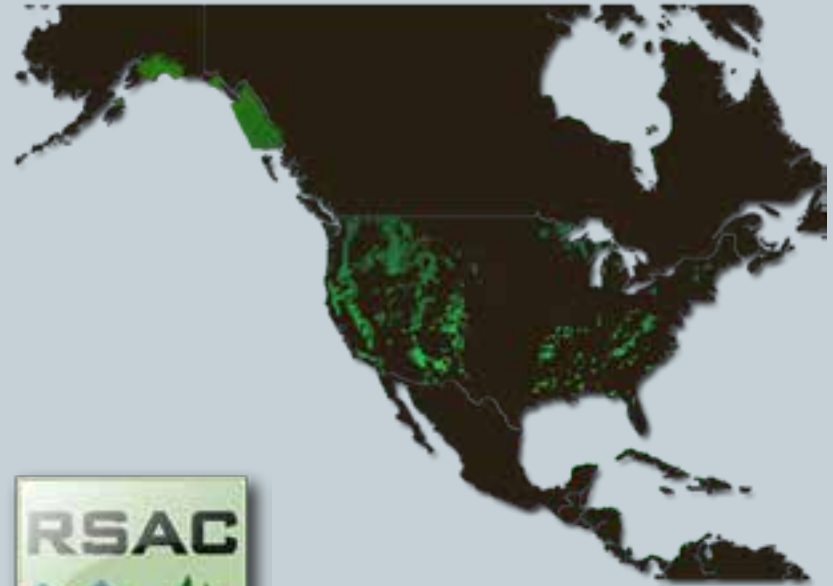# 2013 ESRI SWUC
Lessons Learned – Building ArcGIS Server 10.1 Image Services

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Geospatial
Management
Office
United States Forest Service

USDA Forest Service – Geospatial Context

✓ The Forest Service manages 155 National Forests and 20 National Grasslands.

✓ Total land equals 193 million acres in 44 States & other territories, representing nearly 30 percent of all federally-managed lands.

Presentation Outline

- Introduction
  - Migrate from legacy 9.3.1 system or build from Scratch
- Discussion of 10.x image services
  - Process workflow
  - New functionality for Forest Service users
  - Bugs, stumbles and workarounds
  - Caching Tips
  - Current Status
- Derived Products
  - Tile packages
- Next Steps, Acknowledgements and Conclusion

Migrate or build from Scratch?

– **Existing 9.3.1 Image server implementation**

Migrate or Start from Scratch?

- ~500-600 TB of Imagery at the SLC Data Center
- Hundreds of image services
  - E.g. Every state had its own NAIP service by year e.g. UT NAIP 2009, UT NAIP 2011
  - USFS Resource Photography –Individual National Forests and Grasslands (Sub-meter)
  - FSTopo Primary Base Series (1:24K), Secondary Base Series(1:126,720)
  - eTOPO(USGS 1:24K,1:100K,1:250,oooK topo), eSAT (LANDSAT) and others

- Direct Migration from 9.3.1 to 10.1 was not a good way to go for us due to
  - Software bugs that slowed/stopped down the migration
  - Projection issues when moving from 9.3.1 isDefs to Mosaic Datasets
  - Potentially not future proof, possible loss of new 10.1 server features
  - Need for consolidation of services for easier maintenance and improved UX
- Different user communities – Basemap imagery users, Remote sensing analysts, Web developers, Enterprise GIS integration

10.1/10.2 Image services

- Advantages over legacy 9.3.1 Image Server Platform
  - Dual Function Image services
    - Cached and Dynamic Services in a single service
      - ArcMap users can toggle between both options from layer properties in TOC
      - Web Developers can toggle using code
    - E.g. for NAIP imagery - Switch between 3 band RGB cached service to 4 band dynamic service (access to all 4 bands)
  - REST endpoints now available to developers
    - http://166.2.126.140/arcgis/rest/services
    - http://166.2.126.140/arcgis/rest/services/NAIP2012_CONUS/ImageServer
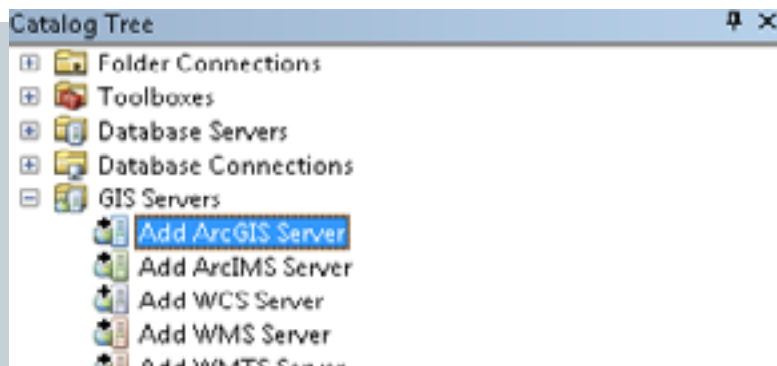 - More image processing functionality
    - Raster function templates
    - More pixel based processing functionality
    - Enable temporal analysis for categorical and continuous thematic raster datasets
- Disadvantages:
  - Cannot view cached 1o.1 image services in previous versions of ArcGIS
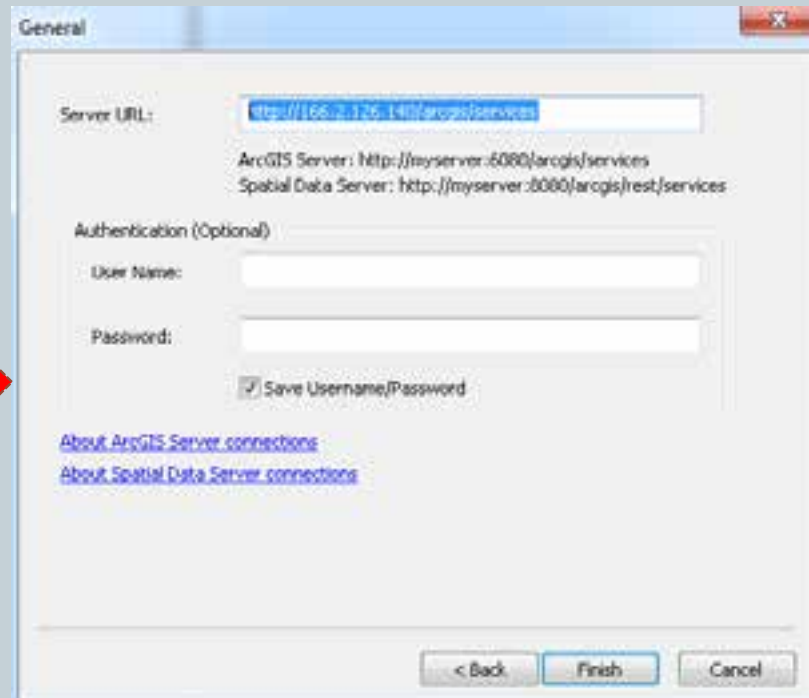   - Older ArcGIS clients default to the dynamic service

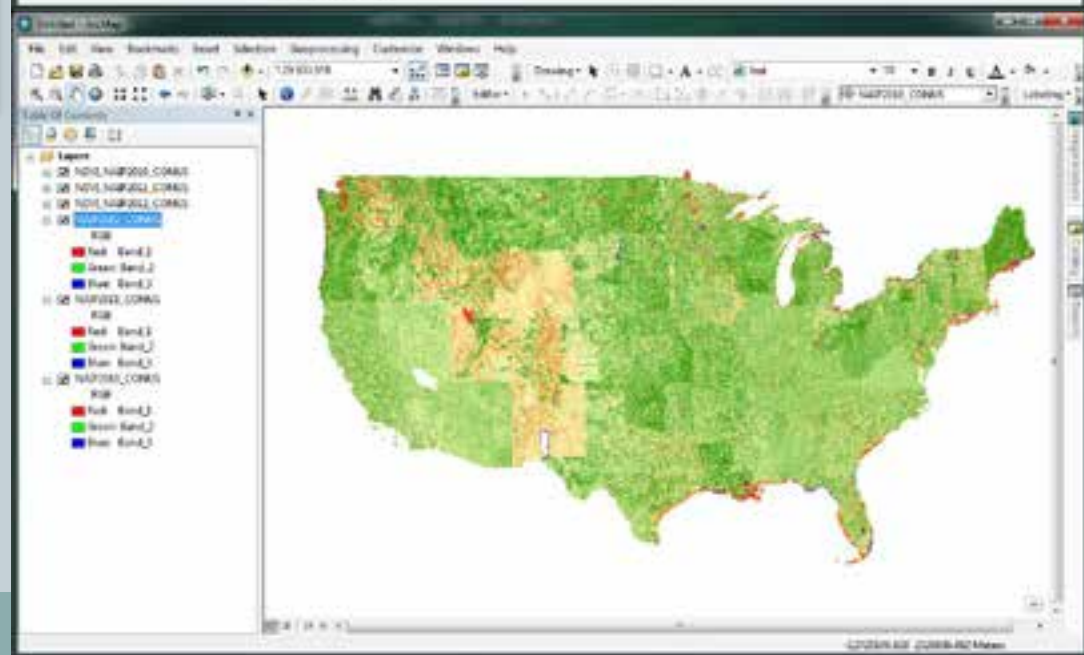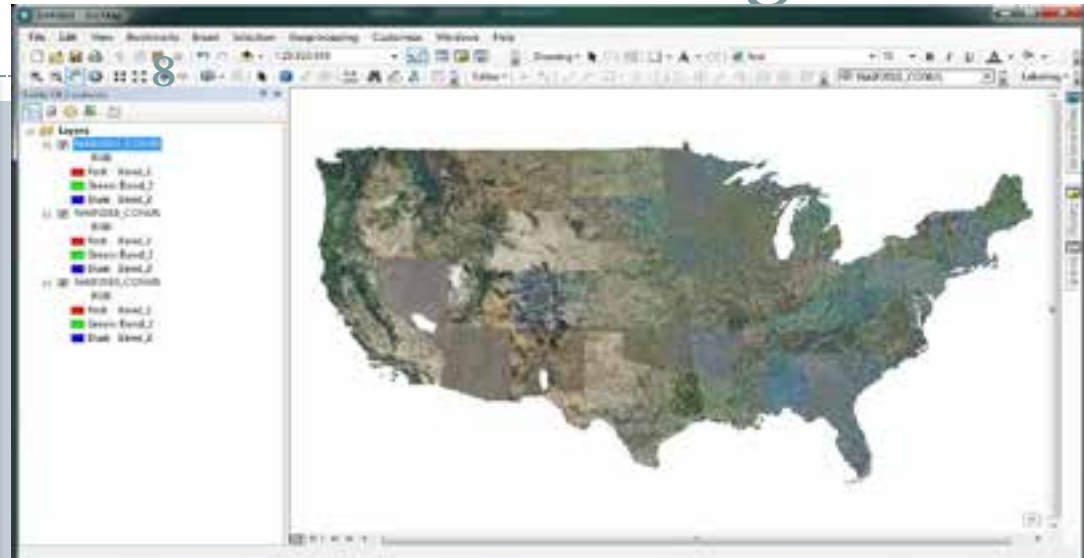# How to connect to ArcGIS 10.1 Server in ArcGIS Desktop?
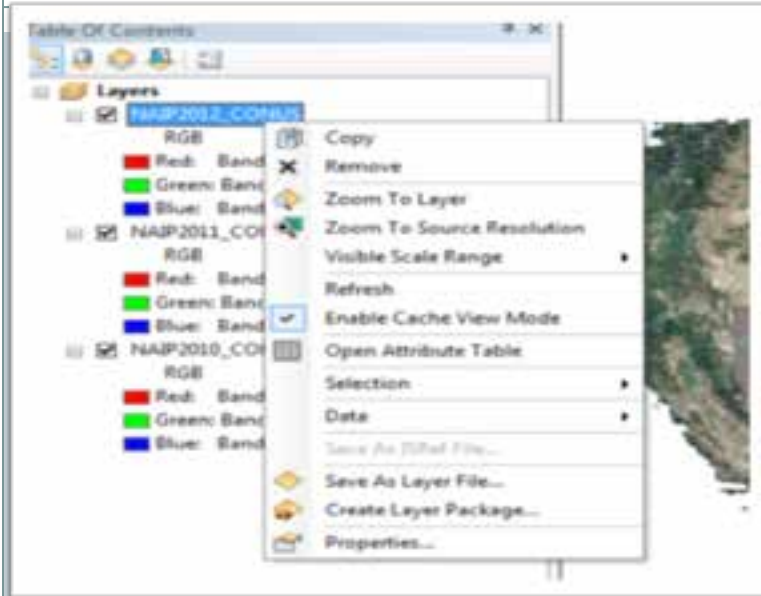
Catalog Tree
- ⊞ 📁 Folder Connections
- ⊞ 🧰 Toolboxes
- ⊞ 🗄 Database Servers
- ⊞ 🗄 Database Connections
- ⊟ 🗄 GIS Servers
  - 🔷 **Add ArcGIS Server**
  - 🔷 Add ArcIMS Server
  - 🔷 Add WCS Server
  - 🔷 Add WMS Server
  - 🔷 Add WMTS Server

ArcGIS 10.1 Server URL for Testing:
http://166.2.126.140/arcgis/services

(Note: Do not try to open in web browser. Use only in ArcGIS Desktop)

Add ArcGIS Server

This wizard guides you through the process of making a connection to an ArcGIS Server. You can create a connection to use, publish, or administer GIS services.

What would you like to do?

- ⦿ Use GIS services
- ◯ Publish GIS services
- ◯ Administer GIS server

< Back | Next > | Cancel

General

Server URL: http://166.2.126.140/arcgis/services

ArcGIS Server: http://myserver:6080/arcgis/services
Spatial Data Server: http://myserver:8080/arcgis/rest/services

Authentication (Optional)

User Name:

Password:

☑ Save Username/Password

About ArcGIS Server connections
About Spatial Data Server connections

< Back | Finish | Cancel

10.1 Image Services Beta Testing

Dataset sizes:

NAIP 2012: ~18 TB
NAIP 2011: ~14 TB
NAIP 2010: ~24 TB
Overviews: ~ 10 TB
Cache: ~3.5 TB

Process Workflow Outline - NAIP services

- Create Source mosaic datasets for each state in a NAIP Year using the overall extent and projection (Web Mercator Aux. in our case)

  - Use the parallel processing factor. Test and find an ideal setting for your machine.

- Create a Derived Mosaic dataset for a NAIP year in a different geodatabase and add the source 'state' mosaic datasets to it

- Create Image service using the Derived Mosaic dataset in ArcGIS Server and then cache that service

- Once created, you can export the cache to tiled packages that can be used in mobile systems, disconnected environments and also uploaded/published in ArcGIS Online.

- *Excellent Resource: http://resources.arcgis.com/en/help/image-management-workflows/index.html*

Currently available services in ArcGIS 10.1 Server
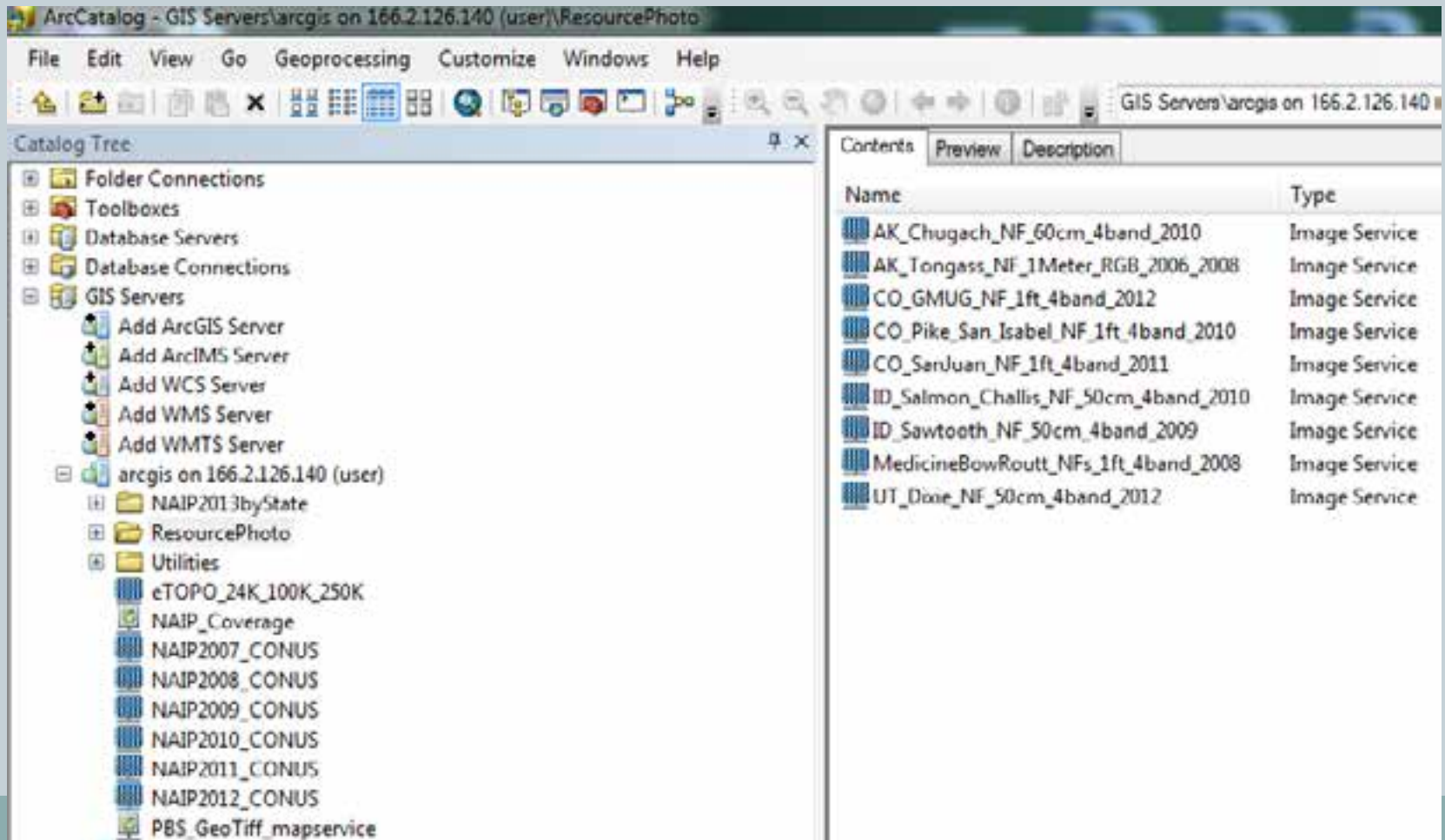
– **National Services available for testing**

Contents	Preview	Description	

Name	Type
NAIP2013byState	ArcGIS Server Folder
ResourcePhoto	ArcGIS Server Folder
Utilities	ArcGIS Server Folder
eTOPO_24K_100K_250K	Image Service
NAIP_Coverage	Map Service
NAIP2007_CONUS	Image Service
NAIP2008_CONUS	Image Service
NAIP2009_CONUS	Image Service
NAIP2010_CONUS	Image Service
NAIP2011_CONUS	Image Service
NAIP2012_CONUS	Image Service
PBS_GeoTiff_mapservice	Map Service

Currently available services in ArcGIS 10.1 Server

– **Resource Photography – more coming soon**

WMS, WCS, WMTS (OGC)

– **Example: NAIP 2012 OGC endpoints**

- Web Map Service (WMS) -
  - http://166.2.126.140/arcgis/services/NAIP2012_CONUS/ImageServer/WMSServer?request=GetCapabilities&service=WMS
- Web Coverage Service (WCS) -
  - http://166.2.126.140/arcgis/services/NAIP2012_CONUS/ImageServer/WCSServer?request=GetCapabilities&service=WCS
- Web Map Tile Service (WMTS) –
  - http://166.2.126.140/arcgis/rest/services/NAIP2012_CONUS/ImageServer/WMTS/1.0.0/WMTSCapabilities.xml

Using Image Services in Analysis

- Max request size
  - Limit the number of rows and columns(Pixels) that can be exported.
- Select appropriate Cell Size
  - Spatial Analyst and 3D Analyst tools
    - Select the right size – e.g. 1 meter or 1 kilometer in environment settings
  - Other tools – Use "Make Mosaic Layer Tool" where appropriate
- Select appropriate extent

10.1 Image Services Beta Testing
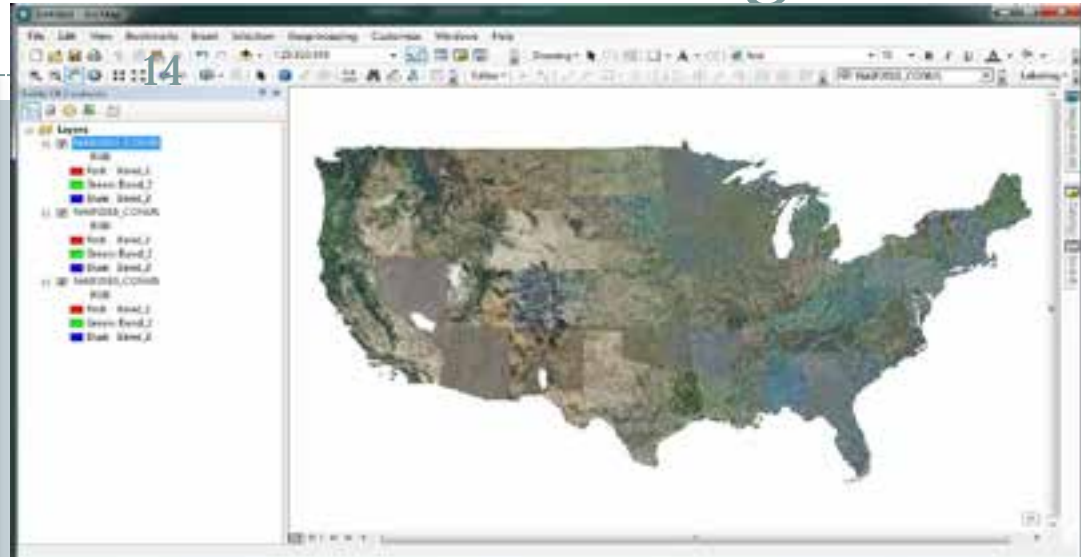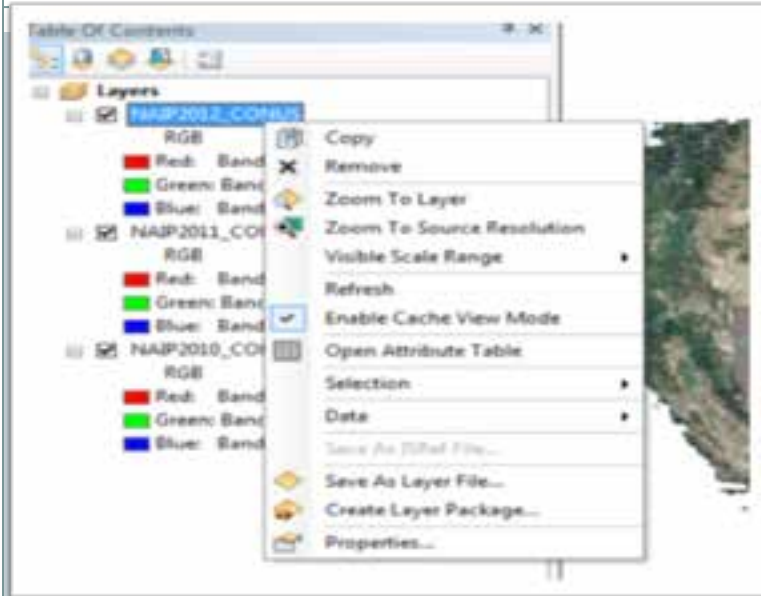
Tip #1: Use Dynamic Image Service (Non-Cached) at large map scales and NOT at CONUS level as shown in the NDVI Screenshot).

Tip #2: In ArcMap versions prior to 10.1, make the image layers (dynamic) visible only at the desired scales than at all scales
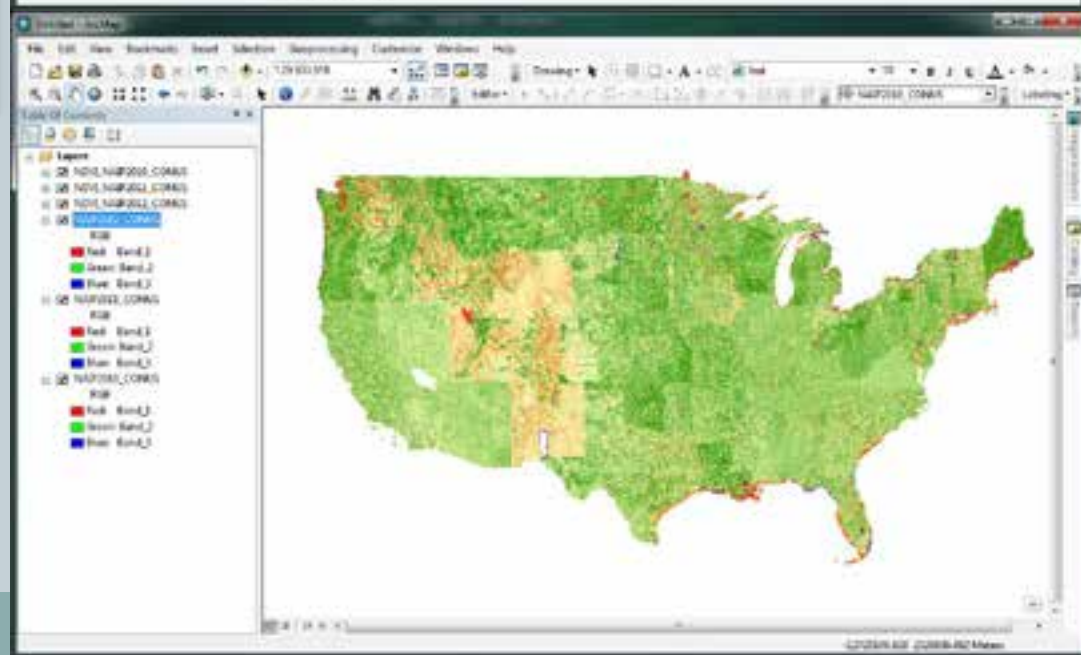
Caching Tips

– Max Source Cell Size (MSCS):

  - Property to be set in image service properties->Caching->Advanced Settings properties; Cell size in map units
  - Determines if cache levels are built bottom up (from the largest scale or directly sampled from the dynamic service at the appropriate scale)

– Decide Max Cache Level:

  - Each higher cache level (larger map scale) results in your storage requirement at least being doubled)

– Caching in which projection – Web Mercator or something else

– Use boundary feature class to limit cache extent while caching at large map scales

– Use ArcGIS Server 10.2 if available for large caching jobs especially at very large map scales (>1:5000)

  - Caching Controller service and better load balancing

Tile Packages (.tpks)

– **Useful for disconnected offline use of large, high resolution and multi-source/resolution raster datasets**

  - Remote Field Locations
  - Low/No bandwidth situations
  - Wildfire/Disaster response
  - Mobile GIS applications

– **Upload into ArcGIS Online**

  - Rapid dissemination
  - Use in web maps
  - Publish as hosted map service

Bugs, Stumbles and Workarounds

10.2 bugs:

1. Bug NIM096060: A referenced mosaic dataset does not list the Geographic Transformation applied in the properties when created from a mosaic dataset that has different datum for the spatial reference.

2. Bug NIM093793: In ArcCatalog 10.2, the Manage Map Server Cache Tiles tool does not show cached scales of a cached map service.

3. Bug NIM093971: In ArcMap 10.2, when an areas of interest (AOI) feature class extends beyond the service boundaries, the Export Map Server Cache tool partially exports the cache and indicates success with warnings in the geoprocessing results window. The tool should fail with an error.

4. Bug NIM094969: Provide ability to use Tile Packages(.tpk) in ArcPad as basemaps while working in an offline environment

Declined:

5. Bug NIM094723: The mosaic dataset overview image quality is different when it is built in ArcGIS 10.1 SP1 (possibly due to the implementation of Gaussian blurring).

Performance issues and 10.1/10.2 hot fixes and patches (such as Add raster dll, 2 GB cache bundle size limitation – Contact esri support for latest info)

- Note that many patches are coming out in two versions for 10.1 and 10.2

Bugs, Stumbles and Workarounds

Fixed in 10.2:

NIM087651 Unable to generate overviews for a mosaic dataset with certain 4-band NAIP (National Agriculture Imagery Program) imagery.

NIM087827 The Add Rasters to Mosaic Dataset tool fails for specific ISdef's with or without parallel processing factor.

Unknown/Open in 10.1:

Bug NIM087308: When a geoprocessing tool is run using the Parallel Processing environment variable with 64-bit background geoprocessing, the separate processes are run as 32-bit processes.

Bug NIM089097: In ModelBuilder the Repair Mosaic Dataset Paths tool will incorrectly list model variables as drop-downs in Query Definition parameter.

Bug NIM089148: Enhance the Repair Mosaic Dataset Paths tool to have workspace browse options and be active by default without needing to click on the plus sign.

Bug NIM088937: Gray out the option to use JPEG compression if the input mosaic dataset is 4 band, or provide documentation that this compression will not be honored as a compression type for 4 band mosaic datasets.

Bugs, Stumbles and Workarounds

- Tiled vs. Striped GeoTiffs
  - By default, GeoTiffs are created as tiled in ArcGIS and not striped as before
  - This can create problems when you deal with older datasets.
  - Copying a raster dataset using ArcGIS results in a recreation of the dataset and sometimes solves dataset access problems
- Pyramids vs. Overviews
  - I prefer overviews over pyramids
  - Ignore previously built pyramids or recreate them if possible
- Remember restarting a image service does not have the same effect as before 10.1
  - Changing mosaic dataset properties does not propagate the changes to the service on restart. You will have to delete and republish the service.

Next Steps

– Steps/Challenges:

- Balance the load for background imagery services vs. supporting new server-side image processing options for image processing functionality

- Improve performance of dynamic services

- Communication and Training of users

- Transition to Production system while applying the lessons from the beta testing

    - Script the transition where possible using ArcGIS Server REST Admin API and ArcPy using python scripts

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Questions and Feedback

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