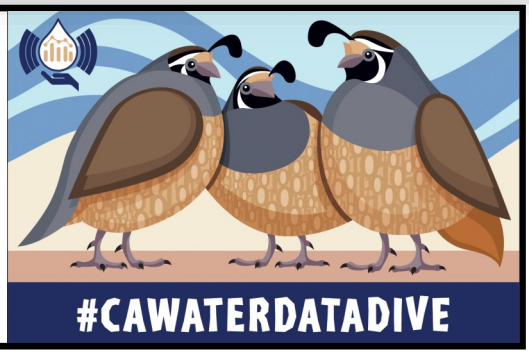
CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

California Water Boards 5th Annual Water Data Science Symposium

Partnering with Communities for Better Water Outcomes

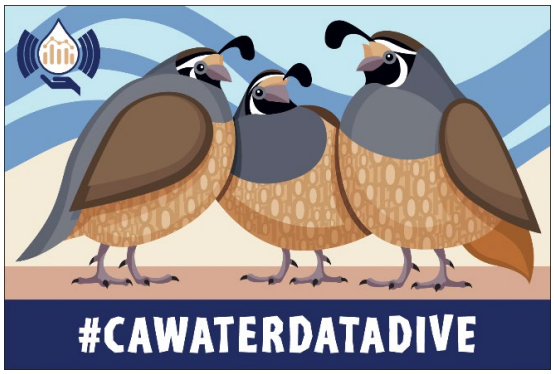


California Water Boards

5th Annual California Water Data Science Symposium

Partnering with Communities for Better Water Outcomes

Symposium Program



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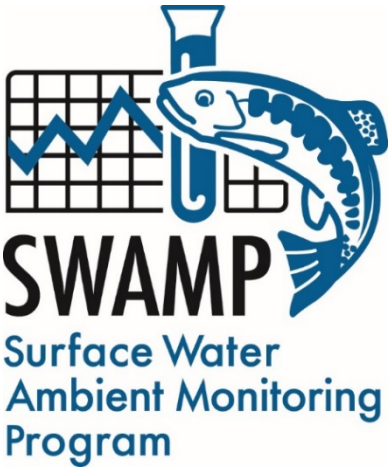


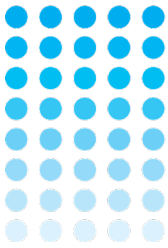
Community Advisory Committee

The Water Data Science Symposium Planning Committee would like to acknowledge and thank the members of the Community Advisory Committee for their dedication and hard work to improve the inclusion of diverse voices into the 2020 Water Data Science Symposium. While the Science Symposium Planning Committee is dedicated to increasing diversity at all levels of the Science Symposium so that this event reflects the diversity of California, we needed help to make this commitment more real. The members of the Community Advisory Committee provided invaluable feedback and helped the Planning Committee incorporate more diverse voices and perspectives throughout the Symposium planning process.

Members of the Community Advisory Committee include:

Co-Chairs	Members
Helen Fitanides, The Watershed Project	Eric Bason, Shoreline EJ
LaDonna Williams, All Positives Possible	Dimitra Long, C'Witzan Circles

ALL POSITIVES POSSIBLE
Restoring Lives Restoring Communities



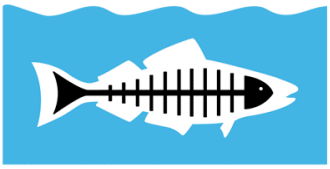
the watershed project

Shoreline EJ

Presenter Acknowledgements

ALL POSITIVES POSSIBLE
Restoring Lives Restoring Communities

Internet of Water



Heal the Bay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California Water Boards
5th Annual California Water Data Science Symposium
Partnering with Communities for Better Water Outcomes
Day 1 - Monday, June 29, 2020

Virtual Attendance via: https://video.calepa.ca.gov/
Continue the conversation on Slack

Plenary Session

Time	Topic
8:30 - 9:00	Sign-on and check-in
9:00 - 9:05	Symposium logistics *Greg Gearheart* *State Water Resources Control Board*
9:05 - 9:30	Welcome *E. Joaquin Esquivel* *State Water Resources Control Board*
9:30 - 10:00	*Keynote Address* Out of thin air: the path forward to a safe, resilient, reliable, renewable source of water, food, and energy for today *Moses West* *AWG Contracting*
10:00 - 10:05	**Break**
10:05 - 10:50	Keynote Panel Discussion: EJ Communities 411 💧 911 *Eric Bason[1], Dimitra Long Bundy[2], LaDonna Williams[3]* *(1) Shoreline EJ, (2) C'Witzan Circles, (3) All Positives Possible*

Session 1: Selected Community Perspectives

Time	Topic
10:50 - 11:15	Demystifying water data for diverse communities *Nataly Escobedo Garcia* *Leadership Counsel for Justice and Accountability*
11:15 - 11:40	Eastern Coachella Valley: a model of community engagement, partnership and collaboration

	Yaneth Andrade *Pueblo Unido CDC*
11:40 - 12:00	SB 200: finding strategies for funding allocation, planning and implementation *Lesly Figueroa* *Leadership Counsel for Justice and Accountability*
12:00 - 12:30	**Lunch**

Session 2: Putting Water Data to Work

Time	Topic
12:30 - 12:55	Automated Consumer Confidence Reports for streamlined water quality data *Rich Pauloo* *University of California, Davis*
12:55 - 1:20	California Division of Drinking Water: emergency response tools *Wes Stieringer, Misha Anderson* *State Water Resources Control Board*
1:20 - 1:45	Heal the Bay's NowCast Program: predicting water quality using government generated data *Lucy Rieves* *Heal the Bay*
1:45 - 1:52	Heal the Bay's Watershed Report Card *Annelisa Moe, Katherine Pease, Amanda Wagner* *Heal the Bay*
1:52 - 2:07	**Break**

Session 3: What's the Deal with Water Quality?

Time	Topic
2:07 - 2:32	An exploration of non-detection result treatments in groundwater quality summary statistics *Emily Houlihan* *State Water Resources Control Board*
2:32 - 2:57	Sacramento-San Joaquin Bay-Delta water quality constituent tracker and decision support

	Amye Osti[1], Jon Burau[2], Sarah Lesmeister[3], Nathan Hemenway[1], Dave Osti[1], Darcy Austin[4] *(1) 34 North, (2) United States Geological Survey, (3) California Department of Water Resources, (4) State Water Contractors*
2:57 - 3:22	Statewide monitoring of pesticide residues in wastewater treatment: implications for California surface waters *Jason Carter, Robert Budd, Jennifer Teerlink* *California Department of Pesticide Regulation*
3:22 - 3:37	**Break**
3:37 - 4:02	A comprehensive water quality assessment framework that unifies data with physical, statistical, and causal modeling *Dan Wang, Nan Singhasemanon, Jennifer Teerlink, Kean Goh* *California Department of Pesticide Regulation*
4:02 - 4:10	Extending the bounds: the water quality value stream from raindrop to faucet *Chuck Louisell, Bob Bowcock* *True Elements LLC*
4:10 - 4:15	Daily wrap-up and adjourn *Nick Martorano* *California Water Quality Monitoring Council*

California Water Boards
5th Annual California Water Data Science Symposium
Partnering with Communities for Better Water Outcomes
Day 2 -Tuesday, June 30, 2020

Virtual Attendance via: https://video.calepa.ca.gov/
Continue the conversation on Slack

Plenary Session

Time	Topic
8:30 - 9:00	Sign-on and check-in
9:00 - 9:05	Welcome and logistics *Nick Martorano* *California Water Quality Monitoring Council*
9:05 - 9:20	2020 Water Data Challenge *Water Data Challenge Organizing Team*

Session 1: Data Driven Communities

Time	Topic
9:20 - 9:45	Urban Drool Tool: integrating water usage data with watershed data to engage the community in using water wisely *Laura Rocha[1], Amanda Aprahamian[2], Aaron Poresky[3], Drew Atwater[1]* *(1) Moulton Niguel Water District, (2) County of Orange, (3) Geosyntec Consultants*
9:45 - 10:10	Exploring the Contra Costa County Water Quality Dashboard *Helen Fitanides[1], Sadie Gill[2]* *(1) The Watershed Project (2) Intelligent Ecosystems Institute and FlowWest*
10:10 - 10:35	RiverDB: a cloud-based water quality collaborative *Karl Ronning[1], Thomas Spellman[2]* *(1) South Yuba River Citizens League, (2) RiverDB.org*
10:35 - 10:50	**Break**

10:50 - 11:15	Climate change impacts on a Sierra Nevada foothill watershed: two decades of citizen-science data demonstrate climate-driven shifts in perennial stream water quality *Jeffrey Lauder, Weston Slaughter, Chloe Tremper, Justin Wood, Dorothy Punderson, Joanne Hild* *Sierra Streams Institute*
11:15 - 11:40	Disadvantaged Community Involvement Program: an overview *Joel Osuna, Boykin Witherspoon* *Water Resources and Policy Initiatives*

Session 2: Open Data

Time	Topic
11:40 - 12:05	Communicating data in the San Francisco Estuary *Jenna Rinde* *California Department of Water Resources*
12:05 - 12:35	**Lunch**
12:35 - 1:00	Making statewide groundwater geochemistry available to the public *Carolyn Cantwell* *State Water Resources Control Board*
1:00 - 1:25	Improving water data accessibility and usability through an integrated data repository and visualization portal *Jeffrey (Chuck) Hansen* *United States Geological Survey*
1:25 - 1:32	Implementing the Open and Transparent Water Data Act *Christina McCready on behalf of the AB 1755 Partner Agency Team* *California Department of Water Resources*

Session 3: Lightning Talk Launch

Time	Topic
1:32 - 1:39	Investigating the potential to use sewershed surveillance to inform COVID-19 epidemiology *Claire Waggoner* *State Water Resources Control Board*

1:39 - 1:46	Comparing effects of historical changes in precipitation and landscape imperviousness on urban catchment-scale flooding: implications of drainage design in response to changing conditions *Jiada Li, Steven Burian, Zachary Bortolot* *University of Utah*
1:46 - 1:53	A playbook to promote statewide trash monitoring methods and comparable data *Shelly Moore[1,2], Tony Hale[1]* *(1) San Francisco Estuary Institute, (2) Southern California Coastal Water Research Project*
1:53 - 2:00	Lightning Talk Launch: Q & A
2:00 - 2:15	**Break**

Session 4: Got Algae?

Time	Topic
2:15 - 2:22	The good, the bad, the algae: drone imagery of macroalgae and macrophytes over the Klamath *Chippie Kislik[1], Laurel Genzoli[2], Maggi Kelly[1,3]* *(1) University of California, Berkeley, (2) University of Montana, (3) University of California Agriculture and Natural Resources*
2:22 - 2:29	Interstate Technology and Regulatory Council Harmful Cyanobacterial Bloom (HCB) Team: current status and forthcoming information and tools for HCB monitoring, prevention, management, communication, and response *Beckye Stanton[1], Brian Reese[2], Angela Shambaugh[3], Ben Holcomb[4], Cherri Baysinger[5]* *(1) California Office of Environmental Health Hazard Assessment, (2) Idaho Department of Environmental Quality, (3) Vermont Department of Environmental Conservation, (4) Utah Department of Environmental Quality, (5) Interstate Technology and Regulatory Council*
2:29 - 2:36	Engagement with State and Non-State Stakeholders to Address Gaps in State Monitoring for Harmful Algal Blooms *Ashley R. Ward* *Internet of Water, Duke University*
2:36 - 2:41	Got Algae? Lightning Talks: Q & A

Session 5: Mercury: More Than a Planet

Time	Topic
2:41 - 2:48	Mercury from space! The use of high-resolution in-situ and remote sensing to model mercury in surface water of the San Francisco Bay-Delta *Mark Marvin-DiPasquale[1], Jacob Fleck[1], Erin Hestir[2], Brian Bergamaschi[1], Charles Alpers[1], Lisamarie Windham-Myers[1]* *(1) United States Geological Survey, (2) University of California, Merced*
2:48 - 2:55	High-resolution temporal modeling of mercury flux associated with the South San Francisco Bay Salt Ponds Restoration *Maureen Downing-Kunz, Mark Marvin-DiPasquale* *United States Geological Survey*
2:55 - 3:02	Water quality downstream from the second largest mercury mine in North America: New Idria, California *Rachel A. Hohn[1], Cindy De Jesus Bartolo[1], Kyle H. Ikeda[1], Philippe J. Leguellec[2], Byran C. Fuhrmann[3], Danielle L. Bram[1], Scott C. Hauswirth[1], Marc W. Beutel[3], Priya M. Ganguli[1]* *(1) California State University, Northridge, (2) Granada Hills Charter High School, (3) University of California, Merced*
3:02 - 3:09	Mercury speciation in Castaic Lake State Recreation Area, California *Greg Jesmok[1], Kyle H. Ikeda[1], Byran Fuhrmann[2], Scott C. Hauswirth[1], Marc W. Beutel[2], Priya M. Ganguli[1]* *(1) California State University, Northridge, (2) University of California, Merced*
3:09 - 3:14	Mercury: More Than a Planet Lightning Talks: Q & A

Session 6: Fire & Water

Time	Topic
3:14 - 3:21	Long-term toxicity impacts to water quality resulting from wildfires in the Malibu Creek watershed *Christian L. Hoover, Michael F. Kushner, Kyle H. Ikeda, Erin E. Schmitt, Kenny Orihuela, Danielle L. Bram, Priya M. Ganguli, Scott C. Hauswirth* *California State University, Northridge*
3:21 - 3:28	Turning up the heat: effects of wildfire and climate warming on water quality of a hypereutrophic California lake

	Angela De Palma-Dow[1], Ian M. McCullough[2], Jennifer Brentrup[3] *(1) Lake County Water Resources Department, (2) Michigan State University, (3) University of Vermont*
3:28 - 3:34	Fire & Water Lightning Talks: Q & A
3:34 - 3:45	Symposium wrap-up and adjourn *Greg Gearheart[1], Nick Martorano[2]* *(1) State Water Resources Control Board, (2) California Water Quality Monitoring Council*

Welcome and 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.

Moses West, Founder, AWG Contracting & Water Rescue Foundation

Moses West is the Founder and Owner of AWG Contracting. Mr. West combines a very unique background as a prior member of the United States Armed Forces where he is an esteemed member of the 75th Ranger Regiment, the Second Armored Division, the Second Infantry Division, the Seventh Cavalry Regiment and the 101st Airborne Division. The experiences of military deployments provided Mr. West with a unique appreciation for the value of water and his advanced technical skills, thus propelling him into his lifelong mission of producing the leading edge of the most advanced technology to produce water from air. AWG Contracting under the guidance of Mr. West, has successfully completed deployments of large AWG Units to Puerto Rico, and recently to Flint Michigan providing an extremely pure and unlimited source of free water to the residents all on donations. The mission to Puerto Rico was the first time that any technology such as this has ever been powered by solar energy. Mr. West is currently developing new methods of implementation of his technology to include social responsibility and ownership of local water, food and energy production based around the science of centralized "point specific" water production from the atmosphere.

Monday, June 29

Keynote Panel Discussion: EJ Communities 411 💧 911

Environmental justice (EJ) communities, especially those located in low income areas and along our shorelines, who are Black, face racism and discrimination resulting in levels of heath, environmental, and economical inequities and disparities that are above all other populations combined. These inequities more often than not result in the lack of necessary data and reports that benefit EJ communities and many times exclude input from those directly affected and the vital issues they face. This necessary data remains largely invisible in the data, processes and decisions that affect their quality of life.

Panelists:

Eric Bason, Shoreline EJ

Dimitra Long Bundy, C'Witzan Circles

LaDonna Williams, All Positives Possible

<u>Session 1: Selected Community Perspectives</u>

DEMYSTIFYING WATER DATA FOR DIVERSE COMMUNITIES, **Nataly Escobedo Garcia**

Experiences and insights into the process of demystifying water data for the diverse communities in the Eastern Coachella Valley and San Joaquin Valley, including developing educational materials targeted to different populations and water quality issues.

EASTERN COACHELLA VALLEY: A MODEL OF COMMUNITY ENGAGEMENT, PARTNERSHIP AND COLLABORATION, **Yaneth Andrade**

Using a Community-Driven approach, Pueblo Unido CDC has found a new way to engage community leaders and created collaborative efforts with other non-profit organizations, public institutions and elected officials to attract resources for critical infrastructure in the Eastern Coachella Valley.

SB 200: FINDING STRATEGIES FOR FUNDING ALLOCATION, PLANNING AND IMPLEMENTATION, **Lesly Figueroa**

Water contamination has been plaguing rural communities for over two decades. Understanding of community dynamics, water data and new emerging technologies has enable establishing funding opportunities for interim solutions and consolidation approaches to remediate water contamination.

Session 2: Putting Water Data to Work

AUTOMATED CONSUMER CONFIDENCE REPORTS FOR STREAMLINED WATER QUALITY DATA, **Rich Pauloo**

Present sources of water quality information for public water systems in California (i.e. - consumer confidence reports, or CCRs) are fragmented across thousands of water utilities in the state, lack consistency and clarity, and tend to communicate data via hard-to-understand tables. Near-real-time, standardized, and easy to understand water quality reports would improve the public's understanding of the water they buy and consume. Automated water quality report creation could serve as a starting point (rough draft) for CCRs written by water agencies or offer a backstop for agencies with minimal resources to dedicate to a CCRs, or that presently file handwritten CCRs.

calwaterquality.com aggregates publicly available water quality data for ~ 3,000 California community water systems to report: compliance status, chemicals detected within the past 2 years, average detection levels for all contaminants tested for, water quality indicators, and local water and health system contact information. Future efforts will secure real-time water quality reports by: (1) automating the reporting system, (2) visualizing more samples statistics in addition to the mean 2-year detected level, and (3) expanding information to include historical trends in water quality and compliance.

CALIFORNIA DIVISION OF DRINKING WATER: EMERGENCY RESPONSE TOOLS, **Wes Stieringer**

The Division of Drinking Water's GIS workgroup has created several map tools that incorporate water system facilities and service areas and data from other agencies (e.g. earthquakes, floods, fire, planned power outages) to create the Emergency Response Tool and Public Safety Power Shutoff (PSPS) Tool. By having these tools available to our staff, they are able to respond to events that affect infrastructure, assisting water systems and other agencies with facility inventories at risk, helping to maintain safe water delivery to the public.

HEAL THE BAY'S NOWCAST PROGRAM: PREDICTING WATER QUALITY USING GOVERNMENT GENERATED DATA, **Lucy Rieves**

Heal the Bay has been aggregating and processing agency collected beach water quality data into the Beach Report Card for over 30 years. The Beach Report Card provides easy-to-understand water quality information free to the public, so people have an overview of where and when it is safe to get in water. The Beach Report Card has helped identify chronically dirty beaches, identify water quality trends, and helped influence water quality policies. More recently, our NowCast program has utilized this aggregated data to make daily water quality predictions at California beaches allowing Heal the Bay to fill in the information gaps left by

traditional weekly monitoring. Sampling protocol requires at least 24 hours between procurement and analysis, and varying sampling agencies and schedules can create data gaps on local public health platforms. This presentation will focus on how we use government-collected data to improve the resolution and clarity of the water quality information available for public use. It will also discuss the challenges in messaging, awareness, and user comprehension that must be overcome as well as technical barriers.

HEAL THE BAY'S WATERSHED REPORT CARD, **Annelisa Moe**

Stormwater and dry weather runoff flow through our streets, into our waterways, and out to the ocean, picking up pollutants along the way that pose serious risks to public and environmental health. As cities attempt to ramp up stormwater capture efforts throughout California to meet both water quality and water supply needs, it is essential to engage communities early and often, so the best projects move forward, are implemented quickly, and last. Heal the Bay's Watershed Report Card aims to make regulatory information more accessible to communities by conveying water quality monitoring data in an engaging and user-friendly way to explain why immediate action is necessary.

Through the Municipal Separate Storm Sewer System Permit program, permittees are required to monitor numerous constituents. This information is available to the public, but is not truly accessible without significant time, resources, and technical training to understand what the data mean. This pilot project used regulatory data and index methodology to assign intuitive A through F grades to water monitoring locations in the Los Angeles River Watershed. This project provides accessible stream health information to permittees, regulators, and all stakeholder including members of the public.

<u>Session 3: What's the Deal with Water Quality?</u>

AN EXPLORATION OF NON-DETECTION RESULT TREATMENTS IN GROUNDWATER QUALITY SUMMARY STATISTICS, **Emily Houlihan**

Over two thirds of the individual groundwater analyses currently hosted on the GAMA Groundwater Information System are "non-detection" results, or results that are less than a reporting limit (left-censored data). Although these results do not usually indicate water quality concerns, they are challenging to communicate accurately and incorporate into summary statistics because the true value of the result is unknown. Options for dealing with these left-censored results include simple substitution of zero or some fraction of the reporting limit, or analysis by a different method such as a median or rank based tests. Additionally, there are water quality constituents for which the reporting limit is higher than the maximum contaminant level (MCL) such as 1,2,3-Trichloropropane (TCP), which are especially challenging to incorporate into meaningful results. This presentation will explore the impact of different

treatment of left-censored data on groundwater quality summary statistics using real examples and explore methods of communicating left-censored data accurately in datasets and final analyses.

SACRAMENTO-SAN JOAQUIN BAY-DELTA WATER QUALITY CONSTITUENT TRACKER AND DECISION SUPPORT, **Amye Osti**

The constituent tracker provides a web-based tool for generating constituent fields as a data visualization from time series data at 50 fixed sites throughout the Delta. The basic concept behind the constituent tracker will work for any constituent including: temperature, conductivity, turbidity, Chl-a, DO. At some limited number of sites, FDOM and a suite of nutrients are also measured (nutrients are mostly measured in the north Delta up to the confluence).

Using the advection algorithm developed by USGS, the Constituent Tracker linearly interpolates constituent values to a constant point in tide using the velocity at each site to estimate the constituent fields between stations. The constituent tracker will allow us to: identify and track in space the source of any measured constituent; to track turbidity throughout the system including the evolution of the turbidity bridge between confluence and the facilities, the turbidity field near the regulatory stations (Prisoner's Point, Holland Cut and Victoria Canal) and near the facilities themselves. The tools proposes to replace DWR's weekly turbidity transects that likely provide spurious tidally aliased data; help to identify localized events: such as wind-wave generated turbidity in Franks Tract and its influence on the turbidity triggers and exports; leverage existing nutrient and water velocity time series to estimate their spatial distributions (where data are available) and assess biological rates important in phytoplankton blooms and monitor the spatial distribution of the salt field which is especially important during droughts when DCIU can govern south delta distributions and when barriers are installed.

STATEWIDE MONITORING OF PESTICIDE RESIDUES IN WASTEWATER TREATMENT: IMPLICATIONS FOR CALIFORNIA SURFACE WATERS, **Jason Carter**

The California Department of Pesticide Regulation (CDPR) initiated a statewide monitoring program in 2019 to evaluate pesticide concentrations in wastewater. Twenty-five participating wastewater treatment plants (WWTPs) collected 24-hour composite influent and pre-sterilization effluent samples, which were subsequently analyzed for 23 pesticides and pesticide degradates. Pyrethroids, imidacloprid, fipronil and fipronil degradates were frequently detected in all influent samples. Regional variations were observed in influent concentrations, with several pesticides detected at higher frequencies and concentrations in Southern California samples. We compared pesticides between individual WWTP's influent and effluent samples to evaluate if residues were reduced or transformed during treatment. In general, pyrethroid concentrations were greatly diminished during the treatment process. Fipronil was somewhat reduced by treatment, however, there was a corresponding increase in fipronil degradate

concentrations. In addition to our sampling at WWTPs, collecting subsewershed samples that correspond to suspected intensive pesticide sources of down-the-drain pesticide discharge will enable CDPR to pair pesticides of concern with their potential entry routes into the waste stream. This study will inform CDPR's understanding of pesticide residue sources contributing to wastewater, their reduction/modification during treatment at WWTPs, residue concentrations in effluent, and the potential impact of those residues to sensitive aquatic organisms in California surface waters.

A COMPREHENSIVE WATER QUALITY ASSESSMENT FRAMEWORK THAT UNIFIES DATA WITH PHYSICAL, STATISTICAL, AND CAUSAL MODELING, **Dan Wang**

The assessment of water quality using surface water monitoring data alone is a challenging task, particularly given that the data have highly intermittent and irregular sampling frequency in both temporal and spatial scales. To overcome this challenge, we have explored a new assessment framework that compensates for the shortcomings of surface water monitoring data with other data collected at more refined and regular temporal and spatial scales. Those data sources provide information on large number of possible factors that can affect the fate and transport of pollutants in the environment, including watershed characteristics (land use, topographic, soil property, etc.), climate, demographics, and management practices. The new framework uses those data along with surface water monitoring data to unify physical, statistical and causal modeling by informing each other in the modeling processes and guides the generation of new data through additional field studies and monitoring efforts. As a result, the assessment is more comprehensive and robust to the study area, and the knowledge gained could be applicable to other areas or periods of time.

EXTENDING THE BOUNDS: THE WATER QUALITY VALUE STREAM FROM RAINDROP TO FAUCET, **Chuck Louisell**

Leading edge water quality researchers have viewed water quality as a system-of-systems interaction, but in-practice, methodologies are often conducted within defined boundaries such as a watershed, a municipality, or a water treatment plant. Breaking through this barrier is the catalyst for advancement. Cross-boundary visibility reveals impacts of one action at one point on many actions at many points. This one-to-many view identifies a value-stream in which each downstream stakeholder has a value proposition to meet - habitat & wildlife management, recreational use, food production, and/or human consumption. This presentation introduces the pedigree methodology based on publicly available & privately shared data that considers the lifecycle of water - precipitation, seasonality, land use, flow systems, and natural & man-made chemical influences.

To get started, follow raindrops or snowmelt to streams, lakes, aquifers, and rivers. At each point of use, a new value-stream node is created that may return water to the flow, move it to groundwater, or export it to another system. This concept leads to the idea of a water pedigree

similar to those used in pharmaceutical supply chains that record chains of custody and process exposure from raw material sourcing to the shelf, and for some, to the consumer.

Tuesday, June 30

Session 1: Data Driven Communities

URBAN DROOL TOOL: INTEGRATING WATER USAGE DATA WITH WATERSHED DATA TO ENGAGE THE COMMUNITY IN USING WATER WISELY, **Laura Rocha**

The Urban Drool Tool is an open-source web application built through a collaborative effort between MNWD and the County of Orange. The tool combines water consumption data, account information, and watershed data to match household water use with each neighborhood's urban runoff. The goal of the tool is to motivate water use efficiency by helping users understand the watershed and recreational benefits of staying within their water budgets. This tool is helping identify areas that would benefit most from water efficiency programs.

Through a suite of automated data connections and Python scripts, the tool builds and maintains a current and historic database of water usage metrics at the neighborhood scale. From this database, the tool displays current water usage patterns and historic trends, including metrics that approximate "urban drool" (dry weather runoff) and summarize participation in incentive programs. The tool also builds on watershed data compiled by the County of Orange, to help the user learn about where their runoff flows and what watershed or recreational resources it affects. Finally, the tool provides case studies and news bulletins to help users learn about opportunities to reduce urban drool while saving on their water bill.

EXPLORING THE CONTRA COSTA COUNTY WATER QUALITY DASHBOARD, **Helen Fitanides**

Long-term, standardized water quality monitoring is key to determining the health of watersheds and communities. The Watershed Project's Urban Creeks Water Quality Monitoring Project provides training and employment for local residents and students, empowering citizen scientists as they collect uniform water quality data in Contra Costa County creeks. In 2019 they worked with Intelligent Ecosystems Institute to build the Contra Costa County Water Quality Dashboard, which allows community members to learn about water quality and explore data collected in the county. This tool incorporates data collected by The Watershed Project, along with data pulled from the California Environmental Data Exchange Network. Additional sites will be added to the application as this program grows, and TWP staff has been trained to update the application with new data as it becomes available. This visualization platform is provided for free to the public, with the goal of educating the community about water quality issues and how we can work to reduce them. By creating a shared dataset of this kind, we can

learn important information about local trends, with the goal of improving water quality for communities. Additionally, the community will be empowered to make changes to improve water quality in their watersheds.

RIVERDB: A CLOUD-BASED WATER QUALITY COLLABORATIVE, **Karl Ronning**

Currently, there are limited options for non-profit water quality monitoring programs for a database to fit their needs. Off-the-shelf options are expensive and not easily tailored for non-profits striving for data transparency and accessibility. Most non-profits do not have the expertise to create a database to enter, store, export and chart data without compromising data quality. RiverDB hopes to fill that need by giving users a customized data entry form to their specific dataset, perform quality control checks, the ability to contribute instantaneous and continuous data, and to provide auto-generated charts and tables for data analysis. RiverDB runs on the cloud and allows partner organizations a unique opportunity to share and compare their data.

One of the primary benefits of RiverDB, is the "publishing portal", linking data to its free, user-friendly website. Once online, any user can sort, query, graph and download any data set of their choosing. We believe all data collected by hard-working citizen scientists should be open and accessible to all. Our vision is to create a nation-wide model for other organizations to adopt allowing an inexpensive, easy, and user-friendly option to contribute data to a standardized, larger data set with easy comparison and analysis between watersheds.

CLIMATE CHANGE IMPACTS ON A SIERRA NEVADA FOOTHILL WATERSHED: TWO DECADES OF CITIZEN-SCIENCE DATA DEMONSTRATE CLIMATE-DRIVEN SHIFTS IN PERENNIAL STREAM WATER QUALITY, **Jeffrey Lauder**

Detecting climate change-induced impacts on water quality is an important step in developing watershed-scale stream climate change resilience strategies including restoration and management objectives. However, such an analysis is difficult, and dependent on datasets that cover large spatial scales at high resolution over sufficiently long time periods to detect both climatic signals and the potential range of natural background variation. Use of extreme climatic events can serve as "natural experiments" to provide upper and lower bounds for parsing climatic signals from this background variation. Here we leverage 21 years of monthly citizen-science water quality monitoring data in a Northern Sierra Nevada foothill watershed to ask how climate stress, local-scale stress, and their interactions influence stream water quality. This dataset includes both the wettest (2011, 2017, 2018) and hottest and driest (2012-2016) periods on record for the region, providing a unique opportunity to assess whole-watershed resilience to extreme events and whether climate change signals can be parsed from background variation. Such an analysis paves the way for identification of management objectives that incorporate both small-scale water quality and long-term climate change resilience.

DISADVANTAGED COMMUNITY INVOLVEMENT PROGRAM: AN OVERVIEW, **Joel Osuna**

Water resource and disadvantaged community (DAC) issues have become increasingly important in the current environmental and legislative climate. As a result, the Water Resources and Policy Initiatives (WRPI) group is collaborating with various California State University (CSU) campuses and other parties to address these topics under the Disadvantaged Community Involvement Program (DACIP). Critical project outcomes include regional water resilience, improved water quality and quantity in communities most in need, and effective stakeholder engagement in water resources management. This presentation will focus on the main objectives of this project and current work efforts. This will include the use of data, modeling, and modern data systems and infrastructure to help identify and inform communities, service providers, and other stakeholders as well as produce data-driven solutions.

Session 2: Open Data

COMMUNICATING DATA IN THE SAN FRANCISCO ESTUARY, **Jenna Rinde**

Since 1975, the Environmental Monitoring Program (EMP) has collected water quality, nutrients, phytoplankton, benthic invertebrates and zooplankton within the San Francisco Estuary (SFE). The EMP is comprised of California Department of Water Resources, California Department of Fish and Wildlife and the United States Bureau of Reclamation. Water Right Decision 1641 mandates the EMP to monitor potential impacts from the State Water Project and Central Valley Project within the SFE and make data publicly accessible. This presentation will provide an overview of how the EMP utilizes innovative technology, ensures data accessibility and communicates to broader audiences. Recently, the EMP acquired a state-of-the-art research vessel, Sentinel and upgraded to the latest water quality instrumentation. The environmental data and metadata are accessible through various data repositories and portals. Lastly, the presentation will go over how the EMP communicates to broader audiences through a web application and other approaches.

MAKING STATEWIDE GROUNDWATER GEOCHEMISTRY AVAILABLE TO THE PUBLIC, **Carolyn Cantwell**

Knowledge of the geochemical characteristics of groundwater is necessary to analyze important aspects of California's groundwater resource. Geochemical profiles of groundwater are required to understand potential impacts associated with groundwater recharge operations, sources of groundwater in a basin, potential impacts associated with oil and gas operations, and other academic and regulatory issues. The GAMA Groundwater Information System includes groundwater quality data that is sufficient to characterize the geochemical profiles of thousands of groundwater samples throughout California. However, developing reliable geochemical profiles for a groundwater sample presents quality assurance issues and data

manipulation requirements that are distinct from those typically involved with evaluating individual chemicals. This talk will highlight some ways we can present and analyze our data to bring the benefits of geochemical characterization to stakeholders across all sectors.

IMPROVING WATER DATA ACCESSIBILITY AND USABILITY THROUGH AN INTEGRATED DATA REPOSITORY AND VISUALIZATION PORTAL, **Jeffrey (Chuck) Hansen**

Timely access to water quality and habitat condition data – especially recent and real-time data – is vital to support responsive management and to facilitate a greater understanding of dynamics in aquatic habitats of the Sacramento-San Joaquin Delta. Web-based access to real-time and historical data can provide the ability to respond more quickly and in innovative ways to changing conditions in the Bay-Delta ecosystem as well as provide the foundation for interpretation of changing conditions over time. We are attempting to integrate USGS data with other publicly available data into a single repository where they can be analyzed and visualized together using an on-line visualization portal, enhancing the value and utility of all these data. Scientists, managers, and the public will be able to explore hypotheses and test ideas directly in the portal and download the relevant data with the click of a button. Interactive maps and animated time-series visualizations bring data to life and illustrate how the system interconnects in many complex and exciting ways. Along with partners and local stakeholders, we hope to improve access to a broad range of data types useful for monitoring aquatic habitat conditions and evaluating biogeochemical processes in the Delta.

IMPLEMENTING THE OPEN AND TRANSPARENT WATER DATA ACT, **Christina McCready on behalf of the AB 1755 Partner Agency Team**

The Open and Transparent Water Data Act (AB 1755, Dodd) requires the Department of Water Resources, in consultation with the California Water Quality Monitoring Council, the State Water Resources Control Board, and the California Department of Fish and Wildlife, to create, operate, and maintain a statewide integrated water data platform; and to develop protocols for data sharing, documentation, quality control, public access, and promotion of open-source platforms and decision support tools related to water data.

A team of partner agencies (listed below) is collaborating with and learning from others – including State and federal agencies, data experts, data providers, and data consumers – to chart a successful path forward.

AB 1755 Partner Agencies:

- State Water Resources Control Board
- California Water Quality Monitoring Council
- California Department of Fish and Wildlife
- Department of Water Resources

- Governor's Office of Planning and Research
- California Government Operations Agency
- California Natural Resources Agency
- Delta Stewardship Council

Session 3: Lightning Talk Launch

INVESTIGATING THE POTENTIAL TO USE SEWERSHED SURVEILLANCE TO INFORM COVID-19 EPIDEMIOLOGY, **Claire Waggoner**

Researchers around the world are investigating the potential to use sewershed surveillance to inform COVID-19 epidemiology. Sewershed monitoring, including for pathogens such as SARS-CoV-2 that causes COVID-19, is a promising tool that could be developed with additional research and implemented with other data (e.g., clinical data) in the future to assess community infection, trends or changes in infection, risk exposure, and viral evolution. The State Water Board has ongoing research with the Water Research Foundation and researchers at Stanford University and University of Michigan to contribute to this global body of science with the goal of being able to link the concentration SARS-CoV-2 in wastewater to COVID-19 prevalence in communities. This lightning talk will provide a snapshot of sewershed surveillance and highlight research needs that could further develop sewershed surveillance as a tool to improve our ability to respond to the current COVID-19 pandemic, and future outbreaks.

COMPARING EFFECTS OF HISTORICAL CHANGES IN PRECIPITATION AND LANDSCAPE IMPERVIOUSNESS ON URBAN CATCHMENT-SCALE FLOODING: IMPLICATIONS OF DRAINAGE DESIGN IN RESPONSE TO CHANGING CONDITIONS, **Jiada Li**

Cities planning future stormwater drainage systems must consider several uncertainties, including climate change, degrading infrastructure, and changes in urban landscape characteristics. Designers are accounting for aging infrastructure and changes in precipitation patterns in stormwater planning and design. However, considering the timing and pattern of urban redevelopments, such as densification and infill, remains an area of uncertainty. The goal of this paper is to advance the consideration of future urban redevelopment in stormwater drainage planning and design by quantitatively comparing the climatic and urbanized influences on historical flooding statistics (flooding volume, peak flooding rate, and flooding duration). The study case is selected in the Sugar House drainage catchment in Salt Lake City, Utah, which is used to assess the flooding sensitivity and severity forced by precipitation and imperviousness changes. A machine-learning-based Geography Data Mining Analyst presents that the imperviousness percentage changes in the study case accelerated from 1971 to 1985 by over 20%, but it decelerated by 1.77% from 2001 to 2015. Two 15-year rainfall-runoff simulations find that flooding volume is more sensitive to precipitation changes than imperviousness changes. This continuous simulation also signifies that precipitation changes posse more

impacts on flooding magnitude and duration than imperviousness changes. Comparing the effects of varying precipitation and imperviousness percentage on flooding severity uncovers the importance of adapting urban drainage systems to changing climate and urbanization. Such a quantitative comparison provides implications for designing and maintaining a sustainable urban drainage system.

A PLAYBOOK TO PROMOTE STATEWIDE TRASH MONITORING METHODS AND COMPARABLE DATA, **Shelly Moore**

Currently, municipal and county trash monitoring programs across the state employ a variety of trash monitoring methods. In most cases, the data yielded by the various trash monitoring programs do not translate well across methods to address concerns of broad geographic and longitudinal significance. Furthermore, contributions from community-based scientists cannot be effectively analyzed alongside those from neighboring programs. This leaves key questions unanswered: Where are the state's most critical hot spots for trash? How is the state doing in addressing its trash reduction goals? Answering these questions with confidence requires coordination and data exchange at a scale currently infeasible.

Several years ago, the Ocean Protection Council funded the Southern California Coastal Water Research Project and the San Francisco Estuary Institute to develop a ""Playbook"" of trash monitoring methods in an effort to address these deficiencies. The Playbook does not strictly prescribe methods, but rather relates trash monitoring methods to management questions with a clear sense of associated certainty, repeatability, practicality, and cost. It also shares data exchange methods, vetted with the benefit of the newly formed Trash Monitoring Workgroup, to promote greater data interoperability and usability. Furthermore, the team also explored innovations in trash monitoring using drones and computer vision.

<u>Session 4: Got Algae?</u>

THE GOOD, THE BAD, THE ALGAE: DRONE IMAGERY OF MACROALGAE AND MACROPHYTES OVER THE KLAMATH, **Chippie Kislik**

Imagery from unmanned aerial vehicles (UAVs) has been used to map submerged primary producers in shallow lakes and streams. However, there is little research on the effectiveness of UAV-based benthic algae and macrophyte detection in large, deep rivers. We provide a novel application of UAV imagery for monitoring the lower Klamath River, a highly productive, deep river in which in situ observations are difficult. We estimated percent cover of algae and macrophytes along 10 reaches of the river in June and July 2019. Aerial imagery was captured using a red-green-blue (RGB) camera mounted on a Phantom 4 Pro UAV, and in situ surveys conducted via swimming and snorkeling were incorporated to validate these data. Applying Random Forest classification to the imagery, we detected benthic macrophytes and macroalgae

at depths down to 2m in a fairly clear river (secchi depth > 6.5 ft). Macrophytes dominated the upstream sites in closer proximity to Iron Gate Dam, while filamentous algae dominated the downstream sites below the Scott and Salmon River tributaries. In upcoming years, four proposed dam removals are expected to alter the species composition and abundance of benthic algae and macrophytes, and aerial imagery provides an effective method to monitor these changes.

INTERSTATE TECHNOLOGY AND REGULATORY COUNCIL HARMFUL CYANOBACTERIAL BLOOM (HCB) TEAM: CURRENT STATUS AND FORTHCOMING INFORMATION AND TOOLS FOR HCB MONITORING, PREVENTION, MANAGEMENT, COMMUNICATION, AND RESPONSE, **Beckye Stanton**

Interstate Technology and Regulatory Council (ITRC) established a Harmful Cyanobacterial Bloom (HCB) Team in January 2019 to share information and develop guidance for HCB monitoring, prevention, management, communication, and response. The team is comprised of representatives from state and federal government, industry, academics, and other entities involved with HCBs nationwide. The resources developed will be provided as an interactive web-based platform and a downloadable document. Opportunity for review and feedback is ongoing with an external review version available June 1, 2020 and comments due by July 15, 2020. The final products will be available via the ITRC website in March 2021.

ENGAGEMENT WITH STATE AND NON-STATE STAKEHOLDERS TO ADDRESS GAPS IN STATE MONITORING FOR HARMFUL ALGAL BLOOMS, **Ashley R. Ward**

California's water management challenges are complex. One critical attribute of these challenges is the ability of state, local, and tribal leaders and stakeholders to marshal data and information necessary to support sustainable water management decisions. Freshwater harmful algal blooms (FHABs) are an increasing problem in California's lakes and rivers. Currently there is no adequate funding for statewide routine monitoring; therefore, comprehensive statewide monitoring data is limited. Several groups across California are currently monitoring FHABs, and California state agencies are interested in leveraging this third-party science capacity to more comprehensively respond to HAB events. This year, the Internet of Water (IoW) has partnered with the California State Water Resources Control Board (SWRCB), tribal representatives, and community groups to help improve California's HAB case management system. Thoughtful engagement with stakeholders is critical to developing a system that is both usable and sustainable. This presentation will describe the engagement process with state and non-state stakeholders, summarize the challenges to and results of this engagement, and present next steps for this partnership.

Session 5: Mercury: More Than a Planet

MERCURY FROM SPACE! THE USE OF HIGH-RESOLUTION IN-SITU AND REMOTE SENSING TO MODEL MERCURY IN SURFACE WATER OF THE SAN FRANCISCO BAY-DELTA, **Mark Marvin-DiPasquale**

Mercury continues to be a contaminant of concern in the San Francisco Bay-Delta. One of the impediments to addressing this concern is that there has been insufficient water-quality data collected at the spatial scale and temporal intervals necessary to fully understand the hydrodynamic and biogeochemical processes controlling mercury chemical speciation, transport and bioaccumulation. Traditional approaches to water-quality monitoring rely on the collection of discrete water samples, an approach that is both labor-intensive and expensive, and which typically results in low spatial and temporal data density. With recent advances in both remote sensing platforms and deployable in-situ water-quality sensor arrays, the ability to collect data at higher spatial and temporal resolution has increased dramatically. Recent efforts have focused on linking discrete data with in-situ and remote sensing data to model surface-water mercury and methylmercury concentrations at high spatial and temporal resolution to a degree not previously achievable. This presentation will focus on an ambitious ongoing study in the Bay-Delta that leverages this capacity for high-resolution monitoring of in-situ and remotely sensed water-quality parameters (e.g. turbidity, fluorescent dissolved organic matter, chlorophyll, flow) by coupling it with traditionally collected (lower resolution, discrete samples) surface water mercury data. Results to date will be highlighted.

HIGH-RESOLUTION TEMPORAL MODELING OF MERCURY FLUX ASSOCIATED WITH THE SOUTH SAN FRANCISCO BAY SALT PONDS RESTORATION, **Maureen Downing-Kunz**

Traditional approaches to contaminant monitoring typically utilize expensive discrete water sampling and generally result in datasets with low temporal resolution unsuitable for large-scale prediction of contaminant transport and fate. In this work, we combined long-term (2-6 year), high-frequency (15 min) in-situ water-quality data from two monitoring stations with discrete (hourly to seasonal) sampling for mercury to model the continuous flux of mercury species in Alviso Slough, a mercury-impacted tidal reach adjacent to the South Bay Salt Ponds Restoration Project in San Francisco Bay, California. For each station (mid slough and upper slough) and mercury species (particulate total mercury and particulate methylmercury), multi-parameter statistical models were developed considering inputs of suspended-sediment concentration, tidal phase, stage, Julian day, upstream inflow, and specific conductance. These models produced estimations of mercury-species fluxes at temporal resolutions not previously achievable and provided a method to examine the effect of management actions on the direction and magnitude of mercury flux between restoration sites within the study area. This presentation will highlight how this approach informed the restoration project management and demonstrate the value of high-resolution, continuous monitoring to better understand the fate and transport of both sediment and contaminants of concern.

WATER QUALITY DOWNSTREAM FROM THE SECOND LARGEST MERCURY MINE IN NORTH AMERICA: NEW IDRIA, CALIFORNIA, **Rachel A. Hohn**

We are investigating water quality downstream from the former New Idria Mercury Mine in the Southern California Coast Ranges. Mercury (Hg) mined in the Coast Ranges was used extensively in the Sierra Nevada Ranges during the Gold Rush and abandoned mines continue to impact water quality throughout the state. The New Idria mine was the second largest mercury producer in North America and mining waste covers over 40 acres of land. Previous studies from the 1990s demonstrate that runoff from waste piles is the primary source of mercury to the local watershed. We sampled over a ~5 km transect downstream from the mine and our data indicates that mercury is primarily transported with the suspended particulate load. The introduction of acid mine drainage to San Carlos Creek results in abundant iron precipitation. We attribute rapid mercury attenuation downstream to particles settling out of the water column. However, this material can readily be remobilized during high flow events. We also observed seasonal variability, with the highest Hg concentrations occurring in the wet season. Future work will include estimating the flux of Hg leaving the mine site, evaluating sediment concentrations along a downstream transect, and assessing potential downstream impacts to sensitive habitats.

MERCURY SPECIATION IN CASTAIC LAKE STATE RECREATION AREA, CALIFORNIA, **Greg Jesmok**

Castaic Lake, located ~70 km north of Los Angeles, is primarily fed by the California Aqueduct. It is one of 12 major water reservoirs in California and is a popular fishing and recreation area, despite fish consumption advisories based on elevated mercury concentrations. Although fish in the reservoir have been tested for mercury, there is limited information regarding mercury concentrations in water and sediment within the lake. To address this data gap, we are quantifying the concentrations of total mercury (HgT) and organic bioaccumulative monomethylmercury (MeHg) within the water column. Our results will allow us to assess the relative importance of in situ sources of mercury compared to inputs via the watershed, atmosphere, and aqueduct. We aim to illustrate how mercury moves through this ecosystem by characterizing geochemical trends in Castaic Lake, its tributaries, and inputs from Pyramid Lake, and combining these results with existing information regarding the biological and physical dynamics of Castaic. Ultimately, our study serves to establish a baseline for mercury cycling in a West Coast reservoir that will be impacted by climate change.

Session 6: Fire & Water

LONG-TERM TOXICITY IMPACTS TO WATER QUALITY RESULTING FROM WILDFIRES IN THE MALIBU CREEK WATERSHED, **Christian L. Hoover**

In November 2018, the Woolsey Fire burned the majority of the Malibu Creek Watershed, a coastal watershed in the Santa Monica Mountains ~30 miles west of Los Angeles, California. In

addition to the loss of habitat and vegetation, wildfires affect water quality through physical and geochemical changes. Incomplete combustion of organic material during fires produces polycyclic aromatic hydrocarbons (PAHs), a class of organic compounds with known carcinogenic and mutagenic properties. Furthermore, the post-fire increase in erosion mobilizes particle-bound contaminants, including PAHs, into waterways, potentially affecting wildlife and human health. We conducted multiple sampling events starting in December 2018 to assess PAH, nutrient, and suspended sediment concentrations at locations throughout Malibu Creek and its tributaries. We collected water and soil samples periodically and during storm events to evaluate spatial and temporal changes in contaminant concentrations and to characterize the source and environmental persistence of these pollutants. Results from the wet season following the Woolsey Fire show an increase in PAH concentrations within the Malibu Creek Watershed during and immediately after storm events, with concentrations decreasing during the 2019 dry season. Our 2019-2020 data demonstrate a rebound in PAH concentrations during the initial rain events of the second post-fire wet season.

TURNING UP THE HEAT: EFFECTS OF WILDFIRE AND CLIMATE WARMING ON WATER QUALITY OF A HYPEREUTROPHIC CALIFORNIA LAKE, **Angela De Palma-Dow**

The Mendocino Complex was the largest wildfire in post-settlement California history, burning 459,123 acres from July to November 2018. The Complex burned 40% of the Clear Lake watershed, raising concerns about fire and fire response effects on water quality. Clear Lake is the largest natural lake entirely within California, is hypereutrophic and is primarily used for recreation, drinking water, tribal use, and supports a tourism-based local fishing economy. Long-term lake monitoring since the 1960s facilitates contextualization of post-fire water quality with respect to long-term trends. We found that Clear Lake total phosphorus (TP) has increased 0.003-0.005 mg/L/yr since the late 1960s across three sample stations (surface), but that post-fire surface TP, total suspended solids (TSS) and chlorophyll-a (chl-a) were within historical ranges of variability (since 2004 for TSS and chl-a). Long-term TP was more strongly correlated with maximum air temperatures than precipitation or watershed wildfire, suggesting a role of warming-induced sediment resuspension and dissolved oxygen depletion in long-term TP increases. Overall, our results suggest greater vulnerability of large, eutrophic or hypereutrophic lake water quality to long-term climate warming rather than episodic, large wildfires due to high pre-fire nutrient pools. Nonetheless, our study underscores the value of long-term water quality monitoring and the need to study fire effects across a wide range of lake, landscape and fire characteristics to promote more effective future water resource management.

Presenter and Panelist Index

Andrade Magaña, Yaneth; Pueblo Unido CDC

Yaneth Andrade Magaña is the Director of Community Capacity Building for Pueblo Unido CDC, a 501(c)(3) nonprofit organization serving the unincorporated communities of the Eastern Coachella Valley. Her role is to serve as a bridge between community priorities and decision-making spaces, assisting community leaders to build their capacity to take the lead of the advocacy efforts. Yaneth was raised in the Coachella Valley and is a proud daughter of farm workers. In 2016, she graduated from the University of California, Irvine with a B.A. in political science and international studies. She leads the community engagement portion of both water and wastewater infrastructure projects lead by Pueblo Unido.

Bason, Eric; Shoreline EJ

Eric Bason is the Founder and Executive Director of Shoreline EJ an organization dedicated to fighting racial injustice within the Climate Change and Environmental Justice movements. Shoreline EJ seeks to end racial disparities in Data Collection, Access to Funding and Resources, Boards memberships on large Climate Change and Environmental Justice Organizations.

Cantwell, Carolyn; State Water Resources Control Board

Carolyn Cantwell is an Engineering Geologist with the State Water Resources Control Boards' Groundwater Ambient Monitoring and Assessment (GAMA) Program. She attended University of California, Davis for her undergraduate and M.S. degrees in geology, with an emphasis in geochemistry. Her research projects at University of California, Davis investigated the groundwater geochemistry and mineralogy of geothermal systems. Prior to joining the State Water Boards, she was an Engineering Geologist at California's Division of Oil, Gas, and Geothermal Resources. She enjoys bringing geochemistry into multidisciplinary efforts to better understand and support the sustainable use of our groundwater resources.

Carter, Jason, California Department of Pesticide Regulation

Dr. Jason Carter is an Environmental Scientist with the Surface Water Protection Program at California's Department of Pesticide Regulation (CDPR). His work focuses on monitoring pesticide residues in wastewater, as well as conducting product registration evaluations and examining cannabis as a potential source of pesticide residues in surface water. He earned a Ph.D. in plant biology from University of California, Davis in 2019 and has worked at CDPR since finishing his doctorate. Prior to his Ph.D. studies, he served for three years as a Peace Corps volunteer in Panama.

DePalma-Dow, Angela; Lake County Water Resources Department

Angela De Palma-Dow is a Program Coordinator in the County of Lake Water Resources Department where she coordinates various programs such as aquatic invasive species, stormwater, surface-water quality monitoring, cyanobacteria outreach, water resources data management, and post-fire water quality monitoring. Angela has a B.S. in biological science and chemistry minor from California State University, Sacramento and a M.S. in fisheries and wildlife with an emphasis on limnology from Michigan State University. Angela has conducted aquatic surveys and monitoring in over six states with multiple universities, state and local agencies, and non-profits. Angela has swum from Alcatraz island twice and has two cats.

Downing-Kunz, Maureen; United States Geological Survey

Maureen Downing-Kunz is a Research Hydrologist at the USGS California Water Science Center, where she leads a team that specializes in sediment transport and high-frequency water-quality data collection in San Francisco Bay. Maureen has contributed to studies of sediment flux at many spatial and temporal scales throughout the estuary, water-quality effects of tidal wetland restoration and drought, sediment-flocculation processes, and effects of invasive species on marsh development and bed erodibility. Maureen studied civil and environmental engineering and received her B.S. and M.Eng. from the University of Louisville and her M.S. and Ph.D. from the University of California, Berkeley. Outside of work, Maureen enjoys a range of activities and volunteer efforts that take her deep into the woods, from backpacking to hunting to mountain biking.

Escobedo Garcia, Nataly; Leadership Counsel for Justice and Accountability

Nataly is a Policy Coordinator - Water Programs based in the Fresno office. She was born in Mexicali and raised in Oxnard, CA. She has a B.A. from the University of California, Santa Cruz, in Latin American and Latina/o studies, as well as a M.A. in cultural anthropology from California State University, Los Angeles. She is currently studying social ecology at the University of California, Irvine, expecting to receive her Ph.D. in 2022. She is particularly interested in how issues of water injustice, water rights, and water governance impact people of color, low-income people, and farmworker communities in California.

Figueroa, Lesly; Leadership Counsel for Justice and Accountability

Lesly, a longtime resident of the City of Coachella, works as a policy advocate with Leadership Counsel for Justice and Accountability in the Eastern Coachella Valley in the communities of Thermal, Oasis, Mecca, North Shore and Coachella focusing on issues like affordable housing, water and wastewater infrastructure, air quality, active transportation, and land-use planning. Growing up in Coachella and through efforts like Building Healthy Communities, her interest of community planning and the built environment grew to inspire her to pursue a degree in urban studies and planning at University of California, San Diego with a focus on global health and environmental studies. Now, Lesly is back in the community that raised her to continue to advance the work of community organizers, advocates, and community leaders that deconstruct legacies of neglect and oppression in rural communities like the Eastern Coachella Valley.

Fitanides, Helen; The Watershed Project

Helen Fitanides works to involve communities in their local watersheds through monitoring creek water quality, benthic macroinvertebrates, and Olympia oysters in the San Francisco Bay Area. She is passionate about both the scientific and educational aspects of these programs and worked in the scientific research field before joining the Bay Area nonprofit The Watershed Project in 2015. Helen also heads the Contra Costa Watershed Forum's Creek Monitoring Subcommittee, where she facilitates the exchange of technical expertise and monitoring equipment with community scientists, and coordinates creek monitoring throughout Contra Costa County.

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; Intelligent Ecosystems Institute and FlowWest

Sadie Gill is a Senior Data Scientist at FlowWest and received her B.S. in physical geography from University of California, Santa Barbara and her M.S. in statistics from California State University, East Bay. She brings expertise in data visualization, statistics, spatial analysis, and web development to tackle the greatest water and natural resources challenges. Her job enables her to pursue her two biggest passions: conservation of earth's natural wonders and being nosy at scale. She was a member on winning teams for the 2018 and 2019 California Water Data Challenges.

Hansen, Jeffrey; United States Geological Survey

Jeffrey (Chuck) Hansen is a hydrologist with the USGS California Water Science Center. He holds a M.S. in geology from California State University, Sacramento and a B.S. in economics from the University of Iowa. Currently focusing on the Sacramento-San Joaquin Delta, Chuck is leading an effort to expand the accessibility and usability of USGS water-quality, geochemical, and biological data for the Delta community, and to integrate those data with that of other local agencies and stakeholders. His team is developing an interactive web platform for discrete and real-time scientific data delivery and analysis for use by researchers, regulators, and the general public.

Hohn, Rachel A.; California State University, Northridge

Rachel Hohn is a graduate student at California State University, Northridge in the Department of Geological Sciences. She is researching the transport and fate of heavy metals associated with historic mining in California, with a focus on the element mercury. Rachel is interested in policy related to the remediation and management of environmentally impacted sites. She is excited to join the Central Coast Regional Water Quality Control Board as an Engineering Geologist in May 2020 where she will work on the Active Oil Field Regulatory Program.

Hoover, Christian L.; California State University, Northridge

Christian is a senior undergraduate at California State University, Northridge, and is the lead student on a watershed study to assess impacts from the 2018 Woolsey Fire. Christian lead the extraction and analyses of polycyclic aromatic hydrocarbons (PAHs) from water and soil samples and now teaches that technique to both undergraduate and graduate students. He also conducts regular sampling events to characterize water quality during baseflow conditions and storm events and presented his findings at the American Geophysical Union Annual Conference. In the future, Christian hopes to continue working with water quality and management challenges in California.

Houlihan, Emily; State Water Resources Control Board

Emily Houlihan is an Engineering Geologist with the State Water Boards' Groundwater Ambient Monitoring and Assessment (GAMA) Program. Emily holds an M.S. in geology from the University of California, Davis. Emily is interested in the intersection of groundwater quality data, statistical methods, and data accessibility. At the State Water Boards, Emily helps conduct statistical analyses of groundwater quality data and improve public access to groundwater quality data.

Jesmok, Greg; California State University, Northridge

Greg Jesmok is a 2nd year graduate student in geological sciences at California State University, Northridge. His research focuses on the biogeochemical cycling of mercury in lakes, with a particular focus on Castaic Lake, one of 71 reservoirs in California (CA) deemed impaired due to elevated Hg concentrations in fish. It is one of the twelve largest reservoirs in CA, and a vital component of the CA State Water Project. In addition to his work on reservoirs, Greg is Vice-President of Environmental

Science without Borders, a multinational peer-mentorship group connecting scientists around the world.

Kislik, Chippie; University of California, Berkeley

Chippie Kislik is a Ph.D. student in the Environmental Science, Policy, and Management Department at University of California, Berkeley. She is fascinated by the applications of remote sensing in water quality analysis and resource management. Her current research focuses on how unmanned aerial vehicles (UAVs, also known as drones) and high-resolution satellite imagery can detect algae and aquatic plants in freshwater systems of California. Chippie enjoys engaging in environmental education, as well as hiking, whistling, speaking Spanish, and watching a good Wes Anderson film.

Lauder, Jeffrey; Sierra Streams Institute

Jeffrey Lauder has a background in tree physiology, climate science, forest ecology, aquatic ecology, and statistical modeling, with more than 10 years of research experience in the forests of the Sierra Nevada. His current interests include examining how climate change has already impacted and may continue to impact Sierra Nevada ecosystems ranging from water quality and stream health to forest drought resilience and fire likelihood.

Li, Jiada; University of Utah

Jiada Li is a Ph.D. student in the Department of Civil and Environmental Engineering at the University of Utah. He completed his B.A. at the South China University of Technology and obtained an M.S. at Tongji University. He is now working as a graduate research assistant at the Urban Water Group. His research area includes smart stormwater systems, real-time control, flooding resilience, climate change, sensor placement optimization, and machine learning. Working with his Ph.D. supervisor Prof. Steven Burian, Jiada's dissertation aims to address the research needs, respectively by 1) the better understanding of how historical changes in precipitation and landscape surface affect urban flooding severity in urban drainage systems; 2) the quantitative analysis of future flooding resilience influenced by climatic and urbanized changes; 3) the development of real-time control simulation tool and application using real-time control to improve flooding resilience in the context of urbanization and climate change.

Long Bundy, Dimitra; C'Witzan Circles

Dimitra E. Long Bundy is the Executive Director C'Witzan Circles. She is a member of the Ft. Yuma Quechan Indian Tribe – Federally Recognized Colorado River Indian Tribe (C.R.I.T.), through her father's lineage. Her Mother was of the Cherokee Indian (Native American) and of African American/Black ancestry. C'Witzan Circles works to support Black and Native American communities and to support underserved and under-privileged communities that are affected by environmental health and social injustices. We especially focus on water preservation and protection in the Northern California area. Our earth's water sources must be expanded, protected, and restored. We seek remedies from our earth's natural elements that naturally helps to restore our cycle of life to a healthier existence. We have worked on numerous projects over the past 10 years to support other non-profit organizations that focus on serving the same purpose and communities. We reserve tribal and indigenous rights to self-determination to achieve these goals.

Louisell, Chuck; True Elements LLC

Chuck Louisell, Ph.D., P.E. has over thirty years of experience in water resources, big data, predictive analytics, and adaptive and complex artificial intelligence applications. Early in his career, Dr. Louisell developed and implemented management plans for sensitive, high quality watersheds. In recent years, he has managed strategic programs for cloud, artificial intelligence, and cybersecurity in regulated utilities. Dr. Louisell has specific experience in information and data solutions focused on the security of critical infrastructure systems. Since earning his Ph.D. in 2003, Dr. Louisell has maintained an active academic and research agenda serving as a Senior Research Associate at Virginia Tech.

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.

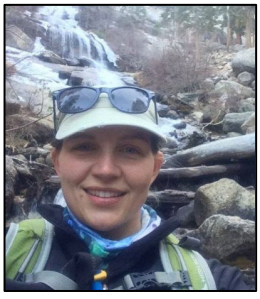
Marvin-DiPasquale, Mark; United States Geological Survey

Dr. Marvin-DiPasquale is a lead scientist at the U.S. Geological Survey (USGS) in the 'Earth System Processes Division', where he leads a research program entitled 'Biogeochemical Cycling at Regional Scales'. He completed a B.S. in chemistry at State University of New York at Stony Brook in 1987, and a Ph.D. in 1995 from University of Maryland, Marine and Estuarine Environmental Science Program, with a focus on the microbial ecology of Chesapeake Bay sediments. He began a career at the USGS (Menlo Park, CA) as a 'National Research Council' post-doc in 1995 and became a project chief in 2004. During much of his tenure at USGS his research focus has been on mercury biogeochemistry in various ecosystems, including: the San Francisco Bay watershed and associated mining areas throughout CA; FL Everglades; Carson River, NV (mercury Superfund site); Great Salt Lake, UT; coastal, Louisiana; Patagonia region of Argentina; and multiple USGS study locations throughout the U.S..

McCready, Christina; California Department of Water Resources

Christina McCready is a Principal Engineer with the California Department of Water Resources (DWR), where she manages the Integrated Data and Analysis Branch of the Division of Statewide Integrated Water Management. She believes that a statewide integrated data platform will benefit the state's people by providing water management decision-makers and the public with access to timely and coordinated datasets of documented quality. Chris' work with DWR has included civil engineering design, construction inspection, Oroville facilities relicensing, project communications, and, most recently, integrated regional water management. Chris is a licensed professional civil engineer and holds a B.S. in civil engineering from California Polytechnic State University, San Luis Obispo.

Moe, Annelisa; Heal the Bay



Annelisa is Heal the Bay's water quality scientist focusing on stormwater pollution. She helps to keep our water clean and safe by advocating for comprehensive and science-based water quality regulation and enforcement in the Los Angeles area, and throughout California. Annelisa completed her M.S. in geological sciences at California State University, Northridge, researching environmental responses to paleoclimate fluctuations. Before joining the team at Heal the Bay, she worked with the Central Valley Regional Water Quality Control Board in the Surface Water Ambient Monitoring Program, and the Los Angeles Regional Water Quality Control Board in the Underground Storage Tank Program.

Moore, Shelly; San Francisco Estuary Institute

Shelly Moore has been an Environmental Scientist conducting research on aquatic systems in southern California for more than 25 years. She has worked as a project and data manager for large-scale regional surveys, such as the Southern California Regional Bight Survey. She has also developed web-based and desktop applications for scenario- and data-driven analyses. Her current projects are focused on developing monitoring methods to measure marine debris and trash and microplastics in aquatic systems.

Osti, Amye; 34 North

Amye Osti, CEO and Founder of 34 North, specializes in the intersection of technology, natural resource management and public policy. As leader of a diverse team of technologists, Osti is responsible for bringing OpenNRM collaborative natural resource management data platform to market as well as build a vibrant open data community. The company is now a leading provider of data management solutions in California for managing our natural resources. OpenNRM Enterprise Data Platform is currently used to manage large scale multi-agency efforts between USGS, USFWS, USBR, USACE, MWD, SWRCB, DWR, CalFire, USFS, EPA and many others managing California's watersheds. In addition to company initiatives, Osti leads strategic efforts that help shape the technological landscape for managing environmental data.

Osuna, Joel; Water Resources and Policy Initiatives

Joel Osuna has worked at the Center for Geospatial Science and Technology (CGST) at California State University, Northridge for 10 years. He is currently a project manager helping to lead the work done on National Hydrography Dataset (NHD) update projects and NHD sub-stewardship in California. He is also a data manager in the Disadvantaged Community Involvement Program for Los Angeles and Ventura Counties. His previous work has primarily focused on using geographic information systems (GIS) for water resources, including topics such as historical ecology modeling, wetland and surface water mapping, and water quality mapping.

Pauloo, Rich; University of California, Davis

Rich is a Ph.D. Candidate studying physical hydrogeology at the University of California, Davis. He is a two-time award recipient of the California Water Data Challenge, a winner of the Microsoft AI for Earth Challenge grant, and the creator of www.calwaterquality.com. His research interests concern the monitoring and modeling of overdrafted aquifers. Methodologically, Rich integrates tools from geostatistics, 3D groundwater flow and contaminant transport, statistical/machine learning, optimization, calibration, and mathematical modeling to explain and forecast the behavior of hydrologic systems. He is also fascinated by remote sensor networks, data science, data visualization/communication, and open source software.

Poresky, Aaron; Geosyntec Consultants

Aaron Poresky is a Principal Engineer with Geosyntec Consultants. He has 14 years of experience in watershed management, integrated planning, and applied research, including high-profile and complex projects for a wide range of clients. Mr. Poresky has assisted municipal stormwater permittees throughout the west coast. In Orange County, Mr. Poresky has supported the municipal stormwater permittees with development and implementation of the South Orange County Water Quality Improvement Plan. In collaboration with municipal stormwater permittees and the Moulton Niguel Water District, he has led the development of two innovative software tools - the OC Stormwater Tools and the Urban Drool Tool - to integrate datasets, improve watershed understanding, and streamline workflows.

Rieves, Lucy; Heal the Bay

After studying applied mathematics and atmospheric and oceanic sciences at the University of Colorado, Lucy began working with Heal the Bay where she builds and maintains the predictive Ocean Water Quality modeling system known as NowCast. Along with releasing daily predictions for up to 40 California beaches, she collects and processes FIB data for the entire west coast to generate weekly ‘grades’ for beaches. Her focus is on growing the NowCast system to include more beaches, optimizing model performance, and automating data collection, cleaning, and quality assurance workflows. Outside of work, Lucy is passionate about gardening and outdoor recreation.

Rinde, Jenna; California Department of Water Resources and Interagency Ecological Program Data Utilization Work Group

Jenna Rinde is an Environmental Scientist for DWR within the Environmental Monitoring Program (EMP). For the last 8 years, she has been a part of various discrete and continuous water quality monitoring programs within the San Francisco Estuary. Jenna joined the EMP in 2015 and is one of the discrete water quality leads. The EMP is a unique monitoring program that encompasses: water quality, phytoplankton, zooplankton and benthos. Jenna assists with each component of EMP, but her areas of responsibility include: managing and publishing data, updating monitoring plans, leading field crews, and managing contracts. Jenna holds a B.S. in environmental science from California State University, Monterey Bay and a M.S. from the University of San Francisco in environmental management.

Rocha, Laura; Moulton Niguel Water District

Laura Rocha is a Senior Water Resource Planner with Moulton Niguel Water District. Laura has over 15 years of experience in water resources planning, environmental review, and permitting. Her areas of responsibility for Moulton Niguel Water District focus on long-range water resources planning, implementing watershed-related projects, water resources policy development, and water demand/supply forecasting. Laura's specific interests include stormwater capture and education and has recently joined the team developing and implementing the Smart Watershed Network and Urban Drool Tool, both of which aim to reduce urban runoff. Laura attended the University of California, Santa Barbara for her undergraduate degree and California State University, Fullerton for her graduate degree, both in environmental studies.

Ronning, Karl; South Yuba River Citizens League

Karl is a hydrologist for the South Yuba River Citizens League (SYRCL), a non-profit organization in Nevada City, CA. SYRCL was founded in 1983 by grassroots activists determined to protect the South Yuba River from dams and eventually gained Wild and Scenic designation for the river. Karl manages SYRCL's citizen science-based River Monitoring Program in addition to studying the impacts from legacy mining and conducting hydrological monitoring for SYRCL's meadow restoration projects. Prior to SYRCL, Karl worked alongside the National Weather Service studying fire

weather, weather forecasting for La Grande Weather Service in Oregon, and serving two years of AmeriCorps throughout California and Hawaii.

Spellman, Thomas; RiverDB.org

Thomas is a freelance software engineer and has worked with a broad range of businesses and non-profits. He's a life-long resident of the Yuba Watershed and has dedicated his skills to providing solutions to some of the data management challenges that citizen-science monitoring groups face on a regular basis. RiverDB is the result of learning from several previous designs, this time with a focus on benefiting a much wider range of water science organizations.

Stanton, Beckye; California Office of Environmental Health Hazard Assessment

Beckye's position at the Office of Environmental Health Hazard Assessment is primarily focused on HABs (both freshwater and marine) with particular emphasis on collaboration and outreach. Those aspects were also key in her past work on habitat restoration, invasive plant control, and water quality improvements at the Sacramento-San Joaquin Delta Conservancy and on natural resource damage assessment following environmental impacts such as oil spills for the California Department of Fish and Wildlife Office of Spill Prevention and Response. Her academic background includes a Ph.D. in pharmacology and toxicology from University of California, Davis and a B.S. in biological sciences from Calvin College.

Stieringer, Wes; State Water Resources Control Board

Wes is an Environmental Scientist with State Water Resources Control Board Division of Drinking Water (DDW) Metropolitan District, serving Los Angeles County, and is the co-chair of DDW's GIS workgroup. The workgroup is comprised of other DDW staff statewide, and the map tools and data are the result of collaboration and efforts of the entire group. He received his B.S. in environmental science from Oregon State University in 2014 and has been with DDW since 2015. Prior to DDW, he worked in pharmacy for 28 years, mostly providing for long-term-care residents.

Waggoner, Claire; State Water Resources Control Board

Claire Waggoner is an Environmental Program Manager overseeing the Sustainable Water Plans and Policies section in the Division of Water Quality at the California State Water Resources Control Board and has been working at the State Water Board for over 7 years. Claire and her team are currently developing and implementing water quality control plans, policies, and programs related to recycled water, stormwater capture and use, constituents of emerging concern, salt and nutrient management, seawater desalination, and restoration projects for the Santa Monica Bay National Estuary Program.

Wang, Dan; California Department of Pesticide Regulation

Dr. Dan Wang is a Senior Environmental Scientist with the California Department of Pesticide Regulation (CDPR). She leads the data assessment workgroup that aims to understand the status/trend of pesticide contamination in the aquatic system and assess potential risk. The workgroup also supports other functions of the Surface Water Monitoring Program in the Environmental Monitoring Branch, including informing the design of future monitoring studies, supporting the development of mitigation, enforcement and regulatory actions as well as evaluating the effectiveness of those actions.

Ward, Ashley R.; Internet of Water, Duke University

Ashley's career has focused on engaging communities to develop long-term, sustainable strategies relevant to their particular community needs. Her previous work with NOAA's Carolinas RISA team connected rural and urban communities and policy-decision makers with relevant climate and health data, particularly related to vulnerabilities and impacts. Before her work with CISA, Ashley worked with communities in NC on a host of issues such as local food availability and asset-based economic development strategies. Ashley's passion is building coalitions to advance scientific understanding and communicate information in a way that is relevant for use by decision-makers. Having worked in a broad range of communities with varying levels of capacity, Ashley is particularly thoughtful about meeting communities where they are and working from there to achieve community goals.

Williams, LaDonna; All Positives Possible

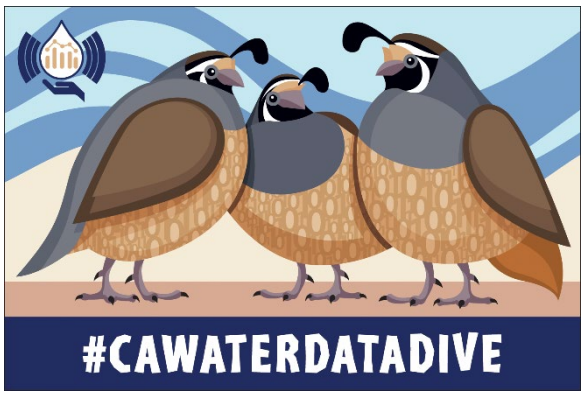
LaDonna Williams is Programs Director for All Positives Possible, a small grassroots community based environmental Justice organization located in Richmond and Vallejo, CA. She is a mother of 6 who discovered her former low-income residence was built directly on top of a superfund site. She has over 30 years of experience in community health, outreach, organizing and advocacy, and environmental justice supporting the invisible low and below poverty, Black and minority communities who's health and lives suffer the injustices and equities from racism, discrimination, big money oil & gas industries, and governmental decisions that harm where we live, work, play, and pray, placing profit over human lives. LaDonna's advocacy and commitment to fighting for our God given right to clean air, soil and water is evident locally, regionally, and nationally.

Witherspoon, Boykin; Water Resources and Policy Initiatives

Boykin Witherspoon is Executive Director of the CSU Water Resources and Policy Initiatives (WRPI). Responsibilities include: strategic planning and budgeting; promotion with community, universities, and industry; development and oversight of contracts and grants; etc. Additionally, Mr. Witherspoon is a focused problem solver with international project management experience developing Geographic Information System (GIS) applications and software for sustainable landscape architectural planning and design. Mr. Witherspoon's professional experience includes managing interdisciplinary teams of designers, scientists, and software developers creating innovative and sustainable land use and land planning solutions with an emphasis on programmatic suitability and capability analysis.

About The 2020 Logo

The Water Data Science Symposium Planning Committee updated the logo this year to contain a California quail covey because we felt these photogenic little birds epotimize this year's Symposium.



Did you know?

1. The California quail (*Callipepla californica*) was adopted as California's official state bird in June 1931!
2. The California quail are communal birds. Our goal for each Water Data Science Symposium is to grow our water data community to be more inclusive and representative of all communities in California.
3. These small ground-dwelling birds are ubiquitous throughout California. Water and the associated science, data, and challenges are statewide and felt by all communities in California.
4. The California quail are sensitive to environmental change but remain resilient. We believe that together, as a united Water Data Community, we too will be resilient as we work to overcome the challenging environmental changes we will all be facing in the future (access to clean water, fire impacts, climate change, etc.).

Thank you for joining the 2020 California Water Data Science Symposium!

Stay connected with the water data science community by:

Joining the Slack Workspace

Registering for the Data Innovation and Utilization Workgroup Email List
(under the General Interests drop down)

Attending future water data science events!

@cawaterdatadive @CaMonitoring @swamp_water_ca @sfei_asc
#cawaterdatadive #caswamp #waterdata #cawater