SCCWRP Director's Report

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FALL 2021 ISSUE

Kelp farms being studied to improve coastal water quality

SCCWRP and its partners have completed the initial phases of integrating a pair of Southern California Bight computer models to investigate how offshore kelp farms might be used to reduce the ecological effects of intensifying coastal ocean acidification and hypoxia (OAH).

Researchers are using the two models, which are being coupled in a stepwise fashion, to generate solutions-focused insights about specific potential locations that could be optimal for cultivating kelp farms offshore. Communities in other parts of the world already have started growing kelp offshore as a management strategy for improving coastal water quality, including mitigating OAH conditions.

The model integration work, which kicked off earlier this year, involves coupling a model that predicts how Southern California coastal waters will be impacted by OAH to a second model that explains how kelp farming influences physical and biogeochemical ocean processes. Through the models, researchers can examine the potential of kelp farms in Southern California to remove nutrients and carbon dioxide from the water via the plants' natural photosynthetic processes.

Excess nutrients and elevated carbon dioxide levels – which come from human activities on land – can exacerbate coastal OAH in Southern California's coastal ocean, underscoring the need to identify regional management solutions for mitigating these changes to seawater chemistry.

The California Ocean Protection Council, for example, in its 2020-2025 Strategic Plan identified aquaculture, including seaweed farms, as a priority investment – in part, because it's a potential solution for buffering against coastal acidification.

Over the past few months, researchers have placed kelp farms into the physical-biogeochemical ocean processes model, as well as added kelp effects on ocean physical processes.

Already, the coupled model is being used to investigate how proposed Southern

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Cover photo: Researchers are evaluating how cultivating kelp farms, such as this one growing off the coast of Santa Barbara, could be used to reduce the ecological effects of intensifying ocean acidification and hypoxia in Southern California coastal waters. (Photo courtesy of Javier Infante)

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Calendar

Thursday, November 4
CTAG quarterly meeting
(Remote participation only)

Friday, December 3
Commission meeting
(Remote participation only)

California kelp farms can alter a site's ocean circulation patterns in ways that cause more nutrient-laden deeper waters to be brought to the site. These nutrients are beneficial in promoting seaweed growth, while the fact that the nutrients are being removed from the water column could change the trajectory of biogeochemical cycling processes that trigger OAH.

SCCWRP and its partners initially are focusing on Santa Monica Bay and the San Pedro shelf, plus Santa Barbara, where pilot kelp farms have already been installed offshore. Each proposed farm site must be evaluated separately, as the potential ecological benefits provided by kelp farming are highly site-dependent.

The two models being coupled together are:

» **Southern California Bight OAH model**: SCCWRP and its partners have spent nearly a decade developing a state-of-the-art physical-biogeochemical ocean processes model known as ROMS-BEC (Regional Oceanic Model System-Biogeochemical Elemental Cycling) that predicts if and how nutrients introduced via wastewater effluent, stormwater runoff and atmospheric deposition alter pH and dissolved oxygen levels across the Bight. The effort is part of an ongoing West Coast-wide OAH modeling initiative.

» **Macroalgal Cultivation Modeling System (MACMODS)**: A research team led by the University of California, Irvine has spent the past three years developing a model that predicts how kelp farms modify seawater chemistry and ocean circulation patterns. The model explains how kelp farms remove nutrients and carbon dioxide from the water column, trigger more underwater scattering of light due to the kelp canopy, and reduce water flows due to the kelp's physical structure.

Photo courtesy of Javier Infante

A field crew from the aquaculture company Ocean Rainforest examines kelp that has been growing on ropes suspended in an underwater farm off the coast of Santa Barbara. SCCWRP and its partners are using computer modeling to explore how offshore kelp farms might be used to reduce the ecological effects of intensifying coastal ocean acidification and hypoxia.

By coupling the models, researchers can examine at a site-specific level how adding a seaweed farm is expected to alter ocean circulation patterns and biogeochemical cycling processes at the site and beyond.

The kelp farming investigation is the second effort by SCCWRP and its partners to leverage the Southern California Bight OAH model to study different facets of coastal ecosystem health. Last year, researchers coupled the OAH model to a coastal algal blooms model to understand when and where production of toxic *Pseudo-nitzschia* algal blooms is most likely to occur.

Initial results from the kelp farming modeling work are expected to be available in about a year.

For more information, contact Dr. Christina Frieder.

Study examines feasibility of using human cyanotoxin thresholds to protect aquatic life

SCCWRP and its partners have completed an initial investigation into whether existing cyanotoxin thresholds intended to protect the health of humans exposed to cyanotoxins in freshwater systems also could be used to protect the health of fish, invertebrates and amphibians.

The two-year study, published this summer by the journal *Science of the Total Environment*, found that existing, national health-based toxicity levels should be adequate for protecting aquatic life from acute exposure to a major class of cyanotoxins known as microcystins. These same levels, however, may not fully protect aquatic life from chronic exposure.

The study, which involved examining cyanotoxin data from more than 150 aquatic life toxicity studies, is one of the

first efforts to examine whether existing cyanotoxin thresholds for human health protection also could be applicable to aquatic life. Although thresholds already exist to protect humans exposed to toxins via recreational water-contact activities, comparable thresholds for aquatic life have not yet been developed.

Cyanobacterial blooms, which can contaminate freshwater and marine systems with toxins that harm both humans and aquatic life, are becoming more frequent and severe across California as waters warm in response to climate change. Both the U.S. Environmental Protection Agency and California have developed concentration-based cyanotoxin trigger values to protect humans from recreational-contact exposure.

The study found that while both the EPA and California trigger values would be adequate for protecting aquatic life from acute exposure to microcystins, protection from chronic effects would depend on whether the EPA's trigger values vs. the most stringent of California's tiered trigger values is applied.

The management need to protect humans as well as aquatic life from cyanotoxin exposure is outlined in a comprehensive statewide strategy developed by the State Water Board earlier this year. The proposed strategy provides a long-term roadmap for how California could boost its capacity to monitor the growing threat posed by freshwater harmful algal blooms (HABs).

In late October, SCCWRP briefed several key agencies, including EPA and California's Office of Environmental Health Hazard Assessment (OEHHA), on the findings of its initial investigation, which is known as a meta-analysis.

SCCWRP's Anne Holt deploys a passive sampling device in Legg Lake in Whittier Narrows Recreation Area to measure cyanotoxin concentrations in the lake, which has been tainted green by a toxin-producing cyanobacterial bloom. Researchers are examining whether existing cyanotoxin thresholds designed to protect the health of humans from cyanotoxin exposure also could be used to protect the health of aquatic life.

If water-quality managers pursue development of cyanotoxin thresholds for aquatic life, the researchers recommend expanding toxicity analyses to study more classes of cyanotoxins. SCCWRP and its partners initially studied four prevalent classes of cyanotoxins – microcystins, cylindrospermopsin, anatoxin-a and saxitoxin – but found that there are only enough data to draw conclusions about microcystins.

The researchers also recommend gathering more data on the sub-lethal effects of chronic exposure. Although chronic exposure can lead to impaired development and reproduction in aquatic life, as well as mortality, the researchers found that chronic exposure has not been nearly as extensively studied as acute exposure.

Already, SCCWRP has convened a working group of international experts on cyanobacteria, ecotoxicity and risk assessment to help the research community identify the quality-assurance criteria necessary to improve consistency for future experimental and reporting parameters for cyanotoxin toxicity studies, as well as to assess the health risks of exposure for aquatic organisms. The workgroup began meeting in late October.

For more information, contact Dr. Alvina Mehinto.

Interactive mapping tool to help managers ID causes of poor stream condition

SCCWRP and its partners are wrapping up production of an initial version of a user-friendly, web-based management tool for helping stream managers rapidly narrow down likely causes of poor stream condition.

The Rapid Screening Causal Assessment (RSCA) tool, which is expected to be available in alpha form in late November, is intended to speed up the traditionally time-consuming process of analyzing site-specific stream bioassessment data to pinpoint which types of stressors are likely responsible for degraded biological condition.

Stream managers in California increasingly are being required under their wastewater and stormwater discharge permits to investigate likely causes of poor stream condition. These causal assessment analyses, which can take six months or more, traditionally have required specialized training to analyze and interpret bioassessment scores generated through the California Stream Condition Index (CSCI) and Algal Stream Condition Index (ASCI) scoring tools.

The RSCA tool standardizes and automates labor-intensive stream causal assessment analyses, displaying site-specific insights on an interactive, point-and-click mapping dashboard. The RSCA tool also provides a high-level overview of major causes of stress across watershed-scale areas.

Using the RSCA, stream managers can rapidly rule out unlikely causes of stream degradation. Simultaneously, the RSCA can help managers understand which stressors are most likely to threaten biologically healthy streams, enabling managers to take informed actions to protect these streams. The RSCA tool also provides feedback to managers on data gaps in their monitoring programs and recommendations for future additions.

A field crew collects data from a stream in the Big Bear Lake watershed as part of a stream condition assessment. SCCWRP and its partners have developed a web-based management tool intended to speed up causal assessment, a traditionally time-consuming process that involves analyzing site-specific stream bioassessment data to pinpoint which types of stressors are likely responsible for degraded biological condition.

The RSCA tool represents an expansion of existing SCCWRP-developed web tools designed to help managers understand the major causes of impairment to stream health. The RSCA is designed to be used in tandem with the:

» Stream Classification and Priority Explorer (SCAPE), which predicts the degree to which stream biointegrity scores are likely to be limited, or "constrained," by urban and agricultural development

» Stream Quality Index (SQI), which places bioassessment data side by side with chemistry and physical habitat data to offer context to stream managers investigating causes of low stream bioassessment scores

Unlike the SCAPE and SQI tools, the RSCA tool will provide more in-depth causal assessment analyses that consider a wider range of stressor types that commonly impair the health of Southern California streams. The RSCA also will explicitly link the biology (i.e., SCAPE) and stressors (i.e., SQI, in part) at a site together.

Four potential causes of biological impairment will be initially evaluated via the RSCA tool: altered habitat, altered water temperature, elevated conductivity, and eutrophication. Three additional types of stressors – altered flows, invasive taxa and sediment toxics – will be added in the near future.

The RSCA tool is envisioned to support the first tier of a three-tiered causal assessment framework for efficiently determining why bioassessment scores are low at a given stream site. After the rapid screening-level tier would come a detailed causal assessment, followed by a confirmatory causal assessment.

SCCWRP developed the proposed causal assessment framework after evaluating the utility of a stream causal assessment framework known as the Causal Analysis/Diagnosis Decision Information System (CADDIS) developed by the U.S. Environmental Protection Agency. During the CADDIS evaluation, which consisted of

four case studies published in 2015, SCCWRP and its partners determined that the CADDIS framework would need to be modified for application in California.

The RSCA tool is initially being developed for the San Gabriel River watershed, but will eventually be adapted for use across California. A publicly accessible beta version of the RSCA tool is expected to be released next spring.

For more information, contact Dr. David Gillett.

Template established for how boat harbors could modify copper regulatory targets

SCCWRP and its partners have completed a three-year study that establishes a template for how Southern California boat harbors could pursue scientifically validated modifications to default regulatory targets for dissolved copper levels on a site-specific basis.

The study, which focused on Marina del Rey Harbor in Los Angeles County, found that the default regulatory standard of 3.1 ug/L for copper in the harbor could be set higher while still adequately protecting marine life from this contaminant. Raising the default regulatory target for a pollutant is a regulatory process known as setting a site-specific objective.

Under the harbor's existing Total Maximum Daily Load (TMDL) regulatory target, water-quality managers are required to reduce copper loading by about 85%, which would require boat owners to make significant changes to the types of anti-fouling paint they typically use on boats. Copper is added to boat paint to prevent barnacles and other marine life from attaching to and growing on the vessels' underside.

Water-quality managers and harbor operators are closely watching Marina del Rey – the largest small-boat harbor in North America – as it has the potential to become the first boat harbor in Southern California with a site-specific water-quality objective for copper. Multiple other harbors in the region are facing similar copper TMDL challenges, including Shelter Island Yacht Basin in San Diego County and Newport Harbor in Orange County.

If water-quality managers elect to pursue changing Marina del Rey's regulatory target for copper, the SCCWRP-led study would serve as the scientific justification for such a change. Marina del Rey's copper objective could be set somewhere between 4.1 and 4.3 ug/L, up from the existing 3.1 ug/L maximum, according to the study's findings. Although no decisions have been made yet, this hypothetical scenario would not eliminate the need for copper-free paints altogether; it would, however, reduce the number of boats required to replace their bottom paint.

During the study, which was published in August as a SCCWRP technical report, researchers used an approach known as the Water Effects Ratio (WER) – endorsed by the U.S. Environmental Protection Agency – that enables researchers to evaluate the effects of local water-quality characteristics on copper toxicity.

Although the default regulatory target for copper in California boat harbors is set based on the results of standardized laboratory toxicity tests that use laboratory-clean seawater, natural factors such as dissolved organic carbon can bind copper, reducing its bioavailability to marine life.

In Marina del Rey's case, natural factors in the harbor's seawater reduce copper bioavailability, giving water-quality managers the option to pursue raising the cap on copper concentrations.

Setting a site-specific objective is a public process that can take years. If successful, the public process in Marina del Rey Harbor would culminate with the Los Angeles Regional Water Quality Control Board adopting the site-specific objective in the region's Basin Plan.

For more information, contact Ken Schiff.

The water-quality regulatory targets for copper concentrations in Marina del Rey Harbor, above, in Los Angeles County have been exceeded, which could require significant modifications to the copper-based paints used to reduce fouling on boats. A SCCWRP-led study found that the existing regulatory target for copper could be set higher while still adequately protecting marine life from copper's adverse effects.

Updates by Thematic Area

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

BIOASSESSMENT

International partnership established to assess health of Baja California estuaries

SCCWRP has built a partnership with researchers in Mexico to assess the health of coastal estuaries in Baja California next year using a proposed estuarine monitoring framework developed for California.

SCCWRP and its partners traveled to Baja California in October to conduct initial field reconnaissance in preparation for the full test, scheduled for spring 2022 at two sites: Bahía de San Quintín and Estero Punta Banda.

The proposed California estuarine monitoring framework was developed last year to bring consistency to estuarine monitoring efforts statewide. The framework consists of a set of customizable field protocols for sampling an estuary over a three-day period; it is undergoing a final round of testing in spring 2022 prior to being rolled out across California.

In addition to the benefit of being able to test the framework outside California, researchers hope that the more pristine condition of Baja California's estuaries can provide an additional point of comparison for Southern California estuaries.

Estero Punta Banda in Baja California is one of two Mexican coastal estuaries where SCCWRP and its partners plan to test-drive a new estuarine monitoring framework originally developed for California. The monitoring framework is intended to bring statewide consistency to estuarine assessment efforts.

SMC study to explore options for improving biological health of modified channels

The Southern California Stormwater Monitoring Coalition (SMC) has approved a three-year, SCCWRP-led study to be launched next year that will evaluate multiple potential management options for improving the biological health of streams that have been modified through channel hardening.

The study, greenlit by the SMC in September, will examine the environmental factors that cause modified channels to generally score poorly on the California Stream Condition Index (CSCI) and Algal Stream Condition Index (ASCI) bioassessment scoring tools.

Researchers will examine if and how bioassessment scores might be improved if managers invest in a range of actions, including improving water quality, altering flow management practices, changing channel maintenance regimes and restoring the channels to a less modified state.

Modified channels, which make up an estimated 40% of all stream-miles in coastal Southern California, tend to receive poorer bioassessment scores than other types of streams.

ECOHYDROLOGY

Tool unveiled for evaluating effects of potential reductions on L.A. River flows

SCCWRP and its partners have developed a user-friendly, web-based tool that enables L.A. River water-quality managers to use an agreed-upon scientific approach for evaluating whether the river's flows can be reduced for water recycling purposes, while simultaneously protecting ecological and recreational benefits provided by these flows.

Treated wastewater effluent is discharged into the Los Angeles River from the nearby L.A.-Glendale Water Reclamation Plant. SCCWRP and its partners are studying how to optimally restore aquatic ecosystems along the Los Angeles River in the face of anticipated reductions in the river's flows in the coming years for water recycling purposes.

The tool, unveiled in October, makes publicly accessible the technical process that more than 50 L.A. River management stakeholders earlier this year agreed to use to optimally balance competing demands on the L.A. River's limited flows. More runoff and wastewater effluent discharges are expected to be diverted from the river in the coming years for water-recycling purposes.

The tool enables managers to develop science-informed environmental flow targets for the urban river after evaluating how a wide range of potential flow-reduction scenarios would affect the ecological and recreational benefits that are provided by the L.A. River's flows.

The L.A. River approach to setting flow targets, published as a SCCWRP technical report and in a data portal, is expected to serve as a precedent-setting template that paves the way for managers to make environmental flow decisions for streams statewide.

Study examining how to restore L.A. River as flows reduced

SCCWRP and its partners have launched an investigation into how to optimally restore aquatic ecosystems along the Los Angeles River in the face of anticipated reductions in the river's flows in the coming years.

The work, which kicked off in August, will use computer modeling tools developed earlier this year to predict how the river's ecological functioning and recreational opportunities will be affected as water-quality managers divert more of their runoff and wastewater effluent discharges from the urban river for water-recycling purposes.

SCCWRP worked with more than 50 L.A. River management stakeholders to agree upon a scientific process for evaluating if and how the effluent-dominated L.A. River's flows can be reduced for water-recycling purposes while simultaneously protecting the ecological and recreational benefits provided by these flows.

Researchers' goal is to offer recommendations on how to restore the river in a manner that promotes optimal ecological functioning and enhanced recreational opportunities. Among the restoration options being considered under the L.A. River Revitalization Master Plan are low-flow channel modifications, substrate modifications, introduction of pseudo-floodplains and enhanced shading.

CLIMATE CHANGE

Series of tools being built to study how warming waters, hypoxia will limit where species can live

SCCWRP and its partners have begun working to build a series of species-specific tools for predicting how reductions in dissolved oxygen levels due to warming California coastal waters and changing seawater chemistry will limit where key species can live.

The study, launched in August, involves developing metabolic index tools that can calculate the temperature-dependent "breathability" of coastal waters for specific species – including pteropods, kelp bass, rock fish, Dungeness crab and krill – in the California Current System.

The work builds on a proof-of-concept effort last year to develop a West Coast metabolic index for Northern Anchovy fish. Eventually, researchers anticipate building about a dozen of these species-specific tools for estimating how population abundances will change over time in the California Current System.

Warming waters and changes in seawater chemistry due to ocean acidification and hypoxia are expected to increasingly constrain where along the West Coast that key marine species can survive.

CONTAMINANTS OF EMERGING CONCERN

Bioanalytical screening expands to San Gabriel, Santa Ana watersheds

SCCWRP and its partners have analyzed an initial set of water samples collected from the San Gabriel River and Santa Ana River watersheds using bioanalytical screening tools – a major expansion of an ongoing effort to begin using the screening technology to routinely monitor freshwater systems for major classes of bioactive contaminants.

During the study's first phase, completed in September, researchers analyzed water samples from 20 different sites using the using the glucocorticoid receptor, estrogen receptor and aryl hydrocarbon receptor assays. California already requires certain types of recycled water to be screened using the latter two assays.

Researchers plan to conduct follow-up analysis on water samples with high bioactivity levels to determine the specific chemical contaminants responsible.

Researchers are using the diversity of sites across two urban watersheds to test-drive bioanalytical technology on a wider scale. This effort complements a similar, ongoing effort by the Southern California Bight 2018 Regional Monitoring Program to apply the same three bioassay tools to screen the region's coastal marine sediments.

MICROBIAL WATER QUALITY

Variants of COVID-19 virus detected in Southern California wastewater streams

SCCWRP and its partners have found that variants of the SARS-CoV-2 virus – including mutations found in the virus's Eta variant lineage – can be detected in wastewater influent streams across Southern California using next-generation DNA sequencing methods.

The proof-of-concept study, published in September by the journal *Applied and Environmental Microbiology*, was able to strongly correlate viral levels in wastewater with COVID-19 case counts in five major Southern California sewersheds.

The findings are an important step forward in ongoing efforts to use wastewater streams to track COVID-19 infection rates in communities, including the Delta and Eta variants.

During the study, researchers also examined whether the same sequencing methods could be used to monitor other pathogenic viruses in wastewater – including adenoviruses, bocaviruses, influenza A, noroviruses and coronaviruses other than SARS-CoV-2. This effort was successful as well, suggesting that wastewater has the potential to be used to monitor multiple types of population-wide outbreaks.

REGIONAL MONITORING

Monitoring framework undergoing final testing to evaluate health of estuaries statewide

SCCWRP and its partners are initiating a final round of field testing this fall on a proposed statewide monitoring framework for assessing the health of California's coastal estuaries, including two dozen estuarine Marine Protected Areas (MPAs).

The proposed framework, which researchers developed last year, 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.

Researchers completed an initial round of field testing last spring on the framework at 15 estuary sites statewide. The researchers found that the assessment framework's approach to evaluating ecological functioning allows for greater flexibility and comparability across California's highly heterogenous estuaries. Assessing ecological functioning also is directly tied to the beneficial-use goals that environmental managers are working to protect.

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

Photo courtesy of Sanitation Districts of Los Angeles County

Researchers have been able to detect variants of the SARS-CoV-2 virus in wastewater influent streams across Southern California, including the Sanitation Districts of Los Angeles County, above, using next-generation DNA sequencing methods. The study is an important step forward in efforts to use wastewater streams to track COVID-19 infection rates.

ADDITIONAL RESEARCH AREAS

Database being compiled to probe quality-assurance issues with *Ceriodaphnia* toxicity test

SCCWRP is compiling a comprehensive database of historical information from nearly 1,000 *Ceriodaphnia dubia* toxicity tests as part of an ongoing, two-year effort to ensure that this commonly used toxicity test is capable of producing consistently high-quality, comparable results.

The database, expected to be completed in mid-November, will enable researchers to investigate concerns about the repeatability and consistency of the Whole Effluent Toxicity *C. dubia* chronic reproduction test. The test is a standardized toxicity test that uses a species of water flea to evaluate the quality of wastewater and stormwater discharges.

In the coming months, researchers plan to conduct a meta-analysis of the database to identify potential issues that could be affecting quality and comparability of toxicity testing results.

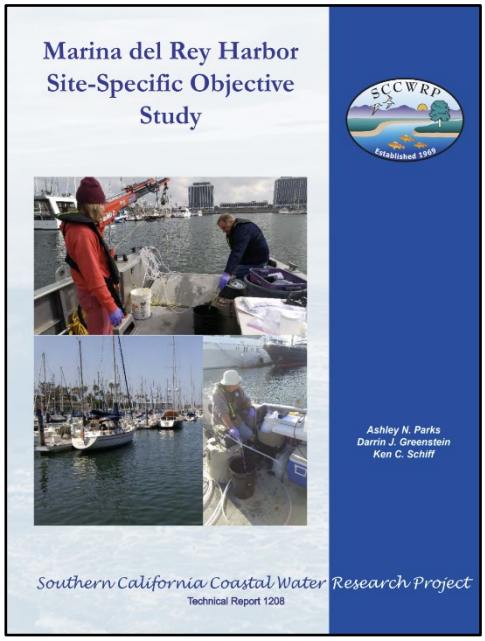
The *C. dubia* toxicity database encompasses information about laboratory-specific procedures, reproduction and survival data, and water quality data. The information was provided by 17 State-accredited laboratories.

New SCCWRP Publications

Journal Articles

Ahmed, W., S.L. Simpson, P.M. Bertsch, K. Bibby, A. Bivins, L.L. Blackall, S. Bofill-Mas, A. Bosch, J. Brandão, P.M. Choi, M. Ciesielski, E. Donner, N. D'Souza, A.H. Farnleitner, D. Gerrity, R. Gonzalez, J.F. Griffith, P. Gyawali, C.N. Haas, K.A. Hamilton, H. Chanditha Hapuarachchi, V.J. Harwood, R. Haque, G. Jackson, S.J. Khan, W. Khan, M. Kitajima, A. Korajkic, G. La Rosa, B.A. Layton, E. Lipp, S.L. McLellan, B. McMinn, G. Medema, S. Metcalfe, W.G. Meijer, J.F. Mueller, H. Murphy, C.C. Naughton, R.T. Noble, S. Payyappat, S. Petterson, T. Pitkänen, V.B. Rajal, B. Reyneke, F.A. Roman, J.B. Rose, M. Rusiñol, M.J. Sadowsky, L. Sala-Comorera, Y. Xiang Setoh, S.P. Sherchan, K. Sirikanchana, W. Smith, J.A. Steele, R. Sabburg, E.M. Symonds, P. Thai, K.V. Thomas, J. Tynan, S. Toze, J. Thompson, A.S. Whiteley, J. Chui Ching Wong, D. Sano, S. Wuertz, I. Xagoraraki, Q. Zhang, A.G. Zimmer-Faust, O.C. Shanks. 2022. Minimizing errors in RT-PCR detection and quantification of SARS-CoV-2 RNA for wastewater surveillance. *Science of the Total Environment* 805:149877.

Bednaršek, N., K.A. Naish, R.A. Feely, C. Hauri, K. Kimoto, A.J. Hermann, C. Michel, A. Niemi, and D. Pilcher. 2021. Integrated Assessment of Ocean Acidification Risks to Pteropods in the Northern High Latitudes: Regional Comparison of Exposure, Sensitivity and Adaptive Capacity. *Frontiers in Marine Science* 8:671497.



SCCWRP has published a study that provides a scientific template for how Southern California boat harbors could pursue modifications to default regulatory targets for dissolved copper levels on a site-specific basis. The study focused on Marina del Rey Harbor in Los Angeles County.

Bednaršek, N., R. Ambrose, P. Calosi, R.K. Childers, R.A. Feely, S.Y. Litvin, W.C. Long, J.I. Spicer, J. Strus, J. Taylor, F. Kessouri, M. Roethler, M. Sutula, S.B. Weisberg. 2021. Synthesis of Thresholds of Ocean Acidification Impacts on Decapods. *Frontiers in Marine Science* 8:651102.

Du, B., W. Lao, C.S. Wong, K. McLaughlin, K. Schiff. 2021. Scrutinizing surficial sediment along a 600-km-long urban coastal zone: Occurrence and risk assessment of fipronil and its three degradates. *Science of the Total Environment* 151071.

Estes, M., C. Anderson, W. Appeltans, N. Bax, N. Bednaršek, G. Canonico, S. Djavidnia, E. Escobar, P. Fietzek, M. Gregoire, E. Hazen, M. Kavanaugh, F. Lejzerowicz, F. Lombard, P. Miloslavich, K.O. Möller, J. Monk, E. Montes, H. Moustahfid, M.M.C. Muelbert, F. Muller-Karger, L.E. Peavey Reeves, E.V. Satterthwaite, J.O. Schmidt, A.M.M. Sequeira, W. Turner, L.V. Weatherdon. 2021. Enhanced monitoring of life in the sea is a critical component of conservation management and sustainable economic growth. *Marine Policy* 132:104699.

J.A. Rothman, T.B. Loveless, J. Kapcia III, E.D. Adams, J.A. Steele, A.G. Zimmer-Faust, K. Langlois, D. Wanless, M. Griffith, L. Mao, J. Chokry, J.F. Griffith, and K.L. Whiteson. 2021. RNA viromics of Southern California wastewater and detection of SARS-CoV-2 single nucleotide variants. Applied and Environmental Microbiology DOI:10.1128/AEM.01448-21.

Ledezma-Espinoza, A., J.K. Challis, F. Roa-Gutierrez, A. Sanchez-Kopper, E. Castellon, C.S. Wong. 2021. Photolysis of the nonsteroidal anti-inflammatory drug sulindac: elucidation of kinetic behaviour and photodegradation pathways in water. *Environmental Science Processes & Impacts* 23:1405-1417.

McLaughlin, K., J. Davis, A. Bonnema, B. Du, G. Ichikawa, W. Jakl, W. Heim, K.C. Schiff. 2021. Regional assessment of contaminant bioaccumulation in sport fish tissue in the Southern California Bight, USA. *Marine Pollution Bulletin* DOI:10.1016/j.marpolbul.2021.112798.

McLaughlin, K., M.D.A. Howard, G. Robertson, C.D.A. Beck, M. Ho, F. Kessouri, N.P. Nezlin, M. Sutula, S.B. Weisberg. 2021. Influence of anthropogenic nutrient inputs on rates of coastal ocean nitrogen and carbon cycling in the Southern California Bight, United States. *Elementa: Science of the Anthropocene* 9:00145.

Smith, J., D. Shultz, M.D.A. Howard, G. Robertson, V. Phonsiri, V. Renick, D.A. Caron, R.M. Kudela, K. McLaughlin. 2021. Persistent domoic acid in marine sediments and benthic infauna along the coast of Southern California. *Harmful Algae* DOI:10.1016/j.hal.2021.102103.

Walker, J.B., A.L. Bijak, L. Blum. 2021. Genetic Diversity and Clonal Structure of Spartina alterniflora in a Virginia Marsh. *Northeastern Naturalist* 28:357-370.

Wang, P., B. Du, J. Smith, W. Lao, C.S. Wong, E.Y. Zeng. 2021. Development and field evaluation of the organic-diffusive gradients in thin-films (o-DGT) passive water sampler for microcystins. *Chemosphere* 287:132079. DOI:10.3389/fmicb.2021.674214.

Zhou, J., S.M. Theroux, C.P. Bueno de Mesquita, W.H. Hartman, Y. Tian, S.G. Tringe. 2021. Microbial drivers of methane emissions from unrestored industrial salt ponds. *ISME Journal* 1-12.

Zimmer-Faust, A.G., J.A. Steele, X. Xiong, C. Staley, M.L. Griffith, M.J. Sadowsky, M. Diaz, J.F. Griffith. 2021. A Combined Digital PCR and Next Generation DNA-Sequencing Based Approach for Tracking Nearshore Pollutant Dynamics Along the Southwest United States/Mexico Border. *Frontiers in Marine Science* DOI:10.3389/fmicb.2021.674214.

Journal Articles (Accepted)

Kessouri, F., K. McLaughlin, M. Sutula, D. Bianchi, M. Ho, J.C. McWilliams, L. Renault, J. Molemaker, C. Deutsch, A. Leinweber. In press. Configuration and validation of an oceanic physical and biogeochemical model to investigate coastal eutrophication in the Southern California Bight. *Journal of Advances in Modeling Earth Systems*.

Frieder, C., C. Yan, M. Chamecki, D. Dauhajre, J. C. McWilliams, J. Infante, M. McPherson, R. Kudela, F. Kessouri, M. Sutula, I B. Arzeno-Soltero, K. Davis. In press. A macroalgal cultivation modeling System (MACMODS): Evaluating the role of physical-biological coupling on nutrients and farm yield. *Frontiers in Marine Science*.

Samuel, R., R. Meyer, N. Davies, N. Jeffery, C. Meyer, C. Pavloudi, K.J. Pitz, M. Sweetlove, S. Theroux, J. van de Kamp, A. Watts. In press. Towards a Global Public Repository of Community Protocols to Encourage Best Practices in Biomolecular Ocean Observing and Research. *Frontiers in Marine Science*.

Stein, E.D., J. Zimmerman, S. Yarnell, B. Stanford, B. Lane, K. Taniguchi-Quan, A. Obester, T.E. Grantham, R.A. Lusardi, S. Sandoval-Solis. In press. The California Environmental Flows Framework: Meeting the Challenges of Developing a Large-Scale Environmental Flows Program. *Frontiers in Environmental Science-Freshwater Science*.

Technical Reports

Mazor, R.D., K. McCune. 2021. Review of flow duration methods and indicators of flow duration in the scientific literature: Western Mountains. Technical Report 1222. Southern California Coastal Water Research Project. Costa Mesa, CA.

Parks, A.N., D.J. Greenstein, K.C. Schiff. 2021. Marina del Rey Harbor Site-Specific Objective Study. Technical Report 1220. Southern California Coastal Water Research Project. Costa Mesa, CA.

Schiff, K., M. Beck, E. Fassman-Beck. North Orange County Municipal Separate Storm Sewer System (MS4) Monitoring Evaluation. Technical Report 1221. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Fassman-Beck, E., D. Diehl, J. Lapinski, A. Montoya, M. Borst. Innovating Traditional Instrumentation for Effective BMP Flow Monitoring. California Stormwater Quality Association Annual Conference. October 26-27, 2021. Via webinar.

Fassman-Beck, E., K. Schiff. New Data-Driven Metrics for Evaluating BMP Performance. California Stormwater Quality Association Annual Conference. October 26-27, 2021. Via webinar.

Fassman-Beck, E., K. Schiff. Evaluating BMPs with Data-Driven Performance Categories. International Conference on Urban Drainage. Oct 25-28, 2021. Via webinar.

Fassman-Beck, E. (session moderator) Wetlands. International Conference on Urban Drainage. October 25-28, 2021. Via webinar.

Irving, K. Application of flow ecology analysis to inform prioritization for stream restoration and management actions. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Mazor, R., S. Dusterhoff. Assessing and managing biological integrity in modified channels: Updates on regional and statewide studies. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Mazor, R., J. Morgan. Monitoring and assessment tools that recognize the

unique functions of California's temporary waters. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Schiff, K. Improving MS4 Monitoring Programs: Assessing the last 10 years of monitoring data in Orange County. California Stormwater Quality Association Annual Meeting. October 26, 2021. Via webinar.

Schiff, K. (session organizer) BMP Effectiveness Workshop. California Stormwater Quality Association Annual Meeting. October 27, 2021. Via webinar.

Smith, J., S. Theroux. DNA-based methods used to identify toxin-producing cyanobacteria in California waterbodies. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Taniguchi-Quan, K. The South Orange County Flow Ecology Study: Flow Ecology Approach for Watershed Prioritization. California Stormwater Quality Association Annual Conference. October 27, 2021. Via webinar.

Theroux, S. (session leader) Enhancing the value of marine omics/eDNA practices across the ocean community. Fifth Community Workshop of the IOC-UNESCO Ocean Best Practices System. September 22, 2021. Via webinar.

Walker, J. A framework for bioassessment and monitoring of California's estuaries. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Walker, J. (session organizer) Bioassessment in estuaries. California Aquatic Bioassessment Workgroup & California Chapter of Society for Freshwater Science Annual Meeting. October 13, 2021. Via webinar.

Wong, C.S. California's microplastics measurement intercalibration study. American Water Works Association California-Nevada Section Annual Fall Conference. October 18-21, 2021. Via webinar.

Conference Posters

Lao, W., B. Du, D. Shultz, J. Smith, C.S. Wong. Quantitatively measuring freely dissolved cyanotoxins with diffusive gradients in thin films (DGT) samplers in recreational lakes of Southern California, USA. EmCon: International Conference on Emerging Contaminants. September 13-14, 2021. Via webinar.

Martindale, S., R. Guill. Defining organizational success as a precursor to communicating more effectively. California Stormwater Quality Association Annual Meeting. October 26-27, 2021. Via webinar.

Other Presentations

Fritz, K., R. Mazor, J. Kelso, T. Nadeau, W. Beck, R. Harrington, K. Swann, and B. Topping. USEPA Regional Streamflow Duration Assessment Methods. USGS Water Mission Area seminar series. Via webinar.

Mehinto, A.C. Health-based microplastics thresholds for ambient waters. San Francisco Bay Regional Monitoring Program (RMP) Workgroup Meeting. September 27, 2021. Via webinar.

Stein, E. Development and application of environmental flows for California. USEPA-Region 9 lunchtime training seminar series. August 12, 2021 . Via webinar.

Stein, E. LA River Environmental Flows project. Los Angeles Regional Water Quality Control Board. Sept. 9, 2021. Via webinar.

Schiff, K. Bacteria Source Tracking. Center for Watershed Protection Seminar Series. September 23, 2021. Via webinar.

Smith, J., K. Florea. Environmental Drivers of CyanoHABs and Cyanotoxins in Clear Lake: 2019 – 2021. Clear Lake Cyanobacterial Task Force. October 20, 2021. Via webinar.

Taniguchi-Quan, K. A functional flows approach for developing environmental flows in California. Palomar College. October 19, 2021. Via webinar.

Taniguchi-Quan, K. South Orange County Flow Ecology Study. South Orange County Water Quality Improvement Plan monthly meeting. August 23, 2021. Via webinar.

Thornton Hampton, L.M., S. Coffin. ToMEx: Toxicity of Microplastics Explorer. Scripps Institution of Oceanography Center for Marine Biodiversity and Conservation workshop. September 8, 2021. Via webinar.

SCCWRP Personnel Notes

Commission

Barbara Romero, the new Director and General Manager for the City of Los Angeles's Sanitation and Environment bureau (LASAN), became a Commissioner this summer, replacing Enrique Zaldivar, who retired.

Jayne Joy, who has served as an Alternate Commissioner for the Santa Ana Regional Water Quality Control Board since 2018, became a full Commissioner this summer, replacing Hope Smythe, who retired.

Mark Lombos, an Assistant Deputy Director for the Los Angeles County Department of Public Works, has been appointed an Alternate Commissioner and CTAG Representative, replacing Paul Alva, who retired. Alva served as Alternate Commissioner for three years and CTAG Representative for about seven years.

CTAG

Kaitlyn Kalua, who will join the California Ocean Protection Council in November, is being appointed to CTAG, replacing Holly Wyer, who took a new position with the California Coastal Commission. Wyer served on CTAG for four years.

Philip Markle, who has served as a CTAG Representative for the Sanitation Districts of Los Angeles County since 2017, retired in October. His replacement has not yet been named.

Scientific Leadership

Dr. **Bowen Du** has been appointed to the External Affiliations Committee and Journal Outreach Committee for the organization Benchmarking and Publications for Non-Targeted Analysis.

Dr. **Elizabeth Fassman-Beck** has been appointed a member of the Scientific Organizing Committee of the International Conference on Urban Drainage, held October 25-28, 2021 via webinar.

Dr. **Jayme Smith** has been appointed to the conference steering committee for the 11th US HAB Symposium, scheduled for October 2022.

Dr. **Eric Stein** has been appointed a member of the Society of Wetland Scientists' Ways and Means Committee.

Promotions

Duy Nguyen, who has worked part-time as a SCCWRP IT Assistant since 2019, was promoted in August to a full-time Research Technician focusing on programming and data analysis projects. He graduated in May with a master's in computational and applied mathematics from Cal State Fullerton.

Departures

David Wanless, who has worked as a Senior Research Technician in the Microbiology Department since 2018, left SCCWRP in October to take a position with environmental technology manufacturer Fluidion.

Jeffrey Chokry, who has worked as a Research Technician in the Microbiology Department since 2019, left SCCWRP in August to take a position with the University of California, Los Angeles.

SCCWRP COMMISSIONER SPOTLIGHT

Head of LASAN pursuing a cleaner, greener L.A.

For Barbara Romero, being tapped to lead the City of L.A.'s Sanitation and Environment bureau (LASAN) is an opportunity to continue her lifelong quest to create a cleaner, greener Los Angeles.

Barbara Romero

As a former Deputy Mayor under L.A. Mayor Eric Garcetti for six years, Romero worked to secure funding, political will and community support to move the needle on issues like climate change, environmental justice, climate equity and achieving multiple benefits from every green infrastructure investment. Before that, she worked for 10 years in leadership roles with the Mountains Recreation and Conservation Authority, a Joint Powers Authority of the Santa Monica Mountains Conservancy.

"I've spent my career working on the environment," said Romero, who started in July as LASAN's Director and General Manager. "The core of LASAN is about protecting the City's environment – I feel very blessed to be helping to implement a lot of the environmental policies that I helped create in the Mayor's office."

At LASAN, Romero oversees about 3,000 employees that manage wastewater, solid waste and runoff for about 4 million City residents. Romero replaces Enrique Zaldivar, who retired after nearly 14 years of service on the SCCWRP Commission.

"LASAN can move the needle on climate change in a meaningful way, and I'm excited to continue to elevate LASAN as a national leader in water and waste," Romero said.

A native of the Boyle Heights/East L.A. neighborhood, Romero has made the environment a centerpiece of her work ever since a mentor early in her career advised her to "pick an issue."

During her time at the Mountains Recreation and Conservation Authority, Romero connected City residents to green spaces and natural resources, especially water. By making the connection personal to them, they are more likely to be proactive and engaged in improving and protecting these resources, she said.

Barbara Romero spends quality time on the field with her son Brady while serving as the head coach of his Little League team last spring.

"Now I get to continue to expand that work at a larger scale," she said.

Romero also was a key stakeholder in the L.A. River Revitalization Master Plan, adopted by the Los Angeles City Council in 2007.

Throughout her career, Romero has been peripherally aware of SCCWRP's work. She's particularly impressed by projects like SCCWRP's recent effort to bring together L.A. River stakeholders to reach consensus on a scientific process for deciding how much wastewater and runoff can be diverted from the L.A. River for water recycling purposes.

When she's not working, Romero volunteers as a coach on her son's Little League team. Last season, she served as head coach.

"I decided if I don't make time to coach my son now, then when?" Romero said. "The upside of COVID is it has helped us reflect on what matters in our lives. In my new role at LASAN, I plan to bring urgency to my role because, if not now, then when?"

Barbara Romero

Job: Director and General Manager, City of Los Angeles Sanitation and Environment (July 2021-present)

SCCWRP role: Commissioner

Prior jobs: Deputy Mayor for City Services, Office of L.A. Mayor Eric Garcetti (2015-2021); Commissioner, City of L.A. Board of Public Works (2013-2015); Chief of Urban Projects and Watershed Planning, Mountains Recreation and Conservation Authority (2003-2015); Field Deputy, Office of State Senator Richard Polanco (1999-2002); Cluster Supervisor/Coordinator/Team Leader, L.A. Conservation Corps (1994-1999); Community Organizer, Healthy Start Program (1994); Student Coordinator, L.A. Unified School District Partnership Program with UC Irvine (1993-1994)

Education: B.A. psychology, University of California, Los Angeles (1999)

Residence: Sherman Oaks

Family: Son Brady, 9

Hometown: Boyle Heights and East L.A.

Hobbies: Hiking; bike riding; working out; coaching Little League

SCCWRP PARTNER SPOTLIGHT

Chemist pivots research focus to microplastics

When Dr. Bart Koelmans began his career in environmental chemistry more than three decades ago, microplastics was neither his expertise nor a focal point of his research.

Dr. Bart Koelmans

In his first 17 years after earning his doctorate in The Netherlands, Koelmans focused on understanding the fate and health risks of a range of contaminants in aquatic systems, including trace metals, hydrophobic chemicals and engineered nanomaterials.

Then, in 2011, Koelmans attended a Society of Environmental Toxicology and Chemistry conference session on microplastics. He realized the same ecotoxicology principles he'd been using to quantify the health risks of ingestion and absorption of various contaminants could be readily applied to study microplastics as well.

"We were well-equipped to reuse our expertise to begin answering microplastics questions," said Koelmans, a Professor of Aquatic Ecology and Water Quality at Waginengen University in The Netherlands. "For me, this research was curisoity-driven and evolved entirely organically – I had no plan or or grand design."

Over the past decade, Koelmans has become one of the world's leading researchers on understanding the health risks of microplastics exposure in aquatic systems. He's consulted on microplastics risk assessment issues for the Dutch federal government, the World Health Organization and, now, the State of California, which is working to better understand the health risks of microplastics exposure in advance of developing microplastics management strategies for the coastal ocean and drinking water.

Dr. Bart Koelmans and his wife Bernadette explore Madeira, a remote Portuguese island off the northern coast of Africa, during a 2017 vacation.

A.A. Bart Koelmans, Ph.D.

Job: Professor, Aquatic Ecology and Water Quality, Wageningen University in The Netherlands (2005-present)

SCCWRP role: SCCWRP collaborator investigating health risks of microplastics exposure

Prior jobs: Personal Chair (2005-2017), Associate Professor (2000-2005) and Assistant Professor (1988-2000), Wageningen University

Education: Ph.D. environmental sciences, Wageningen University (1994); M.S. ecotoxicology, environmental geochemistry and inorganic chemistry, Utrecht University (1987); B.S. chemistry (biology track), University of Utrecht (1984)

Residence: Amerongen, The Netherlands

Family: Wife Bernadette, head of the Quality of Health Care and Health Economics Department at the Dutch National Institute for Public Health and the Environment; three adult sons, ages 21 to 27; one cat

Hometown: Den Helder, The Netherlands

Hobbies: Listening to classical music; amateur photography; writing poems and song lyrics; cooking

About a year ago, Koelmans joined a SCCWRP-facilitated group of international experts that has been helping the State Water Board develop thresholds that define for California environmental managers the concentrations at which microplastics begin to adversely affect aquatic organisms' health. Koelmans is working on a parallel effort for the federal Dutch Research Council.

"It's interesting to be doing science that doesn't end up in a desk somewhere," Koelmans said. "We're quite early in our understanding of health effects – we're learning to drive the car at the same time we're taking it out on the highway."

Growing up in The Netherlands, Koelmans had no grand plans to become an environmental chemist. In college, he was interested in geology and geochemistry, and eventually fell into the environmental side as research opportunities opened up for him. Upon starting his Ph.D. at Wageningen University in 1988, he was hired as an Assistant Professor. He earned his Ph.D. in 1994 and has been teaching and doing research at Wageningen ever since. The university about 1-1/2 hours southeast of Amsterdam.

When he's not working, Koelmans enjoys amateur photography – everything from taking family portraits to capturing streetscapes and nature. He also writes poems and song lyrics – but just for fun; he's never published his work.

SCCWRP STAFF SPOTLIGHT

Gastropub job helps undergrad chart career path

Kristine Gesulga ended up pursuing a career in the environmental sciences through an unusual route: a part-time serving position at a gastropub in Riverside.

Kristine Gesulga

At the time, Gesulga was pursuing a degree in psychology from UC Riverside – but increasingly realizing psychology wasn't for her. Gesulga finally decided to take a break from school and work full time at the Salted Pig gastropub in downtown Riverside. One day, a colleague offered her some career advice in passing: Breweries rely on microbiologists to manage their fermentation processes.

For Gesulga, the idea resonated: She'd always enjoyed science, and she loved her gastropub job, so why not pursue a career as a brewery microbiologist? Immediately, Gesulga went back to school to earn an associate's in math and science at Riverside City College, then transferred to Cal State Long Beach as a microbiology major.

"I told my Long Beach faculty adviser about the brewery career I wanted to pursue, and he was a little skeptical – but in a good way," Gesulga said. "And then I ended up really loing the environmental side of microbiology."

Gesulga, who has worked for 1-1/2 years as a part-time Laboratory Assistant in the Chemistry Department, was promoted in May to a full-time Research Technician in SCCWRP's Biology Department. She intends to work for a few years, then pursue a master's or Ph.D. in environmental microbiology.

Kristine Gesulga climbs at Mount Baldy in the San Gabriel Mountains during a 2018 rock-climbing trip.

Kristine Gesulga

Job: Research Technician, SCCWRP Biology Department (started May 2021)

Prior jobs: Laboratory Assistant, SCCWRP Chemistry Department (2019-2021); Undergraduate Researcher, California State University, Long Beach (2020-2021); gastropub server, Salted Pig in Riverside (2014-2019)

Education: B.S. microbiology, California State University, Long Beach (2021); A.S. math and science, Riverside City College (2019)

Residence: Riverside

Family: Fiancé Dominik, a UC Riverside postdoctoral fellow in earth system modeling and biogeochemical cycling; cat Owen; three fish

Hometown: Moreno Valley

Hobbies: Rock climbing (indoors and outdoors); backpacking; frequenting local breweries

"I love that SCCWRP has broadened my horizons and helped me see how to apply science in the real world," said Gesulga, who just graduated in May with a B.S. in microbiology from Cal State Long Beach. "I still love breweries, but I love microbial ecology more."

When Gesulga began working at SCCWRP in fall 2019, her first project was preparing samples containing known quantities of microplastics particles for an international study facilitated by SCCWRP to compare multiple laboratory methods for measuring microplastics in the environment.

During that project, she found herself grinding up cubes of grocery-store-purchased fish tissue one day, and using fine-tipped tweezers to manually add tiny microplastics particles to samples – one at a time – on other days.

"It was a lot of trial-and-error, a lot of experimentation, a lot of teamwork," Gesulga said. "It was a full science experience."

More recently, Gesulga helped the Toxicology Department with lab work for an ongoing study investigating how bioanalytical assays could be used to provide an early-warning indicator that certain classes of bioactive chemical contaminants are potentially triggering adverse biological impacts in fish.

In her spare time, Gesulga is an avid rock climber. She trains at Hangar 18 in Riverside, sometimes as often as three or four days a week. And she's climbed in places as varied as Hurricane, Utah; New Jack City near Barstow; and Black Mountain near Idyllwild.

"It's a good way to work out and having fun doing it," she said.

SCCWRP SCENES

Cautiously resuming in-person interactions

SCCWRP has gradually been resuming in-person interactions – both internally and with external groups – following the agency's phased reopening that began in June. Most recently, SCCWRP hosted the California Association of Sanitation Agencies and the California Water Environment Association for an in-person seminar in mid-October that included a few dozen attendees. SCCWRP also held two in-person activities for staff this fall: a recent screening of a documentary film about California's water supply, and an internal staff seminar for select staff to present their long-term research vision. This winter, SCCWRP is scheduled to host two scientific conferences that will offer both in-person and remote attendance options: the Urban Drainage Modeling Conference (January 10-12, 2022), and the 2nd National Workshop on Marine Environmental DNA (February 1-4, 2022). At all events, SCCWRP is requiring proof of vaccination or a negative COVID-19 test within the last 48 hours, as well as face masks to be worn indoors.

SCCWRP has gradually been resuming in-person interactions, including hosting the California Association of Sanitation Agencies and the California Water Environment Association in October for an in-person seminar, right. Below, SCCWRP staff enjoy a catered outdoor lunch in October that followed an hour-long internal SCCWRP seminar, during which scientific staff presented their long-term research vision to colleagues.

Photo courtesy of Alec Mackie, California Water Environment Association