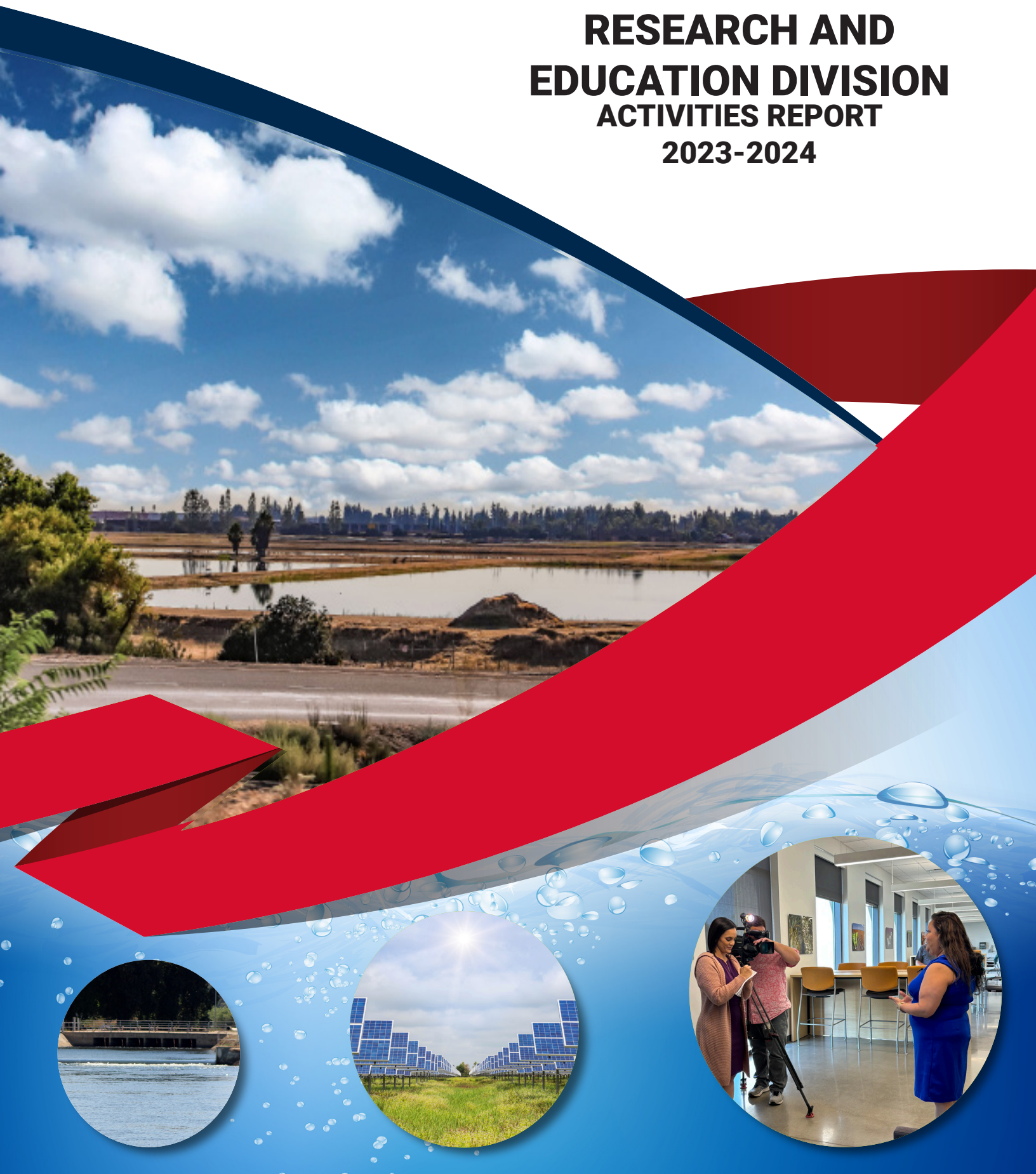


RESEARCH AND EDUCATION DIVISION ACTIVITIES REPORT 2023-2024



Interim Director's Message



Dear Colleagues and Partners,

I am delighted to present the 2023-2024 Activities Report for the California Water Institute (CWI) Research and Education Division. This year has been marked by significant advancements, innovative research, and impactful community outreach, all aimed at addressing the critical water challenges facing our region.

Our advisory committee, comprised of dedicated interdisciplinary experts, has been instrumental in guiding our initiatives. Additionally, our Faculty Fellows have contributed significantly to our research and educational programs. We are excited to share the fruits of their work in the coming months with you.

Throughout the year, we held several educational events geared towards children, the Fresno State community, and community members from all over. They joined us to learn about the water cycle, historical water events that have shaped California's water infrastructure, our research projects, as well as critical activities like imagining a day without water.

This year, we have undertaken several significant research projects and collaborations, as well as continued some from past years. We completed a Groundwater Recharge Feasibility Study aimed at strategically placing recharge basins to maximize benefits for small communities. This project was focused on Fresno County but provided us the opportunity to apply for and be awarded a grant that will encompass four counties. The Shallow Subsurface Artificial Groundwater Recharge (SSAGR) System Research was completed, and a report was published. The project, done in collaboration with the Fresno State University Farm Laboratory, focused on researching the feasibility and benefits of SSAGR systems in agricultural fields.

We continue to participate in and help coordinate two ongoing efforts focused on bringing different water interest groups together for one goal: the sustainability of the San Joaquin Valley.

As we reflect on our accomplishments, we remain committed to advancing our mission of promoting sustainable water management through research, education, and community engagement. I am grateful for the unwavering support of our advisory committee, faculty fellows, partners, and the broader community. Thank you for your continued dedication to addressing the water challenges facing our region. Together, we can make a meaningful impact on the sustainability of our precious water resources.

I also want to extend my gratitude to the amazing team of assistant directors, staff, and students that form the CWI Research and Education team. We are successful because of their commitment and dedication to our mission.

Sincerely,

A handwritten signature in blue ink that reads "Laura Ramos" with a decorative flourish at the end.

Laura Ramos
Interim Director

Advisory Committee

The Campus Advisory Committee includes one faculty member from each college to provide multidisciplinary guidance to the CWI Research and Education Division. We are thankful for all the advice they have provided to our team.



Florence Cassel



David Drexler



Andres Jauregui



Andrew Jones



Robert Lull



Fayzul Pasha

Frederick
Peinado Nelson

Monica Rivera



Beth Weinman

Faculty Fellows

Our Faculty Fellows are full-time faculty at Fresno State who come from the various colleges of the University. They actively engage graduate and undergraduate students in research that seeks to solve Valley water resource management problems while educating our students in these areas.



Samuel Contreras-Ruiz



Earvin Balderama



Aimee Jacobs



Pei Xu



Christina Macias



Jorge Pesantez-Sarmiento



Xiangxiong Kong



Michella Calvarese

During the 2023-2024 Academic Year, the CWI Faculty Fellows formed two teams to develop a proposal or white paper. Learn more about the teams below.

Team 1 – Developing a Farm Digital Twin

Team 1 comprised of Jorge Pesantez, Aimee Jacobs, Pei Xu and Xiangxiong Kong. They focused on creating a white paper and grant proposal for a farm digital twin, which is a digital model of an intended or actual real-world physical product, system, or process that serves as the effectively indistinguishable digital counterpart. The team, supported by CWI staff, submitted a \$200,000 grant proposal and is awaiting results. If successful, work will commence in Spring 2025.

Team 2 – Health Impacts of Water Quality

Team 2 consisted of Christina Macias, Earvin Balderama, Samuel Contreras-Ruiz and Michelle Calvarese. They investigated the health impacts of groundwater quality in Tulare County. A white paper was developed proposing research to assess correlations between groundwater quality and health issues in the county. The research aims to document health impacts from groundwater use, educate affected communities, and share their stories through a compelling documentary.

Education & Outreach

IFA Kids Ag Camp (July 24, 2023)

The Kids Ag Camp, hosted by the Jordan College's Institute for Food and Agriculture, offered hands-on learning experiences for kids between the ages of 7-12. CWI hosted one of the days by coordinating four stations where students observed demonstrations of the water cycle and were involved in interactive activities. Students learned a variety of information about different water-related activities through painting, playing with water toys, creating cardboard models and sensory bottles, and participating in a storm runoff simulation activity.



Water Book Club (August – December 2023)

The Water Book Club, hosted by CWI, took place from August to December 2023. Book Club participants read *Water to the Angels: William Mulholland, His Monumental Aqueduct, and the Rise of Los Angeles* by Les Standiford. This weekly virtual event brought together students, faculty, and staff to read and discuss the topic of water sustainability. Twenty faculty, staff, and students from all over the campus participated.



Managing Water and Farmland Transitions in the San Joaquin Valley (September, 2023)

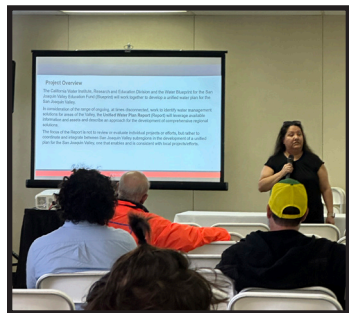
The Public Policy Institute of California (PPIC), CWI, and the Central Valley Community Foundation co-hosted on the Fresno State campus the event "Managing Water and Farmland Transitions in the San Joaquin Valley." The event was the culmination of a two-year study on options for farmland that might have to be repurposed due to insufficient water resources. Some of the options recommended included solar, groundwater recharge and replenishment, habitat, and floodplain restoration. The event covered topics such as farmland management and water sustainability. You can read the publication at <https://www.ppic.org/publication/managing-water-and-farmland-transitions-in-the-san-joaquin-valley/>.

Imagine a Day Without Water (October 19, 2023)

CWI hosted a virtual "Imagine a Day Without Water" event to raise awareness about water issues, availability, and support services for water insecurities. The event featured presentations from community speakers, community leaders, and academics who offered more insight into water-related challenges and resources across the state. Attendees received information on water levels, outreach resources, and strategies for addressing both short-term and long-term water issues. Recent studies on feasible solutions for the water crisis were also discussed, highlighting considerations for investing in water systems and resources. This event held a Q&A session where participants asked experts about wells, their operations, solutions for drought, and water rights.

Ag Tech Day (October 27, 2023)

The 7th Annual Ag Tech Day displayed the latest in agricultural irrigation, water, and energy management technologies. The event, hosted by the Center for Irrigation Technology (CIT), included live field demonstrations on the Fresno State Farm. CWI hosted one of the sites along the Farm tour where Assistant Director Cordie Qualle presented his research findings on the Shallow Subsurface Artificial Groundwater Recharge (SSAGR) Project.



World Ag Expo (February 14, 2024)

As the largest annual outdoor agricultural exposition, the World Ag Expo in Tulare displays the latest in farm equipment, ag communications, and technology. CWI held four bootcamps throughout the event focusing on water rights, water conveyance, groundwater recharge, and CWI's involvement in developing a Unified Water Plan. These bootcamps allowed event attendees to have a better understanding of how water is managed in California and the latest research to support groundwater sustainability.

Groundwater Awareness Week Webinar (March 15, 2024)

CWI celebrated the 25th anniversary of Groundwater Awareness Week with an online seminar discussing the ins-and-outs of all things groundwater-related. Groundwater Awareness Week underscores the indispensable role of groundwater amidst ongoing challenges of water scarcity. CWI Assistant Director Cordie Qualle, Professor of Political Science Dr. Tom Holyoke and Interim Director Laura Ramos made presentations on groundwater regulations, current groundwater research conducted by CWI, and the importance of groundwater to the local economy and communities.

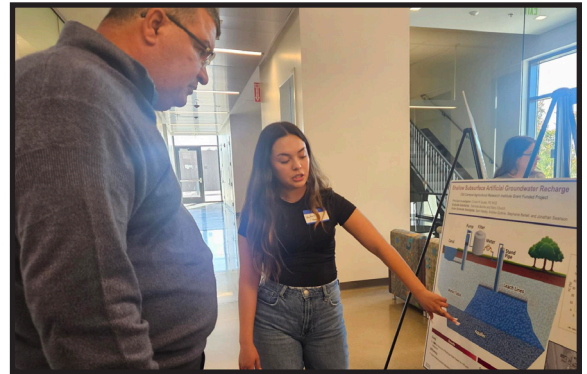
World Water Day (March 22, 2024)

The World Water Day open house held at Fresno State brought awareness to the importance of accessible freshwater for drinking and sustainable management of our freshwater resources. Sponsored by the California Water Institute and the Civil and Geomatics Engineering Department, the event was attended by water experts, engineers, and researchers who displayed posters and discussed how water resources are managed in the state, along with innovative research on water sustainability. In addition to a water facts scavenger hunt organized by CWI, students and other attendees heard from a panel of engineers discussing their careers in the water industry.



JARC Research Showcase (April 2, 2024)

The third annual Jordan Agricultural Research Center (JARC) Research Showcase brought together scientists and researchers across multiple fields to discuss how water is incorporated into their studies. The research showcase had affiliates and stakeholders from across California and the nation, including the USDA, the Pacific Coast Coalition, and the US Department of Defense, as well as many others. Students and faculty gave presentations on current works in nutritional studies, targeted water filtration, groundwater recharge, and more. CWI student staff, Victoria Vera and Ashley Cortez, presented posters on two recent projects on sustainable groundwater management and groundwater feasibility.



Water Awareness Month: Water Bootcamp (May 2024)

CWI hosted its annual water bootcamp in celebration of Water Awareness Month in May. Featuring four virtual sessions, including one dedicated to Spanish speakers, the bootcamp was designed to educate the public about California's complex water system. The sessions covered the spectrum of water-related topics including hydrology, climate change, water rights, groundwater recharge and regulations, and water distribution. Presenters included Interim Director Laura Ramos, CWI Assistant Director Cordie Qualle, and Political Science Professor Dr. Tom Holyoke.



Dog Days (June 2024)

Dog Days took place from June 24 through July 12 with transfer students and first year students alike learning about the programs, opportunities, and clubs Fresno State has to offer. CWI staffed a table to promote the new water minor to prospective students, demonstrating all the benefits that come with the water minor and how it can help them in their future careers.

Presentations and Appearances

Interim Director Laura Ramos made several presentations and appearances during the year. Ramos educated the public about water management issues, provided an overview of CWI including current research projects and partnerships, and promoted Fresno State water-related research and academic opportunities.

Fresno Sunrise Rotary Presentation (October, 2023)

Fresno Sunrise Rotary provided an avenue for CWI to highlight Fresno State research projects, education programs, and collaborations with other organizations in the water industry. Providing relevant information to Fresno Sunrise Rotary members, the presentation gave a glimpse of the new water minor available at Fresno State, and the individual water resource and research centers in the San Joaquin Valley.

Water Minor Presentations to Students & Advisors (April 2024)

The University Advising Center received a water minor presentation that went in depth into the requirements, expected outcomes, and usefulness of the new water minor at Fresno State. Necessary information was presented to advisors and prospective students, including the required courses and units, GPA standards, elective options, jobs in this field, and examples of how this minor could help students in their future careers.



CSU, Fresno Foundation Board of Directors

The presentation to the CSU Fresno Foundation informed the Board of Directors about current CWI activities and discussed the water minor. Founded in 1962, the CSU Foundation's mission is to enhance the educational excellence of California State University in teaching, learning, community service, and applied research.

Communities for a New California - Monthly General Meeting (April 25, 2024)

Interim Director Laura Ramos attended the monthly general meeting of Communities for a New California to discuss groundwater contamination. During her presentation, she gave a comprehensive overview in Spanish, covering topics such as water contamination, treatment methods, different types of contaminants, and the various ways water can become contaminated. Teaching the community about their water and how to manage it effectively can boost community involvement and enhance the drive to find solutions for California's water crisis. By increasing awareness and understanding, people are more likely to engage in addressing the issue and advocate for necessary changes.

Research Projects

California Partnership for the San Joaquin Valley - Water Work Group

Working with the Office of Community and Economic Development, CWI staff is helping coordinate and facilitate the San Joaquin Valley Partnership Water Work Group. In 2023, the work group focused on developing an outreach plan and marketing materials to inform San Joaquin Valley growers about resources available to them to learn more about groundwater recharge benefits and how to get involved. A website was also being developed with resources available from city, county, state, and federal agencies. These resources highlights groundwater recharge benefits, success stories, how to overcome limitations, and best management practices. Information on this effort is shared on RechargeCA.org.



Leaky Acres, a large scale groundwater recharge project in Fresno, is a prime example of what a beneficial land usage could be.

Climate-Smart Farmland Transition Study



Solar panels used to produce energy for farm use, placed in agricultural land no longer being farmed.

The California Water Institute (CWI) and the Public Policy Institute of California (PPIC) worked together on a study to observe climate and cost friendly solutions to the water crises and farming here in California. Bringing together water, climate, and soil researchers, farmers, engineers, and city and land planners, the Climate-Smart Farmland Transition Study allowed the Valley an opportunity at innovating greater agricultural techniques and advancing climate science. The collaboration opened communication between stakeholders that do not normally work together, determining better ways to facilitate agricultural growth while keeping in mind water scarcity and funding. A final report of the Farmland Transition Study can be found at <https://www.ppic.org/publication/managing-water-and-farmland-transitions-in-the-san-joaquin-valley/>

Groundwater Recharge to Benefit Disadvantage Communities in Fresno County Feasibility Study

In January 2024, CWI along with Fresno State faculty and students published a report on the findings of a feasibility study that identified and evaluated the feasibility of groundwater recharge basins near small communities in Fresno County. This study, funded by Bank of California, formally Pacific Western Bank, aimed to provide sustainable water management solutions for communities that commonly experience groundwater quality and quantity issues.

Focusing on water for disadvantaged communities, civil engineering students at Fresno State identified four potential sites for groundwater recharge in Kerman, Raisin City, Caruthers and Laton. Each site was evaluated by examining the areas for groundwater quality, soil conditions, current land use, availability of surface water supply, construction costs, ease of maintenance and operation, and community benefit. Through further research, the positive effects this study can have on future groundwater quality and recharge potential may mark a significant step towards addressing critical groundwater issues in the region.

The project also included education to the selected communities about groundwater recharge. CWI Staff developed an informational flyer in English and Spanish that described what groundwater recharge is, the benefits and potential concerns. The flyers were then distributed to the communities, and we hope to do in person education in the future.

San Joaquin Valley Water Collaborative Action Program

In 2020, CWI in partnership with Water in the West at Stanford University began the San Joaquin Valley Water Collaborative Action Program (CAP). CAP is a coalition of leaders from agriculture, water agencies, environmental justice organizations, environmental organizations, academia, and state and federal agencies working to collectively tackle the San Joaquin Valley's water challenges through on-the-ground action.

Together, CAP has been making remarkable strides. In its first phase, CAP members established a vision statement, defined the problem, and outlined necessary outcomes for long-term sustainability. Now in its second phase, CAP is developing potential action items to ensure safe and sustainable drinking water, improve ecosystem health, repurpose land and reduce demand. In the second phase, CAP's members took a more active role in the direction of CAP and CWI moved to a facilitation and coordination role. CWI is proud of the growth and direction that CAP is taking and looks forward to its continued growth.



CAP tour participants visit the San Luis Reservoir.

Shallow Subsurface Artificial Groundwater Recharge (SSAGR) System Research

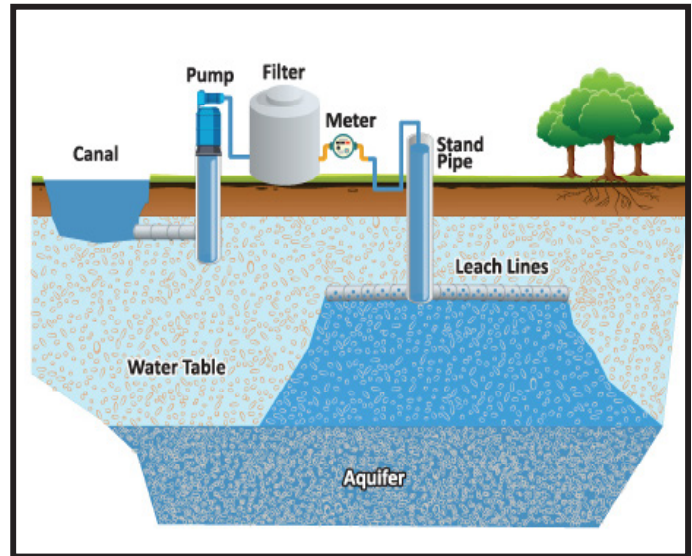
In September 2023, the CWI published a report highlighting the positives of Shallow Subsurface Artificial Groundwater Recharge (SSAGR) as a water management tool. The report was based on a three-year research project conducted at the Fresno State Farm to investigate the efficiency and cost of SSAGR. The report presents SSAGR as an innovative approach to water management, which could add another tool to the current California water management system. This new system, designed to address a loss of groundwater quality and quantity, operates through a leach line system that directs clean water into the groundwater table. The report takes time to introduce the challenges posed by overuse of groundwater and offers the SSAGR strategy as a solution to enhance the sustainability of water resources across the state.

For the public, this means reducing loss of water due to evaporation, less disruption of farming operations and seamlessly integrating with existing drip irrigation systems. Additionally, SSAGR can span a considerable amount of land, with the added benefit of the system not leaching legacy pesticides, fertilizers, or herbicides into the groundwater. To read the report, [click here](#).

All research done was funded by the California State University Agricultural Research Institute, with private donations and contributions from Lidco, Inc. and Grundfos Pumps.

PPIC Crop Transitions

The Public Policy Institute of California (PPIC), the California Water Institute and the Center for Irrigation Technology (CIT) at Fresno State are collaborating on a two-year project to analyze the benefits and costs of current crop growth, water use, and farmland in the San Joaquin Valley. This experiment will look for the minimum amount of water required to keep crops and cropland viable. The experiment will take place at the Fresno State University Agricultural Lab.



Unified Water Plan for the San Joaquin Valley

CWI will be developing a unified water plan for the San Joaquin Valley alongside the Water Blueprint for the San Joaquin Valley, thanks to a grant awarded by the Bureau of Reclamation.

This two-year project aims to identify a holistic approach to water management solutions for the Valley by leveraging information and assets from current plans and strategies prepared by local agencies. These water management agencies include groundwater sustainability agencies, local nitrate management zones and local water districts and municipalities.

Through this research initiative, the project team plans to address strategies for water management solutions in the San Joaquin Valley while also focusing on a water plan implementation approach.



Canal running through agricultural land in the San Joaquin Valley.

CWI on Social Media

CWI has utilized social media accounts over the last year as educational outreach tools to provide updates regarding California water issues, promote events hosted by CWI, and education for the community to see what is happening with California water and what CWI is doing to find solutions. Student staff member Ysabella Ramirez works as the social media strategist to help ensure frequent activity and accurate information. Over the fiscal year, CWI has gained 21 followers on "X" and 103 additional followers on LinkedIn.

In the News

Professor delves into 'Fragmentation of Western Water Policy' in new book

<https://www.fresnostatenews.com/2023/11/16/professor-delves-into-fragmentation-of-western-water-policy-in-new-book/>

Dr. Tom Holyoke wrote a fourth book focused on the issues with water policies. In his book, he discusses the potential need for a national policy that would be more cohesive and solve more problems, namely the dispersion of water rights throughout the state. Going in depth at how water politics is changing and becoming more relevant in political campaigning, Dr. Holyoke navigates the conflicts over water in the United States between water stakeholders and how these incongruous policies affect different communities.

New report details potential water management solution

<https://www.fresnostatenews.com/2023/12/14/new-report-details-potential-water-management-solution/>

Fresno State engineering lecturer Cordie Qualle spoke with a farmer about issues and concerns surrounding the Central Valley's communities and proposed a solution: Shallow Subsurface Artificial Groundwater Recharge (SSAGR). Qualle explained the research that showed this method of water management outperformed the rest, resulting in no evaporation losses and costing as much as eight times less than other methods.

California Water Institute awarded grant to bolster regional climate resilience

<https://www.fresnostatenews.com/2024/01/24/california-water-institute-awarded-grant-to-bolster-regional-climate-resilience/>

The Governor's Office of Planning and Research awarded nearly \$569,000 to CWI and its partners for a project that addresses drought and flooding by planning for sustainable use of surface and groundwater. The project, "Climate Resiliency through Regional Water Recharge in the San Joaquin Valley," will educate rural communities on groundwater recharge and establish a collaborative response team and plan for effective floodwater management, ensuring vulnerable communities are prioritized. This inaugural Regional Resilience Grant, part of the Integrated Climate Adaptation and Resiliency Program, is supported by the governor's multi-year climate budget and aims to fortify climate change resilience at a regional level.

Water and looming SGMA regulations discussed at World Ag Expo

https://hanfordsentinel.com/news/local/water-and-looming-sgma-regulations-discussed-at-world-ag-expo/article_5756286e-9a9d-5319-ad12-6f8bc4aea4b4.htmlmc_cid=3439a98bc4&mc_eid=452a39aaa5

The World Ag Expo in Tulare County had visitors from all over the world communicating their ideas and concerns about water management and water resources. The main thing agreed upon by everyone was that water is being overused and undermanaged. California has decided to step up and temporarily set regulation standards for the whole state while researchers, experts, and partners devise a strategy that is sustainable, equitable, and economically friendly. As Laura Ramos commented, the government needs to step in and start providing support to vulnerable communities.

REPORT: Fresno State report details how Shallow Subsurface Artificial Groundwater Recharge can recharge clean water to aquifers

<https://mavensnotebook.com/2024/02/28/report-fresno-state-report-details-how-shallow-subsurface-artificial-groundwater-recharge-can-recharge-clean-water-to-aquifers/>

Fresno State looked at different recharge basins to see which was most effective at providing clean water over the course of four months. The results showed that the Shallow Subsurface Artificial Groundwater Recharge (SSAGR) systems did not lose any water throughout the recharge process and stayed at 100% efficiency during the hotter days. While a recharge basin can recharge more water than the SSAGR system at a given time, it cannot do so as efficiently as it loses water throughout the recharge process.

San Joaquin Valley water plan takes shape

https://hanfordsentinel.com/news/local/san-joaquin-valley-water-plan-takes-shape/article_42736535-645e-5c5a-9881-298d0d36c1d3.html

The California Water Institute and Water Blueprint of San Joaquin Valley are collaborating on a sustainable, long-term water management plan that will focus on water-related issues and solutions to provide the Central Valley with reliable water resources. Using grant money of \$1 million, the Blueprint and CWI are collecting data regarding the quality of water, the infrastructure throughout the state, the population, the economy, and vulnerable communities. They plan to use this data to formulate a reliable plan and educate the public on water resources and effective water management.

New minor in Water Education at Fresno State

https://abc30.com/fresno-state-new-minor-water-education-csu/14727269/?utm_medium=email&utm_source=govdelivery

Fresno State is introducing a new water minor for students to learn about water systems, disparities, problems and solutions, and water politics. This minor is the first of its kind at Fresno State and the CSU system.

Fresno Metropolitan Flood Control District Newsletter Guest Story: Beneficial Groundwater Recharge

<https://indd.adobe.com/view/a5fe934b-b086-4a60-90cd-f43d4b852cf5>

Article written by Tom Holyoke, Laura Ramos, and Cordie Qualle from the California Water Institute. The 2022-2023 wet season brought unprecedented atmospheric rivers that slammed the Fresno area with severe rainfall. That season of unexpected storms served as a reminder that traditional weather patterns can no longer be relied upon for future planning. California must soon recognize the urgent need for legislation, infrastructure, and equipment to mitigate the potential effects of extreme weather events.

Fresno State Offers New Minor Focused on Water

<https://abc30.com/14791327/>

Fresno State is offering a one-of-a-kind minor in water that allows students to learn about water sources and systems, agriculture, geography, geology, and politics.

Empowering Spanish-speaking communities through water education

<https://www.fresnostatenews.com/2024/05/28/empowering-spanish-speaking-communities-through-water-education/>

Spanish-speaking communities are greatly affected by droughts and floods, and the increase of groundwater recharge systems. Laura Ramos of the California Water Institute held presentations during the Water Bootcamp to teach Spanish-speakers about water sources and systems and their rights. While most Spanish-speakers know some English, it is crucial to provide them with information and resources in their native language, especially as their communities are seeing bigger impacts made by climate change and how we are addressing it.

Kudos to campus employees

<https://campusnews.fresnostate.edu/june-24-2024/kudos-to-campus-employees>

Laura Ramos, interim director, California Water Institute, has joined the UPWARD Advisory Group to engage with experts and interested parties who are willing to lend their skills, guidance, and knowledge to help with modernizing access by the public to water rights records.

Contact:

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Website: californiawater.org

Phone: (559) 278-7001



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