14th Annual
CSU Water Advocacy Towards Education & Research
Conference

Our WATER’s Future:
Challenges and Next Steps

April 13, 2023
Welcome Message

Hello Conference Attendees,

We are so excited and pleased to bring you the first conference as ‘CSU-WATER’ (Water Advocacy Towards Education and Research), which officially launched July 1, 2022. We bring some new directions and areas of emphasis and engagement. We’ve focused our core goals on outreach across the CSU, with external partners, and integration of these across California to best address our onerous and dynamic water issues. To best achieve these goals, we’ve added internal governance in the formation of two faculty-based groups; an Internal Working Group and Campus Reps. in my visits to 10 CSU campuses so far, I’ve learned of so many great efforts focused on water education, programs, and research. It seemed natural to create the Campus Rep group to serve as information pipelines with CSU-WATER and across campuses.

Stories of campus water activities will be highlighted in our newly launched CSU-WATER newsletter, which first came out in March. The newsletter and Campus Reps are just part of what we’ve created to encourage you to reach out and let us know about your water education, community, and research fronts.

We also aim to help you engage more thoroughly with other water professionals. Join us! Since the launch of CSU-WATER, we have led or been Co-PI’s on $9.27M in total proposed funding.

This year’s conference theme is ‘Our WATER’s Future: Challenges and Next Steps’ including panels on Floods, Water Quality, and Water Quantity. We also offer five special guest speakers who have been instrumental in our CSU-WATER network building. During the sessions I encourage you to consider additional connections within and among water issues in our state and how you can be active in our CSU-WATER networks.

Best Regards,

Steve Blumenshine
Interim Executive Director
CSU-WATER

Vision, Mission, & Key Goals

Vision

CSU-WATER will be a resource for education, research, and policy development to help state agencies, regulators, and lawmakers achieve a long-term, sustainable water supply for California based on good science. CSU-WATER aims to convene and organize the vast knowledge and expertise related to water within the CSU and will help foster collaborations to demonstrate this capacity as a resource in California for information and solutions regarding the state’s water resources.

Mission

CSU-WATER is designed to target the capabilities and resources within the 23 California State University Campuses to provide academic preparation, applied research, and partnerships with stakeholders, addressing all aspects of water use. CSU-WATER serves to focus synergistically with the many centers and programs of excellence within the CSU on water issues. The goals listed below support the key elements in the CSU-WATER mission.

Key Goals

- To develop academic and community partnerships to create public awareness and broad support to address water issues.
- To increase and support CSU research and external funding through multi-campus collaborations.
- To promote CSU awareness of resources to support student water-related career opportunities.

Special thanks to the CSU-WATER Conference Planning Committee:

Jennifer Alford, San Bernardino  Thomas Horvath, Monterey Bay  Yize Li, Bakersfield
Pitiporn Asvapathanagul, Long Beach  Laurie Huning, Long Beach  Sami Maalouf, Northridge
Carisse Ballard, Monterey Bay  Emmanuel Iyiegbuniwe, San Marcos  Rae McNeish, Bakersfield
Julian Fulton, Sacramento  Michael Karp, San Bernardino  John Olson, Monterey Bay
Christopher Gibson, Fullerton  Crist Khachikian, Northridge  Erik Porse, Sacramento
Riya Ganguli, Northridge  Keila Khatib, San Jose
Our WATER's Future: Challenges and Next Steps

**April 13, 2023**

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<td>Conference Opens – Breakfast, Networking and Poster Session</td>
<td>Laura Ramos, Associate Director, CSU-WATER</td>
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<td>Conference Overview</td>
<td>Vanya Quiñones, President, CSU Monterey Bay</td>
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<td>University Welcome</td>
<td>Steve Blumenshine, Interim Director, CSU-WATER</td>
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<td>8:50 am</td>
<td>Water Markets and Drought Resilience Post-SGMA</td>
<td>Anita Chaudhry, CSU Chico</td>
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<td>9:15 am</td>
<td>Flood: Challenges and Opportunities</td>
<td>Stefan Talke, Cal Poly SLO, Serena Lee, Cal Poly SLO, Drake Abrahamsson, Cal Poly SLO, Danielle Salt, Sacramento State</td>
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<tr>
<td>11:30 am</td>
<td>Research Overview and Collaboration Opportunities with the</td>
<td>Eric Stein &amp; Steve Weisberg, Southern California Coastal Water Research Project</td>
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<td>12:00 pm</td>
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<td>Examples of Youth Engagement and Workforce Development Programs</td>
<td>Brian Currier, Sacramento State, Ben Chou, CSU Northridge, Kian Bagheri, San Diego State, Kelly Hollman, San Diego State, Tesfayohanes Yacob, Cal Poly Humboldt</td>
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<td>Water Quality</td>
<td>Stefan Talke, Cal Poly SLO, Serena Lee, Cal Poly SLO, Drake Abrahamsson, Cal Poly SLO, Danielle Salt, Sacramento State</td>
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<td>2:30 pm</td>
<td>Introduction to the California Water Boards and the Surface</td>
<td>Anna Holder, California State Water Resources Control Board</td>
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<td>Networking Break &amp; Poster Session</td>
<td>Jasbir Sidhu, Punjabi American Growers Group</td>
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<td>3:15 pm</td>
<td>Irrigation Water Economic Hardship on Farms</td>
<td>Jennifer Alford, Associate Director of Research, CSU-WATER</td>
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<td>Grant Roundtable</td>
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<td>4:45 pm</td>
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Research Overview and Collaboration Opportunities with the Southern California Coastal Water Research Project

Eric Stein, Department Head, Biology Department, Southern California Costal Water Research Project

Dr. Eric Stein is a principal scientist at the Southern California Coastal Water Research Project (SCCWRP), where he is head of the Biology Department. Dr. Stein oversees a variety of projects related to in-stream and coastal water quality, bioassessment, hydrodynamization and environmental flows, watershed modeling, and assessment of wetlands and other aquatic resources. His research focuses on effects of human activities on the condition of aquatic ecosystems, and on developing tools to better assess and manage those effects. Dr. Stein has authored and co-authored over 150 journal articles and technical reports and participates on numerous technical workgroups and committees related to water quality and aquatic resource assessment and management. Prior to joining SCCWRP in 2002, Dr. Stein spent six years as a Senior Project Manager with the Regulatory Branch of the Los Angeles District Corps of Engineers, and four years with a private consulting firm.

Steve Weisberg, Executive Director, Southern California Costal Water Research Project

Dr. Stephen Weisberg is Executive Director of the Southern California Coastal Water Research Project Authority (SCCWRP), a research consortium formed by 14 California water agencies to ensure a solid scientific foundation for their management activities. His research focuses on developing molecular tools to support environmental monitoring. He serves on the Governing Board and scientific advisory committees for several other organizations involved with development and adoption of new technologies, including the Southern California Coastal Ocean Observing System, the California Ocean Protection Council Science Advisory Team, the California Water Quality Monitoring Council, the California Sea Grant Advisory Team, the NDAA Science Advisory Board and the EPA’s Board of Scientific Counselors. He received his Ph.D. in biology from the University of Delaware, and his B.G.S. from the University of Michigan.

Examples of Youth Engagement and Workforce Development Programs in ACWA and Santa Clara Valley Water

John Varela, Board Chair, Santa Clara Valley Water District & Region 5 Chair, Association of California Water Agencies

Director John Varela was appointed to the Santa Clara Valley Water District Board of Directors in December 2015. He was elected by the voters in November 2016, and re-elected in 2018 and 2022. Director Varela is the 2023 board chair. His current term expires in 2026.

Director Varela serves on Valley Water’s Agricultural Water Advisory Committee, Water Commission, and the joint water committees for Morgan Hill, Gilroy, and San Felipe Division Reach One.

Director Varela is a former Morgan Hill city mayor and councilmember. He serves on the Board of Directors for Association of California Water Agencies, Joint Venture Silicon Valley, Morgan Hill Chamber of Commerce, and the Pajaro River Watershed Flood Protection Authority. He is also involved in the South County Regional Wastewater Authority and Safe Clean Water Independent Monitoring Committee.

Introduction to the California Water Boards and the Surface Water Ambient Monitoring Program (SWAMP)

Anna Holder, Environmental Scientist, California State Water Resources Control Board

Anna Holder (she/her) is an Environmental Scientist in the Office of Information Management and Analysis (OIMA) at the California State Water Resources Control Board. She is Surface Water Ambient Monitoring Program (SWAMP) Bioaccumulation Monitoring Program Coordinator, Safe to Eat Workgroups Co-chair, and OIMA’s Tribal Coordinator. Anna obtained her M.S. and B.S. from CSU Monterey Bay in Applied Marine and Watershed Science. Regardless of role, Anna uses data science, ecology, and science communication to inform the sustainable and equitable management of California’s natural resources.

Irrigation Water Economic Hardship on Farms

Jasbir Sidhu, Punjabi American Growers Group

Jasbir Sidhu migrated to the USA at the age of 12 in 1976 and completed his education in California with a degree in Electrical/Electronic Engineering. His professional career of 28 years was very successful starting from entry-level engineer to executive management and GM (General Manager) of Consumer Electronic division at Western Digital Corporation, where he was responsible for the $1B business annually and long-term corporate strategy.

Sidhu retired from high-tech industry and joined biological company Cisbay as President and part owner of the company. Cisbay focuses on microbial technology for soil rejuvenation and wastewater treatment. Within three years, the business successfully grew to 10 countries with effective business models and product strategy.

During the Covid-19 timeframe in 2020, Sidhu helped start a non-profit organization called PAGG (Punjabi American Growers Group) to help family farmers in California. The PAGG organization, founded in September 2020, represents California Punjabi-Sikh farmers who farm over 700,000 acres in California. The organization currently has over 350 members farming over 200,000 acres. A majority of the members are in Fresno and Madera counties in California, but is now expanding in other counties of the state. PAGG’s goals are to provide ag technical knowledge, business education, government laws/regulations or government policies, reduce farm input costs, optimize farming operation and market knowledge and gain fair market pricing. PAGG utilizes social media, two Punjabi radio programs, a website, and hands on workshops to empower farmers.

Last year, Sidhu started a fertilizer company called Fertilizer Depot Inc. to provide customized solutions for farms in addressing some of the key fundamental issues with water/soil and trees. This is the first fertilizer company owned by a Sikh/Punjabi in California. The company sources raw material directly from the manufacturer and provides custom formulations at reduced costs compared to the industry. Sidhu also has a joint family farm in Kerman, Ca since 1986. Sidhu’s parents worked very hard to get their kids educated while still connected to their farming roots.
**Campus Support**

Each campus should have a grants/contracts office that is able to provide grant writing/development support as well as guide you through your University requirements.

**Understanding the Grant Application**

Read and understand the application requirements, guidelines, and instructions carefully, including:

- Deadlines
- Funder’s priorities and objectives
- Necessary components/documents

**Common Components of a Grant Proposal**

- Project summary/abstract - a brief summary of the project/research.
- Project narrative/project description – answers to funder questions should be detailed and comprehensive, yet easy to understand.
- Scope of work – provides a detailed description of the proposed project or research and serves as a basis for evaluating the feasibility of the project/research. (More information below)
- Organizational capacity – demonstrates the organization’s ability to successfully implement the project/research.
- Personnel/management plan – a list of the personnel involved in the project/research, including their roles and responsibilities (may include attachment of resumes or biographical sketches).
- Evaluation plan – outlines the data collection and analysis methods that will be used to monitor and evaluate the success of the proposed project or research.
- Sustainability/future plans – how the project or research will be sustained after the grant funding ends and ensure long-term success. Demonstrates to the funding organization that the project/research will have a lasting impact and will continue to benefit the target audience or community even after the funding has ended.
- Letters of support/commitment - from partners/collaborators, if any.

**Scope of Work**

Scope of Work helps ensure that the project is well-defined, achievable, and aligned with the goals and objectives of the funding organization. It also serves as a reference point throughout the project, helping to ensure that the project stays on track and meets its goals and objectives.

- Objectives – a clear and concise statement of the project’s overall goals and objectives.
- Activities – a detailed description of the specific activities that will be carried out as part of the project, including timelines and milestones.
- Deliverables – a list of the specific outputs and outcomes that will be produced by the project, such as reports, publications, or products.
- Timeline – outlines the major milestones of the project and the expected completion dates.
- Budget/budget narrative – a detailed budget that outlines the costs associated with carrying out the project, including personnel, equipment, materials, travel, and other direct and indirect costs. Pay attention to what costs are eligible or ineligible and make sure the budget is realistic and accurately reflects the costs of the project.

**Grant Writing Tips**

**Review and Edit**

Review and edit the grant application to ensure proper grammar, spelling, and formatting (page limits, word limits, font type, line spacing, margins).

**Grant Resources**

- Grants.gov - centralized location for federal funding opportunities (USDA, EPA).
- California Grants Portal – all grants and loans offered by California state agencies (DWR, CDFA, CalEPA, DOC).
- National Science Foundation - independent federal agency that supports science and engineering in all 50 states and U.S. territories. Investments account for about 25% of federal support to America’s colleges and universities for basic research.
- Grants Resource Center - Available to some CSU campuses. Its search engine, GrantSearch, includes private and federal funding opportunities screened for recurrence and for higher education eligibility.

**Additional Resources**

- California Grants Portal
- Department of Water Resources Organizational Chart
- California Regional Water Boards
- California Water Association
- California Water Association Regulated Utilities
- California Strategic Growth Council
- California Domestic Water Company
- California Water Efficiency Partnership (Wholesale Providers)
- Pacific Institute (Water Resiliency)
- Public Policy Institute of California
- California Association of Resource Conservation Districts
- CA Governor’s Office of Planning and Research
- CA Department of Conservation
- CA EPA
- CA Department of Food and Agriculture
- CA Integrated Regional Water Management (IRWM)
- CA Sustainable Groundwater Management Act (SGMA)
Development of a Smart Water Pre-treatment System for Controlled Environment Agriculture Using Microplasma and AI Machines | By Sankha Banerjee, Abel Lopez, Jose Guerrero, Nadine Barton, Luis Cordova, Prakhayat Gautam, and Manan Sehgal

An innovative microplasma-assisted water treatment process coupled with integrated nanofiltration systems for the removal of micro and nanoparticle-based organic and inorganic contaminants to improve the efficiency of the downstream ion exchange processes allowing treatment of waters with elevated levels of total dissolved solids (TDS). Additionally, the feasibility of other downstream processes such as electrodialysis and electro-deionization processes will be assessed based on system parameters such as ionic species removal/recombination and TDS levels of the water sources. A new water stream is created in areas where conventional water sources are diminishing. Imported fertilizer and water transportation requirements are reduced, saving energy, and lowering GHG and NOx emissions.

Rethinking the Future of Dairy Wastewater at the Water-Energy Nexus: Steam Hydrogasification Based Process for Synergistically Treating Agriculture-Derived Waste Streams | By Marco Ceja and Zhongzhe Liu

California is the largest producer of agricultural products in the United States and holds almost all of the nation’s top ten agricultural counties according to the Census of Agriculture by the USDA. In particular, the Central Valley of California is one of the world’s most productive agricultural regions and many Valley counties (e.g. Tulare, Fresno, Kern) are at the top of the nation’s agriculture producing counties. Accordingly, California generates more than 20 million dry tons of agricultural residues per year and the Valley has the highest concentration of agricultural wastes (e.g. orchard and vineyard pruning, crop residues, animal manure). However, traditional treatment methods such as land application, burning, and biological conversion still generate some concerns (e.g. parasite, air pollution, non-stabilized byproducts). In addition, the Valley is home to the largest concentration of dairies in California. Tulare County is the largest milk producer in the United States, accounting for about $1.6 billion in 2016. The City of Tulare established a large industrial wastewater treatment facility for treating regional dairy wastewater. Treating high-strength wastewater such as dairy wastewater is still challenging and has a higher cost compared to municipal wastewater. Hence, new solutions to sustainable and synergistic treatment of regional agricultural wastes and dairy wastewater are highly needed. Steam hydrogasification reaction (SHR) is an advanced and self-sustainable technology that can convert agriculture-derived waste streams (typically high protein and moisture content) into renewable energy and fuels without costly drying processes. The SHR Laboratory at the Energy National Energy Technology Laboratory has performed an in-depth techno-economic analysis of the SHR-based process and confirmed that the SHR-based process has the potential for 12% higher efficiency at 18% lower capital costs compared to other state-of-the-art gasification technologies. In this study, the SHR-based process was used to synergistically treat the commingled agricultural wastes (e.g. dairy wastewater, orchard prunings) for the first time. The preliminary experimental data showed that the SHR-based process led to high carbon conversion and desired syngas composition for further downstream upgrading such as water gas shift (WGS) reaction. When WGS is integrated with SHR, the final product is renewable fuel, synthetic natural gas (SNG).

Analysis of Water Quality Near Homeless Encampments Along Santa Rosa Creek and Russell Creek | By Athena Everson, Lily Roberts, Claudia Mayo, Anna Lichterman, Ylla Hartman, Hailey Elson, and Jackie Guilford

Our goal was to examine the impact of homeless activity on the water quality of urban creeks in Santa Rosa, CA. Water was sampled upstream and downstream of areas with frequent homeless encampments on Santa Rosa Creek and Russell Creek monthly from October 2022 - February 2023. Water samples were analyzed for fecal bacteria (enterococcus, E. colii), nitrogen, phosphorus, ammonia, TSS, pH, temperature, and conductivity. Concurrent with water sampling, walking surveys were conducted to document signs of homeless activity. The relationship between water quality and homelessness was determined.

Amending Fertilizers with Carbon Nanoparticles as a Strategy to Improve Lettuce Nitrogen Recovery and Reducing Nutrient Losses in the Salinas Valley | By Sean Gleavesman, Hailey Elson, and Jackie Guilford

The large amounts of nitrogen (N) fertilizer used to sustain lettuce production in the Salinas Valley pose a threat to coastal and groundwater resources. To address water quality concerns, the Central Coast Regional Water Quality Control Board has adopted Ag Order 4.0, which places a limit on N loading from agricultural operations and will require growers to reduce N application rates and improve NUE over time. Strategies commonly recommended to mitigate N losses, such as planting cover crops, are often difficult to fit into the intensive lettuce production systems of the Salinas Valley. The use of carbon nanoparticles (CNPs) as a fertilizer additive is a nondisruptive N management tool that has been shown to improve yields and NUE elsewhere, but the impact of CNPs on lettuce growth on Salinas Valley soils has not been investigated. There is also a need to understand how CNPs impact nitrate leaching from these soils. Recent advances in the manufacture of CNPs have eliminated production costs and have addressed previous health and environmental concerns associated with CNPs, making this technology worthy of investigation in Salinas Valley lettuce production. Our research objective is to evaluate the impact of fertilizer solution amended with CNPs on lettuce yields, NUE, and nitrate leaching using different Salinas Valley soils. Greenhouse studies are in progress in which we are testing eight treatments consisting of different CNP application rates. The same treatments are used in each study, but different soils are used with contrasting texture and nitrate leaching potential. Our preliminary results showed yields were higher in pots receiving N plus 100 mg/L CNPs than in pots receiving only N. We also found that just adding 400 mg/L CNPs to pots without N fertilizer resulted in a 42% yield increase. Soil, leachate, and plant tissue samples are currently being assessed for soil inorganic N, leachate nitrate, and plant tissue N, respectively. All these data are ready to present at the CSU-WATER conference. Our long-term goal is to use findings from this research to inform future decisions for field studies exploring the use of CNPs as a N management tool in the Salinas Valley.

The De-Aging of Water Resources in the Northern Sierra Nevadas | By Emily Handy

As climate change continues to exacerbate the severity of weather patterns, the majority of the state of California has come to suffer from longer periods of drought and shorter, but more intense rainy seasons. With multi-year droughts comes a decrease in snowpack in the mountains. Alpine watersheds within the Sierra Nevada mountain range are a vital source and storage of water for California and Nevada. Snow water equivalent from snowpack feeds riparian systems that function as California’s primary sources of water which in the northern region of the state predominantly came from local resources. Baseflow conditions are seen earlier in the season and last longer than they used to due to decreased snowpack as a result of climate change. Sagehen Creek, a montane watershed just north of Truckee, CA, follows this behavior. Climate change is contributing to the de-aging of groundwater within aquifers. Without the back pressure of snowpack that helps to maintain water levels, spring and baseflow conditions have been decreasing. This decrease has historically been replenished, even in the absence of pumping. This is resulting in a disequilibrium, shifting the ratio of modern to old water in these reservoirs so that there is more old water than there was before. Multiple key springs throughout the watershed head tributaries, but these lose radon to the atmosphere as water travels downstream. Points of groundwater discharge directly into the creek itself were identified through radon surveys along select reaches of the creek. The most notable area of discharge was found to be in Kiln Meadow, where the stream traverses Quaternary alluvium in the valley of the watershed. This follows a trend of high radon activity within younger, alluvial surficial geologic formations and lower radon activity within older tertiary volcanic formations observed in all of the monitored groundwater sources in the watershed. The decreasing young to old water fraction reported to this endogenous radon system would decrease the ecosystem, if there is not sufficient precipitation to recharge aquifers at a rate greater or equal to the rates of discharge throughout the watershed, eventually there will not be enough water to support the flow of the creek and springs.

Shallow Subsurface Artificial Groundwater Recharge (SSAGR) | By Samuel Hawley and Professor Cordie Qualle

Shallow Subsurface Artificial Groundwater Recharge (SSAGR) is a simple concept. We use leach lines to percolate recharge water in agricultural fields below the crop root zone. SSAGR utilizes the existing pump and filter infrastructure of a field's drip system to deliver water to the gravity-fed leach lines through a standpipe. The advantages of SSAGR are: 1) it is below the root zone, so it does not impact crop health and it does not leach residual chemicals and nutrients into the groundwater; 2) it does not impede access, or use of the field due to flooding; and 3) it delivers nearly 100-percent of the recharge water for percolation to the groundwater table. Our research will be successful if we can show that the cost per acre-foot for SSAGR is competitive with other forms of recharge which could open many acres of farmland for recharge where soil strata are appropriate. Our work is focused on researching the efficiency and cost of the SSAGR...
system in terms of acre-feet of water recharged as a function of the cost to recharge the water. A water balance is used to calculate the net water recharged and actual construction and operations costs are used to determine the cost to recharge the water. The poster presentation will illustrate the SSAGR system, its groundwater recharge performance, and operations costs.

Determining the phosphorus levels of streams in natural background by Anna Herrera

Phosphorus is an essential nutrient for living organisms. Anthropogenic sources of phosphorus include but are not limited to water treatment plants, runoff from agriculture and fertilized lawns, failing septic systems, and animal manure storage runoff. Since phosphorus is considered a limiting nutrient, meaning the element is in the least quantity in and therefore limits growth in aquatic ecosystems, the element can be used as an ecological indicator to measure anthropogenic effects. In order to determine the appropriate phosphorus quantity for streams we need to define natural background in streams. Natural background is the condition of waters in the absence of human-induced alterations based on the best scientific information available. Determining natural background helps set water quality objectives by defining which phosphorus came from human sources and which is supplied naturally. Providing ability to not over use or over protecting streams. Due to industrialization, pristine natural background water sites are almost nonexistent. Water quality monitoring was also infrequent prior to industrialization. Given the lack of reference sites undisturbed by anthropogenic effects, estimates of the natural ranges of nutrients in streams are needed. We developed a model to predict natural background total phosphorus (TP) concentrations from watershed environmental factors like geology and climate. Because the model includes temporally dynamic predictors of climate, it predicts TP concentrations for each individual stream segment throughout the continental United States from January 2000-December 2020. We also compare current measurements of TP in streams to predicted natural background TP to quantify anthropogenic inputs of phosphorus.

The Impact of Groundwater Pumping from the Cannabis Industry on Streamflow and the Necessity for Validating Analytical Stream Depletion Models in Humboldt County by Andy Heise

As the California drought lengthens, an increasing number of cannabis growers are turning to groundwater as a solution to their water woes. The worsening drought is causing a reduction in streamflows, but now, as more and more farmers are turning to groundwater, streamflow depletion models are needed. Analytical stream depletion models are used to estimate stream flow depletion at a watershed or a regional level is difficult. In recent years water modelers have been turning to analytical models to estimate stream depletion since numerical models can require extensive data, can be time-consuming, and are expensive to develop. However, to our knowledge, there is limited research done on validating analytical stream depletion models with field data. The objective of this research project is to estimate stream depletion in highly impacted watersheds in Humboldt County that have marijuana cultivation that uses groundwater pumping to irrigate crops. We will use published analytical models for depletion models and validate the model using field data. Collecting field data will consist of installing stream gages, installing observation wells, conducting pumping tests, stable oxygen isotope analysis, and installing meters on irrigation wells to measure water usage in real-time using a 4G wireless telemetry system. We expect to observe stream depletion to be caused by irrigation extraction in selected wells depending on the underlying geology, distance from the well to the stream, and the pumping flow rate at the well. We also expect to validate well-regarded analytical models used for stream depletion estimation in the context of the selected watersheds in Humboldt County. We also hope to have a better idea of the amount of stream depletion that is occurring in Humboldt County in association with irrigation-based marijuana cultivation.

Water quality monitoring was also infrequent prior to industrialization. Given the lack of reference sites undisturbed by anthropogenic effects, estimates of the natural ranges of nutrients in streams are needed. We developed a model to predict natural background total phosphorus (TP) concentrations from watershed environmental factors like geology and climate. Because the model includes temporally dynamic predictors of climate, it predicts TP concentrations for each individual stream segment throughout the continental United States from January 2000-December 2020. We also compare current measurements of TP in streams to predicted natural background TP to quantify anthropogenic inputs of phosphorus.
Identification and Quantification of OH Formation Potential in Constructed Wetlands Treating Wastewater for the Removal of Pharmaceuticals | By Marty King and Tesfa Yacob

Currently, the EPA does not regulate concentrations of pharmaceuticals and personal care products (PPCPs) in wastewater effluent; however, some PPCPs are known to cause adverse effects to the environment so presence of PPCPs in effluent is of considerable concern. Wetland natural treatment systems offer a sustainable alternative to traditional wastewater treatment systems. Constructed wetlands, such as those incorporated in the Arcata Wastewater Treatment Facility (AWWTF) in northern California, provide interaction between dissolved organic carbon (DOC) in the wastewater and sunlight, promoting photochemical reactions and producing reactive oxygen species (ROS). ROS, particularly hydroxyl radical (OH), have been shown to react with PPCPs, leading to transformation/removal. Characterization of DOC is an initial step in assessing conditions for formation of OH within wetlands. The AWWTF treatment train includes oxidation (OX) ponds, followed by treatment wetlands (TW), and enhancement wetlands (EW).

The hypothesis: OH production at AWWTF changes throughout the treatment process with respect to plant matter and sunlight exposure. Biological, photic, physical, and other mechanisms transform the DOC within the wastewater, altering its potential to photo react and produce OH which then transforms/removes PPCPs. Wastewater samples were collected at locations along the treatment train of AWWTF. Samples were analyzed for water quality: DOC, BOD, and pH. Fluorescence excitation emission spectra (EEMs) were collected and used to construct parallel factor analysis (PARAFAC) models to identify the contribution of different organic groups comprising the fluorescence signal of the wastewater.

Experiments are being conducted on wastewater samples using a solar simulator to quantify OH production potential and assess how it changes along the treatment train. Initial DOC characterization at AWWTF suggests that DOC increases along the treatment train, even though BOD decreases. Additionally, EEMs show a larger fulvic peak in TW effluent compared to OX pond effluent. This correlates the increased plant matter concentrations in the TW with increased OH production potential. On the other hand, the EEMs also show the emergence of a humic peak in the TW, which has been known to quench OH production. The humic peak was smaller than the fulvic acid peak suggesting an increase in OH production potential as the wastewater leaves OX ponds and flows through the TW.

Thermal Energy Storage: A Viable Application for Desalination Concentrate | By Reza Baghaei Lakeh, Rozina Nalbandian, and Tihamer Engel

In this paper, a combination of computational fluid dynamics (CFD), lab-scale experimentation, and techno-economic analysis are presented that show technical and economic feasibility of repurposing desalination salt as a low-cost thermal energy storage medium. A lab-scale demonstration of the repurposed desalination salt as a low-cost thermal energy storage system is developed and tested. A detailed techno-economic analysis showed that using unseparated and minimally processed concentrate salt reduces the cost of thermal energy storage below the U.S. Department of Energy's cost target of $15/kWh. A computational model was to analyze the heat transfer behavior of the concentrate salt as it undergoes charging and discharging cycles. The desalination salt compositions were obtained with analytical chemistry data combined with thermodynamic software to predict the precipitation of salt species out of a simulated aqueous solution. Three concentrate samples were analyzed to find the ion composition. The dominant anions were chlorides, carbonates, bicarbonates, sulfates, and hydroxides for all samples and the dominant cations were sodium, calcium, magnesium, and potassium. The ion composition was then used in the OLIO Studio: Stream Analyzer software to calculate the expected salt species using water chemistry techniques.
Technical Assistance Program to Support Disadvantaged Communities (DACs) with Drinking Water and Wastewater Projects | By Randy Marx

OWP is a nonprofit, self-supporting unit within University Enterprises, Inc. (UEI), an auxiliary of California State University, Sacramento (CSUS). OWP's internal staff consists of more than 35 employees, including engineers, scientists, GIS specialists, technical editors, graphic designers, computer programmers, and administrative and IT support. I will discuss OWP's work assisting disadvantaged communities (DACs) with water and wastewater projects. OWP is a current Technical Assistance (TA) Provider to the State Water Resources Control Board (SWRCB) under three Agreements, including Proposition 1, Groundwater and Safe and Affordable Drinking Water Fund (SAFER), to offer technical assistance to DACs on drinking water, groundwater, and wastewater issues. The current value of these three Agreements with the SWRCB is approximately $42,000,000. OWP has been a TA Provider to the DFA since September 2016, implementing 139 TA Requests. I would describe our overall body of our engineering and environmental work and in particular highlight 4 or 5 projects we are doing in the Monterey area. For all Work Plans, OWP project managers establish a contact list of project stakeholders, including representatives from local community organizations, and invite them to monthly calls to update them on project progress, obtain input, and involve them in project decisions. OWP's consultants in the field also attend various local community meetings, such as city council meetings, TA Applicant Board of Director meetings, and community outreach meetings, to engage community members. We have 7 of us OWP Project Managers leading these projects, with my role as the overall Program Manager. These projects are resulting in improvements to DAC drinking water systems throughout California.

Sulfur Burner Reservoir Water Treatment Effect on Microalgae Chlorella Vulgaris | By Sarah Marks

An experiment was conducted in which water from four different Cal Poly holding reservoirs was spiked with microalgae and observed daily. The four reservoirs had been subject to varying levels of sulfur dioxide treatment, a water quality treatment that is accepted to cause short term decrease in biological life. However, little is known about the long term effects of the sulfur treatment. This experiment was conducted at least a month after the sulfur treatment ended at all the reservoirs. Results showed that after enough time, there is no lingering effect from the sulfur treatment preventing further algae growth.

Using Smart Meters to Improve the Management of Water Distribution Systems | By Jorge Pesantes

This seminar shows the results of forecasting water demand to improve water distribution systems management based on data-driven methods. The forecast model predicts water demand using hourly data from smart meters and three machine-learning methods. Demands are predicted using lagged demand, seasonality, weather, and household characteristics. Time-series clustering is applied to delineate data based on the time of day and day of the week which improves model performance. Accurate predictions of hourly demands can be used to update operational decisions, identify post-meter leaks, and improve decisions to mitigate leaks and water quality incidents. The applications of using smart metered data as part of a portfolio of modeling tools provide opportunities for researchers and practitioners to improve the management of water systems in the digital era.

Intergenerational democracy for sustainable water allocation | By Jung Sook You

I ask how different institutional rules and voter composition from different generations lead individuals to conserve resources like surface water, leaving enough to provide for the next generation. My questions are two-folds: (1) whether a democratic decision-making system promotes sustainable water allocations over multiple generations and (2) whether a representation of the future generations in the group decision-making system promotes sustainable water allocations. To answer the questions, I extend the intergenerational good game framework and design online experiments for understanding possible intergenerational cooperation among overlapping generations.

Investigating the Capabilities of Fluorescence Spectroscopy for High-Frequency and Real-Time Water Quality Monitoring in Urban Water Systems | By Kenisha Shipley, Natalie Madleno, and Alicia Kinoshita

Monitoring water quality in urban waters is an essential component of maintaining the health and safety of the surrounding communities. However, real-time detection of microbial pollutants and contaminants is difficult to achieve, given field site and instrument limitations. Previous work involving stormwater analyses has demonstrated that fluorescence spectroscopy from a benchtop fluorometer, specifically tryptophan-like fluorescence intensity, can be used to detect certain markers of anthropogenic, microbial pollution which can be correlated to total aerobic bacteria counts and total coliforms in source waters. The use of in situ fluorescence sensors is a viable option for real-time water quality monitoring, and although field studies are limited, recent work testing the detection of wastewater in laboratory experiments is promising. Installation of a sensor platform is underway at the Alvarado Creek, an urban, channelized headwater stream that feeds into the San Diego River and will be equipped with a submersible fluorometer and dissolved oxygen sensor with telemetry and data-logging capabilities, which will allow real-time water quality monitoring. Capturing meaningful real-time fluorescence data in riverine environments is essential to understanding the extent that tryptophan-like fluorescence can track the temporal variability in water quality and detect the frequency of pollution events. Continuous collection of fluorescence and water quality data will also aid in understanding the hydrologic and biogeochemical processes underlying episodic, diel, and long-term dynamics of fecal indicator bacteria in urban streams. Due to the many environmental and technological variables associated with long-term instrument deployments, a significant portion of the project will establish best practices for sensor calibrations, sensor maintenance, and deployment strategies to ensure data quality and consistency. Ultimately, the results of this work will provide valuable data on the subsurface fluorometer capabilities for real-time detection of anthropogenic pollutants. The methods and strategies developed here for an urban, headwater stream could be applied to additional sites to provide local communities with effective resources to rapidly detect water contamination. Initial results from previous analysis demonstrate negative trend between land elevation and the high-water levels across our three study locations. These results are constant with Lidar differencing analysis results which show large regions of subsidence with a larger proportion of levees affected by negative vertical movement along San Joaquin River compared to the Sacramento River. Applying these findings to our locations, Venice Island experienced higher rates of subsidence compared to Antioch and Benicia and thus the levees at these locations are likely at higher risk of future failure. This example demonstrates how our results can guide decisions about levee improvement priority. While our analysis focuses on a smaller number of specific Delta sites, the methodology employed, and knowledge gained provide a valuable framework which could assist to determine levee upgrade priorities across the entire Delta.

Production of Agricultural Water and Nutrients from Saline Water Sources | By William Wright and Enrique Alameda

The overarching goal of the research is to move towards sustainable water and nutrient management in the Southwestern US by efficient use and reuse of local water and nutrient resources. It is necessary to utilize non-traditional water sources (brackish waters) where fresh water sources are limited, non-sustainable, or nonexistent. The approach is to develop a water treatment system that combines advanced membrane and ion exchange processing to extract both phytotoxic constituents and nutrients from brackish water, while minimizing waste. The recovered nutrient products would be used locally for fertigation systems and water for irrigation and other uses, resulting in reduced dependence on imported nutrients, thereby reducing energy use and greenhouse gas emissions. Salinity in both water and soil would be reduced.

POSTER ABSTRACTS

US by efficient use and reuse of local water and nutrient resources. It is necessary to utilize non-traditional water sources (brackish waters) where fresh water sources are limited, non-sustainable, or nonexistent. The approach is to develop a water treatment system that combines advanced membrane and ion exchange processing to extract both phytotoxic constituents and nutrients from brackish water, while minimizing waste. The recovered nutrient products would be used locally for fertigation systems and water for irrigation and other uses, resulting in reduced dependence on imported nutrients, thereby reducing energy use and greenhouse gas emissions. Salinity in both water and soil would be reduced.

Intergenerational democracy for sustainable water allocation | By Jung Sook You

I ask how different institutional rules and voter composition from different generations lead individuals to conserve resources like surface water, leaving enough to provide for the next generation. My questions are two-folds: (1) whether a democratic decision-making system promotes sustainable water allocations over multiple generations and (2) whether a representation of the future generations in the group decision-making system promotes sustainable water allocations. To answer the questions, I extend the intergenerational good game framework and design online experiments for understanding possible intergenerational cooperation among overlapping generations.
Drake Abrahamsson
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Drake Abrahamsson is 23 years old, and from San Clemente, California. He’s a graduate student at Cal Poly SLO pursuing my Masters Degree in Civil & Environmental Engineering. He completed his undergraduate degree in Civil Engineering at Cal Poly SLO as well. He focused primarily on hydrology in his undergraduate degree, but also has interest in the wastewater treatment area of water resources engineering. In his graduate degree he has been able to learn more about coastal engineering which is really exciting for him. He teaches a hands-on water resources laboratory where students perform experiments with topics from pipe flow to hydraulic jumps in a lab setting. He also teaches a surfboard shaping class at Cal Poly. He has been shaping surfboards since he was 16 and his summer job for the last few years has been shaping surfboards at a professional level for one of Southern California’s largest longboard manufacturers, as well as custom orders for his own clients. In his free time, he like to care for rare cacti and succulents, as well as hand make all the pots for the plants in his collection. He is an active member of the Indiana Cactus and Succulent Society. After he complete his graduate degree he is planning on traveling with the main goals of surfing an “endless summer” in the winter in the Southern hemisphere before starting work in the field of coastal engineering.

Enrique Alameda Jr
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Enrique Alameda is a student at CSU Fresno majoring in Chemical Engineering. He was born and raised in Tijuana, Mexico. He plans to graduate in May 2024 and then go on to graduate school to pursue a career as a chemical engineer. Enrique’s main interests include chemistry, physics, and mathematics. He enjoys playing soccer and basketball in his free time. He is looking forward to working on research projects and helping with stakeholder engagement.

Jennifer Alford
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Jennifer Alford is an Associate Professor and Interim Chair for the Department of Geography and Environmental Studies at CSU San Bernadino. She has worked with CSU WATER for over 4 years on multiple CA Department of Water Resources Disadvantaged Communities grants, often partnering with other CSU campuses. Dr. Alford assumed the role as the Associate Director of Research for CSU WATER in Fall 2022 and is actively working to develop and implement CSU Faculty-Student-Community research cohorts across the CSU system. She is particularly interested in advancing community partnerships that promote student learning through inquiry field research experiences.

Kian Bagheri
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Kian Bagheri is a Joint Doctoral Student with San Diego State and UC San Diego. Her research broadly encompasses the interactions between stormwater and aquatic ecosystems.

Elijah Banda
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Elijah Banda is a Project Coordinator for the California Water Institute at Fresno State and CSU-WATER. He is a recent graduate from Fresno State with a Bachelors in City and Regional Planning with a Minor in Geography. Since being hired he has had a chance to work on numerous projects and help with stakeholder engagement.

Sanka Banerjee
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Sanka Banerjee, Ph.D. is an Associate Professor and the Graduate Program Coordinator in the Department of Mechanical Engineering at Fresno State. He has extensive experience in the interdisciplinary areas of materials fabrication, plasma processing, and characterization. He founded the Energy Devices and Plasma Applications Laboratory at Fresno State in 2016 which is partially funded by the Department of Defense and Southern California Edison. Dr. Banerjee has also worked in the Princeton Plasma Physics Laboratory (a national laboratory at Princeton University) on the synthesis and surface modification of nanomaterials using thermal and micro-discharge plasmas. Before that he earned his M.S. and Ph.D. from the University of Rochester in Materials Science and Engineering.

Nicholas Banuelos
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Nicholas Banuelos is an undergraduate student at California State University, Long Beach studying Environmental Science and minoring in Biology and Geology. His research interests involve creating cleaner, more efficient wastewater treatments to combat microplastics for a healthier and more sustainable environment in developing communities, but also for wildlife. This ties into his other interests in coastal ecology, studying ways to sustain marine life in drastically changing environments due to climate change. He has an interest in tracking the health of the ocean and the pertinent materials, biocorrosion, and chemical micropollutants (pollutants of emerging concern) coupled with microplastics removal in water and wastewater.

Nadine Barton
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Barton is a senior mechanical engineering student at California State University, Fresno and will be graduating in Spring, 2023. He is attending with his senior design team. They are integrating two water treatment systems.

Steve Blumenshine
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Dr. Blumenshine is the Interim Executive Director of CSU-WATER. He directs the Water Advocacy Towards Education and Research (WATER) program which develops and strengthens water research and scholarship in the CSU System and throughout CA in collaboration with external partners and other water stakeholders. These efforts focus on including faculty and students throughout the 23 campus CSU System to address critical water resource issues and agricultural, urban, and environmental water allocations. More recently he was the Director of the Research & Education Division of the California Water Institute at Fresno State. Dr. Blumenshine served 20 years in the Director of Defense and Southern California Edison. He has over 30 refereed journal publications and over 50 presentations in national/international conferences and technical meetings. He has also received several grants from federal (DoD, NIST, USDA) state (DWR), local agencies (City of Fresno, and FPD), and private industry (Qualcomm, Southern California Edison). He actively collaborates with UC Merced and the State University of New York, Buffalo State in developing lead-free ferroelectric perovskite oxides and halides for biomedical and structural health monitoring applications. He also works on active filtration and desalination devices for wastewater treatment and purification.

Nathaniel Bogie
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There group studies movement of water through the saturated and unsaturated zones as well as how plants use this water. There current projects include looking at how agricultural practices influence deep drainage (recharge) of groundwater. Additionally, they study how traditional practice of intercropping with deep rooted native shrubs in the West African Sahel that can serve as pumps to transfer water from deep, moist soil layers to shallow-rooted crop crops growing nearby during extreme drought. There other work involves studying how deficit and drip irrigation and management of cover crops can improve production of oilseed crops and vineyard pruning, crop residues, animal manure). However, traditional treatment methods such as land application, burning, and biological conversion still generate some concerns (e.g. parasite, air pollution, non-stabilized byproducts). In addition, the Valley is home to the largest concentration of dairies in California. Tulare County is the largest producer of agricultural products in the United States and holds almost all of the nation’s top ten agricultural counties according to the Census of Agriculture by the USDA. In particular, the Central Valley of California is one of the world’s most productive agricultural regions and many Valley’s counties (e.g. Tulare, Fresno, San Joaquin) are the top of the nation’s agriculture producing counties. Accordingly, California generates more than 20 million dry tons of agricultural residues per year and the Valley is the largest concentration of agricultural wastes (e.g. orchard and vineyard pruning, crop residues, animal manure). However, traditional treatment methods such as land application, burning, and biological conversion still generate some concerns (e.g. parasite, air pollution, non-stabilized byproducts). In addition, the Valley is home to the largest concentration of dairies in California. Tulare County is the largest producer of agricultural products in the United States, accounting for about $1.6 billion in 2016. The City of Tulare established a large industrial wastewater treatment facility for treating regional dairy
wastewater. Treating high-strength wastewater such as dairy wastewater is still challenging and has a higher cost compared to municipal wastewater. Hence, new solutions to sustainable and synergistic treatments of regional agricultural wastes and dairy wastewater have been sought. Hydrothermal carbonization (HTC), coupled with steam gasification reaction (SHR) is an advanced and self-sustainable technology that can convert agriculture-derived waste streams (typically high moisture content) into renewable energy and fuels without costly drying process. The Department of Energy National Energy Technology Laboratory has performed an in-depth techno-economic analysis of the SHR-based process and confirmed that the SHR-based process has the potential for 12% higher efficiency at 18% lower capital costs compared to other state-of-the-art gasification technologies. In this study, the SHR-based process was used to synergistically treat the commingled agricultural wastes (e.g. dairy wastewater, orchard pruning) for the first time. The preliminary experimental data showed that SHR-based process led to high carbon conversion and desired syngas composition for further downstream upgrading such as water gas shift (WGS) reaction. When WGS is integrated with SHR, the final product is renewable fuel, synthetic natural gas (SNG).

Anita Chaudhry
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Her teaching and research is in the field of environmental and natural resource economics, focusing on the two-way links between people’s access and use of natural resources and economic outcomes. For more detail on her background, visit her webpage: https://sites.google.com/site/stateradio/home

Ben Chen
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Ben Chen is a project manager for the Center for Geospatial Science and Technology at California State University, Northridge, where his work focuses primarily on natural resources management, vulnerability and underserved communities, and local government. He has more than a decade of experience in water resources policy and management of water resources necessitates an integrated strategy that requires the combined effort of multiple disciplines and takes into consideration the needs of the end-users. Such a strategy requires knowledge of physical processes, the combination of modeling, field and laboratory investigations, and her integration with newly available technology. Her specific areas of expertise include groundwater flow modeling under unsaturated and saturated conditions, managed aquifer recharge (MAR), stormwater management, saltwater intrusion in coastal and island aquifer systems, seasonal forecasting to improve food and water security in emerging regions, and transport of perfluoralkyl substances (PFAS) in the subsurface.

Luis Cordova
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Cordova is a senior mechanical engineer attending Fresno State. He is attending this conference to present the water treatment system that he and himself have been working on.

Brian Currier
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Brian is a senior research engineer with the Office of Water Programs at California State University, Sacramento. He holds B.S. and M.S. degrees in Environmental Engineering from the University of California, Davis, and is a licensed Professional Engineer.

Hailey Elson
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Hailey Elson is a senior at Sonoma State University, she is majoring in Environmental Science, Geography, and Management with a focus in Environmental Policy and Management and a Minor in Geology. She is interested in water policy and water resource management because of the classes she has taken as well as an internship she did through her University about invasive species in water channels. She wants to learn more about watershed management in creeks and rivers, plus the conservation of these habitats, and is hoping to pursue a career in something similar.

Athena Everson
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Everson is a senior at Sonoma State University majoring in Environmental Science. She became interested in water policy during her internship with Sonoma Water, where she worked in the Water Resources Planning division. As a result of the hydrology class she is currently taking, she is considering pursuing a career in watershed management.

Emily Everton
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Emily Everton is a Junior in Environmental Science at Chico State with a Minor in Chemistry. She is the vice-president of the Associated Environmental and Geological Students (AGES) club and works as Supplementary Instructor in Chemistry. Her research experience includes boundary-layer turbulence modeling with LiDAR and urban storm runoff remediation. She will present on her experience with the 2022 Big Chico Creek Watershed Tour.

Rima Ewing
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Rima Ewing is a recent graduate of environmental science and she loves to work in an interdisciplinary field in which she can connect environmental and ecological science with Geographic Information Systems (GIS) technology and utilize this powerful program for more accurate spatial, data, and temporal analysis with the purpose of better management plans. He is interested in understanding how different factors can impact each other and natural ecosystems over time and his favorite field is mountains, rivers, and in general higher elevations.
April 13 & 14, 2023

This research is vital in proposing methods for reducing groundwater in soil types commonly found in the Salinas Valley to analyze their sustainability. His current research focuses on urban water resilience and conducts research on issues related to water and energy policy and now she hope to pursue a career in water policy.

Dr. Fernandez has been involved in research in fog and fog water collection for the past 15 years. He has a large array of standard fog collectors located both on and near the campus of CSUMB. He actively participates with determining both the characteristics of fog and the potential to extract water from fog as a function of regional location.

Kelley Giron
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Dr. Jimmy Guilinger is a new Assistant Professor and director of the Watershed Geology Lab in the Department of Applied Environmental Science at CSU Monterey Bay. Following undergraduate and master’s degrees in geology at Boise State University and Idaho State University, Jimmy received his Ph.D. from UC-Riverside in Environmental Science. He currently teaches undergraduate and graduate level courses in geomorphology, watershed hydrology, and environmental management. The focus of his research is on understanding the hydro-geomorphic dimensions of landscape disturbances, such as wildfire, and their resultant impacts on human communities and freshwater resources. He is new to the Central Coast and is excited to kickstart projects within the realm of physical watershed science in the region and elsewhere in California.

Emily Handy
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Handy was a Environmental Resources Engineering undergraduate student at Cal Poly Humboldt and she now admitted to University of Nevada, Reno where she will study geosciences in the fall.

Some of her greatest interests are: geochemistry, water resources, responsible resource extraction, use, and reuse, and the protection and remediation of the environment to protect biodiversity and climate resilience.

Ylla Hartman
Student, CSU Sonoma
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Phosphorous is an essential nutrient for living organisms. Anthropogenic sources of phosphorus include but are not limited to water treatment plants, runoff from agriculture and fertilized lawns, failing septic systems, and animal manure storage runoff. Since phosphorus is often a limiting nutrient, meaning the element is in the least quantity and in therefore limits growth in aquatic ecosystems, the element can be used as an ecological indicator to measure anthropogenic effects. In order to determine the appropriate phosphorus quantity for streams we need to define natural background in streams. Natural background is the condition of waters in the absence of human-induced alterations based on the best scientific information available. Determining natural background helps set water quality objectives by defining how much phosphorus can come from human sources and how much is supplied naturally. This helps set water quality objectives that do not over or under protect streams. Due to industrialization, pristine natural background water sites are almost nonexistent. Water quality monitoring was also infrequent prior to industrialization. Given the lack of reference sites undisturbed by anthropogenic effects, estimates of the natural ranges of nutrients in streams are needed. We developed a model to predict natural background total phosphorus (TP) concentrations from watershed environmental factors like geography and climate. Because the model includes temporal dynamic predictors of climate, it predicts monthly TP concentrations for each individual stream segment throughout the continental United States from January 2000–December 2020. This model explained 63% of the variation in natural background concentrations. We also compared current measurements of TP in streams to predicted natural background TP to quantify anthropogenic inputs of phosphorus.

Sam Hawley
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The California Water Institute focuses on all aspects of sustainable water resource management solutions through outreach, entrepreneurship, education, testing, and interdisciplinary research. Through hands-on learning and research opportunities fostered by the Institute, students are prepared to enter the workforce as well-trained graduates. At the same time, water stakeholders are an important resource to help CWI and Fresno State develop the next generation of professionals through our partnerships. Our CWI collaborative and comprehensive approach to water management solutions is a prime example of what we can accomplish when the University and the community work together to address and solve current and future water issues. CWI provides all stakeholders with convenient access to Fresno State’s extensive water research and development programs and services. The institute positions Fresno State as a national leader in water research and sustainability by engaging the campus community and academic experts from all disciplines to address the most challenging water issues of our time. The California Water Institute has three divisions: the Center for Irrigation Technology, the Research and Education Division; and the Water, Energy and Technology Center.

Ylla Hartman is a GEP (Geography Environment and Planning) major at CSU Sonoma. She has been working at the city of Santa Rosa in the Water dept. and has been taking courses to shape her career path towards sustainable watershed development. She is very excited to attend and learn what my fellow colleagues are doing in this realm.

Hydraulics, Engineering Geology, Advanced Geospatial Modeling, Water and the City of Santa Rosa, he works with a small group of students each year on projects related to watershed management and water quality. In previous years, they have explored the effectiveness of a Ludwigs removal project. This year, they are trying to determine the impact of homeless activity near urban creeks in Santa Rosa on water quality in those creeks.

Andrea Herrera
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Phosphorous is an essential nutrient for living organisms. Anthropogenic sources of phosphorus include but are not limited to water treatment plants, runoff from agriculture and fertilized lawns, failing septic systems, and animal manure storage runoff. Since phosphorus is often a limiting nutrient, meaning the element is in the least quantity and in therefore limits growth in aquatic ecosystems, the element can be used as an ecological indicator to measure anthropogenic effects. In order to determine the appropriate phosphorus quantity for streams we need to define natural background in streams. Natural background is the condition of waters in the absence of human-induced alterations based on the best scientific information available. Determining natural background helps set water quality objectives by defining how much phosphorus can come from human sources and how much is supplied naturally. This helps set water quality objectives that do not over or under protect streams. Due to industrialization, pristine natural background water sites are almost nonexistent. Water quality monitoring was also infrequent prior to industrialization. Given the lack of reference sites undisturbed by anthropogenic effects, estimates of the natural ranges of nutrients in streams are needed. We developed a model to predict natural background total phosphorus (TP) concentrations from watershed environmental factors like geography and climate. Because the model includes temporal dynamic predictors of climate, it predicts monthly TP concentrations for each individual stream segment throughout the continental United States from January 2000–December 2020. This model explained 63% of the variation in natural background concentrations. We also compared current measurements of TP in streams to predicted natural background TP to quantify anthropogenic inputs of phosphorus.

Kelly Hollman
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Second year Civil Engineering master’s thesis student with a focus on microplastics and water quality.
Emmanuel Iyiegbuniwe
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Emmanuel Iyiegbuniwe is an Associate Professor of Environmental & Occupational Health, Department of Public Health at California State University San Marcos (CSUSM). He earned both MPh and PhD degrees in Environmental & Occupational Health Sciences from the School of Public Health, University of Illinois at Chicago (UIC). Additionally, he earned a Master of Business Administration (MBA) from Western Kentucky University (WKU). Prof. Iyiegbuniwe has over 30 years of academic, administrative, and consulting experience in public health in Canada, Nigeria, and USA. Previously, he served for three years as the inaugural Director of Public Health at CSUSM where he provided vision, direction, and leadership for CSUSM’s MPH programs with concentrations in Global Health and Health Promotion & Education. Currently, he teaches graduate courses and conducts various research studies on public health topics related to environmental and occupational health. He has received numerous awards/honors including Harvard University School of Public Health’s Lee Kuan Yew Family Foundation Fellowship, California State University Chancellor’s International Partnership Programs Fellowship, Kentucky Public Health Association’s William Bill Patton Environmental Service Award, Western Kentucky University, College of Health and Human Services’ Outstanding Faculty for Research and Creativity Award, and United States Agency for International Development (USAID) & Thomas Jefferson Leadership and Advanced Skills Fellowship (1992-94).

Anu Jani
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Anu Jani is an Assistant Professor of Crop Management at CSU Monterey Bay. His research focuses on developing crop and soil management strategies that optimize nitrogen recovery to protect groundwater and the marine environment. He conducts his work in collaboration with the private sector, non-profit organizations, and federal agencies is his work.

Lee Johnson
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Lee Johnson is a senior research scientist in the College of Science at CSU Monterey Bay, and is a member of the Cooperative for Research in Earth Science and Technology at NASA Ames Research Center. Lee has served as Principal- or Co-Investigator for research grants from NASA’s Applied Sciences Program, California Dept. of Water Resources, California Dept. Food & Agriculture, and USDA. He is interested in agricultural applications of remote sensing, with emphasis on crop monitoring. Lee has authored/co-authored over 40 peer-reviewed journal articles and has led or contributed to development of four refereed technical book chapters. Lee is a recipient/co-recipient of professional awards from NASA, the Federal Laboratory Consortium for Technology Transfer, and the American Society of Agricultural and Biological Engineers.

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Emmanuel Iyiegbuniwe is an Associate Professor of Environmental & Occupational Health, Department of Public Health at California State University San Marcos (CSUSM). He earned both MPh and PhD degrees in Environmental & Occupational Health Sciences from the School of Public Health, University of Illinois at Chicago (UIC). Additionally, he earned a Master of Business Administration (MBA) from Western Kentucky University (WKU). Prof. Iyiegbuniwe has over 30 years of academic, administrative, and consulting experience in public health in Canada, Nigeria, and USA. Previously, he served for three years as the inaugural Director of Public Health at CSUSM where he provided vision, direction, and leadership for CSUSM’s MPH programs with concentrations in Global Health and Health Promotion & Education. Currently, he teaches graduate courses and conducts various research studies on public health topics related to environmental and occupational health. He has received numerous awards/honors including Harvard University School of Public Health’s Lee Kuan Yew Family Foundation Fellowship, California State University Chancellor’s International Partnership Programs Fellowship, Kentucky Public Health Association’s William Bill Patton Environmental Service Award, Western Kentucky University, College of Health and Human Services’ Outstanding Faculty for Research and Creativity Award, and United States Agency for International Development (USAID) & Thomas Jefferson Leadership and Advanced Skills Fellowship (1992-94).

Anu Jani
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Anu Jani is an Assistant Professor of Crop Management at CSU Monterey Bay. His research focuses on developing crop and soil management strategies that optimize nitrogen recovery to protect groundwater and the marine environment. He conducts his work in collaboration with the private sector, non-profit organizations, and federal agencies is his work.

Lee Johnson
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Lee Johnson is a senior research scientist in the College of Science at CSU Monterey Bay, and is a member of the Cooperative for Research in Earth Science and Technology at NASA Ames Research Center. Lee has served as Principal- or Co-Investigator for research grants from NASA’s Applied Sciences Program, California Dept. of Water Resources, California Dept. Food & Agriculture, and USDA. He is interested in agricultural applications of remote sensing, with emphasis on crop monitoring. Lee has authored/co-authored over 40 peer-reviewed journal articles and has led or contributed to development of four refereed technical book chapters. Lee is a recipient/co-recipient of professional awards from NASA, the Federal Laboratory Consortium for Technology Transfer, and the American Society of Agricultural and Biological Engineers.
Lee is a physical oceanographer with experience monitoring and modelling coastal and estuarine environments. Her past research addressed a range of topics including constituent transport (sediments dissolved and particulate contaminants, stormwater runoff) in estuarine environments, overland flooding due to extreme weather events, feedbacks between sea level rise and tidal dynamics, and coastal monitoring and management challenges arising from climate change. She is currently working with Dr. Talke, from Cal Poly’s Dept of Engineering and Environment, investigating the impacts of sea level rise and vertical land motion in the San Francisco Bay/Delta.

**Anna Lichterman**

Dr. Yize Stephanie Li completed her B.S. from Peking University and achieved her Ph.D. from the University of Virginia, both in physics. She joined CSUB faculty as an Associate Professor in Fall 2015, and is currently an Associate Professor of Physics. Her areas of research include low-dimensional electronic and photonic materials and devices, topological materials, and materials and devices for sensing and energy applications. Dr. Li has published 16 articles in high-impact peer-reviewed journals with international reputation. She has mentored 69 CSUB undergraduates, including 19 women and 40 URM, from six different majors.

Her research mentees won research awards, received scholarships, coauthored in her publications and presentations, and/or presented their research in regional conferences. Moreover, Dr. Li has been awarded a research grant from NSF (as the PI), an equipment grant from USDA (as a co-PI), two CSUB system-wide research grants (as the PI), and six CSUB individual grants (as the PI), all of which support/supported undergraduate research.

**Sami Maalouf**

Dr. Yize Li has been a research collaborator for USGS projects. He recently completed his Ph.D. in Civil Engineering with Dr. Yize Li in 2022. His research interests are centered on environmental fluid mechanics (water quality models, turbulence, transport phenomena, stratified flow, surface and groundwater flow and contamination) and sustainable development (heat disposal, alternative energy systems, hydroelectric power and energy conservation). Current research focuses on modeling the fate and transport of contaminants around coastal zones and in groundwater. Ongoing work deals with 1. Bioremediation from SWRO desalination plants and its effects on the coastal environment and 2. Dead-end pores in groundwater. He is interested in researching engineering education, finding ways to enhance and optimize the teaching/learning experience and building sustainable fundamental engineering disciplines and practical applications in civil engineering. Since June 1999, Dr. Maalouf has been working in the field of Civil Engineering. His experience in the industry includes working for a major water-resources/environmental engineering firm (Montgomery-Watson-Harza—now part of Stantec), a local municipality (City of Las Angeles), and an international non-profit organization (United Nations Development Programme). He became licensed as a Professional Engineer (Civil) in the State of California in 1995. Between 1996 and 2002, he started up (along with two other partners) and worked at a construction firm. After leaving the firm, he helped find a small consulting firm where he still works part-time. The work involves analyzing and designing (along with rehabilitating) coastal and retaining structures, designing stormwater and wastewater conveyance systems, designing stormwater Best Management Practice (BMP) plans, and performing hydraulic and hydrologic studies. Over the last 17 years, he has assisted at designing five former California State University, Pomona engineering students and trained them as junior engineers. Additionally, he has helped recruit six assistant professors in the last 20 years. Currently, he is a Professor of Environmental Engineering at Cal Poly Pomona and teaching a course on atmospheric rivers. He is a visible heat storage manager. He studies engineering tensions and the impacts of sea level rise and vertical land motion in the San Francisco Bay/Delta.
v已是r项目的工作，为长期的饮用水解决方案提供低收入社区在西海岸的水管理需求。

Much of Roxanne’s academic and professional career has been focused on the intersection of community development work and small water systems. Roxanne has a B.A. in Mathematical Sciences from Bethel College-KS as well as a M.S. in Environmental Engineering and Certificate in Engineering for Developing Communities from the University of Colorado, Boulder.

Roxanne is a second-year master’s student studying landscape management, environment, and researchers to identify and address the water resource needs of California’s agriculture, urban, environment, and disadvantage communities.

Laura Ramos
Associate Director, CSU-WATER
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Laura Ramos is the Associate Director for Administration for CSU-WATER and Associate Dean of Research and Education at the California Water Institute, located at California State University, Fresno. With over 20 years of experience in water resource management, Laura has played an integral role in various water initiatives and programs since joining the Fresno State community in 2001.

In her current role, Laura manages multiple programs and oversees the Research and Education Division of the California Water Institute. Her primary goal is to elevate the water IQ of the community by engaging stakeholders throughout the San Joaquin Valley in pursuit of sustainable water resource management. This includes working closely with Fresno State faculty, staff, students, and researchers to identify and address the water resource management needs of California’s agriculture, urban, environment, and disadvantaged communities.

Connor Rudmann
Student, CSU-Pomona
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Rudmann is a second-year master’s student studying landscape architecture and regenerative systems. He is fascinated by the pursuit of sustainable water resource management solutions. This goal was achieved by engaging stakeholders throughout the San Joaquin Valley in various water-related realms including dam breach modeling and analysis, technical assistance for stormwater compliance, TMDL evaluation and modeling, EAP development and support, stormwater quality tool development, and BMP performance assessments.

Christine Seeger
Student, CSU San Bernardino
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Graduate Student researching headwater stream resiliency within the San Bernardino National Forest.

Maryam Shafahi
Faculty, CSU-Pomona
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Maryam Shafahi is a professor in Mechanical Engineering Department, at California State Polytechnic University, Pomona. Her research includes water filtration, water conservation and sustainability.

All Sharbat
Faculty, CSU-Pomona
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All Sharbat is a Professor of Civil Engineering at California State Polytechnic University, Pomona. His research focuses on water quality engineering. His work involves development of desalination technologies for saline and brackish waters, and has patented ideas for improving the efficiency of desalination technologies. He has experience in water purification technologies and selective removal of constituents from water. He holds a PhD in Civil and Environmental Engineering at the University of Nevada Las Vegas. He is a registered professional civil engineer.

Kenisha Shipley
Faculty, CSU San Diego
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Shipley is a Postdoctoral fellow in the environmental engineering department in the Water Innovation and Reuse Lab. Her research is focused on the detection and impacts of pollutants in urban waters.

Garrett Struckhoff
Faculty, CSU-Fresno
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Dr. Struckhoff’s research interests include algal biofuels, the combination of solar electricity generation and greenroofs, and photoremediation. He received his undergraduate and masters from the Missouri University of Science and Technology, and his doctorate from the University of Iowa. Prior to joining CSU-Fullerton, he held a post-doctoral position at the Air Force Institute of Technology.

Stefan Talkie
Faculty, CSU San Luis Obispo
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Dr. Talkie’s research focuses on hydrodynamic processes and climate change effects in estuaries, rivers, and the ocean, using a combination of field research, data analysis, and modeling. Talkie uses numerical simulations and recently re-discovered archival data extending back to the 1820s to obtain a better understanding of how estuaries, rivers, and coastal regions function, and how they are changing over time due to anthropogenic interventions and sea-level rise. The past is present. Understanding long-term trends in water levels (tides, storm surge, sea-level, and river flow) and water quality (temperature, salinity), and discerning their local or climate-related causes, can help coastal and inland regions plan for the future.

Chi-Hao Wang
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Our Geography and City and Regional Planning programs are designed to train students so they can be equipped with theoretical knowledge and practical experience needed to be competitive in the global market and have a successful career as an urban and regional planner. GIS analyst, data and mapping consultant, information specialist, climatologist, natural resources specialist, environmental consultant state/local public health/social services administrator, diplomat, teacher and economic researcher.

Matthew Weingarten
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Matthew Weingarten’s research in hydrogeology includes numerical modeling and optimization techniques in the analysis of groundwater flow. One of his research aims to better understand future water resource estimates as well as understand how fractures and faults affect groundwater flow.

William Wright
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Dr. William Wright began his career with Black & Veatch Consulting Engineers in 1986 after earning a BS degree in Civil Engineering at UC Berkeley, obtaining a license to practice Civil Engineering (CA), and then earning MS and PhD degrees in Civil and Environmental Engineering at UC Davis in 1995 and 2000, respectively. Dr. Wright joined the Civil Engineering faculty at Fresno State in 1999. His responsibilities include instruction in civil and environmental engineering and administration of the graduate program. His research interests include water and wastewater treatment, salinity management, conversion of food waste to marketable products (e.g., bioplastics and activated carbon), manure management, digestion/fermentation, and biofuels. Recent work has focused on the production of water and fertigation nutrients from nontraditional water sources using ion exchange and membrane technologies.

Tesfayoneses Yacob
Faculty, CSU Humboldt
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Tesfayoneses Yacob is an assistant professor of environmental engineering who is passionate about access to clean water and a hygienic and safe living environment for all communities regardless of economic status. Currently he is researching the removal of pharmaceutical compounds from wastewater through the use of treatment wetlands. Moreover, he has active research projects
on wildfire-related air quality monitoring and management, and on sustainable supply of water in a rapidly urbanizing developing country cities. In his previous research and service work, he has focused on thermochemical treatment of fecal sludge and biomass, the development of innovative point-of-use drinking water treatment technologies, and industrial and mining wastewater treatment. He has researched treatment technologies such as filtration, adsorption, coagulation/precipitation, ligand complexation, biological, and thermo-chemical. Sources of wastewater studied included: mine waste rock drainage, flowback from hydraulic fracturing, and domestic sewage. His teaching experience includes senior capstone design, water and wastewater treatment, groundwater hydrology, hazardous waste and air pollution management, environmental transport processes, fluid mechanics, computational methods, appropriate technology for developing communities, and engineering statics. He enjoys hiking, taking long walks, reading, and listening to audiobooks. He has a B.Sc. in Chemical Engineering from Addis Ababa University and a Ph.D. in Civil and Environmental Engineering from the University of Colorado at Boulder.

Jung You
Faculty, CSU East Bay
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Her main research interests include: 1) designing sustainable resource allocation and pricing schemes, 2) electricity and energy market analysis; and 3) development of performance metrics applicable to business practices and social justice. To conduct research projects, she utilizes game-theoretic approach and empirical analysis. She also conducts experimental investigations as well as surveys. As a faculty in the Economics Department, she regularly teaches environmental economics, public economics, game theory, and econometrics. She enjoys teaching those courses since her students choose diverse topics in social and economic issues and present their short-term research projects in my courses.

Yolonda Youngs
Faculty, CSU San Bernardino
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Dr. Yolonda Youngs is an Associate Professor in the Department of Geography and Environmental Studies at California State University San Bernardino. She specializes in environmental and cultural geography, environmental policy and management, national parks and protected areas, public lands, environmental justice, cultural landscapes, and GIS. She has active and ongoing water resources projects in the Santa Ana River Watershed, San Bernardino Mountains, Colorado River (Arizona, Grand Canyon NP), Upper Snake River (Grand Teton NP Wyoming), Yellowstone Lake (Wyoming). She also has interests in coastal and marine resource protection and conservation.

Julissa Zavala
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Julissa Zavala is the Grants and Contracts Facilitator with the California Water Institute and CSU-WATER. Ms. Zavala helps with researching, drafting, and submitting proposals that help the organizations receive grant funding. This funding advances CWI’s mission to engage the San Joaquin Valley, California, and the world, with Fresno State’s faculty, staff, and students to pursue current and sustainable water resource management solutions through education, collaboration and research.

Kyle Zoldoske
Student, San Joaquin College of Law
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Kyle Zoldoske is a 3rd year law student at the San Joaquin College of Law. He previously graduated from Fresno State with a Bachelor of Arts Degree in Communication. During his time at Fresno State, he competed on the Barking Bulldog Policy Debate Team where he won the University of North Las Vegas and CSU Fullerton tournaments in 2018-2019; served as Fresno State’s student body Associated Students Inc. (ASI) Senator for Sustainability; served in the Cal State Student Association (CSSA) during his time in ASI; and held an officer position in Fresno State’s student Sustainability Club. Kyle has a passion for environmental sustainability, the environment, and water in California. Upon graduating law school, he plans to take his career to Sacramento where he can advocate and create policies for water law.

ATTRADEES

ATTENDEES

4TH ANNUAL CSU-WATER CONFERENCE

April 13 & 14, 2023

The California State University
WATER ADVOCACY TOWARDS EDUCATION & RESEARCH
CSU-WATER Campus Representatives have been established to foster bilateral communication of CSU-WATER relevant information, opportunities, and goals to and from their campus community. A first order of business will be updating the ‘Campus Expert’ list that can be shared throughout the CSU as well as with external partners and stakeholders.

Implementing the new goals and directions for CSU-WATER has and will greatly benefit from feedback of faculty leaders in the CSU during this interim period. Working group members continue to provide advice and opinions on how to best engage CSU students, faculty, administrators, and institutes on collaborations that mutually support our CSU-WATER goals.

Not Pictured:
- Simeng Li, Pomona
- Stephen G Osborn, Pomona