Imagery and Raster Data in ArcGIS

Abhilash and Abhijit
Agenda

• Imagery in ArcGIS
• Mosaic datasets
• Raster processing
ArcGIS is a Comprehensive Imagery System
Integrating All Types, Sources, and Sensor Models

Making Imagery Accessible

... Imagery is a Fundamental Part of the Systems
ArcGIS is a Comprehensive Imagery System

- Comes with Imagery
- Provides Advanced Imagery Tools
- Manages Massive Image Collections
ArcGIS Comes With Imagery

Esri Curated

World Imagery
Landsat Natural Vue
World Landsat GLS
World Elevation

From Imagery Providers
From ArcGIS Users
ArcGIS Provides Advanced Imagery Tools
Visualization, Processing and Analysis

- Color Balance
- Mosaicking
- Ortho-Rectification
- Change Analysis
- Classification
- 3D Measurement
- Automatic Alignment
- Pan Sharpen

- Fast
- Dynamic
- Massively Scalable

Open and Leveraged by Partners
ArcGIS Manages Massive Image Collections

Providing Accessibility to all Forms of Imagery

Wide Range of Sensors & Sources
- Satellite, Aerial, Scanned, Processed
- Nadir, Oblique, FMV, Lidar, Radar
- Pan, Multispectral, Float, Categorical

Levels of Imagery
- Static Cache (Backdrop)
- Preprocessed (GIS Ready)
- Raw (Unprocessed)
Image Management Workflow
Using Mosaic Datasets

Highly Scalable, from Small to Massive Volumes of Imagery

Create Catalog of Imagery
Reference Sources
Ingest & Define Metadata
Define Processing to be Applied

Apply:
On-the-fly Processing
Dynamic Mosaicking

Access as Image or Catalog
Image Dissemination
ArcGIS Online
Integrating with & in the Cloud

Register with ArcGIS Online
Massive Accessibility
Content Management
ArcGIS Enables Tools for the Two key User Groups

Imagery Managers
- Manage
- Disseminate
- Large Collections of Imagery

Imagery Users
- Visualization & Analysis
- Simple Accessibility
- Content

Image Management Workflows in Imagery Resource Center
Accessing imagery and raster data

File on Disk
- GeoDatabase
- Image Service

ArcGIS Online
- Add Data...
- Add Basemap...
- Add Data From ArcGIS Online...

Map Service
- WCS / WMS Service
- ais3 (admin)
- MapService
- tm7_13.img
- WCS_ImageService
- rasterL_1
Accessing Imagery In ArcGIS

Abhilash
Mosaic Datasets

Abhijit
Mosaic Dataset - Storage

- A model in geodatabase
- Stored as set of tables
  - Footprint table references source images
  - Boundary, Seamlines
  - Raster type, color correction
- Displayed as a composite layer in Map
  - Boundary
  - Footprint
  - Image
Why Mosaic Dataset?

• A lot of images
  - Ortho images, DEM, scanned maps -> mosaic
  - Sensor images -> process
  - Manage and catalog -> search and retrieve

• Advantages
  - Store efficiently (reference images)
  - Process fast (on-the-fly)
  - Scalable
  - Search easily (selection and query)
  - Update easily
  - Multiple clients
Mosaic Dataset – Mosaic Method

- Mosaic method to set the display order
  - North west (default)
  - Closest to center
  - By attribute
  - Closest to nadir
  - Seamline

- Mosaic operator to resolve the overlaps
  - First/Min/Max/Mean/Blend

- Closest to the center

- By attribute: cloud cover
Creating a Mosaic Dataset

Create Mosaic Dataset tool – Create table schema

<table>
<thead>
<tr>
<th>OID</th>
<th>Shape</th>
<th>Raster</th>
<th>Name</th>
<th>MinPS</th>
<th>MaxPS</th>
<th>LowPS</th>
<th>HighPS</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Polygon</td>
<td>&lt;Raster&gt;</td>
<td>P01.met</td>
<td>0</td>
<td>90</td>
<td>10</td>
<td>30</td>
<td>Primary</td>
</tr>
</tbody>
</table>

• Footprint table – internal raster catalog with more fields

• Parameters to set
  - Define spatial reference
    - Web Mercator or spatial reference used by your organization
  - Number of bands and pixel types
  - **Product definition**
    - Used for automatic band matching
    - Examples: RGB, RGBI, Landset, etc
Adding Rasters

Add Rasters to Mosaic Dataset tool - Populate field values

<table>
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<td>Primary</td>
</tr>
<tr>
<td>2</td>
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<td>&lt;Raster&gt;</td>
<td>P02.met</td>
<td>0</td>
<td>90</td>
<td>10</td>
<td>30</td>
<td>Primary</td>
</tr>
</tbody>
</table>

- Raster value contains a raster function (process definition)
  - References images on disk
  - Process on the fly
  - Contains metadata, statistics, thumbnails

- A raster type defines what to add
  - Understand sensor metadata
  - Construct the raster function
  - Add additional fields
    - Sensor, CloudCover, etc.
Raster Function: 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, Color Correction
  - Vegetation Index, Classify
  - Shaded Relief, Slope, Aspect
  - Dynamic mosaicking
- Applied to
  - Raster datasets
  - Individual rasters in mosaic
  - Complete Mosaic Dataset

Utilizing the full image information content
Enhancing Mosaic Dataset

- Refining Footprint
- Building Seamlines
- Color Correcting Mosaic Dataset
- Build Overview
Publish Image Services

• **Capabilities**
  - Mosaicking, catalog
  - Mensuration, editing

• **Parameters**
  - Transmission format (JPEG, LZ77/LERC)
  - Mosaic methods
  - etc

• **Server raster functions**
  - Register using function template
  - response to client’s request
  - server side on-the-fly image processing
Mosaic Dataset

Abhilash
Processing raster in ArcGIS

Abhijit
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, or Image Analysis window
Clipping

- Clip a portion of raster to fit your study area
- Clip with geoprocessing tool, or Image Analysis window.
Mosaicking

- Combine two or more adjacent and overlapping rasters together
- Mosaic with geoprocessing tool, or Image Analysis window
Pansharpening

- Fuse a low resolution RGB image with a high resolution panchromatic image
  - Output is a high resolution color image
- Pansharpen with geoprocessing tool, or Image Analysis window
Orthorectify

- Increase the geographic accuracy of an image
  - Requires an image with sensor model and an elevation source
- Orthorectify with geoprocessing tool, or Image Analysis window
Image Analysis window

- Clip
- NDVI
- Colormap to RGB
- Difference
- Pan-sharpening
- Orthorectify
- Export data
- Shaded relief
- Mosaic
- Filter
- Mask
- Add Function
- Composite bands
Raster Processing

Abhilash
What’s New in Imagery at 10.2

- More Imagery in ArcGIS Online
- Search for Imagery from Desktop
- More Sensors
- More Raster Functions
- Automated Workflows
- Improved Geoprocessing Tools
- Caching Imagery and Publishing to ArcGIS Online
- Enhanced APIs for Image Services
- Enhanced Use of Image Services in WebMaps