ArcGIS 10.0 Imagery

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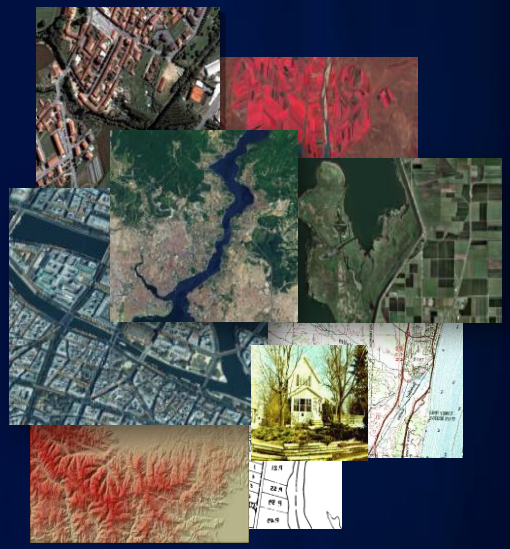
Presentation Overview

- Imagery and raster data
- What is a mosaic dataset
- Use of mosaic datasets
- Build a mosaic dataset
- Migrate to mosaic datasets

- Q&A

Characteristics of Imagery and Raster Data

- Many sources
  - Aerial photographs
  - Satellite imagery from many sensors
  - DEM and scanned maps
  - Analytical data
- High resolution and large volume

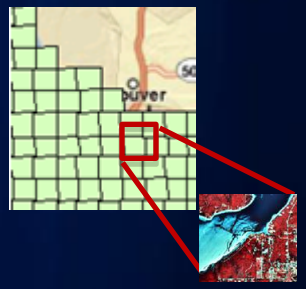


- Requirements:
  - Store efficiently
  - Easy to search
  - Fast to process
  - Accessible

Evolution of Raster Data Models in ArcGIS

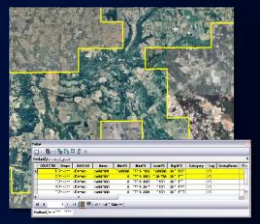
- Raster dataset (8.0)
  - A single image

- Raster catalog (9.0)
  - A collection of raster datasets
  - Managed/unmanaged



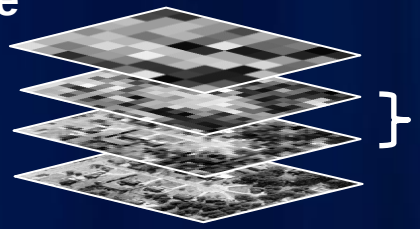
- Image Server (9.2)

- Mosaic dataset (10.0)
  - Enhanced raster catalog with mosaic view and on the fly processing capability
  - Managing and serving a collection of images

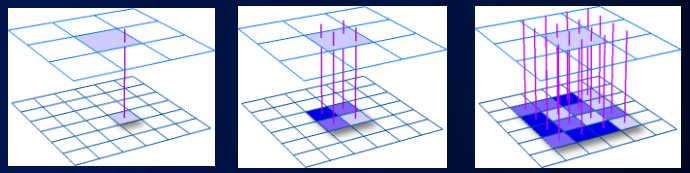


Raster Datasets

- **Formats**
  - TIFF (bigTIFF), Mrsid, JP2000, NITF, CADRG, Geodatabase raster etc
  - Compress: JPEG/LZW/LZ77/PackBits/CCITT
- **Pyramids**
  - Reduced resolution copies of the source
  - Improve display performance
  - Support three resample methods
  - Can be compressed



- **Statistics**
  - Enhance visual display



Nearest neighbor | Bilinear interpolation | Cubic convolution

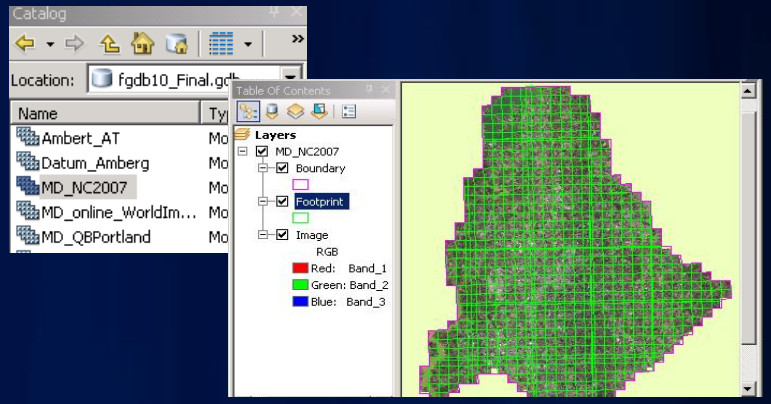
- **Build Pyramids and Statistics tool**
  - Support mosaic dataset

Mosaic Dataset

- A GDB data model for managing and serving image collections
- Supported in FGDB/PGDB/SDE
  - Do NOT store pixels but reference them
- Advantages
  - Reduce processing time and storage
  - Catalog large image collection fast
  - Seamless display at all scales
  - Multiple sensors and metadata
  - Streamline update and maintain quality

Mosaic Datasets – Storage Schema

- A composite layer in ArcMap
  - Footprint/boundary/seamline
  - Image



- Stored as a set of internal geodatabase tables

Name	Purpose
Catalog	A raster catalog that stores function rasters and the footprints
Boundary	A feature class that defines the mosaic dataset boundary
Seamline	A feature class that maintains the seamlines for advanced mosaicking operations
Raster Type	A table holding each raster type instance
Log	A table that logs operations that have been performed

Mosaic Datasets – Catalog Table

OID	Shape	Raster	Name	MinPS	MaxPS	LowPS	HighPS	Category	…
1	Polygon	<Raster>	P01.met	0	90	10	30	Primary	
2	Polygon	<Raster>	P02.met	0	90	10	30	Primary	
5	Polygon	<Raster>	filename1.tif	90	270	90	90	Overviews	

- **A special raster catalog**
  - **Shape field stores the footprints**
  - **Raster field stores function raster datasets**
- **Function raster datasets**
  - **Store references to the image along with processing**
  - **Process on the fly during access**
- **MinPS and MaxPS define the visibility ranges of the rasters**

Mosaic Dataset – Overviews

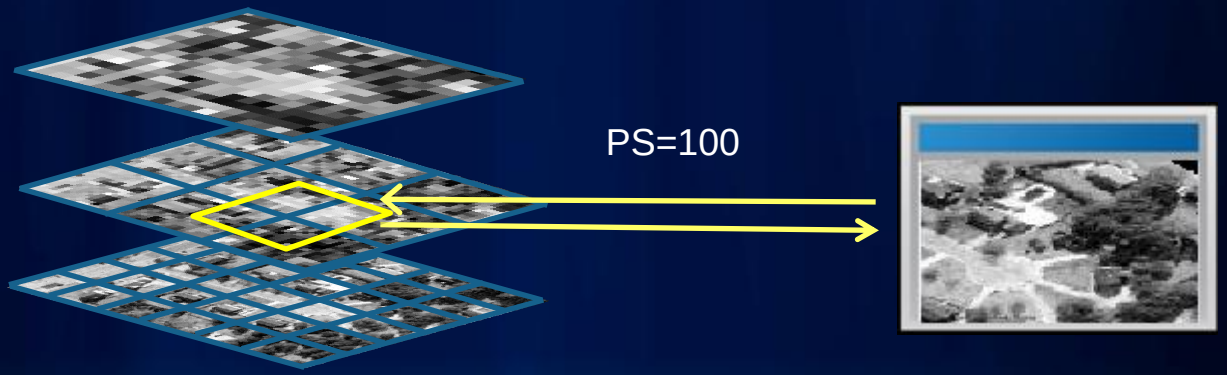
- Fast and seamless display
- Overview vs. Pyramids
  - Overviews for mosaic dataset
  - Pyramids for raster dataset

- A set of resampled rasters
  - Multiple levels
  - Each level has multiple tiles
  - Each tile is a tiff file

Overview: 180m
(range: 180-1800)

Overviews: 60m
(range:60-180)

Sources: 20m
(range: 0-60)

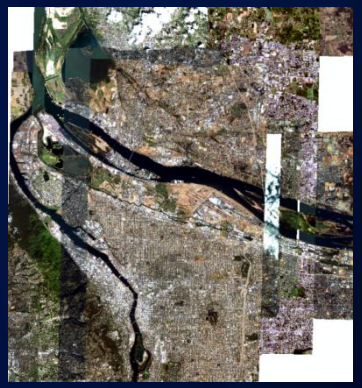


Mosaic Dataset – Mosaic Rules

- **Control which raster/pixels to display**

- **Mosaic method to sort the rasters**
  - **Closest to center (default)**
  - **By attribute**
  - **Closest to nadir**
  - **North west**
  - **Seamline**
- **Mosaic operator to resolve the overlaps**
  - **First/Min/Max/Mean/Blend**

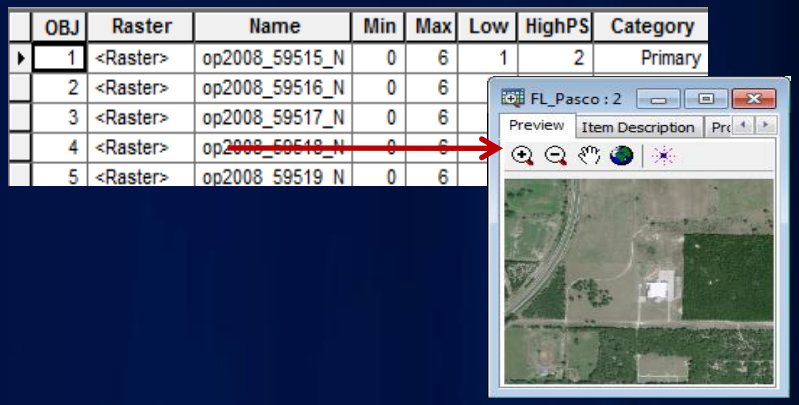
Closest to the center



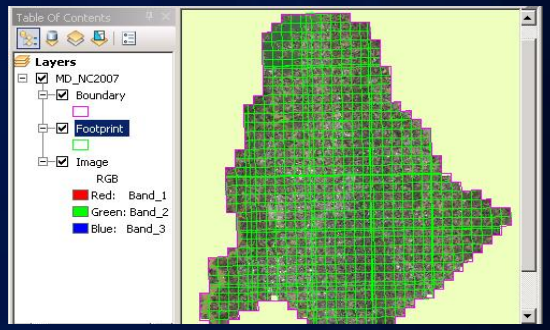
By attribute: cloud cover

Use of Mosaic Dataset

- Use as a catalog
  - Selection/query
  - Add selected images to Map
  - View raster and metadata
  - Time aware



- Use as a raster dataset
  - Seamless display
  - Export a raster dataset
  - Use as an input to geoprocessing tool



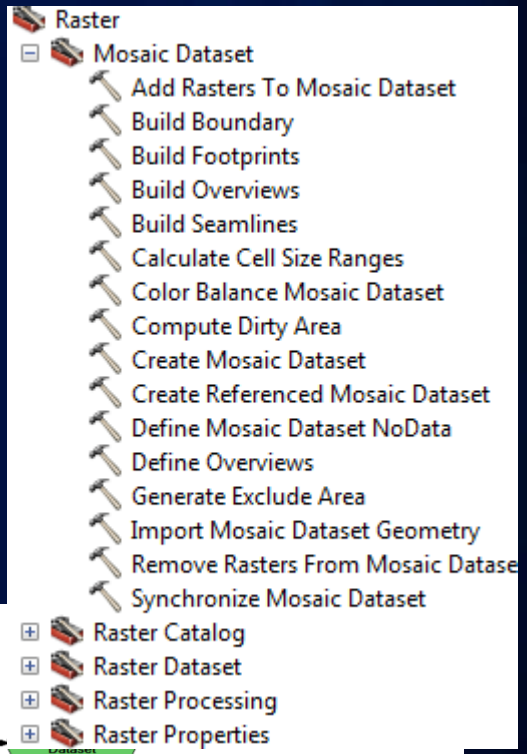
Use of Mosaic Dataset (Continue)

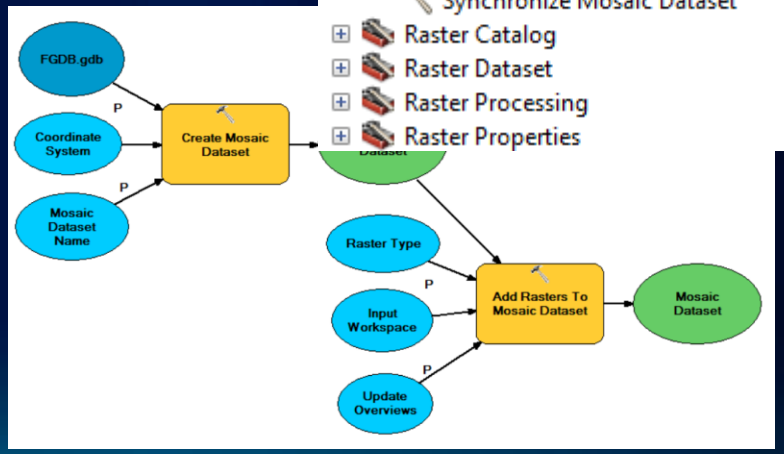
- Serve as an image service
  - Similar functionality as local mosaic dataset
  - Access as a catalog
    - Select/download selected images
    - Time aware
  - Access seamless mosaic
  - REST
  - WCS/WMS
- Image Extension license

Build a Mosaic Dataset

- Mosaic dataset toolset
- Automate with model and python

- Typical workflow
  - Create a mosaic dataset
  - Add rasters
    - Calculate cell size range
    - Build boundary
  - Build overviews (optional)
  - Edit properties (optional)



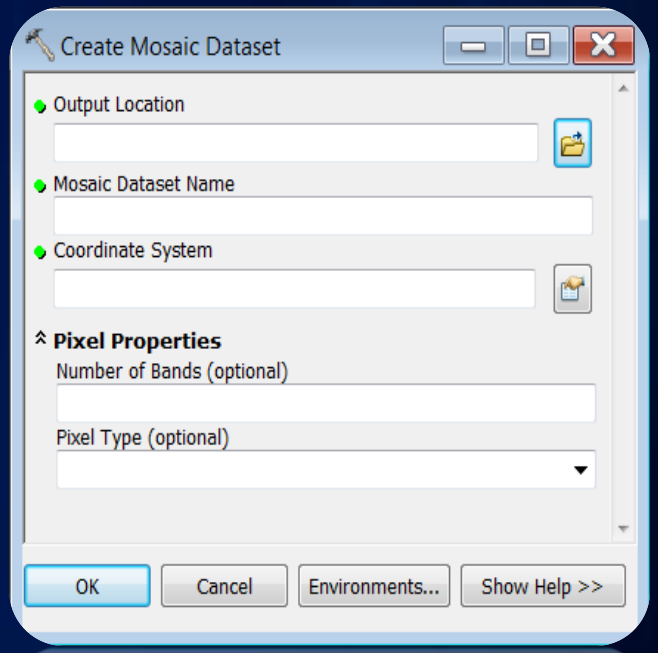


Build a Mosaic Dataset - Create

- Create table schema and define pixel properties

- Spatial reference (required)
  - Used in footprints and overviews
  - Can be different from input
  - Datum consideration

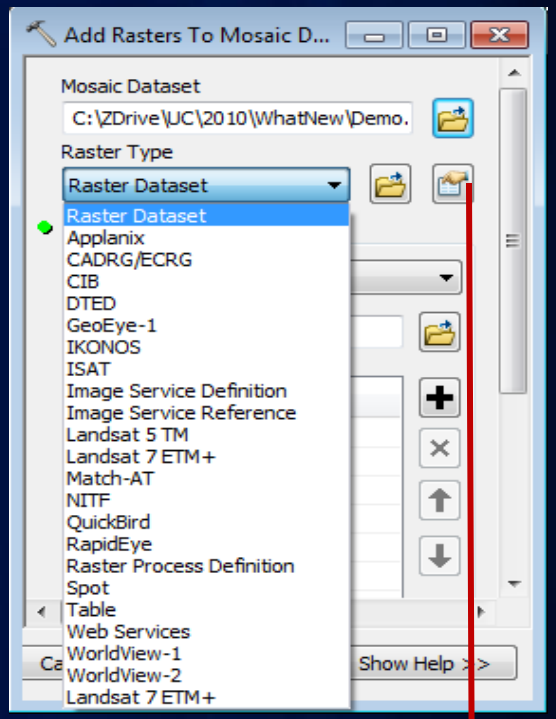
- Number of bands
  - Taken from the first added raster
- Pixel type
  - Taken from the first added raster

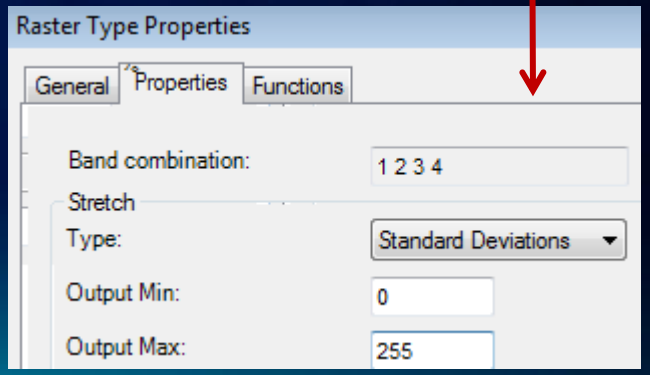


Build a Mosaic Dataset – Add Rasters

- Specify a raster type
  - Define the format to crawl
  - Metadata to read and fields to create
  - Processes to apply

- Support many raster types
  - Raster Dataset/NITF/CADRG/etc.
  - QB/IKONOS/Landsat/WVI/WVII/etc
  - Web Services
  - Table/Image Service Definition





Build a Mosaic Dataset – Cell Size Ranges

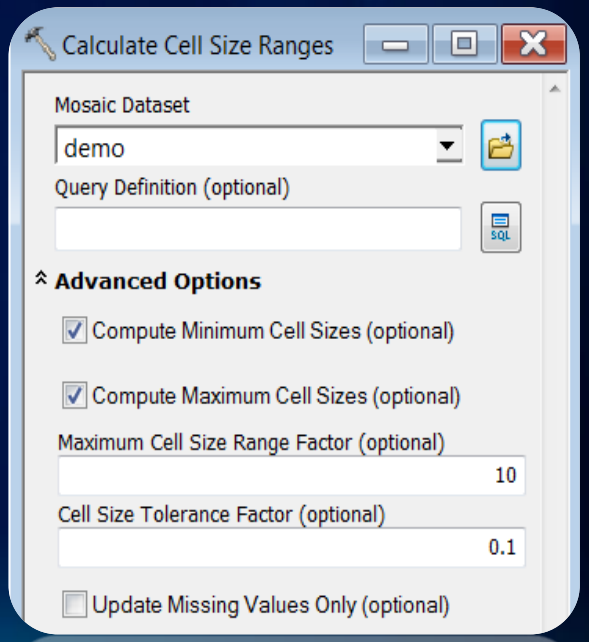
OBJECTID *	Raster	Name	MinPS *	MaxPS *	LowPS *	HighPS *	Category	Tag
1	<Raster	Campus_08May2008	0	12.329262	0.616463	1.232926	1	Dataset
2	<Raster	Campus_14May2008	0	11.338233	0.566912	1.133823	1	Dataset

- **MinPS and MaxPS define the visibility of the rasters**
- **Use Calculate Cell Size Ranges tool**
- **Based on source and overlaps**
- **Default cell size range factor is 10**

30m visible range 30-300

5m visible range 0-50 → 5-30

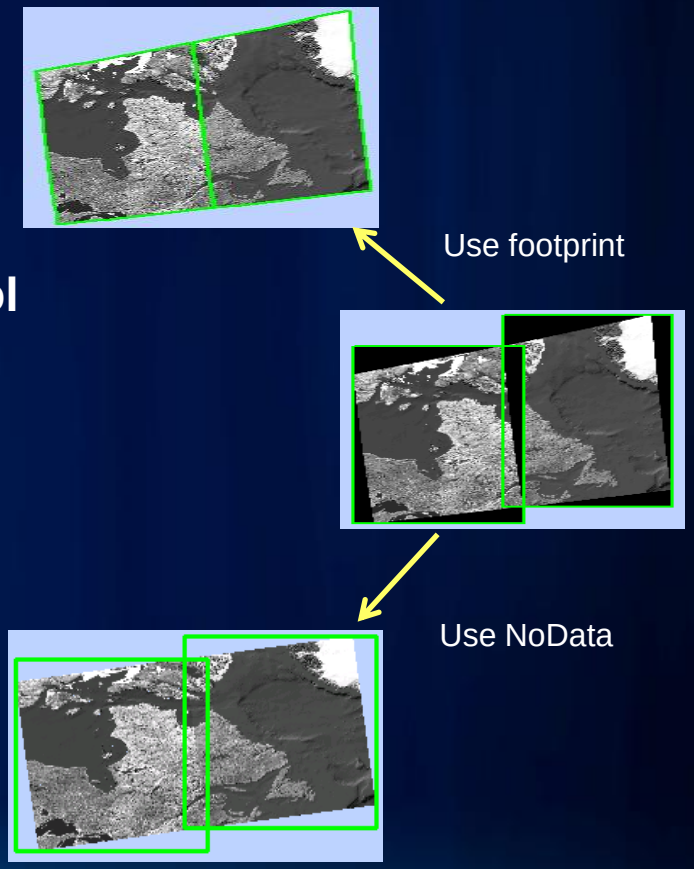
1m visible range 0-5



Building a Mosaic Dataset – Background

- **Footprint**
  - **Build Footprint tool**
  - **Edit using Editor**
  - **Import Mosaic Dataset Geometry tool**

- **Define NoData**
  - **Based on a value**
  - **Based on a range**



Build a Mosaic Dataset - Boundary

- Define the boundary of the mosaic dataset
  - Pixels outside the boundary will be clipped
- Build using Build Boundary tool
  - Calculated based on footprints
- Can be modified using Editor
- Import Mosaic Dataset Geometry tool

Build a Mosaic Dataset – Overviews

OID	Shape	Raster	Name	MinPS	MaxPS	LowPS	HighPS	Category	…
1	Polygon	<Raster>	P01.met	0	90	10	30	Primary	
2	Polygon	<Raster>	P02.met	0	90	10	30	Primary	
3	Polygon	<Raster>	filename1.tif	90	900	90	90	Overviews	
4	Polygon	<Raster>	filename2.tif	90	900	90	90	Overviews	

- **Build Overviews tool**
  - **Generate overview images**
- **Define Overviews tool**
  - **Redefine the default parameters**
- **Optionally add an external raster as overview**

Default overview parameters:

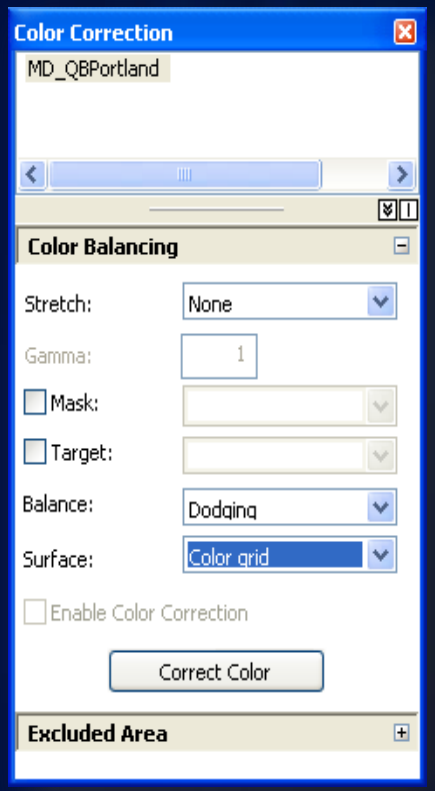
TIFF format with JPEG
Size is 5120x5120
Factor of 3
Overview location

Build Mosaic Dataset – Advanced Processing

- Color Correction
  - Based on a calculated color surface
  - Based on an existing target raster
  - Support excluded area

Before

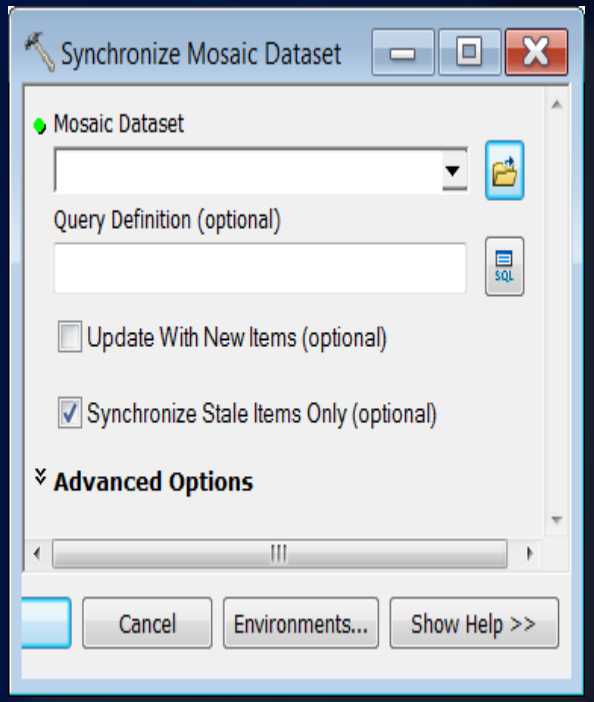
After



- Seamlines
  - Used for seamline mosaicking
  - Build Seamlines GP tool
  - Edit and Import seamlines

Mosaic Dataset – Update

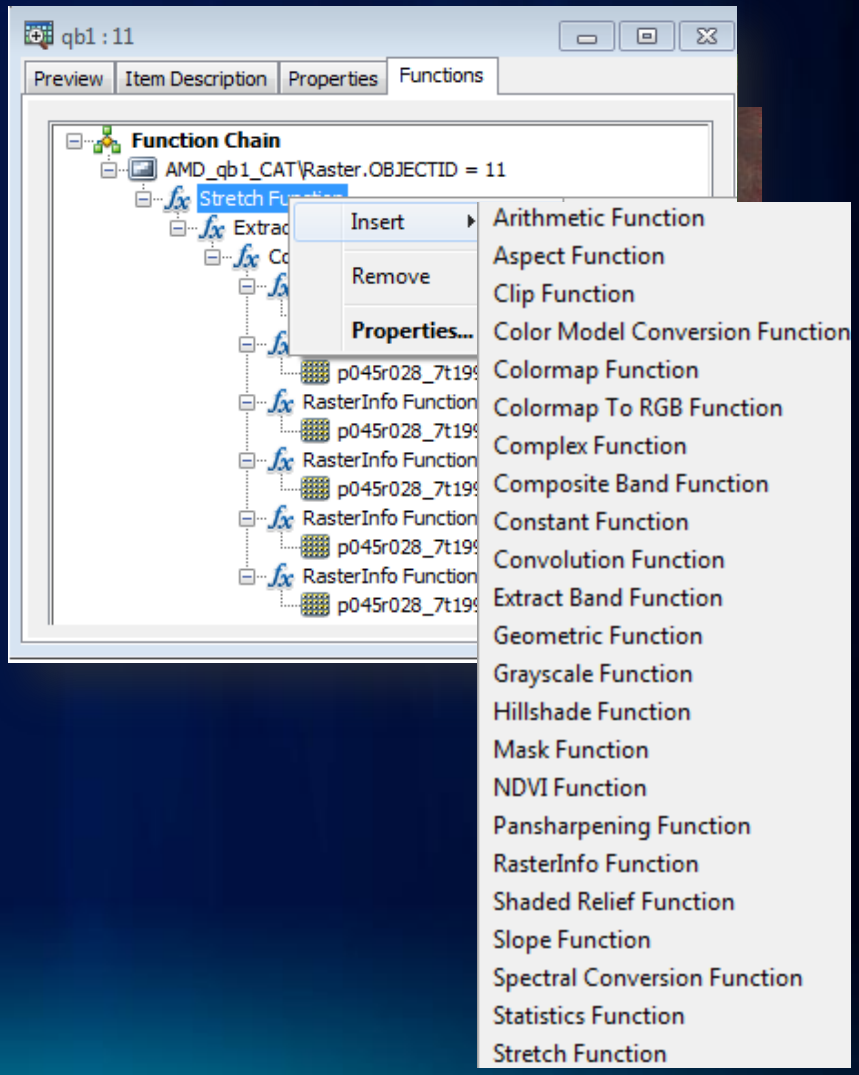
- Add new rasters from a folder
  - Synchronize Mosaic Dataset tool
    - Identify new data in the folder
  - Add Raster tool
- Source rasters are changed
  - Changes in geometric/metadata/etc.
  - Run Synchronize Mosaic Dataset tool
- Remove Rasters
  - Use Remove Rasters from Mosaic Dataset tool



Mosaic Dataset – On-the-fly Processing

- Process image on-the-fly
  - Image enhancement
  - Orthorectification, Pan-sharpen
  - Shaded relief, hillshade, etc

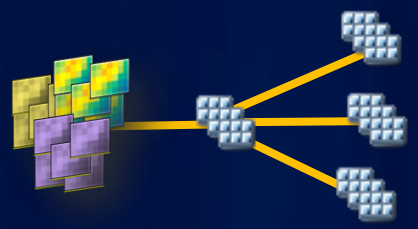
- Add at mosaic dataset level
- Add at raster level
  - Apply to the raster



Reference Mosaic Dataset

- References an external mosaic dataset or raster catalog
  - Supported in GDB and file (.amd)
  - Catalog table is read-only

- Created by specifying
  - Definition query
  - Area of interest



Boundary = My County

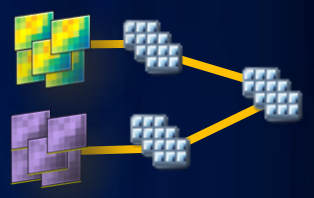
Where Sensor = Landsat and Cloud <10%

Add NDVI processing

- Provides multiple views of the source mosaic dataset
- Prevents editing of the source mosaic dataset

Mosaic Dataset - Derived

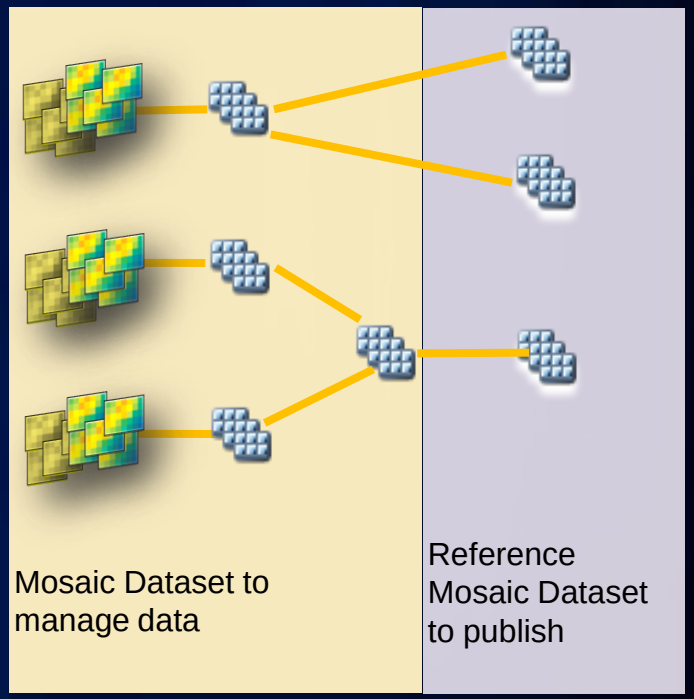
- Adding mosaic datasets to a mosaic dataset
  - Using Table raster type
  - Copy all records and the raster type to the master mosaic dataset



- Adding selected items of a mosaic dataset
  - Save as a mosaic layer
  - Add mosaic layer use Table type
  - Selected records will be added to mosaic dataset

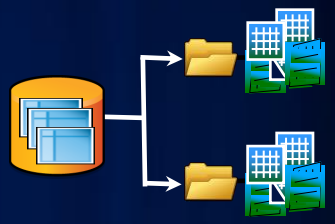
Image Management Patterns

- **Create mosaic datasets with data** of **similar type**
  - **Elevation**
  - **Ortho images of same date**
  - **QuickBird/IKONOS**
  - **Landsat 5 or 7**
- **Create derived mosaic datasets if needed**
- **Create referenced mosaic datasets**

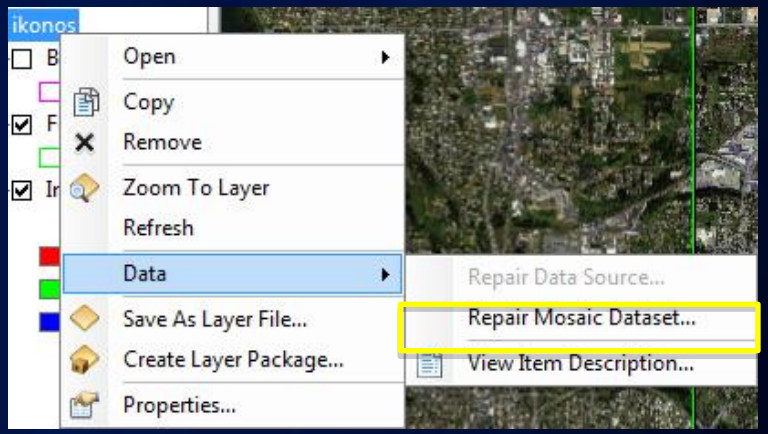


Moving a Mosaic Dataset

- Move all
  - Copy the FGDB where the mosaic dataset resides
  - Copy the source and overview images
  - Use Repair dialog to repair the paths



- Extract a portion
  - Create a new folder
  - Create a target File geodatabase
  - Use Distributed Geodatabase toolbar
  - Copy/move the whole folder



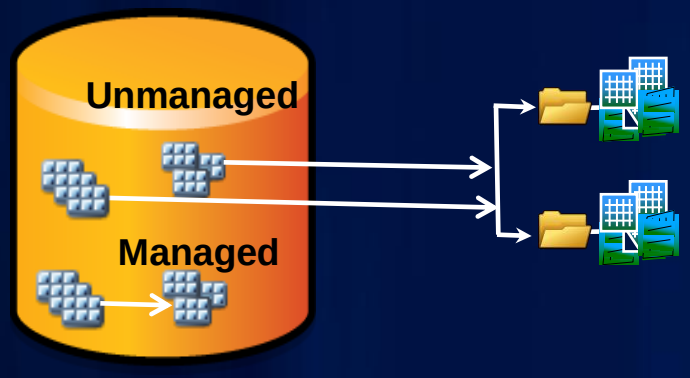
Migrating to Mosaic Datasets

- From Image Server Service Definition
  - Create a mosaic dataset
  - Use Image Service Definition raster type
  - Add the ISDef file
- Raster Process Definition raster type

Image service Definitions	Mosaic dataset
.\Amberg.ISDef	
ImageService.ISDef	Mosaic dataset
Footprint.dbf	Footprint feature class
Boundary.dbf	Boundary feature class
Seamline.dbf	Seamline feature class
.\RPDefs\rasteris.RPDefs	Function raster datasets

Migrating to Mosaic Datasets (Continue)

- **From a raster catalog**
  - Create a mosaic dataset
  - Use Table type to add
  - Raster datasets are re-added as function raster datasets



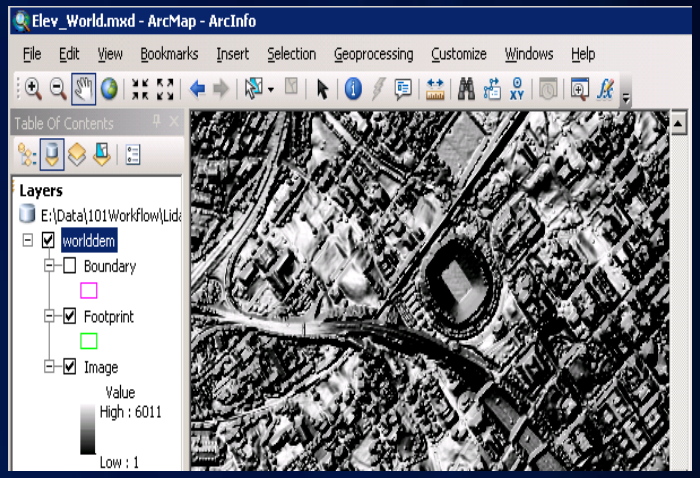
  - Find the source data and re-create mosaic dataset

Summary

- Mosaic dataset advantages
- Usage of mosaic datasets
- How to build a mosaic dataset
- Reference and derived mosaic datasets
- Update and deploy mosaic datasets
- Migrate to mosaic dataset

What is New for Mosaic Dataset in 10.1

- Support more raster types
  - LAS, LASDataset, Terrain
  - Radarsat2, Kompsat, Formosat
- Many New tools
  - Analyze Mosaic Dataset
  - Edit Raster Function
  - Set Mosaic Dataset Properties
  - Alter Mosaic Dataset Schema



- New raster functions
  - Remap Function/Band Arithmetic Function/Attribute Table Function
- Enhancements
  - Automatic seamline generation
  - Calculate footprint by geometry
  - Create good looking mosaic dataset easily

Questions?