National Aeronautics and Space Administration

NASA's Water Resources Program

Supporting Water Management in the U.S. West and Beyond

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WestFAST Webinar

6/16/2026

Water at NASA
Overview

1 **Who We Are**
An introduction to NASA's applied water capabilities

2 **How We Work**
Water Resources Program's projects and priorities

3 **An Example: Western Snow Drought**
How Earth System Science can inform water management

4 **Next Steps & Future Work**
How to access data and connect with us

NASA Earth Science Division (ESD)

Providing decades of data to help in understanding our planet's interconnected systems, from a global scale down to minute processes.

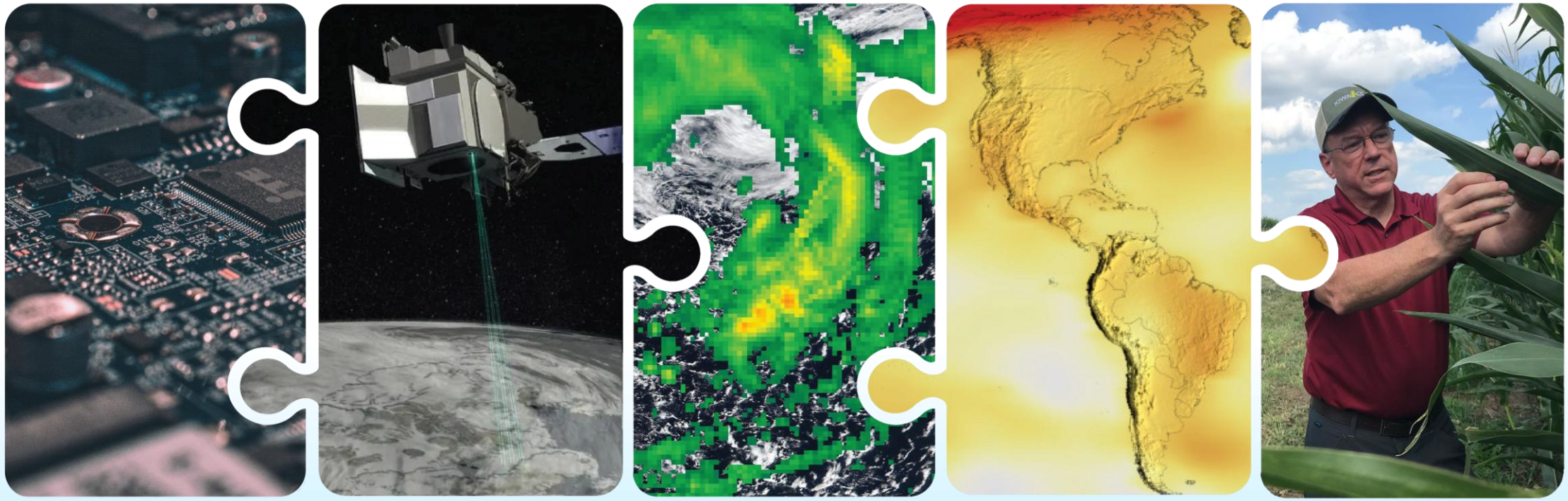
NASA produces data that is free to access and use for everyone

You can discover decades of data for anywhere in the world

NASA offers tools and services for viewing, accessing, and interacting with data

NASA data can validate in situ and modeling data or fill data gaps

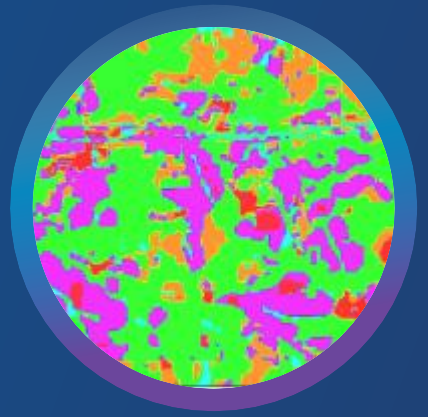
ESD's End-to-end
Earth System Science Capability



Earth Action **At Work**

Driving U.S. Economic Growth

Helping American businesses use Earth data to grow and compete, training workers, decision-makers, and turning data into real-world solutions.



Accelerating AI Usage

Widening access to Earth information and scaling-up the impact of using AI for Earth applications.

Equipping Local Leaders to Act

Delivering trusted data and tools to state, local, tribal, and federal partners to increase resilience, security, and prosperity.

Strengthening American Resilience

Strengthening American resilience to hazards such as fires, floods, drought, heat, and health threats.

NASA Water Resources Program

WATER RESOURCES SCIENCE TO ACTION PORTFOLIO

Develops and delivers NASA Earth observation solutions and decision-support tools with end-users to monitor and manage freshwater and nearshore water resources.

WESTERN WATER ACTION OFFICE (WWAO)

Co-develops and applies NASA Earth observation tools with western U.S. partners to address critical water challenges and build resilience.

WATER FOR IMPACT PARTNERSHIPS

Builds strategic partnerships to accelerate innovation, coordinate across sectors, and empower communities for lasting water impact.

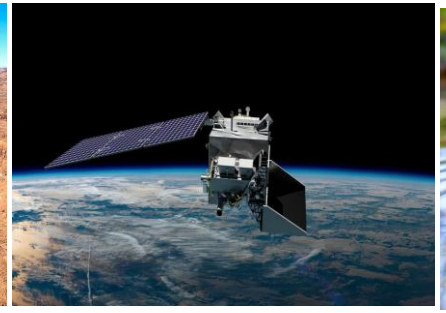
FOCUS AREAS OF THE WATER RESOURCES PROGRAM

- Drought resilience and water scarcity
- Pollution monitoring and water quality management
- Integrated water infrastructure for stormwater, floodwater, and wastewater management
- Sustainable water use for hydropower, public supply, and irrigation
- Water risk assessment and adaptive management for resilience
- Coordinated transboundary water management spanning freshwater and coastal systems

NASA Water Resources Program
Western Water Action Office (WWAO)

Improve water management in the Western U.S. through satellite-based EO, strengthening economic resilience and reducing risks for communities and ecosystems.




Partnerships & Engagement

- Build sustained relationships with the water management community
- Develop strategic partnerships with committed collaborators
- Communicate critical needs back to NASA missions

Rapid Innovation

- Understanding the needs of the water resource community
- Enabling advancement of NASA data, technology, and models in ways that are directly relevant and impactful for the community

Scaling Impact

- Scaling successful initiatives,
- expanding solutions to more water managers and communities, and
- Making NASA data more accessible and actionable for non-experts.

NASA Water Resources Program
Our Priorities

- **Addressing Regional and Global Needs:** Tackle urgent regional water challenges and develop strategies for global water security and resilience.
- **Enhancing Water Use Efficiency:** Optimize water use, reduce waste, and promote sustainable distribution across sectors and regions.
- **Improving Water Quality Management:** Advance monitoring and management of freshwater and nearshore water quality, focusing on regions with significant contamination issues.
- **Strengthening Resilience:** Assist vulnerable regions in adapting to changing conditions, extremes, and ensuring systems resilience and equitable access to water resources.
- **Empowering Communities:** Use NASA Earth science to raise awareness and support sustainable water solutions.

NASA Water Resources Program

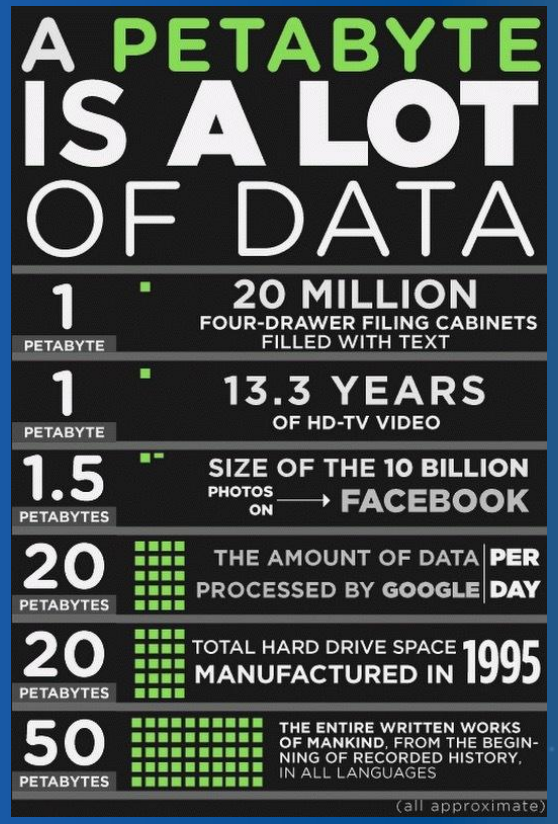
Transforming Earth science research into actionable & innovative solutions

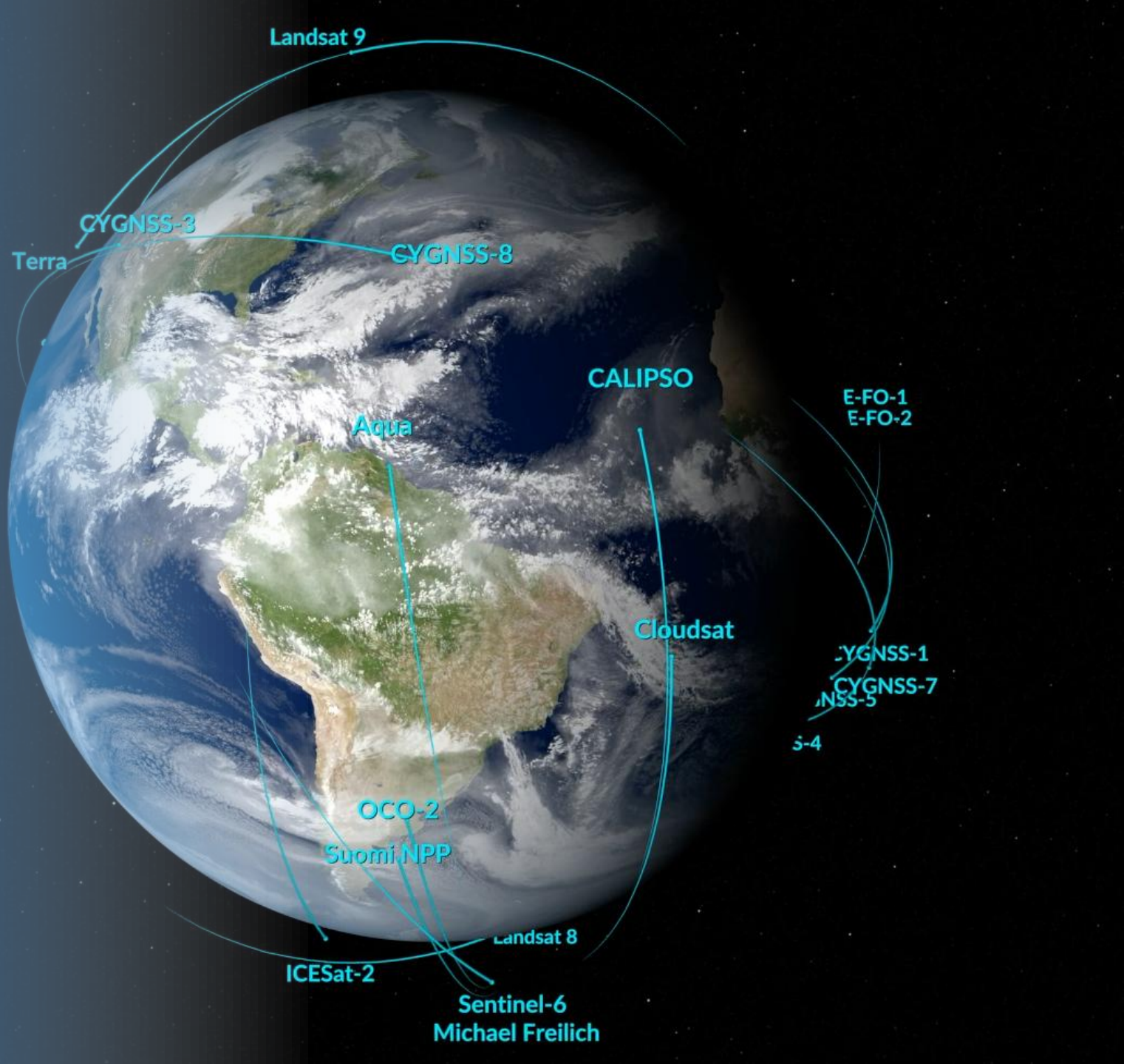
1. Leveraging Earth observation data grounded in sound science
2. Partnering with communities
3. Integrating cutting-edge technologies
4. Turning data into actionable insights

EARTHDATA

ESD Operates One of the Largest Open Archives on the Planet

148.8 PB





SOLID EARTH

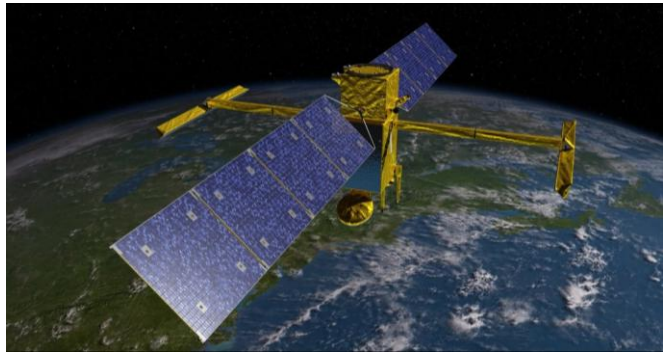
WATER CYCLE

ECOSYSTEMS & NATURAL RESOURCES

LAND-SEA CONTINUUM

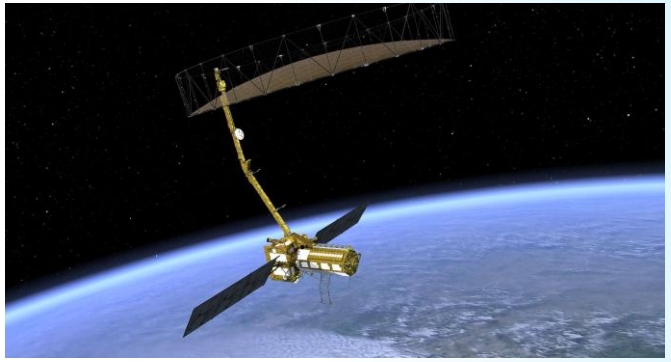
The Future of Earth Science for Water

In the next decade NASA is leading an outpouring of information from space!



Surface Water and Ocean Topography (SWOT)

Launched:
December 2022

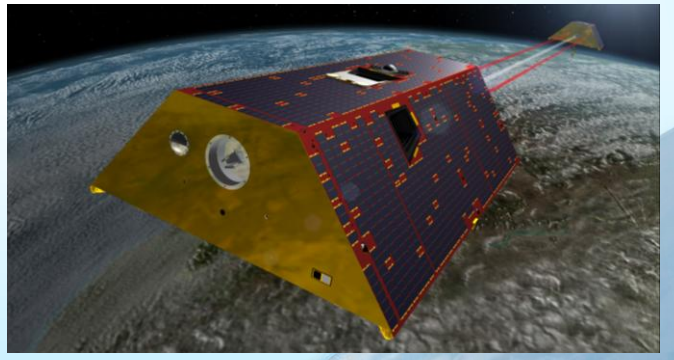


NASA-ISRO SAR (NISAR)

Launched:
July 2025

Plankton Aerosol, Cloud, Ocean Ecosystem (PACE)

Launched:
Feb. 2024

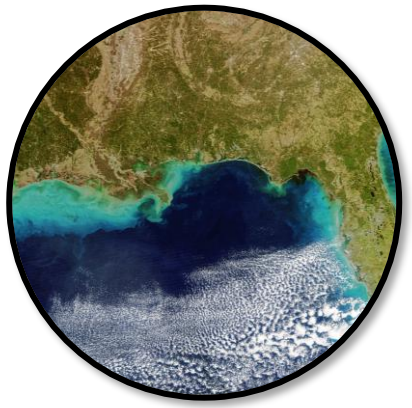


GRACE-Continuity (GRACE-C)

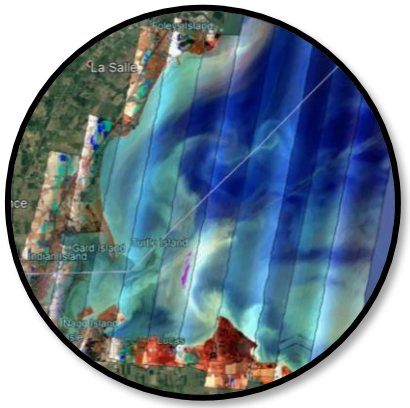
Launch Target: No earlier than 2028

What We Can "See" From Space
Water Applications

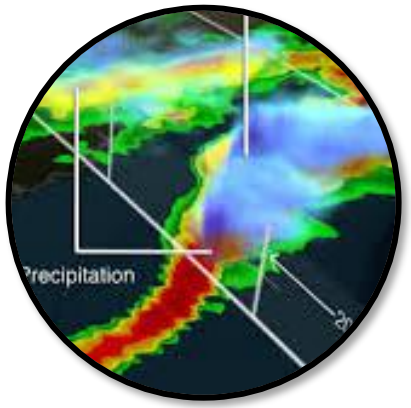
Water Temperature



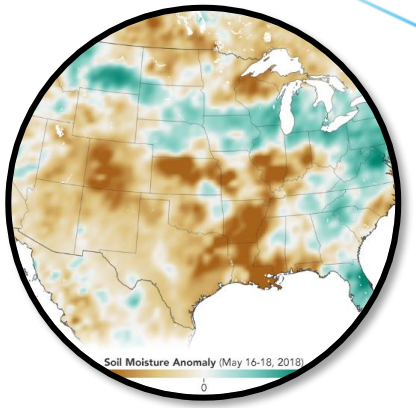
Salinity



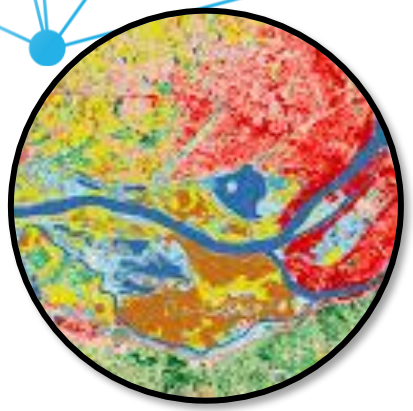
Algal Blooms



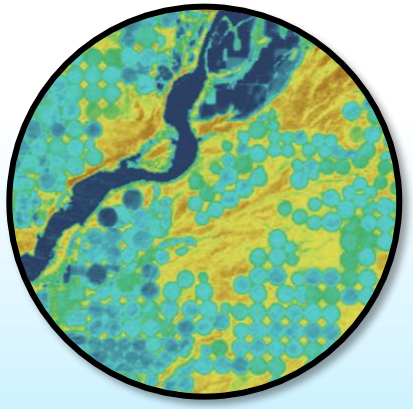
Rainfall



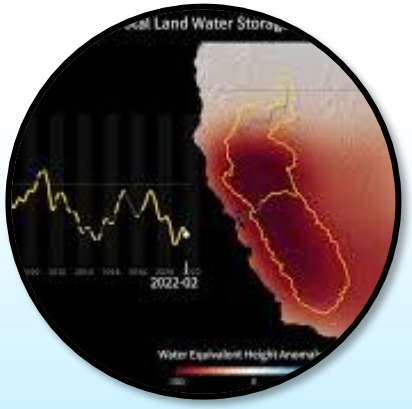
Soil Moisture



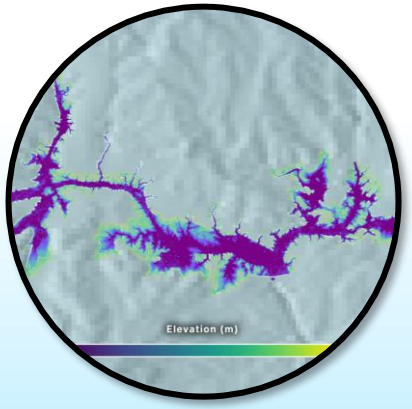
Land Cover Change



Crop Water Use



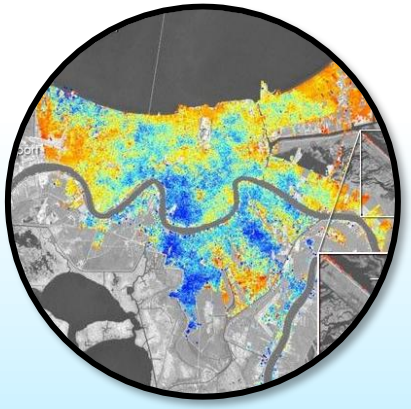
Groundwater Storage



Reservoir Extent

Snowpack

Flood Mapping

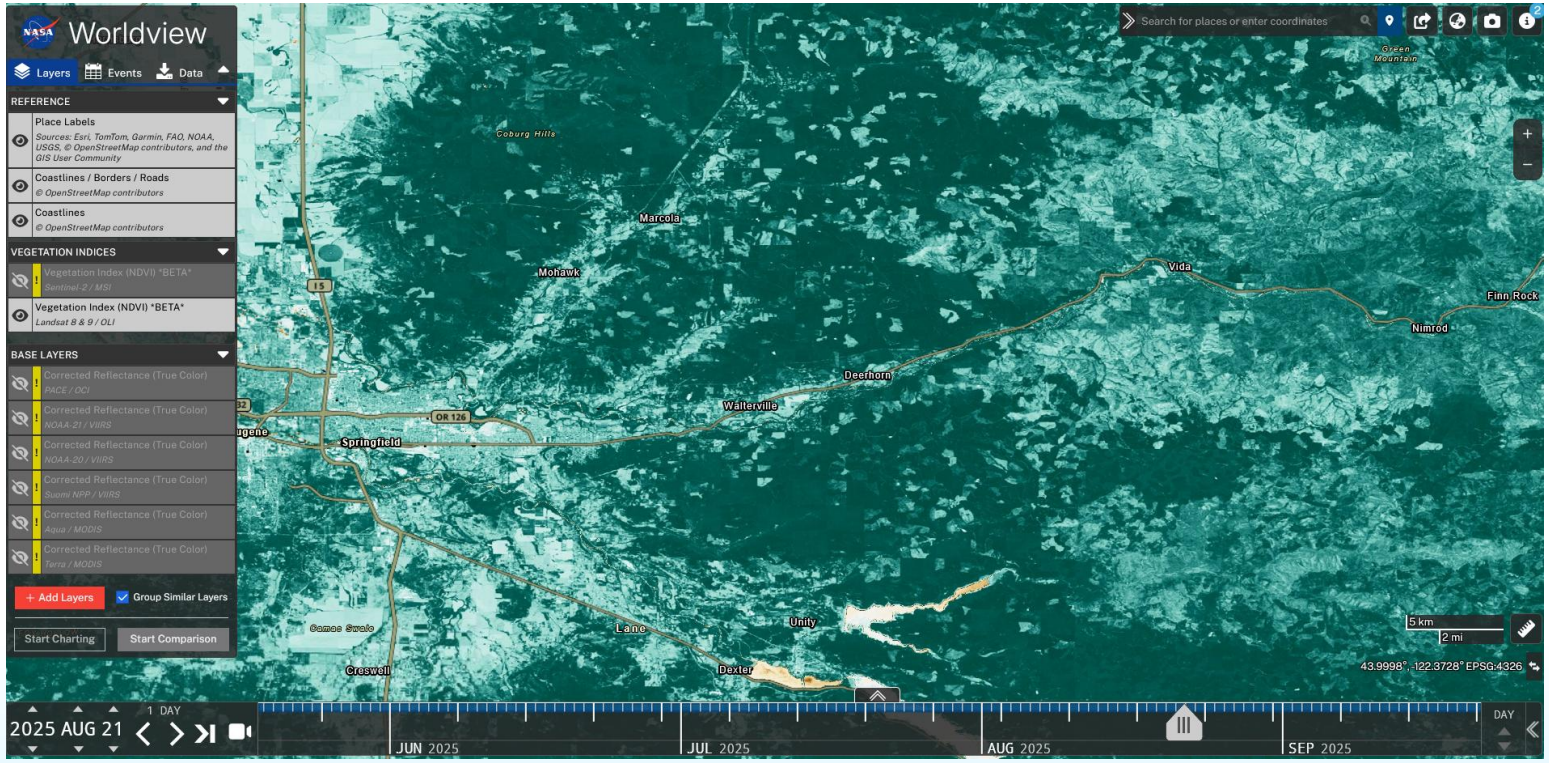


Land Subsidence

Moving from Data to Decisions

Water Observations

- Precipitation
- Snowpack
- Groundwater
- Water Quality Indicators
- Evapotranspiration
- Soil Moisture
- Surface Water Extent
- Land Use/Land Cover



NASA Water Resources Program

NASA Satellite Data → Sustained use of NASA data in water resource/risk management decisions

Earth science isn’t just something we do.

It's built for people to use.


Little Wood River
Reintroduced Beaver Area
No Beaver Area
Baugh Creek Road

Building Partnerships **In Your State**

Arizona

- Department of Water Resources
- Central Arizona Project

California

- Department of Water Resources
- San Diego Department of Environmental Health & Quality
- Tijuana River National Estuarine Research Reserve
- Gallo Winery

Colorado

- Northern Water
- Denver Water
- Colorado Basin River Forecast Center

Idaho

- Department of Environmental Quality
- Department of Water Resources
- Coeur d'Alene Tribe

Building Partnerships
In Your State

Kansas

- Kansas Water Office
- Kansas State Geological Survey

Montana

- Department of Natural Resources and Conservation

North Dakota

- Department of Water Resources

Nebraska

- National Drought Mitigation Center

New Mexico

- Office of the State Engineer

Nevada

- Division of Water Resources

Oregon

- Water Resources Department

Building Partnerships
In Your State

Texas

- Texas Water Development Board
- El Paso Water

Utah

- Division of Water Resources
- Central Utah Water Conservancy District

Washington

- Washington State Conservation Commission
- State Climate Office
- Departments of Ecology, Health, Fish and Wildlife, Agriculture

Federal

- US Bureau of Reclamation
- US Department of Agriculture
- US Forest Service
- NOAA National Integrated Drought Information System
- Environmental Protection Agency
- International Boundary and Water Commission

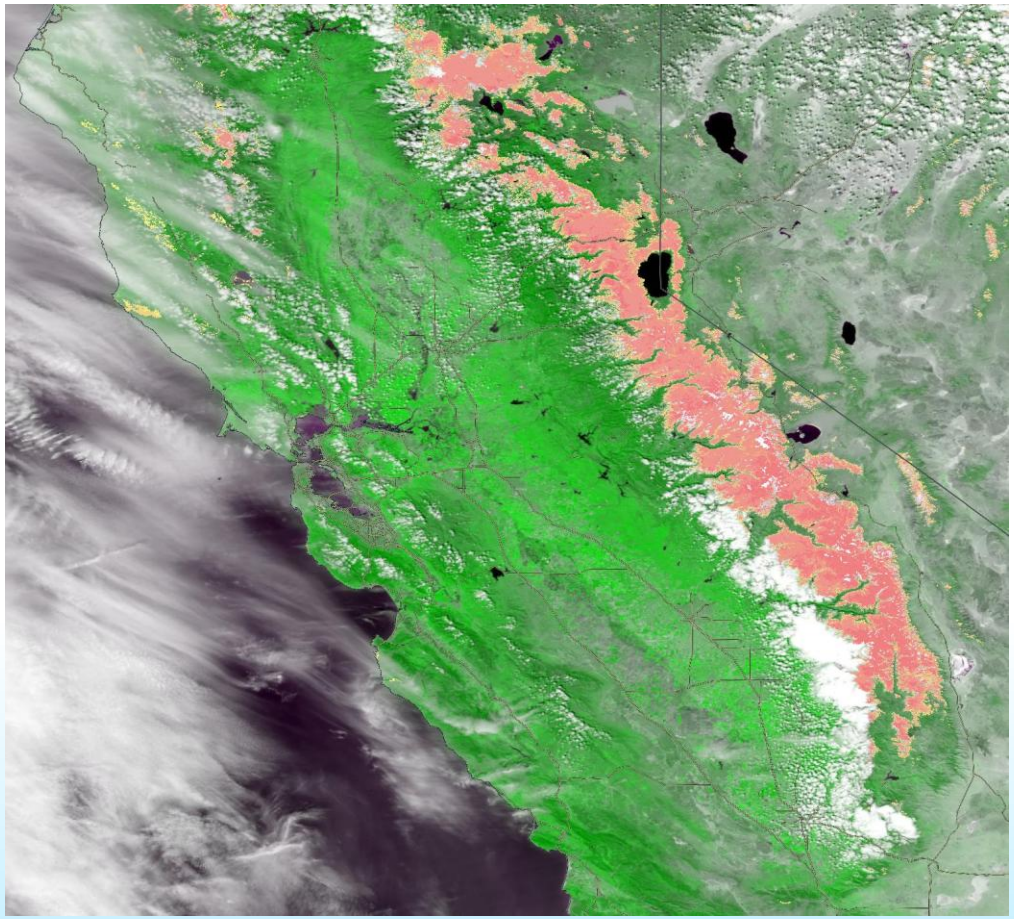
Building Partnerships
In Your State

Water Resources Program science team meeting. Massachusetts Institute of Technology, September 2024

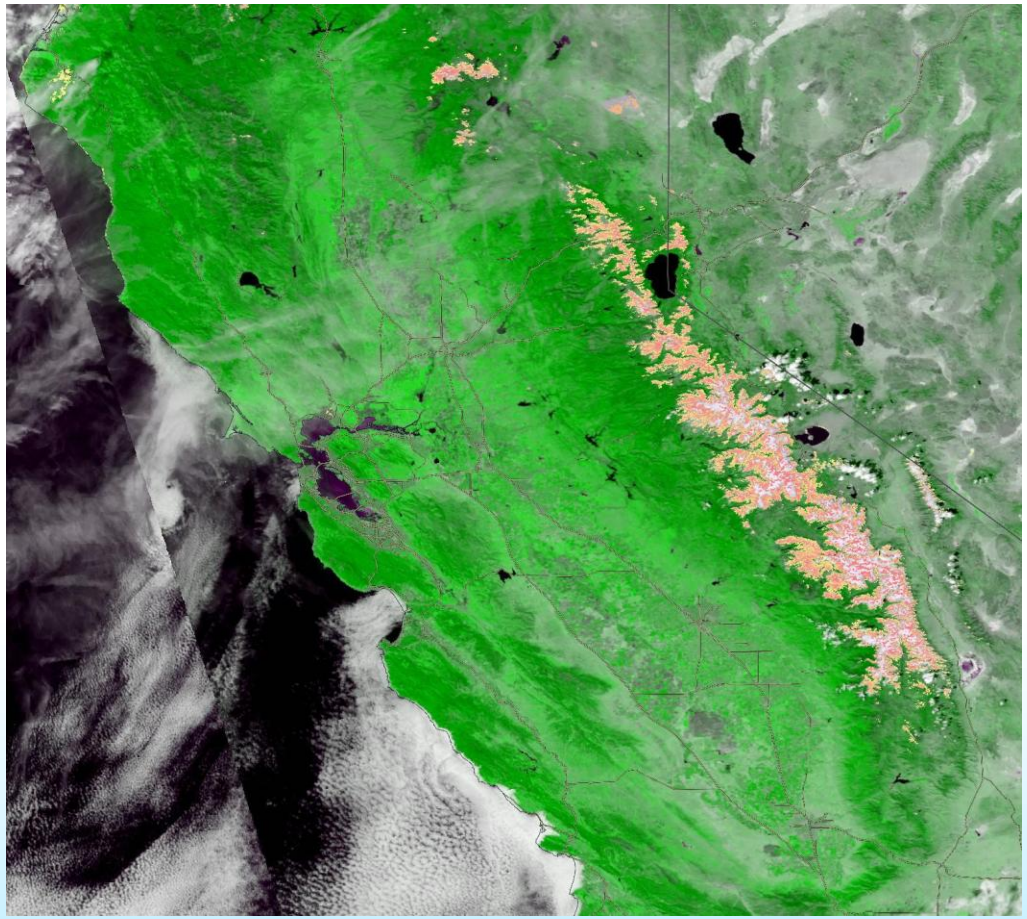
Building Partnerships
Across the West

State	Local	Federal	Other
Washington Department of Fish and Wildlife	Iowa City – A UNESCO City of Literature	USDA	Gallo Family Vineyards
Nevada Division of Water Resources	Groundwater Rolling Plains Conservation District	Bureau of Reclamation	International Boundary and Water Commission
Central Utah Water Conservancy District	City of Loveland	National Weather Service	Hayden Lake Watershed Improvement District
California Department of Water Resources	Northern Water	NOAA	Carollo
Office of the State Engineer – Interstate Stream Commission	Denver Water	Forest Service – Department of Agriculture	Coeur d'Alene Tribe
Arizona Department of Water Resources	City of Kerrville, Texas	EPA	Tijuana Estuary – Tijuana River National Estuarine Research Reserve
Texas Water Development Board	County of San Diego – Environmental Health & Quality		
California Water Boards	Cedar Rapids – City of Five Seasons		
WASCO	Des Moines Water Works – Water You Can Trust for Life		
Idaho Department of Environmental Quality	el paso Water		

2026 Western US Snow Drought
What it is, why it matters, and what NASA is doing about it



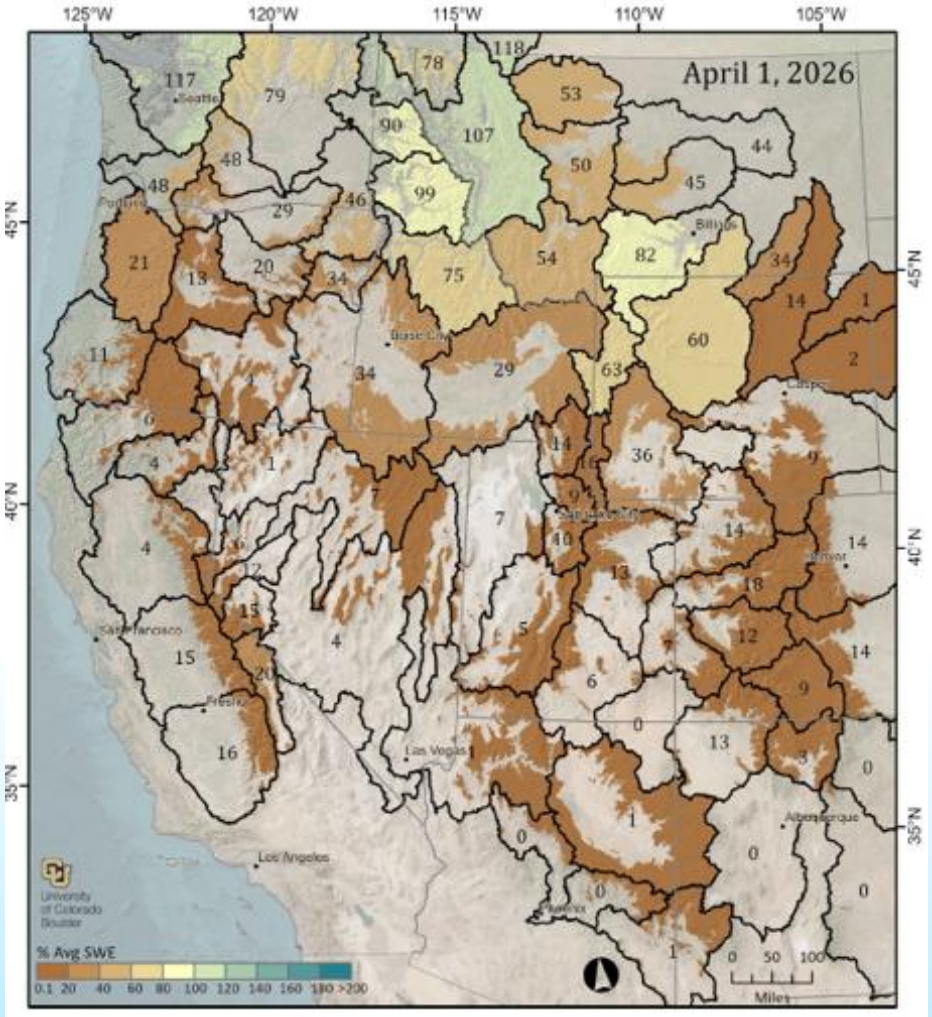
NASA Worldview VIIRS NDSI, 28 March 2025



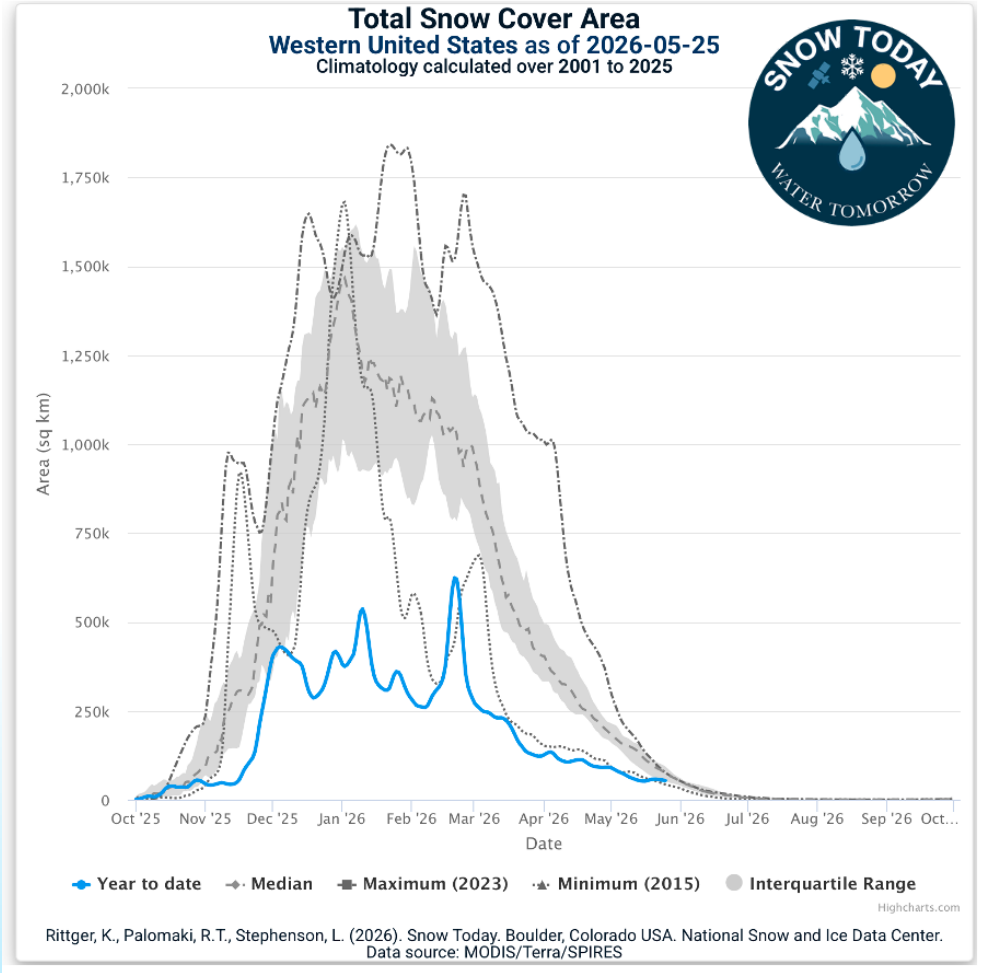
NASA Worldview VIIRS NDSI, 28 March 2026

2026 Western US Snow Drought

What it is, why it matters, and what NASA is doing about it

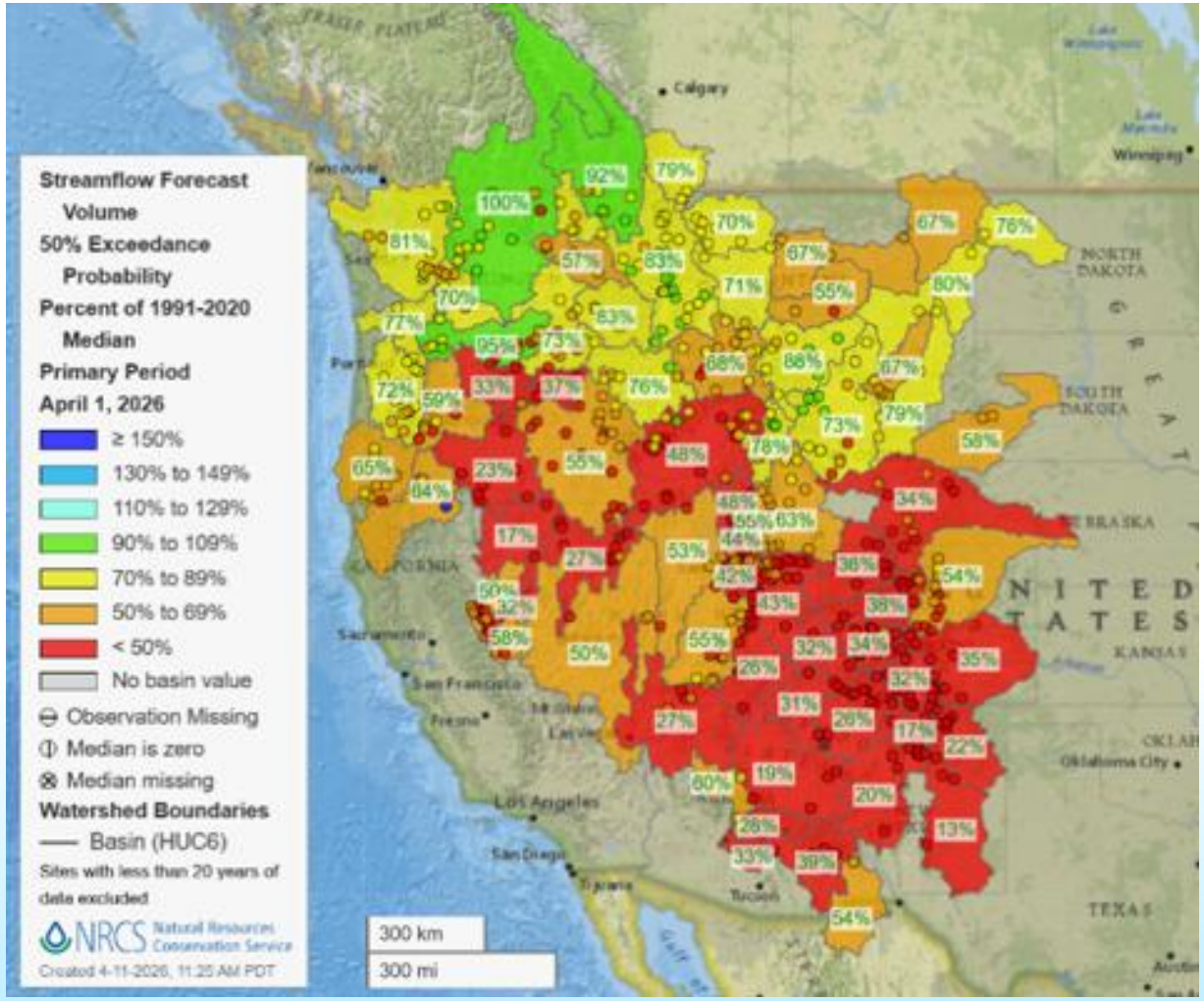


NASA satellite data-driven SWE-fusion



NASA satellite data-driven Snow Today

2026 Western US Snow Drought
The 2026 drought storyline



USDA NRCS water supply forecasts issued April 1

- Mountain snowpack is a gigantic reservoir driving the majority of the West's spring-summer river runoff
- "Snow drought" – low snow at start of spring, due to warm temp and/or low precip
- 2026: unusually severe & widespread
- Warm snow drought along West Coast + warm/dry snow drought in Intermontane West + West-wide March heat wave
- AZ, CO, ID, NV, NM, OR, UT, WY: record-low April 1 SWE; CA saw its 2nd lowest
- Particularly severe in Colorado Basin: many forecast points < 30% average river runoff
- Hydrologic drought is persisting into June 1 residual forecasts – little relief in sight

2026 Western US Snow Drought
Examples of implications

Columbia River Basin

- Spring snowmelt helps water managers balance flood risk, water supply, water quality, recreation, and ecosystem needs
- Reservoir operations guided by legally mandated instream flow requirements to rebuild commercial and recreational salmon fishing industries
- Example: Cougar Reservoir is managed by USACE to support salmon migration, which can require releases to keep water levels low into spring before refilling for summer needs
- But with April 1 SWE in some Lower Columbia sub-basins at 14-27% of normal, spring runoff may not be enough to refill

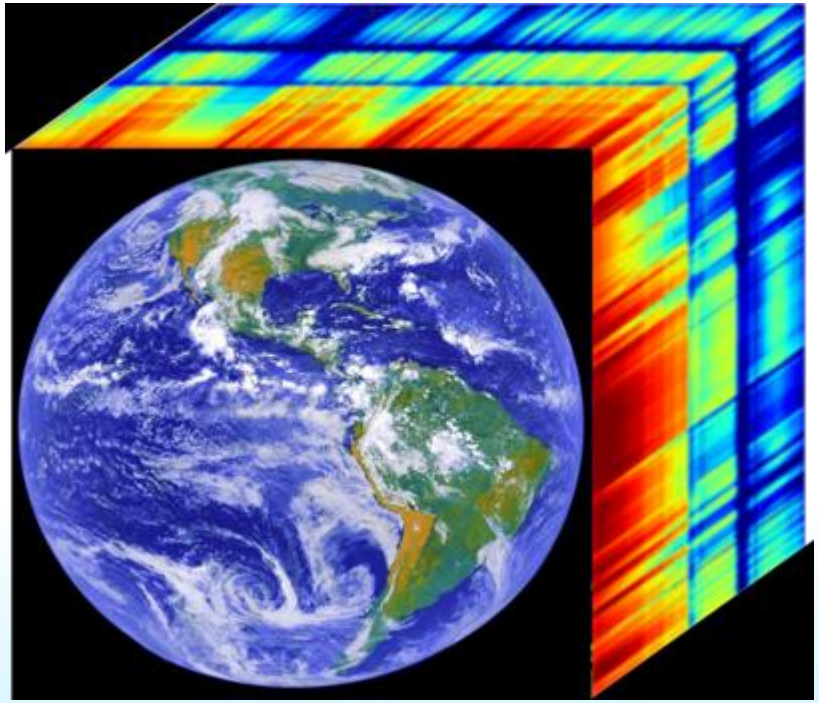
Colorado River Basin

- 2026 snow drought exacerbates historical overallocations under 1922 compact and reservoirs depleted by years of drought
- Water levels at Lake Powell may drop below level needed to generate hydropower
- Cascading risks for electricity and water deliveries across the Southwest
- USBR may look to offset losses with larger releases from also-depleted upstream reservoirs like Flaming Gorge, which could intensify political and legal tensions between upper and lower basin states
- Arizona and Nevada may compensate by obtaining abundant water from San Diego's seawater desalinization plants?

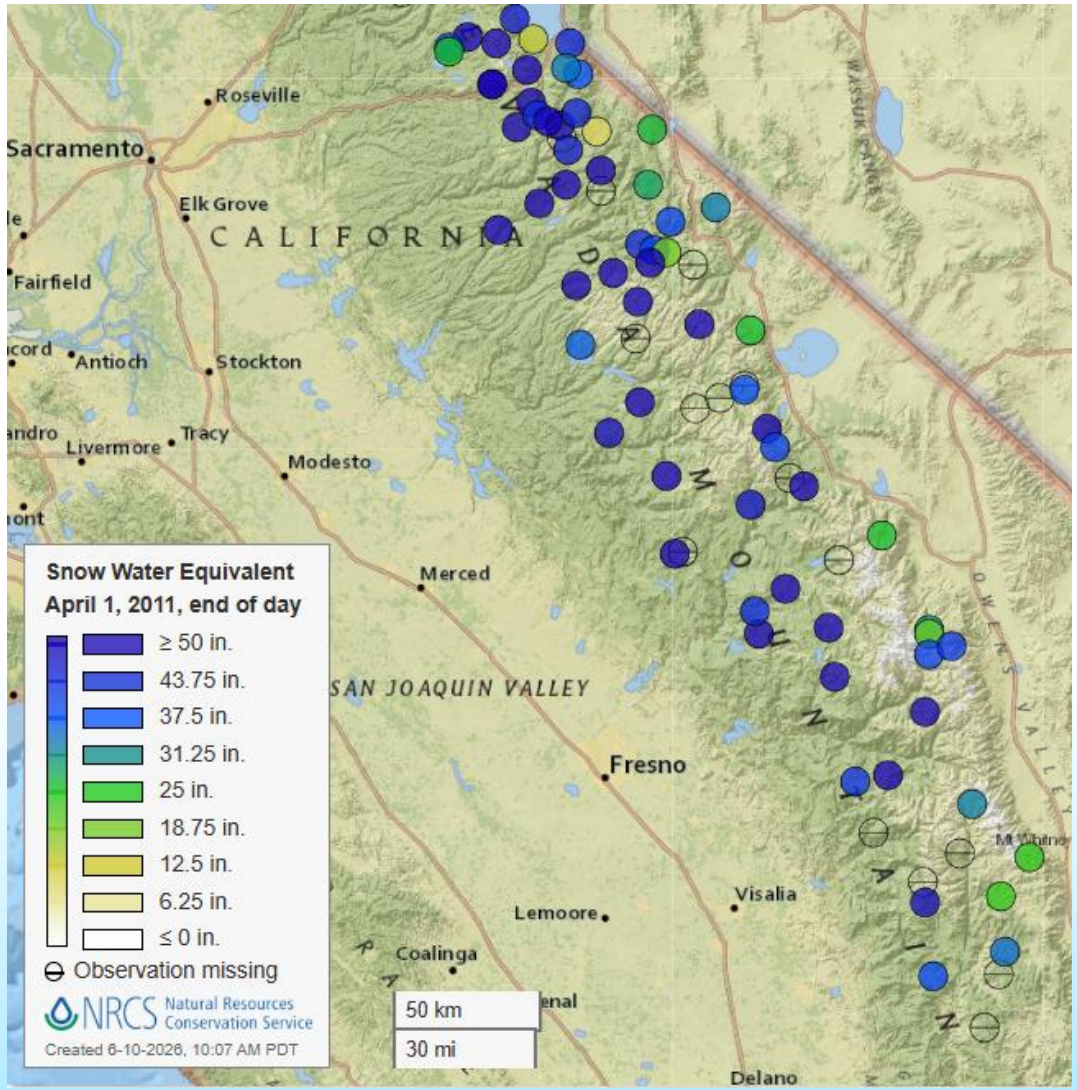
2026 Western US Snow Drought
NASA's role

What is NASA's unique contribution to addressing Western snow droughts?

- NASA is not a water management agency and does not make water policy
- **NASA leverages its Earth satellite fleet & other assets to objectively provide unique, high-quality, long-term, spatially complete data that water managers need to monitor snow drought, forecast its consequences, and respond effectively – filling critical knowledge gaps that in-situ networks and commercial satellites can't**
- NASA information is especially valuable because it is transparent, consistent across jurisdictions, scientifically vetted, and freely available
- These qualities matter when water decisions affect multiple states, sectors, communities, and legal obligations: NASA data facilitate a level playing field of available knowledge/agreed facts



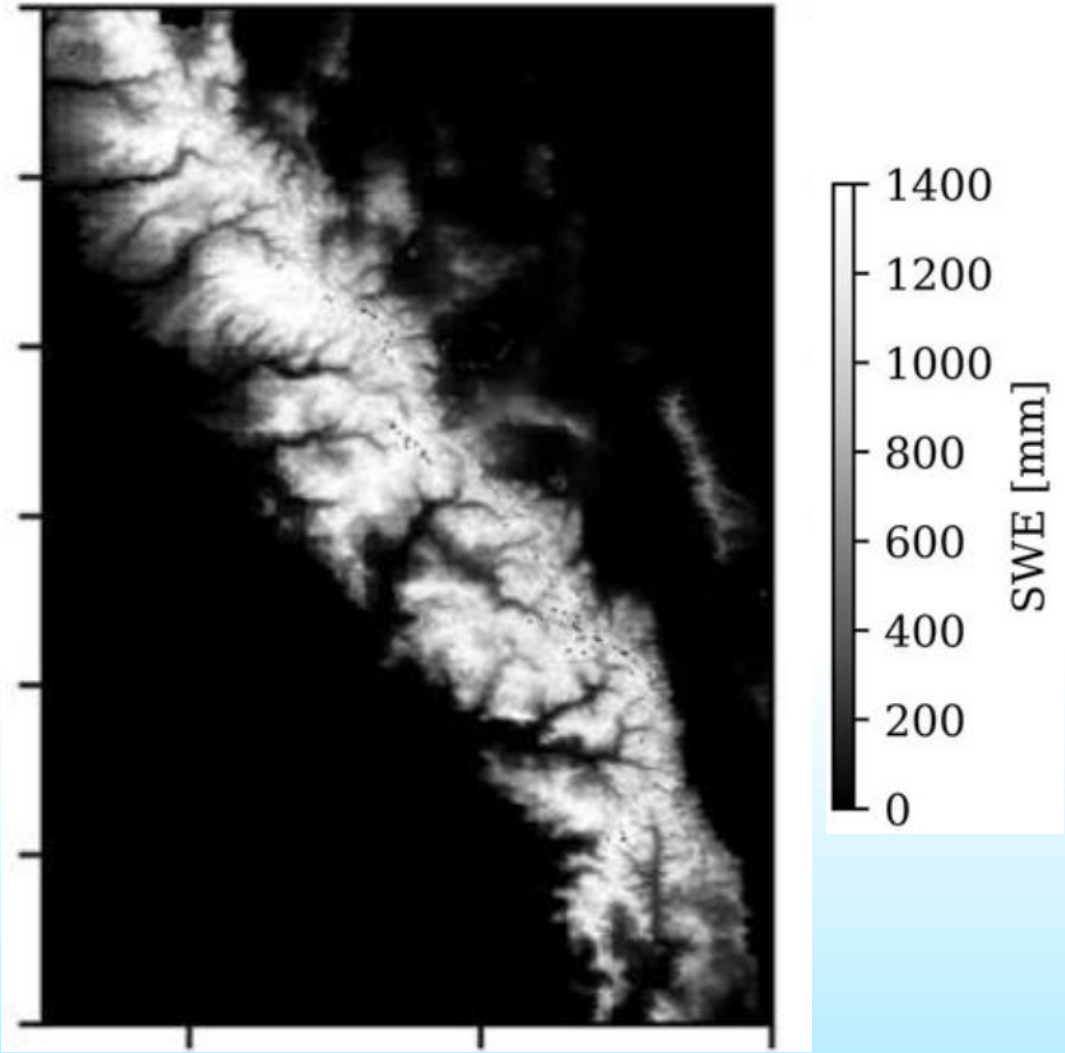
The 2026 Western US Snow Drought
How remote sensing helps



In-situ spatial point SWE measurements

- USDA NRCS & CADWR CCSS: carefully selected sites forming a network of ~1000 locations West-wide
- Sole source of widely available direct observations for SWE (telemetered snow pillows, manual surveys)
- Daily rain-or-shine data are backbone for operational water supply forecast & water management systems
- Necessary & irreplaceable ground truth/input for NASA & other remote sensing/snow models
- But no information between sites
- Problematic for rain-on-snow flood forecasting (low elevation snow below sites); early/late season (snowpack is patchy or rises above sites); and when narrowing margins between supply & demand require more precise information on total basin SWE

The 2026 Western US Snow Drought
How remote sensing helps

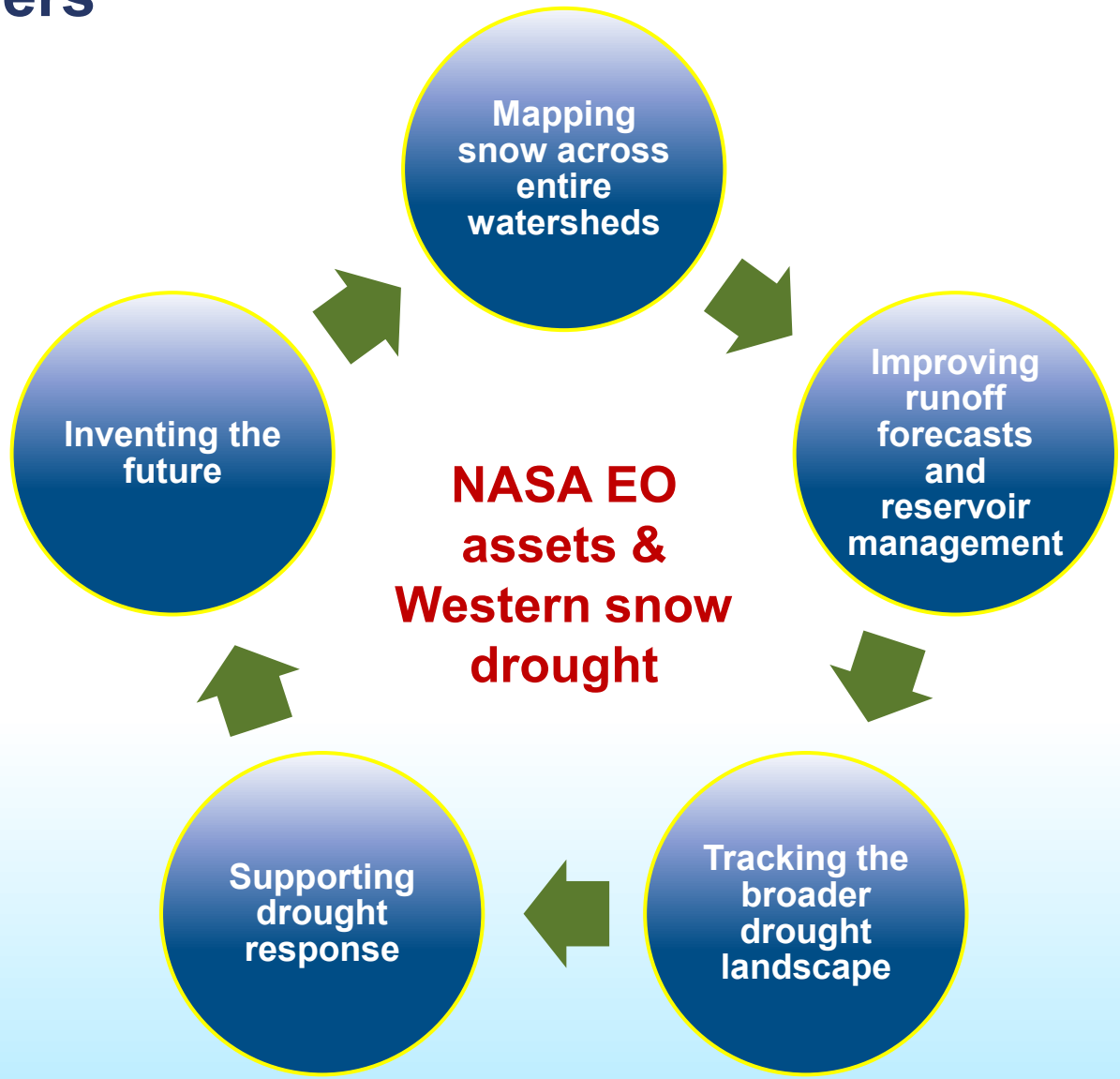


NASA remote sensing-based measurements

- Example: new large-scale SWE model from NASA Goddard Space Flight Center (Justin Pflug et al), shown for Sierra Nevada here
- Will be assimilated into NASA NLDAS-3, which in turn will be consulted by NIDIS
- Uses deep learning (LSTM) model driven by space-based (MODIS) multispectral remote sensing data
- Spatially complete and consistent information on mountain snowpack – not just at point locations
- Will have the reasonable resolution, high cadence, and short latency required for practical operational purposes

2026 Western US Snow Drought
How NASA supports water managers

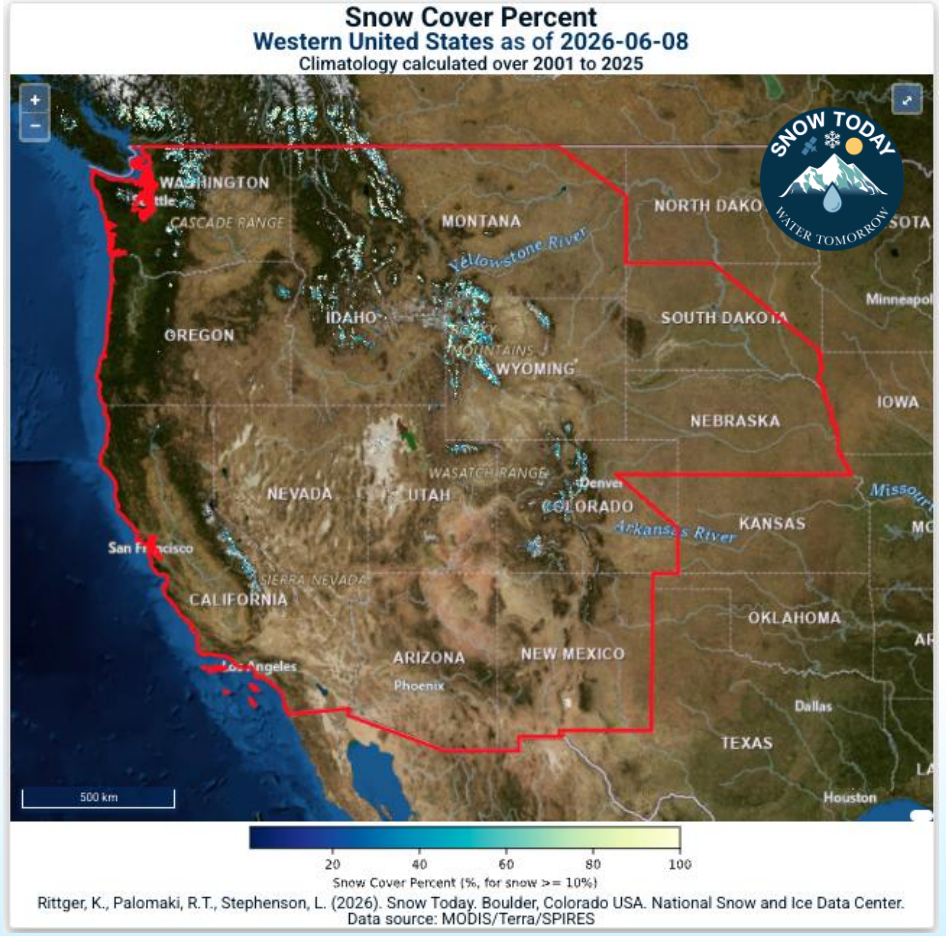
Five main ways NASA helps water managers act on snow drought



2026 Western US Snow Drought
How NASA supports water managers

1 Spatially complete snow mapping

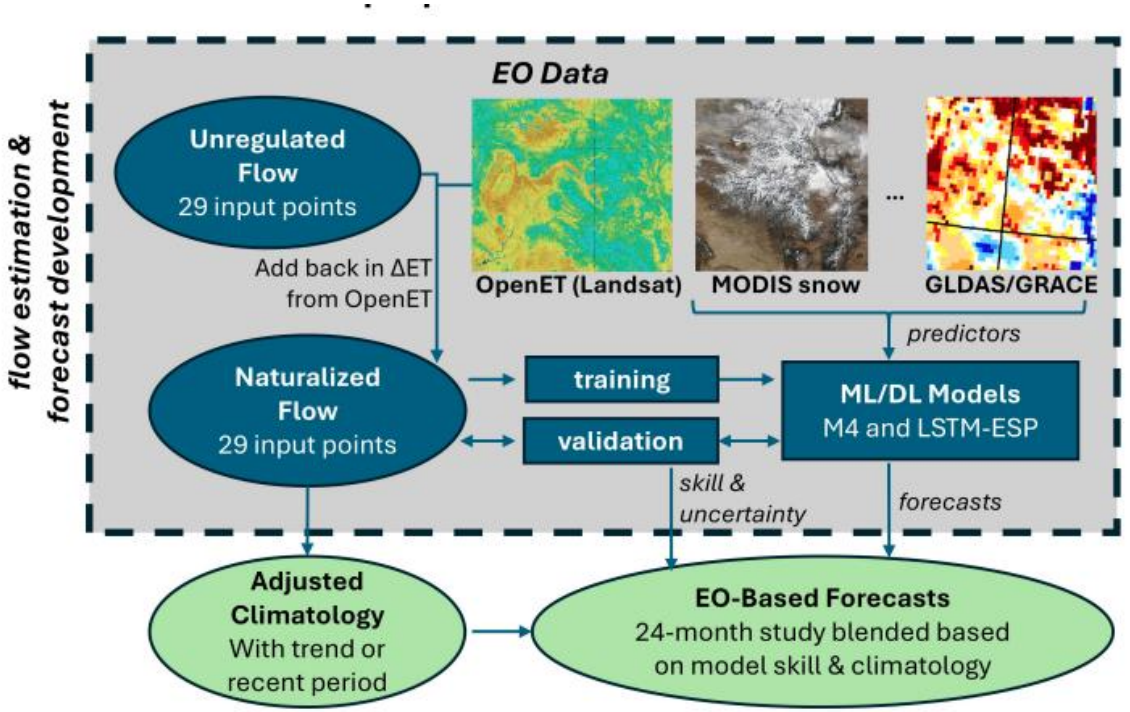
- Water managers need to know just how much snow there is & where it is
- NASA satellite and airborne remote sensing, and RS-driven modeling, enable detailed views of snow cover and SWE across Western watersheds
- Examples:
  - **NOAA SNODAS & CU Boulder SWE-Fusion**: Models that blend satellite data to estimate the actual water volume stored in snowpacks.
  - **NASA LSTM**: Next-generation deep learning models utilizing NASA data for advanced snow prediction.
  - **ASO Inc. / M3Works**: Airborne LiDAR mapping (developed at NASA/JPL) for highly precise snow depth measurements.
  - **Citizen Snow Observatory (OSU)**: Enhancing physics-based models with satellite and citizen-gathered ground data.
  - **Snow Today**: Daily satellite maps showing snow-covered extent and duration.



2026 Western US Snow Drought
How NASA supports water managers

2 Improved river runoff/reservoir inflow forecasts

- Optimally allocating scarce resources (like water in a snow drought) requires careful management; management requires planning; planning requires forecasts
- Reservoir inflow forecasts are a cornerstone of Western US water systems, using fine-tuned hyperlocal watershed models to translate climatic context into specific and actionable water information – streamflow predictions – at the scales and locations decision-makers actually work at
- Examples:
  - **NOAA CBRFC:** Uses *Snow Today* MODIS-derived snow albedo data to constrain melt rates in snowmelt/streamflow models.
  - **ASO & SWE-Fusion:** Provides direct quantitative guidance to forecasters in the Sierra Nevada and Rockies.
  - **Upstream Tech:** Ingests MODIS snow cover into deep-learning commercial streamflow forecasts.
  - **Salt River Project:** Uses the multi-sensor, ML SWANN model (University of Arizona) for forecasting.
  - **USDA-NRCS:** Currently integrating GRACE groundwater data, SWE-fusion, and MODIS snow cover data into their advanced M4 West-wide runoff forecast model.

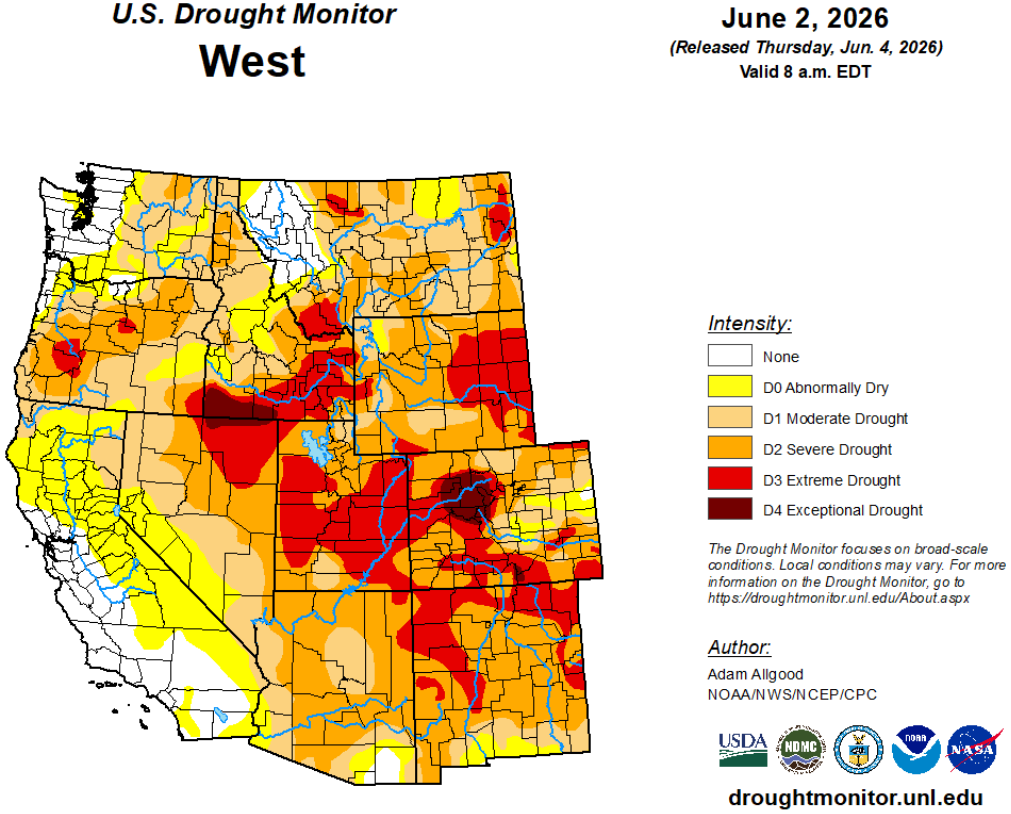


EO-driven framework for natural flow estimation and ML/DL-based streamflow forecasting. (Small et al. CU Boulder)

2026 Western US Snow Drought
How NASA supports water managers

3 Tracking the broader drought landscape

- Snow isn't the only important environmental variable in a snow drought
- For instance, dry subsurface conditions (groundwater levels and soil moisture) act as a sponge that absorbs snowmelt and can create downstream hydrologic drought during a normal snow year – and conversely, wet subsurface initial conditions can mitigate the impacts of a snow drought

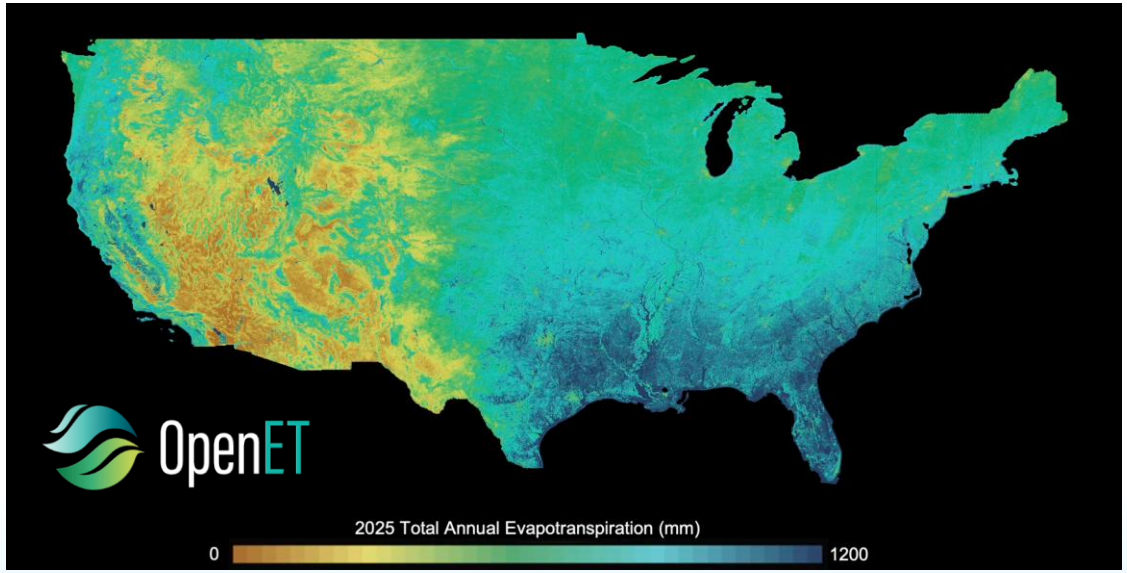


- Examples:
  - **Below Ground (GRACE, SMAP, NISAR):** Mapping groundwater and soil moisture to detect hidden droughts and track water reserves.
  - **Surface Water (SWOT, VIIRS):** Monitoring river flows, reservoir levels, and shrinking/growing lakes from space.
  - **Ecosystems & Watersheds (ECOSTRESS, HLS, EMIT, OPERA)**: Tracking how forests use water and how wildfires impact downstream water processes.
  - **Decision Support (LDAS):** Fusing this data into seamless, high-resolution models that power the US Drought Monitor (e.g., WLDAS: Colorado state climatologist; NLDAS-3: NIDIS)

2026 Western US Snow Drought
How NASA supports water managers

4 Drought response

- NASA data also helps guide water management responses when a drought is anticipated or underway
- One high-profile success is OpenET, widely adopted by water managers and farmers to manage agricultural water use during drought, conserving water and saving money
- Uses Landsat to measure consumptive water use (irrigation minus return flows) at high resolution in near-real time & makes the information easily accessible to a wide range of users
- Multi-benefit, “win-win” opportunities illustrated by OpenET are a defining characteristic of NASA’s open-science approach to drought response, at scales ranging from an individual farmer’s field to the entire Colorado River Basin



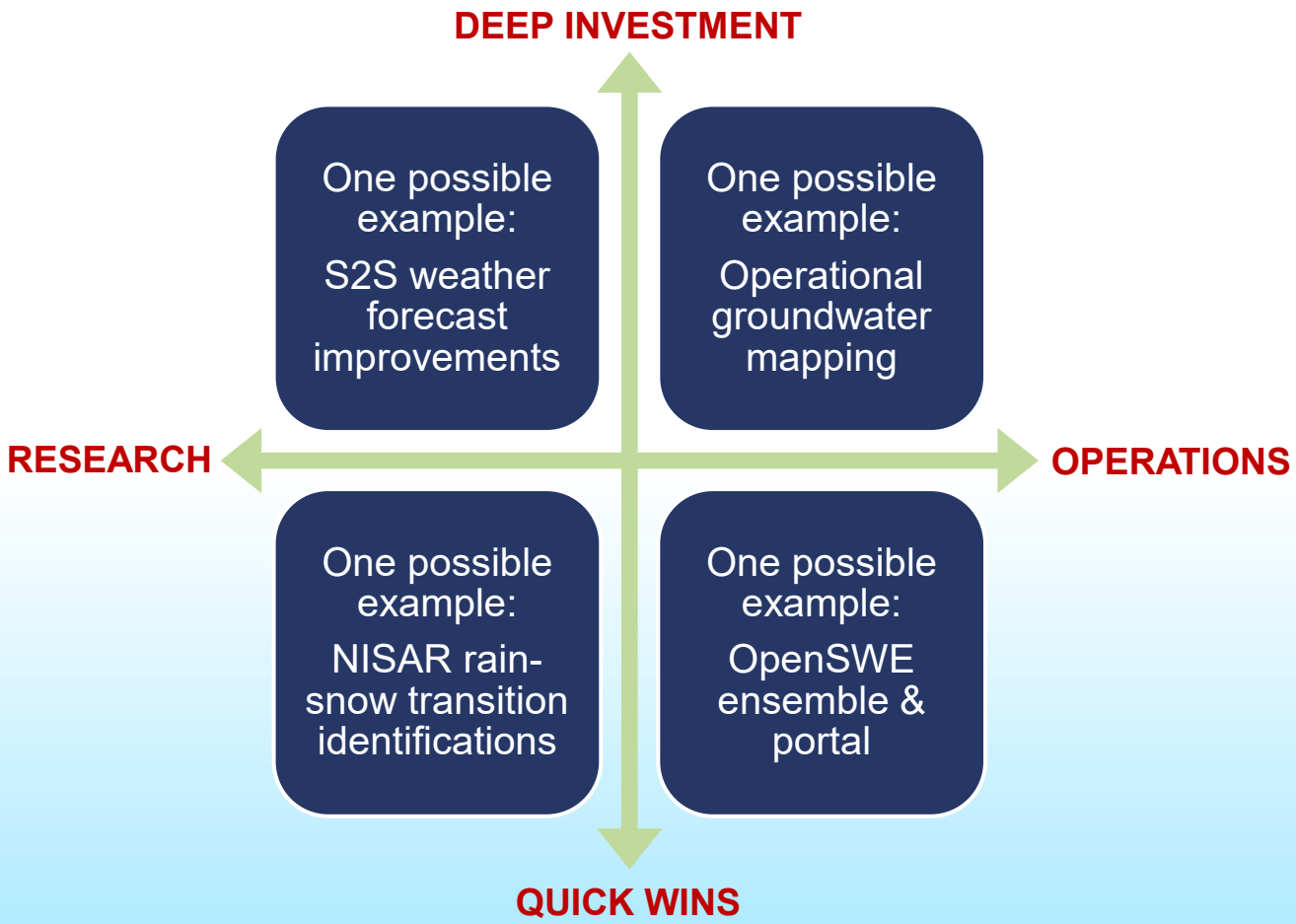
2026 Western US Snow Drought
How NASA supports water managers

5 Inventing the future

- Innovation is NASA's hallmark, and missions like MODIS and Landsat (with USGS) created iconic datasets that fundamentally changed how we understand the world and manage water
- This innovation continues….
- Snow drought: water managers report to WRP that uncertainty around how dire the situation will actually be this summer itself deeply complicates decision-making – and that what NASA brings to the table around snow drought management is unique data that mitigates this uncertainty… focus for present & future NASA work
- Snow drought has diverse impacts: integrated efforts within WRP, across NASA Earth Science Division Earth Action, and beyond across all of NASA + federal/state/local agencies
- **Where are we taking this next?**

2026 Western US Snow Drought
Inventing the future: all hands on deck at NASA

PROJECT PORTFOLIO



MISSION PORTFOLIO

- **EAGLE**
  Landsat-like spatial resolution with VSWIR hyperspectral + TIR multispectral
- **FALCON**
  lidar, radar, PMM
- **GRACE-C**
  Continuity with GRACE + GRACE-FO
- **QGG**
  Quantum sensors for high-sensitivity gravity measurements

Consider: Are Earth Observations right for you?

Earth observations (EO) can include satellite data, observations, models, simulations – sometimes in combination with *in situ* data.

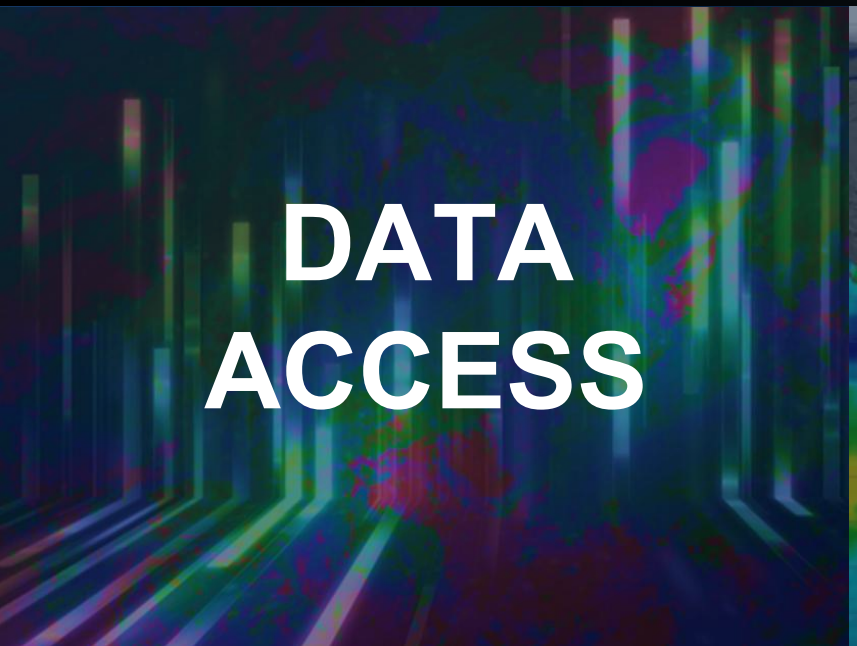
- **What decisions and actions could EO data support?**
  - Clearly define decision-making processes, including the decision(s) and who makes them
  - Identify the variable or phenomena of interest (e.g., surface water extent, soil moisture)
  - Determine if there is a threshold that triggers a decision or action
  - Keep in mind other data and tools that come into play, and where EO data could add value
- **Has someone done this before?**
  - Research case studies such as GeoEvidence Explorer
- **Consider ethics and risks of introducing EO**
  - Potential for misinterpretation and misuse, including understanding accuracy
  - Protecting sensitive location data
- **Distinguish between "must have" vs "nice to have"**
  - Consult with technical advisors on aspects such as spatial resolution, frequency, and latency
- **Consider *how* you could engage with EO data – processing yourself? Using a mapping portal?**
  - There are different entry points to downloading/analyzing versus visualizing NASA EO data

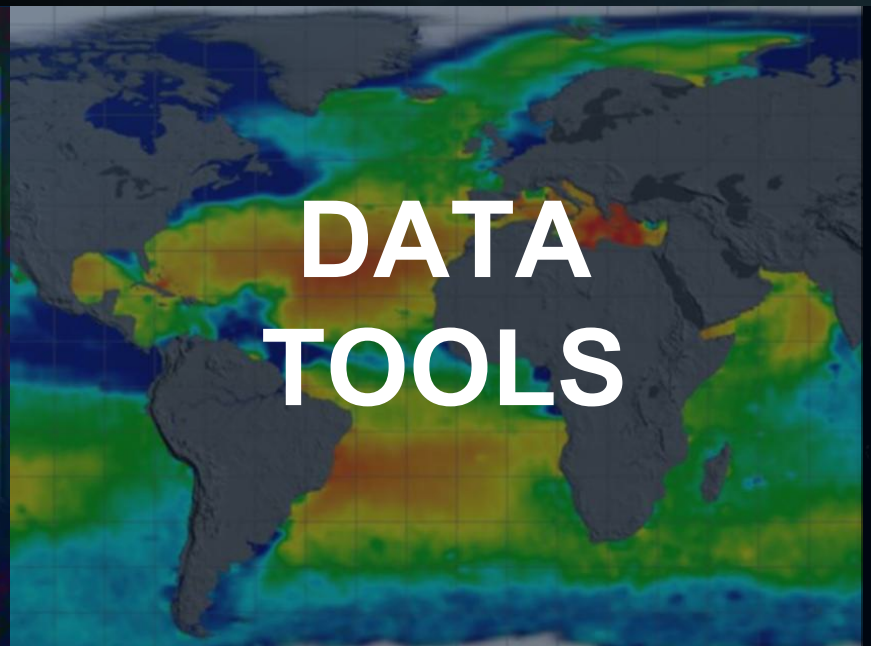
We understand that there are barriers to entry for using the data, and we're here to help.

*Adapted from https://nasalifelines.org/lifelines-gallery/eo-humanitarian-decision-maker-guide/

Your Gateway to NASA Earth Observation Data

The Earth Science Data Systems (ESDS) Program provides open access to NASA's archive of Earth science data, empowering researchers and decision makers to better understand and protect our home planet.





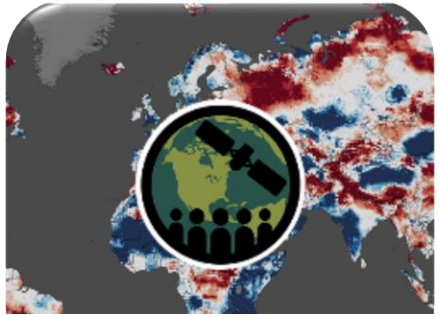
Getting Started with NASA Water Data

NASA Applied Remote Sensing Training Program (ARSET)

Featured Trainings:

Monitoring and Predicting Floods Using NASA EO (June 18-25, 2026)

NASA EO for Reservoir and Water Utility Management (August 4-11, 2026)



Monitoring Groundwater Changes for Water Resources Management

NASA Snow and Ice Data Products and Applications for Water Resources Management

Monitoring Water Quality of Inland Lakes using NASA EO

We are a part of an **ecosystem**

Users & Decision-makers
Fed, state & local gov, general public, private sector, and others

Private Sector LLMs/GeoAI, Consultancies, and Value-added Data Services

Commercial Satellite Data Providers

Other public EO data providers

USGS science for a changing world

NOAA

esa

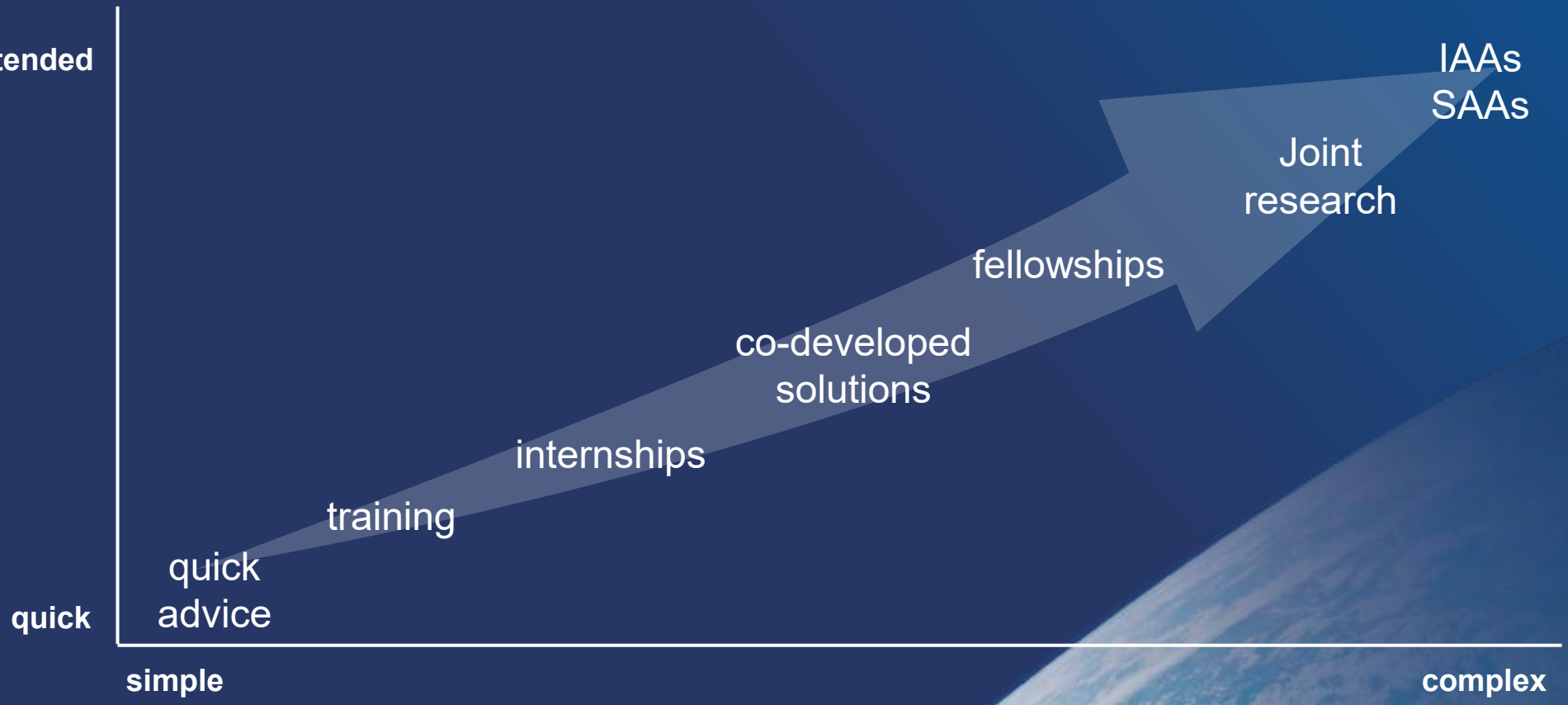
Copernicus Europe's eyes on Earth

Researchers and Applications developers

NASA Earth Science

Working with **NASA Water Resources**

There are many ways to work with NASA Water Resources. We could introduce you to valuable new data, develop partnerships that can optimize or transform entire workflows, and many things in between.



Who to contact at

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https://tinyurl.com/NASA-WSWC

NASA Earth

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