4th Annual Water Board Water Data Science Symposium

#CAWATERDATADIVE

July 1-2, 2019

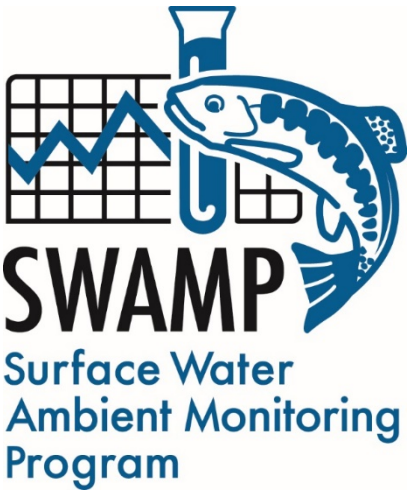
Open Water California: Innovating Through Integrating and Expanding the Water Data Community

4th Annual Water Data Science Symposium

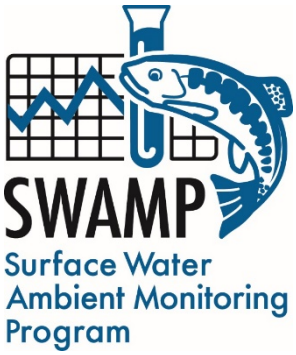
Open Water California: Innovating Through Integrating and Expanding the Water Data Community

Symposium Schedule

Event Sponsors



Presenter Acknowledgements

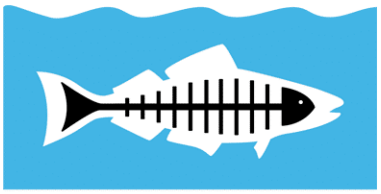



Caltrans


CLEAN WATER TEAM
CITIZEN MONITORING PROGRAM OF THE STATE WATER RESOURCES CONTROL BOARD


CALIFORNIA
WATER
QUALITY
MONITORING COUNCIL


CUAHSI
Universities Allied for Water Research


Heal the Bay


FlowWest


greenway


DRI
Desert Research Institute


Texas Water
Development Board


CALIFORNIA TROUT
FISH · WATER · PEOPLE


DELTA STEWARDSHIP COUNCIL


NASA


Jet Propulsion Laboratory
California Institute of Technology


Moss Landing Marine Laboratories

About Sacramento

Food & Drink

The Bank
629 J St., Sacramento, CA 95814
Food Court: https://www.thebank629j.com/

Blue Prynt
815 11th St, Sacramento, CA 95814
New American: bluepryntsacramento.com/

Crest Cafe
1017 K St., Sacramento, CA 95814
Modern Mediterranean:
http://crestcafeonline.com/

Backbone Cafe
729 J St., Sacramento, CA 95814
Organic: https://www.backbonecafe.com/

La Bonne Soupe Cafe
980 9th St. Ste 165, Sacramento, CA 95814
Sandwiches and Soups: http://la-bonne-soupe-cafe.cafes-city.com/

La Cosecha by Mayahuel
917 9th St, Sacramento, CA 95814
(Cesar Chavez Park)
Mexican: http://lacosechasacramento.com/

The Coconut On T
1110 T St., Sacramento, CA 95811
Thai: http://www.thecoconutthai.com/

The Grange
926 J St, Sacramento, CA 95814
American:
http://www.grangerestaurantandbar.com/

TableVine
1501 14th St., Sacramento, CA 95814
American: https://www.tablevine.com/

The Rind
1801 L St., Ste 40, Sacramento, CA 95811
American: http://therindsacramento.com/

Ramen House Ryujin
1831 S St., Sacramento, CA 95811
Ramen: http://ryujinramen.com/

Federalist Public House
Pizza and Beer Garden:
https://federalistpublichouse.com/

Lucca Restaurant & Bar
1615 J St., Sacramento, CA 95814
Italian: https://www.luccarestaurant.com/

Mother Restaurant
1023 K St, Sacramento, CA 95814
Vegetarian:
https://www.mothersacramento.com/

Mas Taco Bar
1800 15th St., Ste D, Sacramento, CA 95811
Mexican: https://www.mastacobar.com/

Punch Bowl Social
500 J St Suite 100, Sacramento, CA 95814
American:
https://www.punchbowlsocial.com/location/sacramento

Attractions

Crocker Art Museum
California State Railroad Museum
Sacramento Zoo
Old Sacramento State Historic Park
Capitol Park
McKinley Park
American River Parkway
Historic River Cruise

Local Events

June 30
Sunday Blues Jam @ Torch Club
2019 Sacramento French Film Festival
Waterfront Yoga in Old Sacramento

July 1
Jazz Concert @ Dante Club
California Classic
Waterfront Yoga in Old Sacramento

July 2
Reggae Night @ The Press Club
California Classic
Waterfront Yoga in Old Sacramento

2019 California Water Boards Science Symposium:

Innovating Through Integrating and Expanding the Water Data Community

4th Annual Science Symposium, July 1-2, 2019

CalEPA Headquarters Building - 1001 I St., Sacramento, CA 95814

Remote Attendees Visit: https://video.calepa.ca.gov/

Day 1 - Monday, July 1st, 2019 Byron Sher Auditorium	
8:00 - 9:00	Registration and check-in
9:00 - 9:10	Welcome and logistics *Karen Mogus, California Water Quality Monitoring Council*
9:10 - 10:00	Keynote speakers *E. Joaquin Esquivel and Laurel Firestone,* *State Water Resources Control Board*
Open Science and Data Visualization	
10:05 - 10:25	Open E.T.: filling the biggest data gap in water management *Justin Huntington, Desert Research Institute*
10:30 - 10:50	The Stream Quality Index: a multi-indicator tool for enhancing environmental management communication *Marcus Beck, Southern California Coastal Water Research Project*
10:50 - 11:10	**Break**
11:15 - 11:35	USGS open science then and now *Alex Etheridge, United States Geological Survey*
11:40 - 12:00	A slough of information for the public *Gene Oh; Joel Kramer, Weston Solutions*
12:00 - 1:15	**Lunch**
Freshwater Harmful Algal Blooms	
1:15 - 1:35	Visualizing harmful algal blooms from space: a web tool highlighting long-term trends and where to sample tomorrow *Randy Turner, San Francisco Estuary Institute*
1:40 - 2:00	Mystery to management: toxic cyanobacteria in Northern California coastal rivers *Keith Bouma-Gregson, State Water Resources Control Board*

Data Innovations	
2:05 - 2:25	Environmental robotics as tools for monitoring water quality *Alex Forrest, University of California, Davis*
2:30 - 2:50	Machine learning for clean water act violation monitoring *Elinor Benami, University of California, Davis*
2:55 - 3:35	**Extend break for posters, vendor "Innovator Lounge" tour, and networking**
3:35 - 4:15	Panel discussion: Internet of Water
4:20 - 5:00	Lightning talks: short presentations on innovative tech and special studies
5:00 - 5:10	Daily wrap and adjourn *Nick Martorano, California Water Quality Monitoring Council*

Day 1 Concurrent Session - Water Science Datathon Klamath Room	
10:00 - 10:10	Welcome and logistics Teams: - Water Source Time Machine - Trash Data Model - "Consumer Confidence Report (CCR)" Application
10:10 - 12:00	Get "hacking"!
12:00 - 1:15	**Lunch**
1:15 - 4:30	Continue "hacking"!
4:30 - 5:00	Daily wrap and adjourn

GitHub Repositories:

- Water Source Time Machine: http://bit.ly/WaterDatathon2019_WaterSources
- Trash Data Model: http://bit.ly/WaterDatathon2019_Trash
- "CCR Application": http://bit.ly/WaterDatathon2019_CCRApp

2019 California Water Boards Science Symposium:

Innovating Through Integrating and Expanding the Water Data Community

4th Annual Science Symposium, July 1-2, 2019

CalEPA Headquarters Building - 1001 I St., Sacramento, CA 95814

Remote Attendees Visit: https://video.calepa.ca.gov/

Day 2 - Tuesday, July 2nd, 2019 Byron Sher Auditorium	
8:00 - 9:00	Registration and check-in
9:00 - 9:10	Welcome and logistics *Nick Martorano, California Water Quality Monitoring Council*
Opening Presentation	
9:10 - 9:30	Space hydrology: California waters from low earth orbit *Orestis Herodotou, Planet*
Trash and Microplastics	
9:35 - 9:55	AI and trash: cameras on street sweepers to I.D. trash and understand effectiveness *Walter Yu, Caltrans; Gary Conley, 2NDNATURE*
10:00 - 10:20	Using remote sensing to address trash monitoring challenges *Tony Hale, San Francisco Estuary Institute*
10:25 - 10:45	Microplastic monitoring in San Francisco Bay *Diana Lin, San Francisco Estuary Institute*
10:45 - 11:05	**Break**
Remote Sensing	
11:05 - 11:25	Concerned citizen scientist & bull kelp: compiling monitoring data for optimal conditions for growth of bull kelp along Northern California's coast *Jim Penny, Greenway Partners*
11:30 - 11:50	Turbidity in the San Francisco Bay and Delta from Sentinel-2 and CDEC station data *Christine Lee, NASA Jet Propulsion Laboratory*
11:55 - 12:15	Measuring mercury from space? Developing low-cost optical monitoring techniques to conduct high resolution temporal and spatial mapping of mercury in surface waters of the San Francisco Bay-Delta *Erin Hestir, University of California, Merced*
12:15 - 1:30	**Lunch**
Ecological Flows	
1:30 - 1:50	Managing rivers, floodplains, and water infrastructure to mimic natural patterns and productivity

	Jacob Katz, Cal Trout
1:55 - 3:10	Panel discussion: ecological flows
3:10 - 3:30	**Break**
Data Visualization	
3:30 - 3:50	Using online spatial data tools to communicate and disseminate groundwater data: GAMA Program data strategies *Dorian Bellan, State Water Resources Control Board*
3:55 - 5:10	Unveiling of the 2019 Water Quality Status Report *Greg Gearheart, State Water Resources Control Board*
5:10 - 5:20	Symposium wrap up and next events *Nick Martorano, California Water Quality Monitoring Council*

Day 2 Concurrent Session - Community Water Science Workshop Klamath Room	
10:00 - 10:10	Introduction and welcome *Helen Fitanides, The Watershed Project; Erick Burres, State Water Resources Control Board*
10:10 - 10:30	Best practices for community water science groups *Erick Burres, State Water Resources Control Board*
10:35 - 10:55	Quality assurance plans made easy *Melissa Morris, State Water Resources Control Board*
11:00 - 11:20	Communicating and working with laboratories *Jacob Oaxaca, Environmental Laboratory Accreditation Program (ELAP)*
11:25 - 11:45	Getting data into CEDEN and why it matters *Jarma Bennet, State Water Resources Control Board*
11:50 - 1:00	**Networking lunch and discussion session**
1:00 - 2:00	Data science skills workshop
2:05 - 2:25	Overview of water quality indices *Ali Dunn and Nick Martorano, State Water Resources Control Board*
2:30 - 3:00	Open discussion
3:00 - 3:10	Daily wrap and Adjourn

Keynote Speakers

E. Joaquin Esquivel, Chair, State Water Resources Control Board

E. Joaquin Esquivel was appointed to the State Water Resources Control Board by Governor Jerry Brown in March 2017 and designated by Governor Gavin Newsom as Chair in February 2019. Previously, he served as Assistant Secretary for federal water policy at the California Natural Resources Agency in the Governor's Washington, D.C. office, where he facilitated the development of policy priorities between the agency, the Governor's Office, the California Congressional delegation, and federal stakeholder agencies. For more than eight years prior to that he worked for U.S. Senator Barbara Boxer of California, most recently as her legislative assistant covering the agriculture, Native American, water, oceans, and nutrition portfolios, in addition to being the director of information and technology. He was born and raised in California's Coachella Valley. He holds a B.A. from the University of California, Santa Barbara in English.

Laurel Firestone, Board Member, State Water Resources Control Board

Laurel Firestone was appointed to the State Water Resources Control Board by Governor Gavin Newsom in February 2019. Prior to joining the Board, Laurel co-founded and co-directed, from 2006-2019, the Community Water Center (CWC), a statewide non-profit environmental justice organization. Based in California's Central Valley and Central Coast, the CWC helps disadvantaged communities gain access to safe, clean, and affordable drinking water and build civic engagement and leadership to achieve the human right to water.

Laurel has received a variety of awards and recognitions, including the James Irvine Foundation's Leadership Award in 2018, and the Gary Bellow Public Service Award by the Harvard Law School in 2013. She also received an Equal Justice Works fellowship to start the Rural Poverty Water Project in the Central Valley in 2004-06 as part of the Center for Race, Poverty and the Environment. Laurel served on the Tulare County Water Commission from 2007-2012 and co-chaired the Governor's Drinking Water Stakeholder Group from 2012-2014. She served on a variety of state policy advisory committees and partnered with universities to develop research and clinical programs to ensure the human right to water. In 2009, Laurel authored the comprehensive Guide to Community Drinking Water Advocacy and has written a variety of articles relating to safe drinking water and the environment. Laurel graduated with honors from Harvard Law School and holds a B.A. *magna cum laude* in Environmental Studies from Brown University.

Monday, July 1

Session 1: Open Science and Data Visualization

OPEN ET: FILLING THE BIGGEST DATA GAP IN WATER MANAGEMENT, **Justin Huntington**

A web visualization and application programming interface (API) called Open ET is currently being developed to provide low-cost, automated and widely accessible evapotranspiration (ET) data at user-defined scales and timeframes. The platform uses data from multiple satellites and employs an ensemble of trusted methods to calculate ET. Dr. Huntington will go over the motivation, current status, and future direction of the OpenET project.

THE STREAM QUALITY INDEX: A MULTI-INDICATOR TOOL FOR ENHANCING ENVIRONMENTAL MANAGEMENT COMMUNICATION, **Marcus Beck**

To quantify the ecological condition of wadable streams, environmental managers rely on three main lines of evidence: physical, chemical and biological. Traditionally, results for each line of evidence have been synthesized and presented separately because watershed managers historically have not had access to a rigorous, methodical approach for integrating the three lines of evidence – and interpreting conflicting results. The Stream Quality Index (SQI) is designed to systematically integrate physical, chemical and biological lines of evidence, producing a single unified assessment of stream health. The SQI eliminates reliance on subjective and ad-hoc interpretative tools by allowing managers to integrate the three lines of evidence and communicate findings to support environmental decision-making.

USGS OPEN SCIENCE THEN AND NOW, **Alex Etheridge**

This talk will provide an overview of USGS's long history of public data dissemination based on foundations of data management, QA, and peer review. The story of synthesizing and developing a near-real-time sediment concentration model in Alameda Creek will illustrate the utility of USGS open data repositories and code repositories. Current challenges and future directions in USGS data science will also be discussed.

A SLOUGH OF INFORMATION FOR THE PUBLIC, **Gene Oh and Joel Kramer**

Public engagement in the protection of water resources is enhanced by public-friendly presentation of water quality study objectives and findings. This presentation explores the use of innovative data visualization tools to convey the purpose and results of a study conducted in North County San Diego for the past three years to assess nutrient and algal conditions in a slough. Through publication of an easily comprehendible story map, we aim to make water quality monitoring studies accessible, interesting, and interactive for the public.

Session 2: Freshwater Harmful Algal Blooms

VISUALIZING HARMFUL ALGAL BLOOMS FROM SPACE: A WEB TOOL HIGHLIGHTING LONG-TERM TRENDS AND WHERE TO SAMPLE TOMORROW, **Randy Turner**

Specialized satellite imagery is being used to estimate cyanobacteria concentrations in 255 large waterbodies within and upstream of California. The San Francisco Estuary Institute, in partnership with the State Water Board, has developed a Satellite Analysis Tool to simplify the viewing of this powerful data. This tool can help users assess the status and trends of cyanobacteria concentrations, is an automated early screening tool to guide monitoring for protection of public health, and the data can be downloaded to compare it against other environmental datasets to understand the relationships between environmental conditions and cyanobacteria blooms.

MYSTERY TO MANAGEMENT: TOXIC CYANOBACTERIA IN NORTHERN CALIFORNIA COASTAL RIVERS, **Keith Bouma-Gregson**

Toxic cyanobacteria form harmful algal blooms in lakes and reservoirs across the State. In North Coast Rivers, proliferations of toxic cyanobacterial mats grow along the river bottom, rather than suspended in the water column as in lakes. In the last ten years, a network of citizen scientists, agency staff, academic researchers, and international collaborators have increased our understanding about the ecology and physiology of cyanobacteria in Northern California Coastal Rivers. I will tell the story of how the work of this research effort has improved the public health response to benthic toxic cyanobacteria in California.

Session 4: Data Innovations

ENVIRONMENTAL ROBOTICS AS TOOLS FOR MONITORING WATER QUALITY, **Alex Forrest**

Autonomous robotics (gliders, Autonomous Underwater Vehicles, etc.) are increasingly being used to monitor water quality issues in lakes and oceans. Presenting case studies from Lake Tahoe (CA-NV) and Lake Geneva (Switzerland) will be used to illustrate their potential for water managers and stakeholders.

MACHINE LEARNING FOR CLEAN WATER ACT VIOLATION MONITORING, **Elinor Benami**

Public agencies aiming to enforce environmental regulation have limited resources to achieve their objectives. However, increasing amounts of publicly available data suggest that machine learning methods can inform efficient use of these limited resources. This talk reviews recent work that leverages increasing amounts of electronic data that aims to identify and remedy environmental harms and outlines principles to consider in the real-world implementation of such approaches.

Internet of Water Panel

The Internet of Water aims to build and strengthen a dynamic and connected network of communities and institutions to facilitate the open, shared, and integrated use of useable water data and information. The goal of this panel is to provide an overview of the Internet of Water and discuss current and future projects they will collectively pursue.

Moderator: Greg Gearheart, State Water Resources Control Board

Panelists:

Jerad Bales, Consortium of Universities for the Advancement of Hydrologic Science, Inc.

Sam Marie Hermitte, Texas Water Development Board

Adel Abdallah, WaDE 2.0/WAMDAM.org

Peter Colohan, Internet of Water

Lightning Talks

EVALUATION OF HORIZONTAL LEVEES TO TREAT WASTEWATER, PROVIDE HABITAT, AND REDUCE FLOOD RISKS ALONG COASTS, **Aidan Cecchetti**

Horizontal Levees are subsurface wastewater treatment wetlands built on wedges of sediment used to buttress coastal storm control levees. Preliminary results from research conducted at an experimental wetland system suggest that Horizontal Levees have a significant capacity to remove a suite of contaminants found in municipal wastewater effluent, including nutrients, pharmaceuticals, and pathogen indicators. For a wide range of contaminants, hydrological conditions (i.e., the interplay between subsurface flow, overland flow and evapotranspiration) exert significant control over contaminant removal, with other design and operational features having a smaller impact on the amount of removal observed. We are currently conducting research to understand the removal mechanisms responsible for these observations. In addition to wastewater polishing, Horizontal Levees can provide valuable habitat for a variety of animals and can help protect coastal areas against flooding by attenuating storm surges.

CITIZEN SCIENCE FOR BEACH WATER QUALITY: ASSESSING FRESHWATER DISCHARGES AND VOLUNTEER PARTICIPATION PATTERNS, **Wiley Jennings**

Coastal rivers and creeks in urban areas are commonly suspected sources of fecal pollution at beaches. However, measuring the extent of freshwater impact along beaches is infrequently done because it requires many measurements in time and space. In this study, we worked with 46 volunteer citizen scientists to determine alongshore extents of freshwater impact near discharges at two California beaches, employing frequent low-cost salinity measurements over a three-month sampling campaign and extensive quality control measures. Because sustained

volunteer participation is critical to citizen science studies, we also investigated the effect of a randomized informational feedback intervention on participation, as well as relationships between self-reported volunteer motivations and participation.

HOW CRUDE OIL/PAH EXPOSURE IMPACTS EMBRYONIC FISH DEVELOPMENT, **Victoria McGruer**

Polycyclic aromatic hydrocarbons (PAHs) are a main constituent of crude oil and pervasive pollutants in the aquatic environment which arise from many environmental and anthropogenic sources. Early life stage fish are particularly vulnerable to PAHs and sublethal exposure commonly leads to a number of phenotypic effects that may influence fitness. Several recent studies have used transcriptomics to evaluate biological responses with oil exposure, and many of these highlight cholesterol biosynthesis as one of the top impacted pathways. In this talk I will discuss our continuing research on the impacts of PAHs on cholesterol biosynthesis in early life stage fish, which highlight the value of omics technologies in providing unbiased predictions into toxicological effects.

VISUALIZATION OF 1ST TWO YEARS OF DELTA RMP PESTICIDE DATA, **Matt Heberger**

The Delta RMP Pesticides Data Visualization is a web app for visualization of the first 2 years of pesticides data collected by the Delta Regional Monitoring Program. The web app is meant to be simple and easy to use and was made with free and open-source software. The app shows the concentrations of 152 pesticides measured at several sites in the Sacramento-San Joaquin Delta. Concentrations of a chemical don't tell you much -- the important thing is whether they occur at concentrations that can cause harm. The app lets you compare observations to Aquatic Life Benchmarks developed by the USEPA, to determine whether pesticides may be causing harm to fish and wildlife.

A CALL FOR OPEN ACCESS TO TRASH DATA, **Win Cowger**

Data on trash abundance is critical for making policy and management decisions. Although collected by many of the groups represented at this symposium, access to trash data is often restricted between groups, slowing the process of innovation, standardization, and application. A lack of data access inhibits the ability of dischargers, researchers, and managers to respond effectively to the global crisis of plastic pollution. This presentation highlights current challenges in the field of trash pollution and identifies the character and scope of data needed to address these challenges and drive positive change. We close with a call to join the effort to make trash data available for the benefit of all.

ROBUST AND ACCESSIBLE DATA WITH R, **Sadie Gill and Emanuel Rodriguez**

This talk will showcase the use of R and other open source tools to create robust data packages. Data packages enable data to be documented, accessible and open. The FlowWest team will showcase two packages that have contributed to streamlining data-driven decision making.

Concurrent Session: Water Science Datathon

Data wranglers will work alongside subject matter experts to develop data schema and begin to answer questions related to one of three topics:

- **Water Source Time Machine:** The State Water Board's Division of Drinking Water regulates approximately 7,500 public water systems (PWS) in California. Although each PWS has a unique identifier, the current or former sources(s) of water each system uses are not as easy to identify. Participants will work on conceptualizing how to develop a tool that would allow users to select a location within a PWS boundary and see where current and past sources of water come from.
- **Trash Data Model:** The State Water Board's Office of Information Management and Analysis (OIMA) is developing a new method to monitor and assess the quantity, distribution, and makeup of trash on streets to better understand the amount of trash entering (or being prevented from entering) California's waterbodies. While a data model for this project has been developed, there is plenty of more work to do! We need to streamline the current data model, develop a corresponding data schema, and develop a way to integrate (1) data across temporal and geographic scales and (2) monitoring methods for trash, debris and microplastics, etc.
- **"Consumer Confidence Report (CCR)" Application:** Every community water system and every nontransient-noncommunity water system must prepare and distribute an annual Consumer Confidence Report (CCR) to their users. Each CCR contains information on source water, levels of any detected contaminants, and compliance with drinking water regulations (including monitoring requirements), along with some educational information. We would like to develop a way to allow public water systems to port their data to an application that, like a weather forecast application, allow geotagged data to integrate into and inform drinking water quality and sources of water datasets.

GitHub Repositories:

- Water Source Time Machine: http://bit.ly/WaterDatathon2019_WaterSources
- Trash Data Model: http://bit.ly/WaterDatathon2019_Trash
- "CCR Application": http://bit.ly/WaterDatathon2019_CCRApp

Tuesday, July 2

Opening Presentation

SPACE HYDROLOGY: CALIFORNIA WATERS FROM LOW EARTH ORBIT, **Orestis Herodotou**

Learn how Planet's satellite imagery is being used to uncover actionable insights about our changing environment and how Planet's unique daily coverage can help inform policy, conservation, and economics for California's most precious resource, water.

Session 1: Trash and Microplastics

AI AND TRASH: CAMERAS ON STREET SWEEPERS TO ID TRASH AND UNDERSTAND EFFECTIVENESS, **Walter Yu and Gary Conley**

Computer vision and AI are becoming popular for remote sensing and field data collection. As a result, this presentation will highlight one such use case for litter detection from street sweepers and other field data collection methods. Topics will include a brief demo, best practices for deployment and benefits of streamlining data collection.

USING REMOTE-SENSING TO ADDRESS TRASH MONITORING CHALLENGES, **Tony Hale**

Through a project funded by the California Ocean Protection Council, in partnership with the State Water Board, SFEI (San Francisco Estuary Institute) and SCCWRP (Southern California Coastal Water Research Project) has been had the opportunity to apply new technologies to old environmental problems. How can trash monitoring practitioners increase their assessment spatial range while also increasing the frequency of their assessments? The application of drones and machine learning to these challenges promises to unlock new possibilities for increased efficiency and time savings. However, estimating the accuracy, precision, and cross-comparability of these new methods is key to ensuring the credibility of their results.

MICROPLASTIC MONITORING IN SAN FRANCISCO BAY, **Diana Lin**

The latest studies are finding microplastic pollution to be ubiquitous, and there is strong interest from the public and governments to understand potential impacts to ecosystems and human health. SFEI, in collaboration with 5Gyres, and with funding from the Moore Foundation, is completing a multi-year comprehensive study of microplastics in San Francisco Bay, including monitoring microplastics in Bay water, sediment, fish, as well as in the wastewater and stormwater pathways. This presentation will highlight preliminary findings from this study.

Session 2: Remote Sensing

CONCERNED CITIZEN SCIENTIST & BULL KELP: COMPILING MONITORING DATA FOR OPTIMAL CONDITIONS FOR GROWTH OF BULL KELP ALONG NORTHERN CALIFORNIA'S COAST, **Jim Penny**

Kelp forests provide 3D habitat for ~800 species but with the rise of persistent urchin barrens across the globe, probable causes of kelp decline such as urban run-off, climate change and higher SST, and nutrient changes need to be evaluated. Remote Satellite and ROV in situ methods can be used to monitor, map, & build detailed 3D temporal spatial data base of kelp habitat conditions and used to assess trends in critical ocean conditions. This monitoring can help build awareness to the problem and provide examples of solution paths.

TURBIDITY IN THE SAN FRANCISCO BAY AND DELTA FROM SENTINEL-2 AND CDEC STATION DATA, **Christine Lee**

Analysis of water column optical properties through use of satellite or airborne remote sensing has the potential to increase the extent of in situ monitoring networks or supplement such programs by orders of magnitude. In this talk, we evaluate turbidity in the San Francisco Bay and Delta, California, as measured by in situ water quality stations, downloaded from the California Data Exchange Center (CDEC), and as derived from European Space Agency Sentinel-2 satellite data with two different turbidity algorithms (Dogliotti *et al.*, Nechad *et al.*) by directly comparing these sources following spatial and temporal matching.

MEASURING MERCURY FROM SPACE? DEVELOPING LOW-COST OPTICAL MONITORING TECHNIQUES TO CONDUCT HIGH RESOLUTION TEMPORAL AND SPATIAL MAPPING OF MERCURY IN SURFACE WATERS OF THE SAN FRANCISCO BAY-DELTA, **Erin Hestir**

Mercury (Hg) contamination and bioaccumulation in wildlife is a persistent problem that has been studied extensively in many discrete locations throughout the San Francisco Bay-Delta. However, new tools are needed to facilitate a more comprehensive understanding of the spatial and temporal dynamics of Hg speciation (including methylmercury), transport and fate in complex aquatic systems. Recently, the CDFW funded UC Merced and the USGS to conduct research to develop a tool for the science and management community that enables high resolution mapping of mercury (Hg) species in the Delta. A main goal of the work is to develop models to predict Hg and methylmercury (MeHg) from non-Hg water quality parameters, and to relate these to remote sensing and in-situ optical measurements. The anticipated result is high spatial resolution time-series maps of dissolved and particulate Hg species in the Delta surface waters which will be used to address two primary information gaps: 1) the effects of wetland restoration on Hg speciation and mobilization on downstream delta-sub-regions, and 2) the transport and fate of Hg in the Delta.

Session 3: Ecological Flows

MANAGING RIVERS, FLOODPLAINS, AND WATER INFRASTRUCTURE TO MIMIC NATURAL PATTERNS AND PRODUCTIVITY, **Jacob Katz**

This presentation will explore a portfolio of recent landscape-scale, multi-species, multi-benefit floodplain management projects that demonstrate that agriculture, water supply, flood control and recovery of endangered species are all compatible efforts resulting from the multi-benefit use of floodplains, even within the extensively altered and highly managed agricultural landscape of the Central Valley. Only when diverse interests come together to build multi-benefit projects that improve conditions for salmon at every life stage will we see real water solutions that support fish and people. We can get there by reconciling a working knowledge of river ecosystems into flood and water supply management by operating our water infrastructure to mimic natural hydrologic patterns and allow native fish to recognize the river systems that they evolved in and are adapted to.

Session 4: Data Visualization

USING ONLINE SPATIAL DATA TOOLS TO COMMUNICATE AND DISSEMINATE GROUNDWATER DATA: GAMA PROGRAM DATA STRATEGIES, **Dorian Bellan**

In cooperation with the U.S. Geological Survey, the California State Water Board Groundwater Ambient Monitoring and Assessment (State Water Board GAMA) Program provides a comprehensive assessment of statewide groundwater quality. Online spatial web tools allow staff geologists to effectively and attractively communicate large amounts of groundwater quality data and information to a wide audience that includes water managers, environmental groups, and the public.

UNVEILING OF THE 2019 WATER QUALITY STATUS REPORT, **Greg Gearheart**

The Water Quality Status Report is an annual data-driven snapshot of the Water Board's water quality and ecosystem data. This third edition of the report is organized around the watershed from land to sea. Each theme-specific story includes a brief background, a data analysis summary, an overview of management actions, and access to the raw data.

Ecological Flows Panel

The goal of this panel is to provide an introduction and overview of efforts by a group of agencies in CA to develop the California Environmental Flows Framework (CEFF), which is an approach and set of tools for developing ecological and environmental flow targets for stream in California. The panel will discuss CEFF, the technical elements being developed by the technical workgroup, and how various agencies propose to use the CEFF products in their programs. Several examples of early implementation of the CEFF will also be discussed. Once completed the CEFF and the interagency group will support improved collaboration and coordination among agencies and programs managing environmental flows in CA.

Moderator: Eric Stein, Southern California Coastal Water Research Project

Panelists:

Belize Lane, Utah State University

Amber Villalobos, California Department of Fish and Wildlife

Daniel Shultz, State Water Resources Control Board

Julie Zimmerman, The Nature Conservancy

Sarah Yarnell, University of California, Davis

Concurrent Session: Community Water Science Workshop

An impressive amount of water quality data in California is being collected by small water quality monitoring projects. Oftentimes these data represent waterbodies or sections of waterbodies that would otherwise be unmonitored and there would be no data available for them. The organizations conducting these projects are not only important watershed stakeholders but also valuable collaborators. This workshop is being held to assist these organizations by increasing their ability to collect and share data of known quality with the Water Boards and others.

BEST PRACTICES FOR COMMUNITY WATER SCIENCE GROUPS, **Erick Burres**

When it comes to managing a water quality monitoring project, especially one that incorporates volunteers that may have little or no science background, there is no such thing as “plug-and-play”. In this brief presentation you will learn some very helpful tips, best practices, and strategies so that your monitoring program can achieve success.

QUALITY ASSURANCE PLANS MADE EASY, **Melissa Morris**

Even seasoned scientists and engineers can find the prospect of developing a new quality assurance project plan a daunting task. Breaking through the fog of complex information and rumors, we will explore several key questions about your monitoring project that will demystify and simplify your path to an effective and efficient project plan.

COMMUNICATING AND WORKING WITH LABORATORIES, **Jacob Oaxaca**

Laboratory test results impact many areas of our daily lives such as assurance of safe drinking water and environmental monitoring. California Government agencies rely on the competence of laboratories to deliver the results on which important decisions are made. Accreditation enhances public confidence in test results and is a tool to show that laboratories are capable of producing accurate and defensible data. This presentation will cover how to select an accredited laboratory and best practices for communicating and working with a laboratory to meet your analytical testing objectives.

GETTING DATA INTO CEDEN AND WHY IT MATTERS, **Jarma Bennet**

The California Environmental Exchange Network is a collection of water quality-related monitoring results. Jarma Bennett will discuss the five "W's" (who, what, why, where, and when), including the steps for providing data and whether to access CEDEN data.

DATA SCIENCE SKILLS WORKSHOP, **Office of Information Management and Analysis**

Staff from the State Water Board's Office of Information Management and Analysis provide attendees with information and resources to improve their data science skills. Attendees will learn the basics of data science and an overview of how to use R, Tableau, and Power BI to analyze, visualize and communicate with their data.

OVERVIEW OF WATER QUALITY INDICES, **Ali Dunn and Nick Martorano**

Analysis and interpretation of water quality and aquatic ecosystem monitoring data can be challenging and complicated. Water quality indices are often used to summarize and report complex data in simple and consistent terms (e.g., poor to good) for specific beneficial uses of water such as aquatic life. We will take a high-level view of the various grading systems, or water quality indices, used throughout the State and how these tools can inform future monitoring and management/restoration actions.

Poster Presentations

1. REMOTE SENSING OF AGRICULTURAL WATER SCARCITY, **Joel Kramer**

   Water shortages in Colorado River agriculture have major impacts on farmer decision-making. We analyze satellite imagery with vegetation indices to describe the impact of the lining of the All-American Canal as well as a 7.2 earthquake on agriculture in the Mexicali Valley. In a novel, accessible approach, we use remote sensing to visualize affected regions and survey farmers about how they adapt to water shortages. Results show how shocks affect farmer recovery and the distribution of water resources. This method would apply well to analogous regions in California such as the Imperial, Coachella or Central Valleys.

2. DEVELOPING WATERSHED WIDE ECOLOGICAL INSTREAM FLOW PRESCRIPTIONS USING A RAPID APPROACH TO INFORM WATER MANAGEMENT DECISIONS, **Amber Villalobos and Lily McDougall**

   To inform water management decisions and protect fish and wildlife, the California Department of Fish and Wildlife is developing a rapid instream flow assessment approach that incorporates site-specific methods and recently developed regional and watershed level flow assessment tools to identify instream flow regime prescriptions for California watersheds. Primary benefits of the rapid assessment approach are that it allows more timely development of flow criteria, broader coverage of entire watersheds, as well as species-specific and ecosystem flow prescriptions based on natural flow regime patterns. The flow criteria can be tailored to specific ecological management goals for a stream or watershed. In addition, we identify and provide multiple flow criteria outputs and functional flow components allowing for a diversity of water management applications depending on the individual or combined goals of species, habitat, and ecological integrity.

3. THE USE OF ROVS TO ASSESS CALIFORNIA'S WATER INFRASTRUCTURE TO ENSURE THE SAFETY AND RELIABILITY OF OUR WATER SYSTEM, **Lefty Ayers**

   The safe and effective use of ROV's, or Remotely Operated Vehicles has been utilized in water-related industries around the world. IMMERSED was created to utilize these ROVs to assess California’s water infrastructure using 4K camera technology to perform underwater inspections of waterways, dams, canals, and other water infrastructure to provide accurate information to help water managers maintain the safety and reliability of our water system.

4. CAMP FIRE EMERGENCY WATER QUALITY MONITORING, **Alisha Wenzel and Michael Parker**

   In the early morning hours of November 8th, 2018, the Camp Fire ignited in Pulga, CA, a small town in the Feather River Canyon. Driven by strong northeasterly winds, low humidity and extremely low soil moisture levels, the small fire exploded into an inferno within a few hours and became the deadliest and most destructive fire in California history. The Camp Fire destroyed the community of Concow and the densely populated town of Paradise, with a total of 19,336 structures lost or destroyed. The fire impacted the Butte Creek watershed and the northern watershed of the West Branch and the North Fork of the Feather River. Both watersheds are used for drinking water and support important cold water and wildlife habitat. Butte Creek provides one of the last pristine spawning habitats for the federally listed Central Valley Spring Run Chinook Salmon. Due to the fire occurring during the onset of the wet season and the sheer number of destroyed structures, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) led a multi-agency effort to establish an emergency water quality monitoring program. Just over a month after the Camp Fire ignited, the Central Valley Water Board, California Department of Water Resources, California Department of Transportation, and other local agencies selected ten monitoring sites and initiated sampling. The list of constituents sampled included analysis for nutrients, metals, and polycyclic aromatic hydrocarbons (PAHs). Sampling events were timed around significant rain events to capture over land flow and storm water discharge. Preliminary results from December 2018 to May 2019 show intermittently elevated concentrations of metals and PAH's at all sites.

5. THE CALIFORNIA AND NATIONAL WATER QUALITY MONITORING COUNCILS, **Nick Martorano**

   Posters and fact sheets will be available to provide stakeholders information on the California Water Quality Monitoring Council and the National Water Quality Monitoring Council. Information will include how to interact with the Councils and ways to engage with the Council workgroups on a state and national scale.

6. CALIFORNIA'S GROUNDWATER AMBIENT MONITORING AND ASSESSMENT (GAMA) PROGRAM, **Dori Bellan, Aaron Button, Carolyn Cantwell, Emily Houlihan and Jan Stepek**

   GAMA staff will be available to demonstrate several online tools to search and display groundwater quality data for California. Users will be able to investigate groundwater quality in their neighborhoods, as well as on more regional scales. Posters depicting California's groundwater quality will be on display, as well as information about the data the GAMA Program provides. Fact Sheets for specific groundwater contaminants will also be available to stakeholders.

7. AI AND TRASH: CAMERAS ON STREET SWEEPERS TO ID TRASH AND UNDERSTAND EFFECTIVENESS, **Walter Yu and Gary Conley**

   A demonstration of the AI and trash use case of litter detection from street sweepers and other field data collection methods will be provided.

8. A VIEW INTO THE DELTA PLAN PERFORMANCE MEASURES, **Scott Jason Navarro**

   A poster presenting the Delta Plan Performance Measures Reporting Tool 1) Online tool to view and access performance measures information relevant to the Delta Plan strategies and recommendations 2) Show key website features such as: website intuitiveness, data interactivity, and a format that allows for communication to a wide audience. 3) Various data visualizations from different data sets for each performance measure

9. DIVING INTO DATA NAVIGATOR AND EXPLORING EDERS (ENVIRONMENTAL DATA ENTRY AND REPORTING SYSTEM), **Stacey Swenson and Cassandra Lamerdin**

   Diving into Data Navigator and Exploring eDERs (Environmental Data Entry and Reporting System), We are pleased to present a continuation of the Central Coast's online data exploration tool along with the Environmental Data Entry and Reporting System managed by the Marine Pollution Studies Lab at Moss Landing Marine Labs.

Vendor Exhibits

1. **YSI, a Xylem Analytics brand:** YSI's environmental products provide high quality, high resolution data to better understand and manage our water resources. They are used for wastewater process control, climate change and drought studies, flood monitoring and warning, stormwater runoff monitoring, groundwater quantification and contamination, aquaculture production and source water safety. In addition to standard products, YSI's custom integrated systems help customers obtain critical data in most any application. Tell us what you need and let us design and deploy a total system, even if you simply just want the data.

   Presenter: Diego Davis

   Diego Davis is the regional Technical Sales and Support Manager for Xylem Analytics. He received his B.S. in Environmental Systems: Earth Science from the University of California, San Diego in 2011. In his former role as a Hydrologic Technician, Diego managed and executed projects over a wide range of applications such as measuring piped and open channel irrigation discharge, stream gauging per USGS protocol, monitoring meteorological conditions, real time data telemetry, and beta testing. In his current role, he provides technical and consultative support for YSI, SonTek and WaterLOG product lines to agencies throughout California, Arizona, Nevada and Hawaii.

2. **Planet:** Planet is an integrated aerospace and data analytics company that operates history's largest commercial fleet of satellites, collecting daily, high resolution imagery of everywhere on earth. Planet's daily snapshot captures a massive amount of information about our changing planet and is delivered with the software and analytics users need to make critical business decisions.

   Presenter: Jasmine Rice

3. **120WaterAudit:** State Agencies, Public Water Systems and Facilities use's software and kits to manage water programs at scale. Our platform supports the workflows agencies, field teams, water operators, and water quality compliance program managers need to ensure effective data transparency and program management. The state of Maryland, state of Indiana, Chicago and Pittsburgh execute large scale water quality programs powered by the 120WaterAudit platform.

Presenters:

Dan Moyers
EVP of Product and Operations

Antony Rhine
Director of Sales

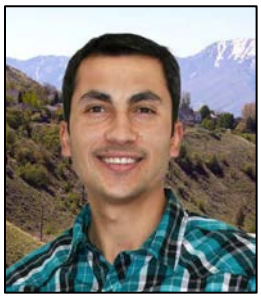
4. **FREDsense Technologies:** FREDsense creates portable instruments for doing water quality analysis in the field. We will be showcasing our FRED-Arsenic unit, which allows users to collect arsenic speciation data in the field in about an hour, allowing them to optimize their treatment process. With new parameters launching soon, FREDsense is moving analytical lab analysis into the field.

Presenter: David Lloyd

David's work ranges from managing complex innovation programs to working in projects as diverse as DNA assembly, environmental remediation, and biosensors. His hard work has earned him a nomination as a Top 40 Under 40 by Avenue Magazine. He expertly leads FREDsense in business and development growth and client satisfaction.

Presenter and Panelist Index

Abdallah, Adel; WaDE 2.0 / WAMDAM.org



Adel is a Ph.D. Candidate in the Civil and Environmental Engineering Department. With a research emphasis on hydroinformatics, Adel designed the Water Management Data Model (WaM-DaM) to enable water managers and researchers to use one database management system to organize, interpret, and compare multiple water resources datasets for study areas. He is also designing data workflows to automate preparing input data and reusing output data for multiple water management models. He demonstrates these methods in the Bear River Watershed, Utah. You may follow Adel's research repositories on GitHub: https://github.com/amabdallah. Adel aims for a career in academia to advance cutting-edge informatics methods and applications and teach them to the next generation of engineers. He looks forward to improving the understanding and management of water resources systems by advancing the science and practice of managing and publishing data and models. Adel has a passion for cooking, loves skiing and hiking, and likes to read about history, leadership, and effective teaching methods.

Ayers, Lefty; IMMERSED

Lefty has worked across multiple disciplines in natural resource management and other fields related to logging, ranching, and wildlife management.

Bales, Jerad; Consortium of Universities for the Advancement of Hydrologic Science, Inc.

Dr. Jerad Bales is Executive Director of the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI). CUAHSI is a 501(c)3 research organization representing more than 130 U.S. universities and international water science-related organizations. CUAHSI develops infrastructure and services for the advancement of water science in the United States. Prior to his position with CUAHSI, Dr. Bales was the U.S. Geological Survey's Chief Scientist for Water. In this position, he was the Senior Executive re-sponsible for $100M of activities related to the planning and devel-opment of national hydrologic research and technology transfer.

Beck, Marcus; Southern California Coastal Water Research Project

Marcus is an Ecologist in the Biology Department at the Southern California Coastal Water Research Project (SCCWRP) who specializes in developing environmental scoring and data visualization tools to assess water body condition. He received his Ph.D. and M.S. in Conservation Biology (minor in Statistics) from the University of Minnesota, and his B.S. in Zoology from the University of Florida. He is an advocate for open science approaches to improving the reproducibility, transparency, and communication of bioassessment methods.

Bellan, Dorian; State Water Resources Control Board

Dori Bellan is an engineering geologist for the State Water Board's GAMA Program. Dori attended Eastern Kentucky University for her undergraduate studies in Geology. Her graduate studies at the Center for Earthquake Research and Information at the University of Memphis were in geophysics and paleo seismology, in cooperation with the USGS. She has worked in the GAMA Program since 2005 and enjoys performing spatial analyses, employing data to better understand groundwater conditions, and communicating groundwater issues to the public with outreach and visual tools.

Benami, Elinor; University of California, Davis

Elinor Benami is a Postdoctoral Scholar in the Agricultural and Resource Economics department at the University of California, Davis. She holds a Ph.D. in Environment and Resources from Stanford University and a bachelor's degree in economics from UNC-Chapel Hill. Dr. Benami's research focuses on how we can better detect, predict, and manage environmental hazards that affect people's lives, including how we can use machine learning methods to direct Clean Water Act inspections to cost-effectively enhance environmental quality in California and beyond.

Bennet, Jarma, State Water Resources Control Board

Jarma Bennett is the lead of the data Integration and Analysis Unit in the Office of Information Management and Analysis at the State Water Board. She is the program manager of CEDEN, as well as the California Integrated Water Quality System, another database administered by the Water Board. She is a registered civil engineer and has over 20-years of experience at the State and Regional Water Boards.

Bouma-Gregson, Keith; State Water Resources Control Board

Keith Bouma-Gregson is the Freshwater Harmful Algal Bloom Program Co-Lead for the State Waterboards. He has a M.S. in Aquatic Sciences from the University of Michigan and a Ph.D. from University of California, Berkeley. He has studied cyanobacteria since 2012, when he began his dissertation on benthic cyanobacteria in Northern California.

Burres, Erick; State Water Resources Control Board

Mr. Burres has a background in conservation biology (B.S. Zoology, MPA Public Policy and Administration) and has worked throughout California in wild lands management and conservation as well as wildlife, marine and fisheries research. Currently he is the SWRCB's Citizen Monitoring Coordinator for the Clean Water Team. Since 2000 he and the Clean Water Team have worked statewide supporting programs engaged with community-based watershed management and citizen science water quality monitoring projects.

Button, Aaron; State Water Resources Control Board

Aaron is an engineering geologist for the State Water Board's GAMA Program. He attended Sacramento State University for his undergraduate work in Geology and worked in the groundwater cleanup sector for six years after graduation. Aaron is a registered professional geologist.

Cantwell, Carolyn; State Water Resources Control Board

Carolyn is an Engineering Geologist with the State Water Boards' GAMA program. Carolyn holds an M.S. in Geology from University of California, Davis with a focus on geochemistry. Carolyn's other work experience includes a position at the Division of Oil, Gas and Geothermal Resources, and the Lawrence Berkeley National Laboratory.

Cecchetti, Aidan; University of California, Berkeley

Aidan grew up in coastal New Hampshire and attended the University of New Hampshire, receiving a B.S. in Environmental Engineering prior to coming out to the Bay Area to conduct graduate research at University of California, Berkeley under the supervision of David Sedlak. Aidan's research interests include natural and biological water treatment systems,

wastewater treatment and reuse, and biogeochemistry. Outside of research, Aidan is an avid hiker and enjoys cooking and traveling with his partner, Michael.

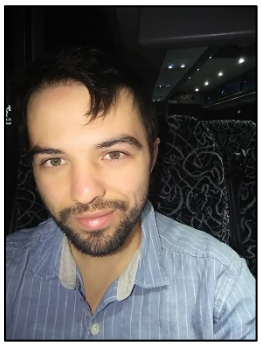
Colohan, Peter; Internet of Water

Peter Colohan is the Executive Director of the Internet of Water, a project based at Duke University's Nicholas Institute for Environmental Policy Solutions. Peter comes to the IoW after nearly a decade of Federal service with the National Oceanic and Atmospheric Administration (NOAA). At NOAA, Peter was a key advocate for the development of the National Water Model and the creation of the NOAA Water Initiative. From 2012-2014, Peter served as the Assistant Director for Environmental Information within the White House Office of Science and Technology Policy, where he worked closely with all Federal agencies responsible for climate, water and environmental science and technology.

Conley, Gary; 2NDNATURE

Gary combines expertise in hydrology, pollution dynamics, and applied math to develop watershed-based tools used by natural resource managers throughout the United States. With 15 years of experience helping local agencies mitigate water quality issues, Gary leads a team of applied scientists at 2NDNATURE to support development of water quality modeling and effectiveness assessment tools. He draws on his work at NOAA, where he led a multi-agency monitoring collaborative to address regional non-point source pollution issues. Gary holds a B.S. in Earth Sciences from University of California, Santa Cruz and a M.S. in Geography from San Diego State University.

Cowger, Win; University of California, Riverside



Win Cowger is a Ph.D. Student and NSF Graduate Research Fellow in Environmental Science at University of California, Riverside. I conduct field and lab research to refine our knowledge of the sources and sinks of plastic pollution with empirical modeling. I am assessing microplastics in streams throughout California. I am addressing these questions: are the current regulations on plastic pollution effective at preventing plastic pollution, how much microplastic is flowing into the ocean, and where are the microplastics coming from? You can see my current opensource database here: https://opendata.letsdoitworld.org/#/

Dunn, Ali; State Water Resources Control Board

Ali Dunn is a Senior Environmental Scientist in the Office of Information Management and Analysis at the State Water Resources Control Board. She is the lead of the Surface Water Ambient Monitoring Program Unit and chair of the Healthy Watersheds Partnership. Ali obtained her degree in Biological Sciences with a focus on Conservation Biology in 2011. Her work at the Water Boards has focused on watershed management and restoration, including integrated assessment approaches that help tell the story of California's diverse aquatic ecosystems and their complex and interacting dynamics.

Etheridge, Alex; United States Geological Survey

Alexandra Etheridge is a water-quality specialist at the USGS California Water Science Center. She has worked as a field technician, a project hydrologist, and a water-quality specialist over the course of her 13-year USGS career. She has specific interest in using high-frequency hydrologic and water-quality data as proxies in regression models to estimate constituent concentrations and loads in near-real-time.

Fitanides, Helen; The Watershed Project

Helen is a Project Coordinator for The Watershed Project and manages the Creek Monitoring and Wild Shorelines Programs and is also the Watershed Coordinator for SPAWNERS. Helen grew up on the Central Coast of California and studied marine biology at Cal Poly, San Luis Obispo. She went on to manage a research lab at the University of California, Santa Barbara, where she investigated the impacts of nanomaterials on aquatic food webs. While the work was fascinating, what she really wanted to do was get outside and work with nonprofits. She moved to the Bay Area in 2013 to achieve that goal, and has since worked with San Francisco Baykeeper, Friends of Five Creeks, and Friends of Sausal Creek, as well as The Watershed Project and SPAWNERS. Helen lives in the Strawberry Creek Watershed.

Forrest, Alex; University of California, Davis

Alex's general area of research focuses on understanding the influences between localized bathymetry and the surrounding water column. As much of this work is on a scale logistically difficult (e.g. large-scale shorelines) or impossible (e.g. under-ice) to survey with traditional techniques, he has worked since 2006 with Autonomous Underwater Vehicles (AUVs) as data collection platforms to further his research. From lakes to oceans, Alex believes in having the right tool for job at hand has worked with a wide variety of conventional and leading-edge techniques to observe and monitor our water resources. From developing glider systems for ongoing work at Lake Tahoe to modelling sediment transport around water infrastructure, each tool expands our capacity for observation in a world that's inherently complex and transdisciplinary in nature.

Gearheart, Greg; State Water Resources Control Board

Greg Gearheart is the Deputy Director at the California State Water Resources Control Board's Office of Information Management and Analysis and considers his job to be the chief data liberator for all the Water Boards' data. He has been the director of the Office of Information Management and Analysis for four years. Prior to this appointment Greg served as the statewide Storm Water Program Manager for about seven years. In his 25 years at this organization Greg has worked in many different program areas, including wetlands, watershed management, organizational development and enforcement. Greg received a B.S. in Environmental Resources Engineering from Humboldt State University and also grew up behind the redwood curtain.

Gill, Sadie; FlowWest

Sadie combines a unique background in GIS, data science, and computer programming to develop creative data-driven solutions to natural resources problems.

Hale, Tony; San Francisco Estuary Institute

As Program Director for Environmental Informatics, Dr. Tony Hale represents five technical teams: Geographic Information Systems, Application Development, Data Services, IT Systems, and Design & Communications. Dr. Hale joined SFEI in 2013 and has also served as member of several state-level committees. He is currently co-chair of the Data Management Workgroup, affiliated with the California Water Quality Monitoring Council. In December 2018, he was selected to serve as a member of USEPA's National Advisory Council for Environmental Policy and Technology. With SFEI, Dr. Hale has advanced SFEI's communications practices, overseen the development of new data visualization technologies, and partnered with state and federal agencies to address complex data management challenges.

Heberger, Matt; San Francisco Estuary Institute

Matthew Heberger is an Environmental Scientist at the Aquatic Science Center in Richmond, California, where he manages the Delta Regional Monitoring Program. For the last 20 years, he has worked on water issues as a hygiene and sanitation educator in West Africa, consulting engineer, and policy analyst in Washington D.C. and California. Matthew holds a B.S. in Agricultural and Biological Engineering from Cornell University and received a master's degree in Water Resources Engineering from Tufts University.

Hermitte, Sam Marie; Texas Water Development Board

Sam Marie Hermitte has been with the Texas Water Development Board since June of 2012 and currently serves as the Assistant Deputy Executive Administrator of Water Science and Conservation. Her areas of responsibility include strategic planning, legislative analysis and implementation, drought policy and project coordination, technical writing and review, and special initiatives such as the development of TexasFlood.org. Hermitte holds a bachelor's degree in public policy analysis from the University of North Carolina at Chapel Hill and a master's degree in public affairs with a portfolio in integrated watershed studies from the LBJ School of Public Affairs at the University of Texas at Austin.

Herodotou, Orestis; Planet

Orestis Herodotou is a software engineer at Planet where he builds geospatial and satellite imagery analysis tools to help uncover actionable insights about our changing planet. He is an avid sailor on the SF Bay and serves as a 5Gyres Institute Ambassador, contributing to ocean plastic pollution citizen-science research and educational programs.

Hestir, Erin; University of California, Merced

Erin Hestir is an Assistant Professor in Civil and Environmental Engineering at University of California, Merced where she leads the Earth Observation and Remote Sensing Laboratory. Dr. Hestir holds a Ph.D. from University of California, Davis and a B.A. from University of California, Berkeley. Her research focuses on aquatic ecosystems under threat from competing pressures to meet societal needs for water and food security while sustaining biodiversity and other ecosystem services such as water quality. She has expertise in geospatial analytics, hyperspectral and satellite remote sensing and sensor networks for inland and coastal waters and wetlands.

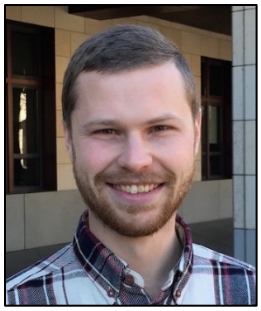
Houlihan, Emily; State Water Resources Control Board

Emily Houlihan is a Scientific Aid with the State Water Boards GAMA program. Emily completed her M.S. in Geology at University of California, Davis, where her research included studies of the Sierra de Maz in northwestern Argentina.

Huntington, Justin; Desert Research Institute

Justin Huntington is a Research Professor of Hydrology at the Desert Research Institute and Western Regional Climate Center in Reno, Nevada. His research is focused on evapotranspiration, surface and groundwater interactions, drought, agriculture, and groundwater dependent ecosystems. Justin's recent activities include enabling land and water managers to create climate and remote sensing products in-house for improved decision support via cloud computing, stakeholder engagement, and outreach. His projects are primarily being funded by the U.S. Bureau of Reclamation, U.S. Geological Survey, NASA, Google, and multiple foundations. He is one of 21 members of the 2018-2023 Landsat Science Team.

Jennings, Wiley; Stanford University



Wiley Jennings is a Ph.D. student in Environmental Engineering at Stanford University. He studies tools, broadly defined to include microbiology, statistical modeling, and citizen science, to assess the microbial water quality of environmental waters to ensure that they are safe for human exposure.

Katz, Jacob; Cal Trout

Jacob was born with gills. Fascinated with what happened below the water line he grew up chasing fish in every creek, puddle, river and pond he could find. Eventually Jacob was hooked by school taking a Ph.D. in Ecology at the University of California, Davis Center for Watershed Sciences. He is Senior Scientist at the conservation non-profit California Trout, where his work focuses integrating ecologic science into the management and operation of California's water infrastructure, developing ways to get greater fish and wildlife benefit out of working agricultural landscapes and finding win-win solutions for people and the environment to ensure that California will always be home to wild salmon.

Kramer, Joel; San Diego State University and Weston Solutions

Joel Kramer is a geographer with a professional background in community-based habitat restoration and water quality monitoring. Joel is interested in analyzing the spatial dimension of water contamination in order to engage stakeholders in conservation efforts.

Lamerdin, Cassandra; Moss Landing Marine Laboratories

Cassandra Lamerdin has wide ranging scientific expertise in the fields of both Marine and Environmental Sciences. Some of the large-scale monitoring programs she has participated in were Surface Water Ambient Monitoring Program, the CA Bay Protection Toxic Cleanup Program, California's portion of EPA's Coastal Environmental Monitoring and Assessment Program and inventorying California's Invasive Species in marine and inland harbor environments. Cassandra was the lead on creating and coordinating the data management efforts for SWAMP. She led the Data Management Team at MPSL in building a successful data management system which was able to organize information in a comparable manner of known and documented quality.

Lane, Belize; Utah State University

Dr. Belize Lane is an Assistant Professor of Hydrology in the Department of Civil and Environmental Engineering at Utah State University and a researcher at the Utah Water Research Laboratory. Belize's research focuses on supporting resilient rivers for humans and ecosystems in the western U.S. and more efficiently allocating our limited freshwater resources. She received her Ph.D. in Hydrologic Sciences and her M.S. in Water Resources Management from the University of California, Davis, and her B.S. in Ecology from the University of California, San Diego.

Lee, Christine; NASA Jet Propulsion Laboratory

Christine joined the Science Applications and Data Interactions group at the NASA Jet Propulsion Laboratory in 2014 after a 2-year term at NASA Headquarters in Washington, D.C as an AAAS Science and Technology Policy Fellow. Her professional interests include working to improve the utility of remote sensing for water quality monitoring through conducting applied research and developing partnerships within the water resources/water quality management practitioners community. Christine is also an Associate Program Manager for the NASA Applied Sciences Water Resources program. Christine has a Ph.D. in Civil and Environmental Engineering from University of California, Los Angeles studying coastal water quality issues and developing rapid, viability-based detection methods for monitoring water quality.

Lin, Diana; San Francisco Estuary Institute

Diana Lin is an environmental scientist at SFEI, where she investigates contaminants of emerging concern and microplastics in the San Francisco Bay. She received a Ph.D. in Environmental Engineering and Science at Stanford University in 2015 after completing her dissertation on natural attenuation processes from DDT-contaminated sediment. Following her Ph.D., she served as a legislative aid in the California legislature.

Martorano, Nick; California Water Quality Monitoring Council

Nick Martorano is an environmental program manager within the Office of Information, Management, and Analysis as the Director of the California Water Quality Monitoring Council (Council). Nick is responsible for the overall direction of the Council, coordination between the Council and water quality and ecosystem health stakeholders, and public dissemination of information generated by the Council's theme-specific workgroups. In previous positions, Nick has led the development of California's Integrated report; developed and implemented basin plan amendments, total maximum daily loads, and water quality control policies.

McDougall, Lillian; California Department of Fish and Wildlife

Lillian McDougall is an Environmental Scientist for the Instream Flow Program (IFP) in the California Department of Fish and Wildlife's (CDFW) Water Branch. Lillian earned a B.S. in Wildlife and Fisheries Conservation Biology from the University of California, Davis. Her experience prior to the IFP consisted of work in the CDFW Region 2 anadromous fisheries program life cycle monitoring projects. In her current position, she is focused on performing and developing rapid instream flow assessments and approaches for California watersheds.

McGruer, Victoria; University of California, Riverside

Victoria is a Ph.D. student studying aquatic ecotoxicology in the Schlenk research group at the University of California, Riverside where she looks at the effects of oil exposure on fish early life stages. Her interest in water science began while working at the Massachusetts Water Resources Authority and talking with water system users. She then took steps towards research, working on a project which utilized remote sampling to detect harmful algal blooms. She obtained her B.S. in Environmental

Science and Biology from Northeastern University in Boston, MA before committing to summer and moving Southern California.

Mogus, Karen; California Water Quality Monitoring Council

Karen Mogus is the Deputy Director for the State Water Board's Division of Water Quality and is responsible for statewide water quality planning, policy development and implementation, statewide permitting, and establishing consistency among the nine Regional Water Quality Control Boards. Prior to joining the Division of Water Quality, Ms. Mogus served as the Assistant Deputy Director of the Division of Drinking Water where she directed the development of a regulatory framework for potable reuse of recycled water, worked to address drinking water quality issues in disadvantaged communities, and led the review of the state's environmental laboratory accreditation program. She also has served as Director of the State Water Board's Office of Information Management and Analysis and spent 10 years at the Central Valley Regional Water Board working on a variety of water quality control and assessment programs.

Morris, Melissa; State Water Resources Control Board

Melissa Morris is on a mission to make quality assurance and data management accessible to all audiences. Trained as an Environmental Scientist and Quality Control Officer, she has spent the last two decades developing, implementing, and assisting others with quality and data management systems. Her experiences encompass every scale monitoring, regulatory, and data use projects throughout California, including the Water Board's Surface Water Ambient Monitoring Program (SWAMP). Melissa holds a M.S. in Biological Sciences and currently serves as the Assistant Deputy Director of the Office of Information Management and Analysis at the State Water Board.

Navarro, Scott Jason; Delta Stewardship Council

Scott Navarro is an environmental scientist with the Delta Stewardship Council. Scott works within the Council's planning division with the performance management unit. Since working with the Council, Scott has been working on administering and developing several of the Council's web applications, creating outreach materials, and implementing and tracking the Delta Plan performance measures. Currently, the performance management unit is conducting outreach to showcase the Council website, the Delta Plan Performance Measures Dashboard.

Oaxaca, Jacob; Environmental Laboratory Accreditation Program

Jacob Oaxaca is a Senior Environmental Scientist Supervisor of the Program Development, Research and Enforcement Unit for California's Environmental Laboratory Accreditation Program (ELAP). He oversees a multi-disciplinary team who work on regulatory initiatives, technical inquiries, and criminal and administrative enforcement investigations. Jacob holds a B.S. in Chemistry from the University of Texas at Austin and has worked as an Environmental Chemist for environmental remediation and compliance projects. Prior to joining ELAP, Jacob worked as a Research Technician with Chevron's Fuel Technology and Additives Division in Richmond, CA, performing sample analysis for product identification/integrity using GC and FTIR instrumentation.

Oh, Gene; Weston Solutions

Gene Oh is an environmental scientist with experience in a multitude of water and sediment quality projects. Gene's interests in water data science include database management, statistical testing, and integration of software programs to optimize data analysis and visualization.

Parker, Michael; Central Valley Regional Water Quality Control Board

Michael Parker is an Engineering Geologist with the Cannabis Enforcement Unit at the Central Valley Regional Water Quality Control Board in Redding. He has worked for the Central Valley Water Board for the past three years. Prior to joining the Central Valley Water Board, Michael spent time working for the California Department of Fish and Wildlife and for the US Forest Service. Michael attended California State University, Chico for his bachelor's and Master's in Geology. In the past year Michael has been tasked with assessing post-fire water quality impacts and leading a multiple agency effort to develop and implement post-fire water quality monitoring for the fall 2018 Camp Fire.

Penny, Jim; Greenway Partners

Jim received his B.S. in Genetics from University of California, Berkeley and was a California Institute of Technology Ph.D. Candidate in Molecular Biology. Jim has been an avid ocean dweller, body surfing since age 5, and exploring giant kelp forests in Channel Islands for 30 years. Combining a deep connection with the ocean with a scientific approach to complex problems, he hopes to build a robust data set of physical and chemical conditions required for NorCal's kelp forests to understand the root causes of bull kelp decline and identifying possible restoration strategies at a local, rural level along portions of northern California's coastal regions.

Rodriguez, Emanuel; FlowWest

Emanuel is a data scientist at FlowWest, he combines a background in statistics and data science with computer programming to bring innovative data-driven decision-making tools to water resource management.

Shultz, Daniel; State Water Resources Control Board

Daniel Schultz is an Environmental Program Manager with the State Water Resources Control Board in the Division of Water Rights. He has worked for the Division since 2010 and currently serves as the Program Manager for the Cannabis Section, whose primary task is the development of interim and long-term requirements for the diversion and use of water and discharge of waste for cannabis cultivation. Daniel Schultz earned his B.S. in Forestry and Natural Resources with a concentration in Hydrology from California Polytechnic State University, San Luis Obispo.

Stein, Eric; Southern California Coastal 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, hydromodification, 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. 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.

Stepek, Jan; State Water Resources Control Board

Jan is an Engineering Geologist with the State Water Board's GAMA program. Jan holds a M.S. from the Academy of Mining and Metallurgy in Cracow, Poland. Jan has broad and extensive experience at the Water Boards and in the private sector working on a wide variety of hydrogeologic projects, including numeric modelling of groundwater.

Swenson, Stacey; Moss Landing Marine Laboratories

Stacey Swenson has 30 years of experience in quality assurance (QA) and quality control (QC) of environmental data, getting her start in an EPA Superfund lab, and then later in her career, working at an environmental data consulting firm. She developed both the data verification and validation processes for the Surface Water Ambient Monitoring Program (SWAMP) including the processes used for SWAMP's Bioaccumulation Oversight Group (BOG). She is the project manager for the MPSL-MLML Regional Data Center including the data vocabulary review lead for the state to ensure comparability between data sets in the California Environmental Data Exchange Network (CEDEN).

Turner, Randy; San Francisco Estuary Institute

Randy received his Master's in Environmental Science and Management from the Bren School at the University of California, Santa Barbara in 2010. He has been working on water quality issues in the Klamath River for nearly 10 years and is the Coordinator for the stakeholder-driven Klamath Basin Monitoring Program. Randy is the Principal Investigator for cyanobacteria projects at SFEI and is leading the effort to understand the

status and trends of cyanobacteria and harmful algal blooms in large waterbodies across California.

Villalobos, Amber; California Department of Fish and Wildlife

Amber Villalobos is a Senior Environmental Scientist at the California Department of Fish and Wildlife's (CDFW) Water Branch. At the CDFW, Amber leads a team that ensures fish and wildlife needs are considered in water quality policy, water rights, regulation, and legislation throughout California. Amber's previous work includes, managing and creating FERC hydroelectric project Section 401 water quality certifications and California Environmental Quality Act documents. She also contributed to the CDFW anadromous fish lifecycle monitoring and habitat projects located in the northern coastal counties. Amber earned a B.S. in Geology from Humboldt State University. On her personal time, she enjoys slaying fish with her spear gun, volunteering, and participating in outdoor activities**.**

Wenzel, Alisha; Central Valley Regional Water Quality Control Board

Alisha Wenzel is an Engineering Geologist with the Surface Water Assessment Program (SWAMP) at the Central Valley Regional Water Quality Control Board. Alisha has worked as the regional SWAMP coordinator for the past eleven years, helping to design and implement monitoring studies throughout the Central Valley Region. Prior to joining the Regional Board, Alisha spent five years working as a hydrologist for the US Forest Service. Alisha has bachelor's and master's degrees in Geology from the University of California, Berkeley.

Yarnell, Sarah; University of California, Davis

Dr. Sarah Yarnell is a research hydrologist at the Center for Watershed Sciences at the University of California, Davis. Her primary research interests lie at the intersection between Stream Ecology, Fluvial Geomorphology, and Riverine Hydrology. Her current research focuses on quantification and management of environmental flows in Sierra Nevada watersheds, understanding impacts of altered and natural flow regimes on channel morphology and aquatic species, and integrating hydrologic processes into restoration of mountain meadows. She has also co-taught several courses on river ecosystems through University of California, extension, and for undergraduates and graduates through the University of California, Davis Earth & Planetary Sciences department. Through her research, she is a recognized expert on the ecology of the Foothill yellow-legged frog, and she has worked closely with resource agencies and watershed

stakeholders to provide technical expertise regarding scientific study plans and instream flow management recommendations.

Yu, Walter; Caltrans

Walter Yu is a Senior Transportation Engineer with the Caltrans Stormwater Program and currently uses data analysis and machine learning to improve compliance with the Caltrans NPDES Permit requirements and Statewide Trash Amendments. Walter has over 12 years of experience with Caltrans, including over 6 years with implementing water quality and stormwater compliance programs. He has a B.S. in Civil Engineering from University of California, Berkeley and currently pursuing a M.A. in Software Engineering from the Harvard Extension School.

Zimmerman, Julie; The Nature Conservancy

Dr. Julie Zimmerman is Lead Scientist for Freshwater for TNC California and is located in the Sacramento office. Julie's focus is to develop collaborative, science-based approaches to water management and river restoration in California. Before joining TNC in California, Julie worked on salmon restoration with the US Fish and Wildlife Service in Sacramento and environmental flows with The Nature Conservancy's Connecticut River Program and Chesapeake Bay Program. Julie received her B.A. in Environmental Studies from University of California, Santa Barbara, her M.S. in Ecology from Colorado State University, and her Ph.D. in Fisheries from University of Minnesota.