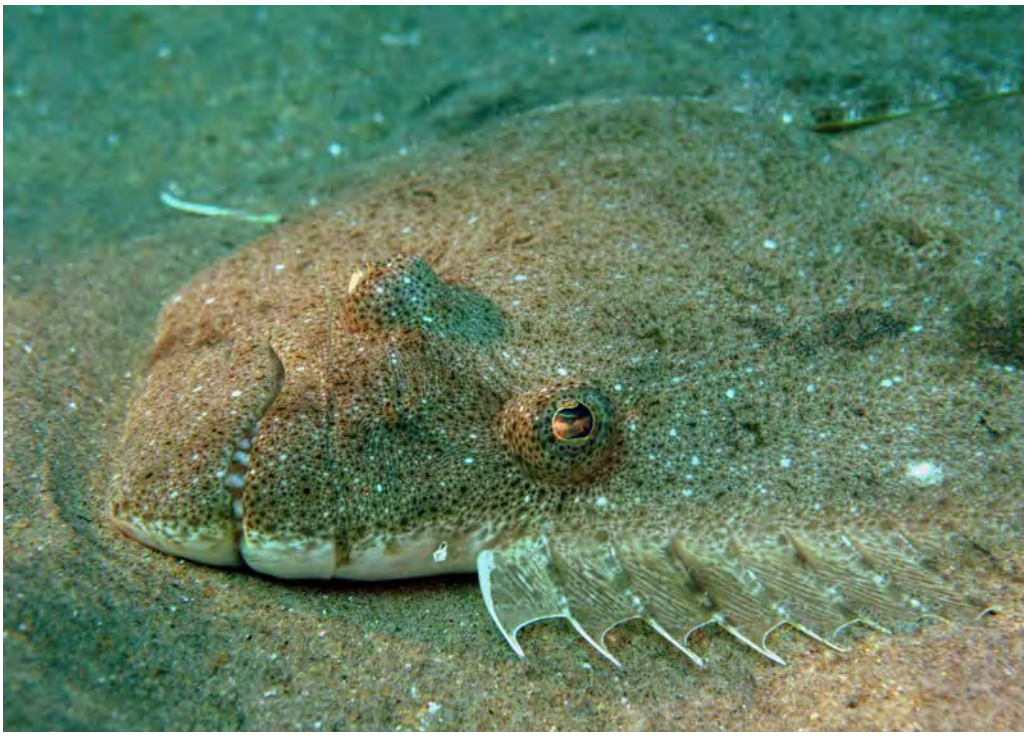

SCCWRP Director's Report

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SUMMER 2018 ISSUE

Framework approved to assess sediment's impacts on humans

The State Water Board has approved a standardized sediment assessment framework intended to better protect the health of humans who consume seafood caught in California's enclosed bays and estuaries, the latest development in SCCWRP's efforts to improve management of legacy sediment contamination.

The framework, described in a SCCWRP technical report, defines for environmental managers how to assess compliance with a statewide regulatory program intended to reduce the ecological impacts of sediment contamination on humans, who can be exposed via food web transfer. Already, the framework has been applied to the Los Angeles/Long Beach Harbors area and the Dominguez Channel that drains to it.

The State Water Board approved the framework on June 5 in Sacramento; next, it will undergo review by California's Office of Administrative Law and U.S. Environmental Protection Agency, Region 9.

If the framework receives final approvals, it will become the official method for implementing California's Sediment Quality Objective (SQO) for protection of human health. The human health SQO – one of three adopted by the State Water Board in 2008 for enclosed bays and estuaries – consists of a one-sentence regulatory target that calls on sediment contamination to not be present "at levels that will bioaccumulate in aquatic life to levels that are harmful to human health."

SCCWRP and its partners have spent more than a decade conceptualizing, building and vetting the human health SQO framework to create a standardized technical definition of what it means to be in compliance with this regulatory target. Application of the framework in the L.A./Long Beach Harbors area over the past five years has served as a key case study for test-driving the utility of the new framework.

California's sediment management community will use the framework to assess compliance with TMDLs (Total

Contents

Cover photo: SCCWRP has co-developed a sediment assessment framework intended to protect the health of humans who consume sportfish such as the California halibut, a bottom-feeding fish that camouflages with seafloor sediment. (Photo courtesy of Barbara Lloyd)

To subscribe: The SCCWRP Director's Report is published quarterly by the Southern California Coastal Water Research Project. To receive this newsletter by email, contact pubrequest@sccwrp.org.

Calendar

Thursday, August 16
CTAG quarterly meeting

Friday, September 7
SCCWRP Commission meeting

Thursday, November 8
CTAG quarterly meeting

Maximum Daily Loads) and other regulatory compliance programs intended to better protect humans from sediment contamination in enclosed bays and estuaries.

Compliance-based programs already in existence will not be required to move to the standardized framework, although they will have the option to do so. Historically, these programs have been developed on a water body-specific basis, leading to inconsistencies in technical approaches statewide.

The framework is not expected to significantly alter existing sediment-quality monitoring programs in California's enclosed bays and estuaries, although managers may need to adjust their sampling practices and analysis methods, including collecting more fish tissue and water samples to analyze contaminant concentrations.

The human health SQO framework relies on standardized, quantitative indicators of sediment contamination's human health effects to score the quality of sediment in enclosed bays and estuaries into categories ranging from "unimpacted" to "clearly impacted." Two types of analyses are conducted:

» **Chemical exposure analysis**: Sportfish tissue chemistry data are compared to the advisory sportfish tissue contamination levels developed by California's Office of Environmental Health Hazard Assessment (OEHHA).

SCCWRP has co-developed a sediment assessment framework that defines for environmental managers how to assess compliance with a statewide policy intended to protect humans who consume seafood from California's enclosed bays and estuaries. Humans can become exposed to sediment contamination via food web transfer.

» **Site linkage analysis**: The linkage between site sediment contamination and tissue contaminant concentration is evaluated using bioaccumulation models.

Application of the framework is limited to PCBs (polychlorinated biphenyls) and chlorinated pesticides – two major chemical contaminant classes that drive health risks from consuming contaminated seafood.

The framework is designed to complement California's SQO assessment framework for the protection of sediment-dwelling aquatic life, which was approved for regulatory use in enclosed bays and estuaries in 2009. Both frameworks use standardized, quantitative indicators with defined thresholds to provide consistency and statewide comparability.

SCCWRP is continuing to develop tools and resources to assist agencies in implementing the human health SQO framework, including hosting training workshops, preparing a technical support document, and developing data analysis software to streamline analyses.

For more information, contact Steve Bay.

Study sheds light on how to improve DNA sequencing analysis methods to ID organisms

SCCWRP and its partners have completed a two-year study shedding light on best-practices approaches for analyzing raw DNA sequencing data to identify the organisms present in an environmental sample, the latest step in an ongoing effort to adapt DNA barcoding technology for routine monitoring applications.

The intercalibration study, completed in May, found that laboratories can use many of their own algorithms, data filters and reference databases to analyze raw DNA sequencing data, and still get comparable, high-quality results. Study participants recommended relatively minor adjustments to these DNA analysis protocols – known as bioinformatics pipelines – to decrease variability in the results.

Researchers already have made significant progress toward adapting DNA-based taxonomic identification methods for routine environmental monitoring, including developing methods for sample collection, sample processing and selection of genetic barcode targets. DNA

barcoding has been shown to be cheaper, faster and, in some cases, more reliable than manual taxonomic identification under a microscope.

During the study, researchers focused on identifying potential challenges associated with labs using their own bioinformatics pipelines to analyze raw DNA sequencing data. Bioinformatics pipelines consist of a series of detailed steps and decision points that enable labs to rapidly process millions of reads of raw sequencing data, and ultimately make a determination about the types of organisms present in a given environmental sample.

While developing a single standardized bioinformatics pipeline for taxonomic identifications might be an eventual goal, labs need to have flexibility to continually adjust their DNA analysis methods because of the speed with which the field of bioinformatics is advancing.

The intercalibration study involved participation from five of the world's leading labs that have developed a bioinformatics pipeline to conduct taxonomic identifications: Australia's Macquarie University, Canada's University of Guelph, the U.S. Environmental Protection Agency's Office of Research and Development, the National Oceanic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratory, and SCCWRP. SCCWRP also coordinated the intercalibration exercise.

Each of the five labs received the same set of raw DNA sequencing data, which was obtained from small, sediment-dwelling organisms known as benthic meiofauna in a coastal sediment sample. Some of the sediment samples were treated with a pesticide to examine whether the labs could distinguish changes in the composition of the meiofauna community.

Each lab independently analyzed the raw sequencing data using its own bioinformatics analysis pipeline. The pipelines encompass steps such as error control, sequence alignment and gene annotation.

All of the participating labs were able to distinguish the meiofauna community in the pesticide-treated sediment from that of the control. Following a reconciliation step, the five labs achieved about 80% correlation in identifying the types of organisms present in the meiofauna community; there also was about 80% correlation with direct comparisons of each lab's DNA sequences. By contrast, a traditional taxonomic identification might achieve about 60% correlation.

Researchers also examined whether the five labs could distinguish the composition of organisms living at various specific locations along two rivers that terminate at an inland wetland. Using a different DNA marker to guide their identification analyses, all five labs were able to distinguish the two rivers from each other, as well as to distinguish among individual sites along each river. The labs achieved strong correlation with direct comparisons of their DNA sequencing analyses, as well as with identifying the types of organisms present.

The participating laboratories developed multiple recommendations for decreasing variability among bioinformatics pipelines, including how sequences are identified and assigned to samples, how taxa are defined based on sequence similarity, and the importance of developing a hand-curated taxonomic identification database.

DNA-based species identification methods already are being incorporated into routine environmental sampling efforts across California. For example, the Southern California Stormwater Monitoring Coalition has begun identifying stream algae samples via DNA analysis, and the Algal Stream Condition Index – a statewide tool for scoring stream health based on the composition of the algal community – will rely on DNA to identify algal species. Thus, it is important that multiple independent laboratories can produce consistent, high-quality data after applying a few relatively minor quality-control measures.

For more information, contact Dr. Joshua Steele.

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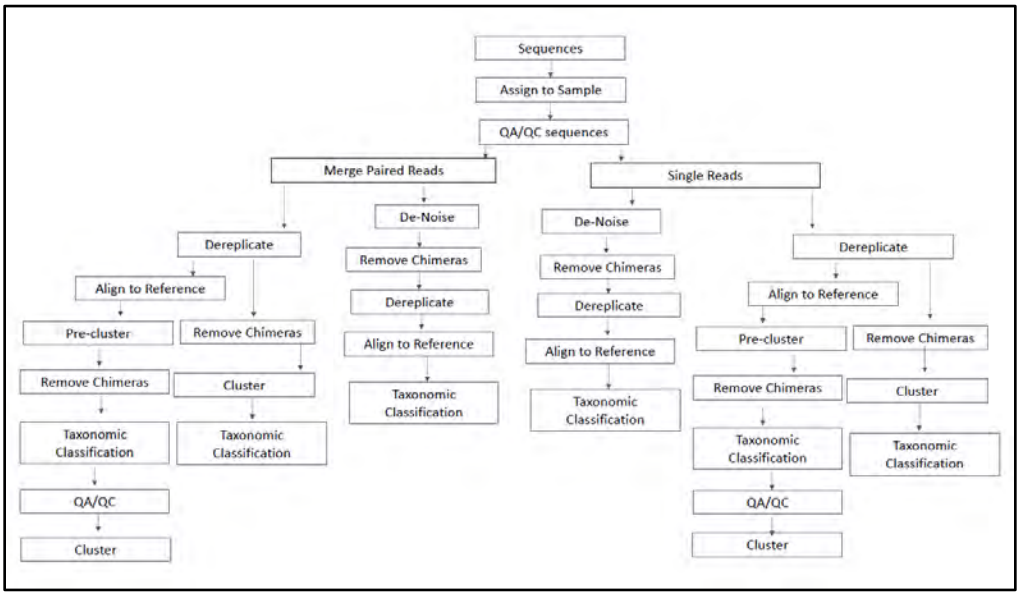


Designing a bioinformatics pipeline requires researchers to make a number of decisions related to how to analyze their raw DNA sequencing data, as shown in this conceptual diagram. Because various labs have developed their own bioinformatics pipelines to identify the organisms present in an environmental sample, SCCWRP coordinated an intercalibration study to understand how these labs could adjust their bioinformatics pipeline to improve the comparability of results.

Updates by Thematic Area

SCCWRP Research Themes BIOASSESSMENT • ECOHYDROLOGY • EUTROPHICATION • CLIMATE CHANGE • SEDIMENT QUALITY • CONTAMINANTS OF EMERGING CONCERN • MICROBIAL WATER QUALITY • REGIONAL MONITORING

BIOASSESSMENT

Study exploring how to dramatically streamline stream causal assessments

SCCWRP and its partners have begun test-driving a novel approach to assessing stream health that has the potential to shave a year or more off the time required to determine cause of ecological degradation at a stream site.

Instead of conducting a stream condition assessment first, and then following up with a causal assessment later, researchers are seeking to collect data for both assessments during the same field sampling event. Year 1 field sampling for the three-year study was completed in June in San Bernardino County's Big Bear watershed.

The causal assessment approach being tested during the study is a rapid, screening-level evaluation, where a standard list of possible stressors is either eliminated from consideration or identified as a possible cause of impairment based on a standard set of evidence types.

During Year 1 field sampling, researchers collected causal assessment data at the same time as they gathered condition assessment data. Condition assessments are conducted via stream health scoring tools such as the California Stream Condition Index, co-developed by SCCWRP.

Condition assessments typically take about six months, while causal assessments – which are typically not started until the condition assessment is completed – often take a year.

ECOHYDROLOGY

Study shows flow classification tool can be adapted to distinguish intermittent and ephemeral streams in Southwest

SCCWRP and its partners have shown in a proof-of-concept study that a flow classification tool that can rapidly distinguish intermittent streams from ephemeral streams in the Pacific Northwest is feasible for application in the U.S. Southwest.

The tool, which determines a stream's flow duration based on easily observed field indicators, was originally developed by the U.S. Environmental Protection Agency. Researchers are now adapting and refining the tool for use across California, Arizona and New Mexico. Researchers also are developing a comparable tool in parallel for use in the adjacent Western Mountains region.

Watershed managers need to be able to distinguish intermittent streams from ephemeral because, in certain cases, they are subject to different regulatory requirements. Intermittent streams are defined as streams that have sustained seasonal flows from snow melt and groundwater, whereas ephemeral streams only experience brief surface flows from runoff.

The proof-of-concept study found that certain biological indicators – including riparian plants and aquatic invertebrates that prefer perennially flowing water – are particularly effective at distinguishing stream types.

Researchers will spend the next year finalizing the Southwest tool; they will particularly focus on how to account for the long-term variability observed in Southern California stream flow patterns.

New Mexico's Santa Fe River, left, is classified as an intermittent stream under a new flow classification tool co-developed by SCCWRP, while New Mexico's Arroyo Chamiso, right, is classified as an ephemeral stream. The tool relies, in part, on visual observations of the plant community to determine classification. Willows and other water-loving vegetation thrive in the Santa Fe River, which is sustained by groundwater, while sagebrush and other upland vegetation dominate in the drier Arroyo Chamiso.

Stream geomorphology data being collected to aid watershed managers in setting flow targets

SCCWRP and its partners have begun field sampling at coastal stream sites across California to collect data on geomorphic structure, part of an ongoing effort to develop a standardized framework to help watershed managers set environmental flows that protect stream health statewide.

Researchers in July began collecting data on stream geomorphology – or the physical characteristics of a stream channel – to better understand how geomorphic structure influences a stream's hydrologic flow patterns and overall ecological functioning. Researchers plan to place California coastal streams into categories based on their geomorphic characteristics, then build a tool that can provide channel morphology information for stream sites across coastal California.

Watershed managers will be able to use the geomorphology information to improve resolution and streamline and standardize the process by which they evaluate environmental flow needs for stream sites; these analyses are the foundation for setting scientifically defensible flow targets.

The geomorphology classification project is the next step in the ongoing development of the California Environmental Flows Framework, a best-practices approach for establishing ecologically relevant flow targets for streams based on flow patterns, channel morphology and the response of the ecosystem. Researchers already have classified streams across California into nine major categories based on their hydrologic characteristics.

Environmental flow targets developed to protect Santa Clara River Estuary

A scientific review panel that includes participation by SCCWRP has completed an analysis of the environmental flow needs of the Santa Clara River Estuary.

The flow target analysis, completed in June, marks the first time that SCCWRP has helped evaluate the flow regime necessary to protect the ecological integrity of an estuarine environment. SCCWRP's previous flow target analyses have focused on protecting streams.

The goal of the analysis was to develop recommendations for the maximum ecologically sustainable discharge to the estuary that the City of Ventura should be allowed. All effluent above this level would be available to be diverted for recycling purposes.

The three-member review panel concluded that the City could divert about 95% of its effluent and still protect four priority Santa Clara River Estuary species sensitive to changes in flow.

The review panel did not come to the same conclusions as a previous flow target analysis commissioned by the City of Ventura.

CLIMATE CHANGE

Member agencies provide feedback to improve West Coast acidification model's accuracy

SCCWRP's member agencies provided feedback in June to a team of West Coast ocean modelers on how to assess uncertainty in a computer model that predicts how the region's coastal waters will be affected by ocean acidification and hypoxia.

During an all-day CTAG intersessional workshop at SCCWRP, CTAG representatives and other interested stakeholders reacted to proposed approaches for comparing ocean observations to the model's predictions, and for interpreting how marine organisms will be affected by changes in ocean chemistry that have been predicted by the model.

The modeling work involves coupling West Coast physical and biogeochemical ocean models together to understand the roles of global carbon dioxide emissions, natural upwelling processes, and nutrients introduced via wastewater effluent, stormwater runoff and atmospheric deposition in driving coastal ocean acidification and hypoxia. The model is being run with and without these pollution sources over a 10-year period.

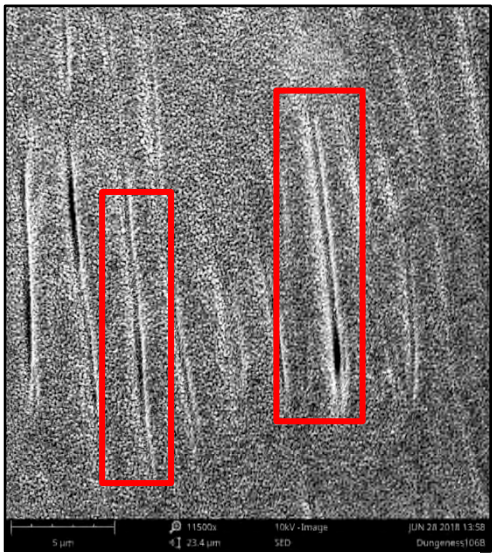
Validating the model and reaching agreement on an approach to interpreting biological impacts are key steps in applying the model to quantify the impact of local pollution sources on acidification and hypoxia – a high-priority recommendation of California's Ocean Acidification Action Plan.

SCCWRP will convene a follow-up meeting this fall to present preliminary modeling results that incorporate member agency feedback.

Signs of shell dissolution detected in Dungeness crab larvae

Researchers have detected signs of dissolution in the carapace, or external shell, of Dungeness crab larvae in response to ocean acidification in the natural environment, the first such documentation that shell dissolution already has begun in this commercially important species.

The finding was obtained as part of an ongoing two-year study that began in 2016



The carapace, or external shell, of Dungeness crab larvae show signs of shell dissolution as a result of exposure to ocean acidification in the natural environment. Above, extensive pit marks are visible on a carapace magnified 11,000 times under the scanning electron microscope – a sign that its carbonate crystals are dissolving.

to predict impacts to the Pacific Northwest Dungeness crab industry from ocean acidification.

Researchers observed severe dissolution patterns that are indicative of exposure to corrosive water at the earliest stages of development. The findings suggest that this commercial fisheries species – a $150 million industry on the U.S. West Coast – could face serious, population-level challenges in the coming years.

The study will help spark important discussions about best management practices for fisheries and ecologically protected coastal areas in the face of intensifying acidification.

Effort launched to develop acidification thresholds for echinoderms

SCCWRP and its partners have launched an effort to develop expert consensus on biologically relevant thresholds at which sea stars, urchins and other echinoderms can be expected to experience adverse impacts from ocean acidification.

The goal of the project is to investigate how to use organisms that are sensitive to corrosive seawater conditions as an early-warning indicator of acidification's biological impacts on West Coast marine communities. SCCWRP and its partners already have developed recommended acidification thresholds for pteropods, or sea snails; a manuscript summarizing this work is nearing completion.

Both pteropods and echinoderms depend on minerals in seawater to form their protective outer shells. Because acidification can trigger shell dissolution and other adverse impacts, these organisms are well-suited to serve as sentinel indicators of the intensity and pace with which acidification is impacting coastal marine ecosystems.

In late fall, SCCWRP will convene and host an advisory panel of global experts on echinoderms that will be tasked with developing consensus around biologically relevant acidification thresholds for echinoderms. A similar panel of pteropod experts was convened in September 2017.

In Washington's Puget Sound, researchers have cultivated an underwater kelp forest – demarcated by floating buoys in the photo above – to assess whether kelp forests could alleviate the corrosive impacts of ocean acidification on vulnerable marine animals.

SCCWRP will update the California Ocean Protection Council's Science Advisory Team on the status of this acidification threshold development work during an August 23 webinar.

Study evaluating potential of kelp forests to offset impacts of coastal ocean acidification

West Coast researchers have completed the first year of field work for a three-year study examining whether planted kelp forests in Washington's Puget Sound could help protect vulnerable shell-forming organisms from the corrosive effects of ocean acidification.

SCCWRP's role in the multidisciplinary study, which began in 2017, includes helping to deploy mesocosms in the middle of a Puget Sound planted kelp forest; the mesocosms house pteropods, two oyster species and mussels.

Researchers are hoping the study will shed light on whether cultivation of coastal kelp forests is a viable management strategy for helping to offset the intensifying effects of acidification on marine calcifying communities.

Current science suggests that kelp forests have the ability to change the carbonate chemistry of water through natural photosynthetic processes that remove carbon dioxide. But it is unclear if the change is significant enough to improve habitat conditions for calcifiers.

Study finds oxidative stress in pteropods could serve as early-warning indicator of climate change's biological impacts

SCCWRP and its partners have completed a two-year study showing that pteropods, or sea snails, experience cellular and physiological stress as a result of multiple stressors exposure related to climate change.

The study, completed in July, found that exposure to warming water temperatures, ocean acidification, and low dissolved oxygen concentrations can lead to increased oxidative stress, which is measured using oxidative stress biomarkers.

The finding is significant because researchers have traditionally focused on shell dissolution as a way to measure the impacts of ocean acidification on pteropod health. Oxidative stress has the potential to serve as an early-warning indicator of not just acidification's impacts on pterpods, but also the multi-stressor impacts related to climate change.

The study also found that oxidative stress leads to degradation of cellular lipids. Not only can this result in the loss of lipid reserves and structural damage to pteropod cell membranes, but juvenile fish that consume pteropods and that depend on these lipids to support their own growth and development could be adversely affected.

Preliminary modeling tool unveiled to predict sea level rise's impacts on wetlands

SCCWRP and its partners have developed a preliminary computer modeling tool that enables coastal resources managers to predict how low-lying wetlands in Upper Newport Bay and the Tijuana River Estuary will be impacted by sea level rise.

The modeling tool, presented in preliminary form to the project's advisory group in June, will predict how the trajectory of ecological impacts to wetlands in the coming decades could be altered by various potential management interventions. Seas are expected to rise anywhere from 1 to 8 feet over the next century.

The project's Management and Technical Advisory Group (MTAG) provided input on which management scenarios should be evaluated using the model. Potential interventions include spreading sediment across the surface of wetlands to raise their elevation, and reducing stress on native plant and animal species by more aggressively controlling non-native species.

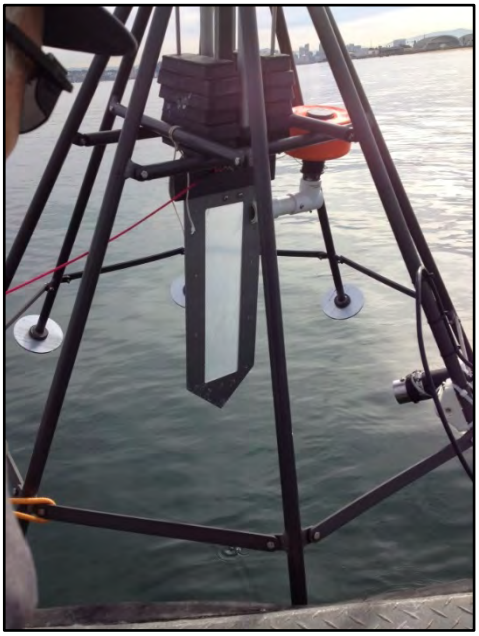
Researchers have begun modeling the ecological effect of these scenarios as the project enters its next phase.

SEDIMENT QUALITY

Round 1 field sampling completed for study probing origins of sediment contaminants that bioaccumulate in fish

SCCWRP and its partners have completed the first round of field sampling for a two-year study investigating whether legacy contaminants found in the tissue of San Diego Bay fish are coming from contaminated bay sediment or at least partially from somewhere else.

The sampling, completed in June, relies on passive sampling technology to measure the dissolved concentration of sediment-associated contaminants in three locations – just beneath the surface sediment layer, just above the surface layer, and in the water column. Sampling of sediment, fish and zooplankton also was conducted.



A field crew deploys a passive sampling device into San Diego Bay for a study probing the origins of contamination found in fish in the bay. The device consists of a pointed metal frame containing polyethylene film that is inserted into the surface layer of sediment for a month. The device measure contaminant concentrations in the water between sediment particles, known as sediment pore water, and at the sediment-water interface just above.

The study will probe the veracity of a common assumption in sediment management that all legacy chemical contaminants that have bioaccumulated in fish tissue at a given site originated with contaminated sediment at the site.

Although now-banned chemical contaminants like PCBs and DDTs that have stuck to sediment particles are known to gradually dissolve back into the water column, it is unclear if these contaminants also are being spread extended distances through the water column.

CONTAMINANTS OF EMERGING CONCERN

Discussions underway on how to implement proposed recycled water policy

Water recycling agencies and State Water Board staff have begun discussing how to implement a proposed statewide policy that would require recycled water to be monitored using bioanalytical cell screening assays.

At an all-day workshop at SCCWRP in June and a public hearing in Sacramento a week later, water recycling agencies and other stakeholders received clarification about the policy amendment, which would incorporate bioanalytical screening into routine monitoring of certain recycled-water applications in California, including groundwater recharge for indirect potable reuse.

The policy amendment was released in draft form by State Water Board staff in May; the State Water Board will consider adopting it as early as December 2018.

SCCWRP and its partners are working to adapt bioanalytical screening for water-quality monitoring applications; this prototype technology has the potential to provide a rapid, cost-effective approach to comprehensively screen recycled water for major classes of bioactive contaminants, including unknown chemicals that exert similar biological impacts on aquatic organisms.

At the SCCWRP workshop, which attracted about 150 participants, recycled water agencies expressed support for a phased implementation of bioanalytical monitoring, plus formation of a bioanalytical advisory group that would provide guidance on best-practices approaches for end users. SCCWRP already has begun exploring how to put together the advisory group.

First large-scale CEC screening study targeting marine environment incorporated into Bight '18

Bioanalytical cell screening assays and non-targeted chemical analysis are being used for the first time to screen for CECs across the Southern California Bight as part of an expanded Bight '18 sediment quality study.

Participants of the Southern California Bight 2018 Regional Monitoring Program, which began field sampling in July, are collecting both seafloor sediment and the tissue of sportfish. SCCWRP and its partners are screening the samples for evidence of bioactive contaminants that have the potential to trigger biological impacts in fish.

Bioanalytical screening, a commercially available technology that SCCWRP and its partners are working to adapt for use in aquatic monitoring applications, and non-targeted chemical analysis, an analytical method that identifies chemical mixtures by their unique fingerprints, together have the potential to help water-quality managers cost-effectively and comprehensively screen water bodies for bioactive CECs.

Bight '18 participants will be able to use the study's findings to help identify and prioritize habitats where CECs may pose the greatest ecological health risks in the Southern California Bight.

SCCWRP and its partners already have successfully applied bioanalytical screening and non-targeted analysis to freshwater systems across California. Test-driving these technologies across the Bight will provide insights into their efficacy in a complex marine environment.

MICROBIAL WATER QUALITY

Sampling underway for study examining uniqueness of microbial community inside sewer vs. storm drain

SCCWRP and its partners have begun collecting samples from San Diego-area sanitary sewer and storm drain systems for a study investigating whether a unique microbial community is found inside each of these two infrastructure types.

The study, which initiated field sampling in July, is intended to shed light on whether leaking sewer pipes could be responsible for human fecal contamination found in urban waterways. Sampling efforts are scheduled to expand to Los Angeles and Orange Counties by the end of this year.

SCCWRP will use DNA-based microbial source tracking methods to determine whether the composition of the bacterial community inside sanitary sewer pipes – known as biofilm – is consistently distinguishable from the biofilm inside storm drain pipes.

The biofilm community that lines the insides of sewer pipes is theorized to be the product of unique environmental factors, including temperature, moisture, darkness and rich nutrient supplies.

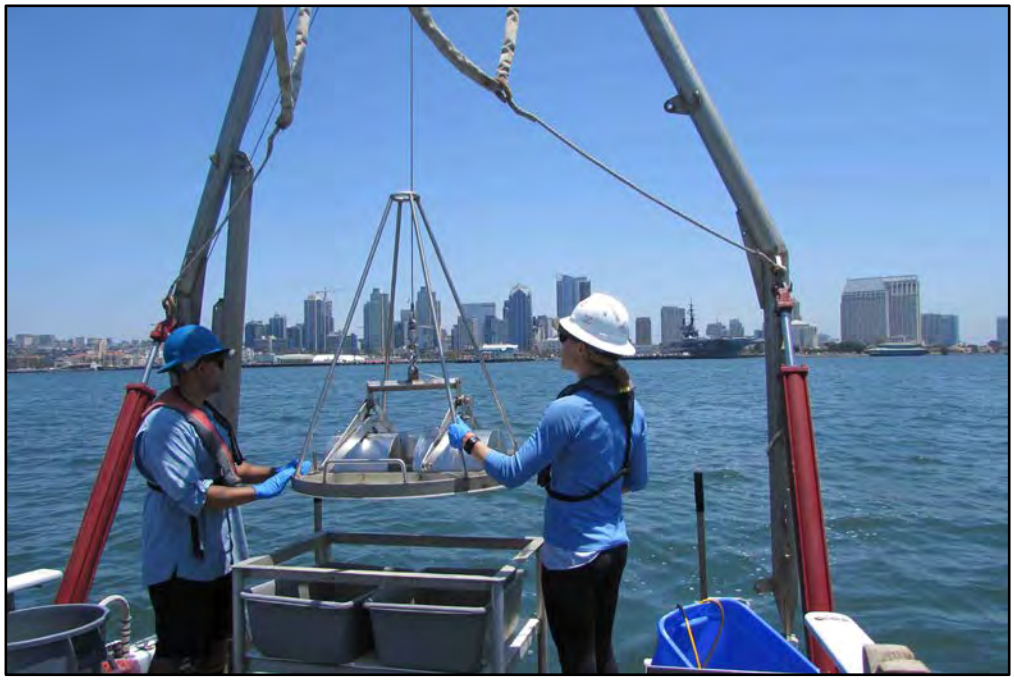
REGIONAL MONITORING

Bight '18 field sampling underway to assess sediment quality

The sampling window for the Southern California Bight 2018 Regional Monitoring Program opened July 1, with participants starting to collect seafloor sediments to evaluate the chemical, toxicological and biological health of Southern California's coastal areas.

A total of 49 environmental organizations are participating in the Bight '18 sediment quality element, which is targeting 11 distinct Bight coastal habitats across more than 1,500 square miles of Bight coastal waters.

Almost 400 sites will be sampled for sediment, and trawl nets will be used at roughly half the sites to sample fish,



Courtesy of Wood Environment & Infrastructure Solutions

A field crew lowers a sediment grab sampler into San Diego Bay during field sampling for the Southern California Bight 2018 Regional Monitoring Program. Bight '18 will assess sediment quality across more than 1,500 square miles of coastal waters.

A field crew from the Southern California Stormwater Monitoring Coalition (SMC) conducts a trash survey of Fullerton Creek in Orange County in June. The SMC is conducting trash surveys in streams across Southern California to support a Bight '18 study tracking the spread of trash in aquatic systems.

large invertebrates, and trash found along the seafloor.

To create a comprehensive assessment of sediment quality, hundreds of sportfish consumed by humans also will be collected and analyzed for chemical contaminants known to bioaccumulate in Southern California marine food webs.

Sampling is scheduled to wrap up in late September.

SMC conducting trash surveys in watersheds to support Bight '18

The Southern California Stormwater Monitoring Coalition (SMC) has launched trash sampling surveys in wadeable streams across coastal Southern California to support the Southern California Bight 2018 Regional Monitoring Program's efforts to track the spread of trash in aquatic systems.

The survey work, launched in May, will help the Bight '18 Trash study element paint a fuller picture of how trash in coastal waterways could be contributing to the volumes and types of trash found on the Southern California Bight seafloor.

Bight '18 also is documenting how far trash has spread across the Southern California Bight continental shelf – an effort that has been completed in every cycle of the Bight program since 1994.

New SCCWRP Publications

Journal Articles (Published)

Beck, M.W., T.W. Jabusch, P.R. Trowbridge, D.B. Senn. 2018. Four decades of water quality change in the upper San Francisco Estuary. *Estuarine, Coastal and Shelf Science* 212:11-22.

Jonker, M.T.O., S.A. van der Heijden, D. Adelman, J.N. Apell, R.M. Burgess, Y. Choi, L.A. Fernandez, G.M. Flavetta, U. Ghosh, P.M. Gschwend, S.E. Hale, M. Jalalizadeh, M. Khairy, M.A. Lampi, W. Lao, R. Lohman, M.J. Lydy, K.A. Maruya, S.A. Nutile, A.M.P. Oen, M.I. Rakowska, D. Reible, T.P. Rusina, F. Smedes, Y. Wu. 2018. Advancing the use of passive sampling in risk assessment and management of contaminated sediments: Results of an international ex situ passive sampling inter-laboratory comparison. *Environmental Science and Technology* 52:3574-3582.

Lao, W., K.A. Maruya, D. Tsukada. 2019. An exponential model based new approach for correcting aqueous concentrations of hydrophobic organic chemicals measured by polyethylene passive samplers. *Science of the Total Environment* 646:11-18.

Parks, A.N., M.G. Cantwell, D.R. Katz, M.A. Cashman, T.P. Luxton, K.T. Ho, and R.M. Burgess. 2018. Assessing the release of copper from nanocopper-treated and conventional copper-treated lumber into marine waters I: Concentrations and rates. *Environmental Toxicology and Chemistry* 37:1956-1968.

Parks, A.N., M.G. Cantwell, D.R. Katz, M.A. Cashman, T.P. Luxton, J.G. Clar, M.M. Perron, L. Portis, K.T. Ho, and R.M. Burgess. 2018. Assessing the release of copper from nanocopper-treated and conventional copper-treated lumber into marine waters II: Forms and bioavailability. *Environmental Toxicology and Chemistry* 37:1969-1979.

A special issue of the journal *Freshwater Biology* has been published that focuses on environmental flow management in a water-scarce and uncertain future. The issue was co-edited by SCCWRP's Dr. Eric Stein; SCCWRP co-authored four of the 21 articles in the issue.

Saarman, E.T., B. Owens, S.N. Murray, S.B. Weisberg, R.F. Ambrose, J.C. Field, K.J. Nielsen, and M.H. Carr. 2018. A framework for informing permitting decisions on scientific activities in marine protected areas. *PLoS One* 13:e0199126.

Journal Articles (Online)

Parks, A.N., M.A. Cashman, M.M. Perron, L. Portis, M.G. Cantwell, D.R. Katz, K.T. Ho, and R.M. Burgess. 2018. Magnitude of acute toxicity of marine sediments amended with conventional copper and nanocopper. *Environmental Toxicology and Chemistry* DOI: 10.1002/etc.4232.

Journal Articles (Accepted)

Lane, B., S. Sandoval, E.D. Stein, S. Yarnell, G. Pasternack, and H. Dahlke. In press. Beyond metrics: The role of hydrologic baseline archetypes in environmental water management. *Environmental Management.*

McLaughlin, K., N.P. Nezlin, S.B. Weisberg, A.G. Dickson, J.A.T. Booth, C.L. Cash, A.Feit, J.R. Gully, M. Howard, S. Johnson, A. Latker, M.J. Mengel, G.L. Robertson, A. Steele, and L. Terriquez. In press. Acidification patterns on the southern California continental shelf. *Continental Shelf Research*.

Smith, J., P. Connell, R.H. Evans, A.G. Gellene, M.D.A. Howard, B.H. Jones, S. Kaveggia, L. Palmer, A. Schnetzer, B.N. Seegers, E.L. Seubert, A.O. Tatters and D.A. Caron. In press. A decade and a half of Pseudo-nitzschia spp. and domoic acid along the coast of southern California. *Harmful Algae*.

Technical Reports

Howard, M.D.A. 2018. Cyanotoxin and cyanobacteria monitoring in Lake Elsinore and Canyon Lake, 2015-2017. Technical Report 1010. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Beck, M. Prioritizing management goals for stream biological integrity within the context of landscape constraints. Surface Water Ambient Monitoring Program (SWAMP) Data Science Symposium. June 20-21, 2018. Sacramento, CA.

Beck, M. Landscape scale risk assessment of cyanobacteria blooms in California lakes. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Howard, M., D. Caron, R. Kudela, K. Loftin, A. Tatters, K. Hayashi, J. Smith, A. Donovan, Z. Laughrey, C. Nagoda, E. Fetscher, S. Fluharty, R. Fadness, J. Crooks, J. McCullough, M. Almeida. Monitoring multiple HAB toxins as the land-sea interface in coastal California. Association for the Sciences of Limnology and Oceanography 2018 Summer Meeting. June 10-15, 2018. Victoria, Canada.

Mazor, R. A vision for a more effective use of biological data in water resource management. Surface Water Ambient Monitoring Program (SWAMP) Data Science Symposium. June 20-21, 2018. Sacramento, CA.

Mazor, R. Transcending aquatic-terrestrial boundaries: Ecology, conservation and management of temporary freshwaters. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Mazor, R. Assessing ecological health of dry phase intermittent rivers and ephemeral streams. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Mazor, R. Supporting management decisions with a landscape model to predict biotic condition in CA. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Mazor, R. California Dreamin': A vision for more effective use of biological data in water resource management. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Stein, E.D. Key challenges and opportunities in incorporating environmental flows into bioassessment. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Stein, E.D. Understanding variation associated with bioinformatics processing of environmental genomic data. Society of Freshwater Science Annual Meeting. May 20-24, 2018. Detroit, MI.

Stein, E.D. Understanding Variation Associated with Bioinformatics Processing of Environmental Genomic Data. 2018 International Workshop on Environmental Genomics: Building a Path to Regulatory Acceptance of Evidence from Ecogenomics. June 8, 2018. St. John's, Canada.

Theroux, S., R. Mazor, M. Sutula, E. Stein. A predictive algal index for California wadeable stream bioassessment: performance with morphology versus DNA barcode data. Association for the Sciences of Limnology and Oceanography 2018 Summer Meeting. June 10-15, 2018. Victoria, Canada.

Other Presentations

Bednarsek, N. Pteropods under multiple stressors effects in the California Current System. Monterey Bay Aquarium Research Institute. July 11, 2018. Monterey, CA.

Howard, M. Summary of the 2016 Field Survey in the Russian and Eel Rivers and Implications for Monitoring. Benthic Harmful Algal Blooms Workgroup. May 2018.

Howard, M. Monitoring approaches for multiple HAB toxins at the land-sea interface in coastal California. California Cyanobacteria Harmful Algal Blooms Network Meeting. April 26, 2018. Costa Mesa, CA.

Maruya, K. Organizer and moderator, State of California Constituents of Emerging Concern Bioanalytical Screening of Recycled Water Workshop. June 11, 2018. Costa Mesa, CA.

Mazor, R., and M. Beck. California's approach to identifying sites where bio-integrity is constrained by Landscape Alteration. U.S. Environmental Protection Agency Nutrient Criteria Workshop for Western States. May 3, 2018. San Francisco, CA.

Mehinto, A., K. Schiff. Using bioanalytical screening assays to screen for constituents of emerging concern. National Coastal Condition Assessment Management Committee. July 11, 2018.

Mehinto, A. Current state of bioanalytical monitoring. State of California Constituents of Emerging Concern Bioanalytical Screening of Recycled Water Workshop. June 11, 2018. Costa Mesa, CA.

Schiff, K. Climate change impacts on water quality. San Diego Regional Water Quality Control Board. May 9, 2018. San Diego, CA.

Stein, E.D. An ecological framework for reviewing compensatory mitigation. Army Corps of Engineers and the Association of State Wetland Managers Compensatory Mitigation Webinar Series. June 12, 2018.

Stein, E.D. State's Environmental Flows Framework and SCCWRP's related research. Santa Ana Regional Water Quality Control Board. June 11, 2018. Riverside, CA.

Sutula, M. Investigations of impact of anthropogenic nutrients on ocean acidification and hypoxia in the California Current. U.S. Environmental Protection Agency Nutrient Criteria Workshop for Western States. May 3, 2018. San Francisco, CA.

Taylor, J. SCCWRP's biological modeling of sea level rise impacts on coastal wetlands. Tijuana River Estuary Interagency Management and Technical Advisory Committee. June 13, 2018. Imperial Beach, CA.

SCCWRP Personnel Notes

Commission

Angela George-Moody, Alternate Commissioner for the Los Angeles County Flood Control District, was promoted to Commissioner in June, replacing Gary Hildebrand, who was promoted to a new position.

Ellen Blake, Assistant Director of the Water Division for the U.S. Environmental Protection Agency, Region 9, assumed the role of Commissioner in May, filling a vacancy. Janet Hashimoto will continue to serve as Alternate Commissioner.

Paul Alva, CTAG Representative for the Los Angeles County Flood Control District, was appointed Alternate Commissioner in June, filling the vacancy when Angela George-Moody was promoted to Commissioner. Alva also will continue to serve on CTAG.

Greg Gearheart, who has served as the CTAG Representative for the State Water Resources Control Board for the past four years, was appointed Alternate Commissioner in June, replacing Darrin Polhemus.

Renee Purdy, who was recently named Assistant Executive Officer for the Los Angeles Regional Water Quality Control Board, was appointed Alternate Commissioner in August, filling the vacancy created when Deborah Smith was promoted to Commissioner.

Scientific Leadership

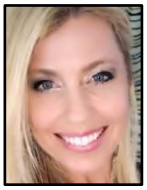
Dr. **Alvina Mehinto** has been appointed Co-Secretary of the Southern California chapter of the Society of Environmental Toxicology and Chemistry.

Ken Schiff was appointed in June to the Industrial Environmental Association's Technical Advisory Committee on Stormwater Monitoring.

Ken Schiff has been appointed to the Planning Committee for the 11th National Water Quality Monitoring Conference, to be held March 25-29, 2019 in Denver, Colorado.

CTAG

Lori Webber, a Senior Environmental Scientist for the California State Water Resources Control Board's Division of Water Quality, was appointed to CTAG in June, replacing Greg Gearheart, who has been promoted to Alternate Commissioner.



Lisa Haney, a Regulatory Specialist for the Orange County Sanitation District, was appointed to CTAG in August, replacing George Robertson.

New Faces

Dr. **Kris Taniguchi-Quan,** who recently completed her Ph.D. in geography from San Diego State University and the University of California, Santa Barbara, joined SCCWRP in June as a Scientist in the Biology Department.

Dr. **Marc Verhougstraete,** an Assistant Professor at the University of Arizona's Zuckerman College of Public Health, joined SCCWRP in June as a Visiting Scientist in the Microbiology Department. He will spend about four days a month at SCCWRP for the next several years.

David Wanless, who has more than a decade of experience working in molecular laboratories, joined SCCWRP in August as a Senior Research Technician in the Microbiology Department.

SCCWRP COMMISSIONER SPOTLIGHT

Engineer drawn to long-term wastewater planning

Everyday, James Herberg goes to work doing something he loves – long-term planning.

James Herberg

As General Manager of the Orange County Sanitation District (OCSD), Herberg doesn't just oversee day-to-day operations for an agency that manages nearly 400 miles of sewer lines in northern and central Orange County. What gets him excited is capital improvement projects and planning that will benefit the community 10 to 20 years down the road.

"In the wastewater business, you cannot stop investing – that's a huge part of my job that people don't really see," said Herberg, a Board Certified Environmental Engineer. "I've been fortunate that there were decades of really solid planning that came before me."

Herberg, who has worked at OCSD for most of his three-decade career, replaced Dr. Bob Ghirelli as a SCCWRP Commissioner. Ghirelli served on the Commission for 19 years.

One of the most high-profile projects Herberg has worked on is OCSD's innovative Groundwater Replenishment System, launched in 2008. The system – a collaboration with the Orange County Water District – enables more than half of all OCSD treated wastewater effluent to be purified for groundwater recharge; much of this supply is eventually extracted and used locally.

Herberg first worked on the system in the early 1990s, when he helped build a microinfiltration demonstration project while at the Orange County Water District, where he worked for six years early in his career. A decade later, he helped design and launch the full system at OCSD.

"This was all possible because of planning decisions made decades ahead – figuring out how to maximize the capacity, selecting the right technologies for disinfection, even securing enough land to build on," Herberg said.

James Herberg enjoys a bike ride through Laguna Beach's Top of the World recreation area earlier this year.

James Herberg, P.E., B.C.E.E.

Job: General Manager, Orange County Sanitation District (2013-present)

SCCWRP role: Commissioner

Prior jobs: OCSD Assistant General Manager/Director of Engineering (2006-13); OCSD Director of Operations and Maintenance (2005-06); OCSD Engineer, Engineering Supervisor, and Acting/Engineering Manager (1995-2005); Senior Engineer, Orange County Water District (1989-95); Assistant Engineer, OCSD Operations Division (1986-89)

Education: M.S. civil/environmental engineering, California State University, Long Beach (1996); B.S. civil engineering, University of Oklahoma (1986)

Residence: Mission Viejo

Family: Wife Shauna; daughters Natalie, 22, who just graduated from UC Berkeley, and Haley, 18, an incoming freshman at the University of Oklahoma; cat Muffin

Hometown: Grand Forks, North Dakota

Hobbies: Attending his daughters' track-and-field competitions; running; mountain biking in south Orange County

Herberg's fascination with water was shaped as a child growing up in North Dakota's Red River Valley, a region prone to flooding that also was grappling with water contamination issues at the time. By the time Herberg got to college, he knew he wanted to work in a water-related field. Although he majored in civil engineering, he was primarily interested in the environmental aspects of the field.

"The first course I took on water just resonated with me – I loved it," Herberg said. "It was so much more interesting to me than structural or traffic engineering."

Herberg says he's excited to serve on the SCCWRP Commission and to be part of an organization known for its impartial, independent assessments of how humans are impacting the environment.

"It's great to have someone who's looking at these complex issues who's trusted and who has credibility," Herberg said.

Herberg is a former competitive cross-country and track runner; he was a state cross-country champion in high school and lettered four times in college. Today, he and his wife, Shauna, enjoy attending sports competitions for their two daughters.

CTAG SPOTLIGHT

Scientist keeps one foot in science, other in policy

Lori Webber has a tough time deciding whether she likes the technical aspects of water-quality management or the policy development aspects more.

Lori Webber

In her role as Senior Environmental Scientist with the State Water Board's Water Quality Assessment Unit, she doesn't have to choose – she splits her time about 50-50 in each area.

"Having one foot on both sides of the aisle gives me an opportunity to focus on the big picture," Webber said. "We're a huge agency, so what I enjoy doing is making connections and ensuring coordination between the technical and policy sides – it results in better outcomes."

Webber was appointed to CTAG in June, replacing Greg Gearheart, who was promoted to Alternate Commissioner.

Until April, Webber worked for six years as coordinator of the State Water Board's Surface Water Ambient Monitoring Program (SWAMP), which works to integrate and expand monitoring efforts across California.

Now Webber leads a unit of State Water Board scientists charged with assessing and reporting on impaired water bodies for federal 303(d) listing purposes. She also facilitates various water-quality improvement initiatives for the Division of Water Quality, including an effort to standardize fecal indicator bacteria objectives for recreational zones across California, and a project with SCCWRP to understand environmental flow needs in the Los Angeles River.

As a CTAG Representative, Webber is looking forward to continuing a strong relationship with SCCWRP that began when she served as statewide SWAMP coordinator.

"SCCWRP supports us immensely on the technical side of things; I love using SCCWRP to help us make connections to academia and other subject-matter experts," she said.

Lori Webber enjoys a boating trip through the Jackson Meadow Reservoir in the Tahoe National Forest during a summer camping trip.

Lori Webber

Job: Senior Environmental Scientist, Water Quality Assessment Unit, Division of Water Quality, California State Water Resources Control Board (2018-present)

SCCWRP role: CTAG Representative (started June 2018)

Prior jobs: Senior Environmental Scientist and Surface Water Ambient Monitoring Program (SWAMP) Coordinator, State Water Board (2012-2018); English teacher in Ecuador (2008-12); Environmental Scientist, Central Valley Regional Water Quality Control Board (2000-08); Post-Graduate Researcher, University of California, Davis (1998-2000); Peace Corps Volunteer in Ecuador (1993-96); Field Technician, U.S. Forest Service (summers 1991-92)

Education: M.S. environmental science, Indiana University (1998); B.A. geography, Humboldt State University (1992)

Residence: Davis, California

Family: Husband Luis, an architectural drafter; daughter Christina, 14; dog Bella, a terrier; cat Twinkle

Hometown: Sacramento

Hobbies: Hiking, traveling (especially to coastal parks), reading books, barbecuing with friends

Webber's interest in water-quality issues was sparked when she joined the Peace Corps in 1993 after graduating college. She was sent to Loja, Ecuador, where she spent 2-1/2 years working for an NGO called Arcoiris that focused on natural resource protection and environmental education.

"I became very aware of what happens when environmental regulations are either non-existent or not implemented – it really left an impression on me," Webber said.

When she returned to the U.S., Webber enrolled in an environmental science master's program at Indiana University. After graduating, she worked at UC Davis for two years, then at the Central Valley Regional Water Quality Control Board in Rancho Cordova for eight years.

In 2008, Webber left the U.S. for four years with husband Luis, whom she met as a Peace Corps volunteer, and their young daughter. They lived in Luis's hometown, where Webber taught English at a local university and volunteered for an environmental NGO.

SCCWRP PARTNER SPOTLIGHT

Microbiologist juggles multiple research lines

Dr. Marc Verhougstraete doesn't limit his research to just one major project or scientific question at a time; he prefers to juggle multiple microbiology-related investigations simultaneously.

Dr. Marc Verhougstraete

Verhougstraete, an environmental health sciences researcher at the University of Arizona, says his work falls into three main research lines: First, he's studying how to optimize hospital disinfection protocols and intervention systems to reduce hospital-acquired infections. Second, he's examining how to prevent bacterial pathogens in tainted irrigation water from being transferred onto crops consumed by humans. And third, he's looking at how to reduce health risks associated with consuming water from wells and other inadequately treated sources.

"I really like to have a lot of projects going at once," said Verhougstraete, an Assistant Professor at the University of Arizona's College of Public Health in Tucson. "It would not be enough to focus on one area – I need all of these projects to maintain my full interest in protecting public health."

In late June, Verhougstraete began working as a part-time Visiting Scientist in the Microbiology Department. He's splitting his time between SCCWRP, where he'll work two days every other week, and the University of Arizona, where he teaches, runs a research laboratory and serves as a Co-Director of the Environment, Exposure Science and Risk Assessment Center.

"I hope to bring some of SCCWRP's technology and knowledge back to Arizona," Verhougstraete said. "And I hope to contribute my public health perspective to SCCWRP."

Dr. Marc Verhougstraete explores Cascade Lake on a 2017 trip to Yellowstone National Park.

Marc Verhougstraete, Ph.D.

Job: Assistant Professor, Zuckerman College of Public Health, University of Arizona (2016-present)

SCCWRP role: Visiting Scientist, SCCWRP Microbiology Department (started June 30)

Prior jobs: Research Professor and Post-Doctoral Research Associate, University of Arizona (2012-15); Post-Doctoral Research Associate, University of North Carolina, Chapel Hill (2012-13); Professional Assistant, Michigan Department of Environmental Quality (2005-10)

Education: Ph.D. integrated water microbiology, Michigan State University (2012); B.S. environmental biology and zoology, Michigan State (2007)

Residence: Splitting time between Long Beach and Tucson

Family: Partner Amy

Hometown: Lansing, Michigan

Hobbies: Trail running, ultimate frisbee, surfing, hiking and backpacking

Verhougstraete stumbled into the world of environmental microbiology as a Michigan State University undergraduate. He was majoring in zoology at the time, but wasn't interested in the large mammal research being performed by his professors. He decided to explore options outside the university, ultimately landing at the Michigan Department of Environmental Quality as a part-time student assistant.

Working for the Department of Environmental Quality opened Verhougstraete's eyes to the complex microbial contamination challenges facing Michigan beaches. Within his first few months on the job, a fellow student whom he was collaborating with contracted a serious infection – likely during beach field sampling – that led to total temporary paralysis. Diagnosed with Guillain–Barré Syndrome, she did not regain the ability to walk again for about a month, he recalled.

"She has permanent nervous system damage – this could have been any child or adult at the beach," he said. "I realized the importance of water quality and the significant research needs in this field."

When he's not working, Verhougstraete enjoys trail-running, traveling and playing ultimate frisbee. On his twice-monthly visits to Southern California, he's looking forward to exploring Idyllwild, the Cleveland National Forest and other sites.

SCCWRP STAFF SPOTLIGHT

Microbiologist drawn to collaborative work

Throughout her tenure as a doctoral student and postdoc, Dr. Amy Zimmer-Faust has been drawn to collaborating on multidisciplinary teams to tackle big-picture ecological challenges.

Dr. Amy Zimmer-Faust

As a Ph.D. student at UCLA, Zimmer-Faust took part in a seminal SCCWRP-led study examining best-practices molecular methods for tracking sources of microbial contamination at California beaches. Zimmer-Faust also led an offshoot of the project exploring how sediment influences the persistence of microbes in aquatic environments.

Then, during her postdoctoral work with the U.S. Environmental Protection Agency, Zimmer-Faust spent 2-1/2 years studying microbial contamination issues in urban and agricultural runoff in coastal Oregon. She was the lead microbiologist on a multidisciplinary team that examined how contamination is cycling through five watersheds draining to Oregon's Tillamook Bay.

"I love collaborating and working closely with stakeholders, trying to provide information that they can use to improve management of systems," said Zimmer-Faust, who started May 8 as a Scientist in SCCWRP's Microbiology Department. "I'm drawn to applied science, where you're constantly thinking about what information is needed and then working on the questions that solve these needs."

Dr. Amy Zimmer-Faust goes backpacking with her shepherd mutt, Gus, near Mt. Adams in Washington in 2017. Zimmer-Faust has spent the past 2-1/2 years living in the Pacific Northwest.

Amy Zimmer-Faust, Ph.D.

Job: Scientist, Microbiology Department (started May 8)

Prior job: Postdoctoral Researcher, Western Ecology Division, U.S. Environmental Protection Agency National Health and Environmental Effects Research Laboratory in Newport, Oregon (2016-2018)

Education: Ph.D. environmental science and engineering, University of California, Los Angeles (2015); M.S. environmental health sciences, UCLA (2012); B.S. aquatic biology, University of California, Santa Barbara (2009)

Residence: Long Beach

Family: Partner Marc, a professor of environmental health science; dog Gus, a shepherd mutt

Hometown: Palos Verdes

Hobbies: Surfing, swimming, running, hiking, yoga

Zimmer-Faust has been interested in the aquatic sciences since she was an undergraduate at UC Santa Barbara. Initially, she thought she'd become an ecologist, but as she progressed in her studies, she became increasingly interested in the human health side.

During her master's at UCLA, Zimmer-Faust examined disinfection practices for seawater in the ballast tanks of commercial ships. The water, which is routinely pumped into and out of the tanks to stabilize ships, must be treated properly so that aquatic organisms don't escape into the environment.

During her postdoc, Zimmer-Faust was largely responsible for introducing water-quality managers in the Tillamook Bay area to microbial source tracking technology, which allows managers to trace contamination back to its sources and points of origin.

"This work resonated well with the stakeholders," Zimmer-Faust said. "They're putting a lot of effort into improving water quality, so they're excited about these tools. I find it rewarding to work in a discipline aimed at protecting public health."

Zimmer-Faust has loved the ocean and swimming since before she learned to walk. She's also an avid surfer; her favorite local surfing spot is the Cove in Palos Verdes. In Oregon, she braved chilly waters to surf at Agate Beach in Newport, Oregon.

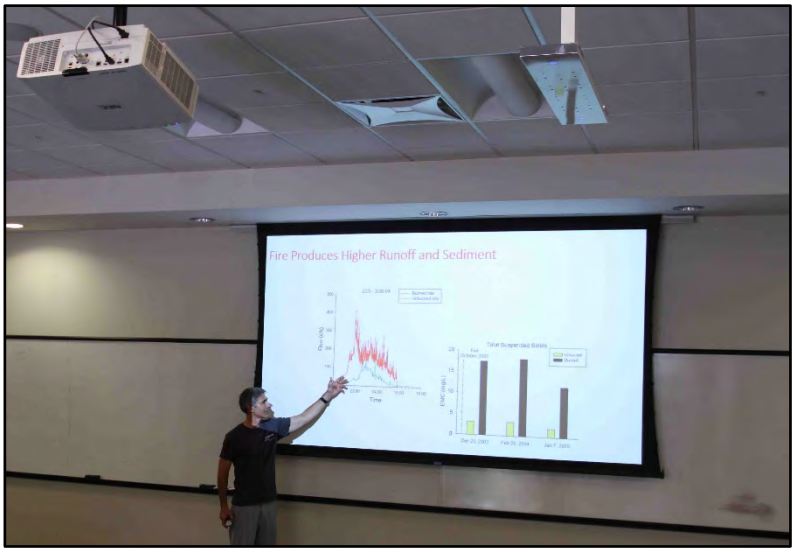
"I have just always loved water," she said. "It's really intriguing to think about how it has such a huge impact on everything around it."

SCCWRP SCENES

A new lease on life

SCCWRP in June renewed the lease on its Costa Mesa headquarters, which will extend SCCWRP's tenure in the building by 11 years. SCCWRP originally moved into the 27,000-square-foot, custom-designed facility in 2007.

The new lease agreement enables SCCWRP to begin upgrading and refurbishing its physical facilities. The first major change, made in July, was replacing the digital projectors in SCCWRP's three main conference rooms. The new high-definition, widescreen projectors offer brighter, sharper, higher resolution. Other updates in the coming months will include a redesign of SCCWRP's laboratories, installation of additional desk workstations, and new carpeting.



In SCCWRP's Large Conference Room, the previous projector, left, was a standard-definition, analog projector. The replacement, right, is a high-definition, widescreen digital projector. All three of SCCWRP's conference rooms received the equipment upgrades.