NASA WWAO Water Resource Management Needs Assessment

Great Basin 2025

Process, Workshop, Outcomes

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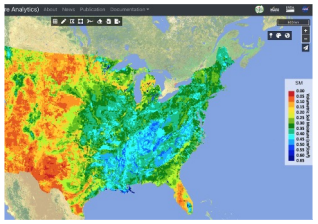
March 2026

June 13, 2025, ISS
NASA Earth Observatory
https://science.nasa.gov/earth/earth-observatory/sweeping-vistas-above-the-great-salt-lake-154632/

NASA’s Western Water Action Office (WWAO)

- **Established in 2016 at JPL**, WWAO serves water end users across the western United States
- **Part of NASA Earth Action’s Water Resources Program (WRP)**, connecting NASA Earth science with real-world water management
- **Needs-Driven Mission:**
  - Identify priority water management challenges
  - Accelerate use of NASA remote sensing, research, tech to support decision making

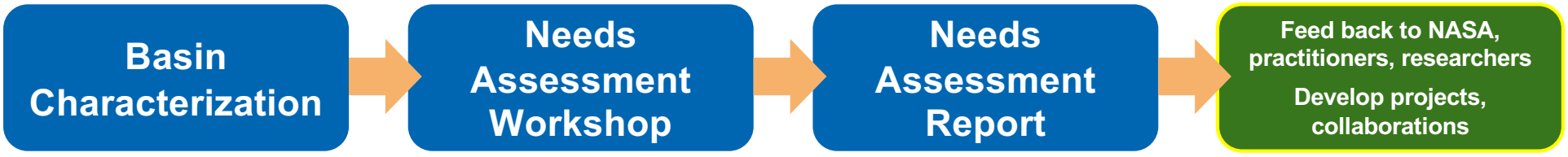




Why needs assessments?

- WWAO connects **NASA data and tools with water management needs**
- Assessments identify **decision gaps and opportunities**
- Needs assessments organized around **major river basins >** Best reflects how water is managed in the west
- Great Basin assessment: **Final basin in 10-year series** spanning 8 basins and regions

WWAO Basin Needs Assessment Process



Describe basin water management, end-user sectors

Create internal report for workshop planning

Identifies preliminary workshop “focus areas”

Convenes water practitioners and NASA SMEs

Identify priority water challenge areas, data gaps & needs

Capture as use cases

NASA SMEs review use case drafts

Draft report reviewed by workshop participants

Published on WWAO site & advertised

Final report delivered to:
NASA HQ (Water Resources Program & EA), NASA water missions, workshop attendees

Feed back to NASA, federal agency partners, water practitioners, researchers

Feed virtuous cycle

For GB, with Metroplitan Group

About the Great Basin

Large closed interior basin (~200,000 sq mi)
- Spans Nevada, Utah, Wyoming, Oregon, Idaho, and California
- **Water does not drain to the ocean, flows to terminal lakes or evaporates/infiltrates**

Arid region with highly variable water supply
- Limited precipitation
- Water availability highly sensitive to mountain snowpack, spring snowmelt

Water storage and groundwater are critical
- Reservoirs capture spring runoff for use later in the year
- Groundwater provides essential supplemental supply

High agricultural demand & growing competition
- Ag accounts for majority of water use (over 70% in Nevada and Utah)
- Increasing competition from municipal, industrial, ecological needs

Major lakes illustrate regional water stress
- The **Great Salt Lake** has lost ~73% of water and ~60% of surface area since 1850
- Risks to ecosystems, public health, regional economies

Workshop Objectives

1. **Generate ~15-20 use cases** within identified focus areas; describe water needs and challenges
2. **Strengthen relationships** between WWAO and end users, water managers, decision makers
3. **Gather information** to help inform NASA's future science endeavor, including NASA SMEs and current and future missions

Workshop Design

- **Three-day facilitated workshop**
  - Designed to be highly interactive (breakouts and discussions) to draw out detailed operational insights from stakeholders rather than relying primarily on presentations AND provide/support networking opportunities
- **Broad regional stakeholder participation**
  - State agencies, tribes, irrigation districts, water utilities, NGOs, and universities
  - *Federal agencies largely absent due to the federal government shutdown*
- **Discussions organized around key water management themes (focus areas)**
- **Primary output: water management use cases**
  - Documented decision contexts, management challenges, and associated data gaps identified by stakeholders

Day 1	**Setting the Stage for Focus Areas and Use Cases**
Day 2	**Determining the Use Cases**
Day 3	**Use Case Finalization, Prioritization, and Reporting Out**

Report describes workshop activities

Focus Areas

1. Hydroclimate Extremes, Variability, and Risk
2. Surface Water–Groundwater Interaction
3. Agriculture/Irrigation & Water Availability/Budget
4. Water Infrastructure & Measurement
5. Watershed Health & Water Quality

Use Cases | Hydroclimate Extremes, Variability, & Risk

- **Better Drought Definition and Decision Framework**
- **Monitoring Wildfire Impacts on Air Quality, Water Quality, and Snow**
- **Impacts of Drying of Terminal Lakes, Dust, Air Quality, and Albedo**
- **Flood Risk Characterization and Prediction**

Summary of Challenges	Summary of Data Gaps
• Difficulty anticipating and managing drought, flooding, and rapid shifts in hydroclimate conditions • Limited ability to translate climate drivers and variability into operational water supply forecasts and risk assessments • Increasing need to plan for compound extremes affecting reservoir operations, drought planning, and water allocations	• Limited spatial resolution and coverage of precipitation, snowpack, and snow water equivalent data • Gaps in soil moisture, evapotranspiration, and watershed conditions needed for forecasting • Forecast tools and datasets often not available at spatial and temporal scales relevant for management decisions

Use Cases | Groundwater & Surface Water Interaction

- **Understanding and Mapping Spatio-Temporal Connectivity Between Aquifers and Surface Water**
- **Irrigation, Agriculture, and Their Interface with Surface and Groundwater**
- **Balancing Water Supply and Use by Humans and Nature**

Summary of Challenges	Summary of Data Gaps
• Uncertainty in how groundwater pumping and recharge affect streamflow, springs, and wetlands • Difficulty incorporating groundwater dynamics into basin water budgets and water management decisions • Challenges supporting groundwater sustainability planning and water rights administration	• Sparse groundwater monitoring networks and limited basin-scale storage estimates • Lack of spatially continuous data linking groundwater and surface water systems • Limited mapping of recharge zones, aquifer characteristics, and hydrologic connectivity

Use Cases | Watershed Health and Water Quality

- **Post-Disturbance Restoration for Ecosystem/Watershed Health**
- **Improved Access to Information for Rangeland Management and Forecasting**
- **Identifying Point & Nonpoint Source Pollution in Water**

Summary of Challenges	Summary of Data Gaps
• Difficulty monitoring watershed condition and ecosystem health across large landscapes • Wildfire, vegetation change, and land use impacts are altering hydrology and water quality • Limited ability to link watershed condition to water supply reliability and ecosystem resilience	• Limited spatial monitoring of vegetation condition, riparian health, and watershed disturbance • Sparse data on sediment transport, water temperature, and nutrient loading • Lack of integrated datasets connecting watershed condition, hydrology, and water quality

Use Cases | Agriculture & Irrigation and Water Availability & Budget

- **Gaps in Mid-Elevation Snow Monitoring**
- **Monitoring Inventory and Flow of Springs/Small Streams in the Great Basin**
- **Water Budget and Scenario Planning for Farmers**
- **Water Budget for Irrigation Water Suppliers**

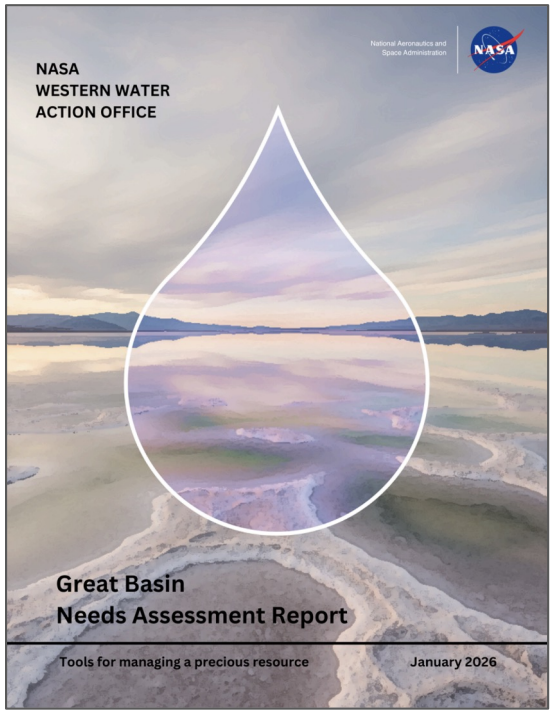
Summary of Challenges	Summary of Data Gaps
• Difficulty accurately estimating agricultural consumptive use and maintaining basin water budgets • Limited ability to evaluate conservation programs, irrigation efficiency, and water transfer strategies • Changing irrigation practices and crop patterns complicate water demand estimates	• Uncertainty and inconsistency in evapotranspiration (ET) estimates across methods • Incomplete mapping of irrigated lands, crop types, and irrigation practices • Limited integration of satellite-derived ET and water use data into operational water accounting systems

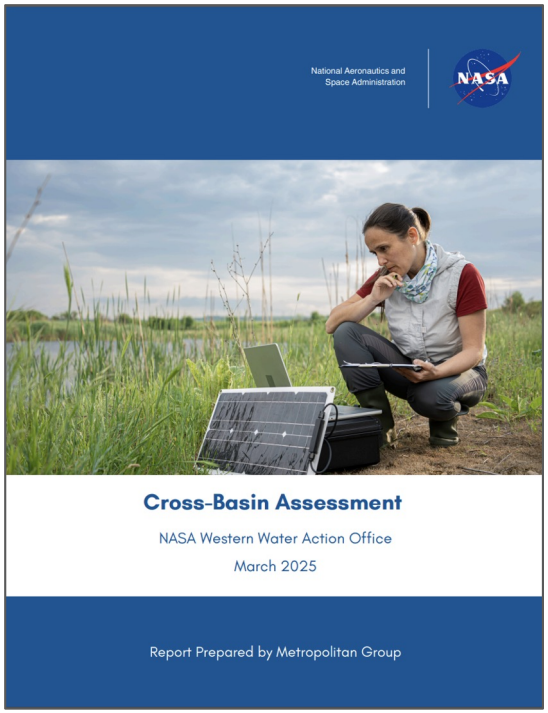
Use Cases | Water Infrastructure and Measurement

- **Understanding Changing Snowpack and SWE to Locate New Resilience Efforts Like Reservoirs**
- **Closing the Gap Between Diversion Rights and Actual Diversions**
- **Characterizing/Measuring Reservoir Capacity Across the Great Basin**

Summary of Challenges	Summary of Data Gaps
• Insufficient measurement infrastructure to support water allocation, accounting, and system operations • Limited information on reservoir operations, diversion flows, and water delivery efficiency • Aging infrastructure and changing hydrology increase operational uncertainty	• Sparse or outdated stream gauges, diversion measurement devices, and canal monitoring • Limited real-time data on reservoir storage, evaporation, and sedimentation • Poor integration between remote sensing observations and operational measurement systems

Reports





Great Basin Needs Assessment Report ***plus*** **Cross Basin Assessment**

wwao.jpl.nasa.gov

Click on **Resources**