Tuesday May 12, 2026 starting at 1:25 pm CDT

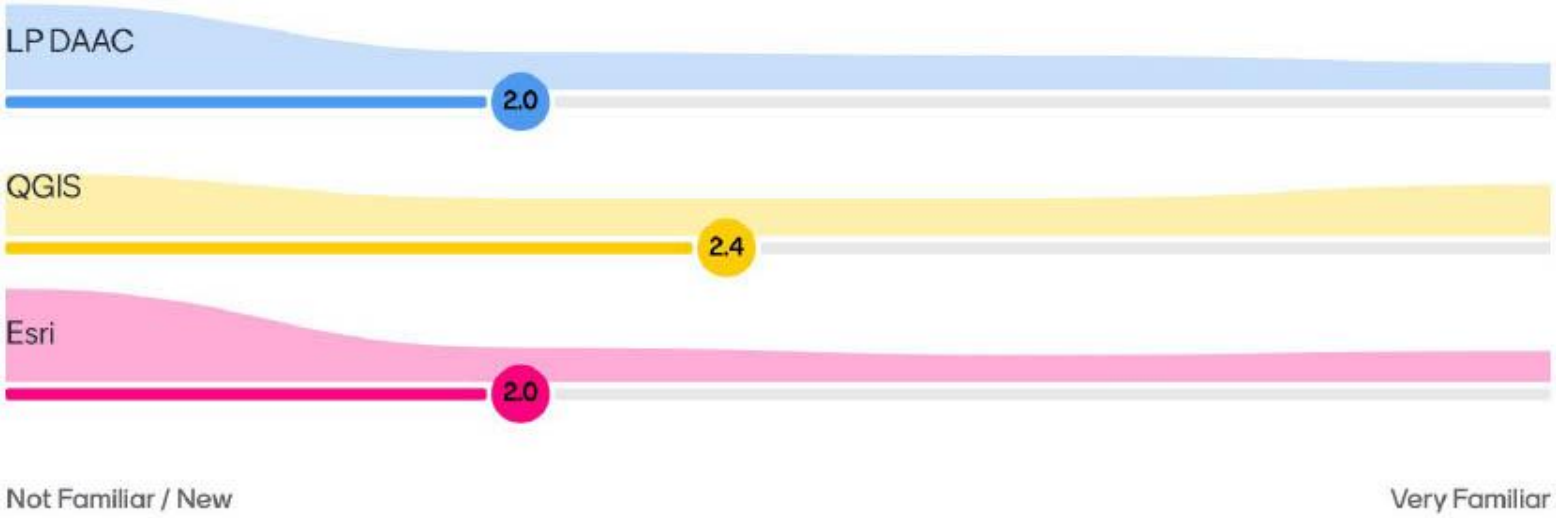
Session 3: Accessing HLS in Various Environments

Goals:

- Demonstrate methods of discovery, download, visualization, and analysis of HLS.
- Engage with each environment and inform explorative opportunities.

Time (CDT)	Topics	Format	Speaker
1:25 - 1:30 (5 min)	**Introducing HLS in Various Environments**	**Presentation**	**Essence Raphael, NSITE & UAH**
1:30 - 2:30 (60 min)	Getting Started with HLS Data Access (+ Q&A)	Demo & Interactive 	Mahsa Jami, USGS EROS
2:30 - 3:30 (60 min)	Working with HLS Data in QGIS: Access, Visualization, and Analysis (+ Q&A)	Demo & Interactive 	Qiusheng Wu, UTK
3:30 - 3:40 (10 min)	Break		
3:40 - 4:40 (60 min)	HLS Data and Services in ESRI's ArcGIS Online and ArcGIS Pro (+ Q&A)	Demo & Interactive 	Leah Schwizer & Nalin Ly, NASA EGIST

(1/1) Rank how familiar you are working with HLS data in these environments



Session 3: Accessing HLS in Various Environments
Presenters

Mahsa Jami

NASA LP DAAC Scientist

USGS EROS Center

Qiusheng Wu

Professor and Graduate Studies Director

University of Tennessee, Knoxville

Leah Schwizer

EGIST Manager

NASA EGIST

Nalin Ly

GIS Analyst

NASA EGIST

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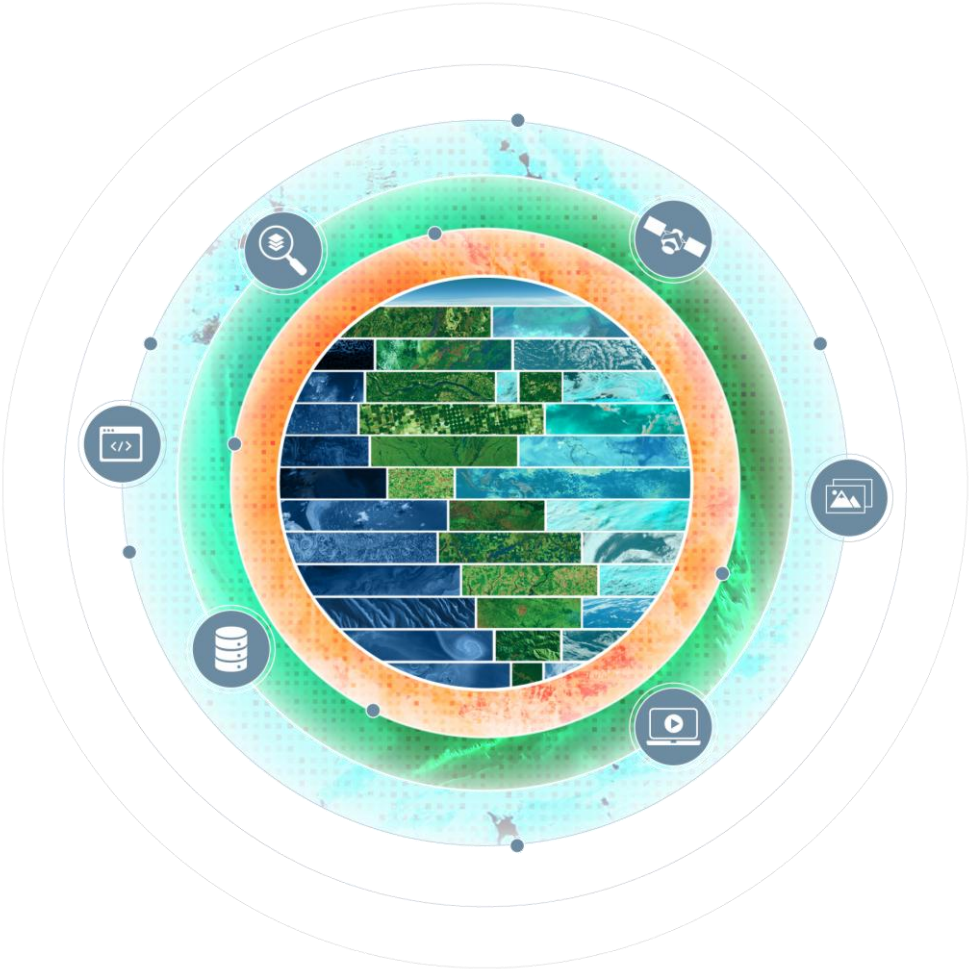
EARTHDATA

Getting Started with HLS Data Access



Mahsa Jami

Erik Bolch

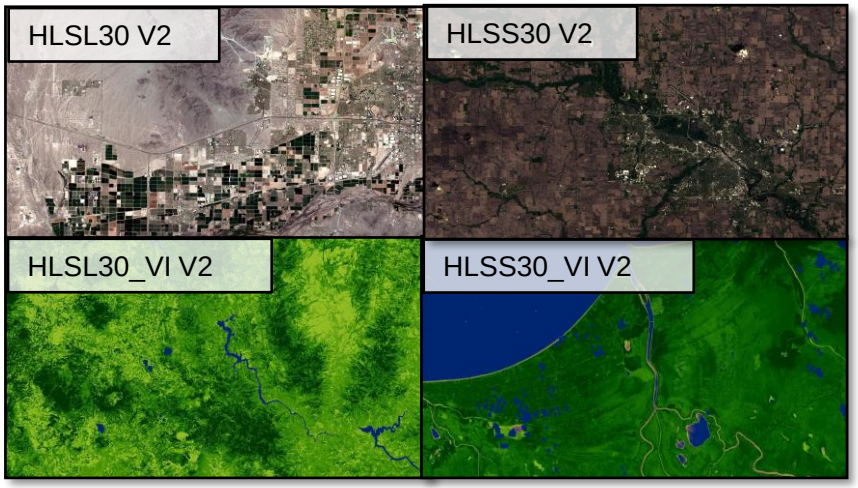
Nathan Roberts

KBR, contractor to the U.S. Geological Survey (USGS) Earth Resources Observation and Science Center, Sioux Falls, SD 57198, USA. Work performed under USGS Contract 140G0121D0001.

U.S. Department of the Interior
U.S. Geological Survey

Outline

- About the NASA's LP DAAC
- NASA Earthdata Website
- Earthdata Cloud
- Find and Access HLS Data Using Earthdata Search
- Resources to Find and Access HLS Data Programmatically
- AppEEARS



About Us

Land Processes (LP) Distributed Active Archive Center (DAAC)

NASA’s Land Discipline Archive

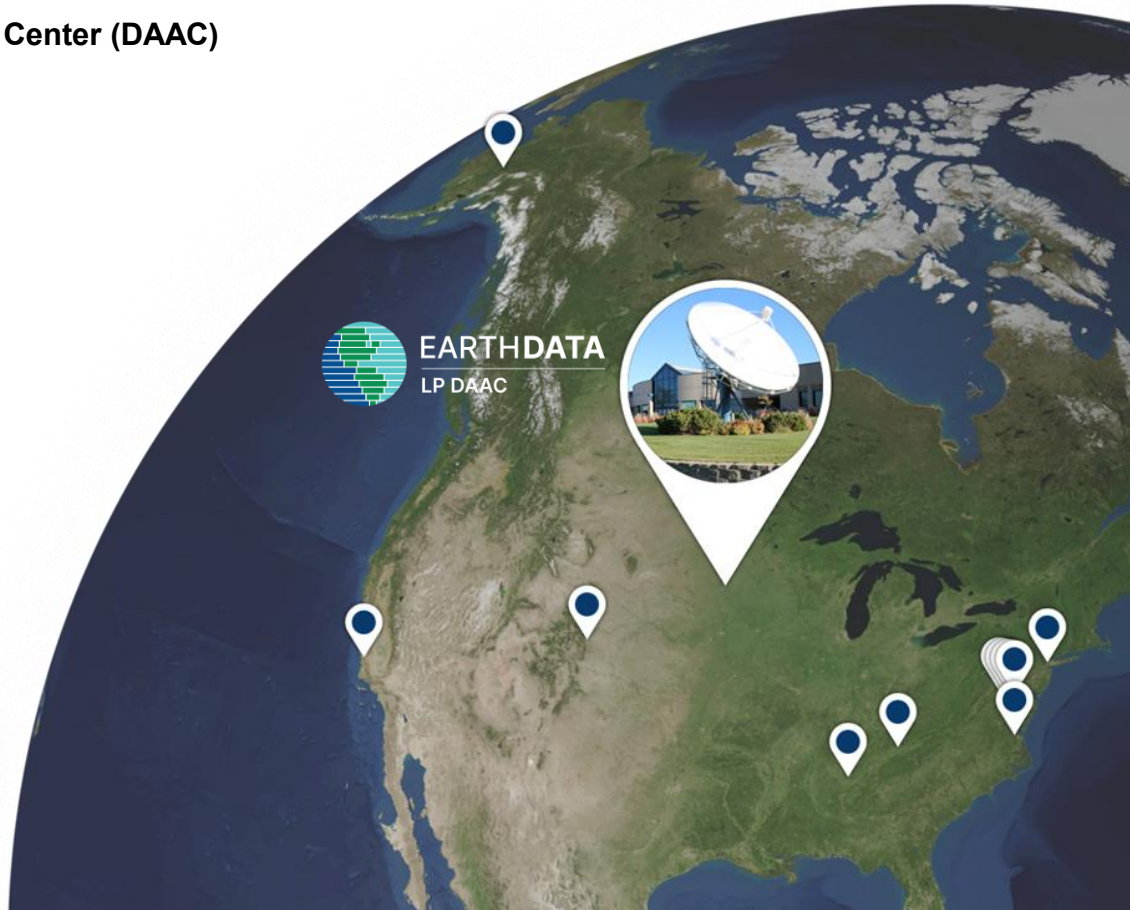
Sponsored by NASA’s Earth Science Data and Information System (ESDIS) Project

Partnership between USGS & NASA

Located and Managed at USGS EROS in Sioux Falls, SD

All data and resources available at no cost

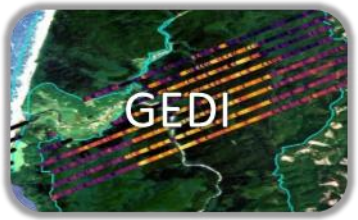
EARTHDATA CLOUD

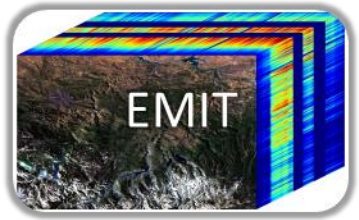


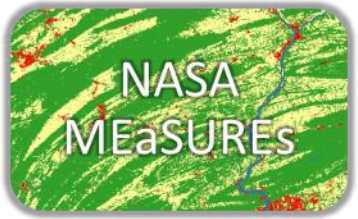
USGS NASA

Supported Missions

Currently archive and distribute **over 1,000** data products to the remote sensing community at no charge







USGS NASA

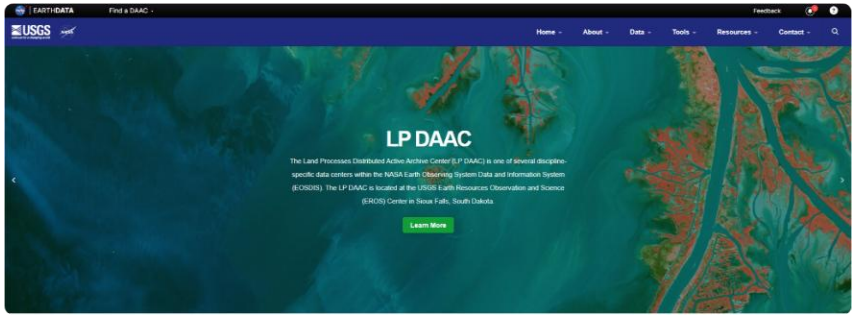
Website Migration

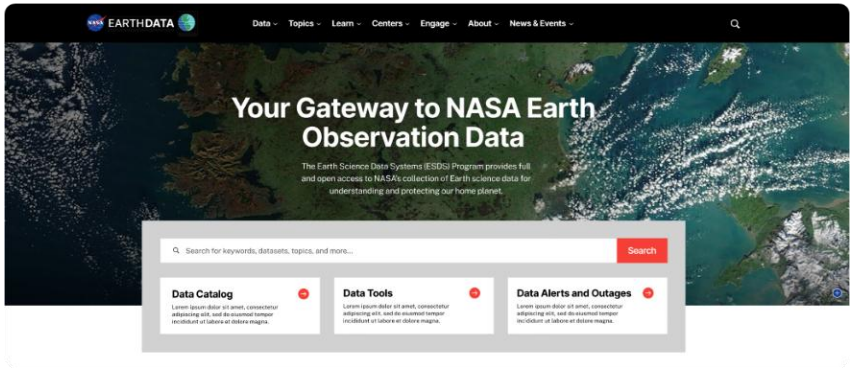
Moved from: https://lpdaac.usgs.gov/

lpdaac → NASA EARTHDATA earthdata.nasa.gov

To: https://www.earthdata.nasa.gov/

Launch Date was June 17, 2025!





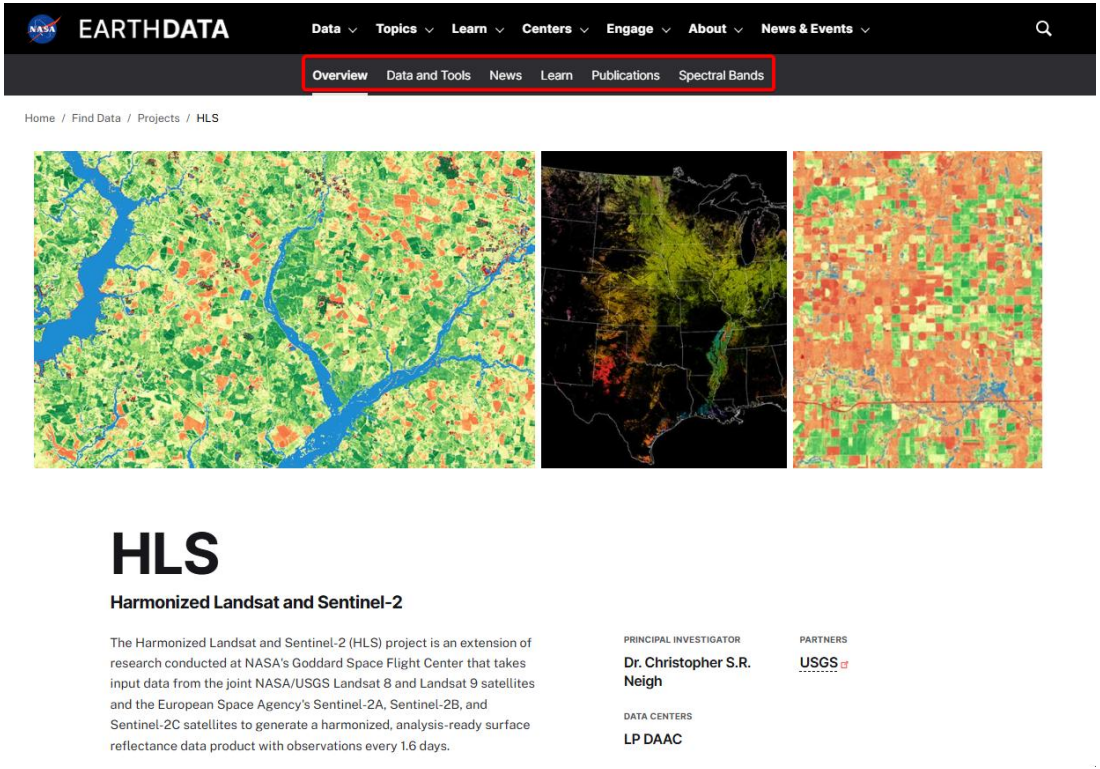
Feedback?
Let Us Know

USGS NASA

Earthdata Website

HLS Project

https://www.earthdata.nasa.gov/data/projects/hls

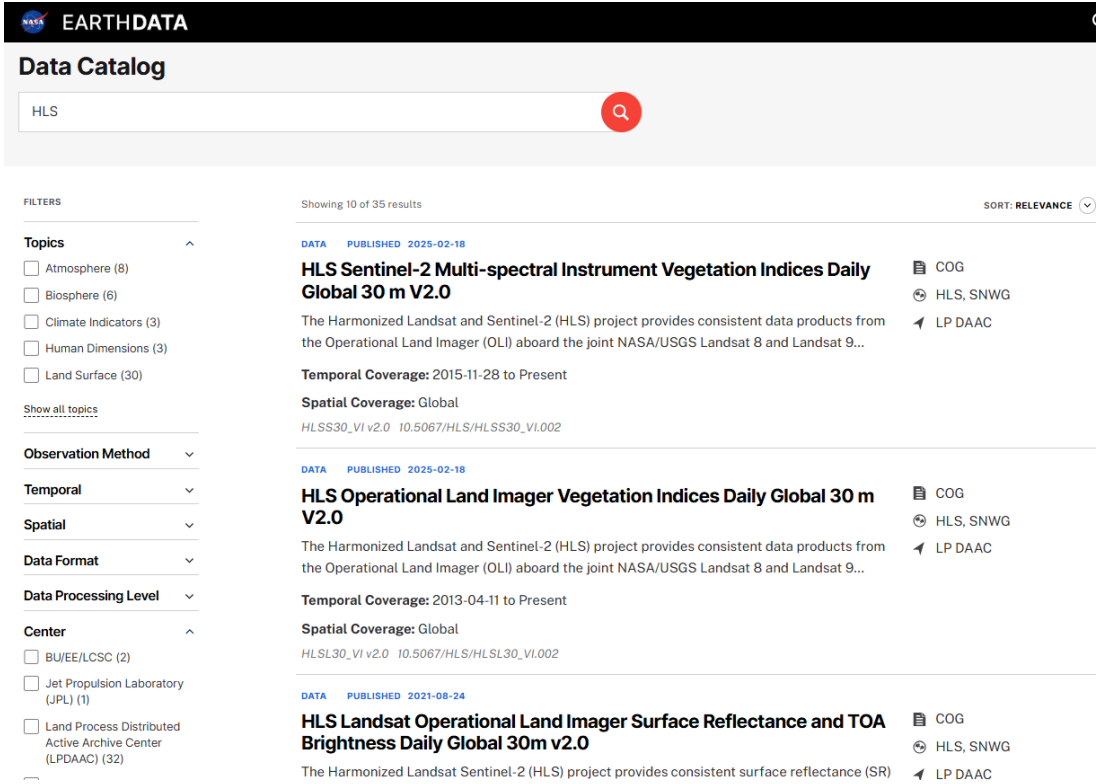


USGS NASA

Earthdata Website

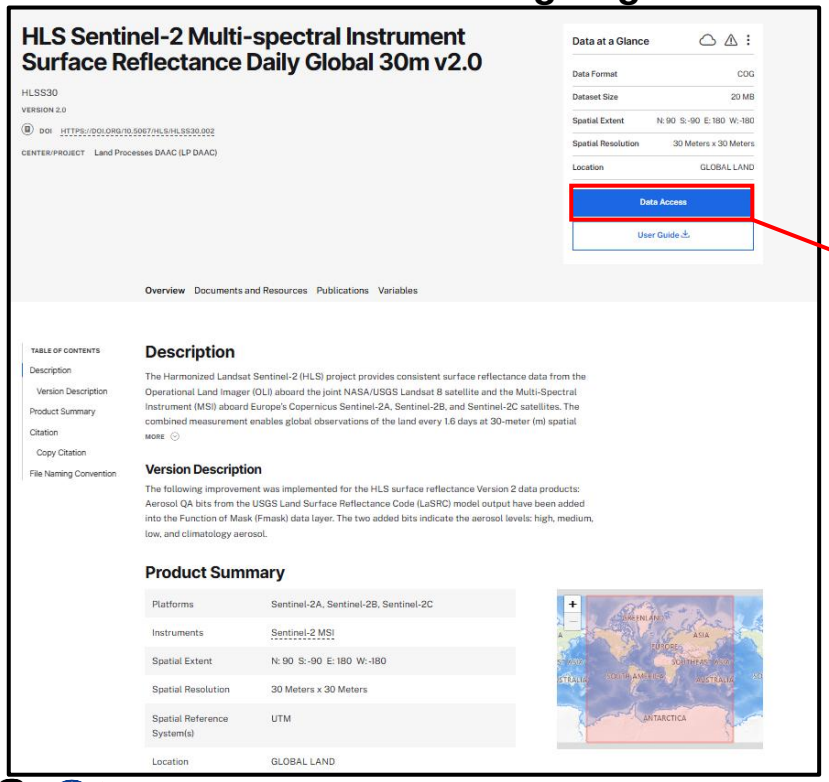
Data Catalog

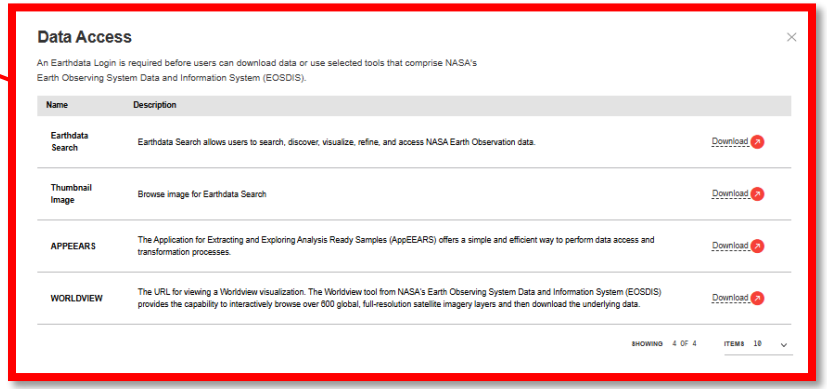
https://www.earthdata.nasa.gov/data/catalog?keyword=HLS



Earthdata Website

HLS Dataset Landing Page

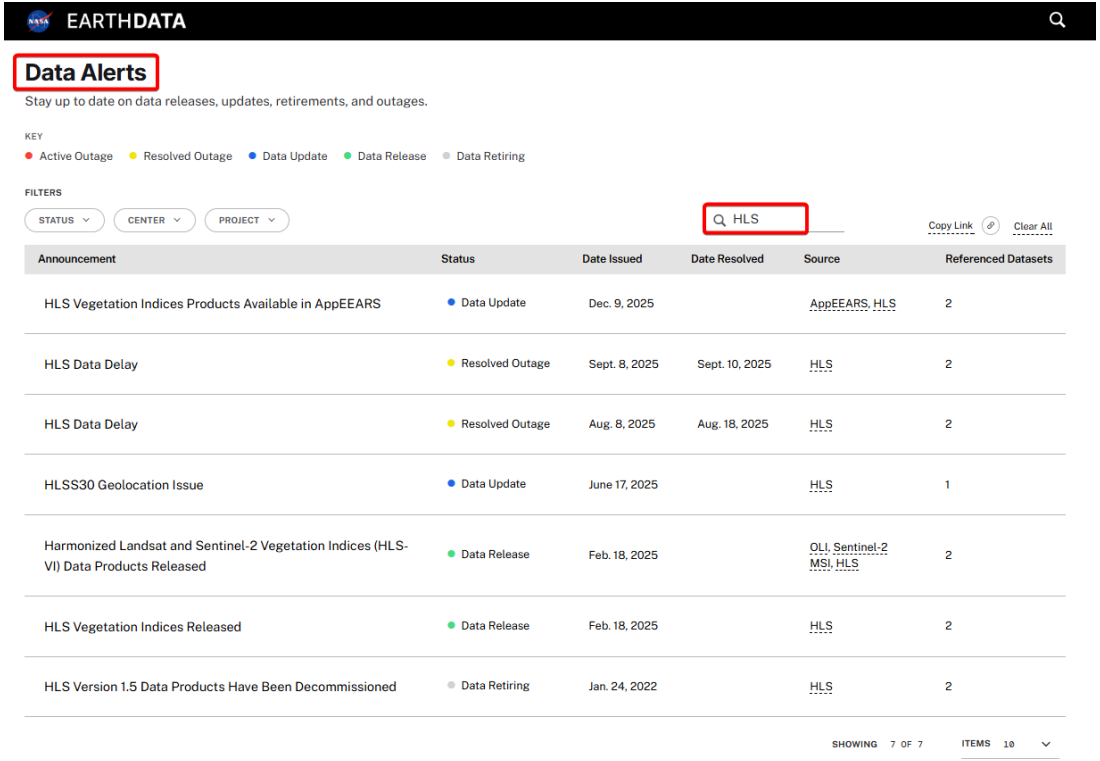




Earthdata Website

Data Alerts

https://www.earthdata.nasa.gov/data/alerts-outages

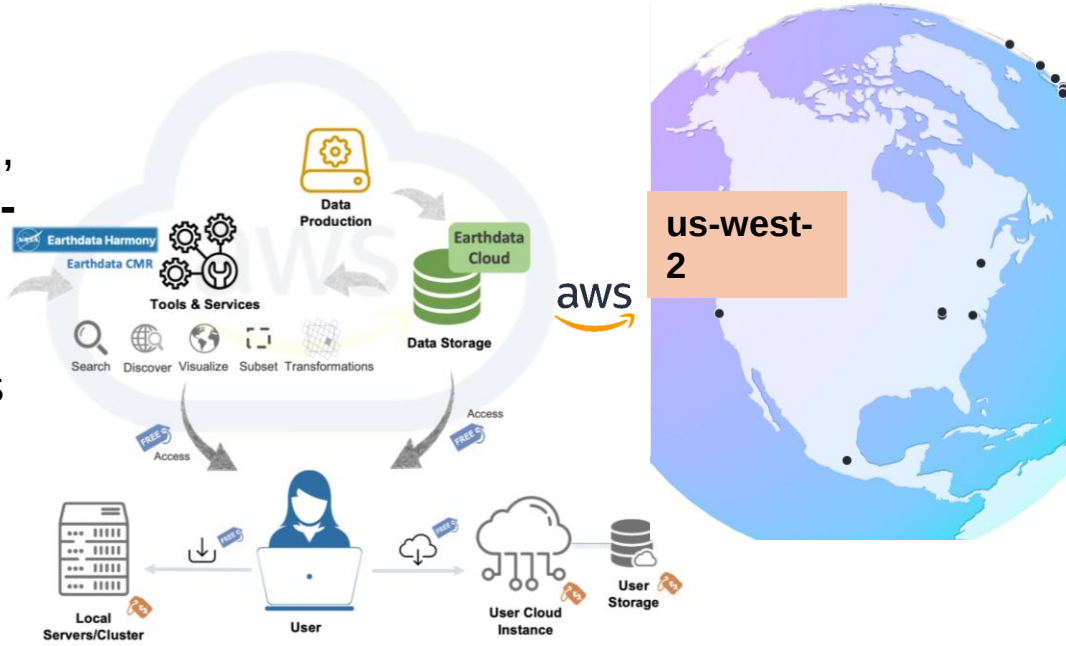


Where is HLS Data Stored?

Earthdata Cloud (EDC) is the managed commercial cloud containing all NASA Earth data, tools, and services stored in **AWS us-west-2** region.

Common Metadata Repository (CMR) is the centralized NASA Earthdata Metadata Catalog and the key mechanism for **Data Search.**

All NASA Earthdata are indexed in CMR.



Find and Access Data

Graphical User Interface (GUI)

Earthdata Search

- Enterprise Data Search, Discovery, and Access System
- Enables discovery of 10,000+ NASA Earth Data Products (Land, Atmosphere etc.)
- Search and filter results
- https://search.earthdata.nasa.gov/search

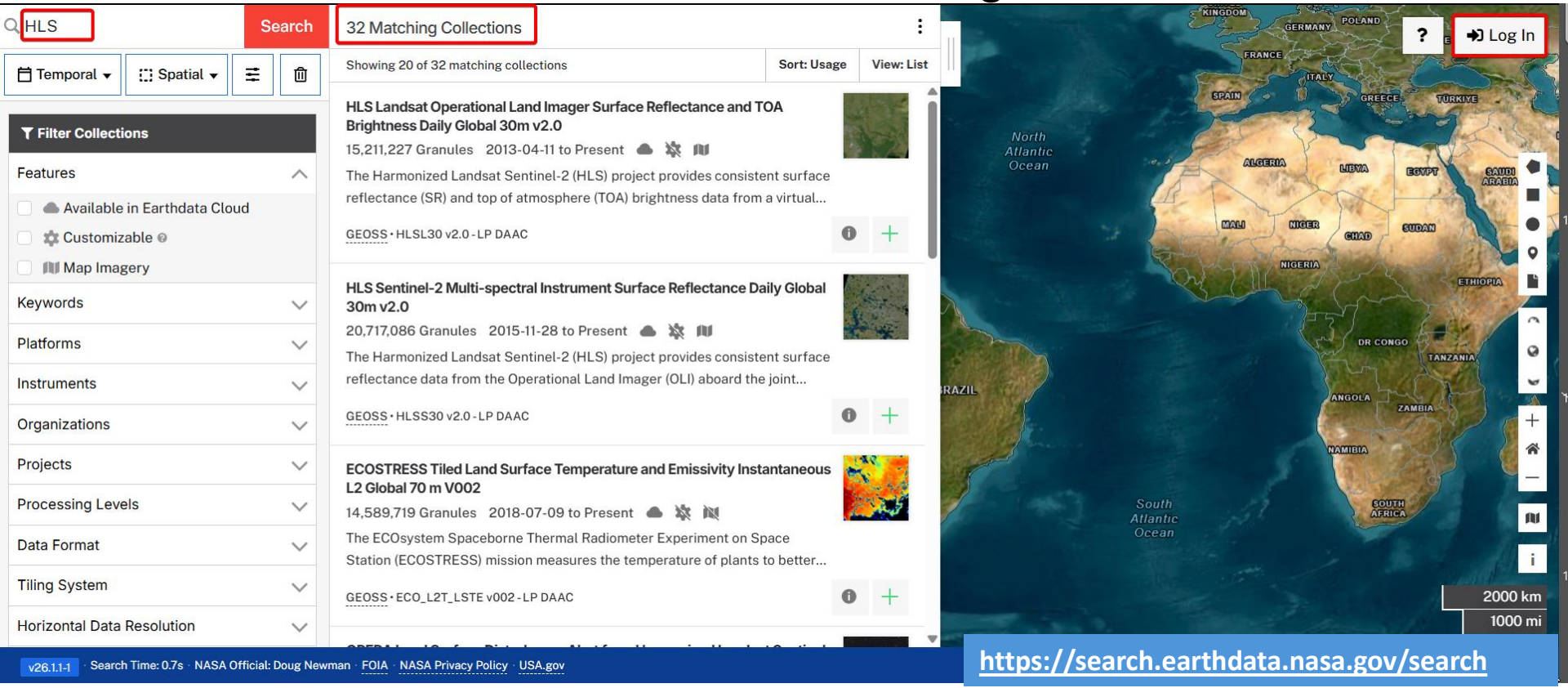
Application Programming Interface (API)

CMR API

- **earthaccess** (Python Library for Interacting with NASA Earthdata via CMR https://earthaccess.readthedocs.io/en/stable/
- **CMR SpatioTemporal Asset Catalog (STAC) API**

USGS

Demo 1: Find and access HLS data using Earthdata Search

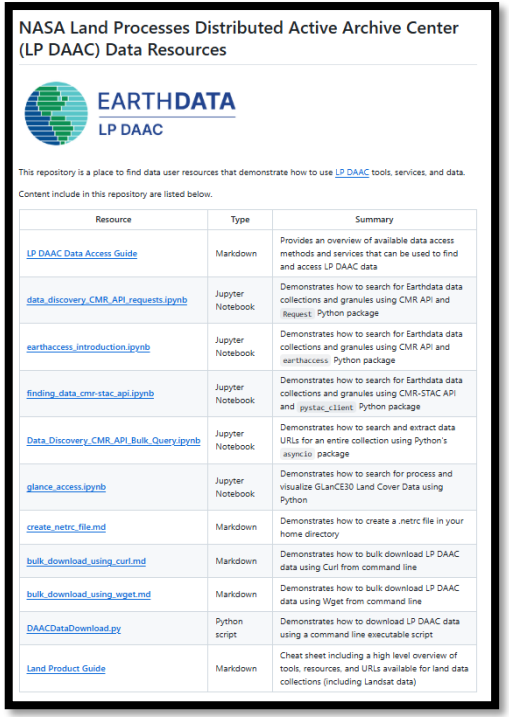


https://search.earthdata.nasa.gov/search

USGS NASA

Find and Access HLS Data Programmatically

LP DAAC Data Resources
https://github.com/nasa/LPDAAC-Data-Resources



NASA Land Processes Distributed Active Archive Center (LP DAAC) Data Resources

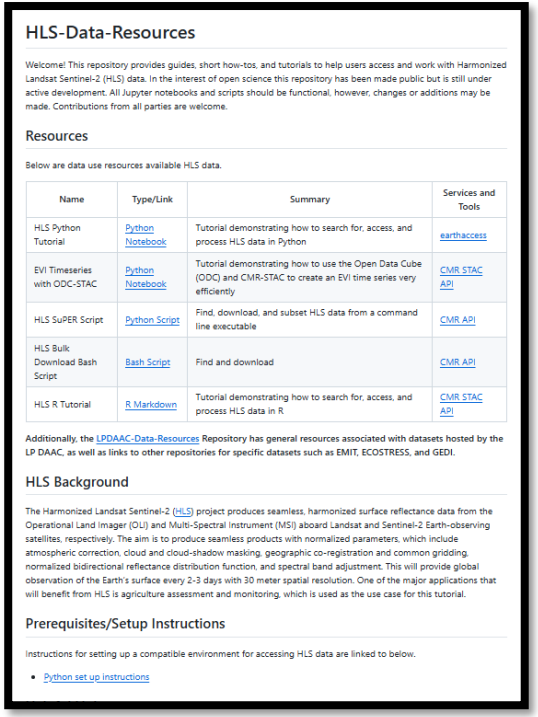
EARTHDATA
LP DAAC

This repository is a place to find data user resources that demonstrate how to use LP DAAC tools, services, and data.

Content include in this repository are listed below.

Resource	Type	Summary
LP DAAC Data Access Guide	Markdown	Provides an overview of available data access methods and services that can be used to find and access LP DAAC data
data_discovery_CMR_API_requests.ipynb	Jupyter Notebook	Demonstrates how to search for Earthdata data collections and granules using CMR API and `Request` Python package
earthaccess_introduction.ipynb	Jupyter Notebook	Demonstrates how to search for Earthdata data collections and granules using CMR API and `earthaccess` Python package
finding_data_cmr-stac_api.ipynb	Jupyter Notebook	Demonstrates how to search for Earthdata data collections and granules using CMR-STAC API and `pystac_client` Python package
Data_Discovery_CMR_API_Bulk_Query.ipynb	Jupyter Notebook	Demonstrates how to search and extract data URLs for an entire collection using Python's `asyncio` package
glance_access.ipynb	Jupyter Notebook	Demonstrates how to search for process and visualize GLanCE30 Land Cover Data using Python
create_netrc_file.md	Markdown	Demonstrates how to create a .netrc file in your home directory
bulk_download_using_curl.md	Markdown	Demonstrates how to bulk download LP DAAC data using Curl from command line
bulk_download_using_wget.md	Markdown	Demonstrates how to bulk download LP DAAC data using Wget from command line
DAACDataDownload.py	Python script	Demonstrates how to download LP DAAC data using a command line executable script
Land Product Guide	Markdown	Cheat sheet including a high level overview of tools, resources, and URLs available for land data collections (including Landsat data)

HLS Data Resources
https://github.com/nasa/HLS-Data-Resources



HLS-Data-Resources

Welcome! This repository provides guides, short how-tos, and tutorials to help users access and work with Harmonized Landsat Sentinel-2 (HLS) data. In the interest of open science this repository has been made public but is still under active development. All Jupyter notebooks and scripts should be functional, however, changes or additions may be made. Contributions from all parties are welcome.

Resources

Below are data use resources available HLS data.

Name	Type/Link	Summary	Services and Tools
HLS Python Tutorial	Python Notebook	Tutorial demonstrating how to search for, access, and process HLS data in Python	earthaccess
EVI Timeseries with ODC-STAC	Python Notebook	Tutorial demonstrating how to use the Open Data Cube (ODC) and CMR-STAC to create an EVI time series very efficiently	CMR STAC API
HLS SuPER Script	Python Script	Find, download, and subset HLS data from a command line executable	CMR API
HLS Bulk Download Bash Script	Bash Script	Find and download	CMR API
HLS R Tutorial	R Markdown	Tutorial demonstrating how to search for, access, and process HLS data in R	CMR STAC API

Additionally, the LPDAAC-Data-Resources Repository has general resources associated with datasets hosted by the LP DAAC, as well as links to other repositories for specific datasets such as EMIT, ECOSTRESS, and GEDI.

HLS Background

The Harmonized Landsat Sentinel-2 (HLS) project produces seamless, harmonized surface reflectance data from the Operational Land Imager (OLI) and Multi-Spectral Instrument (MSI) aboard Landsat and Sentinel-2 Earth-observing satellites, respectively. The aim is to produce seamless products with normalized parameters, which include atmospheric correction, cloud and cloud-shadow masking, geographic co-registration and common gridding, normalized bidirectional reflectance distribution function, and spectral band adjustment. This will provide global observation of the Earth's surface every 2-3 days with 30 meter spatial resolution. One of the major applications that will benefit from HLS is agriculture assessment and monitoring, which is used as the use case for this tutorial.

Prerequisites/Setup Instructions

Instructions for setting up a compatible environment for accessing HLS data are linked to below.

- Python set up instructions

USGS NASA

AppEEARS

Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)

What is AppEEARS?

NASA Earthdata tool that offers a **simple and efficient way to perform data access and transformation processes**

What does it do?

- Allows users to **subset data spatially, temporally, and by layer**, through user-defined **point** and **area** samples
- **Mosaic** and **clip** data for area samples
- **Customize** the outputs (projection/format)
- Provides decoded quality information and summary statistics
- Provides reproducible outputs

What kind of data?

Enables access to geospatial data from a **variety of federal data archives**

How can users work with AppEEARS?

- **GUI** - Graphic User Interface
- **API** - Application Programming Interface

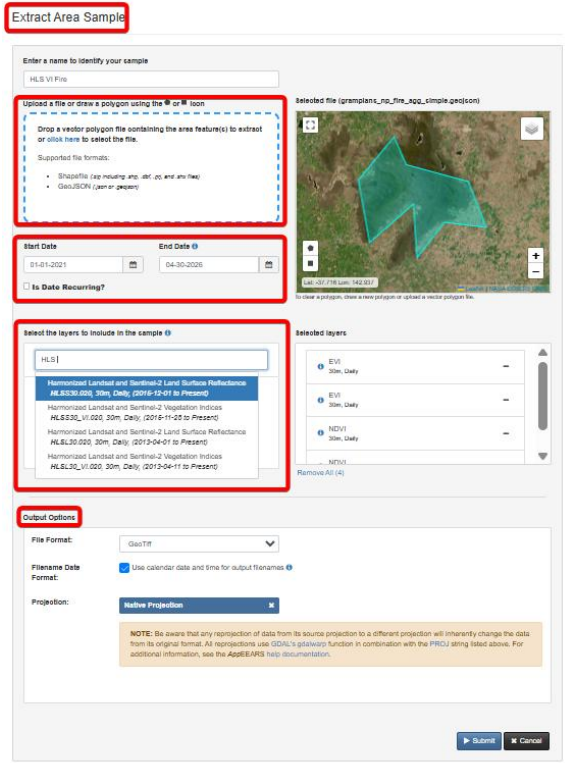
How can AppEEARS help?

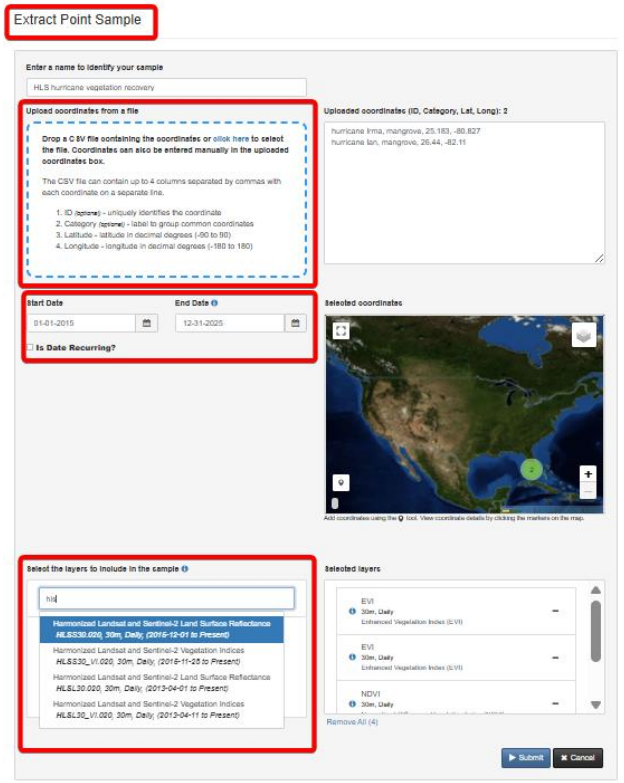
- Reduces download volume by 99% compared to raw source files
- Lives in Earthdata cloud next to the source data
- Facilitates data preparation
- Ensures traceability and reproducibility
- Enhances interoperability across diverse datasets
- Adapts to user needs for a better experience

https://appeears.earthdatacloud.nasa.gov/

USGS

Demo 2: Subset HLS Data Using AppEEARS





USGS NASA

EARTHDATA

earthdata.nasa.gov

Contact Us

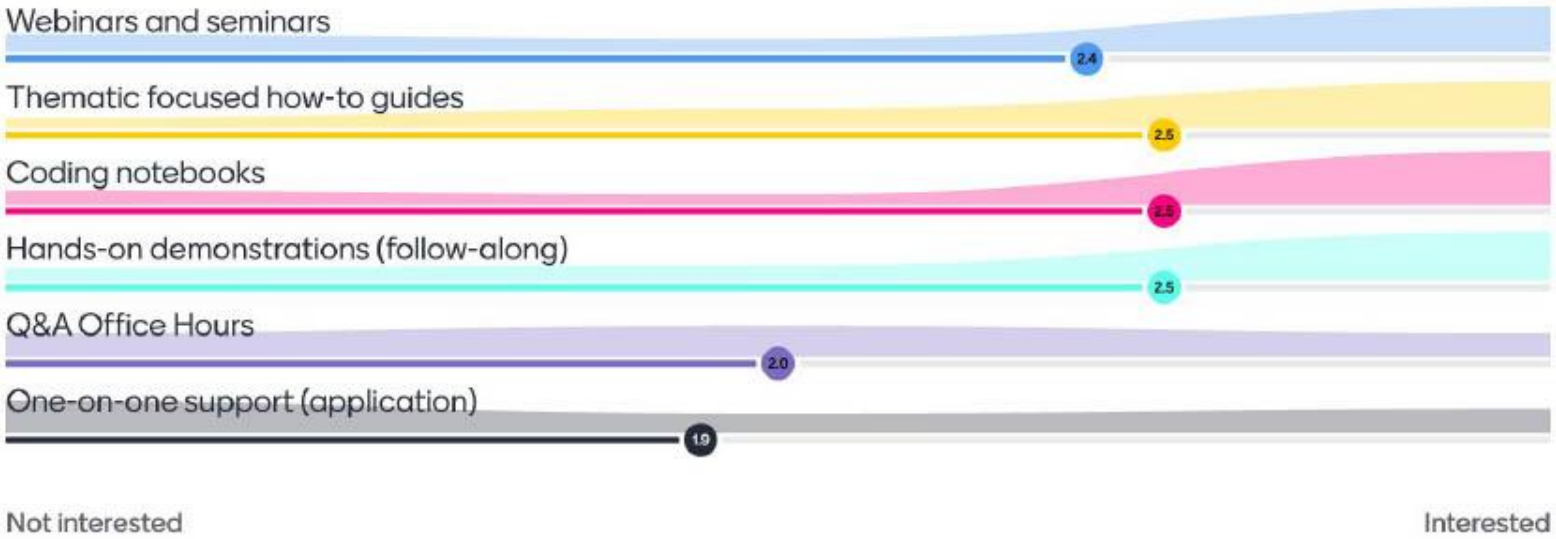
lpdaac@usgs.gov

Start a Discussion on the Earthdata Forum:
forum.earthdata.nasa.gov

Subscribe to the LP DAAC Listserv:
Send a blank email to lpdaac-join@lists.nasa.gov

USGS NASA

(1/2) Which type of support would you need to get started with HLS in LP DAAC?



(2/2) What barriers might prevent you from using HLS in LP DAAC tomorrow?

Infrequent updating.	lack of skills	Skills/training	Programming challemges
Nothing	cost, bandwidth, programming challenges	Lack of skills	Just taking the time to explore.

(2/2) What barriers might prevent you from using HLS in LP DAAC tomorrow?

Its bit complex	Training	Programming	Lack of skills
Training	Lack of support	spatial resolution is too coarse, CPU infrastructure	programming challenges

(2/2) What barriers might prevent you from using HLS in LP DAAC tomorrow?

Training

There is a learning curve to understand access issues

bandwidth for learning program

no barriers

The ability to do it an other way

skills/training

programming challenges- how to pull, mosaic, and analyze massive data volumes while minimizing computational burden

Lack of data proceaaing skills

(2/2) What barriers might prevent you from using HLS in LP DAAC tomorrow?

Software or hardware limitations Processing satellite imagery often requires powerful computers, enough storage space, and compatible software such as: * QGIS * ArcGIS Pro * Google

API coding resources

No barriers

training with a community of practice could be advantageous

clouds;

Skills/training

Cannot access hls data without auth.

time, other required duties. very short staffed nowadays

(2/2) What barriers might prevent you from using HLS in LP DAAC tomorrow?

Access issues.

Programming

Coding resources.

Bandwidth and processing power for work with large areas

Las principales barreras serían la optimización de los pipelines de ingesta para integrar la STAC API con sistemas locales, los posibles costos de transferencia de datos fuera de la nube de la NASA

HLS in Various Environments

Questions from the Audience

What other **questions do the participants have** that we haven't answered yet?

What else could the presenters help with?

Participants, please post your questions in the Webex Q&A

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Working with HLS Data in QGIS: Access, Visualization, and Analysis

Qiusheng Wu
Associate Professor
Department of Geography & Sustainability
University of Tennessee, Knoxville
https://gishub.org

THE UNIVERSITY OF TENNESSEE KNOXVILLE

HLS Workshop
Slides: https://tinyurl.com/QGIS-HLS

slides

Outline

- Open Geospatial Solutions
- NASA Earthdata Plugin
- Earth Engine Data Catalogs Plugin
- Leafmap Plugin
- OpenGeoAgent Plugin
- Live Demos
- Q&A

Open Geospatial Solutions

https://opengeos.org

Python Packages

anymap	geemap	geoai
geospatial	geospatial-ml	HyperCoast
leafmap	lidar	mapwidget
open-buildings	pygis	segment-geospatial
whitebox-python	whiteboxgui	

Data Catalogs

geospatial-data-catalogs	aws-open-data	aws-open-data-geo
aws-open-data-stac	Earth-Engine-Catalog	NASA-CMR-STAC
NASA-Earth-Data	stac-index-catalogs	maxar-open-data
datasets	data	ee-tile-layers

Web Apps

streamlit-geospatial	streamlit-map-template	solara-geemap
solara-geospatial	solara-template	solara-maxar
voila-geospatial	geospatial-dataviz	surface-water-app

QGIS Plugins

Basemaps	CDSE	Earth Engine Data Catalogs
Geemap	GeoAI	HyperCoast
Leafmap	Map	Maxar Open Data
NASA Earthdata	NASA OPERA	Notebook
Plugin Template	SamGeo	STAC
Terrascope	Timelapse	Whitebox AI Agent

MapLibre GL JS Plugins

maplibre-gl-components	maplibre-gl-earth-engine	maplibre-gl-extend
maplibre-gl-geo-editor	maplibre-gl-html-widget	maplibre-gl-layer-control
maplibre-gl-layer-manager	maplibre-gl-lidar	maplibre-gl-noaa-lidar
maplibre-gl-planetary-computer	maplibre-gl-plugin-template	maplibre-gl-splat
maplibre-gl-storymaps	maplibre-gl-streetview	maplibre-gl-swipe
maplibre-gl-time-slider	maplibre-gl-typescript-examples	maplibre-gl-usgs-lidar

R Packages

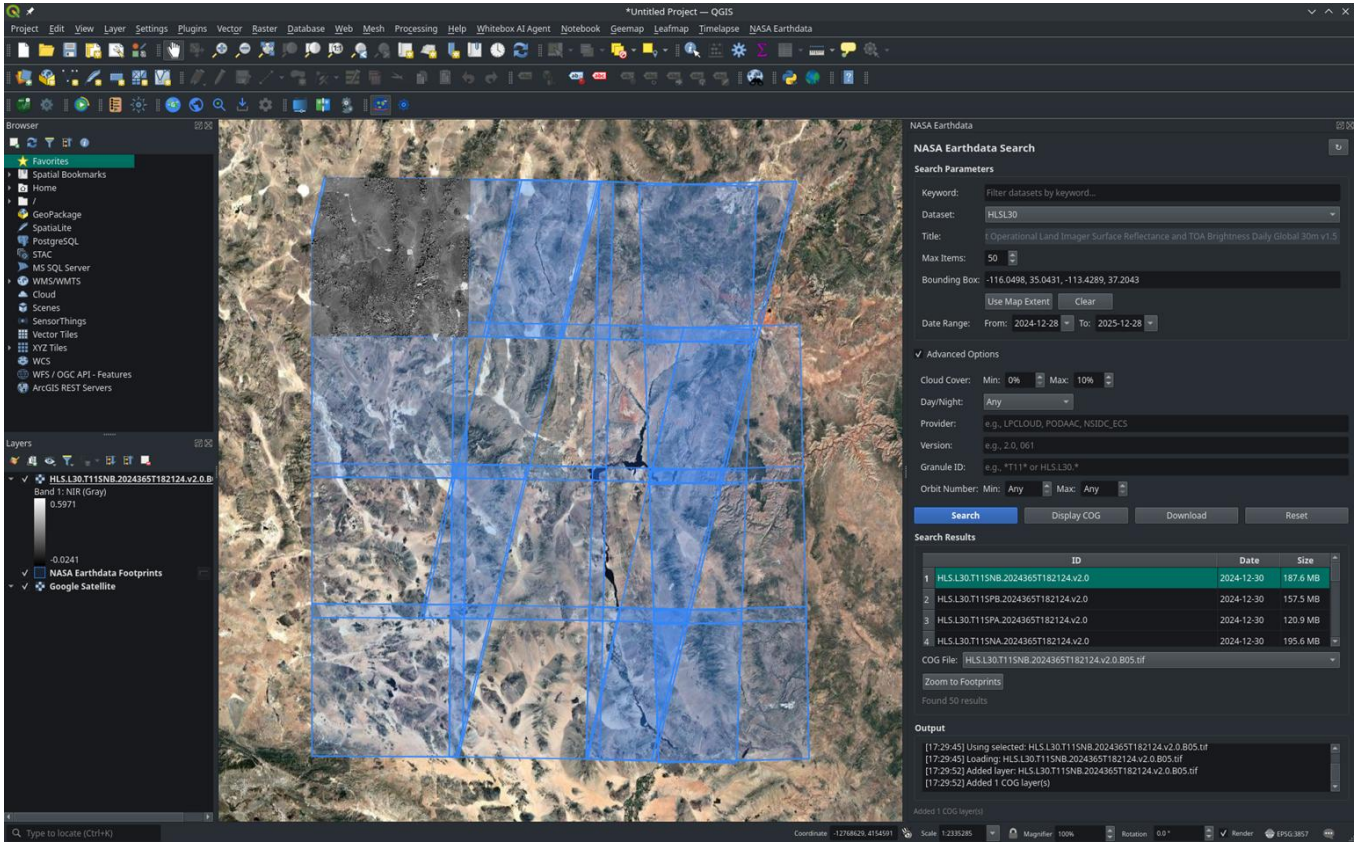
whiteboxR

ArcGIS Toolboxes

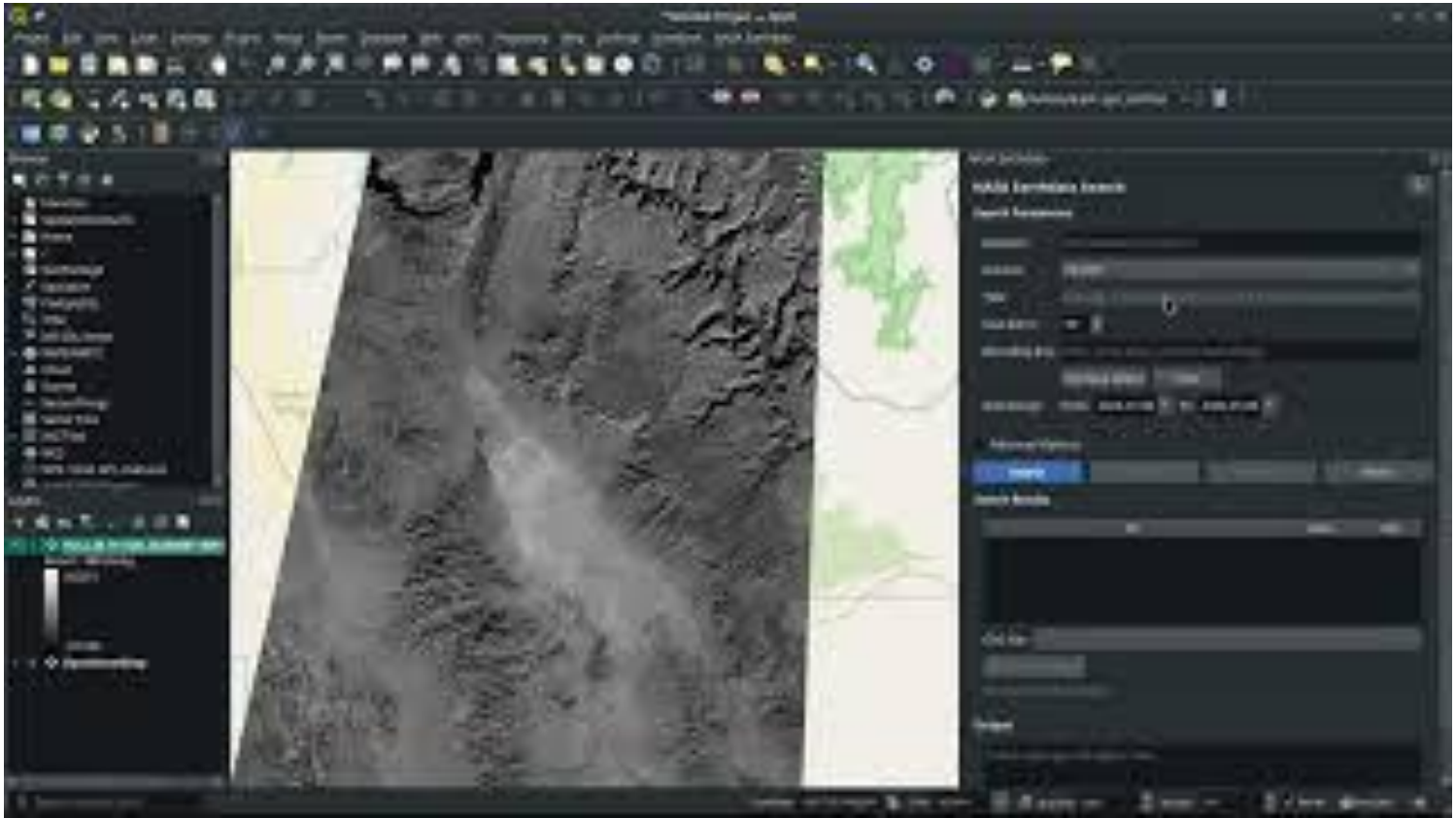
WhiteboxTools-ArcGIS

NASA Earthdata Plugin

https://github.com/opengeos/qgis-nasa-earthdata-plugin

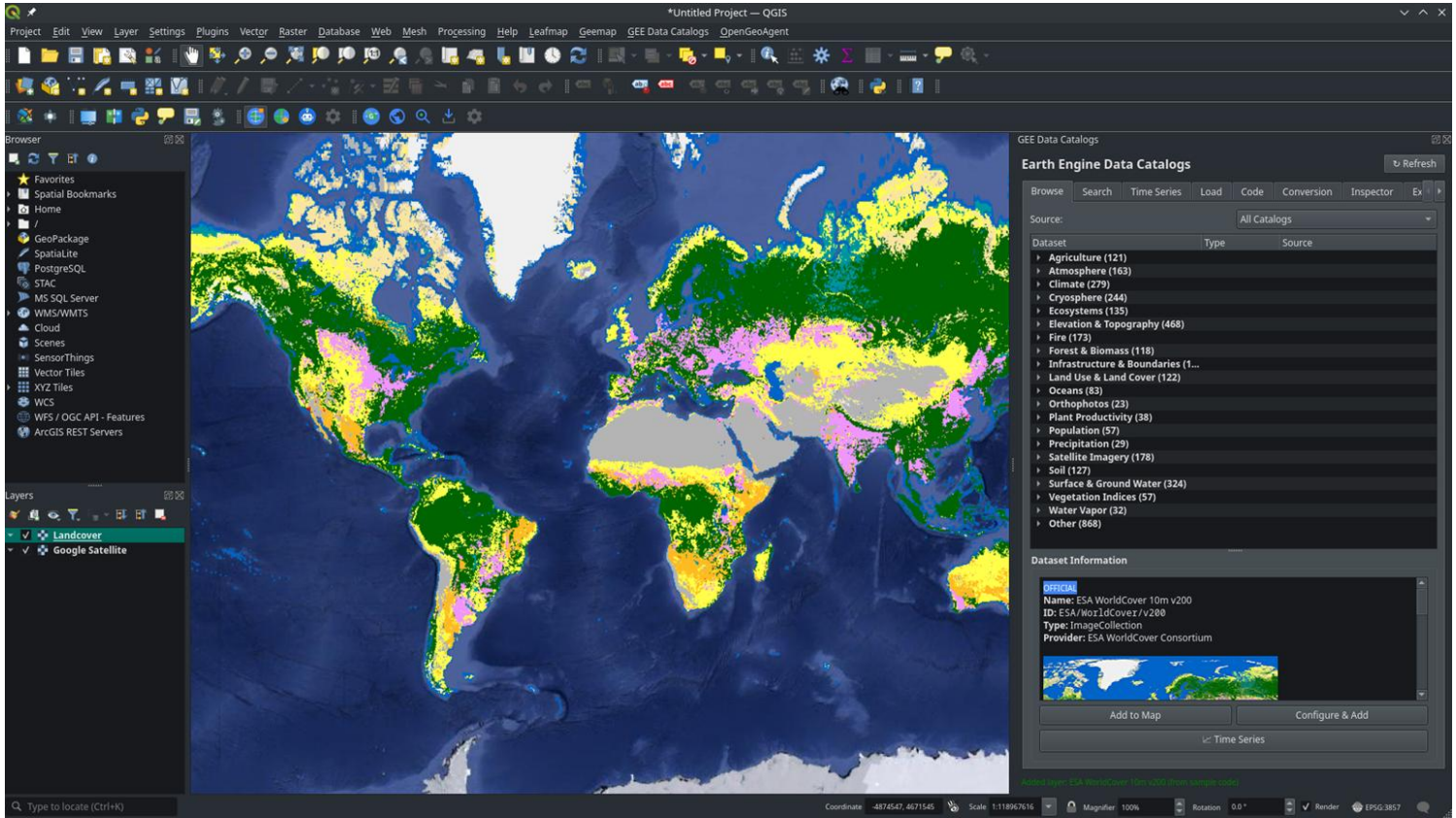


NASA Earthdata Plugin

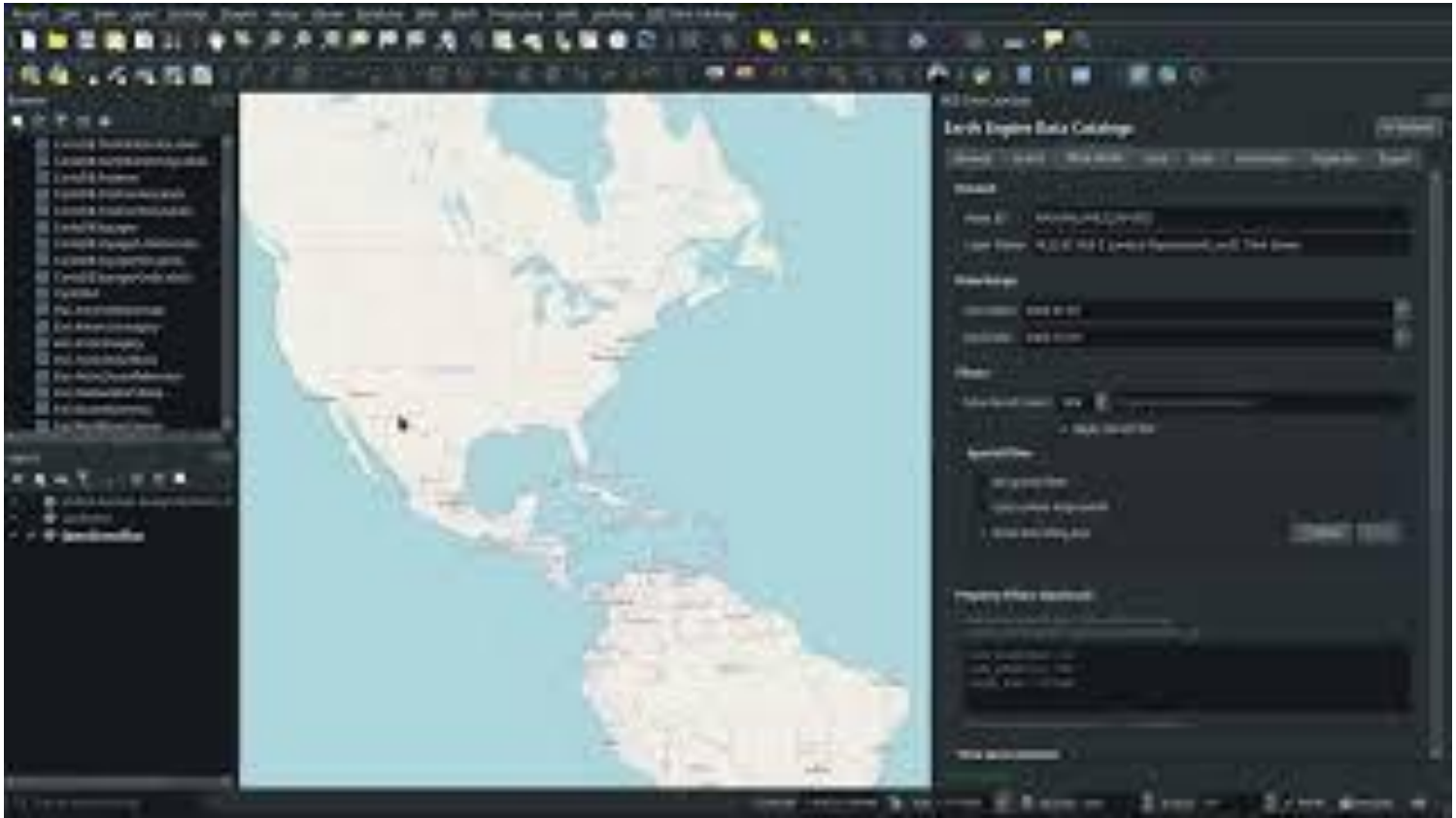


Earth Engine Data Catalogs Plugin

https://github.com/opengeos/qgis-gee-data-catalogs-plugin

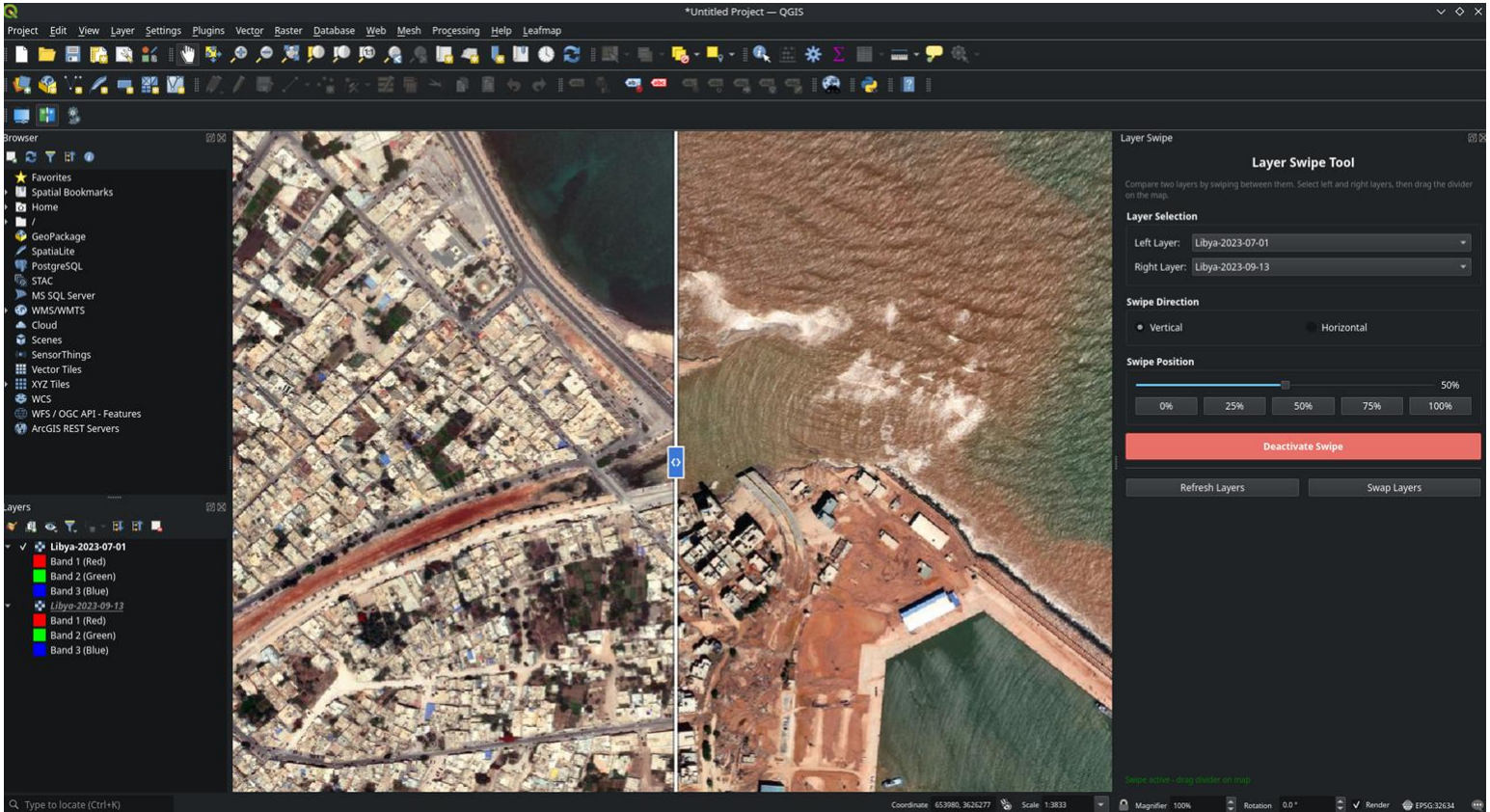


Earth Engine Data Catalogs Plugin



Leafmap Plugin

https://github.com/opengeos/qgis-leafmap-plugin



Leafmap Plugin

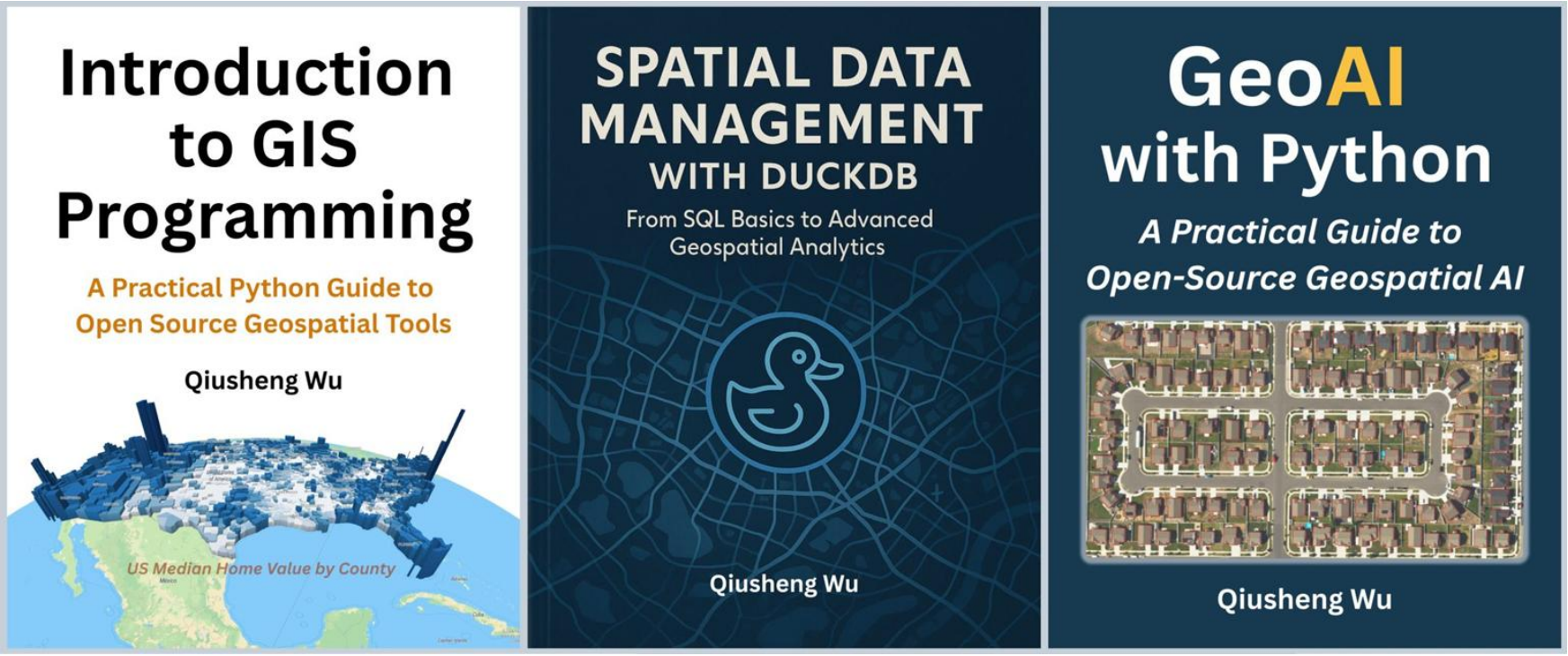
OpenGeoAgent Plugin

https://github.com/opengeos/GeoAgent

Additional Resources

Books

https://opengeopub.com/bundles/geopython



https://gispro.gishub.org https://duckdb.gishub.org https://book.opengeoai.org

YouTube

https://youtube.com/@giswqs

Open Geospatial Solutions

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Thank you!

Any questions

Qiusheng Wu

https://gishub.org

Live Demos

(1/2) Which type of support would you need to get started with HLS in QGIS?

(2/2) What barriers might prevent you from using HLS in QGIS tomorrow?

no barriers	No barrier	Plug in installation problems	skills/training
More training	Training	All good	tools, and cost

(2/2) What barriers might prevent you from using HLS in QGIS tomorrow?

Much less barriers with the tools just presented

Licenses to Google Earth engine or open ai.

Training

Aliño/training

Setting up HLS plugins and dataset in QGIS

Training

Just taking time to implement

Mainly enough time

(2/2) What barriers might prevent you from using HLS in QGIS tomorrow?

Lack of training for robust repeatability

No Barriers

No Barriers yet. Possibly the skills

More training and possibly licenses

Training

Possibly the skill set.

Skills/training

Las barreras críticas son la caducidad de las credenciales S3 (1 hora) que requiere automatización, la latencia de red local que afecta la fluidez del GIS de escritorio, y la necesidad de configurar f

HLS in Various Environments

Questions from the Audience

What other **questions do the participants have** that we haven't answered yet?

What else could the presenters help with?

Participants, please post your questions in the Webex Q&A

Tuesday May 12, 2026 starting at 1:25 pm CDT

Session 3: Accessing HLS in Various Environments

Goals:

- Demonstrate methods of discovery, download, visualization, and analysis of HLS.
- Engage with each environment and inform explorative opportunities.

Time (CDT)	Topics	Format	Speaker
1:25 - 1:30 (5 min)	Introducing HLS in Various Environments	Presentation	Essence Raphael, NSITE & UAH
1:30 - 2:30 (60 min)	Getting Started with HLS Data Access (+ Q&A)	Demo & Interactive 	Mahsa Jami, USGS EROS
2:30 - 3:30 (60 min)	Working with HLS Data in QGIS: Access, Visualization, and Analysis (+ Q&A)	Demo & Interactive 	Qiusheng Wu, UTK
3:30 - 3:40 (10 min)	**Break**		
3:40 - 4:40 (60 min)	HLS Data and Services in ESRI's ArcGIS Online and ArcGIS Pro (+ Q&A)	Demo & Interactive 	Leah Schwizer & Nalin Ly, NASA EGIST

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National Aeronautics and Space Administration

GIS Tools, Services, & Resources for HLS

Presented by NASA's ESDS GIS Team (EGIST)

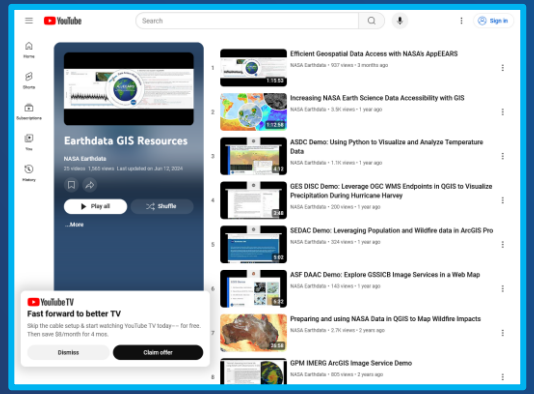
HLS Workshop – May 12-13, 2026

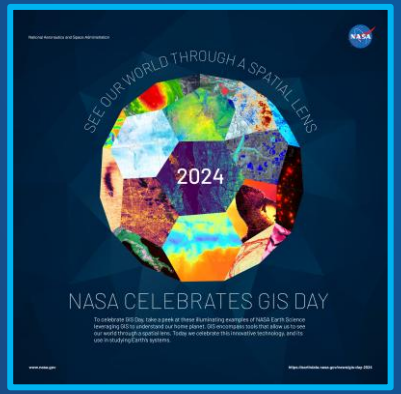
Who is the EGIST?

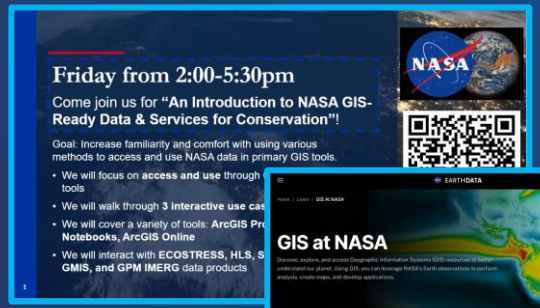
Maintain an awareness of GIS capabilities/efforts **across NASA Earth Science** to encourage the development, coordination, & maturation of GIS

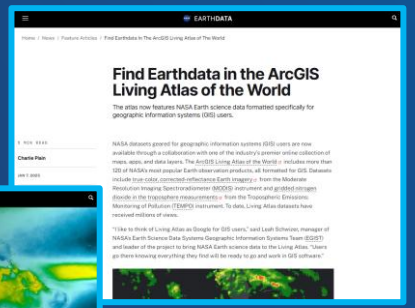
Build a community to curate, publicize, & highlight **GIS content to aid users in navigating Earth science data**

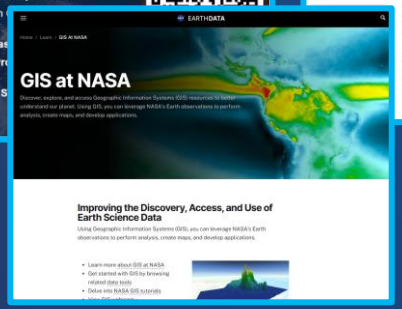
Demonstrate the use & utility of GIS for NASA Earth Science by **leading public-facing technical discussions, webinars, & workshops**











What are we here to talk about today?

EGIST focuses on enabling **NASA data to be "GIS-ready"**.

This refers to data, services, & maps/apps are **compatible with common GIS software/tools**.

- We will be **demoing HLS data and services** within Esri software.
- *…but why Esri?*

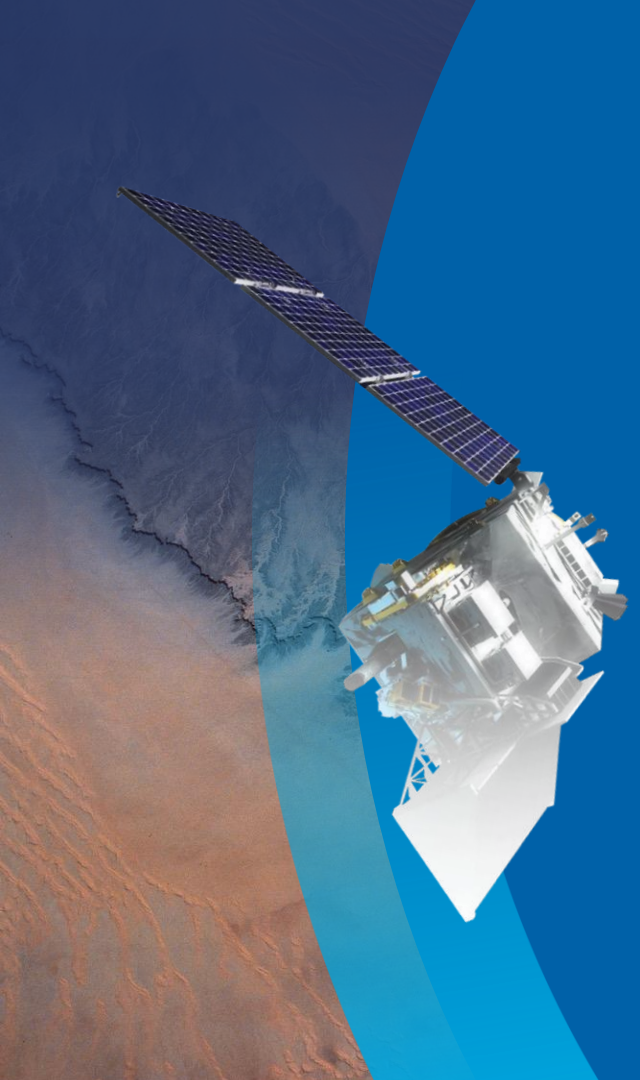
	2022 %	2022 N	2022 CSI
Tool used to work with data ~~			
ArcGIS	61%	1,022	84
Quantum GIS (QGIS)	45%	751	84
Excel	30%	496	83
ENVI	24%	397	84
Other/open source	23%	377	83
ERDAS/IMAGINE	16%	268	85
Global Mapper	15%	243	84
GDAL	14%	242	84
MATLAB	12%	199	84
GRASS	11%	187	84
Jupyter Notebooks	11%	189	82
Convert to Vector	6%	108	83
Panoply	6%	107	85
IDRISI	5%	88	84
Geomatica	4%	64	81
HDFView	4%	64	82
SeaDAS			
GrADS			
Ferret			
HEG			
IDV			
MapReady			
NCL			
Don't know/Not applicable			
HDFLook			
IDL			
MODIS Reprojection Tool (MRT)	0%	0	--
R	0%	0	--
Number of Respondents		1,674	

Since 2017, **ACSI reports that ArcGIS is the most used software tool/package** for working with NASA EO data at 61%, followed by QGIS (45%), & Excel (30%).

Working closely with its federal partners, over the years, Easi **has vastly improved its ability to handle imagery** & scientific data formats.

Agenda

- Demonstrations:
  - Downloaded Data Files in ArcGIS Pro
  - Cloud Storage Connection in ArcGIS Pro
  - SpatioTemporal Asset Catalog (STAC) in ArcGIS Pro
  - Global Imagery Browse Service (GIBS) in ArcGIS Pro & ArcGIS Online (AGOL)
  - Earthdata GIS (EGIS) Image Service in ArcGIS Pro & ArcGIS Online
- Esri's Landsat & Sentinel Viewers
- Earthdata GIS Resources



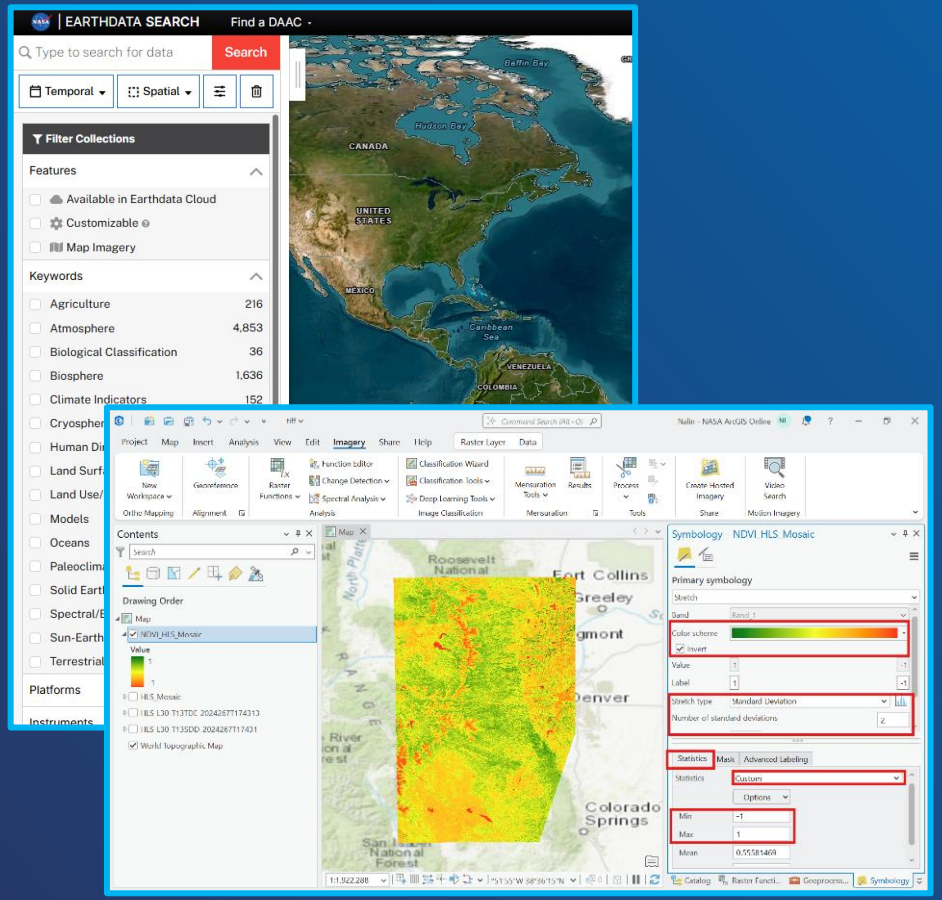
Demoing HLS:
Using Downloaded Data Files from Earthdata Search in ArcGIS Pro

Overview

This workflow assumes users have downloaded granules from Earthdata Search.

Users will use ArcGIS Pro to:

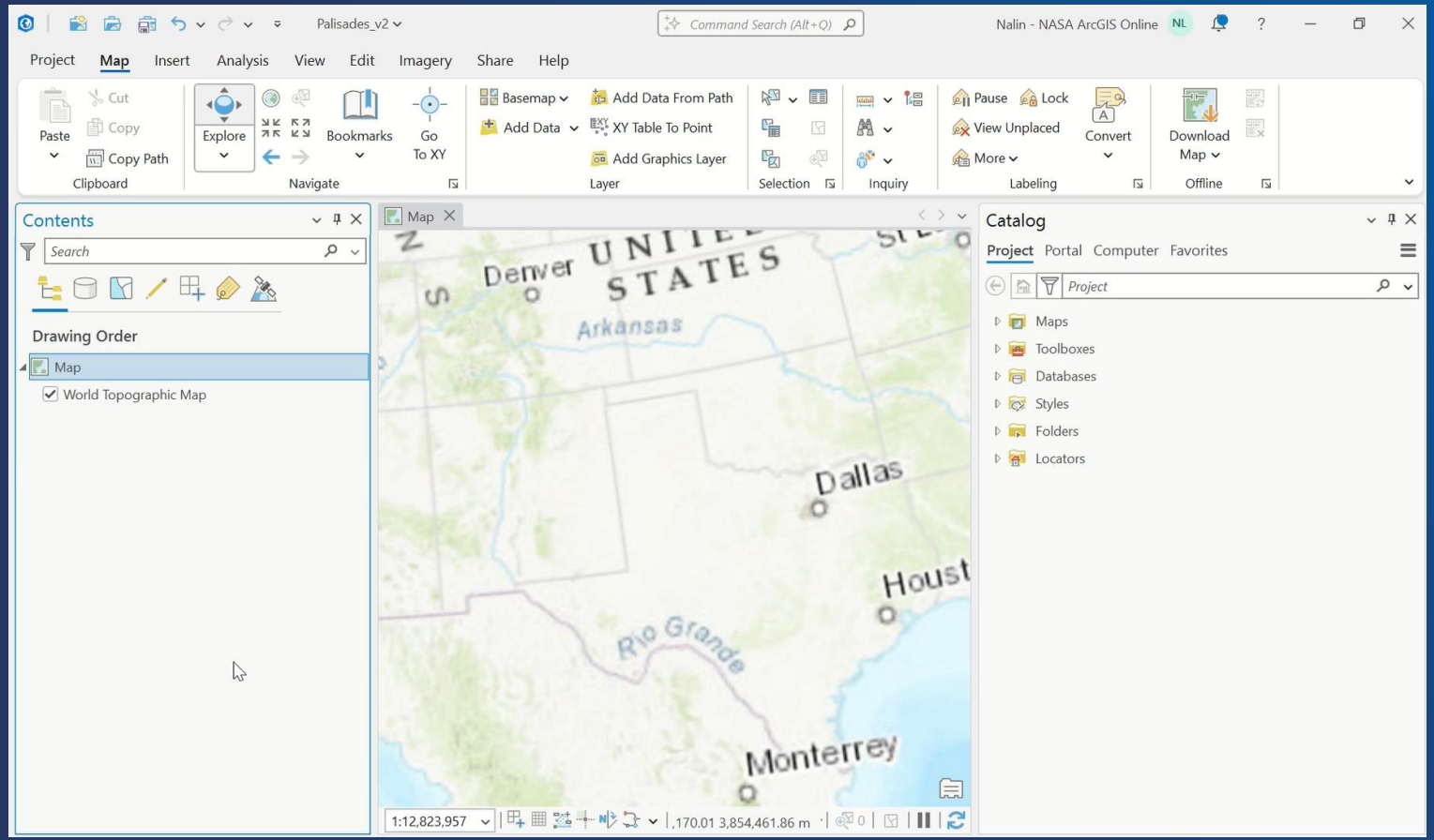
1. combine individual spectral bands into a multiband composite
2. Clip imagery to a boundary
3. Apply an NDVI raster function for basic vegetation analysis
4. Subtract output NDVIs for Change Detection



Palisades Fire Overview

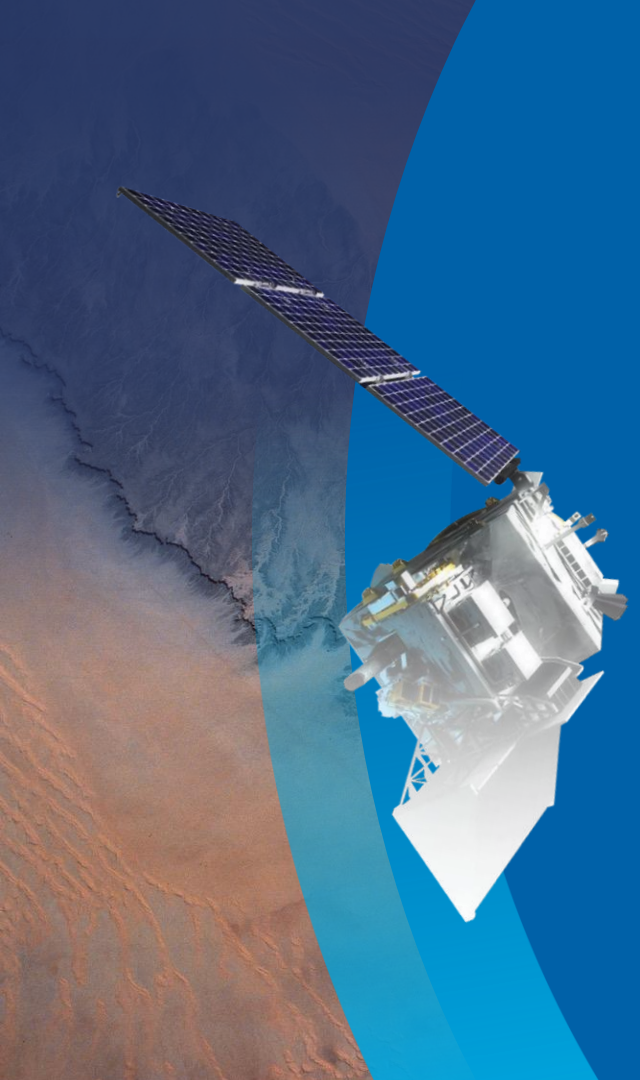
- Wildfire that started in the Santa Monica Mountains in Los Angeles County
  - Spread to areas in the Pacific Palisades, Topanga, and Malibu
  - ~23,500 acres burned between 1/7/2025 – 1/31/2025

Workflow Demonstration



Recap

- Data is freely and openly available to download through Earthdata Search
- A broad set of tools and raster functions are available to leverage this data in a wide variety of workflows
    - Clipping helps focus the analysis area
    - NDVI raster functions assess vegetation
    - Raster Calculator can quantify change between pre- and post-event imagery



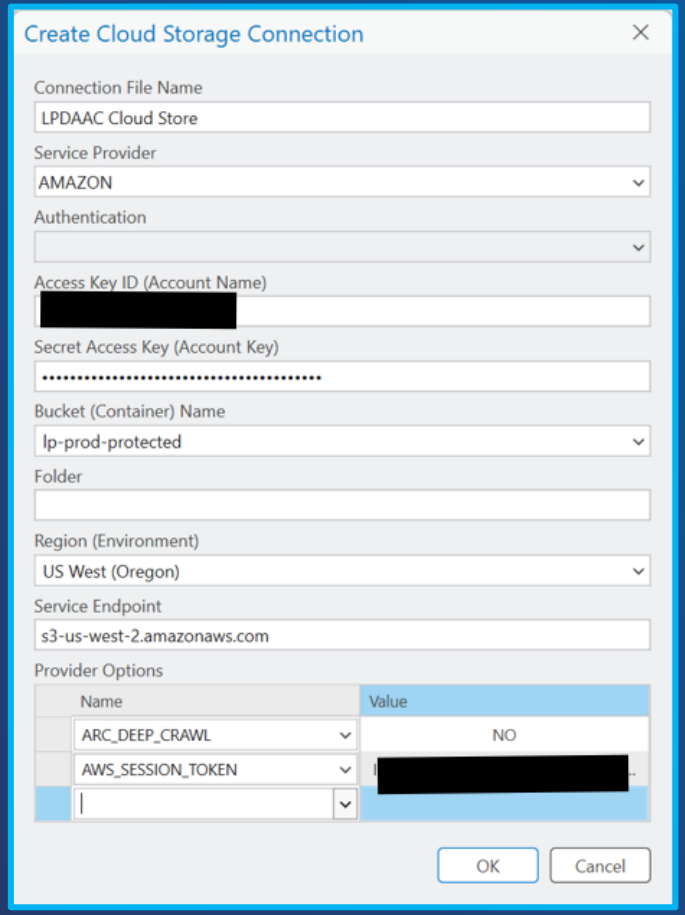
Demoing HLS: Discovering Content with Cloud Storage Connection in ArcGIS Pro

Overview

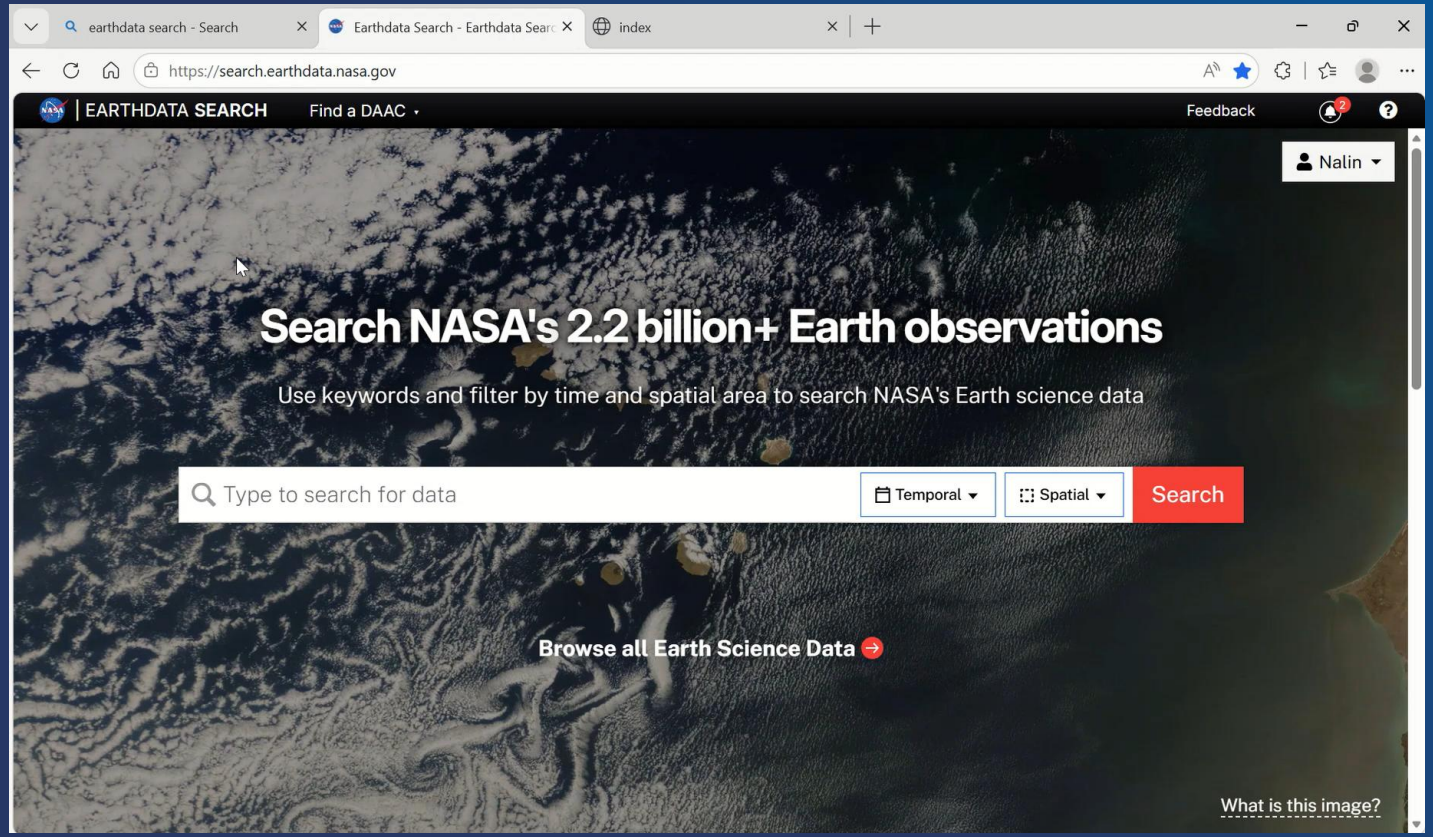
- Securely access data directly from the cloud via temporary credentials
  - Earthdata Search results
  - LPDAAC credential endpoint

Known Limitations:

- Temporary credentials are valid for 1 hour
- Requires user to be operating within US-West-2 (Oregon) on ArcGIS Pro installed from an AWS US-West-2 server
  - NASA's requestor pays model limits the ability for any/all users to access data through CSC due to egress costs

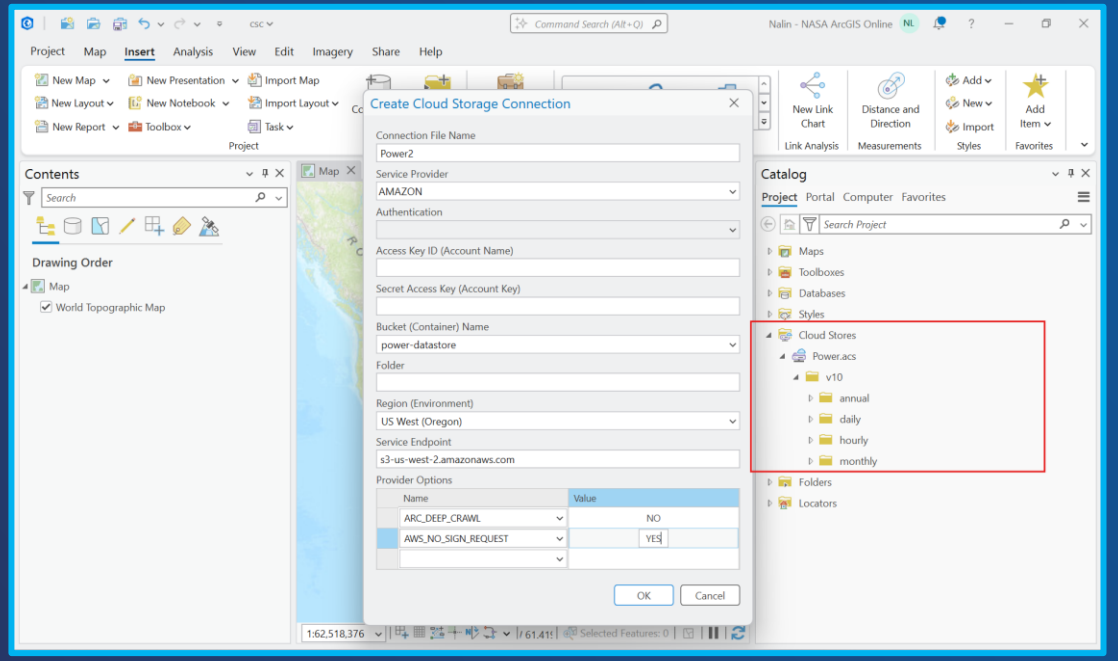


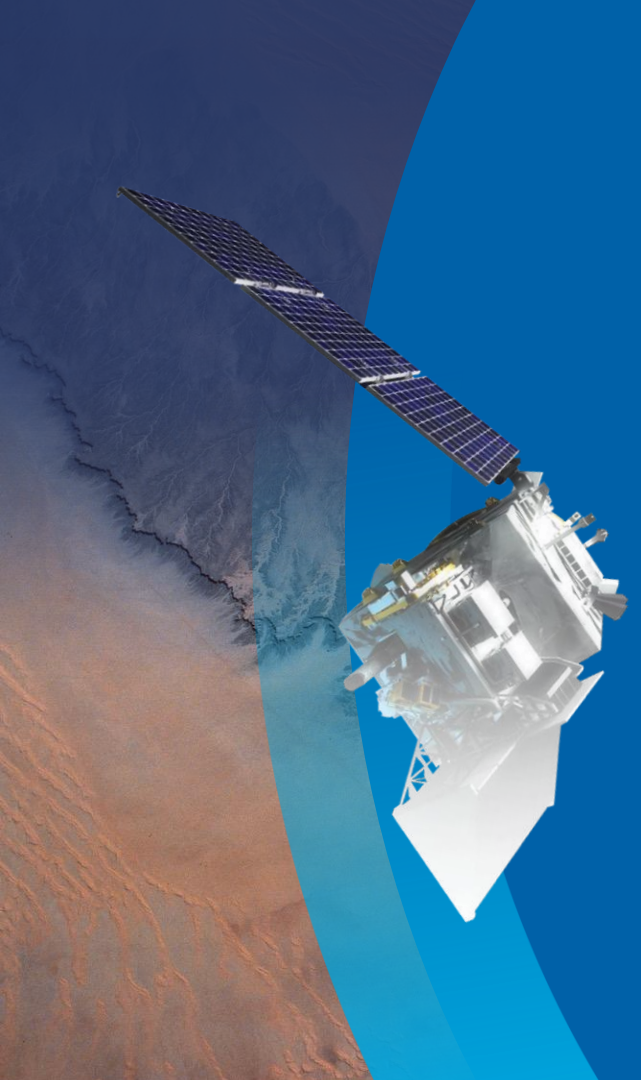
Workflow Demonstration



Recap

- Cloud Storage Connections offer a direct way to gain access to data in the cloud and quickly add to your project
- Credentials expire after 1 hour
- Users with instances downloaded and run from a US-West-2 server can leverage this workflow more readily/easily





Demoing HLS: Discovering Content via SpatioTemporal Asset Catalog (STAC) in ArcGIS Pro

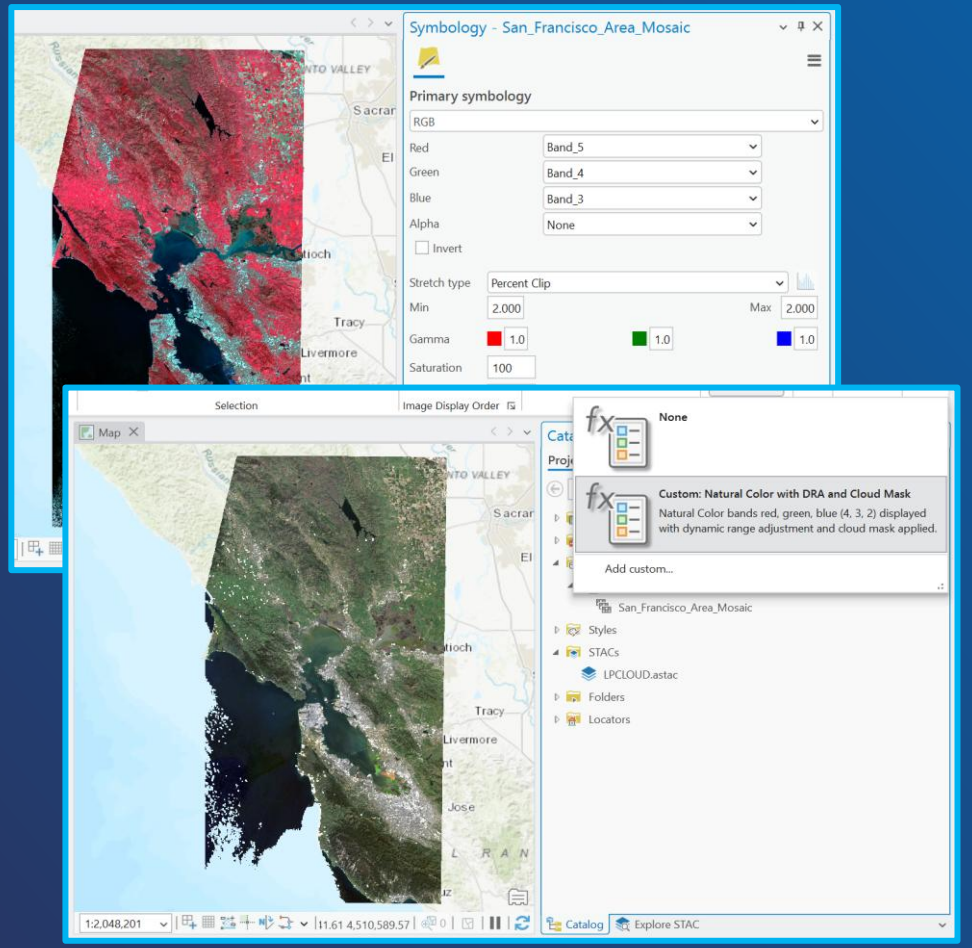
Overview

- **Common Metadata Repository (CMR)**
  - Earthdata metadata catalog
- **SpatioTemporal Asset Catalog (STAC)**
  - Standard for organizing and searching cloud-hosted geospatial data
- **NASA CMR-STAC**
  - bridges CMR system and STAC standard by making CMR metadata searchable through a STAC-compatible interface.

Workflow Overview

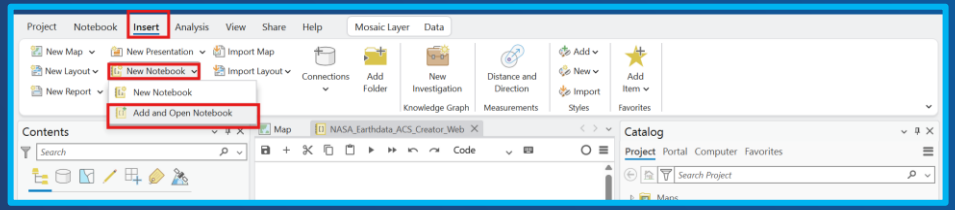
- Searching and filtering data
- Using ACS files to authenticate access
- Add data to a mosaic dataset
- Use of RasterType and Raster Function Templates (RFT) to visualize HLS imagery

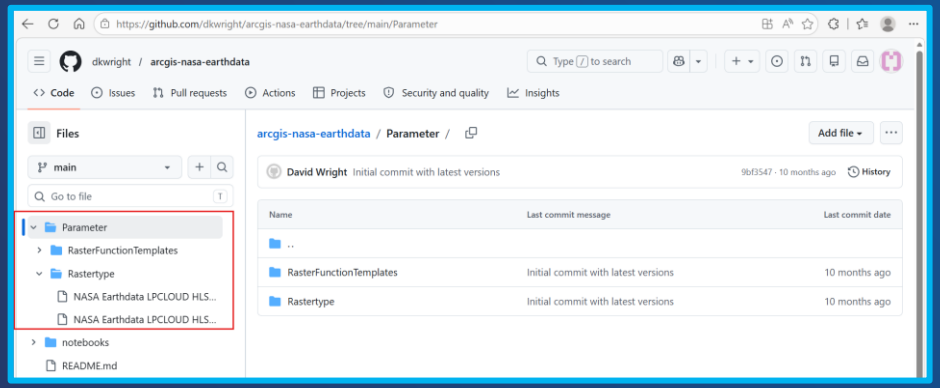
***NOTE: Empty mosaic dataset has been created ahead of the demo for STAC data**



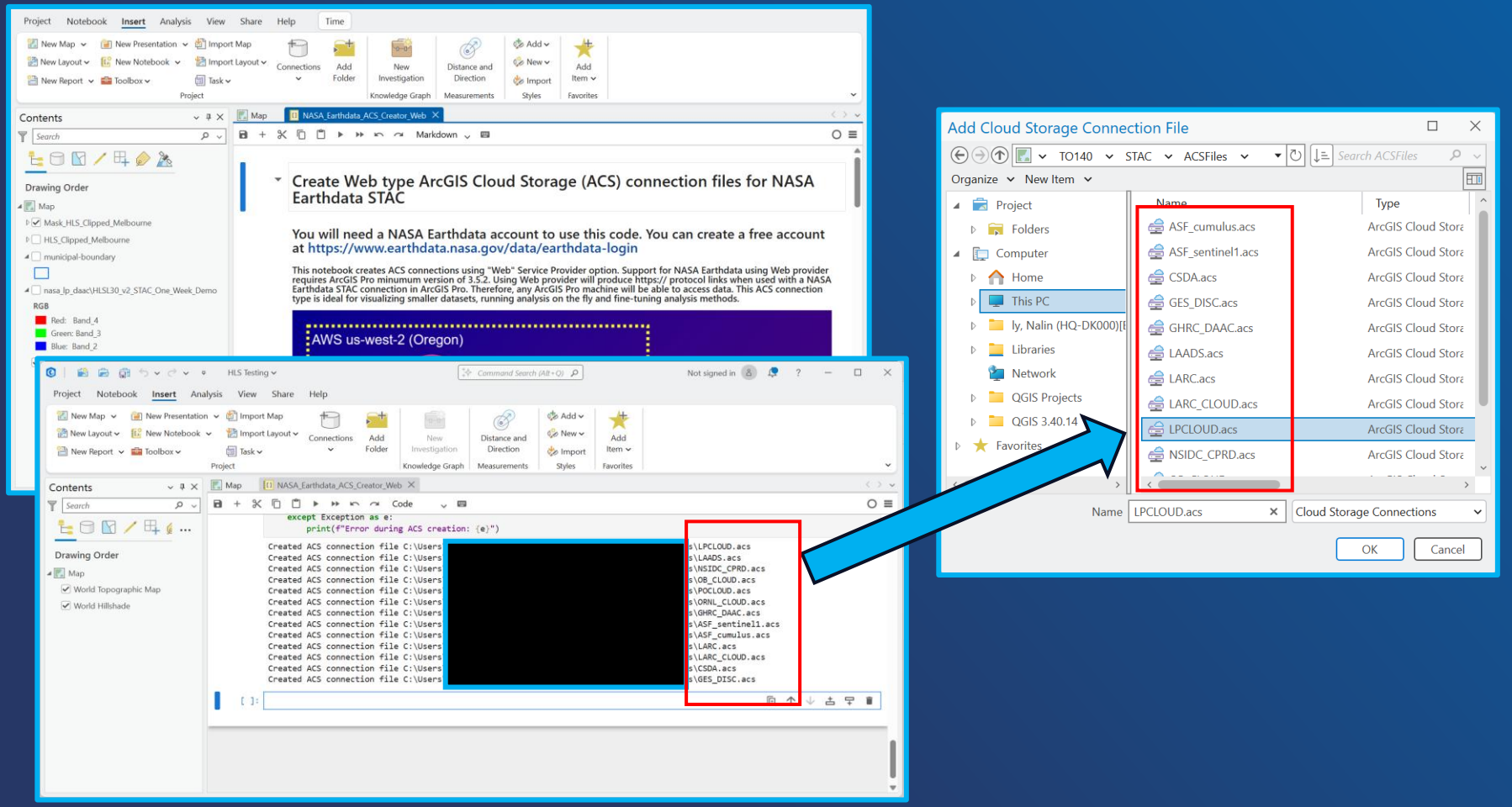
Preparing Your Environment with the dkwright Repository

- The dkwright arcgis-nasa-earthdata github repository is a supplemental resource that streamlines use of NASA Earthdata in ArcGIS with the following:
  - ArcGIS Cloud Storage (ACS) file generation for access
    - ArcGIS Pro 3.5.2 or later
    - This ACS connection type is ideal for visualizing smaller datasets, running analysis on the fly, and fine-tuning analysis methods
  - **Raster Types** to define how the imagery is read and structured by ArcGIS for consistent interpretation
  - **Raster Function Template (RFT)** to define how the data is rendered and analyzed; applies preconfigured symbology

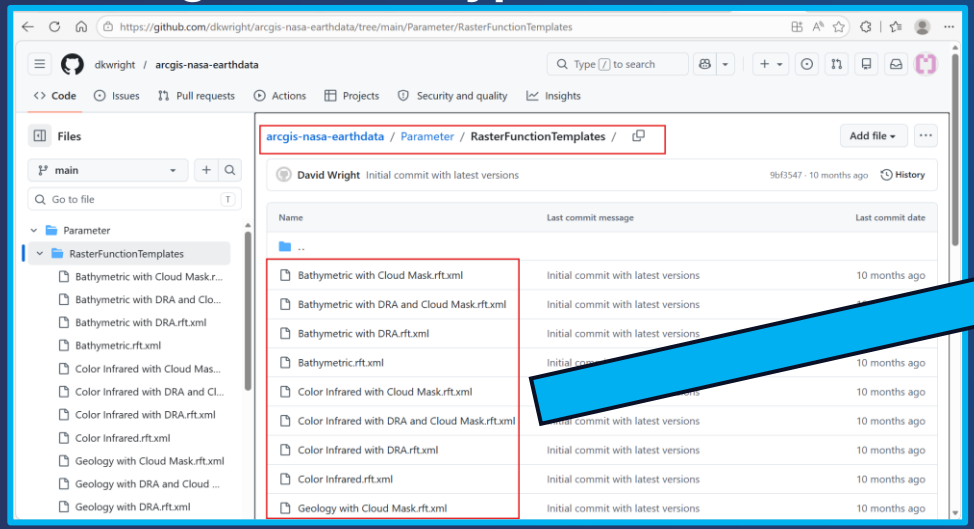


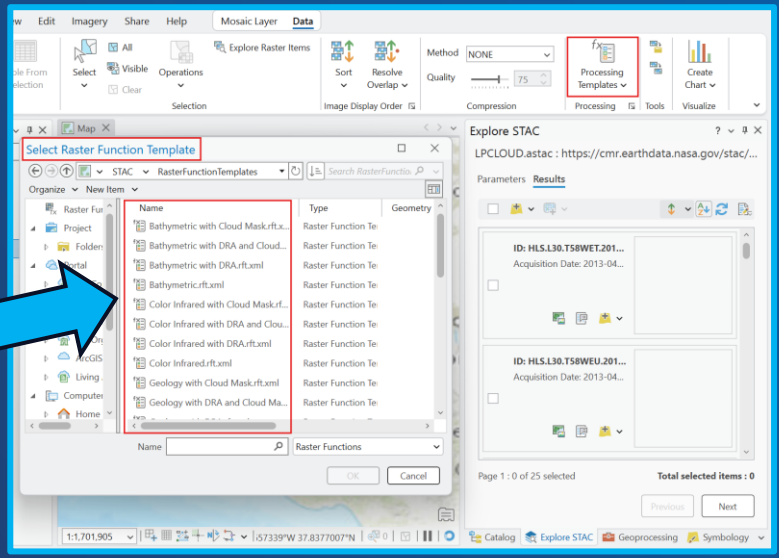


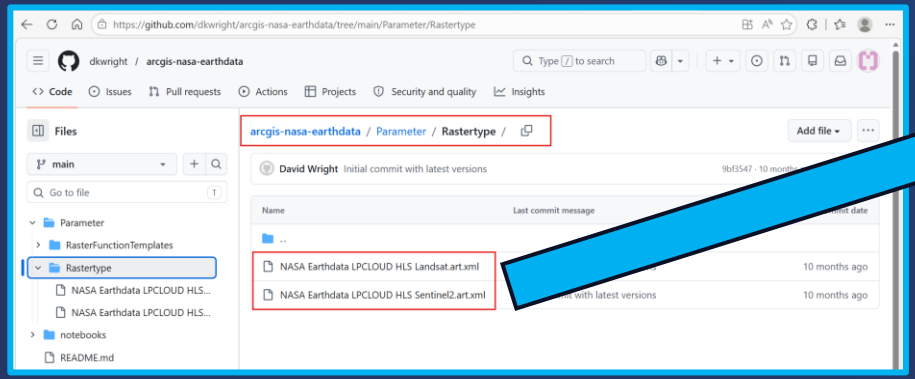
Dkwright Web ACS Notebook Generation

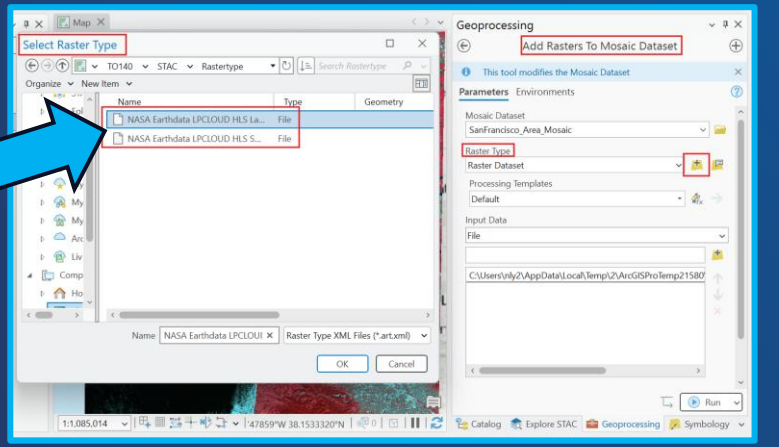


Dkwright Raster Type and RFT

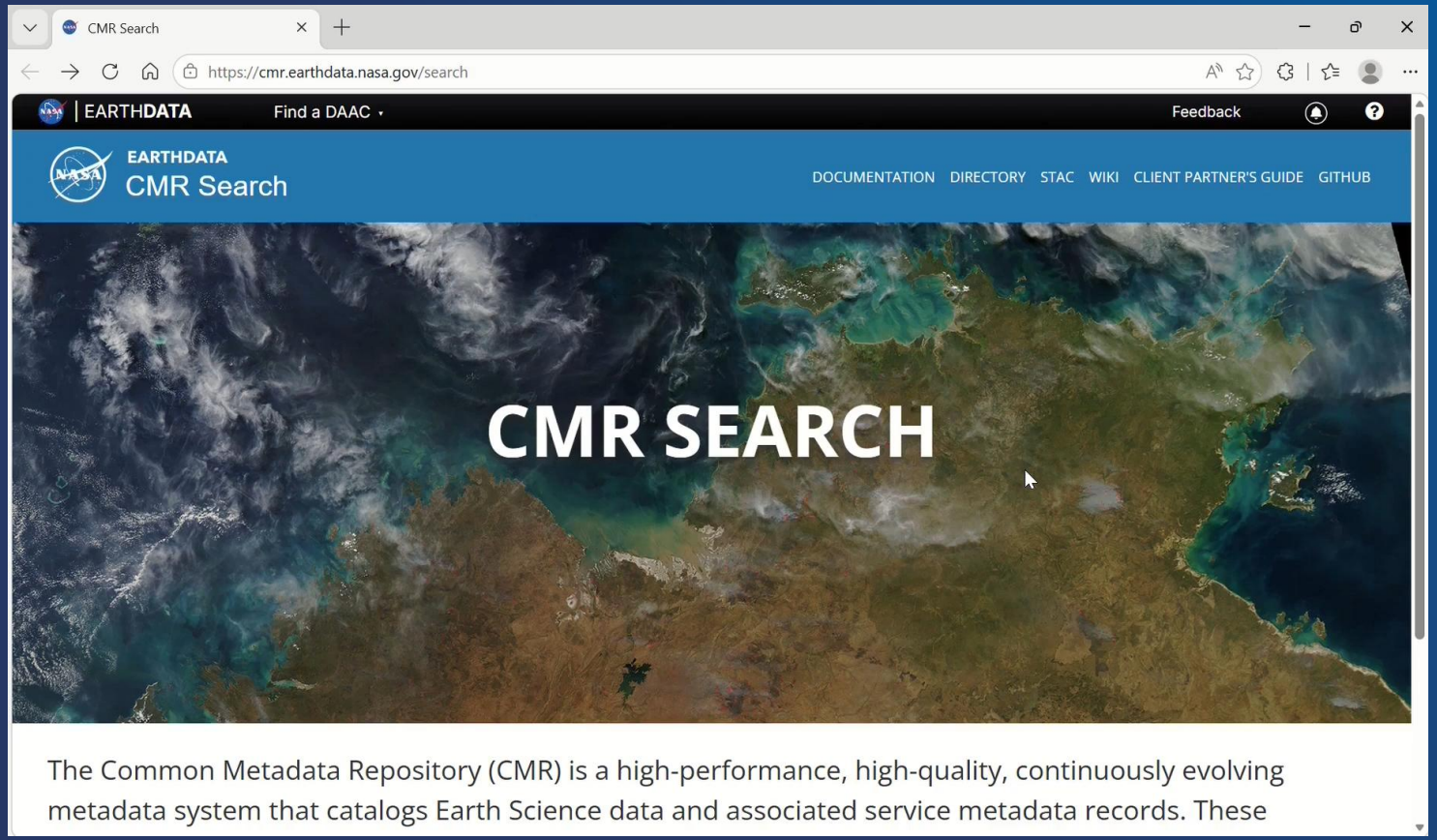






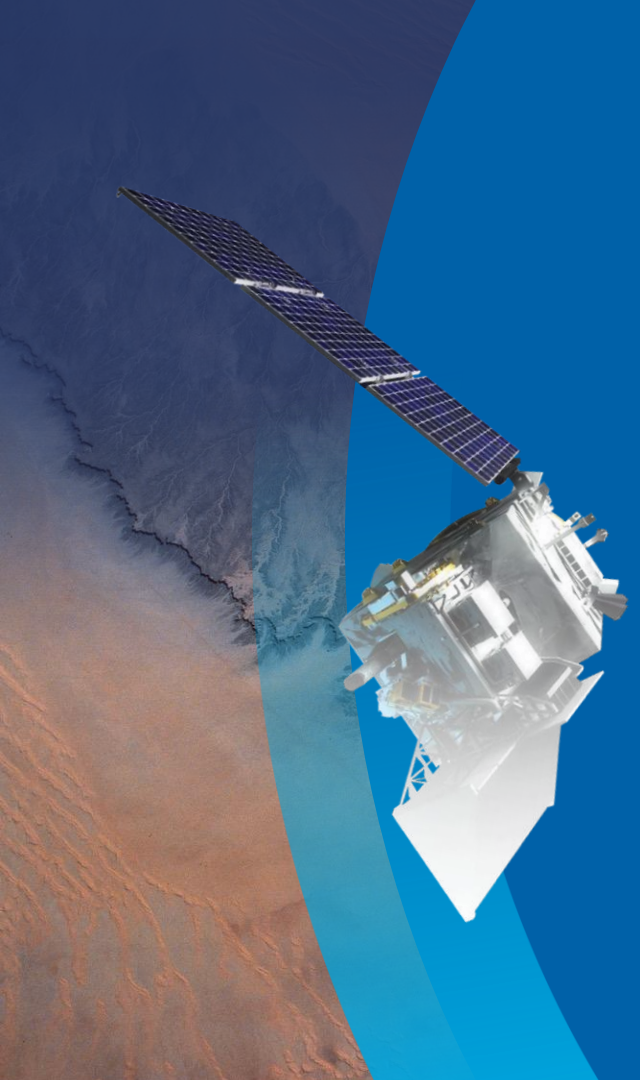


Workflow Demonstration



Recap

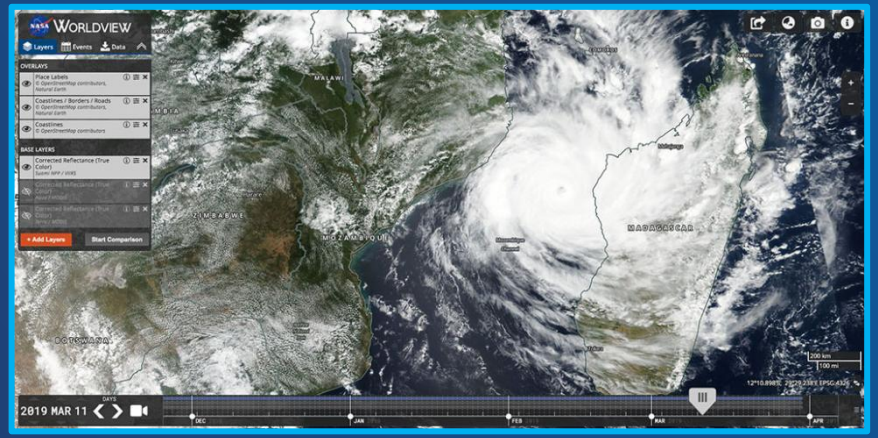
- STAC is an effective method to discover and learn about data
- STAC can be used publicly, without temporary credentials to browse available collections
- NASA’s implementation of STAC using the Common Metadata Repository (CMR) has underlying limitations regarding access and use of data
- Future improvements underway to establish a more consistent user experience across the collections in CMR

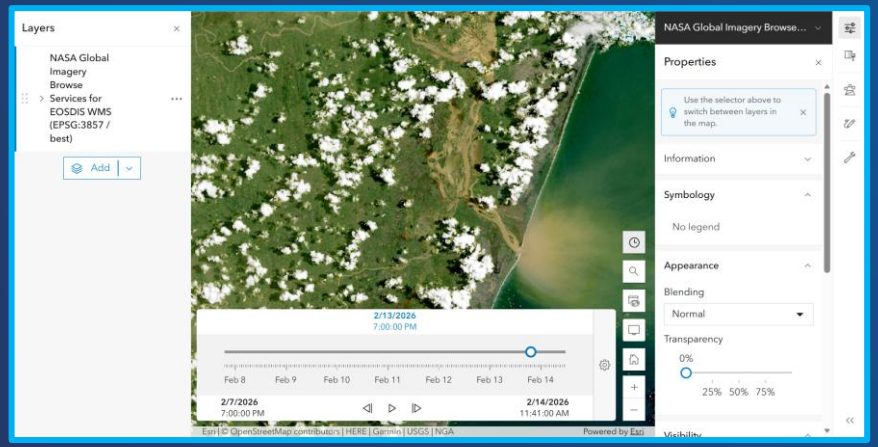


Demoing HLS: Accessing & Using the Global Imagery Browse Service (GIBS) in ArcGIS Pro

GIBS Overview

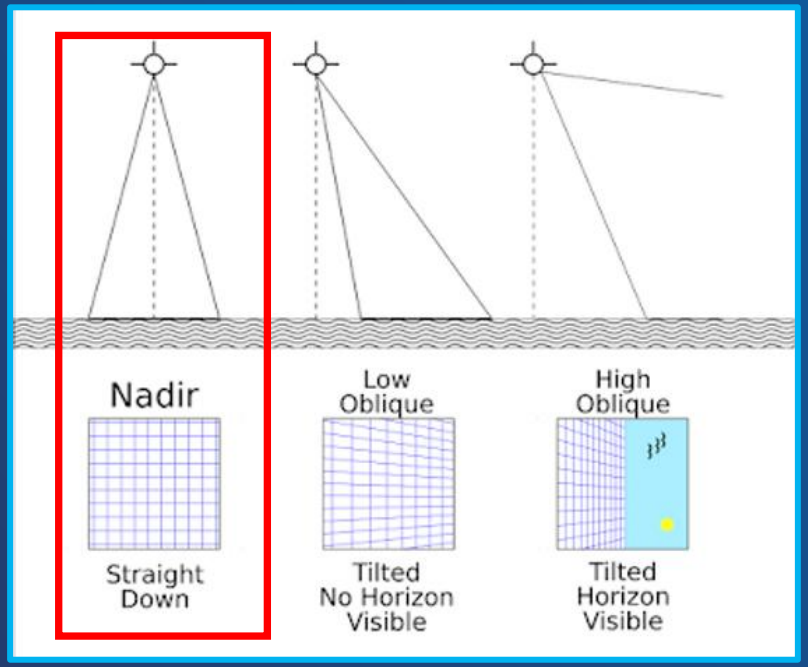
- **Web map service (WMS)** and Web Map Tile Services (WMTS) that provides access to global, full-resolution satellite imagery
    - WMS allows GIS software view map layers hosted online without downloading the underlying data
- Compliant with Open Geospatial Consortium (OGC) standards
- Backend of NASA Worldview interactive web application
    - Worldview is a free user-friendly data visualization tool for satellite imagery
    - Uses GIBS to rapidly retrieve its imagery for an interactive browsing experience



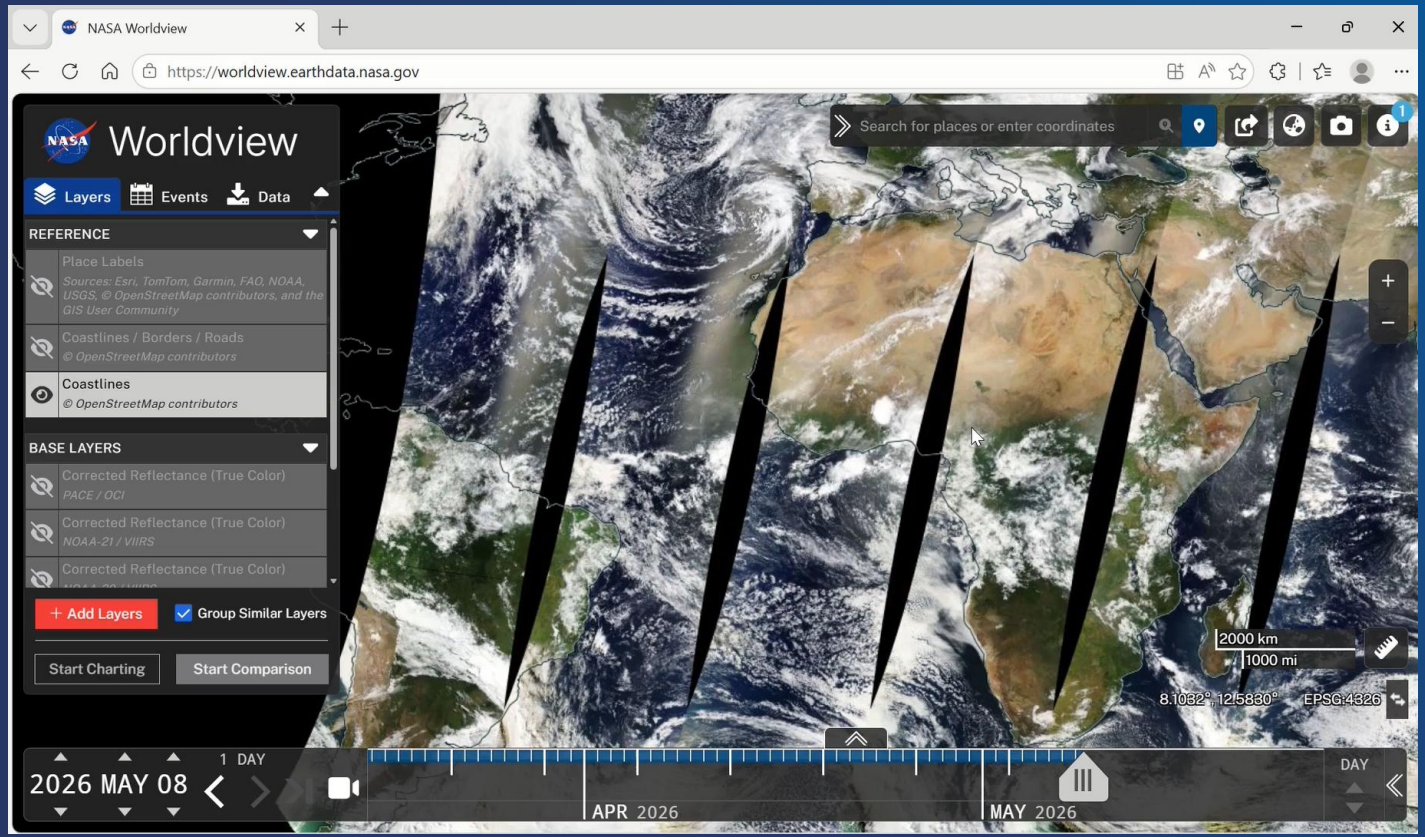


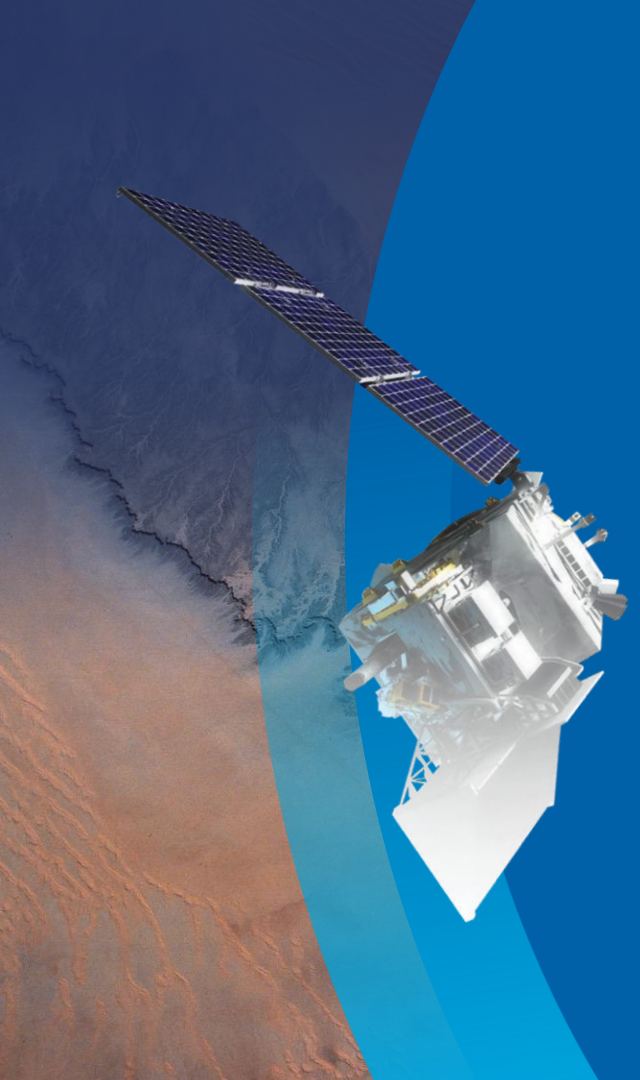
GIBS Workflow

- Find GIBS endpoints
- Access GIBS in ArcGIS Pro and ArcGIS Online
    - Nadir Bidirectional Reflectance Distribution Function (BRDF) Adjusted Reflectance
        - 30-meter Nadir BRDF-Adjusted Reflectance (NBAR)
        - Normalization that corrects for angular effects, producing data as if viewed from directly overhead
- Configure time enabled properties



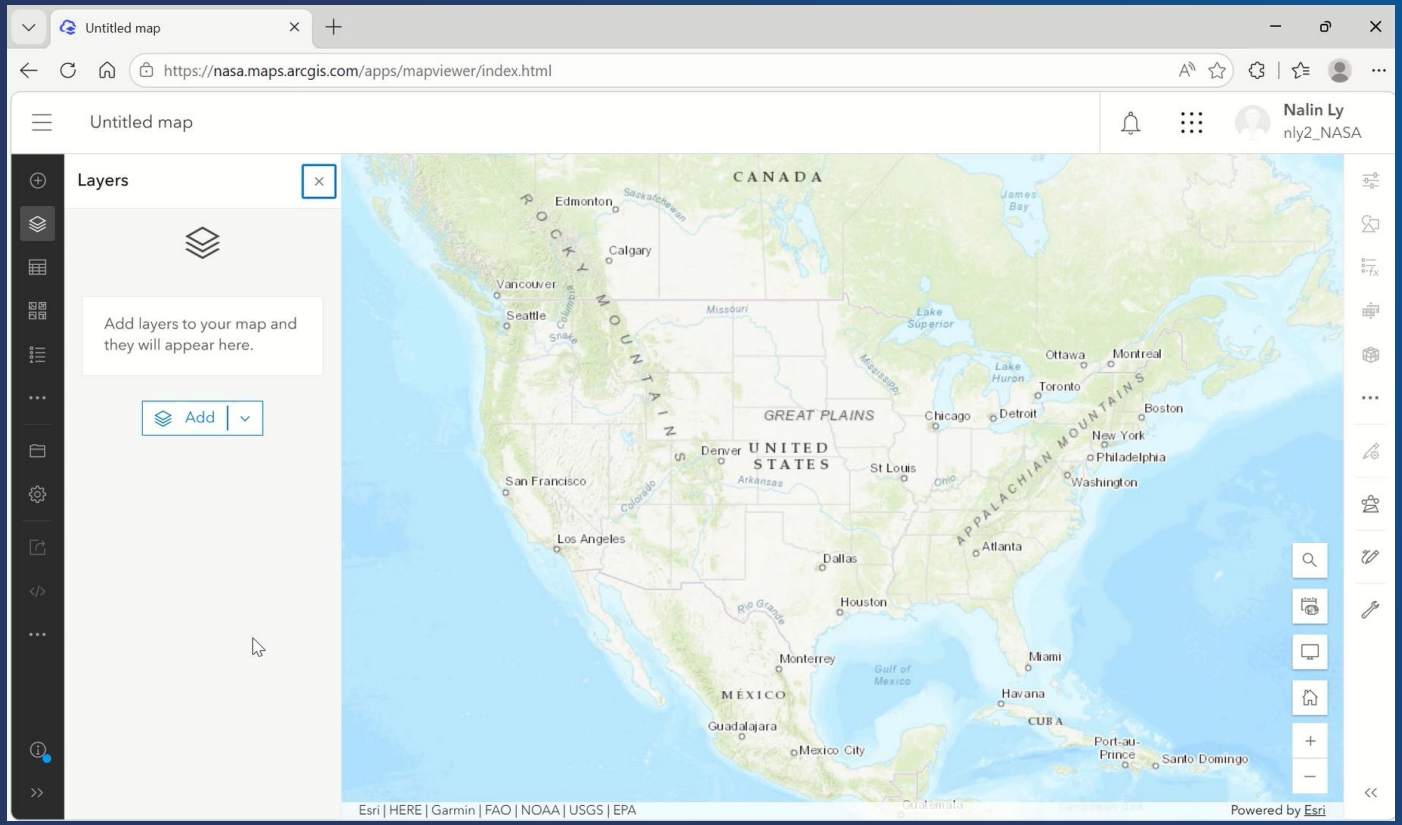
Workflow Demonstration





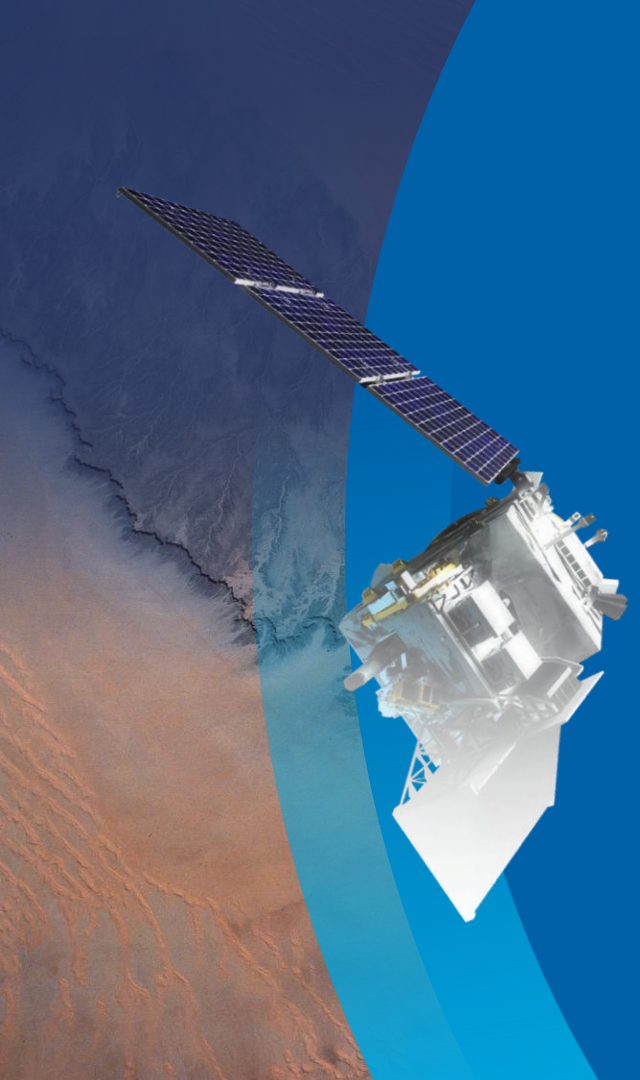
Demoing HLS: Accessing & Using the Global Imagery Browse Service (GIBS) in ArcGIS Online (AGOL)

Workflow Demonstration



Recap

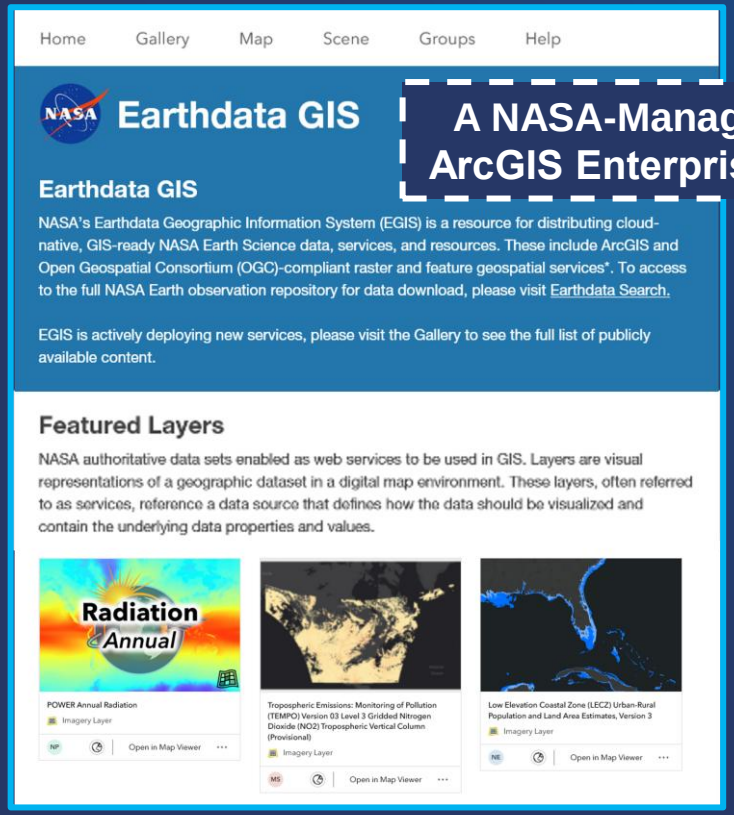
- GIBS is the backend of Worldview
- Contains an extensive catalog of services (1,000+)
- Provides NRT, time-enabled data, and global coverage
- WMS can be used across compliant GIS clients
- WMS provides visualization only
- Useful for quick exploration and identifying areas or dates for further analysis



Demoing HLS: Accessing & Using the Earthdata GIS (EGIS) Image Service in ArcGIS Pro

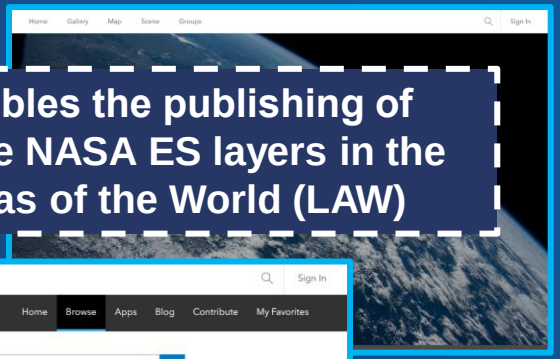
Future Living Atlas of the World (LAW) Layer

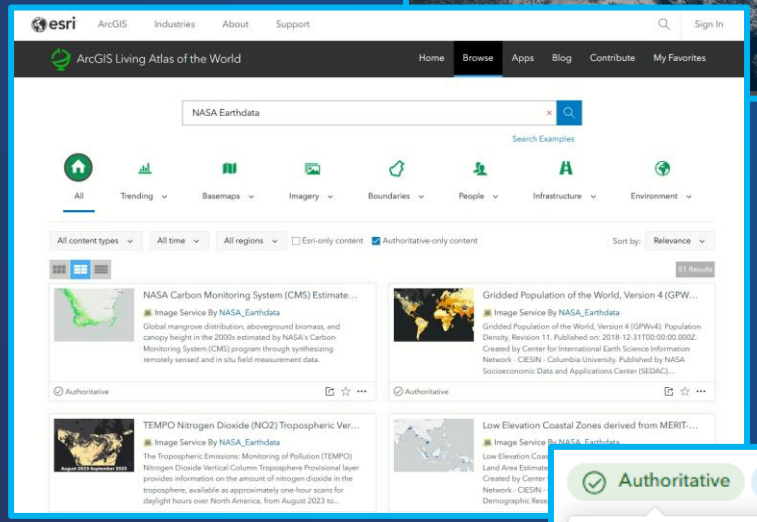
Enabling GIS at NASA: Earthdata GIS

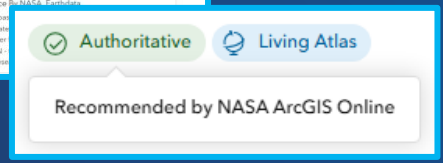


A NASA-Managed ArcGIS Enterprise…

…that enables the publishing of authoritative NASA ES layers in the Living Atlas of the World (LAW)





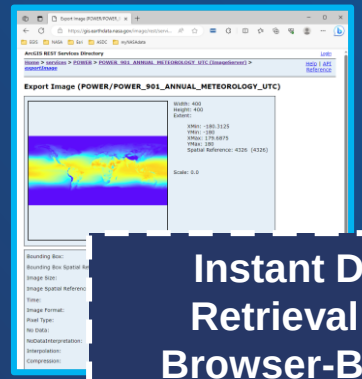


Why these services?

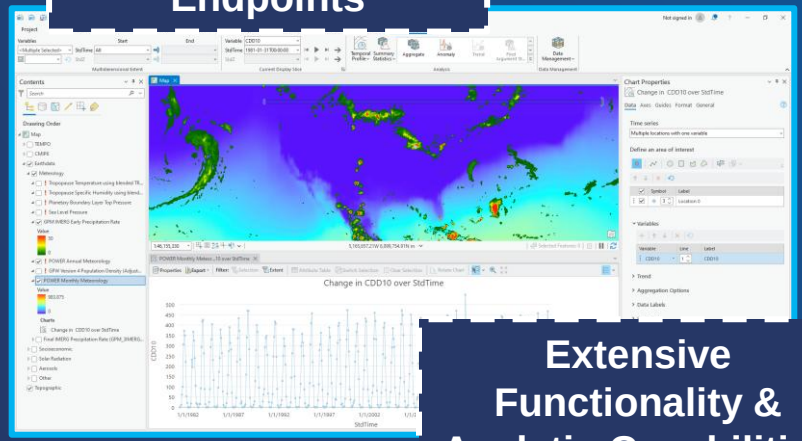
Image & feature services enable users to **reduce the time spent on data wrangling & pre-processing** in order to increase time for analysis. With these services, you can:

- Perform raster analytics including aggregates, differences, or classifications
- Perform raster functions including reprojection, orthorectification, clipping, application of complex image processing algorithms, & more

Integration w/ Interactive Data-Driven Apps



Instant Data Retrieval via Browser-Based Endpoints

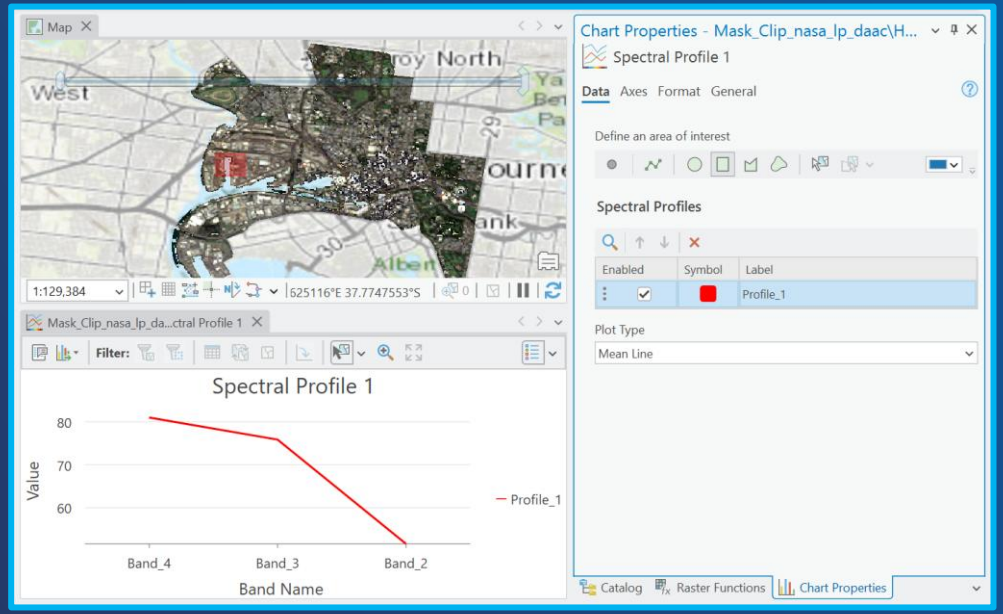


Extensive Functionality & Analytic Capabilities

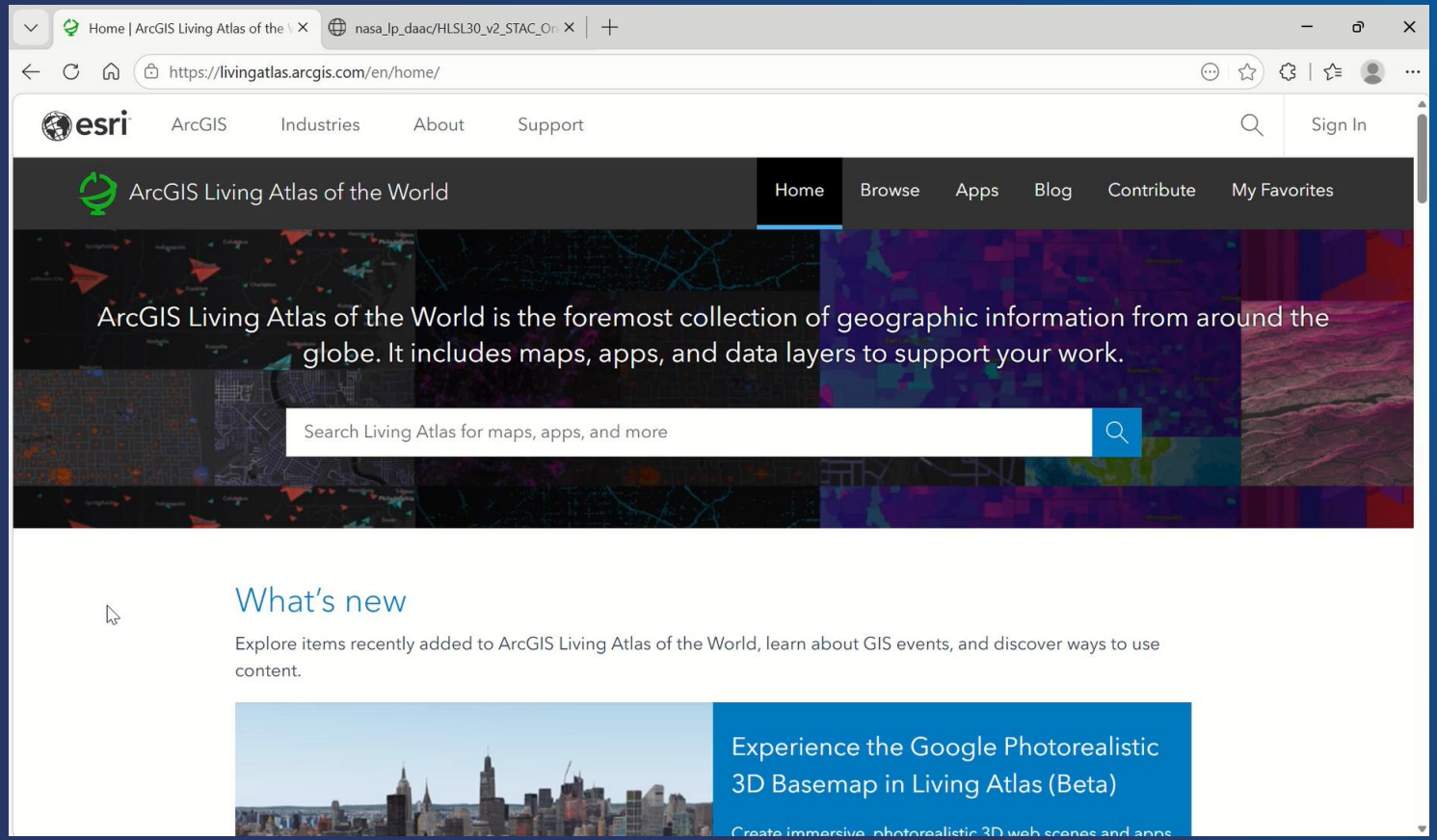
Workflow Outline

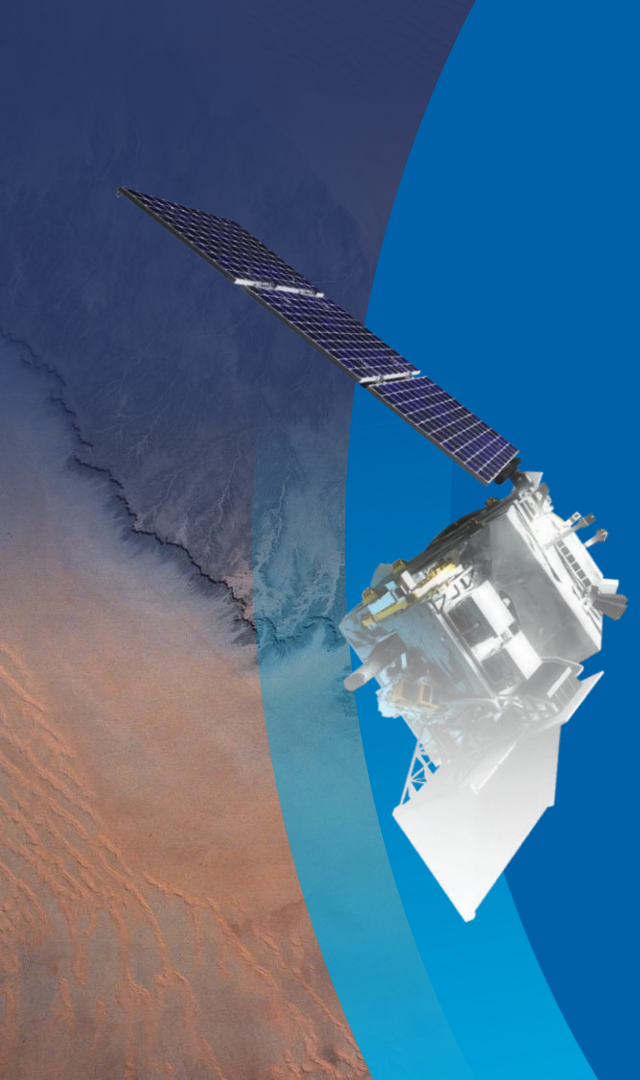
- Find an Image Service Endpoint
- Add an Image Service to ArcGIS Pro
- Clip to a Boundary
- Apply Mask
- Create a Spectral Profile

REMINDER: *This demonstration will use a prototype service. The full HLS service is currently in development.*



Workflow Demonstration





Demoing HLS:

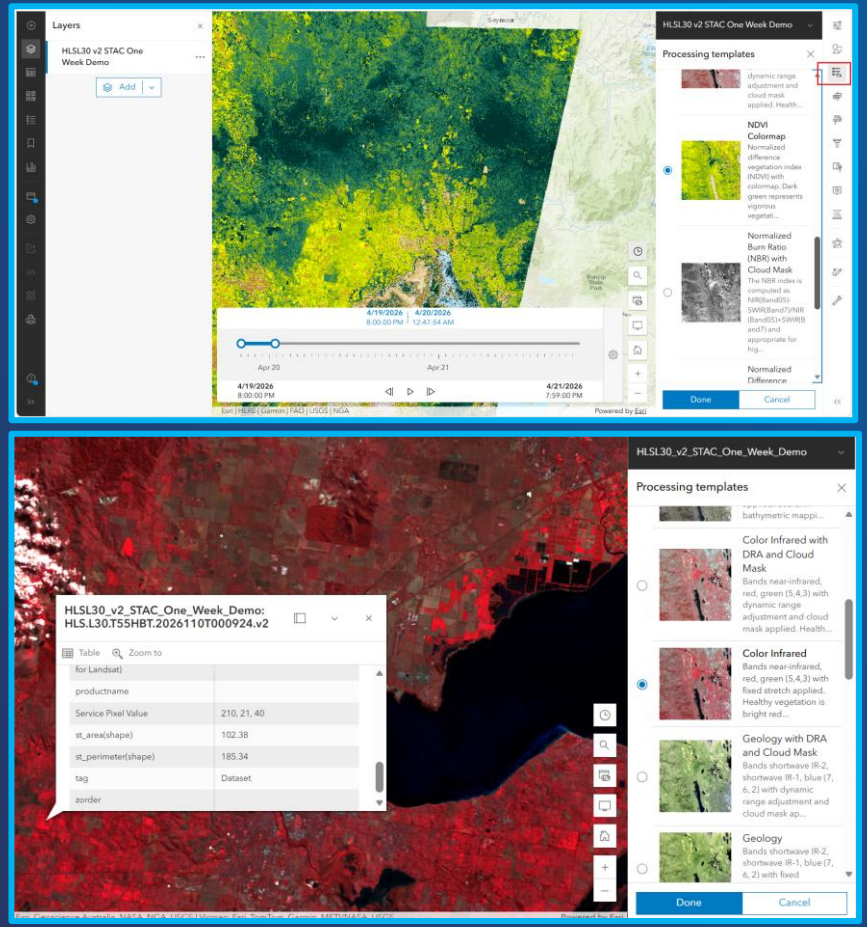
Accessing & Using the Earthdata GIS (EGIS) Image Service in ArcGIS Online

Future Living Atlas of the World (LAW) Layer

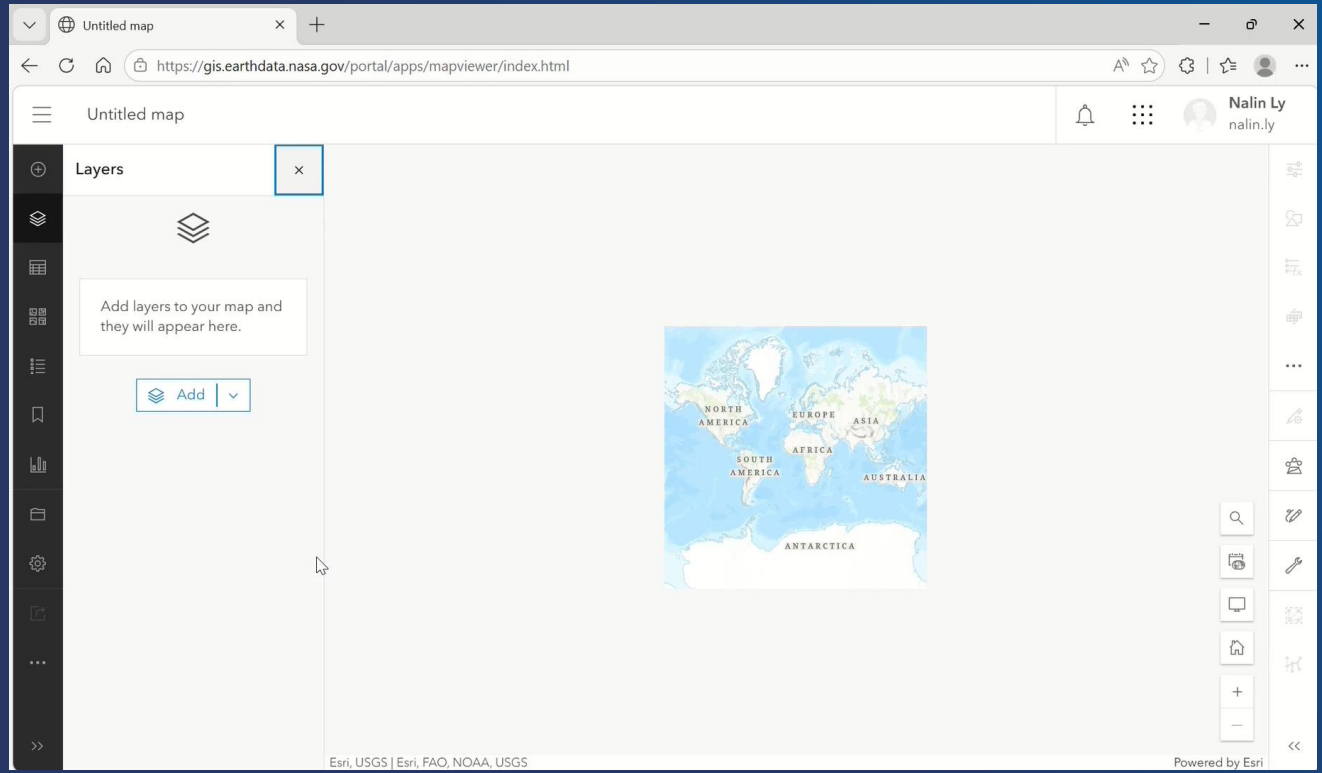
Workflow Outline

- Add Image Service to ArcGIS Online
- Configure time enabled properties
- Navigate the Image Collection Explorer
    - Filter, query, preview, and select granules
- Apply Processing Templates
- Identify Pixel Values

REMINDER: *This demonstration will use a prototype service. The full HLS service is currently in development.*

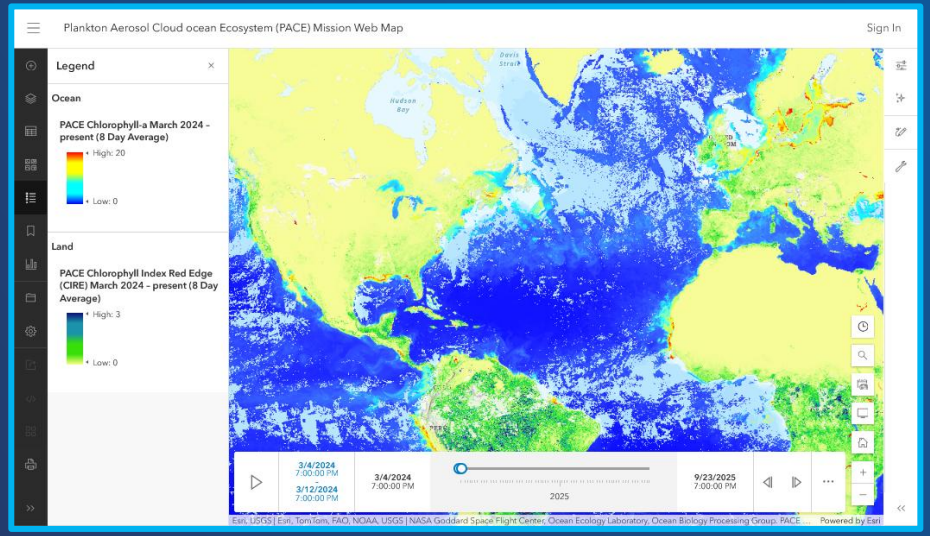


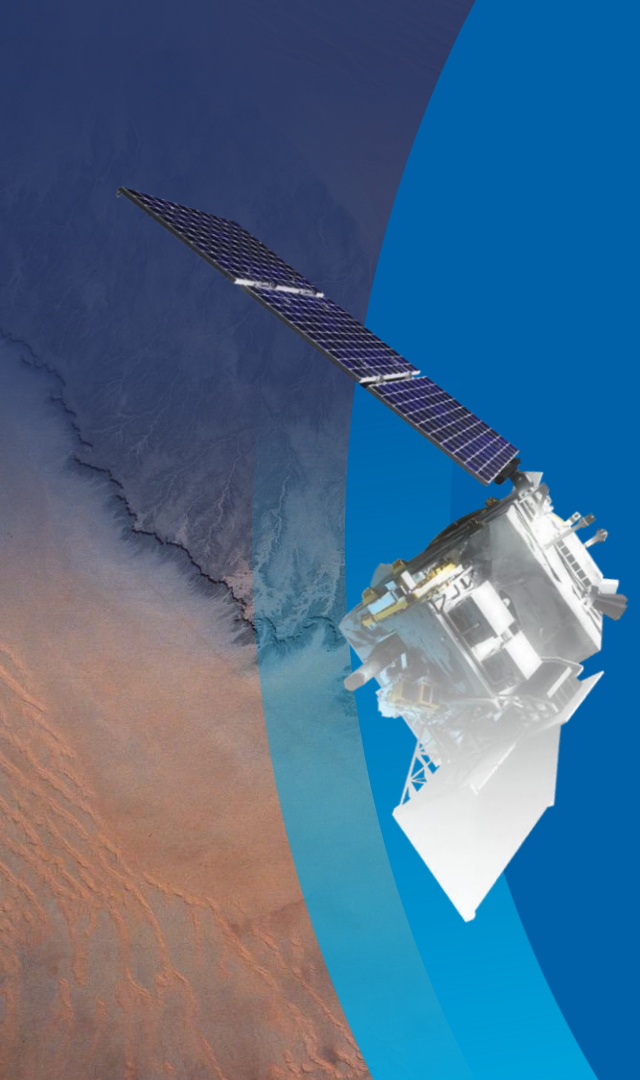
Workflow Outline



Recap

- Image services provide analytic capabilities to perform raster functions using the underlying data collection
    - EGIS services provide REST endpoints to use in a variety of GIS clients/tools
    - Analytic tools in ArcGIS Online use Credits
- Image service will be in sync with the official repository of NASA data
- Full HLS production service is in the works
- Plan to nominate to Esri's Living Atlas of the World to improve discoverability





GIS Tools

Esri’s Landsat and Sentinel Viewer applications

EXPLORE
SWIPE
ANIMATE
ANALYZE

DYNAMIC
FIND A SCENE

DYNAMIC VIEW

In the current map display, the most recent and most cloud free scenes from the Landsat archive are prioritized and dynamically fused into a single mosaicked image layer. As you explore, the map continues to dynamically fetch and render the best available scenes.

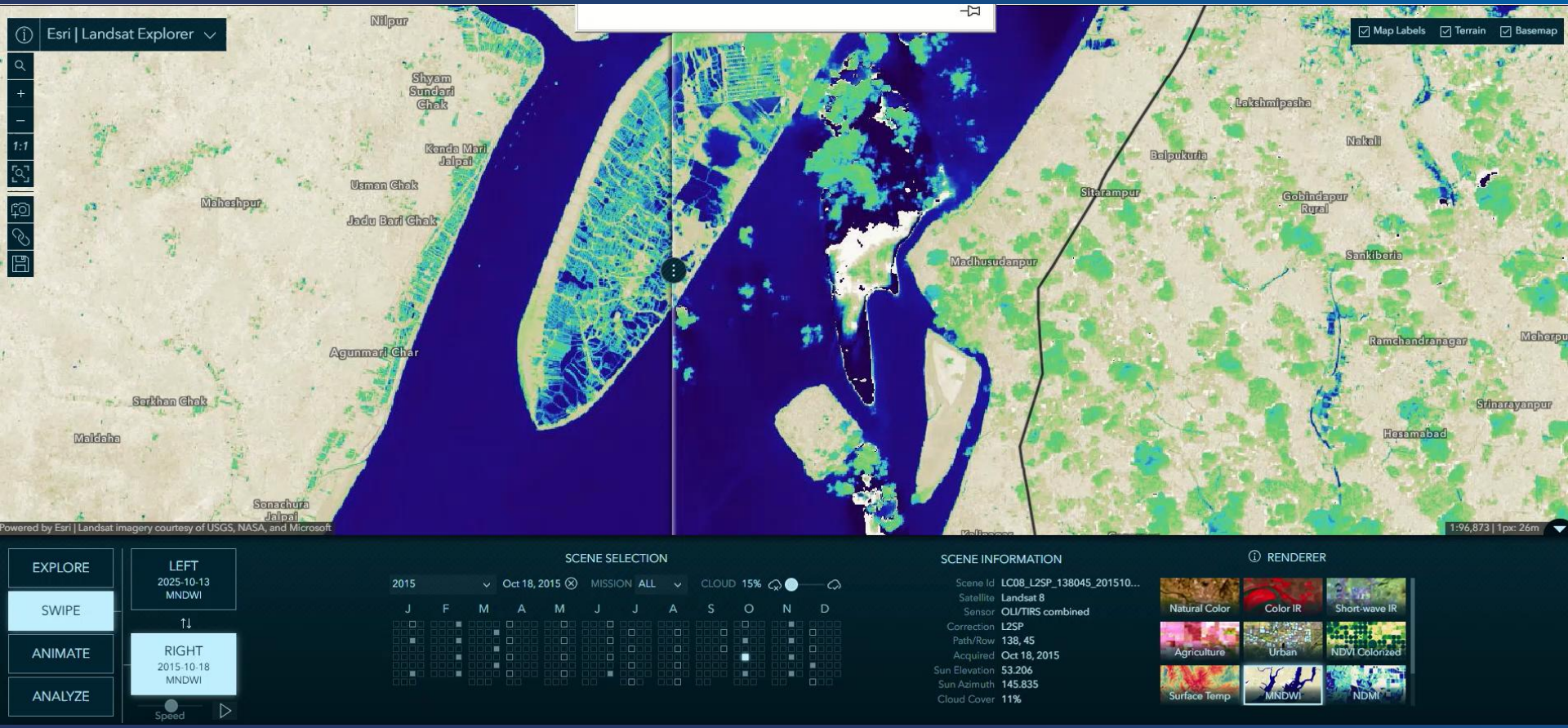
To select an individual scene for a specific date, try the FIND A SCENE mode.

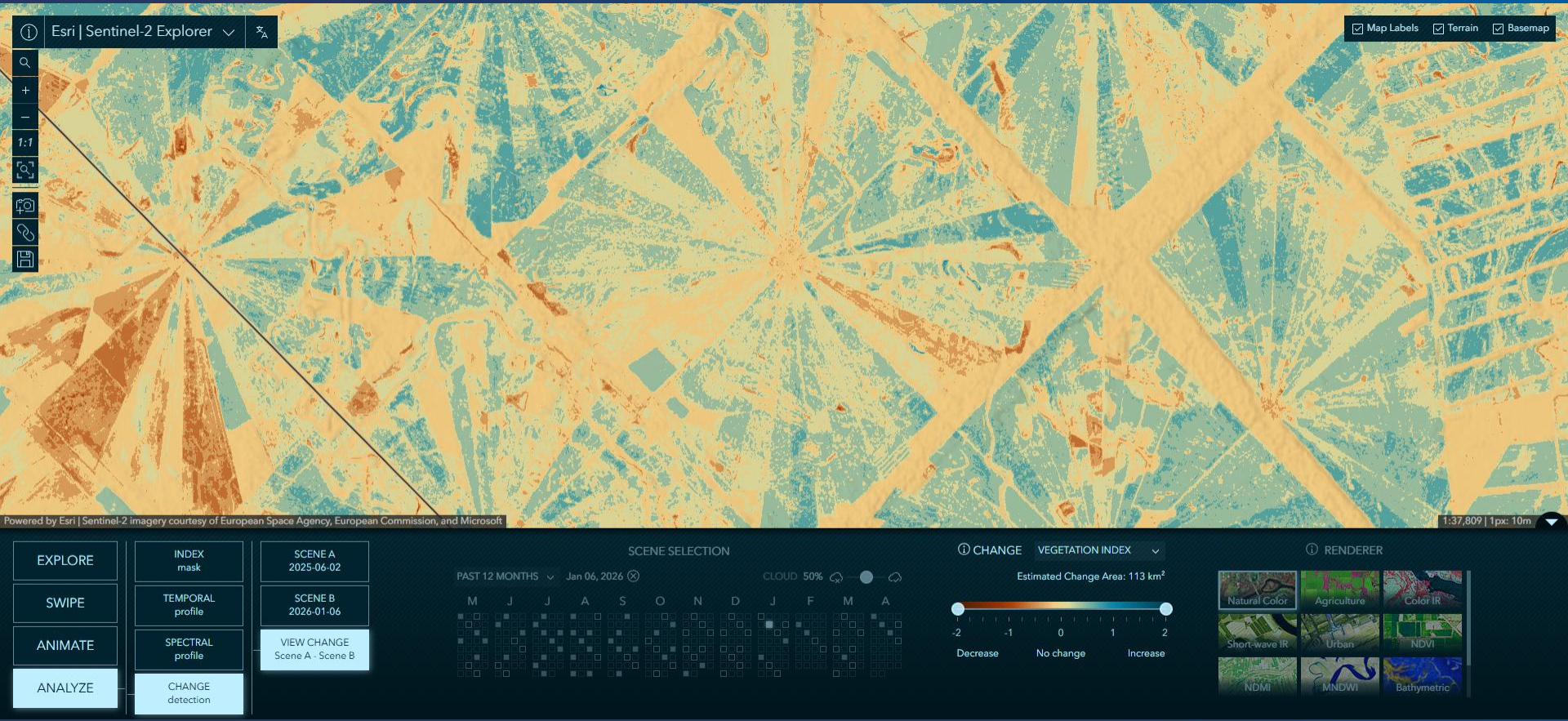
INTERESTING PLACES

Ganges Delta | Grand Canyon | Lake Mackay | Richat
Kalahari Dunes | Kuiseb Canyon | Quelccaya | Gosses Bluff
Three Gorges | Dasht-e Kevir | Ouarkziz | Etosha Pan

RENDERER

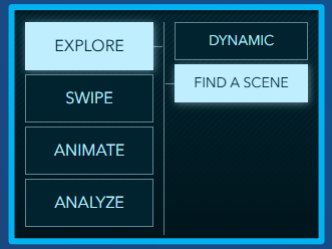
Natural Color | Color IR | Short-wave IR
Agriculture | Urban | NDVI Colorized
Surface Temp | MNDWI | NDMI

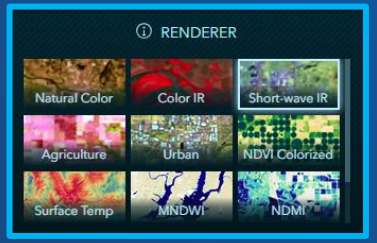

Esri | Landsat Explorer
Map Labels
Terrain
Basemap
Nilpur
Shyam Sundari Chak
Kenda Mari Jaipai
Usman Chak
Maheshpur
Jadu Bari Chak
Agunmari Char
Serkhan Chak
Maldaha
Sonachura Jaipai
Lakshmipasha
Nakali
Belpukuria
Sitarampur
Gobindapur Rural
Madhusudanpur
Sankiberia
Ramchandranagar
Srinarayanpur
Hasamabad
Powered by Esri | Landsat imagery courtesy of USGS, NASA, and Microsoft
1:96,873 | 1px: 26m
EXPLORE
SWIPE
ANIMATE
ANALYZE
LEFT
2025-10-13
MNDWI
RIGHT
2015-10-18
MNDWI
Speed
SCENE SELECTION
2015
Oct 18, 2015
MISSION ALL
CLOUD 15%
J F M A M J J A S O N D
SCENE INFORMATION
Scene Id LC08_L2SP_138045_201510...
Satellite Landsat 8
Sensor OLI/TIRS combined
Correction L2SP
Path/Row 138, 45
Acquired Oct 18, 2015
Sun Elevation 53.206
Sun Azimuth 145.835
Cloud Cover 11%
RENDERER
Natural Color
Color IR
Short-wave IR
Agriculture
Urban
NDVI Colorized
Surface Temp
MNDWI
NDMI

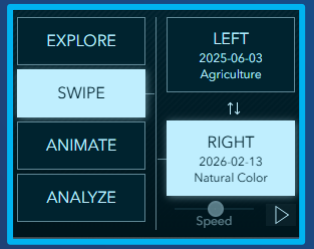

Esri | Sentinel-2 Explorer
Map Labels
Terrain
Basemap
1:1
Powered by Esri | Sentinel-2 imagery courtesy of European Space Agency, European Commission, and Microsoft
1:37,809 | 1px: 10m
EXPLORE
SWIPE
ANIMATE
ANALYZE
INDEX mask
TEMPORAL profile
SPECTRAL profile
CHANGE detection
SCENE A 2025-06-02
SCENE B 2026-01-06
VIEW CHANGE Scene A - Scene B
SCENE SELECTION
PAST 12 MONTHS
Jan 06, 2026
CLOUD 50%
M J J A S O N D J F M A
CHANGE
VEGETATION INDEX
Estimated Change Area: 113 km²
-2 -1 0 1 2
Decrease
No change
Increase
RENDERER
Natural Color
Agriculture
Color IR
Short-wave IR
Urban
NDVI
NDMI
MNDWI
Bathymetric

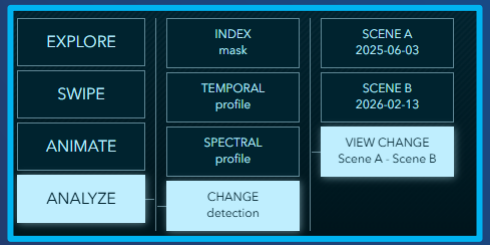
Capabilities

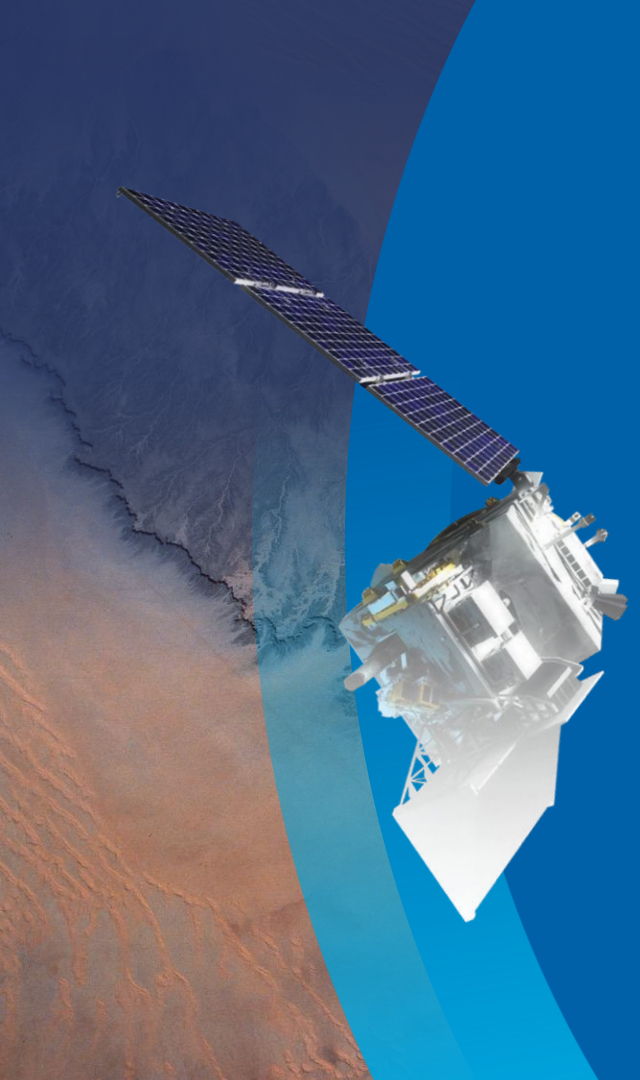
- Interactive Find a Scene by location, sensor, time, & cloud cover
- Select imagery renderings (e.g. SWIR to visualize forest burn scars)
- On-the-fly multispectral band combinations & indices
- Visual change by time, & comparison of different renderings, with Swipe & Animation modes
- Dynamic statistical change analysis
- Additional analysis to include threshold masking & temporal profiles









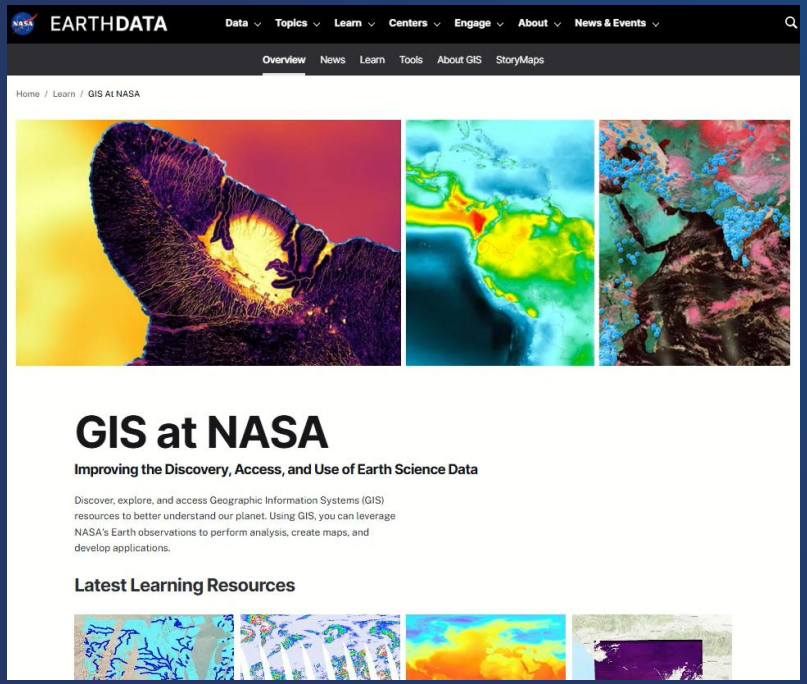


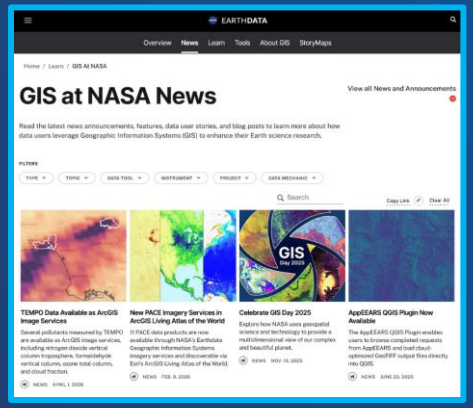
NASA Earth Science GIS

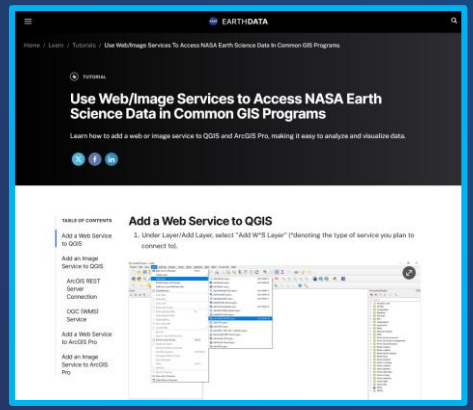
GIS Resources

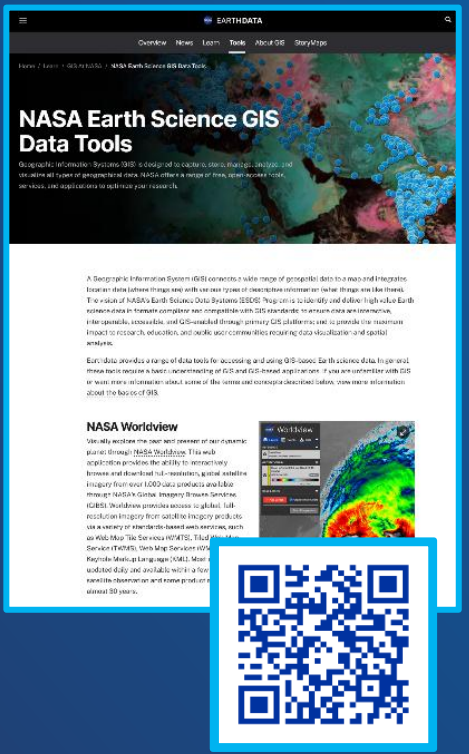
https://earthdata.nasa.gov/learn/gis

Our GIS Homepage









Which of the access methods you saw today are you most likely to integrate into your workflow?

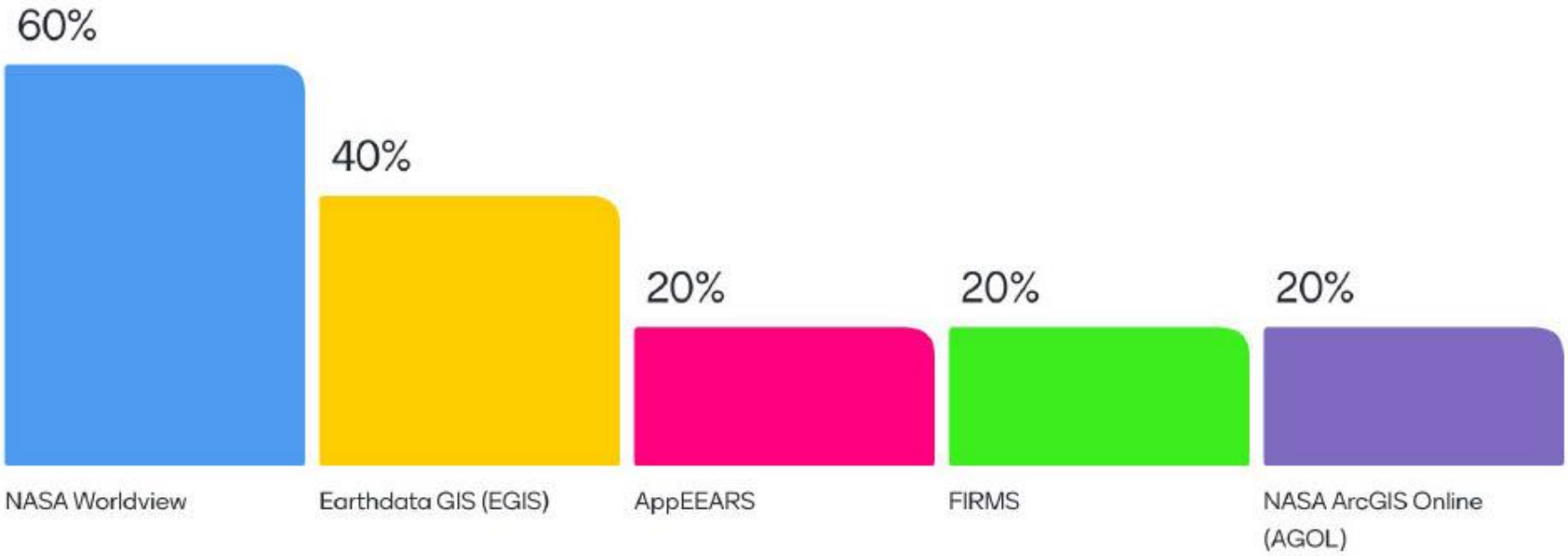
What are your requirements for using HLS data in GIS tools?

How interested are you in emerging technologies, such as STAC and Cloud Connections?

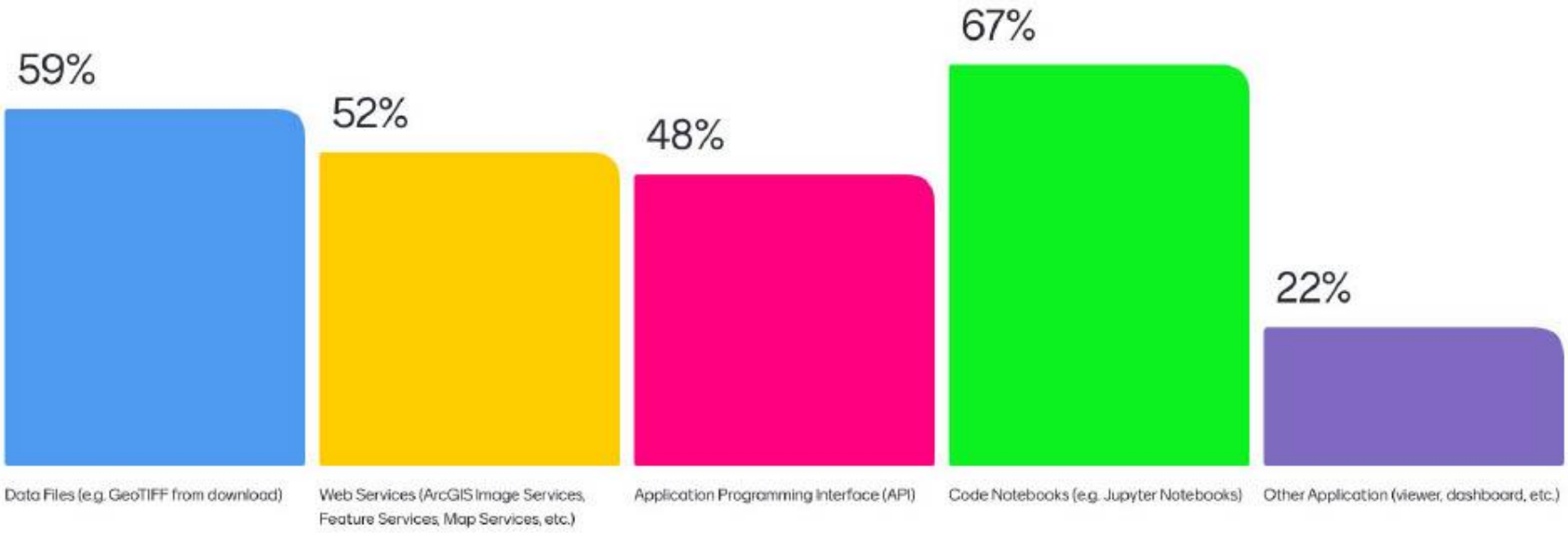
Are there other NASA data that you'd like to see as image service?

Would a Viewer application be valuable and useful?

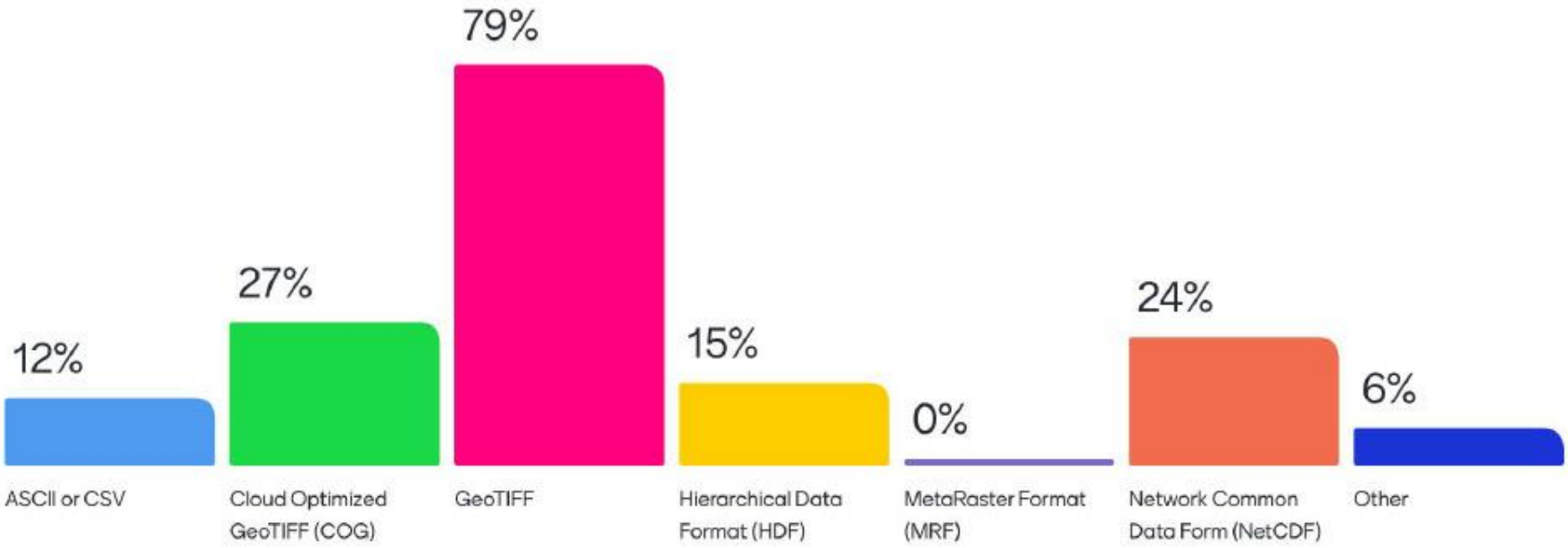
(1/5) Have you used any of the following GIS NASA tools or services? (select all that apply)



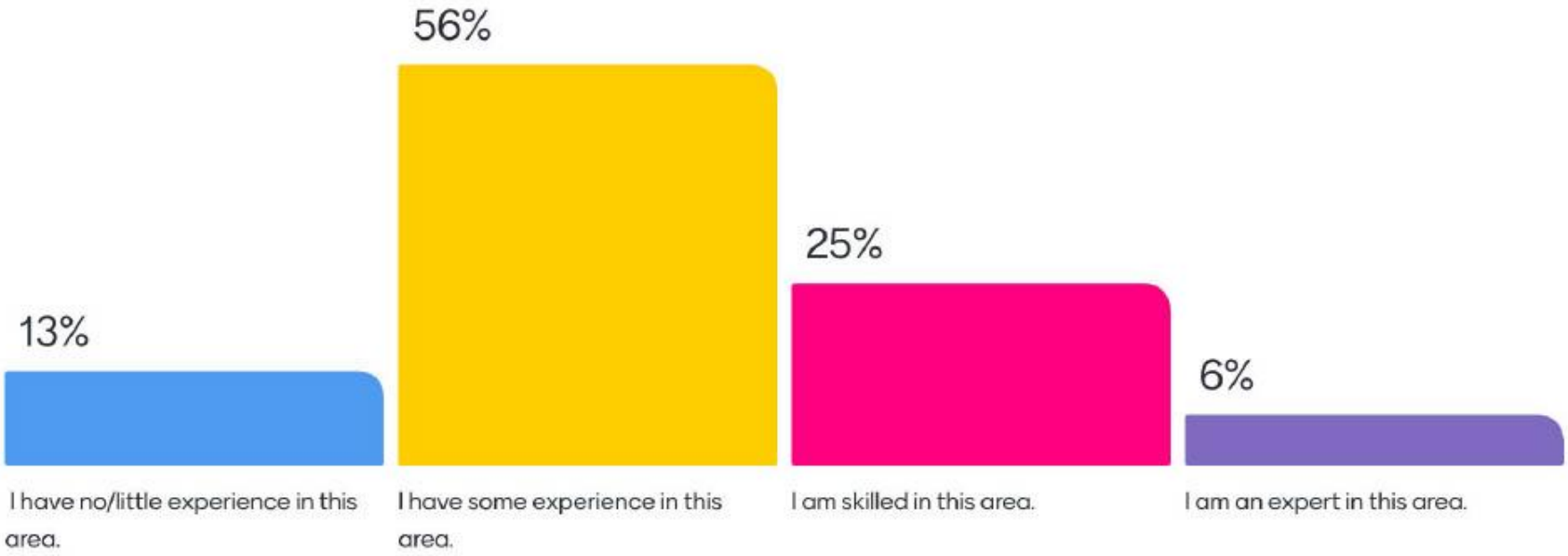
(2/5) How do, or would, you prefer working with NASA data?



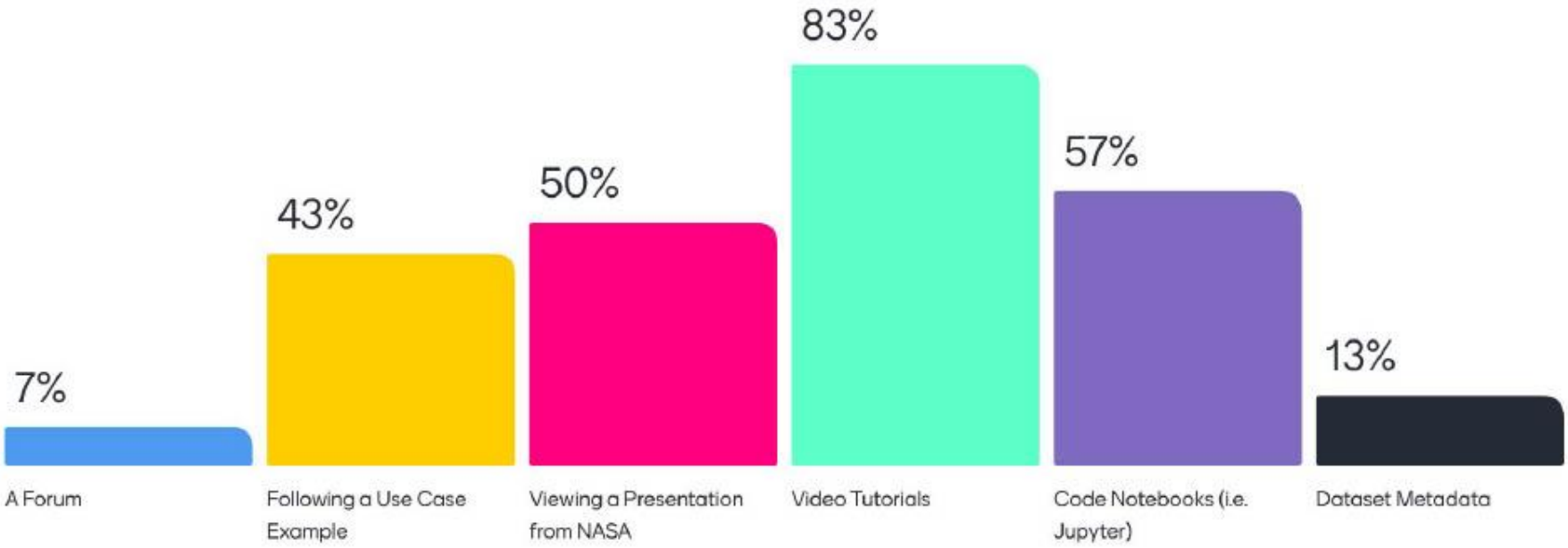
(3/5) Which raster data formats do you prefer to work with? (select all that apply)



(4/5) How would you rate your knowledge or skills working with data using programmatic languages (Python, R, etc.)?



(5/5) How do you prefer to learn about using NASA data in GIS?



HLS in Various Environments

Questions from the Audience

What other **questions do the participants have** that we haven't answered yet?

What else could the presenters help with?

Participants, please post your questions in the Webex Q&A

Tuesday May 12, 2026 starting at 4:40 pm CDT

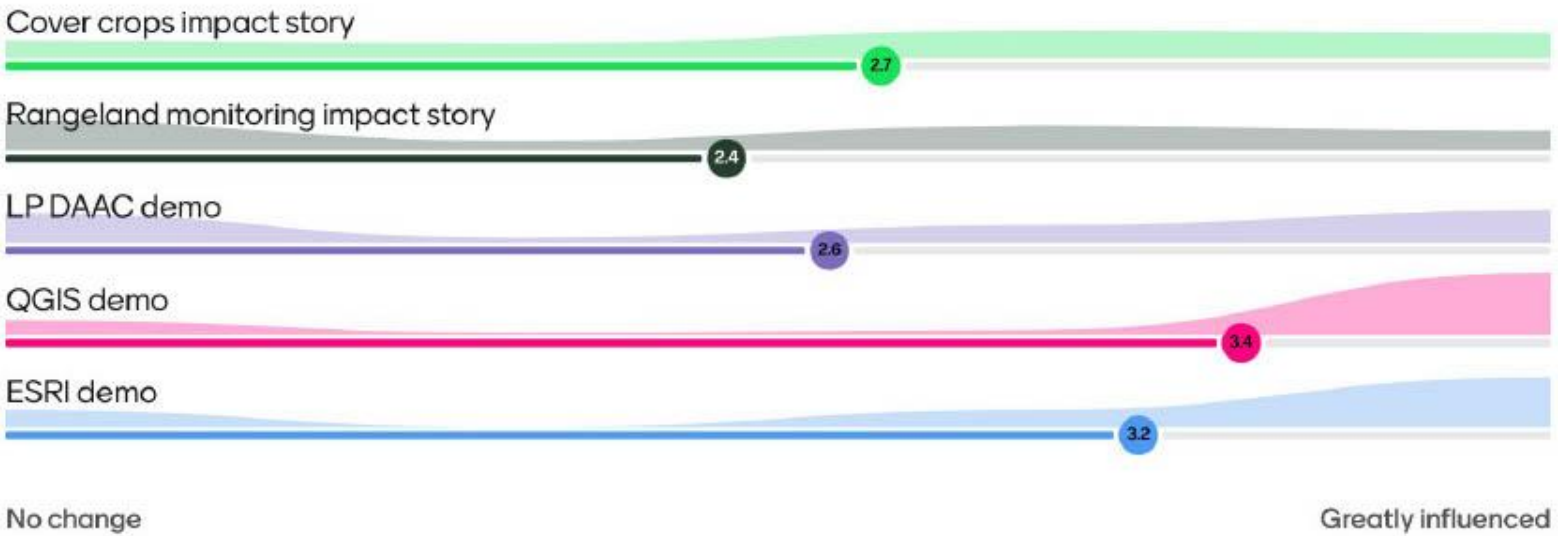
Session 4: Resources, Feedback, & Next Steps

Goals:

- Summarize Day 1 and provide resources for continued feedback
- Preview Day 2 and post-workshop opportunities

Time (CDT)	Topics	Format	Speaker
4:40 - 4:50 (10 min)	Summary, Resources, & Next Steps	 Presentation & Interactive	Stephanie Jiménez, NSITE & UAH

(1/1) Rank how today's sessions influenced your interest or further use of HLS



Day 1 Summary: Demonstrating meeting community needs and expanding on functionalities and collaborations

NSITE & Solution Teams

NASA Worldview

LP DAAC

ESRI Suite

QGIS Plugins

USDA ARS

Summary of HLS Related Products

HLS Core

- HLS L30
- HLS S30

Low Latency

- HLS L30
- HLS S30
- HLS L10 (Prototype Data)
- HLS S10

Derived HLS Products

- HLS L30 VI
- HLS L30 VI

BDEC VI Composites

- HLS S30 VI
- HLS S30 VI

OPERA

- Surface Disturbance (DIST)
- Dynamic Surface Water Extent (DSWx)

Under Development

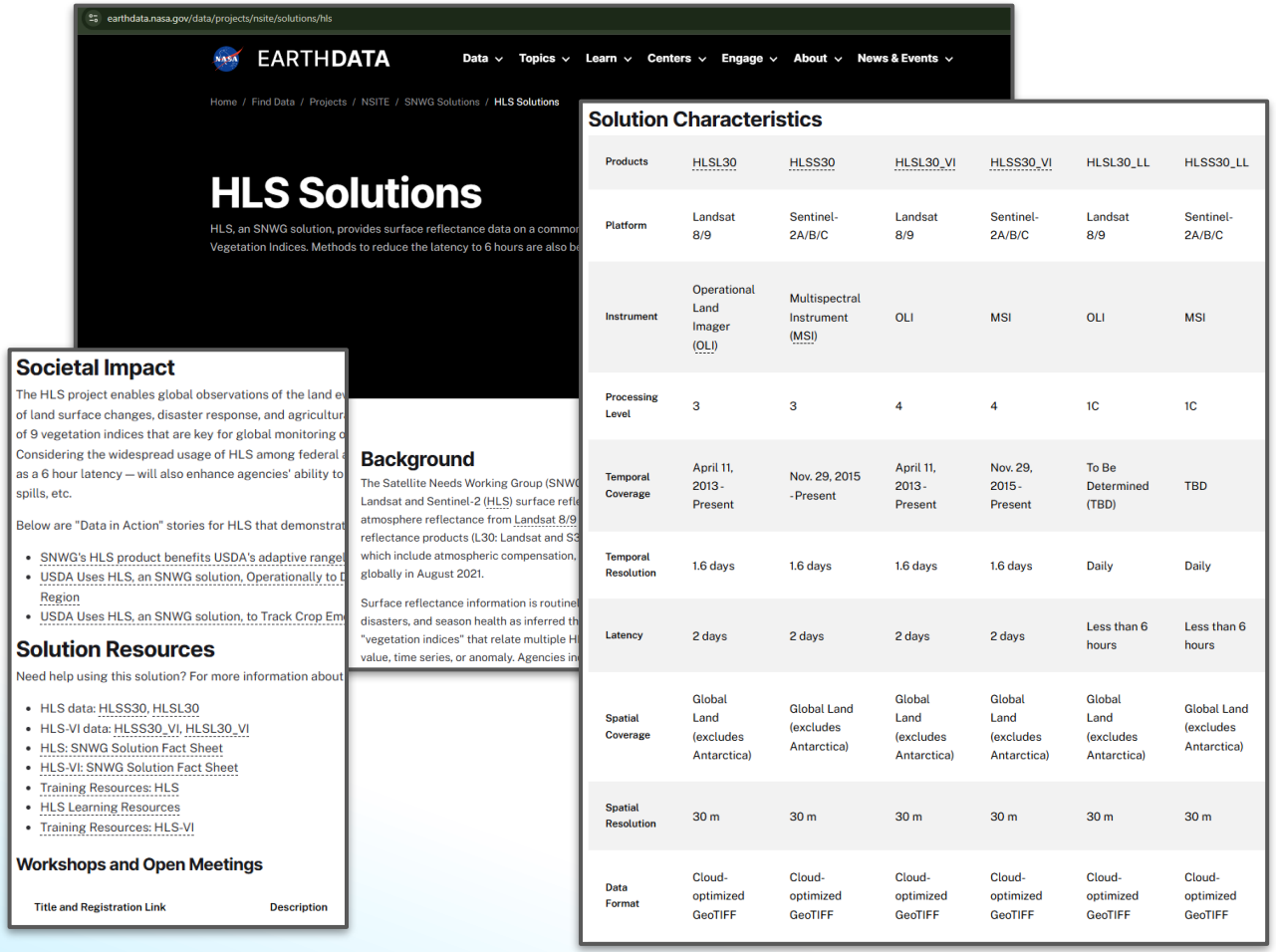
Available & Improving

Products under development are open to iterative feedback and co-design with users.

NSITE LATEST ON HLS

The latest NASA led information and updates

- NSITE led HLS solution background
- Status for development and production for HLS core, HLS LL, HLS VI, HLS 10 m, and derived products
- Data fact sheets, and trainings
- Examples of societal impact
- Updates on workshops and open meetings

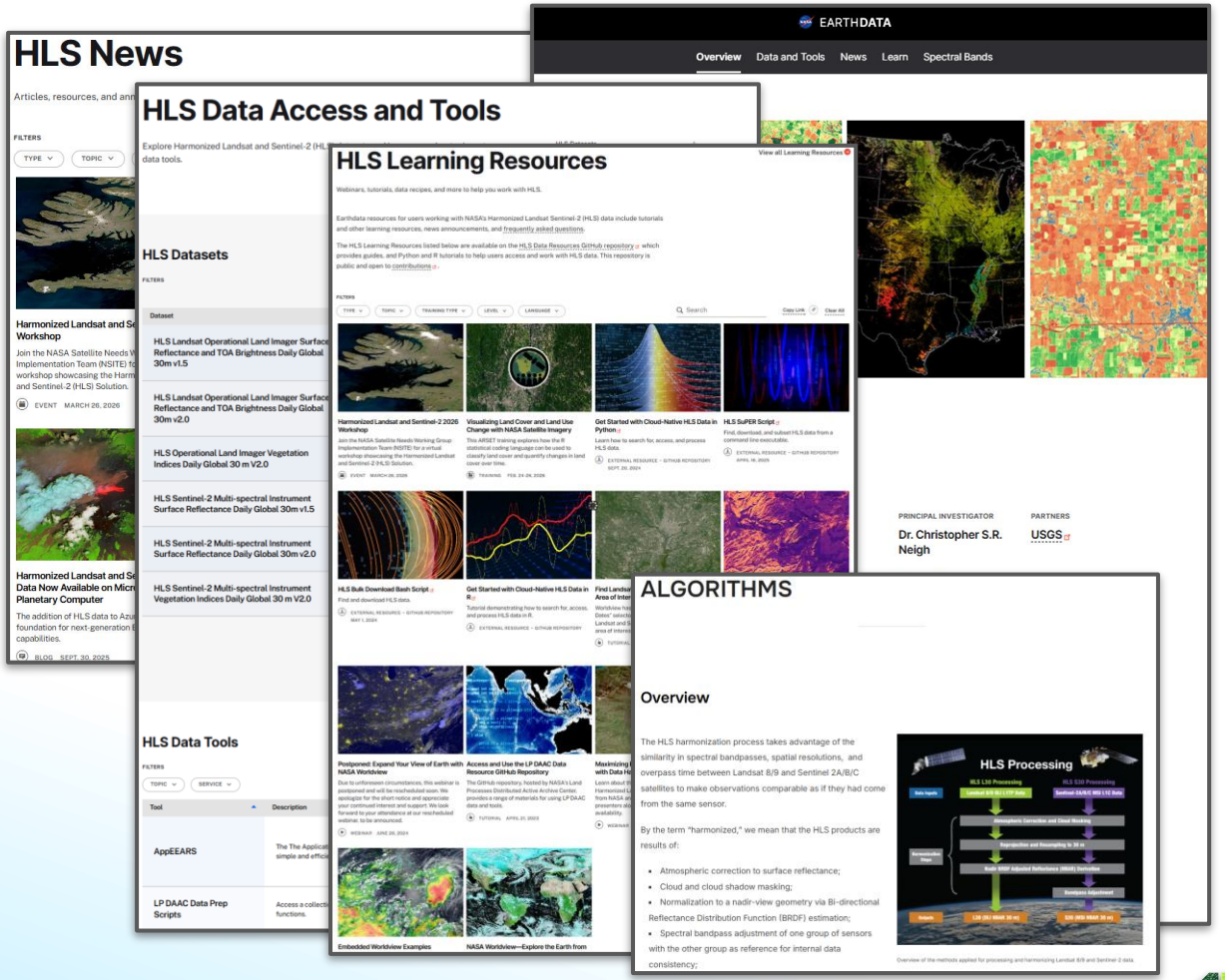


https://www.earthdata.nasa.gov/data/projects/nsite/solutions/hls

Earthdata HLS Page

Expanding information on the data, tools, and learning

- HLS background
- Technical and science specifications for each HLS product
- Data access methods and tools for each HLS product
- News, stories, contact & Meet the Team
- Learning resources across NASA programs and other partners
- Publications & citations

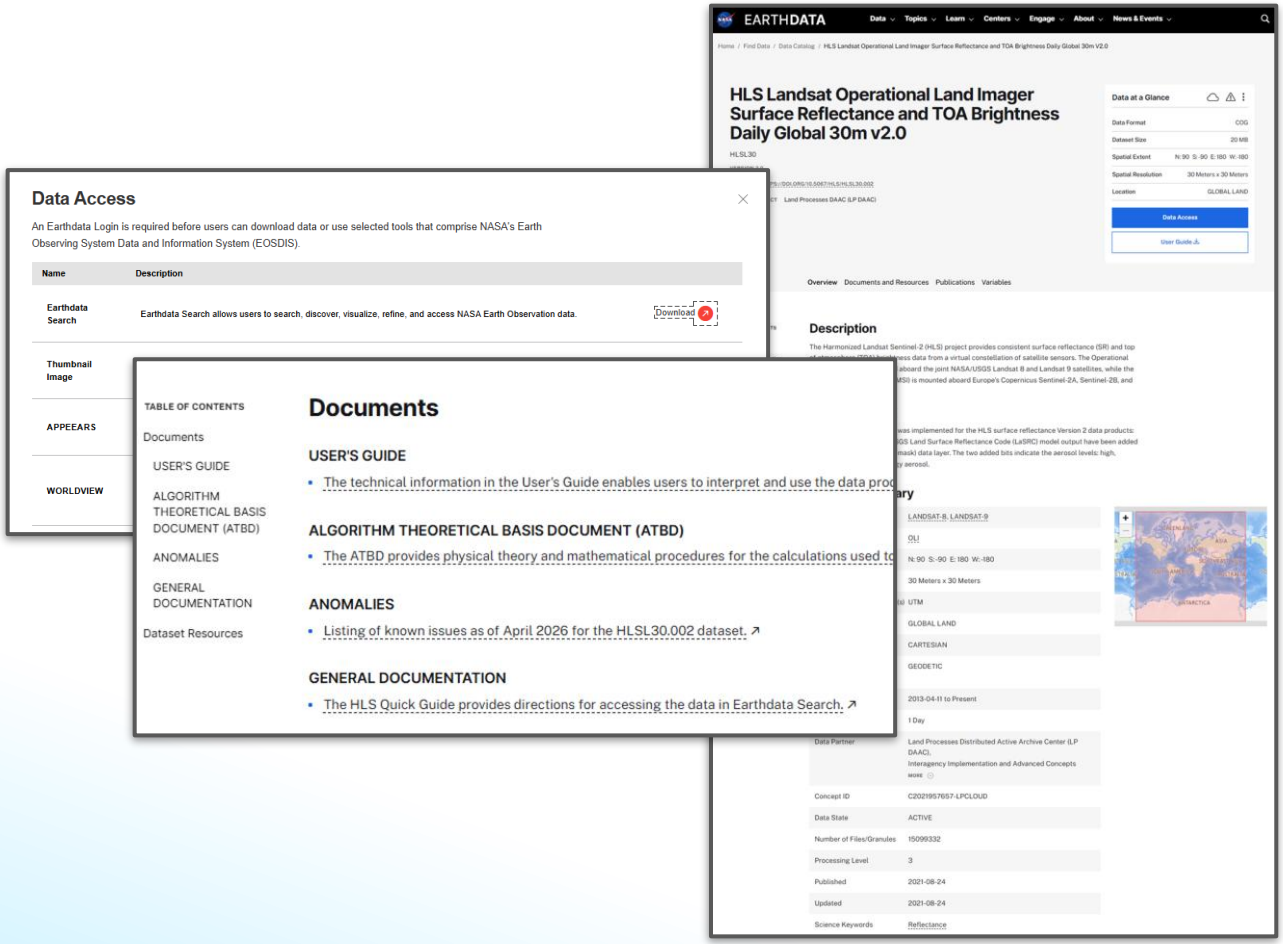


https://www.earthdata.nasa.gov/data/projects/hls

Earthdata Data Catalog

Specific Dataset Documentation

- Catalog info per dataset version with technical specifications
- **User Guide**
- Algorithm Theoretical Based Document (ATBD)
- **Anomalies / Known Issues documentation**
- Related publications
- Data citation information / DOIs



https://www.earthdata.nasa.gov/data/projects/nsite/solutions/hls

NASA Led
Summary of Ways to Access & Interact with HLS Data

Source	Resources	Available Products
Earthdata	Earthdata Search: HLS L30 v2.0 | HLS S30 v2.0 | HLS L30 VI | HLS S30 VI and Earthdata GIS	HLS L30 HLS S30 HLS L30 VI HLS S30 VI
LP DAAC	HLS LP DAAC | LP DAAC HLS Github | Cloud-Native HLS Data Example	
Code / Cloud Resources	SpatioTemporal Asset Catalog (STAC) API | Modelling with HLS in R | L30 AWS bucket | S30 AWS bucket | Access NASA Harmony	
Other NASA	Worldview tutorials | The Application for Extracting and Exploring Analysis Ready Samples *App*EEARS |	

Commercial & Community Led
Summary of Ways to Access & Interact with HLS Data

Source	Resources	Available Products
Google Earth Engine	HLS L30 v2.0 | HLS S30 v2.0	HLS L30 HLS S30 *DSWx-HLS (OPERA)*
Microsoft	Planetary Computer	HLS L30 HLS S30
ESRI	OPERA ArcGIS toolbox | Prithvi Burn Scar Deep Learning Package | Prithvi Crop Classification Deep Learning Package	HLS L30 HLS S30
Planet	Community page | HLS via Planet	HLS L30 HLS S30
QGIS	OPERA plugins | Landsat water mask plugin	HLS L30 HLS S30 *DSWx-HLS* *DIST-ALERT-HLS* *DIST-ANN-HLS*

Stay Connected to HLS Developers and the Community

Information Exchange and Reciprocal Communication

Community Forums

EarthData Forum | Google Earth Engine Developers Group | Planet Insights Platform (community page) | ESRI Living Atlas of the World community | Microsoft Planetary Computer (discussions)

Stay Connected About HLS

Sign-up for occasional HLS related emails

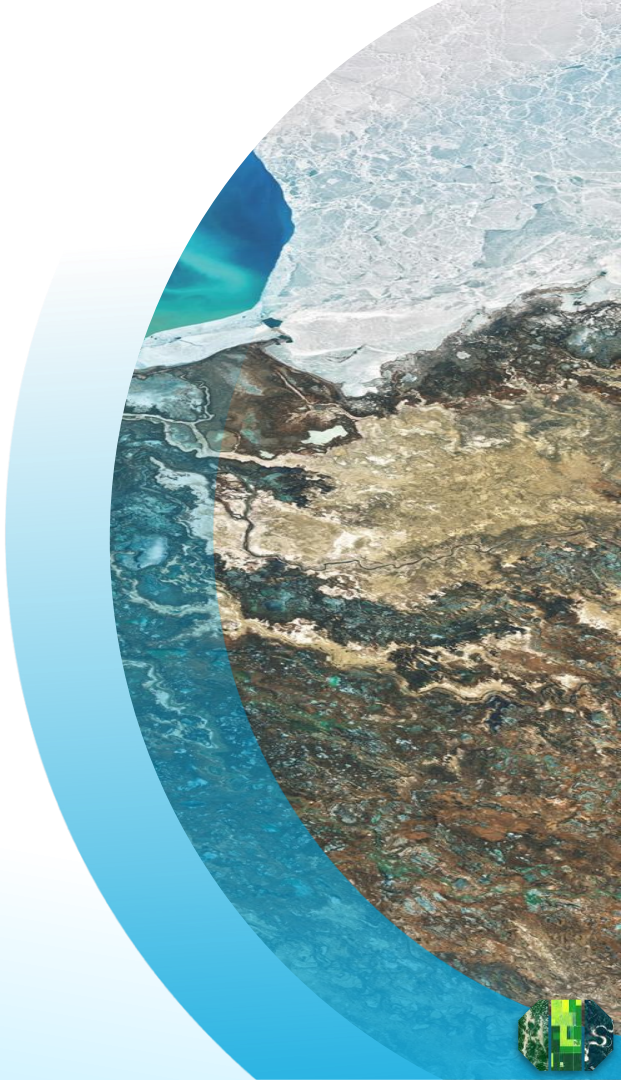
Direct Contact

About HLS (meet the team) page on Earthdata website

NSITE Newsletter

Sign-up for NSITE's quarterly email newsletter

https://bit.ly/4uBbuvz



Post-Evaluation
(~3 min)

NASA Earth | *Thank **you!***