SCCWRP Director's Report

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SUMMER 2020 ISSUE

Statewide HABs early-warning system being developed

SCCWRP and its partners have launched a two-year pilot study to develop a statewide early-warning system for coastal harmful algal blooms (HABs) that relies on autonomous microscopes to alert water-quality managers that a bloom event could be imminent.

The pilot network, which will be the first of its kind on the West Coast, marks the next phase of expansion for the statewide Harmful Algal Bloom Monitoring and Alert Program (HABMAP), which has been collecting coastal HABs data for more than a decade via weekly grab sampling at piers.

Technology advances in recent years have paved the way for automated, real-time HABs monitoring in coastal waters.

During the pilot, nine Imaging FlowCytobot (IFCB) units will be deployed off California piers and offshore moorings for several months at a time to capture hourly images of phytoplankton a few meters beneath the water's surface.

The underwater images will then be transmitted via the web to computers on land that will use machine learning and image recognition software to estimate HABs levels in the water.

This continuous, real-time stream of HABs data has the potential to dramatically improve water-quality managers' ability to predict when a bloom event is imminent.

More often than not, HABs are detected after the bloom already has occurred, limiting the effectiveness of management efforts to mitigate HABs' impacts on fisheries and recreational activities.

Earlier detection also could give marine mammal rescue groups more advance notice to respond to animals sickened by HABs toxins and adaptively sample for toxins.

Meanwhile, researchers hope the additional HABs data at new timescales will help them better understand the specific environmental causes of HABs. Data from the pilot network will be fed

Contents

5 | Updates by Thematic Area

9 | New SCCWRP Publications

10 | Quarter in Review

11 | SCCWRP Personnel Notes

12 | SCCWRP Spotlights

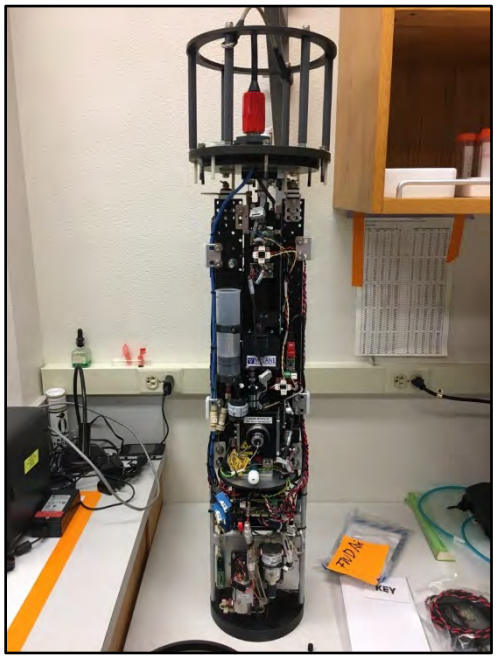
Cover photo: King Harbor in Los Angeles County is tainted a reddish-brown color by a harmful algal bloom (HAB) species known as dinoflagellate, which can poison and kill seabirds. Researchers are working to build a statewide early-warning system for coastal HABs. (Photo courtesy of Erica Seubert, College of the Canyons)

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 13
CTAG quarterly meeting
(Remote participation only)

Friday, September 11
Commission meeting
(Remote participation only)



The Imaging FlowCytobot (IFCB), pictured above with its outer casing removed, is an autonomous microscope device that can continuously capture and transmit images of underwater phytoplankton for analysis. Researchers are using the units to build a statewide early-warning system for coastal harmful algal blooms (HABs).

into the California Harmful Algae Risk Mapping (C-HARM) system, which is being used to improve predictions of coastal HABs.

HABs, which result from the overgrowth of microscopic algae, or phytoplankton, are ecologically disruptive events that are becoming more frequent and more intense across California as waters warm. HABs are responsible for, among other things, contaminating shellfish with toxins, reducing fisheries yields, sickening marine mammals and triggering closures of recreational water bodies.

The IFCB units selected for the pilot study were first made commercially available in 2016 by manufacturer McLane Research Laboratories Inc. based in Massachusetts. In California, the underwater vehicles already have been piloted in the Santa Cruz Wharf and San Francisco Bay, as well as off the coasts of Orange and San Diego Counties.

The underwater units are being deployed at nine coastal California sites, from Trinidad in Humboldt County to San Diego. SCCWRP will help maintain the IFCB unit that will be deployed off Newport Pier in Orange County.

In one case study demonstrating the value of autonomous HABs monitoring, an IFCB unit that had been deployed on a mooring off Del Mar in spring 2020 captured the initiation of the bloom event that triggered bioluminescent ocean waves. Because of COVID-19 pandemic-related restrictions on HABs grab sampling, the IFCB provided was one of the only data sources for studying this bloom.

All nine IFCB units are expected to be deployed by summer 2021.

For more information, contact Dr. Jayme Smith.

Three-tiered framework developed for assessing health of seagrass beds

SCCWRP has developed a three-tiered framework incorporating bioassessment methods to help environmental managers across coastal California comprehensively evaluate the health of eelgrass and other types of submerged aquatic vegetation (SAV).

The SAV assessment framework, described in a SCCWRP technical report published in August, represents an important step forward in efforts to better protect and restore this ecologically significant habitat, including within California's estuarine Marine Protected Areas (MPAs).

Seagrass beds – which are scattered across shallow coastal areas with soft-bottom sediments – provide critical habitat for organisms such as fish, crabs, lobsters and turtles. Because of their ecological significance, SAV condition assessments also can shed important insights into overall coastal water quality and ecological integrity.

Traditionally, SAV monitoring in California has been focused primarily around documenting the locations and extent of eelgrass, which is the dominant type of seagrass found in California's coastal embayments. Although these insights have helped inform protection and restoration efforts, this type of monitoring does not directly help managers understand if coastal areas containing SAV are achieving designated beneficial uses.

The SAV assessment framework was developed over a three-year period in consultation with a technical advisory committee.

Researchers have developed an assessment framework to help managers evaluate the health of seagrass beds like this one, above, in Newport Bay in Orange County.

The three tiers of the framework encompass:

» measurements of SAV's presence and extent
» assessments of overall water body condition based on SAV health
» assessments of overall ecological functioning based on SAV health

During the framework's development, eight seagrass beds were surveyed in Newport Bay and San Diego Bay. Researchers found that their condition declined along a predictable stressor gradient in response to increasing environmental stressors.

SCCWRP's SAV assessment framework is designed to be used with all types of seagrass, although it was calibrated initially using eelgrass in Southern California. Researchers will continue to pilot-test the SAV framework in more seagrass beds across California over the next three years.

Eventually, the new framework could be adopted and incorporated into routine seagrass monitoring programs, including California's estuarine MPA program.

For more information, contact Dr. David Gillett.

Photo courtesy of Christine Whitcraft, California State University, Long Beach

A round stingray swims through an eelgrass bed in Newport Bay in Orange County. Researchers have developed a three-tiered framework that incorporates bioassessment methods to help environmental managers across coastal California comprehensively evaluate the health of eelgrass and other types of submerged aquatic vegetation (SAV).

New passive sampling approach developed to measure cyanotoxins in freshwater systems

SCCWRP and its partners have shown in a proof-of-concept study that a newer, more experimental form of passive sampling technology known as o-DGT can be used reliably to measure levels of a ubiquitous class of cyanotoxin found in California freshwater systems.

The two-year study, published in July as a SCCWRP technical report, found that o-DGT passive samplers are a cost-effective alternative to traditional grab sampling for measuring multiple types of microcystins.

Not only did researchers show that o-DGT provides an integrated measure of toxin levels over time, but the technology also is able to quantify microcystins better than existing forms of passive sampling, including Solid Phase Adsorption Toxin Tracking (SPATT), which can provide only semi-quantitative estimates.

Water-quality managers are increasingly turning to passive sampling to expand routine cyanotoxin monitoring across California and beyond, underscoring the value of developing multiple types of passive sampling.

Researchers envision the o-DGT method being used as a complement to – or replacement for – SPATT-based passive sampling. SPATT remains one of the easiest, most accessible approaches for cyanotoxin monitoring, especially for capturing qualitative estimates of toxin levels.

Passive samplers are small, simple devices made of inexpensive, commercially available resins or films that are typically deployed for weeks or months at a time to sorb contaminants in the water column. Then, the devices are retrieved and analyzed in a lab.

Cyanotoxins, which are produced by some types of harmful algal blooms (HABs), are becoming more common in California as waters warm; these ecologically disruptive blooms can be deadly to domestic pets and harmful to humans who come into contact with contaminated water.

During the study, which was conducted with the Los Angeles Regional Water Quality Control Board, o-DGT passive sampling devices were deployed for one to three weeks in three L.A.-area lakes, one Northern California lake and one coastal harbor. Researchers were able to estimate the water concentrations of microcystin toxins, even at low levels.

Based on the findings of the o-DGT study, researchers will continue to evaluate the performance of this type of passive sampler.

SCCWRP already has begun examining o-DGT's ability to measure other types of cyanotoxins, including anatoxin-a, cylindrospermopsin and saxitoxin.

o-DGT passive sampling devices have been found to provide more quantitative measurements of cyanotoxins in freshwater systems than existing technologies like SPATT (Solid Phase Adsorption Toxin Tracking). Above, a thin layer of o-DGT polymer film that sits atop a holder, left, is secured to the holder and then mounted to a stainless-steel spindle, right, in preparation for deployment.

Researchers also are interested in linking o-DGT passive sampling measurements to existing statewide cyanotoxin thresholds that, when exceeded, trigger specific management responses intended to minimize ecological and public-health risks.

o-DGT passive sampling devices, which are made of a thin polymer film, already have been shown to accurately estimate concentrations of other common types of environmental contaminants, including pharmaceuticals and polyfluorinated alkyl substances (PFAS).

Contaminants that adhere to o-DGT devices are measured by taking into account predictable properties of the chemicals that control chemical diffusivity rates.

Consequently, o-DGT sampling rates are much less dependent on flow rate, ionic strength, pH and other environmental factors than SPATT and other more common types of passive sampling. Additionally, once chemicals sorb to o-DGT, the sorption is typically irreversible.

For more information, contact Dr. Bowen Du.

Study probing how to apply bioassessment tools to modified channels statewide

SCCWRP has launched a three-year effort to explore when and how bioassessment scoring tools should be used to evaluate the health of California streams that have been modified through channel hardening – an unresolved, often-debated issue that has complicated more widespread adoption of these tools.

The project, which kicked off in early August, involves running analyses on bioassessment scores for modified channels in multiple regions of California. Researchers will work to develop guidance and recommendations that help stream managers better understand potential appropriate uses – and limitations – of these tools.

Bioassessment scoring tools like the California Stream Condition Index (CSCI) and the Algal Stream Condition Index (ASCI), both co-developed by SCCWRP, are the focus of ongoing management efforts to more effectively protect the biological integrity of wadeable streams statewide.

Although these tools provide key insights about overall stream health by evaluating the composition of sentinel in-stream biological communities, modified channels tend to score uniformly lower with bioassessment indices than other stream types do – a phenomenon that persists even when water quality in modified channels is relatively good.

As a result, managers may lack effective options that they can implement to improve bioassessment scores in modified channels – short of removing or extensively modifying the hardening features altogether, which would be a costly option that could compromise flood control.

SCCWRP's statewide study will examine the factors and conditions that constrain managers' ability to boost bioassessment scores and achieve water-quality goals for modified channels.

The goal is to build a strong technical foundation for managers, so they can make informed, transparent decisions about when and how to apply

bioassessment scoring tools to modified streams.

During the study, SCCWRP will select regions from across California based on geography and land use, and identify types of channel modifications that commonly occur in each. Then, researchers will examine the ranges of bioassessment scores within each modified channel type, and analyze how scores are influenced by various environmental stressors.

Researchers are tentatively planning to focus on agricultural regions in Southern California, the Central Valley and the Central Coast, as well urban areas outside of Southern California. Modified channels in urban Southern California already have been studied.

Previous SCCWRP research with the Southern California Stormwater Monitoring Coalition (SMC) has underscored the limitations of using stream bioassessment tools as the basis for protecting the health of the region's modified channels:

» In a 2015 study evaluating the performance of the CSCI – a bioassessment index that uses benthic macroinvertebrates to score stream health – researchers found that Southern California modified channels achieve lower-than-expected bioassessment scores even in the absence of environmental stressors that bring down scores for other types of streams. The study concluded that channel hardening itself was likely responsible.

Modified channels like San Lorenzo Creek in California's Central Coast, above, will be the focus of a three-year study exploring when and how bioassessment scoring tools should be used to evaluate the health of California streams statewide that have been modified through channel hardening. This unresolved, often-debated issue has complicated more widespread adoption of stream bioassessment tools.

» A follow-up 2017 study evaluating the performance of the ASCI – which uses algae to score stream health – found that bioassessment scores in modified channels were not correlated with gradients in water quality, suggesting that even if managers made water-quality improvements to modified channels, it would be unlikely to boost bioassessment scores.

Researchers are soliciting partners to help select study regions, and to help identify major types of channel modification in each region.

For more information, contact Dr. Raphael Mazor.

Updates by Thematic Area

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

ECOHYDROLOGY

Stream flow classification tool receives preliminary endorsement, to be rolled out across U.S. Southwest

A new tool that can rapidly distinguish among perennial, intermittent and ephemeral streams in the U.S. Southwest has received preliminary endorsement from a technical steering committee, paving the way for its rollout across an area stretching from California to Texas.

The flow duration classification tool, which was tentatively endorsed in July, uses easily observable field indicators – including presence of wetland vegetation and specific types of aquatic insects – to classify streams based on the duration of their surface flows. The tool is a collaboration of SCCWRP, the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (USACE).

Researchers have developed a tool that can rapidly distinguish among perennial, intermittent and ephemeral streams in the U.S. Southwest, including this tributary of Agua Caliente Creek in San Diego that is classified as an ephemeral stream.

Ephemeral streams are water bodies that experience surface flows only after rain events, whereas intermittent streams experience sustained seasonal flows from snow melt and groundwater.

The tool is designed to support regulatory programs that require streamflow duration classifications, such as implementing riparian buffer best management practices, and identifying appropriate water quality standards for non-perennial streams. Additionally, the USEPA and USACE plan to further develop the tool to inform Clean Water Act regulatory decisions under a recent federal rule that clarifies the central role of stream flow duration information in identifying Waters of the United States.

This fall, SCCWRP will begin rolling out a beta version of this tool across the Arid Southwest region, focusing on outreach, training and soliciting feedback for further regional calibration and improvement.

CLIMATE CHANGE

Ocean's 'breathability' for anchovies being used to track impacts of climate change

A research team that includes SCCWRP has found that populations of Northern Anchovy fish rise and fall in predictable ways in response to how "breathable" the ocean water is for them – a finding that has enabled scientists to use this keystone prey species to begin tracking the impacts of climate change on West Coast ecosystems.

The research finding, published in May by the journal *Science Advances*, showed that the southern part of anchovies' range in the Southern California Bight could become uninhabitable by 2100 as a result of reduced availability of dissolved oxygen. Global climate change is reducing oxygen availability by triggering ocean warming and by altering seawater chemistry.

During the anchovy study, researchers showed that there is a strong correlation between the "breathability" of the ocean water and the abundances of Northern Anchovy found in a particular area. The water's "breathability" was calculated using a recently developed, anchovy-specific metabolic index that's designed to measure the temperature-dependent availability of dissolved oxygen in relation to the species' oxygen needs.

The anchovy work is part of an ongoing, four-year study to develop a similar, species-specific metabolic index for each of 13 commercially and ecological important California Current species, then apply the indices to explore how their habitats will be squeezed by reduced oxygen availability.

Effluent sampling completed for study examining dispersal patterns of wastewater plume

SCCWRP and the Orange County Sanitation District (OCSD) have completed a comprehensive round of in-plant effluent sampling for a three-year study exploring how the dilution and mixing patterns of OCSD's wastewater effluent plume are expected to change as more treated effluent gets recycled.

Data from the three-month sampling effort, completed in July, will be used to predict the concentrations of nutrients and other contaminants in the plume in the coming years.

Then, researchers will use a computer ocean model to simulate plume dispersion scenarios based on OCSD's expected final water-recycling goal, including how contaminants in the plume are expected to affect biogeochemical cycling in coastal waters.

Increased wastewater recycling in the coming years is expected to reduce effluent volumes in drought-prone California, leading to more concentrated plumes that may have different buoyancy and mixing characteristics.

MICROBIAL WATER QUALITY

Wastewater samples collected from 9 local POTWs to build national COVID-19 surveillance system

SCCWRP and its partners have collected and preserved wastewater influent samples from nine Southern California treatment plants over the past four months for a national study investigating how wastewater influent could be used to monitor the prevalence of COVID-19 infections in communities in near real time.

The more than 300 Southern California samples will give researchers a range of data points to use for correlating virus counts to community infection rates. The goal is to build an early-warning, wastewater-based surveillance system to track trends in COVID-19 community infection rates.

Wastewater streams have the potential to offer more accurate, earlier, comprehensive insights about community infection rates than individual testing of subsets of the population.

In the coming weeks, SCCWRP will begin quantifying the virus counts in the samples using droplet digital PCR (polymerase chain reaction), a more sensitive quantification method than older PCR techniques. SCCWRP has played a national role in helping to adapt droplet digital PCR for water-quality monitoring.

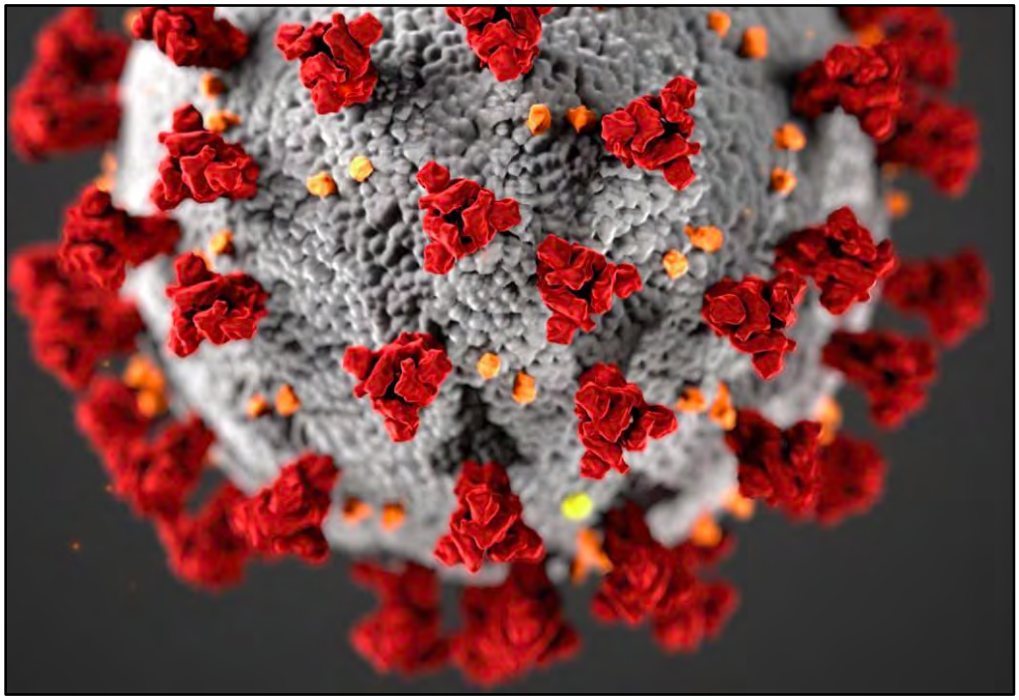


Image courtesy of U.S. Centers for Disease Control and Prevention

The SARS-CoV-2 virus, pictured in this artist rendering, is prevalent in wastewater streams entering treatment plants. Researchers have collected and preserved more than 300 wastewater influent samples from nine Southern California treatment plants for a national study investigating how wastewater influent could be used to provide near real-time monitoring of the prevalence of COVID-19 infections in communities.

STORMWATER BMPs

Study launched with EPA to improve mechanistic understanding of bioretention planters

Southern California researchers working to optimize the ability of bioretention planters to treat stormwater runoff have launched a two-year project with the U.S. Environmental Protection Agency's Office of Research and Development (ORD) to improve mechanistic understanding of this type of stormwater BMP (best management practice).

The project, launched in July, will seek to document how the physical design and configuration of bioretention planters contributes to their effectiveness in slowing down and reducing the volume of runoff flowing through them. This foundational understanding will help researchers optimize the design of this BMP type to remove contaminants from urban runoff, particularly rooftop runoff.

The project, which complements a similar ongoing East Coast effort, is a partnership between EPA ORD, SCCWRP and the Riverside County Flood Control and Water Conservation District, which will host the research at its Low Impact Development (LID) facility.

Recent studies examining the performance of bioretention systems, including planters, have underscored how little is known about optimizing this BMP type, even as Southern California stormwater managers have invested heavily in installing bioretention BMPs in recent years.

Statewide effort launched to improve monitoring programs that support adaptive stormwater management

SCCWRP has launched a statewide effort examining how to design monitoring programs that can optimally support stormwater managers' adaptive management programs, where watershed management plans, including BMPs, are implemented on timescales of 10+ years.

The project, which began in July with the first meeting of a technical advisory committee, involves developing a statewide monitoring program framework intended to bring clarity, consistency and equity to how stormwater managers across California develop their adaptive management programs. The project will use a data-driven approach to identify modifications to existing watershed management plans that can reasonably assure increasingly positive outcomes for water quality.

Existing stormwater discharge permits sometimes use vague, conflicting language to describe adaptive management, leading to inconsistencies in monitoring program design and reporting requirements.

Although the framework is intended to provide statewide guidance, it will be designed to provide flexibility for stormwater managers to address regional concerns.

REGIONAL MONITORING

Second Bight '18 Sediment Quality assessment report published

The Southern California Bight 2018 Regional Monitoring Program has published the second of its Sediment Quality assessment reports, and two others are undergoing internal review later this summer.

The Bight '18 Sediment Chemistry report, published in July, found that 79% of sediment Bight-wide is considered to produce minimal to low chemical contamination exposure levels – a finding that has remained relatively consistent over the past 15 years. Only 3% of sediment Bight-wide is in the worst, or high exposure, category.

While offshore areas generally had lower exposure levels, estuaries and marinas are the embayment strata with the greatest portion of sediment classified as producing high chemical contamination exposure levels.

The technical committees for two other Bight '18 Sediment Quality assessment reports – "Bioaccumulation in Sportfish" and "Trawl-Caught Fish and Invertebrates" – are meeting later this summer to review draft reports.

The first Bight '18 assessment report, Sediment Toxicity, was published in April.

Image courtesy of Wood Environment and Infrastructure

Researchers are developing a standardized monitoring framework for assessing the condition of California's coastal estuaries, including Upper Newport Bay in Orange County, above, one of the State's estuarine Marine Protected Areas (MPAs).

Monitoring framework being developed to assess health of estuaries statewide

SCCWRP and its partners have begun working to develop a standardized, statewide monitoring framework for assessing the condition of California's coastal estuaries, including the State's 24 estuarine Marine Protected Areas (MPAs).

The project, which kicked off in May with the formation of a management advisory committee, involves designing a monitoring program for evaluating multiple aspects of estuarine health, including benthic infauna, fish and marsh vegetation.

The framework is intended to bring consistency to estuarine monitoring efforts statewide. Although monitoring programs exist for estuaries across California, these programs have never been coordinated, limiting data comparability and managers' ability to track the overall health of estuaries statewide.

The California Ocean Protection Council intends to use this monitoring framework to report on the health of California's estuarine MPAs in 2024.

New SCCWRP Publications

Journal Articles (Published)

Aylagas, E., A. Borja, X. Pochon, A. Zaiko, N. Keeley, K. Bruce, P. Hong, G.M. Ruiz, E.D. Stein, S. Theroux, N. Geraldi, A. Ortega, L. Gajdzik, D.J. Coker, Y. Katan, T. Hikmawan, A. Saleem, S. Alamer, B.H. Jones, C.M. Duarte, J. Pearman, S. Carvalho. 2020. Translational Molecular Ecology in practice: Linking DNA-based methods to actionable marine environmental management. *Science of the Total Environment* DOI:10.1016/j.scitotenv.2020.140780.

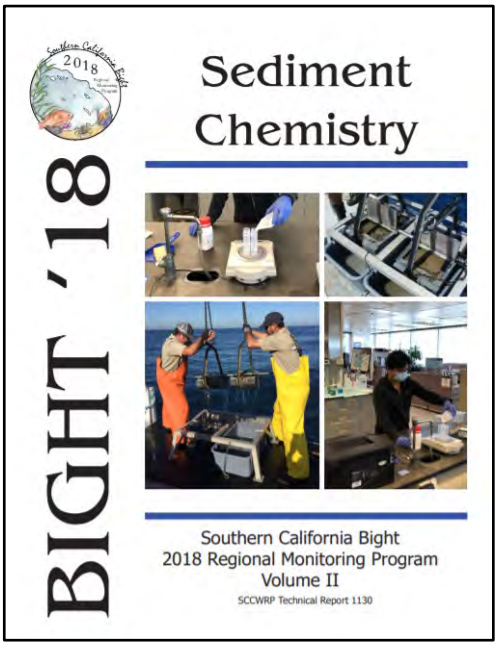
Bednarsek, N., G. Pelletier, A. Ahmed, R.A. Feely. 2020. Chemical Exposure Due to Anthropogenic Ocean Acidification Increases Risks for Estuarine Calcifiers in the Salish Sea: Biogeochemical Model Scenarios. *Frontiers in Marine Science* 7:580.

Challis, J.K., A. Parajas, J.C. Anderson, E. Asiedu, J.W. Martin, C.S. Wong, M.S. Ross. 2020. Photodegradation of bitumen-derived organics in oil sands process-affected water. *Environmental Science: Processes & Impacts* 22:1243-1255.

Howard, E.M., J.L. Penn, H. Frenzel, B.A. Seibel, D. Bianchi, L. Renault, F. Kessouri, M.A. Sutula, J.C. McWilliams, and C. Deutsch. 2020. Climate-driven aerobic habitat loss in the California Current System. *Science Advances* 6:p.eaay3188.

Major, K.M., B.M. DeCourten, J. Li, M. Britton, M.L. Settles, A.C. Mehinto, R.E. Connon, S.M. Brander. 2020. Early Life Exposure to Environmentally Relevant Levels of Endocrine Disruptors Drive Multigenerational and Transgenerational Epigenetic Changes in a Fish Model. *Frontiers in Marine Science* 7:4714.

Ulibarri, N., K.A. Goodrich, P. Wagle, M. Brand, R. Matthew, E.D. Stein, B.F. Sanders. 2020. Barriers and opportunities for beneficial reuse of sediment to support coastal resilience. *Ocean and Coastal Management* DOI:10.1016/j.ocecoaman.2020.105287.



The Southern California Bight 2018 Regional Monitoring Program has published its second assessment report focusing on sediment chemistry in the coastal ocean.

Winship, A.J., J.T. Thorson, M.E. Clarke, H.M. Coleman, B. Costa, S.E. Georgian, D. Gillett, A. Gruss, M.J. Henderson, T.F. Hourigan, D.D. Huff, N. Kreidier, J.K. Pirtle, J.V. Olson, M. Poti, C.N. Rooper, M.F. Sigler, S. Viehman, and C.E. Whitmire. 2020. Good practices for species distribution modeling of deep-sea corals and sponges for resource management: data collection, analysis, validation, and communication. *Frontiers in Marine Science*. 7:303.

Journal Articles (Online)

Beck, M.W., C. O'Hara, J.S. Stewart-Lowndes, R.D. Mazor, S. Theroux, D.J. Gillett, B. Lane, G. Gearheart. 2020. The importance of open science for biological assessment of aquatic environments. *PeerJ* DOI:10.7717/peerj.9539.

Brown, A.K., J. Ackerman, N. Cicek, C.S. Wong. 2020. In situ kinetics of human pharmaceutical conjugates and the impact of transformation, deconjugation, and sorption on persistence in wastewater batch bioreactors. *Environmental Pollution* DOI:10.1016/j.envpol.2020.114852.

Paul, M., B. Jessup, L.R. Brown, J. Carter, M. Cantonati, D. Charles, J. Gerritsen, D. Herbst, R. Stancheva, J. Howard, B. Isham, R. Lowe, R. Mazor, P. Mendez, P. Ode, A. O'Dowd, J. Olson, Y. Pan, A. Rehn, S. Spaulding, M. Sutula, S. Theroux. Characterizing benthic macroinvertebrate and algal biological condition gradient models for California wadeable streams, USA. *Ecological Indicators* DOI: 10.1016/j.ecolind.2020.106618.

Journal Articles (Accepted)

Griffith, J.F. , S.B. Weisberg, Y. Cao, M. R. Raith, A. Schriewer, X. Yu, J. Gregory, J. Guzman, K.D. Goodwin, L. Othman, S. Choi, S. Rapoport, S. Steele, and T. Nguyen. In press. Assessing applicability of Enterococcus qPCR methods at thirty-six southern California beaches. *Journal of Microbiological Methods*.

Rochman, C.M., S.B. Weisberg, S.L. Moore and A. Whitley. In press. The Unknowns of Microplastics: We cannot understand what we cannot measure. *Applied Spectroscopy*.

Theroux, S., R.D. Mazor, M.W. Beck, P.R. Ode, E.D. Stein, M. Sutula. In press. Predictive biological indices for algae populations in diverse stream environments. *Ecological Indicators*.

Wyer, H., D. Halberstadt, D. Polhemus, S.L. Moore, S.B. Weisberg, S. Coffin, and C. Rochman. In press. Steps scientists can take to inform aquatic microplastics management – A perspective informed by the California experience. *Applied Spectroscopy*.

Zimmer-Faust, A.G., J.A. Steele, J.F. Griffith, K. Schiff. In press. The challenges of microbial source tracking at urban beaches for Quantitative Microbial Risk Assessment (QMRA). *Marine Pollution Bulletin.*

Technical Reports

Ashby, K., A. Davis, G. Gearheart, J. Harwood, T. Hogue, D. Kleis, S. Luce, P. Ode, D. Senn. 2020. Southern California Stormwater Monitoring Coalition Five-Year Research Agenda 2019-2024. Technical Report 1126. Southern California Coastal Water Research Project. Costa Mesa, CA.

Du, B., J. Smith, K. Maruya, C.S. Wong. 2020. Comparison of Novel Passive Sampling Methods to Identify Cyanotoxins and their Sources. Technical Report 1123. Southern California Coastal Water Research Project. Costa Mesa, CA.

Du, B., C.S. Wong, K. McLaughlin, K.C. Schiff. 2020. Southern California Bight 2018 Regional Monitoring Program: Volume II. Sediment Chemistry. Technical Report 1130. Southern California Coastal Water Research Project. Costa Mesa, CA.

Martindale, S., S.B. Weisberg, S. Coffin. 2020. Status of Legislation and Regulatory Drivers for Microplastics in California. Technical Report 1133. HORIBA Scientific. Kyoto, Japan.

McCune, K., D.J. Gillett, E.D. Stein. 2020. Methods and Guidance on Assessing the Ecological Functioning of Submerged Aquatic Vegetation in Southern California Estuaries and Embayments. Technical Report 1136. Southern California Coastal Water Research Project. Costa Mesa, CA.

Taniguchi-Quan, K., R.D. Mazor, J. Brown, R. Guill, M. Yeager, A. Suter, J. Rudolph, B. Isham, and S. Johnson. 2020. 2018-2019 Report on the SMC Stream Survey. Technical Report 1127. Southern California Coastal Water Research Project. Costa Mesa, CA.

Weisberg, S.B, F. Chan, J.P. Barry, A.B. Boehm, S. Busch, S.R. Cooley, R.A. Feely, L.A. Levin. 2020. Enhancing California's Ocean Acidification and Hypoxia Monitoring Network. Technical Report 1137. California Ocean Science Trust. Sacramento, CA.

Quarter in Review

Conference Presentations

Mazor, R. Diversity, Equity and Inclusion (workshop moderator). Society for Freshwater Science Summer of Science Conference. June-July 2020. Via webinar.

Nissen, K. , M. Borst, E. Fassman-Beck. Hydrological Monitoring (Lag and Capture) of Bioretention Planters. International Low Impact Development Conference. July 20-24, 2020. Via webinar.

Schiff, K. Chat with an Expert (invited panelist). Southern California Society of Environmental Toxicology and Chemistry. July 2, 2020. Via webinar.

Theroux, S. Mind the gap: bridging the distance between eDNA research and regulatory integration. International Workshop on Environmental Genomics. June 24-25, 2020. Via webinar.

Other Presentations

Bednaršek, N. Ocean acidification risks and solutions for economically and ecologically sensitive calcifiers. National Oceanic and Atmospheric Administration. July 2020. Via webinar.

Fassman-Beck, E. BMP Performance in Relation to Vegetation Cover, Mulch, & Maintenance. San Diego County Land Development Workgroup Meeting. May 20, 2020. Via webinar.

Fassman-Beck, E. SCCWRP's Stormwater BMP Research. San Diego County Land Development Workgroup Meeting. May 20, 2020. Via webinar.

Schiff, K., and M. Sutula. Climate Change: Ocean Acidification (facilitators for first workshop in a series). July 14, 2020. Via webinar.

Schiff, K., and E. Stein. Impacts of wildfire on water quality. Upper Los Angeles River Watershed Management Committee. July 22, 2020. Via webinar.

Sutula, M. Climate Change Effects on pH and Acidification. South Coast Water Boards discussion on climate change policy. July 24, 2020. Via webinar.

Theroux, S. California algae assessment. Diatom Web Academy. July 21, 2020. Via webinar.

Weisberg, S. Enhancing California's Ocean Acidification and Hypoxia Monitoring Network: Recommendations from the California Ocean Acidification and Hypoxia Science Task Force. California Ocean Protection Council. June 19, 2020. Via webinar.

Weisberg, S. Enhancing California's Ocean Acidification and Hypoxia Monitoring Network: Recommendations from the California Ocean Acidification and Hypoxia Science Task Force. State of Washington Marine Resources Advisory Council. August 5, 2020. Via webinar.

SCCWRP Personnel Notes

New Faces

Dr. **Heili Lowman**, who just earned her Ph.D. in ecology, evolution and marine biology from the University of California, Santa Barbara, joined SCCWRP in June as a Scientist in the Biology Department. She is a biogeochemist who specializes in data visualization.

Dr. **Heiko Schoenfuss**, a Professor of Biological Sciences at St. Cloud State University in Minnesota, joined SCCWRP in July as a Visiting Scientist in the Toxicology Department. He specializes in tracking biological changes in fish from exposure to contaminants of emerging concern (CECs).

Syd Kotar, who worked as a Laboratory Assistant in the Toxicology Department from 2017 to 2019, re-joined SCCWRP in July as a Research Technician in the Chemistry Department.

Lucy Mao, who worked at SCCWRP from 2016 to 2019, re-joined SCCWRP in June as a Research Technician in the Microbiology Department.

Promotions

Minna Ho, who has worked at the Biogeochemistry Department since 2017, most recently as a Senior Research Technician, was promoted to Scientist in July.

Scientific Leadership

Dr. **Elizabeth Fassman-Beck** has been appointed to the Technical Advisory Committee of the Los Angeles County Department of Public Works' Strategic Planning Group LID/Groundwater Study.

Dr. **Elizabeth Fassman-Beck** has been appointed to the Technical Advisory Committee for the Los Angeles County Department of Public Works' Watershed Management Modeling System.

Dr. **David Gillett** has been appointed chair of the Attendees Experience Committee's Career Networking sub-committee for the Coastal and Estuarine Research Federation's 2021 Conference.

Darrin Greenstein has been appointed to the Steering Committee of the Society of Environmental Toxicology and Chemistry—North America's Aquatic Toxicity Testing Interest Group.

Dr. **John Griffith** has been appointed to the Experts Panel for a project titled "Building Capacity and Communication Networks in SARS-CoV-2 Sewage Surveillance Programs for a Public Health Response" that is supported by the Alfred P. Sloan Foundation.

Dr. **Faycal Kessouri** has been appointed to the Technical Advisory Committee for the Integral Corporation project "A Risk Assessment Framework to Evaluate Effects of Offshore Wind Farms on the California Upwelling Ecosystem."

Dr. **Raphael Mazor** has been appointed a member of the Society for Freshwater Science's Justice, Equity, Diversity, and Inclusion Task Force.

Dr. **Alvina Mehinto** has been appointed to the Editorial Board of the journal *Environmental Science & Technology Letters*.

Ken Schiff has been appointed to the Planning Committee for the Center for Watershed Protection's 2021 National Stormwater Conference.

Dr. **Jayme Smith** was re-elected to the early-career seat on the National Harmful Algal Bloom Committee in July.

Dr. **Stephen Weisberg** has been appointed to the Dean's Advisory Council for the University of Delaware's College of Earth, Ocean and Environment.

Dr. **Stephen Weisberg** has been appointed to the Water Research Foundation's Advisory Committee for Microplastics in Water: Occurrence, Removal, Fate and Transport in Water Treatment.

Kelcey Chung, who has worked as a Laboratory Assistant in the Biogeochemistry Department since 2019, was promoted to Research Technician in June.

Departures

Dr. **Jennifer Taylor**, a Scientist in the Biology Department who has worked at SCCWRP since 2017, left in July to relocate to the East Coast.

SCCWRP COMMISSIONER SPOTLIGHT

L.A. Regional Board is dream job for manager

Jenny Newman has known since she was in grad school more than two decades that she's wanted to work for the the Los Angeles Regional Water Quality Control Board.

Jenny Newman

Although her first job after graduation was working for a private consulting firm for 1-1/2 years, she still kept her sights set on the L.A. Regional Board.

"I can't imagine working anywhere else," said Newman, who was hired 19 years ago by the L.A. Regional Board as an Environmental Scientist. "I love L.A., I'm an L.A. native and I love working for the State and being a public servant. I think we have tremendous authority at this level to protect the water and the land for all people."

Newman was appointed a SCCWRP Alternate Commissioner in June 2019 following her promotion to Assistant Executive Officer. She replaces Renee Purdy, who became Commissioner upon her promotion to Executive Officer last year.

As one of her agency's two Assistant Executive Officers, Newman oversees a 62-member staff that encompasses Regional Programs, NPDES Permitting, and the Groundwater Permitting and Land Disposal Sections. She focuses on cross-programmatic, big-picture issues, interacting routinely with both her own staff and permittees.

"I miss being immersed in the technical weeds a little, but I also enjoy taking a step back and helping others realize: 'Hey, let's not miss the forest for the trees here,'" said Newman, whose former Regional Board role was Regional Programs Section Chief.

Newman has known she wanted to work on environmental issues since the seventh grade, when she put together a report on rivers and lakes for a geography class.

Jenny Newman explores the Scottish National Gallery of Modern Art during a 2017 family trip.

Jenny Newman

Job: Assistant Executive Officer, Los Angeles Regional Water Quality Control Board

SCCWRP role: Alternate Commissioner (started June 2019)

Prior jobs: 19 years with L.A. Regional Board: Chief, Regional Programs Section (2018-2019), Chief, TMDL Unit 3 (2007-2018); Environmental Scientist (2001-2007); Environmental Scientist, Science Applications International Corporation (2000-2001)

Education: M.S. environmental science and management, University of California, Santa Barbara (1999); B.S. earth science, University of California, San Diego (1997)

Residence: Little Tokyo neighborhood of Los Angeles

Hometown: Mar Vista neighborhood of L.A. (near Venice)

Hobbies: Going to concerts, art shows and museums; spending time with her nephew; exploring downtown L.A.; traveling

After majoring in earth science at UC San Diego, Newman enrolled in the newly opened Bren School of Environmental Science & Management at UC Santa Barbara in 1997. There, she took part in a group master's thesis on coastal bacterial contamination – an issue that cemented her interest in working in environmental management and that introduced her to the Regional Boards.

While in grad school, Newman also learned about SCCWRP through her faculty adviser's participation in the Southern California Bight 1998 Regional Monitoring Program.

Throughout her 19-year Regional Board career, Newman has interacted frequently with SCCWRP, including by directly partnering with multiple SCCWRP scientists on studies. She's looking forward to continuing this spirit of collaboration as a SCCWRP Alternate Commissioner.

"I'm excited to have a greater role in directing the organization and making sure the Regional Board perspective is included in projects," Newman said. "SCCWRP provides me a diferent avenue to work with the same stakeholders I work with at the Regional Board."

In her spare time, Newman, who lives in L.A.'s Little Tokyo neighborhood, enjoys exploring downtown L.A. on foot. She regularly walks down to the L.A. River and through the Arts District, and loves checking out neighborhood shops, restaurants and bars.

CTAG SPOTLIGHT

Regulator has worked on other side of the fence

Jason Bill understands what it's like to work on the other side of the regulatory fence – because before he joined the Santa Ana Regional Water Quality Control Board in 2014, that's exactly what he did.

Jason Bill

For six years, Bill worked as a biologist for Caltrans, helping the State agency to minimize biological and water-quality impacts from roadway projects.

And earlier in his career, Bill spent four years working for a regional planning organization serving Arizona's Tucson metropolitan area and other parts of Pima County.

"These jobs helped me really understand the needs of the regulated community, and how to avoid environmental impacts through different design approaches and construction methods," said Bill, the Santa Ana Regional Board's 401 Water Quality Certification Coordinator. "It makes me more effective at influencing their projects now in a positive way."

Bill has been serving on CTAG since April 2019; he replaced Doug Shibberu, who assumed different duties at the Regional Board.

Much of Bill's time is spent overseeing the Regional Board's permitting activities under Section 401 of the federal Clean Water Act. He works with a team of seven 401 permit writers; his focus is ensuring consistency in how permits get written.

Bill, who grew up in coastal Virginia along the tidally influenced Rappahannock River, has long been drawn to water and environmental issues. He majored in biology at the College of William and Mary in Virginia, then ventured west to get his master's in ecology and evolutionary biology from Rice University in Texas.

He moved to Arizona after his wife was accepted into a Ph.D. program in Tucson, then to Southern California after she was offered a faculty position at Cal State San Bernardino.

Jason Bill hikes the Pacific Crest Trail with wife Caroline during a May 2020 trip to Big Bear Lake in San Bernardino County.

Jason Bill

Job: Environmental Scientist, Santa Ana Regional Water Quality Control Board (2014-present)

SCCWRP role: CTAG Representative

Prior jobs: Environmental Planner, California Department of Transportation (2008-2014); Botanist/GIS Specialist, San Bernardino National Forest (2004-2008); Research/Statistical Analyst, Pima Association of Governments (2000-2004); Project Biologist, Geo-Marine (1998-1999); Research Assistant, Colorado State University (1997-1998)

Education: M.A. ecology and evolutionary biology, Rice University (1995); B.S. biology, College of William and Mary (1992)

Residence: Running Springs

Hometown: Fredericksburg, Virginia

Family: Wife Caroline, an administrator at Cal State San Bernardino; daughter Louise, 17, who will be starting college at UC Berkeley this fall; son, Ben, 14; one dog, a pit bull-German shepherd-Labrador mix; one cat

Hobbies: Hiking wilderness trails outside his home; backyard vegetable gardening; playing the guitar and electric organ

Bill enjoyed his tenure at Caltrans, but jumped at the opportunity to move to the Regional Board in 2014 because of its smaller size and smaller geographic jurisdiction.

"It gave me the opportunity to learn something new without having to relocate," said Bill, who lives in the mountain community of Running Springs in the San Bernardino National Forest.

Bill first learned about SCCWRP while at Caltrans; he took part in a SCCWRP-led training course on the California Rapid Assessment Method for wetland habitats.

"Over the years, SCCWRP has really informed my regulatory decision-making pathways and helped me understand why our regulations are written as they are," he said. "I hope now I can help guide SCCWRP's research needs into the future."

In his spare time, Bill plays the guitar and electric organ – just for fun, in his basement. He also recently completed an eight-year stint coaching elementary and middle school basketball for both his daughter and son.

SCCWRP PARTNER SPOTLIGHT

Professor changing careers to run plant nursery

When Dr. Heiko Schoenfuss began his career as a tenured biology professor nearly two decades, he made a commitment to himself not to stay in the same job for more than 20 years.

Dr. Heiko Schoenfuss

Schoenfuss, a Professor of Biological Sciences at St. Cloud State University in Minnesota, is now making good on that promise: He's leaving his faculty position at the end of this year to take a full-time job co-managing a wholesale plant nursery in Riverside County with his wife. He already relocated temporarily to Southern California in January to begin the transition.

"I'm not leaving St. Cloud because I'm having a midlife crisis," Schoenfuss said. "As I've moved into more senior positions, I found myself spending the vast majority of my time and energy on administrative tasks – instead of doing science."

Schoenfuss is confident his career change will free up more of his time to focus on research. Over the past few months, he's been putting in a full day as Operations and Compliance Manager at Alta Nursery in San Jacinto, then spending several hours each evening working on journal manuscripts and collaborating with colleagues, including at SCCWRP.

He'll return to Minnesota this fall to teach his final St. Cloud State University course and sell his home.

"I spend 12-15 hours a week now on research writing – a real luxury compared to what would happen in fall semester," Schoenfuss said. "And because I don't spend an entire day on administrative paperwork, my mind is ready to be very productive and focused in the evening."

Dr. Heiko Schoenfuss enjoys a backpacking trip with wife Tonya through the mountains of southern Germany in 2017.

Heiko Schoenfuss, Ph.D.

Job: Professor, Biological Sciences, St. Cloud State University (2001-present); Operations and Compliance Manager, Alta Nursery in San Jacinto, California (2020-present)

SCCWRP role: Visiting Scientist in the Toxicology Department (started July 2020)

Prior jobs: Director, Aquatic Toxicology Laboratory, St. Cloud State University (2002-2020); Research Associate, Department of Fisheries & Wildlife, University of Minnesota (1999-2001); Biological Sciences Instructor, Southeastern Louisiana University (1995-1997); Zoology Laboratory Instructor, Louisiana State University (1993-1997)

Education: Ph.D. evolutionary morphology, Louisiana State University (1997); M.S. veterinary anatomy, LSU (1997); B.S. biology, University of Bayreuth in Germany (1991)

Residence: San Jacinto

Family: Wife Tonya, a food science and nutrition professor and incoming President of Alta Nursery; three dogs (pit bull, husky mix and miniature pinscher)

Hometown: Baden-Baden in southwestern Germany

Hobbies: Curating a 5,000-volume personal library; long-distance running; hiking and traveling

Schoenfuss joined SCCWRP in July as a Visiting Scientist in the Toxicology Department. He'll be building upon a longstanding collaboration with SCCWRP's Dr. Alvina Meninto focused on tracking biological changes in fish from exposure to contaminants of emerging concern (CECs) in freshwater systems. It's exactly the type of research Schoenfuss looks forward to having more time for.

A native of the Black Forest region of southwestern Germany, Schoenfuss first came to the U.S. as part of a one-year, post-baccalaureate study-abroad program at Louisiana State University (LSU) focused on fish and functional anatomy. He loved it so much that he stayed at LSU to earn his Ph.D. in evolutionary morphology and a master's in veterinary anatomy.

Since 2001, he's been working at St. Cloud and running the university's Aquatic Toxicology Laboratory, which he founded.

Schoenfuss is temporarily living in San Jacinto with his in-laws, who are in the process of transitioning ownership of Alta Nursery to him and his wife. The couple already has purchased land in the foothills of nearby Hemet to build a home.

SCCWRP STAFF SPOTLIGHT

Biogeochemist keeps research interests broad

When Dr. Heili Lowman entered her doctorate program at UC Santa Barbara in 2015, she knew she didn't want to take the traditional route of selecting a single, niche research topic for her dissertation.

Dr. Heili Lowman

Instead, the biogeochemist proactively pursued multiple types of research projects. She studied, among other things, the ecological consequences of nutrient recycling in beach sand, how climate change is impacting the nutritional quality of kelp, and the fate and impact of terrestrial debris that is transported via stormwater to the coastal ocean.

"I can't say that my dissertation is what you would call normal," said Lowman, whose dissertation is centered loosely around coastal biogeochemical processes on land and at sea. "But these multidisciplinary, multi-environment research questions are the ones that really interested me."

Lowman, who just defended her dissertation, started in June as a Scientist in the Biology Department. She will specialize in data visualization – a discipline she focused on extensively during her Ph.D. – continuing the work of Dr. Marcus Beck, who left SCCWRP last year to relocate to Florida.

Lowman says the unusual approach she took to her doctoral dissertation has prepared her well to work in SCCWRP's collaborative, multidisciplinary environment. She's learned how to deftly juggle multiple projects at once, to proactively partner with scientists from other disciplines, and to continually push the boundaries of creativity in designing studies.

Dr. Heili Lowman explores a bog wetland during a trip to Estonia in summer 2019.

Heili Lowman, Ph.D.

Job: Scientist, SCCWRP Biology Department (started June 2020)

Prior jobs: Graduate Researcher and Teaching Assistant, UC Santa Barbara (2015-2020); Research Assistant, University of Iowa (2014); Senior Associate for Healthcare Performance Improvement, Berkeley Research Group (2012-2014); Communications Coordinator, National Marine Sanctuary Foundation (2012)

Education: Ph.D. ecology, evolution and marine biology, University of California, Santa Barbara (2020); B.A. chemistry and French/Francophone studies, Vassar College (2012)

Residence: Koreatown in Los Angeles

Family: Partner Sam, a screenwriter; two cats

Hometown: Hockessin, Delaware

Hobbies: Walking on the beach; mountain hiking; trail running in Griffith Park in Los Angeles; cooking

"I've gotten really good at spinning up projects that are not in my exact area of expertise," Lowman said, "and structuring research questions to be interesting to people outside the field, especially managers."

Lowman's love for the coastal environment was shaped as a child growing up in Delaware near Chesapeake Bay. Her grandfather owned a house on the bay where she spent her summers swimming, fishing and crabbing.

As an undergraduate at Vassar College in Upstate New York, Lowman took a class on Louisiana coastal processes that included a field trip to the region – an experience that helped cement her interest in the environmental sciences.

After graduating in 2012, Lowman spent three years working and traveling. She went to France to teach for a summer, then worked for the National Marine Sanctuary Foundation, as a healthcare industry consultant, and in a university biology lab. She worked in four states during this period: Maryland, Missouri, Iowa and Connecticut.

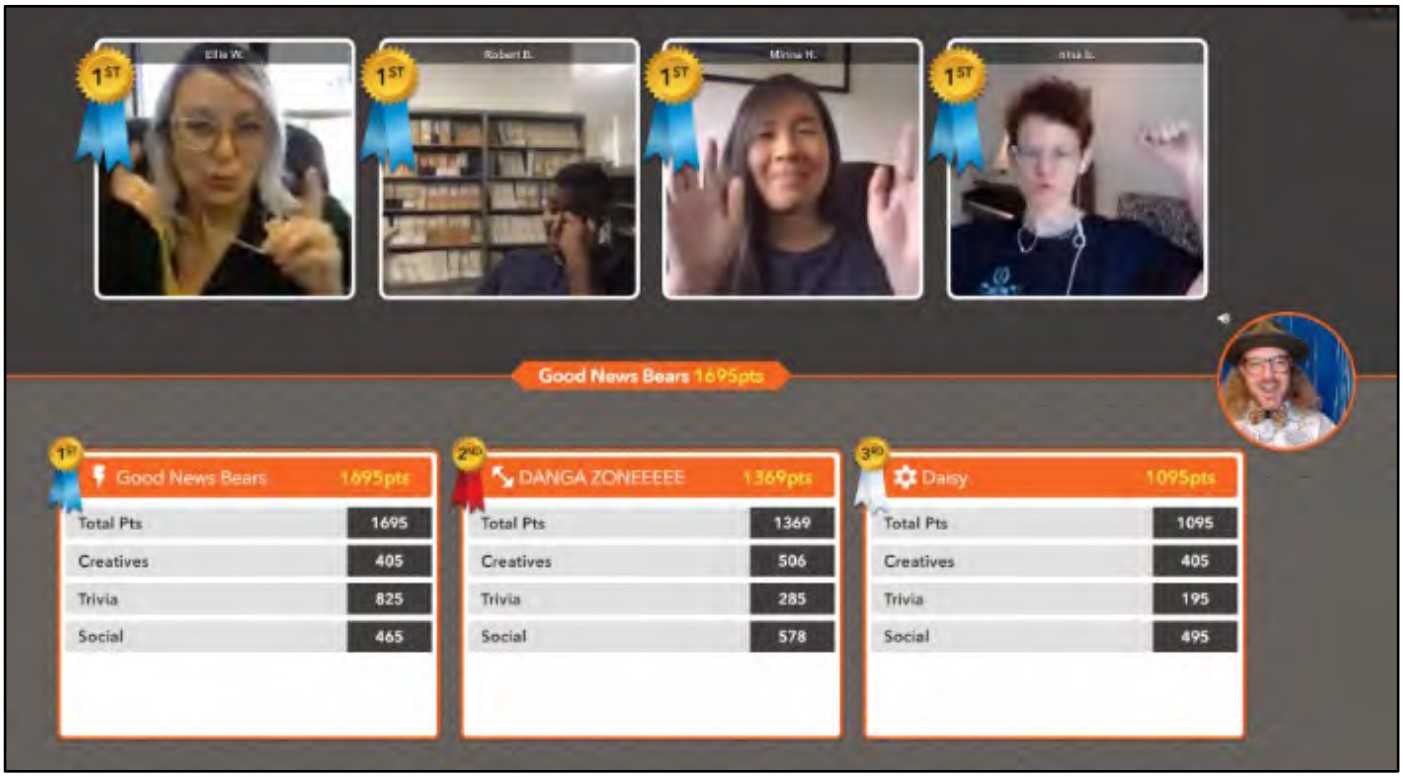
"While I was working these day jobs, I was continuing to explore and define exactly what I wanted to do for my career," Lowman said.

Lowman has been living in Los Angeles for the past year with her partner, Sam, and commuting to UC Santa Barbara. They plan to move to Long Beach at the end of the summer.

SCCWRP SCENES

Virtual team-building fun

SCCWRP staff took part in a one-hour, competitive online game in July to bond and build staff spirit. The virtual team-building event, which was hosted by The Go Game, divided SCCWRP staff into multiple teams to answer trivia questions and complete other quests via a custom web portal. SCCWRP staff members participated using their webcams. Bragging rights were awarded to first-, second- and third-place finishers.



Clockwise from above, SCCWRP staff members Ellie Wenger, Robert Butler, Minna Ho and Dr. Nina Bednarsek celebrate their first-place win in SCCWRP's one-hour team-building game in July; SCCWRP's personal host for the game, Seth, who appeared via webcam, asks trivia questions and keeps track of scores; and SCCWRP teams create a "preschooler work of art" during a timed group exercise.