Presentation Abstracts and Presenter Index

Tuesday, October 13, 2020

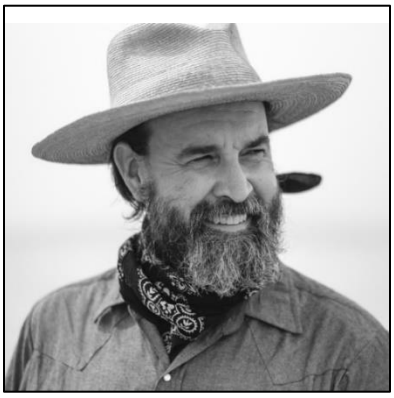
Welcome

Ali Dunn, Surface Water Ambient Monitoring Program Unit Chief and
Nick Macias, President, Society for Freshwater Sciences, California Chapter

Keynote Speech

Through the Bottleneck: The Ecology of California's Future

Obi Kaufmann



Obi Kaufmann, best-selling author of THE CALIFORNIA FIELD ATLAS and THE STATE OF WATER— Understanding California's most precious resource, brings his work to the California Aquatic Bioassessment Workgroup and California Chapter Society for Freshwater Sciences Annual Meeting on Tuesday, October 13th, 2020, for a presentation that includes his new book THE FORESTS OF CALIFORNIA. In his artful yet analytical thesis, the transformation of California's resource landscape, an unceasing, monumental effort that extends back over the past 170 years will be matched in its comprehensive totality only by the further transformation of that same landscape over the next 170 years. What will California look like governed by a post-carbon economy? What are the variables at play when thinking about our continued human residency into the future and how will our relationship to the natural world evolve with the advent of climate breakdown in the emerging era of megafire, among the myriad other factors that are currently affecting our cultural and biological bottleneck? Obi's at-once practical and yet hopeful, solution-based message is based on realistic applications of ecological theories and historical predictions and offers a welcome antidote to the despair offered so often by both the contemporary media and our current, political environment. Obi will be addressing the profound changes that California's living landscape has undergone and continues to go through and what that means for biodiversity and humanity. Perhaps more importantly, Obi's ideas of multidisciplinary ecology, restoration theory, and geographic literacy point to a new era of conservation, one that we can usher in together.

Presentation Abstracts

Session 1 Panel: Incorporating Temporary Streams into Monitoring and Management: The UK Experience

Moderator: Raphael Mazor, Southern California Coastal Water Research Project

AN INTRODUCTION TO COLLABORATIVE TEMPORARY STREAM RESEARCH IN THE UK

Rachel Stubbington

The Dynamic Streams Research Group, based at Nottingham Trent University in the UK, comprises academic researchers who actively collaborate with ecosystem managers at regulatory agencies – in particular the Environment Agency – on projects that support aquatic–terrestrial biodiversity within healthy temporary streams. In this short talk, leader Rachel Stubbington will provide a brief overview of the group's recent progress and future priorities, to set the scene for subsequent presentations by doctoral researchers Chloe Hayes and Kieran Gething and collaborators Judy England and Tim Sykes.

TERRESTRIAL INVERTEBRATES AS BIOMONITORS IN 'WINTERBOURNE' STREAMS

Rachel Stubbington

Temporary streams that shift between wet and dry states include the 'winterbourne' chalk streams of south England. Our understanding of winterbourne biodiversity is biased towards aquatic invertebrate communities, and their terrestrial counterparts remain all but unknown. We surveyed terrestrial invertebrate communities in winterbourne reaches of the Candover Brook, comparing the richness, composition and conservation value of communities sampled with different methods (pitfall, ground search) in different seasons (summer, autumn), and at sites that had been dry for different durations (2 weeks, >1 year, > 3 years). We identified some groups (e.g. beetles) to species level, whereas others (e.g. springtails) were left at the group level. We recorded 138 taxa, which our mixed identification level makes an underestimate of species-level biodiversity, not least because springtails were most abundant (33%). Beetles were most biodiverse (~100 taxa), in particular the ground beetles (Carabidae), for which 45 taxa included 4 nationally rare or scarce species. Carabids have diverse environmental preferences and they therefore have particular potential within biomonitoring programmes developed to assess ecological quality during dry phases. We recommend sampling in two seasons using two methods to maximize biodiversity estimates, with 7–d pitfall trapping in summer being an effective single method.

ENGLISH TEMPORARY STREAMS AND WHY WE ARE INTERESTED IN THEM

Judy England

Temporary rivers (also known as Intermittent Rivers and Ephemeral Streams) naturally shift between flowing, pool and dry states, creating mosaics of wet and dry habitats that change in space and time. These dynamic ecosystems are common in England's cool and wet climate. They take many forms, such as headwater streams that trickle and cut through peat uplands, limestone rivers in the dales of the White Peak and winterbournes (seasonal streams that only flow in winter) crossing chalk downlands. We need to better understand our temporary rivers so we can manage these valuable ecosystems more effectively. We need to know where they are, where intermittence is natural, and where it reflects water resource pressures. We also need to learn to distinguish between ecological responses to natural intermittence, an environmental stressor, and to other pressures, such as physical modification, diffuse pollution and over-abstraction.

CHALK STREAM WINTERBOURNES - A CASE STUDY

Tim Sykes

Chalk winterbournes are not exempt from anthropogenic pressures common to most rivers. The Candover Brook is a case in point. Located in the headwaters of the River Itchen, in Hampshire, central southern England, the Candover Brook is a 12km chalk stream, of which the upper 6.5km is naturally intermittent. The perennial chalk stream reach is highly valued and protected for its landscape, rich biodiversity and angling opportunities. In contrast, the temporary reach is managed and valued very differently - physical modification, diffuse pollution, groundwater abstraction and neglect are major risks. Locally, management is not strategic, evidently driven mainly by riparian owners' perceived flood risks. Apart from ecologists, there is little evidence that people interact with or value the winterbourne. Yet the temporary winterbourne feeds into and impacts the highly valued perennial reach. Measures to protect, enhance and monitor the chalk stream could be applied to the temporary reach, and vice versa, in a strategic catchment-based approach. Why isn't it?

PUBLIC PERCEPTIONS OF DRY TEMPORARY STREAMS

Tim Sykes

Winterbournes are etched into our cultural heritage in place names such as Otterbourne, Lambourn, King's Somborne and Winterbourne Abbas which dot the rolling chalk landscape of south England. The headwaters of iconic chalk streams, winterbourne flows are naturally intermittent in time and space as groundwater levels naturally pulse. In their flowing phase, winterbournes resemble perennial chalk streams in their aesthetic beauty, and may similarly enhance wellbeing and inspire awe. However, in their natural pooling and dry phases, they are sometimes (mis-)interpreted as being damaged or degraded chalk streams, the assumption being that they should be perennial. Even those who understand the natural cycle of dry winterbournes have described them as appearing incomplete - literally missing the water, but does society also value them less, or perceive cultural ecosystem services foregone? This is complicated because many perennial chalk streams are artificially dry too, due to anthropogenic impacts, hence the landscape has both naturally temporary and unnaturally dry chalk streams. What does society make of this? What cultural ecosystem services do people perceive they

derive from temporary winterbournes and do these ebb and flow in response to the natural cycle of flowing/pooling/dry phases?

DRY-PHASE PLANT COMMUNITY RESPONSES TO HUMAN IMPACTS IN COOL, WET TEMPORARY STREAMS

Chloe Hayes

Temporary streams are expanding in spatial extent and drying duration even in cool, wet regions. Although efforts are being made to improve their biomonitoring, dry phases and their terrestrial inhabitants typically remain overlooked – despite their high potential to distinguish between sites experiencing different impacts. I investigated how dry-phase plant communities including aquatic and terrestrial species respond to changing habitat conditions in 'winterbourne' English streams. Over eight months, I characterized in-channel, bank and bank-top communities at 14 sites across four streams. Sites varied in their morphology, land use, shade, sediment composition, sediment moisture content, nutrient concentrations and poaching. As streams were drying, moisture was the main influence on plant communities, with aquatic macrophytes persisting longer at sites with shorter dry-phase durations, thereby reducing the occurrence of colonizing terrestrial species. From late spring to early autumn, sites and dominated by fine sediments and with grazed agricultural land or recreational grassland supported communities with low species richness but high abundances of competitive generalists. In contrast, sites with more heterogeneous sediments and more natural land uses (e.g. woodland) supported diverse aquatic-terrestrial communities. My results will inform the development of effective methods to assess the ecological quality of temporary streams during dry phases.

IDENTIFYING SITES OF HIGH TERRESTRIAL INVERTEBRATE RICHNESS AND RARITY FROM SIMPLE HABITAT SURVEYS

Kieran Gething

Monitoring terrestrial invertebrates is key to understanding temporary stream diversity but can be time-consuming, limiting the number of surveys which can be done. However, an effective process to identify priority sites for biomonitoring remains undefined. To identify sites of ecological interest, we attempted to predict sites of high conservation value (characterized using the richness and rarity of sampled invertebrate assemblages) using citizen-science habitat survey data. We used a dataset of 91 terrestrial beetle samples collected from exposed riverine sediments adjacent to UK perennial rivers. Beetles were selected as test organisms because published evidence suggests they are a diverse group with a broad range of environmental preferences, making them good indicators of habitat conditions. We used indices calculated using data from 'MoRPh', a standardized citizen science method, to characterize habitat conditions. Predicted site-specific richness and assemblage rarity scores were significantly correlated with the actual values recorded by biomonitoring. This implies that sites warranting investment of biomonitoring resources may be identified by a fast, simple habitat survey. Following further research to better characterize habitat-species relationships, collaboration with river managers will facilitate the testing and application of our findings to monitor temporary stream communities.

Session 2

Moderator: Peter Ode, California Department of Fish and Wildlife

A CONCEPTUAL FRAMEWORK AND SAMPLING METHODOLOGY FOR BIOASSESSMENT IN EELGRASS (ZOSTERA MARINA) BEDS IN CALIFORNIA'S ESTUARIES

David Gillett and Kenneth McCune

Submerged aquatic vegetation (SAV) is a conspicuous, ecologically important feature of the coastal zone. However, it is also a habitat for which we lack a standardized bioassessment framework. In collaboration with the San Diego Regional Waterboard and SAV experts from management and academic sectors, we have developed a three-tiered framework for assessing the extent, health, and functioning of SAV. Though developed to be applicable to all species of SAV, we have started focusing on methods and indicators applicable to eelgrass (Zostera marina). With our expert panel, a series of key ecological functions were identified, as well as the best structural indicators to inform the assessment of those functions. A pilot study was then conducted to determine the practicality of applying those methods in a monitoring context and to refine them for application in estuaries. Data were collected from a series of beds along a nominal stressor gradient in multiple seasons and in two embayments. Inter-bed patterns were consistent among seasons, but the largest magnitude of all measurements was observed in the winter. Based on this work, we have created an initial SOP for working in eelgrass beds, which we are now beginning to apply in estuaries across the state.

A REGIONAL ASSESSMENT OF TRENDS IN STREAM CONDITION IN SOUTHERN CALIFORNIA

Raphael Mazor

The Stormwater Monitoring Coalition (SMC) has been evaluating the condition of streams in Southern California since 2009 and began revisiting nearly 200 previously sampled probabilistic sites in 2014 (60 of which were sampled 3 or more times). California Stream Condition Index (CSCI) scores at many (35%) streams were stable, varying less than 0.22 points over time. However, significant changes ($p<0.1$) were detected at a small number of sites. Improvements were detected at 4 sites, while significant decreases were observed at 3. Scores were too variable to classify at 45% of sites, suggesting that long-term sampling may be required. This approach to assessing trends provides greater insight into changes in regional condition by showing how site-specific changes contribute to overall stability.

RESTORATION AND PROTECTION PRIORITIZATION TOOL FOR SOUTHERN CALIFORNIA STREAMS

Jerry Diamond

The City of San Diego developed a Restoration and Protection Prioritization (RPP) Tool to help identify stream segments where restoration or protection activities are likely to provide significant improvements in ecological condition. The RPP Tool incorporates stressor information, predictive assessments of biological condition, and the latest science on recovery potential to identify high priority sites for restoration or protection. Stressor information is provided by the Causal Assessment Screening

Tool (CASTool) that was developed by the City and is summarized as a score of stressor intensity, which is added to a recovery potential score and the Biological Condition Gradient (BCG) level to calculate an overall score for Potential for ecological uplift at a site. Biological potential is determined using either actual biological data for a site or using modeled data based on the statewide CSCI. The RPP Tool also incorporates a score for potential Threats, using future land use changes, and a score for Opportunities, which includes potential co-benefits and user considerations. The user can weight the various input factors to provide flexibility and support specific objectives. The RPP Tool currently includes the Southern California Stormwater Monitoring Coalition (SMC) region and can be extended to support other regions of the state.

Wednesday October 14, 2020

Session 3 Panel: Environmental DNA approaches for biodiversity and species monitoring

Moderator: Suzie Theroux, Southern California Coastal Water Research Project

ADVANCING EDNA TOOLS FOR BIOASSESSMENT APPLICATIONS

Suzie Theroux

Advancing eDNA tools for bioassessment applications: The use of environmental DNA (eDNA) has the potential to revolutionize the way we perform biomonitoring. However, there are key gaps in our understanding of the fate and propagation of eDNA in the environment that are limiting the routine use of eDNA-based tools. California is now investing in the development of DNA-based approaches for invasive and endangered species monitoring as well as complex community-level surveys. This presentation will review a series of pilot studies that are focused on better understanding the persistence of eDNA in the wild, including comparisons of eDNA propagation in urbanized versus natural stream systems and a study comparing eDNA-based species detections with traditional observations. Together, the results of these studies will help inform our interpretations of eDNA signals and advance the development of eDNA tools for routine monitoring applications.

USING ENCLOSURE EXPERIMENTS TO INFORM EDNA INTERPRETATION IN THE SAN FRANCISCO ESTUARY

Ann Holmes

Environmental DNA (eDNA) is an emerging tool for biomonitoring but best practices for interpreting eDNA detections are still developing. The heterogeneous nature of estuaries presents a challenge for eDNA monitoring, particularly when target species are rare. Enclosure studies reveal how environmental conditions affect eDNA detection and can guide best practices. Here we describe results of an enclosure experiment with endangered delta smelt (Hypomesus transpacificus) in a tidal, freshwater region of the San Francisco Estuary. Our results characterize how distance, tide direction, and site characteristics

influence eDNA detection. Detection was most consistent at distances less than 10m from the enclosures. On a flood tide, positive detections were more frequent upstream from the enclosures. On an ebb tide, positive detections were more frequent downstream from the enclosures. We saw some variation in eDNA detection rates between the two sites, perhaps due to shore morphology and differences in vessel traffic. The estimated eDNA concentration of all samples was below the Limit of Quantification (LOQ), suggesting that in this system eDNA is best suited for determining presence/absence only. This work helps to establish capabilities and limitations for eDNA monitoring of delta smelt and may inform eDNA detection of other rare estuarine species.

CDFW'S FIRST IN-HOUSE EDNA PROJECTS: RECENT SUCCESS IN AIDING REINTRODUCTION OF A LISTED TROUT AND FUTURE DIRECTIONS WITH NATIVE FISHES

Kristen Ahrens

The California Department of Fish and Wildlife (CDFW) has recently applied environmental DNA (eDNA) methods to address conservation and management issues in fisheries and to conduct applied research. CDFW is using eDNA to support recovery and reintroduction efforts for listed native fishes and is embarking on new research to determine efficacy of using eDNA methodology to assess the distributional status of native fishes in a fish assemblage for which recent information is lacking. This presentation illustrates two eDNA applications CDFW is utilizing to support its fisheries programs. The first completed project involved monitoring for non-native trout in the Silver King Creek drainage to support reintroduction of listed Paiute Cutthroat Trout. This application was used in parallel with field sampling to determine if eradication of non-native species was successful and included the use of quantitative PCR (qPCR) assays to assess non-native trout presence. Recently funded research will also support a study to assess efficacy of using eDNA to determine presence of fishes in the Lahontan fish assemblage using qPCR assays. Outcomes of this study include direct comparison of eDNA data and electrofishing data and will determine feasibility of eDNA methods for range-wide use and ongoing monitoring and management.

A BIODIVERSITY COMPOSITION MAP OF CALIFORNIA DERIVED FROM ENVIRONMENTAL DNA METABARCODING AND EARTH OBSERVATION

Meixi Lin

California's ecosystems are under threat from ongoing anthropogenic environmental change. Effective conservation management requires more thorough biodiversity surveys that can reveal system-level patterns and that can be applied rapidly across space and time. Taking advantages of modern ecological models, we integrate environmental DNA and Earth observations to evaluate regional biodiversity patterns for a snapshot of time, and provide critical community-level characterization. As part of the CALeDNA efforts, we collected 278 samples in spring 2017 from coastal, shrub and lowland forest sites in California. 16,118 taxonomic entries recovered were associated with environmental variables to test their predictive strength on alpha, beta, and zeta diversity. Local habitat classification was diagnostic of community composition, representing a characteristic of biodiversity hotspots. With gradient forest models, environmental variables predicted 35% of the variance in eDNA patterns at the family level, with elevation, sand percentage, and greenness (NDVI32) as the top predictors. We also found a positive

relationship between environmentally predicted families and their numbers of biotic interactions. Our study provides the first example of integrating citizen science based eDNA with biodiversity mapping, with promises to produce large scale, high resolution assessments that promote a more comprehensive understanding of the factors that influence biodiversity.

JONAH VENTURES: KNOWLEDGE IN SEQUENCE

Nicole Witzel and Peter Houpt

Jonah Ventures, founded in 2013 by two ecologists, helps other scientists answer ecological questions by sequencing environmental DNA (eDNA). Although initially focusing on reconstructing animal diets, Jonah Ventures has expanded to use quantitative PCR and next-generation sequencing with aquatic eDNA. For both citizen and professional scientists, we provide simple, pre-assembled kits to sample water. Users then collect meta-data on a phone app, send the sample to our lab where it is processed, and data are returned via an online data portal. Assays include source-tracking fecal bacteria, detecting the presence of individual aquatic species such as non-native species, and quantifying aquatic assemblages.

Bioassessment is the next big challenge. Using Next Generation Sequencing, we can determine the presence or relative abundance of different species of phytoplankton, macroinvertebrates, mussels and fish in a water body. Once these data are compiled, it is a small step to score each species as indicators of environmental conditions such as eutrophication, and then calculate integrated environmental conditions. Before eDNA-based bioassessment is routine, work is needed to improve sequence reference libraries, score taxa relative to environmental conditions, and calculate eDNA-based bioassessment indices relative to reference conditions.

Session 4

Moderator: John Olson, California State University, Monterey Bay

SURFACE WATER AMBIENT MONITORING PROGRAM (SWAMP) BIOASSESSMENT PROGRAM: PREVIEW OF STATEWIDE CONDITIONS OF PERENNIAL STREAMS & SNAPSHOT OF CURRENT PROGRAM EFFORTS

Ali Dunn

This presentation will cover the SWAMP Bioassessment Program's current efforts as well as a preview of the Perennial Streams Assessment (PSA) Report. Data from the PSA and five other probabilistic stream surveys were integrated to produce a statewide stream condition assessment (status and trends) for the 11-year time period 2008-2018. This is the first updated statewide assessment since 2015. A snapshot overview of statewide results as well as key program recommendations will be presented.

PREDICTING GEOGRAPHIC DISTRIBUTIONS OF FISHES IN REMOTE STREAM NETWORKS USING MAXIMUM ENTROPY MODELING AND LANDSCAPE CHARACTERIZATIONS

Anna Holder, Arev Markarian, Jessie M. Doyle, and John R. Olson

The Bureau of Land Management (BLM) manages the National Petroleum Reserve - Alaska on the remote North Slope but has limited data on fish distributions on which to base leasing and management decisions. To address this, we used environmental DNA, traditional sampling, watershed landscape characterizations, and maximum entropy modeling to develop species distribution models (SDMs) for 19 fish species. The difficulty of characterizing up stream environments for every stream-reach has limited the development of SDMs for riverine taxa to using either only local conditions or a small subset of potential watersheds. We apply a new technique (StreamCat) to characterize the background variation in watershed conditions. We also assessed how including temporal variation in addition to spatial variation and how adjusting the parameters that controlled model parsimony would affect model performance. The best models (mean TSS = 0.87 across all 19 taxa) used only static data, regularization parameters between 1.0 (default) and 2.0 (slightly more parsimonious), and watershed background data. Important predictors in these models included temperature, slope, and land cover. Approaches like this have great potential for providing critically needed data in rapidly developing but data-poor regions like the North Slope of Alaska.

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

Jeff 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 20 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.

Session 5

Moderator: Keith Bouma-Gregson, State Water Resources Control Board

HYPOLIMNETIC OXYGENATION TO CONTROL MERCURY BIOACCUMULATION IN LAKES: TWO CASE STUDIES

Mark Beutel and Marc Seelos

With the ubiquitous presence of mercury in California waterbodies, and the ability for low levels of mercury in sediment and water to accumulate to high levels in aquatic biota, implementing management strategies to minimize mercury bioaccumulation is a huge challenge. This presentation will discuss two case studies that tracked the effects of hypolimnetic oxygenation, the addition of pure oxygen gas to enhance dissolved oxygen levels in bottom waters of reservoirs, on mercury uptake into biota. The simple working hypothesis is that maintenance of elevated oxygen levels in the profundal zone will repress the production of toxic methylmercury by anaerobic bacteria. The first case study is Twin Lakes, two low-mercury, mesotrophic natural lakes in eastern Washington state. The study showed that during years with high oxygen addition, mercury levels were lower in lake biota. But overall, zooplankton mercury was higher in the oxygenated lake compared to the reference lake. The second case study includes five mercury-contaminated reservoirs in the Santa Clara Valley that are oxygenated with the aim of lowering mercury uptake into fish. An assessment of year-to-year trends of mercury in fish suggest that oxygenation has lowered fish mercury levels in some of the reservoirs.

STATISTICALLY MODELING 28 YEARS OF PERIPHYTON BLOOMS IN AN OLIGOTROPHIC LAKE

Karen Atkins

The amount of periphyton at a specific location is dependent on physical, chemical, and ecological functions making it particularly challenging to predict. Researchers have monitored periphyton blooms in Lake Tahoe, USA, since 1982. Here, our objective is to identify long term periphyton trends and to link these trends to lake conditions using statistical methods, including Bayesian modeling. First, we analyze spatial and temporal patterns of periphyton at sampling stations around the lake. The results of Mann-Kendall tests show that on a lake-wide, spatially-averaged basis, ash-free dry mass decreased over time while Chlorophyll-a rates remained within the same range. However, looking at sites individually, periphyton levels increased at some sites and decreased at others. To further characterize processes responsible for periphyton growth we implement a Bayesian hierarchical modeling strategy. Through this method, we create multiple layers of conditional models to address spatial and temporal influences on periphyton. We input measured meteorological, nutrient, and sloughing data to clarify their relative influence on the spatial distribution of periphyton biomass. The output of this model has the ability to focus research efforts and potential management actions on periphyton blooms.

MANAGING THE NITROGEN TO PHOSPHORUS (N:P) RATIO FOR IMPROVED AQUATIC ECOSYSTEM FUNCTION

Byran Fuhrmann

Anthropogenic activity has led to increased nutrient loading into aquatic ecosystems such as lakes and reservoirs, often resulting in harmful algal blooms (HABs). Phosphorus loading in particular has led to the occurrence of cyanobacteria-rich HABs which can release toxins and limit beneficial uses.

Cyanobacteria are also less likely to be consumed by zooplankton, leading to a reduction in the effective trophic transfer of nutrients into the food web. Recent evidence has supported the idea that increasing the nitrogen to phosphorus (N:P) ratio can favor beneficial algal assemblages by reducing the advantage of nitrogen fixation, a trait common among cyanobacteria. This talk will cover case studies involving nitrate addition and phosphorus reduction resulting from the application of Phoslock®. Nitrate addition has been used to increase the N:P ratio by increasing the amount of bioavailable nitrogen and may have additional aquatic ecosystem benefits such as enhancing the sediment redox potential under oxygen limited conditions. Phoslock has been used to permanently sequester labile phosphate, also increasing the N:P ratio by decreasing the bioavailable phosphorus. The application of Phoslock has restored many eutrophic and hypereutrophic systems. This presentation will provide insight into these novel management strategies for waterbodies which suffer from eutrophication.

Presenter Index

Ahrens, Kristen; California Department of Fish and Wildlife

Kristen is a Research Scientist with the California Department of Fish and Wildlife. She has a background in population genetics research and biological consulting and is currently a part-time lecturer in the Biology Department at Sacramento State. Her current work is focused on use of environmental DNA for fisheries monitoring and management, as well as population genetics of Golden Trout.

Atkins, Karen; University California, Davis

Karen Atkins is interested in understanding how biological, chemical, and physical factors affect aquatic ecosystems. As a Ph.D. candidate at the University of California, Davis she is working to understand what factors contribute to benthic algae blooms in pristine oligotrophic lake habitats. Most recently she is using 28 years of field data from Lake Tahoe and statistical modeling techniques to identify the environmental conditions that control periphytic algae biomass. Understanding Lake Tahoe's unprecedented dataset will shed light on trends of increased benthic algae blooms in lakes globally.

Beutel, Marc; University California, Merced

Marc Beutel is a professor of Civil and Environmental Engineering at UC Merced. His work focuses on sustainable control of dilute pollutants in the environment, including the effects of bottom-water oxygen addition on mercury cycling and bioaccumulation in lakes and reservoirs.

Diamond, Jerry; Tetra Tech, Inc.

Dr. Jerry Diamond has been working with the City of San Diego on sediment quality issues, bacteria recreational water quality criteria, biological objectives, and most recently, web-based analytical tools for screening causes of biological impairment and for supporting restoration and protection priorities.

Doyle, Jessie; Desert Research Institute and Department of Applied Environmental Science, California State University, Monterey Bay

Jessie Doyle, M.S., received her degree at California State University, Monterey Bay in Applied Marine and Watershed Science. Her previous work experience with the Desert Research Institute has helped her develop into a research professional focused in the field of geospatial analysis and environmental science. Currently, she is working as an ORISE Fellow in the care of the USEPA Pacific Ecological System Division.

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 Unit Chief. She obtained her degree at California State University, Sacramento in Biological Conservation and has nearly 9 years of experience working in natural resource conservation and watershed management for the state of California.

England, Judy; Environment Agency, Freshwater Biological Association and Queen Mary University of London

Judy is a national research scientist for the Environment Agency. As an applied researcher Judy works with many academics to address real-world issues and to distil research into application. Recently this has included a focus on intermittent rivers and ephemeral streams. These dynamic ecosystems transition between wet and dry states are expected to increase with climate change. Working in collaboration existing extensive data sets are being used to explore long-term patterns across spatial scales and develop novel tools and techniques to assess the quality of these systems.

Fuhrmann, Byran; SePRO Corporation and University of California, Merced

Byran is an aquatic technology development scientist at SePRO corporation working out of Sacramento and he is the Northern California director of the California Lake Management Society (CALMS). He received his PhD in Environmental Systems from UC Merced where he studied redox and oxygen control on water quality in California reservoirs. He also holds a BS in Chemistry, an MBA and an MS in Environmental Engineering Sciences. He has previously worked as an instructor for an environmental engineering course on water quality and as the quality assurance manager at an environmental laboratory.

Gething, Keiran; Nottingham Trent University, UK

Kieran Gething is a PhD researcher at Nottingham Trent University, UK. His research interests include the terrestrial and aquatic invertebrate fauna of temporary streams, and techniques which may facilitate their incorporation into regulatory biomonitoring programmes. In particular, Kieran is analysing the relationships between terrestrial invertebrates and physical habitat characteristics, to identify sites with the potential to support communities of high ecological quality.

Gillett, David; Southern California Coastal Water Research Project

David Gillett is a senior ecologist who specializes in studying the influence of anthropogenic disturbances and habitat quality on the structure and functioning of marine, estuarine, and freshwater benthic communities. His research focuses on the development of biologically-based methods for habitat quality assessment using both traditional and molecular-based tools. He is leading efforts to develop condition assessment indices for coastal habitats in California and across the country from the seagrasses of estuaries to the soft sediments of the continental slope.

Hayes, Chloe; Nottingham Trent University, UK

Chloe Hayes is a PhD researcher at Nottingham Trent University, UK. Her research focuses on the aquatic–terrestrial plant communities that inhabit the summer-dry channels of temporary chalk streams in southern England. Chloe's work is characterizing these communities and their responses to environmental variables indicative of human activities, and she is collaborating with river managers to ensure her findings are used to improve temporary stream biomonitoring.

Holder, Anna; Desert Research Institute, California State University, Monterey Bay, and State Water Resources Control Board

Anna Holder is an Environmental Scientist in the Office of Information Management and Analysis at the State Water Resources Control Board. She is the Program Coordinator for the Surface Water Ambient Monitoring Program's Bioaccumulation Monitoring Program and Technical Lead for the Healthy Watersheds Partnership. Anna is also a Statistical Modeler for the Desert Research Institute and obtained her M.S. and B.S. from CSU Monterey Bay in Applied Marine and Watershed Science. Regardless of role, Anna uses data science, ecology, and science communication to contribute to and inform the sustainable management of natural resources.

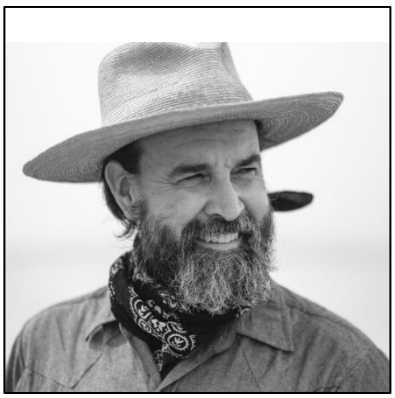
Holmes, Ann; University of California, Davis

Ann Holmes is a PhD candidate in Ecology at the University of California, Davis. She has an MS in Biology from San Francisco State University and a BA in Biology from Cornell University. She studies aquatic organisms and trophic interactions using genetic methods. Her dissertation research in the Genomic Variation Laboratory focuses on environmental DNA (eDNA) detection of fish in estuaries. There are few published studies using eDNA in estuaries despite their ecological and socio-economic value. She is interested in using genetics to inform conservation and management.

Houpt, Peter; State Water Resources Control Board

Peter Houpt has been with SWAMP for the past 3 years. He is a recent graduate of Oregon State University's College of Forestry. He earned his BS in Natural Resources, specializing in Landscape Analysis.

Kaufmann, Obi; Keynote Speaker



For Poet, painter, and naturalist Obi Kaufmann, California is a magic network of living systems that connect in a grand, quilted array of ecology and beauty. The California Field Atlas, (Heyday, 2017) his first book, a comprehensive tour of California's natural world that balances science with Kaufmann's signature, data-driven art and illustration topped the San Francisco Chronicle Bestseller list for over three months and was the recipient of many awards including the 2018 Gold Medal from the San Francisco Commonwealth Club for Significant Contribution to Publishing and the 2018 NCIBA Book of the Year. Continuing what he says, is the "investigation into the infinite creativity behind the world's most beautiful place," Kaufmann is producing what will be a six-volume series. Each of the five books to follow the Atlas will focus on one aspect of California's natural world, including Water, Forests, Coasts, Deserts, and Fire. The second in the series, another bestseller, The State of Water, Understanding California's Most Precious Resource, is available from HEYDAY books. The third in the series, The Forests of California, debuted as a number one bestseller in the Fall of 2020 and was praised by the Los Angeles Times as a "timely and important call to action."

An avid conservationist, Obi Kaufmann regularly travels around the state, speaking on issues of ecological restoration and preservation to such groups as the Klamath-Siskiyou Wildland center, the Mojave Desert Land Trust, The Audubon Society, The California Native Plant Society, The Anza Borrego Foundation, The Mono Lake Committee, Sonoma Land Trust, the Peninsula Open Space Trust, and Friends of the River in Coloma. A life-long resident of California, Obi Kaufmann makes his home base in Oakland and is currently working on Field Atlases to come.
The California Field Atlas is published by heydaybooks.com. Obi Kaufmann posts daily work on Instagram @coyotethunder and publishes essays at www.coyoteandthunder.com

Lauder, Jeff; University of California Merced and Sierra Streams Institute, Sierra Streams Institute

Jeff 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.

Lin, Meixi; Department of Ecology and Evolutionary Biology, University of California, Los Angeles

Meixi is a PhD student in the Wayne Lab (EEB, UCLA) since 2017. She is interested in applying non-invasive genetics tools to conservation biology. She has been studying applications of “environmental DNA” as part of the CALeDNA team. For her dissertation research, she analyzed the macro-ecological pattern recovered from eDNA signals across the state of California and the community-environment interactions. She explored the possibilities of using a capture-array technique to enrich mammalian DNA in surface soil extracts.

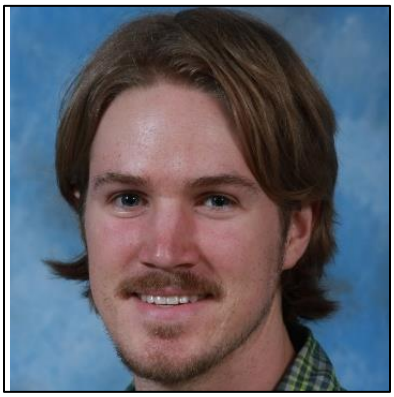
Markarian, Arev; Desert Research Institute, Department of Applied Environmental Science, California State University, Monterey Bay

Arev obtained her Master's in Applied Marine and Watershed Sciences in May of 2019 where she first started contributing to the System for Mapping and Predicting Species of Concern project in the Watershed Environments and Ecology lab at CSU Monterey Bay. She has since been a part of and has managed consultation projects at NASA Ames for various watersheds throughout the Pacific Islands. Arev has more recently joined the GIS team at the Global Security Communication Center under The Walt Disney Company, and is continuously discovering new ways of contributing her background in spatial analysis to the betterment of her community.

Mazor, Raphael; Southern California Coastal Water Research Project

Raphael Mazor is a Principle Scientist with the Southern California Coastal Water Research Project. Since 2008, he has helped coordinate the stream bioassessment program for the Stormwater Monitoring Coalition. He obtained his Ph.D. from Dr. Vince Resh at UC Berkeley in 2006, focusing on temporal and spatial variability in benthic macroinvertebrate data. His current research focus is on assessing the impacts of hydrologic change in intermittent and ephemeral streams.

McCune, Kenny; Southern California Coastal Water Research Project and California State University, Long Beach



Kenny McCune is a Research Technician at SCCWRP and primarily works on management and analysis of data used for the development of monitoring programs. He also has experience modeling and assessing freshwater and marine environments. As part of his M.S. thesis research at California State University Long Beach and his work at SCCWRP, he is developing and testing methods for monitoring submerged aquatic vegetation. Kenny grew-up in Southern California and spent his time as an undergraduate (California State University Fullerton) researcher in the rocky intertidal. In his free time, Kenny enjoys visiting tide pools with family and scuba diving.

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 are 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.

Seelos, Mark; Valley Water

Mark Seelos is an Associate Water Resources Specialist with Valley Water (San Jose, CA). He has a BS in environmental geology from UC Santa Cruz and is currently pursuing a Ph.D. in environmental systems at UC Merced. He is a certified lake manager and serves on the executive board of the California Lake Management Society.

Stubbington, Rachel; Nottingham Trent University, UK

Rachel Stubbington is a freshwater ecologist based at Nottingham Trent University, UK. She leads the Dynamic Streams Research Group, whose research explores rivers that dry in cool, wet regions. She views these temporary streams as aquatic–terrestrial ecosystems and is particularly interested in better characterizing the terrestrial biodiversity streams support during dry phases. Rachel collaborates with industry partners to ensure that her team's scientific advances inform real-world improvements to ecosystem management. She led the Community Ecology and Biomonitoring Working Group in the European Science and Management of Intermittent Rivers and Ephemeral Streams network from 2016 to 2020.

Sykes, Tim, University of Southampton, UK

Tim Sykes (@RiversandPeople) is a part-time PhD researcher at the University of Southampton, UK. Through the lens of cultural ecosystem services and nature's contribution to people, Tim is investigating our relationship with chalk stream headwaters - winterbournes - in their natural dry, pooling & flowing phases, and chalk aquifers. Tim is especially interested in contributions to well-being, life satisfaction, sense of place, ecosystem dis-services, solastalgia/ecological grief related to environmental condition; and geocognition; relational and intrinsic values. Tim also works for the UK Environment Agency, leading a team integrating nature conservation management, ecosystem restoration, and fisheries enforcement.

Theroux, Susie; 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.

Witzel, Nicole; Jonah Ventures

Nicole attended the University of Wisconsin-River Falls and the University of Wisconsin-Steven's Point, where she received majors in Conservation, Field Biology, and Wildlife Ecology. She completed her Masters at Tennessee State University, creating a protocol for detecting and quantifying the Streamside Salamander (Ambystoma barbouri) in Tennessee using environmental DNA. Nicole started working for the eDNA-based company, Jonah Ventures, in October of 2019 as a Research Associate. She works in the Jonah Ventures lab and teaches people about the many applications of eDNA as an efficient, cost-effective option for source-tracking, invasive species monitoring, bioassessments, diet reconstruction, and learning about aquatic assemblages.