USGS Update

National Academies of Sciences, Engineering and Medicine

Committee on Earth Science and Applications from Space

April 3, 2025

Tim Newman

*National Land Imaging Program Coordinator*

U.S. Geological Survey

USGS Mission and Vision

The USGS mission is to monitor, analyze and predict current and evolving dynamics of complex human and natural Earth system interactions and to deliver actionable information at scales and timeframes relevant to decision makers.

Vision Statement: Lead the Nation in 21st-century integrated research, assessments, and prediction of natural resources and processes to meet society's needs.

Water Resources

Core Science Systems

USGS Mission Areas

Natural Hazards

Energy and Minerals

Ecosystems

≋ **USGS**

USGS by the Numbers

People

- **8,410** Employees
- **1,436** Contractors
- **591** Emeriti
- **198** Volunteers

Locations

- **491** Laboratories
- **391** Facilities — In all 50 states and 2 territories (Guam and Puerto Rico)
- **60** Science Centers (7 Regions)
- **22** Programs (5 Mission Areas)
- **10** Climate Adaptation Science Centers (1 National - 9 Regional)
- **43** Cooperative Research Units
- **54** Water Resources Research Institutes

Science and Monitoring

- **170,000+** Publications (since 1879)
- **54,000** 7.5-minute Quadrangles (Topographic Maps)
- **1000+** At-Risk Species Studied
- **25** Active Patents (85 since 1996)
- **1** Research Reactor
- **~20,000** USGS-operated Groundwater Wells monitored for water level and water quality
- **11,800+** USGS-operated Streamgages
- **~4,000** USGS-operated Earthquake Sensors in U.S.
- **~70** U.S. Volcanoes Directly Monitored of 161 Considered Active
- **14** Geomagnetic Observatories
- **3** Satellites
- **201M** Landsat data downloads
- **100%** Interferometric Synthetic Aperture Radar (IfSAR) Data Collected in Alaska
- **94.7%** National Coverage of 3DEP High-resolution Elevation Data
- **56%** U.S. Coverage of Geologic Maps (Detailed to Intermediate Scale)
- **171** Geologic Provinces USGS Assesses for Undiscovered Oil and Gas Resources
- **~100** Mineral Commodities for which USGS Collects National Data for 180 Countries

Partnerships

- **4,300** Partners/Cooperators
- **5,157** Contracts, Cooperative Agreements, and Grants

Funding

- **$1,455M** 2024 Enacted
- **$646M** 2024 Reimbursables
- **$69M** 2024 Bipartisan Infrastructure Law (BIL)

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USGS makes extensive use of satellite data

Terra, Aqua, Landsat, Sentinel-2, JPSS (VIIRS): Use in land cover, mineral resources, volcanic activity, natural hazards, hydrology, snow cover, forests, urban environments

ECOSTRESS: Use in mineral mapping, land surface temperature, National Hydrologic Model, fire, volcanic, cryospheric, and land cover mapping

EnMAP, EMIT, AVIRIS: Use hyperspectral data in mineral resources mapping

Aura: Use in volcano hazards, coastal, marine geology, toxic substances, hydrology mapping
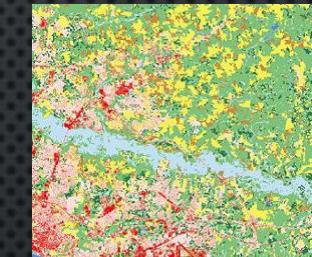
ICESat-2: Use in snow, ice, glacier, forestry applications

Grace-FO: Use in drought, hydrology, mass change characterizations

**TSIS-1:** Use in instrument calibration and validation activities

CALIPSO / CloudSat: Use in fisheries, streamflow, snow modeling, drought, ecology, contaminant, and soil mapping

Planet, MAXAR: High-resolution commercial imagery for agriculture, forestry, water and ecosystems studies

DSCOVR: Use in atmospheric characterization, geomagnetism programs
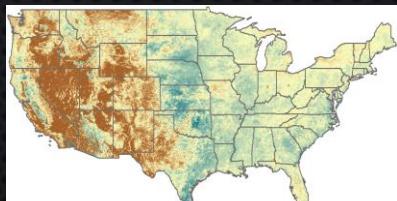
New and Upcoming U.S. and International Missions: PACE, SWOT, NISAR, SBG, TSIS-2, LSTM, CHIME, TRISHNA

USGS is a user and provider of Earth Observation data

Earth Mapping Resources Initiative (Earth MRI) Mapping the Nation's Geology and Resources

- **Current focuses**
- Critical mineral resources
- Still in the ground
- Above ground in mine waste
- Construction resources (industrial minerals)
- Infrastructure hardening and disaster planning

- **Additional applications**
- Infrastructure
- Energy and water resources
- Natural hazards
- Land use planning

Partners
- State and Federal agencies
- Tribes
- Industry
- Non-Governmental Organizations
- Universities

Funding
- $10.8M in annual appropriations
- $320M over 5 years through Bipartisan Infrastructure Law
- $5M in Disaster Supplemental

Data
- All Earth MRI data are freely available to the public

Topography—3D elevation lidar data

Geology—USGS and State geological survey maps

Geophysics—Aeromagnetic, radiometric, and gravity data
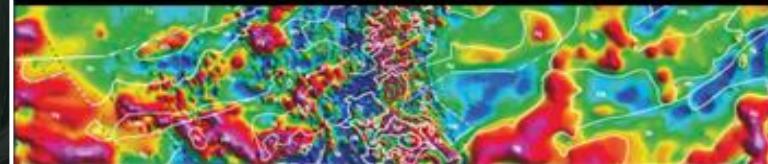
Geochemistry—Rocks, soils, and stream sediments

Mineral deposit databases—USMIN, MRDS, ARDF

Coreholes—Geophysical logs and core samples

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BIL-funded Earth MRI hyperspectral survey of the Southwest

USGS-NASA partnership:

- **Hyperspectral surveys help identify minerals at the surface**, such as in mine waste. These surveys are also useful for understanding **acid mine drainage, debris flows, agriculture, wildfires, biodiversity, and many other fields**.

- USGS Earth MRI funding is supporting NASA's airborne hyperspectral data collection.

- Largest area on Earth of contiguous hyperspectral coverage at such fine spatial resolution.

- Complete hyperspectral coverage of California and soon for Nevada and Arizona.

|	
2018	Previously collected NASA hyperspectral data (AVIRIS-Classic). ~325,000 sq. km
2023 2024	USGS Earth MRI 2023-24 AVIRIS-Classic hyperspectral and MASTER thermal infrared multispectral data. ~483,000 sq. km
2025	Planned data collection for 2025

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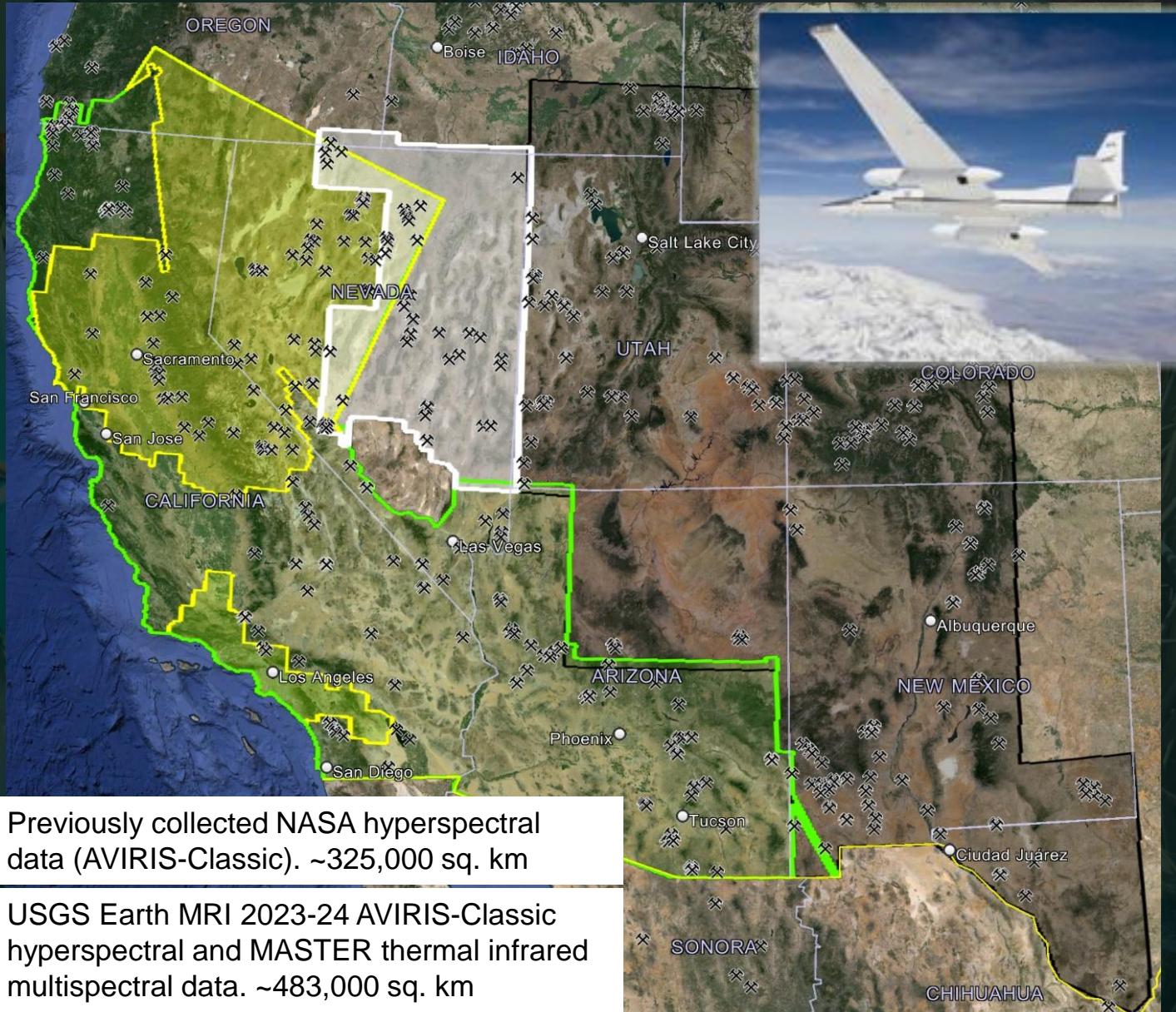
Earth MRI data collection

Topography

High-resolution elevation data help identify **geological structures**, estimate **volumes of materials** and model **how water moves** across the Earth's surface.

Geology
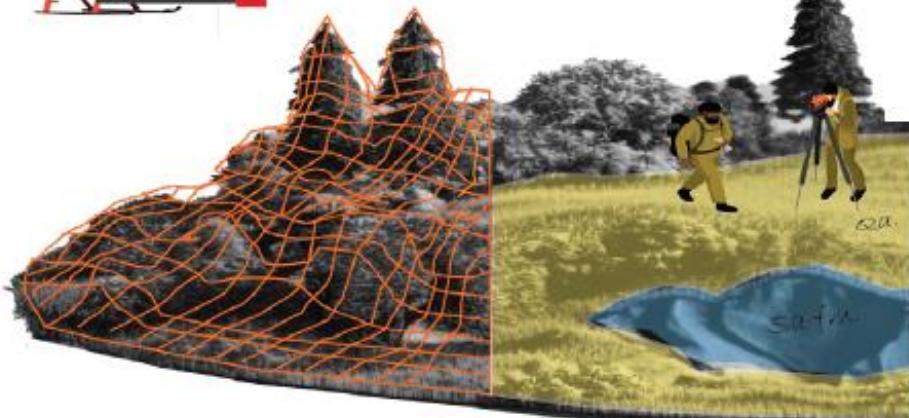
Geologic maps identify **rock types on the Earth's surface**. Earth MRI's geologic mapping advances understanding of areas with mineral potential.

Geochemistry

Laboratories measure **concentrations of minerals in rocks** and inform remediation by showing **how minerals interact with the environment**.

Geophysics

Magnetic and radioactive signatures of underground rocks can identify **buried minerals and large geological structures**.
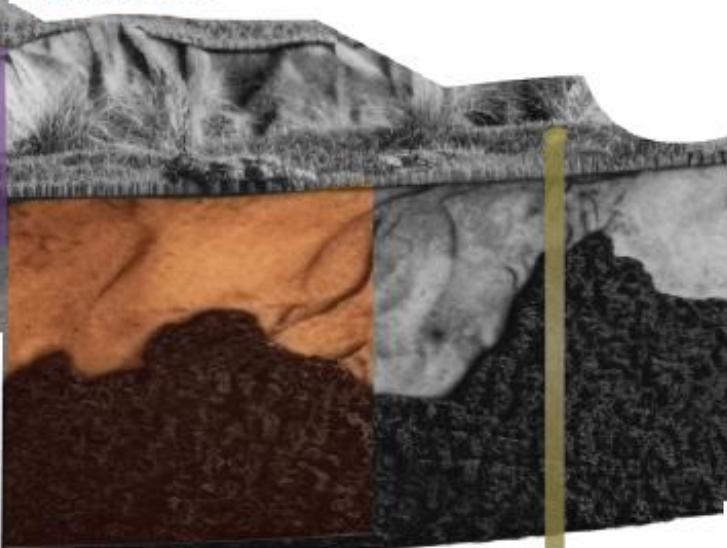
Borehole Information

Old and new rock samples and drill cores help identify **rock types below the Earth's surface**.

...and more
*
Hyperspectral imagery to identify minerals on the surface of the Earth and in mine wastes
*
**Mine waste** locations, volumes and mineral composition
*

USGS: Long history of partnerships with NASA

USGS Astrogeology Science Center
- Started in 1961 to support the Apollo Program including astronaut training
- Supports robotic NASA missions including Mars rovers
- Supports Artemis - return of humans to the Moon - with science, cartography, and astronaut training
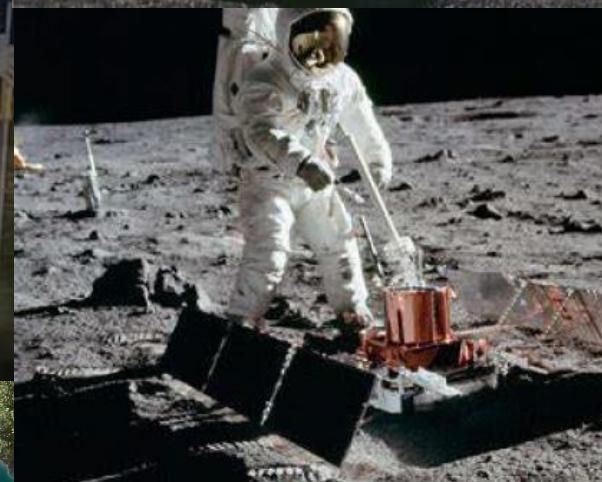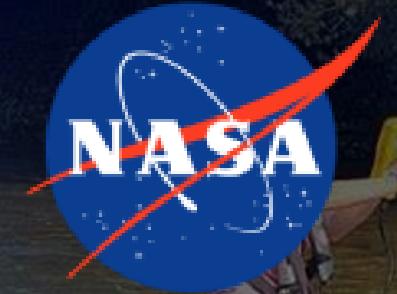
Landsat
- Since 1972, a continuous record of images of the Earth's land surfaces, surface waters, and coastal regions to monitor natural- and human-induced change

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Landsat is used everywhere!

Network Diagram Describing
Data ⟹ **Products** ⟹ **Users**

Based on OSTP-led Earth Observation Assessment

Landsat data

Direct and intermediate products

DOI Bureau Users
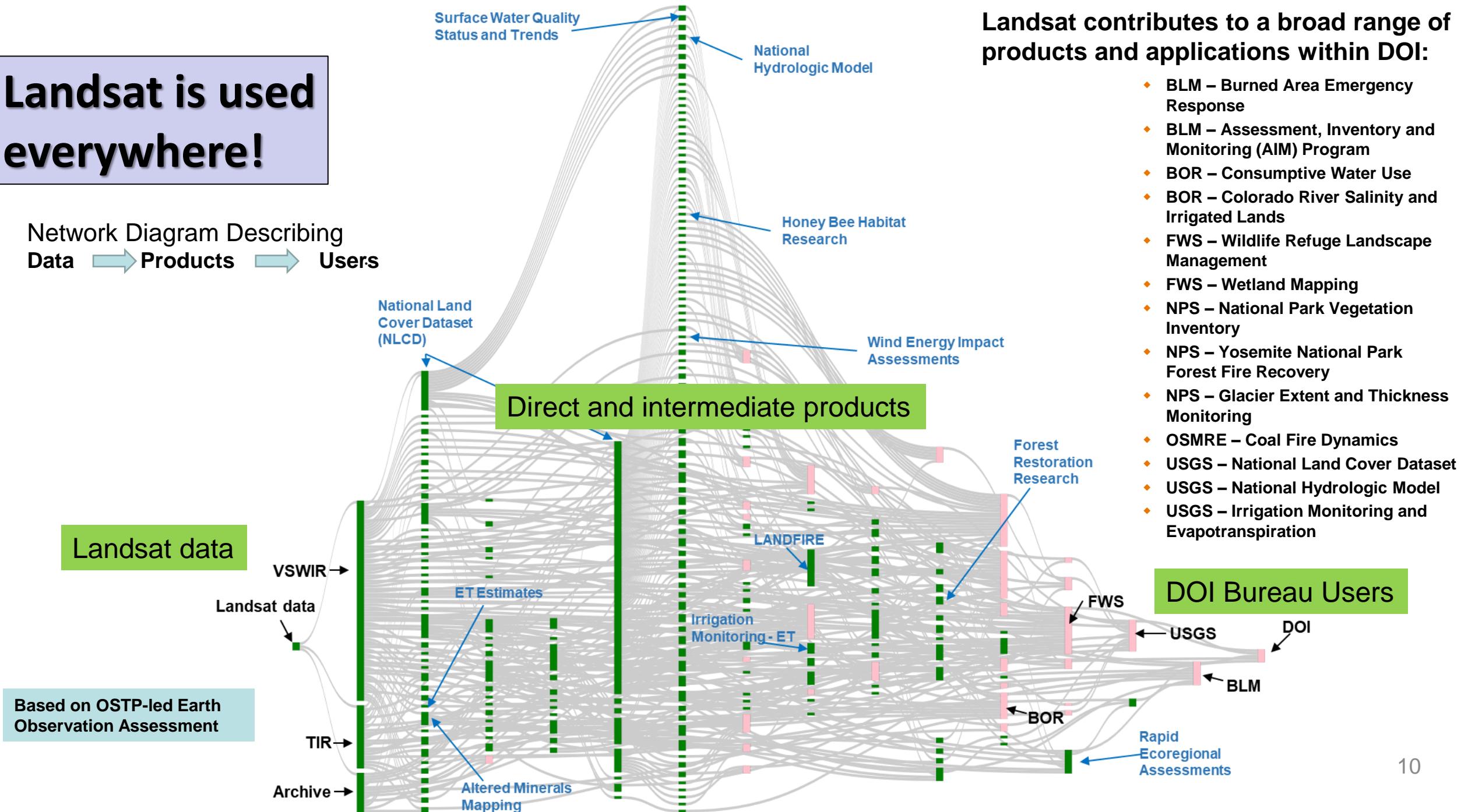
Landsat contributes to a broad range of products and applications within DOI:

- BLM – Burned Area Emergency Response
- BLM – Assessment, Inventory and Monitoring (AIM) Program
- BOR – Consumptive Water Use
- BOR – Colorado River Salinity and Irrigated Lands
- FWS – Wildlife Refuge Landscape Management
- FWS – Wetland Mapping
- NPS – National Park Vegetation Inventory
- NPS – Yosemite National Park Forest Fire Recovery
- NPS – Glacier Extent and Thickness Monitoring
- OSMRE – Coal Fire Dynamics
- USGS – National Land Cover Dataset
- USGS – National Hydrologic Model
- USGS – Irrigation Monitoring and Evapotranspiration

Diagram labels: Surface Water Quality Status and Trends, National Hydrologic Model, Honey Bee Habitat Research, Wind Energy Impact Assessments, National Land Cover Dataset (NLCD), Forest Restoration Research, ET Estimates, LANDFIRE, Irrigation Monitoring - ET, Altered Minerals Mapping, Rapid Ecoregional Assessments, VSWIR, Landsat data, TIR, Archive, FWS, USGS, DOI, BLM, BOR

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Current Landsat Applications and Users

Landsat is the **single most-used** land imaging data set by U.S. Federal users and is the 2nd highest in societal benefit impact (behind GPS) of 1,300 Earth observation systems

Landsat applications by registered users at USGS EarthExplorer

Pie chart:
- Training & Education 15%
- Utilities & Engineering 10%
- Agriculture 9%
- Energy & Minerals 8%
- Land Use & Mapping 8%
- Environmental Monitoring 8%
- Rural & Urban Development 5%
- Public Safety 5%
- Fisheries & Wildlife 5%
- Disasters 5%
- Water 4%
- Forests & Rangelands 4%
- Other 14%
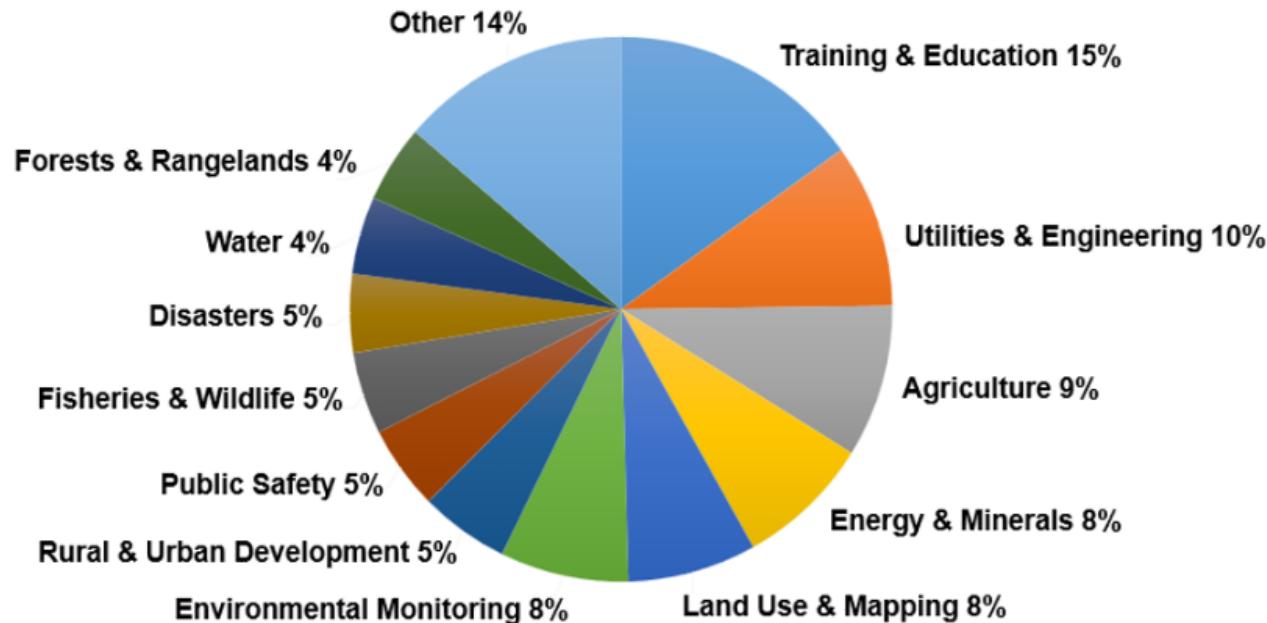
- Federal agencies (e.g., DOI, USDA, NASA, DOD, NGA, NOAA, State, EPA)
- State agencies (natural resources, municipal planning, transportation)
- Commercial (e.g., Exxon-Mobil, MapBox, Descartes Labs, Esri, Gallo, ITT, MDA Federal)
- Cloud service providers (e.g., Amazon Web Services, Google Earth Engine, Microsoft Azure)
- University educators and researchers
- Commercial Earth observation satellite operators (Maxar, Planet, Orbital Sidekick, Hydrosat, …)
- Non-profit and international users
- General public

Supports Federal, State, Tribal, local, commercial, academic, non-profit, and international use

Landsat Operations Status

Landsat 9 (2021 -)

Collecting 750 new scenes (11 million square miles) per day; mission fully operational since 2022

Landsat 8 (2013 -)

Collecting 750 new scenes (11 million square miles) per day; *will fall below 50% availability in 2030*

Landsat 7 (1999 - 2025)

Lowered into storage orbit; decommissioning process underway

**Earth Resources Observation and Science Center (EROS)**

Landsat Archive Operations

Final FY24 Statistics:

~18 billion accesses via Commercial Cloud;

~100 million product downloads;

~50 thousand terabytes managed.

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Sustainable Land Imaging (SLI)

- Joint program by which NASA & DOI/USGS implement new Landsat missions

- NASA develops space & launch segments

- DOI/USGS collects user needs, develops & maintains ground systems to collect, archive, process & distribute SLI data to users; operates on-orbit spacecraft

- Governed by SLI Joint Steering Group (JSG)

  - Top-level board to integrate SLI program efforts

  - Co-Chairs: DOI Assistant Secretary for Water & Science and NASA Associate Administrator for Science (Dr. Nicola Fox)

  - JSG meetings in 2017, 2020, 2022 defined and approved the Landsat Next mission

National Research Council (2013): The U.S. Government should establish a "Sustained and Enhanced Land Imaging Program" with persistent funding for current & future needs; a "comprehensive, integrated program that capitalizes on NASA and USGS strengths, maintains current capabilities, and enhances imaging capabilities and data products via emerging technology."

NASA	SLI Joint Steering Group	DOI
Associate Administrator, Science Mission Directorate		Assistant Secretary, Water and Science
Director, Earth Science Division		Director, United States Geological Survey
Associate Director, Flight Programs	SLI Roundtable	Associate Director, Core Science Systems
Program Executive, SLI		Program Coordinator, National Land Imaging
NASA Project Manager(s)		USGS Project Manager(s)

NASA/DOI Interagency Agreement for Collaboration on SLI Projects (2021)

Per the SLI Agreement, Interior and NASA work together to define and execute Landsat missions

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Landsat Next "Superspectral Triplets"

Designed to provide more frequent and finer-resolution science-quality data of the Earth's changing land surface, surface waters, and coastal regions, complementing commercial and international datasets and meeting user needs of the 2030s

Based directly on user needs documented from across Fed/Civ community

- **3 smaller satellites**, launched together, delivering combined **6-day revisit time** supporting more frequent coverage of changing processes such crop growth and coastal change and hazards.

- **"Super-spectral"** with **15 new bands** (5 thermal infrared bands in all) supporting water use/quality, soil conservation, and mineral mapping.

- **Improved spatial resolution** (from 30 to **10-20 meters multispectral** and from 100 to **60 meters thermal infrared**) for finer targets of farm fields, forest disturbance, urbanization, inland lakes & streams.

- **Sustained radiometric quality** supporting science and commercial users.

NASA "Landsat's Next Chapter" Video
https://svs.gsfc.nasa.gov/14262.

The Landsat Next mission will result in the largest collection of new Landsat data in the history of the program, estimated at 15 times the data volume of Landsat 9.

NASA awarded Landsat Next imaging instrument contract in June 2024, conducted successful requirements review in February 2025, released detailed spacecraft bus information in February; USGS completed trade studies and formulated acquisition strategy alternatives and requirements for ground systems development.

USGS
science for a changing world

Driving Applications for Landsat Next Superspectral Triplets

Societal Benefit Area	Application	Benefits from Landsat Next
Agriculture	U.S and global agricultural monitoring	Landsat Next will allow USDA Foreign Agricultural Service (FAS), Farm Service Agency (FSA) and National Agricultural Statistics Service (NASS) more precise observation of crop emergence.
	Crop residue monitoring/soil conservation	Landsat Next observations in the early growing season can allow USDA Natural Resources Conservation Service to detect cover crop and crop residue for soil conservation at the field-scale.
Forestry	Forest health monitoring	Landsat Next will aid USFS, BIA, BLM, FWS, NPS and USGS in the detection and identification of insect/disease agents for forest health monitoring, since symptoms are often seasonal and transient.
Water Resources	Evapotranspiration and water use	Landsat Next frequent observations of evapotranspiration (ET) are needed for field-scale ET estimates and continuous water use monitoring operationally by BOR, USGS, FAS, NASS and Western States.
Water Quality	HAB detection and monitoring	The new targeted spectral bands for water quality provided by Landsat Next will enable detection of specific organisms that cause harmful blooms.
Cryosphere	Snow/water availability	Higher temporal frequency and new targeted spectral measurement capabilities of Landsat Next will reduce cloud cover contamination while increasing detection.
Energy & Minerals	Mineral exploration and energy resource management	Landsat Next will enhance mineral exploration and energy resource management by providing richer spectral data and greater spatial resolution, improving the detection of minerals, and helping the commercial sector locate fuel sources and geological deposits more efficiently, reducing cost and risk while maximizing investment returns.
Wildfire	Pre- and post-fire assessment	Landsat Next higher temporal revisit is needed to capture the onset of more frequent wildfires and provide immediate post-fire response.

Landsat Next NASA/USGS Partnership

NASA and USGS provide an independently-funded joint-agency partnership.

- Handover of mission to USGS for continued operations following completion of on-orbit commissioning.

NASA is responsible for space segment (instrument(s), spacecraft), launch and on-orbit checkout.
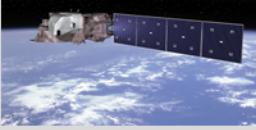
- Includes engineering support for mission operation readiness and support for on-orbit anomalies.

USGS will build and deliver the ground segment, operate the observatories after the commissioning phase and provide data processing and distribution.

- Systems engineering support during development
- Mission Operations Center (MOC) and backup
- Ground Network
- Data Processing and Archive System (DPAS)
- Provide Flight Operations Team

NASA — Space Segment
- LandIS
- Spacecraft Buses
- Technical Authority (TA)
- Mission Protection

Launch Segment
- Launch Vehicle

USGS — Ground Segment
- Mission Operations Center
- Ground Network
- Archive
- Science Products
- User Interface
- Technical Authority
- IT Security
- NASA Support Services

Mission Readiness

NASA		USGS
GRTs	Flight Operations Readiness	Initial Operating Capability
MRTs	Pre-launch	Phase E Operations
Simulations	Commissioning	Giver/Receiver Mgmt

Landsat Next Space and Ground Segment Summary
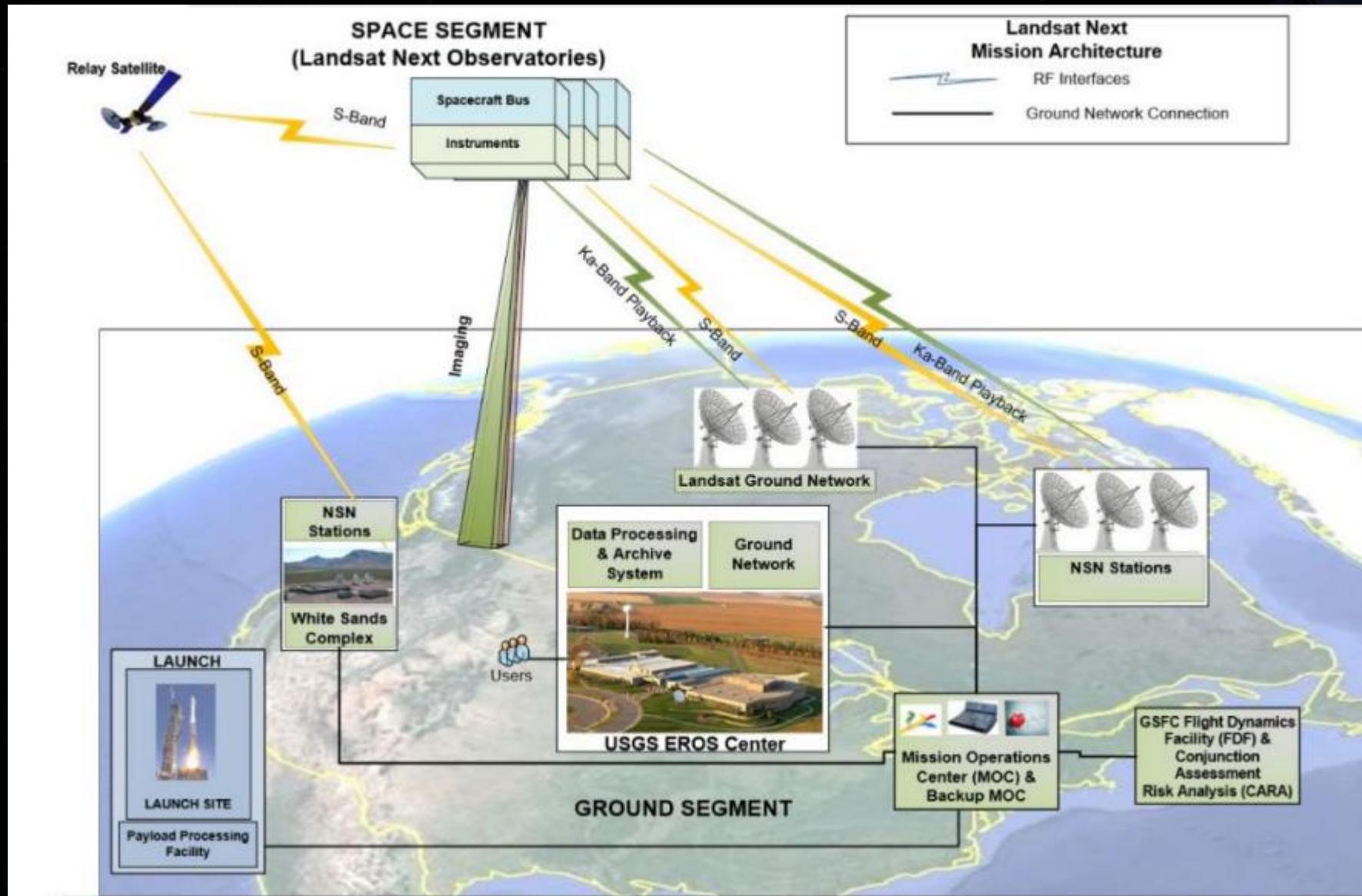
Multi-satellite Operations Center Functions

- Telemetry
- Operations
- Planning and Analysis

Primary Ground Network (GN) Functions

- Ground and Observatory Interfaces
- Data Transfer

Primary Data Processing & Archive System Functions

- Data Management
- Data Storage
- Metrics
- Reporting

Landsat Next Ground System Challenges

LANDSATNEXT

Mission Operations:

Operates 4-5 satellite missions at a time.

Data Volume:

Collects about 15 times the amount of data as Landsat 9.

Space-to-Ground Data Rate:

Requires more robust communications systems to transmit imagery data to the ground, with increased data volume.

Ground Station Access:

Needs additional ground station contacts to download all of the imagery data.

Data processing:

Requires more data processing for the increased data volume.

Data Storage:

Needs more commercial cloud storage at an increased cost over today's data.

Data Product Dissemination:

Requires new ways to disseminate data with the increased demand by governmental and private users.

Data Product Interoperability:

Requires improved data operability for future solutions to use observations and ancillary data from numerous sources.

The increasing demands on the USGS Landsat Next ground system development require additional resources beyond the current NLI program baseline to keep pace with NASA on the multi-year development

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Notable Landsat Next Endorsements (2024)

Department of Agriculture (June 21 Letter from Under Secretary of Agriculture to NASA and DOI):

- *"USDA agencies provided significant inputs to the design of the Landsat Next Architecture."*
- *"Many USDA strategic objectives depend upon continuity and improvement of Landsat observations."*

Department of State (Secretary of State and Australian Foreign Minister signed a Joint Communiqué on the U.S.-Australia Landsat Next 2030 International Partnership Initiative on August 5):

- *Formally recognizes Australia as a partner in the Landsat Next satellite mission, which will provide critical insights into the Earth's land surfaces, surface waters, and coastal regions. (Australia is expending US $130 million over the next four years, with increased annual funding pledged thereafter through 2045, for Landsat Next-related critical ground station infrastructure, personnel, and services.*

National Geospatial-Intelligence Agency (NGA) (Oct. 24 letter from NGA Director to NASA and DOI)

- *"The [NGA] relies on Landsat's unique capabilities to fulfill critical mission areas."*
- *"Landsat Next will provide improved applications such as increased resolution, six-day periodicity, and twice as many spectral bands that can identify and monitor agriculture, water use, crop health, and signs of food insecurity worldwide."*

U.S. Group on Earth Observations (USGEO) Earth Observation Assessments (EOAs):

- *2023 Agriculture and Forestry EOA (*July 2024*):* Landsat ranked **#4** most-impactful of over **1,000** Earth observation data sources by over **600** Subject Matter Experts (SMEs) across 8 Federal agencies (Evaluating/monitoring agricultural conditions, irrigation, natural hazards, fuel conditions, and land management).
- *2023 Climate EOA* (December 2024): Landsat ranked **#1** most-impactful of nearly **2,000** Earth observation data sources by over **800** SMEs across 8 Federal agencies (Evaluating/monitoring coastal change, water resources, terrestrial ecosystems, and supporting environmental assessments/land surface science).

Western States Water Council (WSWC) (August 16th Letter from Executive Director of the WSWC Tony Willardson to NASA and DOI):

- WSWC's mission *"is to ensure that the West has an adequate, secure, and sustainable supply of water of suitable quality to meet its diverse economic and environmental needs now and in the future."*

- *"The WSWC strongly supports Landsat Next. We urge you to give this investment a high priority in your FY2026 budget requests."*

- *"As we address the results of decades of drought in the West and continuing climate uncertainty, adequately and expeditiously funding preparations for the launch of Landsat Next and its operations is critical."*

- WSWC is *"particularly concerned with maintaining data continuity and integrity with Landsat thermal-infrared (TIR) and reflected light imagery given the aging Landsat 8 and Landsat 9."*

- *"Landsat spectral measurements are important – both thermal and reflected – with measurement accuracy and quality. Landsat Next will provide more and better data for water managers."*

- *"Much like weather observations and GPS, Landsat data is used every day to better understand our dynamic planet and adapt to its changing climate."*

- *"Landsat is the only operational satellite having both thermal data and a spatial resolution fine enough to map water-resources use at the level of agricultural fields."*

- *"There is an urgent need to accelerate, not delay, funding decisions in order to ensure there are no future data gaps."*

- *"The WSWC strongly supports a continuing National Land Imaging Program and expresses our strong support for the approval and construction of the Landsat Next mission without delay. Again, we ask that you give a high priority in your FY2026 budget requests for Landsat Next."*

"Planet and other commercial companies use Landsat's exquisite sensors and over 50-year record of observations to calibrate our commercial instruments. By combining Landsat's exquisite calibration with Planet's high-resolution and high-temporal observations, we can continue to advance research and applications in agriculture, disasters, water resources, wildfires - and many more."
     - Jeff O'Neil, Director of Government Affairs at Planet

Landsat Economic Value Study (2024)

The report "**Economic Valuation of Landsat and Landsat Next 2023**" was released by the Native American Technology Corporation (NATECH) in September 2024.

- Economists from Colorado State University and TerraWatch Space authored the study, which estimated the economic benefits of Landsat imagery to users who access Landsat data through USGS Earth Explorer.

Key Highlights:

- **Landsat's value to users was estimated at $25 billion in 2023**, based on the Contingent Valuation Method, a broadly accepted, peer-reviewed economic methodology for valuing non-market goods.

- NATECH also completed a multiple regression analysis to **estimate the added value of improvements provided by Landsat Next** and found that value to be approximately **$33 billion**. (These figures are conservative as they do not account for value derived to users of Landsat from commercial platforms such as Google, Amazon, Microsoft, etc.)

- NATECH also investigated **benefits of Landsat through case study applications related to revenue generation and cost savings**. For example, the economic value of patents citing Landsat was estimated to be $40+ million for 42 patents granted in 2023, based on returns to the inventor. Another highlighted millions of dollars in savings using Landsat to improve the targeting of post-wildfire restoration activities.
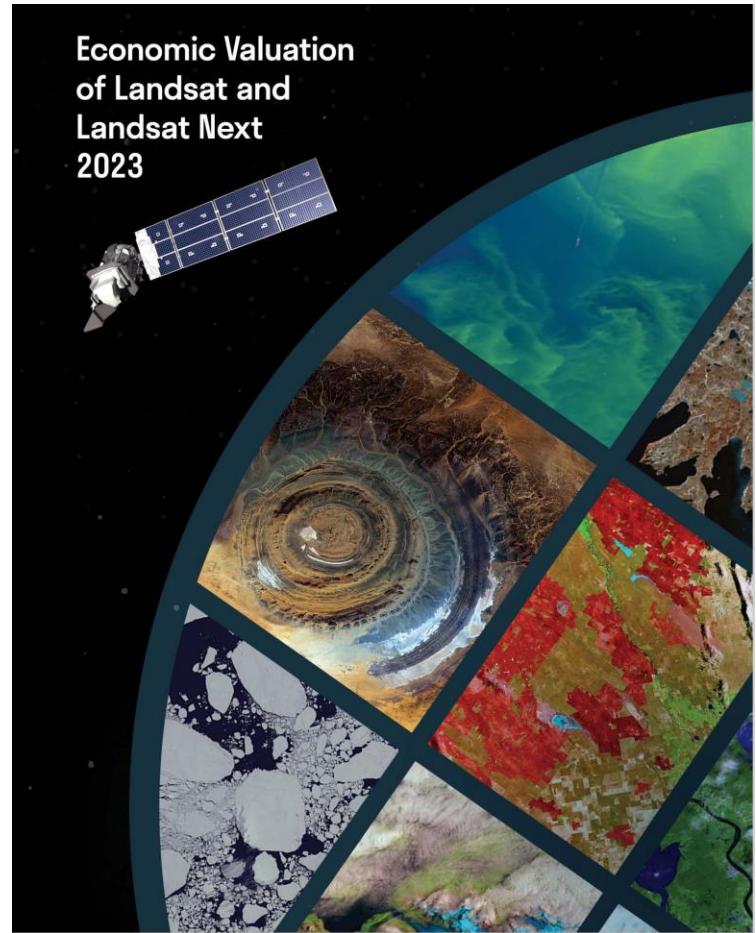
Economic Valuation of Landsat and Landsat Next 2023

Annual National Land Cover Database (NLCD) Release

Annual NLCD Collection 1.0: 1985 – 2023

Annual NLCD Collection 1.0 (1985-2023)

- Released October 24th, 2024.

- Landsat-based land cover and change product.

- Covers Conterminous United States (CONUS).

- Documents how America's landscape have changed over the past four decades.

- Maps land cover, detects land change, characterizes fractional impervious surface.

- Suite of six land cover and land cover change products for each year from 1985-2023 at 30m spatial resolution.

- Powered by modern deep-learning algorithms

National Land Cover Database | U.S. Geological Survey

National Land Cover Database (NLCD) Annual Land Cover Products
Change Animation of Northern Virginia/Washington DC - 1985-2023

Legend

Color	Code	Description
(blue)	11	11 Open Water
(light blue)	12	12 Perennial Ice/Snow
(light pink)	21	21 Developed, Open Space
(pink)	22	22 Developed, Low Intensity
(red)	23	23 Developed, Medium...
(dark red)	24	24 Developed High Intensity
(gray)	31	31 Barren Land (Rock/Sand/...
(green)	41	41 Deciduous Forest
(dark green)	42	42 Evergreen Forest
(light green)	43	43 Mixed Forest
(brown)	51	51 Dwarf Scrub
(tan)	52	52 Shrub/Scrub
(pale yellow)	71	71 Grassland/Herbaceous
(yellow green)	72	72 Sedge/Herbaceous
(green)	73	73 Lichens
(teal)	74	74 Moss
(yellow)	81	81 Pasture/Hay
(brown)	82	82 Cultivated Crops
(light blue)	90	90 Woody Wetlands
(blue)	95	95 Emergent Herbaceous...

1985 NLCD Land Cover

Washington DC
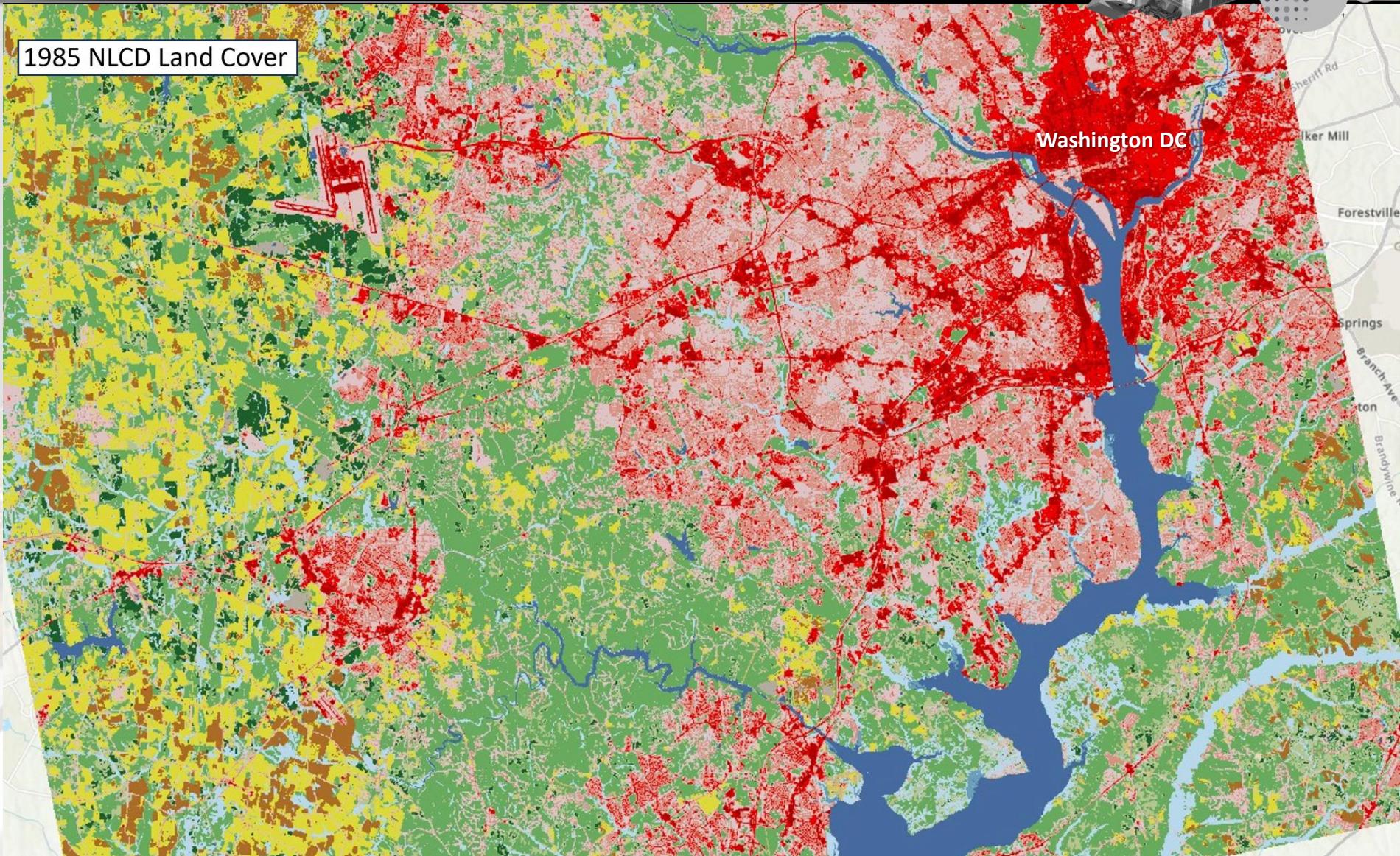
Landsat and NLCD – Uses for Energy & Minerals

Fossil Fuel Extraction & Infrastructure

- Pipeline routing
- Disturbance Mapping
- Mine Site Assessment
- Post-mining Reclamation
- Power Grid Planning
- Hazards Risk Assessment

Mineral Exploration & Extraction

- Site Suitability Assessment
- Hydrology / Water Protection
- Erosion / Sediment Control
- Regulatory Compliance
- Mine Closure & Rehabilitation
- Mineral Extraction Conflicts

Renewable Energy Development

- Hydropower – Watershed Management
- Hydropower – Water Use / Availability
- Bioenergy – Biomass Resource Mapping
- Solar Energy – Site Suitability Analysis
- Wind Energy – Site Suitability Analysis
- Environmental Impact Assessments

How can the National Academies' assessment of and advocacy for our Agency missions be effective in the new Administration?

Opinion: Historically, the Earth Science Decadal Surveys highlight new, cutting-edge space missions required to meet National Academies' science research priorities. They tend to take current operational missions—which are based on user needs collected by the operational agencies--for granted, assuming they'll be there in the future as part of a "Program of Record" to underpin science. But arguing for the science value of new, developing space-based observations and information alone is no longer sufficient.

Recommendation: In times of limited budgets, the National Academies need to pivot to stronger support for the current and developing operational systems that serve varied operational and science needs across the nation. The National Academies should recommend future operational NOAA and USGS Earth observation systems like GeoXO and Landsat Next, emphasizing the priority of these new operational missions over traditional NASA research missions.

Rationale: Operational federal government missions are the foundation of the nation's success, generating billions of dollars for the economy with a myriad of applications while simultaneously underpinning science research across the nation and around the world.

NASA "Landsat's Next Chapter" Video https://svs.gsfc.nasa.gov/14262
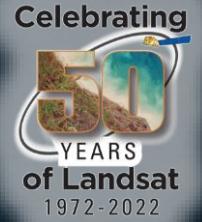
Thank You!

BACKUP SLIDES

Black circles – "Raw" Planet Data

Red Squares – "Raw" Landsat Data

Blue circles – Planet Data correct to Landsat

Healthy Crop (Alfalfa) vs Harvested Crop Trusted Landsat data

Noise in "raw" Planet data is nearly on the same scale as Healthy vs Harvested Crop

Planet, corrected with Landsat, captures a fuller growing period than Landsat alone
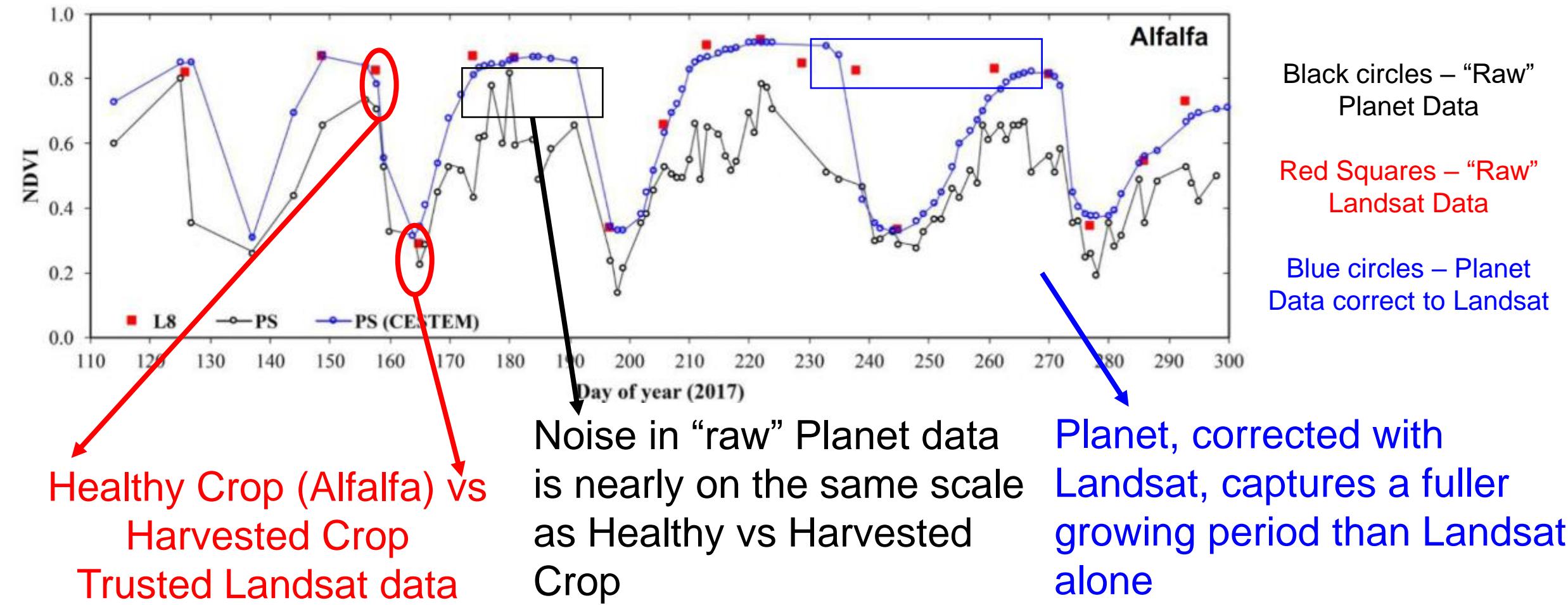
Landsat Detects Economically Important Raw Materials, Minerals, & Commodities

Tungsten[1]
wear-resistant applications, primarily in the construction, metalworking, mining, and oil- and gas-drilling industries[2]
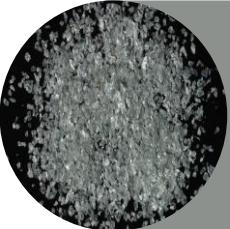
Chlorite[3]
Disinfect drinking water[6]

Muscovite[10]
Electrical condensers, heating elements, roofing material, cosmetic products[4]
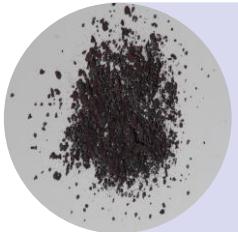
Hematite[3]
Iron, steel, painting[4]

Kaolinite[3]
Paper production, light bulbs, adhesives[7]
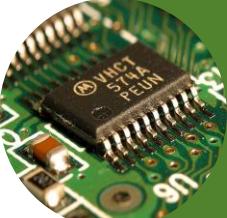
Gold Alteration Zones[11]
Electrical connectors, computer chips, electroplating[12]

Calcite[3]
Cement, steel, glass, building materials, water treatment[4]

Montmorillonite[3]
Oil drilling, desiccant[8]

Biotite[10]
Electrical components, lubricant[4]

Illite[3]
ceramics, paints, drilling fluids, and agricultural products[5]

Dolomite[9]
Metallurgy, fertilizers, animal feeds, cosmetics[5]

Pyrite[13]
Battery components, water treatment, pigments, fertilizers[14]

Landsat Next: Mineral Mapping & Rare Earth Elements

Top: USGS Rare-Earth Elements Bottom: EPA Electric Vehicles
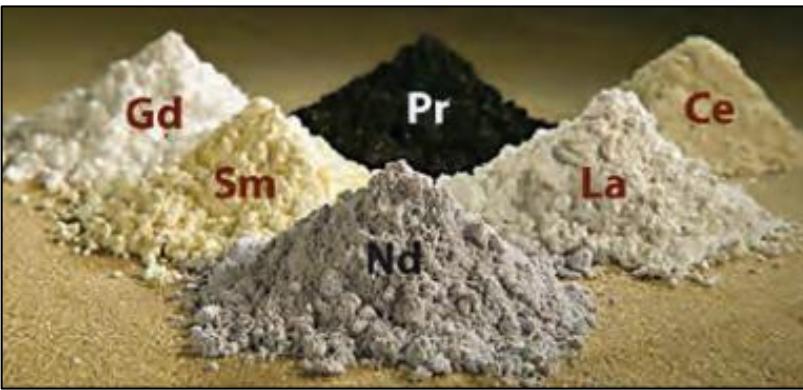
With more than twice as many spectral bands, Landsat Next will provide *improved mineral and surface composition mapping* capabilities.

- *Superspectral coverage* provides the spectral information to differentiate mineral groups. For example, Landsat Next spectral bands can identify porphyry deposits as a major source for copper and sulfide deposits for zinc[1].

Landsat Next's new narrow bands at 740nm and 865nm are *critical in identifying areas containing neodymium*, a rare Earth element used to make strong magnets[2]

- These magnets are used in wind turbines, cell phones, electronics, MRIs, and in manufacturing motors for hybrid vehicles[3]
- Neodymium is also a pathfinder in locating other critical rare earth elements, 80% of which are currently imported by the U.S. from China, creating a national security risk[4].

The improved spatial resolution of Landsat Next will help locate and identify the minerals in smaller deposits or when minerals exist in narrow veins.