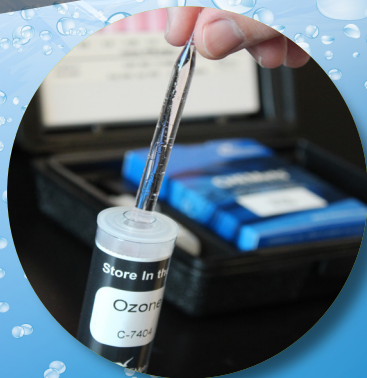


RESEARCH AND EDUCATION DIVISION ACTIVITIES REPORT 2021 - 2022



ENVIRONMENT

Panelists: Pablo Garza, Environmental Defense Fund
Sandi Matsumoto, The Nature Conservancy;
Zach Smith, Colorado Water Trust;
Phillip Womble, Stanford University

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Director's and Associate Director's Message

The world is experiencing unprecedented climate change. Locally, the San Joaquin Valley is in a third year of drought in what is likely prolonged drought cycles. As the availability of surface water diminishes and a reduction in available groundwater due to regulations, it is imperative that all water interests work together towards solutions. The location and expertise of the California Water Institute (CWI) at Fresno State places us at the forefront of education and research on pressing water issues.

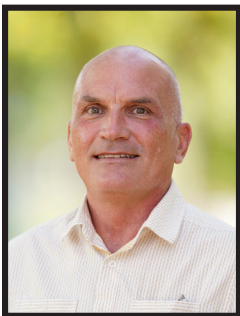
The year was filled with educational, research, and stakeholder engagement activities. On the educational theme, we hosted two water bootcamps, one in-person at the World Ag Expo in February and a virtual one in May. New this year was the addition of a Spanish version that was very well received. In June, we finished the year with a one-day summer program hosted by the Lyles College of Engineering on water for high school and middle school students.

The highlight of CWI's research efforts for this year was the continuation of the subsurface groundwater recharge site on the Fresno State University Farm. The stakeholder engagement process keeps us pretty busy these days, especially as it relates to the SJV Water Collaborative Action Program (CAP). CAP includes stakeholders from agriculture, environment, water agencies, safe drinking water advocates, and local governments to develop a shared vision, problem statement, and solution sets for water in the San Joaquin Valley.

This past year marked the second year of the CWI Faculty Fellows and the Campus Advisory Committee. We are thankful for all their time in bringing their expertise to support our mission and help find solutions to the valley water problems.

We invite all our existing and new partners to work with us in the 2022-2023 fiscal year to continue our education, research, and stakeholder engagement activities to work on solutions to water in the valley.

Sincerely,



Steve Blumshine

Steve Blumshine
Director 2021-2022



Laura Ramos

Laura Ramos
Associate Director 2021-2022

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Faculty Fellows

The California Water Institute (CWI) Faculty Fellows is a program that engages full-time faculty in research that advances CWI's mission.

The second year of the faculty fellows program was a very successful one. Sixteen faculty from all over the campus joined with CWI to collaborate in advancing research at Fresno State.



MIKE MUSTAFA
BERBER



LUCA BRILLANTE



QIN FAN



BRADLEY W.
HART



THOMAS
HOLYOKE



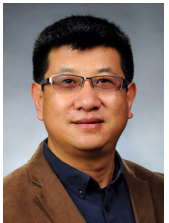
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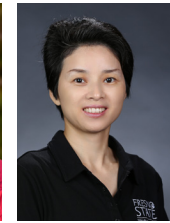
KALYANI MAITRA



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BALAJI SETH



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ZHI WANG



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Campus Advisory Committee

The Campus Advisory Committee was formed from one faculty member from each college to provide multidisciplinary guidance to CWI.



FLORENCE
CASSEL



DAVID DREXLER



ANDRES
JAUREGUI



ANDREW JONES



ROBERT LULL



FAYZUL PASHA



FREDERICK
PEINADO NELSON



MONICA RIVERA



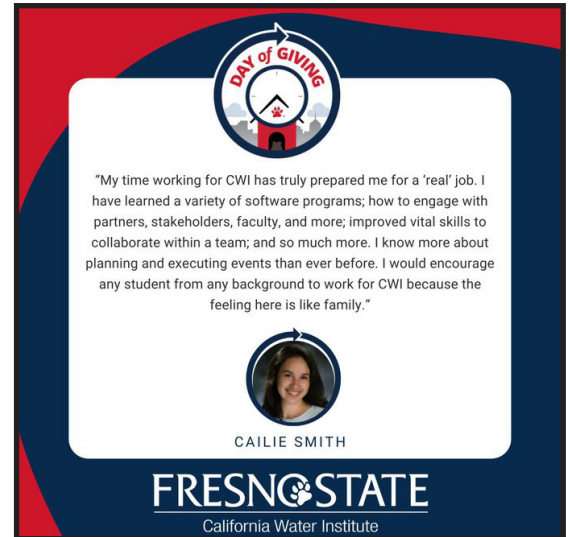
BETH WEINMAN

Education and Outreach

Day of Giving (November 4, 2021)

CWI participated in Fresno State’s fifth annual Day of Giving which is a day to donate to Fresno State’s colleges, schools, and areas on campus. CWI students put together a Twitter and email fundraising campaign to raise money for the institute.

During this time, funds that we raised helped support students learn various software programs and provide them the opportunity to engage with stakeholders throughout the community. Students have also been able to work on projects that involve outreach for dry well owners in the San Joaquin Valley and give them opportunities to plan numerous events and learn in real world settings hands-on.



The graphic above is marketing material used on Day of Giving created by a CWI student that highlights the students that CWI employs.

Water Book Club (February – May 2022)

During the spring of 2022, staff, faculty, and students at Fresno State read, “The Death and Life Along the Colorado River” by David Owen. The club met virtually and discussed topics related to the river such as infrastructure, legal agreements, reservoirs, power plants, farms, fracking sites, ghost towns, possible solutions to lessen water usage from the river, and more. Attendees learned and asked questions about how we can save the Colorado River for present and future usage.



Participants from the Spring 2022 Water Book Club during one of the virtual lunch meetings.

World Ag Expo (February 10, 2022)

In February, the Center participated in the World Ag Expo seminar session by providing four general water presentations. Associate Director, Laura Ramos, presented 30-minute sessions about:

- Groundwater recharge,
- surface water distribution,
- How to Read a GSP,
- and a presentation on the subsurface recharge project CWI is working on.

The seminars were very well received and were attended by about 20 guests each.



Associate Director, Laura Ramos, presenting the Water Cycle to World Ag Expo attendees in just one of the various sessions that were offered.

Fresno State Water Showcase (March 2, 2022)

CWI hosted the inaugural virtual 2022 Fresno State Water Showcase for attendees to get a drop of what water related projects and studies that are happening within the Fresno State campus.

The event featured water-related research, studies, education, activities, and more in a 5-minute lightning talks style with time for questions and answers.

To watch a replay of the event please visit, www.californiawater.org/community/



The collection of images above are the Fresno State faculty members who presented their water-related research at the Inagural Water Showcase.

California Department of Water Resources Airborne Electromagnetic Surveys Demonstration (March 17, 2022)

Webinar: CWI worked with the Department of Water Resources to bring a groundwater management webinar to the public. The webinar featured the technology that DWR is using to measure groundwater basins. This information is critical to understanding the water below us.

In-person: The California Department of Water Resources held a live demonstration of an Airborne Electromagnetic (AEM) Surveys taking place in California's high- and medium- priority groundwater basins. Data is collected using geophysical instruments on a hoop that is towed beneath a helicopter. A current is generated in the hoop that sends an electromagnetic signal into the subsurface. Images of depths up to about 1,000 feet can be captured and processed to understand ground conditions.



A group of DWR staff and invited guests pose for a photo to mark the live demonstration of Airborne Electromagnetic (AEM) Surveys.



Attendees got a closeup look of the Airborne Electromagnetic (AEM) Survey equipment.

World Water Day Symposium (March 22, 2022)

Partnering with Fresno State's Sustainability Club, CWI brought its water research and education resources to the World Water Day Symposium.

The symposium also had guest speaker, North Folk Mono Tribal Chair, Ron Goode, who spoke about tribal water rights. The event was attended by Fresno State students, faculty, and staff.



Guest Speaker, Ron Goode, is giving his presentation about tribal water rights.

Water Bootcamp (May 6, 13, 20, & 27, 2022)

California Water Institute’s Water Bootcamp, in partnership with the World Ag Expo, is an annual, multi-day, virtual series dedicated to water topics. With May being Water Awareness Month, CWI hosted Water Bootcamp on every Friday in May to increase water education and provide resources for San Joaquin Valley communities. Topics included, California watersheds, groundwater management and recharge, surface water distribution, water rights, and more.

Mitigation Strategies

Infrastructure Investment Categories

- Watershed Management
- Environmental and Ecosystem Resources
- Surface and Ground Storage
- Conveyance (new and refurbished)
- Surface Water Treatment Facilities
- Advanced Wastewater Treatment Facilities

Environmental Enhancement

- Watershed management
- Restoration of Riparian Ecosystems

New Canals:

- Trans-Valley Canal
 - Enhance transfer water between the Kings River and the San Joaquin River particularly during flood events
- Cross Valley Canal
 - Improves the resiliency with connection between the California Aqueduct and the Friant Kern Canal

New Storage:

- Del Puerto Canyon Reservoir
- Expand Pacheco Reservoir
- Expand San Luis Reservoir

Water Banking

- New banking opportunities
- Expand Kern County Groundwater Banking

New Water Treatment Plants

- Increase the ability to use surface water for drinking water

Refurbish Aging Water Management Infrastructure

The photo above shows Laura Ramos, Associate Director, presenting at the Water Bootcamp.

How to Read a GSP (June 16, 2022)

CWI partnered with Maven’s Notebook and CivicWell to speak about Groundwater Sustainability Plans (GSP). During the webinar, attendees learned what all GSPs have in common, what they cover, and key items and phrases that are important in understanding how Groundwater Sustainability Agencies will ensure groundwater sustainability.

For more information please visit, bit.ly/HowToReadaGSP

Groundwater Sustainability Agency (GSA)

Department of Water Resources
CA.GOV SGMA PORTAL

What is a GSA

SUBMIT AND VIEW SGMA INFORMATION AND DATA

GSA Formation | GSP Submittal | ALT Alternative Submittal | ADJ Adjudicated Areas | BBM Basin Modification | RES SGMA Portal Resources

<https://sgma.water.ca.gov/portal/>

www.californiawater.org

Laura Ramos, Associate Director, presenting How to Read a GSP to attendees.

LCOE Summer Engineering Experience (June 21, 2022)

Fresno State Lyle's College of Engineering asked California Water Institute's Division of Research and Education to lead two sessions educating middle and high schoolers about civil engineering and its relation to water. Students engaged in various activities regarding water treatment, wastewater treatment, and creating a marketing campaign to educate and inform people to use treated wastewater. The sessions were led by faculty member Cordie Qualle and assisted by CWI's student assistants.



Middle school students analyze the process of how water is filtrated and cleansed.



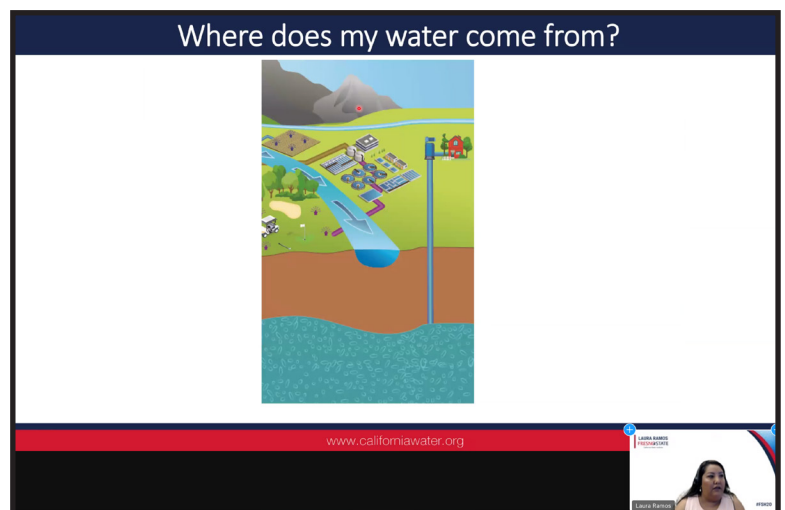
High schoolers can be seen discussing ideas for their marketing plans on how to promote drinking treated wastewater.

Rural Residential Purchases: What to Know about Groundwater and Wells (June 30, 2022)

CWI partnered with Fresno State's Gazarian Real Estate Center and London Properties to host a free online seminar that informed real estate agents and consumers about private wells, and what consumers need to know about buying a property with a private well.

A replay of the recording can be found on the Gazarian Real Estate YouTube page:

<https://youtu.be/HB9xEhZgpII>



Associate Director, Laura Ramos, presented on groundwater and residential wells to attendees. The image above showed attendees where their water comes from.

Publications

Central California Business Review:

Wine, Water, & Land

This magazine, published by the Fresno State Craig School of Business, features valuable insights into how the wine industry is growing and changing, water availability in California, and the regional economy such as consumer and real estate sentiments.

Water Availability: Economic Impacts and Solutions is the title of the article written by Laura Ramos, Cordie Qualle, and Michael Shires for Craig's Central California Business Review April 2022 Issue.

The article can be found on the Craig School News website: <https://fresnostatecsb.com/water/>



Laura Ramos presenting at the magazine issue launch event.

Groundwater Sustainability: Agency Groundwater Metering and Well Monitoring Program

The East Kaweah Groundwater Sustainability Agency (EKGSA), on behalf of the Kaweah Subbasin Groundwater Sustainability Agencies (KSB-GSAs), contracted with the California Water Institute (CWI) to investigate the functionality of water meter systems to measure, collect, and aggregate pump discharges from groundwater wells and aggregate it into a formal report.

The report published in March of 2022 describes the process taken to evaluate water meters, telemetry units, as well as cloud-based services that aggregate the data collected from the meters. The report concludes with recommendations from CWI to the KSB-GSA's.

Sustainable Groundwater Management Act Governance Strategies Summary Report

This report outlines the initial implementation of SGMA by the GSAs in 21 critically over-drafted groundwater subbasins. Based on a review of multiple statutes, regulations, early research, official government documents, and interviews with individuals involved in the process, the CWI staff explain how these first GSAs were created and the organizational and governance challenges they navigated.

Once formed, the GSAs were charged with the development and implementation of groundwater sustainability plans (GSPs). A review of the formation process for this set of GSAs was particularly instructive. As they were required to meet a set of SGMA requirements two years earlier than the remaining legislatively identified basins.

Presented in an approach that moves from the general to the specific, this report documents the historical process of how 125 GSAs began to implement SGMA. In addition, this report provides essential baseline information to help researchers, regulators, policymakers, and GSAs develop and evaluate governance and future governance strategies, statutes, and regulatory actions.

Research Projects

Climate Smart Farmland Transition

SGMA will likely require the removal of agricultural land from production to achieve sustainable groundwater levels. Land fallowing must be appropriately planned to preserve high-value lands from fallowing and mitigate potential negative impacts of fallowing. The Public Policy Institute of California (PPIC) is researching planning options for fallowed land. The effort will engage a diverse group of stakeholders, including growers, agricultural and urban water managers, land planners, and air quality experts, to propose and vet solutions. CWI is assisting PPIC with stakeholder outreach and engagement.



Leaky Acres in Clovis, California, a groundwater recharge basin, is a prime example of what a beneficial land usage could be.

San Joaquin Valley Water Collaborative Action Program

CWI is part of the facilitating and coordinating team for the San Joaquin Valley Water Collaboration Action Program (CAP). CAP is an unprecedented collaborative effort. More interest groups engaged in Valley water issues are “at the table” than ever before. The participating interest groups include:

- safe drinking water and disadvantaged community (DAC) advocate,
- local city and county governments,
- environmental NGOs,
- growers and the agricultural industry,
- and water agencies from throughout the Valley.

CAP Members are working on solutions to address five desired outcomes for Valley water resources. The desired outcomes are safe drinking water, sustainable water supplies, ecosystem health, sustainable agriculture, land use; infrastructure; replenish aquifers, consistent policies, and sound science. During Phase 1 of the program, CAP participants developed more than 90 proposed solutions to address the desired outcomes. During Phase 2, the group hopes to evaluate existing projects and help streamline any future work.



Members of CAP toured around the city of Visalia, California, and visited Nichols Farm.

Date Analytics to Obtain B-Corp Certification

The B-Corp Certification is given to for-profit companies that meet the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose. Companies are evaluated on their overall impact on the community, employees, customers, and the environment.

CWI worked with Woolf Enterprises, a third-generation Central Valley family-owned farm since 1974, earned its place in corporate responsibility by becoming a Certified B Corporation. Through partial funding from the Agriculture Research Initiative, the California Water Institute and faculty, staff and students from the Craig School of Business provided data analytics and assistance in developing an Environmental Management System. In the 2021-2022 academic year, CWI staff, and students worked on updating the EMS to reflect updated data.

Kings Water Association Committee Facilitation

The California Water Institute is assisting the Kings Water Alliance by facilitating conversations with their constituents to review and implement their Early Action Plan. In January of 2020, the California Office of Administrative Law approved the Salt and Nitrate Control Program, marking the beginning of local implementation efforts to improve water quality consumption.

The Kings Water Alliance has prepared and submitted the Preliminary Management Zone Proposal and Early Action Plan to the Central Valley Water Board. Kings Water Alliance will move forward with reviewing it with their stakeholders.

Partnership 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. The work group focused on developing an outreach plan informing the public of resources that are available to help San Joaquin Valley residents affected by drought maintain access to drinking water.

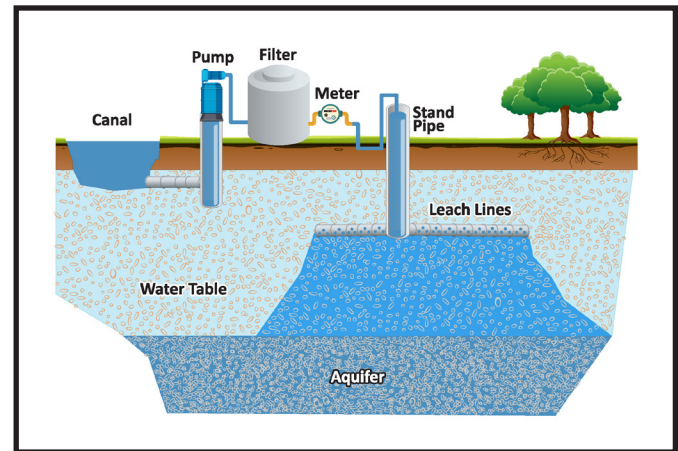
The work group developed an outreach plan, and marketing materials that can be used by anyone as well as a website with resources by county. Information on the effort can be found at www.mywellwentdry.org.



The flyer above is to inform home owners who have a dry well about available resources. The flyer is made in 9 different languages to ensure community members have equal access to safe, reliable, and affordable drinking water.

Subsurface Groundwater Recharge Research

An innovative approach to groundwater recharge is the application of a recharge system that is installed below the crop's rootzone. This system is referred to as Shallow Subsurface Artificial Groundwater Recharge or SSAGR for short. A SSAGR system is comprised of a pipe system with perforations and any runoff water or excess available surface water can be transported and distributed through this pipe system facilitating the percolation of water right into the groundwater aquifer. CWI is working with the Fresno State University Farm Laboratory to install this system below the crop's rootzone, and conduct research in economic feasibility, agricultural soil health, impacts on agricultural industry, and agricultural water usage. This research should be conducted to demonstrate the benefits of a SSAGR system in agricultural fields.



The illustration demonstrates how the subsurface groundwater recharge operates.

Flow Meter Evaluation Program

Working with the Greater Kaweah Groundwater Sustainability Agency, Mid-Kaweah Groundwater Sustainability Agency, and the East Kaweah Groundwater Sustainability Agency, CWI conducted a Groundwater Metering and Well Monitoring Pilot Program. The objective of the pilot program is to test and evaluate different types of deep irrigation well metering units, data collection and transmission methods for flow metering data, and data storage software and hardware systems used to archive data for analysis. The final deliverable for the pilot program was an evaluation report that describes the various types of systems available for irrigation well metering and provide a recommended approach and specification for meter system implementation.



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FRESNO STATE

California Water Institute

