



Esri International User Conference | San Diego, CA
Technical Workshops | Tuesday, July 12th, 2011

Introduction to Imagery and Raster Data in ArcGIS

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Overview of Presentation

- **Varieties - types of rasters**
- **Raster properties**
- **Display Raster Data in ArcMap**
- **Display a Mosaic Dataset**
- **Process Raster Data in ArcGIS**
- **Expectations for ArcGIS 10.1**
- **Questions / Comments**

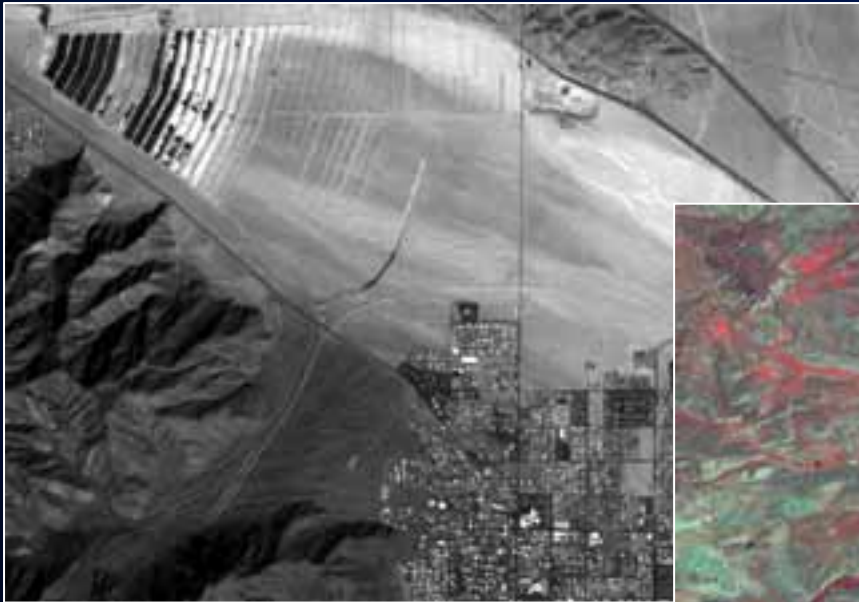
Varieties of Imagery and Raster Data

Aerial Imagery



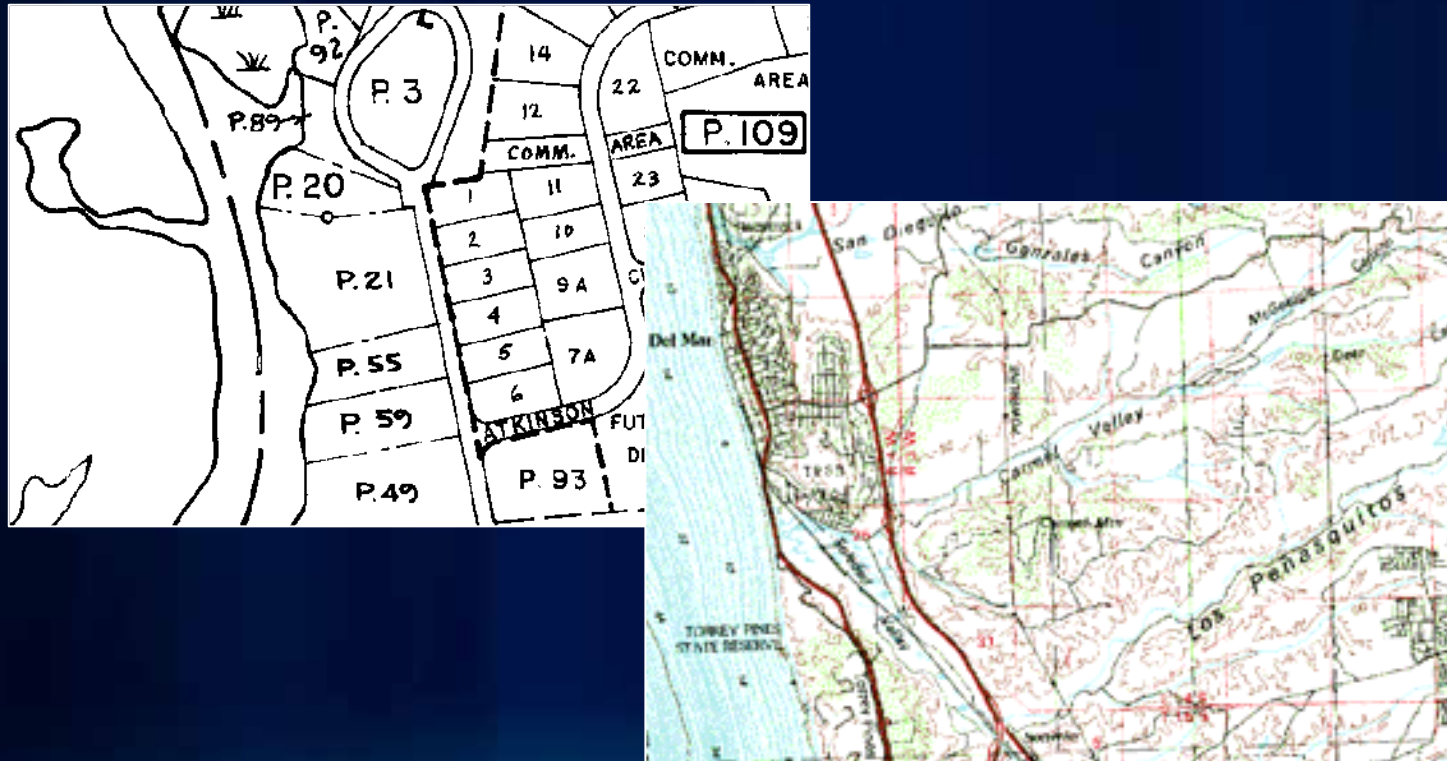
Varieties of Imagery and Raster Data

Satellite Imagery



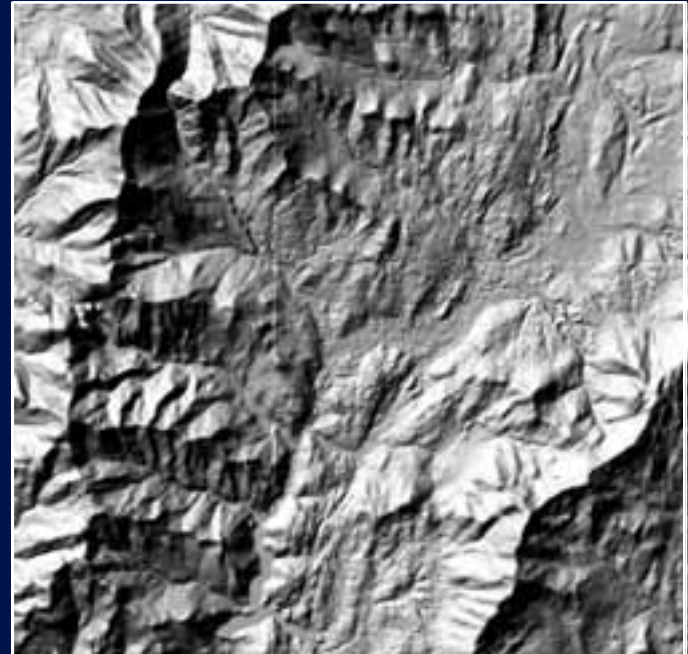
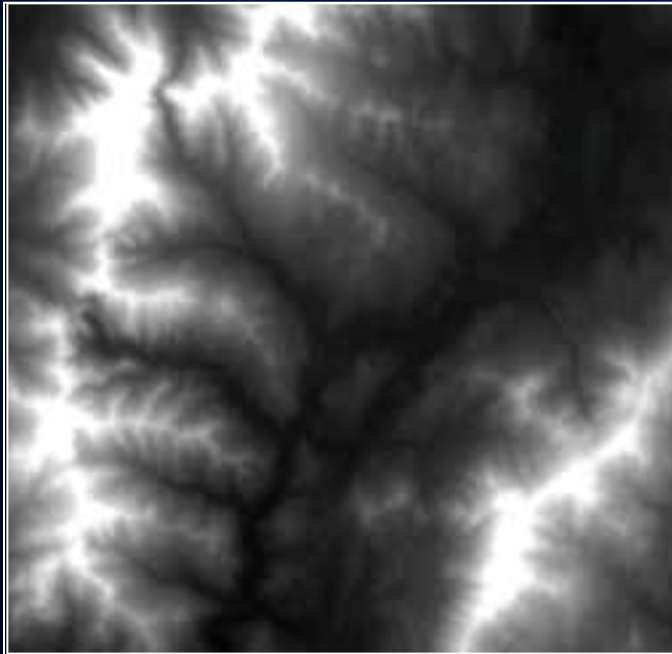
Varieties of Imagery and Raster Data

Scanned Maps or Base Maps



Varieties of Imagery and Raster Data

Elevation / Hillshade



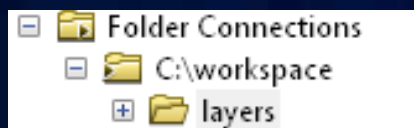
Varieties of Imagery and Raster Data

Pictures or Graphics

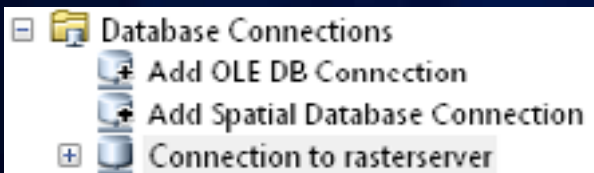


Adding Imagery and Raster Data

- **File on disk**



- **Geodatabase**

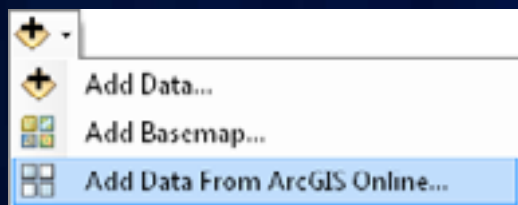


Mosaic dataset

- New at Version 10
- Images remain in original formats
- Metadata is stored in attributes
- Able to manage large collections of data

Adding Imagery and Raster Data

ArcGIS Online



Map Service

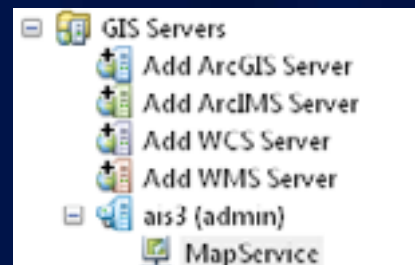
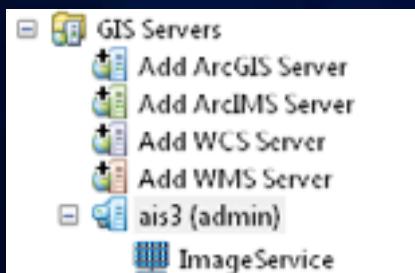
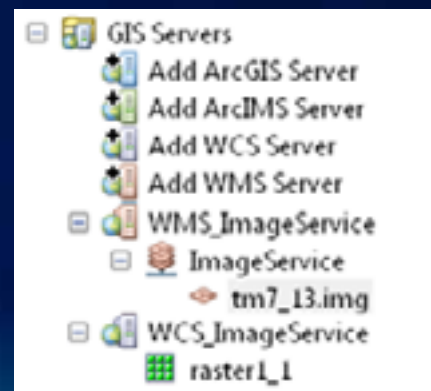


Image Service

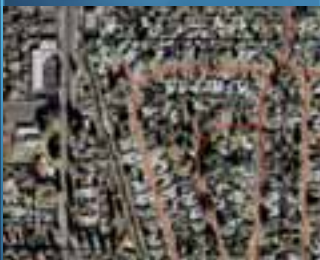


WCS / WMS Service



Using Raster Data Demo

Any license level



Raster Properties

- **Data source**
 - Type of file and location
- **Raster information**
 - Information about the pixels
- **Extent**
 - Top, bottom, left and right extents
- **Spatial reference**
 - Coordinate system information
- **Statistics**
 - Min, max, mean, and standard deviation (per band)

The screenshot shows the 'Raster Dataset Properties' dialog box with the 'General' tab selected. The dialog contains a table of properties and their values. Several rows are highlighted with red rectangles: 'NoData Value' (0), 'Colormap' (absent), 'Pyramids' (present), 'Extent', 'Spatial Reference' (NAD 1927 UTM Zone 12N), and 'Statistics'.

Property	Value
Data Source	
Raster Information	
Columns and Rows	1700, 1520
Number of Bands	1
Cellsize (X, Y)	30, 30
Uncompressed Size	4.95 MB
Format	GRID
Source Type	continuous
Pixel Type	unsigned integer
Pixel Depth	16 Bit
NoData Value	0
Colormap	absent
Pyramids	present
Compression	Default
Extent	
Spatial Reference	NAD 1927 UTM Zone 12N
Statistics	

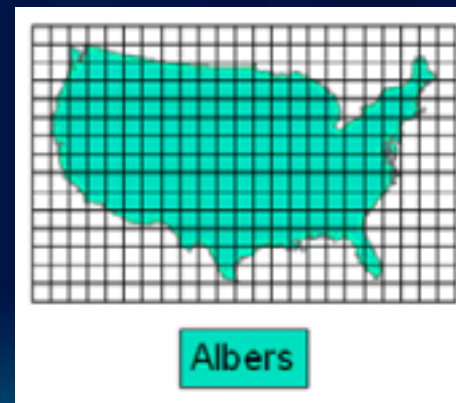
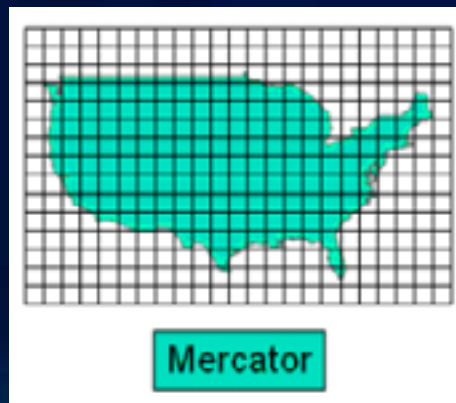
OK

Extent + Spatial Reference = Geographic location

- Extent = top, right, bottom, and left minimum bounding rectangle

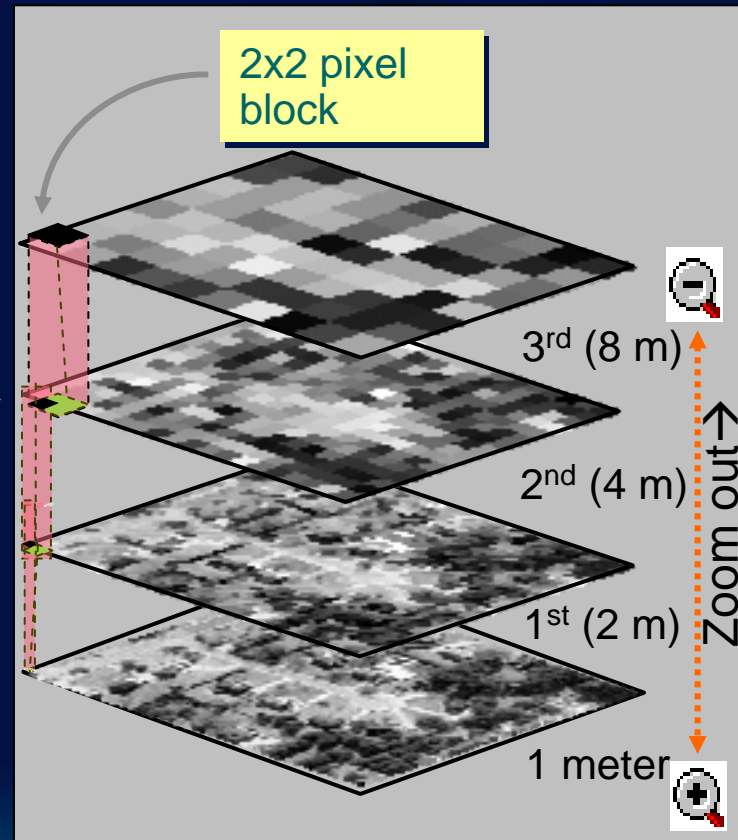


- Spatial reference = projection



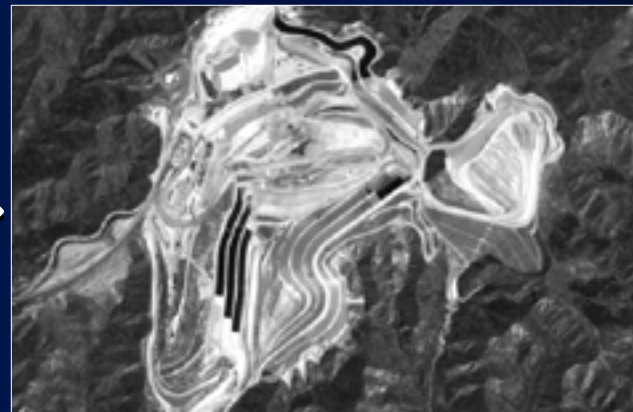
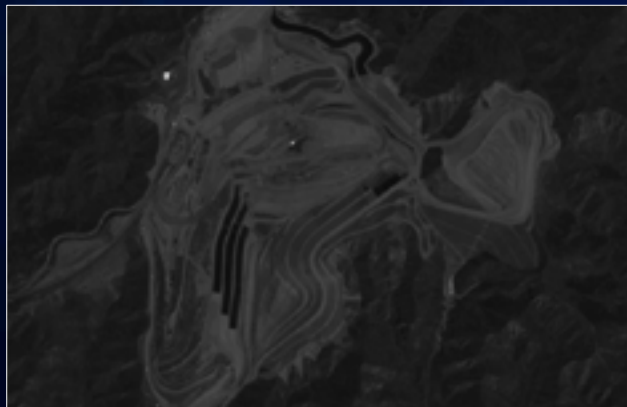
Raster Pyramids

- Multiple resolution dataset layers of the original raster
- Improves display performance
 - Uses closest resolution level, then resampled data is displayed
- Adds additional storage
 - But can now be compressed (10.0)
- Pyramids are not used during analysis



Statistics

- **Calculates the minimum, maximum, mean, and standard deviation for each band**
- **Used in applying a contrast stretch, classifying data, and color correction.**



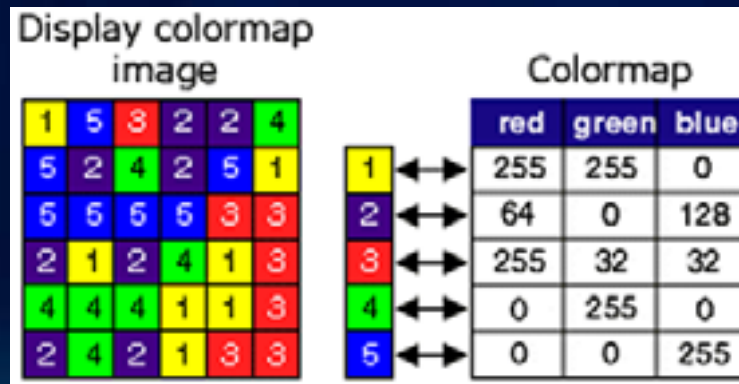
NoData

- **Cells or pixels that do not have data values**
 - NoData and "0" are not always the same.
 - "0" is a valid value
- **Storage**
 - A value for file-based raster
 - A bit mask for ArcSDE, and file-GDB rasters
- **NoData does not participate in statistics calculation**



Colormaps

- **A set of values that are associated with colors (RGB)**
 - Defines how to render each pixel via pseudo color table
 - Used to display rasters consistently with the same colors
 - Especially useful in thematic data or classified imagery
 - a single value represents the class and an appropriate color
- **Able to create your custom CLR in ArcGIS 10**

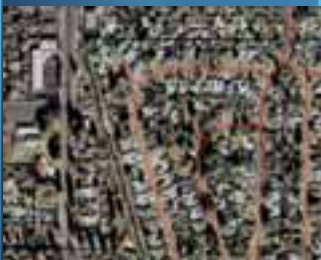


DeKalb County Board

Fulton County Dept. of Health and Wellness/District 3, Unit 2, 04

Raster Properties Demo

Any license level

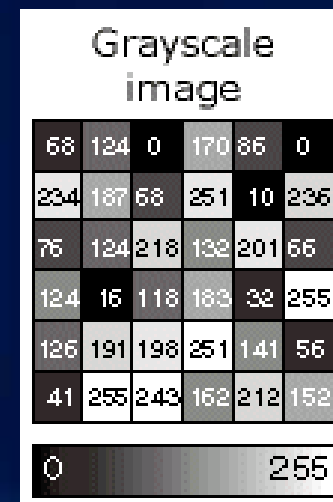
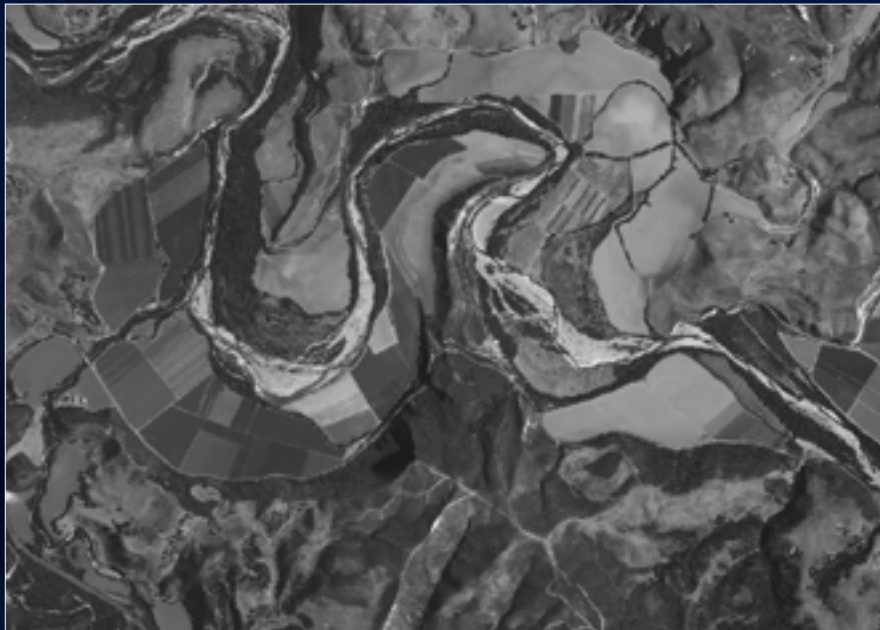


Displaying Raster Data

- **Renderers**
 - Display your data with a renderer that makes your data look good
- **Image Analysis window**
 - Common capabilities in one easy to access location

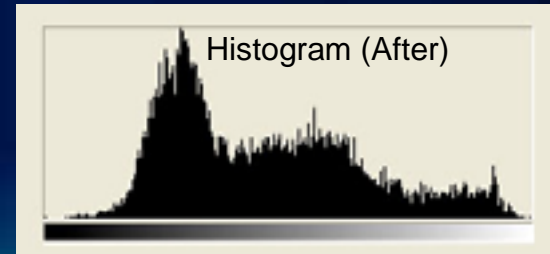
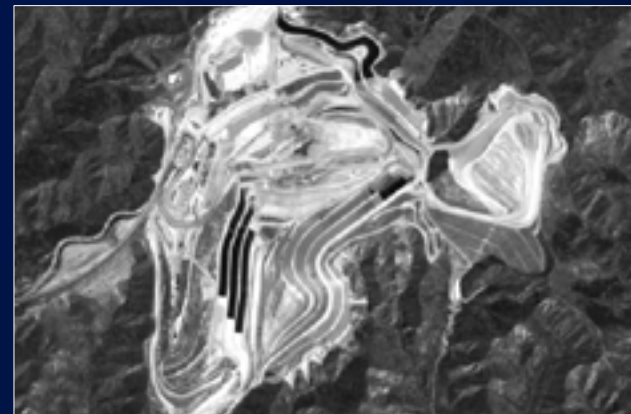
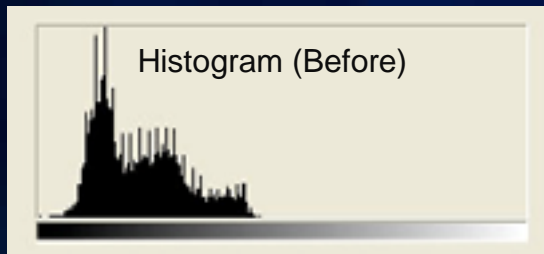
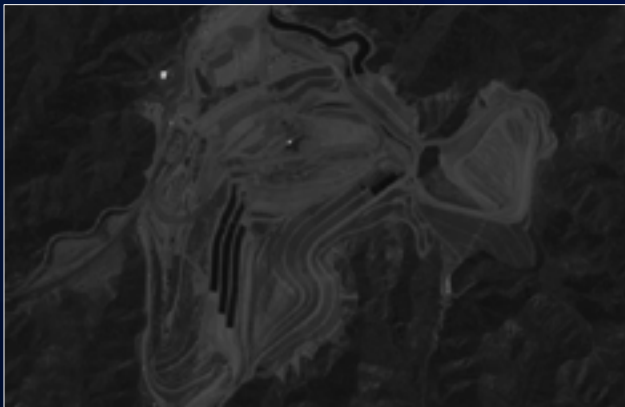
Stretched renderer

- Often used for elevation, satellite and aerial imagery
- **Default:** when raster has more than 25 unique values
 - Stretches values along a color ramp



Stretched renderer

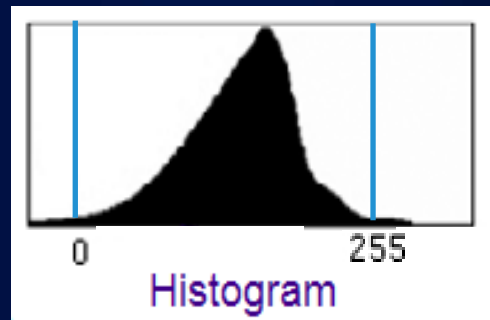
- Stretches values along a color ramp
- Uses a contrast stretch



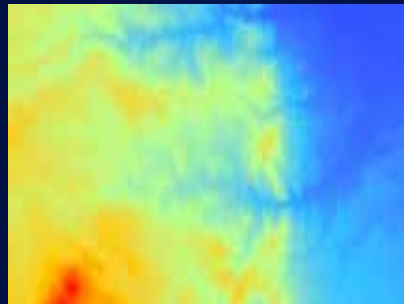
Stretched renderer

NEW at ArcGIS 10

- Percent clip stretch

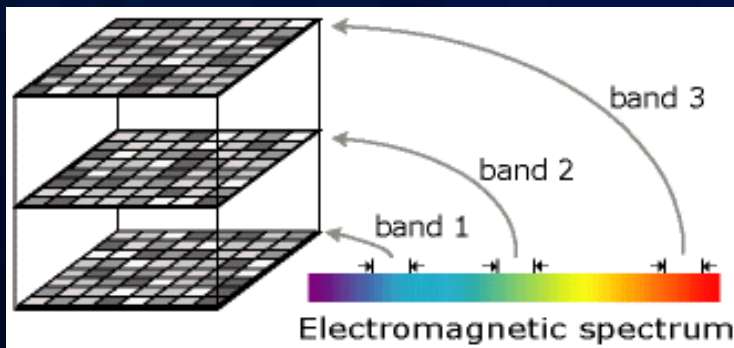


- Advanced labeling



RGB renderer

- Often used for satellite imagery and aerial photos
- **Default: Raster has 3 or more bands**
 - Displays each band through a different color (Red, Green, and Blue)



Unique Values renderer

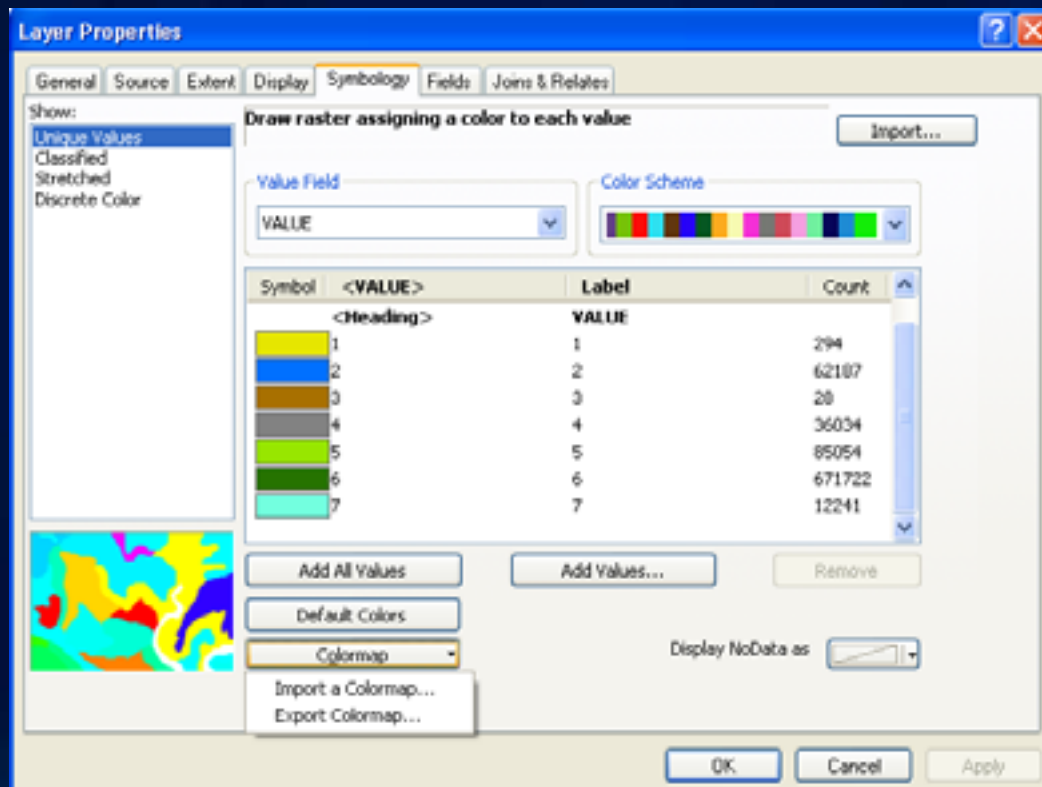
- Often used for land use and scanned maps
- Default: Raster has fewer than 25 unique values
 - Uses random colors for individual values



Unique Values renderer

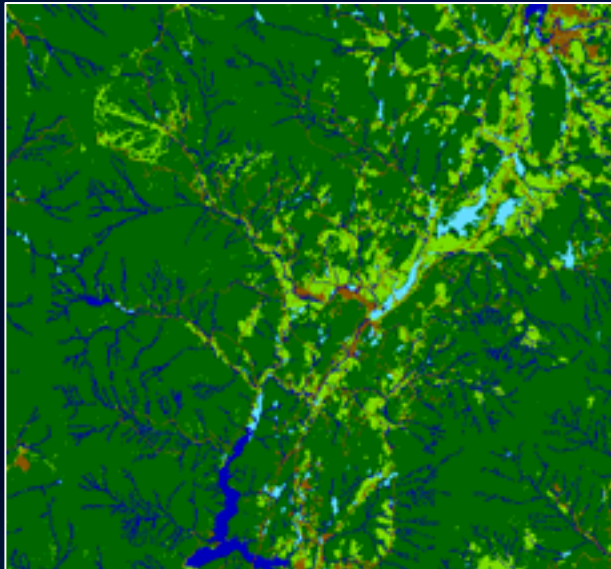
NEW at ArcGIS 10








- Create a custom CLR file



Colormap renderer

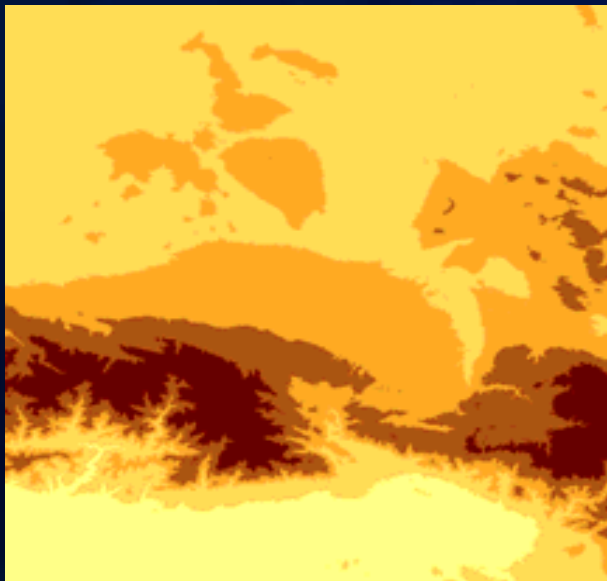
- Often used for land use and soil maps for consistency
- Default: Colormap is present
 - Uses pre-chosen colors for individual values



1 =		= 255 , 255 , 50
2 =		= 0 , 0 , 175
3 =		= 255 , 175 , 20
4 =		= 135 , 90 , 0
5 =		= 120 , 215 , 0
6 =		= 0 , 100 , 15
7 =		= 100 , 220 , 255

Classified renderer

- Often used for grouping data values
- Not a default renderer; can be used for single band data
- Places ranges of pixels into separate categories








Symbol	Range
	0- 500
	501 - 900
	901 - 1,200
	1,201 - 1,700
	1,701 - 3,100

Image Analysis window

- Many rendering and processing tools to make your imagery work easier and faster
- You are able to change the following display parameters:
 - effects tools
 - symbology tools (gamma level, DRA, stretch, etc)
 - choose the resampling method
 - accelerate raster

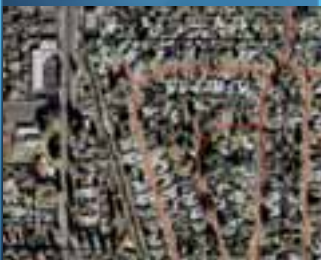
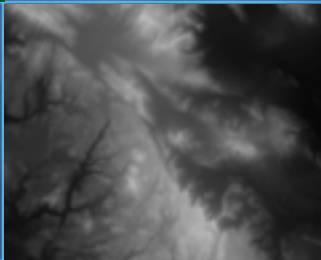


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Raster Display Demo

Any license level



Mosaic Dataset

Optimum Model for Image Data Management

- Quick Catalog
 - All raster datasets
 - Imagery from different sensors
- Create – In Geodatabase
 - Metadata
 - Processing to be applied
 - Default viewing rules
- Access – Any ArcGIS application or as service
- As Image
 - Dynamic Mosaic , Processed on the fly
- As Catalog
 - Footprints, Detailed metadata

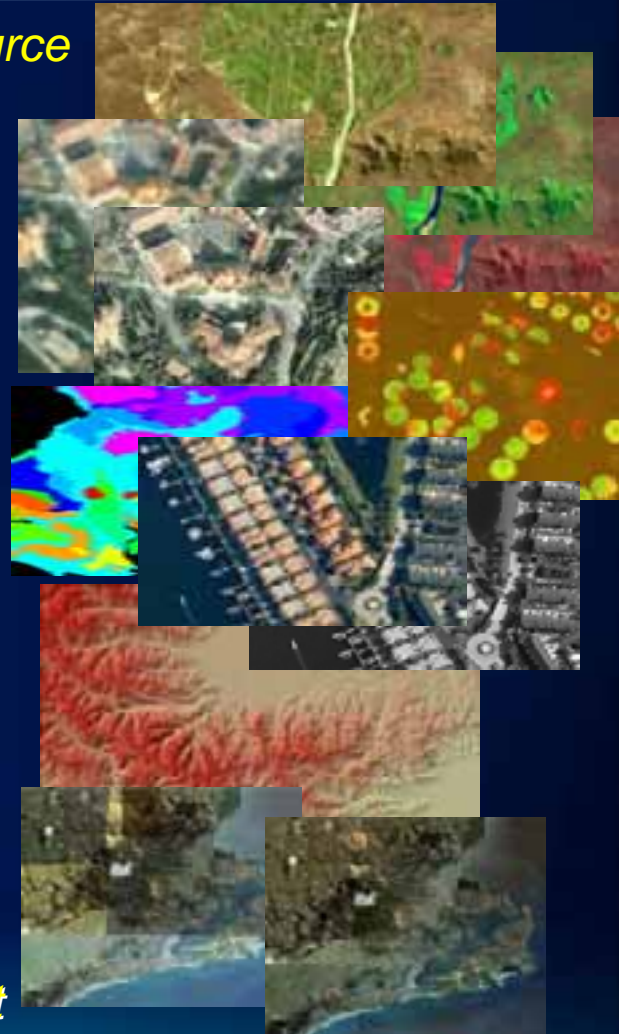


On-The-Fly Processing

Create Multiple Products from a Single Source

- Imagery processed as accessed
- Processes
 - Stretch, Extract Bands
 - Clip, Mask
 - Reproject, Orthorectify
 - Pan Sharpen
 - Vegetation Index, Classify
 - Shaded Relief, Slope, Aspect
 - Color Correction
- Applied to
 - Individual rasters in mosaic
 - Complete Mosaic Dataset

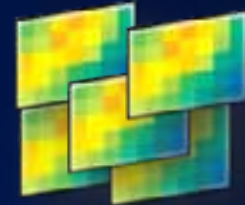
Utilizing the full image information content



Dynamic Mosaicking

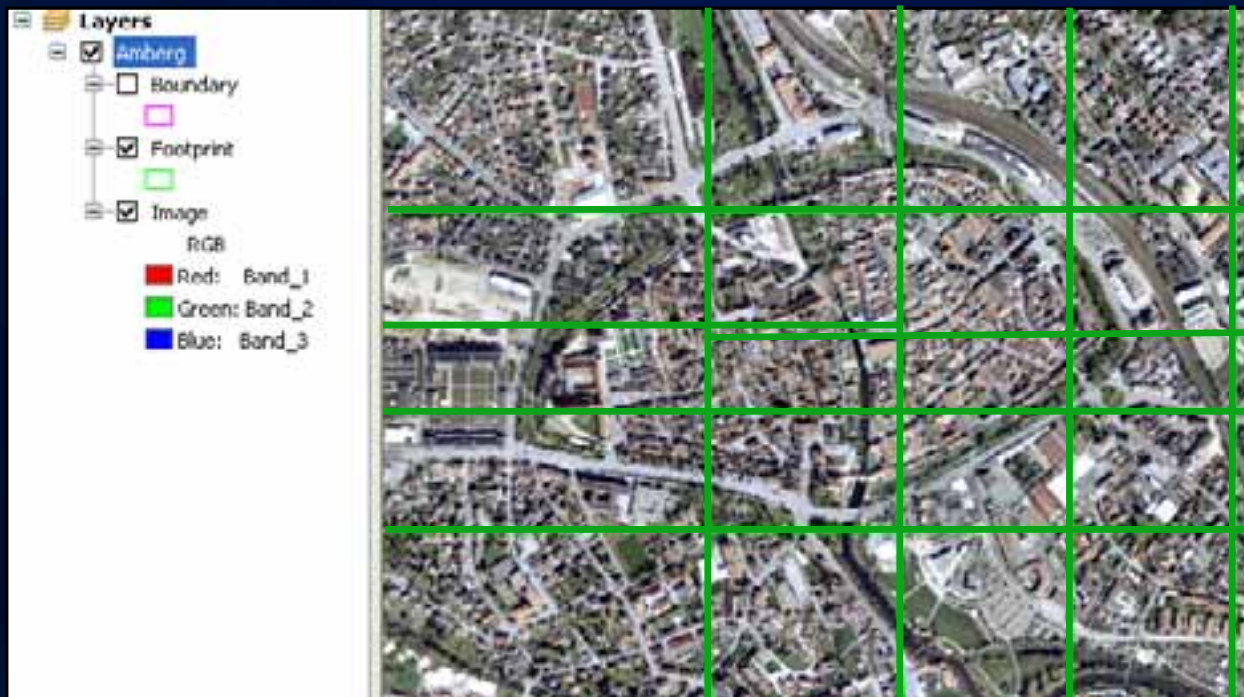
Mosaicking Multiple Images On Demand

- Fuse imagery from multiple sources
- Control of Mosaic Method (Manager/User)
 - By Date – 'Latest', 'Closest to May 2001'
 - By Attribute – 'Highest Sun Angle'
 - By Viewpoint – North, South, East, West
 - Seamline – Feathered blend
- Queries possible – 'Landsat, no clouds, later than June 2001'
 - Display "best" available imagery



Mosaic Dataset rendering

- **Footprint view**
 - View the minimum bounding rectangle for each raster



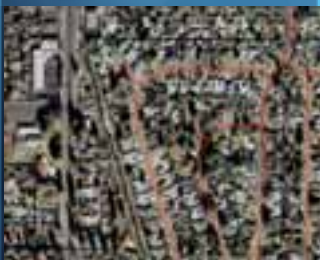
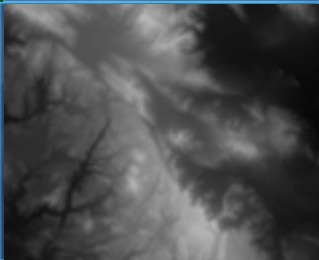
Mosaic Dataset rendering

- **Rendering pixels – similar to a raster dataset**
 - Level of detail – like scale dependency
 - Overviews – display rasters quickly at all resolutions



Mosaic Dataset Demo

Any license level

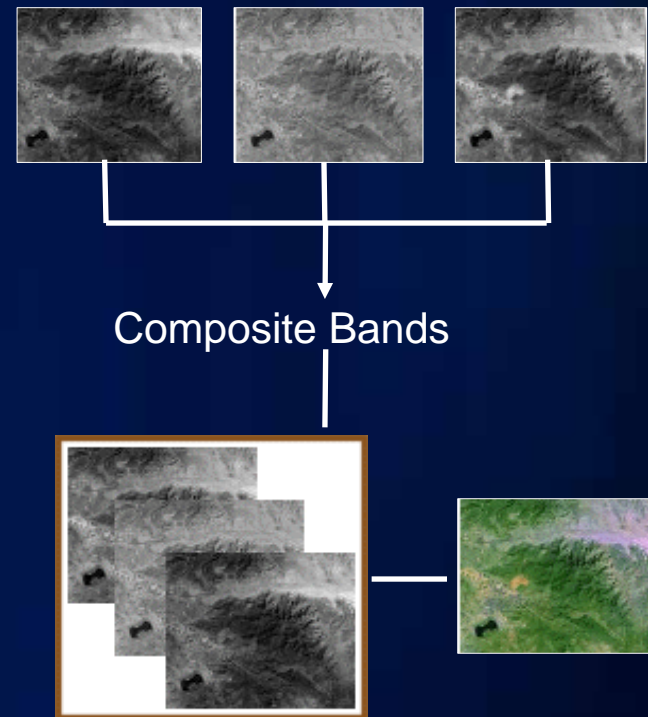


Processing raster data in ArcGIS

- **Combining bands**
- **Clipping**
- **Mosaicking**
- **Pansharpening**
- **Orthorectifying**
- ...

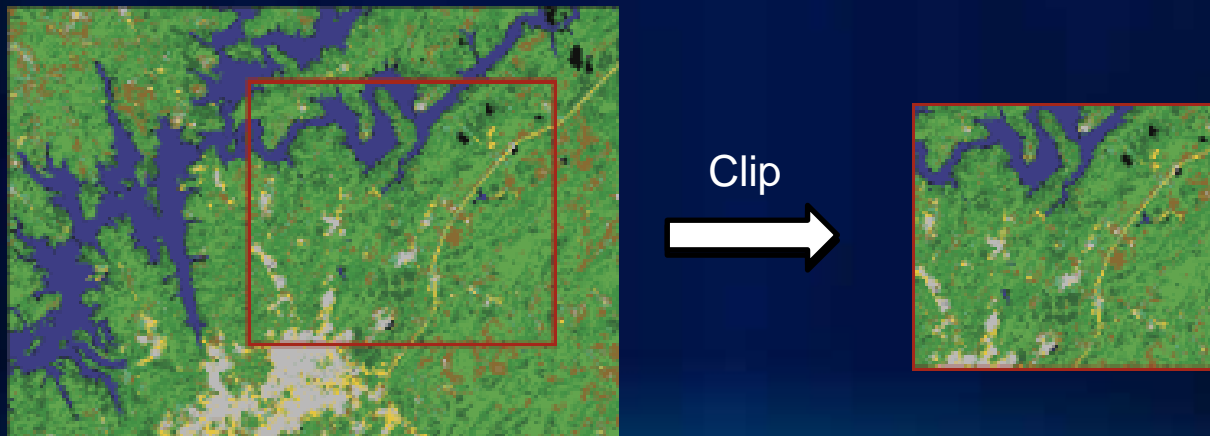
Combining Bands

- Combine many images into a multi-band raster
- Input bands can be from a single or multiple band raster dataset
- Composite with geoprocessing tool, Image Analysis window, or within a mosaic dataset



Clipping

- Clip a portion of raster to fit your study area
- Clip with geoprocessing tools or with Export Data dialog window
- Clip on-the-fly: with Image Analysis window
: within a mosaic dataset



Mosaicking

- **Combine two more adjacent and overlapping rasters together**
- **Many mosaic geoprocessing tools:**
 - Workspace to raster dataset
 - Raster catalog to raster dataset
- **Mosaicking on-the-fly**
 - Mosaic button on the Image Analysis window
 - Mosaic dataset (virtual mosaic)



Pansharpening

- **Fuse a low resolution RGB image with a high resolution panchromatic image**
 - Output is a high resolution color image
- **Geoprocessing tool, raster symbology tab, Image Analysis window, or within a mosaic dataset**



Orthorectify

- **Display an image with more accuracy**
 - Requires an image with sensor model and an elevation source
- **Geoprocessing tool, raster display tab, Image Analysis window, or within a mosaic dataset**

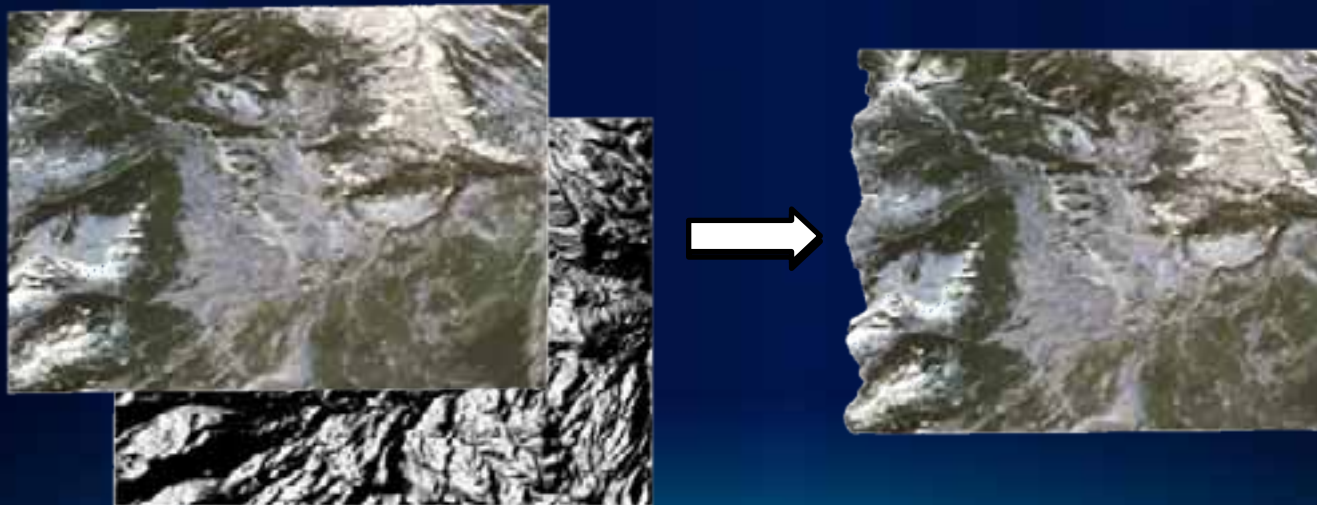
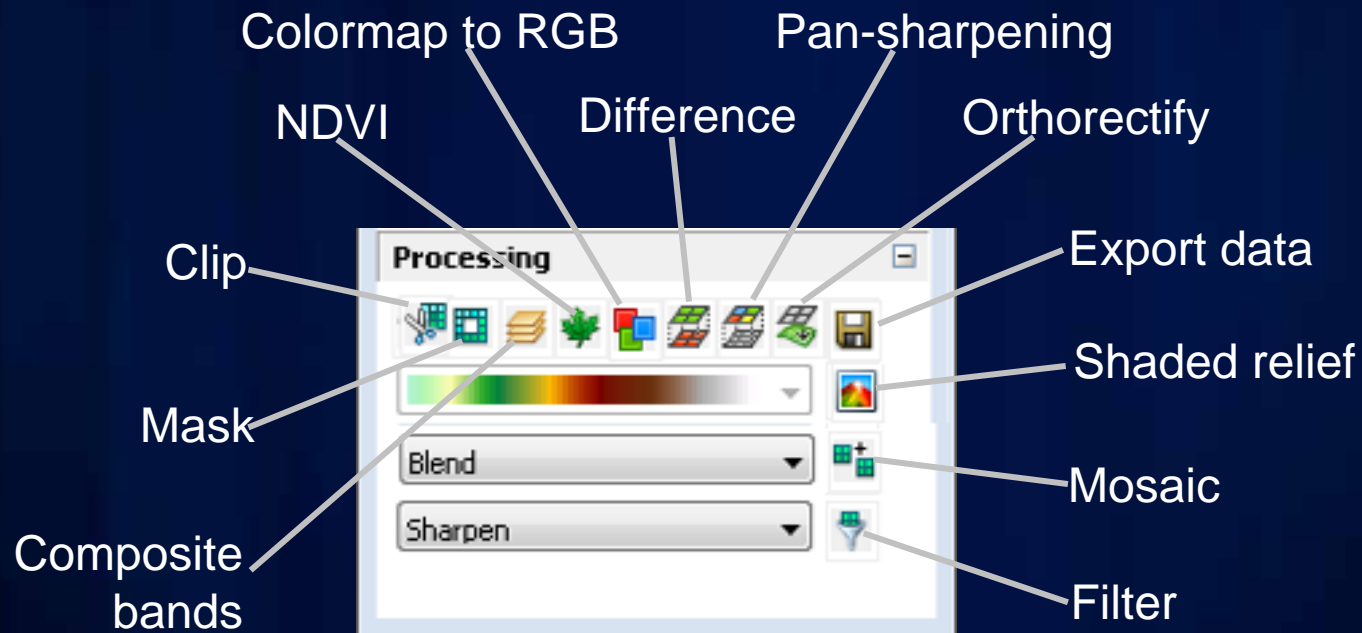
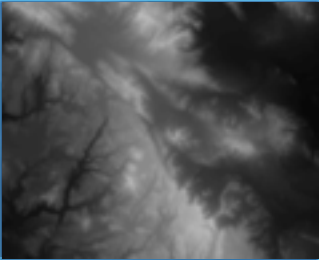
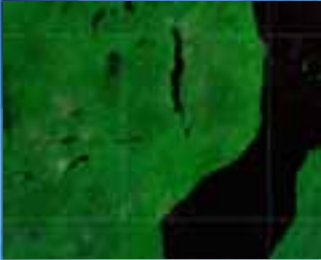


Image Analysis window



Raster Processing Demo

Any license level



What to expect in ArcGIS 10.1

- **More raster formats (16)**
- **Raster products**
- **Image Analysis window updated** - Image mensuration, Interactive histogram stretch, Add function tool
- **Automatic rendering based on data type**
- **New GP tools (8)**
 - Add Raster Function
 - Alter Mosaic Dataset Schema
 - Analyze Mosaic Dataset
 - Set Mosaic Dataset Properties
 - Download Rasters
 - Delete Mosaic Dataset
 - Set Raster Properties
 - Warp From File

What to expect in ArcGIS 10.1

Continued...

- **Batch editing functions**
- **New raster functions (5)**
 - Attribute Table function
 - Band Arithmetic function
 - Radar Calibration function
 - Remap function
 - Speckle function
- **LAS support within mosaic datasets**
- **Improvements for the mosaic dataset**
 - Improved workflows for creating and editing
 - New Raster types (LAS, RADARSAT-2)
 - Able to show colormaps and unique values

Imagery Resource Center

<http://resources.arcgis.com/content/imagery/10.0/about>



Session evaluations

www.esri.com/sessionevals

Recommended Raster Sessions

Managing imagery and
raster using mosaic
datasets (75min)

Tuesday 3:15PM – 15A
Wednesday 8:30AM – 15A

Sharing imagery and
raster data in ArcGIS
(75min)

Tuesday 3:15PM – 14A
Wednesday 1:30PM – 14A

Image processing in
ArcGIS (20min)

Wednesday 8:55AM – 6A

Creating a mosaic
dataset (20min)

Tuesday 9:30AM
Thursday 9:00AM
GDB Island

Georeferencing
imagery (20min)

Tuesday 12:00PM
Wednesday 9:00AM
GDB Island

Color correcting
imagery (20min)

Tuesday 3:30AM
Wednesday 11:00AM
GDB Island

Using the Image
Analysis window
(20min)

Tuesday 4:00AM
Wednesday 3:30AM
GDB Island

Using an image
service in Desktop
(20min)

Wednesday 10:00AM
Web & Server Island

Using mosaic datasets
for serving working with
elevation data (20min)

Thursday 12:00PM
Imagery Island