

**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

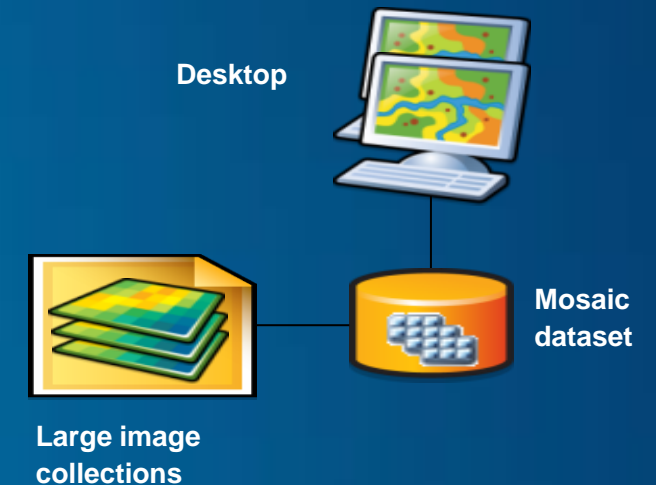
# Outline

- **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





# Demo

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

Dan Zimble - Esri

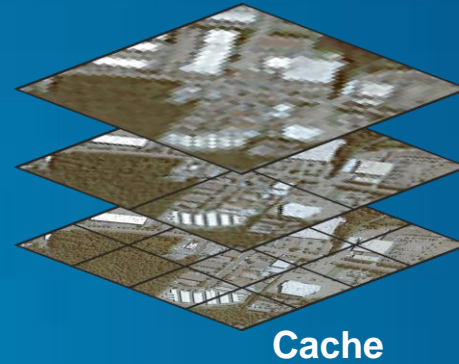
# Four Ways to Provide Image Accessibility

- **Download**
  - Traditional Approach



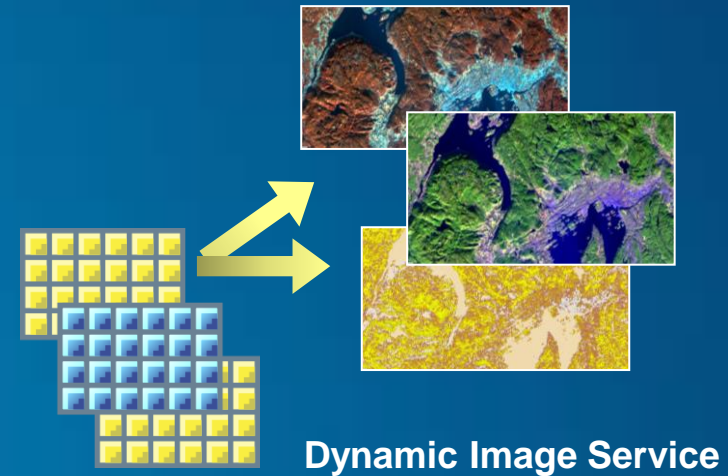
# Four Ways to Provide Image Accessibility

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- **Tile Cache Services**
  - Simple Background Imagery



# Four Ways to Provide Image Accessibility

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





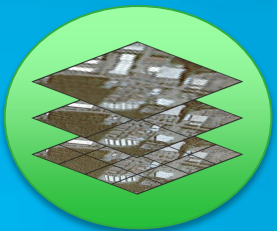
# Four Ways to Provide Image Accessibility

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



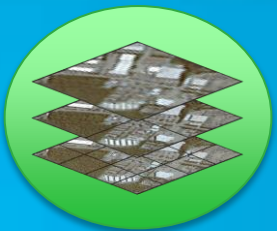
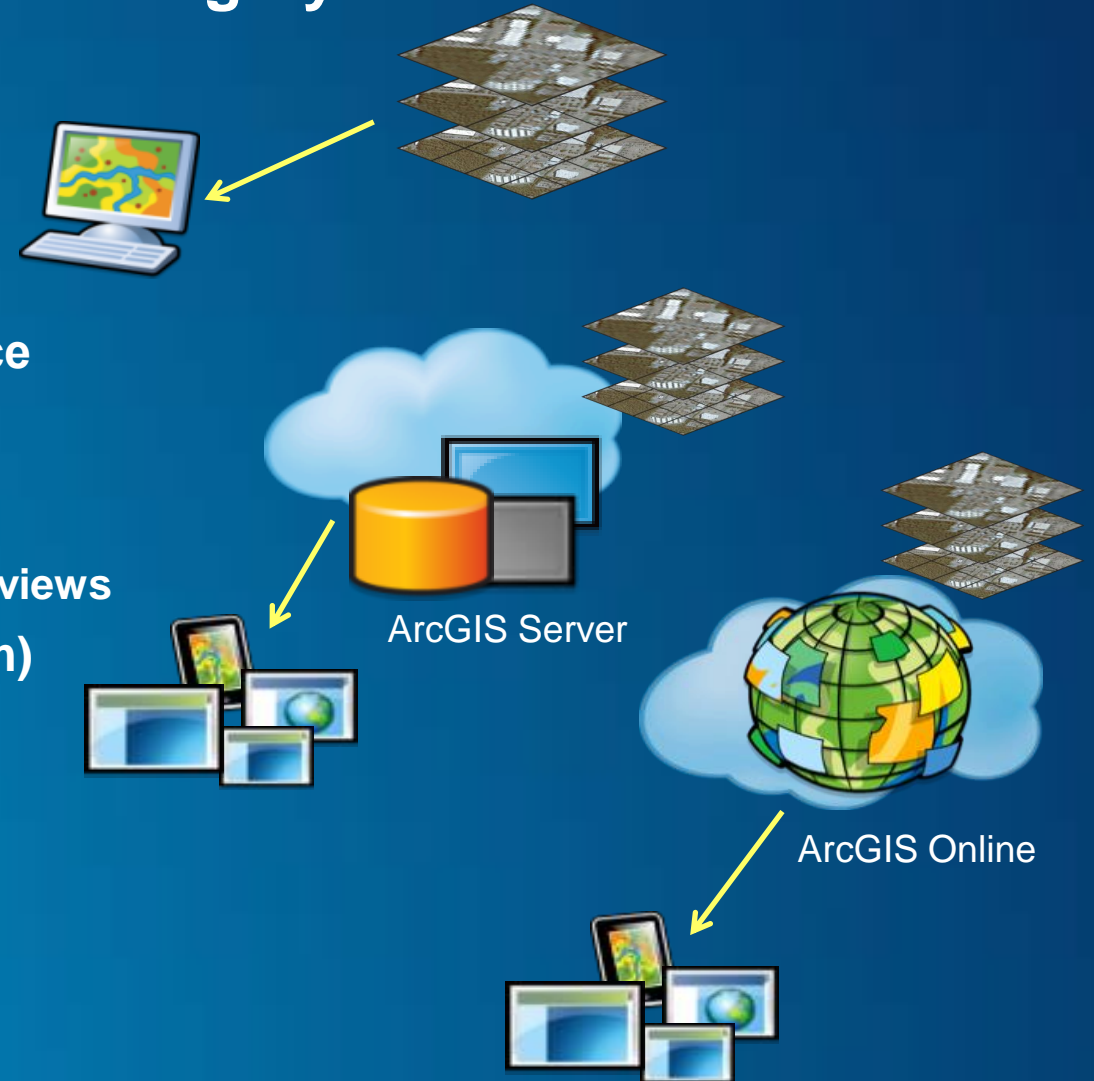
# Three methods to create Raster Tile Cache

- **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.**



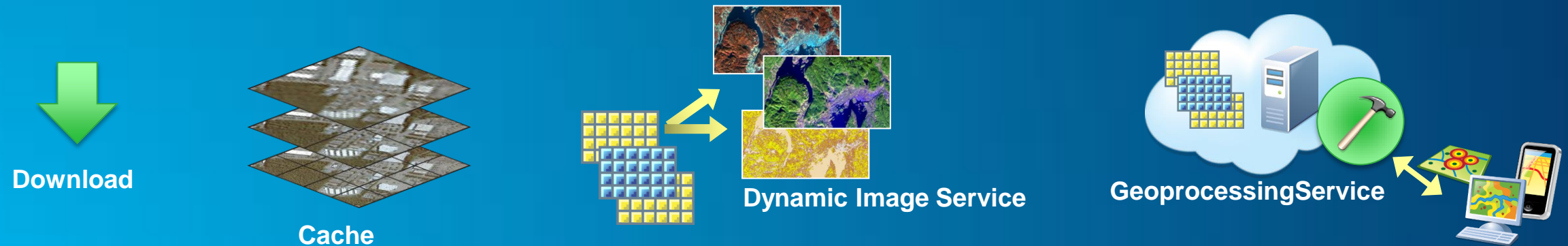
# Demo

**Geoprocessing services**

Cody Benkelman - Esri

# Managing Large Image Collections

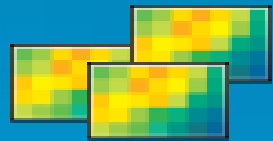
- Source / Derived Mosaic Dataset model
- Recommended “best practice” for large data collections
- Supports any of the image access modes
- Scalable
- Maintainable
- Automation recommended



# Source Mosaic Datasets

Source Imagery

Source Mosaic Datasets



2004

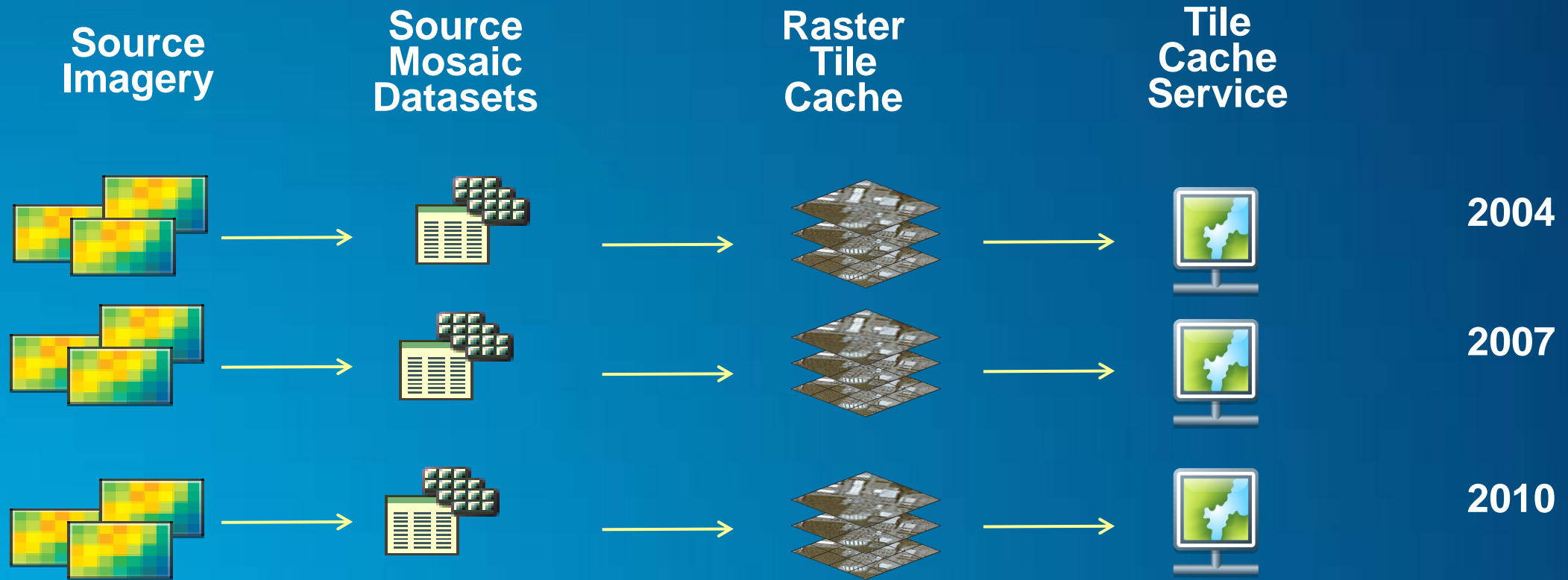


2007



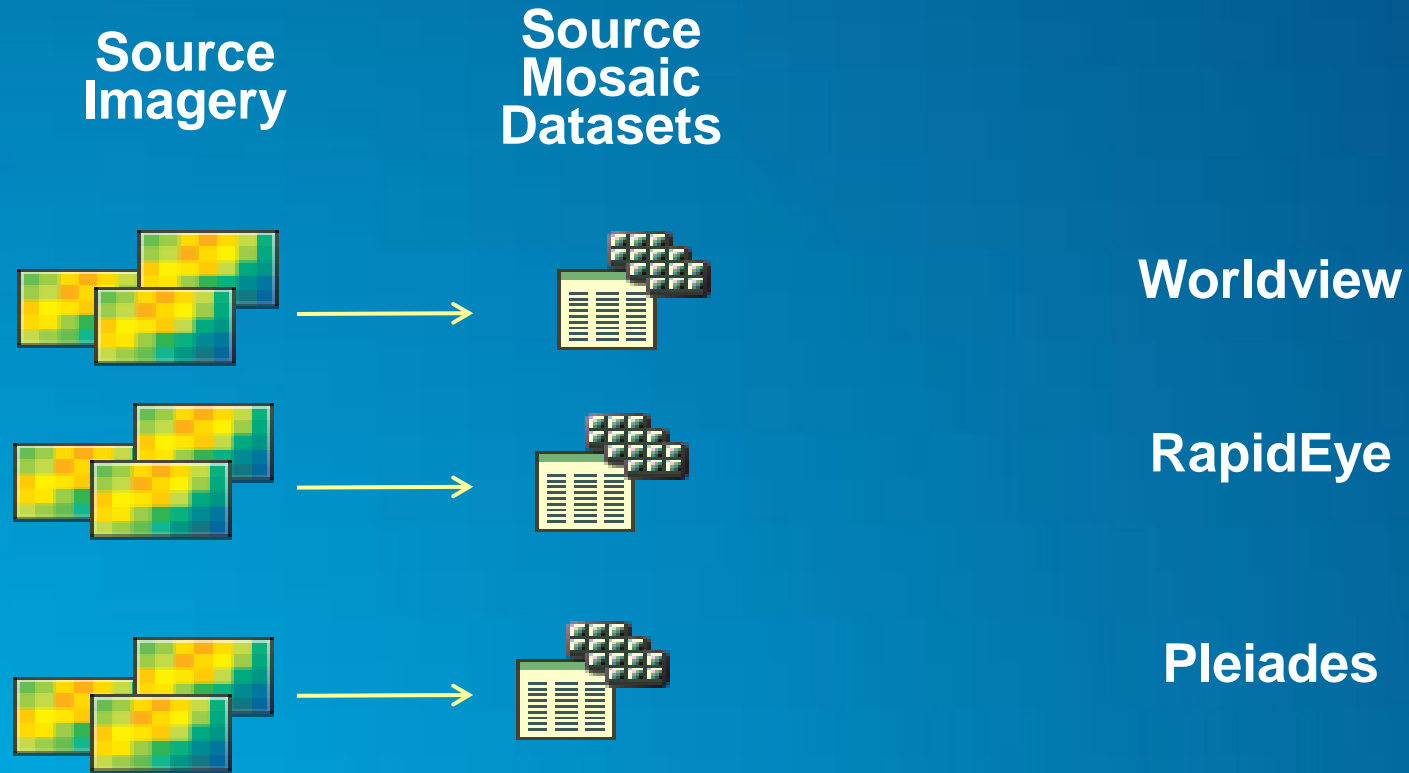
2010

# Source Mosaic Datasets – Direct to Raster Tile Cache

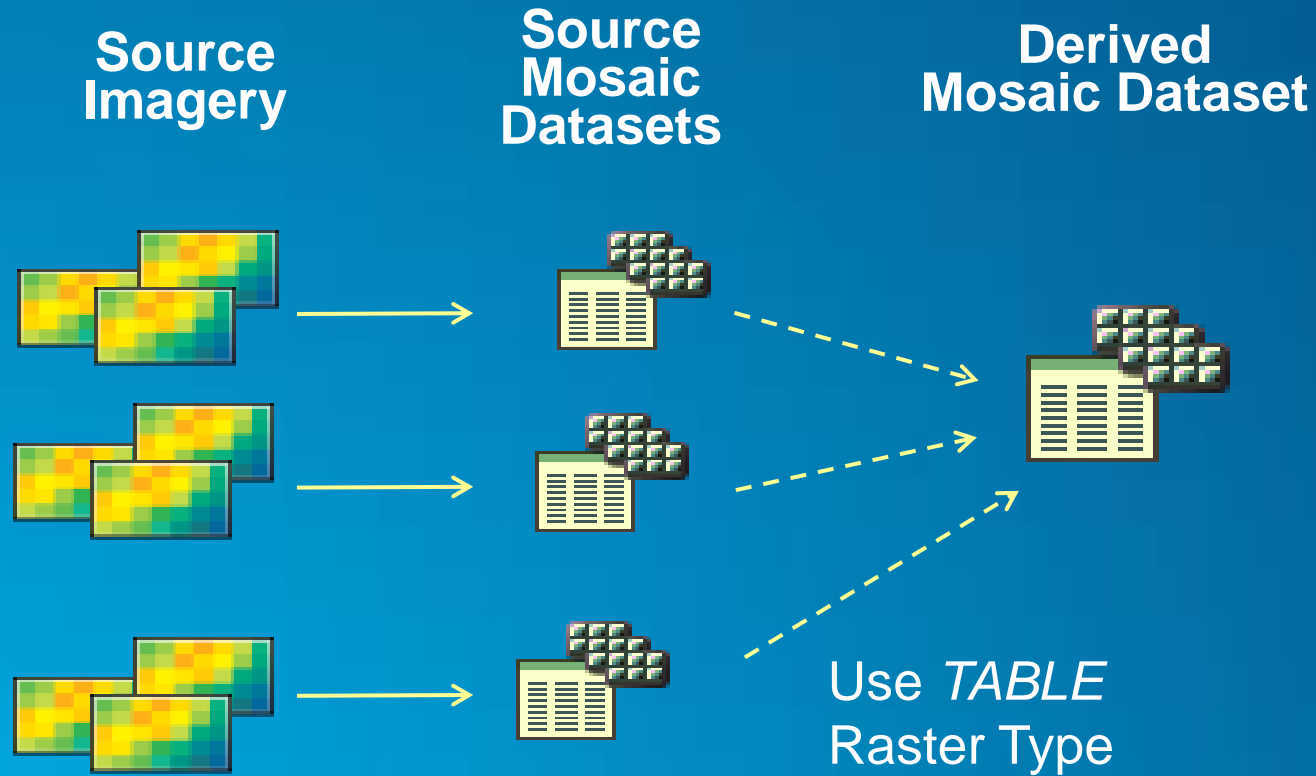




# Source Mosaic Datasets – Multispectral imagery example

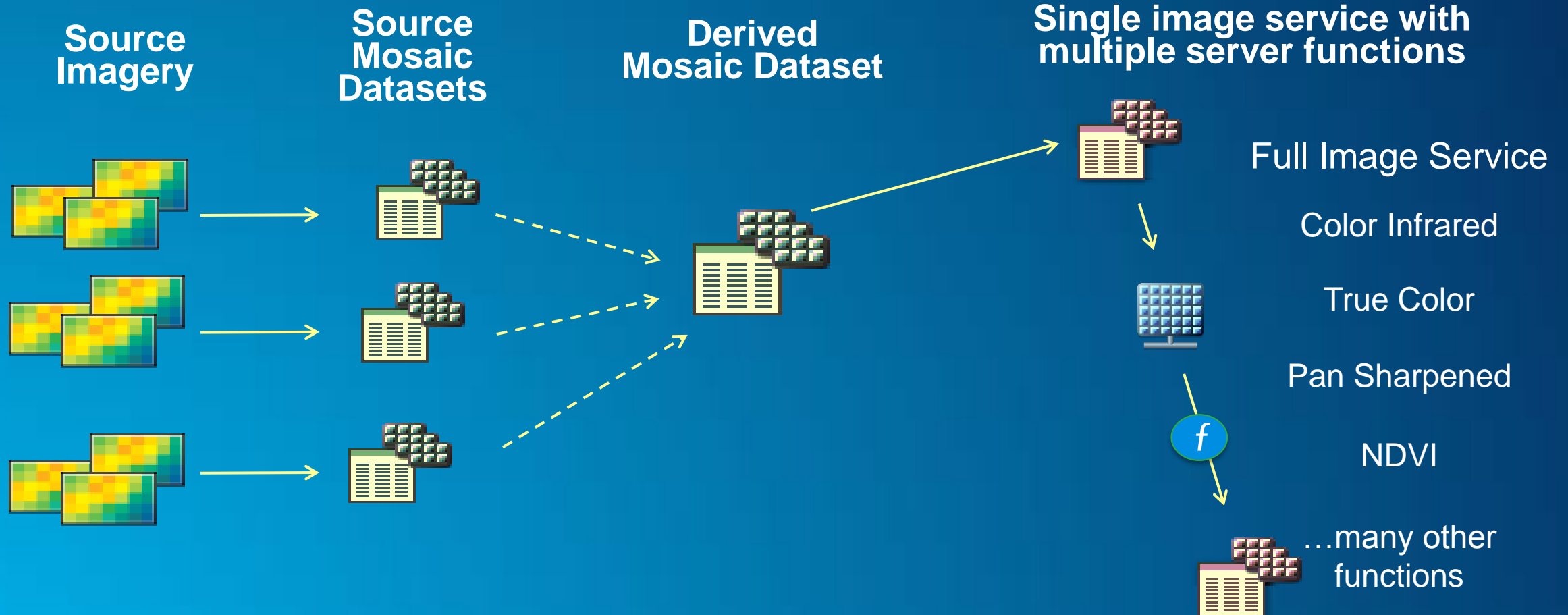


# Combine into Derived Mosaic Dataset

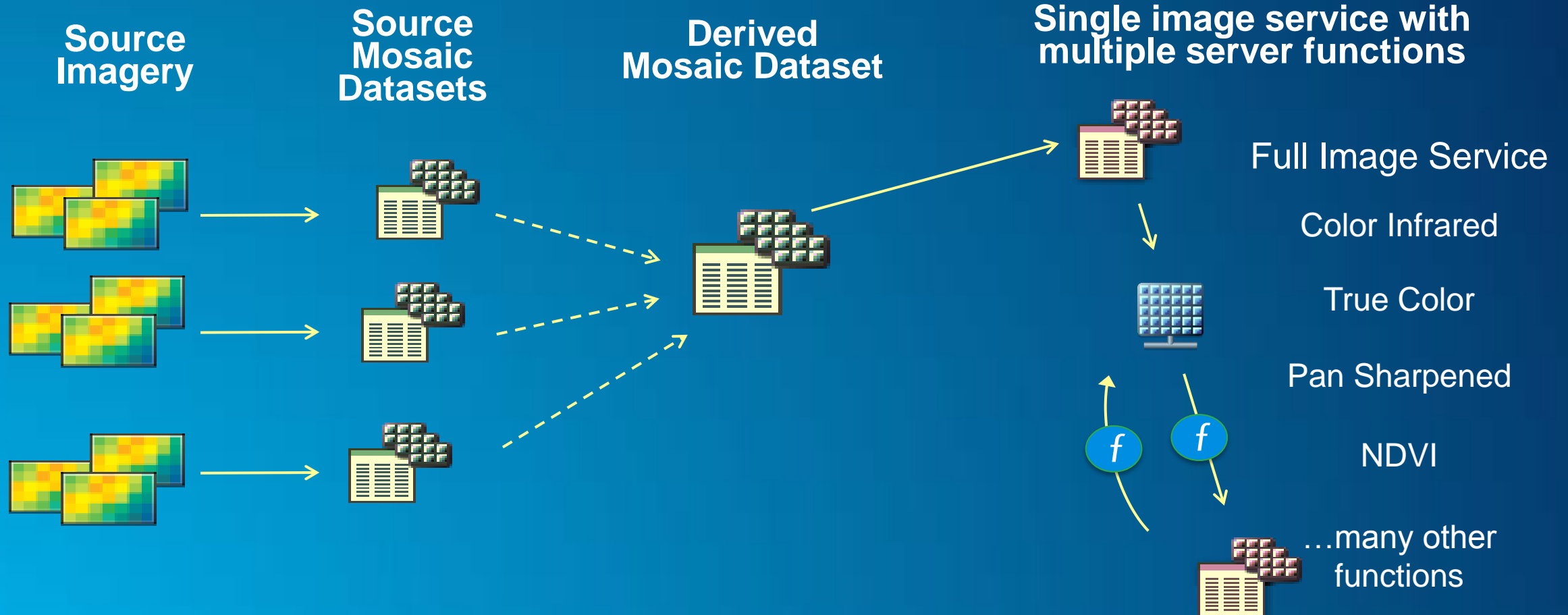


Advantage: All image data available in a single location

# On-the-fly Products using Server Raster Functions

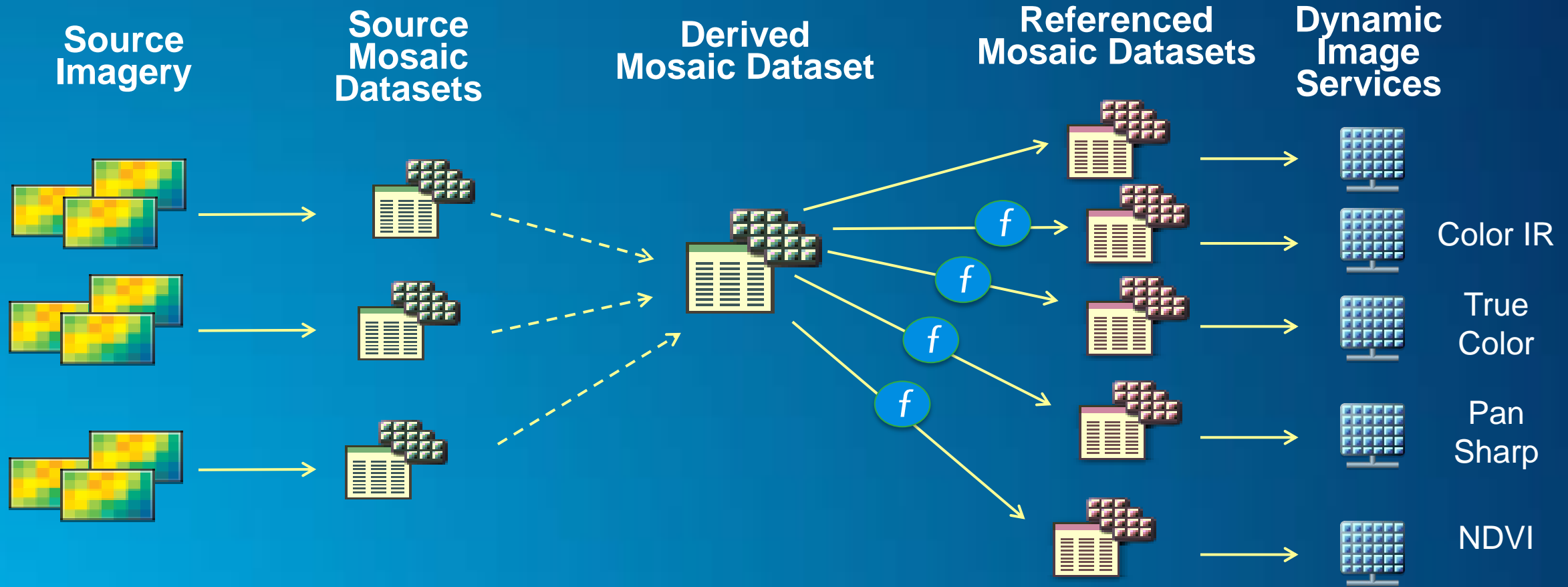


# On-the-fly Products using Server Raster Functions



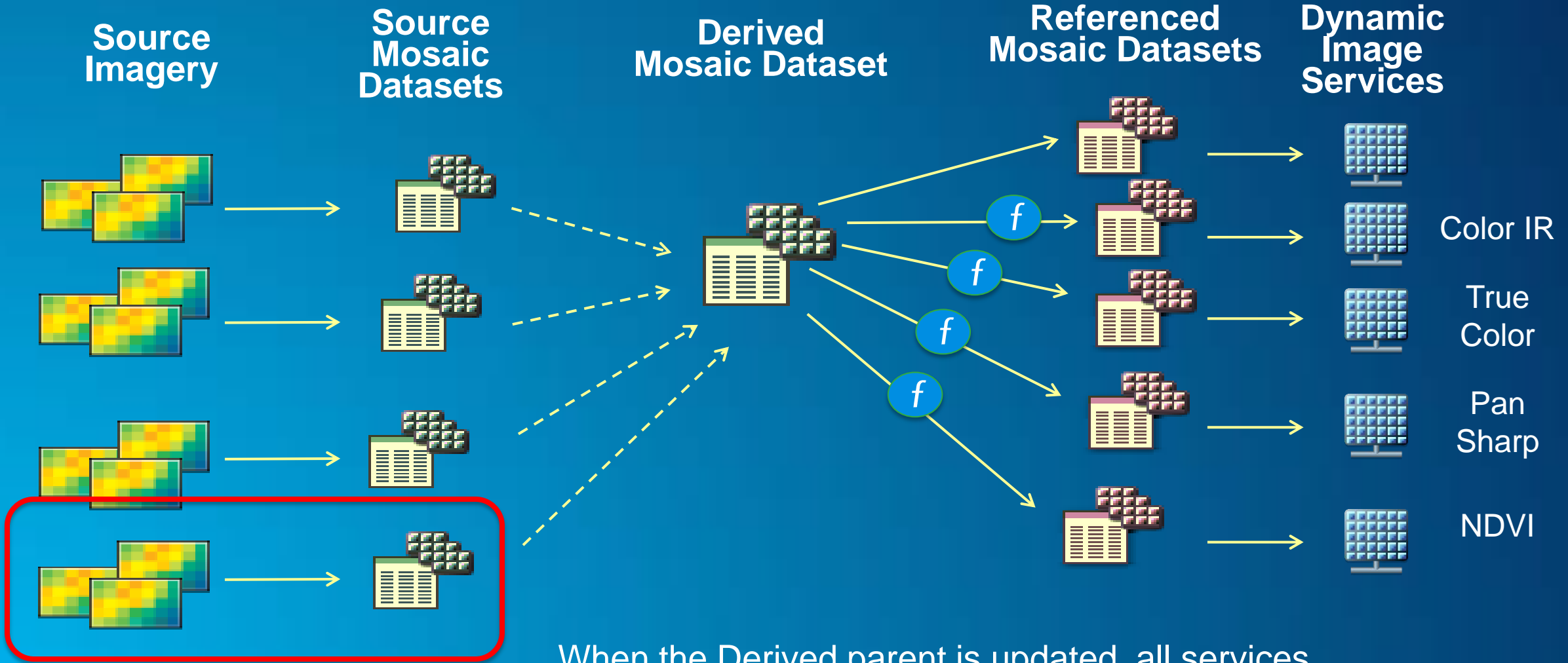
In addition to predefined functions, **client can define functions**

# 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

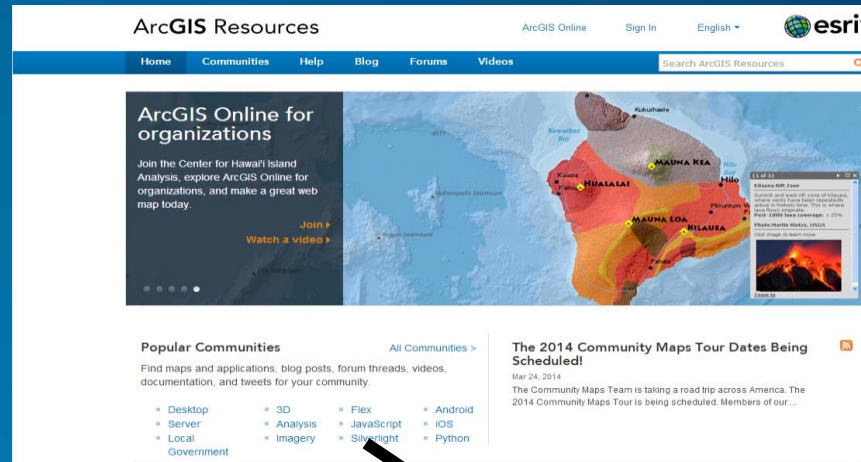
- **Simplicity**
- **Improve Productivity**
  - Repeatability, Maintainability, Scalability
  - Documentation → Facilitate QA & QC, Design Review
- **Training/Examples**
  - Encapsulate best practices
  - Reusable templates



# Image Management Workflows – Landing page

<http://resources.arcgis.com>

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



## ArcGIS Resources

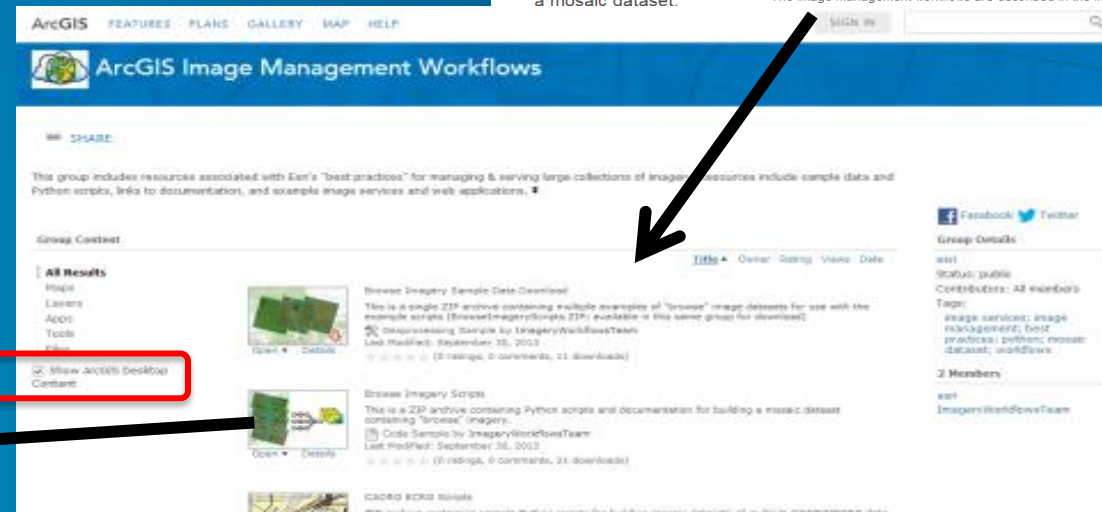
Home Communities Help Blog Forums Videos Search Imagery

### Image Management Workflows

Communities / Imagery

Manage collections of imagery in ArcGIS using a mosaic dataset.

ArcGIS enables you to work with a wide variety of imagery acquired from different sources. These image management workflows provide best practices for managing large collections of imagery to make the imagery quickly and efficiently accessible. The image management workflows are described in the [Image Management](#) articles related to image management best practices for all

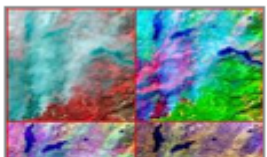


### Landsat 8 Script

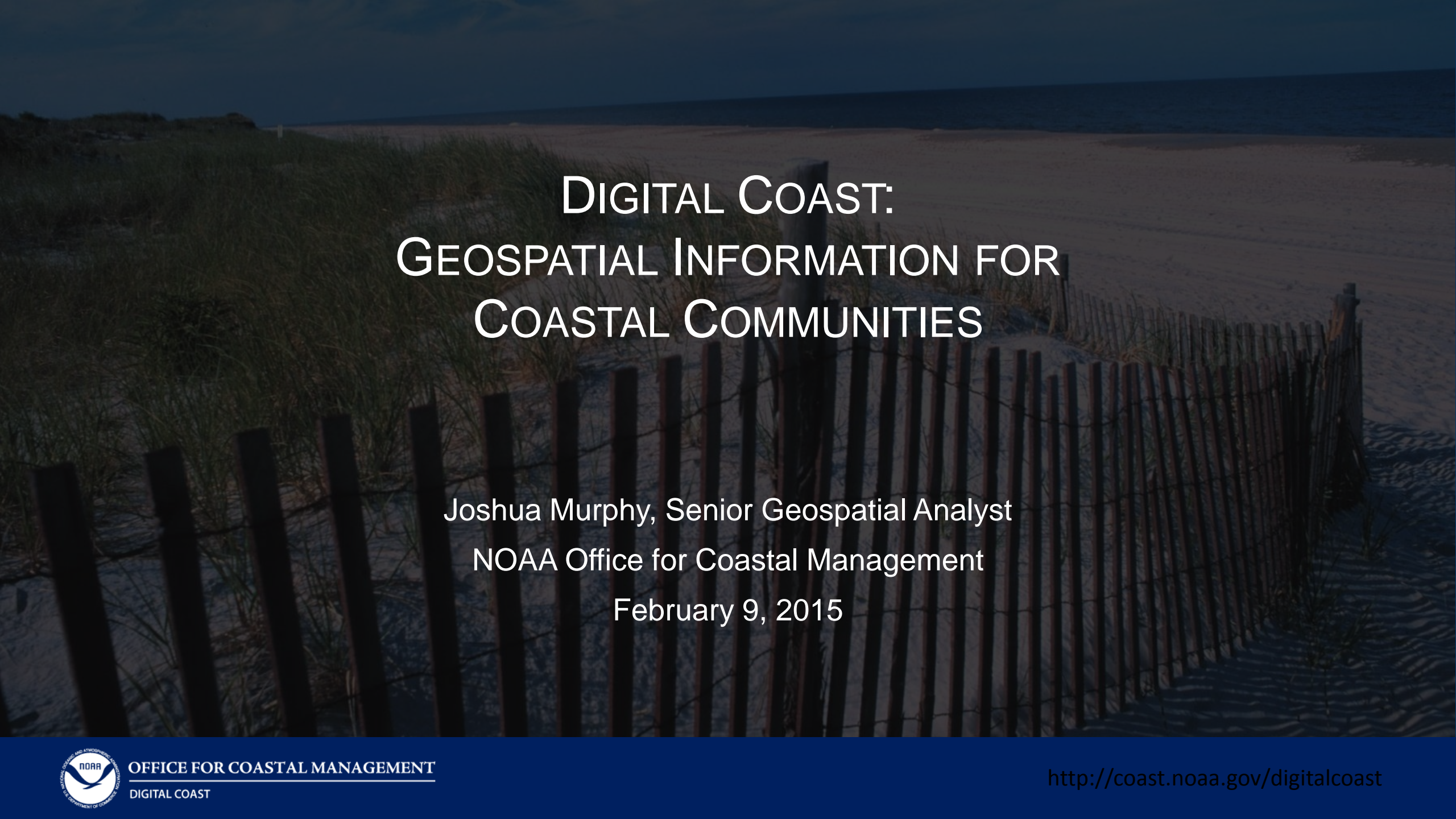
This is a ZIP archive containing Python scripts and doc datasets containing imagery from Landsat 8

Code Sample by ImageryWorkflowsTeam  
Last Modified: October 2, 2013

★★★★★ (1 rating, 1 comment, 229 downloads)



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# 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

**NOAA DigitalCoast**  
OFFICE FOR COASTAL MANAGEMENT

Data Tools Training Stories Topics GeoZone Blog Search

## More Than Just Data

Dive into the Digital Coast to Get the Data, Tools, and Training Communities Need to Address Coastal Issues.

DATA TOOLS TRAINING STORIES TOPICS **NEW**

### What is the Digital Coast?

This NOAA-sponsored website is focused on helping communities address coastal issues and has become one of the most-used resources in the coastal management community. The dynamic Digital Coast Partnership, whose members represent the website's primary user groups, keeps the effort focused on customer needs.

Learn more in our About section, or just dive in. And please provide feedback as often as possible. Hearing from you is what makes the Digital Coast work.

#### Learn More about the Digital Coast

About Contributing Partners Watch the Video

**Top:** [Data](#) [Tools](#) [Training](#) [Stories](#)

- 1 Coastal Lidar
- 2 Coastal Change Analysis Program
- 3 Economics: National Ocean Watch
- 4 Electronic Navigational Charts
- 5 Emergency Response Imagery

### GeoZone Blog [View more](#)

<b>Storm Surge in the Winter?</b> <i>Stephanie Fauver</i> Storm surge is a year-round threat. Make sure you're prepared.	<b>"Loss Is Nothing Else But Change, and Change is Nature's Delight." -Marcus Aurelius</b> <i>John McCombs</i>	<b>Workaround for 16-bit Thematic Tiff in ArcGIS</b> <i>Kirk Waters</i> Is the C-CAP land cover change data displaying	<b>When 50 Shades of Grey Is Not Enough, Try 625</b> <i>Eric Morris</i> Sixteen-bit land cover change? What is that and
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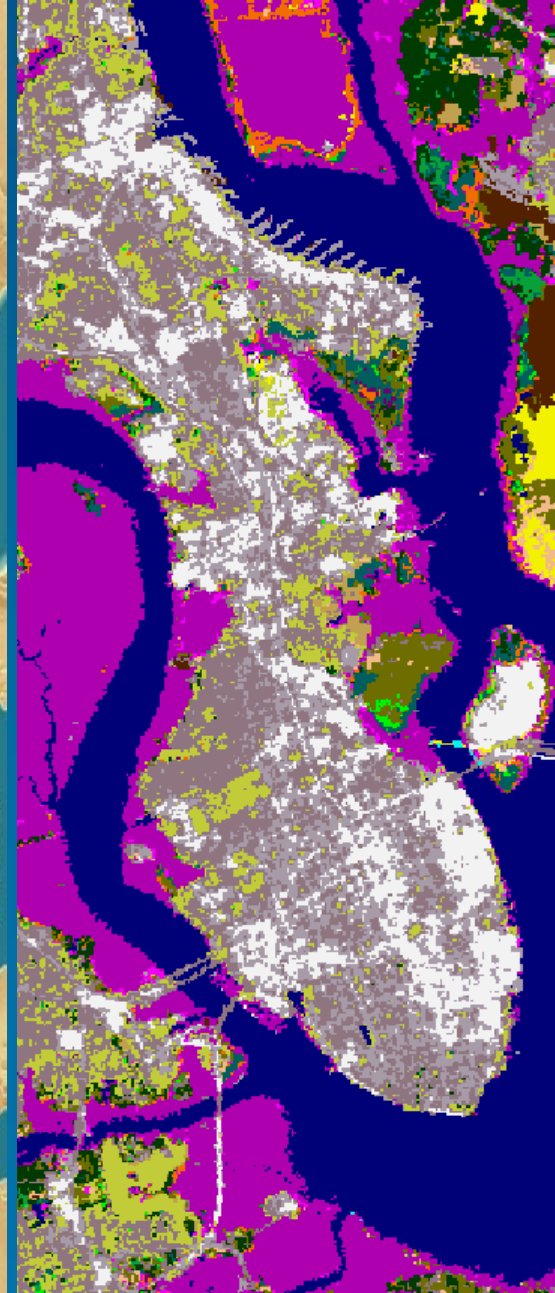
# DIGITAL COAST PARTNERSHIP

- 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

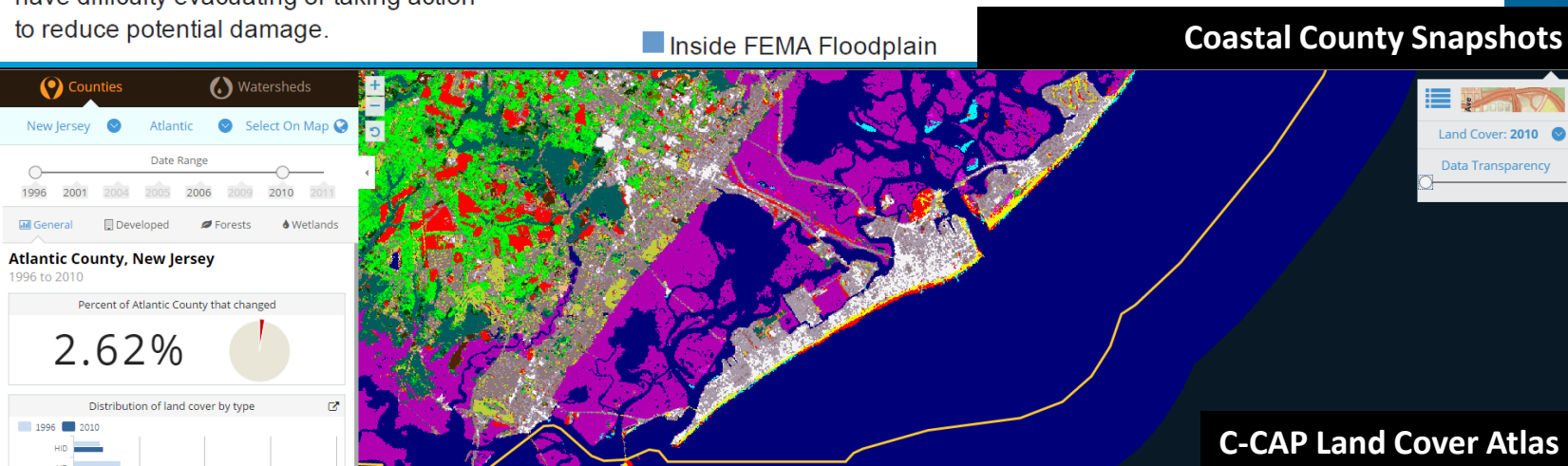
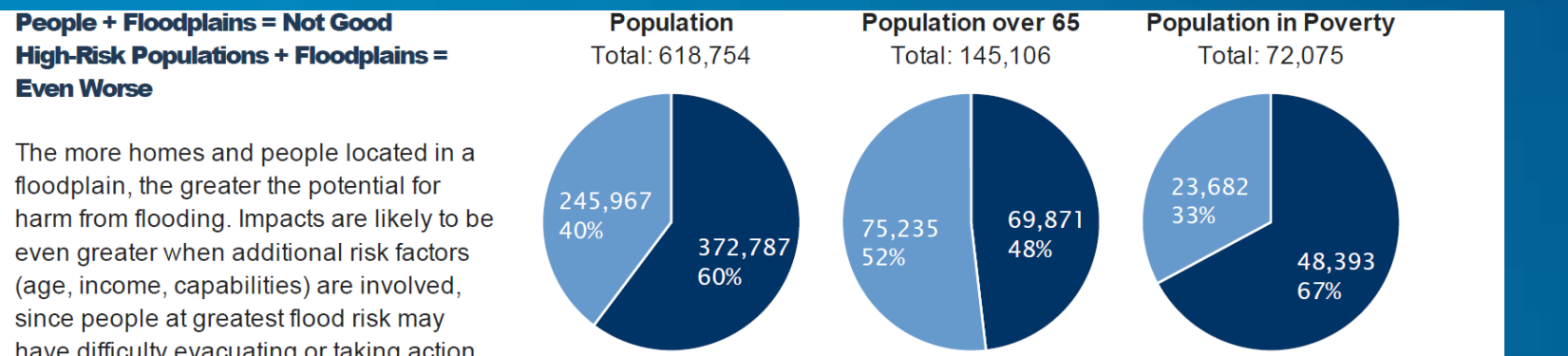


# DATA

- 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

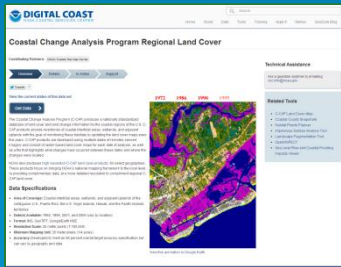


# TOOLS



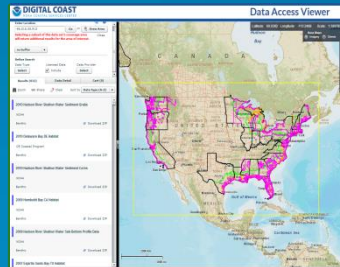
- An inventory of over 50 decision-support and information visualization tools
- Many provide visualization and analysis capabilities without need for GIS software

# THE DIGITAL COAST IN ACTION: FACILITATING USE AND APPLICATION



## DISCOVER

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



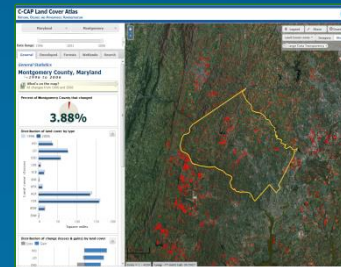
## DOWNLOAD

Land cover data for your community via the Data Access Viewer



## MAP

Develop mash-ups with ESRI and OGC map services



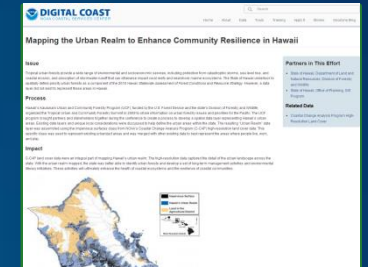
## ANALYZE

Change in your county with the Land Cover Atlas



## LEARN

From data experts through recorded webinars



## SHARE

Outcomes with others through Stories in the Field

DATA

INFORMATION

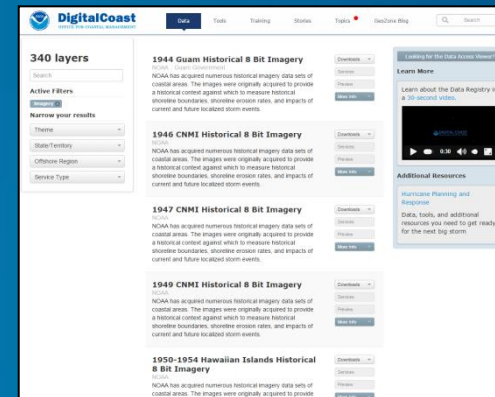
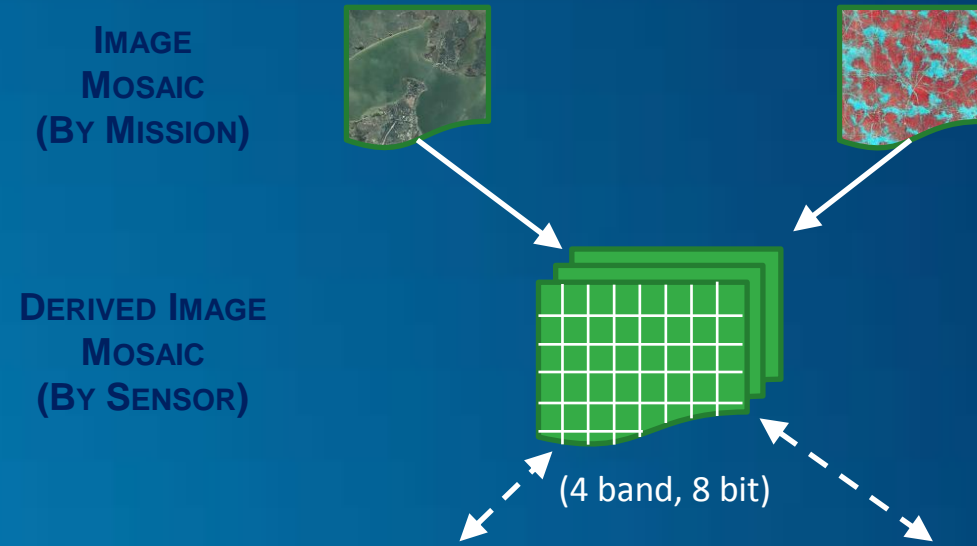
ACTION



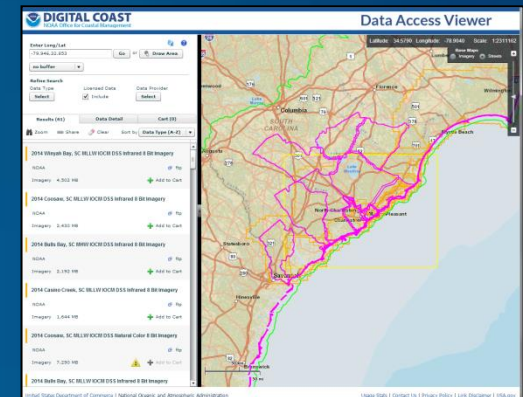


# DIGITAL COAST IMAGERY MANAGEMENT

- 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

ArcGIS FEATURES PLANS GALLERY MAP SCENE HELP Sign In

## Mosaic Dataset Configuration Script (MDCS)

Python script for creating, configuring, and populating mosaic datasets.

Geoprocessing Sample by ImageryWorkflowsTeam  
Last Modified: August 28, 2014

★★★★★ (0 ratings, 259 downloads)

Sign in to rate this item.

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### Description

This is a Python script for creating, configuring, and populating mosaic datasets. It can be used in ArcGIS Model Builder or called from the command line. The script relies on an XML file as input, with the XML used to store all key configuration details such as MD name, data type, multiple paths to input files, etc. See the enclosed documentation for details.

This download .zip archive includes MDCS with documentation, example orthorectified image files, and a configuration file prepared for these orthophotos.

Note that MDCS is maintained as Open Source on GitHub. If you are a developer seeking to extend the functionality of MDCS and contribute/collaborate with the community of users, you will find the repository at <https://github.com/Esri/mdcs-py>.

### Properties

Tags	image_management, workflows, python
Credits	
Size	17 MB
Extent	

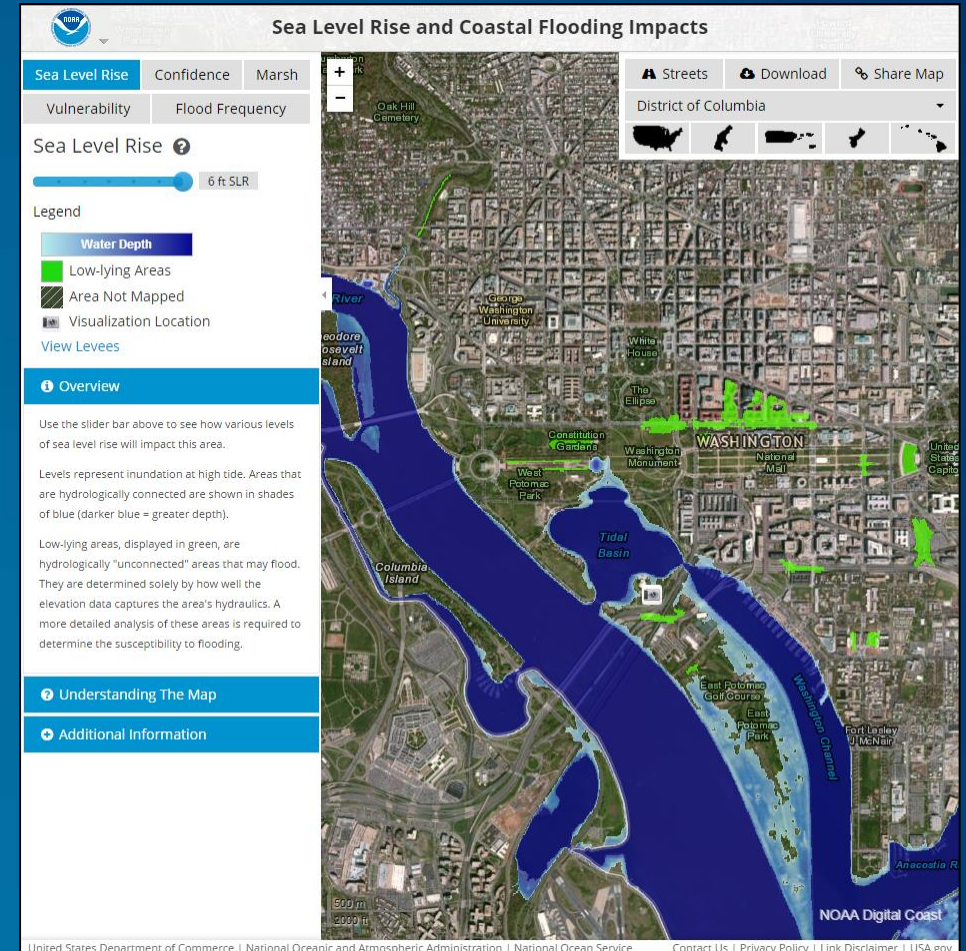
### Comments (0)

Sign in to add a comment.



# 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 from 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](mailto:cbenkelman@esri.com)
  - [dzimble@esri.com](mailto: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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- 18