Federal GIS Conference

February 9–10, 2015 | Washington, DC

Imagery and Raster Data Management and Dissemination

Cody Benkelman & Dan Zimble, Esri

Josh Murphy, NOAA Office for Coastal Management

Outline

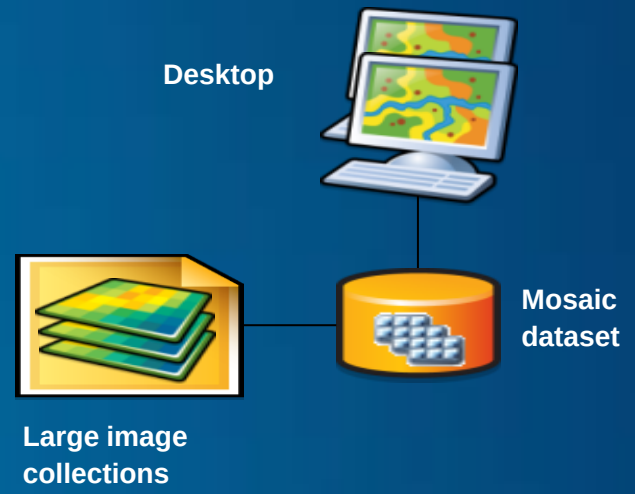
- Underlying technology
- Modes of sharing imagery
- Managing large collections of imagery & raster data
- Creating additional products with raster functions
- Imagery & Applications @ NOAA Office for Coastal Management

Image management using Mosaic Datasets

Highly scalable from small to massive volumes of imagery

- Wide range of sensors and sources
  - Satellite, aerial, processed, scanned, oblique, lidar, radar, categorical, video

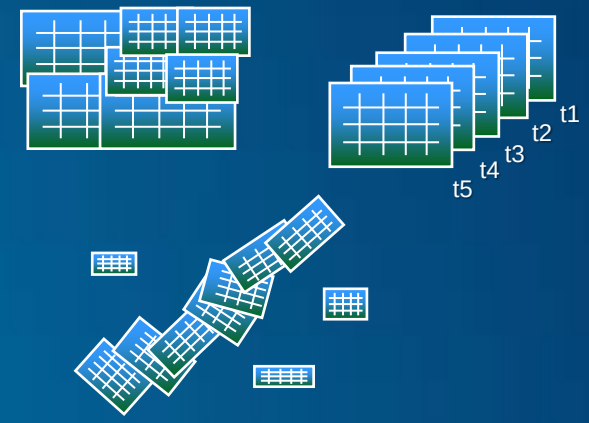
- Create a mosaic dataset in geodatabase
  - Reference to source data
  - Ingest and define metadata
  - Define processing to be applied

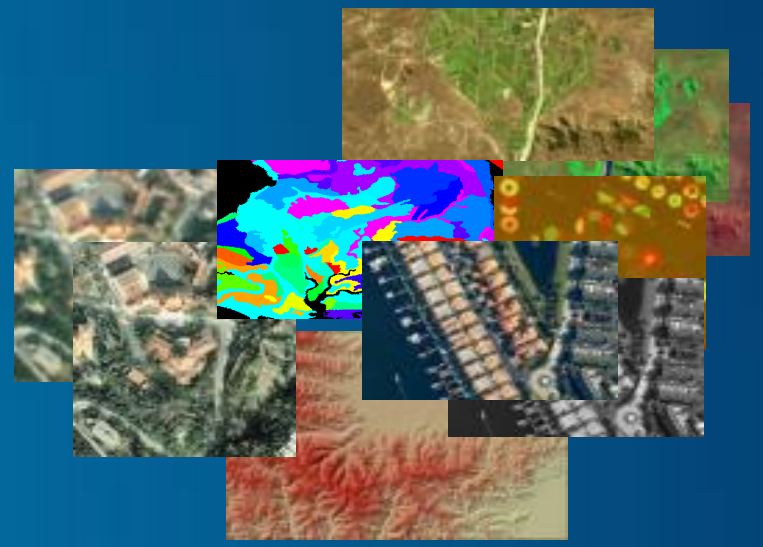


- Access as image or catalog

Empowering imagery

- Dynamic mosaicking
  - Fuse imagery from multiple sources
  - User defined ordering (which image appears on top)
- On-The-Fly processing
  - Process imagery as accessed
  - Create multiple products direct from source
    - Pan sharpened, NDVI
    - Hillshade, Slope, Aspect





Demo

Raster Product, Mosaic Dataset, Raster Functions, Raster Tile Cache

Dan Zimble - Esri

Four Ways to Provide Image Accessibility

- **Download**
  - **Traditional Approach**

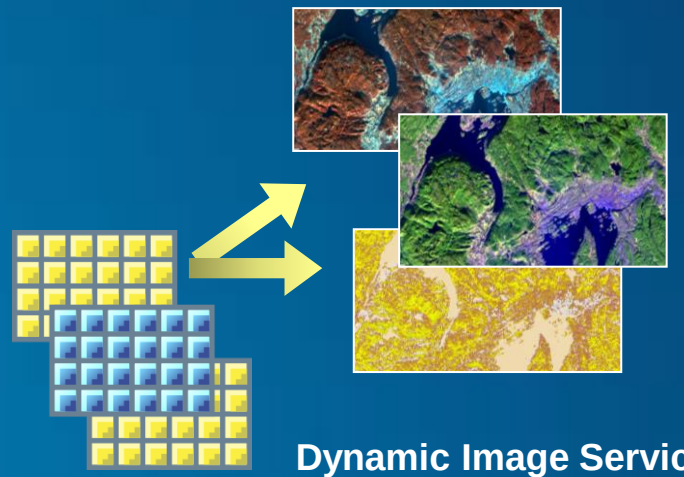
Four Ways to Provide Image Accessibility

- **Download**
  - **Traditional Approach**
- **Tile Cache Services**
  - **Simple Background Imagery**

Cache

Four Ways to Provide Image Accessibility

- **Download**
  - Traditional Approach
- **Tile Cache Services**
  - Simple Background Imagery
- **Dynamic Image Services**
  - Full information content



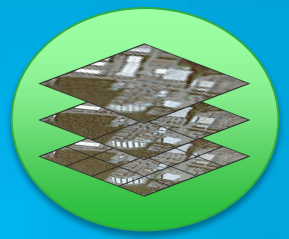
Dynamic Image Service

Four Ways to Provide Image Accessibility

- Download
  - Traditional Approach
- Tile Cache Services
  - Simple Background Imagery
- Dynamic Image Services
  - Full information content
- Geoprocessing Services
  - Get Answers from Imagery

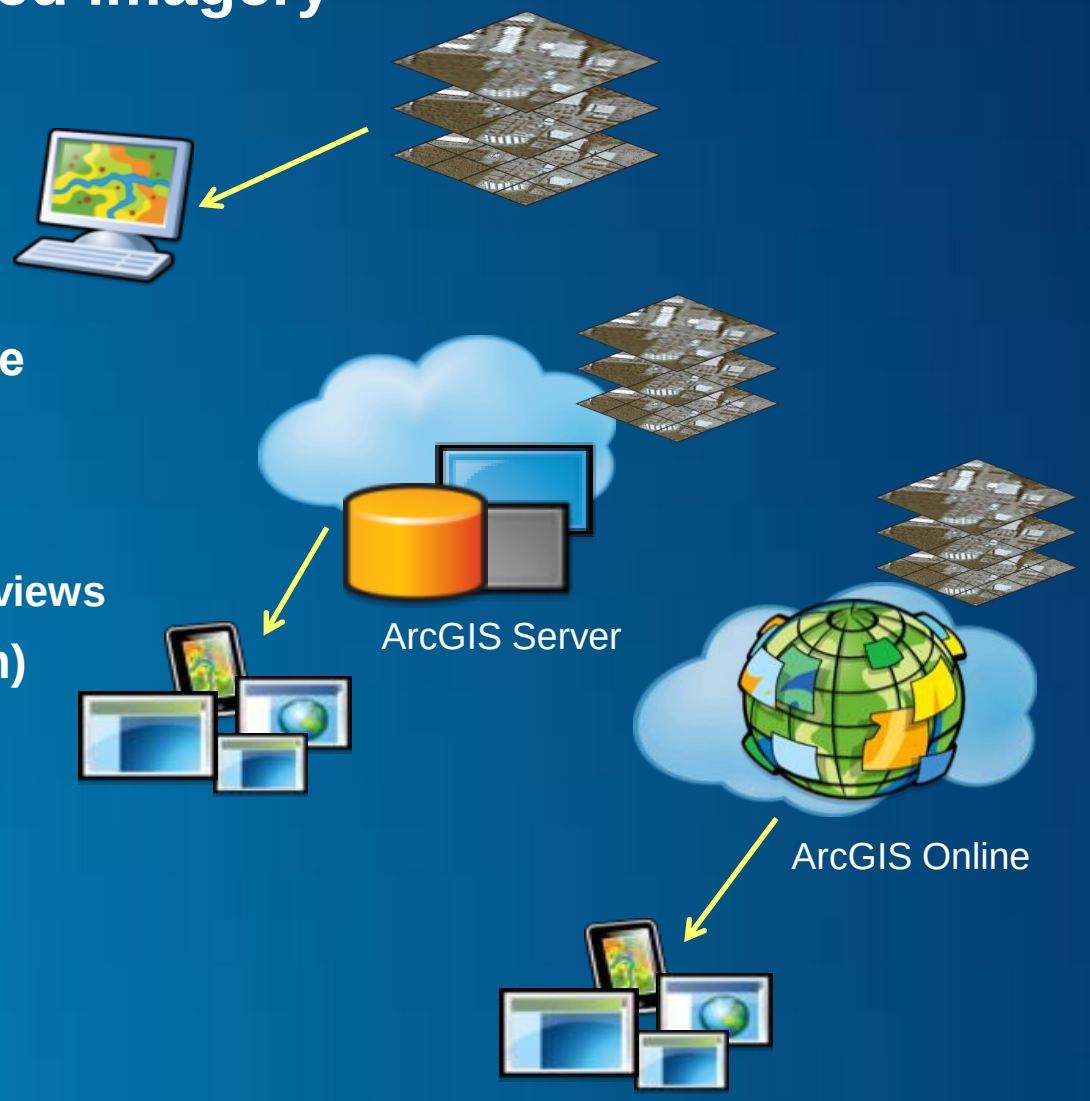
Three methods to create Raster Tile Cache

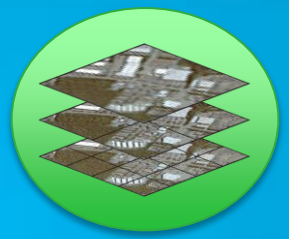
- Using ArcGIS Online
  - Package and upload imagery to ArcGIS Online
  - Cache on ArcGIS Online
- Using ArcGIS for Server
  - Create cache on server
- Using ArcGIS for Desktop
  - Create cache on desktop



Three methods to provide access to cached imagery

- Direct use in ArcGIS for Desktop
  - From disk or via LAN
- Serve through ArcGIS for Server
  - Create cache and “share as” raster tile cache service
- Share through ArcGIS Online
  - Cost: 1.2 credits/GB/month
    - For storage only; no additional charges for number of views
  - Example: State of California (~ 190 GB - L17 @ 1.2m)
    - 230 credits/month → US Pricing < $ 25/month
  - Example: City of Denver (~ 7.8 GB - L20 @ 15 cm)
    - 9 credits/month → US Pricing < $ 1/month





Geoprocessing services

- Standard Geoprocessing tools as well as ModelBuilder may be executed, then results published as a service
- Geoprocessing Service exposes parameters & controls to the client as necessary; returns only results to the client
- Applicable to processes with clearly defined inputs
  - Viewshed, Downstream Trace, Volumetric Calculations, etc.

Demo

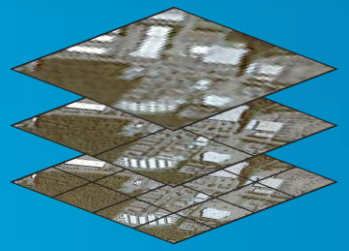
Geoprocessing services

Cody Benkelman - Esri

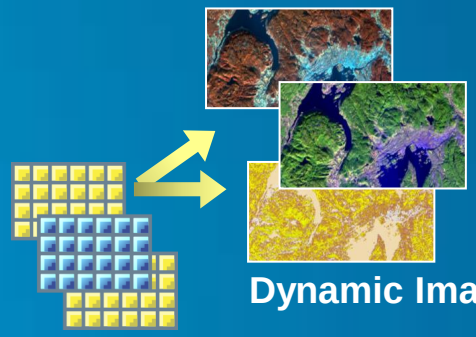
Managing Large Image Collections

- Source / Derived Mosaic Dataset model
- Recommended “best practice” for large data collections
- Supports any of the image access modes
- Scalable
- Maintainable
- Automation recommended

Download



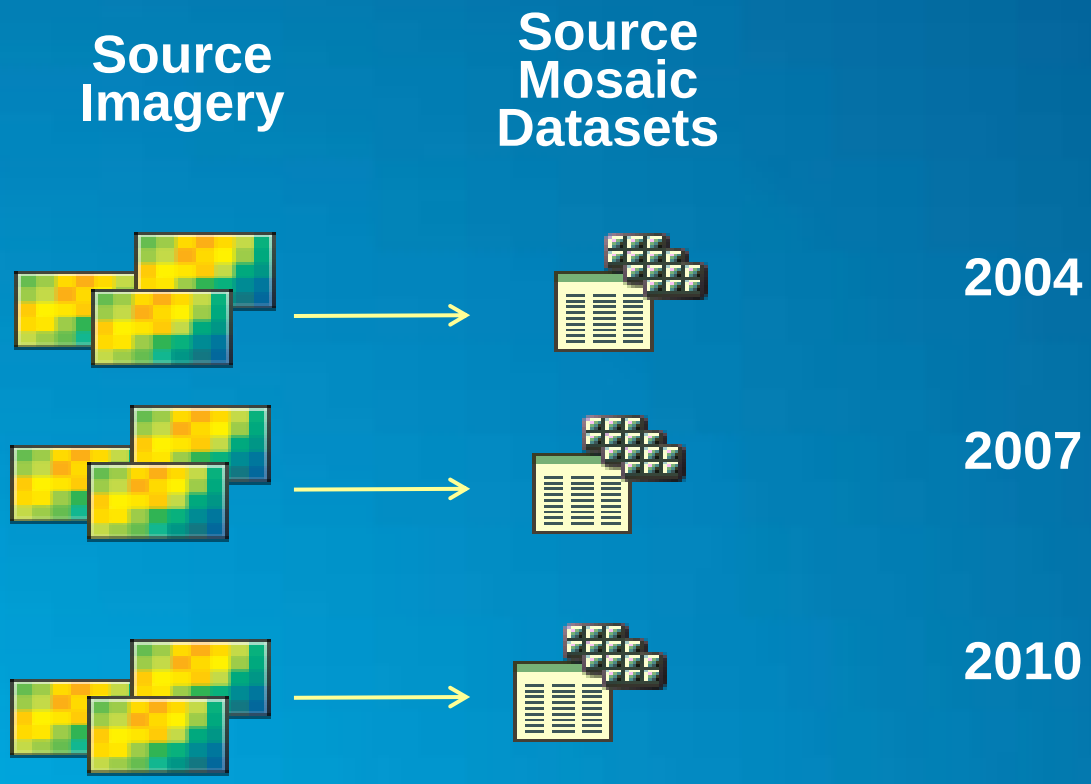
Cache



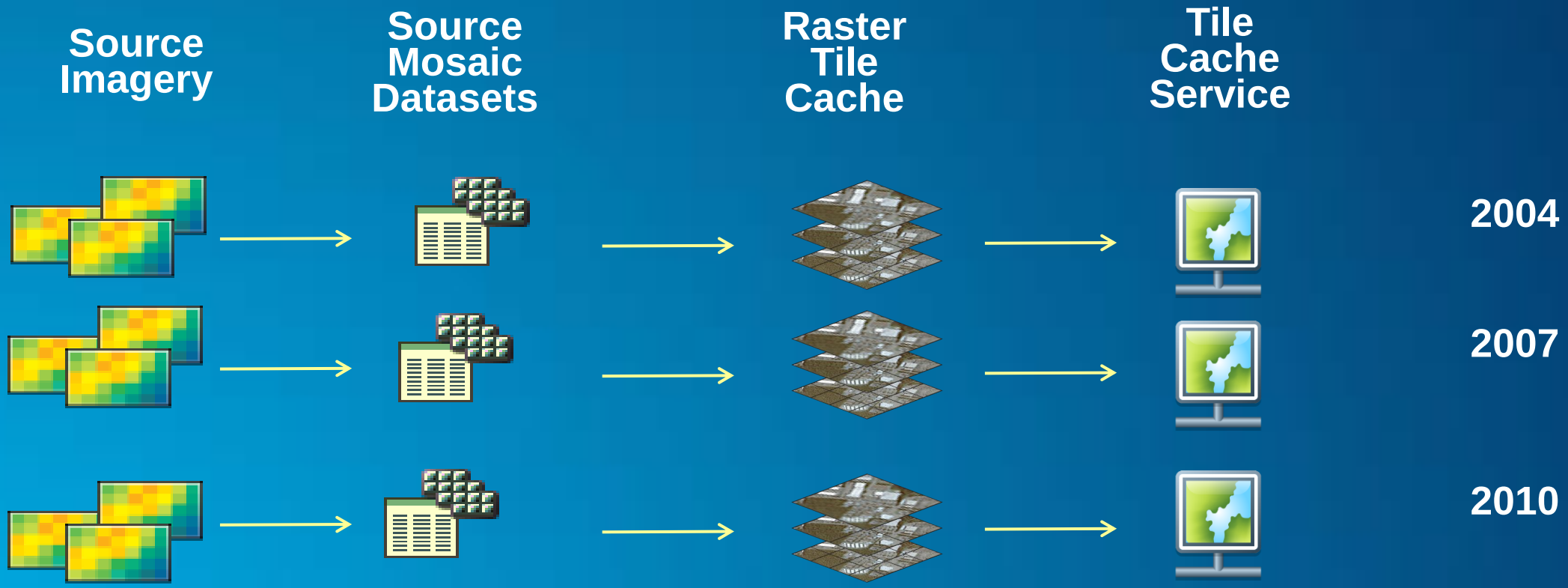
Dynamic Image Service

GeoprocessingService

Source Mosaic Datasets



Source Mosaic Datasets – Direct to Raster Tile Cache



Source Mosaic Datasets – Multispectral imagery example

Source Imagery

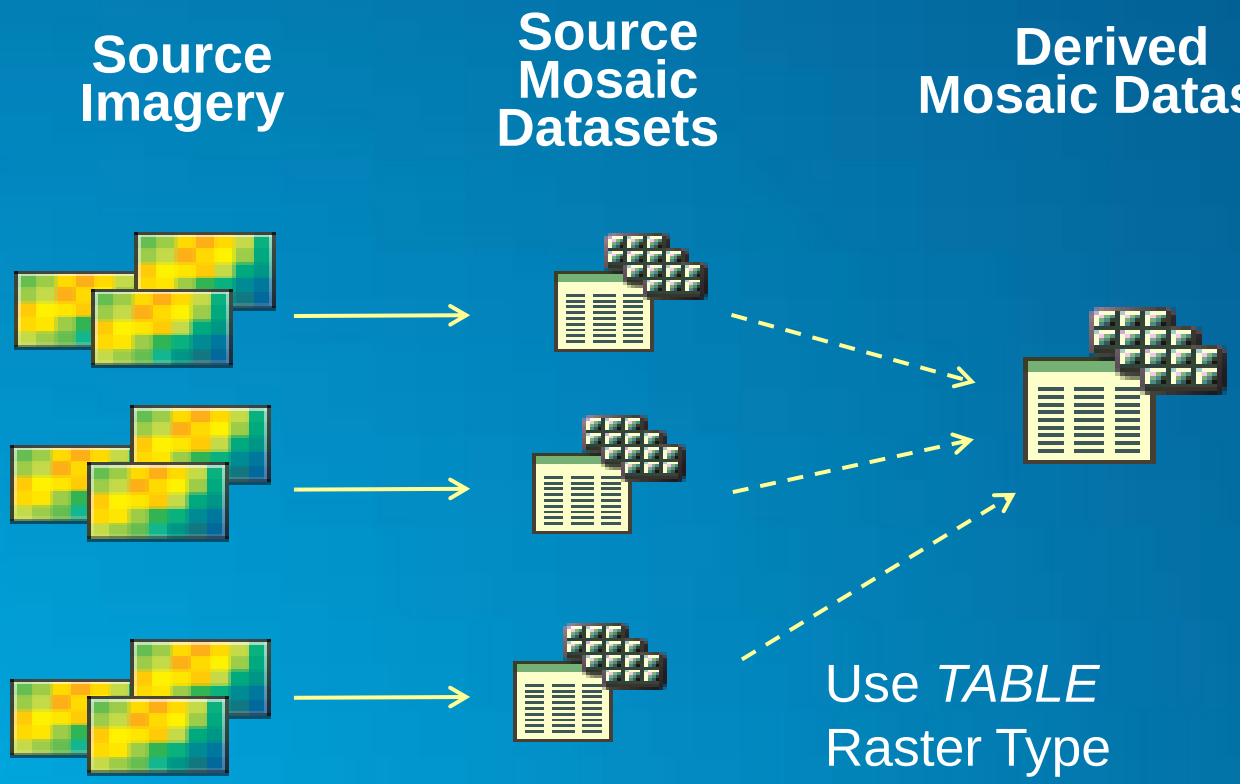
Source Mosaic Datasets

Worldview

RapidEye

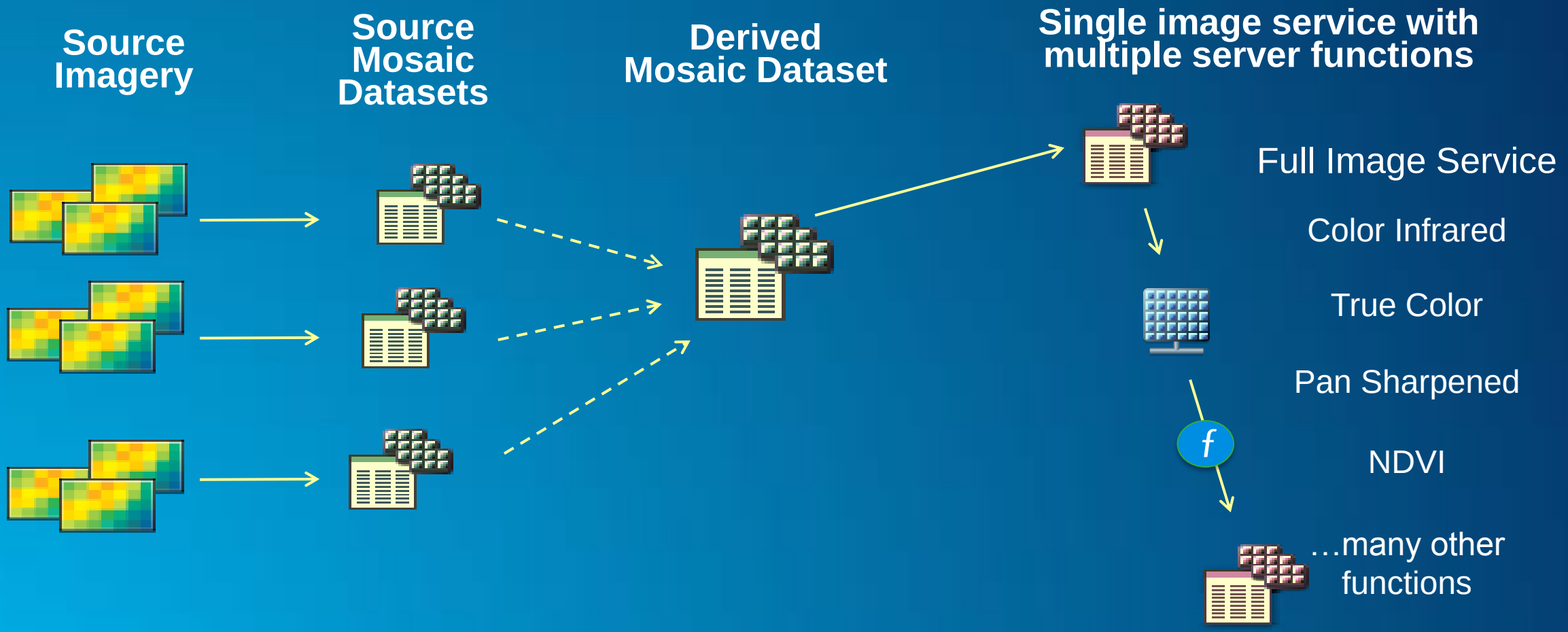
Pleiades

Combine into Derived Mosaic Dataset

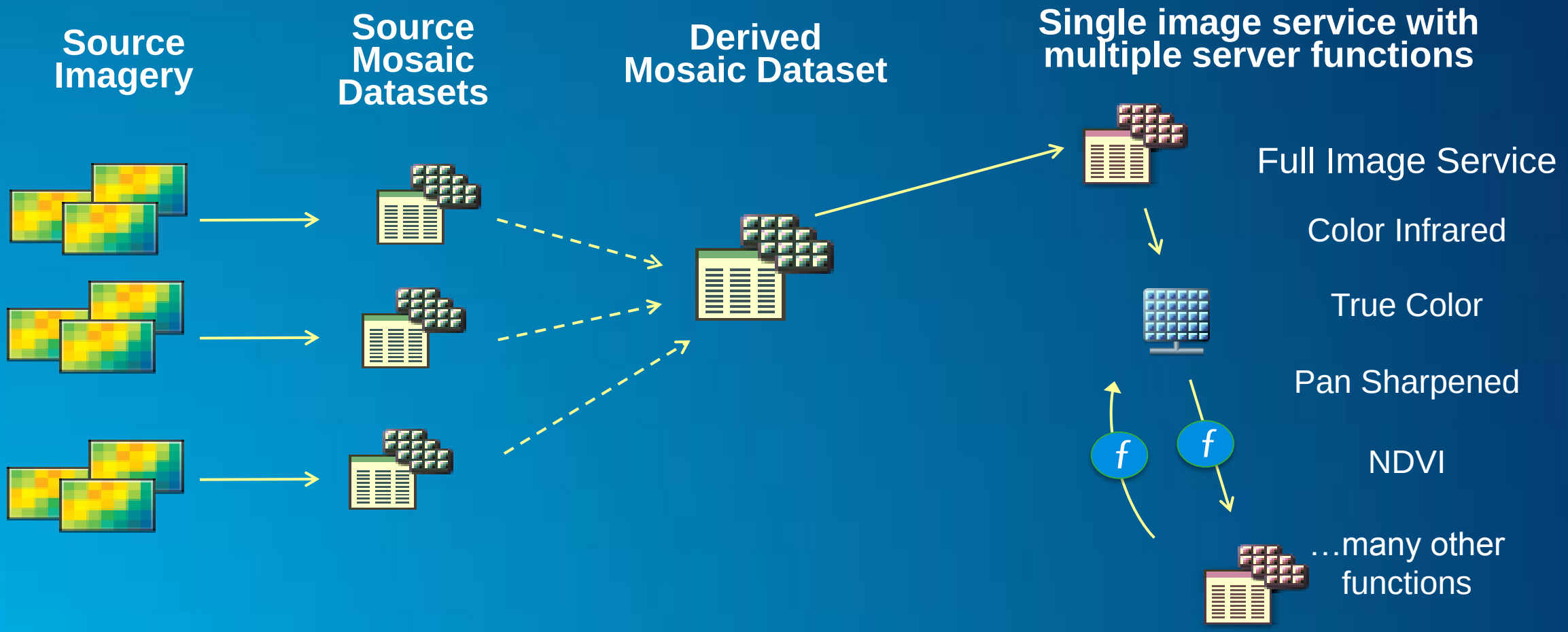


Advantage: All image data available in a single location

On-the-fly Products using Server Raster Functions

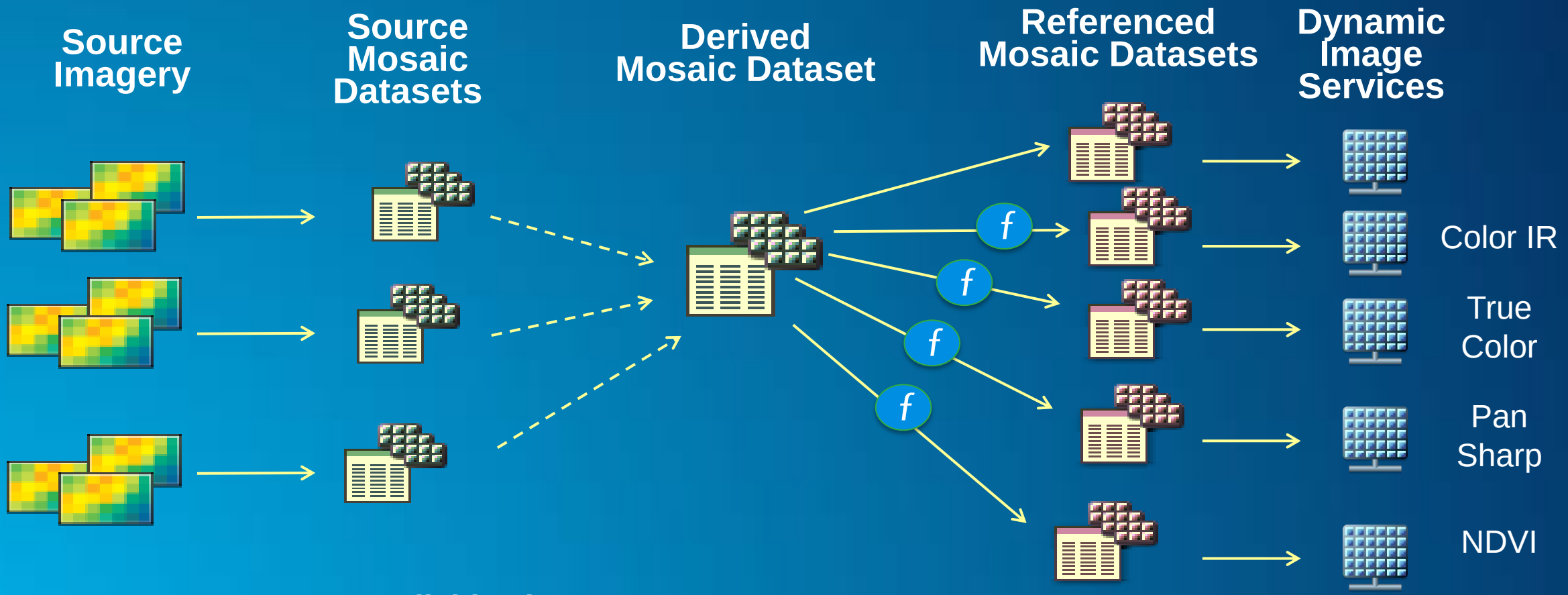


On-the-fly Products using Server Raster Functions



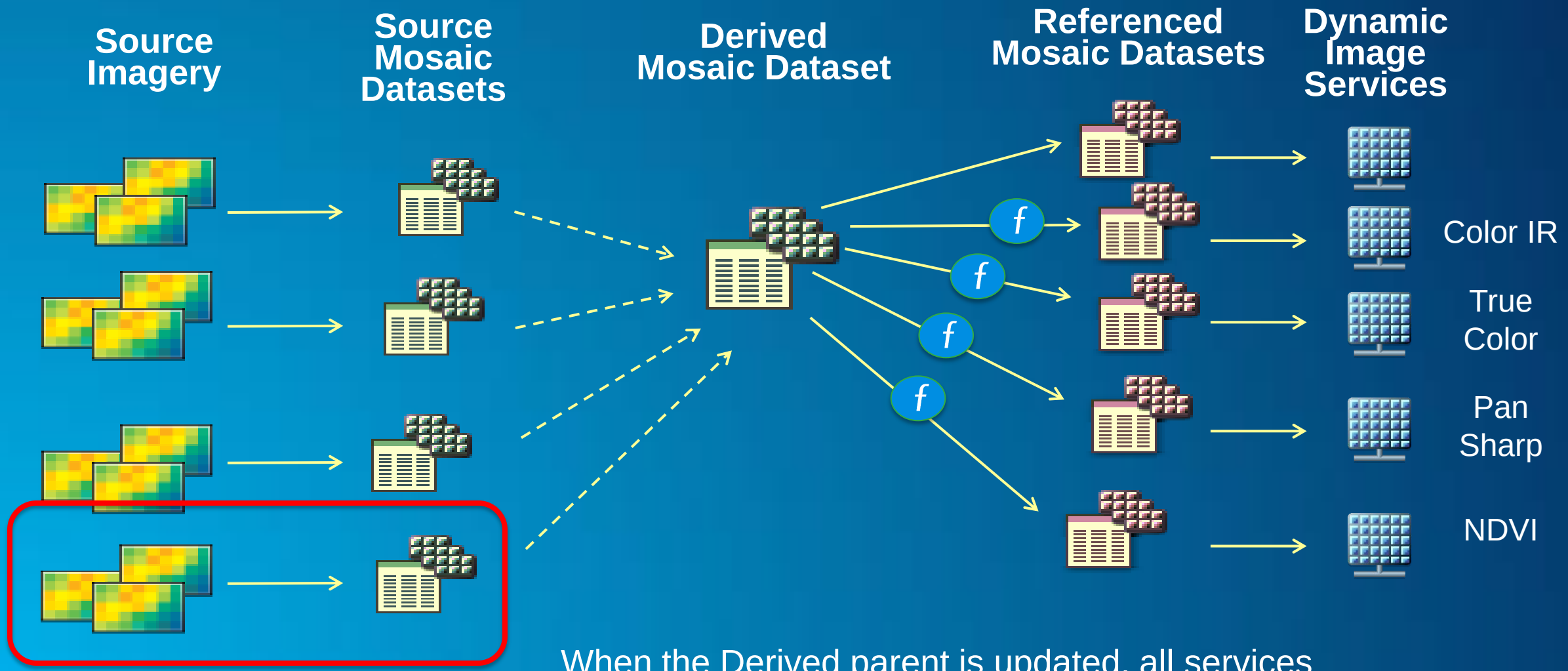
In addition to predefined functions, **client can define functions**

Alternative design using Referenced Mosaic Datasets



Available since ArcGIS 10.0
Appropriate for serving to WMS clients

Update with new data



When the Derived parent is updated, all services synchronize automatically

Scalability & Automation

- Landsat Look - 2 million records
- Landsat 8 – 300 GB/day

Cody Benkelman - Esri

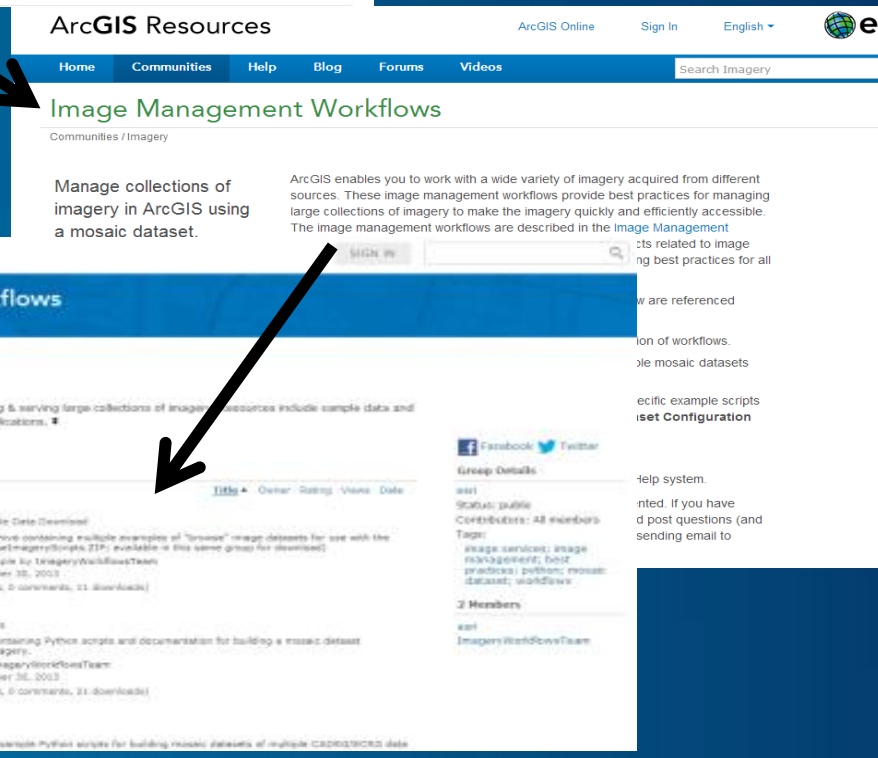
Automated Workflows – for Repeatability & Scalability

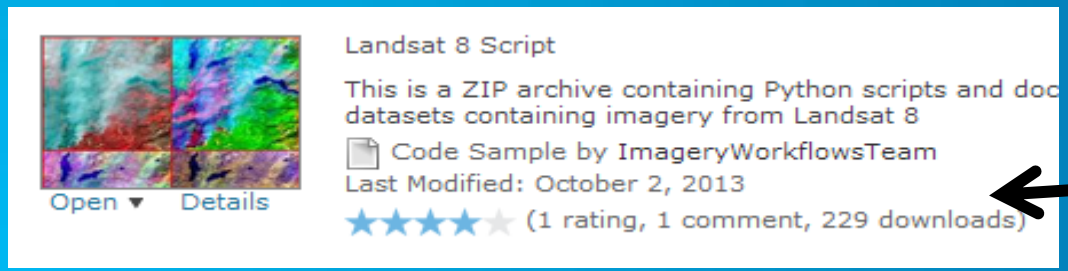
- Simplicity
- Improve Productivity
  - Repeatability, Maintainability, Scalability
  - Documentation → Facilitate QA & QC, Design Review
- Training/Examples
  - Encapsulate best practices
  - Reusable templates

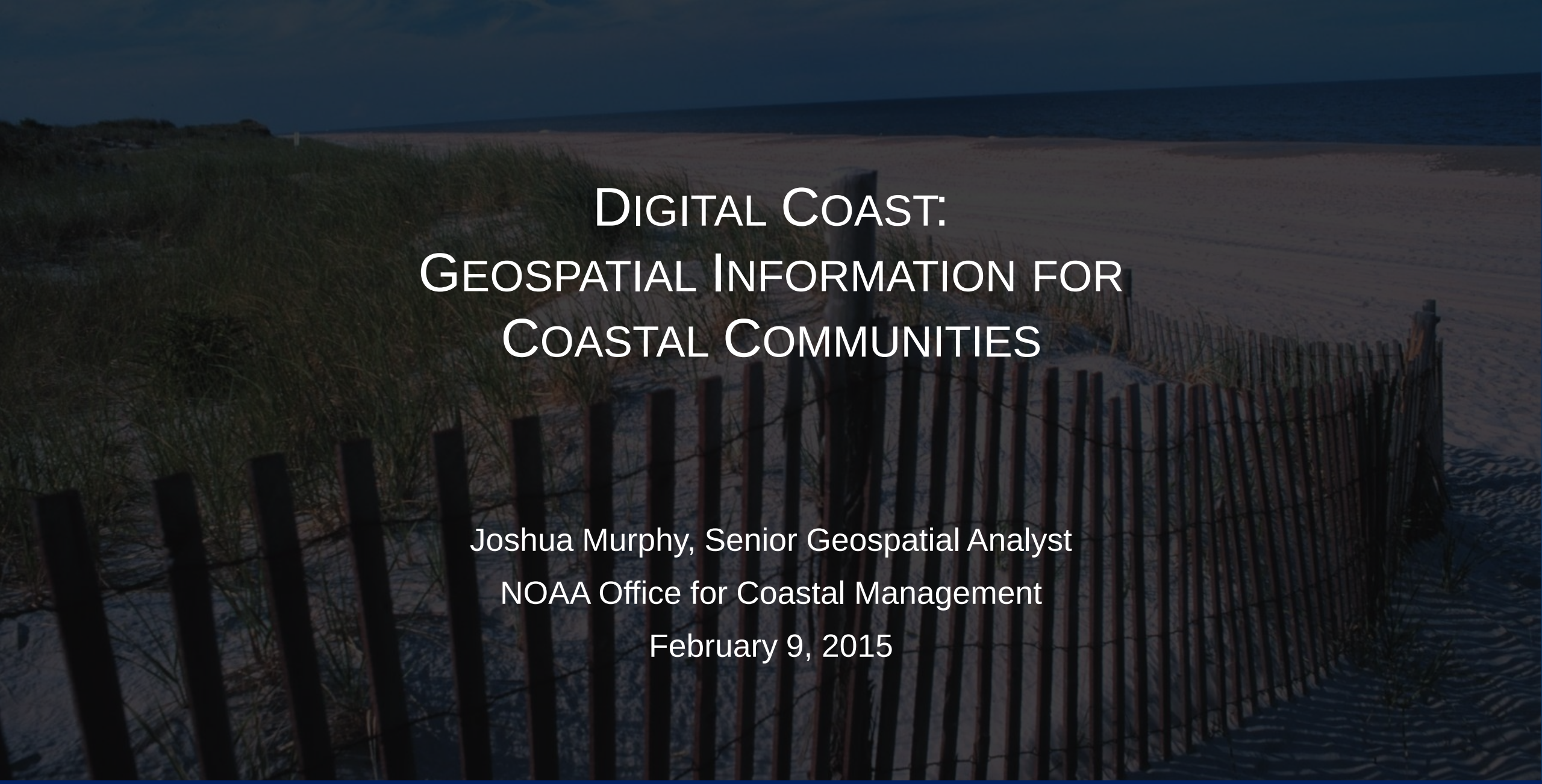
Image Management Workflows – Landing page

http://resources.arcgis.com

- Overview of Workflows
- Guidebook
  - Part of Online Doc
- ArcGIS Online Group
  - Gallery of downloadable items







Digital Coast: Geospatial Information for Coastal Communities

Joshua Murphy, Senior Geospatial Analyst

NOAA Office for Coastal Management

February 9, 2015

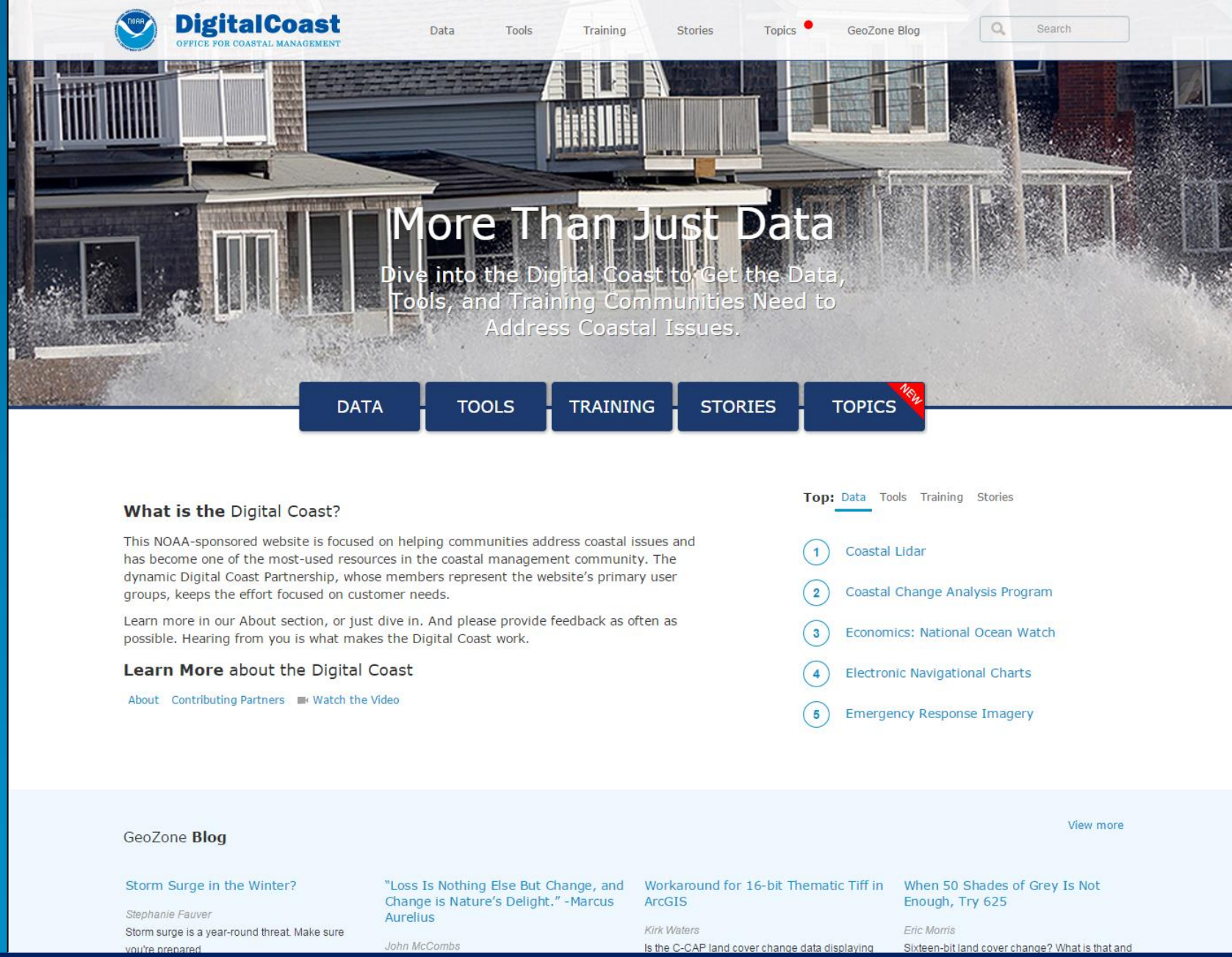
NOAA Office for Coastal Management

Foster sound approaches to coastal management through the following avenues:

- **Collaborative and leveraged approaches**
- **Science-based decision making**
- **Capacity building**
- **Smart governance and investments**
- **Inspiring, educating, and motivating people**

DIGITAL COAST

- **Approach: Bring the geospatial and coastal management communities together**
- **Outcome: A constituent-driven, integrated, enabling platform supporting coastal resource management that is used**

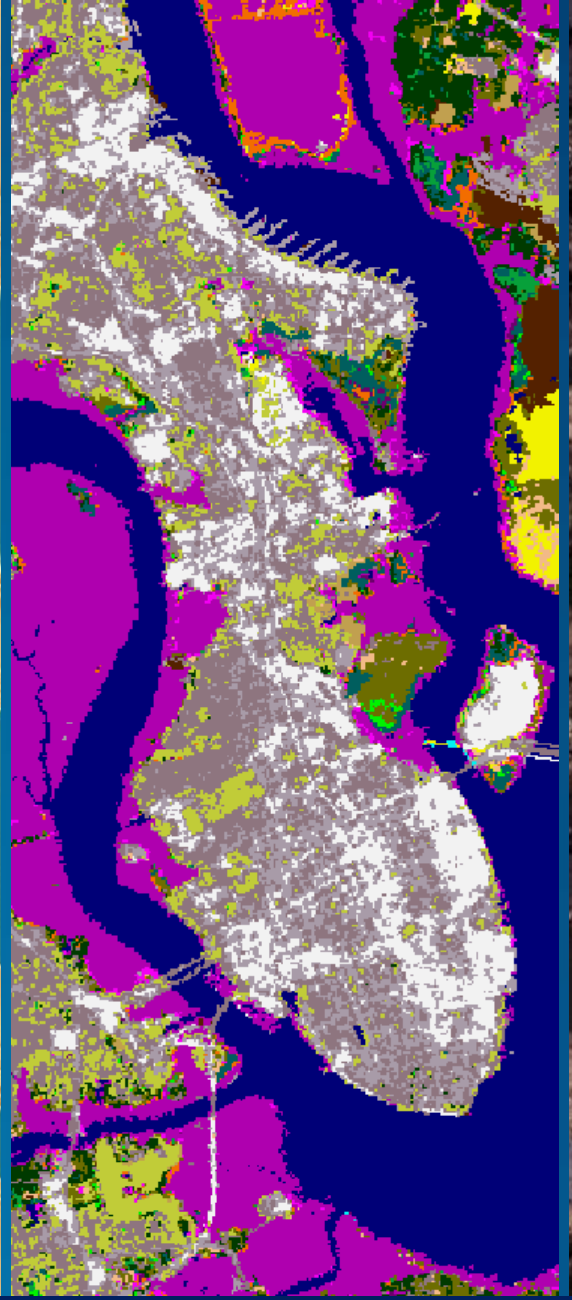


Digital Coast Partnership

- NOAA Office for Coastal Management
- American Planning Association
- Association of State Floodplain Managers
- Coastal States Organization
- National Association of Counties
- National Estuarine Research Reserve Association
- National States Geographic Information Council
- The Nature Conservancy
- Urban Land Institute

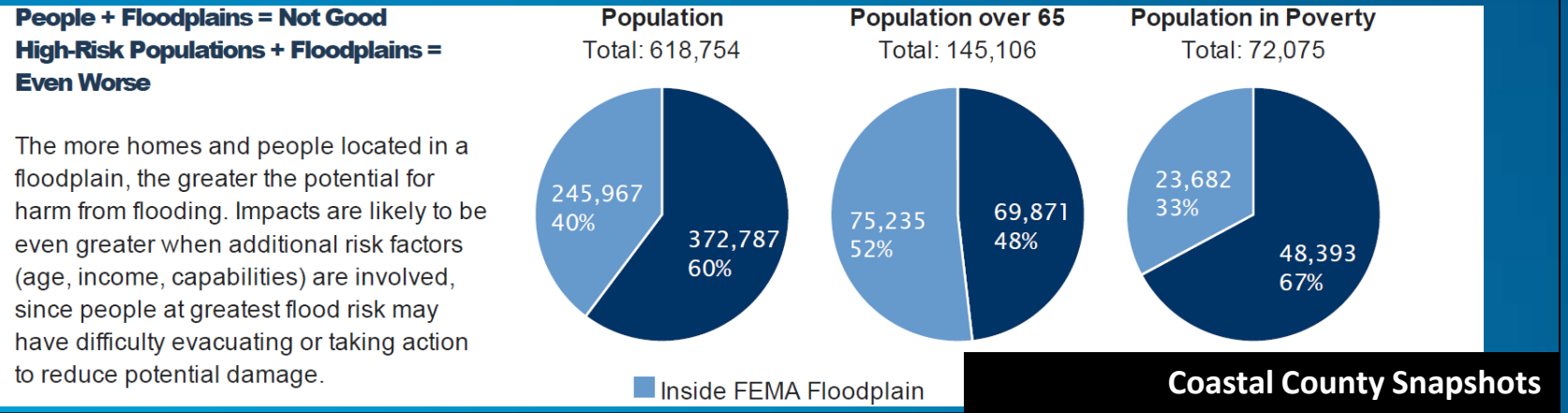
DATA

- Over 65 terabytes of high-resolution elevation data, land cover data, and orthoimagery
- 200+ web mapping services
- Linkages to over 40 national-level coastal data sets

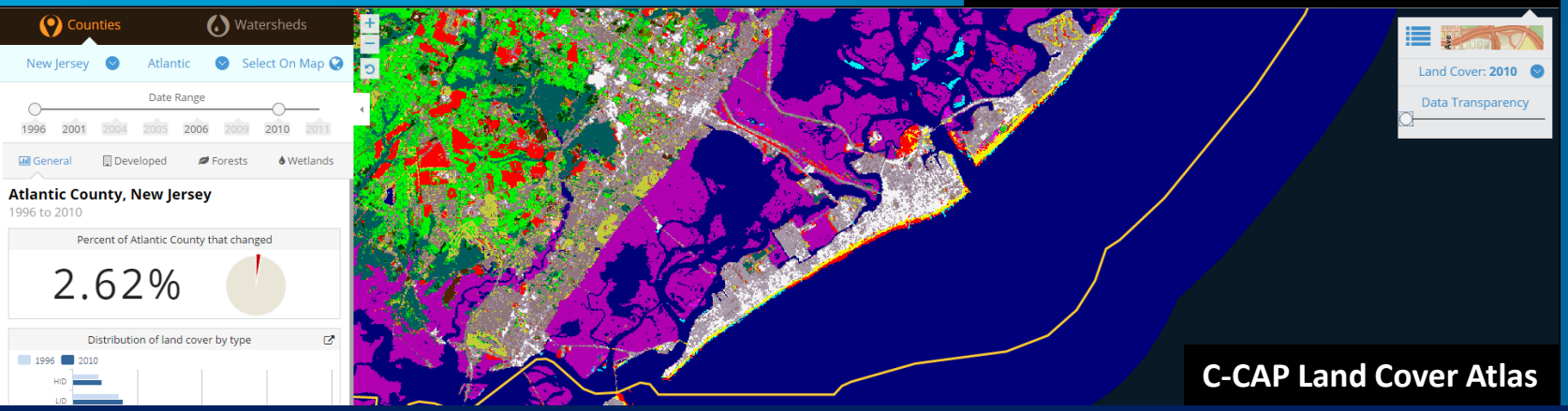


Tools

Sea Level Rise and Coastal Flooding Impacts Viewer



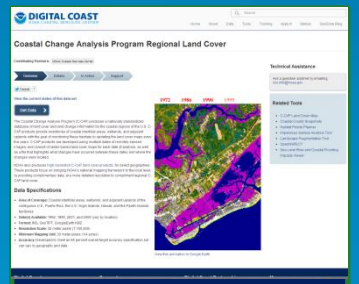
Coastal County Snapshots



C-CAP Land Cover Atlas

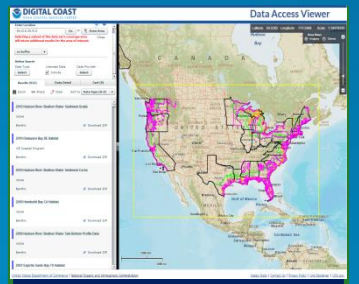
- An inventory of over 50 decision-support and information visualization tools
- Many provide visualization and analysis capabilities without need for GIS software

The Digital Coast in Action: Facilitating Use and Application



DISCOVER

Information on the C-CAP land cover data set on the Digital Coast website

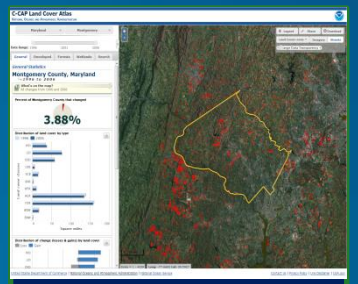


DOWNLOAD

Land cover data for your community via the Data Access Viewer

MAP

Develop mash-ups with ESRI and OGC map services

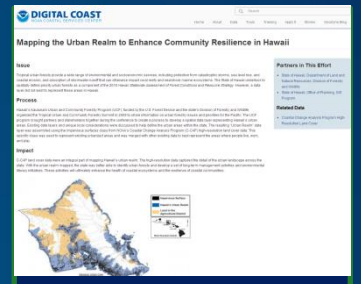


ANALYZE

Change in your county with the Land Cover Atlas

LEARN

From data experts through recorded webinars



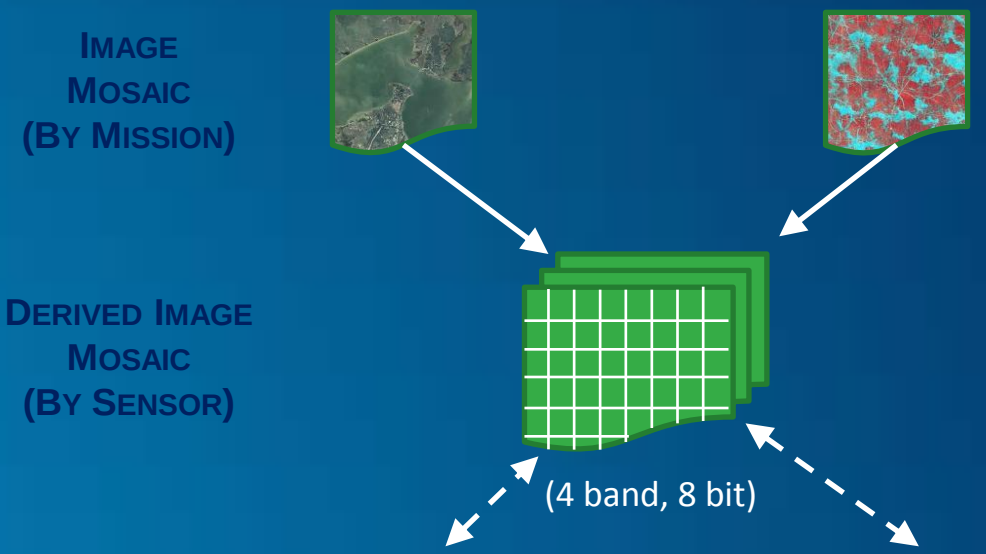
SHARE

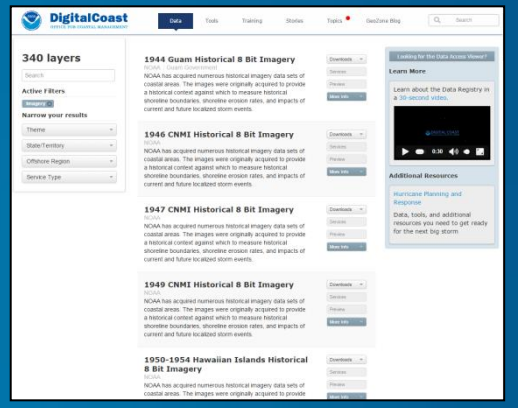
Outcomes with others though Stories in the Field

DATA → INFORMATION → ACTION

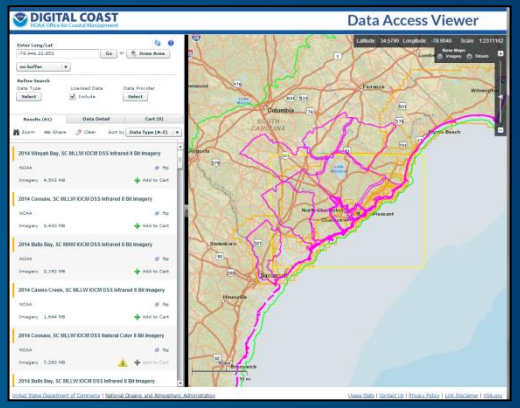
Digital Coast Imagery Management

- 300+ orthoimagery missions
- Much of our orthoimagery and raster data holdings are managed through mosaic datasets (by mission) and derived mosaics (by sensor type)
- Imagery is disseminated through:
  - Automated access through Data Access Viewer (DAV)
  - Manual access through Data Registry (FTP/HTTP download)





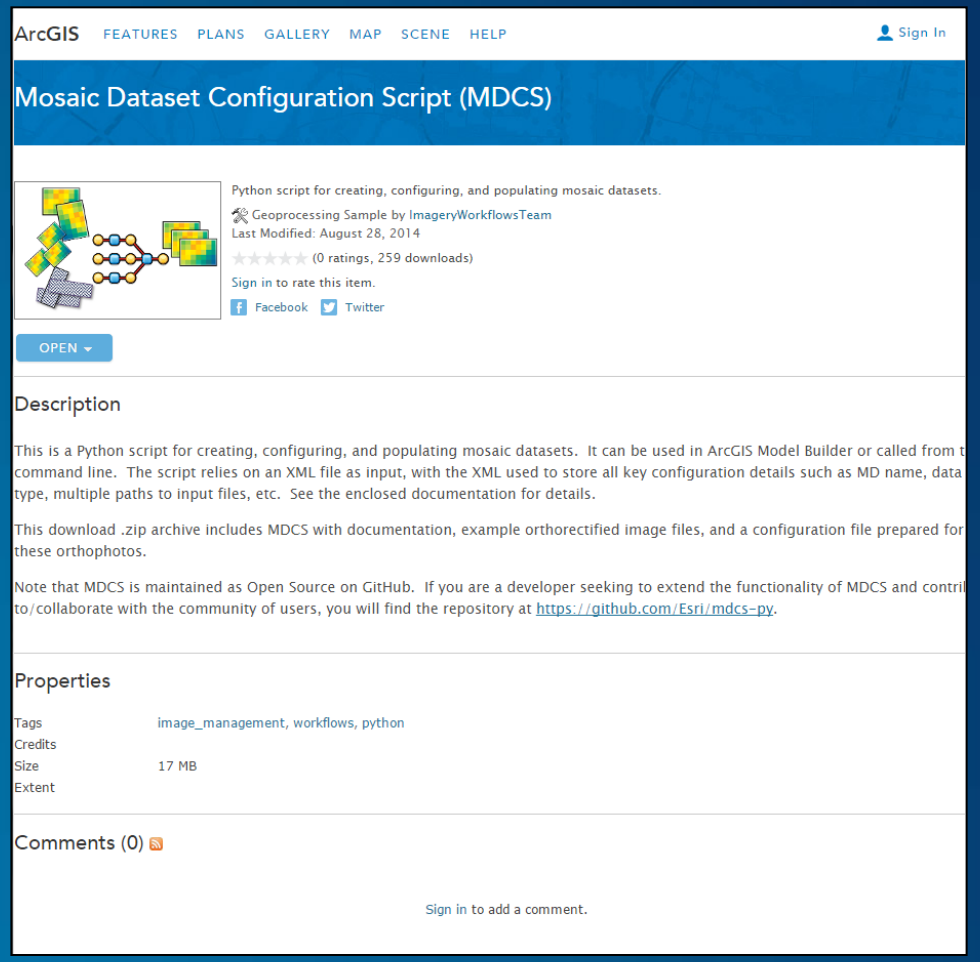
Data Registry



Data Access Viewer

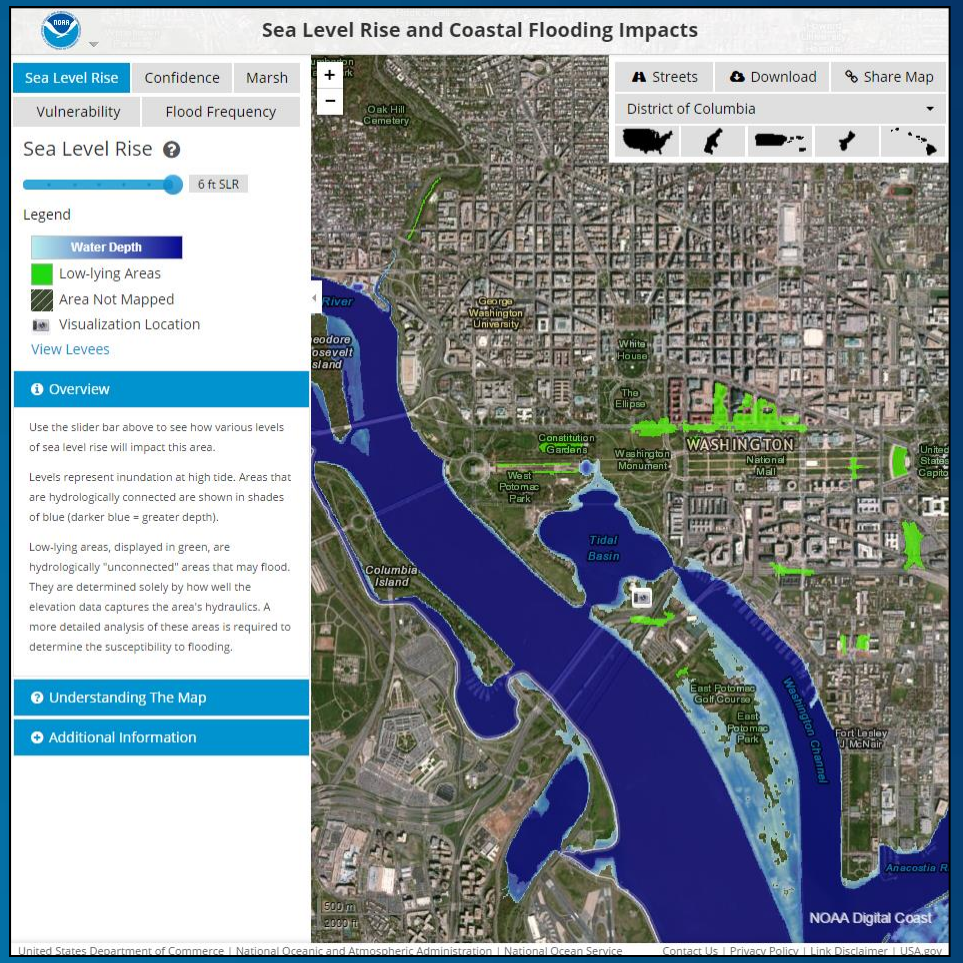
Imagery Management Best Practices

- **Many operational efficiencies are realized through the use of mosaic datasets:**
  - It reduces the amount of data we have to touch in order to develop tile caches for web mapping applications
  - It greatly simplifies the update process as new imagery is acquired
- **Python scripts are now used to develop and update mosaic datasets and map services**
  - We use ESRI's Mosaic Dataset Configuration Scripts (MDCS), which consists of a general XML template and Python scripts that combine many of the processes associated with creating a mosaic dataset



On the Horizon

- We plan on publishing 6 to 8 Dynamic Image Services of MHW, MLLW, 3-band and 4-band imagery that users can access form DAV and the Data Registry.
- We're currently working on a Dynamic Image Service that contains all of our SLR Viewer distribution DEMs.
  - The DEMs are managed through a mosaic dataset, which is then published as an image service.
  - We're experimenting with adding custom functions to the image service.



Resources

- Live Training Seminar re: Raster Tile Cache
  - http://esriurl.com/ImageCacheLTS
- Imagery and Raster Data Management Patterns and Recommendations
  - http://tinyurl.com/imageManage
- Image Management Workflows:
  - http://esriurl.com/ImageManagement
  - Guidebook (Best practices) & ArcGIS Online Group (Sample data and scripts)
- Landsat 8
  - http://www.esri.com/software/landsat-imagery
- Email addresses
  - cbenkelman@esri.com
  - dzimble@esri.com

Understanding our world.

ABSTRACT

- In this workshop, the presenters will describe Esri's recommended architecture for managing and sharing large image collections. Using the power of the Mosaic Dataset to catalog and process imagery and other rasters in multiple data formats and projections, this session will discuss and demonstrate
- A brief overview of Raster Products, Mosaic Datasets, and on-the-fly Raster Functions;
- How to organize your raster data in a hierarchy based on logical data collections;
- How to update your image management structure as new data becomes available;
- How to optimize non-overlapping "background" imagery for fastest access using raster tile cache, if appropriate, or ensure all overlapping datasets are fully accessible;
- How to use raster functions to generate different image products (band ratios such as NDVI, elevation products such as hillshade, slope and aspect) on-the-fly;
- How to publish and access image services with raster functions attached to enable client access to multiple products; and
- Using Python scripts (available on the ArcGIS Resource Center) to automate the process of building and maintaining this architecture to ensure repeatability and self-documentation.
-
- A representative from the NOAA Office for Coastal Management will participate in this presentation, to discuss how their office has employed some of these recommendations to the applications and data in the Digital Coast. See http://coast.noaa.gov/digitalcoast.

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