2022 California Aquatic Bioassessment Workgroup Meeting and California Chapter Society for Freshwater Science Meeting Presentation Abstracts and Presenter Index

Presentation Abstracts
Tuesday, October 11, 2022

Welcome

Ali Dunn, State Water Resources Control Board
John Olson, California State University, Monterey Bay and Society for Freshwater Sciences – CA Chapter

Session 1

DNA-BASED APPROACHES FOR BIOMONITORING: WHAT'S NEXT?

Susanna Theroux, Southern California Coastal Water Research Project

Across California, monitoring programs are advancing the use of molecular methods, from single species detections for invasive crayfish, to broad-scale biodiversity surveys for harmful algae. As programs move to adopt these methods for routine application, the quality assurance and quality control measures that accompany these methods need to keep pace. In this presentation, we will discuss the latest in DNA method development focused on DNA metadata standardization and equipping researchers and managers with the necessary confidence measures to interpret DNA results. These decision frameworks pertain to guidance on avoiding or accounting for false positives and false negatives, species occupancy modeling, and DNA assay validation. We will also discuss the outcomes of the 2022 National Marine eDNA Workshop held in Southern California that focused on developing a national strategy for advancing DNA method adoption for environmental management. Across multiple fronts, California is a leader in DNA methods for biomonitoring and bioassessment and the establishment of comprehensive evaluation criteria will help ensure robust DNA data is informing critical environmental management decisions.

INCORPORATION OF EDNA INTO TRADITIONAL BIOASSESSMENT MONITORING: A SAN DIEGO REGIONAL APPROACH

Chad Loflen, California Water Quality Control Board - San Diego Region

The use of and research surrounding environmental DNA (eDNA) has expanded greatly over the last decade. With the development of standard methods, eDNA has been used in a variety of environmental management applications, often to supplement or replace traditional survey methods. The San Diego Water Board has been working with federal and state partners to pilot the use of targeted species-specific eDNA monitoring as a supplemental measurement when conducting traditional stream bioassessment for benthic macroinvertebrates and algae. Our pilot work has shown eDNA to be a potential useful addition to traditional stream bioassessment monitoring, with results allowing for insight into higher trophic-level aquatic organism presence across wide spatial scales. This presentation will also discuss future efforts to explore novel eDNA analysis methods from bioassessment.

THE DEVELOPMENT OF A NOVEL EDNA ASSAY FOR THE DETECTION OF THE INVASIVE CAULERPA PROLIFERA

Tanner Waters, University of California- Los Angeles

Caulerpa prolifera, a highly invasive algae, has been found for the first time on the West Coast of North America in Newport Bay, CA. Its detection and subsequent removal has relied on traditional scuba monitoring which remains logistically complex and imperfect in its ability to identify and stop the spread. Environmental DNA, the process of collecting water and filtering out free floating cells/DNA shed from an organism of interest, is an emerging methodology for tracking invasive species. In this project we create a species-specific primer/probe set for qPCR and ddPCR for the monitoring of Caulerpa prolifera that allows managers to take one liter of water and test for invasive DNA presence. A process that reduces complexity in the field while increasing accuracy of detection.

MOLECULAR APPROACHES TO IDENTIFY AND MONITOR TOXIGENIC CYANOBACTERIA IN CALIFORNIA LAKES

Jayme Smith, Southern California Coastal Water Research Project

Freshwater lakes in California have been experiencing increasing blooms cyanobacteria in recent years. Cyanobacteria are diverse and many can produce toxins, collectively referred to as cyanotoxins. Cyanotoxins negatively impact beneficial uses in lakes including recreation and drinking waters, endangering both human and animal health. Thus, rapid, accurate identification of cyanobacteria is of critical importance for the effective management of these events. Here we present a study of DNA-based monitoring of Los Angeles area lakes to characterize both the spatial and temporal diversity of cyanobacteria. To characterize spatial diversity, we conducted a regional survey of 17 lakes during the summer of 2020. Using a combination of DNA metabarcode sequencing community analysis and targeted gene ddPCR

assays, we identified broad cyanobacterial species diversity in the region, with more than a dozen potentially toxigenic genera identified. We then conducted high frequency sampling at 3 of these lakes in the summer of 2021 to examine changes in community dynamics over the summer season, where we characterized seasonal changes in cyanobacterial community structure leading up to the presence of cyanotoxins. We coupled our community observations with measurements of cyanotoxins and environmental conditions, to move towards a better understanding of regional cyanobacterial ecology.

Session 2

EXAMINING SHIFTS IN DRYING REGIMES ACROSS CALIFORNIA

Jessica R. Ayers, Department of Environmental Science, Policy and Management, University of California, Berkeley, Berkeley, CA

In California's seasonal climate, intermittent streamflow during the dry season plays a significant role in structuring biological communities. Despite the prevalence of natural drying events and potential increases in intermittency from human alteration and climate change, altered patterns of drying regimes have not been quantified across California. To understand the consequences of low flow alteration on freshwater ecosystems, we examined if and how drying regimes have shifted across California. We first calculated the number of zero flow days to characterize spatial variability of intermittency at reference USGS stations. We then created a stream classification for distinguishing perennial from intermittent streams among reference gages. Finally, we developed a random forest model to assign all non-reference gages to an intermittent stream class based on climate and watershed characteristics. To assess shifts in drying regimes, observed streamflow measured at non-reference gages was used to characterize current drying regimes. These were then compared with expected, natural streamflow class at the same locations over the last 40 years (1980-2020). By quantifying expected natural drying regimes of streams and the degree to which they have been impacted by anthropogenic activities and climate, this work can inform environmental flow practices and guide efforts to monitor, manage, and conserve freshwater ecosystems.

A MODELED INSECT RICHNESS INDEX FOR USE ACROSS FLOW PERMANENCE GRADIENTS: HOW DOES IT COMPARE WITH THE CSCI?

Jennifer Courtwright, Utah State University

Indices developed for perennial streams often perform poorly when applied to nonperennial streams, pointing to the need to optimize indices for nonperennial streams. We used data from 473 sites to develop a bioassessment index applicable across flow permanence gradients in the western USA. We considered several potential indices during development, including a traditional taxa-based O/E index, a modeled MMI including traits thought to be reflective of arid regions, a trait-based O/E, and modeled individual metrics adjusted for the effects of natural environmental gradients. We also included predictors thought to characterize the variability in flow regimes across the arid West and the degree to which streams were isolated from one another. An index based on a single metric (modeled insect richness - MIRI) performed best and classified 88% of degraded sites correctly. To further validate the MIRI, we applied it to 235 sites of known flow permanence and landscape condition status (reference vs degraded) across California. The MIRI classified 77% of degraded sites correctly, compared with 65% by the CSCI. MIRI predictors are consistent with ecological theory, and the MIRI should provide a meaningful assessment of biological integrity. However, thresholds for inferring impairment may differ between perennial and nonperennial streams.

CURRENT UNDERSTANDING OF APPLICATION OF CALIFORNIA'S SURFACE WATER AMBIENT MONITORING PROGRAM BIOASSESSMENT INDICES TO INTERMITTENT STREAMS

Ali Dunn, State Water Resources Control Board

California's Surface Water Ambient Monitoring Program (SWAMP) Bioassessment Program developed the California Stream Condition Index and Algal Stream Condition Index as interpretive tools to summarize biological conditions of wadeable streams statewide. Several studies have been conducted in California on the application of CSCI and ASCI to intermittent (or nonperennial) streams. This presentation will summarize the results of those studies, provide guidance on the application of CSCI and ASCI in intermittent streams, and discuss statewide data gaps and potential pathways to fill them.

Presentation Abstracts
Wednesday, October 12, 2022

Welcome

Ali Dunn, State Water Resources Control Board
John Olson, California State University, Monterey Bay and Society for Freshwater Sciences – CA Chapter

Session 3

VISION FOR AN OPEN-SOURCE LANDSCAPE ASSESSMENT VISUALIZATION TOOL TO IDENTIFY HEALTHY WATERSHEDS AND HIGH-QUALITY WATERS IN CALIFORNIA

Corey Clatterbuck, State Water Resources Control Board

Many water quality programs at the California State and Regional Water Boards (California Water Boards) devote significant resources towards identifying and addressing impaired waterbodies. Although US EPA guidance and Clean Water Act programs support healthy watershed and high-quality water designation and protection as a key national strategy, few data-driven efforts are in place to understand waterbody and watershed protection opportunities in California. As a result, we generally do not know the location of healthy and vulnerable watersheds and high-quality waterbodies statewide, or whether their health status changes over time. Landscape assessment and visualization is one method to improve the understanding of watershed health and prioritization of waterbodies and watersheds for protection and restoration efforts. Multiple Excel-based tools and geographic datasets can provide insight into watershed health, but few provide interactive variable selection, regularly updated data from state monitoring programs, and curated and direct data downloads for areas of interest. To address these needs, the California Water Quality Monitoring Council's Healthy Watersheds Partnership working group (Partnership) and the State Water Board's Surface Water Ambient Monitoring Program (SWAMP) plan to create an open-source landscape assessment visualization tool for watershed health in California. The Partnership drafted a workplan to create this tool using a previously published framework for relative watershed health assessment in the state. We share this draft plan and lessons learned from similar efforts in other regions and states. We will introduce our proof-of-concept tool and discuss functionalities that we plan to add. Initially, the tool will be used to support the strategic framework and action plan for healthy watershed and high-quality water protection efforts at the California Water Boards. By pairing a transparent tool for understanding statewide watershed health with internal strategic planning for waterbody and watershed protection, the California Water Boards can continue fulfilling its mission to preserve, enhance and restore the quality of the state's water resources.

PRIORITIZING STREAM PROTECTION, RESTORATION AND MANAGEMENT ACTIONS USING LANDSCAPE MODELING AND SPATIAL ANALYSIS

Eric Stein, Southern California Coastal Water Research Project

Urban watersheds are often degraded by human activities, reducing their ability to provide ecosystem benefits. While governmental agencies have put forward plans for improving watershed health, resources are limited, and choices must be made as to which watersheds to prioritize and what actions to take. We developed a set of assessment and prioritization tools to support the protection of rivers and associated riparian habitats across California. The tool estimates stream condition at the NHD reach scale based on bioassessment data, uses EPA's StreamCat dataset to identify stressors, includes reach-specific models to help prioritize actions, and accounts for environmental justice using census tract data. Using the prioritization tool, we identified 38% of the stream reaches across California that should be considered the highest priorities for restoration and management actions. At the watershed scale, we were able to identify 7 -40% of reaches that should be prioritized for protection and 10-34% of reaches that should be prioritized for restoration, and management, depending on the watershed. The results of this project can help regional stakeholders and agencies prioritize streams for protection, acquisition, and restoration. The methods are directly transferable to any regional condition and stress data that can be readily obtained.

INTERPRETING BIOINTEGRITY AND BIOSTIMULATORY INDICATORS IN MODIFIED CHANNELS: AN UPDATE ON STATEWIDE AND REGIONAL STUDIES

Raphael D. Mazor, Southern California Coastal Water Research Project

In a set of statewide and regional studies, we have tentatively identified classes of modified channels where alternative management strategies may be necessary to protect aquatic life. Building off of studies in the Bay Area and Southern California, we reviewed over 4000 bioassessment locations to explore different approaches to classifying modified channels. Several classes showed consistently low ranges of bioassessment scores and muted responses to biostimulatory stress. In particular, channels with hardened streambeds, channels constructed from terrestrial habitat, and channels with ambiguous watersheds rarely had high scores for the California Stream Condition Index (CSCI) for benthic macroinvertebrates. Exceptions were usually associated with sites draining minimally developed watersheds. Although mean algal index scores in modified channels were low, high scores were common (compared to the CSCI). Although this study will not be finalized until next year, we expect that a classification system based primarily on bed and bank material will help managers identify channels requiring alternative approaches to protect aquatic life. However, any classification system should be supplemented with initial data collection to determine if high scores may be attained.

Session 4

VULNERABILITY OF ARROYO TOAD TO HYDROLOGIC CHANGE

Katie Irving, Southern California Coastal Water Research Project

The endangered Arroyo toad is native to southern California streams but due to habitat degradation and flow alteration, has critically declined in distribution and abundance over the last few decades. We developed a Species Distribution Model (SDM) for the Arroyo toad in the San Diego region by coupling a, previously built, landscape model together with functional flow metrics that describe seasonal components of the hydrological regime. The new model accounts for features of the hydrologic regime along with specialized characteristics of substrate, geomorphology and vegetation that are necessary to support toad breeding and growth. We apply the SDM to assess vulnerability of Arroyo toads to hydrological change associated with climate change and urban expansion by comparing estimated toad distribution under current and future hydrological conditions. We present the model development, preliminary results, and implications from this study. The approach used enhances our ability to evaluate the toad's vulnerability under future conditions and better plan conservation and management interventions.

MODELING THE DISTRIBUTION OF THE AMPHIBIAN PATHOGEN BATRACHOCHYTRIUM DENDROBATIDIS TO INFORM CONSERVATION MANAGEMENT

Umarfarooq Abdulwahab, Utah State University

Chytridiomycosis, caused by Batrachochytrium dendrobatidis (Bd), can decimate amphibian populations. Bd is common in warm, permanent, and slow-flowing waterbodies; however, it is uncertain how Bd occurrence varies with specific regional and local environmental factors. We used eDNA samples collected at 159 waterbodies to assess Bd occurrence across south- and central-coastal California and used Random Forest and occupancy models to identify the factors associated with Bd occurrence. We detected Bd at 23% of the sampled sites. The Random Forest model identified five predictors of Bd, in order of importance: wettest quarter precipitation (+), vegetation cover (+), percent impervious surface (+), annual mean temperature (+), and watershed slope (-). The occupancy model identified similar relationships between Bd occupancy and these predictors but also showed that detection probability decreased with increasing temperature. Both models predicted low Bd suitability for most areas, but some waterbodies are Bd hotspots. These models may aid managers by identifying both waterbodies of high risk to amphibians and waterbodies that might serve as refugia from Bd. However, there are no established methods of treating chytridiomycosis in the wild, and the predictors of Bd occurrence that we identified imply that once Bd establishes, controlling it will be difficult.

SCIENCE SUPPORTING THE STATEWIDE BIOSTIMULATION, CYANOTOXINS, AND BIOLOGICAL CONDITION PROVISIONS

Joseph Westhouse, State Water Resources Control Board & Southern California Coastal Water Research Project

The State Water Resources Control Board (SWB) is currently developing statewide provisions to establish water quality objective(s) and a program of implementation to address biostimulation, eutrophication, and cyanotoxins; and to improve and preserve biological conditions in California's freshwater systems. The current focus is primarily on wadeable streams, lakes, and reservoirs. Nearly two decades of scientific research have been conducted to develop the scientific basis to justify and support the objectives and thresholds that will be established in the provisions. For wadeable streams, the science is based on three lines of evidence to identify potential thresholds for biostimulatory indicators, including nutrient concentrations and measures of algal biomass: 1.) evaluation of background levels of biostimulatory indicators at reference sites, 2.) response models that identify levels of biostimulatory stress associated with low probabilities of good bioassessment index scores, and 3.) identified change-points for individual algal and invertebrate species to determine biostimulatory stress levels that lead to reductions of sensitive species and/or increases of tolerant species. The SWB will use these lines of evidence to identify numeric thresholds that protect aquatic life while accounting for the natural variability of conditions found in California wadeable streams.

ASSESSING BIOTIC CONDITIONS IN THE CARMEL RIVER AFTER DAM REMOVAL AND RIVER REROUTE

Janelle Vasquez-Nicholas, California State University Monterey Bay

In 2015, the San Clemente Dam was removed from the Carmel River in Monterey County, California. River reroute and sediment stabilization was performed to prevent about 1.91 million cubic meters of accumulated sediment from releasing downstream. We do not know how effective these strategies are for improving ecological conditions, as measured by benthic macroinvertebrate (BMI) indicators. The goal of this study is to quantify the impact of river reroute and dam removal in the Carmel River using BMIs. BMIs were collected downstream of the dam removal and upstream in the rerouted river in 2022 using the Surface Water and Ambient Monitoring Program's (SWAMP) Bioassessment SOP and subsampled using SWAMP's SOP for Laboratory Processing and Identification of Benthic Macroinvertebrates in California. I will present the changes in BMI taxa observed in 2022 compared to 2018. I will also discuss factors that may impact these changes. The results from this study can help managers determine whether river reroute and dam removal have improved biotic conditions in the Carmel River.

Session 5

THE BENEFITS OF HARVESTING RAINWATER

Dennis Evans, Urban Rain Gardens

Urban Rain Gardens water harvesting voucher incentive program evaluates a landscapes return on investment for disadvantaged communities of Merced County. Our watershed academy is for landscape contractors who install, design, maintenance and inspect rainwater catchment systems. The rain garden workshop teach residents of Merced County about water harvesting techniques and how to maintain a rain garden with up to three 55-gallon rain barrels, interpretive signs, an observation well to track infiltration rates. The data from observation wells are used to research the effects on local watersheds.

CURRENT AND FUTURE THERMAL VULNERABILITY IN SIERRA NEVADA STREAMS

Kyle Leathers, University of California Berkeley

As climate change continues to increase air temperature in high-altitude ecosystems, it has become critical to understand the controls and scales of aquatic habitat vulnerability to warming. Here we used a nested array of high-frequency sensors, and advances in time-series models, to examine spatiotemporal variation in thermal vulnerability in a model Sierra Nevada watershed. Stream thermal sensitivity to atmospheric warming fluctuated strongly over the year and peaked in spring and summer—when hot days threaten invertebrate communities most. The reach scale (~50 m) best captured variation in summer thermal regimes. Elevation, discharge, and conductivity were important correlates of summer water temperature across reaches, but upstream water temperature was the paramount driver—supporting that cascading warming occurs downstream in the network. Finally, we used our estimated summer thermal sensitivity and downscaled projections of summer air temperature to forecast end-of-the-century stream warming, when extreme drought years like 2020-2021 become the norm. We found that 25.5% of cold-water habitat may be lost under business-as-usual RCP 8.5 (or 7.9% under mitigated RCP 4.5). This estimated reduction suggests that 27.2% of stream macroinvertebrate biodiversity (11.9% under the mitigated scenario) will be stressed or threatened in what was previously cold water habitat.

UNDER BUDGET: QUANTIFYING RESERVOIR GREENHOUSE GAS EMISSIONS IN PURSUIT OF NET ZERO

Mark Seelos, Valley Water

As public concern over climate change increases, many businesses and government agencies have pledged to achieve carbon neutrality. Most major water management agencies in the San Francisco Bay Area have adopted climate change action plans to achieve net-zero emissions. Reservoirs are potentially significant, but largely unquantified, sources of greenhouse gas emissions. A 2021 study estimated that reservoirs account for about 2% of total global

anthropogenic CO2 equivalents emitted to the atmosphere. Thus, reservoirs may comprise a significant fraction of the carbon budgets of water management agencies. Reservoirs trap organic material and create conditions conducive to the microbial production of carbon dioxide, methane, and nitrous oxide. These gases can be released from reservoirs through diffusive and ebullitive emissions, plant-mediated transport, and turbulent degassing at reservoir outlets. Valley Water partnered with UC Davis to develop methods to quantify greenhouse gas emissions from its ten water storage reservoirs in Santa Clara County. The study aims to characterize the variety of emissions pathways on spatial, seasonal, and diurnal scales. Concurrent characterization of water quality, atmospheric variables, and hydrodynamics helps identify the factors contributing to greenhouse gas emission. Results will be upscaled for incorporation into Valley Water's Climate Change Action Plan in pursuit of net-zero.

HYDROACOUSTIC SENSING OF METHANE STORAGE IN CALIFORNIA RESERVOIRS

Alexander Forrest, University of California - Davis, Tahoe Environmental Research Center, Valley Water

Across all climates, lakes and reservoirs play a role in the generation of greenhouse gases (GHG) is being increasingly acknowledged. This role is particularly important in Mediterranean style climates (e.g. California) where large seasonal water fluctuations drive higher emission rates. Adapting a hydroacoustic technique based on a dual frequency (70/199 kHz) echosounder, five different mesotrophic/eutrophic water storage reservoirs of varying depths and sizes were investigated in Santa Clara County in partnership with Valley Water. This technique allows the identification of areas of increased gas storage on an unprecedented resolution (<10 m). Surface flux rates were also captured every quarter from each reservoir using floating chambers and a portable gas analyzer (LGR-ICOSTM Microportable Gas Analyzer 918) and supported the spatial variability observed with the hydroacoustic survey data products. Key findings include increased seasonal production during summer months and significant off-gassing events during transitions between low and high storage years (e.g. rewetting). Water temperature, dissolved oxygen, and chlorophyll-a concentrations were also measured (using HYDROLAB DS5 sondes) to assess methane drivers. The techniques developed for this subset of California reservoirs show significant potential for synoptic assessment of methane emission which could be used as a broadscale tool in trying to reduce carbon footprint.

Presenter Index

Abdulwahab, Umarfarooq; Utah State University

Umarfarooq Abdulwahab (Farooq) is a Ph.D. Candidate at Utah State University. Originally from Kogi, Nigeria, Farooq is broadly interested in understanding the drivers of biodiversity patterns and developing strategies to optimize biodiversity conservation. He holds a bachelor's degree in Environmental Biology from the University of Maiduguri and a master's degree in Conservation Biology from the University of Jos, where he developed a protocol for habitat assessment using the feeding behavior of birds. For his current research, Farooq is developing a decision support system to protect several imperiled amphibians in California. In his free time, Farooq enjoys birdwatching, coding, and hiking.

Ayers, Jessica R.; Department of Environmental Science, Policy and Management, University of California, Berkeley, Berkeley, CA

My research centers on baseflow and groundwater connection to streams. I am working to understand how changes in baseflow and stream drying affect fish populations and ecological health. Furthermore, I am interested in how climate and land use change have altered the prevalence of intermittent streams, as they are essential habitats that contribute to biodiversity, biogeochemical processes, and water supply.

Courtwright, Jennifer; Utah State University

Jennifer Courtwright is an aquatic ecologist with Utah State University's National Aquatic Monitoring Center. She has been working with the center for about 10 years developing and applying bioassessment indices and working with the Bureau of Land Management to develop a national aquatic monitoring program for BLM streams and rivers. Prior to joining the center Jennifer got her masters in biology focusing on foodwebs in intermittent streams.

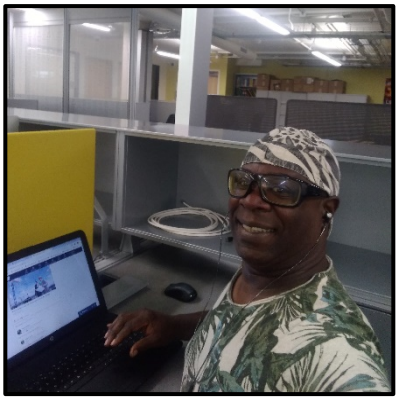
Clatterbuck, Corey; State Water Resources Control Board

Corey Clatterbuck is an Environmental Scientist in the Office of Information Management and Analysis at the State Water Resources Control Board. At the Water Board, Corey plans and advises on data science projects and is the technical lead for the Healthy Watersheds Partnership. Previously, she used skills in open data science to assist statistical analysis and create reproducible workflows for endangered species at the California Department of Fish and Wildlife. Corey was a California Sea Grant State Fellow in 2021 after earning a Ph.D. from the Joint Doctoral Program in Ecology at San Diego State University and the University of California, Davis. Corey views her conservation work as an integral piece of the scientific, social, and political efforts necessary to mitigate climate change for humans and the environment.

Dunn, Ali; State Water Resources Control Board

Ali Dunn is a senior environmental scientist with the California Water Boards and the Surface Water Ambient Monitoring Program. She obtained her degree at California State University, Sacramento in Biological Conservation and has nearly 10 years of experience working in natural resource conservation and watershed management for the state of California.

Evans, Dennis; Urban Rain Gardens



I grew up in Pittsburg, CA, the youngest of 6 boys. For 20 years I worked in operations on many infrastructure projects, learning how to operate mechanical,chemical & natural systems, hydrogeology, permaculture and MS4 among other things. I attended a water harvesting workshop which raised my interest in green stormwater infrastructure projects. After moving to Merced from Dublin, CA, I began going to Merced City Council to try and promote interest in green stormwater infrastructure projects using rock-reed filters to clean water. While in Merced I became a Master Gardener at the UC Master Gardeners Program which shares information to create and raise awareness about green issues. My goal is to host a watershed academy for the community.

Forrest, Alexander; University of California - Davis, Tahoe Environmental Research Center, Valley Water

From the Arctic to the Antarctic, Prof. Alexander Forrest and his research group have been using traditional and emerging technologies to understand how lakes and oceans are being impacted through a changing climate. Graduating from the University of British Columbia (2011), he was previously faculty at the University of Tasmania (Australia) before his current position in the Civil & Environmental Engineering Department at the University of California – Davis where he studies environmental fluid mechanics (the natural flow phenomena affecting water quality). As part of his research, he also plays a key role at the Tahoe Environmental Research Center and is also the leader of the newly formed CITRIS Environmental Robotics Lab @ Tahoe. Bridging science and engineering in this way is essential to address the complex, multidisciplinary environmental issues our society is facing.

Irving, Katie; Southern California Coastal Water Research Project

Dr.rer.nat Katie Irving is a Scientist specializing in the relationship between the distribution of river species and their environment. Her doctoral degree dealt with the role of hydrology in Species' Distribution Models (SDMs) on benthic macroinvertebrates. This work involved developing SDM methodology by creating a hydrologic dataset, optimizing variable selection and testing the performance of existing hydrological datasets. Her current research with SCCWRP focuses on the effects of hydrologic alteration through the development of flow-ecology models, aiming to conserve the health of Californian streams. She received her doctoral degree from Berlin's Liebniz Institute for Freshwater Ecology and Inland Fisheries and Freie Universistaet, her M.S. in freshwater and marine ecology from Queen Mary University of London, and her B.S. in marine biology from the University of Plymouth.

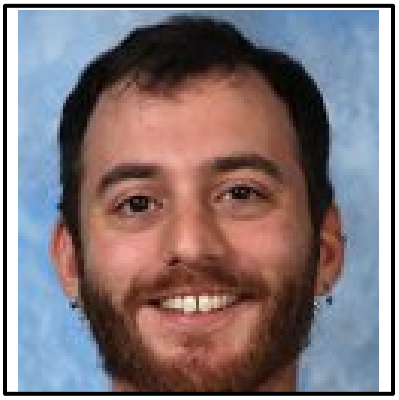
Leathers, Kyle; University of California Berkeley

Kyle Leathers is a Ph.D candidate in Environmental Science, Policy, and Management at UC Berkeley, in the Ruhi Lab. He received his B.S. in Environmental Science from the University of Virginia. His research interests lie in assessing threats and stressors to freshwater ecosystems to better understand, conserve, and restore them. His research at UC Berkeley focuses on the impacts of climate change-induced changes to low flows in Sierra Nevada streams due to early snowmelt. This research includes inspecting alterations to temperature, organism phenology, ecosystem services, and the mechanisms behind observed changes.

Loflen, Chad; California Regional Water Quality Control Board, San Diego

Chad Loflen works as a Senior Environmental Scientist for the State of California Water Quality Control Board San Diego Region. Chad oversees the water quality monitoring, assessment, and research program at the San Diego Regional Board, including the Region's Surface Water Ambient Monitoring Program (SWAMP). Chad is currently the project lead for the San Diego Region on adoption of biological objectives for perennial and intermittent streams.

Mazor, Raphael; Southern California Coastal Water Research Project



Dr. Raphael D. Mazor is a freshwater biologist who specializes in freshwater bioassessment methods using benthic macroinvertebrates and algae. Working at large temporal and spatial scales, he has improved precision, accuracy, and sensitivity of bioassessments using the reference condition approach. In addition, he has studied the population genetics of rare and endangered invertebrates endemic to the vernal pools of California. His current research areas focus on the ecological impacts of hydrologic alteration, particularly in intermittent and ephemeral streams. He received his B.A. in neuroscience and behavior from Columbia University in 1999 and Ph.D. in environmental science, policy, and management from the University of California, Berkeley in 2006. He joined SCCWRP in 2006.

Olson, John; California State University, Monterey Bay

John Olson is a freshwater scientist at California State University Monterey Bay who studies the ecology of streams and rivers and how they influenced by the landscape around them. He examines freshwater ecosystems using a variety of tools like DNA, satellites, and models to better understand how they function. He then applies this knowledge to developing ways to improve the management and health of rivers and streams.

Rastegarpour, Shuka; State Water Resources Control Board

Shuka Rastegarpour is an Environmental Scientist at the State Water Resources Control Board. She received her Bachelor of Science degree in Environmental Studies at California State University, Sacramento. She has 10 years of experience at the State Board collectively working on ocean water quality policy, stormwater permitting, and currently lead coordinator of the Statewide Bioassessment Monitoring Program.

Seelos, Mark; Valley Water

Mark Seelos is an Associate Water Resource Specialist with Valley Water (San Jose, CA). He has a BS in environmental geology from UC Santa Cruz, and a PhD in Environmental Systems from UC Merced. He is a Certified Lake Manager and current President of the California Lake Management Society.

Smith, Jayme; Southern California Coastal Water Research Project

Dr. Jayme Smith is a senior scientist at Southern California Coastal Water Research Project (SCCWRP) who studies the ecology of harmful algal blooms (HABs) in aquatic systems. Dana Shultz is a senior research technician at SCCWRP who specializes in HAB ecological studies. Rich Fadness is an engineering geologist with the North Coast Regional Water Quality Control Board and has extensive experience with benthic cyanobacteria in Northern California. Dr. Emily Duncan is a senior environmental scientist with the Los Angeles Regional Water Quality Control Board and is the regional HAB response liaison. Dr. Susanna Theroux is a senior scientist at SCCWRP who focuses on the development of molecular methods for bioassessment and the study of microbial communities.

Stein, Eric D.; Southern California Coastal Research Project

Dr. Eric Stein is a head of the Biology Department at the Southern California Coastal Water Research Project (SCCWRP). Dr. Stein oversees a variety of projects related to in-stream and coastal water quality, ecohydrology, 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. Dr. Stein has authored over 100 journal articles and 75 technical reports and participates on numerous technical workgroups and committees related to water quality and wetland assessment and management. Prior to joining SCCWRP in 2002, Dr. Stein spent six years as a Senior Project Manager with the Regulatory Branch of the Los Angeles District Corps of Engineers, and four years with a private consulting firm

Theroux, Susanna; Southern California Coastal Research Project

Susie Theroux is an ecologist at SCCWRP, where she works on algal bioassessment and the use of molecular methods in biomonitoring. She is also the lead for the California Molecular Methods Workgroup.

Vasquez-Nicholas, Janelle; California State University Monterey Bay

Janelle Vasquez-Nicholas is a graduate student pursuing a master's degree at California State University Monterey Bay. She is studying benthic macroinvertebrate community composition in rivers undergoing restoration. Janelle's interest in freshwater science began during her early undergraduate studies while working at a nature center in the San Francisco Bay Area. This experience inspired her to pursue a bachelor's degree in Environmental Science and Management with a focus on watershed science at University of California, Davis. After graduating UC Davis, she worked and volunteered in seasonal jobs that led her to pursue a graduate degree. Janelle aspires to become a professional in freshwater ecology and contribute to solving conservation issues in California.

Waters, Tanner; University of California- Los Angeles

Tanner Waters (he/him) is a Ph.D. candidate in the Institute of the Environment and Sustainability at UCLA. His graduate research focuses on using the emerging technique of environmental DNA metabarcoding to assess the impact of coastal restoration and conservation efforts. This work includes partnering with local nonprofits and state agencies to create rich, collaborative research. Specifically, he works with 'The Bay Foundation' investigating the impacts of seagrass restorations on localized biodiversity, 'Heal the Bay' to assess the impact of Los Angeles' Marine Protected Areas on fish richness and abundance, and SCCWRP to create an eDNA tool for detecting invasive species.

Westhouse, Joseph; State Water Resources Control Board & Southern California Coastal Water Research Project

Joseph (Joe) Westhouse has spent the past 11 years working in California Government, four of which as an Environmental Scientist within the State Water Resources Control Board's Division of Water Quality. Joe's educational background in environmental science and biology is complimented by his experience in government, making him well-suited for the scientific and regulatory rigor that comes with developing water quality standards. His primary focus is currently on developing the Biostimulation, Cyanotoxins, and Biological Condition Provisions (Provisions) which will establish statewide water quality objectives and a program of implementation for nutrients, other biostimulatory substances, and cyanotoxins. The objectives will also formalize bioassessment methods, indices, and targets to protect biological integrity in wadeable streams. Central to Joe's heart is his altruistic nature, compassion for people, and understanding that environmental protection and justice are the only true ways to sustainability. Those characteristics driving him, he spent a semester investigating the climate change-related hardships developing nations are facing and will continue to face moving forward, from which he based his thesis on theorizing the seven critical drivers for climate change adaptability in developing countries.