# Data, Tools, and Services from the USGS Earth Resources Observation and Science (EROS) Center

**Danielle Golon[1] Thomas Maiersperger[2]**

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

8/15/2025

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

# Agenda

- Provide a high-level background on data, tools, and services for various EROS projects.

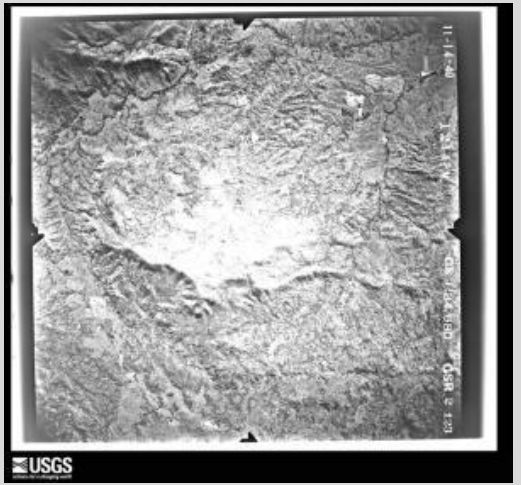
- For in-depth information on any topic, please contact User Services at custserv@usgs.gov.

# EROS Data & Products
## *Background and Key Info*

USGS EROS ingests and archives a wide range of Aerial Photography, Satellite, Elevation, and Emergency Ops data, among many more.

What types of data are available? (sub-selection, visit link to see all)

- Aerial Photography images (1937 – 2023)
- Declassified Imagery Datasets (1960 – 1984)
- Commercial Satellite data – access requires government agency affiliation
- Digital Elevation datasets (CoNED, EDNA, GTOPO30, USGS SRTM, etc.)
- Landsat and additional Satellite Imagery
- Land Cover Products
- Near real-time burn severity maps
- And more!

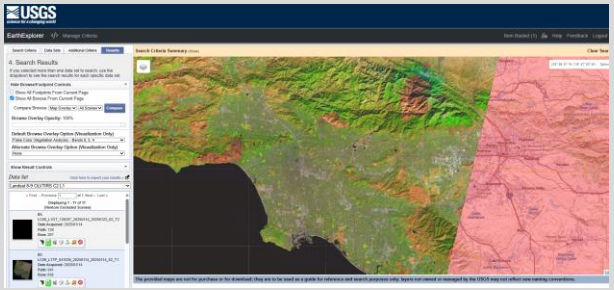



Aerial Photo Single Frame
Near Fresno, CA
11/14/1940

# EROS Tools
## *Data Discovery and Access*

What types of tools are available?

- EROS Registration System (ERS) - Account required to access USGS EROS data.
- BDWA - Makes bulk downloading of data much easier.
- EarthExplorer (EE) - Provides users the ability to query, search, and order geospatial data (satellite images, aerial photographs, etc.).
- HDDSExplorer and Collection Management Tool (CMT) – Tied to our Emergency Operations here at EROS. A unique collection of imagery and documents designed to assist in the response to natural and man-made disasters.
- Machine 2 Machine (M2M) API - Programmatically access the data.




Landsat 8/9 data (False Color Veg Analysis Bands 6,5,4)
Los Angeles, California
January 14, 2025
EarthExplorer

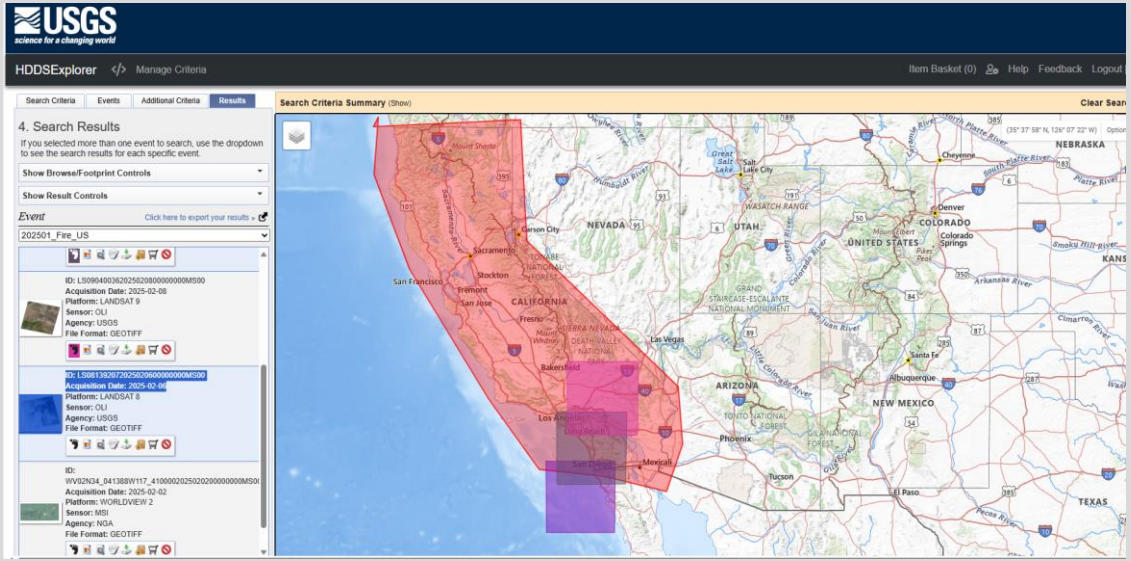
# EROS Tools
## *HDDS Explorer Demo*

HDDSExplorer - A unique collection of imagery and documents designed to assist in the response to natural and man-made disasters.

Help Documentation

Help Contact: custserv@usgs.gov

Demo: observe data related to a recent Fire event in California.



HDDSExplorer

# Landsat
## *Background and Key Info*

The Landsat Program - a series of Earth-observing satellite missions jointly managed by the USGS & NASA. The first Landsat satellite was launched in 1972. The most recent satellite, Landsat 9, was launched in 2021. Over 50 years of data!

Website: https://www.usgs.gov/landsat-missions

What types of data are available?

- Landsat data are provided as Level-1 (radiometrically & geometrically corrected), Level-2 Science Products, Level-3 Tiled Science Products (including Landsat Burned Area Science Products), & Analysis Ready Data (ARD) at a resolution of 30-meters. Data are used to observe land use and to document land and inland water changes due to urbanization, drought, wildfire, biomass, and other changes.

Tools: (Full Data Access Details)

- Data Access
  - EarthExplorer and GloVis
  - Landsat Commercial Cloud Data Access
  - EROS Science Processing Architecture On Demand Interface (ESPA)
    - Access Provisional Landsat science products and Landsat spectral indices.
- Data Information and Services
  - Landsat Archive Dashboard - See how many data were acquired over your AOI.
  - Landsat Acquisition Tool - See when the next scene of your AOI will be acquired.

Join the Landsat Listserv


USGS

# Landsat
## *Wildfire Data Examples*

Landsat 8 RT and Landsat 9 data are available 4-6 hours after acquisition.
+ Nighttime imagery over western US during the summer.


Landsat 8 (True Color 4-3-2)
and Landsat 8 (SWIR / NIR 7-5-4)
Sobernanes Fire near Monterey, CA
Summer 2016
Images Provided by NASA


Landsat 5 Burned Area
Science Data
Yosemite National Park
October 1988

[Landsat Burned Area Science Product]

- Potential Uses:
  - Planning and managing fire occurrences on managed lands.
  - Identifying locations of burned areas to aid in severity analysis.
  - Fire hazard evaluation, disturbance characterization, change tracking.
  - Historical record (1984 to present) of extent of previous fires.

USGS

# Annual NLCD
## *Background and Key Info*

The Annual National Land Cover Database (NLCD) team provides key land cover data. They are part of the Multi-Resolution Land Characteristics (MRLC) consortium, a group of federal agencies who coordinate and generate consistent and relevant land cover information at a national scale for a wide variety of environmental, land management, and modeling applications.

Annual NLCD Websites: https://usgs.gov/annualNLCD and https://www.mrlc.gov/

What types of data are available?

- Annual NLCD data, which consists of 6 raster land use and land cover 30-meter science products for CONUS (1985-2024).
- Rangeland Condition Monitoring Assessment and Projection (RCMAP) data, which provides rangeland vegetation condition and how the landscape has changed through time (1985-2023).

Tools:

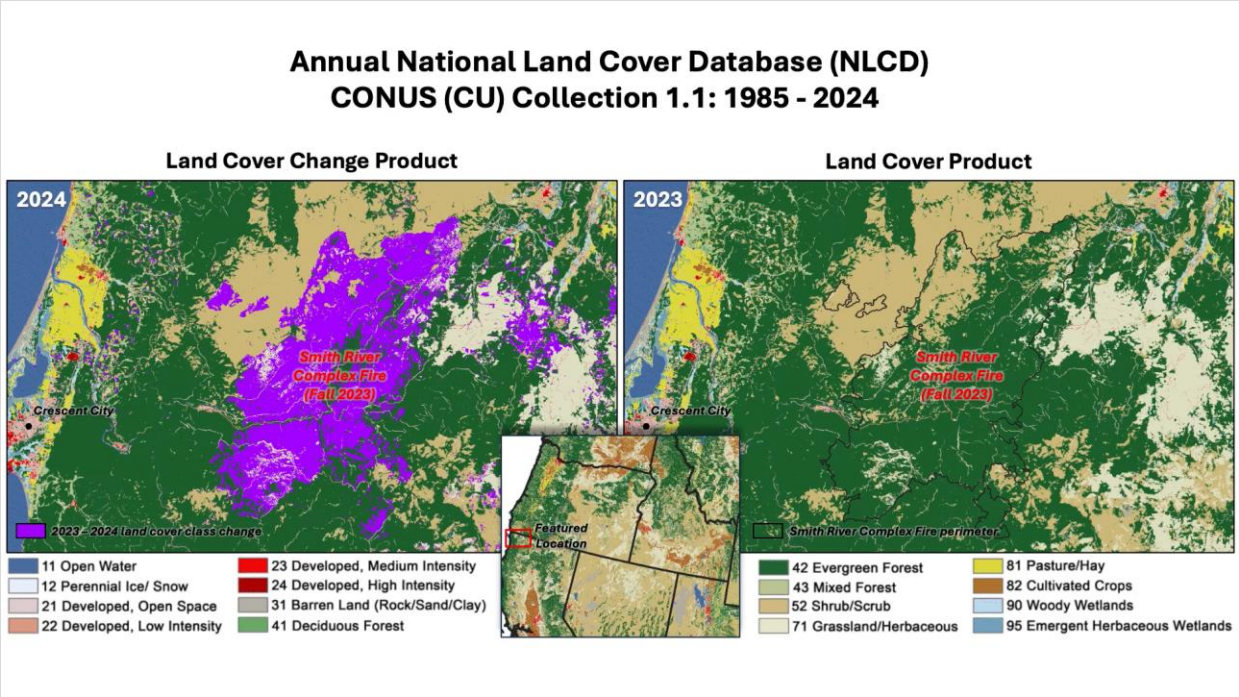
- MRLC Annual NLCD Viewer - Great for visualizing and downloading Annual NLCD data!
- MRLC Rangeland Viewer - Provides access to RCMAP data.
- MRLC NLCD Enhanced Visualization and Analysis (EVA) Tool - Just re-released! Summarizes land cover and change for counties in the US and generates statistics and reports.
- EarthExplorer - Annual NLCD data is now available in EE!
- OGC Services
- Mosaic Downloads

Join the MRLC / Annual NLCD Listserv

USGS

# Annual NLCD
## *Wildfire Data Examples*

Land Cover Change data for observing what the Land Cover looked like before and after the fire.




Annual NLCD Land Cover Change Data
Smith River Complex Fire
2023 and 2024

USGS

# LANDFIRE
## *Background and Key Info*

LANDFIRE is a shared interagency wildland fire management data program across the United States and Territories. Leadership, management, and oversight are through the U.S. Department of Agriculture Forest Service - Fire and Aviation Management and the U.S. Department of the Interior – Office of Wildland Fire.

Website: https://landfire.gov/

What types of data are available?

- LANDFIRE provides more than twenty landscape-scale geospatial products of biological and ecological data and (900+) vegetation, and FBFM13 and FBFM40 fire behavior models that support all-lands planning, fire and natural resources management and operations, analyses, and assessments.

Tools: (Data Access Details)

- Map Viewer - Filter by AOI.
- Full Extent Downloads
- Access the REST API via LANDFIRE Product Service (LFPS)
- Stream Data via LF Image Service, WCS/WMS Services, and AGOL. *(Improved!)*

Contact: https://landfire.gov/contact or email helpdesk@landfire.gov

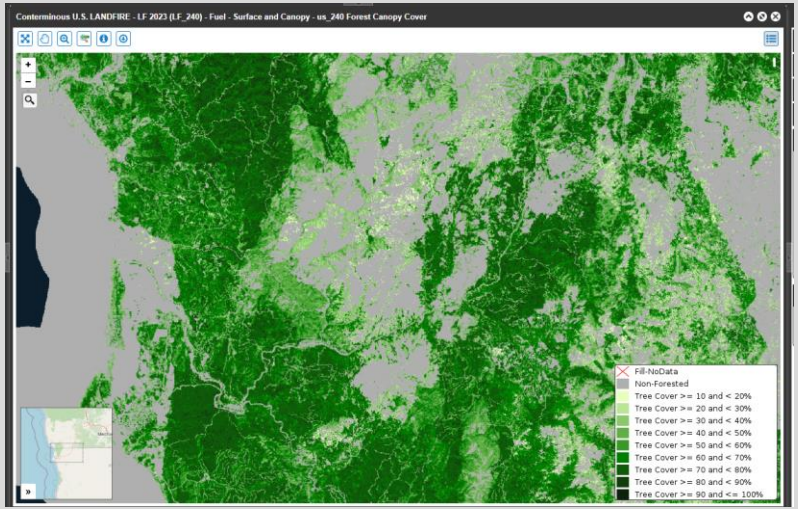
Join the LANDFIRE Mailing List


USGS

# LANDFIRE

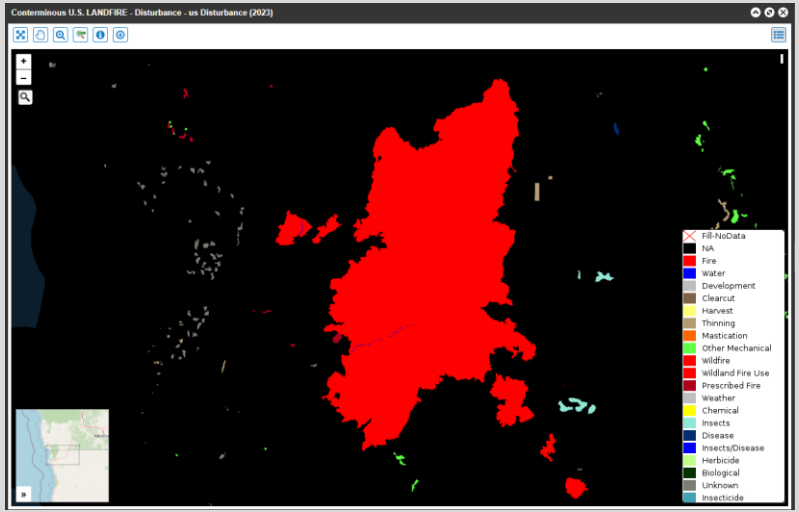
## *Wildfire Data Examples (be sure to visit the website to see more!)*

### Forest Canopy Cover (FCC)




LANDFIRE LF 2023 CC
Smith River Complex Fire
Del Norte County, California
2023

### us Disturbance (2023)




LANDFIRE us Disturbance (2023)
Smith River Complex Fire
Del Norte County, California
2023

USGS

# LANDFIRE
## *MapViewer Demo*

LANDFIRE MapViewer – web-based tool to access and visualize all of LANDFIRE's data.

Help Documentation

Help Contact: helpdesk@landfire.gov

Demo:

- Observe Forest Canopy Cover (FCC) and us Disturbance data over Del Norte County, CA near the Smith River Complex Fire from 2023 and download it!


MapViewer!

# LP DAAC
## *Background and Key Info*

NASA's Land Processes Distributed Active Archive Center (LP DAAC) is a partnership between the USGS and NASA. The LP DAAC processes, archives, and distributes land data products to hundreds of thousands of users in the earth science community.

Website: https://www.earthdata.nasa.gov/centers/lp-daac

What types of data are available?

- LP DAAC data products support the ongoing monitoring of Earth's land dynamics and environmental systems to facilitate interdisciplinary research, education, and decision-making. The LP DAAC archives and distributes data from MODIS, ASTER, VIIRS, ECOSTRESS, EMIT, GEDI, and HLS, among additional smaller MEaSUREs missions (including DEMs) and additional products derived from NASA Earth Observing System (EOS) missions.

Tools:

- Application for Extracting and Exploring Analysis Ready Samples (AppEEARS) - Subset, transform, and visualize geospatial data and results through interactive charts and graphs prior to download.
- NASA Earthdata Search – Find, access, and visualize NASA Earth Science Data.
- NASA Worldview – Quick interactive visualizations

EARTHDATA
LP DAAC

Contact: lpdaac@usgs.gov

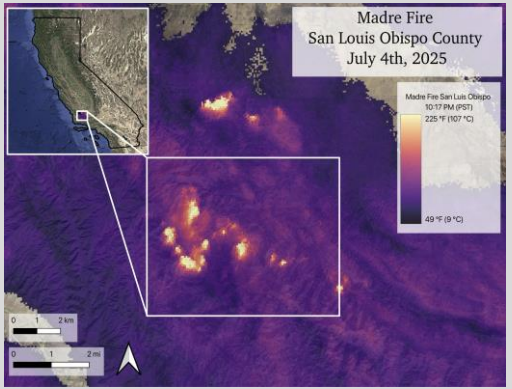
Join the LP DAAC Listserv: Send a blank email to lpdaac-join@lists.nasa.gov

USGS NASA

# LP DAAC
## *Wildfire Data Examples*

Wide range of data that are used to study / observe wildfires—small sampling below visit links to see more!

- Burned Area (64s - MCD64A1, VNP64A1 - Monthly, 500 m)
- Thermal Anomalies and Fire (14s - VNP14A1 (Daily, 1 km), VJ147IMG (6-minute orbit segments, 375 m swath), etc.)
  - Includes *new* FILDA Fire Modified Combustion Efficiency (MCE) Product data! Released in March 2025. Detect 25-30% more fires that are smaller and/or cooler than operational VIIRS Active Fire data. Provides daily global pixel-level characterizations of MCE for nighttime surface fires.
- Evaporative Stress Index (ESI) (ECO_L4T_ESI, ECO_L4G_ESI, etc.)
  - Note all ECOSTRESS – temporal resolution varies based on ISS orbit, 70 m
- Evapotranspiration (ET) (ECO_L3T_JET, &16s - VJ116A3GF (Yearly, 500 m), MOD16A2GF (8-day, 500 m), etc.)
- Vegetation Indices (NDVI and EVI) (HLS L30_VI (~Daily, 30 m), ECO_L2T_STARS & 13s - VNP13A1 (16-day, 500 m), MOD13Q1 (16-Day, 250 m), etc.)
- Land Surface Temperature (LST) (ECO_L2T_LSTE, 11s and 21s – MOD11A2 8-Day, 1 km, VJ121A1N (Daily, 1 km), etc.)




ECOSTRESS LSTE
Madre Fire near San Louis Obispo, CA
July 2025
Image Provided by NASA.
Created by 16-year-old Mathilda Wyss as part of UCLA COSMO Program.

# LP DAAC
## *AppEEARS DEMO*

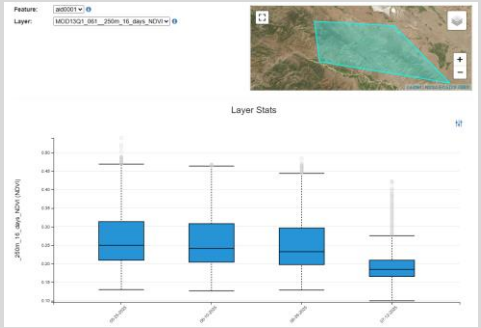
AppEEARS – process, visualize results, and analyze geospatial data BEFORE download!

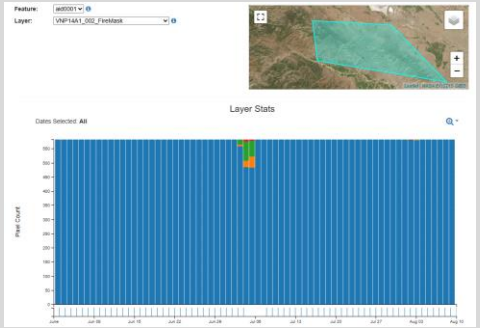
*(Requires Earthdata Login Account)*

Help Documentation and Help Contact: lpdaac@usgs.gov

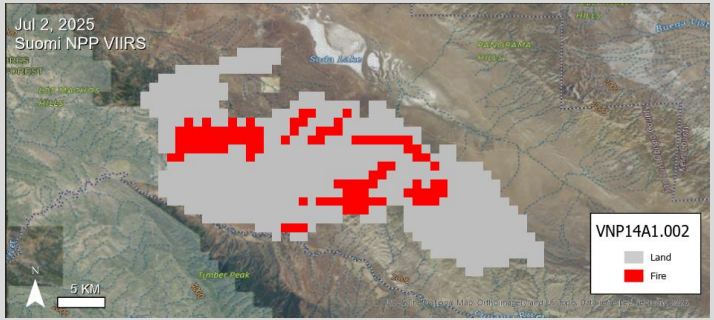
Demo:

- Observe the land before, during and after the Madre Fire (started July 2) with Fire (MOD14A1 and VNP14A1) and NDVI (MOD13Q1) data layers.
  - Big thank you to CALFIRE for providing wildfire perimeter shapefiles!




Madre Fire Results in AppEEARS




VNP14A2 (Data clipped and mosaicked to shapefile using AppEEARS!) Madre Fire July 2, 2025

# Questions?

User Services Contact Info:

- Email
  - custserv@usgs.gov
- Phone (Monday – Friday, 8 am – 4 pm Central Time)
  - 1-800-252-4547
- Join the EROS User Group Listserv.

Communications and Outreach

- Stay up-to-date with all things EROS from our EROS Headlines!
  - Sign up for the EROS Center Headlines Mailing List.
- Follow EROS and Landsat on Social Media.

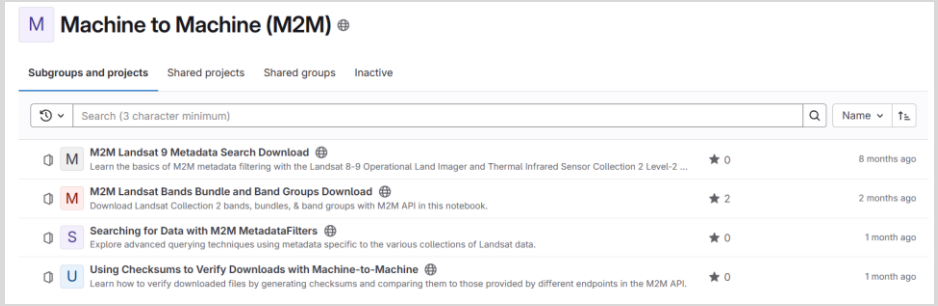
USGS

# Additional Slides – updates from the teams!

Please note: the slides after this slide will not be discussed during the presentation. However, the projects wanted to provide a few updates for any users that are already actively using these datasets or are interested in learning about more e-learning resources for some of these datasets.

# EROS Tools
## *News Highlights!*

- Interested in working with M2M API and not sure how to get started?
  - Check out our new tutorials and guides: Machine to Machine (M2M) · GitLab



M2M API E-Learning Resources

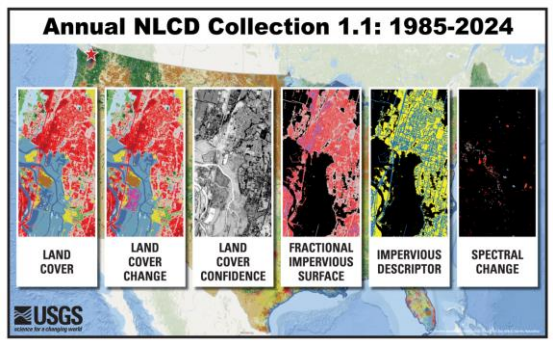
- Looking for more recent walk-throughs of some of our tools? Explore the USGS EROS User Experience Webinar Series Recordings!
  - BDWA
    - Quick Guide Video & Full webinar Video
  - EE:
    - Full Webinar Video

# Landsat
## *Updates!*

- Interested in working with Landsat data in the Cloud? We have recently released several tutorials and guides as data examples for accessing and processing the data in the Cloud in the EROS User Services GitHub!
  - Examples: Introduction to Landsat Spatio Temporal Asset Catalog (STAC), Querying Landsat STAC with PySTAC, Decoding and using the Landsat Pixel QA Band for Masking, Mosaicking and Clipping Landsat COGs and more!
- We are considering what Landsat Collection 3 might look like!
  - If you have any feedback on the topic, or any Landsat feedback in general, please reach out to landsat@usgs.gov and mention “Wildfire Science & Technology Commons Landsat Feedback” in the subject line. Your feedback could help shape futures collections!

# Annual NLCD
## *Updates!*

- Recently released the new Annual NLCD Collection 1.1 data! *(now includes 2024!)*
  - Information Products and Layers
  - User Guide
  - Reference and Validation Information
  - How to Access the data
  - Recently recorded webinar announcing the new data!
  - New Fact Sheet
  - Eyes on Earth Podcast Episodes!
    - Eyes on Earth Episode 126 – Annual NLCD | U.S. Geological Survey
    - Eyes on Earth Episode 130 – NLCD Accuracy | U.S. Geological Survey
  - Annual NLCD Story Map
  - New Annual NLCD FAQs
  - Annual NLCD News



The six different Annual NLCD science products

# LANDFIRE
## *Updates!*

- LANDFIRE has moved to providing annual data updates!
  - New and improved disturbance, vegetation, and fuels data are available each year.
  - Next update for the CONUS Final Annual Disturbance Product coming August 28!
    - All other products coming early October!
- Join LANDFIRE for their Monthly Open Office Hour sessions! Each month guest speakers present on various topics related to LANDFIRE use cases and research studies. LANDFIRE staff will stay on the call at the end to answer any questions users have about the data and tools.
  - Register to attend

# LP DAAC
## *Additional Resources*

- Check out our LP DAAC GitHub!
  - New guide on how to find and access LP DAAC Data!
  - The GitHub also contains scripts, tutorials, and guides for accessing and working with AppEEARS, ECOSTRESS, EMIT, GEDI, HLS, MODIS, VIIRS, and the VSWIR Imaging and Thermal Applications, Learning, and Science (VITALS) repository.
- Be sure to check out the Earthdata User Forum! A lot of great data conversations and news topics are posted there!

# LP DAAC
## *Data Updates!*

- LP DAAC data are now in the Earthdata Cloud!
  - Most new datasets are now directly ingested to the Earthdata Cloud and are not available in the LP DAAC Data Pool. As collections, or their new versions, are fully moved to the Cloud those data will be removed from the LP DAAC Data Pool. The LP DAAC Data Pool will be retired once this effort is complete. Now is the time to start updating your scripts to reflect this change.
    - Check out the recently updated How to Access the LP DAAC From Data Pool and NASA Earthdata Cloud Script for help!

- MODIS is approaching end of mission. While the historical record will remain, and there will be a Version 7, now is the time to start examining and transitioning to other sources, for an easier transition once MODIS forward processing is no longer available.
  - The LP DAAC offers over 400 VIIRS land datasets as compared to 175 MODIS land datasets. There are a lot of datasets to explore to learn if they will meet your needs.

- ASTER is approaching end of mission as well. There will be a final ASTER Version 4, which will be available for the whole collection. ASTER Version 4 data will not require on-demand processing.