

A large graphic of water splashing from the top left corner, with a thick red and blue curved line sweeping across the page from the top left towards the bottom right.

# FRESNO STATE®

California Water Institute

**Building a Sustainable Water Future:  
Research, Partnerships, and Innovation at  
the California Water Institute**



October 2025

## CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>3</b>
<b>INTRODUCTION .....</b>	<b>4</b>
<b>ABOUT THE CALIFORNIA WATER INSTITUTE AND FRESNO STATE RESEARCH .....</b>	<b>5</b>
<b>IMPACT AND APPLICATION OF CWI RESEARCH .....</b>	<b>6</b>
City of Fresno Regional Consolidation Study .....	6
Groundwater Recharge Feasibility Study .....	6
Funding water infrastructure in the .....	7
San Joaquin Valley .....	7
<b>CURRENT RESEARCH .....</b>	<b>9</b>
Unified Water Plan .....	9
Cover Crops .....	9
Climate Resiliency Through Regional .....	9
Water Recharge .....	9
SGMA at Fresno State .....	9
<b>EMERGING RESEARCH PRIORITIES .....</b>	<b>11</b>
Economic Resilience through .....	11
Water-Aligned Agriculture .....	11
Building the Water Rights Atlas of California .....	11
Advancing Technology and Integration .....	11
in Water Management .....	11
<b>RECOMMENDATIONS FOR STAKEHOLDERS .....</b>	<b>13</b>
Policymakers and Regulators .....	13
Local Agencies .....	13
Community Organizations and Nonprofits .....	14
Cross-Sector Recommendation: Build a Regional Water Network .....	14
<b>EXPANDING COLLABORATIONS AND BUILDING FUTURE RESEARCH PARTNERSHIPS .....</b>	<b>15</b>
<b>REFERENCES .....</b>	<b>15</b>

## EXECUTIVE SUMMARY

California faces mounting water challenges, including climate extremes, groundwater overdraft, aging infrastructure, and increasing strain on rural and disadvantaged communities. Sustainable solutions require collaboration across research, policy, and practice.

The California Water Institute (CWI) at Fresno State brings these elements together. Located in the San Joaquin Valley, CWI serves as a hub for applied research, education, and regional collaboration that advances water resilience across the state. This report highlights CWI's key achievements, ongoing projects, and emerging research priorities that demonstrate its leadership in developing practical, evidence-based solutions.

CWI's work has produced measurable community and policy impacts. The Fresno Regional Consolidation Study guided the integration of small water systems into the City of Fresno's distribution network, securing reliable drinking water for disadvantaged neighborhoods. The Groundwater Recharge Feasibility Study identified viable recharge sites near vulnerable communities, directly informing new projects led by regional water agencies.

Current initiatives continue to link research with implementation. Projects such as the Unified Water Plan promote coordinated regional water management, while studies on cover crops and on-farm recharge advance water efficiency and soil health. At Fresno State's own farm, Sustainable Groundwater Management Act compliance upgrades demonstrate how institutional operations can model sustainable water practices while training future water professionals.

CWI's expanding research portfolio includes focusing on emerging priorities such as mapping water rights statewide and evaluating economic resilience through water-aligned agriculture. Looking ahead, CWI plans to unite universities, agencies, nonprofits, and industry partners through a network designed to foster shared learning, data-driven innovation, and regional investment in sustainable water solutions.

Through its research, education, and partnerships, the California Water Institute is advancing a more resilient and equitable water future for California by connecting knowledge to action and driving innovation where it is needed most.



## INTRODUCTION

California's water resource management faces unprecedented challenges at the intersection of hydrologic variability, climate change, and regional disparities. Repeated droughts and intermittent floods strain aging infrastructure and destabilize water-dependent communities. Rising temperatures shift precipitation toward rain rather than snow and reduce snowpack, historically the state's most reliable water storage mechanism.

Within this challenging landscape, the California Water Institute (CWI) at Fresno State serves as a hub for applied research, regional coordination, and capacity building. Located in the heart of the San Joaquin Valley, CWI conducts applied research on groundwater recharge, on-farm interventions, and collaborative planning, integrating hydrologic science with institutional, environmental, and social dimensions.

Groundwater overdraft remains one of California's critical concerns. Aquifers supply approximately 40 percent of water for farming and communities on average, and considerably more during droughts, yet many groundwater basins are being pumped beyond sustainable thresholds (Public Policy Institute of California, 2024). During the megadroughts of 2007–2009 and 2012–2016, the Central Valley lost tens of millions of acre feet of groundwater, recovering less than one-third post-drought, a trend projected to worsen without substantial management reforms (Sarfaraz et al., 2021).

Land subsidence compounds these challenges. Over-pumping has caused sinking ground across the Central Valley, damaging critical infrastructure and impairing water delivery systems. A recent technical report from the California Department of Water Resources warns that subsidence has already reduced deliveries through the State Water Project by 3 percent in some years and could cut capacity by as much as 87 percent by 2043 if current trends continue (California Department of Water Resources, 2025). Structural components such as canals and pipelines are at risk, and loss of conveyance capacity will have cascading impacts on water reliability across the state.

Climate change intensifies these pressures. Higher temperatures accelerate snowmelt and increase precipitation volatility. The result is more frequent shifts between drought and flood, a phenomenon known as "climate whiplash," which further stresses water management systems originally designed for more stable hydrological cycles. Meanwhile, wildfire activity has expanded in frequency and scale, damaging watersheds and introducing sediments, nutrients, and toxins into rivers and reservoirs. These factors collectively erode the resilience of both natural and built water infrastructure.

Regional disparities add further complexity. Northern California benefits from higher precipitation and a more diverse water portfolio, while Southern California continues to rely significantly on imported supplies. Agriculture-dominated regions of the San Joaquin Valley face the most severe pressures, balancing the need to maintain a \$50 billion agricultural economy with compliance under the Sustainable Groundwater Management Act (SGMA). The socioeconomic ripple effects include potential farmland fallowing, reductions in agricultural employment, and heightened vulnerability for small and disadvantaged communities. These dynamics illustrate that California's water challenges are as much social and economic as they are hydrological.

This report situates CWI's research within these statewide challenges. Drawing on survey findings and stakeholder input, it outlines how CWI's work informs policy, supports collaboration, and advances sustainable water governance.



## ABOUT THE CALIFORNIA WATER INSTITUTE AND FRESNO STATE RESEARCH

The California Water Institute at Fresno State serves as a bridge between academia and the water community, aligning education and research to address the region's most pressing water management challenges. Its mission is to connect faculty and students with practitioners to develop interdisciplinary, inclusive, and research-based solutions that advance a sustainable water future. Guided by this mission, CWI's vision is to be the premier research and education institute for water challenges in California.

Fresno State's location in the center of the San Joaquin Valley positions it at the crossroads of California's most complex water issues. Fresno State integrates expertise across engineering, agriculture, environmental sciences, and policy to address complex water issues. Faculty and students collaborate with local water districts, state agencies, and community organizations to create solutions that are scientifically rigorous and grounded in real-world applications.

CWI works with two major Fresno State centers that extend the university's impact beyond the classroom. The Center for Irrigation Technology (CIT) is internationally recognized for testing irrigation equipment and developing water-saving technologies through field-based research and demonstration. The WET Center (Water, Energy, and Technology) accelerates innovation by helping entrepreneurs' pilot and commercialize clean-water and energy technologies. Together, these centers and CWI form an integrated ecosystem linking applied science, technology development, and community engagement to strengthen water resilience statewide.

Recent Fresno State projects demonstrate this interdisciplinary strength. Research has focused on groundwater sustainability, including recharge strategies, monitoring, and collaboration with groundwater sustainability agencies. Others advance irrigation efficiency through the application of artificial intelligence, sensor networks, and climate-smart practices in orchards and field crops. There is also significant work in stormwater management,

watershed health, and restoration of ecosystems such as headwater meadows and river habitats. Research has also extended into water quality and nutrient management, including innovative uses of drainage water and biological approaches to wastewater treatment.

Fresno State's mission extends beyond research. As a public university embedded in the Central Valley, it serves as a convener of diverse stakeholders, linking academic expertise with practitioner and community knowledge. Through CWI, the university enhances water literacy and builds capacity for future water professionals. These efforts help bridge the gap between research and implementation, ensuring that scientific knowledge informs policy and practice.

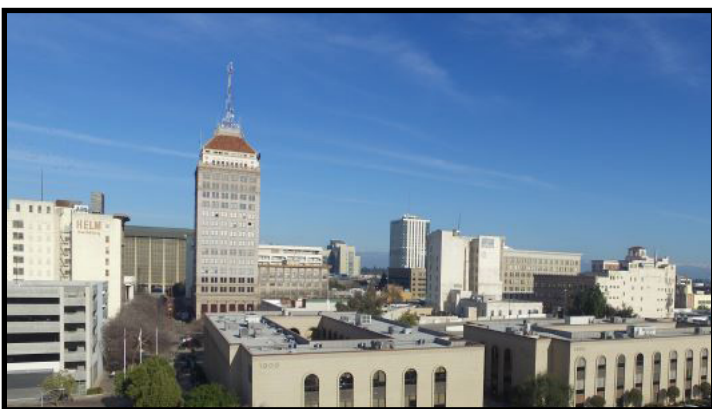
Through its partnerships, Fresno State demonstrates how applied research can support agriculture, urban communities, and the environment. The California Water Institute anchors these efforts by translating university research into actionable strategies that inform policy, foster innovation, and strengthen water resilience across California.



## IMPACT AND APPLICATION OF CWI RESEARCH

CWI's applied research directly informs real-world decisions, helping agencies, communities, and practitioners implement effective, science-based water solutions. The following examples illustrate how recent projects have advanced tangible outcomes across California's Central Valley.

### City of Fresno Regional Consolidation Study



The Fresno Regional Consolidation Feasibility Study demonstrates how Fresno State research can translate into measurable public benefit. Guided by CWI and the State Water Resources Control Board Division of Drinking Water, Fresno State students in Civil Engineering and Construction Management programs evaluated the technical and financial feasibility of consolidating twelve small water systems into the City of Fresno's distribution network. The study sought to identify infrastructure needs, funding mechanisms, and regulatory frameworks that would enable the City of Fresno to extend water services efficiently and sustainably.

The team produced detailed designs, cost estimates, and feasibility reports that met regulatory standards, providing a credible foundation for state and local planning. CWI then collaborated with the City of Fresno, the State Water Board, and Self-Help Enterprises to align engineering designs, funding applications, and community outreach. The partnership bridged academic expertise with regulatory and community needs, helping small systems, many with drinking water violations, understand the long-term benefits of connecting to a sustainable, compliant water supply.

The results are now visible on the ground with consolidation projects underway. The projects are not yet complete, but regular meetings are being held between the State Water Resources Control Board, the small water system, and the City of Fresno to move them forward. Three Palms Mobile Home Park and New Horizon are advancing toward construction, improving drinking water access for hundreds of residents. The project highlights how technical analysis, stakeholder engagement, and student participation can converge to deliver lasting community outcomes.

The study offers a replicable model for regional water system integration that balances infrastructure investment, governance, and equity. It shows how strategic consolidation, supported by state funding and community cooperation, can improve drinking water reliability and advance California's human right to water.

### Groundwater Recharge Feasibility Study



The Groundwater Recharge Feasibility Study evaluated the potential for managed aquifer recharge near disadvantaged communities in Fresno County. Working alongside local agencies, CWI researchers and students identified four promising sites to improve groundwater sustainability and local resilience.

The sites selected were near Kerman, Raisin City, Caruthers, and Laton. In partnership with Fresno State faculty and students, the study used GIS analysis, field evaluation, and engineering design to assess recharge potential. Analysis included hydrologic suitability,

infrastructure access and implementation costs, among others.

Student engineering teams, guided by faculty mentors, analyzed each site's soil infiltration rates, groundwater conditions, and land characteristics, developing preliminary designs and cost estimates for construction and maintenance. Sites were compared based on recharge yield, cost-effectiveness, community benefit, and operational feasibility.

Site-specific costs and surface water availability remain key constraints; financial feasibility will require targeted subsidies, grants, or partnerships. Implementation risks were identified and include variable water supply, permitting challenges, and maintenance needs, which can be managed through coordinated local oversight.

The study's relevance became clear when the Fresno Irrigation District and the North Kings Groundwater Sustainability Agency broke ground on a new recharge basin near Kerman to support a nearby community reliant on groundwater. Although the study did not determine the basin's specific location, its findings validated that the project aligns with the types of sites and benefits identified through CWI's research. This alignment underscores the practical value of Fresno State's applied research in supporting regional planning and investment decisions that strengthen groundwater resilience and protect communities at risk of water insecurity.

The study confirmed that managed recharge near disadvantaged communities is feasible and beneficial, provided financial and institutional barriers are addressed.

Beyond its technical insights, this project demonstrated CWI's distinctive approach: leveraging academic expertise, student engagement, and stakeholder collaboration to produce actionable solutions. The study now serves as a model for low-cost, research-driven analysis that supports regional agencies and builds capacity for sustainable groundwater management in drought-prone areas.

## Funding water infrastructure in the San Joaquin Valley



### *San Joaquin Valley Water Infrastructure Financing Strategy*

The San Joaquin Valley Water Infrastructure Financing Strategy developed a coordinated, long-term framework to strengthen the region's water security and economic resilience amid climate change, infrastructure deterioration, and groundwater overdraft.

The strategy integrated hydrologic analysis, economic modeling, and governance design to identify sustainable funding pathways for regional water infrastructure. The strategy envisioned a one-time \$7 billion investment to offset far greater annual losses in agricultural production and employment, stabilize rural and urban economies, and ensure equitable access to safe water across the San Joaquin Valley's eight counties.

The study assessed current water supply conditions, infrastructure status, and socioeconomic vulnerabilities across the Valley. Building on the economic study done by economist Dr. David Sunding (UC Berkeley), CWI modeled how water shortages affect agricultural production, employment, and tax revenues, and quantified the benefits of coordinated infrastructure investment.

The strategy recommends a hybrid funding model that blends state and federal matching funds, greenhouse gas reduction revenues, a modest regional sales tax (0.5%), and a water use surcharge to support



debt service and operations. While recognizing the regressive nature of certain funding tools, the report emphasizes the need for equitable cost-sharing mechanisms to protect low-income households.

#### *Funding a Future for Water in the San Joaquin Valley*

CWI's research on alternative financing models explores new pathways for funding water infrastructure beyond traditional municipal and irrigation district mechanisms. As discussed in *Funding a Future for Water in the San Joaquin Valley* (2019), relying on funding from local governments creates a lot of tension among these small jurisdictions as they try to decide how the cost burden will be shared, seen most recently in the difficulties creating the Groundwater Sustainability Agencies.

#### *Getting Water Infrastructure Governance Right*

The report, *Getting Water Infrastructure Governance Right* (2020), explores some alternative models for funding and governing water infrastructure systems, especially exploring variants of the Joint Powers Authority (JPA) model. Not only do JPAs make it possible for all the local governments in a region or river basin to collaborate on basin-wide infrastructure, but there are possibilities for them to establish Public Finance Authorities within their governing structures to create regional funding strategies for water infrastructure. These models offer promising frameworks for overcoming fragmented governance and limited local funding capacity, which are issues that have historically slowed infrastructure progress in the San Joaquin Valley.



## CURRENT RESEARCH

The California Water Institute continues to advance research that supports the long-term sustainability of the Central Valley. This section highlights key current and emerging projects.

### Unified Water Plan

The Unified Water Plan project supports the development of a comprehensive San Joaquin Valley Water Plan in partnership with the Water Blueprint for the San Joaquin Valley. The effort builds on existing technical data from regional and statewide planning initiatives, including Groundwater Sustainability Plans, Integrated Regional Water Management Plans, and research conducted by the Public Policy Institute of California, and the California Department of Water Resources.

The project fosters a shared regional approach to water management by engaging agencies, agricultural groups, environmental organizations, and community representatives. It will compile and evaluate solutions such as recharge, conveyance, storage, reuse, and flood mitigation, presenting a unified framework of regional projects and policy recommendations for long-term water sustainability and resilience across the Valley.

### Cover Crops



In partnership with Sustainable Conservation, CWI leads the research and outreach components of a project examining how cover cropping can enhance on-farm groundwater recharge while protecting soil and water quality. The research is measuring how cover crops

affect nitrate leaching, soil health, and water infiltration in pistachio orchards through sensor monitoring and sample analysis. The project's findings will inform best management practices that allow growers to improve aquifer replenishment without compromising water quality or crop productivity.

By combining rigorous field research with stakeholder engagement, the project advances practical tools and data that help growers integrate groundwater recharge into working lands, thus strengthening agricultural sustainability across the San Joaquin Valley.

### Climate Resiliency Through Regional Water Recharge



The Climate Resiliency Through Regional Water Recharge project is developing a framework for using floodwater to enhance groundwater recharge across Merced, Madera, Fresno, and Tulare counties by identifying recharge sites, fostering agency collaboration, and expanding public understanding of recharge benefits.

Public outreach and education are also central to the project. By communicating how recharge supports both community water security and economic resilience, the effort fosters broader support for proactive, science-based groundwater management.

Through this collaborative model, the project demonstrates how regional cooperation and technical planning can work together to strengthen climate resilience and maximize the value of California's variable water supplies.

## SGMA at Fresno State



The SGMA at Fresno State project improves water management across the university's agricultural operations, aligning on-campus practices with the goals of the Sustainable Groundwater Management Act (SGMA).

Fresno State's 1,000-acre farm, within the North Kings Groundwater Sustainability Agency, historically lacked adequate intake, distribution, and storage capacity, leading to excessive groundwater pumping.

CWI and campus partners identified key upgrades to maximize surface water use and reduce groundwater extraction: precision metering, expanded surface water pipelines, and temporary storage basins. These upgrades will enable the university to maximize surface water use, reduce groundwater extraction, and improve irrigation efficiency. The project also supports Fresno State's role as a living laboratory, providing hands-on training for students in water resource management, engineering, and agricultural operations.

Beyond improving the university's sustainability performance, the project serves as a model for institutional farms seeking to combine economic productivity, environmental responsibility, and regulatory compliance.

## EMERGING RESEARCH PRIORITIES

The California Water Institute continually looks forward to identify research projects that will solve key water resource challenges. As water conditions evolve across the state, CWI seeks to anticipate emerging needs and develop research that delivers practical, data-driven solutions for California's communities, growers, and policymakers.

### **Economic Resilience through Water-Aligned Agriculture**

As water supplies in the San Joaquin Valley continue to decline, the relationship between agricultural viability and long-term water availability is becoming increasingly important. Recognizing this, CWI has identified economic resilience through water-aligned agriculture as a key emerging research priority.

This research would evaluate how agricultural production can remain economically sustainable under changing water conditions. The effort integrates agronomic, hydrologic, and economic data to guide crop selection and land-use planning that balance profitability with responsible water use.

The project envisions the development of a GIS-based decision framework that maps zones of long-term water availability, considering rainfall, access to surface water and groundwater levels linking these datasets to crops best suited to those conditions. By incorporating data on crop water demand, production costs, market value, and required return on investment, the framework will help identify farming strategies that align with both water supply realities and economic viability.

The San Joaquin Valley generates over \$24 billion annually in fruit, nut, and vegetable production (Public Policy Institute of California [PPIC], 2023). By identifying water-efficient, high-value cropping patterns and providing actionable data for growers and planners, this research would support both agricultural and economic resilience in the region.

### **Building the Water Rights Atlas of California**

One area of future research focuses on developing a Water Rights Atlas of California. This would be a comprehensive, data-driven tool to visualize and analyze the distribution, seniority, and use of surface water rights across the state.

Water rights determine who can access and use California's surface water, shaping nearly every aspect of the state's water governance and management. Historically, these rights have been difficult to quantify or map due to inconsistent documentation, especially for pre-1914 appropriations. As the State Water Resources Control Board moves toward publishing a complete accounting of rights holders and allocations, new opportunities are emerging for advanced analysis.

CWI researchers envision using GIS technology to map water rights by type, volume, beneficial use, and seniority. This spatial database would allow researchers and policymakers to examine where and how water rights intersect with watershed boundaries, community needs, and ecological priorities.

Given the diminishing availability of water, water rights will become an increasingly important topic in state water law, perhaps the most important. Fresno State can take a leading role in aiding with data analysis and, subsequently, policy analysis.

### **Advancing Technology and Integration in Water Management**

CWI working with faculty are identifying emerging areas of research that can expand Fresno State's applied science and innovation capacity in water management. Several promising concepts are being developed into potential research projects that integrate cutting-edge technology with field-based applications. One priority area focuses on improving groundwater mapping through the use of semi-airborne electromagnetic (AEM) systems that combine unmanned aerial vehicles with ground-based sensors. When paired with gravity-based surveys, these approaches could

offer a cost-effective and scalable method for refining groundwater models, estimating aquifer storage, and identifying optimal sites for recharge projects.

Another emerging focus explores the use of gravimetric survey technology to measure groundwater recharge and subsurface water movement over time. This technique has the potential to provide an affordable, repeatable way to verify how much recharge reaches the aquifer—an essential metric for evaluating the success of managed aquifer recharge efforts. CWI is also interested in future studies that examine how groundwater conditions and stormwater infrastructure influence local economies and property values. Understanding these relationships can help demonstrate the broader community and economic benefits of water investments, reinforcing the importance of integrated, multi-benefit planning. Collectively, these emerging research priorities reflect CWI's commitment to shaping the next generation of data-driven tools and interdisciplinary approaches for sustainable water management in California.



## RECOMMENDATIONS FOR STAKEHOLDERS

CWI's research and stakeholder engagement highlight the need for integrated, inclusive, and financially sustainable approaches to water management in California's Central Valley. The following recommendations synthesize insights from recent studies and stakeholder feedback to guide collaborative, evidence-based governance.

### Policymakers and Regulators



*Strengthen governance and leadership capacity within GSAs and local agencies.*

CWI research on SGMA implementation underscores that leadership and trust are as vital as technical expertise. Policymakers should invest in leadership development, facilitation, and conflict resolution training for local water managers. Programs that build institutional capacity, especially in disadvantaged and rural communities, will accelerate progress toward sustainable groundwater management.

*Simplify and align regulatory frameworks for recharge and consolidation projects.*

Multiple CWI studies revealed that well-intentioned projects often stall due to fragmented permitting, inconsistent CEQA requirements, and unclear cost recovery mechanisms. Streamlining permitting for recharge projects and enabling flexible administrative pathways for small-system consolidations would reduce delays and costs while maintaining accountability.

*Support innovative funding models for regional water infrastructure.*

The San Joaquin Valley Water Infrastructure Financing Strategy and related CWI analyses demonstrate that the region cannot rely solely on traditional grant cycles and local ratepayer funds. Policymakers should enable mechanisms such as Joint Powers Authorities and Public Finance Authorities that allow regional pooling of resources, equitable cost-sharing, and access to broader financing instruments.

### Local Agencies

*Leverage academic and student partnerships for applied problem solving.*

CWI's partnerships with Fresno State students in engineering and construction management have demonstrated that university collaborations can expand analytical capacity, lower study costs, and build the next generation of water professionals. Local agencies should formalize such partnerships through research-to-practice internships and joint pilot projects.

*Adopt transparent decision-making processes to maintain community trust.*

Stakeholder interviews repeatedly emphasized that groundwater sustainability agencies and local boards must engage communities early and clearly communicate how decisions affect domestic well users, small systems, and disadvantaged communities. Using community advisory panels and publishing annual "trust reports" can strengthen legitimacy and compliance.

## Community Organizations and Nonprofits



*Collaborate with academic and agency partners to build local capacity.*

Community organizations can amplify their impact by partnering with universities and agencies to co-develop education programs, outreach materials, and participatory monitoring. These collaborations help translate complex water management decisions into accessible information and empower residents to advocate effectively for water equity.

### **Cross-Sector Recommendation: Build a Regional Water Network**

To move from fragmented projects to coordinated solutions, stakeholders across sectors should collaborate through a network. This network would:

- Share data and best practices on recharge, governance, and infrastructure financing.
- Coordinate pilot projects and funding applications to avoid redundancy.
- Foster collaboration between academia, agencies, and community groups.
- Serve as a platform for joint proposal development and multi-benefit research design.

CWI is well positioned to serve as the neutral convener and facilitator for this effort, drawing on its interdisciplinary expertise and trusted relationships to coordinate efforts that advance sustainable, equitable water governance across the region.

## EXPANDING COLLABORATIONS AND BUILDING FUTURE RESEARCH PARTNERSHIPS

The California Water Institute is advancing a new phase of growth, centered on deepening partnerships and fostering collaborative research across academic, public, and private sectors. As California's water challenges grow increasingly complex, effective solutions will depend on interdisciplinary cooperation and shared innovation.

CWI is deepening its relationships with universities, community colleges, and research centers to build integrated water research networks. These collaborations will emphasize applied research, data sharing, and student engagement to develop practical, science-based strategies for sustainable water management. CWI cultivates partnerships with industry leaders, technology firms, and agricultural innovators accelerating the adoption of emerging tools in groundwater recharge, water reuse, monitoring, and efficiency.

CWI welcomes partnerships and funding collaborations that will enhance its ability to convene experts, conduct applied research, and deliver solutions that improve water resilience statewide. Investment in these efforts will directly support faculty and student research, pilot projects, and the translation of academic knowledge into implementable water management practices.

Through these collaborations, CWI seeks to create a statewide platform where academia, industry, and government work together to advance equitable, multi-benefit approaches to water resource sustainability.

## REFERENCES

- Public Policy Institute of California. (2024, June). Groundwater is a vital, but threatened, component of California's water supply [Fact sheet]. PPIC. Retrieved August 22, 2025, from <https://www.ppic.org/publication/groundwater-in-california/>
- Levy, Z. F., Jurgens, B. C., Burow, K. R., Voss, S. A., Faulkner, K. E., Arroyo-Lopez, J. A., & Fram, M. S. (2021). Critical aquifer overdraft accelerates degradation of groundwater quality in California's Central Valley during drought. *Geophysical Research Letters*, 48, e2021GL094398. <https://doi.org/10.1029/2021GL094398>
- California Department of Water Resources. (2025, May 7). Study finds that subsidence, groundwater over-pumping could limit future water-State Water Project deliveries if no action is taken. Retrieved August 22, 2025, from <https://mavensnotebook.com/2025/05/07/sjv-water-study-finds-that-subsidence-groundwater-over-pumping-could-limit-future-water-state-water-project-deliveries-if-no-action-is-taken/>
- Sarfaraz, S., et al. (2021). Post-drought groundwater storage recovery in California's Central Valley. *Water Resources Research*, (manuscript), UCLA. Retrieved from [https://hydro.ucla.edu/SurfaceWaterGroup/Publications/Sarfaraz\\_et\\_al\\_2021.pdf](https://hydro.ucla.edu/SurfaceWaterGroup/Publications/Sarfaraz_et_al_2021.pdf)
- Madera, C., et al. (2024). Groundwater sustainability and land subsidence in California's Central Valley. *Water*, 16(8), 1189. <https://doi.org/10.3390/w16081189>
- Colorado Sun. (2025, January 31). Does the Colorado River supply most of Southern California's water? The Colorado Sun. <https://coloradosun.com/2025/01/31/does-the-colorado-river-supply-most-of-southern-californias-water/>
- Public Policy Institute of California. (2023). The future of agriculture in the San Joaquin Valley [Policy brief]. PPIC.



**FRESNO****STATE**<sup>®</sup>

---

California Water Institute

2703 E Barstow Ave, MS JC133 • Fresno, Ca 93740  
559.278.7001 • [www.californiawater.org](http://www.californiawater.org)