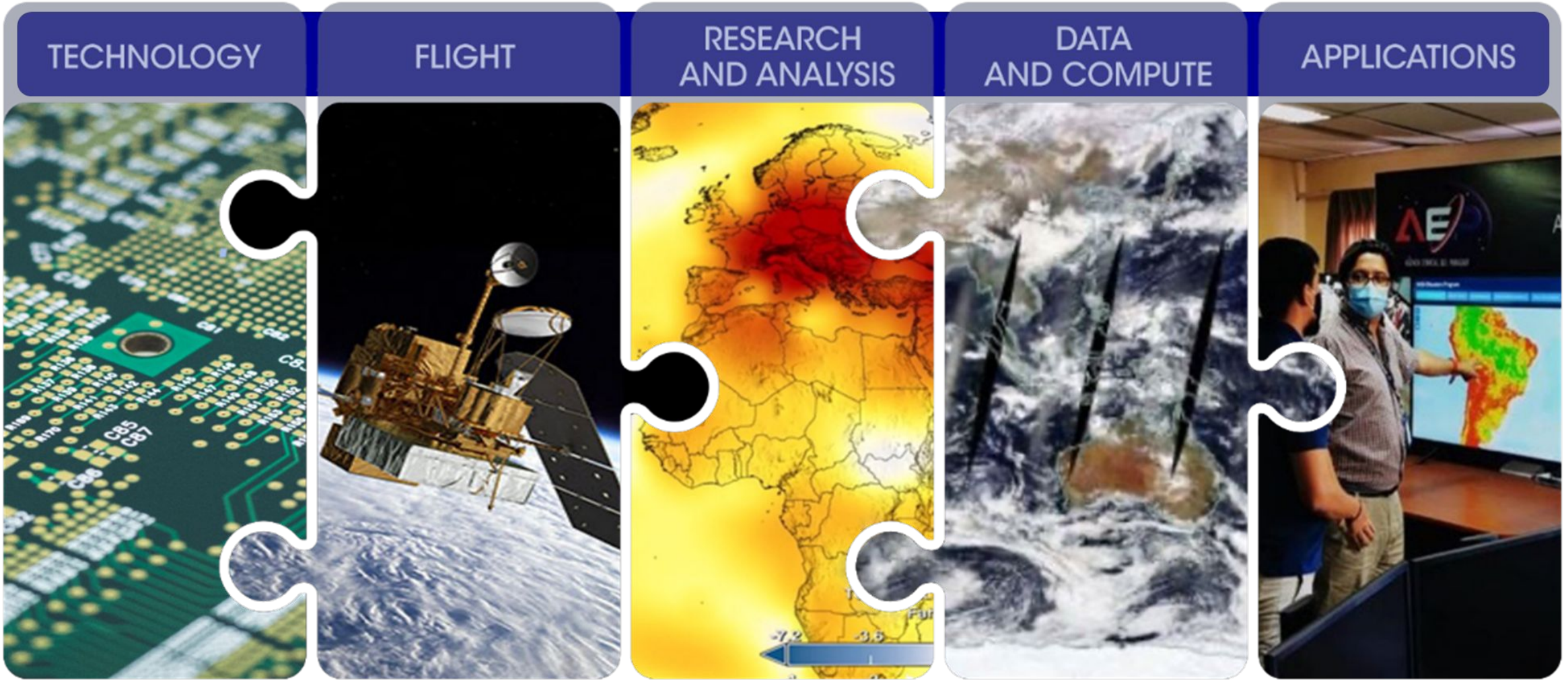
NASA
EARTH SCIENCE

# *Advancing Earth System Science End-to-End*



# APPLIED SCIENCES PROGRAM

**Mission**

Enable people & organizations to apply insights from Earth science to benefit the economy, health, quality of life, and environment.

**What We Do**

We make financial and programmatic investments to generate creative solutions and lower the technical and institutional barriers to using Earth science information

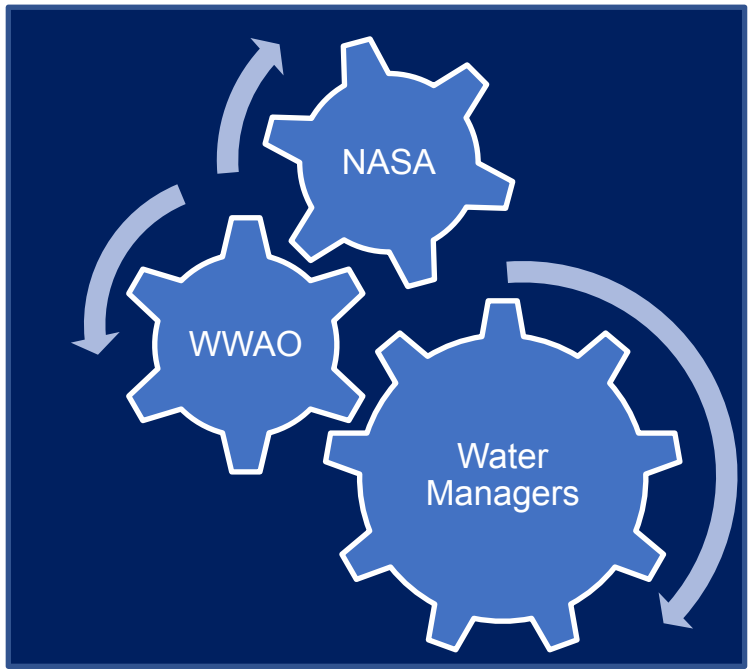
- Work with organizations to use Earth science to improve their decisions and actions
- Draw on our connections with users to bring their feedback and inquiries back to ESD


*User-centric, Solution-oriented, and Applying the most appropriate science*

https://AppliedSciences.NASA.gov/

# NASA's Western Water Applications Office

**Tools for managing a scarce resource**




WWAO's Mission

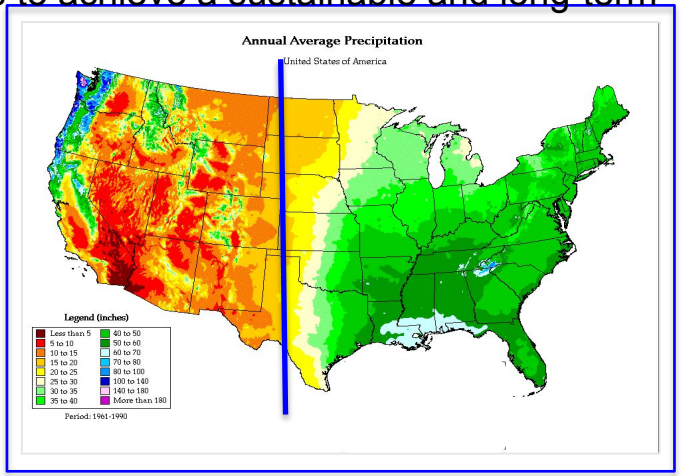
- **Improve how water is managed by getting NASA data, technology, tools into the hands of western water managers**
  - **WWAO was externally reviewed in 2021. New 5 year plan will begin FY23**

WWAO does this by:

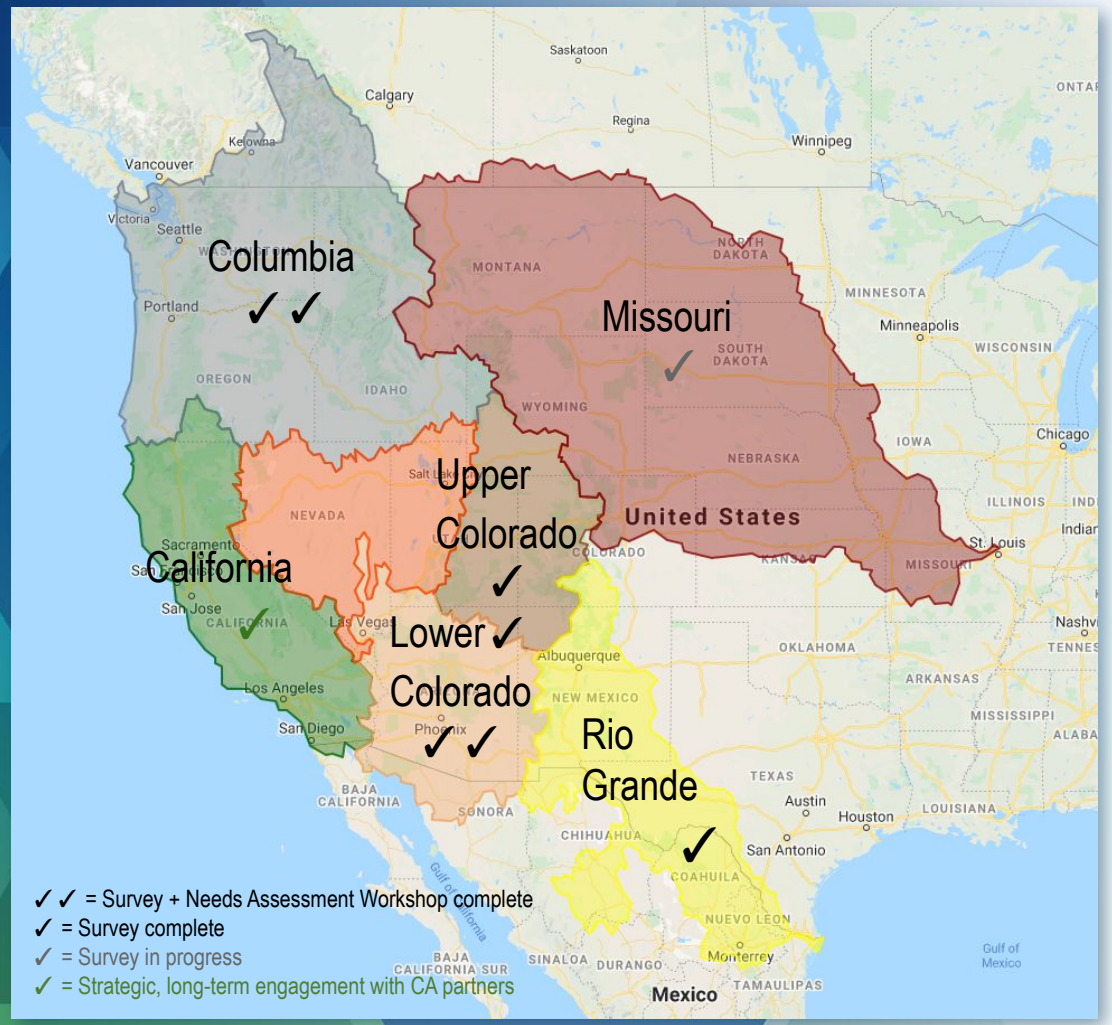
- **Identifying Earth observation needs** in western water management for information and decision support
  - Colorado RB – complete
  - Columbia RB – complete
  - Rio Grande RB – in process – workshop Mar 2022
  - Missouri RB – initiated
- **Making Connections** between stakeholders and NASA scientists, technology, tools, and data, and supporting projects to address needs
- **Transitioning** water applications into operations to achieve a sustainable and long-term impact
  - OpenET
  - Navaho Nation – DSET
  - CropCASMA – USDA NASS – soil moisture
  - Fallowed Land rapid mapping
  - Snow-water from space
  - Ssnow-water from airborne (ASO)
  - More to follow

Why WWAO?

- NASA's science, remote-sensing data and expertise can bring a unique set of capabilities to solving water challenges
- Remote-sensing data can have a real impact on water management
- WWAO leverages decades of investment in science and technology, as well as well-established relationships with stakeholders



# Basin Needs Assessments




A Need Assessment, as defined here, is a multi-part process of identifying and understanding water resources gaps (needs) in the Western U.S and how Earth observations can fill those gaps.

| | | |
|---|---|---|
| Basin Survey | Background Research | Partner interviews |
| Assessment Workshop | Pre Workshop Seminar | Interactive workshop |
| Use Case Definition | Refine Definitions with Partners | Generate Report |
| Projects based on use cases | Informs project development | Projects (co) led with Partners |

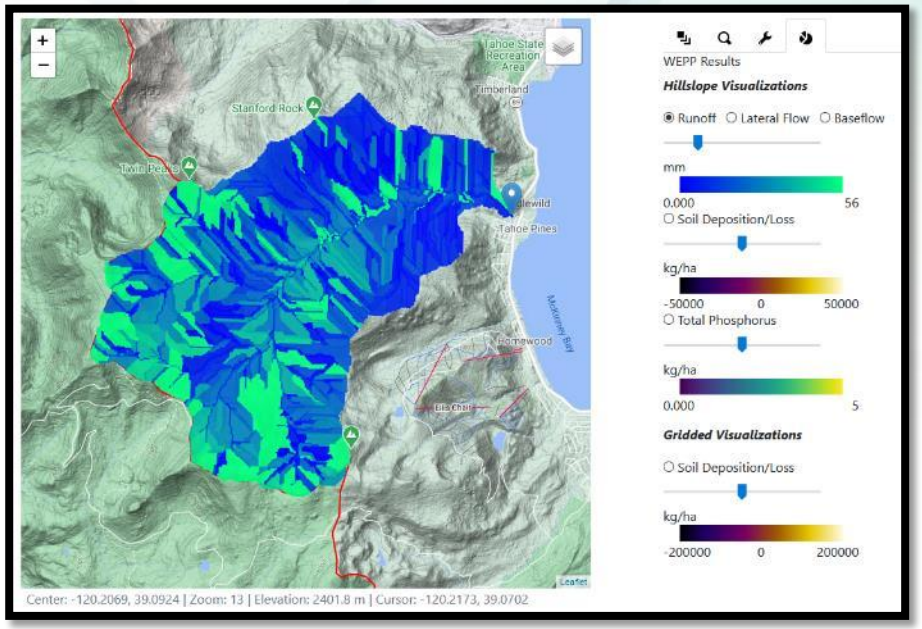
# Improving predictions of water yield and sediment loads in the Columbia River Basin through the incorporation of Landsat-derived vegetation parameters into an existing online process-based hydrology and erosion model (WEPPcloud) (PI: Mariana Dobre, University of Idaho)

https://wepp.cloud/weppcloud

**Problem**: Land managers, water utilities, Burned Area Emergency Response (BAER) teams, and others need tools to quantify the effects of pre- and post-fire treatments on runoff and soil erosion.

**Solution**: Integrate satellite-based vegetation information into the Water Erosion Prediction Project (WEPP) cloud implementation to improve accuracy of runoff and erosion predictions.

**Value:** Improve the accuracy of runoff and erosion predictions to support decision making related to forest treatment programs and post-fire response to mitigate fire impacts on erosion and water quality.

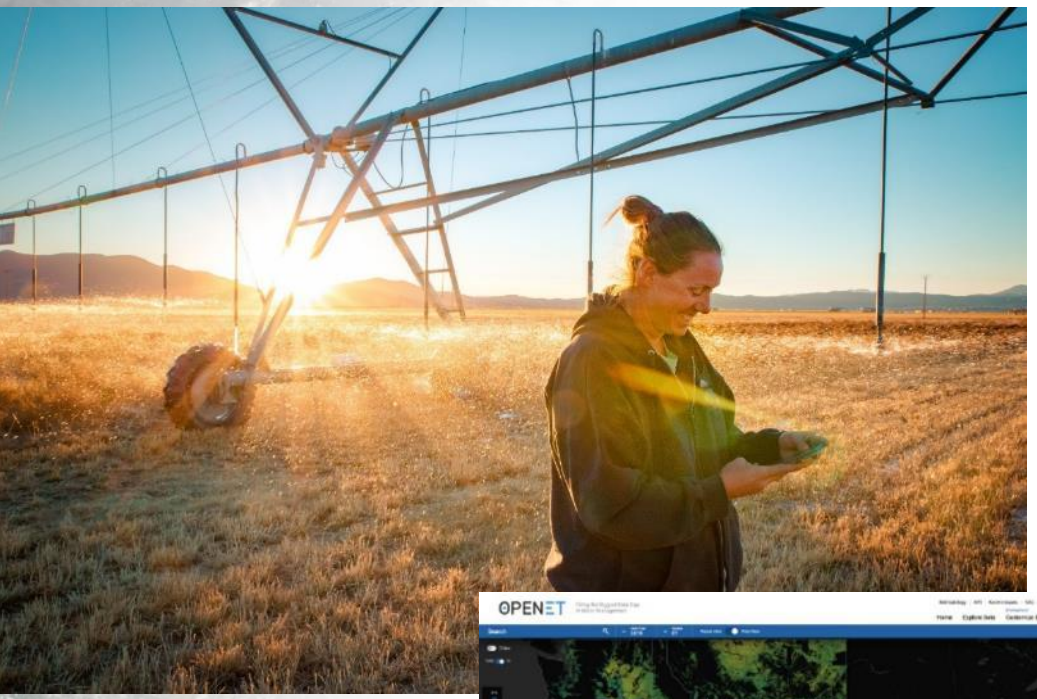


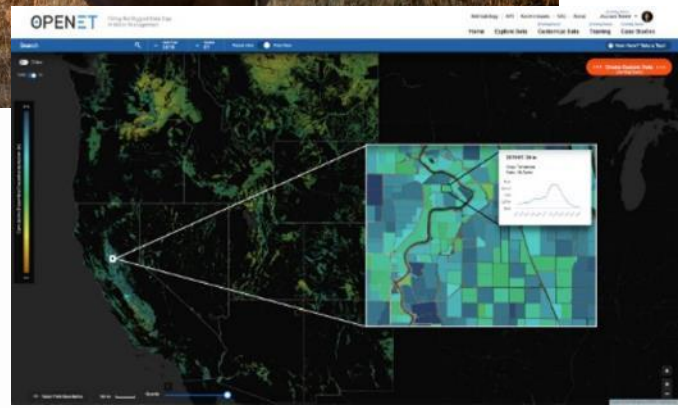

**Simulates: pre- and post-disturbance runoff and soil erosion**

University of Idaho

Washington State University

OPENET






Above: Nevada farmer Denise Moyle will use OpenET to plan irrigation of her alfalfa fields

Right: Screenshot of OpenET platform

# Filling the Biggest Data Gap in Water Management in the Western US

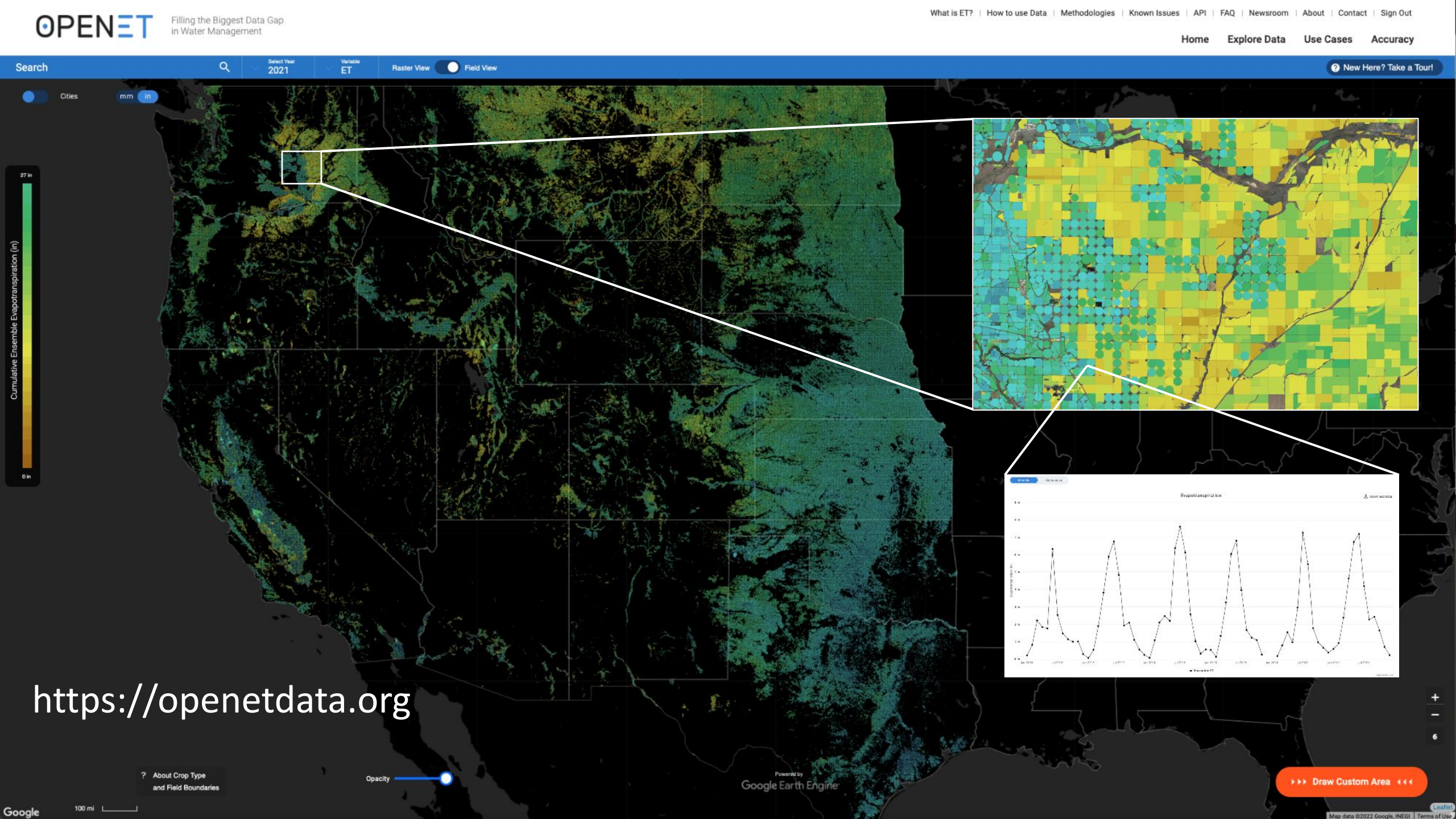
Launch of an operational system of freely-available NASA Earth data on evapotranspiration (ET) now in the hands of farmers and water resource managers

Also supports incentive-driven conservation programs and demand management in the Colorado River Basin and groundwater management in California

Provides data, primarily from the Landsat mission, at:

- daily, monthly and annual timesteps
- a spatial resolution of about one field, 30m x 30m

https://openetdata.org/


OPENET
Filling the Biggest Data Gap in Water Management
What is ET? | How to use Data | Methodologies | Known Issues | API | FAQ | Newsroom | About | Contact | Sign Out
Home
Explore Data
Use Cases
Accuracy
Search
Select Year
2021
Variable
ET
Raster View
Field View
New Here? Take a Tour!
Cities
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in
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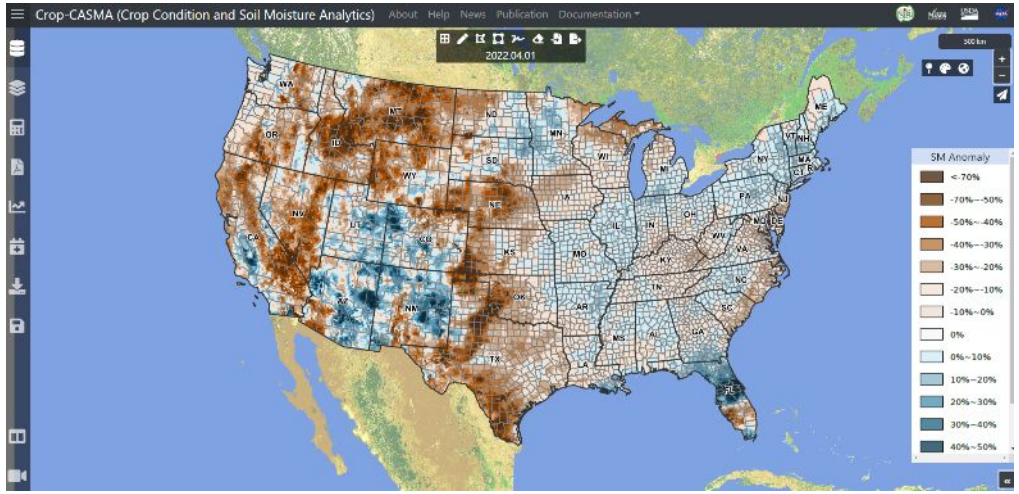
Cumulative Ensemble Evapotranspiration (in)
0 in
Evapotranspiration
? About Crop Type and Field Boundaries
Opacity
Powered by
Google Earth Engine
Draw Custom Area
Google
100 mi
https://openetdata.org

# 2021 Freshwater Activities

- **Landsat 9 launch**
- **5-year review of WWAO**
- **Launch of OpenET**
- **Columbia River Basin Project Selections**




*The Crop-CASMA data viewer shows soil moisture anomalies for CONUS on 1-April-2022: Many western areas showing over 50% less moisture than average.*

# 2022 Freshwater Activities

- **SWOT Launch**
  - Terrestrial water bodies and river discharge volumes; ocean topography
- **Awarded 30 new Water Resources Applications projects**
  - 17 projects addressing water resources in the US West
- **Landsat Next Planning**
  - Finalizing mission concept
- **Missouri and Rio Grande River Basins: EO needs assessments**
- **Domestic Agriculture Consortium – soliciting proposals (due June 17)**

## USGEO: U.S. Group on Earth Observations

Manages a biennial Satellite Needs Process for civil Earth observations needs

Agencies submit needs to NASA for specific satellite-based Earth observation data and information products

### SNWG-2016 and SNWG-2018 Cycles: Water Resources Investments

- Harmonized Landsat-Sentinel-2 products: Sub-weekly, calibrated, multispectral products
- Soil Moisture: Production of NISAR global 200m soil moisture product; increased downlink bandwidth
- Global Surface Water Extent: Harmonized product across Landsat/Sentinel-2/Sentinel-1/NISAR/SWOT
- Land: North America Land Surface Disturbance product/time series on sub-weekly scale (Sentinel1+NISAR)

### SNWG-2020 Cycle: Water related

- Global Harmonized Landsat/Sentinel-2 derived vegetation indices suite

### SNWG-2022: 4th Cycle of Satellite Needs Process

- Agencies submit needs to NASA by Fall 2022

President's FY23 Budget Request includes $20M for satellite needs priorities from agencies

EARTH.
SCIENCE.
ACTION.

# NASA Headquarters
# Science Mission Directorate
# Earth Science Division
# Applied Sciences Program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