Fourier Editor menu bar.

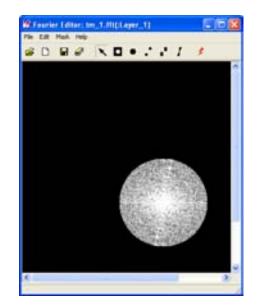
The image is restored to its original state.

Select a Different Filter

1. Select Mask -> Filters.

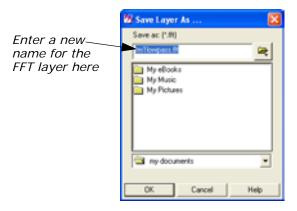
- 2. In the Low/High Pass Filter dialog, click the **Window Function** dropdown list and select **Ideal**.
- 3. Enter a Radius of 80.00.
- 4. Click **OK** in the Low/High Pass Filter dialog.

All frequencies outside the radius of 80 are attenuated and frequencies inside the radius are unaffected. The .fft layer looks similar to the following example:



Save the File

 Select File -> Save As from the Fourier Editor menu bar. The Save Layer As dialog opens.



- 2. In the directory of your choice, enter a name for the new .fft layer, such as TM1lowpass.fft.
- 3. Click OK to save the file.

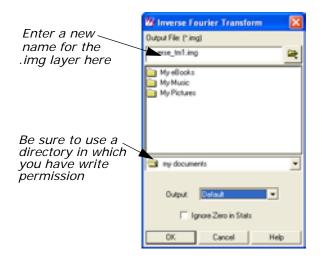
Apply an Inverse Fourier Transformation Now, perform an inverse Fourier transformation so that you can view the original image and see what effect this edit had on it.

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You must save your edits before performing an Inverse Transform Operation.

In the Fourier Editor, click the Run icon for the toolbar or select
 File -> Inverse Transform from the menu bar.

The Inverse Fourier Transform dialog opens.

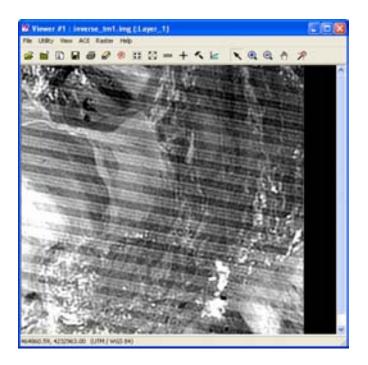


- 2. In the Inverse Fourier Transform dialog under **Output File**, enter a name for the new output file, such as **inverse_TM1.img**. This file has an .img extension by default. Be sure to use a directory in which you have write permission.
- 3. Click OK to create the new file.

A Job Status dialog displays, indicating the progress of the function.

4. When the Job Status dialog indicates that the file is created, click **OK** and then display the file in a Viewer.

Your file should look similar to the following example:



For the other edits performed in this Tour Guide, you can save the .fft layer and perform an inverse Fourier transform at any time. The steps for doing so are not repeated here. However, the result is shown so that you can see how each edit affects the image.

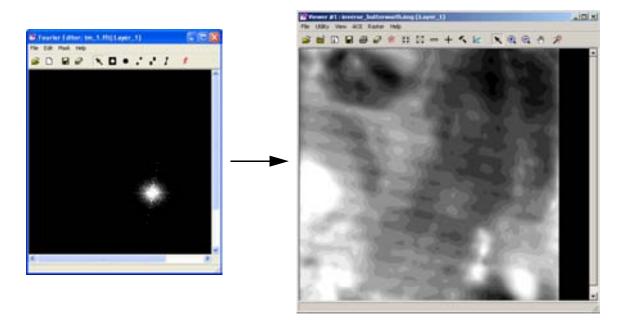
Apply Other Filters

- In the Fourier Editor, click the Open icon icon on the toolbar, or select
 File -> Open from the menu bar.
- 2. In the Open FFT Layer dialog under **FFT Layer**, enter the name of the first .fft layer you displayed (for example, **TM_1.fft**).
- 3. Click **OK** to display the selected file in the Fourier Editor.
- When the file displays, select Mask -> Filters from the Fourier Editor menu bar.
- 5. In the Low/High Pass Filter dialog, click the **Window Function** dropdown list and select **Butterworth**.

This is a smoother function than the Ideal. Use a radius of 80.00, just as with the Ideal.

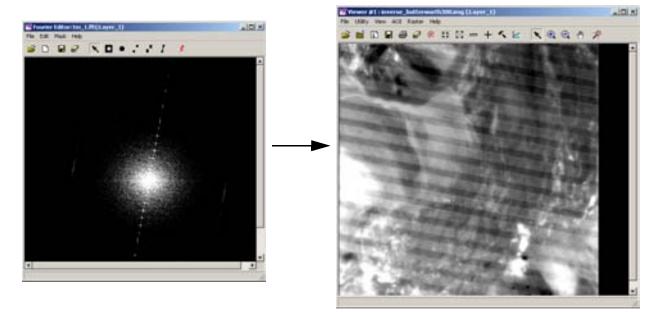
- 6. Change the Radius to 80.00.
- 7. Click **OK** in the Low/High Pass Filter dialog.

The .fft layer and the resulting image are shown in the following picture:



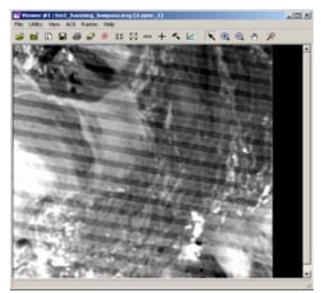
This filter eliminated much of the image content because the radius was too small.

8. Try this same exercise using a Radius of 300.00, rather than 80.00The resulting image looks like the following example:

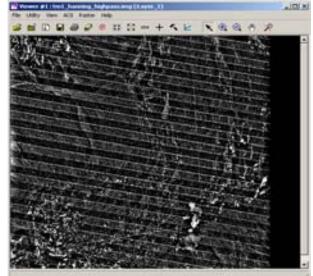


The image is visibly smoothed (perhaps too much). However, the striping remains. You remove the stripes using the wedge filter later in this tour guide. You could try using the Butterworth filter with an even larger radius or the other windows.

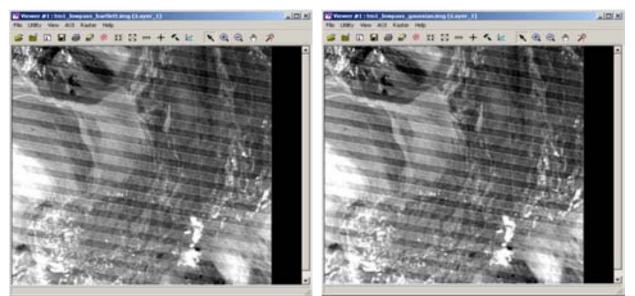
The following graphics illustrate some of these other scenarios.



Type: Low Pass Window: Hanning Radius: 100.00



Type: High Pass Window: Hanning Radius: 20.00



Type: Low Pass Window: Bartlett Radius: 150.00

Type: Low Pass Window: Gaussian Radius: 200.00

9. Redisplay the original .fft layer in the Fourier Editor.

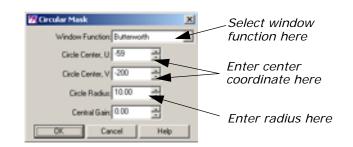
Use a Circular Mask

There are several bright spots in the .fft layer, such as those in the upper left quadrant. These can be eliminated using the circular mask option.

1. With your cursor in the Fourier Editor, click in the center of one of these bright areas. There is one at (u, v) = (-59, -200). You use this coordinate here, but you can use another if you like.

2. When you have selected a coordinate, select Mask -> Circular Mask from the Fourier Editor menu bar.

The Circular Mask dialog opens.



This option is the same as if you were to click the Circular Mask icon



on the toolbar.

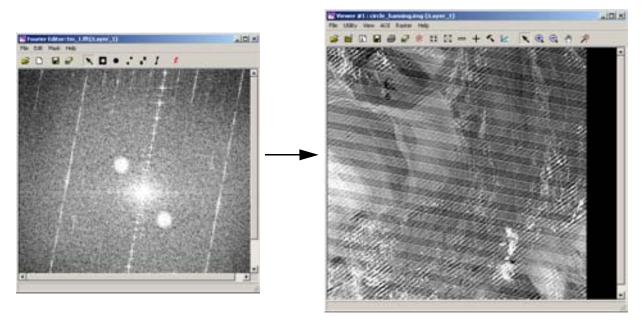
- 3. In the Circular Mask dialog, click the Window Function dropdown list and select Butterworth.
- 4. Enter -59 for the Circle Center, U and -200 for the Circle Center, V.
- 5. Enter a Circle Radius of 20.
- 6. Click **OK** in the Circular Mask dialog to edit the .fft layer.

The bright spot disappears. This edit does not affect the appearance of this particular image very much, since it is such a small area and because the edited area is quite far from the center of the image where most of the image content is contained. However, this technique can be used to remove spikes caused by errant detectors and other types of periodic noise that are manifested by concentrated areas of high or low frequency in the .fft layer.

As an experiment, you create two circles of low frequency to see how they affect the image.

- 7. In the Fourier Editor, select Mask -> Circular Mask.
- 8. In the Circular Mask dialog, enter a Circle Center, U of 44 and a Circle Center, V of 57.
- 9. Enter a Circle Radius of 20.00 and a Central Gain of 10.00.
- 10. Click OK in the Circular Mask dialog.

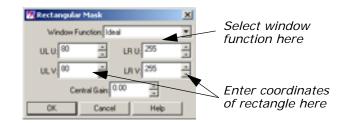
The .fft layer and resulting image look like the following example:



The resulting image has a pronounced diagonal striping, in addition to the original striping.

NOTE: Remember to select another circle center coordinate before trying each new window.

- **Use a Rectangular Mask** The rectangular mask allows you to mask a rectangular area of the .fft layer. This is similar to the circular mask in that it allows you to edit non-central regions of the Fourier image.
 - 1. Make sure the .fft file you created in the previous section, "Use a Circular Mask", displays in the Fourier Editor.
 - In the Fourier Editor menu bar, select Mask -> Rectangular Mask. The Rectangular Mask dialog opens.



- 3. In the Rectangular Mask dialog, click the **Window Function** dropdown list and select **I deal**.
- 4. Enter an upper left *u* (**UL U**) of **80** and an upper left *v* (**UL V**) of **80**.
- 5. Enter a lower right *u* (LR U) of 255 and a lower right *v* (LR V) of 255.
- 6. Click **OK** in the Rectangular Mask dialog.

The top left and bottom right corners of the .fft layer are black. To mask the other two corners, you must repeat this procedure.

- 7. Select Mask -> Rectangular Mask.
- 8. In the Rectangular Mask dialog, click the **Window Function** dropdown list and select Ideal.
- 9. Enter an upper left u (UL U) of 80 and an upper left v (UL V) of -255.
- 10. Enter a lower right u (LR U) of 255 and a lower right v (LR V) of -80.
- **11.** Click **OK** in the Rectangular Mask dialog.

The top, right and bottom, left corners of the .fft layer are now black

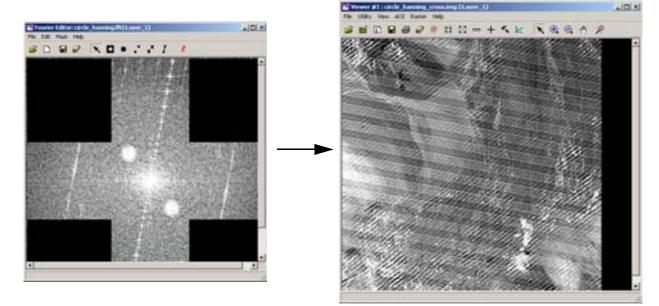
also, making the .fft layer look like a cross.

The resulting image is visibly smoother than the original.

The wedge mask option is often used to remove striping in imagery that appears in the .fft layer as radial lines. Most of the striping in the Landsat image you are using is manifested in the .fft layer as the bright, nearly vertical line that passes through the origin.

- **1.** If it is not already displayed, open the original .fft layer in the Fourier Editor (that is, TM_1.fft).
- 2. With your cursor in the Fourier Editor, click in the center of one of the bright areas that make up the line. You need to enter this information in the dialog. For this example, you use (35, -187).
- 3. Select Mask -> Wedge Mask.

The Wedge Mask dialog opens.



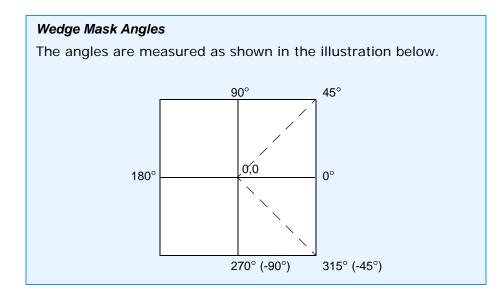
Use a Wedge Mask



4. In the Wedge Mask dialog for the **Center Angle**, enter the following expression to calculate the center of the wedge, based on the coordinate that you selected.

-atan(-185/36)

5. Press Enter on your keyboard. The value returned is 78.99.

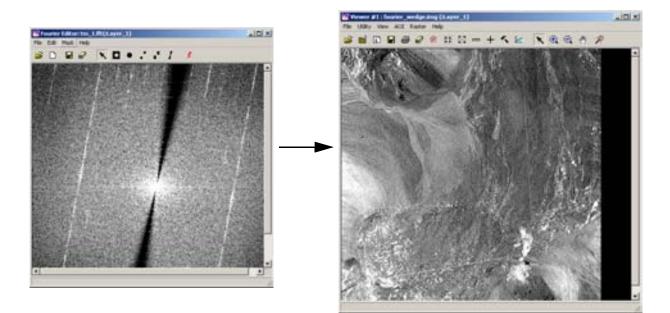


6. Enter a Wedge Angle of 10.00.

This is the total angle of the wedge, in this case, 5.00 degrees on either side of the center.

7. Click OK to edit the layer.

The resulting .fft layer looks similar to the following example:



After performing an inverse Fourier transform, the resulting image is destriped.

Edit Using Mouse-Driven Tools

The mouse-driven tools allow you to perform the same types of edits as in the menu options, but they are a bit easier to use since they are more interactive than the dialogs. You can extend a filter radius or indicate where to place a mask simply by dragging the mouse.

- 1. If it is not already displayed, open the original .fft layer in the Fourier Editor (for example, **TM_1.fft**).
- From the Fourier Editor menu bar, select Edit -> Filter Options.
 The Filter Options dialog opens.



This is where you set the window that is used for all subsequent mouse-driven editing options. However, you can change this window at any time. The **Minimum Affected Frequency** option allows you to enter the minimum frequency value that is affected by the filter. Setting this value to a number less than 10.00 might eliminate very low frequency data that are crucial to the content of the image.

3. In the Filter Options dialog, click the **Window Function** dropdown list and select **Ideal**.

4. Click OK.

Use Low-Pass Filtering

The first tool you use is the Low-Pass Filter tool.

- 1. Click the Low-Pass Filter icon 🚺 on the Fourier Editor toolbar.
- 2. With your cursor in the center of the Fourier Editor, drag toward the right until the *u* coordinate in the status bar reads **80**. Then release the mouse.

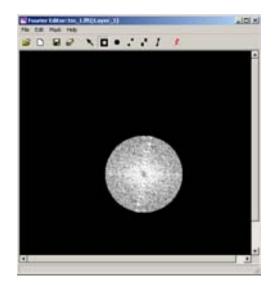
The image is filtered as soon as the mouse is released. This is equivalent to the second filtering operation you performed using the menu bar tools.

You can select **Edit -> Undo** at any time to undo an edit. Select **File** -> **Revert** to undo a series of edits. The Low-Pass Filter tool remains active until you either select another tool or click the Select tool.

Use High-Pass Filtering Next, you use the High-Pass Filter tool.

- 1. Select Edit -> Filter Options from the Fourier Editor menu bar.
- 2. In the Filter Options dialog, click the **Window Function** dropdown list and select **Hanning**.
- 3. Click **OK** in the Filter Options dialog.
- 4. Click the High-Pass Filter icon 🌘 on the toolbar.
- 5. With your cursor in the center of the Fourier Editor, drag toward the right until the *u* coordinate in the status bar reads **20**. Release the mouse button.

The image is filtered as soon as the mouse is released. The combination of filters (both Low-Pass and High-Pass) is shown in the following example:



6. Select File -> Save As from the menu bar.

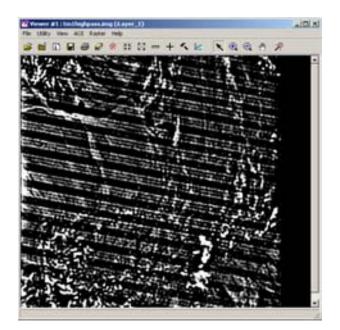
The Save Layer As dialog opens.

- In the Save Layer As dialog, enter a new name for the .fft layer, such as TMhighpass.fft. Be sure to use a directory in which you have write permission.
- 8. Click OK to save the layer.
- Click the Run icon on the toolbar, or select File -> Inverse
 Transform from the menu bar to create an inverse Fourier layer for display.
- In the Inverse Fourier Transform dialog, enter a name for the new .img layer in the directory of your choice, such as TM1highpass.img.
- 11. Click OK.

A Job Status dialog displays, indicating the progress of the function.

12. When the Job Status dialog indicates that the new .img layer is created, click **OK** and then display the layer in a Viewer.

Your new image should look similar to the following example:

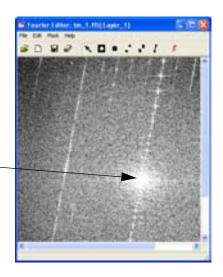


Apply a Wedge Mask

In the next exercise, you remove the nearly vertical radial line in the image, thereby removing the striping in the original image.

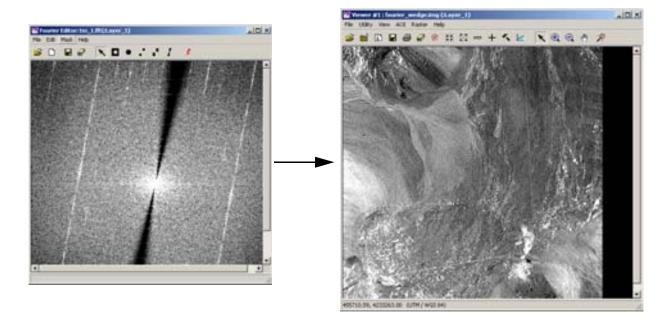
- **1.** Redisplay the original .fft layer in the Fourier Editor if you have not already done so.
- **2.** The Hanning window is still selected from the previous section, so you do not change it.

- 3. Click the Wedge Mask icon 🖌 on the toolbar.
- 4. Using the following example as a guide, with your cursor over the center of the line, drag to the right until the lines of the wedge are about 20 degrees apart. Release the mouse button.



Position your cursor in this area —

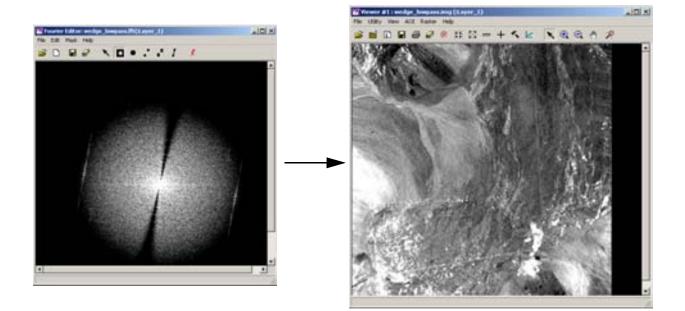
The image is filtered as soon as you release the mouse, and similar to the following example. The resulting image is also shown.



Combine Edits

You may combine as many edits as you like during an editing session. Since the Fourier Transform and Inverse Fourier Transform are linear operations, the effect of each edit on the resulting image is independent of the others. Here, you perform a low-pass filter over the wedged .fft layer that you just created.

- With the .fft layer that you just created displayed in the Fourier Editor, click the Low-Pass Filter tool
- With your cursor in the center of the Fourier Editor, drag toward the right until the *u* coordinate in the status bar is about 200.
 The .fft layer and resulting image look similar to the following:



ERDAS IMAGINE Tour Guides

Image Interpreter

Introduction

Image Interpreter is a group of over 50 functions that can be applied at the touch of a button to images with parameters you input. Most of the Image Interpreter functions are algorithms constructed as graphical models with Model Maker. These algorithms are common enhancements and utilities that have been made easily accessible through the Image Interpreter.

NOTE: Some of these functions are found in other parts of ERDAS *IMAGINE*, but are also listed in Image Interpreter for convenience.

The models used in Image Interpreter functions can be edited and adapted as needed with Model Maker (from Spatial Modeler) or the Spatial Modeler Language.

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See the Spatial Modeler section of this manual for a description of the relationship between Spatial Modeler Language, Model Maker, and Image Interpreter. See the chapter "Geographic Information Systems" in the <u>ERDAS Field Guide</u> for more information on modeling.

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Approximate completion time for this tour guide is 50 minutes.

Many images used in IMAGINE cover a large area, while the actual area being studied can only cover a small portion of the image. To save on disk space and processing time, IMAGINE lets you make new images out of a subset of the entire data set.

In this exercise, you use the Subset Utility to take a subset of a small urbanized Area of Interest (AOI) from a much larger Landsat scene of San Diego.

ERDAS IMAGINE should be running with a Viewer open.

1. Select File -> Open Raster Layer from the Viewer menu bar.

The Select Layer to add dialog opens.

Subsetting an Image

	Select Layer To Add: File Rester Options Multip	le		×	Click OK
Select dmtm.img	Look in: examples DEMmerge_sub ing didaten ing eldoden ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing flavel.ing	 Itevolandkadar.ing Itevolandkadaregion5 ing Itevolandkadaregion5 ing Itevolandkadaregion5 ing Itevolandkadarekev5 ing 	B C FSAR_US mage-dod; FSAR_US Mandcover.i Barlacover.i Barlac	OK Cancel Help Recent Goto	
	File name: dhith ing Files of type: [MAGINE Image (* Insecolor : 591 Roves x 591 Colum	-	Priskening		

- 2. Select **dmtm.img** from the list of examples.
- 3. Click **OK** to have the image display in the Viewer.

Selecting an AOI to Subset

In this section, you use the Subset utility to take a small Subset from a large image without using the Snap to Raster option.

- **1.** With the cursor in the Viewer, right-click to access the Quick View menu.
- Select Inquire Box... from the Quick View menu. The Inquire Box dialog displays. The title of this dialog is Viewer #1: dmtm.img.

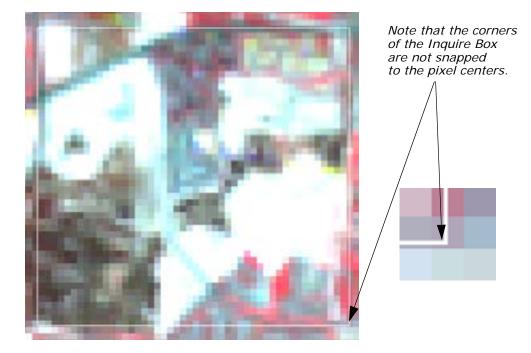
	🕼 Viewer #1: dmtm.img
Uncheck the Snap to Raster	UD: 1690305.570 LRc 1702202.557434
checkbox	ULY: 200632-691217 LRY: 204900.700704
	Type: Map Units: feet
	Snap to Raster Box Color.
	Apply Fit to AOI Close Help

- Click the Snap to Raster checkbox to uncheck this option. This tells the Subset function to use the exact coordinates you enter for the Inquire Box.
- 4. Enter the following coordinates into the Inquire Box dialog:

ULX:	1698385.570
ULY:	288632.691217
LRX:	1702282.557434
LRY:	284900.708704

- 5. Click **Apply** on the Inquire Box dialog. The Inquire Box moves to the new coordinates.
- 6. Click the Zoom In icon 🔍 to zoom in on the Area of Interest.

The image in your Viewer should look something like this:

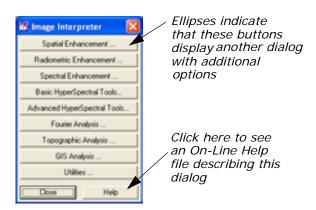


Subsetting an Image Without Snapping

1. Click the Interpreter icon on the ERDAS IMAGINE icon panel.



The **Image Interpreter** menu opens. Each of the buttons in the **Image Interpreter** menu displays a submenu of Image Interpreter functions



2. Select Utilities from the Image Interpreter menu and the Utilities menu opens.

🕼 Utilities	
Change Detection	
Functions	
Operators	
RGB Clustering	
Adv. RG8 Clustering	
Random Class Colors	
Laper Stack	
Subset	
Create File	
Rescale	
Mask	
Degrade	
Replace Bad Lines	
Vector To Raster	
Reproject	
Aggie	
Thematic to RGB	
Morphological	
Close Help	

3. Select **Subset** from the **Utilities** menu and the Subset dialog opens.

Enter input file here	Subset Input File Information	e (*ing)	Output Fi subset_no_snap.im	k: (".ing) o 🚖	Enter output file here
	Coordinate Type:	Subset Definition: (* Two Comers: 0 UL X: 16845452 UL Y: 305701.97 UR X: 0.00 UR Y: 0.00	5 <u>국</u> LRX 1		Click here to import coordinates from the Inquire Box in the Viewer
	Data Type: Input: Unsigned		0.000		
Click here to start the Subsetting process	Output: Unsigne Output Options: Number of Input laye Select Layers: Use a comma for se using a "." (i.e. 2.5.)	NI: 7 [1:7 parated list(i.e. 1.3,5))	Output: Continu		
	OK	Batch A0	Cancel	Help	

 Under Input File in the Subset dialog, enter dmtm.img. This is a Landsat TM image of San Diego, California.

- 5. Under **Output File**, enter **subset_no_snap.img** in a directory where you have write permission.
- 6. Click **OK** to begin the Subsetting process.

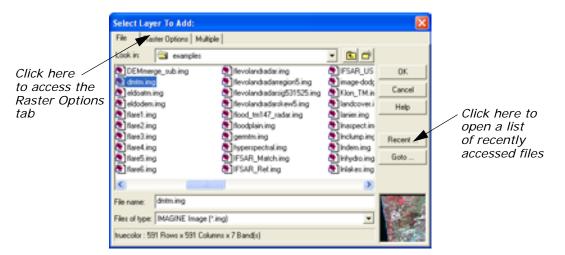
A Job Status bar displays, indicating the progress of the subsetting operation.



 Depending on your eml Preferences (under Session -> Preferences -> User Interface & Session -> Keep Job Status Box), when the Job Status bar shows 100, indicating that the job is 100% done, you must either click OK to close the dialog or the dialog closes automatically.

Displaying the Subset with the Original Data

- **1.** The original image should still be displayed in the Viewer.
- Select File -> Open -> Raster Layer from the menu bar on the Viewer.



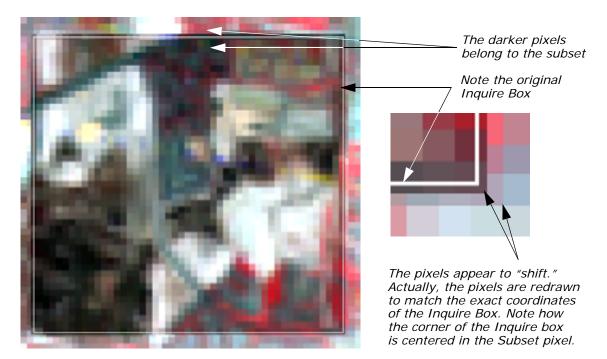
The Select Layer to Add dialog displays.

- 3. Click the **Recent** button to open a list of recently accessed files.
- 4. Select subset_no_snap.img from the List of Recent Files.
- 5. Click **OK** to dismiss the List of Recent Files.
- 6. Click the Raster Options tab.

	Select Layer To Add:	×
	File Raster Options Multiple	
	Display as : True Color	0K
	Lapers to Colons:	Cancel
	Red 4 + Green 3 + Blue: 2 +	Help
		Recent
Click here	Crient Image to Map System	Goto
to uncheck	🔽 Clear Display 🦳 Set View Extent	
the Clear Display	Fit to Frame No Stretch	
option	Data Scaling Background Transparent	1993
	Zoom by: 1.00 📩 Using Nearest Neighbor 💌 Help	

- **7.** Uncheck the **Clear Display** option so the new subset of the original image appears superimposed on the original image.
- 8. Click OK.

The subset displays in the Viewer over the original image.



When a subset of an image is taken from an Inquire Box that is not snapped to the pixel grid of the original image, the subset is drawn using the exact coordinates of the of the Inquire Box. Because the subset pixel grid differs slightly from the original image's pixel grid, the subset image appears "shifted" from the original image.

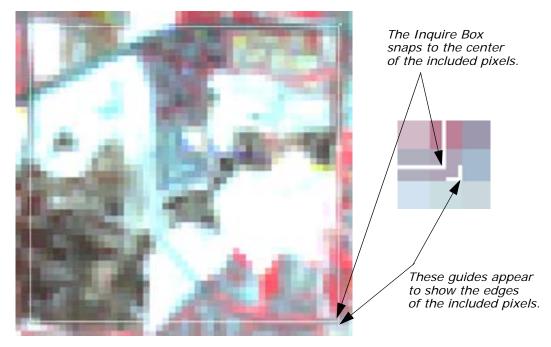
Click the Clear Top Layer icon to remove subset_no_snap.img from the Viewer.

The original image and the Inquire Box should still be displayed in the Viewer.

Subsetting an Image With Snap to Raster

1. In the Inquire Box dialog, click the **Snap to Raster** checkbox to make sure it is active (checked). Click **Apply**.

The Inquire Box snaps to the pixels centers and looks like this:



The coordinates in the Inquire Box dialog update to reflect the new corner coordinates.

- 2. In the Utilities dialog, click the **Subset** button. The Subset dialog displays.
- 3. Under Input File, enter dmtm.img.
- 4. In the **Output File**, enter **subset_snap.img** in a directory where you have write permission.
- 5. Click the From Inquire Box button.

The coordinates in the **Subset Definition** area update to reflect the corner coordinates of the Inquire Box.

6. Click **OK** to start the Subsetting Process.

The Subsetting Progress meter opens, displaying the progress of the subsetting.

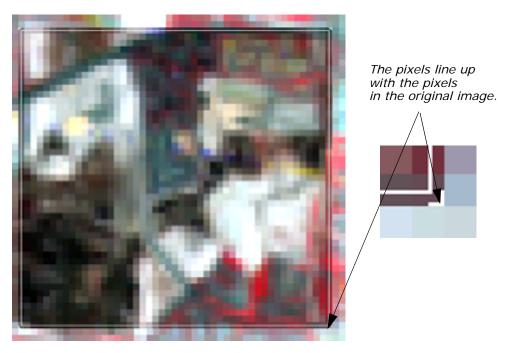
Viewing the Snapped Subset

 Select File -> Open -> Raster Layer from the menu bar in the Viewer.

The Select Layer to Add dialog opens.

- Click the Recent button.
 The List of Recent Files dialog displays.
- 3. Select subset_snap.img from the list.
- 4. Click **OK** on the List of Recent Files to close the dialog.
- 5. Click the Raster Options tab in the Select Layer to Add dialog.
- 6. Deselect the Clear Display option.
- Click OK to open subset_snap.img in the Viewer on top of dmtm.img.

The subsetted image displays in the Viewer.



Because the Inquire Box was snapped to the centers of the pixels before the image was processed, the pixels in the output file lines up exactly with the pixels in the original image.

- 8. Click Close on the Viewer.
- 9. Click Close on the Utilities menu.



ERDAS IMAGINE should be running with a Viewer open.

In this section, you use the convolution and crisp Spatial Enhancement functions to enhance images.

1. Click the Interpreter icon on the ERDAS IMAGINE icon panel.



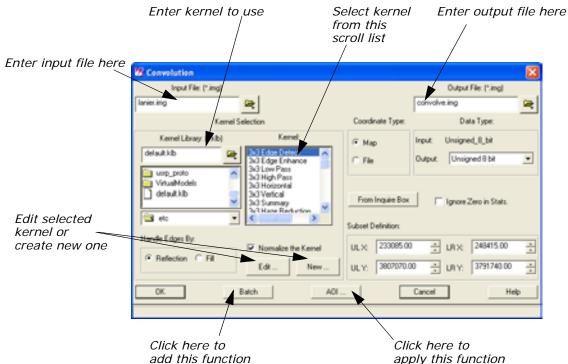
The Image Interpreter menu opens.

2. Select **Spatial Enhancement** from the **Image Interpreter** menu and the **Spatial Enhancement** menu opens.

🖉 Spatial Enhancement 💦 💈	3
Convolution	
Non-directional Edge	
Focal Analysis	
Texture	
Adaptive Filter	
Statistical Filter	
Resolution Merge	
Mod. IHS Resolution Merge	Click here to see
Wavelet Resolution Merge	/ an On-Line Help
Crisp	file describing this
Close Help	dialog

Apply Convolution

1. Select **Convolution** from the **Spatial Enhancement** menu and the Convolution dialog opens.



to a batch file

apply this function to an area of interest

This interactive Convolution tool lets you perform convolution filtering on images. It provides a scrolling list of standard filters and lets you create new kernels. The new kernels can be saved to a library and used again at a later time.

NOTE: Do not close the Image Interpreter menu, as you continue using it in the next section.

Select Input/Output Files

- 1. In the Convolution dialog, under Input File, enter lanier.img.
- Under Output File, enter convolve.img in the directory of your choice. It is not necessary to add the .img extension when typing the file name—ERDAS IMAGINE automatically appends the correct extension.

NOTE: Make sure you remember in which directory the output file is saved. This is important when you try to display the output file in a Viewer.

- Select Kernel Next, you must select the kernel to use for the convolution. A default kernel library containing some of the most common convolution filters is supplied with ERDAS IMAGINE. This library opens in the Kernel Selection part of this dialog.
 - 1. From the scrolling list under Kernel, click 3x3 Edge Detect.
 - 2. Click the Edit button in the Kernel Selection box.

The 3×3 Edge Detect dialog opens.

Ø e:/prog File Edit H		agine 8.7/etc	/default.	kl6 : 3x3 Ed	e 🗌 🛛 🛛
11 ···	• Shit		• •	1.1	
Row	1 2	3			^
1	-1.000 B.	000 -1.000 000 -1.000 000 -1.000			
	1.000	1.000			
c	a.				>
× Size: 3		Y Size: 3	- 3	Default:	0.000

For this exercise, you use the Kernel Editor to simply view the kernel used for the 3×3 Edge Detect filter. However, if desired, you could make changes to the kernel at this time by editing the CellArray.

- 3. Select **File -> Close** from the 3 × 3 Edge Detect dialog.
- 4. Click **OK** in the Convolution dialog.

A Job Status dialog displays, indicating the progress of the function.

5. When the Job Status dialog shows that the process is 100% complete, click **OK**.

Check the File

- Select File -> Open -> Raster Layer from the Viewer menu bar. The Select Layer To Add dialog opens.
- 2. In the Select Layer To Add dialog under Filename, click lanier.img.
- 3. Click **OK** to display the file in the Viewer.
- 4. Open a second Viewer window by clicking on the Viewer icon on the ERDAS IMAGINE icon panel.



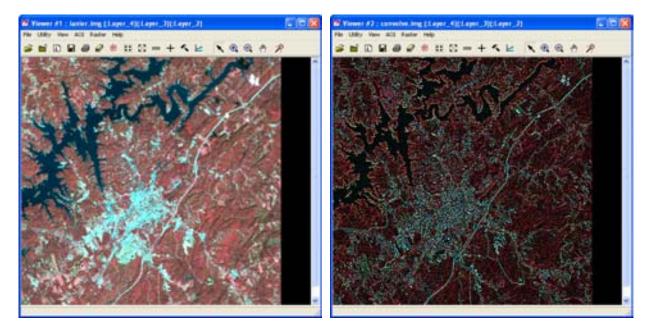
 Select File -> Open -> Raster Layer from the menu bar of the Viewer you just opened.

The Select Layer To Add dialog opens.

- 6. In the Select Layer To Add dialog under **Filename**, enter the name of the directory in which you saved **convolve.img**, and press the Enter key on your keyboard.
- 7. In the list of files, click **convolve.img** and then click **OK**.

The output file generated by the Convolve function, **convolve.img**, displays in the second Viewer.

8. In the ERDAS IMAGINE menu bar, select **Session -> Tile Viewers** to compare the two files side by side.



9. When you are finished comparing the two files, select **File -> Clear** from the menu bar of each Viewer.

Apply Crisp

 Select Crisp from the Spatial Enhancement menu. The Crisp dialog opens.

Enter input file here	🙆 Crisp					Enter output
	Input Fi	le: (".ing)	Outpu	#File: (".ing)		file here
X	panafanta.ing	2	crisp.img		2	
	Coordinate Type:	Subset Definition:		From Inquire	Bax	
	🦷 Мар	ULX 399272.0	IRX	445203.20	÷	
	C File	ULY: 13746973	21 🗄 LBY:	1332046.81	÷	
Click here to	Data Type:		Output options:			
add this function	Input Unsigne	6,8,5R	F Stetch to U	nsigned 8 bit		
to a batch file 🦳	Subjut Unsigne	ed 0 bit 💌	Ignore Zero	in Stats.		Click here to ~apply this function
Click here to view or edit the graphical model			alch	ADI		to an area of interest
graphical model for this function						

The Crisp dialog is a good example of the basic Image Interpreter dialog. Other dialogs may have more prompts for inputs, depending on the function. Each dialog opens with default entries that are acceptable for use. These entries can be changed, if necessary, to achieve specific results.

2. Under Input File in the Crisp dialog, enter panAtlanta.img.

This is a SPOT panchromatic scene of downtown Atlanta, Georgia.

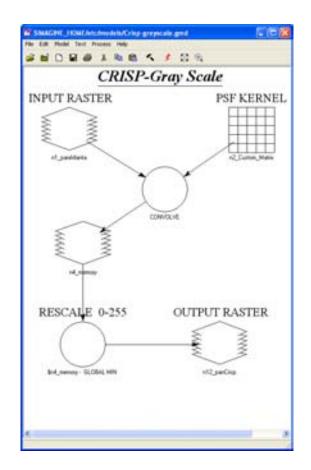
- 3. Under **Output File**, enter **crisp.img** in the directory of your choice as the output file.
- 4. Under **Output Options** in the Crisp dialog, turn on the **Stretch to Unsigned 8 bit** checkbox by clicking on it.

This option produces the output file in unsigned 8-bit format, which saves disk space.

Use the View Option

1. Click the **View** button at the bottom of the Crisp dialog.

The Model Maker viewer window opens and displays the graphical model used for the Crisp function.



The **View** button in each Image Interpreter dialog lets you view the graphical model behind each function. If you want to change the model for a specific purpose, you can edit it through the Model Maker and apply the edited function to the image by running the model in Model Maker.



See "Spatial Modeler" for information on editing and running a model in Model Maker.

- 2. Exit the Model Maker by selecting File -> Close All.
- 3. Click **OK** in the Crisp dialog to start the process.

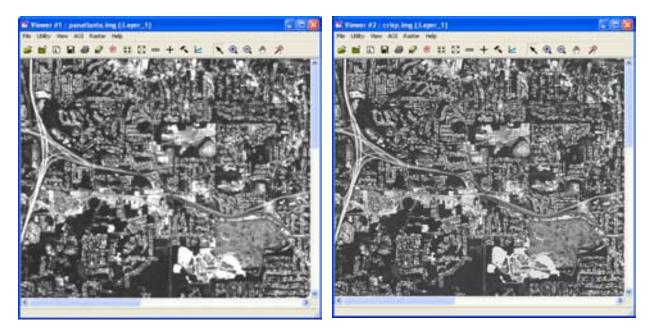
A Job Status dialog opens, indicating the progress of the function.

4. When the Job Status dialog shows that the process is 100% complete, click **OK**.

View Results

- 1. Display panAtlanta.img in a Viewer.
- 2. Display **crisp.img**, the output file generated by the Crisp function, in the other Viewer.

3. Note the differences between the two images; **crisp.img** appears to be sharper.



- **4.** Use the Zoom In icon in the Viewer toolbar to zoom in for a closer look at the crispening of the image in **crisp.img**.
- When you are through, close all the Viewers at once by selecting Session -> Close All Viewers from the ERDAS IMAGINE menu bar.
- 6. Click Close in the Spatial Enhancement menu.

NOTE: Do not close the **Image Interpreter** menu, as you continue using it in the next section.

Apply Radiometric Enhancement

1. In the Image Interpreter menu, select Radiometric Enhancement.

The Radiometric Enhancement menu opens.

	🖉 Radiometric Enhancement 🛛 🔯			
	LUT Stretch			
	Histogram Equalization			
Click here to access —	Histogram Match			
the Brightness Inversion	Brightness Inversion Haze Reduction			
function				
	Noise Reduction			
	Destripe TM Data			
	Close Help			

In this section, you use both the **Inverse** and **Reverse** options of the **Image Inversion** function to enhance images. Inverse emphasizes detail in the dark portions of an image. Reverse simply reverses the DN values.

Apply Brightness Inversion

1. In the Radiometric Enhancement menu, select Brightness Inversion.

The Brightness Inversion dialog opens.

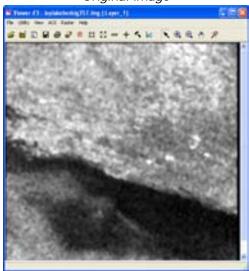
	Brightness Inversion Input File: ("ing) Output File: ("ing)				<i>Enter output file name here</i>
	koplak.ebechig357.in		inverse.ing		
	Coordinate Type:	Subset Definition:	From Inquire	Bax	
	🕫 Мар	ULX 0.00	는 LRX 564.00	-	
	C File	ULY: 0.00	1R Y: 522.00	4	_ Select this option
	Data Type:		Output Options:		to reduce file size
Click here	Input: Unsigne	18 bit	Stretch to Unsigned 8 bit.		
to see model	Output Unsigne	d 0 bit 💌	Ignore Zero in Stats.		Calast setime
in Model Maker 📉			C Reverse @ Inverse		Select option here
	OR Batch ADI Cancel View Help				
		×	/Help		

- 2. In the Brightness Inversion dialog under Input File, enter loplakebedsig357.img.
- 3. Under **Output File**, enter **inverse.img** in the directory of your choice.
- 4. Under **Output Options**, turn on the **Stretch to Unsigned 8 bit** checkbox by clicking on it.
- 5. Under Output Options, click Inverse.
- 6. Click **OK** in the Brightness Inversion dialog to start the process.

A Job Status dialog displays, indicating the progress of the function.

Reverse 1. Select Brightness Inversion from the Radiometric Enhancement menu. The Brightness Inversion dialog opens. 2. In the Brightness Inversion dialog, enter loplakebedsig357.img as the input file. 3. Enter reverse.img in the directory of your choice as the Output File. 4. Turn on the Stretch to Unsigned 8 bit checkbox under Output Options. 5. Click **OK** in the Brightness Inversion dialog to start the process. A Job Status dialog displays, indicating the progress of the function. **View Changes** 1. Open a Viewer and display inverse.img. 2. Right-hold within the Viewer and select Fit Window to Image from the Quick View menu. The Viewer changes size to bound the image data. 3. Select View -> Split -> Split Vertical from the Viewer menu bar. A second Viewer opens. 4. In the second Viewer, click the Open icon \mathbf{B} (this is the same as selecting File -> Open -> Raster Layer from the Viewer menu bar). The Select Layer To Add dialog opens. 5. From the Select Layer To Add dialog, open the file reverse.img. 6. In the second Viewer, select View -> Split -> Split Vertical from the Viewer menu bar. A third Viewer opens. 7. With your cursor in Viewer #3, press Ctrl-r on your keyboard (this is just another way to open a raster layer). The Select Layer To Add dialog opens. 8. From the Select Layer To Add dialog, open the file loplakebedsig357.img.

Original image



Reverse image

Inverse image



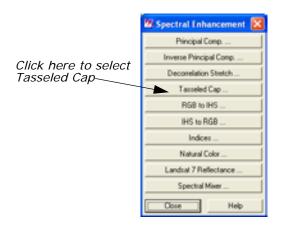
- 10. When you are through, close all three Viewers by selecting Session
 -> Close All Viewers from the ERDAS IMAGINE menu bar.
- 11. Click Close in the Radiometric Enhancement menu.

NOTE: Do not close the **Image Interpreter** *menu, as you continue using it in the next section.*



1. In the Image Interpreter menu, click Spectral Enhancement.

The Spectral Enhancement menu opens.



In this section, you use the following Spectral Enhancement functions:

- Tasseled Cap
- RGB to IHS
- IHS to RGB
- Indices

Use Tasseled Cap

 In the Spectral Enhancement menu, select Tasseled Cap. The Tasseled Cap dialog opens.

Enter input	Tasseled Cap		X Output File: (".ing)		Enter output file here
file here	lanies ing	R	tasseled.ing		
	Coordinate Type:	Subset Definition:	Fit	om Inquire Box	
	G Map	ULX 233085.00	· LR X: 2484	415.00	
	C Fie	ULY: 3807070.0	0 ± LR Y: 3791	1740.00	Click to select this
	Data Type:		Output Options:		option
	Input: Unsign	ed 8 bit	F Stretch to Unsigne	ed 0 bit	
	Output Unsign	ed 0 bit 💌	🗐 Ignore Zero in Sta	<i>k</i> 1.	
		Number of Laye	нк 7		
		Set Coeffi	icients		
Click to set — coefficients		IK Bat			

- 2. Under Input File, enter Ianier.img. That image is a Landsat TM image of Lake Lanier, Georgia, which was obtained by the Landsat 5 sensor.
- 3. Enter tasseled.img in the directory of your choice as the **Output** File name.
- 4. Under **Output Options**, turn on the **Stretch to Unsigned 8 bit** checkbox by clicking on it.
- 5. Click Set Coefficients.

The Tasseled Cap Coefficients dialog opens.

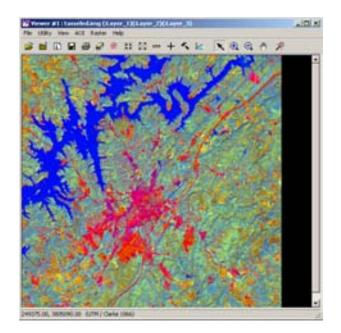
😗 Tasse	led Cap Coelli	cients						2	
Coefficient Definition:									
Layer 1	Layer 2	Layer 3	Laper 4	Layer 5	Layer 6	Laper 7	Additive		
0.2909	0.2493	× 0.4306	÷ 0.5568	× 0.4438	÷0.0000	÷ 0.1706	10.3695	÷	
0.2728	-0.2174	<u>→</u> 0.5508	0.7221	÷ 0.0733	÷ 0.0000	0.1648	-0.7310	÷	
0.1446	0.1761	0.3322	0.3396	- 0.6210	÷ 0.0000	0.4186	-3.3828	÷	
0.8461	-0.0731	0.4640	-0.0032		÷0.0000	÷ 0.0119	0.7879	ż	
0.0543	-0.0232	÷ 0.0339	-0.1937	A162	ž 0.0000	0.7823	-2.4750	÷	
0.1196	-0.8069	0.4094	2 0.0571	- 0.0228	ž 0.0000	- 0.0220	-0.0336	÷	
			0	utput Options:					
Sensor: Landsof 5 TM Number of Lapers: 7									
OK Cancel Heb									

The coefficients that display are the standard default entries for Landsat 5 TM Tasseled Cap transformation. For this exercise, you use the default entries, although you may change these entries at any time.

- 6. Click **OK** in the Tasseled Cap Coefficients dialog.
- Click OK in the Tasseled Cap dialog to start the function.
 A Job Status dialog opens to report the state of the job.
- 8. When the Job Status dialog indicates that the job is **Done**, click **OK**.

Check Results

- 1. Open a Viewer and display lanier.img.
- 2. Open a second Viewer and then open the Select Layer To Add dialog by clicking on the Open icon in the Viewer toolbar.
- 3. In the Select Layer To Add dialog, enter the name of the directory in which you saved **tasseled.img**, press Enter on your keyboard, and then click **tasseled.img** in the file list to select it.
- Click the Raster Options tab at the top of the Select Layer To Add dialog. Under Layers to Colors, use layer 1 as Red, layer 2 as Green, and layer 3 as Blue.
- 5. Click OK in the Select Layer To Add dialog.



The image, **tasseled.img**, shows a degree of brightness, greenness, and wetness, as calculated by the Tasseled Cap coefficients used.

- Layer 1 (red) = the brightness component (indicates areas of low vegetation and high reflectors)
- Layer 2 (green) = the greenness component (indicates vegetation)

- Layer 3 (blue) = the wetness component (indicates water or moisture)
- 6. When you are through, close the Viewers by selecting **Session -> Close All Viewers** from the ERDAS IMAGINE menu bar.

Use the Indices Function

Next, you apply a mineral ratio from the **Indices** function to a Landsat TM image. Such ratios are commonly used by geologists searching for specific mineral deposits in the earth.



For more information on this transformation, see the chapter "Enhancement" in the <u>ERDAS Field Guide</u>.

1. In the Spectral Enhancement menu, select Indices.

Enter input file here	Enter outpu file here
Coordinate Type: Subset Definition: From Inquire Box	file here
Click to select	
Outrad Determine	Click to
Sensor: Landsat TM 💌 🖓 [Stetch to Unsigned () bit]	select this option
Function	
Function definition displays here for selected function function band 5 / band 7 , band 5 / band 4 , band 3 / band 1	

The Indices dialog opens.

- 2. Under Input File, enter tmAtlanta.img.
- Enter mineral.img in the directory of your choice as the Output File.
- 4. Under **Select Function**, click **MINERAL COMPOSITE** in the scrolling list.

This index is a composite of three mineral ratios.

- Clay minerals = band 5 / band 7
- Ferrous minerals = band 5 / band 4

Iron oxide = band 3 / band 1

NOTE: Notice how the selected function is defined beside the **Function** label, underneath the **Select Function** scroll list.

- 5. Under **Output Options**, turn on the **Stretch to Unsigned 8 bit** checkbox by clicking on it.
- 6. Click **OK** in the Indices dialog to start the process.

A Job Status dialog displays, indicating the progress of the function.

7. When the Job Status dialog indicates that the job is **Done**, click **OK**.

Choose RGB to IHS Next, you use the RGB to IHS function (red, green, blue to intensity, hue, saturation) and the reverse IHS to RGB function to enhance the image information obtained by this mineral ratio.

The purpose of this function is to produce an input file for the IHS to RGB function.

1. Select **RGB to IHS** from the **Spectral Enhancement** menu.

The **RGB to IHS** dialog opens.

Input Fil	e (".ing)	Output File: (*.ing)				
mineral.ing	2	rgbtoihs.im	3	2		
Coordinate Type:	Subset Definition:		From Inqu	ire Box		
(¥ Мар	ULX 0.00	÷u	EX 511.00	÷		
C File	ULY: 0.00	÷	-511.00	÷		
No. of Layers:	3 Red 1 🚊	Green:	the F	3 🔆		
	Ignore Zi	ero in Stats.				
	OK B	alch	A01			
	Cancel Vi	ew	Help			

- 2. Enter the mineral ratio output from the previous exercise (mineral.img) as the Input File.
- Enter RGBtoIHS.img (in the directory of your choice) as the Output File.
- 4. Click OK in the RGB to IHS dialog.A Job Status dialog displays, reporting the progress of the function.
- 5. When the Job Status dialog indicates that the job is **Done**, click **OK**.

Choose IHS to RGB

Now, you convert the IHS image back into an RGB image.

 Select IHS to RGB from the Spectral Enhancement menu. The IHS to RGB dialog opens.

Input Fil	e (".ing)		0	utput File	c (".ing)		×
rgbtoihs.ing		2	hstorgb img			9	2
Coordinate Type:	Subset Defin	vitore			From Ing	uire Bo	×
Э Мар	ULX 0	00	÷u	x 5	1.00		÷
C File	ULY: 0	00	÷ 18	m 5	11.00		÷
C No Stretch	No	of Layers:	3	Inter	uity.	1	÷
C Stretch Intensity					Hue	2	÷
Stretch I&S		Ignore Zero	in Stats.		Sak	3	÷
	0K.	Batc		AOI			
	Cancel	View.	-	He	ip		

- 2. In the IHS to RGB dialog, enter **RGBtoIHS.img** output from the previous exercise as the **Input File**.
- 3. Enter **IHStoRGB.img** as the **Output File** in the directory of your choice.
- 4. On the IHS to RGB dialog, click Stretch I & S.

This option applies a global Min-Max contrast stretch to the Intensity and Saturation values in the image before converting.

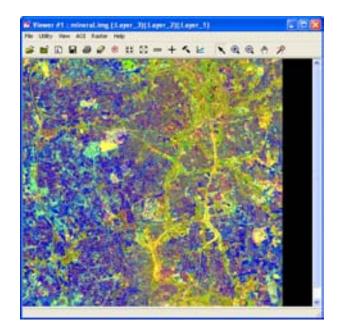
5. Click **OK** in the IHS to RGB dialog.

A Job Status dialog displays, reporting the progress of the function.

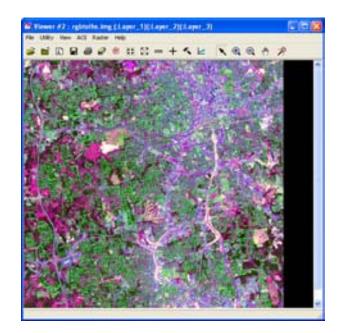
6. When the Job Status dialog indicates that the job is **Done**, click **OK**.

View the Results

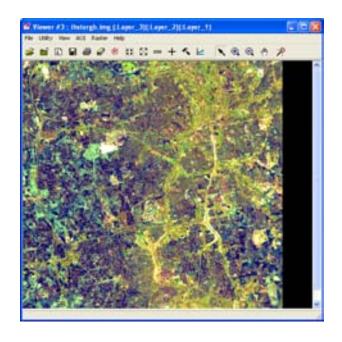
- **1.** Open three Viewers and then open the following files for comparison.
 - **mineral.img**—mineral ratio index. Proper interpretation can reveal the presence or absence of iron, clay, or ferrous minerals.



• **RGBtolHS.img**—red, green, and blue values converted to intensity, hue, and saturation values. This image does not appear similar to the input file. It is not meant for interpretation; it is only meant to produce an input for the IHS to RGB function.



• **IHStoRGB.img** (see special instructions below)—intensity, hue, and saturation values converted to red, green, and blue values (appears similar to **mineral.img**). The intensity and saturation (red and blue) values have been contrast-stretched for better interpretation.





In the Open Raster Layer dialog, when displaying IHStoRGB.img, be sure to load Layer 1 as Red, Layer 2 as Green, and Layer 3 as Blue. This is because the order of the layers was reversed in the transformation.

- When you are through comparing the files, close the Viewers by selecting Session -> Close All Viewers in the ERDAS IMAGINE menu bar.
- 3. Click **Close** in the **Image Interpreter** menu. Click **Close** in the Spectral Enhancement menu.

The Image Interpreter and Spectral Enhancement menus close.

Wavelet Resolution Merge

Part of the Spatial Enhancement menu is the Wavelet Resolution Merge feature. This tour will cover the feature by using two images from the IMAGINE examples directory, **Quickbird_Pyramids_Pan.img** and

Quickbird_Pyramids_MS.img. Both images are of the Egyptian pyramids and are courtesy of DigitalGlobe. Because both of these images have been captured by the same satellite, they are inherently coregistered. Before performing Wavelet Resolution Merge on your own images, you should precisely coregister them to the subpixel level. For more information on how to do this, see the tour for Subpixel Coregistration at the end of the chapter on Polynomial Rectification.



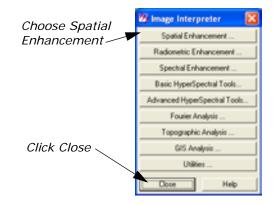
In addition to being precisely coregistered, your images must also have the same footprint on the ground. Wavelet Resolution Merge will not produce the expected results if one image covers more ground than the other image. In that case the images are rewritten to fit one another by the geographic footprint rather than actual map coordinates causing pixel replication.

- 1. Open a Viewer, and click **File -> Open -> Raster Layer** or the open file icon to display the **Select Layer to Add** dialog.
- Hold down the Ctrl key or the Shift key and select QuickBird_Pyramids_MS.img and Quickbird_Pyramids_Pan.img.
- 3. Click the **Raster Options** tab, and click **Clear Display** to deselect it. Click **Fit to Frame**, and **OK**.

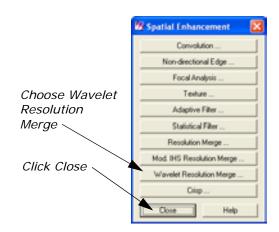
You may want to rotate the image in the Viewer by clicking **View -> Rotate**. A dialog will appear giving you degree and rotation direction options. Whether or not to rotate the image is up to you.

- In the Viewer menu, click Utility -> Swipe to open the Viewer Swipe dialog.
- 5. In the Viewer Swipe dialog, take a few minutes to manually move the swipe feature over the images both horizontally and vertically, so you can see how precisely they are matched. You can also use the Auto Mode and adjust its speed to your preference. When you are finished, click **Cancel** in the Viewer Swipe dialog.
- 6. Next, click the Zoom In icon, and zoom in on some features that interest you. This exercise also gives you a good idea of how well the two images are matched. You can use the Zoom In and Zoom Out icons to adjust your view. When you are finished, click the Reset Window Tools or arrow icon to return to the arrow cursor.
- 7. Click the Interpreter button in the IMAGINE toolbar.

The Image Interpreter dialog opens.



8. Select **Spatial Enhancement**, and click **Close** in the Image Interpreter dialog after the Spatial Enhancement dialog opens.



9. Select **Wavelet Resolution Merge**. After the Wavelet Resolution Merge dialog opens, click **Close** in the Spatial Enhancement dialog.

10 Wavelet Resolution Merg	je	X
High Resolution Input File: (*.in	ng) Multispectral Input File: (*.in	ngl Output File: (*.ing)
Select Layer:	Number of layers: 0	
Spectral Transform:	Layer Selection:	
 G Single Band C IHS C Principal Component 	Number of Multispectral Input layers Select Layers: 1 Use a comma for separated list (i.e. using a "." (i.e. 2.5.).	
Recampling Techniques:	Data Type:	Output Options:
C Nearest Neighbor G Bilinear Interpolation	Gray Scale: None Multispectral: None Output: Float Single	Startch to Unsigned 8 bit Standard Deviation stretch Min-Max stretch Ignore Zero in State.
OK	Cancel	Batch Help

- **10.** Click the open file icon, and select **Quickbird_Pyramids_Pan.img** for the High Resolution Input File.
- **11.** Click the open file icon, and select **Quickbird_Pyramids_MS.img** for the Multispectral Input File.
- **12.** Click the open file icon, navigate to the directory where you want to store your merged image, and type the name of the new file.
- Under Layer Selection, you can type in the range of bands to use in the Select Layers box. For this exercise, you will leave the range at 1:4.

14. Leave the Spectral Transform at Single Band.

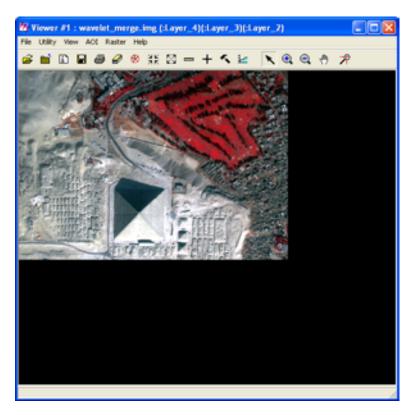
NOTE: The IHS technique is limited to 3 bands, and there are 4 to be considered for this merge. If you chose IHS instead of Single Band, there would be distortions. Single band will use all 4 bands sequentially.

- **15**. Leave the **Resampling Technique**, **Data Type**, and **Output Options** at their defaults.
- 16. Click OK.

The Wavelet Resolution Merge processing dialog appears.



- **17.** Click **OK** when the button is highlighted and the Job State is Done.
- Open a Viewer and display both Quickbird_Pyramids_MS.img and your new merged image. Make sure you click Clear Display in Raster Options to deselect it before adding each image.



19. Using the Swipe and Zoom tools, check the accuracy of the newly merged image.

ERDAS IMAGINE Tour Guides

Orthorectification

Introduction

Rectification is the process of projecting the data onto a plane and making it conform to a map projection system. Assigning map coordinates to the image data is called georeferencing. Since all map projection systems are associated with map coordinates, rectification involves georeferencing.

The orthorectification process removes the geometric distortion inherent in imagery caused by camera/sensor orientation, topographic relief displacement, and systematic errors associated with imagery. Orthorectified images are planimetrically true images that represent ground objects in their true "real-world" X and Y positions. For these reasons, orthorectified imagery has become accepted as the ideal reference image backdrop necessary for the creation and maintenance of vector data contained within a GIS.

By performing space resection, the effects of camera/sensor orientation have been considered and removed. By defining a DEM or constant elevation value (ideal for use in areas containing minimal relief variation), the effects of topographic relief displacement can be considered and removed.

(^C

For information on bundle block adjustment, see the <u>Leica</u> <u>Photogrammetry Suite (LPS) Project Manager User's Manual</u> and <u>LPS Automatic Terrain Extraction User's Manual</u>.

<u>۲</u>

Approximate completion time for this tour guide is 30 minutes.

Rectify a Camera Image

Perform Image to Image Rectification In this tour guide, you orthorectify a camera image of Palm Springs, California, using a NAPP (National Aerial Photography Program) photo.

In rectifying the camera image, you use these basic steps:

- Display a camera image.
- Start the Geometric Correction Tool.
- Enter the Camera model properties.
- Record GCPs.
- Resample or calibrate the image.

Resampling vs. Calibration

Resampling

Resampling is the process of calculating the file values for the rectified image and creating the new file. All of the raster data layers in the source file are resampled. The output image has as many layers as the input image.

ERDAS IMAGINE provides these widely-known resampling algorithms:

- Nearest Neighbor
- Bilinear Interpolation
- Cubic Convolution
- Bicubic Spline

Calibration

Instead of creating a new, rectified image by resampling the original image based on the mathematical model, calibrating an image only saves the mathematical model into the original image as a piece of auxiliary information. Calibration does not generate new images, so when the calibrated image is used, the math model comes into play as needed.

For example, if you want to see the calibrated image in its rectified map space in a Viewer, the image can be resampled on the fly based on the math model, by selecting the **Orient image to map system** option in the Select Layer To Add dialog.

A major drawback to image calibration is that the processes involved with the calibrated image is slowed down significantly if the math model is complicated. One minor advantage to image calibration is that it uses less disk space and leaves the image's spectral information undisturbed.

NOTE: We recommend that image calibration be used only when necessary, due to the drawbacks of the process.

Prepare

ERDAS IMAGINE should be running and a Viewer open.

You must have write permission in a file if you wish to calibrate it.

- 1. In a command shell or Windows Explorer, navigate to the <<IMAGINE_HOME>/examples directory.
- 2. Copy the file **ps_napp.img** to a directory in which you have write permission and at least 10 Mb of space.

3. Set the permissions on **ps_napp.img** to read, write, execute on UNIX by using the command chmod 777 ps_napp.img, or on Windows by right-clicking on the file, selecting **Properties** and deselecting the **Read-only** option.

Next, you should verify that **ps_napp.img** has no map or projection information.

- Select Tools -> Image Information from the ERDAS IMAGINE menu bar.
- Select the file, then click OK in the Image Files dialog to open your copy of ps_napp.img.

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	Width	2294	Height	2294	Type: Cont	inuous	
Layer Info:	Block Width: Compression:	64 None	Block Height	64	Data Type: Unsi Data Order: BIL		
	Pyramid Layer Alg		IMAGINE	2QRec			
	Mitt	0	Max	247	Mean	119.622	
Statistics Info:	Median	124					
	Last Modified	Skip Factor X Aug 11 16:16:43 1		Skip Factor Y:	22		
Map Info:	Upper Le	ex: 0.0)		Upper Left Y: 0.0		
E (Fie)	Lower Rig	93.0	Lower Right Y: -2293.0 Pixel Size Y: N/A				
	Pixel Siz	A					
		er	Geo. Model: None				
		Inknow					
Projection Info:							
	Datum						

- 7. Select Edit -> Delete Map Model.
- 8. Click Yes in the Attention dialog that opens.

	Attention 🔣
Click Yes—you will apply a projection system to the ima ge	Delete map information in this layer? (Any calbration and/or projection will also be loot and layer will revert to a pixel map system) Yes No

9. Select File -> Close to dismiss the ImageInfo dialog.

Review Image Information

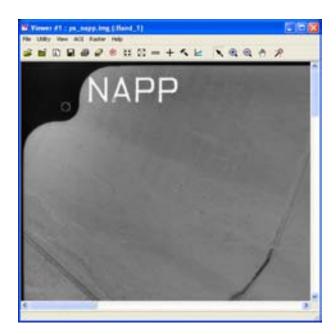
1. Select File -> Open -> Raster Layer from the Viewer menu bar, or

click the Open icon 🧭 on the Viewer toolbar.

The Select Layer To Add dialog opens.

- 2. In the Select Layer To Add dialog, select **ps_napp.img** from the directory into which you copied it.
- **3.** Click **OK** in the Select Layer To Add dialog to display the camera image in the Viewer.

The file **ps_napp.img** opens in the Viewer. The Viewer image displays with a view of the upper-left corner of the photo, as shown in the following picture:



Check for Map Model

Before you continue with geometric correction, you must first make sure that the image does not already have a map model.

On the Viewer toolbar, click the ImageInfo icon 1.
 The ImageInfo dialog opens.

🕼 ImageInfo (ps	_napp.img)								
File Edit View H	elp								
🧀 🗋 🗿 Σ	IA 1	3 Band	,1	• 1	rt 14				
General Projection	Histogram Pie	el data GCI	P_Table						
File Info:	Layer Name: Last Modified:	Band_1 Wed Aug 1	Fil 11 16:16:41 1	e Type: 999	IMAGINE In Num	hage ber of L	apers:	1	
Layer Info:	Width: Elock Width: Compression:	None	Height ck Height	2294 64	Type: Data Type: Data Order:		inuous igned 8-bit		
	Pyramid Layer Alg	prithm:	IMAGINE		sampling				
	Mitt	0	Max	247		Mean	119.622		
Statistics Info:	Median	124 Skie	Mode: FactorX	129 22	Skip Fach	Dex: arY:	28.472 22		
	Last Modified	Wed Aug	11 16:16:43	1999					
Map Info:	Upper L	0.0 % fe			Upper Left 'r':	0.0	-		— Note the pixe
E (File)	Lower Rig	MX: 2293.0		1	Lower Right '1':	-2290.0)		coordinates
	Pixel Si		Pixel Size Y: N/A						
		Unit other			Geo. Model	None -			
		Inknown							
Projection Info:									The model
	Datum								is listed here
	Datum								is listed he

- Look in the Map Info section by Geo. Model. If Geo. Model says Camera, you must delete the map model, therefore, proceed to step
 If there is no model, select File -> Close to dismiss the ImageInfo dialog, then proceed to "Perform Geometric Correction".
- 3. Select Edit -> Delete Map Model from the ImageInfo menu bar.
- 4. Select File -> Close from the ImageInfo menu bar.

Redisplay the file

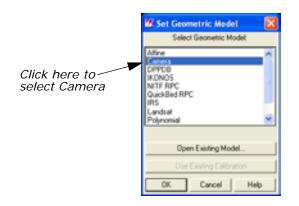
- Click the Close icon in the Viewer currently displaying ps_napp.img.
- **3.** Move your cursor around the image and note the small coordinates in the status area.

The small coordinates are pixel coordinates, not map coordinates. You can now proceed with geometric correction.

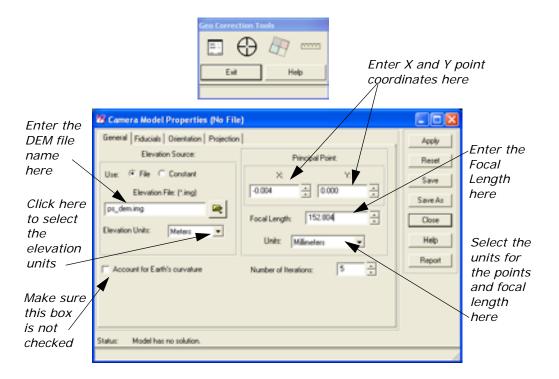
Perform Geometric Correction

1. Select **Raster -> Geometric Correction** from the Viewer menu bar.

The Set Geometric Model dialog opens.



 In the Set Geometric Model dialog, click Camera, and then click OK. The Geo Correction Tools and Camera Model Properties dialogs open.



Set Camera Model Properties

 In the Camera Model Properties dialog, enter the DEM file (ps_dem.img) under Elevation File.

The file **ps_dem.img** is located in the <<IMAGINE_HOME>/examples directory.

NOTE: Upon request, the data provider supplies the camera calibration certificate with the film at the time of purchase. This certificate provides the information needed for step 2 and step 3.

In the Camera Model Properties dialog under Principal Point, enter
 -0.004 for X and accept 0.000 as the default for Y. Then enter
 152.804 for the Focal Length.

NOTE: From the camera calibration certificate, there may be several possible types of the Principal Point coordinates. The Principal Point of Symmetry is preferable.

3. In Units under Principal Point, accept the default of Millimeters.

NOTE: The **X** *and* **Y Principal Point** *coordinates*, **Focal Length**, *and* **Fiducial Film** *coordinates must all be entered in the same units.*

4. For this example, make sure that the **Account for Earth's curvature** checkbox not selected.

V

You should only account for the Earth's curvature when using small-scale images or when it is necessary to take this factor into account. Alternately activating and deactivating this option (and then clicking **Apply**) allows you to observe changes to the RMS error. Accounting for the Earth's curvature slows down the rectification process.

Edit Fiducials

1. Click the **Fiducials** tab at the top of the Camera Model Properties dialog.

Click here to view the Fiducials options	Camera Nodel Properties (No File)	
	General Fiducials Orientation Projection	Apply
Click here to select this Fiducial Type	Fiducial Type: Viewer Fiducial Locator: Status: Unsolved 1 2 1 2 0 4 4 3 0 4 0 10	Reset
Click here to select the Viewer in which to locate fiducials	Poer 8 Color Image X Image Y Film X Film Y	Save As Close Help Report
		1

The Fiducial options display.

- 2. Under Fiducial Type, click the Four Corners fiducial icon
- 3. Under Viewer Fiducial Locator, click the Toggle icon 🔲 .

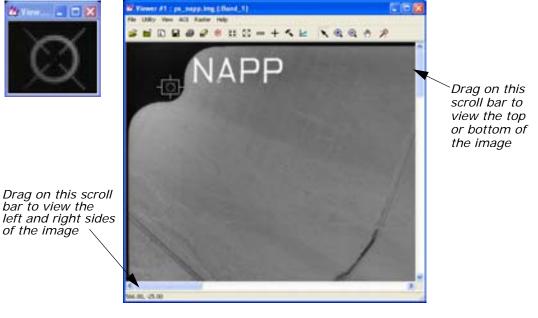
 Follow the instructions by clicking in the Viewer that contains ps_napp.img.



A link box opens in the first Viewer, and the Chip Extraction Viewer also displays (the second Viewer).

5. In the first Viewer, drag the link box to the fiducial in the image you want to digitize (as illustrated in the following example). Place the center of the link box on the fiducial at the center of the area (where the crosshair intersects).

NOTE: Identifying the fiducial may sometimes require Breakpoint/LUT adjustments.



The second Viewer displays the point in the image that you have chosen with the link box.

6. In the Camera Model Properties dialog, click the Place Image Fiducial



7. Move your cursor into the Chip Extraction Viewer (the second Viewer), and click the center area where the crosshair intersects.



Click here to place the image fiducial

The point coordinates display under **Image X** and **Image Y** in the Fiducials CellArray of the Camera Model Properties dialog.

8. Create three more fiducials by repeating step 5 and step 6 in the three other corners of the image in the first Viewer. Move clockwise around the image in the Viewer, using the Viewer scroll bars, as shown in the following illustration:



Enter Film Coordinates

It is necessary to enter the **Film** coordinates into the Camera Model Properties dialog manually. The data provider can include this information in the camera calibration certificate.

1. Being sure to match the point numbers with the proper coordinates, enter the **Film X** and **Film Y** coordinates from the following table:

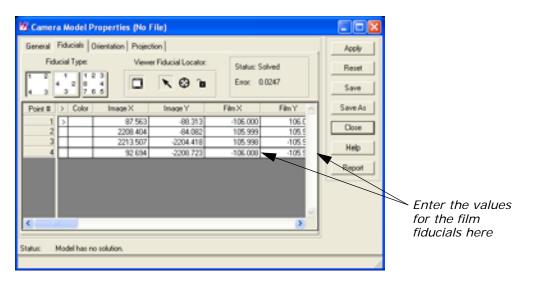
Table 7:	Film X	and Film	Y Coordina	ates
----------	--------	----------	------------	------

Point #	Film X	Film Y
1	-106.000	106.000

Point #	Film X	Film Y
2	105.999	105.994
3	105.998	-105.999
4	-106.008	-105.999

Table 7: Film X and Film Y Coordinates (Continued)

When the last **Film** coordinate has been entered in the Camera Model Properties dialog, the **Status** changes to **Solved** and the software calculates the **Error**. The presence of the **Error** value indicates that the interior orientation parameters have been solved.



An error of less than **1.0000** is acceptable. An error of greater than **1.0000** indicates that the points were inaccurately measured or poorly identified. You can reposition the points using the Select

Image Fiducial icon 🔪 to improve your results.

2. In the Camera Model Properties dialog under Viewer Fiducial

Locator, click the Toggle icon 🔲 .

The Chip Extraction Viewer (the second Viewer) closes.

 Click the Orientation tab in the Camera Model Properties dialog. The Orientation options display.

General Fiducials	Orientation Projection	Acoly			
	Rotation Angle:	Reset			
	Unknown Comega: 0.000	Save			
	Unknown Phi 0.000	Save As			
	Unknown 💌 Kappar 0.000	Close			
Perspective Center Position:					
	Unknown 💌 × 0.000 ÷	Report			
	Unknown • 7: 0.000				
	Unknown 💌 Z 0.000				
latur: Model has	no solution.				

If you have known parameters for the **Rotation Angle** and **Perspective Center Position** derived from another triangulation package, **Fixed**, or if you have estimated values, **Estimate**, you can enter them in the **Orientation** tab.

In this example, the orientation parameters are **Unknown**.

If **Account for Earth's curvature** is selected under the **General** tab, then the options on the **Orientation** tab are disabled (see step 4).

Change Projection

 Click the **Projection** tab in the Camera Model Properties dialog. The Projection options display.

	20 Camera Nodel Properties (No File)	
	General Fiducials Drientation Projection	Apply
	Current Reference Map Projection:	Reset
	Projection: Unknown Spheroid Zone Number: Distanc	Save Save As Close
<i>Click this button to change the</i>	Map Unit: Other	Help Report
projection ——	Set Phojection from GCP Tool	

In the Projection options, click Add/Change Projection.
 The Projection Chooser dialog opens.

	🖉 (Edited) Projection Chooser		×	_Click here to
	Standard Custom			select UTM
	Projection Type UTM		Save	
Click here to view	Spheroid Name: Datum Name:	Clarke 1066	Delete	Click here once
the Custom options	UTM Zone:	11	Rename	the projection has been chosen
	NORTH or SOUTH:	Noth	Cancel	
			Help	

- 3. In the Projection Chooser dialog, click the **Custom** tab.
- 4. Change the **Projection Type** to **UTM** using the dropdown list.
- 5. Change the **Spheroid Name** to **Clarke 1866** using the dropdown list.
- 6. Change the Datum Name to NAD27 using the dropdown list.
- 7. Change the **UTM Zone** to **11** by typing in the value or using the increment nudgers.
- 8. Confirm that the NORTH or SOUTH window displays North.
- 9. Click **OK** in the Projection Chooser dialog.

The projection information you just entered displays under **Current Reference Map Projection** in the Camera Model Properties dialog.

 In the Camera Model Properties dialog, click the dropdown list next to Map Units and select Meters (this activates the Apply button).

	I Properties (No File)	Acoly
	Current Reference Map Projection: Projection: UTM Spheroid: Darke 1985 Zone Number: 11 Datum: NAD27 Map Units: Meteors Add/Change Projection Set Projection from GCP Tool	Reset Save As Close Help Report
Status: Model h	as no solution.	5

11. Click **Apply** and then **Save As** in the Camera Model Properties dialog.

Name the Geometric Model

The Geometric Model Name dialog opens.

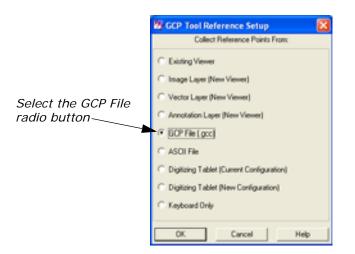
 In the Geometric Model Name dialog next to File name, enter the name geomodel in the directory of your choice, then press Enter on your keyboard.

The .gms file extension is added automatically.

2. Click **OK** in the Geometric Model Name dialog.

Start the GCP Tool and compute RMS Error

In the Geo Correction Tools dialog, click the GCP Tool icon .
 The GCP Tool Reference Setup dialog opens.



2. In the GCP Tool Reference Setup dialog, select GCP File (.gcc) under Collect Reference Points From, and then click OK.

The Reference GCC File dialog opens.

3. In the Reference GCC File dialog, select ps_camera.gcc.

The reference points in this file were obtained from USGS 1:24,000 scale topographical maps using a digitizer.

4. Click **OK** in the Reference GCC File dialog.

A Chip Extraction Viewer (the second Viewer), a link box, and the GCP Tool open.

Piet R	Poet D	> Coke	Kinovi	Yinpit 3	XRet	VRet	28d	Tupe	Stephed	VReidul	PHG Exa	Cureb	Match
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- 3	(ZP #):		000.021	4/1.726	541 909 315	3747250.594	101366	Control					
	GCP BA		1,270,131	-1271.888	544030.3%	3744296.4000	147,218	Cardual					
5	COP #5		1687.298	-580.500	\$45797,266	3747369.601	159 105	Control					
	6CP #6		2146.066	2223 600	547900 790	3740212.455	105.680	Canhol					
7	GCP M7		2019.663	/1102.182	547295 419	3745049.591	134721	Caretal					
	ECP NO.		150.746	430.589	\$10,216,585	3746925.105	249,000	Control					
. 3	GCP #8		765.425	-1525 152	\$29516,199	2743200 1500	453.0001	Control					
							1						

5. In the GCP Tool, click the Solve Geometric Model icon Σ .

NOTE: The orthorectification models do not have the option of Automatic Transform Calculation.

Clicking this icon solves the model and calculates the RMS error and residuals. The **Control Point Error** for the **X** and **Y** values displays beside the icons on the GCP Tool.

Error displays boro

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	11	APR 1	-	-	1401.176	2101 950	544(57.897	3740719.772	118.822	Caretal	0.549	0.542	1.0%	1 102	
	2	GCF RD		1	050.947	2214.612	542301.251	3740224.479	132 506	Control	1.300	0.634	1.529	1.543	
	3	(JCP #)	5	-	000.021	4/1.726	541909 315	2747250 594	100.364	Control	-0.210	0.736	1.705	6.772	1.1.2
	4	GCP BA		-	1,270,131	-1271.888	544030 350	3744296.4000	147,218	Central	8.522	0.600	1.405	5.812	-
	5	60P #5	_	-	1687,298	580 500	545797,266	3747369 601	153 105	Caretal	1.995	0,210	1.176		
	31	GCP #6		-	2146.066	2223 600	547900 790	3740212.455	105 680	Canhol	0.616	4,972	1,161	1.165	
	1	GCP M7		-	2019 6631	0102.182	547295 419	3745049 591	134721	Caretal	0.494	0.8%	1.969		
		GCP #0		-	150.746	430.589	\$10,25,585	3746321.105	248.000	Cartal	0.546	-0.626	14.77	6512	
	10	GCP #8	P	-	765.425	-1525 152	\$20516.099	2743200 1500	453.0001	Control	0.566	0.368	0.675	0.601	-

NOTE: The GCP Tool requires a minimum of three GCPs to run the model and at least six GCPs to make the model accurate and stable.

Choose Your Path

- 6. Click Save in the Camera Model Properties dialog.
 - If you would like to resample the camera image, proceed to "Resample the Image".
 - If you would like to calibrate the camera image, proceed to "Calibrate the Image".

Resample the Image

Resampling requires an input file and a transformation matrix by which to create the new pixel grid.

1. In the Geo Correction Tools, click the Resample icon $I\!\!B$.

The Resample dialog opens.

Enter the output	🕼 Resample	×	
file name here	Output File: (*.img)	Recample Method:	<i>Click this dropdown</i>
	geomodel ing	Cubic Convolution	list to select Cubic Convolution
	Output Mr	ap Information:	
	Projection: UTM		
	Units: meters		
	Number rows: 995	Number columns: 1000	
	Outpu	# Corners:	
Change the output	ULX 538538.000000 ÷	LRK: 543958.000000 *	
cell sizes here	ULY: 3749059.000000 -	URY: 3739915.000000	
		From Inquire Box	
,	Output	Cell Sizes:	Click to enable
	× 10.00000 🚊 Y: 11	Normal	the ignore
	Recalculate Output Defaults	Ignore Zero in Stats	zeros option
	OK. Batch	Cancel Help	

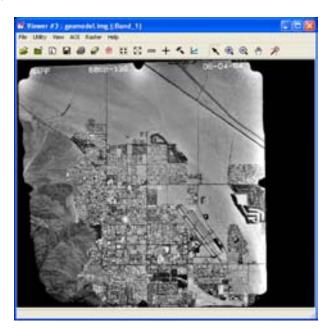
- 2. In the Resample dialog under **Output File**, enter **geomodel.img** in the directory of your choice.
- 3. Under **Resample Method**, click the dropdown list and select **Cubic Convolution**.
- 4. Under Output Cell Sizes, enter 10 for X and 10 for Y.

NOTE: The default **Output Cell Sizes** *are based on the triangulation. The smaller the pixel size, the larger the output file size.*

- 5. Click the Ignore Zero in Stats. checkbox to activate it.
- 6. Click **OK** in the Resample dialog.

A Job Status dialog displays, indicating the progress of the function.

 When the Job Status dialog indicates that the process is 100% complete, click OK. 8. Display **geomodel.img** in a Viewer to view the resampled orthoimage.



- Calibrate the Image To proceed with this portion of the tour guide, you must have completed the steps to rectify **ps_napp.img** in "Rectify a Camera Image".
 - 1. In the Geo Correction Tools dialog, click the Calibrate Image icon

A Calibrate Image warning box displays.



2. Click **OK** in the Calibrate Image warning box.

The Geo Correction Tool and all its associated dialogs close. The file **ps_napp.img** closes and then reopens in the Viewer, with the **Orient Image to Map System** option turned off. To apply the calibration to the image in the Viewer, you must redisplay the output image with the **Orient Image to Map System** option turned on.

- Click the Open icon and navigate to the location where you saved ps_napp.img.
- 4. Select the file, then click the Raster Options tab.

	Select Layer To Add:	
	File Rester Options Multiple	
	Display as : Gray Scale	OK. Cancel
<i>Select the Orient Image to Map System checkbox</i>	Laper 1 🚊	Help
to apply the calibration	Grient Image to Map System	Recent Goto
	Clear Display TSet View Extent	
	Fit to Frame No Stretch Data Scaling Background Transparent Zoom by: 1.00 ÷ Using: Nearest Neighbor	

5. In the **Raster Options** tab, click to select the option **Orient Image** to **Map System**, then click **OK** in the Select Layer To Add dialog.

NOTE: Once calibrated, this image cannot be reused in the orthorectification process using the information/coordinates files provided. Calibration must be deleted (Edit -> Delete Map Model in the ImageInfo dialog) for this file to be used again for this tour guide.

6. In the Viewer, click the Info icon information.

The ImageInfo dialog opens, displaying the information for the calibrated image.

Edit View H				_				
Ο 🕘 Σ	1 🛦 👎	1	land_1	•	14 14			
netal Projection	Histogram Pis	el data	GCP_Table					
	Loper Name:	Band	_1 File	Type:	IMAGINE Image			
File Info:	Last Modified	W/ed	Aug 11 16:16:41 1	999	Number	of Li	WAL	1
	Widh	2294	Height	2294	Type: 0	Conti	nuous	
Layer Info:			Block Height	64	Data Type: 1		pred 8-bit	
caper - rec	Compression				Data Order:	0 II.		
	Pyramid Layer Alg	orithm:	IMAGINE	22 R	reampling			
	Mirc	0	Max	247	Mei	ari:	119.622	
Statistics Info:	Median	124	Mode:	129	Std. Dev	e -	28.472	
			Skip Factor X		Skip Factor Y		22	
	Last Modified	Wed	Aug 11 16:16:43 1	999				
Map Info:	Upper Le	AX: 53	0537.6815997326	0	Upper Left Y: 374	9594	26952900	510
F (Fie)	Lower Rig	h20 54	0555.3920321332	20	Lower Right Y: 373	9917	1005441471	001
	Pixel Siz	e X: N/	(A		Pixel Size Y: N/0			
		Unit me	elens		Geo. Model: Can	iera		
	Projection: U	ITM, Zo	me 11					
Projection Info:	Spheroid 0	Jake 1	166					
	Datum: N	WD27						



For a more in-depth discussion of the concepts behind rectification, see the chapter "Rectification" in the <u>ERDAS Field</u><u>Guide</u>.

Terrain Surface Interpolation

Introduction

The Surfacing Tool enables you to create a three-dimensional surface from irregularly spaced points. Supported input data include:

- ASCII point files
- Arc point and line coverages
- ERDAS IMAGINE *.ovr layers
- existing raster images (IMG)

All input data sources must have X, Y, and Z values. Surface Interpolation calculates Z values at spatial locations where no Z samples exist in the input data source. The output is a continuous raster image that contains Z values calculated from the interpolation process.

The ERDAS IMAGINE Surface Tool uses a TIN interpolation method. At each point where there is a known value, that known value remains unchanged in the output surface. Where the value is not known, it is interpolated from the surrounding known values.

Two TIN interpolation methods are available in the Surface Tool: Linear and Nonlinear. The Linear interpolation method, which makes use of a first-order polynomial equation, results in the TIN triangles being defined as angular planes. The Nonlinear interpolation method, which uses a fifth-order polynomial, results in a smooth surface. In this case, the TIN triangle areas are not considered to be planes, but areas that have rubber sheet characteristics. The Linear interpolation method is quicker and the results more predictable. However, the Nonlinear interpolation method produces more continuous results from irregularly distributed data sets where the observed phenomena has a rolling, nonangular surface characteristic.



Approximate completion time for this tour guide is 15 minutes.

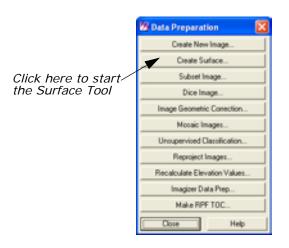
Create a Surface

ERDAS IMAGINE must be running and a Viewer open.

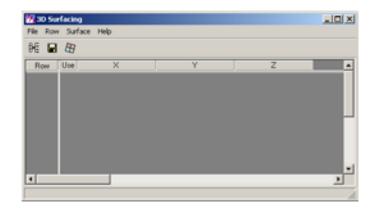
1. Click the DataPrep icon on the ERDAS IMAGINE icon panel.



The Data Preparation menu opens.



 In the Data Preparation menu, click Create Surface. The 3D Surfacing dialog opens.



3. Click **Close** in the **Data Preparation** menu to clear it from the screen.

Import an ASCII File

In the 3D Surfacing dialog, click the Read New Data icon <u>I</u>.
 The Input Data dialog opens.

	💯 Input Data		×	
	Point Data	C Breakline Data		
	Source File Type:	ASCI File	-	
Enter the name of \sim	Sour	ce File Name: (*.dat)	2	Click this dropdown and select ASCII File
the source file here				
	OK.	Cancel	Help	

- 2. In the Read Points dialog, click the dropdown arrow next to **Source File Type** and select **ASCI1 File**.
- 3. Under Source File Name, enter Inpts.dat.

This file is located in the <IMAGINE_HOME>/examples directory, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.

4. Click **OK** in the Read Points dialog.

The Read Points dialog closes, and the Import Options dialog opens.

💯 Import Options	LO X	
File to Import From: d./examples/Impts.dat		Click this tab to preview the
Field Definition Input Preview		input data
Field Type: C Delimited by Separator C Field Width		
Separator Dharacter: WhiteSpace	•	
Row Teminator Character: NewLine (Unix)		
Comment Character:		
Number of Rows To Skip: 0	3	
Column Mapping Output Column Name Input Field Number X 1 Y 2 2 3	- - -	
OK View Cancel	Help	

5. In the Import Options dialog, click the **Input Preview** tab to see how the ASCII file is imported and mapped under the present parameter settings.

🗿 Import Opti	005		LIDI X
ile to Import From	κ (d./examples/inpls.dat	
Field Definition	Input Pre	view	
Row	Field 1	Field 2	
1 1		247591.3125	.3
1 2 2 3 3 4 4 5 5		.247591.53125	.3
3 3		.247660.609375	3
4 4		.247670.21875	.3
5 5		.247686.953125	.3
6 6		.247684.953125	3
7 7		.247716.09375	3
4			2
Column Mapping			
Output Colum	n Name	Input Field Number	*
×		1	
Y		2	
Z		3	
			¥.
	_	iew Cancel	Help

From the **Input Preview** display, you can tell that the **Separator Character** is the comma and that **Field 1** should be ignored.

- 6. Click the Field Definition tab.
- 7. Click the dropdown list next to **Separator Character** and select **Comma**.
- 8. In the **Column Mapping** CellArray, alter the **Input Field Number** column values vertically from **1**, **2**, **3** to **2**, **3**, **4** in order to ignore the ID column of the input file.
- 9. Click OK in the Import Options dialog.

A Job Status dialog opens, reporting the progress of the function.

10. When the Job Status dialog shows that the process is 100% complete, click **OK (if necessary)**.

The **X**, **Y**, and **Z** columns of the 3D Surfacing CellArray are now populated with 4,411 rows of X, Y, and Z coordinates.

	BR	1			
	Use	×	Y	Z	i.
1	X	247591.3125	3790694.250	005.000	
2	×	247591.531	3790054.250	005.000	
3	×	247660.609	3790056.750	005.000	
- 4	×	247670.219	3790694.000	005.000	
5	×	247606.953	3790562.000	005.000	
6	×	247684.953	3790423.250	005.000	
7	×	247716.094	3798251.750	005.000	
8	×	247042.250	3790223.250	005.000	
9	×	247902.391	3798260.750	005.000	
10	X	240110.344	3790219.500	005.000	

11. If you like, you can save these points as a **Point Coverage** (.arcinfo) or an **Annotation Layer** (.ovr) by selecting **File -> Save As** from the 3D Surfacing dialog menu bar.

Perform Surfacing

1. In the 3D Surfacing dialog, click the Perform Surfacing icon 🌆

The Surfacing dialog opens. The extent and cell size defaults are filled in automatically, based on the source ASCII file.

	Surfacing 🕺
	Output File: (*.ing) Surfacing Method:
Enter the path—	suface ing 🙀 Non-linear Rubber Sheeting 💌
and name of the	Output Information: Click here to
output file here	Column 511 Rove 512 Select the surfacing
	Cet See X 3000000 - Cet See Y. 3000000 - method
	IF Make Cells Square
	Output Comers:
The information in these fields is automatically	Click to enable this checkbox
generated	ULY: 3007079.000000 + URY: 3791755.000000 +
	Background 0.0000
	Output Data Type: Unsigned 16 bit
Click OK to run the Surfacing	Contour Map (optional)
program	Create a Contour Map Contour Interval
	Contour Interval Contour Interval Contour Interval Contour Interval Contour At Contour At Contour At
	Remove Contours Shoter Than
	OK Batch Cancel Help
	Perform the Surfacing

The two options for a surfacing method are **Linear Rubber Sheeting** (1st Order Polynomial solution) and **Non-linear Rubber Sheeting** (5th Order Polynomial solution).

- 2. Under **Output File**, enter the name of the output file (for example, **surface.img**) in the directory of your choice.
- 3. Click the dropdown list next to **Surfacing Method** and select **Nonlinear Rubber Sheeting**.
- 4. Click the Ignore Zero In Output Stats checkbox to enable it.
- 5. Click **OK** in the Surfacing dialog.

A Job Status dialog displays, stating the progress of the function.

6. When the Job Status dialog reads that the function is 100% complete, click **OK** (if necessary).

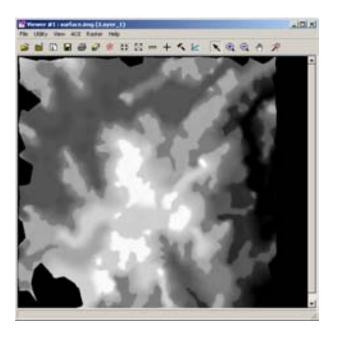
Display the Surface

1. Click the Open icon 🧭 in a Viewer.

The Select Layer To Add dialog opens.

- 2. In the Select Layer To Add dialog under **Filename**, enter the name of the output file you created in step 2., beginning with the directory path in which you saved it.
- 3. Click **OK** in the Select Layer To Add dialog.

The output image displays in the Viewer for you to examine.





To edit portions of the resulting surface, use the raster editing techniques described in "Viewer & Geospatial Light Table" on page 3, "Raster Editor".

Mosaic

Introduction

This tour guide gives you the steps for mosaicking two or more image files to produce one image file. The mosaicking process works with rectified and/or calibrated images. Here, you are shown how to mosaic air photo images as well as LANDSAT images.

Approximate completion time for this tour guide is 45 minutes.

Mosaic Using Air Photo Images

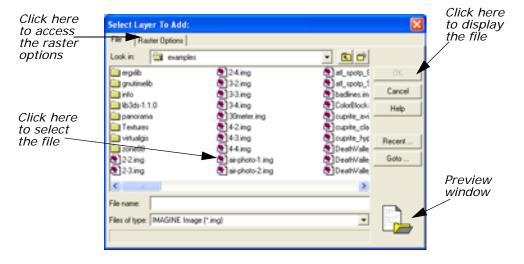
In this section, you use a template to mosaic two air photo images. The two files to be mosaicked are **air-photo-1.img** and

air-photo-2.img. These data files are air photo images of the Oxford, Ohio area.

ERDAS IMAGINE should be running and a Viewer should be open.

 In the Viewer, select File -> Open -> Raster Layer or click the Open icon 2

The Select Layer To Add dialog opens.



- 2. In the Select Layer To Add dialog under Filename, select air-photo-1.img from the file list.
- 3. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 4. Click the Fit to Frame option to enable it.

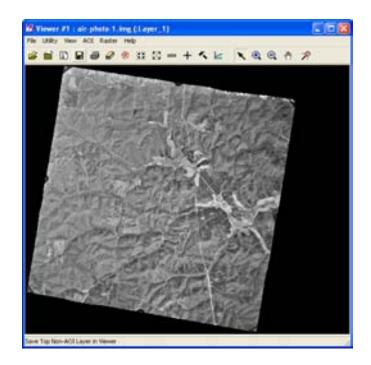
Click OK in the Select Layer To Add dialog.
 The file air-photo-1.img displays in the Viewer.



6. Click the Viewer icon on the ERDAS IMAGINE icon panel to create a second Viewer.

Viewer	

 Repeat step 1 through step 5 for the second Viewer, selecting air-photo-2.img this time.



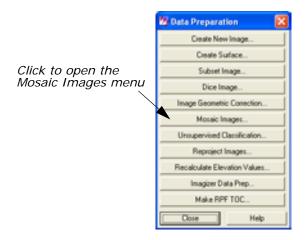
 Position the Viewers side by side by selecting Session -> Tile Viewers from the ERDAS IMAGINE menu bar.

You can resize each Viewer so that they take up less screen space by dragging any corner of the Viewer.

9. In the ERDAS IMAGINE icon panel, click the DataPrep icon.

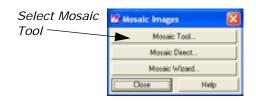


The Data Preparation menu displays.

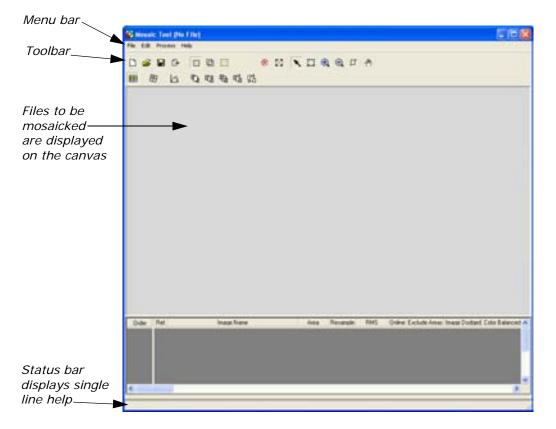


10. In the Data Preparation menu, select Mosaic Images.

The Mosaic Images menu opens.



11. Select Mosaic Tool from the Mosaic Images menu. The Mosaic Tool opens.



12. Click **Close** in the **Data Preparation** menu to clear it from the screen.

Set Input Images

In the first Viewer containing air-photo-1.img, select AOI -> Tools.

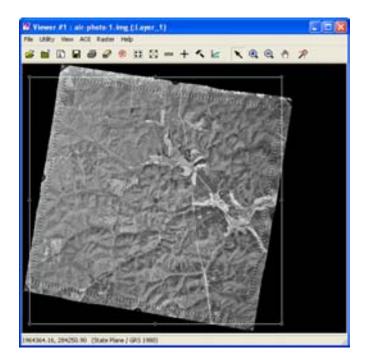
The AOI tool palette displays.



- 2. In the AOI tool palette, click the Polygon icon ${ mod M}$.
- **3.** In the first Viewer, draw a polygon around the border of the inside of the image, cutting out the fiducials, by moving your mouse around the interior border of the image and clicking to draw vertices (that is, on-screen digitize the outline of the image). Middle-click to close the polygon.

NOTE: If you do not have a three-button mouse, you can doubleclick to close the polygon.

When you are finished, the AOI layer is highlighted with a dotted line and the image is surrounded by a bounding box. The image in the first Viewer should look like the following example:



Create a Template

 When you have finished drawing the polygon, select File -> Save -> AOI Layer As in the first Viewer.

The Save AOI As dialog opens.

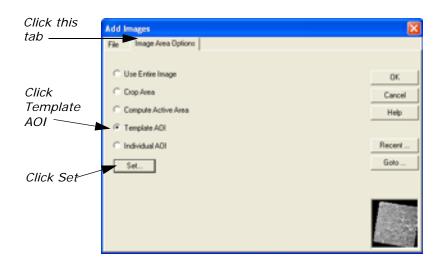
	🖉 Save AOI As 🔀
Enter the directory and file name here	Save AOI as: (1.ao)
	My Music My Pictures
	My Videos
	documents 💌
Click here to save	E Selected Only
	OK Cancel Help

- 2. Under Save AOI as, enter template.aoi in the directory of your choice and click OK.
- In the Mosaic Tool viewer, select Edit -> Add Images, or click the Add Images icon +.

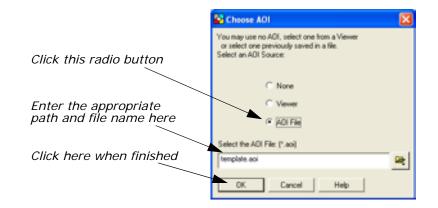
Add Images \times Click this tab to File Image Area Options choose options Look in: 🔄 examples - 🗈 🗗 such as Select this 🦲 ergelib 3_qtoqs_lte 24.ing OK. Template AOI info 👏 3-2 ing file 、 1_qtoqs_16 💽 and the Cancel 🔊 3-3.img 🖢 badines.im accompanying 🛅 lib3ds-1.1.0 💽 3-4 ing 🕤 Colorillock Help 30meter ing panorama cuprite_avi Set button. 📋 Textures 🖲 4-2.ing cuprite_cla 14-3.img 🦲 virtualgis cuprite_hyp Recent. acre00]4-4.ing DeatWalle 22.ing 23.ing Goto DeatWalle air cho DeathValle 🔊 airchoto-2 in g < > File name: airphoto1.ing Files of type: [MAGINE Image (*.ing) ٠ greyscale : 1110 Rows x 1108 Columns x 1 Band(s)

The Add Images for Mosaic dialog opens.

- 4. Under File, select air-photo-1.img.
- 5. Under Image Area Options, click the Template AOI radio button, and then click the accompanying Set button.



The Choose AOI dialog opens.



- 6. In the Choose AOI dialog under AOI Source, select File.
- 7. Under AOI File, select template.aoi from the directory where you saved it.
- 8. Click OK in the Choose AOI dialog.
- Click OK in the Add Images dialog to display air-photo-1.img in the Mosaic Viewer.
- 10. Click the Add Images icon to open the Add Images dialog.
- **11.** In the Add Images for Mosaic dialog under **File**, select **air-photo-2.img**.
- 12. Under Image Area Options, click the Template AOI button and click Set.
- **13.** In the Choose AOI dialog, select **template.aoi** from the directory where you saved it.
- 14. Click OK in the Choose AOI dialog.

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

The data for **air-photo-2.img** displays in the Mosaic Image List CellArray, and a graphic of the image displays on top of the **air-photo-2.img** graphic in the canvas of the Mosaic Tool viewer.

k this for input le	Match histograms, color balance, or image dodge using this icon /
Hersaic vel (Her File)	
	I ● 23 ▼□ Q Q □ A
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Order Fiel Insc	ge Name Area Desangle' 2015 Online Exclude Areas Inage Dodget Calls Balanced
1 X e./popue lies/wagne	E7/Issanples/ae.photo1.m Tampiate NN 5.0000 X 87/Issanples/ae.photo2.m Tampiate NN 5.0000 X
2 (a Jordan Jan Jundan	87/muangles/berghoto-2.ml Templan NN 0.0000 X
Set Mode for Stressectors	*

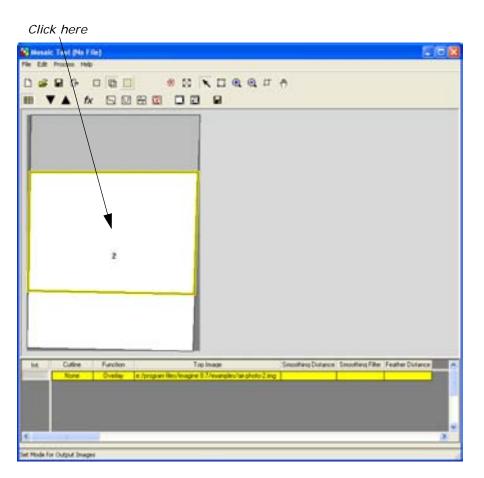
 If the Image List is not automatically displayed at the bottom of the Mosaic Tool viewer, go to Edit -> Show Image Lists, and select it.

The Mosaic Image List displays at the bottom of the Mosaic Tool viewer with the images listed in the CellArray.

Diller	flet,	Invester Name	Ares	freuengie	FORS	Onleas	Exclude Areas	Invace Dodged	Colo Balanced
1	×	d./examples/septoto-1.mg	Tengane	N/N	0.0000	×.			
- 2		d./examples/as.photo-2 mig	Template	NN	6.0000	1.36			

- 1. In the Mosaic Tool viewer, click the Intersection icon intersection lines between the two images.
- **2.** In the canvas of the Mosaic Tool viewer, click in the overlapping area of the two images.

The lines that overlap the two images are highlighted in yellow.

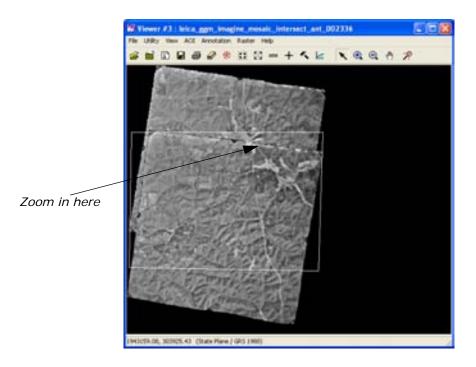


Draw a Cutline

The Mosaic Tool enables you to draw one cutline through all the images or a single cutline in an individual image.

1. In the Mosaic Tool viewer, click the Cutline Selection icon 🔲 .

Viewer #3 opens, displaying the two images as they intersect.



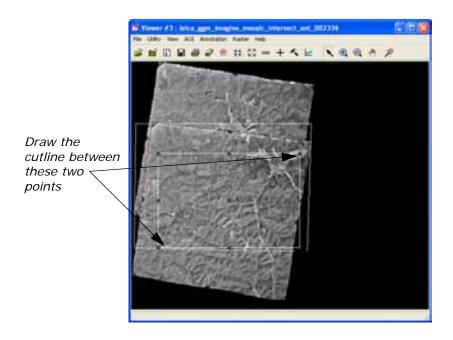
- 2. Use the Zoom In icon (in the Viewer #3 toolbar to zoom in on the spot where you draw your cutline. (Do this by selecting the Zoom In icon and then clicking on the spot for which you want a closer view.)
- **3.** Select the Line icon \swarrow on the AOI tool palette.

Once in the Viewer, the cursor becomes a crosshair.

4. In Viewer #3, draw the cutline by digitizing the intersecting portion (the portion marked by the AOI box). Middle-click when finished.

NOTE: When drawing cutlines, it is best to trace linear landmarks, such as rivers or roads. This conceals any seams in the resulting mosaic.

NOTE: If you do not have a three-button mouse, you can doubleclick to close the polygon.



In the Mosaic Tool viewer, click the AOI Cutline icon 1.
 The Choose Cutline Source dialog opens.

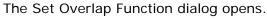
Choose Cutline Source	×
ADI from Viewer	
C Vector from Viewer	
C A01 File	
C Vector File	
Make sure that there is at least one AOI selected in the viewer and then click on DK	
Apply cutines to selected regions only	1
C Cut and merge cutlines crossing multiple intersections	
OK Cancel Help	

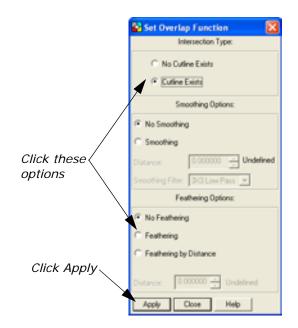
- In the Choose Cutline Source dialog select AOI from Viewer and Apply cutlines to selected regions only (the default), and click OK.
- **7.** An Attention dialog opens, warning you that cutlines can be lost if projection is changed. Click **Yes** in the dialog.

The cutline is highlighted in red in the Mosaic Tool viewer canvas.

🔕 Monalic Tool (PAn File)				
Pile Edit Process Help				
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4				

8. Click the Function icon **fx** in the Mosaic Tool viewer.





9. In the Set Overlap Function dialog under Intersection Type, select Cutline Exists.

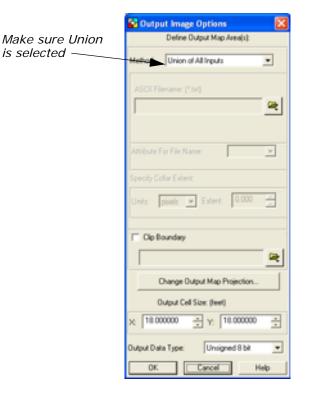
10. Under Select Function, select Feathering.

11. In the Set Overlap Function dialog, click **Apply** and then **Close**.

NOTE: The cutline viewer automatically zooms to whatever is in the Mosaic Tool. In order to only show the overlapping area in the viewer, you need to click the Scale Canvas to Fit Selected Objects icon in .

Define Output Images

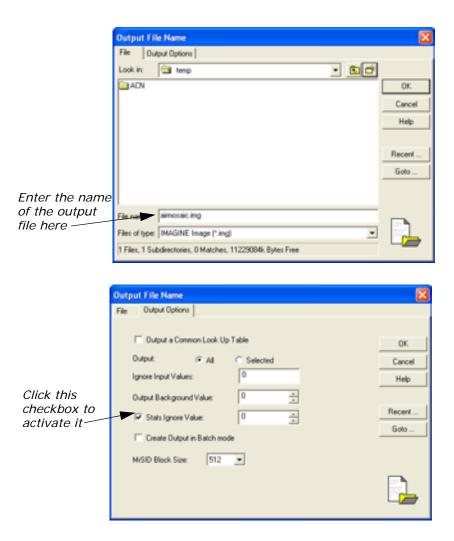
- 1. In the Mosaic Tool viewer, click the Output icon it to activate the output mode.
- In the Mosaic Tool viewer, click the Output Image icon
 The Output Image Options dialog opens.



 In the Output Image Options dialog under Define Output Map Area(s), make sure that Union of All Inputs is selected and click OK.

Run the Mosaic

 In the Mosaic Tool viewer, select Process -> Run Mosaic. The Output File Name dialog opens.



- 2. In the Run Mosaic dialog under **Output File Name**, enter **AirMosaic** in the directory of your choice, the press Enter on your keyboard.
- 3. Click the Output Options tab.
- 4. Click the Stats Ignore Value checkbox to activate it.
- 5. Click OK in the Run Mosaic dialog.

A Job Status dialog displays, showing the progress of the function.

6. Click **OK** when the Job Status dialog reads that the function is 100% complete.

NOTE: The Job Status dialog may close automatically, depending on your settings in Session -> Preferences -> User Interface & Session -> Keep Job Status Box.

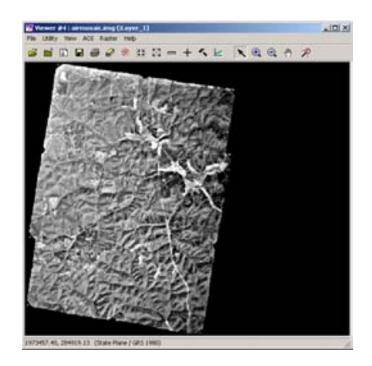
Display the Mosaic

 Click Viewer in the ERDAS IMAGINE icon panel. A new Viewer displays. 2. Click the Open icon 🧭 in the new Viewer.

The Select Layer To Add dialog opens.

- 3. In the Select Layer To Add dialog under Filename, select AirMosaic.img from the directory in which you saved it.
- 4. Click the Raster Options tab and click Fit To Frame.
- 5. Click OK.

AirMosaic.img displays in the Viewer.



6. Compare AirMosaic.img to the original images (air-photo-1.img and air-photo-2.img).

Automatically Generate Cutlines

In addition to drawing a cutline, you can use Mosaic Tool to automatically generate them. In this exercise you use the **2-2.img** and **2-3.img** data in the examples file to generate a cutline and discover how this feature works. You will be starting a new Mosaic Tool Viewer for this exercise.

- 1. Click the DataPrep icon in the IMAGINE toolbar.
- Click Mosaic Images in the Data Preparation dialog. The Mosaic Tool opens.
- 3. Click Close in the Data Preparation dialog to close it.

- In the Mosaic Tool viewer, add the images 2-2.img and 2-3.img by clicking the Add Images icon
- Click the Set Mode for Intersections icon it activate intersect mode.
- Click the Automatically Generate Cutlines for Intersections icon on the toolbar.

The Cutline Generation Options dialog opens.

	Cutline Generation Options	s
	Cutine Generation Method	
Choose which method you want to use	Weighted Cutline Generation Set Geometry-based Cutline Generation	
Check to not see this dialog again	Don't Ask Me This Question Again OK Cancel Help	-

7. Choose the Weighted Cutline Generation option and click Set.

The Weighted Cutline Generation Options dialog opens.

	😵 weighted Cutline Generation Options 🛛 🕺	
You can alter the Segment Length and Bounding Width or leave the defaults	Cutine Refining Parameters Segment Length (in Pixels) 10 Bounding Width (in Pixels) 100 Cost Function Weighting Factors Pixel Value Similarity: 1 Direction: 1 Standard Deviation: 1 OK Cancel Help	If you want one Cost Function to Count more than the others, increase its number

- Leave the default Segment Length, Bounding Width, and Cost Function Weighting Factors at their default settings, and click OK.
- 9. Click OK in the Cutline Generation Options dialog.
- **10.** An Attention box opens telling you that cutlines will be lost if output map projection is changed. Click **Yes** to continue.

The Generating Weighted Cutline job status bar displays while the cutline is being generated. When it is finished a red cutline appears between the two images in the Mosaic Tool viewer.

1	ł	,	

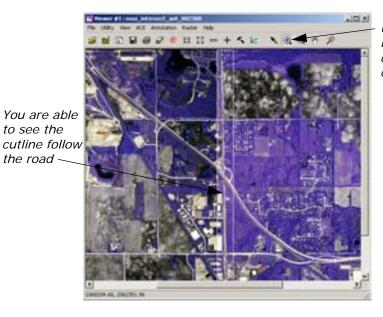
11. Move your cursor within the overlapping portion of the two images where the cutline is drawn and click it.

The area becomes highlighted as does the information below the images.

12. In the Mosaic Tool viewer, click the Cutline Selection Viewer Auto Mode icon .

A Viewer containing the two images opens with the cutline area outlined.

13. Use the Interactive Zoom In icon icon to look at the cutline up close.You are able to see how the cutline that was automatically generated mainly follows the path of a road that separates the two images.



Use the Zoom In icon to view the cutline more closely

Mosaic Using LANDSAT Images

In this section of the tour guide, you mosaic LANDSAT images of MSS and TM scenes.

The three files to be mosaicked are: **wasia1_mss.img**, **wasia2_mss.img**, **and wasia3_tm.img**.

These data files are LANDSAT images of Kazakhstan, in the former USSR.

Display Input Images

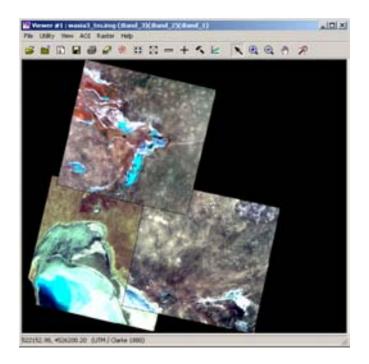
ERDAS IMAGINE should be running and a Viewer should be open.

 In the Viewer, select File -> Open -> Raster Layer or click the Open icon 2

The Select Layer To Add dialog opens.

	Select Layer To Add:	x
	File Raster Options Multiple	
Cliate their	Look in: 🔄 examples	- 6 -
Click this file tab to	Supervised ing	OK
view the raster	TM_1.ing	Cancel
options	TM_shipeding	Help
	myldaria ing	
	venezuela.img	Recent
X	wasia1_mos.ing	
Click here to	vasis2_mos.img	Goto
select the file	1	DI DI
	File name: wasia1_mis.ing	1000
	Files of type: MAGINE Image (*.ing)	· 200
	truecolor : 1143 Rows x 1171 Columns x 3 Band(s)	

- In the Select Layer To Add dialog under Filename, click wasia1_mss.img. Hold down your Shift key after clicking wasia1_mss.img, and click wasia3_mss.img to select all three images at once.
- **3.** Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 4. Click the **Clear Display** option to disable it (this ensures that currently displayed files are not cleared in the Viewer).
- 5. Click the Background Transparent option to enable it.
- 6. Check to be sure that the Fit to Frame option is enabled.
- Click OK in the Select Layer To Add dialog. The three wasia files display in the Viewer.
- 8. When finished, you should be able to see all three files in the Viewer:



9. In the ERDAS IMAGINE icon panel, click the DataPrep icon.

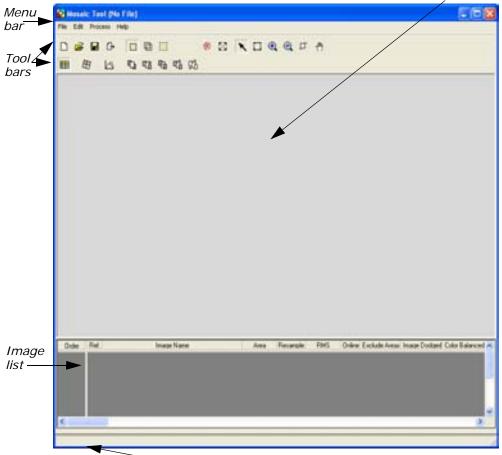


The Data Preparation menu displays.



10. In the Data Preparation menu, select Mosaic Images.

The Mosaic Tool viewer opens.



Files to be mosaicked are displayed here

⁻ Status bar displays single-line help

11. Click **Close** in the **Data Preparation** menu to clear it from the screen.

Add Images for Mosaic

In the Mosaic Tool viewer, click the Add Images icon
 The Add Images for Mosaic dialog opens.

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]shine7.ing]shine0.ing	TM_1.ing (*)(m_060516.ing)		Cancel
]shine9.ing]sku.ing	TM_striped.ing		Help
slope.ing	venezuela.ing		
spots ing spots ing	vgis_30_meter.ing wasia1_max.ing		Recent
StereoSAR_Match.ing	wasia2_mos.imp		Goto
StereoSAR_ReLing	Wesial_tm.ing		
		·	
name: wasia1_mos.img			100

Click this tab and the Compute Active Area button

- In the Add Images dialog under File, select wasia1_mss.img. Hold down the Shift key and click wasia3_mss.img. This should select all three wasia files at once.
- 3. In the Add Images dialog, click the **Compute Active Area** button under **Image Area Options** to enable it, and then click **OK**.

A **Set** button displays when you click Compute Active Area, and if you click it, the Compute Active Area dialog opens.

Active Area Options					
Select Search Layer: 1					
Background Value Range:					
From: 0 × To: 0 ×					
Boundary Search Type:					
Corner C Edge					
Crop Area: 0% -					
OK Cancel Help					

Use this dialog if you want to automatically compute the active areas in your images. For the purpose of this tour, you do not need to click set and change anything in Active Area Options.

The file **wasia1_mss.img** displays as image number **1** in the canvas of the Mosaic Tool viewer. Wasia2_mss.img and wasia3_mss.img display as numbers 2 and 3 respectively.

When you are finished adding the three images, the Mosaic Tool viewer should look like the following:

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							2

Stack Images

The images in the Mosaic Tool viewer are positioned as if they were regular photos that a person stacked by hand. One image intersects everything below it in the stack.

1. Experiment with the stacking order in the Mosaic Tool viewer by clicking on any or all of the images in the canvas and then clicking on any of the icons pictured below:

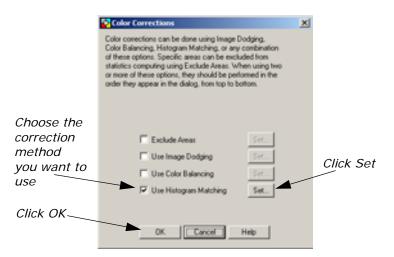


2. When you are finished experimenting with the stacking icons, click outside of the images in the canvas of the Mosaic Tool viewer to deselect the image(s).

Correct Images

Click the Display Color Corrections icon

The Color Corrections dialog opens.



 Check the box for Use Histogram Matching and click Set. The Histogram Matching dialog opens.

Select the	Matching Method	Dverlap Areas	×	 Choose the
Matching Method	Histogram Type:	Band by Band	•	Histogram Type
Check if you want to use an external reference	Histogram Source Filmage File (Ling)	ternal Reference		

- 3. Select **Overlap Areas** from the **Matching Method** dropdown list and click OK.
- 4. Click **OK** in the Color Corrections dialog.
- 5. Click the Set Mode for Intersections icon 🛄 .
- In the Mosaic Tool toolbar, click the Set Overlap Function icon fx.
 The Set Overlap Function dialog opens.
- In the Set Overlap Function dialog under Intersection Type, make sure No Cutline Exists and Overlay under Select Function are chosen. These options are the default choices.

8. Click **Close** in the Set Overlap Function dialog.

Run the Mosaic

 In the Mosaic Tool viewer, select Process -> Run Mosaic. The Output File Name dialog opens.

Output File Name	×
File Output Options	
Look in: 🔄 Users 💌 💽 🗗	
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imagine660	Cancel
i mmod101	Help
color_infrared ing	
Natia_nosaic ing	Recent
	Goto
File name: wasia_mosaic.img	
Files of type: [MAGINE Image (* img)	
truecolor : 2019 Rows x 1883 Columns x 3 Band(s)	

- 2. In the Output File Name dialog, enter a name for the output file in the directory of your choice (for example **wasia_mosaic.img**).
- 3. Click OK in the Output File name dialog.

A Job Status dialog displays, stating the progress of the mosaic operation.

4. Click **OK** in the Job Status dialog when the mosaic operation is finished.

NOTE: The mosaic process time can vary based upon your hardware capabilities and the size of the files.

 Select File -> Close from the Mosaic Tool viewer to clear it from the screen.

You are asked if you want to save the changes in the Mosaic Tool viewer. Save them if you like or click **No** to dismiss the dialog.

Display Output Image

1. Click the Viewer icon on the ERDAS IMAGINE icon panel to open a second Viewer.

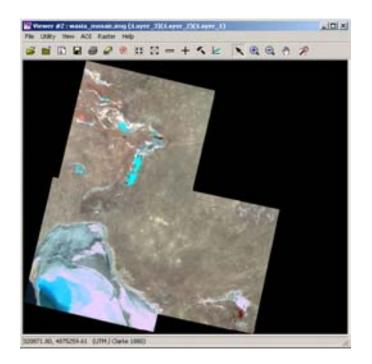


In the Viewer you just opened, select File -> Open -> Raster or click the Open icon 2.

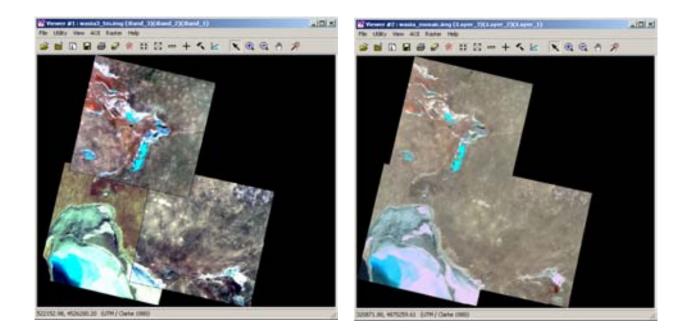
The Select Layer To Add dialog opens.

- 3. In the Select Layer To Add dialog under **Filename**, click the file **wasia_mosaic.img** (or the output mosaic image you previously created). Remember to look in the directory in which you saved the file. You can also click the **Recent** button and choose the file from there.
- 4. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 5. Check to be sure that the Fit to Frame option is enabled.
- 6. Click **OK** in the Select Layer To Add dialog.

The output mosaic file displays in the Viewer.



- 7. In the ERDAS IMAGINE menu bar, select **Session -> Tile Viewers** to position the Viewers side by side.
- 8. Compare the input mosaic images in the first Viewer to the output mosaic image in the second Viewer. You can resize the Viewers by dragging on any of their corners.



Mosaic Color Balancing Using Color Infrared Aerial Photos

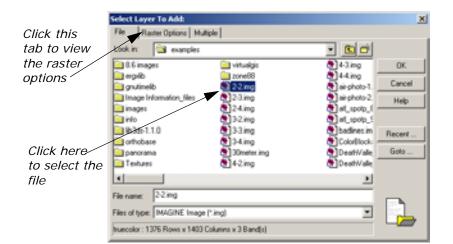
In this section of the tour guide, you mosaic color-infrared aerial photograph images of eastern Illinois, USA. The color red in the photos represents vegetation with deep reds representing healthy vegetation.

The nine files to be mosaicked are: **2-2.img**, **2-3.img**, **2-4.img**, **3-2.img**, **3-3.img**, **3-4.img**, **4-2.img**, **4-3.img**, and **4-4.img**.

ERDAS IMAGINE should be running and a Viewer should be open.

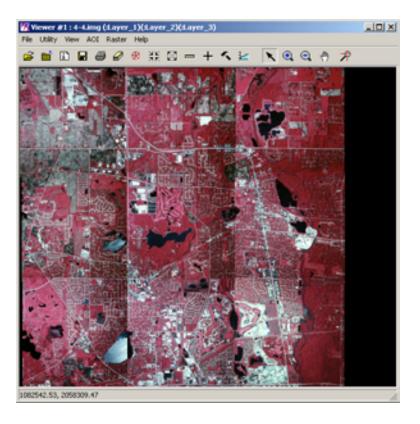
 In the Viewer, select File -> Open -> Raster Layer or click the Open icon 2

The Select Layer To Add dialog opens.



- 2. In the Select Layer To Add dialog under Filename, click 2-2.img. Hold down the Shift key and click 4-4.img. All of the images between the two, 2-3.img, 2-4.img, 3-2.img, 3-3.img, 3-4.img, 4-2.img, and 4-3.img (except for 30meter.img) should also be selected. If you want to deselect an image such as 30meter.img, press Ctrl and click to deselect it. You can also add the images one by one, but it is much faster to use the Shift key to add them all at once.
- 3. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 4. If you are adding the images separately, you will see the Layers to Colors box. Make sure Red is 1; Green is 2; and Blue is 3.
- If adding the images all at once, go to Session -> Preferences -> User Interface and Session and make sure the 3-Band Image Red, Green, and Blue are set to 1, 2, and 3 respectively. If you have had to change these, click User Save and then Close.
- Click the Clear Display option on the Raster Options tab to disable it (this ensures that currently displayed files are not cleared in the Viewer).
- 7. Click the Fit to Frame option to enable it.
- 8. Click the Background Transparent option to enable it.
- 9. Click **OK** in the Select Layer To Add dialog.

You should be able to see all nine files in the Viewer.



You can see patterned color differences in some of the images. Some spots in some of the photos appear brighter or darker than the rest of the image. In order to adjust these color differences, you use the **Mosaic Color Balancing** option in the **Mosaic Tool**.

10. In the ERDAS IMAGINE icon panel, click the DataPrep icon.



The Data Preparation menu displays.

11. In the Data Preparation menu, select Mosaic Images.

The Mosaic Tool viewer opens.

12. Click **Close** in the **Data Preparation** menu to clear it from the screen.

Add Images for Mosaic

In the Mosaic Tool viewer, click the Add Images icon
 The Add Images dialog opens.

Choose this	Add Images File Image Area Options			×	<i>Click this tab</i> <i>and click the</i>
file	Look in examples 0.6 images ergalb grutinelb images images	vitualgis zone88 2.2 mg 2.3 mg 2.4 ing	• 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	OK Cancel Help	Use Entire Image button
	rito Nido-1.1.0 orthobase panovama Tewhizes	 32ing 33ing 34ing 30netering 42ing 	🛃 Colorfillock 📒	Recent	
	File name: 2.2 ing Files of type: IMAGINE Image Inuecolor : 1376 Rows x 1403 C		<u> </u>	}	

- In the Add Images dialog under Image Filename, select 2-2.img through 4-4.img using your Shift or Ctrl key to add them all at once. Do not forget to deselect 30meter.img.
- Click the Image Area Options tab in the Add Images dialog, and make sure the Use Entire Image button is selected, and then click OK.

The files display according to number in the canvas of the Mosaic Tool Viewer.

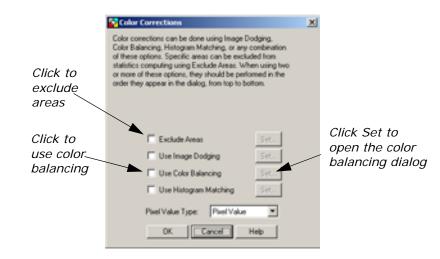
When you are finished adding the nine images, the Mosaic Tool Viewer should look like the following:

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		2	3						
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	7	ā.	,						
der 19	-	Inicial Name	Ans	Resample	Piers	Onire	Exclude Area	e Image Dodo	and Color Balance
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4	d/marphs/34	ng .	Erme	NA	\$ 1000)K			
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	d/manples/43		Erite	NN NN	6.0000			-	-
	d./manpins/84	ed	Eriter	1 144	0.0000	× 1			1

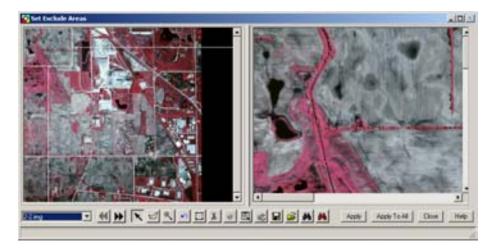
Set Exclude Areas

1. Click the Color Corrections icon 🔝 in the Mosaic Tool viewer.

The Color Corrections dialog opens.



 Select Exclude Areas, and click Set. The Set Exclude Areas dialog opens.



The overview shows the full extent of the image, and the detail view allows you to zoom in on specific areas to create AOIs to be excluded from the Color Balancing process. Use the link cursor to isolate AOIs.

3. Image 2-2.img is the first image displayed in the viewers. Left-hold your mouse and drag the link cursor to the dark body of water in the upper left of the center of the image.

In the **Detail View**, the area is magnified so you can create specific AOIs to exclude from the Color Balancing process.

- 4. Click the Create Polygon AOI icon 🗹
- Your cursor becomes a crosshair when inside a view. Use the Detail View to create polygons around the dark water bodies.



6. When you have finished, use the link cursor to identify any other areas in the image that need to be excluded such as other dark bodies of water, isolated bright urban areas, or bright areas of sun glint.

- 7. Create a polygon around each of the areas you wish to exclude from Color Balancing, and click **Apply**.
- 8. Use the arrow keys or the drop down box to select the next image, 2-3.img

Continue identifying AOIs to exclude through all nine images. Click **Apply** after excluding areas in each image. Click **Close** in the Set Exclude Areas dialog when finished.

Find Like AreasAfter excluding a particular area, you can also use the Find Like
Areas tool to find similar images in one or all of the images you want
to mosaic.

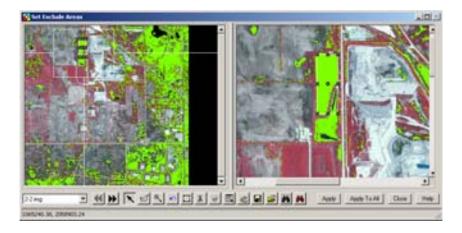
1. Click the Find Like Areas icon **M** in the Set Exclude Areas dialog.

🙀 Find Like Area Options Use the arrows to choose which Select layer to view ADI stats and set searching criteria: layer to use Layer 1 Statistics of the Selected Area The spectral distance information is here Minimum: 10 Maximum: 131 Mean: 23.17 Std. Dev.: 27.917 Median: 12 Mode: 11 Searching Diteria in Laver 1 Use the arrows to Min, Pixel Value: + Max Pixel Valu 131 select your minimum Click this color and maximum pixel palette icon to values Exclude Area Color. choose a color G Current Image only C All Images Apply Searching To: TIK. Cancel Help

The Find Like Areas dialog opens:

- 2. Look at the Layer 1 Statistics of the Selected Area. Notice the Std. Dev (standard deviation), the Mean, and the other statistics.
- 3. Under Searching Criteria in Layer 1 change the Max. Pixel Value to 75.
- 4. Choose the **Exclude Area Color** you want to use by clicking the color palette icon by the color box.
- 5. For Apply Searching To, click All Images.

Set Exclude Areas will calculate the like areas for all images, and the images in both the overview and the detail view will reflect the similar areas in what ever color you chose.



- 6. Click the dropdown arrow and select another image. You can go through all the images to see where the like areas are in each image.
- If you want to, click the Remove Like Areas icon to erase the findings. You do not have to erase the findings, but you can use this icon to do so if you need to.

You can also go back and select an AOI of the lighter colored areas in the image and use Find Like Areas for that as well. Experiment with different types of areas, different spectral distances, and different layers. You can select a dark area and run Find Like Areas and then select a bright-light area and run the feature. Find Like Areas will retain the dark areas while locating and adding the bright areas.

 When you have finished Find Like Areas and excluded the areas in every image you want to exclude for Color Balancing, click Apply To All in the Set Exclude Areas dialog, and click Close.

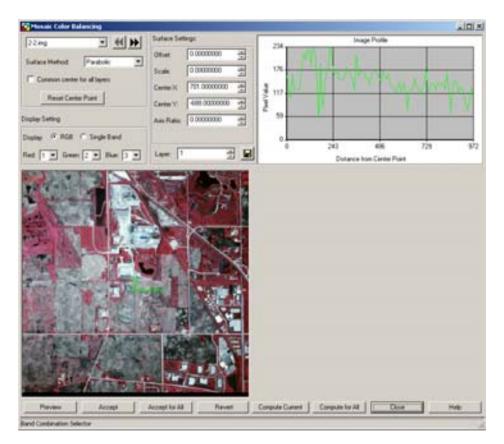
Mosaic Color Balancing

1. In the Color Corrections dialog, deselect Exclude Areas, and choose **Color Balancing** and click **Set**.

The Set Color Balancing Method dialog opens.

Set Color Balancing Method	×
Color balancing can be performed automatically or manually.	
The automatic approach calculates color correction surface	
settings based on a default surface method (specified in	
Preferences). The manual approach allows the user to	
interactively adjust and visually verify the color balanced	
results image by image.	
Correction Method	
C Automatic Color Balancing	
F Manual Color Manipulation Set	
Cancel	

2. Choose Manual Color Manipulation and click Set.



The Mosaic Color Balancing dialog opens.

- 3. The first image, **2-2.img**, displays. If **2-2.img** did not need color balancing, you could skip it, and use the **Arrow Keys** or the dropdown menu in the top left corner to choose another image.
- 4. Under **Display Setting**, make sure RGB is selected, and change Red to 1, Green to 2, and Blue to 3 in order to better compare the mosaicked images with the originals.
- Choose the surface method you want to use in order to color balance the image. You may choose from Parabolic, Conic, Linear, or Exponential.

Unless you are using **Linear** as your surface method, you can click **Common center for all layers** in order to use the same center point in each layer of the image.

- 6. For image 2-2.img, select Conic, and enable Common center for all layers.
- 7. Click **Compute Current** and click **Preview**. The preview viewer displays the color balanced image.
- 8. Click **Accept** after previewing the color balanced image to accept it for mosaicking.

The computed settings are based on the surface method chosen. The **Image Profile** box at the top right of the **Mosaic Color Balancing** dialog depicts the chosen surface method as a red line plotted against a profile of the pixel values shown as a green line between the center point and end point in the image. Results are best when the red line of the surface method matches the general trend of the green line of the image profile.

- 9. Repeat steps 3. through 6. for images 2-3.img, 2-4.img, 3-2.img, 3-3.img, 3-4.img, 4-2.img, 4-3.img, and 4-4.img.
- **10.** Click **Close** in the Mosaic Color Balancing dialog.
- 11. Click OK in the Set Color Balancing dialog.

Match Images

 If you have just completed the previous exercise, click Use Color Balancing to deselect it, and choose Use Histogram Matching. If you are starting this exercise anew, click the Color Corrections icon

in the Mosaic Tool Viewer after adding example images **2-2.img** through **4-4.img**.

The Color Corrections dialog opens.

2. In the Color Corrections dialog, check Use Histogram Matching and Set.

The Histogram Matching dialog opens.

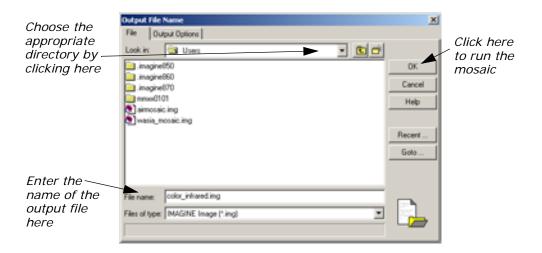
- 3. Select For All Images as the Matching Method.
- 4. Select Band by Band as the Histogram Type.
- **5.** Click **OK** in the Histogram Matching dialog and in the Color Corrections dialog.
- 6. Click the Intersection icon 💼 on the Mosaic Tool toolbar.
- Click the Automatically Generate Cutlines for Intersections icon <u>The Cutline Generation Options dialog opens.</u>
- 8. Click Geometry-based Cutline Generation and OK.
- **9.** Click **Yes** in answer to the question about cutlines being lost if the projection is changed.
- 10. In the Mosaic Tool toolbar, click the Function icon $f\chi$.

The Set Overlap Function dialog opens.

- 11. In the Set Overlap Function dialog under Intersection Type, select Cutline Exists, No Smoothing, and Feathering then click Apply.
- 12. Click Close in the Set Overlap Function dialog.

Run The Mosaic

 In the Mosaic Tool viewer, select Process -> Run Mosaic. The Output File Name dialog opens.



- In the Output File Name dialog under File Name, enter a name for the output file in the directory of your choice (for example color_infrared.img).
- 3. Click OK in the Output File Name dialog.

A Job Status dialog displays, stating the progress of the mosaic operation.

4. Click **OK** in the Job Status dialog when the mosaic operation is finished.

NOTE: The mosaic process time varies based upon your hardware capabilities and the size of the files.

- Select File -> Close from the Mosaic Tool viewer to clear it from the screen.
- 6. Click Yes to save changes in the Verify Save on Close dialog. You can also go directly to the Save Mosaic File As dialog by choosing File > Save in the Mosaic Tool menu.
- **7.** Click the Look in dropdown arrow to choose the directory where you want to save your mosaic file.
- Type the file name in the File name area, and click OK.
 Your parameters and the mosaic set up will be saved.

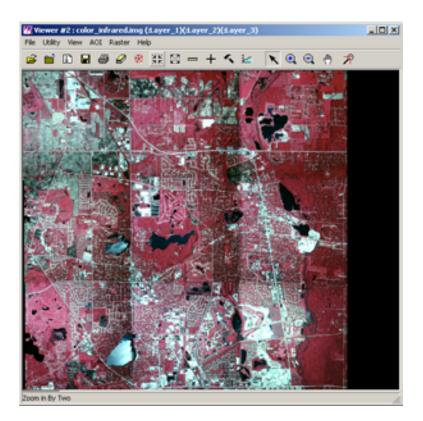
Display Output Image

 Click the Viewer icon in the ERDAS IMAGINE icon panel. A new Viewer displays. 2. Click the Open icon 🧭 in the Viewer you just created.

The Select Layer To Add dialog opens.

- In the Select Layer To Add dialog under Filename, select color_infrared.img from the directory in which you saved it, and then click OK.
- 4. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 5. Check to be sure the Fit to Frame option is enabled.
- 6. Click **OK** in the Select Layer To Add dialog.

The mosaicked output image displays in the viewer.



Mosaic Image Dodging

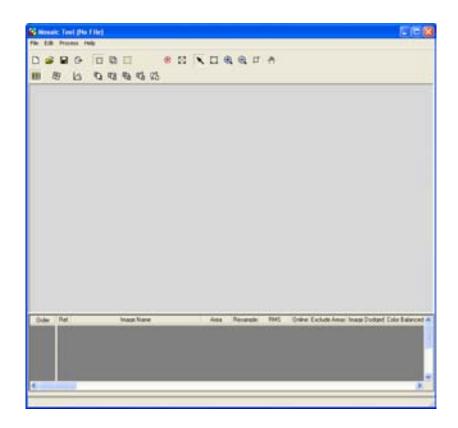
In this section of the tour guide, you use the Image Dodging option to correct light displacement in an image.

1. Click the Data Prep icon



on the IMAGINE toolbar.

 Click Mosaic Images in the Data Preparation list. The Mosaic Tool opens.



- 3. Click the Add Images icon 4 , and select image-dodge-brightspot.img from the examples folder.
- After the image is added to the Mosaic Tool, click the Color Corrections icon .

The Color Corrections dialog opens.

	Color Corrections Color corrections can be done using Image Dodging. Color Balancing. Histogram Matching, or any combination of these options. Specific areas can be excluded from statistics computing uning Exclude Areas. When using two or more of these options, they should be performed in the order they appear in the dialog, from top to bottom.	×
Choose Image Dodging and click the Set button.	Exclude Areas Set. Use Image Dodging Set. Use Color Balancing Set. Use Hotogram Matching Set.	
Click OK	Pixel Value Type: Pixel Value OK Cancel Help	

5. Choose **Use Image Dodging** in the Color Corrections dialog, and click the **Set** button.

- Mosaic Image Dodging ions For Current Image Options For All Images image-dodge-bright-spot.in 💌 📢 🕨 P Band Independent C Don't do dodging on this image Dodging 🤗 Dodge Across Images 🦳 Dodge Individually Statistics Collection Edit Correction Settings. Grid Size: 10 ÷ Apply To All Images **Display Setting** ÷ Apply To All Images Skip Factor X: 1 Display: @ RGB C Single Band Skip Factor Y: ÷ Apply To All Images • Due: Red 1 . Green: 2 Dodged Image Preview Accept for All Compute Current Compute for All Accept Direct Held
- If a prompt about pyramid layers opens, click Yes to calculate them. The Image Dodging dialog opens.

7. In the Image Dodging dialog, make sure under **Display Setting**, the band choices are **Red-1**, **Green-2**, and **Blue-3**.

It is obvious when looking at the image in the dodging viewer that there is a bright spot to correct.

- Look under Statistics Collection at Grid Size, Skip Factor X, and Skip Factor Y. You can change these numbers to suit your purposes, but for this exercise leave them at the defaults of 10, 3, and 3.
- 9. Click Compute Current.
- 10. Click **Preview** to view the image after applying Image Dodging.

The image appears in the Dodge Image Preview section of the dialog.

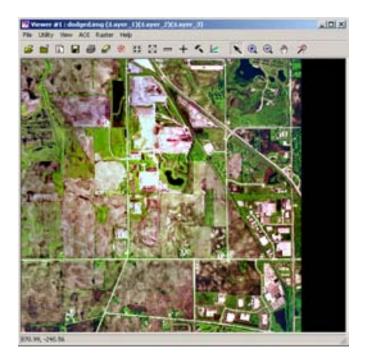
😵 Mosaic Image Dodging	
Options For Current Image	Options For All Images
mage-dodge-bright-spot in 💌 🙀 🕨	🕫 Band Independent
Don't do dodging on this image Statistics Collection	Dodging: @ Dodge Across Images @ Dodge Individually
Grid Size: 10 Apply To All Images	Edit Correction Settings Display Setting
Skip Factor X: 3 Apply To All Images Skip Factor Y: 3 Apply To All Images Edit Correction Settings	Display: @ RGB C Single Band Red: 1 V Green: 2 V Blue: 3 V
Preview Accept Accept Com	pute Current Compute for All Close Help

- **11.** Click **Accept** to accept the dodged image, and click **Close**.
- **12.** Click **OK** in the Color Corrections dialog.
- **13.** In Mosaic Tool, click **Process** and **Run Mosaic**. Even though you are only correcting one image and not technically mosaicking in this process, this option lets you output your dodged image to a file.
- **14.** In the **Output File Name** dialog, browse to the directory where you want to store your output files.
- **15.** Type the **File name** for your image, and click **OK**.
- 16. The Mosaic Job State dialog opens. When it is 100% done, click OK.



Go to the IMAGINE toolbar, and click Viewer.

17. In the Viewer, browse to the directory where your output images are stored, and open the dodged image.



ERDAS IMAGINE Tour Guides

MosaicPro

Introduction

This tour guide gives you the steps for mosaicking two or more image files to produce one image file. The mosaicking process works with rectified and/or calibrated images. MosaicPro allows you the capability of drawing and editing a new seam polygon in an embedded viewer. Seam polygon is applied to the image in which the first vertex is digitized, then the embedded viewer is updated and the input images are stitched along the seam polygon boundaries.

Mosaic Using Laguna Beach Images

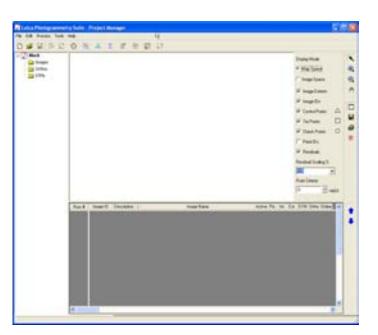
In this section, you will mosaic laguna beach images.

Starting MosaicPro from LPS menu MosaicPro dialog can be started from the LPS **1** or the DataPrep



on the ERDAS IMAGINE icon panel.

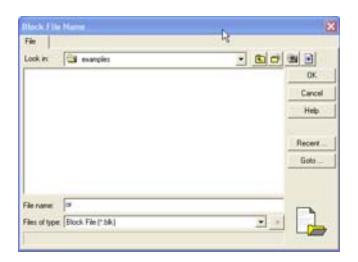
 In the Erdas IMAGINE icon panel, click the LPS icon The LPS Project Manager is displayed.



2. In the Project Manager, select File -> Open or click the Open icon

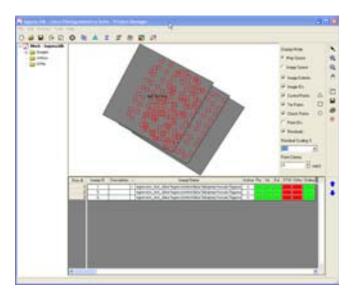


The Block File Name dialog is displayed.



- 3. In the Block File Name dialog under **Filename**, select **laguna.blk** from the list.
- 4. Click **OK** in the Block File Name dialog.

The file laguna.blk is displayed in the LPS Project Manger.



Adding and Displaying Images in MosaicPro

1. Click the Mosaic icon



The Start Ortho Mosaicking dialog is displayed.

📝 Start Ortho Mosaicking. 📐 🛛 🛛
Select Mosaic method to use
MosaicPro
Always use this Mosaic method.
OK Cancel

2. Select **MosaicPro** from the dropdown list and click **OK**.

The MosaicPro Viewer and Elevation Source dialog is displayed.

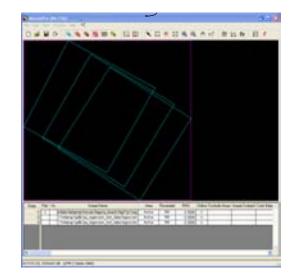
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- 3. In the Elevation Source dialog, click the **DTM File** button.
- **4.** Click the Open icon **a** , and the DTM File dialog is displayed.
- 5. In the DTM File dialog under Filename, select laguna_reference_dem.img from the list.
- 6. Click **OK** in the DTM File dialog.
- Click OK to dismiss the Elevation Source dialog. The Add Images dialog is displayed.

Add Images	×
File Image Area Options	
C Use Enlire Image	0K
C Crop Area	Cancel
Compute Active Area	Help
C Template ADI	
Set	Recent
Block Image Type: Frames	Goto
Set Elevation Source	

- 8. Click the Compute Active Area button.
- 9. Click OK to close the Add Images dialog and add images in the MosaicPro Viewer.

The MosaicPro Viewer is displayed.



The data for **laguna_beach** images displays in the MosaicPro Image List CellArray.

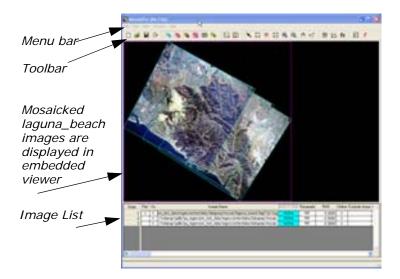
۴-

If the Image List is not automatically displayed at the bottom of the MosaicPro viewer, go to Edit -> Show Image Lists, and select it.

10. Click the Vis box in the image list cellarray, then select View -> Show Rasters in the viewer menu or click the Display raster

images icon 🖣

The raster images are displayed.



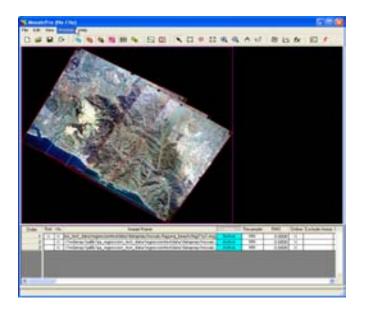
Drawing and Editing Seam Polygons

MosaicPro allows you to draw a seam polygon through images or a single polygon in an individual image.

In the viewer, click the Seamlines Generation Options icon .
 The Seamline Generation Options dialog is displayed.



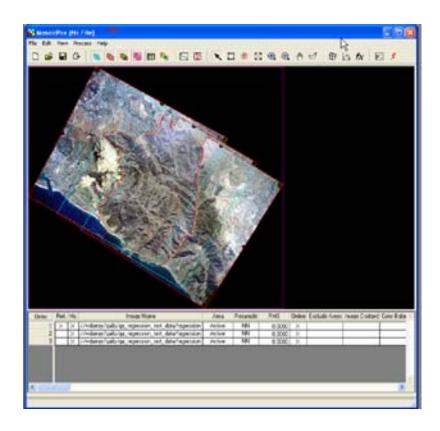
2. Select Most Nadir Seamline and click OK to accept this option.



- **3.** Use the Zoom In icon to look at the seamline area you want to digitize up close.
- **4.** Select the Create Polygon icon on the viewer.

Once in the viewer, the cursor becomes a crosshair.

Draw and edit the seam polygon.
 The edited seam polygon is displayed.



Correcting Color

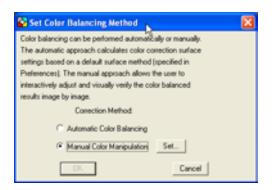
1. Select Edit -> Color Corrections from the viewer menu or click the

Color Corrections icon to open the Color Balancing dialog.

The Color Corrections dialog is displayed.



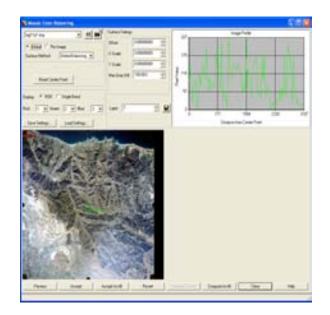
Select Use Color Balancing and click Set.
 The Set Color Balancing Method dialog is displayed.



3. Select Manual Color Manipulation and click Set.

The progress meter runs.

Mosaic Color Balancing dialog is displaced.



- 4. Select **Global** and **Global balancing** form the **Color Balancing** dialog.
- 5. Click Compute for All and Accept for All.
- 6. Click **Close** to accept these changes and close the Color Balancing dialog.
- 7. Click OK to close Color Balancing dialog Method dialog.

In this section, you use the Image Dodging option to correct light displacement in an image.

1. Choose **Use Image Dodging** in the Color Corrections dialog, and click the **Set** button.

The Image Dodging dialog is displayed.

ERDAS IMAGINE Tour Guides

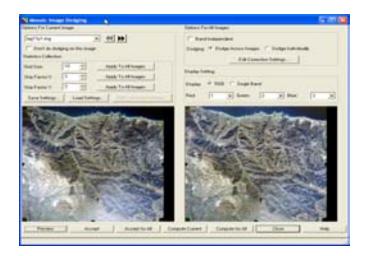
I mage Dodging

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2. In the Image Dodging dialog, make sure under **Display Setting**, the band choices are **Red-1**, **Green-2**, and **Blue-3**.

It is obvious when looking at the image in the dodging viewer that there is a bright spot to correct.

- Look under Statistics Collection at Grid Size, Skip Factor X, and Skip Factor Y. You can change these numbers to suit your purposes, but for this exercise leave them at the defaults of 10, 3, and 3.
- Look under Options For All Images, make sure Band Independent is not selected (unchecked). This will yield Band Dependent results.
- 5. Click Compute Current.
- Click Preview to view the image after applying Image Dodging.
 The image appears in the Dodge Image Preview section of the dialog.

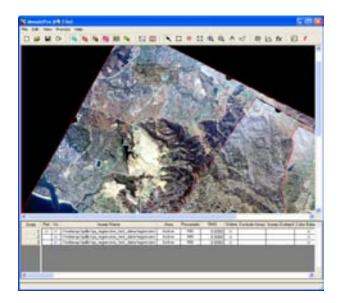


7. Click Accept to accept the dodged image, and click Close.

8. Click **OK** to close Color Corrections dialog.

Previewing the Mosaic

- 1. Select the mosaic preview icon
- 2. Select the area to preview with this box.
- Select Process -> Preview Mosaic for window.
 The preview window is displayed in the image.



- 4. Click **OK** when the Job Status meter is done.
- **5.** Use the Zoom In icon to see the area previewed.
- Select Process -> Delete the Preview Mosaic Window to delete the Preview window.

Setting Seamline Functions

- **1.** Click the Function $\mathbf{f} \mathbf{X}$ icon in the viewer.
- 2. Click No Smoothing for the Smoothing Option.
- 3. Click Feathering for the Feathering Option.
- 4. Click **OK** to accept the changes and close the **Set Seamline Function** dialog.

Defining the Output Images

Click the Output Image icon in the viewer.
 Output Image Options is displayed.

🔁 Outp	ut Image Options 👔
Method	Union of All Inputs
ASCI FI	ename: (*.64)
-	<u>_</u>
	or File Name:
Specify Co	la Esterit
Units:	pixels y Excert, 0.000 +
IT Cip B	oundary
	R
	Drange Output Map Projection
0	utput Cell Size: (meters)
× 300	000 ± Y: 300000 ±
Output Dal	a Type: Unsigned 8 bit 💌
OK.	Cancel Help

- 2. In the Output Image Options dialog under **Define Output Map Area(s)**, make sure that Union of all Inputs is selected.
- 3. Click **OK** to close the Output Image Options dialog.

Running the Mosaic

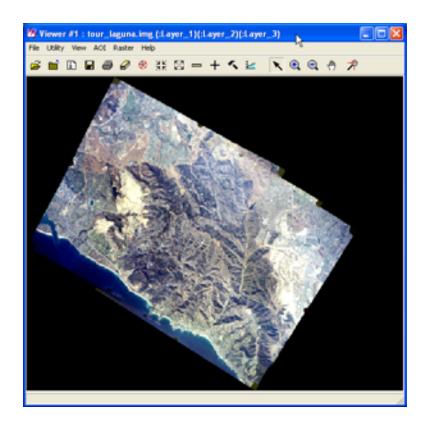
- 1. In the viewer, select **Process -> Run Mosaic**.
- In the Run Mosaic dialog under Output file Name, enter tour_laguna.img in the directory of your choice, then press Enter.

Displaying the Mosaic

- **1.** Open a viewer in the ERDAS IMAGINE icon panel.
- **2.** Click the open icon in the new viewer.
- In the Select Layer to Add dialog under Filename, select tour_laguna.img the file from the directory in which you saved it.

- 4. Click the Raster Options tab and click Fit To Frame.
- 5. Click **OK** to display the file.

The mosaicked image, **tour_laguna** is displayed.



Viewshed Analysis

Introduction

One of the many tasks you can perform using IMAGINE Advantage is Viewshed Analysis. This tour guide describes how to use this analysis tool.

Viewshed Analysis allows you to position an observer on a DEM in a Viewer and determine the visible areas within the terrain. You can adjust the observer's height either above ground level or above sea level and set the visible range.

This tool is useful for planning the location and height of towers used for observation or communications. It might also be used to determine areas that lie within poor reception of standard broadcast towers and are thus potential cable markets.

In this tour guide, you can learn how to:

- start an Image Drape viewer
- start the Viewshed tool
- work with multiple observers
- query Viewshed data and layers

Approximate completion time f

Approximate completion time for this tour guide is 15 minutes.

Create a Viewshed In this exercise, you create a viewshed, and analyze the terrain within it. ERDAS IMAGINE must be running with a Viewer open.
1. Click the Open icon in the Viewer (or select File -> Open -> Raster Layer).
2. In the Select Layer To Add dialog, navigate to the <IMAGINE_HOME>/examples directory.
3. Select the file eldodem.img, then click the Raster Options tab.
4. In the Raster Options tab, make sure that the Fit to Frame

- checkbox is active.
- 5. Click **OK** in the Select Layer To Add dialog.

Add the Raster Image

- 1. Click the Open icon again, and navigate to the <IMAGINE_HOME>/examples directory.
- 2. Select the file eldoatm.img, then click the Raster Options tab.
- 3. In the **Raster Options** tab, make sure that the **Clear Display** checkbox is not active.
- Click **OK** in the Select Layer to Add dialog. Both files are displayed in the Viewer.

Start an Image Drape Viewer and Set the Level of Detail

~ .

 From the menu bar of the Viewer displaying eldodem.img, select Utility -> Image Drape.

The Image Drape Viewer opens displaying **eldodem.img**, which supplies terrain relief, and **eldoatm.img**, which supplies the color. Position the Image Drape Viewer so that it does not cover the first Viewer you opened. Now, you can set the level of detail.

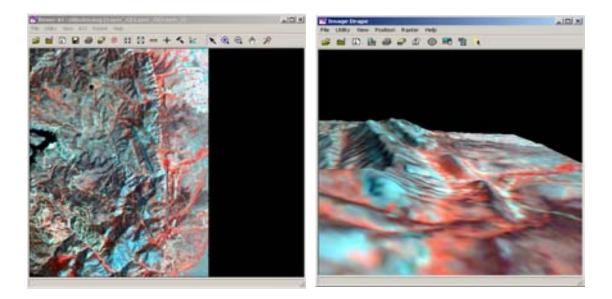
 Select View -> LOD Control from the Image Drape viewer menu bar.

The Level Of Detail dialog opens.

Change DEM			N/ /
level of detail	Kevel Of Detail		' You can also
in this field	DEM LOD PR: 100 - 1	1/	change the level of detail
Change raster	Raster LOD (3): 100 ± 1	1 1 1 1	using these
level of detail	Apply Close Help		meter controls
in this field			

- 3. In the field next to **DEM LOD (%)**, enter **100**, and press Enter on your keyboard.
- 4. Click **Apply** to increase the level of detail in the Image Drape viewer.
- 5. Click **Close** to dismiss the Level Of Detail dialog.

Your two Viewers now look like the following:



Start the Viewshed Analysis Tool

1. Click the Interpreter icon



on the ERDAS IMAGINE icon bar.

The Image Interpreter menu opens.

	💋 Image Interpreter 🛛 🔀
	Spatial Enhancement
	Radiometric Enhancement
	Spectral Enhancement
	Basic HyperSpectral Tools
	Advanced HyperSpectral Tools
Select Topographic	Fourier Analysis
Analysis-	Topographic Analysis
	GIS Analysis
	Utilities
	Close Help

From the Image Interpreter menu, select Topographic Analysis.
 The Topographic Analysis menu opens.

	🖉 Topographic Analysis 🛛 🗶
	Slope
	Aspect
	Level Slice
	Shaded Relief
	Painted Reliet
	Topographic Normalize
Click Miswahad	Raster Contour
Click Viewshed	Surface
	Viewshed
	Anaglyph
	DEM Height Converter
	Close Help

From the Topographic Analysis menu, select Viewshed.
 A Viewer Selection Instructions dialog opens.



- Click in the Viewer containing eldodem.img and eldoatm.img. The Viewshed dialog opens.
- 5. At this time, click **Close** on both the **Image Interpreter** menu and the **Topographic Analysis** menu to remove them from your display.

🐕 Viewshed #1	linked to Viewe	#1						LO X
Function Obser	rvers							
Output Type:	Single Viewshed]				Apply
		-	0		Color	Definition	-	Save Image
Position Units:	Mekers	Spoker:	I.	Z		Hidden		Clear
Height Unit:	Mellers	💌 İntervalı:	5			Visible Perimeter		Center
Distance Units:	Meters	🖌 Height	100.00	Meters				Create
Use Earth Ci	uvalure	Stat	0.00	- Meters				Delete
		Maxima Searci	- 0.00	A Meters				Save
		Pranina Jean	1	1			•	Load
								Close
						\		Help
1						Seler	t Multin	le Viewsha

Click the Observers tab to add an observer

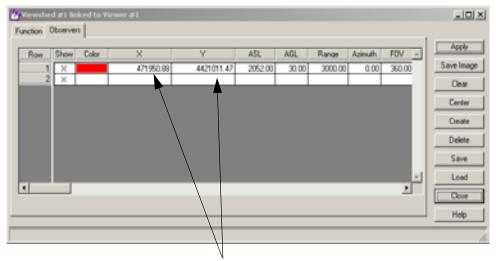
Select Multiple Viewsheds

An observer marker is automatically placed in the center of the Viewer containing **eldodem.img**.

6. In the Function tab of the Viewshed dialog, click the dropdown list next to Output Type to select Multiple Viewsheds.

Add First Observer

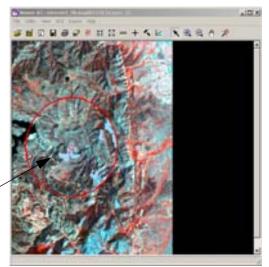
 Click the **Observers** tab in the Viewshed dialog. The **Observers** tab of the CellArray displays.



Specify the observer's position in these columns

- 2. Click in the cell of the X column to enter **471950.88**, then press Enter on your keyboard.
- **3.** Click in the cell of the **Y** column to enter **4421011.47**, then press Enter on your keyboard.
- 4. Click **Apply** in the Viewshed dialog.

The viewshed layer is generated and displays in the Viewer.

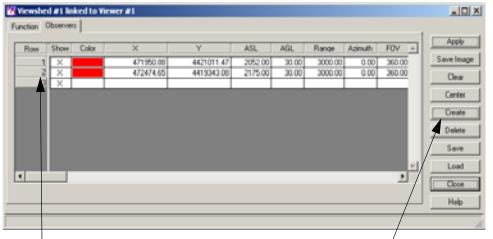


The area of the viewshed is marked by a circle

Add Another Observer

1. Click Create in the Viewshed dialog.

A new observer is added to the CellArray.



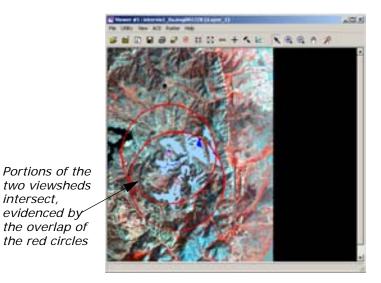
The second observer is added to row 2



- 2. Click in the cell of the second observer's **X** column to enter 472474.65, then press Enter on your keyboard.
- 3. Click in the cell of the second observer's Y column to enter **4419343.08**, then press Enter on your keyboard.
- 4. Click Apply in the Viewshed dialog.

intersect,

The second viewshed layer is generated and displays in the Viewer.



5. Click the **Function** tab in Viewshed dialog to view the legend. The **Function** tab opens, displaying the legend of the viewshed.

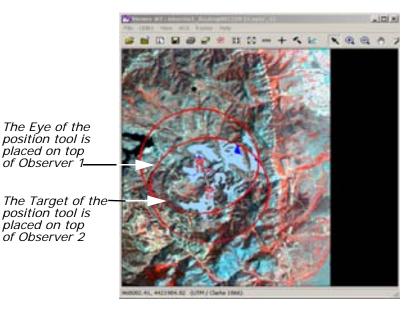
Output Type:	Multiple Viewsh	eds		-				App
osition Units:	Meters	٠	Spokes:	0	3	Color	Definition -	Save Im Clea
feight Units:	Meters	٠	Intervals:	5	3		Visible by 1 Observer Visible by 2 Observers	Cente
istance Units:	Motors	-	Height.	100.00	Meters		Perimeter	Delet
Use Earth Cu	rvalure		Stat	0.00	Meters		×	
		Max	ina Search:	0.00	- Meters	•		Save
						/		Load
						/		Close
						/		Help

The legend displays here, in the Function tab

There are two basic kinds of output. The Viewshed outputs provide a binary analysis of visibility within the specified range. In other words, the image is color-coded to show only visible or hidden areas. The Height outputs provide a color-coded map of the invisible areas indicating the amount of change in observer height required to see a given zone.

Link the Viewers and Set Eye and Target Positions

- Using your mouse, move the Eye of the Positioning tool on top of Observer 1.
- 2. Move the Target on top of Observer 2 in the Viewer.

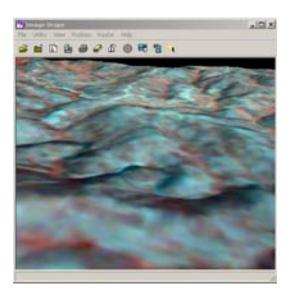


As you move the Positioning tool, the 3D image in the Image Drape viewer is updated. **Observer 1** is now looking at the location of **Observer 2**. The 3D image is positioned so that the target is centered in the Image Drape viewer.



Switch the Eye and Target of the Positioning tool in the Viewer.
 Observer 2 is now looking at the location of Observer 1.

Again, the 3D image rotates to match the **Eye** and **Target** positions of the Viewer.



Save the Viewshed

- What can we do with a saved viewshed? For example, the saved viewshed can be used to create a map composition.
 - In the Viewshed dialog, click Save Image. The Save Viewshed Image dialog opens.

	Save Viewshed Image Viewshed File (".ing)	X
Type the name of the viewshed image here in the directory of your choice	Vervored rive. (1.mg) Ve_four.ing magine840 magine850 magine850 magine870 magine870 magine870 magine870 magine870 magine870 magine870 magine870 magine870 magine870 magine870 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine880 magine870 magine880 magin	A A V Heb

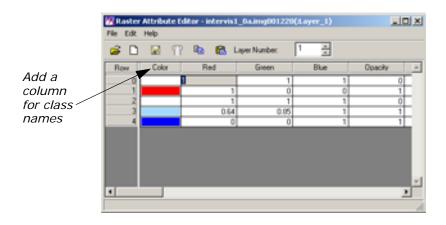
- 2. In a directory where you have write permission, type vs_tour.img in the Viewshed File window.
- Click OK to dismiss the Save Viewshed Image dialog.
 A Viewshed Analysis progress meter opens while the image is saved.
- 4. Click Close to dismiss the Viewshed dialog.

Query Viewshed Data In this section, use the Raster Attribute Editor to query the viewshed layer in the Viewer.

Create Class Names for Viewshed Regions

1. Select **Raster -> Attributes** from the Viewer menu bar.

The Raster Attribute Editor opens.



2. Select Edit -> Add Class Names from the Raster Attribute Editor menu bar.

A new column is added to the front of the Raster Attributes CellArray.

- 3. In **Row 1** of the **Class Names** column, enter **Perimeter**, and press Enter on your keyboard.
- 4. In Row 2, enter Hidden Region, and press Enter on your keyboard.

- 5. In **Row 3**, enter **Visible by One Observer**, and press Enter on your keyboard.
- 6. In Row 4, enter Visible by Two Observers, and press Enter on your keyboard.

	File Edk				_	
<i>Class Names identify</i> <i>each of the areas in</i> <i>the viewshed</i>	Row 0 1	Class Names Class Names Perimeter Hidden Region Visble by One Observers Visble by Two Observers	Color	Red 1 1 1 0.(4 0	Green	Bha

Add Area Column to the CellArray

1. Now select **Edit -> Add Area Column** from the Raster Attribute Editor menu bar.

The Add Area Column dialog opens.

	💯 Add Area Column	×
	Units Acces	
Click OK to accept hectares	Name Atta	
	OK Cancel Help	

2. Select **acres** from the **Units** dropdown list and click **OK** to dismiss the Add Area Column dialog.

The Area column is added to end of the Raster Attributes CellArray.

 Select Edit -> Column Properties from the Raster Attribute Editor menu bar.

The Column Properties dialog opens.

	💯 Column Properties		×
	Columns:	Title:	Area 🔽 Editable
	Class_Names Color Aleaa	Type:	Feel
	Histogram Red Green	Algement:	Right 💌
	Blue Opecity	Format	More
		Formula:	\$"Hatogram"=0.222395
Use the Up and Down buttons to			C Default only C Apply on OK C Auto-Apply
rearrange	Up Down	Display Width:	7.0 MaxWidtr 0
columns	Top Bottom	Units:	00285
	New Delete	OK.	Cancel Help

- 4. In the **Columns** field, select **Histogram**, and click the **Up** button four times to move it below the **Color** column.
- 5. Now select **Area**, and click the **Up** button until it is between **Color** and **Histogram**.
- 6. Click **OK** to apply these changes to the CellArray. The Column Properties dialog closes.

		Lave Native	1 1					
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splayed in the w order	3 Voble by One Otoerver	1.000	1469.36	66.07	0.64	0.05	1	
w oruer	4 Voble by Two Observers		44.9230	262	10	0	1	

 Select File -> Save in the Raster Attribute Editor to save all edits to the CellArray.

You can now easily view the size and location of visible and hidden areas in the viewsheds.

Query the Viewshed Layer

- **1.** Click an area inside the Viewer. The corresponding class is highlighted in the CellArray of the Raster Attribute Editor dialog.
- 2. When you complete your query of the data, select **File -> Close** in the Raster Attribute Editor to dismiss the dialog.

Finish

- 1. Click Close in the Viewshed dialog.
- 2. Select File -> Close in the Viewer.

3. Select File -> Close Image Drape in the Image Drape viewer.

IMAGINE Professional[™]

ERDAS IMAGINE Tour Guides

Spatial Modeler

Introduction	In ERDAS IMAGINE, GIS analysis functions and algorithms are accessible through three main tools:
	script models created with the Spatial Modeler Language (SML)
	graphical models created with Model Maker
	 pre-packaged functions in Image Interpreter
Spatial Modeler Language	SML is the basis for all GIS functions in ERDAS IMAGINE, and it is the most powerful. It is a modeling language that allows you to create script (text) models for a variety of applications. Using models, you can create custom algorithms that best suit your data and objectives.
Model Maker	Model Maker is essentially the SML with a graphical interface. This enables you to create graphical models using a palette of easy-to- use tools. Graphical models can be run, edited, saved, or converted to script form and edited further using the SML.
	This tour guide focuses on Model Maker.
Image Interpreter	The Image Interpreter houses a set of common functions that are created using either Model Maker or the SML. They have been given a dialog interface to match the other processes in ERDAS IMAGINE. In most cases, you can run these processes from a single dialog. However, the actual models are also delivered with the software, so that you can edit them if you want more customized processing.
	For more information on Image Interpreter functions, see "Image Interpreter" on page 257.
	Approximate completion time for this tour guide is 3 hours.
Start Model Maker	ERDAS IMAGINE should be running and a Viewer should be open.

1. Click the Modeler icon

on the ERDAS IMAGINE icon panel.

The **Spatial Modeler** menu displays.

My Spatial Modeler	×
Model Mak	H
Model Librar	ian
Close	Help

2. Click **Model Maker** in the **Spatial Modeler** menu to start Model Maker.

The Model Maker viewer and tool palette open.

ERDAS IMAGINE is delivered with several sample graphical models that you can use as templates to create your own models. Open these models in Model Maker by selecting **File -> Open** from the Model Maker viewer menu bar or clicking the Open icon on the toolbar.

3. Click Close in the Spatial Modeler menu to clear it from the screen.

Create Sensitivity Layer

When three input thematic layers are combined, the resulting file has meaningful class values. These values may also be easily color coded in the final output file so that they are visible over the SPOT panchromatic reference data.

Therefore, you recode the data values of the input files so that the most environmentally sensitive areas have the highest class value and the least have the lowest value. You use class values 0-4, with 4 being the most environmentally sensitive and 0 being the least. This recode also facilitates defining the conditional statement within the function. These recodes are done at the same time the files are defined in the Raster dialog.

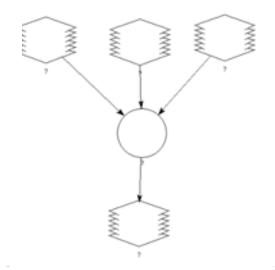
You must have Model Maker running.

NOTE: Refer to the following model when going through the following steps.

- 1. Click the Raster icon 🚺 in the Model Maker tool palette.
- 2. Click the Lock icon f_{1} , which becomes f_{2} .
- **3.** Click in the Model Maker viewer in four different places to place three input Raster graphics and one output Raster graphic.
- **4.** Select the Function icon () in the Model Maker tool palette.
- **5.** Click in the Model Maker viewer window to place a Function graphic on the page between the three inputs and the one output Raster graphic.
- 6. Select the Connect icon S in the Model Maker tool palette.

7. Connect the three input Raster graphics to the Function and the Function to the output Raster by simply dragging from one graphic to another.

Your model should look similar to the following example:



- 8. In the Model Maker tool palette, click the Lock icon to disable the lock tool.
- 9. Click the Select icon 🔪 .
- **10.** In the Model Maker viewer menu bar, select **Model -> Set Window** to define the working window for the model.

The Set Window dialog opens.

Mittlenten Gel Weden Ist Die Verlange einer Fühlten	Click this dropdown list to select Intersection

You want the model to work on the intersection of the input files. The default setting is the union of these files.

- **11.** In the Set Window dialog, click the **Set Window To** dropdown list and select **Intersection**.
- 12. Click OK in the Set Window dialog.

Define Input Slope Layer

The graphic is highlighted and the Raster dialog opens. Raster x File Name: (".ing) Promet Uper for File at Run Tim First, click the Open icon Nearest Neighbor $|\Psi|$ to select the Click here to slope file Output select Ø. Fie C Map processing Data Type: Unsigned 8-bit . window 0.000000 0.00000 File Type: Continuous × 0.000000 □ Ignore 0.0000 ÷ in Stats Calculation Temporary Raster Only Internet × Click here, then here, to recode class values

graphic.

1. In the Model Maker viewer, double-click the first input Raster

2. In the Raster dialog, click the Open icon 😹 under File Name.

The File Name dialog opens.

3. In the File Name dialog under Filename, click the file slope.img and then click OK.

This image has some noise around the edges that you want to eliminate, so you use a subset of this image in the model. To take a subset, you display the file in a Viewer and select the processing window with an inquire box.

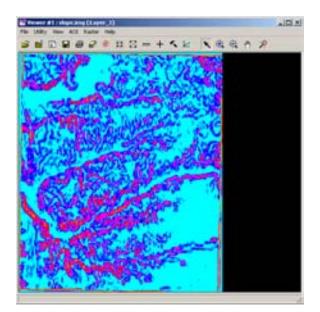
Display Slope Layer

1. Click the Open icon 😹 in a Viewer (or select File -> Open -> Raster Layer from the menu bar).

The Select Layer To Add dialog opens.

Click here to select the Raster Options	Select Layer To Add: Raster Options Multi Look in: 🔄 examples	ple		×	
Click here to	Indax_glacter img Indax_glacter img Inoads: img Iseattle_den.img Ishine2 img Ishine2 img Ishine2 img Ishine3 img Ishine3 img Ishine5		TM_stiped TM_stiped Twidianta ir Venezuela Vgit_30_m Re Vacia1_ms	DK Cancel Help Rocent Jobo	A preview of / the image / displays here

- 2. In the Select Layer To Add dialog under Filename, click the file slope.img.
- 3. Click the **Raster Options** tab at the top of the dialog, and then select the **Fit to Frame** option.
- Click OK in the Select Layer To Add dialog to display the file in the Viewer.



Select Area to Use

 With your cursor in the Viewer, right-hold Quick View -> Inquire Box.

A white inquire box opens near the center of the image displayed in the Viewer. The Inquire Box Coordinates dialog also opens. The title of this dialog is Viewer #1: **slope.img**.

💯 Viewer #1: slope.in	ng <u>X</u>
ULX: 1719947.000000	LFD: 1724483.000000
ULY: 281748.812500	LRY: 277212.812500
Type: Map	Units: feet
Snap to Raster	Box Color
Apply Fit to	AOI Close Help

2. Hold inside the inquire box in the Viewer and drag the box to the desired image area. You use the entire image area you select, except for the edges.

You can reduce or enlarge the inquire box by dragging on the sides or corners.

NOTE: You may wish to select nearly the entire image area with the inquire box, as this is helpful when you compare your output image with the example output image at the end of this exercise.

3. In the Raster dialog, under **Processing Window**, click **From Inquire Box**.

The coordinates in the Raster dialog now match the coordinates in the Inquire Box Coordinates dialog.

4. Click **Close** in the Inquire Box Coordinates dialog.

Now that the processing window is defined, you can recode the values.

- 1. In the Raster dialog, click the **Recode Data** option.
- 2. Click the Setup Recode button.

The Recode dialog opens.

You recode this file so that the classes with a slope greater than 25% have a class value of 1 and all other classes are 0 (zero). This is easy to do using the **Criteria** option of the **Row Selection** menu.

3. With your cursor in the **Value** column of the Recode dialog, righthold **Row Selection -> Criteria**.

The Selection Criteria dialog opens.

Recode Classes

	5 Selection Criteria			×
	Columns:	Functions:	Compares:	
Click here and it displays	New Value Red Green Elive Class_Names Histogram Value Area	tow mod(cap.cbp) abt(cap) int(cap) even(cap) odd(cap) mat(cap.cbp) mat(cap.cbp) tow()	Contrains	7 8 3 • and 4 5 6 • or 1 2 3 • not 0 E • 7
here	Citeix \$"Value"			<u></u>
	Select Subs	R Add Re	move Clear	Close Help

Next, you select all classes with a slope greater than 25%. By looking at the Recode dialog, you can see that all classes greater than **Value 4** have a slope greater than 25%. You can then invert your selection to recode all classes with values less than 25%.

4. In the Selection Criteria dialog, under Columns, click Value.

\$ "Value" displays in the **Criteria** window at the bottom of the dialog.

- 5. Under Compares, click >.
- 6. In the calculator, click the number 4.

The Criteria window now shows \$ "Value" > 4.

7. In the Selection Criteria dialog, click **Select** to select all classes meeting that criteria in the Recode dialog.

All classes greater than **4** are highlighted in yellow in the Recode dialog.

- 8. Click Close in the Selection Criteria dialog.
- 9. In the Recode dialog, confirm that the New Value is set to 1.
- **10.** In the Recode dialog, click **Change Selected Rows** to give the selected classes a new value of **1**.
- With your cursor in the Value column of the Recode dialog, righthold Row Selection -> Invert Selection to deselect all currently selected classes and select all nonselected classes.
- 12. Enter a New Value of O in the Recode dialog.
- **13.** Click **Change Selected Rows** to give the selected classes a new value of **0**.
- **14.** Click **OK** in the Recode dialog. The Recode dialog closes.
- **15.** Click **OK** in the Raster dialog.

The Raster dialog closes. The Raster graphic in the Model Maker viewer now has **n1_slope_RC** written under it.

Define Input Flood Plain Layer

- Double-click the second Raster graphic in the Model Maker viewer. The graphic is highlighted and the Raster dialog opens.
- In the Raster dialog, click the Open icon icon under File Name.
 The File Name dialog opens.
- 3. In the File Name dialog under Filename, select the file floodplain.img and then click OK.

This file does not need to be subset or recoded.

4. Click **OK** in the Raster dialog.

The Raster dialog closes and **n2_floodplain** is written underneath the second Raster graphic.

Define Input Land Cover Layer

- Double-click the third Raster graphic in the Model Maker viewer. The graphic is highlighted and the Raster dialog opens.
- 2. In the Raster dialog, click the Open icon 🗾 under File Name.

The File Name dialog opens.

3. In the File Name dialog under Filename, select the file landcover.img and then click OK.

You recode this file so that the most sensitive areas have the highest class value.

- 4. In the Raster dialog, click the Recode Data option.
- 5. Click the Setup Recode button.

The Recode dialog opens.

- 6. In the Value column of the Recode dialog, click 1 to select it.
- 7. In the New Value box, enter a New Value of 4.
- Click Change Selected Rows to recode Riparian to 4.
 Now both Riparian and Wetlands have a class value of 4.
- 9. With your cursor in the Value column, right-hold Row Selection -> Invert Selection.

Now all classes are selected except one (Riparian).

- With your cursor in the Value column, Shift-click 4 to deselect Wetlands.
- **11.** With your cursor in the **Value** column, Shift-click **0** to deselect the background.

🛃 Recode Class Names New Value Red Green filue Value 0 0.000 0.000 0.000 4 1.000 0.784 0.000 Riparian 1.00 of Courts 0.196 0.19 0.196 1.000 1.000 Wetlands 4 Rows in yellow are 0.784 recoded to a value of 1 ж 4 ÷ Change Selected Rows New Value Cancel THE Heb

Your Recode dialog looks like the following:

12. Enter a New Value of 1.

13. Click Change Selected Rows.

- 14. Click **OK** to close the Recode dialog.
- 15. In the Raster dialog, click OK.

n3_landcover_RC is written under the third Raster graphic in the Model Maker viewer.

Now, all of the files are set up so that the most sensitive areas have the higher class values:

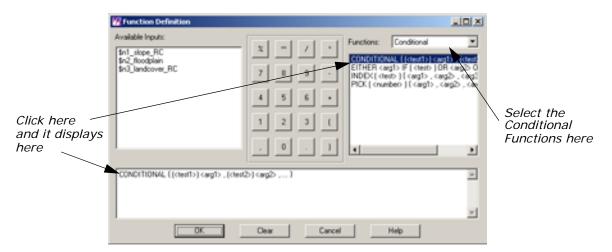
Table 8: Class Values for n3_landcover_RC

Class	Value
> 25 percent slope	1
flood plain	1
riparian & wetlands	4
undeveloped land	1

These values are used in the next step to create the sensitivity file.

Define Function

In the Model Maker viewer, double-click the Function graphic.
 The graphic is highlighted and the Function Definition dialog opens.



Next, you use a conditional statement to create a new file that contains only the environmentally sensitive areas.

- 2. In the Function Definition dialog, click the **Functions** dropdown list and select **Conditional**.
- 3. Click **CONDITIONAL** in the box below **Functions**.

The **CONDITIONAL** function is placed in the function definition window at the bottom of the dialog.

4. Type the following statement in the definition box, replacing the previously created condition statement:

NOTE: The file names can be added to your function definition simply by clicking in the appropriate spot in the function definition, and then clicking on the file name in the list of **Available Inputs**.

This creates a new output file with the class values 0-4. Each class contains the following:

Class	Contents	
0	developed	
1	undeveloped land	
2	flood plain	
3	> 25 percent slope	
4	riparian & wetlands	

 Table 9: Conditional Statement Class Values

Areas with a class value of 4 are the most environmentally sensitive, and are therefore unsuitable for development. Classes 3-1 are also environmentally sensitive, but proportionally less so. Further analysis determines whether classes 3-1 are eligible for development.

- 5. Take a moment to check over the conditional statement you just entered to be sure it is 100% accurate. The model does not run if the information has not been entered accurately.
- 6. Click **OK** in the Function Definition dialog.

The Function Definition dialog closes and **CONDITIONAL** is written under the Function graphic.

Define Output Raster Layer

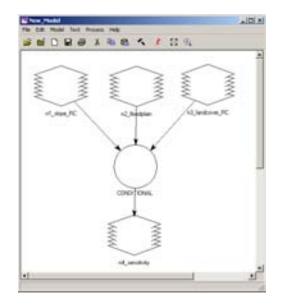
- In the Model Maker viewer, double-click the output Raster graphic. The graphic is highlighted and the Raster dialog opens.
- 2. Under File Name, type the name sensitivity.img for the new output file.

NOTE: Be sure that you specify a directory in which you have write permission.

- **3.** Click the **Delete if Exists** option so that the output file is automatically overwritten when the model is run again.
- 4. Click the File Type dropdown list and select Thematic.
- 5. Click **OK** in the Raster dialog.

The Raster dialog closes and **n4_sensitivity** is written under the output Raster graphic in the Model Maker viewer.

Your model should look similar to the following example:

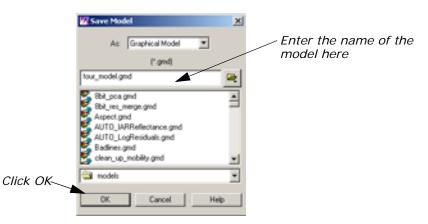


Save and Run the Model

 In the Model Maker viewer toolbar, click the Save icon i (or select File -> Save As from the Model Maker viewer menu bar) to save the model.

The Save Model dialog opens.

2. Enter a name for the model. Be sure you are saving in a directory in which you have write permission.



3. Click OK in the Save Model dialog.

Run the Model

You can now run this portion of the model to see if it works correctly.

 In the Model Maker viewer toolbar, click the Run icon (or select Process -> Run from the Model Maker viewer menu bar) to run the model. While the model runs, a Job Status dialog opens, reporting the status of the model.

2. When the model is finished, click **OK** in the Job Status dialog.

Enhance SPOT Data

To enhance the detail in the SPOT data, you run a convolution kernel over it before it is combined with the sensitivity layer. This portion of the model includes a Raster input, a Matrix input, a Function, and a Raster output.

Follow the next series of steps to create this portion of the model in a new Model Maker viewer. After you have verified that this portion runs correctly, you paste it into the first Model Maker viewer.

NOTE: Refer to the following model when going through the following steps.

- Click the new Window icon in the Model Maker viewer toolbar or select File -> New to create a new Model Maker viewer. The new Model Maker viewer opens.
- Click the Raster icon
 in the Model Maker tool palette, then click the Lock icon

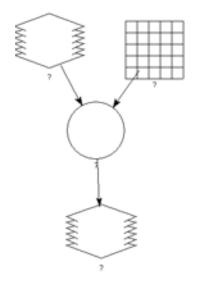
3. Click twice in the Model Maker viewer to place the input and output Raster graphics.

- 4. Click the Matrix icon 🗰 in the Model Maker tool palette.
- **5.** Click in the Model Maker viewer to place the input Matrix graphic. This is where you define the convolution kernel.
- 6. Click the Function icon () in the Model Maker tool palette.
- **7.** Click the Model Maker viewer to place a Function graphic on the page.

Place the Function graphic between the two inputs and the output Raster graphic.

- 8. Click the Connect icon 🔧 .
- **9.** Connect the input Raster graphic to the Function, the input Matrix to the Function, and the Function to the output Raster.

This part of the model looks similar to the following example:



- **10.** In the Model Maker tool palette, click the Lock icon to disable the Lock tool.
- 11. Click the Select icon 🥆 .

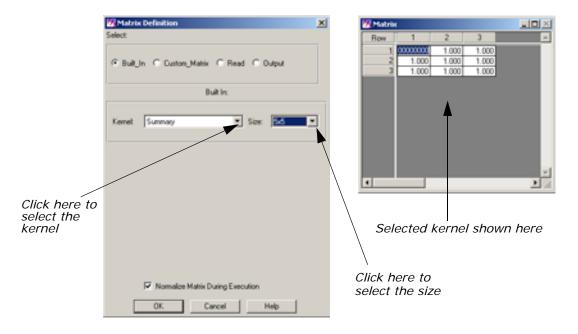
Define Input SPOT Layer

- Double-click the input Raster graphic in the Model Maker viewer. The graphic is highlighted and the Raster dialog opens.
- In the Raster dialog, click the Open icon icon under File Name.
 The File Name dialog opens.
- 3. In the File Name dialog under **Filename**, click the file **spots.img** and then click **OK**.
- 4. Click OK in the Raster dialog.

The Raster dialog closes, and **n1_spots** is written under the input Raster graphic.

Define Input ConvolutionIn Model Maker, you have access to built-in kernels or you can create
your own. In this exercise, use the built-in 5 × 5 summary filter.

Double-click the input Matrix graphic.
 The Matrix Definition and Matrix dialogs open.



- 2. In the Matrix Definition dialog, click the **Kernel** dropdown list and select **Summary**.
- Click the Size dropdown list and select 5x5.
 The kernel displays in the Matrix dialog.
- 4. Click **OK** in the Matrix Definition dialog.

The Matrix Definition and Matrix dialogs close, and **n3_Summary** is written under the Matrix graphic in the Model Maker viewer.

Define Function

 Double-click the Function graphic in the Model Maker viewer. The Function Definition dialog opens.

Click here and it opens here	Available Input: 2 7 9 Sn1_spots 7 9 0 0 Sn2_sponsey 7 9 0 0 0 ORRELATION (coaster) - coaster) 0 0 0 0 0 OVARIANCE (coaster) - coaster) 0 0 0 0 0 0	e_matric NORE - IORE -> wetable
	CONVOLVE (\$n1_spots . \$n3_Summary)	1
	Click here and inputs automatically	

Click here and inputs automatically display in the designated prototype here

2. Click CONVOLVE from the list below Functions.

The **CONVOLVE** statement displays in the function definition window.

- 3. Click in the first prototype (<**raster**>), and then click **\$n1_spots** under **Available Inputs** to define the raster input.
- 4. Click in the second prototype (<kernel>), and then click
 \$n3_Summary under Available Inputs to define the kernel.
- 5. Click **OK** to close the Function Definition dialog.

The Function Definition dialog closes and **CONVOLVE** is written below the Function graphic in the Model Maker viewer.

Define Output Raster Layer

- Double-click the output Raster graphic in the Model Maker viewer. The Raster dialog opens.
- In the Raster dialog under File Name, type the name spot_summary for the new output file. The .img extension is added automatically.

Be sure that you specify a directory in which you have write permission.

- 3. Click the Delete if Exists option.
- 4. Confirm that **Continuous** is selected for the **File Type**.
- 5. Click **OK** in the Raster dialog.

The Raster dialog closes and **n2_spot_summary** is written under the Raster graphic in the Model Maker viewer.

Save and Run the Model

	1.	In the Model Maker viewer toolbar, click the Save icon I (or select File -> Save As from the Model Maker viewer menu bar) to save the model. The Save Model dialog opens.
	2.	Enter a name for the model, such as convolve.gmd , being sure that you specify a directory in which you have write permission.
	3.	Click OK in the Save Model dialog.
Run the Model		You can now run this portion of the model to see if it works correctly.
	1.	In the Model Maker viewer toolbar, click the Run icon <i>(or select Process -> Run from the Model Maker viewer menu bar) to run the model.</i>
		While the model runs, a Status box opens, reporting the status of the model.
	2.	When the model is finished running, click \mathbf{OK} in the Status box.
Combine Models		You now use the Copy and Paste commands to combine these two separate models into one. Make sure that both models you created are open.
	1.	In the menu bar of the second model you created, select Edit -> Select All .
		You can also select objects by clicking and dragging in the Model Maker viewer. All objects contained within the selection box that you draw are selected.
	2.	Click the Copy icon in the toolbar of the same model (or select Edit -> Copy from the menu bar) to copy the selected objects to the paste buffer.
	3.	Click the Paste icon E in the toolbar of the first model (or select Edit -> Paste from the menu bar) to paste the second model into the first Model Maker viewer.
		The second model is pasted on top of the first model.
	4.	Close the second Model Maker viewer by selecting File -> Close .
		<i>NOTE: Do not select</i> File -> Close All , as this closes both of the models.
	5.	Drag the pasted model to the right in the Model Maker viewer, so that it does not overlap the first model.

You can resize the Model Maker viewer to see the entire model.

6. Click outside of the selection to deselect everything.

Combine Sensitivity Layer with SPOT Data

With both the thematic sensitivity layer (**sensitivity.img**) and the SPOT data (**spot_summary.img**) defined, you can use these two files as the input raster layers in a function that combines the two files into one final output. A Scalar is also used in the function to offset the data file values in the SPOT image by five, so that the sensitivity analysis does not overwrite any SPOT data.

NOTE: Refer to the following model when going through the next set of steps.

- **1.** Click the Function icon () in the Model Maker tool palette.
- Click in the Model Maker viewer below the output raster graphics (n4_sensitivity and n7_spot_summary) to place a Function graphic.
- **3.** Click the Scalar icon 🔲 in the Model Maker tool palette.
- **4.** Click in the Model Maker viewer to the left of the Function graphic you just positioned to place an input Scalar.
- **5.** Click the Raster icon **()** in the Model Maker tool palette.
- 6. Click in the Model Maker viewer below the Function to place an output Raster graphic.
- 7. Click the Connect icon \searrow and then on the Lock icon 1 .
- Connect the input Raster graphics (n4_sensitivity and n7_spot_summary) to the Function, the input Scalar to the Function, and then the Function to the output Raster.
- 9. Click the Lock icon 🚡 to disable the lock tool.
- 10. Click the Select icon 🥆 .

Define Input Scalar

 Double-click the Scalar graphic in the Model Maker viewer. The Scalar dialog opens.

	Viscolar X Value: 5 00000000000	
Enter value/	Read From	Change scalar
here /	F Write Tα	type here
	Show Scalar in Session Log	
	OK Cancel Help	

- 2. In the Scalar dialog, enter a Value of 5.
- 3. Click the Type dropdown list and select Integer.
- 4. Click **OK** in the Scalar dialog.

The Scalar dialog closes and **n11_Integer** displays under the Scalar graphic in the Model Maker viewer.

Define Function Next, you create a file that shows sensitivity data where they exist and allows the SPOT data to show in all other areas. Therefore, you use the conditional statement.

 Double-click the untitled Function graphic in the Model Maker viewer. The Function Definition dialog opens.

	19 Function Definition	LO X
When you click here, it displays here	Soll integer	tion: Conditional
	EITHER \$n4_sensitivity IF (\$n4_sensitivity) OR <arg2> OTHERWISE</arg2>	×
	OK Dear Cancel	Help

- 2. In the Function Definition dialog, click the **Functions** dropdown list and select **Conditional**.
- 3. In the list under Functions, click EITHER.

The **EITHER** statement and prototype arguments display in the function definition window.

- Click in the first prototype <arg1>, then click \$n4_sensitivity under Available Inputs to automatically replace the prototype with an argument.
- 5. Click in the prototype <test>, then click **\$n4_sensitivity**.

The function definition now reads:

EITHER \$n4_sensitivity IF (\$n4_sensitivity) OR <arg2> OTHERWISE

- 6. Click the Functions dropdown list and select Analysis.
- Click the remaining prototype, <arg2>, and then scroll down the list under

Functions and click the first STRETCH function to replace <arg2>.

The **STRETCH** function and its prototype arguments are inserted into the function definition.

Function Definition		
Available Inputs: \$r4_stensitivity \$r2_spd_summary \$r11_ivitoper EITHER: \$r4_stensitivity IF (\$r4_stensitivity Online stell	3; " / . 7 0 9 . 4 5 6 • 1 2 3 (. 0 . 1	Functions: Analysis HISTOGRAM (carg1>, IGNORE, cv = UNEARCOMB (caster), cmatrice UD0KUP (carg1>, cableo) PRINCIPAL COMPONENTS (caster PRINCIPAL COMPON
OTHERWISE		2
OK	Clear Cancel	Help

- 8. Click <raster>, then click the file name **\$n7_spot_summary** under Available Inputs.
- 9. Click <stdcount>, then click the number 2 on the calculator.
- 10. Using this same method, replace <min> with 0 and <max> with 250.

The **STRETCH** function uses two standard deviations to stretch the data file values of **spot_summary.img** between 0 and 250. The scalar is added to ensure that there are no data file values between 0 and 4, since these are the values in the sensitivity file.

- **11**. Click in front of **OTHERWISE** to insert the cursor in the function definition.
- **12**. Click + on the calculator, then **\$n11_Integer** under **Available Inputs**, to add the scalar to the function.

The final function definition should look like the following:

EITHER \$n4_sensitivity IF [\$n4_sensitivity] OR STRETCH [\$n7_spot_summary , 2 , 0 , 250] + \$n11_integet[OTHERWISE

13. Click **OK** in the Function Definition dialog.

The Function Definition dialog closes, and **EITHER \$n4_sensitivity IF** is written under the Function graphic in the Model Maker viewer.

Define Output Raster Layer

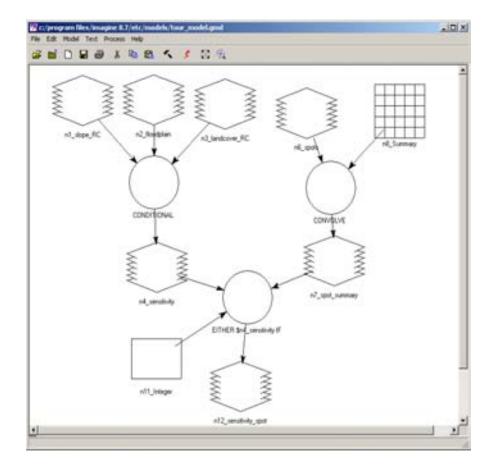
- Double-click the untitled output Raster graphic. The Raster dialog opens.
- 2. In the Raster dialog, enter the file name **sensitivity_spot** for the new output file.

Be sure that you specify a directory in which you have write permission.

- 3. Click the Delete if Exists option.
- 4. Click the File Type dropdown list and select Thematic.
- 5. Click **OK** in the Raster dialog.

The Raster dialog closes, and **n12_sensitivity_spot** is written under the Raster graphic in the Model Maker viewer.

Your final model should look like the following example:



Save and Run the Model

 In the Model Maker viewer toolbar, click the Save icon icon (or select File -> Save from the Model Maker viewer menu bar) to save the model.

Run the Model

You can now run the entire model.

 In the Model Maker viewer toolbar, click the Run icon (or select Process -> Run from the Model Maker viewer menu bar) to run the model.

While the model runs, a Job Status dialog opens, reporting the status of the model.

3. When the model is finished running, click **OK** in the Job Status dialog.

Display New Layer Once your model has run, the new output file is created. You can display this file in a Viewer and modify the class colors and class names of the overlaid sensitivity analysis.

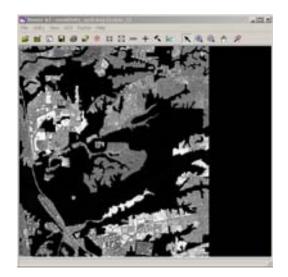
Prepare

You must have run the model and you must have a Viewer open.

In the Viewer toolbar, click the Open icon (or select File -> Open -> Raster Layer from the Viewer menu bar).

The Select Layer To Add dialog opens.

- 2. Under Filename, click the file sensitivity_spot.img.
- 3. Click the **Raster Options** tab at the top of the dialog and confirm that the **Fit to Frame** option is selected, so that you can see the entire layer.
- 4. Click **OK** to display the file.



Adjust Colors

The sensitivity analysis displays with a grayscale color scheme.

In the Viewer menu bar, select Raster -> Attributes.
 The Raster Attribute Editor opens. You add a Class Names column.

۵ (🖬 🕆 🐚	🔂 Lape	Number 1	2	
Row	Histogram	Color	Opacity		
0	0		1		
1	3056		1		
2	1464		1]	
3	1329		1]	
4	4376		1]	
5	0		1]	
6	0		1]	
7	0		1]	
8	0		1]	
9	Ó		1		

2. In the Raster Attribute Editor, select Edit -> Add Class Names.

A new Class_Names column is added to the CellArray.

Next, rearrange the columns so that the **Color** and **Class Name** columns come first. This makes it easier to change the colors of the overlaid sensitivity analysis.

 In the Raster Attribute Editor, select Edit -> Column Properties. The Column Properties dialog opens.

	19 Column Properties			×
	Columns:	Title:	Color	F Editable
First, click the column name here, then click the action here	Class_Names Histogram	Type	Color	Show RGB
	Opecity	Algement	Center 💌	
		Fornat.		Mare
		Fornda		More
			C Default only C Apply on DK	C Auto-Apply
	Up Down	Display Width	5.0 T MaxW	Selfe 🕴 🚊
	Top Bottom	Units:		
Click here to change the order of the column	New Delete	OK	Cancel Help	

- 4. Click **Color** under **Columns**, then click **Top** to make **Color** the first column in the Raster Attribute Editor.
- **5.** Click **OK** in the Column Properties dialog to change the order of the columns.

The Raster Attribute Editor now looks similar to the following example:

	File Edit	Help	iter - sensitivity_spot		ad X
This is class 1, notice the Histogram value	Row 0 1 2 3 4 5 6 7 7 8 9 10 4	Color	Class Names	Histogram 0 3056 14/4 1329 49/16 0 0 0 0 0 0 0 0 0 0 0 0 0	Opacity .

Next, change the colors and class names.

6. To change the color of the class 1, with your pointer over the color patch for that class, right-hold **Other**.

The Color Chooser dialog opens.

Drag this dot to select a color on the color wheel	27 Color Cheoser Standard Custon R 0 0 0 0 0 0 0 0	UK Poply Save Rename	Enter RGB values here or move the slider bars
Drag this slider bar upward to enhance the RGB		Delete Close Help	A preview of the selected color displays here

This dialog gives you several options for changing the class colors. You can move the black dot on the color wheel, use the slider bars, select colors from a library (under the **Standard** tab), or enter RGB values.

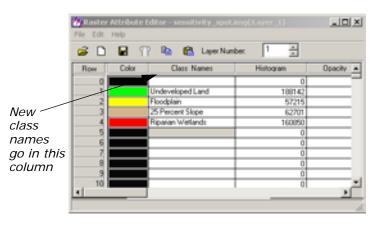
 Experiment with each of these methods to alter the class colors of classes 1 through 4. Change class 1 to Green, class 2 to Yellow, class 3 to Tan, and class 4 to Red.

When you have selected the desired color for a class, click **Apply** and then **Close** in the Color Selector dialog. Then redisplay the Color Chooser for the next class by moving your cursor to that color patch and right-holding a specific color or **Other**.

- 8. Click in the Class_Names column of class 1.
- 9. Type Undeveloped Land. Press Enter on your keyboard.

Your cursor is now in the class name field of class 2.

- 10. Type Floodplain for class 2. Press Enter.
- **11.** Type **>25 Percent Slope** for class 3. Press Enter.
- 12. Type Riparian and Wetlands for class 4. Press Enter.

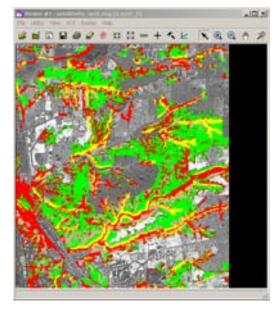


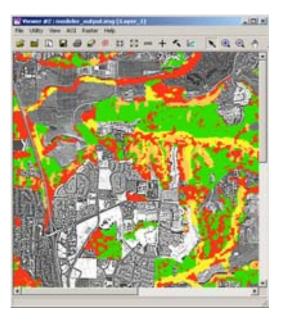
Test the Output

The following steps describe how to compare your output with the one delivered with ERDAS IMAGINE.

You must have completed the Spatial Modeler tour guide up to this point, creating **sensitivity_spot.img** in the process. The file **sensitivity_spot.img** should be displayed in a Viewer.

- Display the file <IMAGINE_HOME>/examples/modeler_output.img in a second Viewer.
- 2. Select **Session -> Tile Viewers** from the ERDAS IMAGINE menu bar to position the two Viewers side by side, so that you can view both images at once.





 In Viewer #1, select View -> Link/Unlink Viewers -> Geographical.

A Link/Unlink Instructions dialog opens, instructing you to click in Viewer #2 to link the two Viewers.

4. Click in Viewer #2 to link the two Viewers and close the Link/Unlink Instructions dialog.

If sensitivity_spot.img is a subset of modeler_output.img, a white bounding box displays in Viewer #2 (modeler_output.img), marking the area of the image that is shown in Viewer #1 (sensitivity_spot.img).

- 5. Select Utility -> Inquire Cursor from either Viewer's menu bar.
- 6. Compare the two images using the Inquire Cursor.

- 7. When you are finished, click **Close** in the Inquire Cursor dialog.
- 8. Right-click in the Viewer displaying **sensitivity_spot.img** to access the **Quick View** menu.
- 9. Select Geo Link/Unlink.
- **10.** Click in the Viewer containing **modeler_output.img** to break the link.

Add Annotation to a Model

You can add annotation to a model to make it more understandable to others, or to help you remember what the model does. It is also a helpful organizational tool if you create several models and need to keep track of them all.

Next, add a title and an explanation of each function to the model you just created.

You must have the model open.

NOTE: Refer to the following model when going through the next set of steps.

Add a Title

- **1.** Select the Text icon **A** in the Model Maker tool palette.
- 2. Click near the center of the top of the model page to indicate where you want to place the text.

The Text String dialog opens.

💯 Text String	×	
Sensitivity Analysis	Model	
0K.	Cancel	Help

- 3. Type these words in the Text String dialog: Sensitivity Analysis Model
- 4. Press Enter on your keyboard, and then click **OK** in the Text String dialog.

The text string you typed in step 3 displays on the page.

Format Text

- 1. Click the text string you just added to select it. The string is reversed out (white on black) when it is selected.
- 2. On the Model Maker viewer menu bar, select Text -> Size -> 24.

The text string is redisplayed at the new point size. If the text overwrites any of the graphics in the model, you can simply click it to select it and then drag it to a new location. In the Model Maker viewer menu bar, select Text -> Style -> Bold.
 The text string is redisplayed in bold type.

NOTE: If you want to edit a line of text, simply double-click it to bring up the Text String dialog again. Correct your entry or type a new one.

Add Text to a Function Graphic

- 1. In the Model Maker tool palette, select the Text tool and then the Lock tool to add text to the first Function graphic.
- **2.** Click the center of the **CONDITIONAL** Function graphic, toward the top of the graphic.

The Text String dialog opens.

3. Type the following words in the Text String dialog:

Create a sensitivity file by

- **4.** Press Enter on your keyboard, and then click **OK** in the Text String dialog.
- 5. Click under the first line of text to add another line.
- 6. In the Text String dialog, type:

combining Slope, Floodplain, and Landcover

- **7.** Press Enter on your keyboard and then click **OK** in the Text String dialog.
- **8**. Repeat step 5 to add a third line of text:

using a conditional statement.

9. Click OK.

All three text strings display over the Function graphic, but they are very large.

Format Text

- 1. In the Model Maker tool palette, click the Lock icon to disable the lock tool and then click the Select icon.
- 2. Click the first line on the Function graphic to select it.
- **3.** Shift-click the second and third lines to add to the selection.
- **4.** Using the same procedure you used to change the point size and style of the title, change these lines to **14** points, **Normal**.

You may also want to adjust the positioning (simply drag on the text).

Add Text to Other Graphics

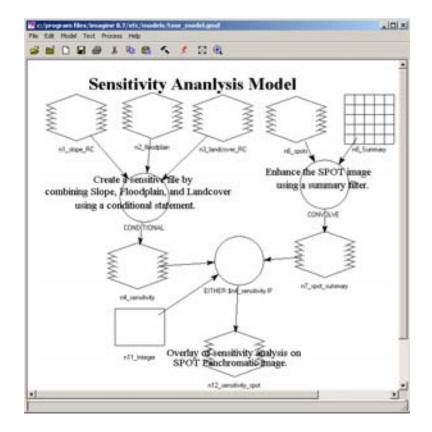
1. Add the following lines of text to the **CONVOLVE** function:

Enhance the SPOT image using a summary filter.

 Next, add these two lines to the final output raster (n12_sensitivity_spot):

Overlay of sensitivity analysis on SPOT Panchromatic image.

Your annotated model should look like the following example.



3. Save the model by selecting **File -> Save** from the menu bar.

The graphical models created in Model Maker can be output to a script file (text) in SML. Select **Tools -> Edit Text Files** from the ERDAS IMAGINE menu bar, and then edit these scripts using the SML syntax. Re-run or save the edited scripts in the script library.

SML is designed for advanced modeling, and encompasses all of the functions available in Model Maker, as well as:

conditional branching and looping

Generate a Text

Script

- complex data types
- · flexibility in using raster objects

To generate a script from a graphical model, follow these steps: The graphical model must be open.

 In the Model Maker viewer menu bar, select Process -> Generate Script.

The Generate Script dialog opens.



The **Script Name** defaults to the same root name as the graphical model. Scripts have the extension .mdl.

- 2. If you do not want to use the default, enter a new file name under **Script Name**.
- 3. Click **OK** to generate the script.

The model is now accessible from the **Model Librarian** option of Spatial Modeler.

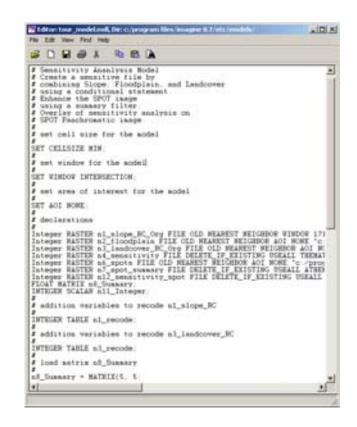
- From the ERDAS IMAGINE icon panel, click the Modeler icon. The Spatial Modeler menu displays.
- Select the Model Librarian option in the Spatial Modeler menu. The Model Librarian dialog opens.

Click here to select the model	Model Librarian Model Library: ("md) Iour_model.md detection_finder.md sateshoarit.md snaitsainerpe.md Iour_model.md	<u> </u>	2
Click here to edit	Edt Run Model Oose	Delete Batch Help	-

From this dialog you can edit, delete, or run script models.

- 6. Under **Model Library**, select the name you used for your model in step 2.
- 7. Click Edit in the Model Librarian dialog.

The model displays in the Text Editor, as in the following example:



Annotation in scripts is located at the top of the file, in the order in which it was entered. If you want the annotation to be in the order of processing, annotate your graphical model from top to bottom.

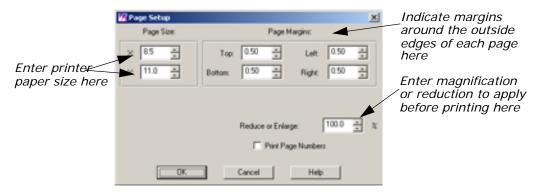
- 8. Select File -> Close from the Text Editor menu bar.
- 9. Click Close in the Model Librarian dialog and the Spatial Modeler menu.

Print the Model

You can output graphical models as ERDAS IMAGINE annotation files (.ovr extension) and as encapsulated PostScript files (.eps extension). You can also output directly to a PostScript printer.

You must have a graphical model open.

 In the Model Maker viewer menu bar, select File -> Page Setup. The Page Setup dialog opens.



The default setting specifies a $8.5" \times 11"$ page size. This is acceptable for most PostScript printers.

- 2. In the Page Setup dialog, adjust the size of the **Page Margins** to suit your preferences.
- 3. Click OK.
- In the Model Maker viewer menu bar, select File -> Show Page Breaks.

Dotted lines indicate page breaks according to the page size specified in the Page Setup dialog. You may have to use the scroll bars on the bottom and side of the Model Maker viewer to see these page breaks.

5. If your model takes up more than one page, you may want to rearrange it so that it fits on a single sheet.

6. In the Model Maker viewer toolbar, click the Print icon
 File -> Print from the Model Maker viewer menu bar).

The Print dialog opens.

Select to print the entire model	Tend III
the entire model	Ten has Charten
Select to print	
specific pages	Par Land

- 7. In the Print dialog, select the page(s) to print in the **Pages** box, or select **All** to print the entire model.
- 8. Click **Print** to print the model.

Apply the Criteria Function

The Criteria function in Model Maker simplifies the process of creating a conditional statement. In this example, you use data from a thematic raster layer and a continuous raster layer to create a new output layer. The input layers include a Landsat TM file and a slope file. This model performs similar to a parallelepiped classifier, but uses slope and image statistics in the decision process. The output file contains four classes: chaparral in gentle slopes, chaparral in steep slopes, riparian in gentle slopes, and riparian in steep slopes.

œ

For information on the parallelepiped classifier, see "Advanced Classification" on page 479.

Before beginning, the ERDAS IMAGINE Classification tools were used to gather training samples of chaparral and riparian land cover. This was done to determine the minimum and maximum data file values of each class in three of the seven TM bands (4, 5, 3). These values are listed in the following table:

Table 10: Training Samples of Chaparral and Riparian Land Cover

	Chap	arral	Riparian		
Band	Min	Мах	Min	Мах	
4	31	67	55	92	

Evaluate Training Samples

	Chaparral		Ripa	rian
Band	Min	Мах	Min	Мах
5	30	61	57	87
3	23	37	27	40

Table 10: Training Samples of Chaparral and Riparian LandCover (Continued)

Slopes below class value 3 are less than 8 percent, and therefore are characterized as gentle. Slopes in class value 3 or above are greater than 8 percent, and are characterized as steep. These values are used in the criteria function.

You must have Model Maker running, with a new Model Maker viewer displayed.

1. Click the Raster icon 🚺 in the Model Maker tool palette, then click

the Lock icon 🚡 .

- **2.** Click three times in the Model Maker viewer to place the two input Raster graphics and the one output Raster graphic.
- **3.** Click the Criteria icon (iii) in the Model Maker tool palette.
- **4.** Click in the Model Maker viewer to place the criteria graphic between the input and output Raster graphics.
- 5. Click the Connect icon 🌯 .
- 6. Connect the input Raster graphics to the criteria and the criteria to the output Raster graphic.
- 7. Click the Lock icon to disable the lock tool.
- 8. Click the Select icon 🔪 .

Define Input Raster Layers

- Double-click the first Raster graphic in the Model Maker viewer. The Raster dialog opens.
- In the Raster dialog, click the Open icon icon under File Name.
 The File Name dialog opens.
- 3. In the File Name dialog under **Filename**, select the file **dmtm.img** and click **OK**.

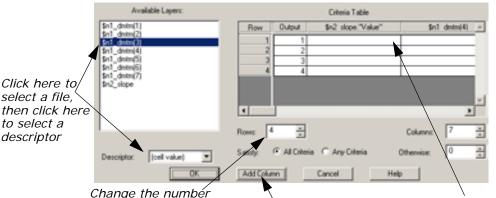
4. Click **OK** in the Raster dialog.

The Raster dialog closes and **n1_dmtm** is written underneath the Raster graphic.

- Double-click the second Raster graphic. The Raster dialog opens.
- In the Raster dialog, click the Open icon icon under File Name.
 The File Name dialog opens.
- 7. In the File Name dialog, select the file **slope.img** and click **OK**.
- Click **OK** in the Raster dialog.
 The Raster dialog closes and **n2_slope** is written underneath the Raster graphic.

Define Criteria

 Double-click the Criteria graphic in the Model Maker viewer. The Criteria dialog opens.



of rows here Click here to add a column–columns display here

- In the Criteria dialog, click \$n2_slope under Available Layers. The descriptor fields associated with that layer are now listed in the Descriptor dropdown list.
- 3. Click the **Descriptor** dropdown list to select the **Value** descriptor.
- 4. Click Add Column to add that descriptor to the Criteria Table.
- 5. Under Available Layers, click **\$n1_dmtm(4)**, then click Add Column to add a column for the minimum data file values in band 4.
- 6. Click Add Column again to add a column for the maximum data file values in band 4.
- 7. Repeat this procedure for \$n1_dmtm(5) and \$n1_dmtm(3).There are now eight columns in the Criteria Table.

- 8. Change the number of **Rows** to **4**, because the final output file has four classes.
- Click in the first row of the \$n2_slope column and type <3. Press Enter on your keyboard.
- 10. Under \$n2_slope, enter >=3 in row 2, <3 in row 3, and >=3 in row 4.
- **11.** In the same manner, enter the minimum and maximum data file values for chaparral and riparian in the **Criteria Table**.

Rows **1** and **2** correspond to chaparral, and rows **3** and **4** correspond to riparian (see Table 10, "Training Samples of Chaparral and Riparian Land Cover").

The Criteria dialog should look like the one in the following diagram:

Available Layers				Criteria T	sble	
_dnin(1)	Baw	Outout	In2 slope "Value"	Seil dotojili	\$n1 dmin(4)	Int domiti
drates(2)		1	<3	>31	-67	2
dnim(4)	3	2) #3)間(057	2
donim(5) donim(6) donim(7) skope		3	0	>55		
	Rover 4					Columne 5

The complete **Criteria Table** should look similar to the following table:

Row	\$n2_slope. "Value"	\$ncc1_dmtm (4)	\$n1_dmtm (4)	\$n1_dmtm (5)	\$n1_dmtm (5)	\$n1_dmtm (3)	\$n1_dmtm (3)
1	<3	>31	<67	>30	<61	>23	<37
2	>=3	>31	<67	>30	<61	>23	<37
3	<3	>55	<92	>57	<87	>27	<40
4	>=3	>55	<92	>57	<87	>27	<40

Table 11: Complete Criteria Table

12. When all of the values are entered into the Criteria Table, click OK.

The Criteria dialog closes and **All Criteria** is written under the criteria graphic.

Define Output Raster Layer

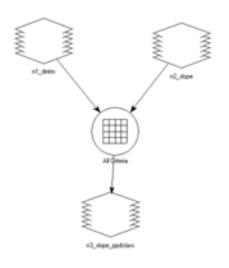
- Double-click the output Raster graphic in the Model Maker viewer. The Raster dialog opens.
- In the Raster dialog under File Name, enter the name slope_ppdclass, then Enter on your keyboard.

Be sure that you specify a directory in which you have write permission.

- 3. Click the Delete if Exists option.
- 4. Click the Data Type dropdown list and select Unsigned 4-bit.
- 5. Confirm that Thematic is selected in the File Type dropdown list.
- 6. Click **OK** in the Raster dialog.

The Raster dialog closes and **n3_slope_ppdclass** is written under the output Raster graphic.

The model you created looks like this:



 In the Model Maker viewer menu bar, select Model -> Set Window to define the working window for the model.

The Set Window dialog opens.

Not wide 2			Click this drandown
Page P.D.	Ranhyja bar		Click this dropdown list to select Intersection
1 [1.0000	Les France	lu lu	
	cent Not	1	

You want the model to work on the intersection of the input files. The default setting is the union of these files.

- 8. In the Set Window dialog, click the **Set Window To** dropdown list and select **Intersection**.
- 9. Click **OK** in the Set Window dialog.

Save the Model

 Click the Save icon i or select File -> Save As from the Model Maker viewer toolbar to save your model.

The Save Model dialog opens.

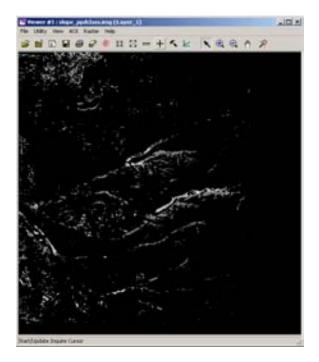
2. In the Save Model dialog, enter a name for your model.

Be sure you are saving the model in a directory in which you have write permission.

- 3. Click OK in the Save Model dialog.
- In the Model Maker viewer toolbar, click the Run icon (or select Process -> Run from the Model Maker viewer menu bar) to run the model.

While the model runs, a Job Status dialog opens, reporting the status of the model.

- 5. When the model is finished, click **OK** in the Job Status dialog.
- 6. If you like, display **slope_ppdclass.img** in a Viewer to view the output image of your model.



The image displays in grayscale. The class values are defined in the criteria function where: 1—chaparral in gentle slopes, 2—chaparral in steep slopes, 3—riparian in gentle slopes, and 4—riparian in steep slopes.

Minimizing Temporary Disk Usage

The Spatial Modeler attempts to perform operations in memory where possible, but there are some common operations that produce temporary files. Any time a Global operation is performed on an intermediate result, a temporary file is produced. For example, if the Global Maximum pixel value is required for an image being calculated, nothing other than an estimate may be produced without actually generating the image.

If an intermediate image is going to be used in two or more additional functions in a model, a temporary file is created. Also if nonpoint functions like Spread and Clump are preformed on intermediate results, or if their results are used in further processes, temporary files are created.

There are two types of temporary files created by Spatial Modeler: temporary files, which are declared as such; and intermediate files, which get created due to the mix of operations. The amount of space required by temporary files can be controlled to some degree by user preferences. By default, Spatial Modeler is shipped to maintain the highest degree of precision at the expense of disk space. The default data type for both temporary and intermediate files is double precision floating point, which uses 8 bytes to store a pixel value. Depending on your needs, you can cut the size of your temporary files in half.

Set Preferences

- 1. Select **Session -> Preferences** from the ERDAS IMAGINE menu bar.
- 2. In the Preference Editor, select the **Spatial Modeler** category.
- 3. Set Float Temp Type to Single Precision Float.
- 4. Set Float Intermediate Type to Single Precision Float.

Spatial Modeler, by default, also does not constrain the area your model processes, so temporary files extend to the union of all your input images. If, for example, you are doing an operation on two input images and your results are only valid in areas where both images exist, then setting the following preference may significantly reduce your temporary space requirements:

5. Set Window Rule to Intersection.

Also to ensure the temporary files get created on a disk drive where space is available, check the following preference:

6. In the Preference Editor, select the User Interface & Session category.

7. Set the **Temporary File Directory** to a local disk with sufficient free space.

In some cases, you may be able to adequately predict the output data range of a calculation. For example, if you calculate NDVI within your model, you know that at most, it can range from -0.5 to 0.5. In this case, you could

- store the result as floating point, taking at least 4 bytes per pixel, or
- scale the results to 0-255 in order to store the result as unsigned 8-bit data, taking just 1 byte per pixel. In this case since you know the range, you can re-scale the data by simply adding 0.5 then multiplying by 255, without the need for any temporary files.

8

For more extensive examples of how models may be written without the use of temporary disk space use Model Maker to open: 8bit_pca.gmd and 8bit_res_merge.gmd in the <IMAGINE_HOME>/etc/models directory, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.

Making Your Models Usable by Others

Prompt User		When you specify specific input rasters or vectors in your model, their complete path is stored in the model. The same is true when you specify output files. So, to give someone else your models, they need to redefine all the inputs and outputs.
		Starting with ERDAS IMAGINE 8.3, inputs and outputs can be set to Prompt User so that no absolute paths are contained in the model. The model, in turn, may easily be shared without the need to redefine any inputs or outputs.
Providing a User Interface to Your Model		Another method of producing a model that can not only be easily shared with others, but is also very easy to run, is to write an EML front-end to your model. You must have ERDAS IMAGINE running.
		Tou must have ERDAS INFORME Furthing.
	1.	Click the Modeler icon modeler icon panel.
		The Spatial Modeler menu opens.

Select Model Maker Nodel Maker Nodel Maker

2. Click Model Maker on the Spatial Modeler menu.

A blank Spatial Modeler viewer opens along with the Model Maker tool palette.

Open an Existing Model

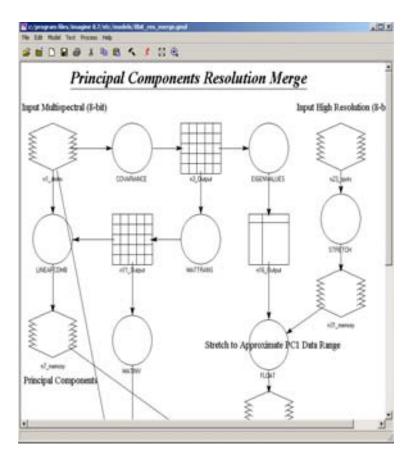
Select File -> Open or click the Open Existing Model icon in the toolbar.

The Load Model dialog opens.

	Load Model:		×
	Fie		
	Look in: 🔯 models	- 0 -	
	🚰 libit_pca.gnd 🛛 💆 Cris	o-greyocale.gmd SHisto_Match	OK
		p_MinMax.gmd SARR.gmd	Cancel
Select		correlation_Stretch.gmd Sidentify_brid;	
8bit_res_merge.gmd		haze_High.gmd	Help
00		haze_Low.gnd Sindex.gnd	
from the list		erence.gnd Sinverse.gnd	
	10 M M	whate.gnd Sinverse_PC.	Recent
		:al_Analysis.gmd Salayerstack.g	-
		votion.gmd Slove_Slove	Goto
	🚰 CreateFile.gnd 🛛 🕺 His	to_Eq.gmd SLogRecidual	
	•	<u>)</u>	
	File name: Sbit_res_merge.gmd		
	Files of type: Graphical Model (*.gnd)	×	
	Filename: c:/program files/imagine 8.7/etc	:/models/8bit_res_merge.gmd - Size: 4378	

Select 8bit_res_merge.gmd in the Load Model dialog, and click OK.

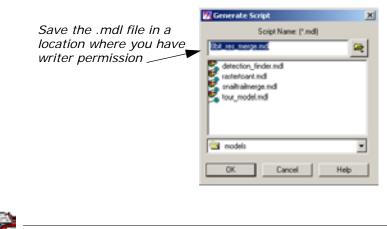
The model opens in the Spatial Modeler viewer.



3. Select Process -> Generate Script.

The Generate Script dialog opens.

- 4. Click the Open icon 📂 in the Generate Script dialog, and navigate to a directory where you have write permission.
- 5. Name the file 8bit_res_merge.mdl, then click OK in the dialog.



Remember where you saved the file. You use it again in "Edit the EML".

6. Click **OK** in the Generate Script dialog.

Edit the Model

- 1. In the Spatial Modeler menu, click Model Librarian.
- Navigate to the directly in which you saved 8bit_res_merge.mdl, and select it.

	10 Model Librarian	×
	Model Library: (*.mdl)	
Select the model	[bi_rec_merge.md	
from your writable directory	Bill, ret, merge md detection_finder.md sastertoant.md sastertoant.md soaib almerge.md tour_model.md	
	a models	-
Click Edit to make	Library Functions:	
changes to the	Edt Delete	
model	Run Model Batch	
	Close Help	

Click the Edit button in the Model Librarian dialog.
 The following SML script displays in the Editor:

Principal Components Resolution Merge # Input Multispectral (8-bit) # Principal Components # Replace PC1 with High Res Data # Inverse PC # Output Merged Image (8-bit) # Input High Resolution (8-bit) # Stretch to Approximate PC1 Data Range # # set cell size for the model # SET CELLSIZE MIN; ± # set window for the model SET WINDOW INTERSECTION; # set area of interest for the model # SET AOI NONE; # # declarations # Float RASTER n1_dmtm FILE OLD NEAREST NEIGHBOR AOI NONE i\$IMAGINE HOME/examples/dmtm.imq1; Integer RASTER n23_spots FILE OLD NEAREST NEIGHBOR AOI NONE i\$IMAGINE HOME/examples/spots.img1; Integer RASTER n29_merge_small FILE DELETE_IF_EXISTING IGNORE 0 ATHEMATIC 8 BIT UNSIGNED INTEGER ic:/temp/merge_small.img1; FLOAT MATRIX n3 Output; FLOAT MATRIX n11 Output; FLOAT MATRIX n26_Output; FLOAT TABLE n16 Output; { # # function definitions # #define n31_memory Float(STRETCH (\$n23_spots(1), 3, 0 , 255)) n3_Output = COVARIANCE (\$n1_dmtm); nl1_Output = MATTRANS (EIGENMATRIX (\$n3_Output)); n26 Output = MATINV (\$n11 Output) ; #define n7_memory Float(LINEARCOMB (\$n1_dmtm - GLOBAL MEAN (\$n1_dmtm) , \$n11_Output)) n16 Output = EIGENVALUES (\$n3 Output) ; #define n22_memory Float(FLOAT(((\$n31_memory - 127.5) * 3 * (SQRT(\$n16_Output[0]))) / 127.5)) #define n38_memory Float(STACKLAYERS(\$n22_memory , \$n7_memory(2: NUMLAYERS (\$n7_memory))))

ERDAS IMAGINE Tour Guides

```
n29_merge_small = LINEARCOMB ( $n38_memory ,
$n26_Output ) +
GLOBAL MEAN ( $n1_dmtm );
}
QUIT;
```

- 4. Locate "\$IMAGINE_HOME/examples/dmtm.img" (in bold above) on line 24 and change it to arg1.
- 5. Locate **"\$IMAGINE_HOME/examples/spots.img**" (in bold above) on line 25 and change it to **arg2**.
- 6. Locate "c:/temp/merge_small.img" (in bold above) on line 26 and change it to arg3.

NEAREST NEIGHBOR AOI NONE arg1; OLD NEAREST NEIGHBOR AOI NONE arg2; FILE DELETE_IF_EXISTING IGNORE 0 ATHEMATIC 0 BIT UNSIGNED INTEGER arg3;

> Select File -> Save, or click the Save Current Document icon in the Editor.

Edit the EML

- 1. Select **File -> New**, or click the New icon [] in the Editor.
- Select File -> Open, or click the Open icon 📂 .
- 3. In the Load File dialog, type ***.eml** for the **File Name** and change **Files of type** to **All Files** and press Enter on your keyboard.

This searches for EML scripts in the directory.

- Browse to <IMAGINE_HOME>/scripts, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.
- 5. Select **8bit_res_merge.eml**, and click **OK** in the Load File directory.

T.

The .eml file is located in <IMAGINE_HOME>/scripts, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.

The following EML script displays in the Editor:

```
component res merge {
frame res_merge {
          title iResolution Mergeî;
          geometry 140,120,250,230;
          statusbar;
          filename hi_res_pan;
          filename outputname;
          button ok;
          filename multi_spec {
              title above center iMultispectral File:1;
              info iSelect the multispectral input
file.î;
             shortform;
             geometry 0,10,245,49;
             select getpref (ìemlî
idefault_data_path1)+1/*.img1;
             filetypedef irasterî;
             on input {
                 if (($multi_spec != ìì) & ($hi_res_pan
!= ìì) &
                  ($outputname != ìì)) { enable ok;
                 }
                 else
                 {
                  disable ok;
                 }
              }
          }
             filename hi_res_pan {
                 title above center ìHigh Resolution
Pan File:1;
                 info iSelect the high resolution pan
input file.1;
                 shortform;
                 geometry 0,70,245,49;
                 select getpref (ìemlî
idefault_data_pathî)+î/*.imgî;
                 filetypedef irasterî;
                 on input {
                  if (($multi_spec != ìì) &
($hi res pan != ìì) &
                    ($outputname != ìì)) { enable ok;
                  }
                  else
                  {
                    disable ok;
                  }
                 }
              }
          filename outputname {
```

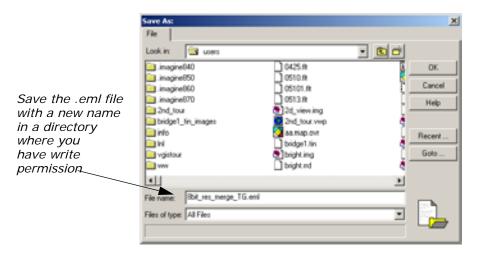
```
title above center iOutput File:1; info
iSelect output file.1;
              shortform;
              geometry 0,130,245,49;
              select getpref (iemlî
idefault_output_pathî)+î/*.imgî;
              filetypedef irasterî pseudotypes off
creatable on;
              newfile;
              on input {
                 if (($multi_spec != ìì) & ($hi_res_pan
!= ìì) &
                  ($outputname != ìì)) { enable ok;
                 }
                 else
                 {
                  disable ok;
                 }
              }
           }
              button ok {
                 title ìOKî;
                 info ìAccept all info and issue the
job.1;
                 geometry 35,190,82,25;
                 on mousedown {
                  disable ok;
                  job modeler -nq
              "c:/program files/imagine
8.7/etc/models/8bit_res_merge.mdl"
                    -meter
                    -state
                    quote($multi_spec)
                    quote($hi_res_pan)
                    quote($outputname)
                    ;
                  unload;
                 }
              }
              button cancel {
                 title iCanceli;
                 info iCancel this process, do not run
the job.1;
                 geometry 140,190,82,25;
                 on mousedown {
                  unload ;
                 }
              }
              on framedisplay {
                 disable ok;
```

```
}
}
on startup {
    display res_merge;
}
}
```

6. Locate "d:/erdas/models/8bit_res_merge.mdl" (in bold above) on line 74, and change it to the location and name of the script you generated.

	New Fird		*142/3#***	r ans Mes, Incorpore 8,3/miliplis/		
3 D		1 R I	B ()			
	,	3	5	disable ck:	2	
	button	title '	ry 35.3 redown diset	all info and imme the job."; %0.82.25; { is objected caller -eq -acter -acter -acter quote(Taulti_spec) quote(Taulti_spec) quote(Taulti_spec) quote(Taulti_spec)	-	- Change this section
	} buttom) cancel title	unlos Cascel			of the code to reflect the location of the .mdl file you edited with arg1, arg2, and
	r	3	ualoe			arg3
,	on free	diseble diseble	r ck.			
on star	tup (display		get/			
5					-	
•1					2	

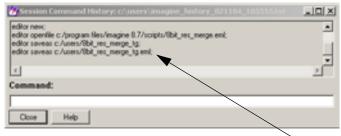
7. Select File -> Save As.



- **8.** In the Save As dialog, navigate to a directory where you have write permission.
- 9. Save the .eml file as **8bit_res_merge_TG.eml**, then click **OK** in the Save As dialog.

Set Session Commands

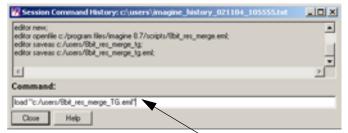
 On the ERDAS IMAGINE menu bar select Session -> Commands. The Session Command dialog opens.



Your most recent commands are listed here

2. In the **Command** field enter the following command (replacing the directory with the one you chose).

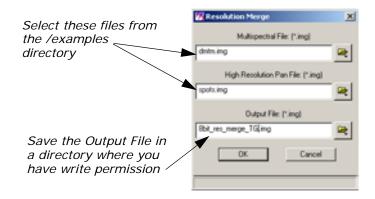
load ic:/temp/8bit_res_merge.emli



Type the load command, plus the location of the .eml file here to execute the model

3. Press Enter on your keyboard.

The following dialog displays:



4. For the **Multispectral File**, select **dmtm.img** from the /examples directory.

The file **dmtm.img** is located in the <IMAGINE_HOME>/examples directory, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.

- 5. For the **High Resolution Pan File**, select **spots.img** from the examples directory.
- 6. For the **Output File**, select a directory in which you have write permission, and enter the name **8bit_res_merge_TG.img**, then press Enter on your keyboard.
- 7. Click OK.

A Job Status dialog opens, tracking the progress.

Modeler - r	unning model: libit_res_merge.mdl	×
Job State: Percent Done:	Done 1001: 0	
	OK Cancel Help	

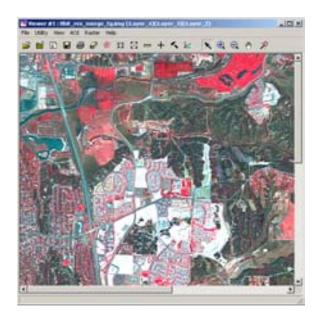
8. When the job is 100% complete, click **OK** in the dialog.

You can set the **Keep Job Status Box** in the **User Interface & Session** category of the Preference Editor so that the Job Status box is dismissed automatically after an operation is performed.

Check the Results

- 1. In the ERDAS IMAGINE icon panel, click the Viewer icon
- 2. Click the Open icon 📂 , and navigate to the directory in which you saved the **Output File** you just created, **8bit_res_merge_TG.img**.
- Click OK in the Select Layer To Add dialog to add the file. The image displays in the Viewer.

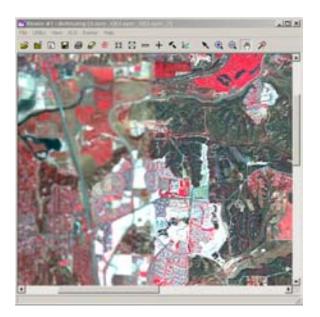
ERDAS IMAGINE Tour Guides



- 4. Click the Open icon, and navigate to the /examples directory.
- Select the file dmtm.img from the list, then click the Raster Options tab.
- 6. Deselect the Clear Display option.
- Click OK in the Select Layer To Add dialog.
 The multispectral file, dmtm.img, lends the color to the resulting file: 8bit_res_merge_TG.img.

Use the Swipe Utility

- 1. From the Viewer menu bar, select **Utility -> Swipe**.
- **2.** Move the slider bar back and forth to see how the two images compare.
- 3. When you are finished, close the Swipe utility.



Check the spots.img image

The panchromatic image, **spot.img**, is the image that lends the detail to the image you created: **8bit_res_merge_TG.img**.

- 1. Click the Viewer icon on the ERDAS IMAGINE icon panel to open a new Viewer.
- 2. Click the Open icon, and navigate to the /examples directory in the Select Layer To Add dialog.
- **3.** Select the file **spots.img**, then click **OK** in the Select Layer To Add dialog.

The file **spots.img** displays in the Viewer. Note the detail in the image.



- When you are finished evaluating the images, select Session -> Close All Viewers from the ERDAS IMAGINE menu bar.
- 5. Close the editors.
- 6. Save changes to your .eml file, 8bit_res_merge_TG.eml.
- 7. Close the .gmd file, do not save changes.

Using Vector
Layers in Your
ModelVector layers may be used in several different ways within models.All processing is done in raster format. However, converting the
vector layers to raster is done on the fly at either a default resolution
or one specified to meet the level of detail required by the
application.

Vector Layers as a Mask One simple application of vector layers is to use polygonal boundaries to cookie-cut your imagery. Whether the polygons represent political boundaries, ownership boundaries, zoning, or study area boundaries, they may be used to limit your analysis to just the portions of the imagery of interest.

In the following example you use a vector coverage to not just cookie-cut an image but to generate an output image for visual presentation that highlights the study area. Inside the study area, you enhance the image, while outside the study area you blur the image to further distinguish the study area.

You must have ERDAS IMAGINE running.

1. Click the Modeler icon icon on the ERDAS IMAGINE icon panel.

The Spatial Modeler menu opens.

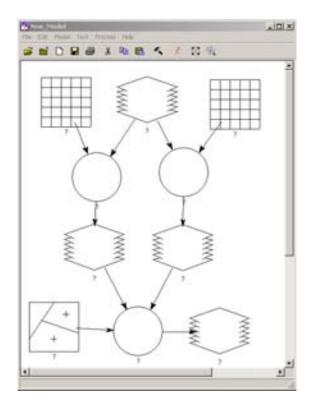


Click the Model Maker button in the Spatial Modeler menu.
 A blank Model Maker viewer opens along with tools.

Set up the Model

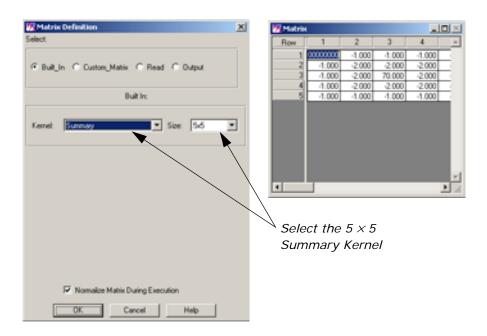
- 1. Click the Raster icon () in the Model Maker tool palette.
- 2. Click near the top center of the Model Maker viewer.
- 3. Click the Matrix icon 🗰 in the Model Maker tool palette.
- 4. Click to the left of the Raster object in the Model Maker viewer.

- 5. Click the Matrix icon again in the Model Maker tool palette.
- 6. Click to the right of the Raster object in the Model Maker viewer.
- **7.** Click the Function icon () in the Model Maker tool palette.
- **8.** Click below and to the left of the Raster object in the Model Maker viewer.
- 9. Click the Function icon again in the Model Maker tool palette.
- **10.** Click below and to the right of the Raster object in the Model Maker viewer.
- **11.** Click the Raster icon in the Model Maker tool palette.
- **12.** Click below the first Function object in the Model Maker viewer.
- **13.** Click the Raster icon again in the Model Maker tool palette.
- 14. Click below the second Function object in the Model Maker viewer.
- **15.** Click the Function icon in the Model Maker tool palette.
- **16.** Click below and between the Raster objects just placed in the Model Maker viewer.
- **17.** Click the Vector icon **F** in the Model Maker tool palette.
- **18.** Click to the left of the Function object just placed in the Model Maker viewer.
- **19.** Click the Raster icon in the Model Maker tool palette.
- **20.** Click to the right of the Function object just placed in the Model Maker viewer.
- 21. Using the Connection tool _____, and optionally the Lock tool, connect the objects in the model as depicted in the following picture. When you are finished, the model looks like the following:



Add Matrix Properties

- 1. Make sure the Selector tool 🥆 is active.
- Double-click the top left Matrix object in the Model Maker viewer. The Matrix Definition and Matrix dialogs open.



- 3. Using the Kernel dropdown list select Summary.
- 4. Using the Size dropdown list select 5x5.
- 5. Click the **OK** button in the Matrix Definition dialog.

Add Raster Properties

1. Double-click the top Raster object in the Model Maker viewer.

	10 Raster		×
	File Name: (*.img)	Input	
	bemtning 😪	Number of Lapers:	6
Select the file	Prompt User for File at Run Time	Number of Rows:	1024
here —		Number of Columns:	1024
		Interpolation: Nearest Neighbor	*
	0.m.s	Processing Windows	
	0.ep.e	G Map C File From Ing	puire Box
	Data Type: Unsigned 8-bit	ULX 635764.00000 - URX 7	777604.000000
	File Type: Continuous		
	Fignore 0.0000 - in State Calculation	ULY: 523863.500000 × URY: 4	42023 50000 3
		Declare as:	rea of Interest.
		Integer 💌 O	hoose ADI
			up Recode
	Temporary Raster Only	C Don't Recode Data	
	K	Cancel Help	

- Click the Open icon 😸 to open the File Name dialog.
- **3.** Select **germtm.img** from the examples directory, and click **OK** in the File Name dialog.
- 4. Click **OK** in the Raster dialog to accept the file **germtm.img**.

Add Matrix Properties

- 1. Double-click the top right Matrix object in the Model Maker viewer.
- 2. Verify that Low Pass is selected in the Kernel dropdown list.
- 3. Using the Size dropdown list select 7x7.
- 4. Click the **OK** button in the Matrix Definition dialog.

Add Function Properties

 Double-click the left Function object. The Function Definition dialog opens.

	A state of the local division of the local d	
Define the Analysis		Factors Product Image: 1 CLUMP (14per): 4.1 0 COMPCLATOR (10per): 1.1 0 COMPCLATOR (10per): 1.0 0.0 COMPARED: (10per): 1.0 0.0
Define the Analysis Function using Inputs in this window	COMULAT (led, genter, led, lawer	

- 2. From the Analysis Functions select **CONVOLVE (<raster> ,** <kernel>), this should be the third item on the list.
- 3. In the lower portion of the Function Definition dialog, click in the middle of <**raster**>.
- 4. Under Available Inputs, click **\$n1_germtm**.
- In the lower portion of the Function Definition dialog, click in the middle of <kernel>.
- 6. Under Available Inputs, click **\$n2_Summary**.
- 7. Click **OK** in the Function Definition dialog.

Add Function Properties

- 1. Double-click the right Function object.
- From the Analysis Functions select CONVOLVE (<raster> , <kernel>), this should be the third item on the list.
- **3.** In the lower portion of the Function Definition dialog, click in the middle of **<raster>**.
- 4. Under Available Inputs, click **\$n1_germtm**.
- In the lower portion of the Function Definition dialog, click in the middle of <kernel>.
- 6. Under Available Inputs, click **\$n3_Low_Pass**.

Your function string should look like the following:

CONVOLVE (\$n1_germtm , \$n3_Low_Pass)

7. Click **OK** in the Function Definition dialog.

Add Raster Properties

1. Double-click the Raster object that is output from the Function on the left.

	The Name (Sing)		4
E Prest V	at to Tax in Figure Taxes	Number of Learns Reamber of Pares In anter of Colores Immediation	Negelos y
Output Units Type File Type In Type	a start		Window Film lingues Else Filon lingues Else
Tourismus.		Dielerar Past 💽	Song of viewed
F Temporary Ra	oter Only Roal	C Recode Data	Seta Recote
	C OK	Cancel Help	1

- 2. In the lower-left corner of the dialog click the checkbox **Temporary Raster Only**.
- 3. Click **OK** in the Raster dialog.

Add Raster Properties

- 1. Double-click the Raster object that is output from the Function on the right.
- 2. In the lower left corner of the dialog click the checkbox **Temporary Raster Only**.
- 3. Click **OK** in the Raster dialog.

Add Vector Properties

 Double-click the Vector object in the lower left corner of the model. The Vector dialog opens.

	Wester		X X
	Select del Webs Layer Vector Layer Name (* accidit I scretti	-	Cellier Der & Detad & Specky - Tunne - Tunne - Tunne
Select zone88 in the /examples directory	F Prompt for File at Fron Time		Promising Weden Poot Inquire Box UCH [7990510706:5] 고 URA [76055100675] UCH [502051420790 곳] URV [7220246020 곳] Col Value:
	Feature Type: POLYGON Reamons To: Memory Drip		Point Presenter Present Number Pointer Resenter Destare at Destare

- 2. Click the Open icon 🧭 under Vector Layer Name.
- **3.** In the Vector Layer Name dialog, navigate to the /examples directory, and select **zone88**.
- 4. Click **OK** in the Vector Layer Name dialog.
- 5. Click OK in the Vector dialog to accept the Vector Layer Name.

Add Function Properties

 Double-click the final Function object. The Function Definition dialog opens.

Available inputs: Dr6_memory Br6_memory Br6_someB8		Functions: Analysis CLUMP (dayeo , 4) CLUMP (dayeo , 8) CONVOLVE (sasteo , desmeb) CORRELATION (costeo , desmeb) CORRELATION (costeo , desmeb) CORRELATION (casteo , desmeb) CONVARIANCE (casteo , desmetable DRIECT LODKUP (casto , desmetable DRIECT LODKUP (casto)	Select the Conditional Function
[17HCR \$n6_memory IF \$n9_zone00 0	R \$n7_memory 01HERWISE	×	— Edit the Function here
OK	Clear Cancel	Help	

- 2. In the Functions dropdown list, select Conditional.
- In the list of Functions, select EITHER <arg1> IF (<test>) OR
 <arg2> OTHERWISE, this should be the second item on the list.

- In the lower portion of the Function Definition dialog, click in the middle of <arg1>.
- 5. Under Available Inputs, click \$n6_memory.
- 6. In the lower portion of the Function Definition dialog, click in the middle of <test>.
- 7. Under Available Inputs, click \$n9_zone88.
- 8. In the lower portion of the Function Definition dialog, click in the middle of <arg2>.
- 9. Under Available Inputs, click \$n7_ memory.
- 10. Click OK in the Function Definition dialog.

Add Raster Properties

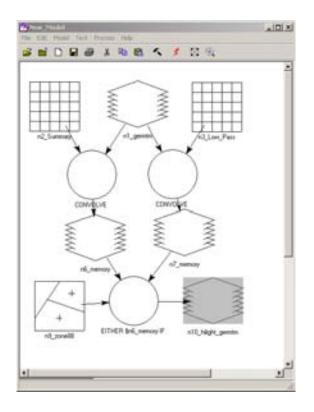
1. Double-click the final output Raster object.

The Raster dialog opens.

	10 Raster	×
	File Name: (*.img)	Input
	hlight_gemtn.ing	Number of Lagence
	Prompt User for File at Run Time	Number of Rover.
The output		Number of Columns:
file name is		Interpolation: Nearest Neighbor
listed here	Output: IF Delete If Exists	Processing Window
	oupe in present cases	C Nap & File From Inquire Box
	Data Type: Unsigned 8-bit	ULX 0.000000 - LRX 0.000000 -
	File Type: Continuous	
	I Ignore 0.0000 - in State Calculation	ULY: 0.000000 + LRY: 0.000000 +
		Declare as: Area of Interest.
		Integer Choose ADI
		C Recode Data Setup Recode
	Temporary Raster Only Integer 💌	C Don't Recode Data
	COK C	Cancel Help

- 2. Click the Open icon and navigate to a directory where you have write permission.
- In the Filename section of the File Name dialog, type hilight_germtm.img for the output image name, then click OK in the File Name dialog.
- 4. Click Delete If Exists checkbox.
- 5. Click the **OK** button in the Raster dialog.

Your completed model should look like the following:



Execute the Model and Check Results

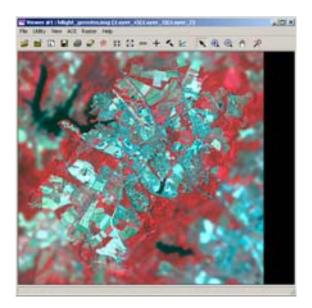
Select Process -> Run, or click the Execute the Model icon sin the toolbar.

A Job Status dialog opens tracking the progress of the function.

- Click **OK** in the Job Status dialog when it reaches 100% complete. Next, use the Viewer to examine your output image and locate the highlighted area.
- **3.** Click the Viewer icon

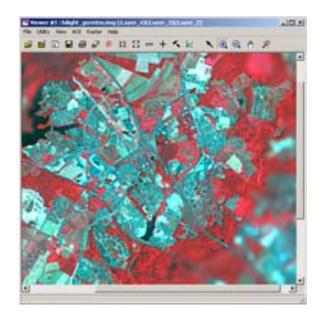
in the ERDAS IMAGINE icon bar.

 Click the Open icon and navigate to the directory in which you saved the output file, hilight_germtm.img, then click OK in the dialog to display the file.



5. Use the Zoom In tool 0 to view the highlighted area.

Notice that the area you emphasized with the model is sharp, while the area surrounding it is fuzzy.



- 6. When you are finished viewing the image select **File -> Close** from the Viewer menu bar.
- **Vector** Another application of using vector layers in models is to calculate summary information about your imagery for each polygon in a vector layer. This summary information can then be stored as an additional attribute of the vector layer.

Add Attributes to Vector Layers

Copy Vector Layers

You must have ERDAS IMAGINE running.

1. Click the Vector icon

on the ERDAS IMAGINE icon bar.

The Vector Utilities menu opens.



 Click the Copy Vector Layer button on the Vector Utilities menu. The Copy Vector Layer dialog opens.

Copy Vector Layer			x	l l	
Vector Layer to Copy: (".arcinto)	-	Output Vector Layer: (zonetit) New Folder RasterProvies registern		4	Keep the name of the file the same
Textures vitualgis zone00	•	temp			This is a directory in which you have write permission
OK Batch		Cancel	Help		

- In the Vector Layer to Copy section, navigate to the <IMAGINE_HOME>/examples directory, and select zone88.
- 4. In the **Output Vector Layer** section, navigate to a directory where you have write permission.
- 5. Type the name **zone88**, then press Enter on your keyboard.

- 6. Click OK in the Copy Vector Layer dialog.A Job Status dialog opens tracking the progress.
- 7. When the job is finished, click **OK** in the Job Status dialog.
- 8. Click Close in the Vector Utilities menu.

Set up the Model

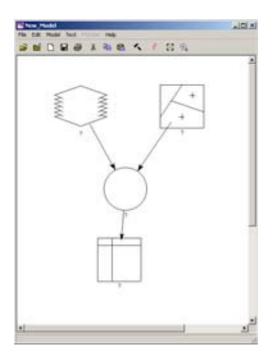
1. Click the Modeler icon in the ERDAS IMAGINE icon panel.

The Spatial Modeler menu opens.



- Click the Model Maker button in the Spatial Modeler menu.
 A blank Model Maker viewer opens along with the tools.
- **3.** Click the Raster icon **()** in the Model Maker tool palette.
- 4. Click near the upper left corner of the Model Maker viewer.
- 5. Click the Vector icon \mathbb{H} in the Model Maker tool palette.
- 6. Click to the right of the Raster object in the Model Maker viewer.
- **7.** Click the Function icon () in the Model Maker tool palette.
- 8. Click below and between the Raster and the Vector objects in the Model Maker viewer.
- 9. Click the Table icon 🛗 in the Model Maker tool palette.
- 10. Click below the Function object in the Model Maker viewer.
- **11.** Using the Connection tool <u></u>, and optionally the Lock tool, connect the Raster object and the Vector object to the Function object as inputs.
- **12**. Using the Connection tool, connect the Function object to the output Table object.

When you are finished, the model looks like the following:



Add Raster Properties

- 1. Confirm the Selector tool 🥆 is active.
- 2. Double-click the Raster object.
- **3.** In the Raster dialog, click the Open icon to open the File Name dialog.
- 4. Select **germtm.img** from the /examples directory and click **OK** in the File Name dialog.
- 5. Click **OK** in the Raster dialog to accept the file **germtm.img**.

Add Vector Properties

 Double-click the Vector object. The Vector dialog opens.

	Contract		
Select the file from the directory in which you copied it	Select and Destrockywall Vector Carle Rame (* accelu) arrel H	*	Line - P Dend - Specty
	(" Pospite file after Tex		Persong Vinder Personale Bar ALM (PERSONAL) BLAR (PERSONAL) B ALM (PERSONAL) BLAR (PERSONAL) B ALM (PERSONAL) BLAR (PERSONAL) B
			Colinae P Use Providence
	Feature Type: POLYSON Radiation Tan Mannaro Dela	2	Declar a: Anna d briend mage e Decent AC.

- 2. Click the Open icon to open the Vector Layer Name dialog.
- **3.** Select the copy of **zone88** you made earlier, and click **OK** in the Vector Layer Name dialog.
- 4. Click **OK** in the Vector dialog.

Add Function Properties

1. Double-click the Function object.

The Function Definition dialog opens.

Image: second	7 0 9 · 220N4 4 5 6 · 220N4 1 2 3 (220N4 220N4 1 2 3 (220N4 20N4	MIC (cone_ratec), cvalue MAX (cone_ratec), cvalue MAX (cone_ratec), cvalue MICAN (constinc) (SNORE c) MICAN (constinc) (SNORE c) MICAN (constinc) (MICAN (constinc)) MICAN (constinc) (MICAN (constinc)) MICAN (constinc) (SNORE cvalue) MIN (constinc) (SNORE cvalue) MIN (constinc) (Constinc) (Cvalue) MIN (constinc) (Cvalue)	Choose the Zonal Function
20NAL MEAN (\$n2_zone00 , \$n1_gen		× Help	

- 2. In the Functions dropdown list, select Zonal.
- 3. In the Functions dropdown list, select ZONAL.
- In the list of Functions, select ZONAL MEAN (<zone_raster> ,
 <value_raster>), this should be the sixteenth item on the list.
- In the lower portion of the Function Definition dialog, click in the middle of <zone_raster>.

- 6. Under Available Inputs, click \$n2_zone88.
- 7. In the lower portion of the Function Definition dialog, click in the middle of <value_raster>.
- 8. Under Available Inputs, click \$n1_germtm(4).
- 9. Click the **OK** button in the Function Definition dialog.

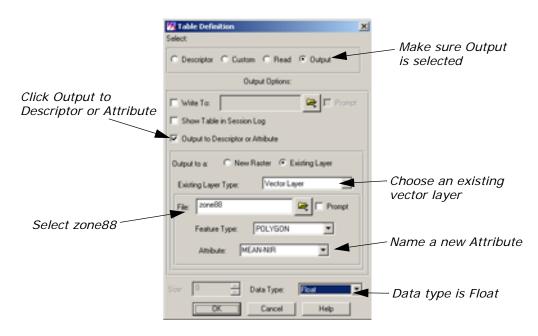
Add Table Properties

1. Double-click the Table object.

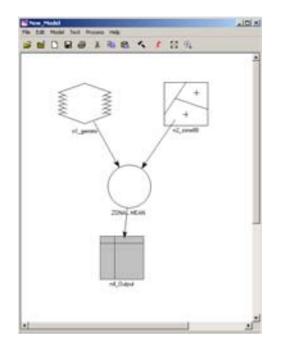
The Table Definition dialog opens.

- 2. Verify that **Output** is selected.
- 3. Under the **Output Options**, click the **Output to Descriptor or Attribute** checkbox.
- 4. For the Existing Layer Type dropdown list, select Vector Layer.
- 5. For **File**, select the copy of **zone88** from the directory in which you saved it earlier.
- 6. Since we are computing a new attribute, for **Attribute**, type **MEAN-NIR**.
- 7. The **Data Type** dropdown list should now be enabled, so select **Float**.

The Table Definition dialog should look as follows:



8. Click OK in the Table Definition dialog.Your model should now look like the following:



Execute the Model and Check the Results

- Select Process -> Run, or click the Execute the Model icon *f* in the toolbar.
- 2. When the Job Status dialog is 100% complete, click OK.
- **3.** Click the Viewer icon **in the ERDAS IMAGINE icon bar**.
- 4. In the Viewer, select **Open -> Vector Layer** from the **File** menu.
- 5. In the Select Layer To Add dialog, select the copy of **zone88** you created and click **OK**.
- 6. From the Viewer's Vector menu select Attributes.
- 7. In the Attribute CellArray, scroll to the right to see the newly created **MEAN-NIR** field.

The values in this column represents the mean pixel value from band 4 (near infrared) of **germtm.img** for each of the polygons in **zone88**.

Debug Your Model

Model Maker facilitates creating a model to accomplish your task, but it may still take some effort to get your model running successfully. Model Maker works hand in hand with Modeler. Model Maker is used to create models graphically. To execute these models, Model Maker creates an SML script, which it hands off to Modeler for execution. Modeler does all of the syntax and error checking, so finding an error in your model is not a single step operation. The following exercises demonstrate some of the common errors encountered in building new models.

Eliminate Incomplete Definition

In building a model, Model Maker provides prototypes for function arguments to be replaced with actual arguments. In this exercise, you see what happens if you forget to replace a prototype.

You must have ERDAS IMAGINE running.

1. Click the Modeler icon on the ERDAS IMAGINE icon panel.

The Spatial Modeler menu opens.

	5 Spatial Modele	• X
Select Model Maker —	Model M	sker
	Model Libr	aian
	Close	Help

2. Click Model Maker on the Spatial Modeler menu.

A blank Spatial Modeler viewer opens along with the Model Maker tool palette.

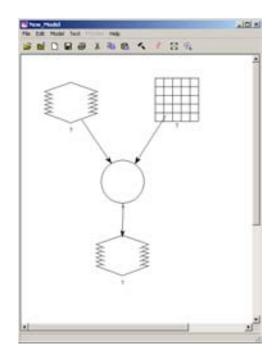
Create the Model

- **1.** Click the Raster icon () in the Model Maker tool palette.
- **2.** Click to place a Raster object in the upper left corner of the Model Maker viewer.
- 3. Click the Matrix icon 🛄 in the Model Maker tool palette.
- **4.** Click to place the Matrix object to the right of the Raster object in the Model Maker viewer.
- **5.** Click the Function icon () in the Model Maker tool palette.
- 6. Click to place the Function object below and centered between the Raster object and the Matrix object in the Model Maker viewer.
- 7. Click the Raster icon in the Model Maker tool palette.
- **8.** Click to place the Raster object below the Function object in the Model Maker viewer.
- 9. Click the Connection icon $\mathbb{S}_{\mathbf{v}}$ in the Model Maker tool palette.

10. Click the Lock icon 🚡 in the Model Maker tool palette. It changes

to reflect the locked state 🔒 .

- **11.** Connect the first Raster object and the Matrix object to the Function object as inputs.
- **12.** Connect the Function object to the final Raster object as an output.
- 13. Click the Selector icon \mathbf{X} in the Model Maker tool palette.
- 14. Click the Lock icon in the Model Maker tool palette to turn it off.Your model now looks like the following:



Add Raster Properties

 Double-click the first Raster object. The Raster dialog opens.

	10 Raster		×
	File Name: (*.img)	Input	
	kimming 😫	Number of Lapers:	7
Select the file	Promot User for File at Run Time	Number of Rows: Number of Columns:	591 591
here ———		Interpolation: Nearest Neighbor	×
	Output	Processing Window:	
	Dete Type: Unsigned 8-bit 💌 File Type: Continuous 💌	GMap C File From Inqui ULX 604646250000 ± URX 733 ULY: 305701.968750 ± URY: 255	2436.250000 -
	I Ignow 0.0000 🗄 in Statu Calculation	Declare as: Area	a of Interest
		Integer V Che	ose ADI
	Temporary Raster Only	Recode Data Setue Setue	Recode
	0K	Cancel Help	

- Click the Open icon in the Raster dialog to open the File Name dialog.
- **3.** In the File Name dialog, select the file **dmtm.img** from the /examples directory.

The file **dmtm.img** is located in <IMAGINE_HOME>/examples, where <IMAGINE_HOME> is the location of ERDAS IMAGINE on your system.

- Click OK in the File Name dialog.
 The Raster dialog updates with the appropriate File Name.
- 5. Click **OK** in the Raster dialog.

Add Matrix Properties

۹r

 In the Model Maker viewer, double-click the Matrix object. The Matrix Definition dialog opens.

Matrix Definition	🙀 Hatris	t				
Select:	Row	1	2	3	- 4	14
	1	00000000	-1.000	-1.000	-1.000	
G Buil_In C Custom_Matrix C Read C Output	2	-1.000	-2.000	-2.000	-2.000	-
		-1.000	-2.000	70.000	-2.000	-
	- 4	-1.000	-2.000	-2.000	-2.000	-
Buit In:	5	-1.000	-1.000	-1.000	-1.000	-11
Kerret	Cho	ose Su	ımma	nry an		5
 House Have Collegic Recution 						
OK Cancel Help						

- 2. From the Kernel list, select Summary.
- **3.** From the **Size** list, select $\mathbf{5} \times \mathbf{5}$.
- 4. Click **OK** in the Matrix Definition dialog.

Add Function Properties

1. Double-click the Function object.

The Function Definition dialog opens.

	10 Function Definition		
Selections you make display here_	Available Inputs: 511_dnim(1) 511_dnim(2) 511_dnim(3) 511_dnim(3) 511_dnim(5) 511_dnim(5) 511_dnim(7) 512_Summary	x / 7 0 9 4 5 6 1 2 0 . 0 .	Functions: Analysis CLUMP (dayeo , 4) CLUMP (dayeo , 4) CLUMP (dayeo , 8) CORRELATION (coveniance_mate CORRELATION (coveniance_mate CORRELATION (casteo) CORRELATION (casteo) COVARIANCE
	CONVOLVE (\$n1_dmtm , dxemeb)		۲ ۲
	COK .	Clear Cancel	Help

- 2. Confirm that the Functions dropdown list shows Analysis.
- 3. Under Functions, select CONVOLVE (<raster> , <kernel>).

- 4. In the lower portion of the Function Definition dialog, click in the middle of **<raster>**.
- 5. Under Available Inputs, click \$n1_dmtm.

At this point you would normally replace the **<kernel>** prototype, but you are going to intentionally forget to do that.

6. Click the OK button.

Add Raster Properties

1. Double-click the output Raster object.

The Raster dialog opens.

File Name: (".img)	Input:
hap_dntn.ing	Number of Layers
Prompt User for File at Pun Time	Number of Rows
	Number of Columns:
	Interpolation: Nearest Neighbor
utaut 🔽 Delete If Exists	Processing Window
uput: P Delete If Exists	C Nap @ File From Inquire Box
Data Type: Unsigned 8-bit	ULX 0.00000 - DRX 0.00000 -
File Type: Continuous 💌	
Ignore 0.0000 - in Stats Calculation	
	Declare as: Area of Interest
	Integer 💌 Choose ADI
	C Recode Data
	Setup Recode
Temporary Rester Drily Integer	Don't Recode Data

- 2. Click the Open icon 📂 , then navigate to a directory where you have write permission.
- 3. In the File Name dialog, enter **sharp_dmtm.img** for the output image name.
- 4. Click **OK** in the File Name dialog.

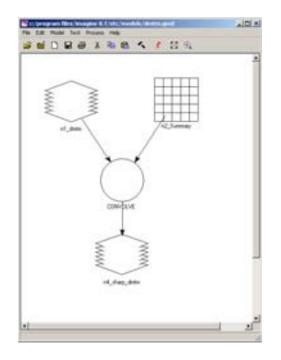
The new file, **sharp_dmtm.img**, is listed in the Raster dialog.

5. Click the Delete If Exists checkbox.

This option allows you to run the model many times. You may have to run the model more than once to get it working.

6. Click the **OK** button in the Raster dialog.

At this point, your model should look similar to the following:



Select Process -> Run or click the Execute the Model icon sin the toolbar.

A Job Status dialog opens, which tracks the progress of the model execution.

Job State:	Done		
Percent Done:	100% 0	 100	

You receive an error similar to the following:



Correct the Model

The next step is to figure out what this error means.

- 1. Click **OK** to dismiss the Error dialog.
- 2. Click OK to dismiss the Job Status dialog.



You can set the Keep Job Status Box in the User Interface & Session category of the Preference Editor so that the Job Status box is dismissed automatically after an operation is performed.

3. In the Model Maker viewer, select **Process -> Generate Script**.

	💯 Generate Script	×
The name of the model	Script Name: (*.mdl)	
displays here ──►	[shapen.nd]	
	info New Folder RatterProxies regolean aone00	
	🖼 temp	•
	OK Cancel He	¢

- **4.** In the Generate Script dialog, click the Open icon, and navigate to a directory where you have write permission.
- 5. Enter the name **sharpen.mdl**, and click **OK**.

Start the Model Librarian

1. In the Spatial Modeler dialog, click the **Model Librarian** button.

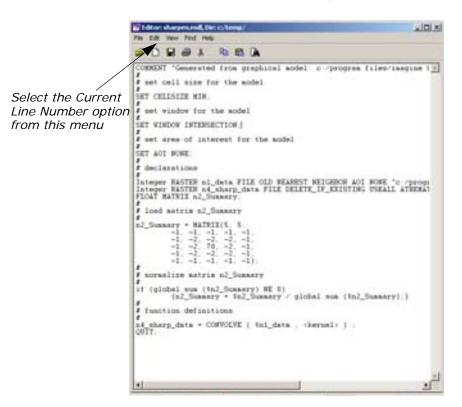


The Model Librarian dialog opens.

	🙀 Model Librarian	X
	Model Library: (".mdl)	
	shapen.md	
Select the model sharpen.mdl from the list	into New Folder RasherPosies regictean sharpen.md	
	Library Functions:	-
	Edt Delete	
	Run Model Batch Coce Help	

2. Navigate to the correct directory, then select sharpen.mdl.

3. Click the Edit button in the Model Librarian dialog.

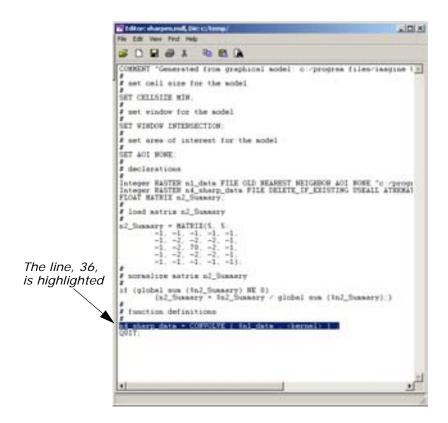


 In the Editor window, select View -> Current Line Number. The Current Line Number dialog opens.

Enter the Line Number	10 Current Line Number		×
you want to view	Line Number:	E	2
	Close	Where	GoTo

- 5. In the Current Line Number dialog, enter **36** for the **Line Number** (the line number referred to in the Error dialog).
- 6. Click the Go To button.

This highlights the line containing the error as depicted in the following picture:



If you examine the selected line, just to the right of the equal sign is a function, which also serves as a label to a Function object in the graphical model. Most syntax errors occur in Function definitions. In general, you generate a script so you can relate the line number given in the error message back to a particular Function object in the model.

Correct the Function

- 1. In the Model Maker viewer, double-click the Function object, CONVOLVE.
- 2. Examine the function definition to determine the error.

In this case, you determine the function definition still has an argument prototype, **<kernel>**, that needs to be replaced with an actual argument.

- **3.** In the lower portion of the Function Definition dialog, click in the middle of **<kernel>**.
- 4. Under Available Inputs, click \$n2_Summary.

Your Function Definition dialog now looks like the following:

	M Function Definition: CONVOLVE			
The input \$n2_Summary replaces <kernel>►</kernel>	Available Inputs: 5n1_dnim(1) 5n1_dnim(2) 5n1_dnim(2) 5n1_dnim(3) 5n1_dnim(5) 5n1_dnim(5) 5n1_dnim(7) 5n2_Stammay	x / 7 0 9 4 5 6 1 2 3 (0)	Functions: Analysis CLUMP (dayeo , 4) CLUMP (dayeo , 4) CLUMP (dayeo , 8) CONVOLVE (casteo , doerneb) CORRELATION (coateo , iSNOR CONVELVATION (coateo) CONVELVANCE (coateo) CONV	е. ож
	CONVOLVE (\$n1_dntm.\$n2_Summay)			X
	ОК	Clear Cancel	Help	

5. Click **OK** in the Function Definition dialog.

Execute the Model

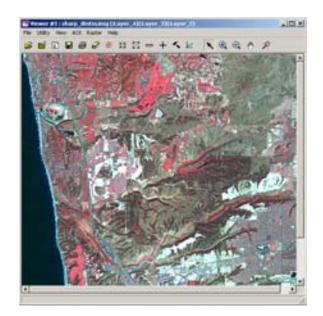
Select Process -> Run or click the Execute the Model icon *sin* the toolbar.

The model should run to completion without error this time.

2. Click the **OK** button to dismiss the Job Status dialog.

Check the Results

- 1. Click the Viewer icon to open a new Viewer.
- **3.** Select the file **sharp_dmtm.img**, then click **OK** in the Select Layer To Add dialog to open it in the Viewer.



4. When you are finished viewing the image, click **File -> Close** in the Viewer to close the image.

There are five basic object types that can be either inputs to or outputs from a model. These are:

- Raster
- Vector (input only)
- Matrix
- Table
- Scalar

Depending on the arguments, each function produces a particular object type.

For example, the GLOBAL MAX function produces a Scalar if the argument is either a Matrix or a Table. However, it produces a Table if the argument is a Raster. In other words, for either a Matrix or a Table, the maximum value may be represented by a single number (that is, Scalar). A Raster has a maximum value in each individual spectral band, so the result in this case is a Table of maximum values: one for each band. In order to be consistent, this is still true for a Raster with only one band. In this case a table is produced with a single entry.

In the following exercise, you build a model that rescales an image based on the maximum pixel value that actually occurs in an image. You do this using the GLOBAL MAX function. Initially, you incorrectly treat the output of the GLOBAL MAX function as a Scalar so you can see the type of error generated.

Eliminate Object type Mismatch

You must have ERDAS IMAGINE running.

1. Click the Modeler icon in the ERDAS IMAGINE icon panel.

The **Spatial Modeler** menu opens.

	🧏 Spatial Modeler 🛛 🕺
Select Model Maker —	Model Maker
	Model Librarian
	Close Help

2. Click Model Maker on the Spatial Modeler menu.

A blank Spatial Modeler viewer opens along with the Model Maker tool palette.

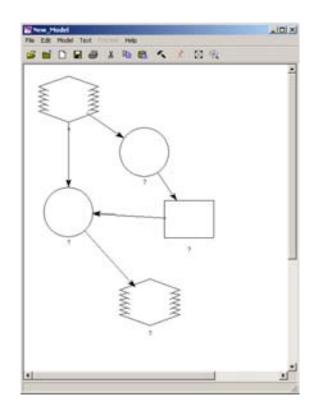
Create the Model

- **1.** Click the Raster icon (1) in the Model Maker tool palette.
- 2. Click to position the Raster object in the upper left corner of the Model Maker viewer.
- **3.** Click the Function icon () in the Model Maker tool palette.
- **4.** Click to position the Function object below and to the right of the Raster object in the Model Maker viewer.
- 5. Click the Scalar icon 🔲 in the Model Maker tool palette.
- 6. Click to position the Scalar object below and to the right of the Function object in the Model Maker viewer.
- 7. Click the Function icon in the Model Maker tool palette.
- **8.** Click to position the Function object to the left of the Scalar object in the Model Maker viewer.
- 9. Click the Raster icon in the Model Maker tool palette.
- **10**. Click to position the Raster object below the Scalar object in the Model Maker viewer.
- 11. Click the Connection icon 🔧 in the Model Maker tool palette.
- 12. Click the Lock icon in the Model Maker tool palette. It changes to the locked state .
- **13.** Connect the first Raster to the first Function.

- **14.** Also connect the first Raster to the second Function.
- 15. Connect the first Function to the Scalar.
- 16. Connect the Scalar to the second Function.
- **17.** Connect the second Function to the final output Raster.

NOTE: You may want to refer to the following diagram of the model to verify your connections. Connections may be broken or deleted by using the Connection tool in the reverse direction of the existing connection.

- **18.** Click the Selector icon **X** in the Model Maker tool palette.
- **19.** Click the Lock icon in the Model Maker tool palette to turn it off. Your model should look like the following:



Add Raster Properties

 Double-click the first Raster object. The Raster dialog opens.

Select the file pots.img	Raster		×
pots.iirig	File Name: (".img)	Input	
	kpots ing	Number of Lapers:	1
	Prompt User for File at Run Time	Number of Rows: Number of Columns:	1024
		Interpolation: Nearest Neighbor	*
	Output: Data Type: Unsigned 8-bit File Type: Continuous I Ignore 0.0000 in Stats Calculation	ULY: 298490.187500 x URY: 2643	104.631405
	Temporary Raster Only Integer	C Recode Data	ee ADI
		Cancel Help	

- 2. Click the Open icon so on the Raster dialog, and navigate to the /examples directory.
- 3. In the Open File dialog, select **spots.img** and click **OK**.

Add Function Properties

 Double-click the first Function object. The Function Definition dialog opens.

19 Function Definition		LO X	
Available Inputs: 911_spots	X - / Functions: Bibbal 7 0 9 GLOBAL DM/DRSTTY [< exp1>] 7 0 9 GLOBAL MAJORITY [< exp1>] 64 5 6 GLOBAL MAJORITY [< exp1>] 1 2 3 [GLOBAL MAJORITY [< exp1>] 1 2 3 [GLOBAL MAJORITY [< exp1>] 6 0 GLOBAL MAJORITY [< exp1>] 1 2 3 [GLOBAL MAJORITY [< exp1>] 1 2 3 [GLOBAL MAJORITY [< exp1>] 6 0 GLOBAL MEAN [< exp1>] 7 0 1	indf ove	Select Global from the Functions list
GLOBAL MAX(\$n1_spot\$)		N	
OK	Clear Cancel Help		

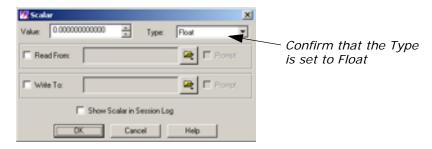
- 2. In the Functions dropdown list, select Global.
- 3. In the list of Global functions, select GLOBAL MAX (<arg1>).
- In the lower portion of the Function Definition dialog, click in the middle of <arg1>.

- 5. Under Available Inputs, click \$n1_spots.
- 6. Click **OK** in the Function Definition dialog.

Add Scalar Properties

1. Double-click the Scalar object.

The Scalar dialog opens.



2. Verify that the Type is set to Float, and click OK.

You select **Float** to insure the model uses floating point arithmetic instead of integer arithmetic. You do this because you are calculating a ratio between 255 and the GLOBAL MAX. In other words, you want to be able to multiply the pixel values by numbers such as 1.3, 2.1, or 3.4 and not just 1, 2, or 3.

Add Function Properties

1. Double-click the second Function object.

The Function dialog opens.

	Function Definition		_0×
The function definition appears here	Available Inputs: Sn3_ptost	x - 7 0 4 5 1 2 . 0	Functions: Analysis CLUMP (dayeo , 4) CLUMP (dayeo , 4) CLUMP (dayeo , 8) CLUMP (dayeo , 8) CONVOLVE (casteo , stamme)) CORRELATION (coateo , lonore , coateo , ISNORE - CONARIANCE (casteo , ISNORE - COVARIANCE (casteo , ISNORE - COVA
	255 / \$n3_Float * \$n1_spots		× ×
	OK.	Cear Cancel	Help

- Using the calculator portion of the Function Definition dialog enter
 255 / .
- 3. Under Available Inputs click \$n3_Float.

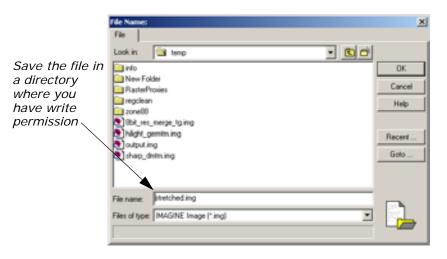
- 4. In the calculator portion of the Function Definition dialog click *.
- 5. Under Available Inputs click \$n1_spots.
- 6. Click **OK** in the Function Definition dialog.

Add Raster Properties

 Double-click the output Raster object. The Raster dialog opens.

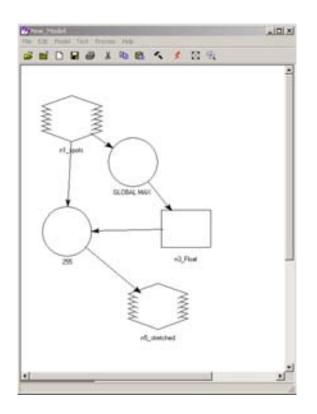
	10 Raster	X
	File Name: (*.img)	Input
	stretched ing	Number of Layers:
	Prompt User for File at Run Time	Number of Rows:
		Number of Columns:
Make sure		Interpolation Nearest Neighbor
you click the Delete If	Output: IF Delete If Exists	Processing Window:
Exists	Output: P Evelete If Exists	C Nap @ File From Inquire Box
checkbox —	Bala Type: Unsigned 8-bit	ULX 0.00000 - LBX 0.00000 -
	File Type: Continuous	
	□ Ignose 0.0000 - in Stats Calculation	ULY: 0.000000 - URY: 0.000000 -
		Declare as: Area of Interest
		Integer 💌 Choose ADI
		C Recode Data Setup Recode
	Temporary Raster Only Integer 💌	C Don't Recode Data
	0K	Cancel Help

- 2. Click the Open icon 📂 in the Raster dialog, then navigate to a directory where you have write permission.
- 3. Enter stretched.img for the output image name, then click **OK** in the File Name dialog.



- In the Raster dialog, click the **Delete If Exists** checkbox.You may have to run the model more than once to get it working.
- 5. Click the **OK** button.

At this point, your model should look similar to the following:



Execute the Model

Select Process -> Run or click the Execute the Model icon so on the toolbar.

A Job Status dialog opens.

Modeler - (running model: egmd_002200	×
Job State:	Done	
Percent Done:	100% 0	
	OK Cancel Help	

You receive an error like the following:

M trre	,	×
0	Assignment to incompatible object type	
	OK IS AI	

The next step is to figure out what this error means.

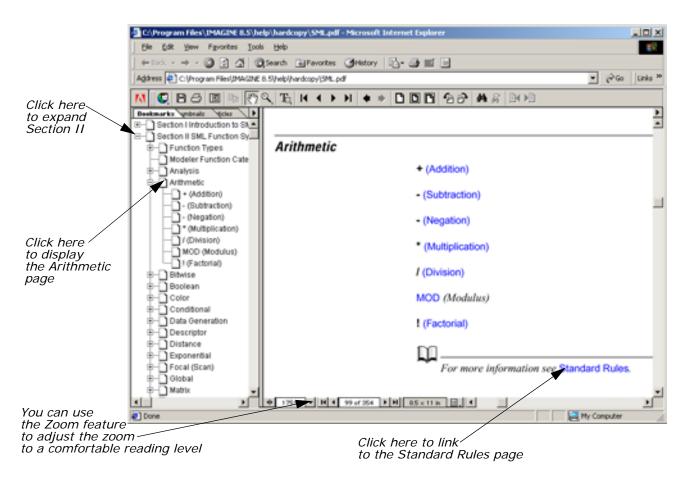
- 2. Click OK to dismiss the Error dialog.
- 3. Click **OK** to dismiss the Job Status dialog.

Check the On-Line Help

When a model is executed, an Assignment statement is generated for each Function object in the model. The error is telling you that one of the Function objects in the model is generating a different object type than what you have it connected to.

You know that in one of our Function objects we using the GLOBAL MAX function, and in the other you are just doing arithmetic. At this point, you can use the online documentation to help out.

- 1. Click Help -> Help for Model Maker.
- Click the hyperlink to the Spatial Modeler Language Reference Manual in the third paragraph. The on-line manual is in Adobe® portable document format (SML.pdf). It opens in a new browser window.
- 3. In the Navigation Pane, click the + beside Section II SML Function Syntax to view all topics included in that section.
- 4. Click the Arithmetic topic to open that page in the Acrobat viewer.



- After reading the topic, click the hyperlink to open the Standard Rules page. The Standard Rules for Combining Different Types topic displays.
- 6. Scroll down to the Object Types section.

While this section contains some very useful information, it gives no indication that anything is wrong with the Function in which you are doing simple arithmetic.

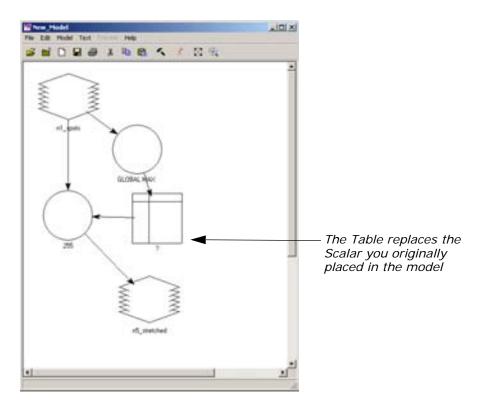
- 7. In the Navigation Pane, click the + beside **Global** to view all the pages under this topic.
- 8. Click GLOBAL MAX (Global Maximum) to display this topic.
- 9. Scroll down to the Object Types section.

Note the on-line documentation states, "If <arg1> is a RASTER, the result is a TABLE with the same number of rows as <arg1> has layers". In your model, you incorrectly connected the output of GLOBAL MAX of a Raster to a Scalar instead of a Table.

10. Select **File -> Exit** from the On-Line Help dialog.

Correct the Model

- **1.** In the Model Maker viewer, click the Scalar object.
- 2. Select Edit -> Clear, or press the Delete key on your keyboard.
- **3.** Click the Table icon 🛗 in the Model Maker tool palette.
- **4.** Click to position the Table object in the location where the Scalar object was in the Model Maker viewer.
- **5.** Using the Connection tool, connect the first Function to the Table, and the Table to the second Function.



Add Table Properties

1. Using the Selector tool, double-click the Table object in the Model Maker viewer.

The Table Definition dialog opens.

10 Table Definition	x
Select	
C Descriptor C Custom C Read C Output	
Output Options:	
🗐 Witte Ta:	
F Show Table in Session Log	
Culput to Descriptor or Attribute	
	Select the Float Data
Stor: 0 🕂 Data Type: Place	Type
OK Cancel Help	
Carca nap	

- 2. Click the Data Type dropdown list, and select Float.
- 3. Click the OK button.

Correct Function Properties

1. Double-click the second Function object.

Notice Model Maker replaced the name of the deleted Scalar object with a **<scalar>** place holder. It did this to remind you what was there before. In this case, you replace **<scalar>** with a Table.

	Marction Definition: 255		
Replace the <scalar> place holder</scalar>	Available Inputs: \$n1_spots \$n6_Output	7 0 9 CLUM CORP 4 5 6 CORP 1 2 3 L COV DIAL	ens: Analysis P(dayeo, 4) P(dayeo, 8) OLVE (casteo, ckemeb) ELATION (covariance, matric ULATION (casteo) RUANCE (casteo, ISNORE - RUANCE (casteo, ISNORE - RUANCE (casteo) CUVS (cductableo, cisevetable) CTLDORUP(cast), cisevetable) MMATRDX1 (matric)
	255 / <scala> " \$n1_spots</scala>		۲ ۲
	ОК	Clear Cancel	Help

- 2. In the lower portion of the Function Definition dialog, click in the middle of <scalar>.
- 3. Under Available Inputs, click \$n6_Output.

	M Function Definition: 255		IX
The correct input, \$n6_Output displays in the window—	Available inputs: 21 spots 50% Output 7 4 1 -		[
	255 / \$n6_Output * \$n1_spots		X
	OK De	tar Cancel Help	

4. Click the **OK** button in Function Definition dialog.

Execute the Model

Select Process -> Run or click the Execute the Model icon some on the toolbar.

The model should run to completion without error this time.

2. Click the OK button to dismiss the Job Status dialog.

The other advantage our model has, by properly treating the output of the GLOBAL MAX function as a Table, is that it works whether the input image has only a single band or hundreds of bands. Remember that, with multispectral data, the Table generated by the GLOBAL MAX function has an entry for each band representing the maximum value in each band, respectively. When we multiply a Raster by a Table, each band in the Raster is multiplied by the corresponding entry in the Table. This allows our model to work on all bands at once without having to loop through each band.

View the Results

- 1. Click the Viewer icon to open a new Viewer.
- **3.** Select the file **stretched.img**, then click **OK** in the Select Layer To Add dialog to open it in the Viewer.



4. When you are finished, click File -> Close in the Viewer to close the image.

Eliminate Division by NOTE: Now that you are familiar with the tools and interface of the Spatial Modeler, the following two examples, "Eliminate Division by Zero" and "Use AOIs in Processing" do not have detailed instructions, or as many screen captures to guide you through the process.

> Calculating band ratios with multispectral imagery is a very common image processing technique. Calculating a band ratio can be as simple as dividing one spectral band by another. Any time division is done, care should be taken to avoid division by zero, which is undefined. In the following model, you can see what errors division by zero can cause and how to correct these errors.

Create the Model

You must have Model Maker running.

- **1.** Click the Raster icon in the Model Maker tool palette.
- 2. Click near the upper left corner of the Model Maker viewer.
- **3.** Click the Function icon in the Model Maker tool palette.
- 4. Click below and to the right of the Raster object in the Model Maker viewer.
- 5. Click the Raster icon in the Model Maker tool palette.
- 6. Click below and to the right of the Function object in the Model Maker viewer.
- 7. Click the Connection icon in the Model Maker tool palette.

Zero

- 8. Click the Lock icon in the Model Maker tool palette.
- 9. Connect the first Raster object to the Function object as an input.
- **10.** Connect the Function object to the final Raster object as an output.
- 11. Click the Selector icon in the Model Maker tool palette.
- 12. Click the Lock icon in the Model Maker tool palette to turn it off.

Add Raster Properties

- 1. Double-click the first Raster object.
- 2. Select ortho.img from the examples directory and click OK.

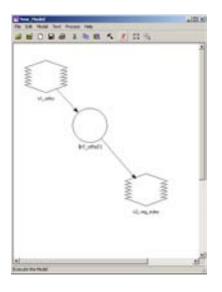
Add Function Properties

- **1.** Double-click the Function object.
- 2. Under Available Inputs, click \$n1_ortho(1).
- In the Calculator portion of the Function Definition dialog, click the / key.
- 4. Under Available Inputs, click \$n1_ortho(2).
- 5. Click the OK button.

Add Raster Properties

- 1. Double-click the output Raster object.
- Navigate to a directory where you have write permission, and enter veg_index.img for the output image name.
- **3.** Click the **Delete If Exists** (you are going to run the model more than once to get it working properly).
- 4. Click the **OK** button.

At this point, your model should look similar to the following:



Execute the Model

1. Select **Process -> Run** or click the Execute the Model icon in the toolbar.

After your model appears to have run to completion you receive the following error:

W tre	*	×
0	Divided by zero	
	OK to All	

Next, you attempt to avoid dividing by zero by setting the output pixel value to zero any place there would be a division by zero.

- 2. Click OK to dismiss the Error dialog.
- 3. Click OK to dismiss the Modeler status dialog.

Change Function Properties

- 1. In the Model Maker viewer, double-click the Function object.
- 2. Click the **Clear** button to start our function definition from scratch.
- 3. In the Functions dropdown list, select Conditional.
- In the list of functions, select EITHER <arg1> IF (<test>) OR
 <arg2> OTHERWISE, this should be the second item on the list.
- In the lower portion of the Function Definition dialog, click in the middle of <arg1>.

- 6. In the Calculator portion of the Function Definition dialog, click the **O** key.
- In the lower portion of the Function Definition dialog, click in the middle of <test>.
- 8. Under Available Inputs, click \$n1_ortho(2).
- 9. In the Functions dropdown list select Relational.
- **10.** In the list of functions select ==, this should be the first item on the list.
- **11.** In the Calculator portion of the Function Definition dialog click the **0** key.
- **12.** In the lower portion of the Function Definition dialog, click in the middle of **<arg2>**.
- 13. Under Available Inputs, click \$n1_ortho(1).
- In the Calculator portion of the Function Definition dialog, click the key.
- 15. Under Available Inputs, click \$n1_ortho(2).

Your Function Definition dialog should now contain the following:

EITHER 0 IF (\$n1_otho(2) == 0) OR \$n1_otho(1) / \$n1_otho(2)/ OTHERWISE

16. Click the OK button.

Execute the Model

 Select Process -> Run, or click the Execute the Model icon in the toolbar.

After all the careful checking for division by zero you get the same error. The reason you still get the same error is that Modeler evaluates the entire statement at once. As it turns out, the error is generated when you do an Integer division by zero. So in order to avoid the integer division and the resulting error, you can use floating point arithmetic to set the output pixel value. You can force the use of floating point arithmetic by simply declaring our input Raster to be of type Float.

- 2. Click **OK** to dismiss the Error dialog.
- 3. Click **OK** to dismiss the Modeler status dialog.

Change Raster Properties

- 1. In the Model Maker viewer, double-click the input Raster object.
- 2. In the lower central portion of the Raster dialog, in the **Declare As** dropdown list select **Float**.

- 3. Click the OK button.
- 4. Select **Process -> Run** or click the Execute the Model icon in the toolbar.

The model now runs successfully to completion without any errors. However, if you view the resulting image, **veg_index.img**, you notice that it is relatively dark and does not contain much detail.



This happens because, even though you are calculating a floatingpoint ratio, you are still outputting an integer result. So, all resulting output pixel values are being truncated to integers. This includes all pixels where the pixel value in band two is larger than the pixel value in band one—these are all set to 0 instead of retaining values such as 0.25, 0.833, or 0.498. In order to maintain the information being calculated, all you have to do is change the type of output file being generated.

Change Raster Properties

- 1. In the Model Maker viewer, double-click the output Raster object.
- 2. In the Raster dialog in the **Data Type** dropdown list select **Float Single**.
- 3. Click the OK button.
- Select Process -> Run or click the Execute the Model icon in the toolbar.

If you view the resulting output image now, you see the full detail from the computations, which are available for further analysis.



Use AOIs in Processing

Area Of Interest (AOI) processing can be used to restrict the area processed of individual images or of the model as a whole. AOIs can be used as masks to cookie cut the desired portions of images. When and how the mask is applied may not be of much interest in a model utilizing point operations. However, in models doing neighborhood operations, when the AOI is applied yields differing results.

For example, if you cookie cut the input image with an AOI before doing an edge detection filter, the model produces artificial edges around the AOI. In this case, you want to do the edge detection on the original input image and cookie cut the results with the AOI. Besides using AOIs as processing masks, Vector layer inputs may also be used. In the following example, you generate and use an AOI to smooth out the appearance of the water in Mobile Bay.

Create AOI

You must have Model Maker running.

- 1. Click the Raster icon in the Model Maker tool palette.
- 2. Click near the upper left corner of the Model Maker viewer.
- 1. In a Viewer, open **mobbay.img** from the /examples directory.
- 2. In the Viewer, click the Show Tool Palette for Top Layer icon.
- 3. Select the Region Grow AOI tool from the palette.
- 4. Click a dark portion of the water near the southeast corner of the image.
- 5. From the AOI menu select Seed Properties.
- 6. Click the Area checkbox to turn it off.

- 7. Enter 20.0 for the Spectral Euclidean Distance.
- 8. Click the Redo button.

Add Raster Properties

- **1.** Double-click the first Raster object.
- 2. Select **mobbay.img** from the /examples directory.
- 3. Click the **Choose AOI** button on the right side of the Raster dialog.
- 4. Select Viewer as the AOI Source and click OK.
- 5. Click **OK** in the Raster dialog.

Add Raster Properties

- 1. Click the Raster icon in the Model Maker tool palette.
- 2. Click to the right of the existing Raster in the Model Maker viewer.
- 3. Double-click this newly placed Raster object.
- 4. Select **mobbay.img** from the /examples directory.
- This time do not select an AOI, but rather just click OK in the Raster dialog.

Add Matrix Properties

- **1.** Click the Matrix icon in the Model Maker tool palette.
- **2.** Click just to the right of the two Raster objects in the Model Maker viewer.
- 3. Double-click this newly placed Matrix object.
- 4. In the Size dropdown list select 5×5 .
- 5. Click OK.

Add Function Properties

- **1.** Click the Function icon in the Model Maker tool palette.
- 2. Click below n3_Low_Pass in the Model Maker viewer.
- 3. Connect **n2_mobbay** and **n3_Low_Pass** to the newly placed Function object.
- 4. Double-click the Function object.
- From the analysis Functions select CONVOLVE (<raster> , <kernel>), this should be the third item on the list.

- 6. In the lower portion of the Function Definition dialog, click in the middle of <**raster**>.
- 7. Under Available Inputs, click \$n2_mobbay.
- 8. In the lower portion of the Function Definition dialog, click in the middle of **<kernel>**.
- 9. Under Available Inputs, click \$n3_Low_Pass.

10. Click OK.

Add Raster Properties

- **1.** Click the Raster icon in the Model Maker tool palette.
- 2. Click below the Function object in the Model Maker viewer.
- 3. Connect the Function object to the new Raster object.
- 4. Double-click the new Raster object.
- 5. Click Temporary Raster Only.
- 6. Click OK.

Add Function Properties

- 1. Click the Function icon in the Model Maker tool palette.
- 2. Click to the left of n5_memory in the Model Maker viewer.
- 3. Connect n1_mobbay, n2_mobbay, and n5_memory to the Function object.
- 4. Double-click the Function object.
- 5. In the Functions dropdown list select Conditional.
- 6. In the list of functions select EITHER <arg1> IF (<test>) OR <arg2> OTHERWISE, this should be the second item on the list.
- In the lower portion of the Function Definition dialog, click in the middle of <arg1>.
- 8. Under Available Inputs, click \$n5_memory.
- 9. In the lower portion of the Function Definition dialog, click in the middle of <test>.
- 10. Under Available Inputs, click \$n1_mobbay.
- **11.** In the lower portion of the Function Definition dialog, click in the middle of **<arg2>**.
- 12. Under Available Inputs, click \$n2_mobbay.

Your Function Definition dialog should now contain the following:

EITHER \$n5_memory IF (\$n1_mobbay) OR \$n2_mobbay OTHERWISE

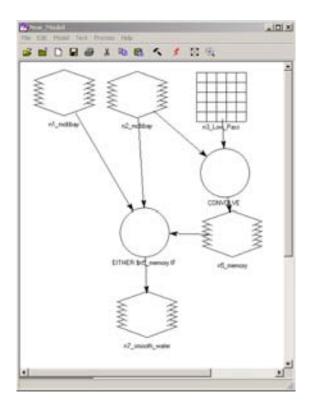
\$n5_memory is the filtered image, **\$n1_mobbay** has the AOI mask, and **\$n2_mobbay** is the original image.

13. Click OK.

Add Raster Properties

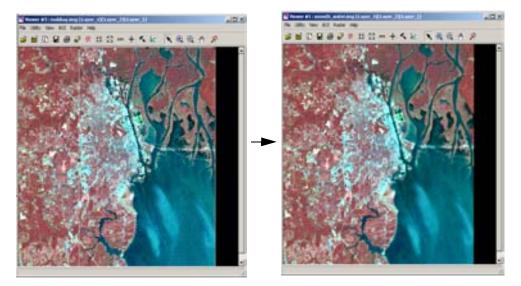
- 1. Click the Raster icon in the Model Maker tool palette.
- 2. Click below the new Function object in the Model Maker viewer.
- 3. Connect the Function object to the Raster object.
- 4. Double-click the output Raster object.
- Navigate to a directory where you have write permission and enter smooth_water.img for the output image name.
- 6. Click the **Delete If Exists**, in case you need to run the model more than once to get it working properly.
- 7. Click the OK button.

Your model should look like the following:



Execute the Model

- 1. Select **Process -> Run** or click the Execute the Model icon in the toolbar.
- 2. Use the Viewer and the Swipe tool to compare the original **mobbay.img** and the new **smooth_water.img**.



Compare the image on the left, above, with the image on the right. The image on the right has been visibly smoothed in the areas of water. You can see this more clearly if you use the Swipe utility in the Viewer (see below).

Using the Swipe Utility

- 1. Open one file in the Viewer.
- 2. Open the second file in the Viewer making sure to uncheck the **Clear Display** checkbox in the **Raster Options** tab of the file selector.
- 3. Select **Swipe** from the Viewer **Utility** menu. The Viewer Swipe dialog opens.

Wiewer Swipe		×	
Swipe Position:			
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Direction	Automatic Swipe:		— Drag this slider
Perical C Horizontal	C Auto Mode Speed.	300 2	
Cancel	Help		

4. Grab the **Swipe Position** slider and drag it left and right while observing the Viewer. As you move the slider to the left, the top image is rolled back to reveal the underlying image.

Advanced Classification



- Evaluate signatures.
- Process a supervised classification.

Define Signatures using Signature Editor The ERDAS IMAGINE Signature Editor allows you to create, manage, evaluate and edit signatures (.sig extension). The following types of signatures can be defined:

- parametric (statistical)
- nonparametric (feature space)

In this section, you define the signatures using the following operations:

- Collect signatures from the image to be classified using the area of interest (AOI) tools.
- Collect signatures from the Feature Space image using the AOI tools and Feature Space tools.

Preparation

ERDAS IMAGINE must be running and a Viewer must be open.

 Select File -> Open -> Raster Layer from the Viewer menu bar, or click the Open icon on the Viewer toolbar to display the image

file to be classified.

The Select Layer To Add dialog opens.

	Select Layer To Add:	×	
	File Rader Options Multiple	OK 1	
Click here to select the raster options	Lapers to Color:	Cancel Help	Click here to display the image
<i>Set values to</i> 4, 5, 3	Orient Image to Map System One Display Set View Extent	Recent	
Click Fit to Frame	Fit to Frame In No Shetch Data Scaling Ill Background Transparent Zoom by: 1.00 + Using: Nearest Neighbor Help		

- In the Select Layer To Add dialog File name section, select germtm.img, which is located in the <IMAGINE_HOME>/examples directory. This is the image file that is going to be classified.
- Click the Raster Options tab at the top of the dialog, and then set the Layers to Colors to 4, 5, and 3 (Red, Green, and Blue, respectively).

- 4. Click the Fit to Frame option to enable it.
- 5. Click **OK** in the Select Layer To Add dialog.

The file **germtm.img** displays in the Viewer. If you would like to see only the image in the Viewer and not the surrounding black space, right-click in the Viewer and select **Fit Window to Image**.

Open Signature Editor

1. Click the Classifier icon on the ERDAS IMAGINE icon panel.



The Classification menu displays.



2. Select **Signature Editor** from the **Classification** menu to start the Signature Editor.

The Signature Editor opens.

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3. In the **Classification** menu, click **Close** to remove this menu from the screen.

In the Signature Editor, select View -> Columns.
 The View Signature Columns dialog opens.



- In the View Signature Columns dialog, right-click in the first column, labeled Column, to access the Row Selection menu. Click Select All.
- 6. Shift-click **Red**, **Green**, and **Blue** in **Column** boxes **3**, **4**, and **5** to deselect these rows.

These are the CellArray columns in the Signature Editor that you remove to make it easier to use. These columns can be reinstated at any time.

7. In the View Signature Columns dialog, click Apply.

The **Red**, **Green**, and **Blue** columns are deleted from the Signature Editor.

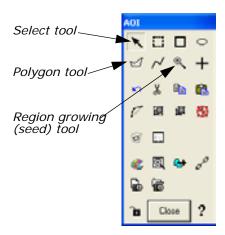
8. Click **Close** in the View Signature Columns dialog.

Use AOI Tools to Collect Signatures

The AOI tools allow you to select the areas in an image to be used as signatures. These signatures are parametric because they have statistical information.

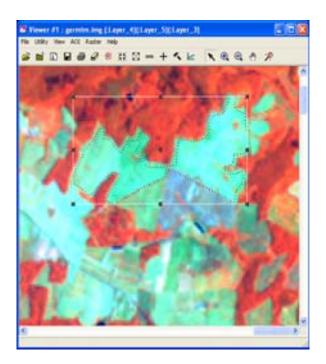
1. Select **AOI** -> **Tools** from the Viewer menu bar.

The AOI tool palette displays.



- 2. Use the Zoom In tool (a) on the Viewer toolbar to zoom in on one of the light green areas in the **germtm.img** file in the Viewer.
- 3. In the AOI tool palette, click the Polygon icon \checkmark .
- In the Viewer, draw a polygon around the green area you just magnified. Click to draw the vertices of the polygon. Middle-click or double-click to close the polygon (depending on what is set in Session -> Preferences).

After the AOI is created, a bounding box surrounds the polygon, indicating that it is currently selected. These areas are agricultural fields.



5. In the Signature Editor, click the Create New Signature(s) from AOI

icon •• or select Edit -> Add from the menu bar to add this AOI as a signature.

- In the Signature Editor, click inside the Signature Name column for the signature you just added. Change the name to Agricultural Field_1, then press Enter on the keyboard.
- In the Signature Editor, hold in the Color column next to Agricultural Field_1 and select Green.

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- 8. Zoom in on one of the light blue/cyan areas in the **germtm.img** file in the Viewer.
- 9. Draw a polygon as you did in step 2 through step 4.

These areas are also agricultural fields.

10. After you create the AOI, a bounding box surrounds the polygon, indicating that it is currently selected. In the Signature Editor, click

the Create New Signature(s) from AOI icon . , or select Edit -> Add to add this AOI as a signature.

- In the Signature Editor, click inside the Signature Name column for the signature you just added. Change the name to Agricultural Field_2, then press Enter on the keyboard.
- 12. In the Signature Editor, hold in the Color column next to Agricultural Field_2 and select Cyan.

Select Neighborhood Options

This option determines which pixels are considered contiguous (that is, they have similar values) to the seed pixel or any accepted pixels.

1. Select AOI -> Seed Properties from the Viewer menu bar.

The Region Growing Properties dialog opens.

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Enter 10 here	Spectra	Euclidean Distance: 10.00	
<i>Click here to create</i> an AOI at the Inquire Cursor	Grow at Inquire Riedo	Set Constraint ADL. Option Invert Close Help	•

Click the Neighborhood icon in the Region Growing Properties dialog.

This option specifies that four pixels are to be searched. Only those pixels above, below, to the left, and to the right of the seed or any accepted pixels are considered contiguous.

3. Under **Geographic Constraints**, the **Area** checkbox should be turned on to constrain the region area in pixels. Enter **300** into the **Area** number field and press Enter on your keyboard.

This is the maximum number of pixels that are in the AOI.

4. Enter 10.00 in the Spectral Euclidean Distance number field.

The pixels that are accepted in the AOI are within this spectral distance from the mean of the seed pixel.

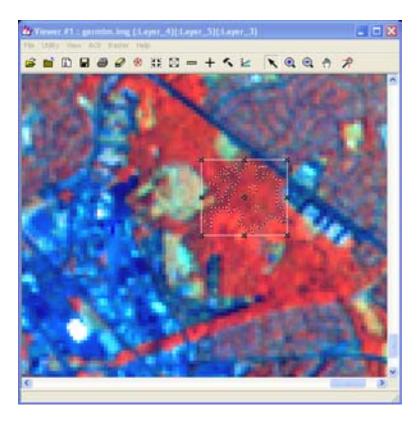
 Next, click **Options** in the Region Growing Properties dialog. The Region Grow Options dialog opens.

🗿 Region Grow	Opti 🔀
🗵 Include Island P	'olygons
🔽 Update Region	Mean
E Buller Region B	oundary
Close	Help

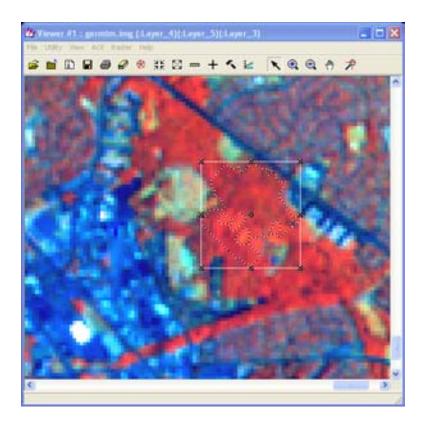
- 6. In the Region Grow Options dialog, make sure that the **Include Island Polygons** checkbox is turned on in order to include polygons in the growth region.
- 7. Click **Close** in the Region Grow Options dialog.

Create an AOI

- 1. In the AOI tool palette, click the Region Grow icon $\overset{}{\leq}$.
- Click inside a bright red area in the germtm.img file in the Viewer. This is a forest area. A polygon opens and a bounding box surrounds the polygon, indicating that it is selected.



- In the Region Growing Properties dialog, enter new numbers in the Area and Spectral Euclidean Distance number fields (for example, 500 for Area and 15 for Spectral Euclidean Distance) to see how this modifies the AOI polygon.
- **4.** In the Region Growing Properties dialog, click **Redo** to modify the AOI polygon with the new parameters.



Add a Signature

1. After the AOI is created, click the Create New Signature(s) from AOI

icon •L, in the Signature Editor to add this AOI as a signature.

- In the Signature Editor, click inside the Signature Name column for the signature you just added. Change the name to Forest_1, then press Enter on the keyboard.
- 3. In the Signature Editor, hold in the **Color** column next to **Forest_1** and select **Yellow**.
- 4. In the Region Growing Properties dialog, enter **300** in the **Area** number field.

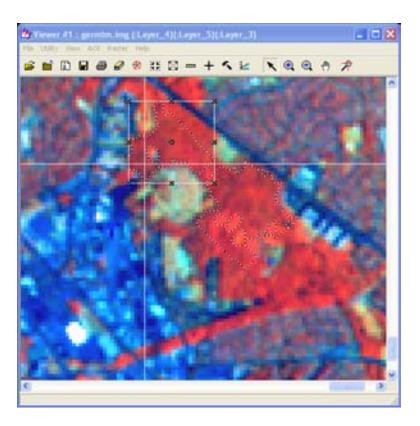
Add Another Signature

1. In the Viewer, select Utility -> Inquire Cursor.

The Inquire Cursor dialog opens and the inquire cursor (a white crosshair) is placed in the Viewer. The inquire cursor allows you to move to a specific pixel in the image and use it as the seed pixel.

2. Drag the intersection of the inquire cursor to a dark red area in the **germtm.img** file in the Viewer. This is also a forest area.

3. In the Region Growing Properties dialog, click **Grow at Inquire**. Wait for the polygon to display.



4. After the AOI is created, click the Create New Signature(s) from AOI

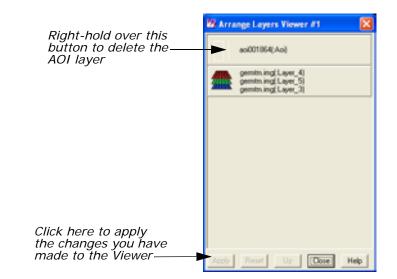
icon • in the Signature Editor to add this AOI as a signature.

- In the Signature Editor, click inside the Signature Name column for the signature you just added. Change the name to Forest_2, then press Enter on the keyboard.
- 6. In the Signature Editor, hold in the **Color** column next to **Forest_2** and select **Pink**.
- **7.** Click **Close** in the Inquire Cursor dialog and the Region Growing Properties dialog.

Arrange Layers

 Now that you have the parametric signatures collected, you do not need the AOIs in the Viewer. Select View -> Arrange Layers from the Viewer menu bar.

The Arrange Layers dialog opens.



- 2. In the Arrange Layers dialog, right-hold over the **AOI Layer** button and select **Delete Layer** from the **AOI Options** menu.
- 3. Click **Apply** in the Arrange Layers dialog to delete the AOI layer.
- You are asked if you want to save the changes before closing. Click No.
- 5. In the Arrange Layers dialog, click Close.

Create Feature Space Image

The ERDAS IMAGINE Feature Space tools allow you to interactively define areas of interest (polygons or rectangles) in the Feature Space image(s). A Feature Space signature (nonparametric) is based on the AOI(s) in the Feature Space image. Use this technique to extract a signature for water.

 Select Feature -> Create -> Feature Space Layers from the Signature Editor menu bar.

The Create Feature Space Images dialog opens.

Frator gornatus incr	🕼 Create	Feature Space Images				
Enter germtm.img	Input	Raster Layer: (*.ing)	Le	ivels Slice:		e Aves:
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Click here to output to a Viewer	1.	-			Rever	se Axes
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	5	gemtm_1_6.fsp.ing		(Layer 1)	Layer 61	20
Click———	- 6	gemtn_2_3.hp.ing		(Layer 2)	ELayer 31	12
germtm_2_5.fsp.img	7	gemtn_2_4.fsp.ing		(Layer 2)	[Layer 4]	12
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Click here to ——— create image	Ł	OK. Batch	ADI	Can	el H	elp
	Laple of all	Possible Feature Space Images				6

 In the Create Feature Space Images dialog under Input Raster Layer, enter germtm.img. This image is located in <IMAGINE_HOME>/examples, and is the image file from which the Feature Space image is generated.

Under **Output Root Name**, the default name is **germtm**. This is the root name for the Feature Space image files that are generated.

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Verify that the directory where the Feature Space image files are saved has write permission.

- In the Create Feature Space Images dialog, click the Output to Viewer checkbox so that the Feature Space image displays in a Viewer.
- Under Feature Space Layers, click the number 8 in the FS Image column in the CellArray to select the germtm_2_5.fsp.img row. (You may need to scroll down to get to FS Image number 8.)

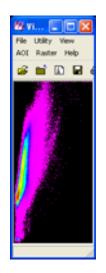
The output Feature Space image is based on layers two and five of the **germtm.img** file. Layers two and five are selected since water is spectrally distinct in this band combination.

5. Click **OK** in the Create Feature Space Images dialog to create the Feature Space image for layers two and five of the **germtm.img** file.

The Create Feature Space Images dialog closes, then the Job Status dialog opens.

	🖉 FS Mapping: e:/dataandoutput/efsp_003616	×
Click here to close this dialog	Job State: Done Percent Done: 100% 0	

After the process is complete, a Viewer (Viewer #2) opens, displaying the Feature Space image.



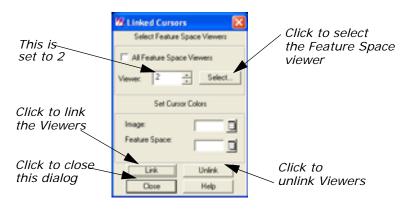
6. Click **OK** in the Job Status dialog to close this dialog.

Link Cursors in Image/Feature Space

The Linked Cursors utility allows you to directly link a cursor in the image Viewer to the Feature Space viewer. This shows you where pixels in the image file are located in the Feature Space image.

 In the Signature Editor dialog, select Feature -> View -> Linked Cursors.

The Linked Cursors dialog opens.



- 2. Click **Select** in the Linked Cursors dialog to define the Feature Space viewer that you want to link to the Image Viewer.
- 3. Click in Viewer #2 (the Viewer displaying the Feature Space image).

The **Viewer** number field in the Linked Cursors dialog changes to **2**. You could also enter a **2** in this number field without having to click the **Select** button.

4. In the Linked Cursors dialog, click **Link** to link the Viewers, then click in the Viewer displaying **germtm.img**.

The linked inquire cursors (white crosshairs) open in the Viewers.

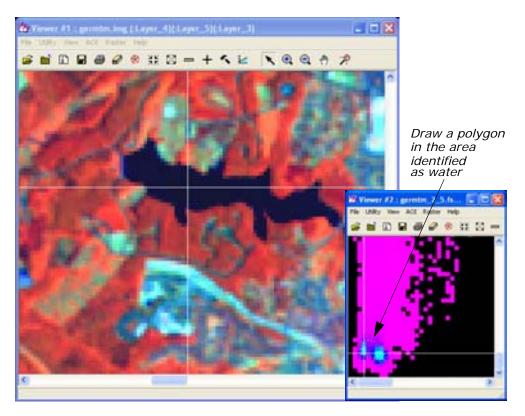
Drag the inquire cursor around in the germtm.img Viewer (Viewer #1) to see where these pixels are located in the Feature Space image. Notice where the water areas are located in the Feature Space image. These areas are black in the germtm.img file (Viewer #1).

You may need to use the **Zoom In By 2** and **Zoom Out By 2** options (accessed with a right-click in the Viewer containing the file germtm.img) to locate areas of water.

Define Feature Space Signature

Any Feature Space AOI can be defined as a nonparametric signature in your classification.

- Right-click inside the Viewer containing the Feature Space image and select Zoom -> Zoom In By 2 until you can see the area beneath the inquire cursor clearly.
- **2.** Use the polygon AOI tool to draw a polygon in the Feature Space image. Draw the polygon in the area that you identified as water.



The Feature Space signature is based on this polygon.

After the AOI is created, click the Create New Signature(s) from AOI icon
 in the Signature Editor to add this AOI as a signature.

 The signature you have just added is a nonparametric signature. Select Feature -> Statistics from the Signature Editor menu bar to generate statistics for the Feature Space AOI.

A Job Status dialog displays, stating the progress of the function.

5. When the function is 100% complete, click **OK** in the Job Status dialog.

The Feature Space AOI now has parametric properties.

- 6. In the Signature Editor, click inside the **Signature Name** column for the signature you just added. Change the name to **Water**, then press the Enter key on the keyboard.
- 7. In the Signature Editor, hold in the **Color** column next to **Water** and select **Blue**.
- In the Linked Cursors dialog, click Unlink to unlink the viewers.
 The inquire cursors are removed from the viewers.
- 9. In the Linked Cursors dialog, click Close.
- Now that you have the nonparametric signature collected, you do not need the AOI in the Feature Space viewer. Select View -> Arrange Layers from the Viewer #2 menu bar.

The Arrange Layers dialog opens.

- **11.** In the Arrange Layers dialog, right-hold over the **AOI Layer** button and select **Delete Layer** from the AOI Options dropdown list.
- 12. Click **Apply** in the Arrange Layers dialog to delete the AOI layer.
- You are asked if you want to save the changes before closing. Click No.
- 14. In the Arrange Layers dialog, click Close.
- 15. Practice taking additional signatures using any of the signaturegenerating techniques you have learned in the steps above. Extract at least five signatures.
- After you have extracted all the signatures you wish, select File -> Save As from the Signature Editor menu bar.

The Save Signature File As dialog opens.

- **17**. Use the Save Signature File As dialog to save the signature set in the Signature Editor (for example, **germtm_siged.sig**).
- **18.** Click **OK** in the Save Signature File As dialog.

Use Tools to Evaluate Once signatures are created, they can be evaluated, deleted, renamed, and merged with signatures from other files. Merging signatures allows you to perform complex classifications with signatures that are derived from more than one training method (supervised and/or unsupervised, parametric and nonparametric).

Next, the following tools for evaluating signatures are discussed:

- alarms
- contingency matrix
- feature space to image masking
- signature objects
- histograms
- signature separability
- statistics



When you use one of these tools, you need to select the appropriate signature(s) to be used in the evaluation. For example, you cannot use the signature separability tool with a nonparametric (Feature Space) signature.

Preparation

You should have at least ten signatures in the Signature Editor, similar to the following:

File Edit	Vew Evaluate Feature Classif	fy Help)							
é 🗅	+L ++ ≣L Σ \\ 🕍									
Class II	> Signature Name	Color	Value	Order	Count	Prob.	Ρ	1	ΗA	^
3	Forest_1		3	3	500	1.000	2	хþ	<pre>k</pre>	1
- 4	Forest_2		-4	4	300	1.000	X	×Þ	K X	
5	Water		5	5	5227	1.000	X	xÞ	<[]	1
6	Asphat		6	6	25	1.000	X	xÞ	x X	1
7	Concrete		7	7	9	1.000	X	×Þ	x X	1
0	Bare Sol		8	8	268	1.000	X	×Þ	×Χ	1
9	Sparse Trees		9	9	17	1.000	X	×Þ	x X	1
10	> Regrowth		10	10	221	1.000	X	×b	x X	1~
<									>	

Set Alarms

The Signature Alarm utility highlights the pixels in the Viewer that belong to, or are estimated to belong to a class according to the parallelepiped decision rule. An alarm can be performed with one or more signatures. If you do not have any signatures selected, then the active signature, which is next to the >, is used.

- 1. In the Signature Editor, select **Forest_1** by clicking in the > column for that signature. The alarm is performed with this signature.
- In the Signature Editor menu bar, select View -> Image Alarm.
 The Signature Alarm dialog opens.

	🛿 Signature Alarm 🛛 🔀	
	Indicate Overlap	
Click to change the	Edit Parallelepiped Limits	
parallelepiped limits	OK Close Help	

3. Click **Edit Parallelepiped Limits** in the Signature Alarm dialog to view the limits for the parallelepiped.

The Limits dialog opens.

 In the Limits dialog, click Set to define the parallelepiped limits. The Set Parallelepiped Limits dialog opens.

Laver		Lower	Upper	1
1	×	112.0000	120.0000	
2	×	41.0000	40.0000	
3	×	39.0000	40.0000	
- 4	\times	102.0000	135.0000	
5	×	69.0000	104.0000	
6	×	18.0000	34,0000	
				~

Method	
④ Minimum/Maximum	
C Std. Deviation	0.00 -
Signatures	
@ Durrent C Selected	C AL
OK Cancel	Help

The Signature Alarm utility allows you to define the parallelepiped limits by either:

- the minimum and maximum for each layer in the signature, or
- a specified number of standard deviations from the mean of the signature.
- If you wish, you can set new parallelepiped limits and click OK in the Set Parallelepiped Limits dialog, or simply accept the default limits by clicking OK in the Set Parallelepiped Limits dialog.

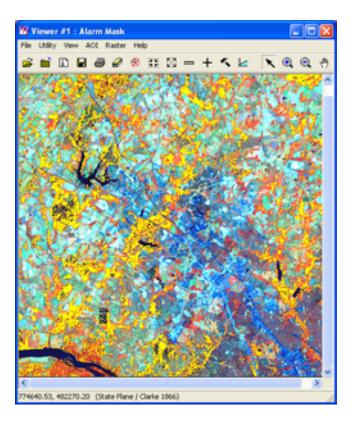
The new/default limits display in the Limits CellArray.

- 6. Click **Close** in the Limits dialog.
- 7. In the Signature Alarm dialog, click OK.

The alarmed pixels display in the Viewer in yellow. You can use the toggle function (**Utility -> Flicker**) in the Viewer to see how the pixels are classified by the alarm.



Be sure that there are no AOI layers open on top of the Alarm Mask Layer. You can use **View -> Arrange Layers** to remove any AOI layers present in the Viewer.



- 8. In the Signature Alarm dialog, click Close.
- In the Viewer #1 menu bar, select View -> Arrange Layers.
 The Arrange Layers dialog opens.
- **10.** In the Arrange Layers dialog, right-hold over the **Alarm Mask** button and select **Delete Layer** from the **Layer Options** menu.
- **11.** Click **Apply** to delete the alarm layer from the Viewer.
- 12. You are asked if you want to save the changes before closing. Click No.
- **13.** In the Arrange Layers dialog, click **Close**.

Evaluate Contingency

Contingency Matrix

The Contingency Matrix utility allows you to evaluate signatures that have been created from AOIs in the image. This utility classifies only the pixels in the image AOI training sample, based on the signatures. It is usually expected that the pixels of an AOI are classified to the class that they train. However, the pixels of the AOI training sample only weight the statistics of the signature. They are rarely so homogenous that every pixel actually becomes assigned to the expected class. The Contingency Matrix utility can be performed with multiple signatures. If you do not have any signatures selected, then all of the signatures are used.

The output of the Contingency Matrix utility is a matrix of percentages that allows you to see how many pixels in each AOI training sample were assigned to each class. In theory, each AOI training sample would be composed primarily of pixels that belong to its corresponding signature class.

The AOI training samples are classified using one of the following classification algorithms:

- parallelepiped
- feature space
- maximum likelihood
- Mahalanobis distance

NOTE: The classification decision rule that is going to be used in the actual image classification should be determined so that it can also be used in the Contingency Matrix utility.

- 1. In the Signature Editor, select all of the signatures by Shift-clicking in the first row of the **Class** column and then dragging down through the other classes.
- In the Signature Editor menu bar, select Evaluate -> Contingency. The Contingency Matrix dialog opens.

	20 Contingency Matrix		×	
	0	Decision Rules:		Click to select
	Non-parametric Rule:	Feature Space	ī.	Feature Space
	Overlap Rule:	Parametric Rule		
	Unclassified Rule:	Parametric Rule	•	
	Parametric Rule:	Maximum Likelihood		
Click to start the process		Use Probabilities		
	Pixel Counts	Pixel Percentages		
	0K.	Cancel Help	J	

3. In the Contingency Matrix dialog, click the **Non-parametric Rule** dropdown list and select **Feature Space**.



See the chapter "Classification" in the <u>ERDAS Field Guide</u> for more information on decision rules.

4. Click **OK** in the Contingency Matrix dialog to start the process.

A Job Status dialog displays, stating the progress of the function.

5. When the process is 100% complete, click **OK** in the Job Status dialog.

The IMAGINE Text Editor opens (labelled **Editor:**, **Dir**), displaying the error matrix.

ile Edit View Find	Help			
ê 🖬 🗇	X 🖻 🛍 🛦			
ERROR MATRIX				^
Convol Infinite				
		Reference Data		
Classified				
Data	Agricultur	Agricultur	Forest_1	1
Agricultur	1627	83	<u> </u>	
Agricultur	117	742	ŏ	
Forest 1	0	0	390	
Forest_2 Vater	0	0	102	
Asphalt	ů.	ŭ	ů	
Concrete	ō	õ	ŏ	
Bare Soil	13	0	0	
Sparse Tre Regrowth	28	0	0	
-		-	-	
Coluan Total	1785	825	500	
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Classified Data	Asphalt	Concrete	Bare Soil	Spe
Agricultur	0	0	0	
Agricultur Forest_1	0	0	0	
Forest_2	ŏ	ŏ	ă	
Vater	0	Ū.	0	
Asphalt Concrete	25	9	0	
Bare Soil	ů.	0	267	
Sparse Tre	Ó	Ö	1	
Regrowth	0	0	0	
Column Total	25	9	260	
		Reference Data		
Classified				
Data	Regrowth	Row Total		~
<				2

- 6. After viewing the reference data in the Text Editor, select **File -> Close** from the menu bar.
- Deselect the signatures that were selected by right-clicking in the Class column and choosing Select None from the Row Selection menu.

Generate a Mask from a Feature Space Signature

The Feature Space to Image Masking utility allows you to generate a mask from a Feature Space signature (that is, the AOI in the Feature Space image). Once the Feature Space signature is defined as a mask, the pixels under the mask are identified in the image file and highlighted in the Viewer. This allows you to view which pixels would be assigned to the Feature Space signature's class. A mask can be generated from one or more Feature Space signatures. If you do not have any signatures selected, then the active signature, which is next to the >, is used.

The image displayed in Viewer #1 must be the image from which the Feature Space image was created.

 In the Signature Editor, select Feature -> Masking -> Feature Space to Image. The FS to Image Masking dialog opens.

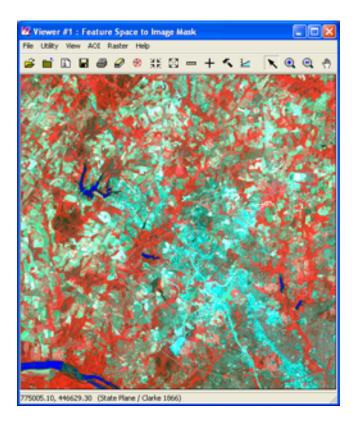
This checkbox should be turned off (disabled)	V FS to Image Masking
Click to create the mask	Indicate Overlap Apply Occe Help

2. In the Signature Editor, click in the > row for **Water** to select that signature.

The mask is generated from this Feature Space signature.

3. Disable the Indicate Overlap checkbox, and click **Apply** in the FS to Image Masking dialog to generate the mask in Viewer #1.

A mask is placed in the Viewer.

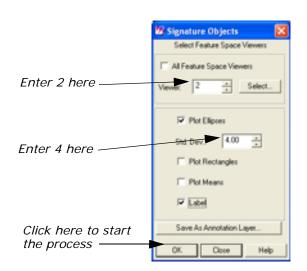


- 4. In the FS to Image Masking dialog, click Close.
- 5. Deselect the Water feature.

View Signature Objects

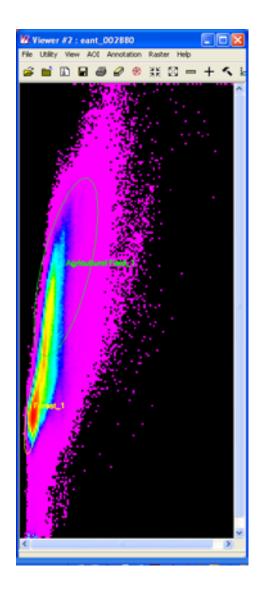
The Signature Objects dialog allows you to view graphs of signature statistics so that you can compare signatures. The graphs display as sets of ellipses in a Feature Space image. Each ellipse is based on the mean and standard deviation of one signature. A graph can be generated for one or more signatures. If you do not have any signatures selected, then the active signature, which is next to the >, is used. This utility also allows you to show the mean for the signature for the two bands, a parallelepiped, and a label.

 In the Signature Editor menu bar, select Feature -> Objects. The Signature Objects dialog opens.



- In the Signature Editor, select the signatures for Agricultural Field_1 and Forest_1 by clicking in the Class row for Agricultural Field_1 and Shift-clicking in the Class row for Forest_1.
- 3. In the Signature Objects dialog, confirm that the **Viewer** number field is set for **2**.
- 4. Set the Std. Dev. number field to 4.
- 5. Enable the Label checkbox by clicking on it.
- 6. Click **OK** in the Signature Objects dialog.

The ellipses for the **Agricultural Field_1** and **Forest_1** signatures display in the Feature Space viewer.



Compare Ellipses

By comparing the ellipses for different signatures for a one band pair, you can easily see if the signatures represent similar groups of pixels by seeing where the ellipses overlap on the Feature Space image.

• When ellipses do not overlap, the signatures represent a distinct set of pixels in the two bands being plotted, which is desirable for classification. However, some overlap is expected, because it is rare that all classes are totally distinct.

When the ellipses do overlap, then the signatures represent similar pixels, which is not desirable for classification.

7. In the Signature Objects dialog, click **Close**.

8. Deselect the signatures for Agricultural Field_1 and Forest_1.

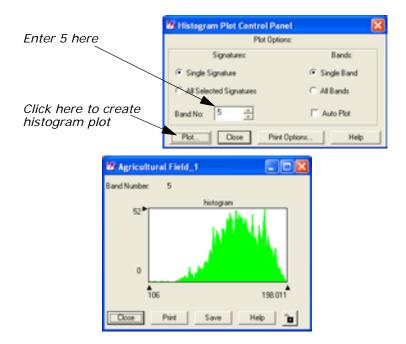
Plot Histograms

The Histogram Plot Control Panel allows you to analyze the histograms for the layers to make your own evaluations and comparisons. A histogram can be created with one or more signatures. If you create a histogram for a single signature, then the active signature, which is next to the >, is used. If you create a histogram for multiple signatures, then the selected signatures are used.

- In the Signature Editor, move the > prompt to the signature for Agricultural Field_1 by clicking under the > column.
- 2. In the Signature Editor menu bar, select View -> Histograms or

click the Histogram icon 🕍 .

The Histogram Plot Control Panel and the Histogram dialogs open.



- **3.** In the Histogram Plot Control Panel dialog, change the **Band No** number field to **5** in order to view the histogram for band 5 (that is, layer 5).
- 4. Click Plot.

The Histogram dialog changes to display the histogram for band 5. You can change the different plot options and select different signatures to see the differences in histograms for various signatures and bands.

5. In the Histogram Plot Control Panel dialog, click **Close**. The two Histogram dialogs close.

Compute Signature Separability

The Signature Separability utility computes the statistical distance between signatures. This distance can be used to determine how distinct your signatures are from one another. This utility can also be used to determine the best subset of layers to use in the classification.

The distances are based on the following formulas:

- euclidean spectral distances between their means
- Jeffries-Matusita distance
- divergence
- transformed divergence

The Signature Separability utility can be performed with multiple signatures. If you do not have any signatures selected, then all of the parametric signatures are used.

- 1. In the Signature Editor, select all of the parametric signatures.
- In the Signature Editor menu bar, select Evaluate -> Separability. The Signature Separability dialog opens.

Set this number field to 3 —	🖉 Signature Separability 🛛 🔀
	Layers Per Combination: 3 = Combination: 20 Pairs Per Combination: 45
	Distance Measure:
Click here ———	In Transformed Divergence
	Output Form: ASDI C CellAmay Report Type:
Click here to start process	G Summary Report Complete Report Use Class Probabilities OK Oose Help

- In the Signature Separability dialog, set the Layers Per Combination number field to 3, so that three layers are used for each combination.
- 4. Click **Transformed Divergence** under **Distance Measure** to use the divergence algorithm for calculating the separability.

 Confirm that the Summary Report radio button is turned on under Report Type, in order to output a summary of the report.

The summary lists the separability listings for only those band combinations with best average and best minimum separability.

6. In the Signature Separability dialog, click **OK** to begin the process.

When the process is complete, the IMAGINE Text Editor opens, displaying the report.

File Edit Vew Find Help Signature Separability Listing File: No File Distance measure: Transformed Divergence Using bands: 1 2 3 4 5 6 Taken 3 at a time Class 1 Agricultural Field_1 2 Agricultural Field_1 3 Forest_1 4 Forest_2 5 Vater 6 Asphalt 7 Concrete 8 Bare Soil 9 Sparse Trees 10 Regrowth Best Minisus Separability Bands AVE MIN Class 1:0 1:4 1:5 1:6 10 Regrowth 1:2 1:3 1:4 1:5 1:6 11 2 5 1:0 1:0 1:0 1:1	🙆 Editor: , Dir:								
Signature Separability Listing * File: No File Distance measure: Transformed Divergence Using bands: 1 2 3 4 5 6 Taken 3 at a time Class 1 Agricultural Field_1 2 Agricultural Field_2 3 Forest_1 4 Porest_2 5 Water 6 Asphalt 7 Concrete 8 Bare Soil 9 Sparse Trees 10 Regrowth Best Minimum Separability Bands AVE MIN Class 1: 2 1: 3 1: 4 1: 5 1: 6 10 Regrowth 1: 2 1: 3 1: 4 1: 5 1: 6 12 5 1969 720 2000 200 2000 2000 12 5 1969 720 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2	File Edit View Fil	nd Help							
File: No File Distance measure: Transformed Divergence Using bands: 1 2 3 4 5 6 Taken 3 at a time Class 1 Agricultural Field_1 2 Agricultural Field_2 3 Forest_2 5 Water 6 Apphalt 7 Concrete 8 Bare Soil 9 Sparse Trees 10 Regrowth Bands AVE MIN Class Pairs: 1:2 1:3 1:4 1:5 1:6 1:9 1:10 2:3 2:4 2:5 3:8 3:9 3:10 4:5 4:6 1:9 1:10 2:3 2:4 2:5 3:8 3:9 3:10 4:5 4:6 1:9 1:10 5:1 6 5:7 5:8 4:9 4:10 5:6 5:7 5:8 5:7 6:8 6:9 6:10 7:8 1 2 5 1969 720 2000 2000 2000 2000 2000 2000 2000 2000	🧉 🗅 🖬 🖉	X 🗈	🛍 ᠺ						
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Taken 3 at a time Class 1 Agricultural Field_1 2 Agricultural Field_2 3 Forest_1 4 Forest_2 5 Water 6 Asphalt 7 Concrete 0 Bare Soil 9 Sparse Trees 10 Regrowth Bands AVE MIN Class Pairs: 1: 2 1: 3 1: 4 1: 5 1: 6 1: 9 1:10 2: 3 2: 4 2: 5 2: 0 2: 9 2:10 3: 4 3: 5 3: 8 3: 9 3:10 4: 5 4: 6 1: 2 5 1969 720 2000 2000 2000 2000 2000 2000 2000 2	Distance	measure:	Transfo	ermed Div	ergence	•			
Class Agricultural Field_1 Agricultural Field_2 Forest_1 Forest_2 Veter Asphalt Concrete Bards AVE MIN Class Pairs: 1: 2 1: 3 1: 4 1: 5 1: 6 1: 9 1:10 2: 3 2: 4 2: 5 2: 0 2: 9 2:10 3: 4 3: 5 3: 8 3: 9 3:10 4: 5 4: 6 1: 2 5 1969 720 2000 2000 2000 2000 2000 2000 2000 2	Using bar	ods: 1 2 3	456						
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2 Agricultural Field_2 3 Forest_1 4 Forest_2 5 Water 6 Asphalt 7 Concrete 8 Bare Soil 9 Sparse Trees 10 Regrowth Bands AVE MIN Class Pairs: 1: 2 1: 3 1: 4 1: 5 1: 6 1: 9 1:10 2: 3 2: 4 2: 5 2: 0 2: 9 2:10 3: 4 3: 5 3: 8 3: 9 3:10 4: 5 4: 6 4: 9 4:10 5: 6 5: 7 5: 0 6: 7 6: 8 6: 9 6:10 7: 8 4: 9 4:10 5: 6 5: 7 5: 0 6: 7 6: 8 6: 9 6:10 7: 8 1 2 5 1969 720 2000 2000 2000 2000 2000 2000 2000 2	Class								
Bands AVE MIN Class Pairs: 1:2 1:3 1:4 1:5 1:6 1:9 1:10 2:3 2:4 2:5 2:0 2:9 2:10 3:4 3:5 3:8 3:9 3:10 4:5 4:6 4:9 4:10 5:6 5:7 5:0 6:7 6:8 6:9 6:10 7:8 0:9 0:10 9:10 2000 2000 2000 2000 2000 <t< td=""><td>2 Agric 3 Fores 4 Fores 5 Vater 6 Aspha 7 Concre 8 Bare 9 Sparse</td><td>ultural Fi t_1 t_2 lt ste Goil s Trees</td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></t<>	2 Agric 3 Fores 4 Fores 5 Vater 6 Aspha 7 Concre 8 Bare 9 Sparse	ultural Fi t_1 t_2 lt ste Goil s Trees							-
1 2 5 1969 720 1 2 5 1969 720 2 000 2 000 2 000 2 000 2000 2 000 2 000 2 000 2000 2			Be	est Minie	un Sepa	arabili	Ly.		
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< >	1 2 5	1969	720	2000 2000 2000 2000 2000	2000 2000 2000 2000 2000	2000 2000 2000 2000 2000	2000 720 2000 2000	2000 2000 2000 2000	2
	¢				_			_	>

This report shows that layers (that is, bands) 2, 4, and 5 are the best layers to use for identifying features.

- 7. In the Text Editor menu bar, select **File -> Close** to close the Editor.
- 8. In the Signature Separability dialog, click Close.

Check Statistics

The Statistics utility allows you to analyze the statistics for the layers to make your own evaluations and comparisons. Statistics can be generated for one signature at a time. The active signature, which is next to the >, is used.

- In the Signature Editor, move the > prompt to the signature for Forest_1.
- In the Signature Editor menu bar, select View -> Statistics or click the Statistics icon 2.

The Statistics dialog opens.

		Univariate			
Laver	Minimum	Maximum	Mean	Std. Dev.	\sim
1	107.000	117.000	112,200	1.210	
2	40.000	45.000	41.972	0.764	
3	37.000	43.000	39.126	0.076	
- 4	106.000	129.000	110.450	4.054	
5	65.000	92.000	77.136	4.530	ι.
6	15.000	26.000	20.300	1.536	\times
		Covariance			
Layer	1	2	3	4	^
1	1	2	0.104	4	^
Lover 1 2	1 1.484 0.082	2 0.082 0.584	3 0.104 0.130	4 0.388 0.119	^
1					^
1 2 3	0.082	0.584	0.130	0.119	^
1 2 3	0.082	0.584	0.130	0.119	<

3. After viewing the information in the Statistics dialog, click **Close**.

The decision rules for the supervised classification process are multilevel:

- nonparametric
- parametric

In this example, use both nonparametric and parametric decision rules.



See the chapter "Classification" in the <u>ERDAS Field Guide</u> for more information on decision rules.

Perform Supervised Classification

Nonparametric

If the signature is nonparametric (that is, Feature Space AOI), then the following decision rules are offered:

- feature space
- parallelepiped

With nonparametric signatures you must also decide the overlap rule and the unclassified rule.

NOTE: All signatures have a nonparametric definition, due to their parallelepiped boundaries.

Parametric

For parametric signatures, the following decision rules are provided:

- maximum likelihood
- Mahalanobis distance
- minimum distance

In this tour guide, use the maximum likelihood decision rule.

Output File

The Supervised Classification utility outputs a thematic raster layer (.img extension) and/or a distance file (.img extension). The distance file can be used for post-classification thresholding. The thematic raster layer automatically contains the following data:

- class values
- class names
- color table
- statistics
- histogram

The image file also contains any signature attributes that were selected in the Supervised Classification utility.

1. In the Signature Editor, select all of the signatures so that they are all used in the classification process (if none of the signatures are selected, then they are all used by default).

2. In the Signature Editor menu bar, select **Classify -> Supervised** to perform a supervised classification.

NOTE: You may also access the Supervised Classification utility from the Classification dialog.

Click to create Enter Supervised Classification a distance file germtm_superclass.img Output Distance File Output File: (".ing) here gemitin superclassing 2 Filename: (*.img) _distance.img Attribute Option Fuzzy Classification Click to select Click to define attributes Feature Space for signatures **Decision Rules** • Feature Space Non-parametric Flule: Enter Parametric Rule Overlap Rule: ٠ Click to select germtm_distance.img here Maximum Unclassified Rule Parametric Rule -Likelihood Maximum Likelihood Parametric Rule Classify zeros ☐ Use Probabilities Click to start the process 08 Batch A01... Cancel Help

The Supervised Classification dialog opens.

3. In the Supervised Classification dialog, under **Output File**, type in germtm_superclass.img.

This is the name for the thematic raster layer.

4. Click the Output Distance File checkbox to activate it.

In this example, you are creating a distance file that can be used to threshold the classified image file.

5. Under Filename, enter germtm_distance.img in the directory of your choice.

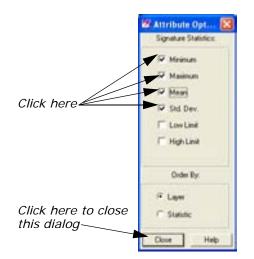
This is the name for the distance image file.

NOTE: Make sure you remember the directory in which the output file is saved. It is important when you are trying to display the output file in a Viewer.

Select Attribute Options

 In the Output File section of the Supervised Classification dialog, click Attribute Options.

The Attribute Options dialog opens.



The Attribute Options dialog allows you to specify the statistical information for the signatures that you want to be in the output classified layer. The statistics are based on the data file values for each layer for the signatures, not the entire classified image file. This information is located in the Raster Attribute Editor.

- 2. In the Attribute Options dialog, click **Minimum**, **Maximum**, **Mean**, and **Std. Dev.**, so that the signatures in the output thematic raster layer have this statistical information.
- **3.** Confirm that the **Layer** checkbox is turned on, so that the information is presented in the Raster Attribute Editor by layer.
- 4. In the Attribute Options dialog, click **Close** to remove this dialog.

Classify the Image

 In the Supervised Classification dialog, click the Non-parametric Rule dropdown list to select Feature Space.

You do not need to use the **Classify Zeros** option here because there are no background zero data file values in the **germtm.img** file.

2. Click **OK** in the Supervised Classification dialog to classify the **germtm.img** file using the signatures in the Signature Editor.

A Job Status dialog displays, indicating the progress of the function.

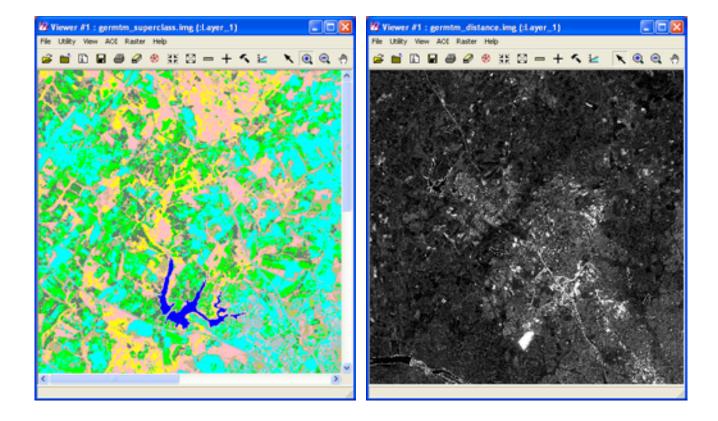
3. When the process is 100% complete, click **OK** in the Job Status dialog.



See the chapter "Classification" in the <u>ERDAS Field Guide</u> for information about how the pixels are classified.

- Select File -> Close from the Signature Editor menu bar. Click Yes when asked if you would like to save the changes to the Signature Editor.
- 5. Select File -> Close to dismiss Viewer #2.
- 6. You do not need to save changes to the AOI in the Signature Editor, so click **No** on that message dialog.
- 7. Click Close in the AOI tool palette.
- 8. Select File -> Clear from the Viewer #1 menu bar.
- 9. Proceed to:
 - "Perform Unsupervised Classification" to classify the same image using the ISODATA algorithm.
 - "Evaluate Classification" to analyze the classes and test the accuracy of the classification, or

The super classification image is pictured on the left, and the distance image is pictured on the right.



Perform Unsupervised Classification

This section shows you how to create a thematic raster layer by letting the software identify statistical patterns in the data without using any ground truth data.

ERDAS IMAGINE uses the ISODATA algorithm to perform an unsupervised classification. The ISODATA clustering method uses the minimum spectral distance formula to form clusters. It begins with either arbitrary cluster means or means of an existing signature set, and each time the clustering repeats, the means of these clusters are shifted. The new cluster means are used for the next iteration.

The ISODATA utility repeats the clustering of the image until either a maximum number of iterations has been performed, or a maximum percentage of unchanged pixel assignments has been reached between two iterations.

Performing an unsupervised classification is simpler than a supervised classification, because the signatures are automatically generated by the ISODATA algorithm.

In this example, you generate a thematic raster layer using the ISODATA algorithm.

Preparation

You must have ERDAS IMAGINE running.

1. Click the Classifier icon in the ERDAS IMAGINE icon panel to start the Classification utility.



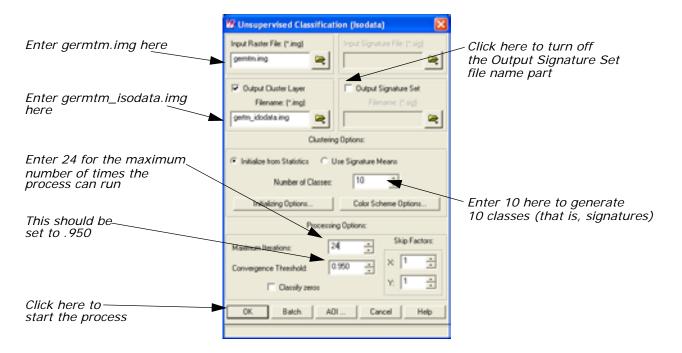
The Classification menu opens.

	🖉 Classification 🛛 🔀		
	Signature Editor		
	Unsupervised Classification		
Click here to start // the Unsupervised	Supervised Classification		
Classification utility	Threshold		
	Fuzzy Convolution		
	Grouping Tool		
	Fuzzy Recode		
	Accuracy Assessment		
	Feature Space Image		
	Feature Space Thematic		
	Knowledge Classifier		
	Knowledge Engineer		
	Frame Sampling Tools		
	Spectral Analysis		
	Close Help		

Generate Thematic Raster Layer

1. Select **Unsupervised Classification** from the **Classification** menu to perform an unsupervised classification using the ISODATA algorithm.

The Unsupervised Classification dialog opens.



- 2. Click Close in the Classification menu to clear it from the screen.
- 3. In the Unsupervised Classification dialog under Input Raster File, enter germtm.img. This is the image file that you are going to classify.
- 4. Under **Output Cluster Layer**, enter **germtm_isodata.img** in the directory of your choice.

This is the name for the output thematic raster layer.

5. Click Output Signature Set to turn off the checkbox.

For this example, do not create a signature set. The **Output Signature Set** file name part is disabled.

Set Initial Cluster Options

The **Clustering Options** allow you to define how the initial clusters are generated.

 Confirm that the Initialize from Statistics radio button under Clustering Options is turned on.

This generates arbitrary clusters from the file statistics for the image file.

2. Enter a 10 in the Number of Classes number field.

Set Processing Options

The Processing Options allow you to specify how the process is performed.

1. Enter 24 in the Maximum Iterations number field under Processing Options.

This is the maximum number of times that the ISODATA utility reclusters the data. It prevents this utility from running too long, or from potentially getting stuck in a cycle without reaching the convergence threshold.

Confirm that the Convergence Threshold number field is set to .95.

Convergence Threshold

The convergence threshold is the maximum percentage of pixels that has cluster assignments that can go unchanged between iterations. This threshold prevents the ISODATA utility from running indefinitely.

By specifying a convergence threshold of .95, you are specifying that as soon as 95% or more of the pixels stay in the same cluster between one iteration and the next, the utility should stop processing. In other words, as soon as 5% or fewer of the pixels change clusters between iterations, the utility stops processing.

 Click OK in the Unsupervised Classification dialog to start the classification process. The Unsupervised Classification dialog closes automatically.

A Job Status dialog displays, indicating the progress of the function.

- 4. Click **OK** in the Job Status dialog when the process is 100% complete.
- **5.** Proceed to the Evaluate Classification section to analyze the classes so that you can identify and assign class names and colors.

Evaluate Classification

After a classification is performed, the following methods are available for evaluating and testing the accuracy of the classification:

- classification overlay
- thresholding
- recode classes
- accuracy assessment

(CE)

See the chapter "Classification" in the <u>ERDAS Field Guide</u> for information on accuracy assessment.

Create Classification Overlay In this example, use the Raster Attribute Editor to compare the original image data with the individual classes of the thematic raster layer that was created from the unsupervised classification (germtm_isodata.img). This process helps identify the classes in the thematic raster layer. You may also use this process to evaluate the classes of a thematic layer that was generated from a supervised classification.

Preparation

ERDAS IMAGINE should be running and you should have a Viewer open.

1. Select File -> Open -> Raster Layer from the Viewer menu bar, or

click the Open icon *icon* in the toolbar to display the **germtm.img** continuous raster layer.

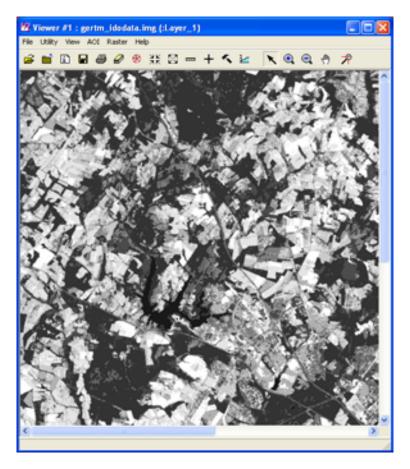
The Select Layer To Add dialog opens.

Click this file tab to see the raster options	Select Leyer To Add: File Raster Options Multiple	×
Click here to select germtm.img	Look in examples	ing OK ping Cancel ing Help
	Bareli ing FSAR_Ref ing FSAR_Ref ing FSAR_USES_DEM.ing FSAR_USES_DEM.ing FsAR_USES_DEM.ing FsAR_USES_DEM.ing Forking Bevolandsdansgor5 ing Klon_TM.ing FebR Bevolandsdanskew6 ing Bardcover.ing Incols	ng Recent
	File name: germinn ing Files of type: [MAGINE Image (* ing) Inuecolor : 1024 Rows x 1024 Columns x 6 Band(s)	

- In the Select Layer To Add dialog under File name, select germtm.img.
- **3.** Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 4. Set Layers to Colors at 4, 5, and 3.
- 5. Click **OK** in the Select Layer To Add dialog to display the image file.
- Click the Open icon again in the Viewer toolbar to display the thematic raster layer, germtm_isodata.img, over the germtm.img file.
- Under File name, open the directory in which you previously saved germtm_isodata.img by entering the directory path name in the text entry field and pressing the Enter key on your keyboard.
- 8. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.

9. Click Clear Display to turn off this checkbox.

10. Click **OK** in the Select Layer To Add dialog to display the image file.



Open Raster Attribute Editor

1. Select **Raster -> Attributes** from the Viewer menu bar.

The Raster Attribute Editor displays.

 In the Raster Attribute Editor, select Edit -> Column Properties to rearrange the columns in the CellArray so that they are easier to view.

The Column Properties dialog opens.

	🖉 Column Properties		X
Click here to move	Columns: Histogram Opacity Color	Title: Type:	Class_Names F Editable
this column	Clans Names Red Green Blue	Algement	Let More
		Format: Formula:	More
Click here to move the selected column up			G Default only C Apply on OK C Auto-Apply
	Up Down	Display Width:	100.0 - MaxWidth: 100 -
Click here to rearrange	Top Bottom		
the columns ———	New Delete	OK.	Cancel Help

- **3.** In the Column Properties dialog under **Columns**, select **Opacity**, then click **Up** to move **Opacity** so that it is under **Histogram**.
- 4. Select Class_Names, then click Up to move Class_Names so that it is under Color.
- **5.** Click **OK** in the Column Properties dialog to rearrange the columns in the Raster Attribute Editor.

The Column Properties dialog closes.

The data in the Raster Attribute Editor CellArray should appear similar to the following example:

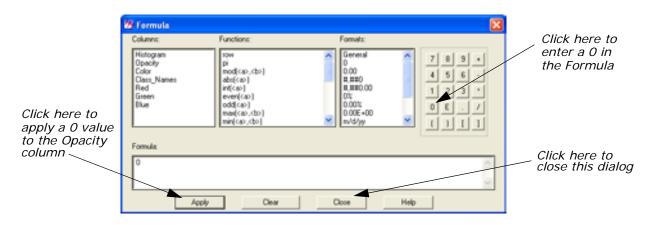
He Edit H		~ · · · ·		-	
6 0	🖬 🏗 🐚	Laper Numb	ec l'	÷	
Row	Histogram	Opacity	Color		
0	0	1		Unclassified	_
1	13015	1		Class 1	
2	249057	1		Class 2	_
3	112409	1		Class 3	_
4	80585	1		Class 4	_
5	102708	1		Class 5	
6	121459	1		Class 6	_
7	66616	1		Class 7	
0	140930	1		Class 0	_
9	110051	1		Class 9	_
10	50566	1		Class 10	_

Analyze Individual Classes

Before you can begin to analyze the classes individually, you need to set the opacity for all of the classes to zero.

- In the Raster Attribute Editor, click the word **Opacity** at the top of the **Opacity** column to select all of the classes. The column turns cyan in color.
- 2. Right-hold on the word **Opacity** and select **Formula** from the **Column Options** menu.

The Formula dialog opens.



3. In the Formula dialog, click **O** in the number pad.

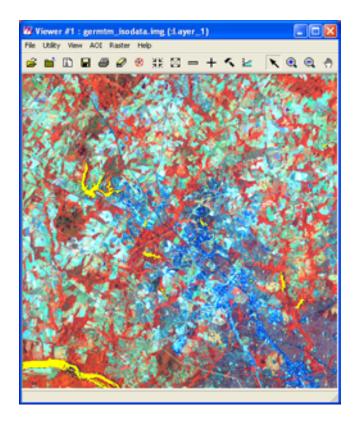
A **0** is placed in the **Formula** field.

- 4. In the Formula dialog, click **Apply** to change all of the values in the **Opacity** column to **O**, and then click **Close**.
- 5. Right-click in the **Opacity** column heading and choose **Select None** from the **Column Options** menu.

le Edit H		-		
<i>2</i> D	🖬 😗 🐚 I	Laper Numb	ec 1	2
Row	Histogram	Opacity	Color	
0	0	0		Unclassified
1	13015	1		Class 1
2	249057	0		Class 2
3	112409	0		Class 3
4	80585	0		Class 4
5	102708	0		Class 5
6	121459	0		Clace 6
7	66616	0		Clacs 7
	140930	0		Clace 0
9	110051	0		Class 9
10	50566	0		Class 10

- In the Raster Attribute Editor, hold on the color patch under Color for Class 1 in the CellArray and change the color to Yellow. This provides better visibility in the Viewer.
- 7. Change the **Opacity** for **Class 1** in the CellArray to **1** and then press Enter on the keyboard. This class shows in the Viewer.

NOTE: If you cannot see any yellow areas within the Viewer extent, you can right-click and select **Zoom -> Zoom Out By 2** from the **Ouick View** menu until yellow areas display within the Viewer.



 In the Viewer menu bar, select Utility -> Flicker to analyze which pixels have been assigned to this class.

The Viewer Flicker dialog opens.

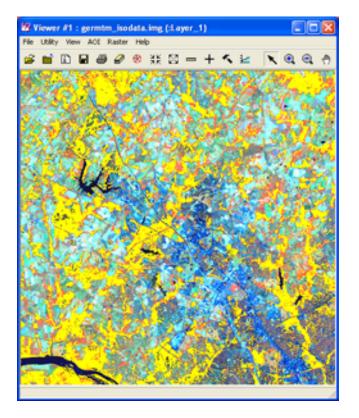
Viewer Flicker Automatic Flicker	×			
Auto Mode Speed	300 📩			
Nanual Flicker				
Cancel	Help			

9. Turn on the Auto Mode in the Viewer Flicker dialog.

The flashing yellow pixels in the **germtm.img** file are the pixels **Class 1**. These areas are water.

- In the Raster Attribute Editor, click inside the Class_Names column for Class 1. Change this name to Water and then press the Enter key on the keyboard.
- In the Raster Attribute Editor, hold on the Color patch for Water. Select Blue from the dropdown list.
- 12. After you are finished analyzing this class, click Cancel in the Viewer Flicker dialog and set the Opacity for Water back to 0. Press the Enter key on the keyboard.

- **13.** Change the **Color** for **Class 2** in the CellArray to **Yellow** for better visibility in the Viewer.
- 14. Change the **Opacity** for **Class 2** to **1** and press the Enter key on the keyboard. This class shows in the Viewer.



Use the Flicker Utility

1. In the Viewer menu bar, select **Utility -> Flicker** to analyze which pixels were assigned to this class.

The Viewer Flicker dialog opens.

2. Turn on the Auto Mode in the Viewer Flicker dialog.

The flashing pixels in the **germtm.img** file should be the pixels of **Class 2**. These are forest areas.

- In the Raster Attribute Editor, click inside the Class_Names column for Class 2. (You may need to double-click in the column.) Change this name to Forest, then press the Enter key on the keyboard.
- 4. In the Raster Attribute Editor, hold on the **Color** patch for **Forest** and select **Pink** from the dropdown list.
- After you are finished analyzing this class, click Cancel in the Viewer Flicker dialog and set the Opacity for Forest back to 0. Press the Enter key on the keyboard.

- 6. Repeat these steps with each class so that you can see how the pixels are assigned to each class. You may also try selecting more than one class at a time.
- 7. Continue assigning names and colors for the remaining classes in the Raster Attribute Editor CellArray.
- 8. In the Raster Attribute Editor, select **File -> Save** to save the data in the CellArray.
- 9. Select File -> Close from the Raster Attribute Editor menu bar.
- **10**. Select **File -> Clear** from the Viewer menu bar.

Use Thresholding The Thresholding utility allows you to refine a classification that was performed using the Supervised Classification utility. The Thresholding utility determines which pixels in the new thematic raster layer are most likely to be incorrectly classified.

This utility allows you to set a distance threshold for each class in order to screen out the pixels that most likely do not belong to that class. For all pixels that have distance file values greater than a threshold you set, the class value in the thematic raster layer is set to another value.

The threshold can be set:

- with numeric input, using chi-square statistics, confidence level, or Euclidean spectral distance, or
- interactively, by viewing the histogram of one class in the distance file while using the mouse to specify the threshold on the histogram graph.

Since the chi-square table is built-in, you can enter the threshold value in the confidence level unit and the chi-square value is automatically computed.

In this example, you threshold the output thematic raster layer from the supervised classification (germtm_superclass.img).

Preparation

ERDAS IMAGINE must be running and you must have germtm_superclass.img displayed in a Viewer.

1. Click the Classifier icon in the ERDAS IMAGINE icon panel to start the Classification utility.



The Classification menu displays.

2. Select **Threshold** from the **Classification** menu to start the Threshold dialog.

The Threshold dialog opens.

- 3. Click Close in the Classification menu to clear it from the screen.
- 4. In the Threshold dialog, select File -> Open or click the Open icon

is to define the classified image and distance image files.

The Open Files dialog opens.

Type in the correct	🕼 Open Files		×
path name and then press Enter here	Classified Image: (*.ing) gentitin_superclass.ing	Distance Image: (* img) gemtm_distance.img	۰I
	gentn_2.5ftp.ing gentn_datarce.ing gentn_superclass.ing gentn_idodata.ing	enhanced.ing geomodel.ing geomot.2.5.tsp.ing geomth_ditance.ing geomth_superclass.ing	
Click here to load files	detendoutput	dataandoutput	-

Select Classified and Distance Images

- In the Open Files dialog under Classified Image, open the directory in which you previously saved germtm_superclass.img by entering the directory path name in the text window and pressing Enter on your keyboard.
- 2. Select the file **germtm_superclass.img** from the list of files in the directory you just opened.

This is the classified image file that is going to be thresholded.

- 3. In the Open Files dialog, under **Distance Image**, open the directory in which you previously saved **germtm_distance.img** by entering the directory path name in the text entry field and pressing Enter on your keyboard.
- 4. Select the file **germtm_distance.img** from the list of files in the directory you just opened.

This is the distance image that was created when the **germtm_superclass.img** file was created. A distance image file for the classified image is necessary for thresholding.

5. Click **OK** in the Open Files dialog to load the files.

Threshold (germtm_superclass.img) - Viewer# -1 File Vew Set Histograms Process Help				
Class >	Class Name	ChiSquare		
1 2	Agicultural Field_1	0.000		
2	Agicultural Field_2	0.000		
	forest_1	0.000		
	fareat_2	0.000		
	Hoter	0.000		
	Concrete	0.000		
	Tare Sol	0.000		
	Sparse Trees	0.000		

 In the Threshold dialog, select View -> Select Viewer and then click in the Viewer that is displaying the germtm_superclass.img file.

Compute and Evaluate Histograms

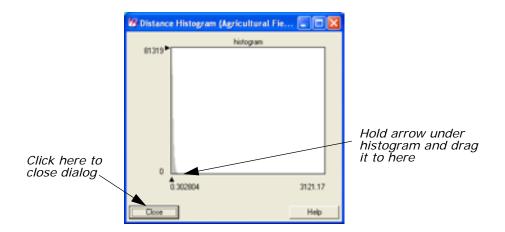
1. In the Threshold dialog, select **Histograms -> Compute**.

The histograms for the distance image file are computed. There is a separate histogram for each class in the classified image file.

The Job Status dialog opens as the histograms are computed. This dialog automatically closes when the process is completed.

- 2. If desired, select **Histograms -> Save** to save this histogram file.
- In the CellArray of the Threshold dialog, move the > prompt to the Agricultural Field_2 class by clicking under the > column in the cell for Class 2.
- 4. Select Histograms -> View.

The Distance Histogram for Agricultural Field_2 displays.



5. Select the arrow on the X axis of the histogram graph to move it to the position where you want to threshold the histogram.

The **Chi-Square** value in the Threshold dialog is updated for the current class (**Agricultural Field_2**) as you move the arrow.

6. In the Threshold dialog CellArray, move the **>** prompt to the next class.

The histogram updates for this class.

7. Repeat the steps, thresholding the histogram for each class in the Threshold dialog CellArray.



See the chapter "Classification" in the <u>ERDAS Field Guide</u> for information on thresholding.

8. After you have thresholded the histogram for each class, click **Close** in the Distance Histogram dialog.

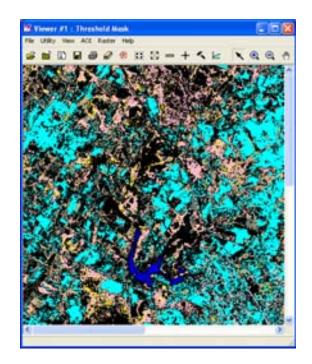
Apply Colors

 In the Threshold dialog, select View -> View Colors -> Default Colors.

Use the default setting so that the thresholded pixels appear black and those pixels remaining appear in their classified color in the thresholded image.

2. In the Threshold dialog, select Process -> To Viewer.

The thresholded image is placed in the Viewer over the **germtm_superclass.img** file. Yours likely looks different from the one pictured here.



Use the Flicker Utility

1. In the Viewer menu bar, select **Utility -> Flicker** to see how the classes were thresholded.

The Viewer Flicker dialog opens.

🛿 Viewer Flicker 🛛 💈	3
Automatic Flicker	
□ Auto Mode Speed 300 ±	
Manual Flicker	
Cancel Help	1

- 2. When you are finished observing the thresholding, click **Cancel** in the Viewer Flicker dialog.
- 3. In the Viewer, select View -> Arrange Layers.

The Arrange Layers dialog opens.

- In the Arrange Layers dialog, right-hold over the thresholded layer (Threshold Mask) and select Delete Layer from the Layer Options menu.
- 5. Click **Apply** and then **Close** in the Arrange Layers dialog. When asked if you would like to save your changes, click **No**.
- In the Threshold dialog, select Process -> To File. The Threshold to File dialog opens.



Process Threshold

1. In the Threshold to File dialog under **Output Image**, enter the name **germtm_thresh.img** in the directory of your choice.

This is the file name for the thresholded image.

2. Click **OK** to output the thresholded image to a file.

The Threshold to File dialog closes.

- Wait for the thresholding process to complete, and then select File Close from the Threshold dialog menu bar.
- 4. Select File -> Clear from the Viewer menu bar.

NOTE: The output file that is generated by thresholding a classified image can be further analyzed and modified in various ERDAS IMAGINE utilities, including the Image Interpreter, Raster Attribute Editor, and Spatial Modeler.

Recode Classes

After you analyze the pixels, you may want to recode the thematic raster layer to assign a new class value number to any or all classes, creating a new thematic raster layer using the new class numbers. You can also combine classes by recoding more than one class to the same new class number. Use the **Recode** function under **Interpreter** (icon) -> **GIS Analysis** to recode a thematic raster layer.

NOTE: See the chapter "Geographic Information Systems" in the <u>ERDAS Field Guide</u> for more information on recoding.

Use Accuracy Assessment The Accuracy Assessment utility allows you to compare certain pixels in your thematic raster layer to reference pixels, for which the class is known. This is an organized way of comparing your classification with ground truth data, previously tested maps, aerial photos, or other data.

In this example, you perform an accuracy assessment using the output thematic raster layer from the supervised classification (germtm_superclass.img).

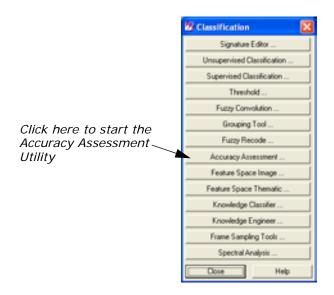
Preparation

ERDAS IMAGINE must be running and you must have **germtm.img** displayed in a Viewer.

1. Click the Classifier icon in the ERDAS IMAGINE icon panel.



The Classification menu displays.



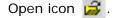
2. Select Accuracy Assessment from the Classification menu to start the Accuracy Assessment utility.

The Accuracy Assessment dialog opens.

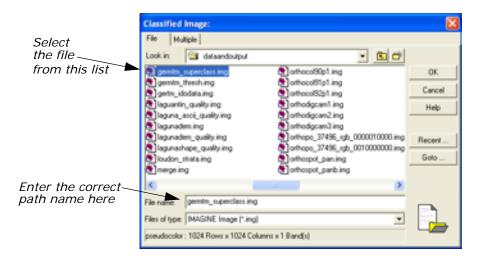
🖉 Accur	acy Assess	ment (No file) -	Viewer# -1			×
File Edit	View Repo	rt Help				
i 🖉 🖉						
Point #	Name	×	Y	Class	Reference	^
						-
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						1

The Accuracy Assessment CellArray contains a list of class values for the pixels in the classified image file and the class values for the corresponding reference pixels. The class values for the reference pixels are input by you. The CellArray data reside in the classified image file (for example, germtm_superclass.img).

- 1. Click Close in the Classification menu to clear it from the screen.
- 2. In the Accuracy Assessment dialog, select File -> Open or click the



The Classified Image dialog opens.



- 3. In the Classified Image dialog, under File name, open the directory in which you previously saved germtm_superclass.img by entering the directory path name in the text entry field and pressing Enter on your keyboard.
- 4. Select the file **germtm_superclass.img** from the list of files in the directory you just opened.

This is the classified image file that is used in the accuracy assessment.

- 5. Click **OK** in the Classified Image dialog to load the file.
- 6. In the Accuracy Assessment dialog, select View -> Select Viewer

or click the Select Viewer icon μ , then click in the Viewer that is displaying the **germtm.img** file.

 In the Accuracy Assessment dialog, select View -> Change Colors. The Change colors dialog opens.



In the Change colors dialog, the **Points with no reference** color patch should be set to **White**. These are the random points that have not been assigned a reference class value.

The **Points with reference** color patch should be set to **Yellow**. These are the random points that have been assigned a reference class value.

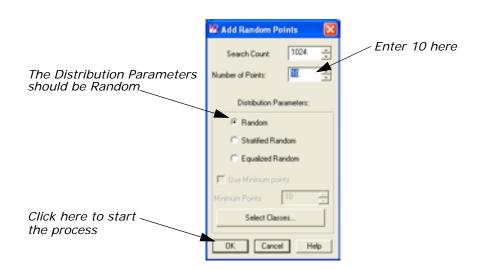
8. Click **OK** in the Change colors dialog to accept the default colors.

Generate Random Points

The Add Random Points utility generates random points throughout your classified image. After the points are generated, you must enter the class values for these points, which are the reference points. These reference values are compared to the class values of the classified image.

 In the Accuracy Assessment dialog, select Edit -> Create/Add Random Points.

The Add Random Points dialog opens.



2. In the Add Random Points dialog, enter a **10** in the **Number of Points** number field and press Enter on your keyboard.

In this example, you generate ten random points. However, to perform a proper accuracy assessment, you should generate 250 or more random points.

3. Confirm that the Search Count is set to 1024.

This means that a maximum of 1024 points are analyzed to see if they meet the defined requirements in the Add Random Points dialog. If you are generating a large number of points and they are not collected before 1024 pixels are analyzed, then you have the option to continue searching for more random points.

NOTE: If you are having problems generating a large number of points, you should increase the **Search Count** to a larger number.

The Distribution Parameters should be set to Random.

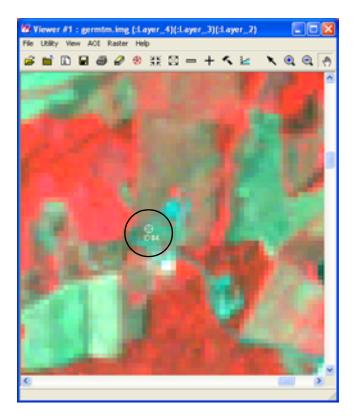
4. Click **OK** to generate the random points.

The Add Random Points dialog closes and the Job Status dialog opens.

This dialog automatically closes when the process is completed. A list of the points is shown in the Accuracy Assessment CellArray.

ile Edit	View Report	t Help				
i 🖉						
Point #	Name	×	Y	Class	Reference	~
1	() III	770484.000	474423.500			
2	10112	749924.000	459703.500			
3	1010	737524.000	514743.500			
- 4	I014	768284.000	501463.500			
5	ID#5	747204.000	446343.500			
6	10.06	736404.000	479383.500			
7	1017	763364.000	510343.500			
0	10.00	638164.000	465303.500			
9	10119	705604.000	466663.500			Y
¢					>	

In the Accuracy Assessment dialog, select View -> Show All.
 All of the random points display in the germtm.img file in the Viewer. These points are white.



6. Analyze and evaluate the location of the reference points in the Viewer to determine their class value. In the Accuracy Assessment CellArray **Reference** column, enter your best guess of a reference relating to the perceived class value for the pixel below each reference point.

As you enter a value for a reference point, the color of the point in the Viewer changes to yellow.



If you were performing a proper accuracy assessment, you would be using ground truth data, previously tested maps, aerial photos, or other data.

 In the Accuracy Assessment dialog, select Edit -> Show Class Values.

The class values for the reference points appear in the **Class** column of the CellArray.

8. In the Accuracy Assessment dialog, select **Report -> Options**. The **Error Matrix**, **Accuracy Totals**, and **Kappa Statistics** checkboxes should be turned on.

The accuracy assessment report includes all of this information.



See the chapter "Classification" in the <u>ERDAS Field Guide</u> for information on the error matrix, accuracy totals, and Kappa statistics.

 In the Accuracy Assessment dialog, select Report -> Accuracy Report.

The accuracy assessment report displays in the IMAGINE Text Editor.

10. In the Accuracy Assessment dialog, select **Report -> Cell Report**.

The accuracy assessment report displays in a second ERDAS IMAGINE Text Editor. The report lists the options and windows used in selecting the random points.

- **11.** If you like, you can save the cell report and accuracy assessment reports to text files.
- **12.** Select **File -> Close** from the menu bars of both ERDAS IMAGINE Text Editors.
- **13.** In the Accuracy Assessment dialog, select **File -> Save Table** to save the data in the CellArray.

The data are saved in the classified image file (germtm_superclass.img).

- **14**. Select **File -> Close** from the Accuracy Assessment dialog menu bar.
- 15. If you are satisfied with the accuracy of the classification, select File-> Close from the Viewer menu bar.

If you are not satisfied with the accuracy of the classification, you can further analyze the signatures and classes using methods discussed in this tour guide. You can also use the thematic raster layer in various ERDAS IMAGINE utilities, including the Image Interpreter, Raster Editor, and Spatial Modeler to modify the file.

Using the Grouping Tool

Setting Up a Class

Grouping Project

This section shows you how to use the Class Grouping Tool to assign the classes associated with an Unsupervised Classification and group them into their appropriate target classes. This tour is intended to demonstrate several methods for collecting classes, not to provide a comprehensive guide to grouping an entire Landsat image.

In this example, you take a Landsat image that has been classified into 235 classes using the ISODATA and the Maximum Likelihood classifications. These 235 classes are grouped into a more manageable number of Land Use categories.

Preparation

1. Start ERDAS IMAGINE.

2. Copy the file **loudoun_maxclass.img** from the <IMAGINE_HOME>/examples directory into a directory in which you have write permission.

Starting the Class Grouping Tool

1. Click the Classifier icon on the ERDAS IMAGINE icon panel.



The Classification menu displays.



2. Select **Grouping Tool** from the **Classification** menu to start the Signature Editor.

The Select image to group dialog opens.

 Navigate to the directory into which you copied the file loudoun_maxclass.img. Select it from the list of files and click OK.
 The Class Crouping Tool and a Viewer displaying the selected image.

The Class Grouping Tool and a Viewer displaying the selected image file open.

4. To view the entire image, right-click in the Viewer and select **Fit Image to Window** from the **Quick View** menu.

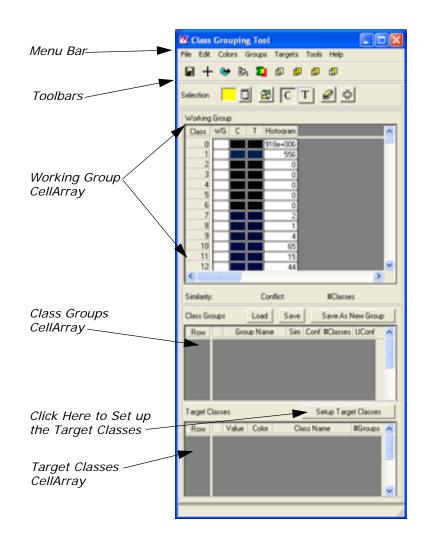
Class Grouping Tool Terminology

Classes are individual clusters of pixels with similar spectral characteristics. These clusters are the result of the unsupervised classification.

Target Classes are the final landuse or landcover categories for which you are interpreting.

Class Groups are the saved groups of classes that represent a single target class.

Working Groups are composed of the currently selected classes which are highlighted in the **Viewer**.



Set Up the Target Classes

1. Click the **Setup Target Classes** button above the **Target Classes** CellArray. The Edit Target Classes dialog opens.

	10 Edit Target Classes	. 🛛
Type the target	Target Class Name	Target Classes
class name here		Agiculture Forest Urban
Click Add->	Add > Bemove (> OK Car	ncel Help

 Place the cursor in the Target Class Name field and type Water. Click the Add -> button.

Water now appears in the list of Target Classes.

- 3. Add Agriculture, Forest, and Urban classes.
- 4. Once you have finished adding **Target Classes**, click the **OK** button on the Edit Target Classes dialog.

You may return to this dialog and add more Target Classes at any point during the grouping process.

The Target Classes you have added display in the Target Classes CellArray.

Click here	Target Cla	0101		Setup Ta	wget Classes]
to change the	Row	Value	Color	Class Name	#Groups ^	1
Target Color	2			Water Agriculture Eccent	0	— Displays the number of Class Groups
Target Class Names	- 4	1		Urban		in the Target Class

Now that the Target Classes are set up, you can assign target colors.

5. Click in the color block next to the **Water** Target Class. Select **Blue** from the Color dropdown list. Continue assigning colors to the Target Classes until colors have been assigned to each of them.



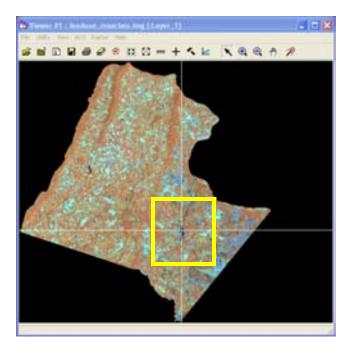
Collecting Class Groups

The main goal of a Class Grouping project is to gather classes of pixels which have common traits into the same Target Classes. To do this, you must select the classes and save them to Class Groups. Class Groups are, as the name suggests, groups of classes that share similar traits; usually these are classes that are in the same landuse category. The Class Groups are themselves members of the Target Classes into which the image is being stratified.

There are numerous ways to collect Class Groups. This tour guide demonstrates how to use the Cursor Point Mode, the AOI Tool, and the Ancillary Data Tool to collect Class Groups.

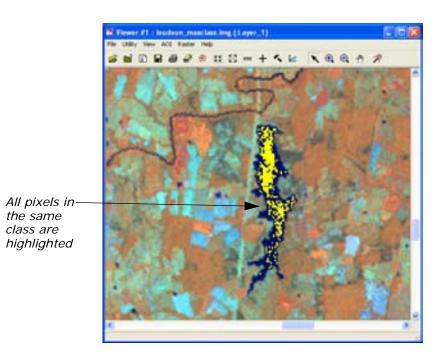
Using the Cursor Point Mode

- 1. In the Viewer, right-click and select **Inquire Cursor** from the **Quick View** menu. The Inquire Cursor dialog displays.
- In the X field, enter 280135.655592. Enter 4321633.145953 into the Y field. Press Enter on your keyboard.
- **3.** In the Viewer, click on the Zoom In icon (and zoom in on the lake identified by the Inquire Cursor.

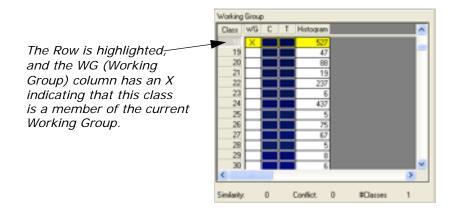


- 4. Click **Close** on the Inquire Cursor dialog.
- Select the Cursor Point Mode icon + on the Class Grouping Tool toolbar. The cursor changes to a crosshair when it is placed in the Viewer.
- 6. In the Viewer, place the crosshair cursor over the lake and click.

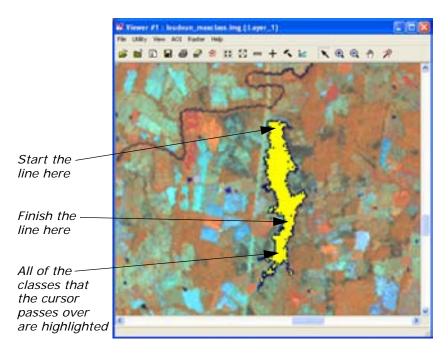
The lake, and all pixels belonging to the same classification as the pixel you selected, are highlighted in the Viewer.



The selected class also highlights in the **Working Group** CellArray.



- **7.** Click the **X** in the **WG** column to clear the currently highlighted class from both the CellArray and the Viewer.
- 8. Now place the crosshair cursor over the lake. Click and drag the cursor in a short line over the lake. All of the classes that the cursor passes over are selected in the Working Groups CellArray.



This provides a much better selection, but there is still some speckling in the selection.

 Right-click inside the Viewer and select Zoom -> Zoom In By 2 to see even more detail.

This will help you select nonhighlighted pixels more easily.

10. Hold down the Shift key on the keyboard, and then click one of the unselected pixels.

Note this adds all of the pixels to the currently selected classes in the **Working Group**. As pixels representing classes are selected, the corresponding **Class** row highlights in the **Working Group** CellArray.

11. Now hold down the Ctrl key on the keyboard and click one of the highlighted pixels. All of the pixels that belong to the same class as this pixel are removed from the selection.

NOTE: The Shift and Ctrl keys may also be used to select and deselect classes directly in the Working Classes CellArray.

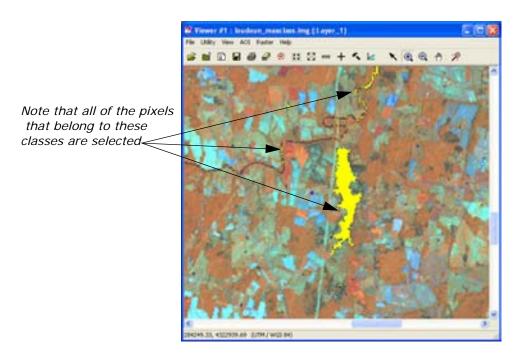
Filling in the Holes and Removing the Speckle

The initial step in any collection method can leave either holes unselected classes that are "islands" within the class—or speckles—selected classes that are "islands" outside of the majority of the selected classes. To increase the accuracy of your Class Groups, you need to fill the holes and remove the speckle.

- **12**. Continue to collect the water classes of this lake using the Shift and Ctrl keys.
- 13. Use the Toggle Highlight icon to turn off the highlighting and see the actual pixels you have selected.Include the class if:
 - adding the class fills the holes in the existing selection,
 - adding the class supplements the edges of the existing selection,
 - removing the class opens significant holes in the selection, or
 - adding the class reduces the overall complexity of the selection.

Exclude the class if

- adding the class creates speckles in places where there were none before,
- removing the class removes speckles in the overall image, or
- removing the class reduces the overall complexity of the selection.



Your selections should look similar to this:

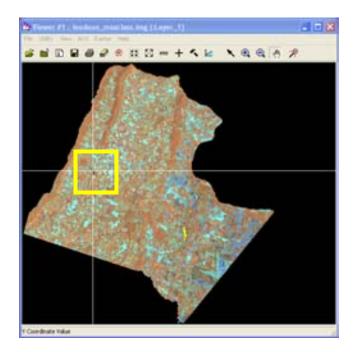
14. Save the Working Group as a Class Group by clicking the **Save As New Group** button above the **Class Groups** CellArray.

Click here to save	Class Gr	oups Load	Save		Save As N	lew Gro.	a
the Working Group	Row	Group Name	Sim	Cont	BClasses	UConf	^
as a new Class Group	1	> Water_1	0	0	21	1.0	
1							

Using the AOI Tools

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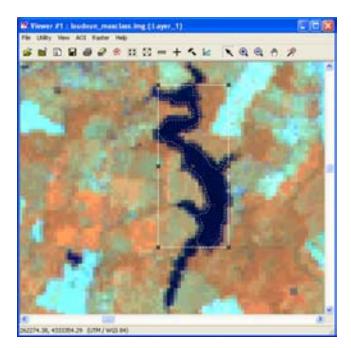
- 1. In the Viewer, right-click and select **Inquire Cursor** from the **Quick View** menu. The Inquire Cursor dialog displays.
- 2. In the Inquire Cursor dialog, enter **261278.630592** in the X: field and **4334243.327665** in the Y: field.
- **3.** Use the Zoom In icon **(Q)** to zoom in on the lake identified by the Inquire Cursor.



- 4. Click Close on the Inquire Cursor dialog to dismiss it.
- If the Class Group from the previous section is still highlighted in the Viewer, click the Clear Working Group contents icon in the Class Grouping Tool dialog to clear the selections.
- Select AOI -> Tools from the Viewer menu bar. The AOI tool palette displays.



7. Digitize a polygon the encompasses the majority of the open water pixels in the largest lake.



 8. In the Class Grouping Tool toolbar, click the Use Current AOI to Select Classes icon .

All of the classes that are contained within the currently selected AOI are highlighted in the **Working Group** CellArray.

9. Using the techniques outlined in "Using the Cursor Point Mode" on page 536, fill in the holes in the selections for these lakes.

10. In the Class Groups CellArray, make sure that the caret > is in the

row for the Water_1 class, then click the Union icon <a>[µ] .

This adds the classes saved in the **water_1** Class Group to the classes that are currently selected in the **Working Group** CellArray.

- 11. Click the **Save** button above the **Class Groups** CellArray to save all of the selected classes in the **Working Group** CellArray.
- In the Class Groups CellArray, click in the Water_1 cell. This group represents the open water land use category, so change the Group Name by typing Open.

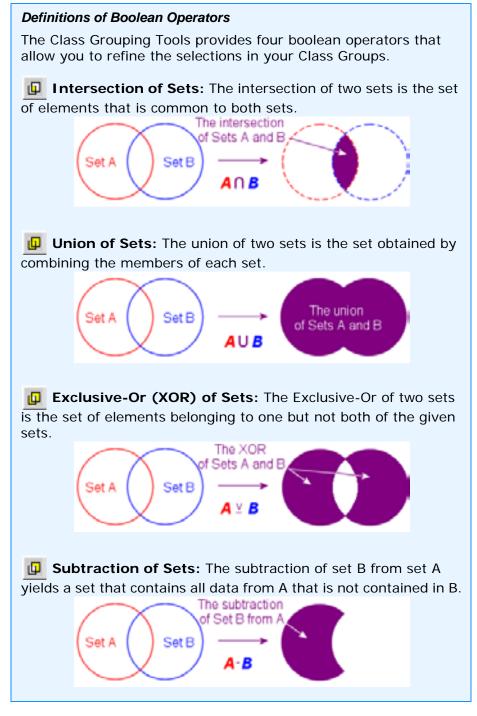
NOTE: The Target Class Name is already a stored part of the Class Group name, so there is no need to repeat it in the Class Group name.

13. In the Class Grouping Tool dialog, click the Clear Working Group

contents icon 🥔 to clear the selections.

Next, remove the AOI you created.

- 14. Select View -> Arrange Layers from the Viewer menu bar.
- **15.** Right-click on the AOI layer and select **Delete Layer** from the **AOI Options** menu.
- **16.** Click **Apply** in the Arrange Layers dialog.
- **17**. Click **No** in the Verify Save on Close dialog prompting you to save the AOI to a file.
- **18**. Click **Close** in the Arrange Layers dialog.
- **19.** Click **Close** on the AOI tool palette to remove it from your display.



It would take a very long time to collect all of the classes in a large image using only the simple tools outlined above. To save time, you should quickly group all of the classes into Class Groups and then refine these initial groupings to more accurately define the study area.

Using the Ancillary Data Tool

The Ancillary Data Tool provides a means of performing this quick initial grouping. By using previously collected data, such as ground truth data or a previous classification of the same area, you can quickly group your image, and then concentrate on evaluating and correcting the groups.

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The thematic file used as the Ancillary Data file need not cover the entire area, but it must at least overlap with the area being grouped.

Setting Up the Ancillary Data Classes

1. In the Class Grouping Tool toolbar, click the Start Ancillary Data Tool

icon 🞦

Two dialogs display, the Ancillary Data Tool dialog and the Ancillary Class Assignments dialog.

2. In the Ancillary Class Assignments dialog, select File -> Set Ancillary Data Layer.

The File Chooser opens.

3. Select **loudoun_lc.img** from the <IMAGINE_HOME>/examples directory, then click **OK**.

A Performing Summary progress meter displays.

 When the summary is complete, click OK to dismiss the progress meter (if your Preferences are not set so that it closes automatically).

The summary process does three things:

- populates the Ancillary Class Assignments CellArray with information from the ancillary data file,
- provides summary values relating the ancillary data file to the file being grouped in the Ancillary Data Tool CellArray, and
- adds three new columns (Diversity, Majority, and Target %) to the Working Group CellArray in the Class Grouping Tool.



For a more detailed explanation of each of these dialogs and their contents, please see the ERDAS IMAGINE On-Line Help.

In the Ancillary Class Assignments dialog CellArray, the rows represent the classes from the ancillary data file (**loudoun_lc.img**) and the columns represent the information from the file being grouped (**loudoun_maxclass.img**).

 In the Ancillary Class Assignments dialog CellArray, scroll down until you see Low Intensity Residential in the Class Name column of the CellArray.

> You may want to expand the size of the Class Names column in the Ancillary Class Assignments CellArray so that you can read the entire Class Name.

6. Click in the corresponding **Urban** column of the CellArray to assign this class to the **Urban** Target Class.

The **X** moves from the **Water** column (the first column in the CellArray) to the **Urban** column.

 Repeat this step for the High Intensity Residential and Commercial/Industrial/Transportation classes to add them to the Urban class as well.

	4 Ancillary Clas	s Assi	gnments										
	File												
	Ancillary Classes	Water	Agriculture	Forest	Urban	Histogram	Value	Red	Green	Elue	Opacity	Class Names	^
		×				0	10	.0062745	0062745	.0062745	1		
		×				0	19	0900392	09000502	.0900392	1		
		×				0	20	0.109004	0.109004	0.109004	1		
Click here to relate	ritensity Residential				х	122673	21	1	1	0		Low Intensity Re	
he Ancillary Data	réensity Residential				X	625	22	1	0.647059	0		High Intensity Re	
	vdustnal/Transporta				х	71271	20	1	0	0	1	Commercial/Indu	
lasses to the Target		×				Û				0.156063	1		
lasses in the image		×				0				0.172549			
eing grouped		×				Û				0.104314			
cing grouped		×				0	27	0.196070	0.196070	0.196078	1		×
	<												>
	Close Help												

 Continue arranging the Xs in the Ancillary Class Assignments dialog so that they properly relate the named classes from the ancillary data file to the remaining Target Classes, which are Agriculture and Forest. If the ancillary data classes do not have labels (Ancillary Classes/Class Names), leave the corresponding X in the Water column.

Collecting Groups Using the Majority Approach

In most cases, this approach would be the first step you took in the grouping process. As a first step, this process would result in a completely grouped image that had no Similarities and no Conflicts between Target Classes.



We have already begun collecting Class Groups, and this causes some conflicts between Target Classes. Once you have assigned the ancillary data classes to the Target Classes, you may minimize the Ancillary Data Tool and the Ancillary Class Assignments dialogs.

 In the Working Group CellArray on the Class Grouping Tool, rightclick in the numbered row labels. Select Criteria... from the Row Selection menu.

	Columns:	Functions	Conpare:	
Click Majority to specify the selection criteria	WG C T Hidogram Diversity Hawato Target %	10W mod((a),(b)) ab((a)) in((a)) in((a)) ever((a)) ever((a)) mar((a),(b)) mar((a),(b)) row()	 C and a container M 	7 8 3 + and 4 5 6 : and 1 2 3 * not 0 E / 1 1 1 1
	E'Mapriy/1	Subset Add F		Close Help

The Selection Criteria dialog displays.

- 2. In the Columns area, click Majority to set the selection criteria.
- In the Target Classes section of the Class Grouping Tool dialog, select the Water Target Class by placing the caret > in the Water row.

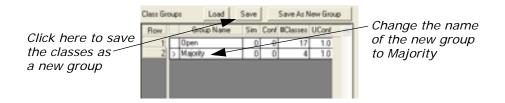


4. In the Selection Criteria dialog, click the Select button.

All of the classes that best represent the selected Target Class are highlighted in the **Working Group** section of the Class Grouping tool.

5. In the Class Groups area of the Class Grouping Tool, click the Save As New Group button.

The selected classes are added as a new class group.



6. Change the name of the new group by selecting the **Water_2** text and typing **Majority**.

This helps you keep track of how the Class Group was collected.

- 7. Repeat step 3 through step 6 for each of the Target Classes, moving the caret in the **Target Classes** CellArray to the next Target Class each time.
- 8. When you are finished, click the **Close** button on the Selection Criteria dialog.
- Save the Grouping Process by selecting File -> Save Image... from the Class Grouping Tool menu bar.

This provides a broad grouping of all the classes in the image, and each Class Group must be closely examined to determine the accuracy of the Majority grouping.

10. Click Close in the Ancillary Data Tool dialog.

- 11. Click Close in the Ancillary Class Assignments dialog.
- **12.** Click the Clear Working Group Contents icon *in the Class* Grouping Tool dialog to prepare for the next section.

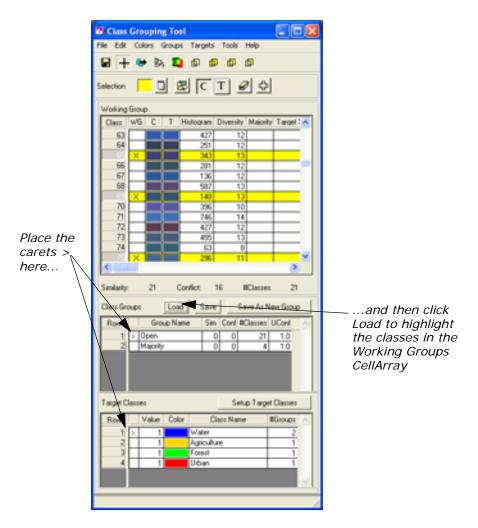
Next, you can learn how to find the grouping conflicts and some strategies for resolving them.

Identifying and Resolving Similarities and Conflicts

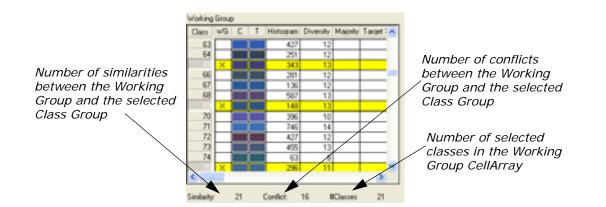
The Class Grouping Tool allows there to be any number of Class Groups representing each Target Class, and there is no restriction on whether or not these groups overlap or conflict with each other. It is frequently the case that a single class may properly belong with more than one target class. These classes are termed conflicted classes, and they generally are a source of speckle in the resulting final classification.

Both Similarity and Conflict are measures of shared classes. Similar classes are shared by other groups within the same Target Class, while conflicted classes shared by groups under a different Target Class.

- In the Target Classes section of the Class Grouping Tool dialog, select the Water Target Class by placing the caret > in the Water row.
- 2. In the Class Groups section of the Class Grouping Tool dialog, select the **Open** Class Group by placing the caret > in the **Open** row.
- 3. In the **Class Groups** section of the Class Grouping Tool dialog, click the **Load** button.

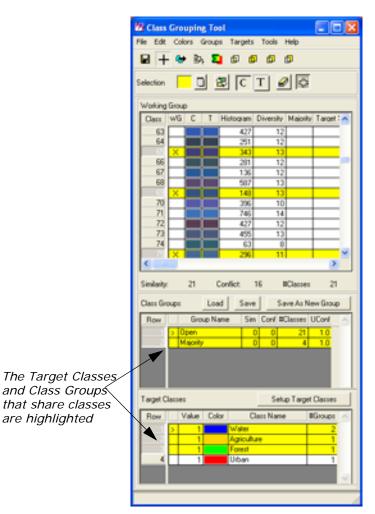


Notice the **Similarity** and **Conflict** numbers displayed just under the **Working Group** CellArray:



The **Similarity** statistics are calculated between the Working Groups and the selected Class Group. These are the same, so we would expect there to be the same number of Similarities and Classes Selected, and this is the case. 4. In the Class Grouping Tool toolbar, click the Toggle

Similarity/Conflict icon rightarrow to highlight the other Target Classes that have classes in common with the Working Group (which is exactly the same as the Open Class Group).



 Select the Agriculture Target Class by placing the caret > in the Agriculture row.

NOTE: The contents of the **Working Group** CellArray do not change when you change the selected Target Class, but the contents of the **Similarity** and **Conflict** statistics have reversed.

6. To identify the classes that these two Target Classes have in common, click the Intersect Working Group with Current Group icon





For more information on Boolean operators, see "Definitions of Boolean Operators".

This loads the intersection of the classes included in the Working Group (Water, Open) and the selected Class Group (Agriculture, Majority).

- **7.** In the Viewer, zoom in on the classes that are currently selected. These classes are located in the Lakes you collected with the AOI Tool.
- **8.** Use the Toggle Highlighting icon \mathbb{R} to view the pixels in question.

These pixels belong in the **Water** Target Class and not in the **Agriculture** Target Class. Next, you remove these classes from the Agriculture Target Class

- 9. Make sure the caret > is still in the **Agriculture** Target Class and the **Majority** Class Group.
- **10.** Click the XOR Working Group and Current Group icon

This loads all of the classes in the selected Class Group (**Agriculture**, **Majority**) without any of the classes that were previously highlighted in the CellArray (the conflicted classes).

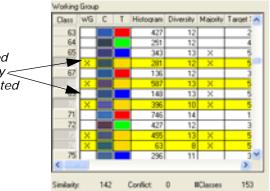
- In the Class Groups area of the Class Grouping Tool dialog, click the Save button to save the Agriculture, Majority Class Group without the conflicted classes.
- **12.** In the Class Grouping Tool toolbar, click the Save icon **H** to save the grouping process to the image file.

Coloring the ThematicSometimes it is helpful to judge your progress by seeing the entireTablepicture. The Class Grouping Tool provides a mechanism for you to
see how the grouping process is progressing.

1. In the Class Grouping Tool menu bar, select **Colors -> Set to target colors**.

The colors in the **T** column in the **Working Groups** CellArray change to reflect the colors of the associated Target Classes.

Classes that are conflicted or are not included in any Target Class are highlighted



All of the classes that have not been grouped into Target Classes or are in conflict with other Target Classes are highlighted. These conflicted or unassigned classes must be resolved.

2. If a class is highlighted but has been assigned a target color, it is included in more than one target class. Use the techniques described in "Identifying and Resolving Similarities and Conflicts" to resolve the conflict.

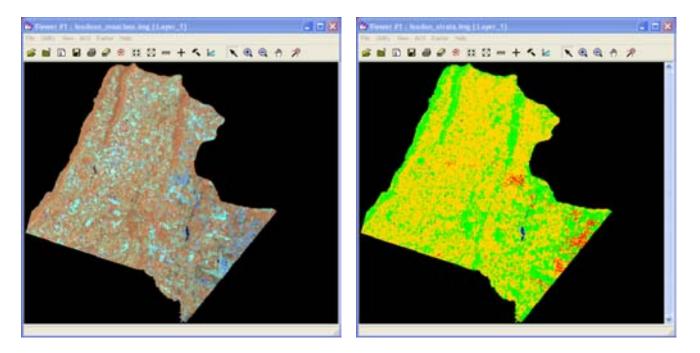
After you have resolved some of the conflicts, you can refresh the classes that remain unresolved by clearing the current working group and then selecting **Colors -> Set to target colors** in the Class Grouping Tool menu bar.

- 3. If a class is highlighted but has not been assigned a target color (that is, the colors in the C and T column of the Working Group CellArray are the same), the class has not yet been collected in any group. Use the techniques described in "Using the Cursor Point Mode" to collect these classes into their groups.
- 4. To change back to the standard color table display in the Viewer,

click the Standard Color Table icon $\ \ C$.

- To view the thematic color table display in the Viewer, click the Thematic Color Table icon T.
- 6. When you have finished the grouping process, click the <u>T</u> icon to display the Thematic colors in the Viewer, then select File -> Save -> Top Layer As.... Save the image as loudoun_strata.img.

You can separately load that image in a Viewer to compare it to the original image, **loudon_maxclass.img**.



Close and Exit

- 1. Select File -> Close from the Class Grouping Tool menu bar.
- 2. Select File -> Close from the Viewer menu bar.
- 3. Select **Session -> EXIT IMAGINE** if you want to end your session.

Frame Sampling Tools

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Introduction	Let's say that you needed to assess the amount a land that is covered by parking lots on a university campus. How would you go about accomplishing this? You could either go and start surveying parking lots, or you could get aerial photography of the campus and start digitizing them. But what if you wanted to analyze the amount of land covered by forests in an entire county, or the amount of arable land planted with grain in an entire state? The cost of collecting ground truth data from the entire county or of digitizing the entire state would be prohibitive to getting an accurate assessment.
	The process of Frame Sampling provides an answer to these types of problems. Frame Sampling is a statistical methodology that enables the accurate survey of a Material of Interest (MOI) in the study area. As the name suggests, Frame Sampling uses a frame to define the study area and the analysis of representative samples from within that frame to estimate the proportion of the MOI in the frame. Although getting ground truth from an entire county or digitizing and entire state might not be feasible, it would certainly make sense to use ground truth and imagery interpretation to calculate the amount of the MOI in these representative samples.
Remote Sensing and Frame Sampling	The use of Frame Sampling and remote sensing can assist the surveyor in achieving the most accurate estimate for the least cost. Remote Sensing provides the analyst with a synoptic view of the entire Frame.
	The classification methods described in "Perform Unsupervised Classification" and the Class Grouping Tool described in "Using the Grouping Tool" provide two methods of "stratification", or creating smaller homogenous units that represent the entire Frame. This stratification reduces the number of samples that are allocated to provide an accurate result.
	High resolution aerial photography can be used in the labeling of the areas containing the MOI in the representative samples, thereby limiting the amount of ground truth data that needs to be collected.
Frame Sampling Tools	The Frame Sampling Tools provide a framework guiding the Frame Sampling process, a means of managing the array of files generated by the process, links to the appropriate remote sensing tools, and the necessary computations for the final analysis of the MOI.

Frame Sampling Tools Tour

This tour guide is intended to walk you through a landcover analysis Frame Sampling project. The frame for this project is defined by the political boundaries of Loudon County. The MOI for this project is forest cover. The Frame Sampling Project Manager provides the ability to track and perform the necessary steps for preparing a file for Frame Sampling. For the purposes of this tour guide, the following preparatory steps have already been performed for you:

- Obtain a large-scale synoptic image (or images) that covers the entire study area.
- Orthorectify that synoptic image. Orthorectification is explained in "Orthorectification".
- Classify the orthorectified image using a classification technique such as ISODATA classification described in "Perform Unsupervised Classification".
- Group the classified image with the Class Grouping Tool. Tips and techniques for Grouping the Classified image are illustrated in "Using the Grouping Tool".

Setting Up the Sampling Project

This section shows you how to set up a Sampling Project and how the Sampling Project Manager allows you to manage and track the files used in the Frame Sampling process.

You perform the following operations in this section:

- Create a Sampling Project
- Assign the Project Files
- Recode the Grouped File
- Create a Sampling Grid
- Select the Samples for Interpretation
- Use the Dot Grid Tool to Label the Samples
- Compute the Final Analysis and Fraction Files

***** -

Approximate completion time for this tour guide is 45 minutes.

ERDAS IMAGINE must be running.

Create a New Sampling Project The first step in the Frame Sampling process is to create the sampling project.

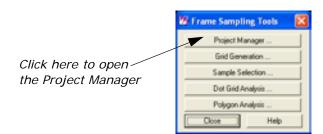
1. Click the Classifier icon on the ERDAS IMAGINE icon panel.



The Classification menu displays.



2. Click the Frame Sampling Tools button to open the Frame Sampling Tools menu.



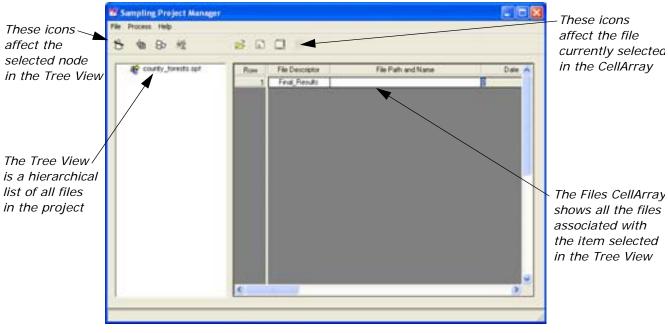
3. Click the **Project Manager** button on the **Frame Sampling Tools** menu.

The Open/Create a Sampling Project dialog opens.

	💯 Open/Create a Sampling Project 🛛 🔀	
Click here to create a new Sampling Project	Open an existing Sampling Project Create a new Sampling Project	Browse to a directory in which you have
	Poject	write permission
	Project File county_forests.spf	
	Sampling Approach	
Enter the project name	Enable at least one of these high resolution analysis types Enable Polygon Analysis	
		Click here to enable
	OK Cancel Help	Dot Grid Analysis

- 4. Click the Create a new Sampling Project radio button.
- 5. If necessary, click the Open File icon and browse to a directory in which you have write permission.
- 6. Enter county_forests.spf as the Project File.
- 7. Select the Enable Dot Grid Analysis checkbox.
- 8. Click OK.

The Sampling Project Manager opens displaying the contents of your new project.



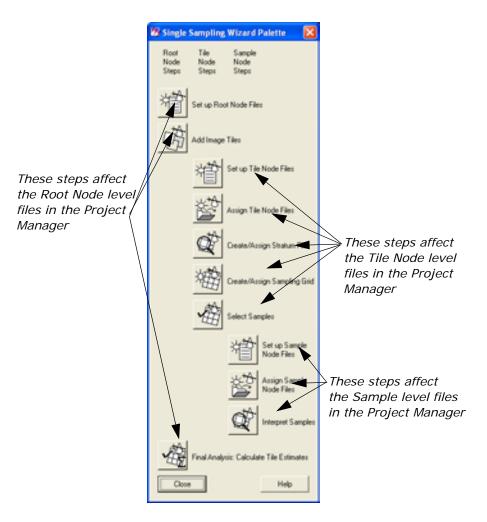
it without losing any of your work.

The Frame Sampling process is very long, and can take several days for large projects. You can save your progress on any project by selecting **File -> Save** from the Sampling Project Manager menu bar. You may then exit the project and return to

Root Level

The Single Sampling Wizard Palette is designed to walk you through the steps associated with the Frame Sampling process.

Click the Use Sampling Project Wizard icon Sampling Wizard Palette.



The general workflow in the Frame Sampling process moves from the top to the bottom of the Single Sampling Wizard Palette. Clicking on an icon in the palette jumps directly to that step in the Frame Sampling workflow wizard.

Single Sampling Project Nodes

Root Node Level steps affect the project as a whole. Root Node files display in the far left of the Tree View hierarchy.

Tile Node Level steps are performed on the Tiles. Image Tiles are the large-scale synoptic images that cover the study area. Each of these Tiles is stratified and then divided into representative samples. Tile Node files are dependent upon one of the Root Node files.

Sample Node Level steps are performed on the high-resolution representative samples of the Image Tiles. These Samples are interpreted for the MOI. Sample level files are dependent upon one of the Image Tiles.

2. Click the Set up Root Node Files icon on the Single Sampling Wizard Palette to open the first step of the Single Sampling Wizard.



The Single Sampling Wizard opens. Each step in the Wizard has text that explains the current step and either allows you to set up the file assignments, or click icons to launch the appropriate tools.

3. Click the Setup Files icon in the Root Node - Setup Files step of the Single Sampling Wizard.



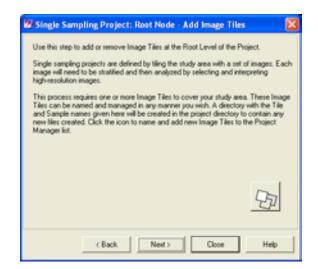
The Root Node - Define File Descriptors dialog displays.

To Add a New File:	W Single Sampling Project: Root Node -	Define File Descriptors	To Edit an Existing File:
Enter the Descriptor for the new file	File Descriptor	Root Level Files to Manage Final_Results	Select a descriptor from the list of root level files
Select the typ e of file to add	Add >> Remove <<		Modify the location of the existing file in the project
Click Add >>	Down Bottom		hierarchy
Modify the location			Click to set
of the new file		▲	the relationship
in the project		Set Process Associations	between the selected
hierarchy		Cancel Help	file and the other files in the project

This dialog allows you to manage the files in the Sampling Project. You can add and remove files from the process, as well as modify the relationship between a file and the process by clicking the **Set Process Associations** button.

- **4.** Click **Cancel** without making any changes to the files. You are returned to the Single Sampling Wizard.
- Click Next > on the Single Sampling Project Wizard. The Root Node

 Add Image Tiles step displays.



6. Click the Add Image Tile icon on the Wizard.



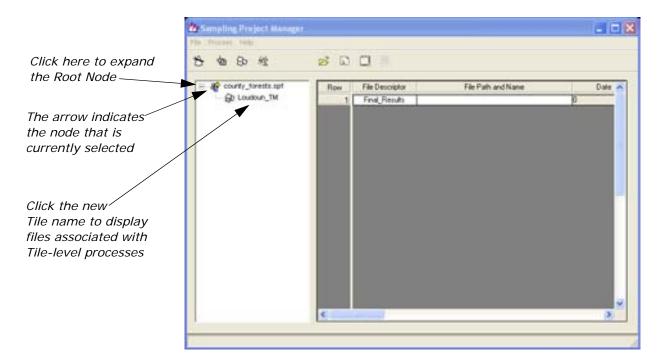
The Root Node - Manage Image Tiles dialog displays. This dialog allows you to add names for the tiles in the Sampling project.

	19 Single Sampling Project:	Root Node - Manage Image Tiles 🔀
Enter the name———I of the new tile	Name of Tile: Loudoun_TM Add>>	List of Tiles Loudoun_TM
Click Add >	Remove <<	
Click Close	Sort	
	Close	Cancel Help

The image tiles must cover the entire area frame. You may need to add more than one tile if the frame cannot be covered by a single tile.

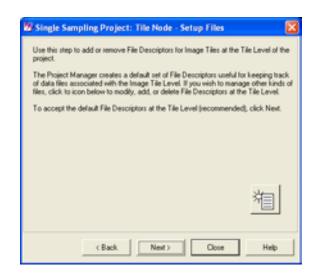
- 7. In the Name of Tile field, type Loudoun_TM.
- 8. Click Add >> to add the tile name to the List of Tiles.
- 9. Click Close to exit the Root Node Manage Image Tiles dialog.

Note that the Tile Node has been added to the Tree View in the Sampling Project Manager.



10. Click **Next >** on the Wizard.

The Tile Node - Setup Files step displays.



11. On the Tile Node - Set Up Files dialog, click Next >.The Tile Node - Assign Files dialog displays in the Wizard.

Tile Level Functions

The Tile level functions are processes that apply to the entire Image Tiles.

Tile Node Files

Imported Tile: An Imported Tile is a native IMAGINE format image that provides the initial synoptic view of the study area. This file provides the initial starting point for all of the files below. The inclusion of an Imported Tile in the project is optional, as long as you can provide a Stratified Tile.

Rectified Tile: A Rectified Tile is an orthorectified version of the Imported Tile. The Rectified Tile must undergo Classification to provide the Classified Tile below. The inclusion of a Rectified Tile in the project is optional, as long as you can provide a Stratified Tile.

NOTE: For more information on orthorectification, see "Orthorectification".

Classified Tile: A Classified Tile is a thematic classification of the Rectified Tile.

NOTE: For instructions on classifying an image, refer to "Advanced Classification".

Stratified Tile: The stratified tile is a refined grouping of the Classified Tile. This grouping is usually performed with the Class Grouping Tool. The Grouped image is then Recoded to include only those strata which contain the MOI. This file is **required** by the Frame Sampling process.

NOTE: For tips and techniques on stratifying images, see "Using the Grouping Tool".

Sampling Grid: The Sampling Grid contains the vector polygons needed for Sample Selection. The Sampling Grid is usually created with the Grid Generation Tool, but it can be a previously created Shapefile. This file is *required* by the Frame Sampling process.

Prior Data: The Prior Data file is any standard IMAGINE .img file that contains information about previous locations of the particular feature class of interest or variation of the occurrence of the material of interest within the study area. This information helps you choose which portions of the image to sample with high-resolution imagery. The inclusion of Prior Data in the project is optional.

Selected Samples: The Selected Samples file defines the Sampling Grid Cells that have been selected for analysis with high-resolution imagery. This file is usually created with the Sample Selection Tool, and is *required* by the Frame Sampling process.

Fraction File: The Fraction File is created by the Final Analysis process.

🕼 Single Sampling Project: Tile Node - Assign Files 🛛 🛛 🔀	
Use this step to assign existing files to the File Descriptors at the Tile Node level. Some files originating from other sources must be manually associated with their appropriate File Descriptors in the Project Manager list of files to manage. This step helps you to make these assignments. Select the Image Tile and File Descriptor for which you wish to make an assignment and then use the File Chocoen to browne to the existing file you want to associate with	This dropdown list has
the selected Descriptor.	all the Image Tiles in the project
Image Tile: Loudour_TM File Descriptor: Classified_Tile	Select Classified Tile
File Disoster: Toudourt_masclass.ing	Browse to the examples directory
(Back Next) Close Help	

The Assign Tile Node Files step allows you to select files that have already been prepared for the sampling process and assign them to their proper places in the project.

- 1. Select Classified_Tile from the File Descriptor dropdown list.
- In the File Chooser section, click the Open File icon and browse to the IMAGINE_HOME/examples directory. Select loudoun_maxclass.img from the list of files, and click OK.
- **3.** Click **Next >** on the Single Sampling Wizard.

The Tile Node - Create/Assign Stratum Files step displays in the Wizard.

	o create a new Stratum file with the Class Grouping Tool or to assign an ric file for use as the Stratum File.
sampling analy smaller, interna standard super Image Tile into produce the st	ite is derived from each Image Tile and is a key component for single cis. This file is a thematic data layer that divides the study area into ally consistent groups (stata) for analysis. We recommend using a niveled or unsuper-ised image classification technique to classify each thematic classes. These classes may then be grouped or edited to rata. Samples of higher resolution data will be used to analyze the leach statam in more detail.
classification in material of inter Click the icon I an existing ima	uping Tool can be used to group clusters of an unsupervised nto strata and to identify those classes that are likely to contain your rest. below to initiate the Class Grouping Tool for the selected Tile. To assign ger file for use as the Stratum file, select a Tile and use the File Diooser le. This step must be performed for each Image Tile.
Image Tile:	Loudour_TM
File Chooser	

NOTE: The Grouped File used in this tour guide was created during the section "Using the Grouping Tool", which is in the Advanced Classification tour guide.

4. If you have not already created the Grouped File, you can click the Class Grouping Tool icon to launch the Grouping Tool. See the "Using the Grouping Tool" section of the Advanced Classification tour guide for more information.



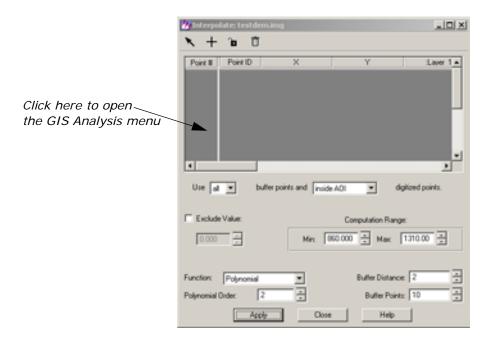
Recoding the Grouped File

Now that you have Grouped the Classified File into class groups, it is necessary to recode the Grouped file so that only those classes which contain the MOI are included in the file. This eliminates the possibility of MOI contribution from strata that have been designated as Non-MOI strata and reduces the noise in the estimate. It also increases the User Confidence in the Final Analysis.

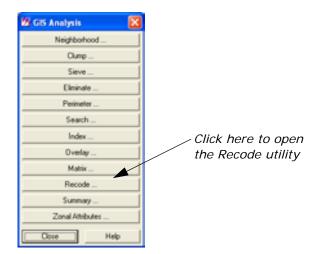
1. From the IMAGINE icon panel, select the Image Interpreter icon.



The Image Interpreter menu displays.



2. Click the GIS Analysis button to open the GIS Analysis menu.



3. Click the **Recode** button to open the Recode dialog.

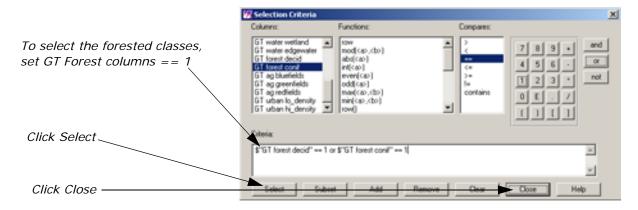
	10 Recode	<u> </u>
Enter the Grouped	Input File: (*.ing) Ioudour_marclass.ing	Output File: (*.ing)
	Setup Recode	Data Type:
Click to Setup the Recode	🗐 Ignore Zero in Stats.	Input: Unsigned 8 bit Output: Unsigned 8 bit
	OK Ba	oh ADI
	Cancel View	Help

- **4.** Select the input file to be recoded, **loudoun_maxclass.img**. This file was created in the "Using the Grouping Tool" tour guide.
- 5. Click the Setup Recode button to open the Thematic Recode dialog.

	🕼 Thema	tic Recode					
	Value	New Value	Histogram	Red	Green	Blue	^
	0		1709177.0	0.000	0.000	0.000	
	1	1	556.0	0.016	0.125	0.302	
	2	2	0.0	0.000	0.000	0.000	
Right-click here	3	3	0.0	0.000	0.000	0.000	
and select Criteria	4	4	0.0	0.000	0.000	0.000	
and select criteria	5	5	0.0	0.000	0.000	0.000	
	6	6	0.0	0.000	0.000	0.000	
	7	7	2.0	0.000	0.027	0.220	
	8	8	1.0	0.000	0.031	0.212	
		9	4.0	0.000	0.039	0.216	
	10	10	65.0	0.000	0.039	0.251	
	11	11	15.0	0.000	0.039	0.231	
	12	12	44.0	0.000	0.035	0.255	~
	<						>
	New Value:	1	÷	0	hange Select	ed Rows	
		OK	Cancel		Help		

Take a moment to look at the columns that appear in the Thematic Recode CellArray. Notice that the columns that were created with the Grouping Tool are all labeled with GT TargetName GroupName. A 0 in this column means that the Class (Value column) is not included in this Group. A 1 indicates that Class is included in the Group.

6. Right-click in the Value column and select Criteria... from the dropdown list.



- 7. Set each of the **GT Forest** columns == 1.
- 8. Click the Select button.

All of the columns that are grouped into the Forest Target Class should be selected in the Thematic Recode dialog.

50 50 60	58	57 58	11070.0 18668.0	0.212	0.251
59 60		58	199997		
60	59		10000.0	0.208	0.157
		59	20755.0	0.161	0.251
	60	60	22235.0	0.153	0.204
61	61	61	25180.0	0.157	0.298
62	62	62	23568.0	0.271	0.212
63	63	63	22873.0	0.192	0.353
64	64	64	26230.0	0.208	0.255
65	65	65	22176.0	0.247	0.243
- 66	66	66	30451.0	0.231	0.318
67	67	67	20334.0	0.157	0.349
61	68	68	25489.0	0.345	0.290
69	69	69	24943.0	0.200	0.318
lew Value:	1		- Drang	e Selected	Rows

- 9. Right-click in the Value column and select Invert Selection.
- 10. Enter 0 in the New Value field and click the Change Selected Rows button.

(alue	New Value	Value	Histogram	Red	Green 🔺	
57	57	57	11070.0	0.212	0.251	
- 50	0	58	19668.0	0.208	0.157	
	0	58	20755.0	0.161	0.251	
- 00	0	60	22235.0	0.153	0.204	
01	0	61	25180.0	0.157	0.298	
1.35	0	62	23568.0	0.271	0.212	
- 65	0	63	22873.0	0.192	0.353	
122	0	64	26230.0	0.208	0.255	
1.2	0	65	22176.0	0.247	0.243	
66	66	66	30451.0	0.231	0.318	
1.0	0	67	20334.0	0.157	0.349	
60	68	68	26489.0	0.345	0.290	
(S)	0	69	24943.0	0.200	0.318	
					2	
	_					
w Value	0		Chang	e Selected	Rows	— Click Change
	-					-
w Value		_	- Chang	e Selected	Rows	— Click Chang Selected R

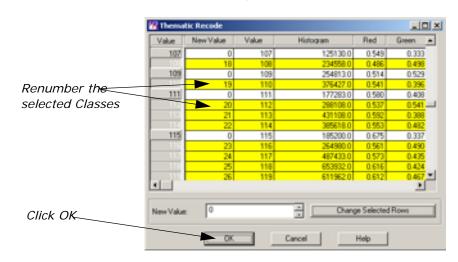
Entér 0 here

All of the Classes that are not members of the Forest Target Class have their pixel values set to 0. This excludes them from the Stratum File and eliminates them from the computations of the Final Analysis.

11. Right-click the **Value** column again and select **Invert Selection** from the dropdown list.

This selects only those classes that are members of the Forest Target Class.

12. Renumber the New Values for the members of the MOI Target class so that they are consecutively numbered. To renumber a class, leftclick in the New Value column and type the number.



13. Click **OK** to exit the Thematic Recode dialog and return to the Recode dialog.

19 Recode		×	
Input File: (*.ing)	Output File: (*.ing) loudour_strate ing	-	
Setup Recode	Data Type: Input: Unsigned 8 bit		Enter loudoun_strata.img
🗖 Ignore Zero in Stats.	Output: Unsigned 8 bit	•	nore
OK IIa Cancel Ver			

- **14.** In the **Output Filename** field, click the Browse icon and browse to the project directory. Enter **loudoun_strata.img** as the File Name and click **OK** in the File Selector.
- **15.** Click **OK** on the **Recode** dialog to start the Recode process. A Progress meter displays.
- 16. When the Progress meter reaches 100%, click OK to dismiss it.

NOTE: You may want to paste the color table from the grouped image to the Attribute Editor of the new stratum file. Use the same criteria selection method as described above to copy the MOI colors to the Stratum file.

Generate the Sampling Grid

- In the Create/Assign Stratum File step, click the Browse icon and browse to the directory in which you created the stratum file. Select loudoun_strata.img from the list of files and click OK.
- 2. Click **Next** in the Wizard.

The Create/Assign Sampling Grid step displays.

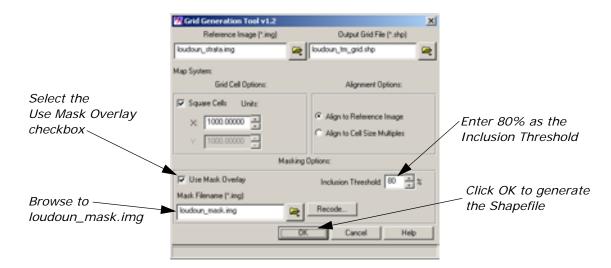
3. In the Create/Assign Sampling Grid step, click the Create Sampling Grid icon to create a Sampling Grid file.



The Grid Generation Tool opens.

Using the Grid Generation Tool

The Grid Generation Tool is used to create a Shapefile grid that overlays the Stratum file.



- 1. Make sure that the **Reference Image** is set as **loudoun_strata.img**.
- Note that the Output Grid File is loudoun_tm_grid.shp. This is the default name, which has _grid.shp appended to the Tile Name. If you change the Output Grid File name, that change is reflected in the Sampling Project Manager.
- 3. Select the Use Mask Overlay checkbox.

The Mask file is used to limit the coverage of the Sampling Grid. Because the Sampling that can be performed in this tour is restricted by your ability to use only the two existing high resolution files, you use the mask file to mask out all of the portions of the Tile that do not have high resolution imagery coverage.

- Next to the Mask Filename part, click the Browse icon and browse to the IMAGINE_HOME/examples directory. Select loudoun_mask.img from the list of files and click OK.
- 5. Enter 80 as the Inclusion Threshold.

Setting the Inclusion Threshold to 80 ensures that at least 80% of every Sample Cell created by the Grid Generation Tool falls within the bounds set by the Mask File.

6. Click **OK** to create the Sampling Grid and return to the Sampling Project Wizard.

A Progress meter opens and tracks the progress of the Grid Generation Process.

When the Create/Assign Sampling Grid step redisplays, click Next
 .

The Select Samples step displays.

Note that the Sampling Project Manager is updated to include the Sampling Grid file you just created.

Sampling Project Manager File Process Help		
5 6 7 U U O		
County_forests.spf	Row File Descriptor File Path and Name 1 Imported, Tile Imported, Tile 2 Rectified_Tile gram Ries/Imagine II.6/examples/loudour, 3 Classified_Tile gram Ries/Imagine II.6/examples/loudour, 4 Shafied_Tile E/lour/sampling/loudour, threats img 5 Sampling_Grid E/lour/sampling/loudour, threats img 6 Prior_Data Selected_Samples 8 Fraction_File Imported_Samples	The new sampling grid me

All of the Tile Node Level files are created in a Tile Level directory which bears the same name as the Tile itself.

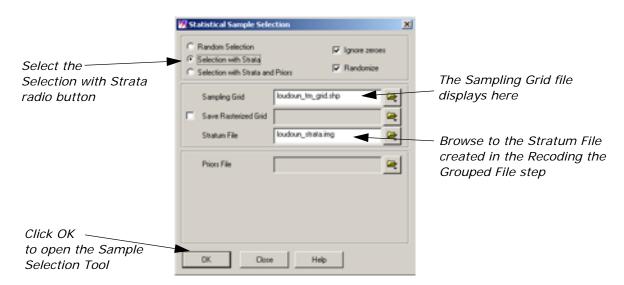
Selecting the Samples

The Statistical Sample Selection dialog allows you to choose which files you would like to open to aid you in the selection of the Sample Cells which are interpreted for the MOI.

1. In the Select Samples step of the Sampling Wizard, click the Select Samples icon.



The Statistical Sample Selection dialog displays.



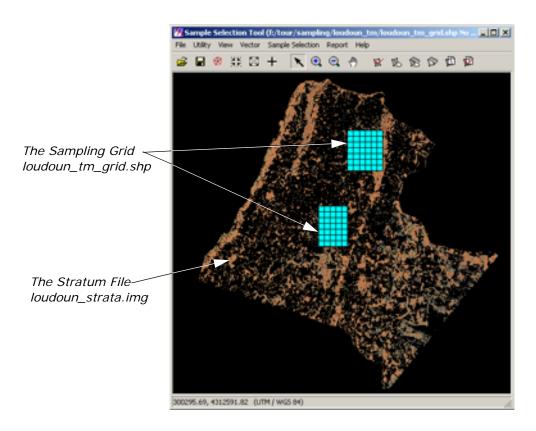
- 2. Select the Selection with Strata radio button.
- 3. Make sure that the **Sampling Grid** file name part displays the **loudoun_tm_grid.shp** file.

4. Make sure that the Stratum File file name part displays the

loudoun_strata.img file. If it does not, click the Browse icon and browse to the file. Select **loudoun_strata.img** from the list of files and click **OK**.

 Click OK in the Statistical Sample Selection dialog to open the Sample Selection Tool.

The Sample Selection Tool opens.



Manually Selecting Cells

1. Using the Manual Zoom icon 🧕 zoom in on the upper portion of the Sampling Grid.

Sample Selection Tool (6/ File Ublity View Vector San	tour/sampling/loudoun_tm/lo	udoun_tm_grid.s., _OX	
		66660	
			Click here to highlight this Cell
		2	
1		li.	

- 2. Click the Selector icon 🔪 in the Sample Selection toolbar.
- 3. Click the indicated Sample Cell to highlight it.
- Select Utility -> Blend from the Sample Selection menu bar. The Viewer Blend / Fade dialog opens.
- 5. Use the meter handle to adjust the amount of blending so that you can view the Stratum File through the Grid. This allows you to select Sample Cells that contain a representative amount to the MOI.

You must exercise caution when manually selecting Sample Cells for interpretation. No more than half of the Samples should be manually selected. Manually selecting more Cells introduces user bias into the calculations.

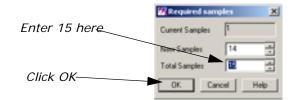
- 6. When you have finished viewing the Stratum file, click **OK** on the Viewer Blend/Fade dialog to dismiss it.
- Click the Accept Manually Selected Cells icon to select this cell for interpretation.

Automatically Selecting Sample Cells

The Sample Selection Tool provides a utility for randomly selecting Cells for interpretation. This utility automatically selects cells based on the size and expected proportion of the MOI in the stratum.

Click the Automatic Selection icon icon in the Sample Selection toolbar.

The Required Samples dialog opens.



Note that the **Current Samples** number box displays the number 1. This is the cell that you manually selected.

2. In the Total Samples number box, type 15 and press Enter.

The **New Samples** number updates to **14**, indicating the number of samples that the program needs to automatically identify.

3. Click **OK** on the Required Samples dialog to close it and automatically select 14 additional cells.

NOTE: Because the Automatic Selection process is random, the automatically selected samples may differ from those in this tour.

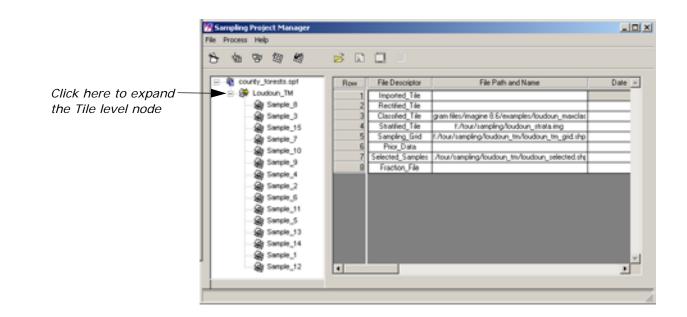
4. Select File -> Save Selected As... to save the selected cells as a new shapefile.

The Save Sampling Grid As dialog opens.

- Navigate to the loudoun_tm directory that contains the loudoun_tm_grid.shp file.
- 6. Enter **loudoun_selected.shp** in the file name and click **OK** to save the shapefile.
- Select File -> Close to dismiss the Sample Selection Tool and return to the Sampling Project Wizard.

A Progress meter displays as the Sample Selection Tool creates AOI bounding boxes for each of the selected samples.

Note that the Sampling Project Manager has been updated to include the 15 samples you have selected.



Sample Level Functions

You are now ready to perform the Sample Level functions.

- Click Next > on the Select Samples step of the Sampling Wizard. The Set Up Sample Node Level Files step displays.
- Click Next > on the Setup Sample Node Files step of the Sampling Wizard.

The Assign Sample Node Files step displays.

🕼 Single Sampling Project: Sample Node - Assign Files	×	
Use this step to assign existing files to the File Descriptors at the Sample Node level.		
Some files originating from other sources must be manually associated with their appropriate File Descriptors in the Project Manager list of files to manage. This step helps you make these assignments.		
Select the Tile, Sample, and File Descriptor for which you wish to make an assignme and then use the File Chocser browse to the existing file you want to associate with	11113	dropdov
the selected Sample.	all o	of the san
	for t	the selec
Image Tile: Loudour_TM		
Sample: Sample_1	This	list cor
File Descriptor: Sample, Boundary		of the file
File Choose: sample_1_bounday.aoi		the selec
(Back Next) Crose Heb	1	
(Dack Nebs) Coole Neb		

This dialog is used to assign files that are associated with each of the Samples to their respective Sample Cell.

Sample Node Files

Sample Boundary: The Sample Boundary is a polygon AOI file that traces the boundary of the Selected Cell. This file is automatically created and by the Project Manager after Sample Selection. It is a required file.

Imported Sample: An Imported Sample is a native IMAGINE format image that provides high resolution view of the representative sample. The inclusion of an Imported Sample in the project is optional, as long as you can provide a Rectified Sample.

Rectified Sample: A Rectified Sample is an orthorectified version of the Imported Sample. The Rectified Sample is used to perform the high resolution interpretation of the Sample Cells. This file is required by the Sampling Process.

NOTE: The Rectified Sample files must be manually assigned to the appropriate samples.

Dot Grid Interpretation: The Dot Grid Interpretation is an annotation file (.ovr) that is the result of a Dot Grid Interpretation of the high resolution sample. This file created by the Dot Grid Tool. This file is required for this sample to be included Dot Grid Final Analysis.

Polygon Interpretation: The Polygon Interpretation is the output file of a Polygon Interpretation of the high resolution sample. This file is created by the Polygon Analysis Tool. This file is required for this sample to be included Polygon Final Analysis.

Assigning the Rectified Samples

The first step in assigning the Rectified Samples is to find out which selected cells overlap which high resolution image.

1. On the ERDAS IMAGINE icon panel, click the Viewer icon to open a Viewer.



2. Click the Open file icon 🧭 on the Viewer toolbar.

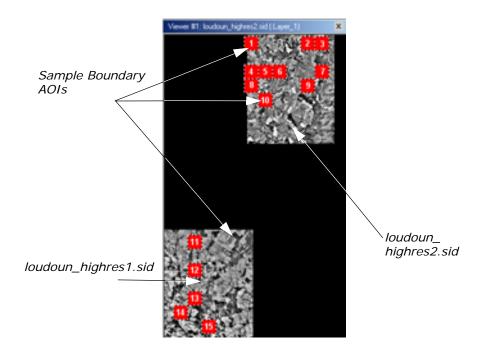
The File Chooser opens.

- 3. Browse to the IMAGINE_HOME/examples directory.
- 4. From the Files of Type dropdown list, select MrSID (*.sid).
- 5. Ctrl-click loudoun_highres1.sid and loudoun_highres2.sid.
- 6. Click OK to open the files in the Viewer.
- Click the Open file icon 😸 on the Viewer toolbar.

The File Chooser opens.

- 8. Browse to the directory that contains your Sampling Project.
- 9. Select the loudoun_tm/sample_1 directory.
- 10. From the Files of Type dropdown list, select AOI (*.aoi).
- 11. Select sample_1_boundary.aoi and click OK.

The AOI that defines the boundary of Sample_1 opens in the Viewer.



- 12. In the Assign Files step of the Sampling Wizard, select **Sample_1** from the **Samples** dropdown list.
- 13. Select Rectified_Sample from the File Descriptor dropdown list.
- **14.** Click the Browse icon and browse to the IMAGINE __HOME/examples directory.
- 15. In the Files of Type dropdown list, select MrSID (*.sid).
- 16. Select the high resolution file that overlaps Sample_1 (loudoun_highres2.sid) and click OK.
- **17.** Repeat step 7 through step 16 for each of the Samples.

Dot Grid Interpretation Dot Grid Interpretation overlays a grid of dots on the portion of the high-resolution image contained within the Sample. You label these dots so that they correctly identify the underlying features. The labeled grid is used to calculate the percentage of the MOI occurring within that portion of the Stratum File.

Placing the Dot Grid

1. Click **Next** > on the Sampling Wizard.

The Interpret High Resolution Samples step opens.

- 2. In the Sample dropdown list, select Sample_1.
- **3.** Click the Perform Dot Grid Interpretation icon to open the Dot Grid Tool.

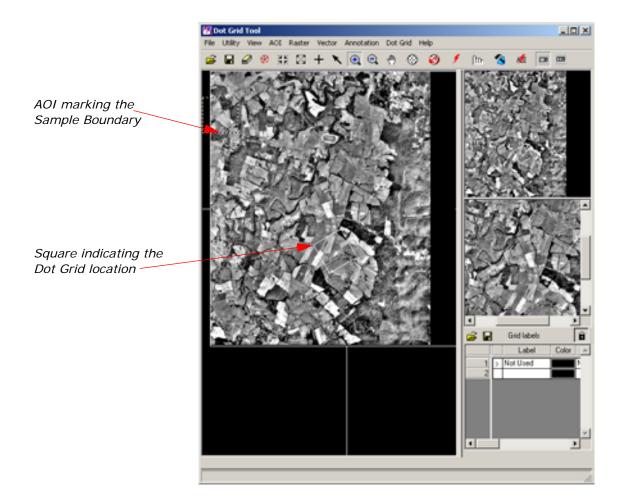


The Create Dot Grid dialog opens.

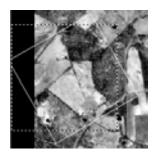
	V Create Dot Grid			
	Ref Image File: Inn Hest/Imagine 8.6/examples/foudour_highves2.sid			
	Edit existing dot grid file? Dot Grid File: E-/tour/sampling/toudoun_im/sample_1/sample_1_do Det			
	Use AQI file? 🔽 [://our/sampling/loudour_tm/sample_1/sample_1_bo	- Select		
	Approach	Fixed		
<u> </u>	Grid Extent Placement Rotation	Rotation		
Select Manual	The Region - C Manual C Fixed 30 - Degrees			
Placement———	C Automatic C Random	Enter 20		
	Size and Spacing	Enter 30		
	Set Extent and Number of dots (compute spacing) Set Number of dots and Spacing (compute extent) Set Spacing and Extent (compute number of dots)			
	☐ Square			
	Extent of dot grid: 300 + wunits 900 + yunits Dot Count			
	Number of Dots: 15 + columns 15 + rows 225			
	Dot Spacing 60.00 - curits 60.00 - y units			
	(All units in meters)			
	OK Cancel Help			

- 4. In the **Approach** group, select the **Manual Placement** radio button. This has the program randomly place the Dot Grid within the Sample.
- 5. Select the Fixed Rotation radio button. Enter 30 in the Fixed Rotation number field.
- 6. Click OK.

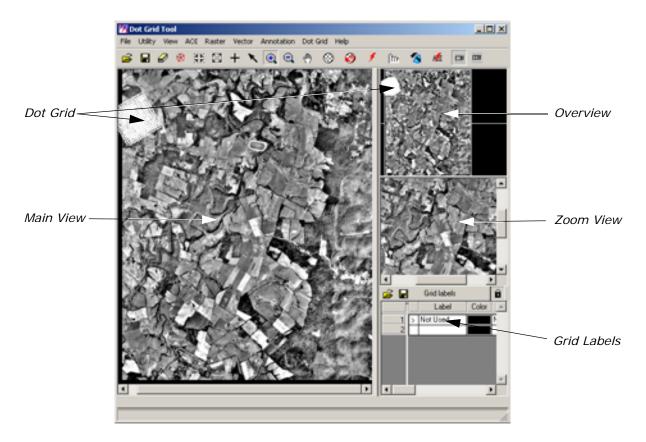
The high resolution image displays in the Dot Grid Tool. An AOI is placed in the image to demarcate the boundary of the Sample. A square indicates the location of the Dot Grid.



7. Drag the Dot Grid square until it covers the majority of the Sample.



8. Double-click inside the square to create the Dot Grid.



Set Up the Grid Labels

The first step in the Interpretation of the Samples is to create a Label set used to label all of the Samples.

- 1. Determine the number of labels used to interpret the Sample. In this tour, use three labels: **Forest**, **Not Forest**, and **Not Used**.
- Select the Append new row to Grid Label CellArray item from the Dot Grid menu. Repeat this for every label you add to the Label Set.
- In the Grid Labels Group, click the Locked icon for to enable the editing of the Grid Labels. The icon changes to indicate that the labels have been unlocked for .
- 4. Click **OK** on the message that informs you that this label set is applied to all of the samples in the project.
- 5. Click in the Label column of row 2. Type Not Forest.
- 6. Click in the Label column of row 3. Type Forest.
- **7.** Click in the **Color** column for **Not Used**. Select **Gray** from the list of colors.

- 8. Click in the **Color** column for the **Not Forest** label. Select **Red** from the list of colors.
- **9.** Click in the **Color** column for the **Forest** label. Select **Dark Green** from the list of colors.

The Grid Labels should look like this:



- 10. Click the Save icon to Save the current label set.
- 11. Read the Warning Message. Click **Save Label Set** on the Warning Message.

The File Chooser opens.

12. Browse to the Sampling Project directory.

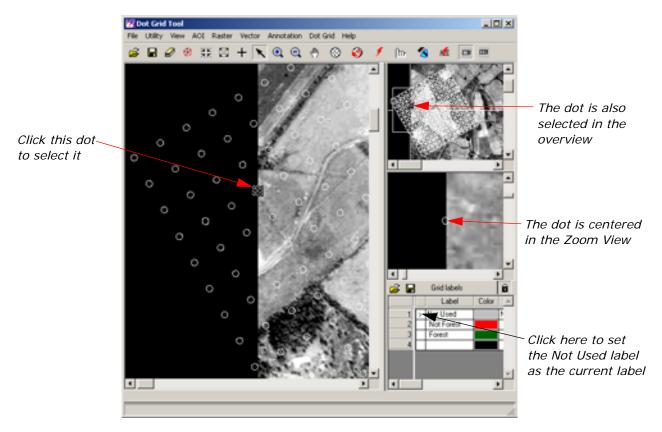
It is generally a good idea to save the Label Set in the Tile level directory. This keeps the Labels in a logical place within the project files hierarchy.

13. Enter forest_moi_labels.lbs as the file name.

14. Click OK to save the Label Set.

Manually Label the Grid

- Use the Manual Zoom icon grid that falls outside of the high resolution image.
- 2. Use the Manual Zoom icon (in the Zoom View to zoom in to a comfortable magnification.
- Use the Manual Zoom icon (in the Overview so that it displays the extent of the Dot Grid.
- 4. Click the Select icon 🔪 on the Dot Grid Tool toolbar.
- Select a dot on the edge of the image by clicking on it in the Main View.



The Zoom View shows that over half of the dot is outside of the image.

- 6. Set the caret > in the **Not Used** row of the Grid Labels by clicking in the first column.
- 7. Label the selected dot by clicking the Label Selection icon f.

The dot is filled with the color of the current label (Not Used) to indicate that it has been labeled.

Automatically Apply Labels

1. Click the Manual Label icon Im to toggle on the Automatic Label

mode. The Automatic Label icon **____** indicates that Automatic Label Mode is active.

- 2. Make sure that the **Not Used** label is still set as the current label in the Labels CellArray.
- **3.** Select another of the dots that lies outside of the high resolution image extent.

The Not Used label is automatically applied to the dot as it is selected.

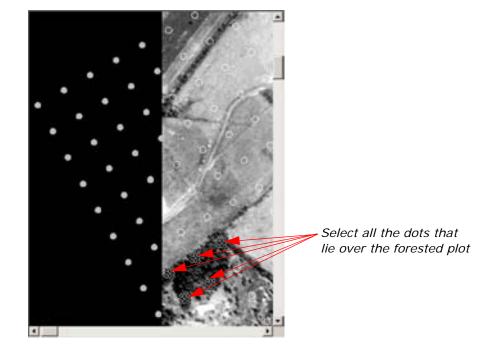
4. Repeat this process to label the dots outside of the image extent.

Label Multiple Dots

 Click the Automatic Label icon _____ to toggle on the Manual Label mode. The Manual Label icon minimicates that Manual Label Mode is active.

In the lower portion of the Main View, there is an area covered by trees.

- 2. Click of the dots in this portion of the image to select it.
- **3.** Shift-click the other dots that overlay this forested plot.



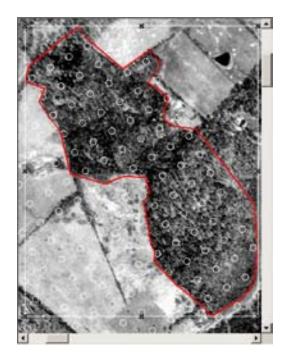
- 4. Place the caret > in the **Forest** label row to set it as the current label.
- 5. Label the selected dots by clicking the Label Selection icon

Use AOI to Label Multiple Dots

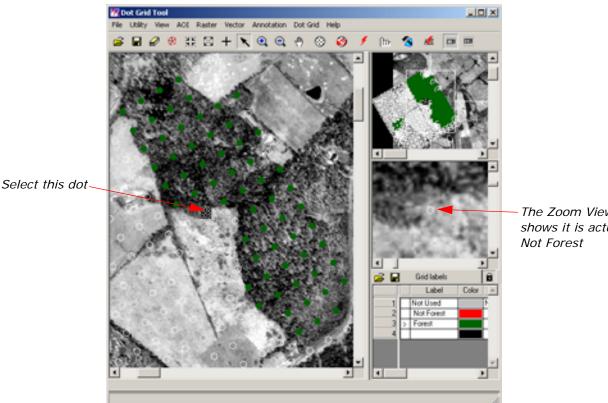
- Use the Manual Zoom icon <u>in</u> to zoom in on the large forested plot in the upper-left portion of the Dot Grid.
- 2. Open the AOI Tools by clicking on the AOI Tools icon 🔨 on the Dot Grid toolbar.

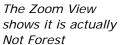
The AOI Tool Palette opens.

- 4. Digitize a polygon around the forested portion of the image.



- **5.** In the Label CellArray, place the caret **>** in the **Forest** label.
- 6. Click the Label AOI icon M to label all of the dots within the polygon.
- 7. Remove the AOI by selecting **AOI** -> **Cut**.
- **8.** Select a dot that lies along the perimeter of the polygon.





Use the Zoom View to analyze whether or not the selected dot is correctly labeled.

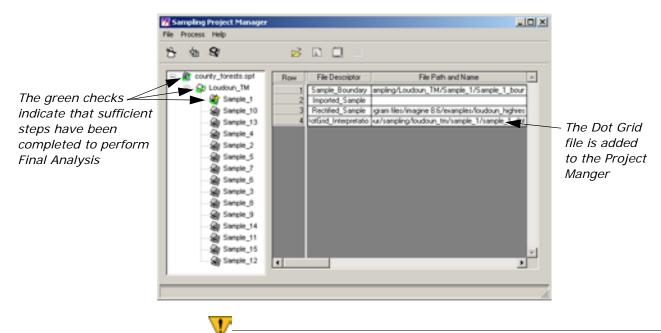
- 9. If it is incorrectly labeled, place the caret > in the **Not Forest** label row, and click the Label Selected Dot icon 🕖 .
- **10**. Continue to analyze the dots that lie along the perimeter of the polygon, relabeling those that were erroneously included in the polygon.

Continue Interpretation

- 1. Continue labeling the Dot Grid until the entire Grid is correctly labeled.
- 2. Select File -> Save -> Save Dot Grid from the Dot Grid Tool menu bar.
- 3. Click File -> Quit to exit the Dot Grid Tool.

The Dot Grid Tool closes and you are returned to the Interpret Samples step of the Wizard.

The Sampling Project Manager updates to include the new Interpretation file.



Although a Final Analysis can be run at this point, the accuracy of the analysis is affected by the limited number of samples that have been analyzed.

4. Continue to interpret the Samples until they have all been labeled. Experiment with the Size and Spacing of the Dot Grid, as well as the Automatic Placement and Rotation options.

The Sampling Project Manager indicates that all of the Samples have been interpreted, and Final Analysis may be performed by placing green check marks in the Tree View.

\$6 St	8 🗅 🗆	10		
a county_forests.spl	Row Fi	le Descriptor	File Path and Name	Date _
B-🚱 Loudoun_TM			npling/Loudoun_TM/Sample_15/Sample_15_box	
- Sample_1		onted_Sample		
- Semple_10	3 Rec	stified_Sample	gram files/magine 8.6/examples/loudoun_highres	
- 🍙 Sample_13	4 106	id_Interpretatio	s/sampling/loudoun_tm/sample_15/sample_15_d	_
- Sample_4				
Sample 2				
Sample 5				
Sample 7				
Sample 6				
Sample 3				
Sample 8				
Sample_9				
- Sample_14				
- Sample_11				
- Sample_15				
Sample_12				
-				
	4			•

- Click Next > in the Interpret Samples step of the Sampling Project Wizard. The Final Analysis step displays.
- 6. Click the Final Analysis icon to start the Final Analysis Wizard.



Final Analysis Wizard

The Final Analysis Wizard lets you set the parameters which dictate how the Final Analysis process runs.

The Final Analysis Wizard opens with the Select Tiles for Analysis step displayed.

	🕅 Select Tiles For Analysis	×	
An X indicates the Tile is included in the	You must belect which Tales will be used in the analysis. By default all Tiles with interpreted samples are pre-selected. To exclude Tales from the analysis, develect them in the table below.		The total number of Samples for the tile
Final Analysis			The number of Samples that have been interpreted and are ready for
	Next> Cancel Help		Final Analysis

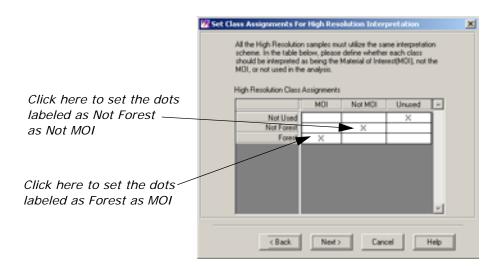
NOTE: If you enabled both Dot Grid and Polygon Analysis when you created the Sampling Project, a preliminary step displays asking you to choose which sampling method to use in the calculations.

 The current Sampling project only uses one Image Tile, so click Next > on the wizard.

The Select Samples To Be Used step displays. If any of the Samples did not represent a good sampling of the MOI (for example, it was centered over a lake or desert) you could exclude that sample from the Analysis.

2. Leave all of the Samples selected and click **Next >** on the wizard.

The Set Class Assignments For High Resolution Interpretation step displays.



 Click in the Not Forest row, Not MOI column to set all of the dots in the Dot Grid that were labeled as Not Forest to be Not the Material of Interest in the Final Analysis.

- 4. Click in the **Forest** row, **MOI** column to set all of the dots that were labeled as Forest to be the Material of Interest for Final Analysis.
- 5. Leave the X in the **Not Used** row, **Unused** column to exclude these dots from the Final Analysis computations.
- 6. Click **Next** > in the Final Analysis Wizard.

The Check File Integrity step displays.

7. Click **Next >** on the Wizard to perform with the project integrity check.

The Final Analysis process performs some preliminary checks to make sure that a Final Analysis can be performed.

8. Click the View Warnings button. The Warning Messages dialog displays.

	Warning Messages Tile Loudour, TM is ready for analysis All selected samples for Tile Loudour, TM will be included	×
Any problem that prohibits a Final Analysis displays at the top of this list of messages		2
	Close Het	

9. Click Close to exit the Warning Messages dialog.

10. Click **Next >** in the **Final Analysis Wizard**.

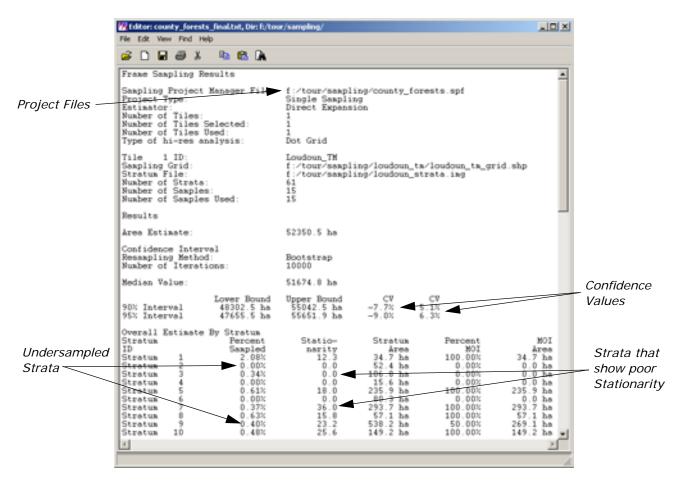
The Single Sampling Parameters step displays.

	store the analysis can proceed. alysis. This step may take a few	/	elect Hectares
Number of Iterations:	10000		om this list
Reports			
Units:	Hectares (ha)		nter _ forest_frac the File Suffix
Fraction Files			
File Suffic	_lorest_hact	- Cl	ick Next
Leaving unchanged could of	werwrite previous files		

11. Select **Hectares** from the **Units** dropdown list as the units in which to perform all the calculations.

- **12.** Enter **_forest_fract** as the suffix for the Fraction File. This identifies the MOI for this fraction file in the Project Manager.
- **13.** Click **Next >** in the Final Analysis Wizard.

The View Analysis Results step displays in the Wizard. The Final Analysis Report opens in a Text Editor window.



The Final Analysis Report gives a wealth of information about the Sampling project up to this point. It can indicate which of the strata are undersampled and which of the strata lack stationarity. Both of these issues must be addressed to achieve an accurate estimation of the land covered by the MOI.

Two Analysis Problems: Stationarity and Undersampling

The first few iterations of any Frame Sampling project serve mainly to reveal where the project breaks down. The Final Analysis Report reveals two of the biggest stumbling blocks for any project: stationarity and undersampling.

Stationarity

Stationarity, or Spatial Stationarity, is the measure of the MOI consistency in each stratum. A low Stationarity value means that the stratum reported relatively consistent MOI content percentages during the resampling iterations.

Undersampled strata

Not every stratum includes areas that are sampled with highresolution imagery, and some of those strata that are included only have a very small percentage of the actual area that is sampled—not enough to make an accurate estimate of the MOI. These areas are said to be Undersampled.

Resolving the Problems

There are a number of ways to reduce the Undersampled strata and the Stationarity of the Strata; two of the most helpful methods are described below:

- Use the Dendrogram Tool (in the Class Grouping Tools) to revise your stratum file and group some of the problematic strata into spectrally similar groups that are adequately sampled. You also need to recode the stratum file again.
- Some of the Strata may include classes that are substantially different from each other. These classes need to be split apart into two separate strata. Use the Dendrogram Tool (in the Class Grouping Tools) to revise your stratum file and regroup these classes.
- Add additional Samples to the project to get a better estimation of the contents of the strata.

1/

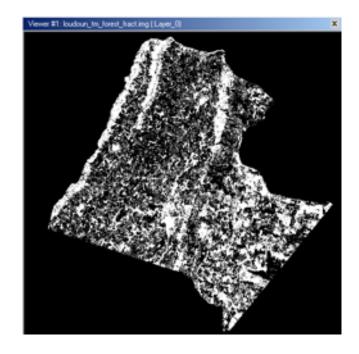
Resolving these problems to achieve an acceptable Confidence Value may require numerous iterations of refining and recoding the Stratum File, adding and/or removing Samples, as well as finding and correcting labelling errors in the Interpretation files.

 Once you are satisfied with the Analysis Results, click Next > on the Final Analysis Wizard to generate the Fraction File.

The Final Analysis process generates a Fraction File for each of the image tiles.

15. Click **Close** on the Final Analysis Wizard to exit the wizard and return to Sampling Project Manager.

The Fraction File, which is generated during the Final Analysis process, is a floating point file; each pixel value represents the probability of that pixel containing the MOI.



ERDAS IMAGINE Tour Guides

IMAGINE Expert Classifier™

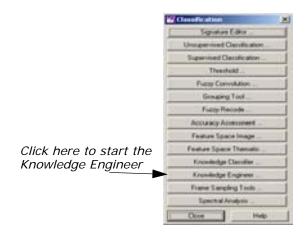
Introduction	This chapter is designed to introduce you to the IMAGINE Expert Classifier [™] . The IMAGINE Expert Classifier is composed of two modules: the Knowledge Engineer and the Knowledge Classifier. The Knowledge Engineer provides the interface for an expert with first- hand knowledge of the data and the application to identify the variables, rules, and output classes of interest and create the hierarchical decision tree. The Knowledge Classifier provides an interface for a non-expert to apply the knowledge base and create the output classification.				
	This set of exercises guides you through the basic process of creating a new knowledge base from scratch. The Knowledge Engineer tools and their uses are presented.				
_					
Create a	In this tour guide you can learn how to:				
Knowledge Base	add hypotheses				
	enter rules for hypotheses				
	edit variables for the rules				
	copy and edit existing rules				
	test a knowledge base				
	<i>Approximate completion time for this tour guide is 30 minutes.</i>				
Set Up the Output Classes	For the purpose of this exercise, suppose that you are determining Residential and Commercial Services map classes from imagery and existing mapped data. (The example classes are a subset of the lanier.ckb provided in the examples directory.)				
	This very simple two class example provides an opportunity to use and become familiar with the tools and processes of the Knowledge Engineer. The Knowledge Engineer aids in the process of designing a knowledge base by allowing you to set up a framework which can be easily be edited and rearranged during the design process.				

Start the Knowledge Engineer

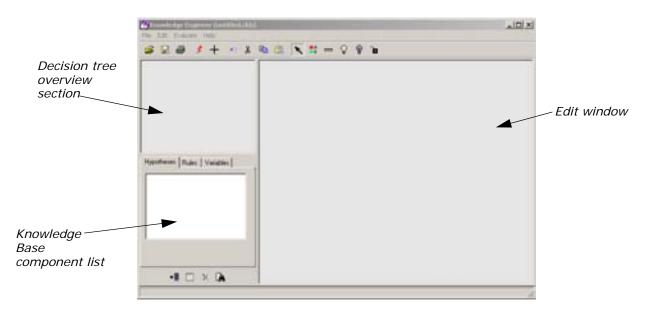
1. Click the Classifier icon and on the IMAGINE icon panel.



2. Select Knowledge Engineer from the Classification menu.



The Knowledge Engineer dialog starts with blank slates in the edit window, the decision tree overview section, and the Knowledge Base component list (**Hypotheses**, **Rules**, and **Variables**).



Place Hypotheses into the Edit Window

1. Select Edit -> New Hypothesis to add the first hypothesis.

The Hypo Props (Hypothesis Properties) dialog opens with **untitled.ckb** in the title bar, a default hypothesis name: **New Hypothesis**, and the **Color** is set to **Grayscale**.

Type the new class name	W Hypo Props: untitled.ckb X	
here	Create an Output Class	
		ecify the or Orange
	Apply Close Help	si orango

- 2. Change the default hypothesis **Name** to the first class name, **Residential**.
- 3. Since you want **Residential** to be an output class, the **Create an Output Class** checkbox is left checked.

You are going to give colors to each of the classes.

 Click the Specify radio button in the Color section. Then use the dropdown menu to select Orange as the color for this class.

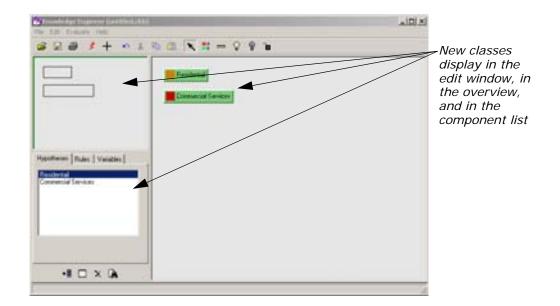
Selecting Colors for Output Classes

If a color is not specified for an output class, it is automatically made grayscale. As additional grayscale output classes are added, grayscale values for each of the grayscale classes are automatically updated and stretched evenly across the range from white to black. This occurs even if some other classes are assigned specific colors.

5. Now click the Apply button in the Hypo Props dialog.

A green rectangle with the hypothesis name **Residential** and chip color displays in the edit window and an outline of the rectangle appears in the knowledge tree overview window. You probably noticed that there are diagonal lines through the hypothesis rectangle in the edit window. These lines remain until conditions have been added that can make the hypothesis true or false.

- Select Edit -> New Hypothesis once again to set up the next class, Commercial Services. Enter the class Name and Specify Red as the color for the class.
- 7. Click **Apply** in the Hypo Props dialog to add the class.
- 8. Click Close on the Hypo Props dialog.



Enter Rules for the Hypothesis

- Select the Create Rule Graphic Tool icon from the Knowledge Engineer dialog icon bar.
- 2. Move the cursor, which changes to the shape of a rule, and click the green hypothesis rectangle for **Residential**.

A yellow rule rectangle, called **New Rule**, is attached to the hypothesis rectangle, **Residential**, by a line that is mirrored in the knowledge tree overview.

The LE Delaw reg	 is low	
Image: Second	A new rule i added to the Residential class	
[]		

3. Double-click the yellow **New Rule** rectangle to open the Rule Props (Rule Properties) dialog.

	🙀 Rule Props: untitled.	ckb			×
Enter the name for	Na	me: Vegetated Within	n City		
the new rule here —	Rule Confidence: Compute from Conditions C Sp		Conditions 🥂 Specif	y 1.0000	-
		Lie	t of Conditions:		
	AND	Variable	Relation	Value	Confidence
Click here to create a new variable					
		Apply	Close H	ielp	

 Change the Name of the rule to Vegetated Within City and leave the Compute from Conditions radio button selected for Rule Confidence.

Enter Variables for the Rule

1. Click within the cell under **Variable** and select **New Variable** from the dropdown list.

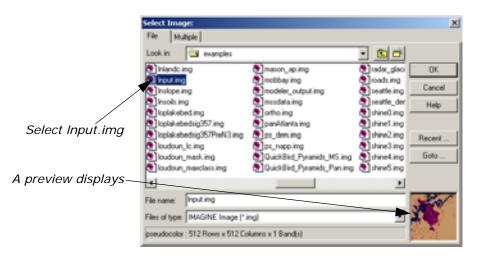
The Variable Props dialog opens.

Type the name of the variable here	Variable Prope: untitled.ckb X Variable Name: Highway Map Coptional Variable Type: Raster Data Type: Integer
	Raster Variable Options:
Select Raster as the	C Imagery C Feature C Graphic Model C Program
Variable Type	C Leave Undefined (Prompt Analyst)
	Infp:
	Select Inage: ('.ing) Layer: ('Layer_1')
	Use: CellValue
	Apply Close Help

2. Change the Variable Name to Highway Map, and change the Variable Type to Raster.

Changing the type to **Raster** switches the bottom part of the dialog to the **Raster Variable Options**, providing a different set of choices than for the **Scalar** variable type.

3. Click the Select Image File icon *j*, then navigate to and select **Input.img** from the <IMAGINE_HOME>/examples directory.



- **4.** Click **OK** in the Select Image dialog to add the file to the Variable Props dialog.
- Click the Apply button in the Variable Properties dialog to add Highway Map to the rule properties CellArray.

	💯 Rule Props: untitled.ckb			X
	Name:	Vegetated Within City		
Highway Map is the	Rule Confidence:	Compute from Conditions	C Specily 1.0000	-
Variable		List of Conditions:		
	AND Vari	ble Relation	Value	Confidence ~
	1 Highway Map		0	1.00
Change the Value—	- 2			
				2
		Apply Close	Help	

- 6. Click **Close** to dismiss the Variable Props dialog.
- In the Rule Props dialog, click in the cell under Value and select Other.
- 8. Into the highlighted cell, type **7** and press Enter on your keyboard (7 is the class number for urban areas in **Input.img**).

🚧 Rule Pr	ops: untitled.ckb					×	
	Name:	Vegetated Within	City				
	Rule Confidence:	Compute from	Conditions C Spe	city 1.0000	-		The Value is now set to 7
		List	of Conditions:				
AND	Vari	sble	Relation	Value	Confide	ence -	
1	Highway Map				7	1.00	
2							
						× .	
		Acoly	Close	Help			

9. Click **Apply** in the Rule Props dialog to enter the changes, then **Close**.

The new rule with its attached variable appears in the edit window. Notice that the diagonal lines in the hypothesis, **Residential**, and rule, **Vegetated Within City**, rectangles have disappeared for the hypothesis and rule you have edited. This is because at least one complete condition is now set.

	a X = 2 9 1		10X	
Hapotheses: Pluke [Vaiables]		me vegetand within Car	<u>? Highway Han in 7</u>	The Variable Highway Map has been added to the tree
-1 - × 0				

Add an Intermediate Hypothesis

In this section, you add an intermediate hypothesis as well as its conditions.

Select the Create Hypothesis icon and click the rule, Vegetated Within City.

An intermediate hypothesis, **New Hypothesis**, is attached to the rule, linked by a **New Hypothesis** == **TRUE** variable.

- 2. Double-click the **New Hypothesis** rectangle to open the Hypo Props dialog.
- In the Hypo Props dialog, change the name to Vegetation and deselect the Create an Output Class checkbox since you do not want this to be an output class.
- 4. Click Apply, then Close.

Create a New Rule

- Using the Create Rule icon _____, place a New Rule on the Vegetation hypothesis.
- 2. Double-click the **New Rule** to open the Rule Props dialog, and change the rule **Name** to **High IR and Low Visible**.
- 3. Click in the cell below Variable and select New Variable.
- 4. Type the name **TM Band 4** in the **Variable Name** field.
- 5. Change the Variable Type to Raster.
- 6. Click the Open icon to open the Select Image dialog, and select **lanier.img** from the <IMAGINE_HOME>/examples directory.

	Select Image:			×
	File Multiple			
	Look in: 🔄 examples		- 🗈 🖻	
Coloct lonion inter	1 flevolandradar.ing	IFSAR_USGS_DEM.ing	Inlandc.ing	OK
Select lanier.img	Revolandradarregion5 img Revolandradarsig531525 img	Timage dodge bright spotting Klon_TM.img	hput.ing	Cancel
	flevoland adartigs of sesting	andcover.ing	hcolsing	Help
	flood_tn147_rader.ing	larier.ing	kplakebed	
	Iloodplain ing	Inaspecting	kçiskebed kçiskebed	0
	hyperspectraling	indem ing	🛃 kudoun_k	Recent
	IFSAR_Matching IFSAR_Reting	Inhydroing	loudoun_m	Goto
A preview displays	() If save needing	(Travering	-	
			<u> </u>	
	File name: larier.ing			1000
	Files of type: IMAGINE Image (*.)	ng)	•	100 C
	truecolor : 512 Rows x 512 Colum	ns x 7 Band(s)		198.2

- 7. Click **OK** in the Select Image dialog to add **lanier.img** to the Variable Props dialog.
- 8. Click the Layer dropdown list and select (:Layer_4).
- Click Apply, then Close in the Variable Props dialog. The Rule Props dialog updates.

성 Rule P	rops: untitled.ckb	-			×	
	Name:	High IR and Low	Visible			Now that you have
	Rule Confidence:		Conditions C Spec of Conditions:	ły [10000		Now that you have created the Variable, change its Relation and Value
AND	Vari	sble	Relation	Value	Confidence -	
1	TM Eand 4				0 1.00	
		Acoly	Cose	Help	×	

- **10.** In the Rule Props dialog, click in the cell below **Relation** and select >=.
- 11. Click, then select **Other** from the **Value** cell, change the **Value** to **21**, then press Enter on your keyboard.
- 12. Now, using step 3 through step 11 above, add layer 2 of lanier.img as the second variable (row 2 under the AND column), name it TM Band 2, set Relation to < and set the value to 35.

<i>Two Variables, their Relations and Values have been added to the rule High IR and Low</i>		Rule Confidence: If Compute from Conditions C Specify					
Visible—	AND	Vari	sble	Relation	Value	Confidence ~	
	1	TM Eard 4		>=	21	1.00	
	2	TM Band 2		<	35	1.00	
	3						
						~	
			Apply	Close	Help		

13. Click **Apply**, then **Close** in the Rule Props dialog.

Copy and Edit

Since the hypothesis for the **Commercial Services** class has very similar rules and conditions to the **Residential** class, some of the conditions can be used directly, or copied and edited to save time.

 Begin editing the Commercial Services class by placing a new rule on the Commercial Services hypothesis rectangle, then doubleclicking the New Rule to open the Rule Props dialog.



Refer to "Enter Rules for the Hypothesis" if you forget how to create a new rule.

2. In the Rule Props dialog, change the **Name** of the rule to **Bright Within City**.

The first variable that is needed is **Highway Map**, which is now in the **Variable** list since it was entered previously.

Click in the cell below Variable and select Highway Map, confirm that the Relation is set to ==, and set the Value to 7.

As before, this makes the variable equal to the urban area from **Input.img**.

	Rule Props: untitled.ckb Name:	Bight Within City		_	X	
The Commercial	Rule Confidence:	Compute from	Conditions C Spec	ły 1.0000	Ξ	
Services class has the rule Bright Within	List of Conditions: AND Variable Relation Value Confidence					
City, which has the Variable Highway	1 Highway Map			7	1.00	
Map						
		Acoly	Close	Help		

4. Click **Apply** in the Rule Props dialog, then **Close**.

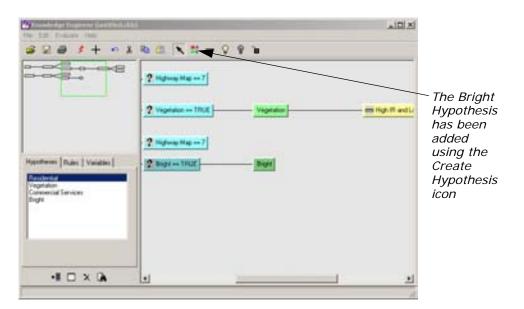
 Now use the Create Hypothesis graphic tool to place a new hypothesis (which is an intermediate hypothesis) on the **Bright** Within City rule rectangle.



See "Add an Intermediate Hypothesis" if you forgot how to create a hypothesis.

- 6. Double-click the New Hypothesis to open the Hypo Props dialog.
- 7. In the Hypo Props dialog, name the new hypothesis **Bright** and deselect the **Create an Output Class** checkbox.
- 8. Click Apply, then Close in the Hypo Props dialog.

The Knowledge Engineer dialog updates accordingly.



Since the rule to be attached to the **Bright** hypothesis is very similar to the **High IR and Low Visible** rule that is attached to the **Vegetation** hypothesis, you can make a copy of it to paste and edit.

- 9. Click the High IR and Low Visible rule.
- 10. Right-click, and select Copy from the Options menu.
- **11.** Click the **Bright** hypothesis, then right-click and select **Paste** from the **Options** menu.

A new rule is attached to the **Bright** hypothesis with a default name of **High IR and Low Visible (1)** (the **(1)** is added since it is a copy).

- 12. Double-click the **High IR and Low Visible (1)** rule to open the Rule Props dialog.
- 13. In Rule Props dialog for the new rule, change the **Name** to **High IR** and **High Visible**.

The only change that needs to be made to the variables is the **Relation** for **TM Band 2**.

- 14. Change the **Relation** for **TM Band 2** to >=.
- Click Apply, then Close in the Rule Props dialog.

	n a 🛪 🛪 =	9 9 1	K Dia	— The portion of the tree visible in the edit window
		m High IT and Law Yoldia	2 114 Band 4 1+ 21 2 114 Band 2 + 21	is highlighted in the overview window
Hopotheses Rules Vanadaes New York Cov Night R and Low Votile Rught Witten Cay High IR and High Voidae	- <u>Bur</u>	III High IT and High Webb (c	2 TH Band & 1+27 2 Th Band 2 1+ 20	Rule properties have been changed for the High IR and High Visible rule
•1 🗆 × 🕼		<u></u>		

At this point, two hypotheses and their conditions have been entered. Now, the two classes can be tested to see what pixels are allocated to them.

Test the Knowledge Base

1. On the Knowledge Engineer dialog toolbar, select the Run Test

Classification icon *for select Evaluate -> Test Knowledge* **Base**).

The Knowledge Classification dialog opens in Test Mode at the **SELECT THE CLASSES OF INTEREST** panel, along with a new Viewer where the test classification displays. All active enabled classes are selected by default.

💯 Knowledge Classification (Test N	tode)	×	
SELECT T	HE CLASSES OF INTEREST:		
Available Classes: Residential Commercial Services	Selected Classes: Add -> Add Ad Remove <- Remove All	Next Previous OK Cancel Help Save At	- The Selected Classes are Residential and Commercial Services

1

- 2. Leave the two classes, **Residential** and **Commercial Services**, selected in the **Selected Classes** section of the Knowledge Classification dialog.
- **3.** Click **Next** to go to the next panel of the Knowledge Classification dialog.

If the **Prompt User** option had been selected instead of entering file names for the variables, an intermediate panel, SELECT THE INPUT DATA FOR CLASSIFICATION, would display here to allow entry of file names.

The Select Classification Output Options panel allows you to set the number of best classes per pixel, set an output area and set an output cell size. The defaults are used here since you only have two classes and small images that are the same size and have the same cell size.

Also note the grayed-out options for Output Classified Image, Output Confidence Image, and Output Feedback Image. These images are made temporary files in Test Mode, but can be selected as output files when running Knowledge Classifier in regular (non-test) mode from the **Classification** menu.

Munowledge Classification (Test Mode))	x	
SELECT CLASSIFIC	ATION OUTPUT OPTIONS:		
1 and Best Classes Per Pixel	Output Classified Image: (Ling) emp_001744.img	Previous	
Produce Confidence Image	Output Confidence Image: (".img) exp_001744_confidence.img	ОК	— Click OK to generate the
Produce Feedback Image	Dutput Feedback (Inage: ("sing) eexp_001744_pathways.ing	Cancel Help	test classification
Area Window Set_	Cel Size Minimum 💌 Set.	Save As	

4. Click **OK** in the Knowledge Classification dialog to start the test classification.

A status bar opens. When the classification has completed, the test classification image displays in the Viewer.



- 5. Click **OK** to dismiss the status bar when the classification is finished.
- 6. In the Knowledge Engineer dialog, click the Start Classification

Pathway Feedback Mode icon 🕂 .

The Classification Path Information dialog opens along with a cursor in the Viewer.

	Map	ication Pat	242170.6627	×	3798375.0000	meters	-0	×
Details about the class under the								_
cursor display here	Row	>	Class Name	_	Class Value	Confidence		-
		JUnderne	d		U			-
			▶ 30.000 곳	Мар	- 🗖 🛛	Close	Help	

 Move the cursor into the orange and red areas in the Viewer, which correspond to the orange **Residential** class and the red **Commercial Services** class.

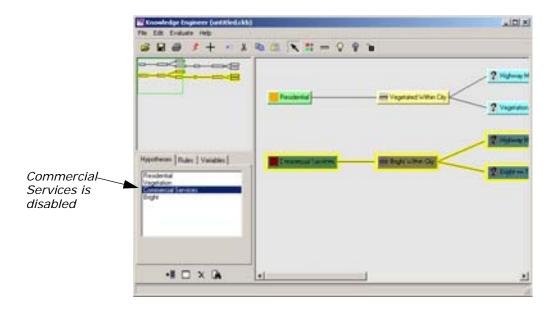
Note that when the cursor is placed on a pixel for one of the classes, the path for the class is highlighted in the Knowledge Engineer dialog and in the overview window. In complex knowledge bases, this feature is useful for telling at a glance which hypothesis was used to classify the point of interest.

International Inspirere (and Statut) The Sill Evaluate Help S S2 S3 S + + − X No C2. (N. 11)	ko. • ♦ ♦ •	
Hypotheses: Rules Vandes Hypotheses: Rules Vandes	The Band & Inc. The Band & Inc.	The class currently under the cursor is highlighted in the Knowledge Engineer dialog
-11 D × 0a ±		

- 8. Click the **Close** button to dismiss the Classification Path Information dialog.
- 9. Select the gray Disable Node icon, then click the Commercial

Services Hypothesis icon \mathbf{Q} to disable it.

The Commercial hypothesis path is grayed-out. This means the class is not considered when a test classification is run (or, in the regular Knowledge Classifier, if the knowledge base has been saved with the class disabled).



10. To enable the **Commercial Services** class once again, click the **Commercial Services** hypothesis graphic with the yellow Enable

Node icon **Q** (or right-click the hypothesis graphic and select **Enable**).

- **11.** Save the knowledge base by selecting **File -> Save As**.
- 12. Navigate to a directory in which you have write permission, and name the file **ResComm_Class.ckb**.
- 13. Click OK in the Save Classification Knowledge Base As dialog.
- 14. Select File -> Close from the Knowledge Engineer dialog, which is now entitled **ResComm_Class.ckb**, to finish.

Create a Portable Knowledge Base

Data

This exercise is going to give you practice creating and using a portable knowledge base. In this example, you use a knowledge base to determine areas most suitable for cross-country travel.

Data available for the project includes the following:

- a landcover classification (supervised.img)
- a DEM (30meter.img)
- a map of minor and major roads (roads.img)
- a near-infrared degraded air photo with 30 m resolution (mason_ap.img)

The file **supervised.img** shows a typical landcover classification derived from Landsat TM data (a portion of the Landsat scene is provided as **tm_860516.img** along with the signature file **tm_860516.sig**, which was used to produce a maximum likelihood classification). The image shows the distribution of broad landcover categories such as different types of forestry, human-made features, water and open ground. However, it does not show the land use of each pixel, or how each pixel could be put to use.

Consider a scenario whereby someone wishes to traverse this area of ground with one or more vehicles. They need to use the landcover information, along with other ancillary data to help determine which areas can be traversed easily and which cannot.

Methodology Given these data sets, we can start to envisage expert rules that are based on these data (and data derived from them) to determine the ease of crossing a particular area.

ERDAS IMAGINE must be running.

1. Click the Classifier icon in the ERDAS IMAGINE icon panel.

Classifier	

The Classification menu opens.



Click Knowledge Engineer in the Classification menu.
 An empty Knowledge Engineer dialog opens.

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Hypotheses Rules Validas	
• • • × •	

Open a Knowledge Base

Next, you can open the **mobility_factors.ckb** knowledge base to examine what expert rules are used and how their components were created.

The Open Classification Knowledge Base dialog opens.

 Navigate to the <IMAGINE_HOME>/examples directory, and select the file mobility_factors.ckb.

<IMAGINE_HOME> is the directory where ERDAS IMAGINE resides on your system.

3. Click **OK** in the Open Classification Knowledge Base dialog to load the file.

The knowledge base of mobility factors opens.

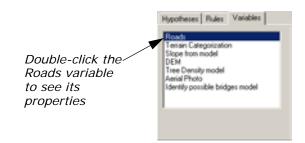
Knowledge Engineer (mobility_facts File Edt Evaluate Help	ars.ckb)		
🔗 🖬 🥔 🍠 🕂 🔹 🐰	🖻 🖄 📉 📰 🗕 🖓 🖗	6	
	Wide Road	m Major Road	2 Roads- 2 Terrain
	Narow Road	em Minor Road	2 Roads 2 Skpe h
Hypotheses Rules Variables Wide Road Namow Road Flat solid open ground (go) Solid open ground (Siol Sheep solid open ground (Siow Go Extreme slope (no go) Water Inn nol	Flat solid open ground (go)	m Flat solid open ground	? Solid op
••• × A	«[]		<u>? Skpe H</u>
			li.

Examine the Knowledge Base

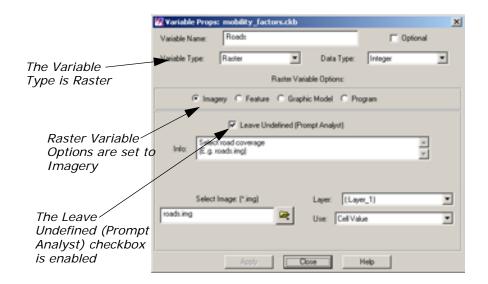
This knowledge base was created by defining as many of the variables as would be needed as possible. For example, roads are going to be the easiest areas to traverse, so a variable was needed to define where roads are that can be used.

1. In the Knowledge Engineer dialog, click the Variables tab.

The variables for the **mobility_factors.ckb** knowledge base display.



In the Variables list, double-click the Roads variable.
 The Variable Props dialog opens.



In the Variable Properties dialog, you can see that the **Variable Type** is **Raster** and the **Imagery** option is selected because the input is an image.

This knowledge base is transportable—you may want to pass it to a colleague in another office, or reuse it yourself to automate a production process. So, rather than selecting a specific image to be used, the **Leave Undefined** checkbox is selected and a prompt for the type of data that you want the end user to supply is typed in the **Info** window (that is, **Select road coverage**).

The same type of imagery variables have been defined for the landcover classification (**Terrain Categorization**), Digital Elevation Model (**DEM**) and air photo (**Aerial Photo**).

Some of the imagery variables are used directly in rules (such as the **Terrain Categorization** variable being used to identify open ground in the image). Others are used indirectly to calculate variable values.

For example, open ground (for example, grass, scrub) is also good for vehicles to cross, but not if the ground is steeply sloping. The fact that an area is open ground can be determined from the landcover classification (the **Terrain Categorization** variable), but you do not have an image that provides slope directly. However, you do have a digital elevation model (the **DEM** variable), which can be used to derive slope.

Derive Slope Values

1. In the Variables tab, double-click the variable called Slope from model.

The Variable Props dialog updates accordingly.

	Wariable Props: mobility_factors.ckb	x				
These are the ——	Variable Name: Slope from model Diptional					
properties for the Slope from model	Variable Type: Roster 💌 Data Type: Float 💌					
variable	Raster Variable Options:					
	C. Imagery C. Feature C. Graphic Model C. Program					
	Graphic Hodel (*gmd) skope gmd 🕥 Edit Model	l				
The Slope from	CollValue CollValue CollValue					
model variable uses	Define Model Input Nodes with Variables: Row Input Node Node Type Variable Definition	1				
a Graphic Model	1 n1_PROMPT_USER Rader DEM					
		4				
	Clear Work File					
	Apply: Close Help					

Notice that the variable is again raster in nature, so the **Variable Type** is set to **Raster**. In this case, however the **Graphic Model** option of the **Raster Variable Options** has been selected. The graphic model associated with this variable is named **slope.gmd**.

2. In the Variable Props dialog, click the **Edit Model** button to view the graphic model.

A Spatial Modeler viewer opens, which contains the model that defines the **Slope from model** variable.

	SLO	OPE - De	grees	1
	-			
INPUT R.	ASTER			
5	>			
WW	NNN			
IL PROMPT	- Ann			
	1	-		
		()		
	8			
		DECRET SLOPE		
			OUTPUT R	ACTED
			OUTPUTR	ASTER
			5	3

This is the model that the variable **Slope from model** uses to calculate the slope of any location.

To make the knowledge base transportable, you do not want to define actual image names in the **slope.gmd** model. Instead, the **INPUT RASTER** and the **OUTPUT RASTER** of the model have been set to **PROMPT_USER**.

In the Variable Properties dialog, the **PROMPT_USER Input Node** that was the output in the model has been defined as the **Output**, and the following CellArray has been used to define which variables should be used to supply which **Input Node**. In this instance, clicking in the **Variable Definition** cell gave the list of defined variables from which **DEM** was selected.

Select the spatial model node that represents the calculated variable (Output)	Graphic Model. (*.gmd) slope.gmd Edit Model Output: r2_PROMPT_USER_c/program files/inagine 8.7/etc/models/slope.gmd_alue Define Model Input Nodes with Variables:					
Select variables as inputs to the spatial model in the CellArray —	Row 1	Input Node n1_PROMPT_USER	Node Type Raster	Variable Defini DEM	ion A	
			Clear Work	Fla		

Thus, a variable has been defined that calculates values on the fly as needed from another variable (in this case, slope is derived from a DEM).

Click the Close Model icon in , or select File -> Close from the Spatial Modeler viewer.

The Spatial Modeler viewer closes.

4. Click Close in the Variable Props dialog.

Build Hypotheses

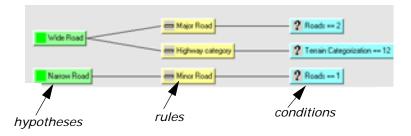
Since you have looked at how the two main types of input variable can be defined, now you can look at how each hypothesis is built in the knowledge base.

The knowledge base **mobility_factors.ckb** displays:

Knowledge Engineer (mobility_fa	ctors.ckb)	1012
File Edit Evaluate Help	🛯 📾 📉 😫 🗕 🖓 💡	6
	Wide Road	m Highway category 2 Roads m Highway category 2 Terrain m Minor Road 2 Roads
Mypotheses Rules Variables Marcov Road Flat tolid open ground (go) Solid open ground (Sol) Shelow solid open ground (Sio) Shelow Solid open ground (Sio)	Flat solid open ground (go)	m Flat solid open ground
••• × A		2 Skpell

The first two hypotheses, **Wide Road** and **Narrow Road**, are fairly simple. The expert rule in these cases is that something identified as a road is going to be easily traversable by the vehicles, with major roads being better than minor roads.

Consequently, the **Wide Road** hypothesis has two rules (that is, they each have an **OR** statement so that either needs to be true for the hypothesis to be true). The first looks for major roads (DN value 2) in the **Roads** variable (roads.img), and the second looks for pixels that are potentially identified as roads by the supervised classification.



1. Double-click the Highway category rule.

The Rule Props dialog opens.

Ø	Rule Pr	ops: mobility_fac	tors.ckb				x	
Name: Highway calego				у				
Rule Confidence:		Rule Confidence:	← Compute from Conditions ← Specify 1.0000					
			Lie	of Conditions:				/Use the scroll bar
AND		Vari	sble	Relation	Value	Confi	dence -	to see the
	1	Terrain Categorizatio	20			12	0.80	Confidence value
	2		Acchy [Close	Help			in the CellArray

The Rule Props dialog shows how this particular rule depends on the **Terrain Categorization (supervised.img)** file.

- 2. In the Rule Props dialog, click the horizontal scroll bar until you can see the **Confidence** value, **0.80**.
- 3. In the Knowledge Engineer dialog, click the Major Road rule.

Its properties display in the Rule Props dialog.

4. Click the horizontal scroll bar until you can see the **Confidence** value, **0.98**.

🖉 Rule Props: mobility	7.fact	ors.ckb			X	
N	ane:					
Rule Confidenc	æ	Compute from List	Conditions C Si of Conditions:	pecify 1.0000	3	The Confidence for the Major Road rule
AND	Varia	ble	Relation	Value	Confidence	is set higher than
1 Roads				2	0.98	that for the Highway
		Apply 📘	Core	Help	×	category rule

Note that the **Confidence** field for the **Highway category** rule has been set to a much lower value than the **Confidence** for the **Major Road** rule. This is because you are less certain of the results from a maximum likelihood classification than you would be from a road map.

The next four hypotheses work on the same basis. The expert rule is that open ground types are good for vehicle passage. As slopes get steeper, however, the open ground becomes less and less manageable until it becomes impassable at very steep angles.

5. Click **Close** in the Rule Props dialog.

Set ANDing CriteriaThese hypotheses also demonstrate the ANDing of criteria in a rule.
The Flat solid open ground (go) hypothesis has only one rule, but
that rule has two conditions. Both conditions must be true for a rule
to be true.

		? Slope from model 4
Flat solid open ground o	(geo) - Flat solid open g	
	1	? colid open ground TRUE
hypothesis	rule	conditions

 Double-click the Slope from model <= 4 condition. The Rule Props dialog opens.

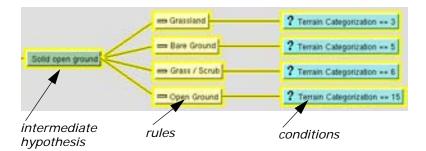
	👯 Rule Pr	ops: mobility_fact	tors.ckb			×
		Name:	Flat solid open gr	ound		
Value must be	Rule Confidence:		Compute from	Conditions C Spec	ity 1.0000	3
less than or equal to 4		_	List	of Conditions:		
cyuui io 4	AND Varia		able	Relation	Value	Confidence ~
	1	Slope from model		(*	4	1.00
	2	Solid open ground			TRUE	1.00
			Apply	Cose	Help	×

In the **List of Conditions** CellArray, the slope calculated by the **Slope from model** variable must be less than or equal to **4** degrees, and (that is, **AND**, note the far left column of the CellArray) the **Solid open ground** variable must be true before this rule can be true.

2. Click Close in the Rule Props dialog.

The rule **Flat solid open ground** is defined by an intermediate hypothesis: **Solid open ground**.

3. In the Knowledge Engineer dialog, click the horizontal scroll bar and move it to the right until you can see the intermediate hypothesis **Solid open ground**.

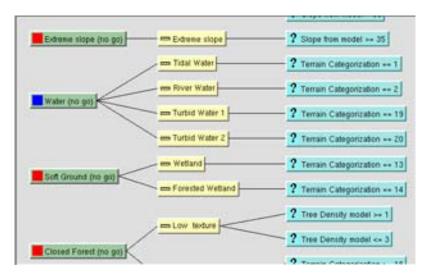


The intermediate hypothesis **Solid open ground** uses the **Terrain Categorization** variable to identify various types of open ground cover.

Check Other Hypotheses

You can check the other hypotheses listed along the left side of the Knowledge Engineer dialog.

- 1. Position the horizontal scroll bar to the extreme left in the Knowledge Engineer dialog.
- 2. Move the vertical scroll bar down until you see the Water (no go) hypothesis.



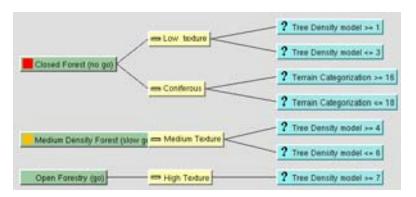
The Water (no go) hypothesis is a simple expert rule that states that if the Terrain Categorization variable shows that a location is water, it is impassable.

3. Note the hypothesis below Water (no go): Soft Ground (no go).

Similarly, the **Soft Ground (no go)** hypothesis is a simple expert rule that states that if the Terrain Categorization variable shows that a location is a type of wetland, it is impassable.

Introduce Spatial Logic to The three forest hypotheses are more complicated, and show how spatial operators can be used within the IMAGINE Expert Classifier the Knowledge Base to create a spatially aware classifier (rather than a traditional perpixel classifier).

> 1. Use the vertical scroll bar to scroll down to the various forest hypotheses.

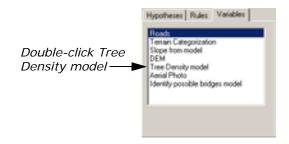


The expert rule is that open forest canopies are easier to traverse than closed forest canopies because space between trunks is not as large with a closed canopy (that is, trees are older and have large trunks). However, it is difficult to determine canopy closure on a perpixel basis.

To a certain degree, canopy closure can be inferred from the type of tree cover. For instance, if the cover is coniferous, then it is more likely that you have a close canopy and close trunks. However, this is more difficult to state for mixed and other types of tree cover.

Consequently, this particular hypothesis also looks at panchromatic aerial photography to try and determine crown closure. However, you cannot determine crown state on a per-pixel basis. Instead, the **Tree Density model** variable (using the **Aerial Photo** and **Terrain Categorization** variables as inputs) executes a graphical model (texture.gmd).

2. Click the Variables tab in the Knowledge Engineer dialog.



3. Double-click to select the Tree Density model variable.

The Variable Props dialog for the **Tree Density model** variable opens:

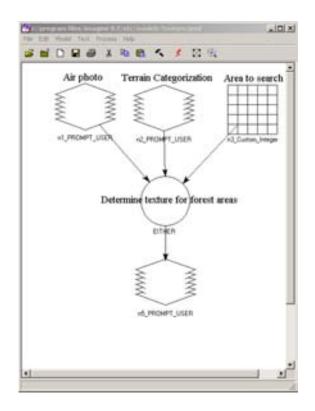
	Wariable P	vops: mobility_fa	ctors.ckb			×
	Variable Nam	e: Tree Density	model		C Optional	l.
	Variable Type	E Raster	٠	Data Type:	Integer	*
			Raster Variable	Options:		
Graphic Model is —— selected for the variable option	0	Imagery C Fea	🕈 🖗 Graphic M	lodel C Progr	yn	
	Graphic Model (*.gmd) Medure gmd Red Kodel.					del
	Output:	PROMPT_USER	Layer:	(Layer_1)	Use: CelVal	10
	Define Model	input Nodes with Vari	ables:			
	Row	Input Node	Node Type	Variable	Definition	*
	1 0	1_PROMPT_USER	Racter	Aerial Photo		
	2 1	2_PROMPT_USER	Racter	Terrain Catego	ization	
						-
			Clear Work	File		
		Apply	Close	He	la l	

4. Note that the **Raster Variable Options** for the **Tree Density model** variable is set to **Graphic Model**.

The model that provides information for the **Tree Density model** variable is **texture.gmd**.

5. Click the Edit Model button in the Variable Props dialog.

The Spatial Modeler viewer opens, which displays the model **texture.gmd**.



This model, **texture.gmd**, is a model that looks at every location that has been determined to be tree cover (from the **Terrain Categorization** variable), and analyzes both the air photo DN value at that location and the DN values in surrounding locations (using a 3×3 moving window) to determine local texture. This spatial variable is then used in the **Close Forest (no go)**, **Medium Density forest (slow go)**, and **Open Forestry (go)** hypotheses to determine the relative density of the tree canopy, and thereby determine the relative ease of vehicular passage.

- 6. Select File -> Close from the Spatial Modeler viewer.
- 7. Click **Close** in the Variable Props dialog displaying properties for the **Tree Density model** variable.

The **Buildings (no go)** hypothesis is a simple expert rule that states that if the **Terrain Categorization** shows that a location is a type of urban area, it is impassable.

Check Buildings Hypothesis

		- ? Terrain Categorization >+ 7
Buildings (no go)	m Suburban	7 Terrain Categorization 9
		 Terrain categorization 4+ 5

Confidences are kept low on these rules so that they do not override the **Wide Road** and **Narrow Road** hypotheses. That is, roads within urban areas are still traversable.

1. Double-click the **Suburban** rule attached to the **Buildings (no go)** hypothesis.

The Rule Props for the **Suburban** rule open.

	🕢 Rule Pr	ops: mobility_fac	tors.ckb			×
		Name:	Sububan			
		Rule Confidence:	Compute from	Conditions C Spe	sily 1.0000	
			Lie	t of Conditions:		
	AND	Vari	able	Relation	Value	Confidence ~
This rule		Terrain Categorizatio	on	>=		7 0.75
	2	Terrain Categorizatio	on	<=		9 0.75
uses an						
AND /						×1
statement/						
		_	Apply	Close	Help	

- **2.** In the Rule Props dialog, move the horizontal scroll bar all the way to the right.
- 3. Notice that the **Confidence** values are set to **0.75**.
- 4. Click Close in the Rule Props dialog.

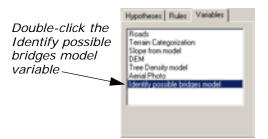
Identify Choke Points

The final hypothesis is another good example of spatially enabling the IMAGINE Expert Classifier. This hypothesis identifies choke points in the road network—points where the road narrows considerably and traffic cannot circumnavigate, thereby representing a potential no go point. The main example of this is bridges.

Bidges / landings (Choke Poin = Bidges / landings / 2 Identify possible bridges wodel -- 1

Identification of bridges might sound like an easy proposition: find roads that are on water. However, the only information we have on location of water bodies is from the landcover classification (the **Terrain Categorization** variable), which cannot identify water that flows below other features. Consequently, a more complex approach is required.

1. Click the Variables tab in the Knowledge Engineer dialog.



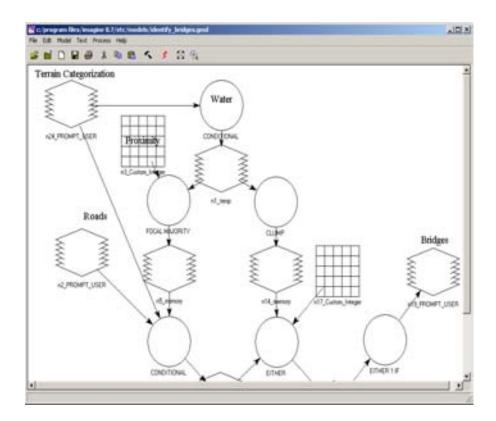
2. In the Variables tab, double-click Identify possible bridges model.

The Variable Props dialog for the variable **Identify possible bridges model** opens.

	Variable Name:		ors.ckb e bridges model		C Optional	x		
	Variable Type:	Racher	*	Data Type:	Integer	•		
			Raster Variable	Options:				
This	C Inagery C Feature C Graphic Model C Program							
variable	Graphic Model. (*.gmd) identity_bridges.gmd 🛛 🙀 Edit Model.							
also uses a Graphic	Oulput: n19_PROMPT_USER Layer: [Layer.] Use: Cel Value							
Model	Define Model Input	t Nodes with Variat	xles:					
	Row	Input Node	Node Type	Variak	le Definition	*		
		ROMPT_USER	Racter	Roads				
	2 n240	PROMPT_USER	Racter	Terrain Categ	porization			
						2		
			ClearWork	Fig				
		Apply	Close		lelp			

3. Click the Edit Model button in the Variable Props dialog.

The model used to identify potential bridges, **identify_bridges.gmd**, shows the expert rule.



Since you cannot immediately identify roads over water, you must instead look at roads in close proximity to water. This could be done by buffering (performing a Search function) on the roads and overlaying this with the location of water pixels. However, many roads simply run alongside lakes or rivers and do not necessarily therefore constitute a choke hazard. Instead, it is better to identify roads that occur in close proximity to at least two discrete water bodies (that is, one on either side of the bridge).

Therefore, **identify_bridges.gmd** first identifies all water pixels from the landcover classification. These locations are fed into two processes. The first finds all locations that are in close proximity to water by using a 5 × 5 circular moving window). These are then overlain with road locations (from **Roads** and **Terrain Categorization** variables) to identify roads in close proximity to water. At the same time, the water pixels are run through a Clump process to produce uniquely numbered, discrete water bodies. A Focal Diversity function is then used at each location determined to be a road in close proximity to water to determine how many of these discrete water bodies are close by. If more than two water bodies are identified, then that road is flagged as being a potential bridge or other choke point. This information is then used in the **Bridges/landings (Choke Point)** expert rule.

This provides a clear example of how the IMAGINE Expert Classifier can be used to integrate spatially aware rules. In this case, the values of neighboring pixels are analyzed to help determine the land use (bridge as opposed to road) of the target pixels. Click the Close Model icon is , or select File -> Close from the Spatial Modeler viewer.

Also note that the **Bridges/landings (Choke Point)** hypothesis is always going to occur at pixel locations that have also met the requirements to be in the **Wide Road** or **Narrow Road** classes (it is extremely difficult to create expert rules that are always mutually exclusive). Consequently, the **Confidence** values on the **Bridges/landings** rule have been set higher than those for the normal road rules. In this way, the **Bridges/landings (Choke Point)** hypothesis always takes precedence in the classifications.

5. In the Knowledge Engineer dialog, double-click the **Bridges/landings** rule.

💋 Rule P	rops: mobility_fac Name:	tors.ckb Bidges / landing	20	_	x	
	Rule Confidence:	Compute from	n Conditions 🔿 Spe	city 1.0000	-	
		Lie	t of Conditions:			
AND	Var	iable	Relation	Value	Confidence -	Check the
1	Identify possible brid	lges model			1 0.99	Confidence value
		Apply [Close	Help	×	Value

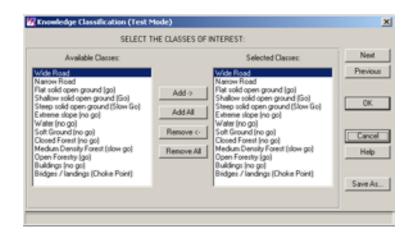
The Rule Props dialog for Bridges/landings opens.

- 6. Move the horizontal scroll bar to the right see the **Confidence** value.
- 7. Note that the **Confidence** of the variable **Identify possible bridges model** is set to **0.99**.
- 8. Click **Close** in the Rule Props dialog.
- 9. Click **Close** in the Variable Props dialog.

Run the Expert Classification

 In the Knowledge Engineer dialog, click the Run icon *f*, or select Evaluate -> Test Knowledge Base.

The Knowledge Classification (Test Mode) dialog opens on the **Select the Classes of Interest** panel.



You want to see results for all of the classes; therefore, you can proceed to the next panel.

2. Click the **Next** button in the Knowledge Classification (Test Mode) dialog.

The Select the Input Data for Classification panel opens.

🐴 Knowle	dge Classification (Test Mod	9		×	
	SELECT THE INPUT	DATA FOR CLASSIFICATION:			
Type:	Variable:	Value:		Next	
IMAGE	Roads	roads.ing	2	Previous	— Use the scroll
	LAYER	(Laper_1)		OK	bar to see the
	ATTRIBUTE	Cell Value			values assigned to
Info:	Select road coverage E.g. roads ing)		×	Cancel Help	variables
IMAGE	Tenain Categorization	supervised img	2	Save As	
	LAYER	Laser 11	× 1	-	

This panel enables you to identify the files to be used as variables, which were set to the **Leave Undefined (Prompt Analyst)** state.

3. Use the vertical scroll bar to see the variables and their corresponding files.

In this Knowledge Base, the **Roads** variable is associated with **roads.img**, the **Terrain Categorization** variable is associated with **supervised.img**, the **DEM** variable is associated with **30meter.img**, and the **Aerial Photo** variable is associated with **mason_ap.img**.

4. Click **Next** in the Knowledge Classification (Test Mode) dialog.

The Select Classification Output Options panel opens.

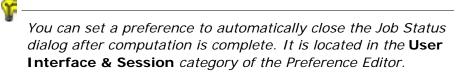
Change the Best Classes	Knowledge Classification (Test Mode) SELECT CLASSIFICATION OUTPUT OPTIONS:				
Per Pixel value to 2	Best Classes Per Pixel	Output Classified Image: ("img) emp_000468.img	Next Previous		
	Produce Confidence Image	Output Confidence (mage: (".ing) emp_000468_confidence.ing	OK		
Confirm that —	Produce Feedback Image	Dutput Feedback Image (*ing) eexp_000468_pathways ing	Cancel Help		
the Cell Size is set to Minimum	Area: Window Set	Cel Size: Minimum 💌 Set	Save At		

- 5. Change the Best Classes Per Pixel value to 2.
- 6. Confirm that the **Cell Size** is set to **Minimum**.
- 7. Click **OK** in the **Select Classification Output Options** panel of the Knowledge Classification (Test Mode) dialog.

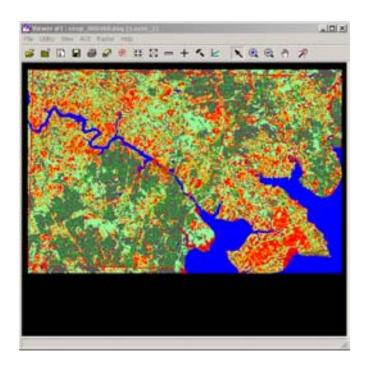
Job Status dialogs open, tracking the progress of the expert classification.

Job State:	Initializing	
Percent Done:	0% 0	100

8. When the job is complete, click **OK** in the Job Status dialogs.



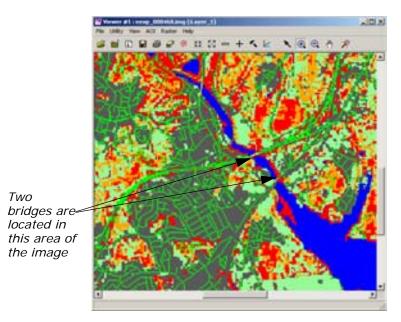
When the process is complete, the classification displays in a Viewer.



Evaluate River Areas

Now that the classification is complete, you should zoom in and see what the IMAGINE Expert Classifier designated as potential bridges.

- 1. In the Viewer toolbar, click the Zoom In icon 🔍 .
- 2. Move your mouse into the Viewer, and click an area of the river.
- **3.** Click as many times as necessary in order to see the detail of the area.



4. Zoom in further until you can see yellow pixels at bridge locations, which indicate the **Bridges/landings (Choke Point)** class.

S.

If you refer back to the Knowledge Engineer dialog, you can see that the **Bridges/landings (Choke Point)** hypotheses has a yellow color square. Therefore, pixels in that class are also yellow.

Use Pathway Feedback You can use the pathway feedback cursor to analyze the classification in the Viewer.

 Click the Classification Pathway Feedback Mode icon + in the Knowledge Engineer dialog.

The Classification Path Information dialog opens.

	19 Classi	fication Pat	h Information				
The class beneath the	Мар	× ×	304657.7364	X	4282208.1412	meters	
inquire cursor							
is identified	Row		Class Name		Class Value	Confidence	
here		> Doted P	Farest (no go)		9	0	99
	2	Bridges	/ landings [Choke Po	int)	13	0	.99
			▶ 20.0000 ÷	Map	. 🗖 🛛	Close	Help

In the Classification Path Information dialog, the second row in the CellArray specifies the second most likely class (hypothesis) for this pixel (since you requested the **2 Best Classes Per Pixel**).

An inquire cursor is placed in the Viewer containing the classification, and the pathway it corresponds to is highlighted in red in the Knowledge Engineer dialog.

- 2. Click the Select icon 🥆 from the Viewer toolbar.
- **3.** Using your mouse click, hold, and drag the inquire cursor to a yellow pixel in the Viewer.

The Classification Path Information dialog and the Knowledge Engineer dialog update accordingly.



The hypothesis, rule, and condition are outlined in red

4. Continue to move the inquire cursor around in the Viewer, and analyze the results in the Classification Path Information dialog and the Knowledge Engineer dialog.

5. When you are finished, click **Close** in the Classification Path Information dialog.

A graphical model (clean_up_mobility.gmd) is supplied for removing the salt and pepper classification pixels from the final landuse map. This model uses a focal majority, but avoids altering the road and water classes.

- 6. Select File -> Close in the Viewer containing the classification.
- 7. Select File -> Close in the Knowledge Engineer dialog.

The knowledge base **mobility_factors.ckb** is an example of how a knowledge base can be built to take into account spatial rather than (or as well as) spectral per-pixel relationships to derive land use information. It also shows how commonly repeated tasks can be automated for repeating within an organization, or to repeat the same methodology at other organizations. instead of running several separate spatial models and trying to integrate the results, the entire process is captured in one knowledge base that can be easily applied to other data and other locations, with consistent results.

ERDAS IMAGINE Tour Guides

IMAGINE AutoSync[™]

ERDAS IMAGINE Tour Guides

IMAGINE AutoSync

Introduction

IMAGINE AutoSync provides both wizard-driven and workstation workflows for the automated rectification of imagery. The IMAGINE AutoSync wizards guide you through the geometric correction process or you can use the workstation for customizable control of your workflow. This tour guide explains the steps for edge matching two images using the Edge Matching Wizard and how to use the IMAGINE AutoSync Workstation to georeference a raw image.

All of the data used in this tour guide are in the <IMAGINE_HOME>/examples directory.



Approximate completion time for this tour guide is 1 hour.

For more information about using IMAGINE AutoSync, see the IMAGINE AutoSync white paper on the IMAGINE AutoSync product page at http://gi.leica-geosystems.com/products/.

Using the IMAGINE AutoSync Edge Matching Wizard

In this section of the tour guide, you use the IMAGINE AutoSync Edge Matching wizard to align two images so that features in the overlapping area match up.

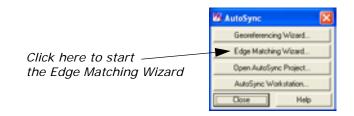
The two files to be edge matched are **air-photo-1.img** and **air-photo-2.img**.

These data files are air photo images of the Oxford, Ohio area. You must have ERDAS IMAGINE running.

1. Click the IMAGINE AutoSync icon on the ERDAS IMAGINE icon panel.

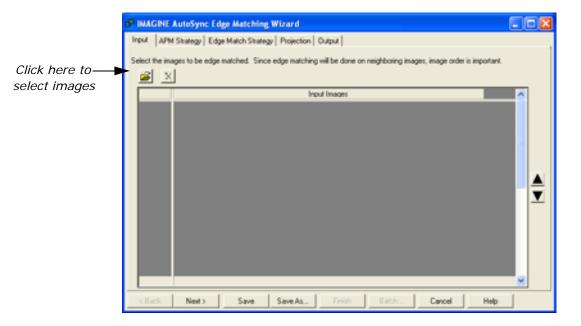


The IMAGINE AutoSync menu opens.



2. Select Edge Matching Wizard... from the IMAGINE AutoSync menu.

The IMAGINE AutoSync Edge Matching Wizard opens.

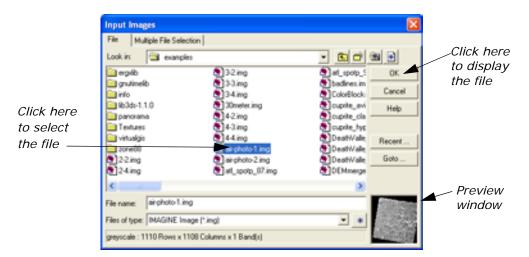


Using the Input tab

In the Input tab, you will add the images to be edge matched. IMAGINE AutoSync will edge match neighboring images, so input image order in the CellArray is important.

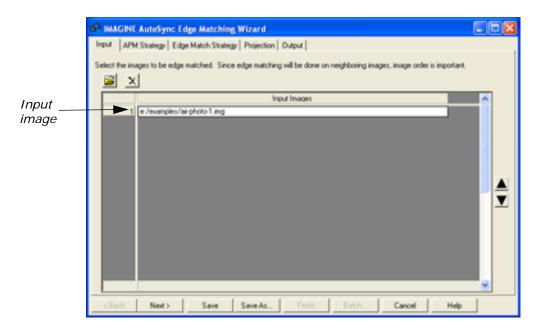
1. In the Input tab, click the Open File icon 🝰

The Input Images dialog opens.



- In the Input Images dialog under File name, select air-photo-1.img from the file list.
- 3. Click OK in the Input Images dialog.

The file **air-photo-1.img** displays in the Input Images column in the Edge Matching Wizard dialog.



 Repeat step 1 through step 3 for the second image, selecting air-photo-2.img this time.

	AutoSync Edge Matching Wizard I Stategy Edge Match Stategy Projection Output	
	ages to be edge matched. Since edge matching will be done on neighboring images, image order is important.	
	Input Images e: /examples/air photo-1 img	6
2	e.rexamples/airphoto1.ing e./examples/airphoto2.ing	
		× V
< Back	Next> Save Save As Finish Batch Cancel Help	

 Click Next> to continue to the APM Strategy tab in the Edge Matching Wizard.

In the APM Strategy tab, you can adjust the algorithm settings that control the placement of automatically generated tie points in your images. You can also select which input image layer to use to achieve a better point matching result.

Using the APM Strategy tab

	P IMAGINE AutoSync	Edge Matching Wize	ard .		
	Input APM Strategy	Edge Match Strategy Pro	jection Output		
	Specily the automatic point measurement (APM) algorithm settings.				
	Input Layer to Use:	Layer_1	•		
	Find Points With	C Default Distribution	Defined Pattern		
Make sure	Intended Number of Po	ints/Pattern: 1	Keep All Points		
is selected	Starting Column:	128 ÷	Starting Line:	128	
	Column Increment:	256	Line Increment:	256	
	Ending Column	0	Ending Line:	0 ÷	
	Automatically Remo	we Blunders	Maximum Blunder Removal Iterati	one: 2	
		Reset	to Defaults Advanced Settings.		
	<back. next=""></back.>	Save Sav	e As Finish Batch	Cancel Help	

- 1. In this tour guide, accept the default settings in the APM Strategy tab. Make sure that **Defined Pattern** is selected.
- 2. Click **Next>** to continue to the Edge Match Strategy tab in the Edge Matching Wizard.

Using the Edge Match Strategy tab

In the Edge Match Strategy tab, you can select a refinement method and choose to apply the refinement to the overlapping area only or the whole image.

	P IMAGINE AutoSync Edge Matching Wizard		
Click to select Linear Rubber Sheeting	Input APM Strategy Edge Match Strategy Projection Output Edge matching is performed on neighboring images by refining their geometric models using a selected method. You can apply refinement to the overlapping area only or to the whole image. If you select Overlapping Area Dnly, you can set a buffer to achieve a smoother transition.		
	Refinement Method: Polynomial Maximum Polynomial Order: 3 ** RMS Threshold: 0.5000 ** Apply Refinement to: (* Overlapping Area Only (* Whole Image)		
<i>Make sure the</i> buffer size is 180	Buffer Around the Overlapping Area (pixels)		
	(Back Next) Save Save As Finish Batch Cancel Help		

1. In the Edge Match Strategy tab, click the Refinement Method list and select Linear Rubber Sheeting.

- Accept the Apply Refinement to default of Overlapping Area Only to apply refinement only to the overlapping area between the images.
- 3. In the Edge Match Strategy tab, in the **Buffer Around the Overlapping Area (pixels):** field, keep the default of **180**.
- Click Next> to continue to the Projection tab in the Edge Matching Wizard.

Using the Projection tab In the Projection tab, you can set a projection for your output images. You can set it to the same projection as the corresponding input image or to another specified projection.

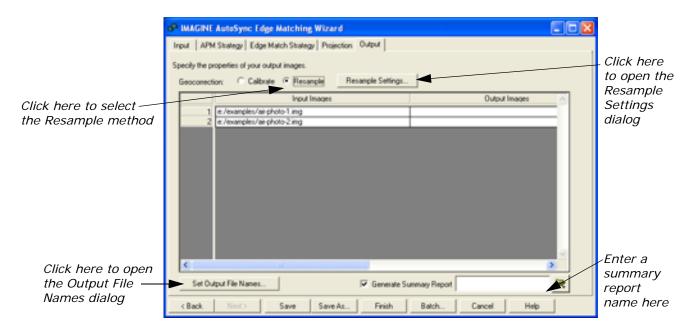
NOTE: The Output Projection fields will be greyed out in the Projection tab until you select the **Resample** geocorrection method in the Output tab.

MAGINE AutoSync Edge Matching Wizard	
Input APM Stategy Edge Match Strategy Projection Output	
Specify the projection for your output images.	
Output Projection	
(* Same as input image	
C Specified Below	
Projection: State Plane, Zone 5001 (FIPS Zone 3402) Spheroid: GRS 1980 Datum: NAD83 (DMA) Map Units: Other	Set Projection
<back. next=""> Save Save As Finish Batch Cancel</back.>	Help

- 1. In the Projection tab, accept the default Output Projection of **Same** as Input Image.
- 2. Click **Next>** to continue to the Output tab in the Edge Matching Wizard.

Using the Output tab

In the Output tab, you can specify the properties for your output images, including selecting the geocorrection method and specifying names for the output files and summary report.



- 1. In the Output tab, select the **Resample** geocorrection method.
- Click Resample Settings... in the Output tab. The Resample Settings dialog opens.

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For more information on the geocorrection methods, see "Resampling vs. Calibration" on page 288.

a ² Resample Settings	
Resample Method: Cubic Convolution	Make sure Cubic Convolution is selected
X Cel Size: 0.00 + Y Cel Size: 0.00 +	is selected
☐ Ignore Zero in Statistics	
OK. Cancel Help	

- **3.** In this tour guide, accept the default settings in the Resample Settings dialog. Make sure the **Cubic Convolution** resample method is selected.
- 4. Click **OK** in the Resample Settings dialog.
- In the Output tab, click the Set Output File Names... button. The Output File Names dialog opens.

	6 ⁰ Output File Names	
Enter a default file name suffix here	Use output directory and life name suffix for calibrated output Default Dutput Directory: (*) d/gen0_idk/examples/ Default Dutput File Name Suffixov4pu4 Cancel Help	<i>Click here to select a default output directory</i>

- In the Output File Names dialog, click the File Selector icon results to select a default output directory of your choice.
- 7. In the **Default Output File Name Suffix** field, enter a default file name suffix of your choice, or use the default **_output**.
- 8. Click OK in the Output File Names dialog.
- 9. In the Output tab, make sure the **Generate Summary Report** checkbox is selected and enter a name of your choice for the HTML

summary report. You can also click the File Selector icon 🔄 to select a directory of your choice.

- **10.** In the Output tab, click **Save** to save the project. A **File Selector** opens, and you can save the project to a directory of your choice.
- **11.** In the Output tab, click **Finish** to complete the edge matching process.

The AutoSync Job status dialog appears, stating the progress of the edge match operation.

🗿 AutoSync	deL	
Job State: Percent Done:	Done 100% 0	
	OK Cancel Help	

12. Click **OK** in the AutoSync Job status dialog when the operation is finished.

NOTE: Edge matching can take several minutes to run, based upon your hardware capabilities and the size of the image files.

Display Output Image

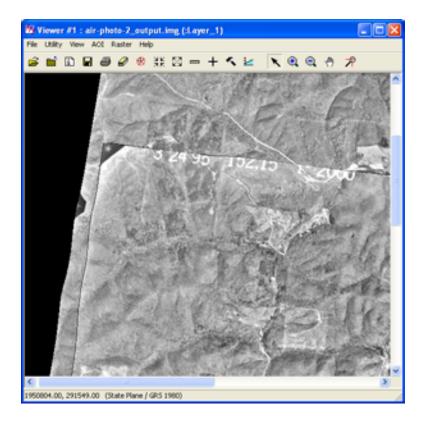
- Click the Viewer icon in the ERDAS IMAGINE icon panel. The Select Viewer Type dialog opens.
- 2. Select Classic Viewer.
- Click OK in the Select Viewer Type dialog.
 A new Viewer displays.

4. Click the Open icon 🍰 in the Viewer you just created.

The Select Layer To Add: dialog opens.

- 5. Click the **Raster Options** tab at the top of the Select Layer To Add: dialog.
- 6. Select the Background Transparent option.
- 7. Click the File tab at the top of the Select Layer To Add: dialog.
- 8. In the Select Layer To Add: dialog under **Filename**, select the output images from the directory in which you saved them.
- 9. Click **OK** in the Select Layer To Add dialog.

The edge matched output images display in the viewer.



Use the Viewer Swipe Tool

- To perform visual verification using the Viewer Swipe tool, select Utility -> Swipe... from the Viewer menu bar.
- 2. The Viewer Swipe dialog opens.

	W Viewer Swipe	
Use the slide to swipe over the images———	50 * 0 100 Direction: Automatic Swipe: 100	
Choose either ——— Vertical or Horizontal	Vertical C Horizontal Auto Mode Speed 300 + Auto Mode Speed 300 + Movie Movie Image Name Image	Use Auto Mode and Speed to watch the images being swiped at a rate you choose

 Check Auto Mode in the Viewer Swipe dialog, and type 500 for the Speed. You can watch as the swipe tool slowly works its way over the images allowing you to evaluate the quality. Experiment with both Vertical and Horizontal direction and different speeds.

View Summary Report Once you have finished edge matching the images, you can view the HTML summary report to review information about the error, tie points, etc.

- **1.** In a Windows Explorer window, browse to the directory where you saved the HTML report (in the Output tab).
- 2. Click to open the HTML file.

The summary report opens in a browser window.

You can experiment with selecting different options in the Edge Matching wizard tabs to produce different results. For example, in the Edge Match Strategy tab, select to apply refinement to the **Whole Image** (instead of the **Overlapping Area Only**) or change the **Buffer Around the Overlapping Area (pixels)** number to see the differences in the resulting output images.

Using the IMAGINE AutoSync Workstation

In this tour guide, you use the georeference workflow in the IMAGINE AutoSync Workstation to georeference a raw Landsat TM image of Atlanta, Georgia, using a SPOT panchromatic image of the same area. The raw Landsat TM image does not have any map information and the SPOT image is rectified to the State Plane map projection.



This tour guide explains the steps for using the georeference workflow in the workstation to georeference a raw image (an image without any map information). When georeferencing a rectified image, you do not need to manually collect tie points before running APM.

To georeference a raw image in the IMAGINE AutoSync Workstation, follow these basic steps:

- create a new IMAGINE AutoSync project ٠
- add an input image
- add an image to reference against the input image •
- collect manual tie points •
- run APM •
- preview the output image •
- improve output image results (if necessary) •
- review the input and reference image map data information
- set the output image projection ٠
- resample or calibrate the output image •
- verify the rectification process •
- view the summary report

Create New IMAGINE AutoSync Project

First, create a new IMAGINE AutoSync project. You must have ERDAS IMAGINE running.

1. Click the AutoSync icon on the ERDAS IMAGINE icon panel.



The AutoSync menu opens.

	🕼 AutoSync 🛛 📓	3
	Georeferencing Wizard	ĺ
	Edge Matching Wizard	j
Click here to start	Open AutoSync Project	Î
the IMAGINE AutoSync	AutoSync Workstation	Î
Workstation	Close Help	Ĵ

 Select AutoSync Workstation... from the AutoSync menu. The IMAGINE AutoSync Workstation Startup dialog opens.

	an IMAGINE AutoSync	: Workstation Startup	×
	IMAGINE AutoSync	Welcome to IMAGINE AutoSync Workstation. From this dialog you may begin a new project, or you may resume working on a previously created one.	
	Charles . P	What would you like to do?	
	APN	Create a new project.	
		Open an existing project	
Click here to create a new IMAGINE			
AutoSync project	Leica	OK Cancel Help	J

- 3. On the IMAGINE AutoSync Workstation Startup dialog, select Create a new project.
- 4. Click OK.

The Create New Project dialog opens.

	Create New Project Doose Project Workflow: Geovelemence Edge Matching	
Enter a project name here	Project File: (*Jap)	
	Please select project output options: Specify the properties of your output images.	 Click here to select the georeference workflow
<i>Click to open the Resample Settings dialog</i>	Geocorrection: Calibrate Perample Resample Settings F ² Use output directory and file name suffic for calibrated output Default Output Directory: (1)	 Click here to select the Resample geocorrection method
	Cancel Hep	Enter a summary report name here

- 5. On the Create New Project dialog, select the **Georeference** workflow.
- In the Project File (*.lap) field, click the File Selector icon enter a project file name of your choice.
- **7.** On the Create New Project dialog, select the **Resample** geocorrection method.
- 8. Click the Resample Settings... button.

The Resample Settings dialog opens.

	of Resample Settings	
Click to accept the default resample settings	Resample Method: Cubic Convolution Cell Size: Image X Cell Size: Image Y Cell Size: Image Y Cell Size: Image I groom Zero in Statistics Clip to Reference Image Boundary OK Cancel	Make sure Cubic Convolution is selected

9. In this tour guide, accept the default settings in the Resample Settings dialog. Make sure the **Cubic Convolution** resample method is selected.



IMAGINE AutoSync provides these widely-known resampling algorithms: Nearest Neighbor, Bilinear Interpolation, Cubic Convolution, and Bicubic Spline. In some cases you may want to change the **Resample Method**, but for this tour guide, leave it set to **Cubic Convolution**.

10. Click OK in the Resample Settings dialog.

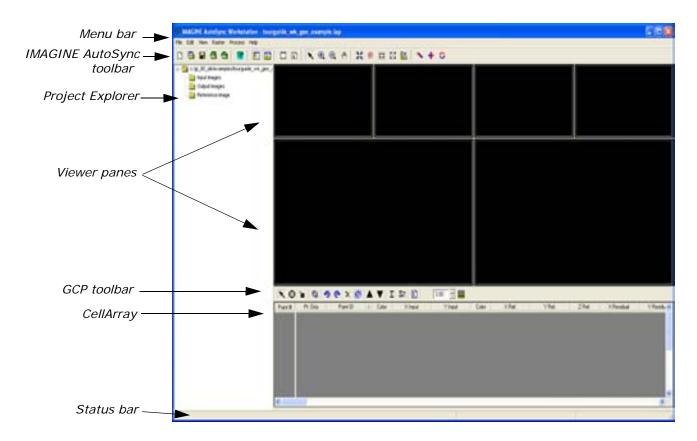
11. In the Create New Project dialog, in the **Default Output Directory**:

(*) field, click the File Selector icon Related to select a default output directory of your choice.

- 12. In the **Default Output File Name Suffix** field, enter a default file name suffix of your choice, or keep the default **_output**.
- 13. In the Create New Project dialog, make sure the Generate Summary Report checkbox is selected. The name of the project in the Project File field defaults as the summary report name, but you

can also click the File Selector icon Region to select a different name and directory of your choice.

14. Click the OK button.



Add Input Image

After you have created the IMAGINE AutoSync project, the next step is to add the input image you want to georeference.

- **1.** To add an input image to the project, do one of the following:
 - In the IMAGINE AutoSync toolbar, click the Open Input Images icon
 - Select File -> Add Images -> Input Images... from the menu bar
 - Right-click on the Input Images folder in the Project Explorer Tree View and select Add Input Image...

The Select Images To Open dialog opens.

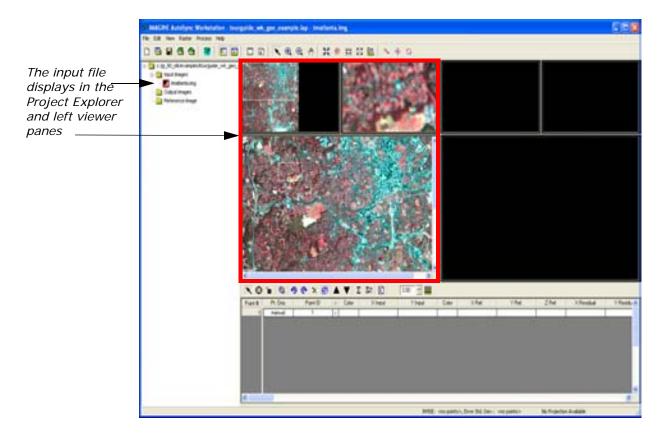
Click here to select the file	Select Images To Open File Multiple Look in examples Shine7.ing TM_1.ing Shine8.ing TM_1bing Shine8.ing TM_stiped ing Shipe ing Venezuela ing Stopts ing Venezuela ing Stopes SAR_Refing Vessia2_mat ing Stopes SAR_Refing Vessia3_mat ing StoperoSAR_Refing Vessia3_mat ing StoperoSAR_Refing Vessia3_mat ing		Click here to add the file
	<u><</u>	×	
	File name: Imatlants.ing Files of type: IMAGINE Image (".ing) Inuecolor : 512 Rows x 512 Columns x 6 Band(s)		Preview window

2. In the Select Images To Open dialog under Filename, click the file tmAtlanta.img.

This file is a Landsat TM image of Atlanta that has not been rectified.

3. Click **OK** in the Select Images To Open dialog.

The input image **tmAtlanta.img** displays in the IMAGINE AutoSync Workstation.



Add Reference Image After you have added an input image, the next step is to add an image to reference against the input image.

- **1.** To add a reference image to the project, do one of the following:
 - In the IMAGINE AutoSync toolbar, click the Open Reference
 Images icon
 - Select File -> Add Images -> Set Reference Image... from the menu bar
 - Right-click on the Reference Image folder in the Project Explorer Tree View and select **Set Reference Image...**

The Select Images To Open dialog opens.

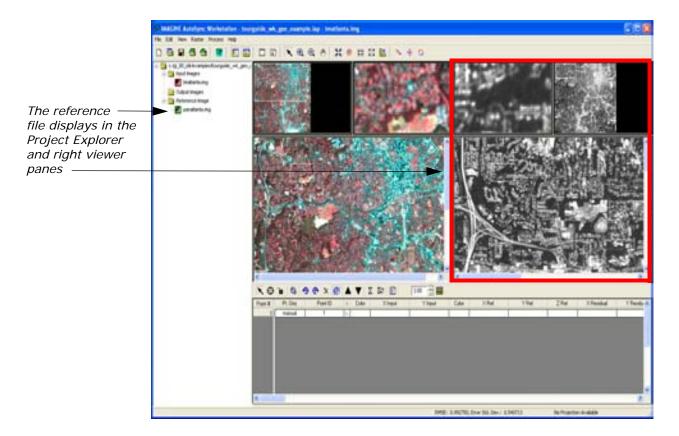
Click here to select — the file	Select Images To Open File Multiple Look in: mobbay ing models_output ing models_ou	Control Interview StereoSAR StereoSAR StereoSAR StereoSAR	—— Click here to add the file
	File name: parvitianta ing Files of type: [MAGINE Image (* ing) greyscale : 1301 Rows x 1401 Columns x 1 Band(s)		Preview window

2. In the Select Images To Open dialog under Filename, click the file panAtlanta.img.

This file is a SPOT panchromatic image of Atlanta. This image has been georeferenced to the State Plane map projection.

3. Click **OK** in the Select Images To Open dialog.

The reference image **panAtlanta.img** displays in the IMAGINE AutoSync Workstation.

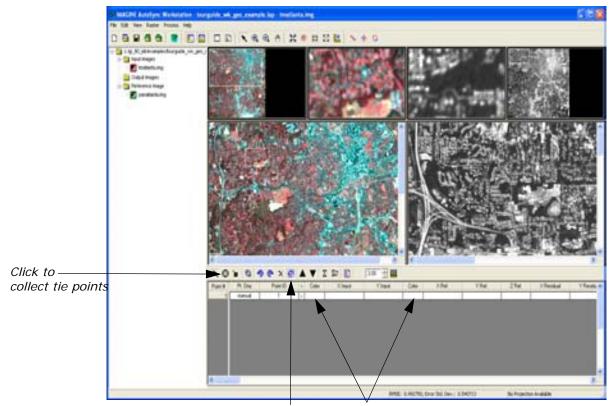


Collect Manual Tie Points

Once you have loaded the input and reference images in the IMAGINE AutoSync Workstation, you can manually collect tie points.

This step is necessary in this tour guide because the input image (**tmAtlanta.img**) is a **raw** image (without any map information). When using the IMAGINE AutoSync Workstation to georeference images with map information, you do not need to manually collect tie points before running APM and you can skip this step.

1. In the GCP toolbar, click the Create GCP icon 🚱 .

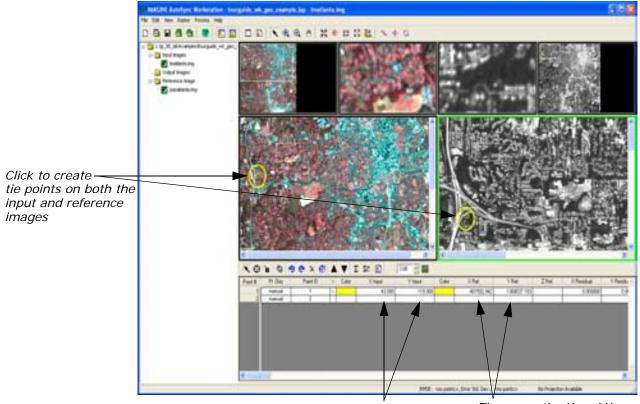


Click to show tie points Click to change the in the viewer panes tie point color to yellow

- 2. In the GCP toolbar, click the Show Selected Points icon $\cancel{8}$.
- To make the input image tie points easier to see in the viewer om the left, right-click in the Color column to the right of Point ID in the first row of the CellArray and select the color Yellow. Repeat this for each tie point in the CellArray.
- 4. To make the reference image tie points easier to see in the viewer on the right, right-click in the **Color** column to the right of **Y Input** in the first row of the CellArray and select the color **Yellow**. Repeat this for each tie point in the CellArray.
- **5.** In the Main View pane of the input image, click a location to collect a tie point.

The point you have created is labeled as 1 in the Main View pane and its X and Y inputs are listed in the CellArray. Also notice that the input image icon in the Project Tree View now has a green border since it now has tie points.

6. In the Main View pane of the reference image, click the same location to collect a tie point.

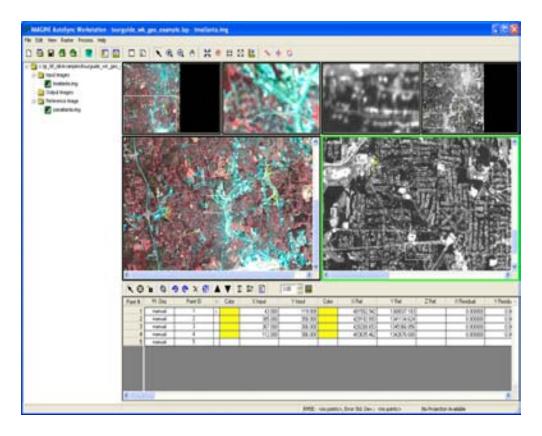


These are the X and Y map coordinates for tie points in the input image (tmAtlanta.img) These are the X and Y map coordinates for tie points in the reference image (panAtlanta.img)

7. Collect at least three manual tie points in both the input and reference images.

You should choose points that are easily identifiable in both images, such as road intersections and landmarks, so that the images match properly. Also, make sure you scatter your tie points around the images so they are not all concentrated in one place. Try to collect tie points that are close to each of the four corners of the images.

Your project in the IMAGINE AutoSync Workstation should now look similar to the following:

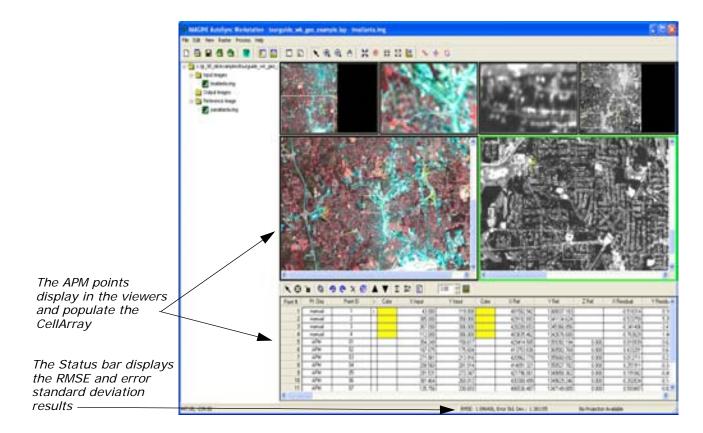


Run APM

After collecting several tie points in the input and reference image, the next step is to run automatic point matching (APM) to automatically generate more control points for your images.

- 1. In the IMAGINE AutoSync toolbar, do one of the following to run APM:
 - In the IMAGINE AutoSync toolbar, click the Run APM icon
 - Select Process -> Run APM from the menu bar
 - Right-click on the input image (tmAtlanta.img) in the Project Explorer Tree View and select Run APM

The Status bar at the bottom of the workstation displays the RMSE and Error Standard Deviation results. The APM points generated populate the CellArray and display in the viewers for both the input and reference images.

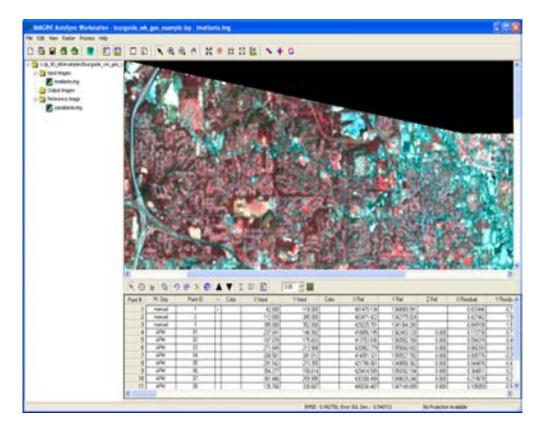


Preview Output Image

After you run APM, you can preview the output image to make sure you are satisfied with the results before resampling or calibrating.

 To preview the output image, right-click on the input image (tmAtlanta.img) in the Project Explorer Tree View and select Preview Output.

The output image displays in the viewer.



Improve Output Image Results

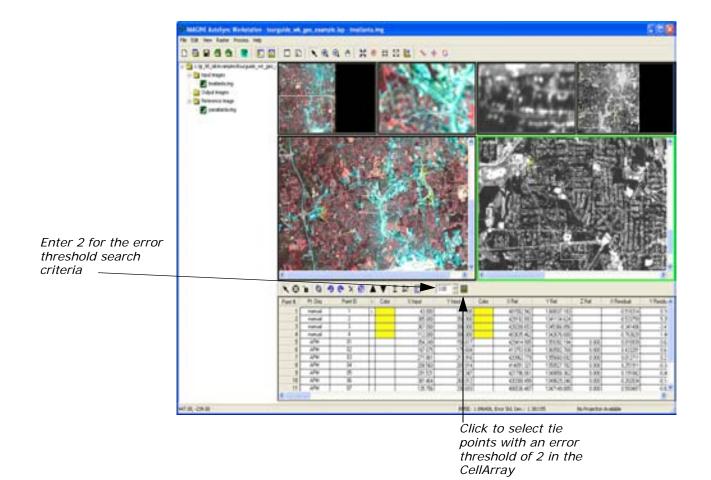
If you preview the output results and the image is warped, shows black images, or produces other unacceptable output, it is most likely the result of incorrect APM tie points or an inappropriate sensor model. In this tour guide, if you are dissatisfied with the results, there are most likely incorrect tie points that you should delete before resampling. If the **Error Std. Dev.** is higher than 2.0, you should also follow these steps to improve the tie points. If you delete incorrect APM points and the results are still poor, then you should try changing the sensor model in the IMAGINE AutoSync Project Properties dialog.



To learn more about improving APM results, see the IMAGINE AutoSync white paper on the IMAGINE AutoSync product page at http://gi.leica-geosystems.com/products/.

1. Right-click on the input image (tmAtlanta.img) in the Project Explorer Tree View and select Review Points.

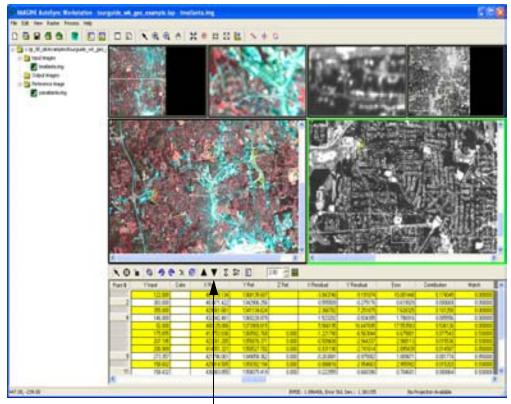
The input and reference images display in the viewer panes, showing the tie points.



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- In the GCP toolbar, enter or use the nudgers to the right of the field to select 2 in the error threshold text box.
- **3.** In the GCP toolbar, click the Select GCPs with Error Threshold icon

The tie points with an error higher than 2 are highlighted in the CellArray.



Click here to drive through the selected points in the CellArray

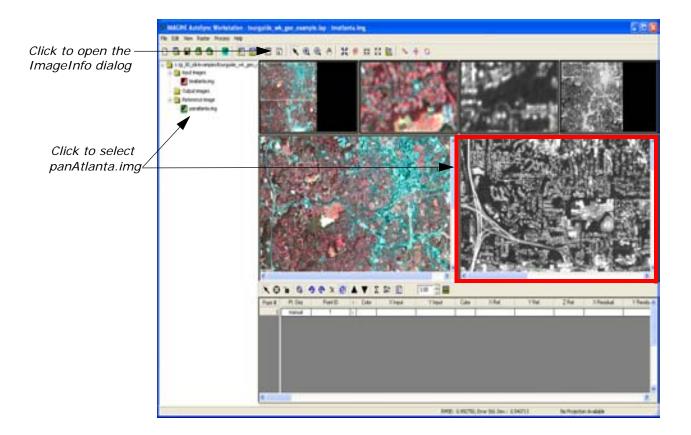
 Click the Drive To icon To click through the selected points in the CellArray.

As you click through the points, the points in the viewers will be highlighted with a box.

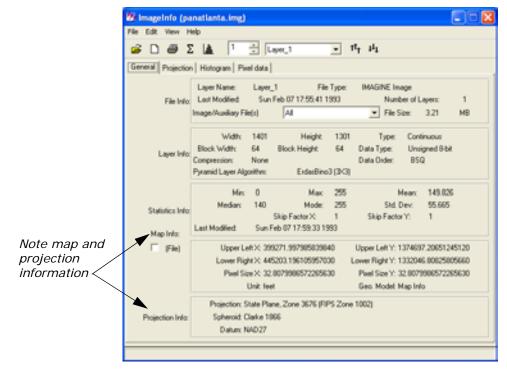
5. When you find a point with a high error, click the Delete GCP X icon.

The selected point is deleted from the viewers and the CellArray.

- After you delete all the points with a high error, right-click on the input image (tmAtlanta.img) in the Project Explorer Tree View and select Preview Output.
- **Review Image Map Data** The next step is to review the image map data for the input and reference image. You can review the map data to learn about the map and projection information in order to determine if you want the output image to have the same projection as the reference image.
 - 1. Click on the reference image in the Main View pane or in the Project Explorer Tree View to select it.

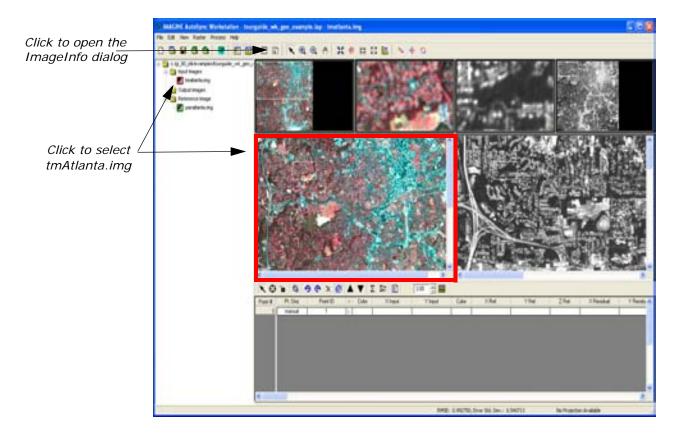


On the IMAGINE AutoSync toolbar, click the ImageInfo icon 1.
 The ImageInfo dialog for panAtlanta.img opens.



Note the information in the **Map Info** section and that the **Projection Info** section shows that the map is georeferenced to **State Plane**.

- 3. When you are finished, select **File -> Close** in the ImageInfo dialog.
- **4.** Click on the input image in the Main View pane or in the Project Explorer Tree View to select it.



- 5. On the IMAGINE AutoSync toolbar, click the ImageInfo icon 👔 .
- 6. The ImageInfo dialog for tmAtlanta.img opens.

	Histogram Par Loper Name:	Layer_1 Sun Fe		Type:	I ^R T J ^I J IMAGINE Image		
Projection	Histogram Pier Layer Name: Last Modified	el data Layer_1 Sun Fe	Fie	Type:			
	Layer Name: Last Modified	Layer_1 Sun Fe			IMAGINE Image		
File Info:	Last Modified	Sun Fe			IMAGINE Image		
		ed al	AI	990	Number of L	аует: 2.09	6 MB
Layer Info:	Width Block Width Compression: Pynamid Layer Alg	None		512 64 3 (3<3)	Data Type: Una	igned 8 bit	
Statistics Info:	Mir: Median:	63 99	Max Mode:	255 83	Mean: Std. Dev:	19.425	
Map Infor	Last Modified				Skip Factor Y:	1	
File)	Lower Rig Pixel Siz	he >:: 511.0 ne >:: N/A	1	l	Pixel Size Y: N./A		
ojection Info:					urea. Modec hione		
	Statistics Info: Map Info: (File)	Layer Info Layer Info Statistics Info Map Info (File) Upper Lo Lover Rig Pixel Statistics Upper Lo Lover Rig Pixel Statistics Upper Lover Rig Pixel Statistics Upper Lover Rig	Layer Info Compression: None Pyramid Layer Algorithm: Map Info: (File) Upper Left × 0.0 Laver Pight × 511.0 Pixel Size × N.4 Unit: other signation Info:	Layer Info Layer Info Compression: None Pyramid Layer Algorithm: EnderBino Main: 60 Max: Median: 99 Mode: Skip Factor X: Last Modified: Sun Feb 07 18:10:00 15 (File) Upper Left X: 0.0 Lover Right X: 511.0 Pixel Size X: N/A Unit: other signification Info:	Layer Info Layer Info Statistics Info Statistics Info (File) Section Info Section Info Sectio	Layer Info Layer Info Compression: None Pyramid Layer Algorithm: ErdasBino3 (3K3) Min: 60 Max: 255 Mean: Median: 99 Mode: 83 Std. Dev: Stajis Factor Y: Last Modified: Sun Feb 07 18:10:00 1993 Map Info: Field Upper Left X: 0.0 Upper Left Y: 0.0 Lower Right X: 511.0 Lower Right Y: 511.0 Piel Size X: N/A Piel Size Y: N/A Unit: ofter Geo. Modet: None Spherod:	Layer Info Layer Info Layer Info Layer Info Batistics Info Median 299 Mode: 83 Std. Dev: 19.425 Median 99 Mode: 83 Std. Dev: 19.425 Skip Factor Y: 1 Last Modified: Sun Feb 07 18 10 00 1993 Till (File) Upper Left Y: 0.0 Lower Right Y: 511.0 Pixel Size X: N/A Pixel Size Y: N/A Unit: other Gee. Model: None Projector: Unknown sjection Info:

Note the information in the **Map Info** section and that the **Projection Info** section shows that this is a raw image with no projection information. Therefore, for this tour guide, use the input projection from the reference image (**panAtlanta.img**) for the output image.

Set Output Image Projection

Since the image to be georeferenced is a raw image with no projection information, you need to change the project properties to set the output projection before resampling or calibrating the image.

- 1. To change the output projection, do one of the following:
 - Select Process -> Project Properties... from the menu bar
 - In the IMAGINE AutoSync toolbar, click the Edit Project

Properties icon

The IMAGINE AutoSync Project Properties dialog opens.

2. Click the Projection tab.

The Projection tab opens in the IMAGINE AutoSync Project Properties dialog.

3. In the Output Projection section, select **Same as Reference Image**.

The projection information from the reference image displays (greyed out).

	aP IMAGINE AutoSync Project Properties	
	APM Strategy Geometric Model Projection Output	
Click here to use the same projection as the reference image	Specily the projection for your output images. Output Projection Same as Input Image Same as Reference Image Specified Below	
The reference ——— image projection info displays here	Projection: State Plane, Zone 3676 (FIPS Zone 1002) Spheroid: Clarke 1866 Datum: NAD 27	
	Map Unitz Meters y	Set Projection
		Advanced Settings
	OK Cancel Help	

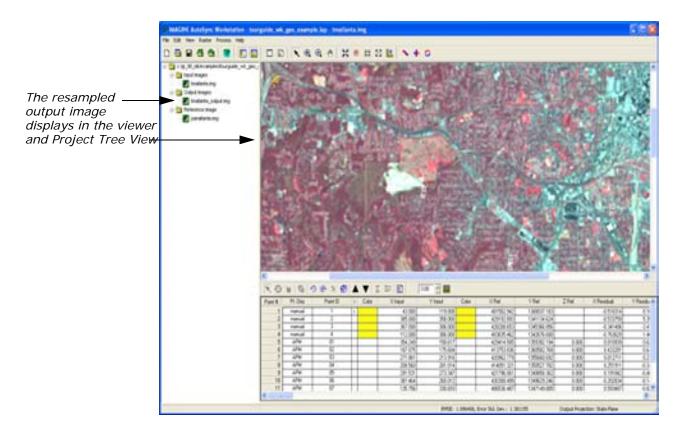
4. Click the **OK** button to close the IMAGINE AutoSync Project Properties dialog.

Resample Output Image Resampling is the process of calculating the file values for the rectified image and creating the output file. All of the raster data layers in the source file are resampled. The output image will have as many layers as the input image.

- **1.** To resample the output image, do one of the following:
 - Select Process -> Calibrate/Resample from the menu bar
 - Right-click on the input image (tmAtlanta.img) in the Project Explorer Tree View and select Calibrate/Resample

You can change the resample settings in the Output tab in the IMAGINE AutoSync Project Properties dialog. You may want to experiment with changing the resample settings later, but this tour guide uses the default settings.

The resampled output image (**tmAtlanta_output.img**) displays in the workstation viewer and the output image name now displays in the Output Images folder in the Project Explorer. Your project in the IMAGINE AutoSync Workstation should now look similar to the following:



Verify Output Image

Once the output image is created, you can use the workstation to perform the output image verification. You can verify that the input image (**tmAtlanta.img**) has been correctly georeferenced to the reference image (**panAtlanta.img**) by visually checking that they conform to each other using the Viewer Blend/Fade, Viewer Swipe, or Viewer Flicker verification tools.

Use the Viewer Blend/Fade Tool

1. To perform visual verification using the Viewer Blend/Fade tool, click

the Start Blend Tool icon 💊 on the IMAGINE AutoSync toolbar.

The Viewer Blend/Fade dialog opens.

	🗗 Viewer Blend/Fade
Use the slide to blend and fade the images —	Elend/Fade Percentage: 100 Automatic Blend/Fade: Automatic Speed: 300 ==
Use Auto Mode and Speed to watch the images being blended together at a rate you choose	Movie I Inage Name Inage Name I Inag

2. Select **Auto Mode** in the Viewer Blend/Fade dialog, and type **500** for the **Speed**. You can watch as the tool slowly blends the images, allowing you to evaluate the quality. Experiment with both different speeds or use the slide to blend and fade the images.

Use the Viewer Swipe Tool

1. To perform visual verification using the Viewer Swipe tool, click the

Start Swipe Tool icon 🕂 on the IMAGINE AutoSync toolbar.

The Viewer Swipe dialog opens.

	d [®] Viewer Swipe	
	Swipe Position:	
Use the slide to swipe over the images		
over the images	Direction: Automatic Swipe:	
Choose either	© Vertical C Horizontal C Auto Mode Speed 300 ±	
Vertical or Horizontal	T Movie	Use Auto Mode and
	Image Name	Speed to watch the
	2 parafanta_output ing	images being swiped at a rate you choose
	H F II = H 🛊 🛊 🗖 II Ŧ	
	Cancel Help	

 Check Auto Mode in the Viewer Swipe dialog, and type 500 for the Speed. You can watch as the swipe tool slowly works its way over the images allowing you to evaluate the quality. Experiment with both Vertical and Horizontal direction and different speeds. Use the Viewer Flicker Tool

1. To perform visual verification using the Viewer Flicker tool, click the

Start Flicker Tool icon **Q** on the IMAGINE AutoSync toolbar.

The Viewer Flicker dialog opens.

	🕫 Yiewer Flicker 🛛 🔀	
	Automatic Flicker.	
Click to quickly switch	□ Auto Mode Speet 300 ±	— Use Auto Mode and Speed to watch the
between the images	Manual Flicker	images switch from top to bottom at a rate you choose
	Image Name mage Name Image Name	
	H F II II H 🗸 🛊 🖬 II ±	
	Cancel Help	

 Check Auto Mode in the Viewer Flicker dialog, and type 500 for the Speed. You can watch as the flicker tool switches between the top and bottom images, allowing you to evaluate the quality. You can also click Manual Flicker to quickly switch between the images. Experiment with different speeds.

View Summary Report You can view the summary HTML report for more information.review information about the error, tie points, etc.

- **1.** To view the summary report, do one of the following:
 - In the GCP toolbar, click the Summary Report icon
 - Right-click on input image (**tmAtlanta.img**) in the Project Explorer Tree View and select **Review Report**.
 - Open a Windows Explorer window, browse to the directory where you saved the HTML report (in the Create New Project dialog) and open the .html file

The summary report opens in a separate browser window.

IMAGINE Radar Interpreter™

ERDAS IMAGINE Tour Guides

IMAGINE Radar Interpreter™

Introduction

Building a model, creating a map, or rectifying an image requires certain steps, regardless of the data you are using. However, processing radar data is application-driven, so there is no preset path to follow. Therefore, this tour guide shows you how the functions work, but you have to experiment on your own data files for your own applications.

The default settings in the IMAGINE Radar Interpreter module dialogs provide acceptable results. However, we recommend that you experiment with the settings to obtain the best results.

NOTE: The data used in this tour guide are in the <*IMAGINE_HOME>/examples directory. Replace<IMAGINE_HOME>* with the name of the directory where ERDAS IMAGINE is installed on your system.

V

Although you can use the IMAGINE Radar Interpreter functions in any order, we recommend that you follow this tour guide in the order that it is presented. It is important to address speckle noise before any other processing.

(P)

See the chapter "Enhancement" in the <u>ERDAS Field Guide</u> for more theoretical information about using the Radar module.

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You can find more information about radar applications in ERDAS IMAGINE in the <u>IMAGINE Radar Mapping Suite User's</u> <u>Guide</u>.

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The IMAGINE Radar Interpreter is part of the IMAGINE Radar Mapping Suite[™], which also includes IMAGINE OrthoRadar[™], IMAGINE StereoSAR DEM[™], IMAGINE IFSAR DEM[™], and the Generic SAR Node.

Approximate completion time for this tour guide is 45 minutes.

Suppress Speckle Noise

In this section, you display two images—one that has been despeckled, and one raw radar image. The objective is to make the two images look alike by using the Speckle Suppression function.

With all speckle suppression filters there is a trade-off between noise reduction and loss of resolution. Each data set and each application has a different acceptable balance between these two factors. The IMAGINE Radar Interpreter module Speckle Suppression filters have been designed to be versatile and gentle in reducing noise (and resolution).

In this section, you also calculate the coefficient of variation for an image. This variable is required to fine-tune many Speckle Suppression filters.

1/

When processing radar imagery, it is very important to use the Speckle Suppression functions before other image processing functions to avoid incorporating speckle into the image.

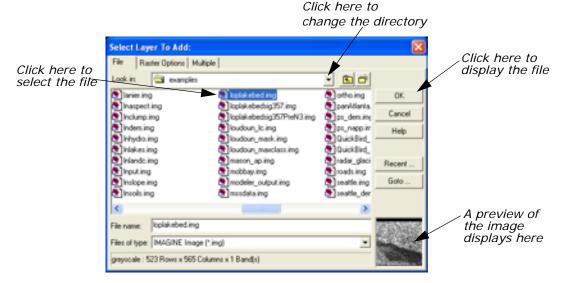
Preparation

ERDAS IMAGINE should be running and a Viewer should be open.

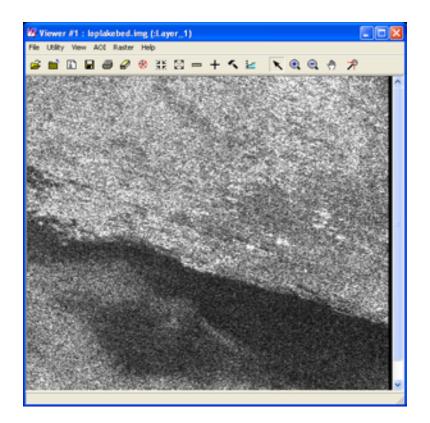
1. In the Viewer menu bar, select File -> Open -> Raster Layer or

click the Open icon 🧭 in the toolbar.

The Select Layer To Add dialog opens.



- 2. In the Select Layer To Add dialog under File name, click loplakebed.img.
- Click OK in the Select Layer To Add dialog.
 The loplakebed.img file displays in the Viewer.



This image is a subset from imagery taken by the Shuttle Imaging Radar (SIR-A) experiment. It is L-band with 25 m pixels. This scene is the shore of Lop Nor Lake in the Xinjiang Province, Peoples' Republic of China. This is an area of desiccated overflow basins surrounded by a series of parallel, wind-scoured, sedimentary ridges. The speckle in this image is obvious.

4. In the ERDAS IMAGINE icon panel, click the Viewer icon to open another Viewer.



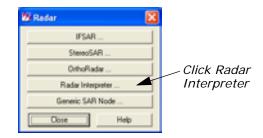
 From the ERDAS IMAGINE menu bar, select Session -> Tile Viewers to position and size the Viewers so that you can see the side-by-side Viewers on the screen.

This helps you to view and evaluate the resultant image after each filter pass, and then decide if another pass is needed to obtain the desired results.

6. Click the Radar icon on the ERDAS IMAGINE icon panel.



The Radar menu opens.



In the Radar menu, click Radar Interpreter.
 The Radar Interpreter menu opens.

	💯 Radar Interpreter 🛛 🔯
Select Speckle—	Speckle Suppression
Suppression	Edge Enhancement
	Image Enhancement
	Texture Analysis
	Adjust Brightness
	Adjust Stant Range
	Close Help

In the Radar Interpreter menu, select Speckle Suppression.
 The Radar Speckle Suppression dialog opens.

	🕼 Rader Speck	le Suppression			
Enter the	Input File	r: (*.ing)	Dutput File: (".img)		
name of the	loplakebed img	2		-	
input file here	Coordinate Type:	Subset Definition:	From Ing	uire Box	
	Смар	ULX: 0.00	± LR × 564.00	-	
	@ Fie	UL.Y: 0.00	÷ URY: 522.00	÷	
	Oata Type:		Moving Window:		Enter window
	Input: Unsigne		Use odd number only:		size here
	Output: Unsign	ed 8 bit. 👻	Window Size: 3	÷	(windows are always square)
	Output Options:				
	Cost. of Var. M		Filter: Lee Signa	~	
	@ 20 C 10		Variation: 0.2000000	-	
Click here ——• to calculate the	Calculate Coeff	icient of Variation	F Ignore Zero in State	- I	
Coefficient of Variation	OK.	Batch	Cancel	Help	
variation				1	

9. In the Radar Speckle Suppression dialog under Input File, enter the file Ioplakebed.img.

Calculate Coefficient of Variation

Next, you calculate the coefficient of variation to be used in this function.

Coefficient of Variation

The coefficient of variation, as a scene-derived parameter, is a necessary input parameter for many of the filters. (It is also useful in evaluating and modifying VIS/IR data for input to a 4-band composite image or in preparing a 3-band ratio color composite.)

Speckle in imaging radar can be mathematically modeled as multiplicative noise with a mean of 1. The standard deviation of the noise can be mathematically defined as:

Standard Deviation of the noise => $\frac{\sqrt{VARIANCE}}{MEAN}$ = Coefficient of

Variation

It is assumed that imaging radar speckle noise follows a Rayleigh distribution. This yields a theoretical value for standard deviation (SD) of .52 for 1-look radar data and SD = .26 for 4-look radar data.

The following table gives theoretical coefficient of variation values for various look-averaged radar scenes.

Table 1: Coefficient of Variation Values for Look-averagedRadar Scenes

Number of Looks (scenes)	Coefficient of Variation Value
1	.52
2	.37
3	.30
4	.26
6	.21
8	.18

1. In the Radar Speckle Suppression dialog, click the checkbox for Calculate Coefficient of Variation.

All the other options in the dialog are disabled, except for the **Subset Definition** and **Moving Window**. If desired, you could specify a subset area of the image for which to calculate the coefficient of variation.

- 2. Under Moving Windows, confirm that the Window Size is set to 3.
- 3. Click OK in the Radar Speckle Suppression dialog.

The Radar Speckle Suppression dialog closes and a Job Status dialog displays, indicating the progress of the function.

4. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).



Depending on your eml **Preferences** (under **Session** -> **Preferences** -> **User Interface & Session** -> **Keep Job Status Box**), when the Job Status bar shows 100 (indicating that the job is 100% done), you must either click **OK** to close the dialog or the dialog closes automatically.

 If it is not already displayed, open the Session Log by selecting Session -> Session Log from the ERDAS IMAGINE menu bar.

The calculated coefficient of variation is reported in the **Session Log**, as shown in the following example.

🖉 Session I	.og: c:\docume	nts and settings\kcurry\imagine_log 📰 🗖	×
23/07/04 13: 23/07/04 13:	13:14 sigmaval(367) 13:14 sigmaval(367) 13:14 sigmaval(367) 13:14 sigmaval(367)	Sigma Value for layer 1 of file loplakebed.img: 0.274552	< ×
<		0	
Close	Help		

- Calculated Coefficient of Variation is reported here

When using the filters in the Speckle Suppression function, you should calculate the coefficient of variation for the input image and use a number close to the calculated coefficient of variation for optimum results.

6. Click **Close** in the Session Log.

Run Speckle Suppression Function

- In the Radar Interpreter menu, select Speckle Suppression.
 The Radar Speckle Suppression dialog opens.
- 2. Under Input File, enter the file name loplakebed.img.
- 3. Under **Output File**, enter **despeckle1.img** in the directory of your choice.

NOTE: Be sure to remember the directory where you have saved the output file. This is important when you display the output file in a Viewer.

- 4. Under Coef. of Var. Multiplier (under Output Options), click 0.5.
- 5. Under **Output Options**, confirm **Lee-Sigma** is selected from the dropdown list next to **Filter**.
- Under Output Options, enter .275 for the Coef. of Variation (coefficient of variation), then press Enter on your keyboard.

This is the value (.275) that was reported in the Session Log when you calculated the coefficient of variation.

7. Click **OK** in the Radar Speckle Suppression dialog.

The Radar Speckle Suppression dialog closes and a Job Status dialog displays, indicating the progress of the function.

8. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).

View Results

1. In the menu bar of Viewer #2, select File -> Open -> Raster

Layer or click the Open icon 🍰 on the toolbar.

The Select Layer To Add dialog opens.

- 2. In the Select Layer To Add dialog, select **despeckle1.img** as the file to open and click **OK**.
- **3.** Repeat step 1 through step 7 under "Run Speckle Suppression Function" to apply the Speckle Suppression function iteratively to the output images, using the following parameters for passes 2 and 3.

Pass	Input file	Output file	Coef. of Var.	Coef. of Var. Multiplier	Window Size
1	loplakebed.img	despeckle1.img	0.275	0.5	3 × 3
2	despeckle1.img	despeckle2.img	0.195	1	5 × 5
3	despeckle2.img	despeckle3.img	0.103	2	7 X 7

Table 2: Speckle Suppression Parameters



You MUST enter a new output file name each time you run a speckle suppression filter. In this exercise, name each pass sequentially (for example, despeckle1.img, despeckle2.img, despeckle3.img, etc.).

Speckle Suppression Filters

The Speckle Suppression filters can be used repeatedly in as many passes as needed.

Similarly, there is no reason why successive passes must be done with the same filter.

The following filtering sequence might be useful prior to a classification.

Filter	Pass	Sigma Value	Sigma Multiplier	Window
Lee	1	0.26	NA	3 × 3
Lee	2	0.22	NA	5×5
Local Region	3	NA	NA	7 × 7 or 9 × 9

Table 3: Filtering Sequence

Use Histograms to Evaluate Images

Next, the ImageInfo method of histogram display is explained.

Histograms

Viewing the histograms of an image is often helpful in determining: the need for filtering, the type of filter to use, and the results of filtering.

You can see a histogram of an image through:

- Tools -> Image Information -> View -> Histogram from the ERDAS IMAGINE menu bar
- Utility -> Layer Info -> View -> Histogram from the Viewer menu bar
- Select Tools -> Image Information from the ERDAS IMAGINE menu bar.

The ImageInfo dialog opens.

2. Select File -> Open from the ImageInfo menu bar to select a file.

You can also click the Open icon 📂 in the ImageInfo toolbar to select a file.

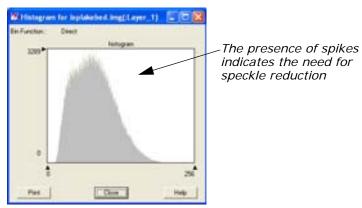
3. In the Image Files dialog, click **loplakebed.img** to select it and then click **OK**.

The information for **loplakebed.img** displays in the ImageInfo dialog.

enu bar 🗡	File Edit View H		_						
	🧯 🗋 🕘 Σ		÷Γ	ayer_1	٠	14 14			
olbar /	General Projection	Histogram Pis	el data						
	File Info:	Layer Name: Last Modified:		,1 Fie ct 06 16:02:45 19	Type: 92	IMAGINE Ima Numbr	-	epers:	1
	Layer Info:	Width Block Width Compression:	565 64 None	Height. Block Height	523 64	Type: Data Type: Data Order:		inuous gned 0-bit	
		Pyramid Layer Alg	orithm:	No pyrami	d layers	present			
	(Mirc	9	Max	255	м	ear:	80.382	
	Statistics Info:	Median:		Mode: Skip Factor X Det 06 16:02:47 15		Std. D Skip Factor		35.512 1	
	Map Info:	Upper La	#X: 0.0)		Upper Left 'r': 0	0		
	E Fiel	Lower Rig				Lower Right Y: -5	22.0		
			ce X: NA Unit: off			Pixel Size Y: N. Geo. Model: N			
				-		area. model ne	04.40		
	Projection Info:								
		Datum							

 In the ImageInfo dialog, select View -> Histogram, or click the Histogram icon .

The histogram for **loplakebed.img** displays.



5. Select **File -> New** from the ImageInfo dialog menu bar to open another ImageInfo dialog.

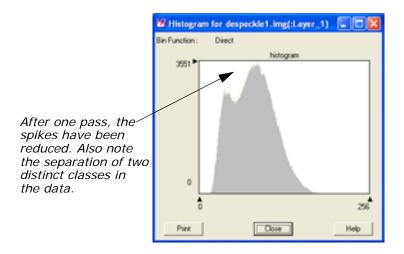
A second ImageInfo dialog opens.

- 6. Click the Open icon 😹 in the new ImageInfo dialog.
- 7. In the Open File dialog, select **despeckle1.img** from the directory in which you saved it and then click **OK**.

The information for **despeckle1.img** displays in the ImageInfo dialog.

8. In the ImageInfo dialog, click the Histogram icon.

The histogram for **despeckle1.img** displays.



- Repeat step 5 through step 8 of "Use Histograms to Evaluate Images" to view the subsequent passes of speckle reduction performed (despeckle2.img, despeckle3.img).
- 10. When finished, click **Close** in the Histogram viewers.
- **11.** Select **File -> Close** from the ImageInfo dialogs.
- 12. Select File -> Clear in both Viewers.

Enhance Edges

In this exercise, you create two images—one that is processed from the original image with the Edge Enhancement function, and one that is processed from the final result of the Speckle Suppression exercise. The objective is to demonstrate the effectiveness of Speckle Suppression prior to Edge Enhancement.

The Edge Enhancement functions in the IMAGINE Radar Interpreter module are similar to the Convolution and Neighborhood options in Image Interpreter.

NOTE: You can use the Edge Enhancement functions on any type of image—not just radar data.

1. From the Radar Interpreter menu, select Edge Enhancement.

The Edge Enhancement dialog opens.

	10 Edge Enhancement		X
	Input File: (".ing)	Coordinate Type:	Kernel Definition:
	loplak.ebed.ing	C Hap	
Select input and output files here	Output File: (".ing)	G File	
	edgeu/.ing	R	
	Subset Definition:	From Inquire Box	
	ULX: 0.00 🚊 U	RX: 564.00	1 4 4 4 4 4
	ULY: 0.00 🚊 U	NY: 522.00	1. 31. 31. 3
	Output Options:		
	File: Previt Gradent	•	Data Type:
	Directors North		Input: Unsigned 8 bit
Select filter here	□ Ignore Zero in Outpu	# Stats.	Output: Unsigned 8 bit 💌
	OK.	Batch	Cancel Help

- 2. In the Edge Enhancement dialog under Input File, enter loplakebed.img.
- 3. Under **Output File**, enter **edgeuf.img** in the directory of your choice.
- 4. Under Output Options, click the Filter dropdown list and select Prewitt Gradient.
- Click **OK** in the Edge Enhancement dialog.
 The Edge Enhancement dialog closes and a Job Status dialog displays, indicating the progress of the function.
- 6. Repeat step 1 through step 5, using despeckle3.img as the Input File and edgess.img as the Output File.

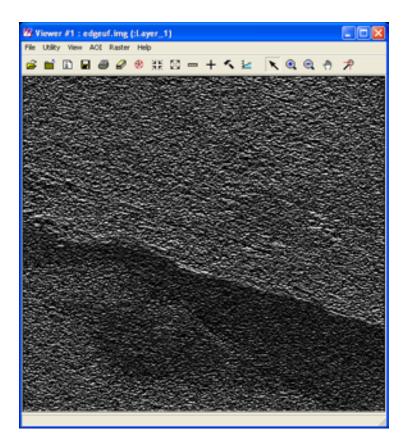
View Results

1. In Viewer #1, select File -> Open -> Raster Layer.

The Select Layer To Add dialog opens.

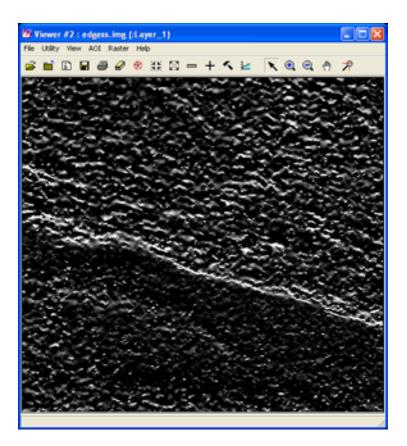
2. In the Select Layer To Add dialog, click the file **edgeuf.img**, then click **OK**.

This is the edge-filtered file derived from the unfiltered radar image file.



- 3. If necessary, start another Viewer. In Viewer #2, select File -> Open -> Raster Layer.
- 4. In the Select Layer To Add dialog, click the file **edgess.img**, then click **OK**.

This is the edge filtered file derived from the speckle-suppressed file.



 In the ERDAS IMAGINE menu bar, select Session -> Tile Viewers to position and size the Viewers so that you can see both of them at once on the screen.

The results should clearly show a more visible lake bed in the image that was speckle filtered (**edgess.img**). As an experiment, you may now want to take the unfiltered, edge-enhanced image (**edgeuf.img**) and pass it through the same Speckle Suppression process done previously. Comparing the result of this experiment with **edgess.img** should show whether it is better to perform speckle suppression before or after edge enhancement.

You can experiment with other edge enhancement filters or proceed to the next section.

6. When you are finished comparing the images, select **File -> Clear** in Viewer #1 and Viewer #2.

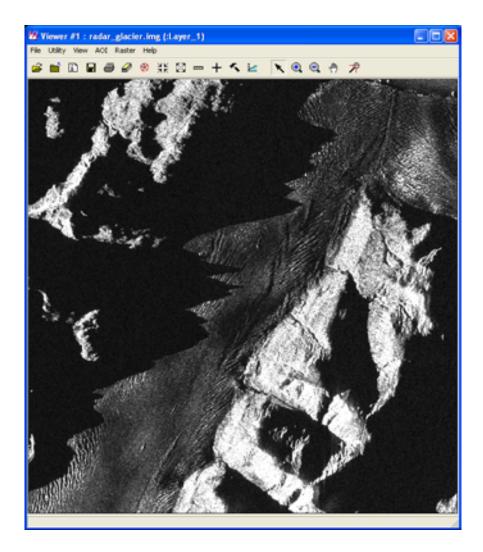
Enhance Image

The IMAGINE Radar Interpreter module provides three image enhancement categories:

- Wallis Adaptive Filter
- Iuminance modification

• sensor merge

	Wallis Adaptive Filter				
	The Wallis adaptive filter is designed to adjust the contrast stretch of an image using only the values within a local region (defined by the window size), which makes it widely applicable. Three possible implementations of this technique are provided: Bandwise, IHS, and PC.				
	 In the Bandwise operation, the adaptive filter is passed over each band sequentially. 				
	 In the IHS implementation, the input RGB image is transformed into IHS space. The adaptive filter is only passed over the intensity (I) component. The image is then transformed back into RGB. 				
	 In the PC implementation, the input bands are transformed into principal components. The filter is only passed over PC-1. An inverse principal component transform is then performed. 				
	In this section, you apply the Wallis adaptive filter function to an image and observe the results.				
Wallis Adaptive Filter	Make sure the IMAGINE Radar Interpreter module is running, and display the file radar_glacier.img in a Viewer.				



- In the Radar Interpreter menu, select Speckle Suppression.
 The Radar Speckle Suppression dialog opens.
- 2. In the Radar Speckle Suppression dialog, enter **radar_glacier.img** as the **Input File**.
- Type in despeckle4.img (in the directory of your choice) as the Output File.
- 4. Select Gamma-MAP from the Filter dropdown list.
- Click OK in the Radar Speckle Suppression dialog to filter the image. The Radar Speckle Suppression dialog closes and a Job Status dialog displays, indicating the progress of the function.
- 6. Click **OK** in the Job Status dialog when the process is complete.
- 7. Select Image Enhancement from the Radar Interpreter menu.The Image Enhancement menu opens.

Click Wallis Adaptive Filter	Walls Adaptive Filter				
	Sensor Marge				

Click Wallis Adaptive Filter in the Image Enhancement menu.
 The Wallis Adaptive Filter dialog opens.

	W Wallis Adaptive Filter				~Enter the	
Enter the	Input File: (".ing)		Output File: (*.img)			name of the
name of the input file here	despeckle4.ing	2	enhanceding		2	output file here
	Coordinate Type:	Subset Definition:		From Inquire	Box	
	C Nep	ULX 0.00	÷ LRX	668.00	÷	
	C Fie	ULY: 0.00	÷ LRY:	676.00	÷	
	Dala Type:		Moving Window:			
	Input Unsigned 8 bit Output: Unsigned 8 bit 💌		Use odd number only. Window Size: 3			
					a	
	Stretch to Uno	igned 8 B≹.				
	Options: Bandwise 💌 🗖 Ignore Zero in Stats.			Set window size here		
Click this checkbox	8: 1 - 0: 1 - 8: 1 - Multiplet:					
to activate this option	OK	Batch	Cancel Help		¢	Enter contrast multiplier here

- 9. In the Wallis Adaptive Filter dialog under Input File, enter the file despeckle4.img.
- **10**. Under **Output File**, enter the name **enhanced.img** in the directory of your choice.
- 11. Under Data Type, click Stretch to Unsigned 8 Bit.
- 12. Under Moving Window, confirm that the Window Size is set to 3.

Rough images usually require smaller window sizes (3×3) , whereas smooth, or cleaner, images can tolerate larger window sizes.

13. Set the Multiplier to 3.00.

14. Click OK in the Wallis Adaptive Filter dialog.

The Wallis Adaptive Filter dialog closes and a Job Status dialog displays, indicating the progress of the function.

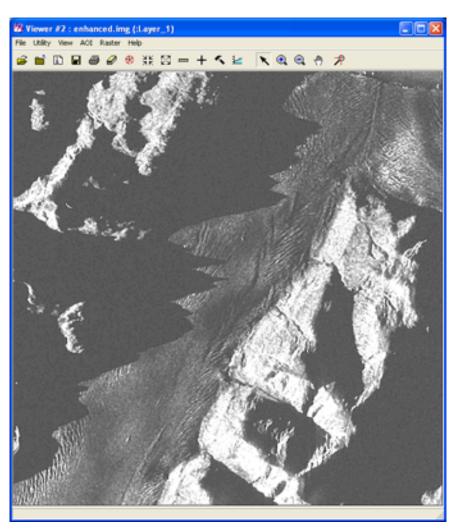
15. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).

View Results

 In the menu bar of Viewer #2, select File -> Open -> Raster Layer.

The Select Layer To Add dialog opens.

2. In the Select Layer To Add dialog, select the file **enhanced.img** and then click **OK**.



- **3.** Examine the differences between the two files.
- **4.** When you are finished comparing the images, select **File -> Clear** in Viewer #1 and Viewer #2.

Apply Sensor Merge

Next, you apply the **Sensor Merge** function to an image and observe the results.

This package of algorithms enables you to combine imagery from different sensors. Examples of this would be radar with TM imagery or multifrequency radar with aeromagnetic data. Three different families of techniques are available: Principal Component, IHS, and Multiplicative (these are similar to those in the Wallis Adaptive Filter option).

Principal Component

In using the **Principal Component** techniques, you have the option to modify the grayscale image in any of the following ways.

- **Remap**—rescales the grayscale image to the range of PC-1.
- **Hist. Match**—matches the histogram of the grayscale image to PC-1.
- **Multiply**—rescales the grayscale image into the 0-1 range and then multiplies the grayscale by PC-1.
- **None**—replaces PC-1 with the input grayscale image.

IHS

Using the IHS family, two options exist.

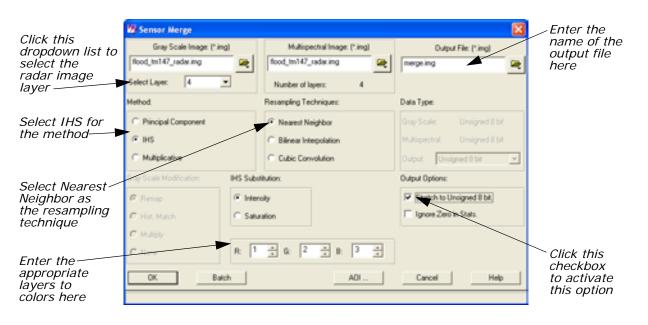
- **Intensity**—rescales the grayscale image to the numerical range of the intensity (I) and then substitutes it for I.
- **Saturation**—rescales the grayscale image to the numerical range of saturation (S) and then substitutes it for S.

Multiplicative

The **Multiplicative** technique remaps the grayscale image to a 0-1 range. Each band is then sequentially multiplied by the remapped grayscale image.

- If it is not already open, open the Image Enhancement menu by selecting Image Enhancement from the Radar Interpreter menu.
- 2. In the Image Enhancement menu, select Sensor Merge.

The Sensor Merge dialog opens.



- In the Sensor Merge dialog under Gray Scale Image, select flood_tm147_radar.img from the <IMAGINE_HOME>\examples directory.
- 4. Click the **Select Layer** dropdown list and select **4** (the radar image layer).
- 5. Enter flood_tm147_radar.img under Multispectral Image.
- 6. Enter **merge.img** as the **Output File** (in the directory of your choice).
- 7. Under Method, click IHS.
- 8. Under Resampling Techniques, click Nearest Neighbor.
- 9. Make sure that Intensity is selected under IHS Substitution.
- 10. In the R, G, and B boxes, enter 1 for R, 2 for G, and 3 for B (the TM image layers).
- 11. Under Output Options, click Stretch to Unsigned 8 bit.
- 12. Click OK in the Sensor Merge dialog.

The Sensor Merge dialog closes and a Job Status dialog displays, indicating the progress of the function.

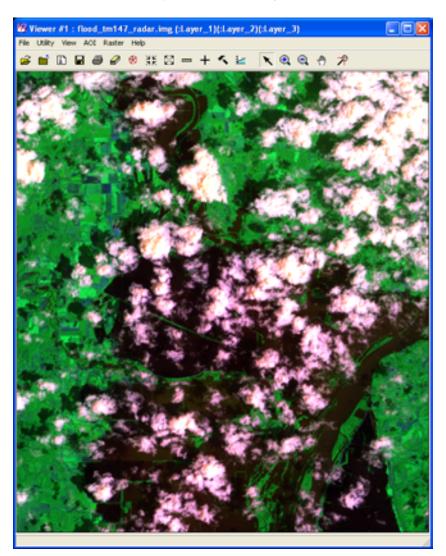
13. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).

View Results

1. In the menu bar of Viewer #1, select File -> Open -> Raster Layer.

The Select Layer To Add dialog opens.

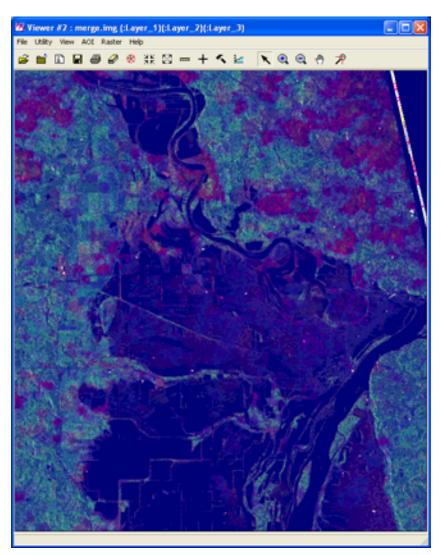
- In the Select Layer To Add dialog, click the file flood_tm147_radar.img.
- 3. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.
- 4. Under Layers to Colors, select 1 for Red, 2 for Green, and 3 for Blue.
- 5. Click **OK** in the Select Layer To Add dialog.



- In Viewer #2, select File -> Open -> Raster Layer.
 The Select Layer To Add dialog opens.
- 7. In the Select Layer To Add dialog, click the file merge.img.
- 8. Click the **Raster Options** tab at the top of the Select Layer To Add dialog.

9. Under Layers to Colors, select 1 for Red, 2 for Green, and 3 for Blue.

10. Click OK.



- **11.** Examine the difference between the two files.
- **12.** When you are finished comparing the images, select **File -> Clear** in Viewer #1 and Viewer #2.

13. Click Close in the Image Enhancement menu.

Next, apply the **Texture Analysis** function to an image and observe the results.

The radar data's sensitivity to texture is an advantage over other types of imagery where texture is not a quantitative characteristic.

NOTE: Texture analysis has been shown to be useful for geologic discrimination and vegetation classification.

Apply Texture Analysis

1. From the Radar Interpreter menu, select Texture Analysis.

The Texture Analysis dialog opens.

Enter the ——— input file name here	Texture Analysis Input File ("ing) fevolandradar ing Ret		Output File: (*.ing Tenture.ing	Enter the output file name here		
	Coordinate Type:	Subset Definition:	From Inc	quire Box		
	C Map	ULX 0.00	÷ LRX 407.00	÷		
	C Fle	ULY: 0.00	÷ LR Y: 401.00	÷		
	Data Type:		Moving Window:			
	Input: Unsigned 16 bit		Use-odd number only:			
	Output: Float Sir	ngle 💌	Window Size: 5	÷		
Select operator to use by clicking here	Operators: Skewness					
	OK	Batch	Cancel	Help	Enter window size here	

- In the Texture Analysis dialog, enter flevolandradar.img, which is located in the <IMAGINE_HOME>\examples directory, as the Input File.
- 3. Enter **texture.img** (in the directory of your choice) as the **Output File**.
- 4. Click the Operators dropdown list and select Skewness.
- 5. Under Moving Window, enter a Window Size of 5.
- 6. Click OK in the Texture Analysis dialog.

The Texture Analysis dialog closes and a Job Status dialog displays, indicating the progress of the function.

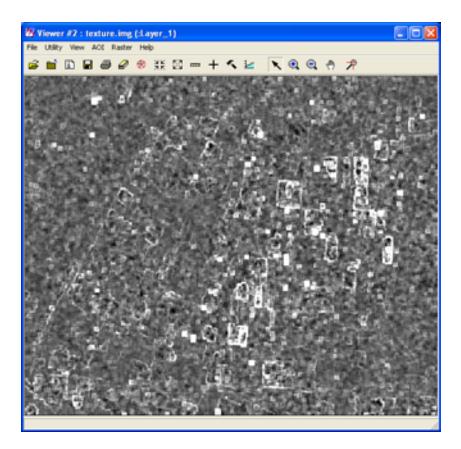
7. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).

View Results

- In the menu bar of Viewer #1, select File -> Open -> Raster Layer.
- 2. In the Select Layer To Add dialog, click the file **flevolandradar.img.** This is an agricultural subscene from Flevoland, Holland. This image is from the ERS-1 satellite in C-band with 20-meter pixels.
- 3. Click **OK** in the Select Layer To Add dialog.



- 4. In Viewer #2, select File -> Open -> Raster Layer.
- 5. In the Select Layer To Add dialog, click the file **texture.img**. then click **OK**.



- 6. Examine the difference between the two files.
- **7.** When you are finished comparing the images, select **File -> Clear** in Viewer #1 and Viewer #2.

Adjust Brightness

- The **Brightness Adjustment** function works by adjusting pixel DN values so that each line of constant range has the same average. In this way, the image is adjusted to have an overall, even brightness. Therefore, you must tell ERDAS IMAGINE whether the lines of constant range are stored in rows or columns. This depends on the flight path of the sensor and the output raster it produces.
 - 1. Select Adjust Brightness from the Radar Interpreter menu.

The Brightness Adjustment dialog opens.

	🙆 Brightness A	djustment			×	
Enter input file	Input File flevolandradar.ing	s (".ing)	Output bight.ing	# File: (*.ing)	=	— Enter output file
	Coordinate Type:	Subset Definition:		From Inquire B	OK	name here
Select subset	P Hap P File	ULX: 0.00 ULY: 0.00	는 LRX 는 LRX	407.00	44	
	Data Type: Input: Unsigned		Output Options:	oply to:	_	
Click to select	Input Unsigner Output Float Sir			F Column Gero in Stats		Select column
output data type	OK	Balch	Cancel	Help	<u> </u>	here

- In the Adjust Brightness dialog under Input File, enter the name of the input file, flevolandradar.img, which is located in the <IMAGINE_HOME>\examples directory.
- 3. Under **Output File**, enter the name of the output file, **bright.img**, in the directory of your choice.
- 4. Under **Subset Definition**, select a subset of the file if you want to apply the function to a portion of the image rather than the entire image.
- 5. Select the **Data Type** under **Output** file. The default is **Float Single**, which is recommended to save disk space.
- 6. Under Apply to in the Output Options, select Column.

You can often tell whether the data are stored in rows or columns by looking at the image header data or by consulting documentation supplied with the data.

P

Use the **Data View** option from the Import/Export dialog or **Tools -> View Binary Data** from the ERDAS IMAGINE menu bar to read the image header data.

7. Click **OK** in the Adjust Brightness dialog.

The Adjust Brightness dialog closes and a Job Status dialog displays, indicating the progress of the function.

- 8. When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).
- 9. Select File -> Open -> Raster layer in the Viewer menu bar.
- **10.** Navigate to the appropriate directory, then select **bright.img**.



11. After processing is complete, you must view and evaluate the resultant image and decide if another pass is needed to obtain the results you want.



See the chapter "Enhancement" in the <u>ERDAS Field Guide</u> for theoretical information.

Adjust Slant Range

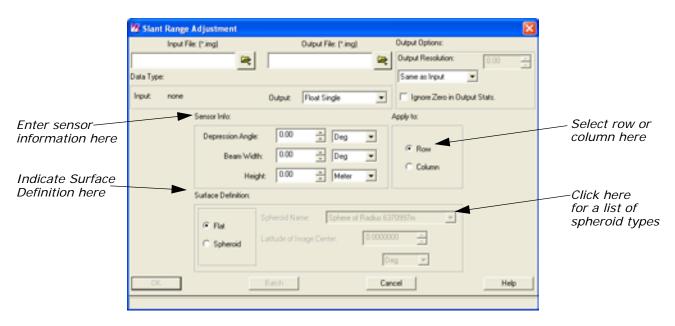
This section does not take you through an actual demonstration of the **Slant Range Adjustment** function, since the full image is required. However, when using this function, you follow the next series of steps.



The Slant Range Adjustment function applies only to radar data.

1. Select Adjust Slant Range from the Radar Interpreter menu.

The Slant Range Adjustment dialog opens.



- 2. In the Slant Range Adjustment dialog under Input File, enter the name of the input file.
- 3. Under **Output File**, enter the name of the output file in the directory of your choice.
- 4. Under **Data Type**, select the data type for the **Output File** by clicking on the dropdown list. The default is **Float Single**, which is recommended to save disk space but still retain precision.
- 5. Under **Sensor Info**, you must enter sensor-specific information that is obtained either from the data header information or from the data distributor.

Use the **Data View** option from the Import/Export dialog or **Tools ->fio View Binary Data** from the ERDAS IMAGINE menu bar to read the image header data.

- 6. Under Apply to, select Row or Column. See the previous section on "Adjust Brightness" for information about row and column selection.
- 7. Under the Surface Definition section:
 - select Flat for shuttle or aircraft data, such as SIR-A or B, or AIRSAR, or
 - select Spheroid for satellite data (ERS-1, Fuyo (JERS-1), RADARSAT, etc.)
- 8. Click OK in the Slant Range Adjustment dialog.A Job Status dialog displays, indicating the progress of the function.

- **9.** When the Job Status dialog indicates that the job is 100% complete, click **OK** (if the dialog does not close automatically).
- **10.** After processing is completed, you must view and evaluate the resultant image and decide if another pass is needed to obtain the desired results.

IMAGINE Vector[™]

ERDAS IMAGINE Tour Guides

IMAGINE Vector™

Introduction

The IMAGINE Vector capabilities are designed to provide you with an integrated GIS package for raster and vector processing. The vector tools in ERDAS IMAGINE are based on the ESRI vector data model, therefore ArcInfo vector coverages, ESRI shapefiles, and ESRI SDE vectors can be used in ERDAS IMAGINE with no conversion.

By integrating raster and vector data into one system, you can compile a complete database of your study area. You can overlay vectors onto current and accurate raster layers to update your vector information, including attributes. You can also use vectors to define an area of interest for an operation, such as classification or enhancement.

The IMAGINE Vector capabilities are divided into these levels:

- Native—vector capabilities that are native to ERDAS IMAGINE. These functions provide vector and attribute display and query using multiple selection tools, as well as vector creation and editing.
- IMAGINE Vector module—an add-on module for ERDAS IMAGINE that provides you with additional vector utility tools and importers/exporters of various vector formats. The utility tools include coverage clean, build, transform, create-label, raster to vector and vector to raster conversion, and a table tool for an INFO database. The importers/exporters handle the following data formats: DFAD, DGN, DLG, DXF, ETAK, IGES, SDTS, TIGER, and VPF.

This tour guide mainly discusses the IMAGINE Vector module. Depending on the package you are using, you may not be able to perform all of the steps. The **Native** capabilities are discussed in "Vector Querying and Editing".

This tour guide covers the following topics:

- copying vector data
- manipulating information attributes
- displaying vector layers
- changing vector symbology
- building and cleaning layers

The data used in this tour guide are in the <IMAGINE_HOME>/examples directory. Replace <IMAGINE_HOME> with the directory where ERDAS IMAGINE is installed on your system (for example, /usr/imagine/880).

A Digitizing Template is supplied in the information packet for ERDAS IMAGINE.

The vector data provided with ERDAS IMAGINE do not have write permission, therefore you need to copy them to another directory so that you can edit them. However, vector layers are not simple files. They are stored in directories called workspaces. Using the simple UNIX copy commands does not copy all of the necessary files. You must use the **Copy** utility provided with ERDAS IMAGINE.

NOTE: If you do not have the full IMAGINE Vector module, you do not need to move the data, since you cannot edit it.

<u>۳</u>--

Approximate completion time for this tour guide is 55 minutes.



Move to the directory where you want to create your workspace. Start ERDAS IMAGINE from this directory. Make sure this is a directory in which you have read/write permissions.

1. Click the Vector icon from the ERDAS IMAGINE icon panel.



The Vector Utilities menu opens.



Depending on the package you have, you may not see all of these utilities.

IMAGINE Vector

This menu lists most of the tools of the IMAGINE Vector module. Through simple dialogs generated from this menu, you can:

- Clean a vector coverage
- Build topology
- Copy, Rename, Delete, and Externalize vector layers (native functions)
- Subset vector layers
- Mosaic polygon layers
- Transform vector coverages from digitizer units to real-world units
- Create polygon Labels
- Convert Raster to Vector layers and Vector to Raster layers
- Manipulate information tables using the Table Tool
- Generate polygon attributes from a background image (Zonal Attributes)
- Convert an ASCII File to a Point Layer

NOTE: Creating vector layers and vector editing tools are available through the Viewer. If you have the IMAGINE Vector module, you can also use the Import icon to access various external vector data types, such as DFAD, DGN, DLG, DXF, SDTS, TIGER, and VPF.

NOTE: The vector utilities in the **Vector Utilities** menu should not be run on open vector layers. Close the layer you are using before running the utility, and do not attempt to open the layer until the process is complete.

2. Select Copy Vector Layer from the Vector Utilities menu.

The Copy Vector Layer dialog opens.

F -t	Copy Vector Layer Vector Layer to Copy: (".arcinto)	Output Vector Layer: (*.arcinfo)	×
Enter vector layer to copy here or simply click here		zonelli	-
	into	bridge1_fin_images	
Enter new vector layer name here	Tektures vitusijs zone00 ·	vgistour vvv zone00	•
Click here to start copy	OK. Batch	Cancel Help	

- 3. In the Copy Vector Layer dialog under **Vector Layer to Copy**, enter the file name **zone88**.
- 4. Under **Output Vector Layer**, enter **zone88** in the directory of your choice.
- 5. Click OK in the Copy Vector Layer dialog.

A Job Status dialog displays to track the progress of the function. When copying is complete, you are ready to proceed with this tour guide.

6. Click **OK** in the Job Status dialog (if it does not dismiss automatically).

The Copy Vector Layer dialog automatically closes.

7. Click Close in the Vector Utilities menu to dismiss it.

Manipulate Info Files

The Table Tool is a utility for managing INFO files. It allows you to view, edit, relate, import/export, copy, rename, delete, merge, and create INFO tables.

Prepare

ERDAS IMAGINE must be running and you must have completed the previous section, "Copy Vector Data".

Start Table Tool

1. Click the Vector icon icon on the ERDAS IMAGINE icon panel.

The Vector Utilities menu opens.

2. In the Vector Utilities menu, click Start Table Tool.

The Table Tool opens.

_			Table D									
File	Edt	Ublities	Relate	View	Help							
2					-1	+8	-11	-8	100	8	ю.	
Ro	w											
-	_	_	_	_	_	_	_	_	_	_	_	
												lh.

3. Click Close in the Vector Utilities menu to clear it from the screen.

Display an INFO File

In the Table Tool, click the Open icon select File -> Open from the menu bar.

The Open Info Table dialog displays.

Click here to select ZONE88.PAT►	Open Info Table Enter the info directory path: (*.info) c.Ausers/info Table List (Total: 4); 20NL08.0A1 DK Browne Close Copy Rename Delete Merge Disniss Help	 Click here to select the info directory path Click here to open the selected info table 	
	Record# Item#	Recier:	

5. In the Open Info Table dialog, click the Open icon to select the **info directory path**.

The Enter the info directory path dialog opens.

- 6. Under **Directory**, check to be sure that the directory to which you copied **ZONE88** is listed. If it is not, type that directory path in under **Filename** and press Enter on your keyboard.
- 7. In the file list under Filename, click info and then click OK.

The directory path and table list for **info** display in the Open Info Table dialog.

NOTE: You can double-click any table name to browse the table contents before clicking **OK** to open that table.

8. In the Open Info Table dialog under **Table List**, click **ZONE88.PAT** and then click **OK**.

The information for **ZONE88.PAT** displays in the Table Tool CellArray.

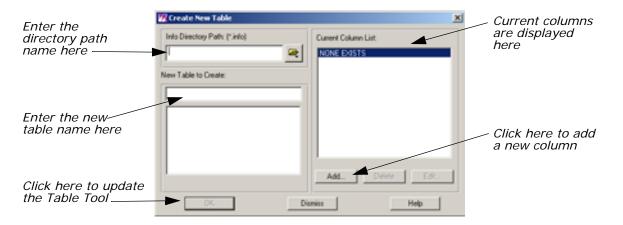
Edik Usik		- - - - - - - - - - -	<u>6</u> . •		
low	AREA	PERIMETER	ZONE88#	ZONE884D	ZONING
1	-470535232.000	120641.367	1	0	0
2	10165996.000	22991.404	2	1	3
3	20490174.000	30434.029	3	2	2
4	39706340.000	40641.965	4	3	23
5	55370640.000	47900.059	5	4	15
6	3267097.500	10308.367	6	5	1
7	2791427.000	7177.106	7	6	1
8	12369503.000	20990.100	0	7	4
9	4202449.500	10005.494	9	0	0
10	9044407.000	24204.061	10	9	7
11	70444104.000	106172.047	11	10	4
12	72101.367	1212.350	12	11	21
13	2407014.250	6807.226	13	12	22
14	567419.125	3070.611	14	13	13
15	625020.875	3926.702	15	14	16

Create a New Table

1. In the Table Tool, click the New icon 🗋 .

A second Table Tool displays. The new Table Tool CellArray is blank.

In the new Table Tool, select File -> New.
 The Create New Table dialog opens.



 In the Create New Table dialog, enter the name of an Info Directory Path in which you have write permission, or click the Open icon to select the directory to put the new table in.

The table list for the path you selected displays in the Create New Table dialog.

4. In the Create New Table dialog under **New Table to Create**, enter the name **ZONE88_NEW.PAT**, and then click **Add**.

The New Column dialog opens.

	Column Name:	20NE80-0	Enter the new column name here
	After Column:	NONE DOSTS	
	Column Type:	İnteger 📃	Click here to select
Click here to add	Internal Width:	4 -	the column type
the new column to the column list in	Display Width:	8	
the Create New	Decimal Places:	0 -	
Table dialog	C OK 1	Cancel Help	

- 5. In the New Column dialog next to Column Name enter ZONE88-ID.
- 6. Next to Column Type click the dropdown list to select Integer.
- 7. Click OK in the New Column dialog.
- 8. Click OK in the Create New Table dialog.

The new table is entitled **ZONE88_NEW.PAT** and has a column entitled **ZONE88-ID**.

💋 Create New Table	×	1
Into Directory Path: (".into) c./users/into	Current Column List 200455340	Column associated with the new table
New Table to Create:		
ZONE88 TIC	Add Delete Edk	New table name
OK I	Diamiss Help	

NOTE: If you create a new table by clicking **File -> New** in an existing table, the existing table is used as a template and the column definitions of the existing table are listed in the Create New Table dialog as the default columns of the new table.

Copy From One Table to Another

1. In the **ZONE88.PAT** Table Tool, click in the column title of **ZONE88-ID** to select that column.

The column is highlighted in blue.

- In the ZONE88.PAT Table Tool, right-hold in the column title ZONE88-ID to select Column Options -> Copy.
- In the ZONE88_NEW.PAT Table Tool, click the column title ZONE88-ID to select it and then right-hold Column Options -> Paste.

The ID numbers for **ZONE88-ID** are entered into the new table, and the **ZONE88-ID** column is highlighted in blue.

Add a Column to the Table

 In the ZONE88_NEW.PAT Table Tool, select Edit -> Add A Column from the menu bar.

The Add Column dialog opens. This dialog is similar to the New Column dialog.

- 2. In the Add Column dialog next to Column Name enter NEW_ZONING.
- 3. Next to Column Type click the dropdown list to select Integer.
- 4. Click **OK** in the Add Column dialog.

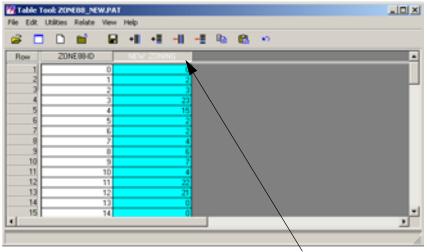
The NEW_ZONING column is added to ZONE88_NEW.PAT.

Relate the Tables

Let's say that you want to compare the **Zoning** information in **ZONE88.PAT** with some new zoning information that you have just received. First, you would need to enter the new zoning information in the **NEW_ZONING** column of the **ZONE88_NEW.PAT** Table Tool.

 Follow the example and enter imaginary numbers, which somewhat differ from the **ZONING** numbers, into the **NEW_ZONING** column. (Enter the numbers by clicking in each cell, typing the number, and pressing Enter on your keyboard.)

NOTE: For this example, it would suffice to only enter numbers for rows 1 through 13. To enter numbers, select **Edit -> Enable Editing**.



Enter the new Zoning info in this column

If you had an ASCII file with the new data in it, you could use the **Column Options -> Import** option.

- In the ZONE88_NEW.PAT Table Tool, click the Save icon icon save your changes.
- In the ZONE88_NEW.PAT Table Tool, select File -> Close from the menu bar.
- In the ZONE88.PAT Table Tool, select Relate -> Relate from the menu bar.

The Relate Manager dialog opens.

In the Relate Manager dialog, click New.
 The Creating New Relate dialog opens.

	Creating New Relate	×
Enter a name for	Relate Name:	
the Relate here —	Comparison	Click here to select
	Source Column:	the source column
	20NE00HD	-
	Target Info Directory: (*)	Enter the name of the
	c./users/into	directory path here or click the icon to select
	Target Table:	a path
	ZONE88_NEW.PAT	<u> </u>
Click here to	Target Column:	
update the Relate Manager dialog	Z0NE8940	Click here to select
5	OK Dismiss Help	the target table

- 6. In the Creating New Relate dialog under **Relate Name**, enter the name **Comparison**.
- 7. Under Source Column, click the dropdown list and select ZONE88-ID.
- 8. Under Target Info Directory, enter the path in which you saved the **ZONE88_NEW.PAT** Table Tool (if it is not already listed).
- 9. Under Target Table, click the dropdown list and select **ZONE88_NEW.PAT**.
- 10. Click OK in the Creating New Relate dialog.

The Creating New Relate dialog closes and the information displays in the Relate Manager dialog.

🙀 Relate Manager		×	
Relate List:	Relate Description:		
Comparison	Source Column:	OK.	— Click OK in the
	20NE0840	Edk	Relate Manager
	Target Info Directory.	New_	
	c:/users/info	Open	
	Target Table:	Save	
	ZONE88_NEW.PAT	Delete	
	Target Column	Dismiss	
	20NE8840	Help	

NOTE: At this point, you can click **Save** in the Relate Manager dialog to save the relates to a table for future use.

11. Click **OK** in the Relate Manager dialog.

ZONE88.PAT is now related to **ZONE88_NEW.PAT**.

: 🗆		R • •	-11 -2 R	6 않 👳	
low	20NE88#	20NE884D	ZONING	R//ZONE88ID	R//NEW ZONING
1	1	0	0	0	(
2	2	1	3	1	
3	3	2	2	2	
- 4	4	3	23	3	2
5	5	4	15	4	1
6	6	5	1	5	
7	7	6	1	6	
8	0	7	4	7	(
9	9	0	0	0	1
10	10	9	7	9	;
11	11	10	4	10	4
12	12	11	21	11	2
13	13	12	22	12	21
14	14	13	13	13	(
15	15	14	16	14	(

This relationship makes it possible for you to compare the different zoning information.

NOTE: Selecting **Utilities -> Table Merge** *enables you to permanently merge the two tables together.*

12. Select **Relate -> Drop** in the related Table Tool to drop the related columns.

Change Vector Symbology

Display a Layer

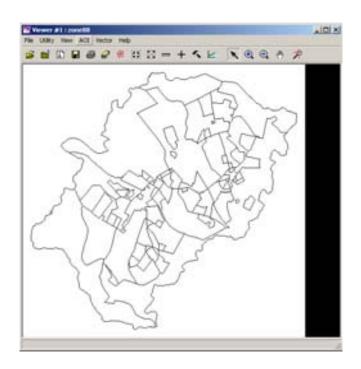
ERDAS IMAGINE must be running and a Viewer open.

 In the Viewer menu bar select File -> Open -> Vector Layer. The Select Layer To Add dialog opens.

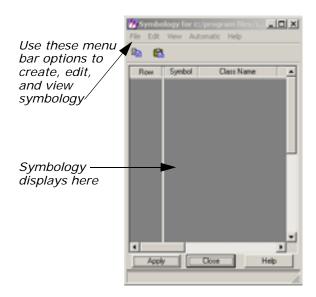
	Select Layer To Add:	x	
Click here tø select the file	1.6 images mg-kb grutinekb grutinekb indomation_files indo indo indo indo	Click he display vector l	the
	Ib3dp-1.1.0 orthobase panorama Textures File name: zone88 Files of type: Arc Coverage	Arc Cove should b file type	oe the

- 2. In the Select Layer To Add dialog, confirm that the File Type selected is Arc Coverage.
- 3. Under Filename, select zone88.
- Click OK in the Select Layer To Add dialog to display the layer in the Viewer.

The **zone88** polygon layer displays in the Viewer, similar to the following example.



 In the Viewer menu bar, select Vector -> Symbology. The Symbology dialog opens.



The Symbology dialog has a CellArray, but it does not yet contain any records.

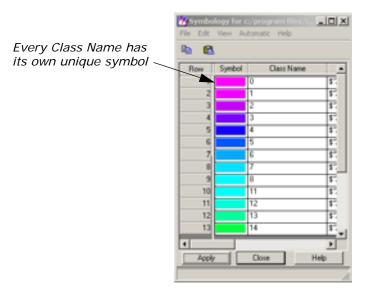
 In the Symbology dialog, select Automatic -> Unique Value. The Unique Value dialog opens.



In this example, you want each zone to have a different symbology.

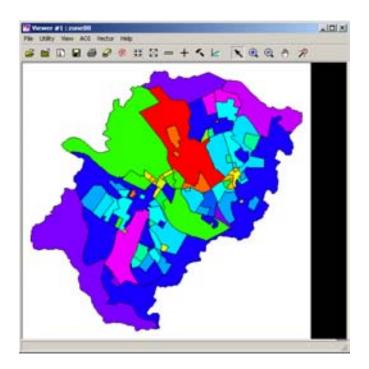
- 7. In the Unique Value dialog, click the dropdown list and select **ZONING**.
- 8. Click the Generate New Styles checkbox to enable it.
- 9. Click OK in the Unique Value dialog.

The Unique Value dialog closes and the CellArray of the Symbology dialog fills with the newly generated styles.



10. Click **Apply** in the Symbology dialog to apply this new symbology to the displayed layer.

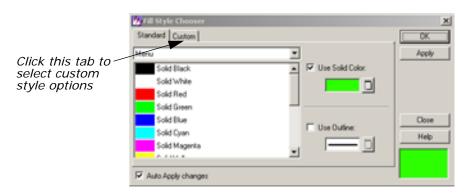
The vector layer is redrawn with the new symbology. As the Symbology CellArray indicates, red areas are zone 23, green are zone 15, dark blue are zone 4, etc.



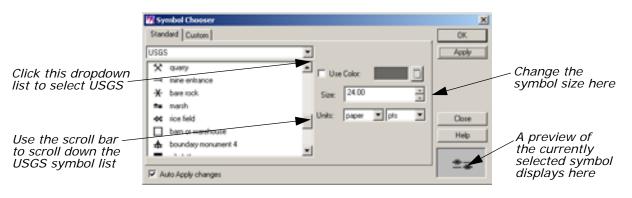
Add Pattern Polygon Fill

Now, change the style of zone 15 (green) from a plain solid to a pattern fill over a solid.

 In the Symbology dialog, hold in the Symbol column for Zone 15 (Row number 14) and select Other. The Fill Style Chooser dialog opens.



- 2. In the Fill Style Chooser dialog, click the **Custom** tab at the top of the dialog.
- 3. Click the Use Pattern checkbox to activate it.
- Hold on the Symbol dropdown list and select Other. The Symbol Chooser dialog opens.



- 5. Click the dropdown list and select **USGS** to display the available USGS symbols.
- 6. Scroll through the symbol list under **USGS** and click the **marsh** symbol.

NOTE: This zone is not really marsh; this example is simply to show you how the pattern fill option works.

7. Change the symbol Size to 24.00 points.

The preview window in the Symbol Chooser dialog displays the symbol and the symbol size you have selected.

8. Click Apply and then Close in the Symbol Chooser dialog.

The preview window in the Fill Style Chooser dialog displays the symbol and the symbol size you selected in the Symbol Chooser dialog.

 In the Fill Style Chooser dialog, change both the X Separation and Y Separation to 10.00 points.

The new style displays in the preview window.

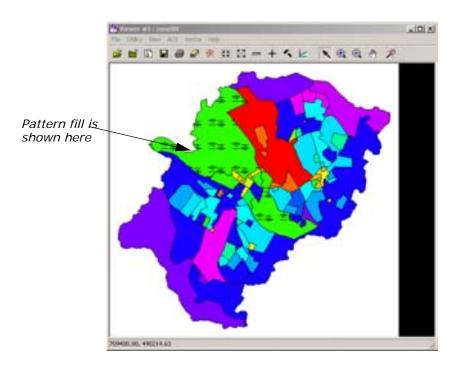
🙀 (Edited) FillStyle Style Chooser		x	
Standard Custom		COK I	
🖓 Use Solid Color.	Use Outine:	Apply Save	
Use Pattern		Delete Rename	
Symbol 主	X Separation: 10.00 2	Close Help	This is the new style
🔽 Auto Apply changes		** **	now style

10. Click Apply and then Close in the Fill Style Chooser dialog.

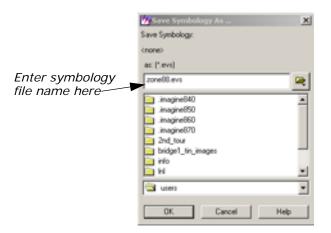
The Fill Style Chooser dialog closes and the new style displays in the Symbology dialog.

11. Click **Apply** in the Symbology dialog to apply this new style to the vector layer in the Viewer.

The polygons in Zone 15 are redrawn with the pattern fill, as in the following example:



12. In the Symbology dialog, select File -> Save As. The Save Symbology As dialog opens.



13. In the Save Symbology As dialog, enter a name for the symbology file, such as **zone88.evs**, in the directory of your choice.

If you use the same root name as your coverage, then this is the default symbology file when you open this vector layer later.

14. Click OK to save the file.

15. Click Close in the Symbology dialog.

16. Select File -> Clear from the Viewer menu bar.

Build Topology

After you have created or edited a vector layer, you must clean or build it to create or maintain the topology and reset the tabular information. If possible, it is always better to run Build instead of Clean. Clean is required only if lines intersect at locations other than nodes, or if there are dangling lines that you wish to automatically delete. This is not the case in this exercise, so you run Build on the new vector layer you just created.

The instructions for running Clean are included at the end of this tour guide for your reference.



Do not clean or build an open vector layer and do not attempt to open a layer that is being cleaned or built.

œ

In order to complete this section, you must have already completed the exercises in *"Vector Querying and Editing"*. A file you created there, **zone88subset**, is used in this example.

1. Click the Vector icon



on the ERDAS IMAGINE icon panel.

The Vector Utilities menu opens.

2. Select **Build Vector Layer Topology** from the **Vector Utilities** menu.

The Build Vector Layer Topology dialog opens.



- 3. In the Build Vector Layer Topology dialog under **Input Coverage**, enter **zone88subset** (or the name you used for the subset in "Vector Querying and Editing"), making sure you are in the proper directory.
- 4. The Feature should be Polygon.
- 5. Click OK in the Build Vector Layer Topology dialog.

A Job Status dialog displays, indicating the progress of the function.

6. Click **OK** in the Job Status dialog when the build is complete (unless your Preferences are set to clear the Job Status dialog upon job completion).



If you get error messages when trying to display a vector layer in ERDAS IMAGINE, build or clean the layer, then try displaying it again. Do not build or clean an open vector layer and do not attempt to open a layer that is being cleaned or built.

7. Display the vector layer and attribute information to verify that the build ran successfully.



 In the Vector Utilities menu, click Clean Vector Layer. The Clean Vector Layer dialog opens.

	Clean Vector Layer		×
	Input Coverage: (*.arcinfo)	Ville to New Dutput.	Click to write to a new output and then enter the output file
Enter the input	prutmelb ivlo ikūds-1.1.0 panosana Testures vitualgis zone88 examples	imagine040 imagine050 imagine050 imagine050 imagine070 ind_sour bridge1_tin_images info	name here
	Feature: Polygon CK Batch	Fuzzy Tolerance: 10.00000 = 2 Dangle Length: 0.00000 = 2 Cancel Help	

- 2. In the Clean Vector Layer dialog under Input Coverage, enter the name of the layer to be cleaned (for example, **zone88**).
- 3. Click the **Write to New Output** checkbox and enter a name for the new file. This file name must not be longer than 13 characters.

NOTE: Although creating a new file is not necessary, we recommend that you do create a new file.

- 4. The Feature should be Polygon.
- 5. For this example, accept the default values for **Fuzzy Tolerance** and **Dangle Length**.

Fuzzy Tolerance and Dangle Length

In general, fuzzy tolerance can be calculated using this formula:

 $(\frac{\text{scale}}{\text{\# of inches per coverage unit}}) \times 0.002$

For example, an input source map at a scale of 1:600 with coverage units in feet would have a fuzzy tolerance of .1:

$$\left(\frac{600}{12}\right) \times 0.002 = 0.1$$

The dangle length value is based on the length, in map units, of the longest overshoot that exists in the coverage. The value specified removes any dangling lines that are less than, or equal to, the value you specify. Any lines longer than the length specified remain in the coverage. To measure the dangle length needed for your coverage, you can use the Measurement Tool to measure lines in the coverage.

6. Click **OK** in the Clean Vector Layer dialog.

A Job Status dialog displays, indicating the progress of the function.

7. When the clean is completed, click **OK** in the Job Status dialog (unless your Preferences are set to clear the Job Status dialog upon job completion).

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