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**
  - Folder Connections
    - C:\workspace
      - layers

- **Geodatabase**
  - Folder Connections
    - C:\workspace
      - fileGeodatabase

- **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)
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**
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
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
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

- Colormap to RGB
- Pan-sharpening
- NDVI
- Difference
- Orthorectify
- Clip
- Export data
- Mask
- Shaded relief
- Composite bands
- Mosaic
- Filter
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 - Remap function
  - Band Arithmetic function - Speckle function
  - Radar Calibration 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

- **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