

# OPENET

FILLING THE BIGGEST DATA GAP IN WATER MANAGEMENT

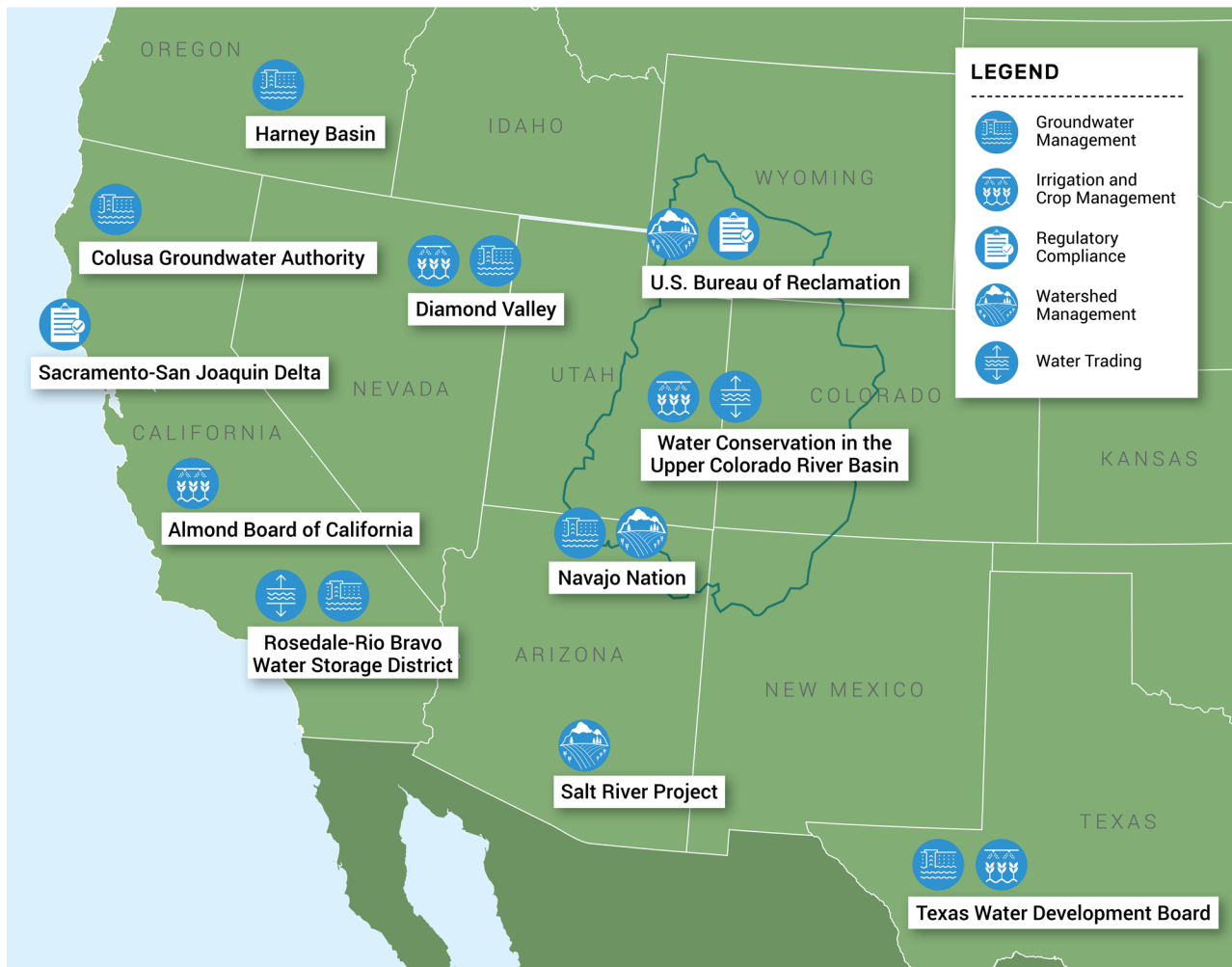
## USE CASES



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## USE CASES



The OpenET project incorporates use cases to highlight the important ways that more accessible evapotranspiration (ET) data can encourage and benefit sustainable land and water management and drive greater adoption.

Currently in various states of development, these use cases will provide site-specific insights to improve local management and decision-making, inform the platform and web interface, build awareness and ownership within end-user communities, and demonstrate the value of OpenET to ensure its uptake and support for the coming decades. Use cases are mapped above, with additional details provided on the following pages.





## Rosedale-Rio Bravo Water Storage District

### Groundwater management and trading in California's Kern Groundwater Subbasin

Rosedale-Rio Bravo Water Storage District (RRB) serves landowners on nearly 44,000 acres in the critically over-drafted Kern Groundwater Subbasin in California. Unlike many other districts in the area, nearly all of RRB's water supplies are used to recharge the groundwater aquifer. Under California's Sustainable Groundwater Management Act, Rosedale is developing a groundwater sustainability plan to balance its supply and demand within 20 years. Evapotranspiration data from OpenET can benefit RRB at both the parcel level for irrigation and crop management and at the subbasin scale for development of a water budget and implementation of the district's open-source accounting platform. The platform, launched this spring, allows landowners to more easily manage their own groundwater budgets, and serves as a foundation to launch a regional water trading program. The ability for growers to buy and sell water from one another can enable them to adopt more innovative water management practices.

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*“Because the OpenET project has brought together a team of leading experts on several approaches for measuring ET, I’m confident it will become the de facto source of water data among landowners and water managers alike.”*

*—Eric Averett, General Manager, Rosedale-Rio Bravo Water Storage District*

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## Sacramento-San Joaquin Delta

### Embracing practical alternatives for regulatory compliance in the Delta

Diverters across California are required to accurately measure all water diversions producing as little as 10 acre-feet of water per year. Complying with the regulation in the Sacramento-San Joaquin Delta has proved particularly vexing. Within the tidal Delta, significant portions of the agricultural land are below sea level, behind protective levees. Water is diverted out of the surrounding channels and onto agricultural lands primarily with siphons, and the flows through a siphon are notoriously difficult to measure accurately. To address the challenge, diverse members of the Delta water community (including environmental NGOs, regulators, farmers, exporters, and water districts) formed the Delta Measurement Experimentation Consortium. Ultimately, the Consortium demonstrated that available measurement methods were expensive, unreliable, and prone to both mechanical failure and operator error. Instead of forcing diverters to acquire measuring devices that produced unreliable data, the Consortium is developing an alternative compliance plan that will rely on OpenET to provide accurate, consistent, close-to-real-time, low cost, actionable measurement of crop consumptive use down to the field level. Importantly, diverters within the Delta have supported the development of OpenET with cash and in-kind contributions as well as with test sites and beta testing. The alternative compliance plan has been endorsed by the Delta Watermaster, who serves on OpenET's advisory committee, and supported by the State Water Resources Control Board and the Delta Stewardship Council. The plan is scheduled to go into effect for the 2022 agricultural irrigation season.

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*“OpenET represents a game-changing leap forward for water management in the West. OpenET will give water users in the Delta a much less expensive alternative method for complying with the state requirement to monitor and report on their water diversions.”*

*—Michael George, Delta Watermaster, California State Water Resources Control Board*

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## Colusa Groundwater Authority

### Planning for groundwater sustainability in the Colusa Basin

The Colusa Groundwater Authority (CGA) is a Joint Powers Authority that includes the County of Colusa, City of Colusa, City of Williams, Glenn-Colusa Irrigation District, Colusa County Water District, Princeton-Codora-Glenn Irrigation District, Provident Irrigation District, Maxwell Irrigation District, Westside Water District, Reclamation District 108, Reclamation District 479, the Colusa Drain Mutual Water Company, and two private pumper representatives. It is situated within the Colusa and West Butte groundwater sub-basins in the broader Sacramento Valley Groundwater Basin. CGA anticipates several needs for ET data as the Authority develops a Groundwater Sustainability Plan for the Colusa subbasin:

- The development of water budgets for the Colusa subbasin; and
- The development of monitoring and reporting tools to track groundwater pumping within the basin, as required by SGMA.

Low-cost, easily accessible ET data will make these activities much more affordable, comparable, and replicable for this and other GSAs as SGMA implementation moves forward.



## Diamond Valley

### Increasing agricultural resilience in a critical management area

Diamond Valley is a terminal groundwater basin located in central Nevada. Over 110,000 tons of alfalfa and grass hay are produced annually from approximately 26,000 acres, irrigated with groundwater via center pivot sprinklers. Groundwater levels within Diamond Valley are continually declining, which recently prompted the Nevada State Engineer's Office to designate the valley as a Critical Management Area. In response, groundwater rights holders developed a groundwater management plan to ultimately reduce groundwater pumping by up to 40% in some places. Using OpenET, farmers in Diamond Valley are able to easily access historical and near-real time consumptive use data so that water budgets and required pumping reductions are better understood. OpenET also allows users to track and demonstrate the degree to which changed irrigation practices or reduced cuttings have contributed to their goals, and can help growers understand the relationship between pumping and ET. The ability to rapidly assess and share information about the benefits of investments in water conservation by the agricultural community is an important strength of OpenET.

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*“If you give farmers better information on when they should or shouldn’t have their water on, you’re going to save water. I think that’s the greatest asset of OpenET.”*

*—Denise Moyle, Diamond Valley Farmer*

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## Navajo Nation

### Improved water management on the Navajo Nation with satellite-based decision support

On the Navajo Nation (N.N.), in the four corners of the southwestern U.S., there is a need for data-driven management of water resources. In this arid region prone to widespread and severe droughts, water scarcity can create impacts on the health of communities, rivers and wildlife, and agricultural production. This project will help the Navajo Nation improve water management with a focus on the following objectives: co-develop modifications to the OpenET platform specific to the agricultural region and end-user needs, coordinate and collaborate among multiple N.N. natural resources departments for an engaged and iterative feedback process on tool modifications, create volunteer and student internship opportunities for research and professional development, and build capacity and outreach efforts to increase the use of OpenET among managers, farmers, and agricultural communities across the N.N.



## Texas Water Development Board

### Informing drought mitigation measures, water demand forecasts, and groundwater models for water managers across Texas

The Texas Water Development Board (TWDB) provides water planning, data collection and dissemination, financial assistance, and technical assistance to help local and regional water managers sustain the state's natural resources, health, and economy. TWDB staff already incorporates estimates of ET into much of their research, modeling, and planning activities for the state. ET data is currently used to:

- (1) Help develop statewide irrigation water use estimates, which then form the basis for demand projections within regional water plans and further inform the development of conservation targets, strategies, and programs.
- (2) Inform evaporative demand and other drought indexes for regional drought monitoring reports. These reports assist the state authorities for drought proclamation and disaster management and inform the disbursement of state funding resources to drought-impacted regions.
- (3) Estimate groundwater recharge components in regional groundwater models, which help local management districts set targets for reduced pumping when needed.

TWDB sees potential for the OpenET platform to improve the accuracy of, and trust in, these current applications, as well as enable a set of additional functionalities, possibly including:

- Incorporation of ET anomaly maps into drought monitoring reports for a higher level of spatial specificity and clearer picture of where drought stress is most acutely being felt;
- Improving the accuracy of lake evaporation estimates for the state, with near real-time reporting for in-season assessment, management, and operation adjustments; and
- Informing water balance efforts for coastal estuaries.



## Harney Basin

### Groundwater use tracking and planning in Oregon's Harney Basin

Groundwater level declines in the over-allocated Harney Basin of Oregon triggered the Oregon Water Resources Department (OWRD) to designate the basin a groundwater area of concern and close the area to new appropriation. A community-based water planning effort led by the Harney County Watershed Council (HCWC) and the Harney County Court, in cooperation with OWRD, will use multiple sources of ET data to support the development and operation of innovative approaches to decreasing groundwater use while sustaining the economy and ecosystem of the Harney Basin. Many of the solutions that the planning group want to pursue related to reducing groundwater use need reliable and complete water-use measurement, reporting and accounting for past, current, and future water use. Currently, however, water-use measurement data in the Harney Basin is limited to a few locations required by water right, with questionable data quality and no way to validate measurements. Although direct measurement devices (e.g., flow meters) may still be deployed in some locations, basin-wide coverage of water-use measurement can only be feasibly and economically achieved through a remotely sensed approach. Combined with data derived from state and federal agencies delineating irrigated fields, OpenET allows for quantification of past, current, and forecasted future water-use.

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*“With the demands on water from a growing population and feeding more people, we have to figure out how to get the best value from every drop of water. ET data is crucial to providing this information.”*

*—Mark Owens, Oregon State Representative and Farmer*

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## Water Conservation in the Upper Colorado River Basin

### Testing innovative management practices with The Nature Conservancy

The Colorado River Basin is an economic engine for the entire country, providing drinking water to more than 40 million people, irrigating over 5 million acres of agricultural land, fueling a multibillion-dollar recreational economy, and supporting diverse wildlife and fish found nowhere else in the world. But drought and warming temperatures are diminishing supply and increasing pressure on limited water resources, with lakes Powell and Mead facing historically low levels. To address this, the Colorado River Basin states and Congress have approved a Drought Contingency Plan that outlines actions water users will take to decrease their water usage. The plan includes exploration of a demand management program in Upper Basin states to reduce water use on a voluntary, temporary, and compensated basis.

In Colorado, the Colorado Basin Roundtable has spearheaded a project to answer several priority questions related to demand management, including evaluating the potential water conservation and agronomic viability for reducing irrigation on high-altitude irrigated pasture. This collaborative research-based project brings together expertise from OpenET, American Rivers, Trout Unlimited, Colorado State University, Utah State University, The Nature Conservancy, The Colorado Water Conversation Board, and agricultural producers in the Kremmling area. Data from OpenET will help the team compare water savings on treatment parcels relative to reference parcels with normal irrigation, and will answer questions about how variations in forage species, soil, and groundwater conditions might affect consumptive use. As stakeholders in the Upper Basin explore the feasibility of a demand management program, this project provides a real-world laboratory for addressing important questions on measuring and verifying water conservation, understanding the agronomic impacts of reduced irrigation, integrating compensation for reduced water use with existing agricultural operations, and evaluating environmental aspects.

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*“OpenET is a great step forward for managing water needs in a time when demand far surpasses supply. Helping our farmers and ranchers more effectively manage their water use not only helps their crop and bottom line, but creates opportunities for more water to remain in our river systems to benefit both people and nature.”*

*—Aaron Derwingson, Water Projects Director, The Nature Conservancy*

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## The Almond Board of California

### Improving irrigation scheduling tools and water production functions

The Almond Board of California represents more than 6,800 almond growers and 104 almond handlers and engages in production, nutrition, and market research; the California Almond Sustainability Program; advertising and promotion in domestic and international markets; quality control; and statistical analysis and dissemination. The Almond Board is concerned about the impacts of both drought and new water regulations on water supplies for its growers. To proactively address these concerns, the Almond Board is currently supporting research to advance the development of irrigation and nutrient management tools and has identified the following potential benefits from integrating satellite-based ET estimates into these tools:

- Support improved corrections for irrigation of immature orchards;
- Determine optimal maximum crop coefficients in different climatic zones; and
- Calculate relationships between applied water, ET, and orchard yield to identify irrigation strategies under different weather conditions that maximize both on-farm water use efficiency and crop yield in almonds.



## Salt River Project

### Impacts of forest restoration on water supply in the Salt and Verde River watersheds

The Salt River Project (SRP) is one of the largest water and power utilities in Arizona, supplying water to about 250,000 acres of land and power for over 1 million customers in the Phoenix area and other rural areas west of the Phoenix area. SRP's ability to supply this water and power is highly dependent on inflows to and operations of a system of seven dams and reservoirs within the Salt River, Verde River, and East Clear Creek River watersheds. The health and successful operation of these dams and reservoirs is a function of the health of these watersheds, the use of water in upstream areas, and SRP's ability to accurately forecast hydrologic yields from this system. Better understanding the impacts of ongoing changes in these systems is critical. For example, in recent decades, forests throughout the SRP watersheds have been impacted by larger and larger wildfires, with several negative impacts in terms of water and power supply for SRP, including reduced water quality, water yield reliability, and reservoir lifespan and capacity. While SRP has installed many gauges and other instruments to help capture surface water impacts, groundwater recharge and ET are often much more difficult and costly to measure. OpenET can help to fill a current data gap, helping SRP staff to:

- Improve their understanding of the impacts of forest restoration and other activities on surface water runoff and groundwater recharge;
- Improve their ability to forecast future runoff in their watersheds; and
- Understand, at large scales and low cost, how various types of activities are changing water balances in SRP's watersheds.



## Bureau of Reclamation and Upper Colorado River Commission

### Assessing consumptive use estimation in the Upper Colorado River Basin

The Bureau of Reclamation (Reclamation) and the Upper Colorado River Commission (Commission) play critical roles in managing water throughout the Upper Colorado River Basin, composed of portions of five states including Arizona, Colorado, New Mexico, Utah, and Wyoming. Every five years, Reclamation is tasked with the creation of a report summarizing estimated annual consumptive uses and losses in the Upper Colorado River Basin for each of the reporting years. Having accurate evapotranspiration data is a critical component of this estimate, so Reclamation and the Commission are conducting a remote sensing feasibility study in the Upper Colorado River Basin to better understand the potential role of satellite-based measurements. Currently, they are in the process of comparing multiple methodologies to assess the differences and ultimately recommend the most fitting option for their reporting needs. Reclamation and the Commission plan to incorporate OpenET into their study for several purposes:

- Better understand how various ET products behave and compare in the upper basin.
- Ease the burden for methodology development, allowing for more focus and investment on the comparison and towards an improved understanding of the uncertainties/accuracies of the various approaches.
- Build trust in the OpenET consumptive use estimates by helping Reclamation and the Commission transparently compare the strengths and weaknesses of various approaches.
- Explore the concept of an ensemble mean as a best estimate, versus the use of a single model.
- Explore new methods to identify actively irrigated lands.
- Apply the Desert Research Institute's ET Demands model to assess the potential crop ET for comparison to remotely sensed ET.

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Learn more about OpenET at [OpenETdata.org](https://OpenETdata.org)