



National Aeronautics and
Space Administration

NASA earth

**National Shellfish Aquaculture
Introduction to NASA Water Resources Program**

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Earth Science Division





National Aeronautics and
Space Administration



EARTH SCIENCE TO ACTION STRATEGY 2024-2034





Earth Science to Action (ES2A)

The strategy taps into NASA Earth Science Division's end-to-end capability as an open enterprise to incorporate innovation, scientific discovery, and emerging user needs to accelerate the use of Earth science and inform the next iteration of programs, missions, and initiatives.

Objectives:

- Holistically observe, monitor, and understand the Earth system
- Deliver trusted information to drive Earth resilience activities





What do we mean by ‘action’?

Our definition of action is accelerating the use of Earth science to support policy and decision-making for society’s well-being.

Be user-centered

Tailor efforts to meet user needs and requirements

Build Bridges

Build bridges across NASA teams, divisions, interagency partners, and commercial private sector.

Scale

Take existing capabilities—applications, models, DSTs—and scale them (horizontally and vertically)





NASA Water Resources Program

The goal of the NASA Water Resources Program is to improve water management using NASA Earth science data, strengthening economic and systems resilience, and reducing water-related risks for communities and ecosystems.

Water Resources Program Objectives

- Optimize Water Use and Management Across Sectors and Geographies
- Advance Water Quality Monitoring and Solutions
- Reduce Risk and Strengthen System Resilience
- Foster Public Awareness and Empower Communities
- Drive Innovation and Accelerate Impact

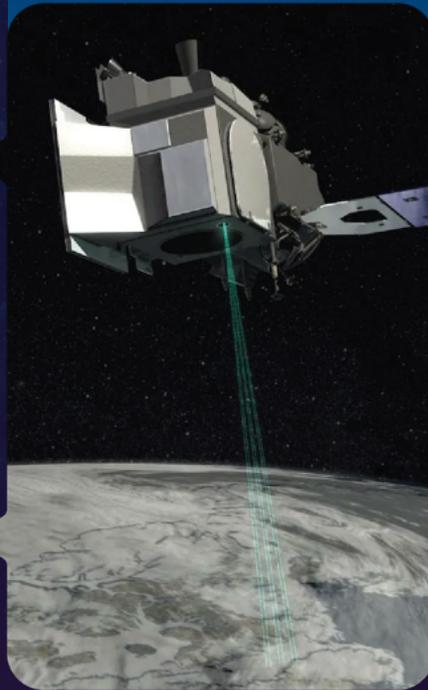


Advancing Earth System Science End-to-end

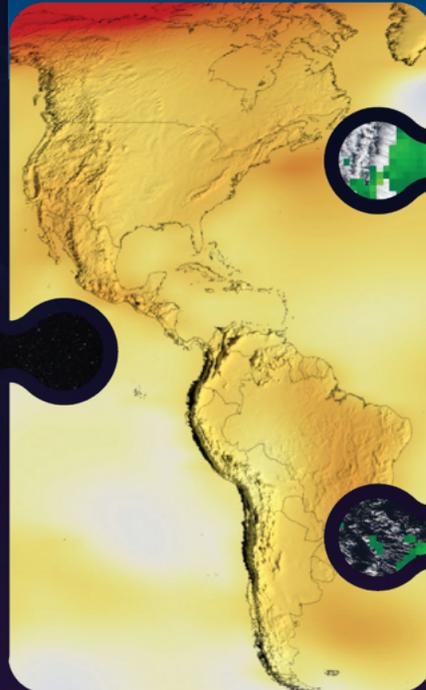
Technology



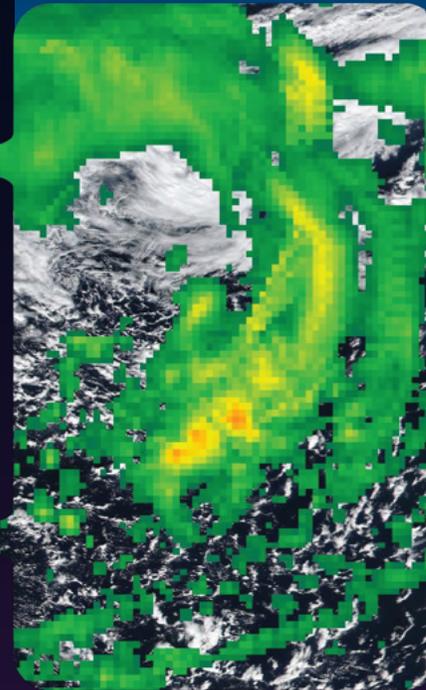
Flight



Research and Analysis



Data and Modeling



Earth Action



Leveraging Earth observations





NASA Water Data

- Precipitation
- Snow Cover
- Groundwater
- Water Quality
- Evapotranspiration
- Soil Moisture
- Surface Water

NASA Water Resources Program

NASA Satellite
Data



Sustained use of NASA data in
water resource management
decisions.





**SOLID
EARTH**

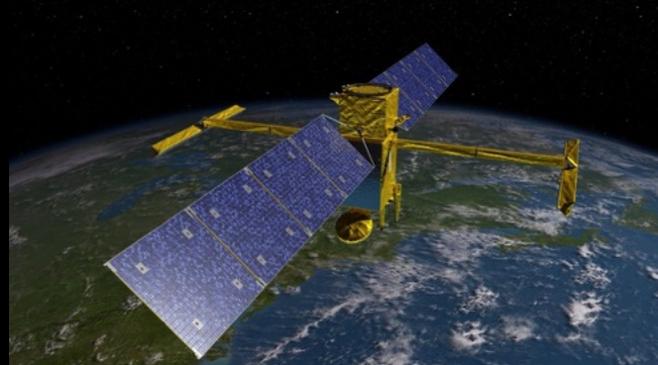
**WATER
CYCLE**

**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

Plankton Aerosol, Cloud, Ocean Ecosystem (PACE)

Launched:
Feb. 2024

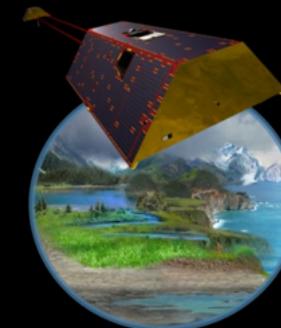


NASA-ISRO SAR (NISAR)

Launched:
July 30, 2025

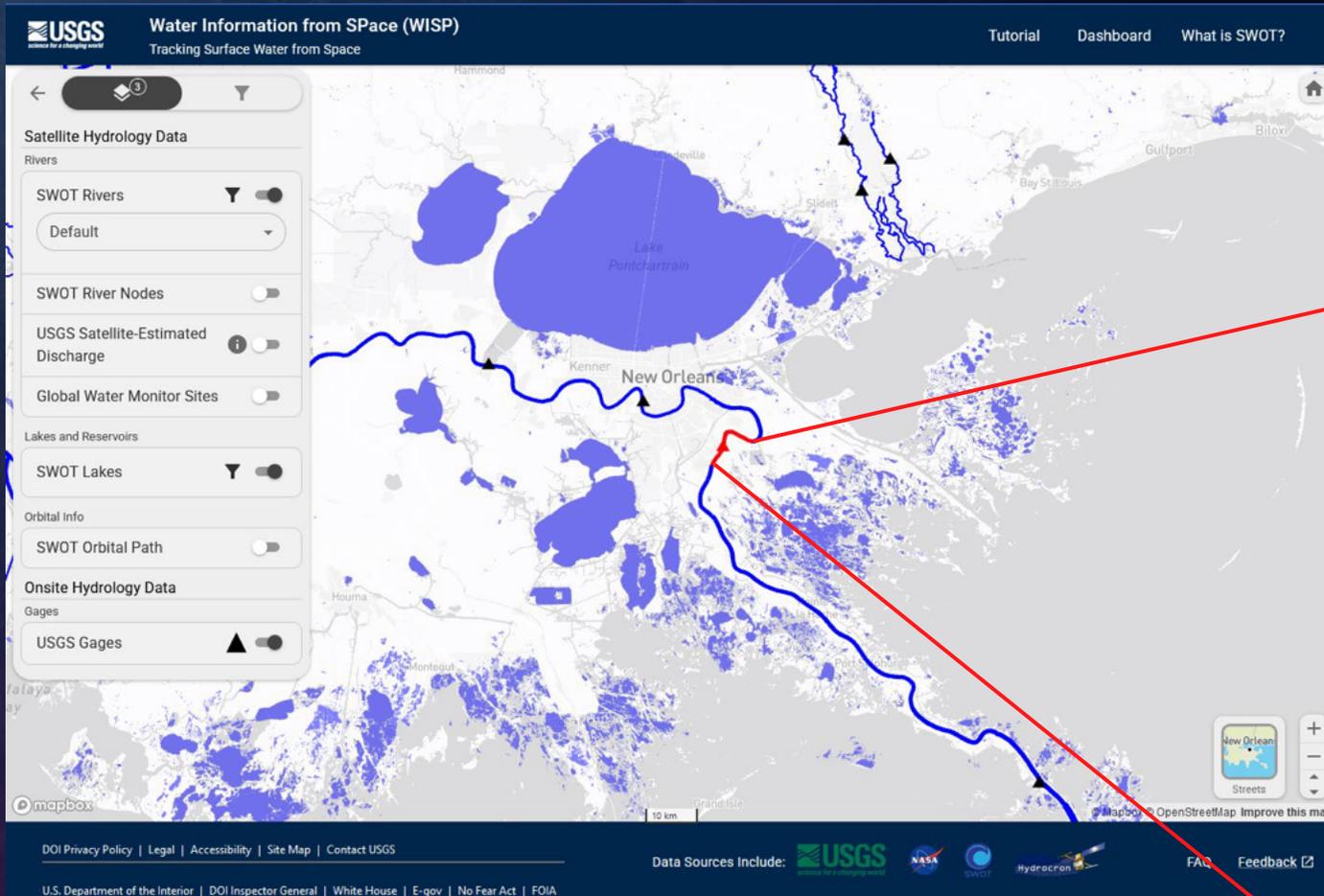
Gravity Recovery and Climate Experiment –Continuity (GRACE-C)

Launch Target:
late 2028



SWOT

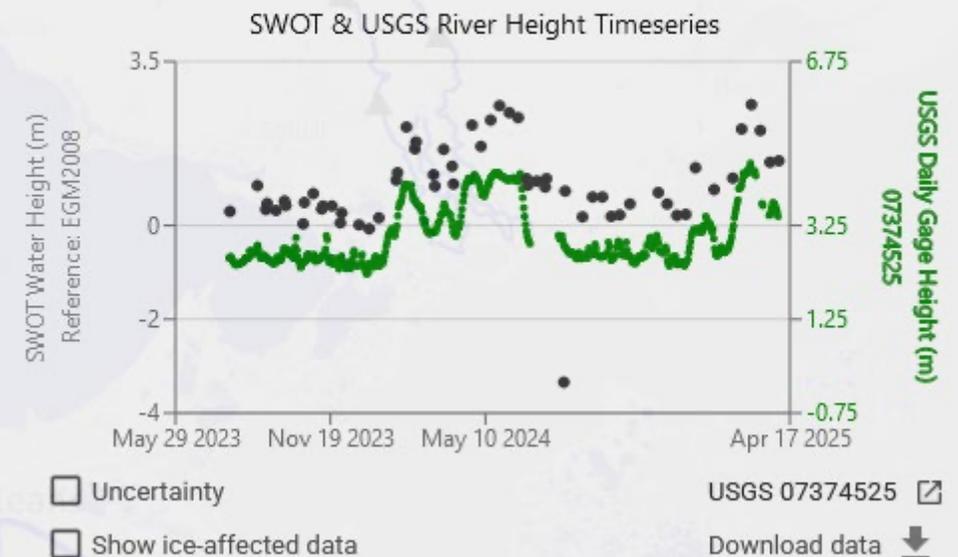
Producing the first global survey of Earth's surface water



Water Information From SPace (WISP)

<https://apps.usgs.gov/wisp>

Mississippi River at Belle Chasse, LA (07374525)

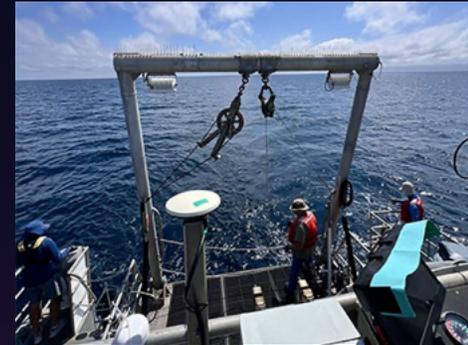
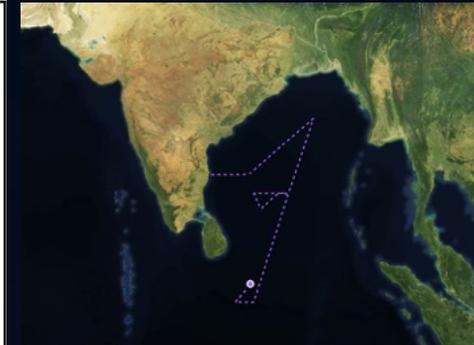


PACE

Plankton, Aerosol, Cloud, ocean Ecosystem

SRON

SPACE
RESEARCH
ORGANISATION
NETHERLANDS



PACE Postlaunch
Airborne eXperiment
(PACE-PAX)



PACE-PAX

July 2020

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission

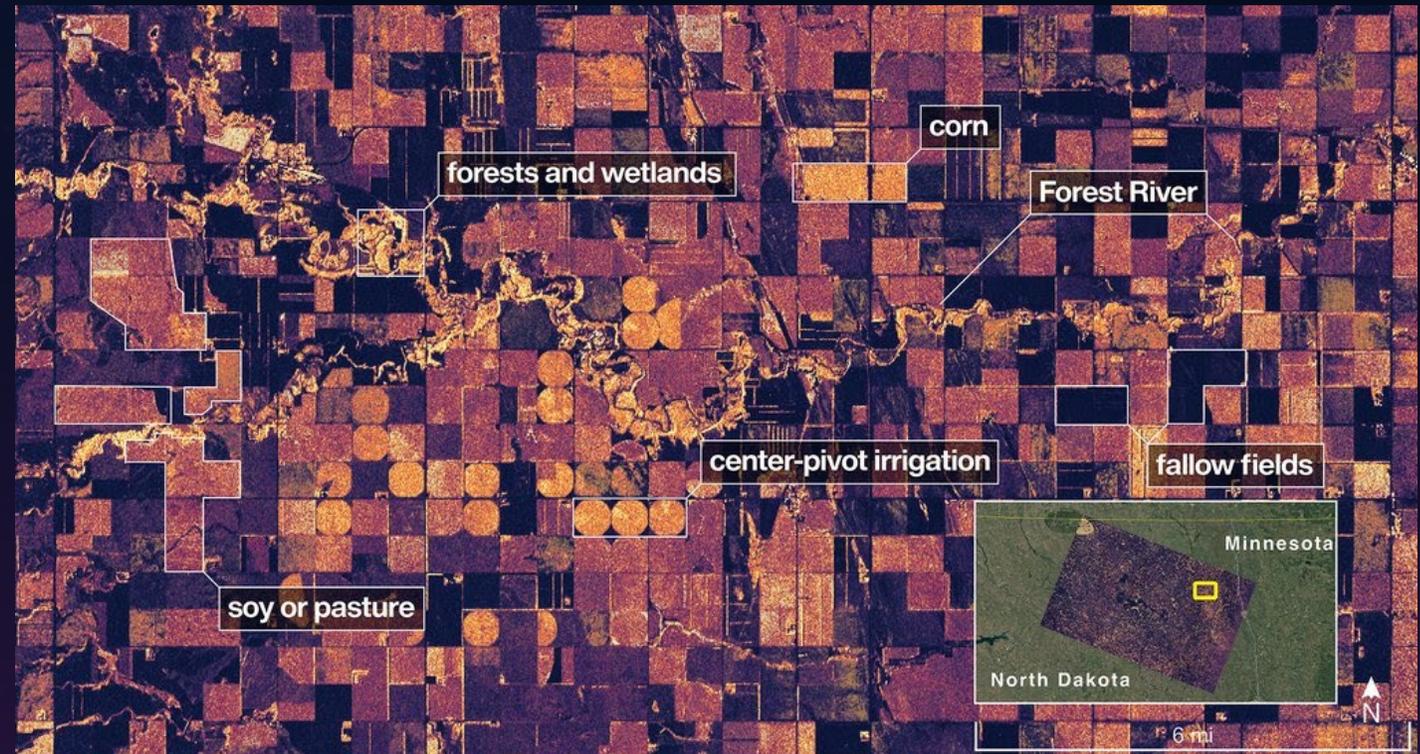
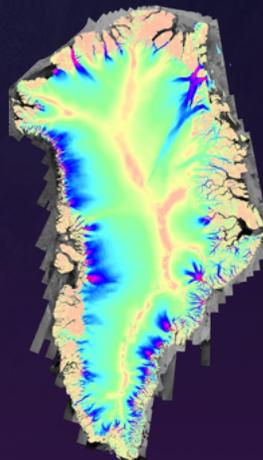
PACE Science Data Product Validation Plan

NISAR



Measuring Earth's changing ecosystems, dynamic surfaces, and ice masses

- Response of ice sheets to climate change and the interaction of sea ice and climate
- Carbon storage and uptake dynamics in wooded, agricultural, wetland, and permafrost systems
- Earthquake, volcanic, and landslide cycles, exploring potentials for urgent response and hazard mitigation
- Soil Moisture
- Dynamics of water, hydrocarbon, and sequestered CO₂ reservoirs



Collaborating with user communities





Working with partners, within communities, is the cornerstone of NASA's mission to support water management needs.

Turning data into actionable insights

(including integrating cutting-edge technologies)



Flooding Impacts on North Carolina Well Water Quality



“We utilized this tool tremendously after Hurricane Helene because we’re constantly being asked how many people were affected, and we don’t have great data in North Carolina”

- Jon Folkes | Deputy Environmental Health Chief

A screenshot of a web browser displaying the 'HAND Output' interface. The browser's address bar shows the URL 'nc-helene-data-nu.hub.arcgis.com'. The page header includes the 'HAND Output' logo and a 'Sign In' button. The main content area is mostly blank, suggesting a map or data visualization that is not fully rendered. At the bottom of the browser window, a navigation menu is visible with several categories: 'Water Quality Resources', 'Disinfection', 'Damage Assessment', and 'Sampling'. Each category has a brief description of the resources available. The footer of the browser window includes the text 'Powered by Esri'.



Precipitation, water management, and algae blooms in South Florida estuaries



“We are committed to investing in new partnerships to better understand the water quality challenges we face. Great things can happen when we join forces!”

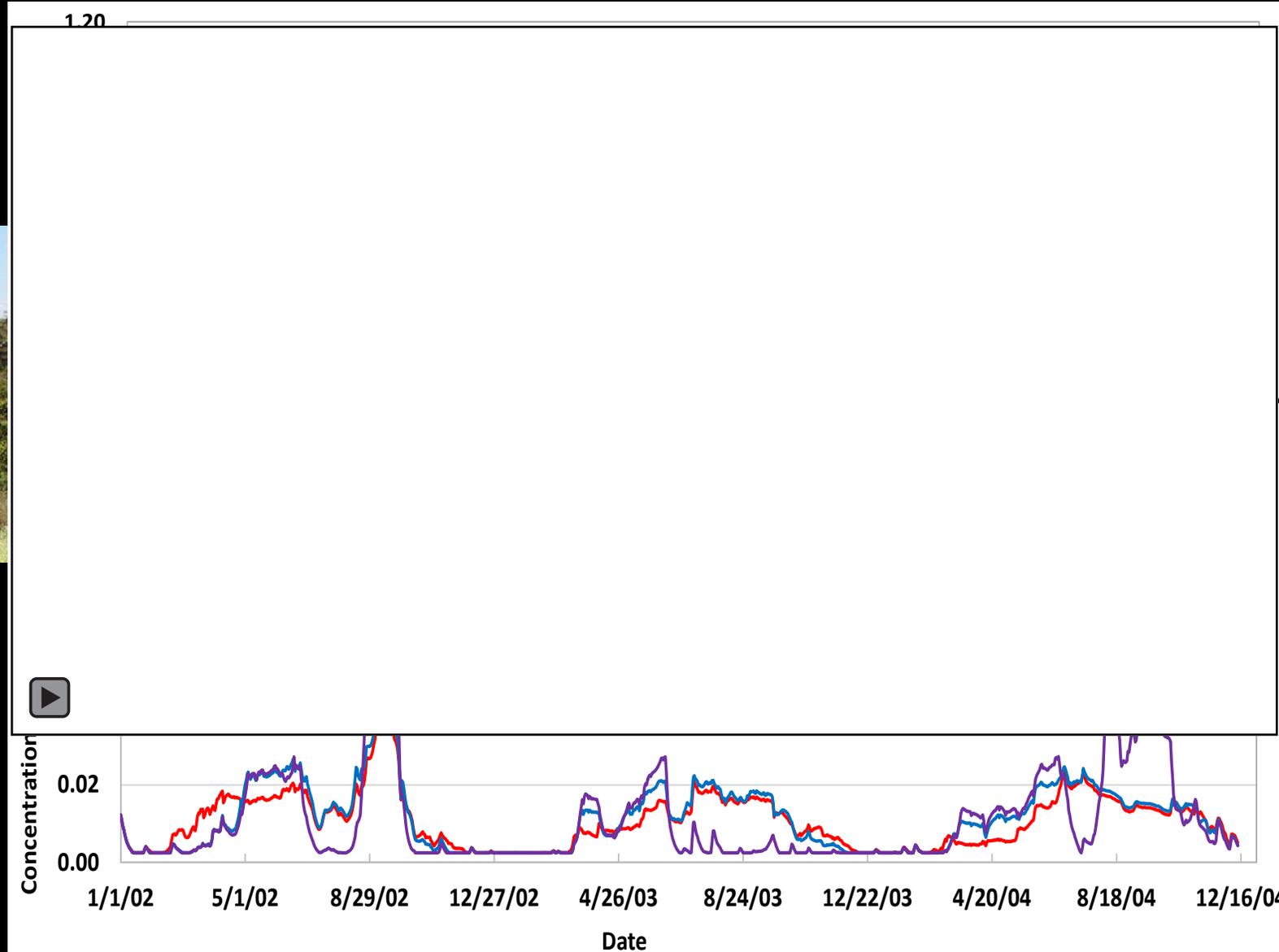
- Lawrence Glenn | SFWMD Director of WR



Agriculture Impacts on Lake Water Quality



AIMS serves as a web based environment for evaluating the impacts of agricultural and channel conservation management practices for any watershed in the United States





Satellite water quality monitoring for U.S. Lakes



Geetika Godavarthy



Milena Perez-Gerus



Logan Rajah

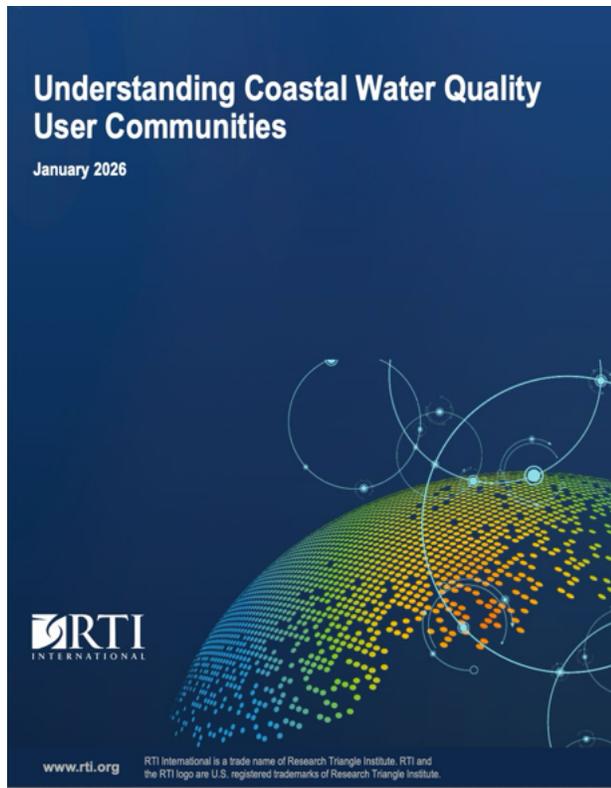


Mrinallee Reddy

LakeSense is a data processing platform designed to observe lake water clarity, turbidity, and chlorophyll over time using public satellite imagery (Sentinel 2A-B and Landsat 8)



From Gaps to Guidance: Stakeholder-Informed Coastal Needs



Partnered with RTI to understand the context and unmet needs of five marine coastal user communities to maximize the value of current and future remote sensing water quality data products.



Fisheries



Recreation
& Tourism



Utilities



Property
Risk



Coastal Aquaculture



Community Stakeholders and Organizations:

- AXA XL
- Coastal Measures
- East Coast Shellfish Growers Association
- Esri
- NOAA
- Oregon Aquaculture Association
- Pacific Shellfish Institute
- The Nature Conservancy
- University of California, Santa Barbara
- University of Maine

Aquaculture



Remote sensing is useful for site selection today, but **operational decision-making based on remote sensing remains rare due to insufficient temporal and spatial resolution of data** relevant to these small coastal aquaculture farms.



Opportunities

Near-shore salinity product development

Improved plume modeling (sediment, nutrients, wastewater)

Improved spectrographic methods to differentiate algae

Enable remote sensing to influence regulatory decision-making

Early warnings for HABs, ice formation, and/or ice movement

Improved resolution of nearshore observations

Understanding salinity and salinity response, “tells me about residence time, *E. coli* and fecal coliform, the total alkalinity of the water, the acidification of the water body—it’s a massively important controlling variable...**It’s such an easy, low-hanging fruit, super important variable that’s actually really difficult to get consistent data and information on...**there’s just not a great water model feeding into these hydrodynamic models to give you an accurate salinity,” now, but CDOM or other approaches could be a solution.

“If there was a spectrographic way to differentiate species of algae, it might **allow us to take steps to mitigate impacts from non-toxic (to humans) blooms that still kill shellfish.**”

“In the near future, **99.9% [of aquaculture] will occur in state waters with dynamic responses and shorter time and special scales**, which will make ocean-oriented satellite instruments not super applicable... this context **requires a rethink of long-term strategic Earth-observing programs.**”

Connect with Water at NASA

Data Access

- [NASA Earth Data](#)
- [Earth Information System: Freshwater](#)
- [Water Pathfinder](#)
- [Agricultural Pathfinder](#)
- [GESDISC](#)
- [Ocean Biology DAAC](#)

Resources

- [ARSET](#)
- [Earth Observatory](#)
- [Western Water Applications Office](#)
- [Scientific Visualization Studio](#)

Open Tools & Applications

- [JPL Opera](#) - six operational product suites for applied remote sensing
- [CyAN](#) – web and app-based tool that provides daily, weekly, and true-color satellite data on potential harmful algal blooms
- [Global Water Monitor](#) - satellite data products relevant to lakes, reservoirs, river channels, wetlands and global mean sea level
- [Open ET](#) - easily accessible satellite-based estimates of evapotranspiration (ET) at the field scale
- [Mascon Visualization Tool](#) – interactive GRACE data
- [SwotViz](#) – Global SWOT Data Viewer
- [WISP](#) – Water Information from Space

Connect with us here





Thank you!



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