SCCWRP Director's Report

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SPRING 2023 ISSUE

Effort launched to standardize microplastics sampling methods

A group of international microplastics experts convened by SCCWRP has begun working to standardize the methods that California is using to collect environmental samples in preparation for measuring their microplastics content – the latest step in California's ongoing effort to build capacity to comprehensively track microplastics pollution in water bodies statewide.

During a two-day kickoff workshop at SCCWRP in March, about 15 researchers from around the world discussed how environmental managers in California and beyond will be able to more accurately and consistently quantify microplastics levels in four types of environmental samples – ambient water, stormwater, sediment and aquatic life – once the methods used to collect these samples are standardized.

SCCWRP facilitated a similar method standardization effort for microplastics measurement methods last year, enabling microplastics levels to be quantified in consistent ways after environmental samples have reached the laboratory. This earlier effort also standardized microplastics measurement methods for drinking water, which paved the way for California's Environmental Laboratory Accreditation Program to immediately begin developing standards that enable environmental laboratories to demonstrate proficiency in the measurement methods.

The current effort to standardize sample collection methods is the next phase of a multi-year effort to build a scientifically robust microplastics monitoring toolbox for California – a necessary precursor to developing a comprehensive statewide monitoring program capable of generating high-quality, directly comparable data for tracking the prevalence and spread of microplastics across California's aquatic environments.

Traditionally, researchers have not used a consistent set of collection methods when sampling ambient water, stormwater, sediment and aquatic life, which has limited researchers' ability to directly compare microplastics measurement

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Cover photo: SCCWRP's Dr. Wayne Lao deploys a mesh sampling device known as a box frame net that collects microplastics and other debris as they flow through the net and become trapped at the far end. Researchers are working to standardize how microplastics are collected in the field.

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Calendar

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

Friday, June 2
Commission meeting
(In-person meeting)

data that have been generated using different sampling methods.

For example, researchers have traditionally collected water samples in the ocean and other water bodies by dragging a manta trawl net along the surface to collect floating debris. However, because smaller microplastics particles can slip through the mesh netting, some researchers have switched to collecting bulk water samples instead. Consequently, when comparing microplastics measurement data generated using the two different collection methods, researchers have been forced to assign a high degree of uncertainty to the comparability of the data.

During the in-person microplastics collection methods workshop, participants divided themselves into four workgroups – one for each of the four types of environmental samples. Each workgroup has been tasked with reaching consensus by summer 2023 on a recommended strategy and study plan for standardizing collection methods, including identifying research projects that are needed to help fill remaining knowledge gaps.

Thus far, workshop participants have concluded that only a few relatively small knowledge gaps remain for ambient water, sediment and aquatic life, but that stormwater sampling will require much more study and optimization to be standardized – a reflection of the fact that stormwater sampling itself is complex, plus stormwater is hypothesized to be a major pathway by which microplastics enter coastal environments.

Once study workplans are developed, researchers will spend the next two years completing method evaluation studies and developing standardized operating procedures (SOPs) for sample collection. This work will also better define uncertainties and limitations of different collection methods and how the results might compare to one another.

As part of their deliberations, workshop participants also have indirectly validated the sample collection methods that the Southern California Bight 2023 Regional Monitoring Program is planning to use this summer to measure microplastics levels in seafloor sediment and bivalves. The planned Bight '23 sample collection methods are consistent with what the workshop participants agree are best practices sampling techniques.

For more information, contact Dr. Leah Thornton Hampton.

A SCCWRP field crew deploys a mesh sampling device known as a box frame net to collect microplastics from the Los Angeles River. As water flow through the net, microplastics and other particles become trapped at the far end. Researchers have begun working to standardize how microplastics are collected from aquatic environments.

Modeling tool developed to predict biological consequences of freshwater salinization

SCCWRP and its partners have developed a modeling tool for predicting how aquatic life becomes increasingly stressed as levels of chloride, sulfate and other ions rise in freshwater ecosystems – a management tool that has the potential to help combat the increased threat of salinization across Southern California and beyond.

The tool, which was released as a web-based app in April, enables managers to generate site-specific insights about how salinization can be expected to degrade biological health for specific segments of wadeable streams. While the tool was initially developed for application in the Santa Ana region, it has the potential to be scaled up for use statewide.

Salinization, which is defined as increased concentrations of ions beyond natural background levels that can harm aquatic life, is becoming a growing management challenge in water bodies statewide – driven by drought, reliance on imported water, and sea level rise. Increased water recycling practices that produce more concentrated brine discharges are

expected to exacerbate salinization challenges in the coming years.

Using the salinization modeling tool, both regulated and regulatory managers will be able to identify site-specific ion thresholds aligned to aquatic life protection goals. Already, the study has identified a range of potential ion thresholds that could help combat the adverse biological effects of salinization in wadeable streams.

The Santa Ana Regional Water Quality Control Board asked SCCWRP to take on this project because the existing regulatory thresholds for ion levels in the region's waterways – originally developed in the 1970s – were not derived to protect aquatic life, but rather to prevent degradation of water quality as a result of increased ion concentrations.

In developing the modeling tool, researchers confirmed that in some cases, existing ion thresholds were set unnecessarily low to protect aquatic life, while in other cases, the thresholds were set too high.

The three-year study also found that ion thresholds should be set on a site-specific basis, with researchers concluding that elevation, rainfall patterns, season and other local factors can create a high degree of variability in natural background levels of ions at different sites.

Researchers have developed a tool for predicting how increasing salinization of streams adversely affects aquatic life. The tool accounts for the fact that different stream ecosystems have naturally different ion levels, including Serrano Creek in Orange County, above, which experiences relatively high background levels of ions compared to streams at higher elevations.

For example, the study found that low-elevation tributaries tend to have high background levels of ions, while high-elevation headwaters tend to have very low background levels. Meanwhile, summer months tend to have higher background levels than winter months, although season has a much smaller influence on natural levels than other watershed characteristics.

The predictive tool that SCCWRP and its partners developed consists of a pair of models:

» The first model predicts natural background ion levels at a given site, enabling the user to calculate salinization for the site by comparing the modeling predictions to measured ionic concentrations at the site.

» The second model explains how increasing ion levels lead to predictable decreases in biological integrity, as measured by the California Stream Condition Index (CSCI) and Algal Stream Condition Index (ASCI) – two stream scoring tools co-developed by SCCWRP for use statewide.

From the publicly accessible web app, users can visualize background levels and explore a range of thresholds in the Santa Ana watershed.

SCCWRP already has begun working to help water-quality managers in the Santa Ana region interpret modeling predictions and determine appropriate next steps. A technical report summarizing the analyses is expected to be published this summer.

For more information, contact Dr. Raphael Mazor.

Second phase launched for Newport Bay study revisiting shellfish water-quality standard

SCCWRP and its partners have launched the second and final phase of a study examining whether an existing water-quality standard designed to protect the health of people who consume shellfish from Newport Bay is built on solid scientific footing – a study that could have implications for similar bodies statewide that also have been failing to meet this regulatory standard.

The study's second phase, which wrapped up field sampling in March, will probe whether California's existing standard for permissible bacterial levels correlates to potentially unsafe levels of pathogens in bivalve shellfish that are harvested from Newport Bay during wet weather.

The study's first phase, which examined this same relationship during dry weather, found no correlation. Bacterial levels in water bodies like Newport Bay, however,

tend to be much higher during wet weather, because stormwater runoff that can wash fecal contamination off hundreds of square miles of landscapes flows through water bodies like Newport Bay to the coastal ocean.

California's existing water-quality objective for recreational shellfish – abbreviated SHEL – is intended to protect recreational shellfish harvesters by limiting bacterial levels in coastal waters where shellfish can grow. Compliance with the SHEL standard is evaluated by measuring bacterial levels in field-collected water samples, not in the edible tissue of shellfish.

Researchers found during the study's first phase that this approach to compliance can lead to underreporting of potential health risks from consuming these shellfish. Bivalve shellfish such as mussels and oysters are filter feeders that can take up bacteria and viruses from the water column, potentially concentrating them in their tissues over time.

By collecting water samples at discrete points in time, fecal contamination that passes quickly through the water column can go undetected – as was the case during a sewage spill that happened to flow through Newport Bay during the study's first phase. Evidence of the sewage spill was detected in the tissues of shellfish, but not via traditional water-quality sampling.

The Santa Ana Regional Water Quality Control Board is among the regulatory agencies that are supportive of revisiting the SHEL standard – set nearly a century ago and not validated using local shellfish data. Meanwhile, the State Water Resources Control Board has identified the SHEL standard as a strategic priority to address statewide.

The outcomes of the Newport Bay study are expected to have implications for other water bodies across California, including Morro Bay and Humboldt Bay, that are failing to meet the SHEL standard year-round.

A SCCWRP field crew deploys oysters in cages in specific locations across Newport Bay in Orange County for a study examining whether a water-quality standard designed to protect the health of people who consume shellfish from the bay is built on solid scientific footing. Field sampling for the study's second phase wrapped up in March.

The SHEL water-quality objective is significantly more difficult to meet than California's water-quality objective designed to protect the health of swimmers and other recreational water contact, known as the REC-1 objective.

The REC-1 objective caps monthly median fecal coliform counts in the water column – a proxy for potential pathogenic contamination – at 200 MPN/CFU per 100 mL, among other measures. By contrast, the SHEL objective caps monthly median fecal coliform counts at 14 MPN per 100 mL.

Consequently, Newport Bay mostly achieves compliance with REC-1 standards during dry weather, but often exceeds the REC-1 objective during wet weather, and exceeds the SHEL objective year-round.

The shellfish study is being done in Newport Bay because Newport Bay is the first water body in California to face a regulatory compliance deadline for the SHEL standard. The study's findings could create momentum to repeat the study in other water bodies in California and/or to open discussions about potential revisions to California's SHEL standard. The study also could lead to setting site-specific standards for water bodies like Newport Bay.

During the study's second phase, oysters were placed in cages in Newport Bay, then harvested at different time points over a six-week period in February and March. The laboratory analysis phase, which will be completed this summer, involves comparing levels of viral pathogens and fecal bacterial indicators in the oysters' tissue to levels in the water column.

A technical report summarizing the findings of the study's dry-weather phase was published last year.

For more information, contact Dr. Joshua Steele.

Updates by Thematic Area

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

BIOASSESSMENT

Training workshop developed to help managers use stream bioassessment data effectively

SCCWRP and its partners have developed a training workshop intended to help managers understand how to appropriately use bioassessment data to protect and restore the health of wadeable streams statewide.

The "Bioassessment 101" workshop, which was held at SCCWRP in March and in Northern California last year, was developed for managers who are not involved in generating stream bioassessment data, but who could benefit from the insights provided by bioassessment data. Previous bioassessment training workshops have been geared at practitioner teams that generate bioassessment data.

The "Bioassessment 101" workshop was developed in parallel with a refreshed workshop for bioassessment practitioners. The practitioner trainings are expected to be offered again in 2024.

To request to participate in the bioassessment trainings, contact Dr. Raphael Mazor.

State, federal agencies briefed for study examining sediment impacts from oil platform installations

SCCWRP has begun briefing multiple federal and State agencies about plans to evaluate sediment quality near offshore oil platforms in the Santa Barbara Channel – part of a three-year study to understand how contamination from the original construction activity may still be adversely affecting marine life.

Researchers – who briefed the U.S. Bureau of Ocean Energy Management, U.S. Army Corps of Engineers and U.S. Environmental Protection Agency, Region 9 in March – will be focusing on piles of seafloor debris known as shell mounds that were created during installation of 26 offshore oil platforms in the Santa Barbara Channel decades ago. The shell mounds may be leaching chemical contaminants into the water column over time, creating potential exposure routes for sediment-dwelling marine life.

Sediment quality will be evaluated via two methods: Traditional sediment quality triad analyses, which are used widely in programs like the Southern California Bight Regional Monitoring Program, and passive sampling, an alternate method that will be used for the shell mounds. Shell mounds cannot be sampled via traditional sediment grab or core sampling because of their density.

The insights from the study will help inform ongoing development of plans by federal and State agencies to decommission and potentially remove the Southern California oil platforms in the coming years. It also could become a template for management of other oil and gas platforms across the country.

ECOHYDROLOGY

Framework developed to assess streams' vulnerability to changes in flow patterns

SCCWRP and its partners have developed a scientific framework that enables watershed managers to systematically

Alison Furler from the California Department of Fish and Wildlife, right, demonstrates field methods for collecting benthic macroinvertebrates from a stream during a "Bioassessment 101" training workshop co-developed by SCCWRP. The workshop is intended to help managers who don't generate bioassessment data understand how to use these data sets to inform their decision-making.

evaluate how changes in stream flow patterns in the coming years will adversely affect sensitive aquatic species and habitats.

The risk decision framework, unveiled during a SCCWRP-hosted training workshop in March, considers how climate change, future land-use changes and changing water management practices will affect the ecological health of streams across the San Diego region. These insights are intended to help managers make informed decisions about which streams to prioritize protecting and restoring.

The framework was developed by coupling two types of models: hydrologic models that explain how stream flow patterns will change across the San Diego region, and species distribution models that explain how sensitive species like the arroyo toad are affected by stream flow alterations.

The work builds off a similar 2019 environmental flows analysis in the Los Angeles region focusing on climate change impacts.

Second phase launched in effort to build technical foundation for cannabis growers to request stream flow diversions

SCCWRP and its partners have initiated the second phase of a two-year study to build the technical foundation for a statewide program requiring California cannabis growers to demonstrate that the water they are requesting to divert from nearby streams to support cannabis cultivation does not adversely affect the streams' ecological health.

The second phase, launched in March, will focus on applying a draft scientific workflow to the North Coast region of California that cannabis growers can use to assess potential ecological risks from diverting stream flows. The workflow is based on the California Environmental Flows Framework, which was recently co-developed by SCCWRP to bring consistency and standardization to how flow targets get set statewide.

The workflow will help water resources managers determine whether the individual and cumulative effects of cannabis growers' proposed stream flow diversions will adversely affect the flow regimes necessary to support aquatic life and ecosystem functioning.

While this initial work is focusing on stream-diversion decisions in the North Coast region of California, the State Water Resources Control Board's Division of Water Rights intends to eventually complete similar analyses for each of 14 regions statewide.

EUTROPHICATION

Newport Bay modeling tool applied to help track spread of invasive Caulerpa seaweed

SCCWRP and its partners have adapted and applied a computer model that was recently developed for informing seagrass restoration efforts in Newport Bay to help managers track and eradicate an ongoing seaweed infestation in this coastal estuary.

The Newport Bay model predicts how and where the highly invasive *Caulerpa* species will proliferate, based on the dispersal of blades that break off the aquatic plant and regrow after being transported by tides and water circulation patterns. Preliminary findings were presented in April to the Newport Bay group that is working to eradicate *Caulerpa*.

Common in saltwater aquaria and native to tropic waters, *Caulerpa* grows rapidly and chokes out native seagrass once introduced to environments like Newport Bay, making eradication a complex management challenge. Unlike seagrass, *Caulerpa* is generally inedible to native aquatic life, which can trigger population declines.

The Newport Bay model was developed via a collaboration between SCCWRP and the University of Toulouse in France; researchers envision expanding the model to tackle a range of management challenges in coastal estuaries statewide.

The South Fork of the Eel River in Northern California, above, is among the streams that California cannabis growers are requesting to divert water from to support cannabis cultivation. Researchers are building the technical foundation for a statewide program that will require cannabis growers to demonstrate that their diversion requests do not adversely affect the streams' ecological health.

CLIMATE CHANGE

Modeling team briefs State Water Board on acidification modeling effort

A research team that has been modeling how managers could mitigate the effects of intensifying ocean acidification and hypoxia (OAH) in California coastal waters was invited to brief the State Water Resources Control Board in March about modeling work completed to date.

During the informational board agenda item, SCCWRP's Dr. Martha Sutula chronicled the modeling team's ongoing efforts to understand how OAH will change coastal seawater chemistry in the coming years, how sensitive marine life will be affected, and how coastal discharges of land-based nutrients can exacerbate these effects.

The State Water Board is considering whether to financially incentivize water-quality managers to invest in removing nutrients from wastewater discharges. The ongoing modeling work is one line of evidence that is expected to help inform deliberations on this proposed incentives program, which will be decided at a later date.

Lab experiments to examine multi-stressor effects of climate change on Dungeness crab

SCCWRP and its partners will evaluate how Dungeness crab are affected by the combined effects of low dissolved oxygen levels, ocean acidification and warming water temperatures as part of an ongoing, multi-year effort to build management tools for tracking the biological consequences of climate change on West Coast ecosystems.

The laboratory exposure experiments, which will be conducted this summer, will examine how the three different stressors combine to adversely affect the "breathability" of the ocean water for juvenile Dungeness crab. To date, researchers have quantified how the ocean's breathability changes in response to declining oxygen levels and rising water temperatures – but not how declining pH may further alter breathability.

Dungeness crab, one of California's top commercial fisheries, is the focus of an upcoming SCCWRP laboratory exposure experiment examining the combined effects of low dissolved oxygen levels, ocean acidification and warming water temperatures on the health of juvenile crabs. The experiment will examine how the three different stressors combine to adversely affect the "breathability" of the ocean water for the crabs.

Dungeness crab are one of California's top commercial fisheries, valued at about $50 million annually.

Researchers are using the laboratory exposure experiments to develop a suite of species-specific metabolic index tools that can help managers track the intensity and pace with which climate change is unfolding along the West Coast.

Advisory panel completes independent review of S.F. Bay nutrient modeling tool

A science advisory panel led by SCCWRP's Dr. Martha Sutula has completed an independent review of a San Francisco Bay computer model being developed to shed light on the ecological consequences of land-based nutrient discharges in the coastal estuary.

The expert panel, which completed its review in February, concluded that the modeling team is making excellent progress validating the model's predictive capabilities. Although suggestions were made for refinements to the model and the approach to validating the model, panelists encouraged early applications of the model to support ongoing nutrient management decisions.

The S.F. Bay model is similar to the Southern California computer model being developed to understand the trajectory of ocean acidification and hypoxia in coastal waters. The two models were developed by independent teams of researchers; both teams are working to understand how land-based nutrient discharges affect coastal ecological health.

CONTAMINANTS OF EMERGING CONCERN

Expert panel affirms California's CEC management strategy is working

An advisory panel of international scientific experts that has been working to review California's management strategy

for monitoring CECs (contaminants of emerging concern) in aquatic environments has concluded that California has successfully implemented the strategy as conceptualized and that these investments have been effective.

The seven-member CEC Ecosystems Panel, which completed its review in April, found that the risk-based management framework that California has been using for deciding which CECs to prioritize and monitor is fundamentally sound. The framework uses multiple tools – including bioanalytical cell assays and non-targeted chemical analysis – to expeditiously zero in on the CECs that pose the greatest health risks to aquatic life.

The CEC Ecosystems Panel was originally convened in 2009 to conceptualize a proposed CEC monitoring strategy for California; this strategy was published in 2012. Since that time, California has largely implemented the original panel's recommendations, including generating extensive CEC monitoring data.

The reconvened panel reviewed the monitoring data and developed a prescriptive workflow that the State Water Resources Control Board can use to analyze and complete quality-control steps for the data – and ultimately use the data to produce updated lists of CECs that should be monitoring priorities for California.

The panel's findings are expected to be published in May to the State Water Board's CEC Program website.

Effort underway to more than double size of microplastics toxicity database

SCCWRP and its partners have begun working to nearly double the size of a public, web-based repository of toxicity data that summarizes the health effects of microplastics exposure on humans and aquatic life – a major expansion that reflects the key role the Toxicity of Microplastics Explorer (ToMEx) is playing in advancing California's microplastics management strategy.

During a four-part SCCWRP workshop series that kicked off in February and concludes in May, about 70 microplastics researchers from 14 nations have been discussing how to evaluate microplastics toxicity studies and decide if and how to add the data from these studies to the ToMEx database. Scoring criteria are being used to decide which studies are not of sufficient quality.

ToMEx, which was originally unveiled last year, is serving as a key resource for microplastics toxicity experts as they develop health thresholds that define for California managers the exposure levels at which microplastics can be expected to trigger adverse biological effects. Preliminary thresholds already have been derived for aquatic life; work is ongoing to amass sufficient data to develop human health thresholds.

The 150+ new toxicity studies that are being added to ToMEx will help researchers refine preliminary aquatic life thresholds that were originally developed in 2021.

MICROBIAL WATER QUALITY

Sampling completed for study probing relationship between HF183 and illness risk

SCCWRP and its partners have successfully completed field sampling for a four-year study probing the relationship between levels of the fecal contamination marker HF183 in wet-weather runoff and the risk that humans exposed to this contamination will become sick.

The study's goal is to increase the management utility of HF183, a genetic marker that is an indicator of human fecal contamination. Although HF183 is widely used as a tool for detecting human fecal sources, no health thresholds have been developed to date that explain illness risks for beachgoers and other people who may inadvertently ingest fecal contamination that comes from wet-weather runoff.

Field sampling, which took place over two wet-weather seasons, wrapped up in March. The study is being conducted in partnership with the Southern California Stormwater Monitoring Coalition.

Surfers paddle away from shore at San Diego's Ocean Beach shortly after a storm. Researchers have completed field sampling for a study probing the relationship between levels of the fecal contamination marker HF183 in Southern California wet-weather runoff and the risk that humans exposed to this contamination will become sick.

Researchers are working to develop an HF183 health risk model that can predict how many humans will get sick after exposure to runoff that has been contaminated with a given level of HF183.

Study launched to measure sewage leaking from privately owned sewer lines

SCCWRP and its partners have initiated a study seeking to estimate how much sewage, if any, is leaking from privately owned sewer lines across the San Diego River watershed and contributing to contamination of waterways during wet weather.

The study, launched in March, represents the latest in a series of investigations probing various potential sources of fecal contamination in the San Diego River watershed; researchers also are investigating potential contributions from public sewers, septic tanks and unhoused people living near waterways.

During the private sewer study, a field team will visit about 100 residential properties to inspect the private lateral lines that connect to the public sewer system; if a lateral line is found to be leaking, the leakage rate will be measured. Then, the data will be extrapolated to estimate sewage leakage levels across all private sewer lines within the San Diego River watershed.

Fecal contamination is widespread in Southern California waterways, but it remains unclear which specific sources are major potential contributors to the contamination.

STORMWATER BMPS

Microplastics added as focal point in SMC street sweeping study

Researchers will investigate the effectiveness of street sweeping in removing microplastics that enter storm drains and contribute to runoff pollution as part of a newly launched Southern California Stormwater Monitoring Coalition (SMC) study quantifying street sweeping's effectiveness in removing multiple common types of stormwater contaminants.

The SCCWRP-led study, which held its first advisory committee meeting in April, is measuring how much bacteria, nutrients, trace metals and other common stormwater contaminants are transported from streets into storm drains during wet-weather flows, and if street sweeping is effective in preventing the transport of at least some of this pollution into storm drains.

The City of Santa Barbara recently decided to join the study and leverage the study design to also investigate microplastics, thereby enabling researchers to extend the study's focus beyond traditional runoff pollutants.

The study represents the first known field-scale effort to isolate and study just the portion of street pollution that gets removed during routine street sweeping. One set of street segments will be swept, while a corresponding set of similar street segments that will serve as the control group will not be swept. A rainfall simulator custom-made by SCCWRP will be used to create controlled rainfall patterns for both street segments.

BMP performance data collected from 5 sites to support regional monitoring network

The Southern California Stormwater Monitoring Coalition (SMC) has successfully collected monitoring data on the performance of structural stormwater BMPs (best management practices) at five sites – a key milestone in ongoing efforts to build the SMC's new Regional BMP Monitoring Network.

During the 2022-2023 wet-weather season, the SMC deployed field teams to the five sites during as many as eight storm events per site. The five monitoring sites represent the halfway point in the planned initial buildout of the monitoring network, which is being led by SCCWRP.

The SMC's Regional BMP Monitoring Network will help address significant, persistent knowledge gaps in managers' understanding of how to optimize the operation, maintenance and performance of structural stormwater BMPs.

SCCWRP, which recently developed web-based tools for integrating data management and analysis into the network, will beta-test the tools with SMC partners in the coming months. The tools are designed to streamline data processing, confirm quality assurance and ensure consistency in data analysis.

A field crew constructs a bioretention planter in Riverside County to study its mechanistic inner workings. The Southern California Stormwater Monitoring Coalition (SMC) has collected performance data of structural stormwater BMPs (best management practices), like bioretention planters, at five sites – a key milestone in ongoing efforts to build the SMC's new Regional BMP Monitoring Network.

REGIONAL MONITORING

Bight '23 to feature 7 study elements probing coastal ocean health

The Southern California Bight Regional Monitoring Program has solidified plans for seven study elements for its upcoming 2023 cycle – the largest number of elements to date – reflecting the program's commitment to probing a wide range of issues affecting the health of Southern California's coastal ocean.

The Bight '23 cycle, which kicks off with field sampling in July, will consist of the following study elements: Sediment Quality, Water Quality, Microbiology, Trash and Microplastics, Estuaries, Harmful Algal Blooms and Submerged Aquatic Vegetation.

Among the contaminants to be monitored during Bight '23 will be CECs (contaminants of emerging concern) recently identified as monitoring priorities via a statewide review panel, including PFAS (per- and polyfluoroalkyl substances), tire wear compounds and microplastics.

Bight '23 also will investigate how a range of contaminants can accumulate in bivalves, including marine and freshwater HAB toxins, pathogens, PFAS and microplastics.

A Bight '18 field crew uses a trawl net to collect sportfish and other marine life from along the seafloor of the coastal ocean. The next cycle of the Southern California Bight Regional Monitoring Program, Bight '23, kicks off this summer with seven study elements – the largest number of elements to date.

New SCCWRP Publications

Journal Articles

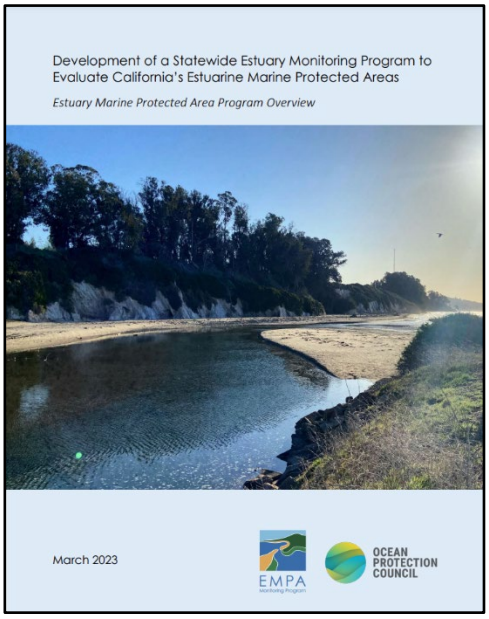
De Frond, H., W. Cowger, V. Renick, S. Brander, S. Primpke, S. Sukumaran, D. Elkhatib, S. Barnett, M. Navas-Moreno, K. Rickabaugh, F. Vollnhals, B. O'Donnell, A. Lusher, E. Lee, W. Lao, G. Amarpuri, G. Sarau, S. Christiansen. 2023. What determines accuracy of chemical identification when using microspectroscopy for the analysis of microplastics?. *Chemosphere* DOI:10.1016/j.chemosphere.2022.137300.

Goodrich, K.A., N. Ulibarri, R. Matthew, E.D. Stein, M. Brand, B.F. Sanders. 2023. Toward improved sediment management and coastal resilience through efficient permitting in California. *Environmental Management* DOI:10.1007/s00267-023-01804-1.

Langknecht, T., W. Lao, C.S. Wong, S. Kotar, D.E. Khatib, S. Robinson, R.M. Burgess, K.T. Ho. 2023. Comparison of two procedures for microplastics analysis in sediments based on an interlaboratory exercise. *Chemosphere* DOI:10.1016/j.chemosphere.2022.137479.

Simons, A.L., S. Theroux, M. Osborne, S. Nuzhdin, R.D. Mazor, J.A. Steele. 2023. Zeta diversity patterns in metabarcoded lotic algal assemblages as a tool for bioassessment. *Ecological Applications* DOI:10.1002/eap.2812.

Simons, A.L., N. Aulerich, H. Carlson, I. Chandra, J. Chancellor, G. Gemayel, D.J. Gillett, D. Levene, J. Line, G. Nichol, H. Patel., and S. Zhu. 2023. Using zeta diversity in describing the health of soft sediment benthic macroinvertebrates in the Southern California Bight. Journal of Coastal Research DOI: 10.2112/JCOASTRES-D-22-00051.1.



SCCWRP and its partners have co-authored a series of newly published technical reports that describe a proposed statewide monitoring framework intended to bring consistency to how California assesses the health of its coastal estuaries.

Siu, J., E.D. Stein, J.S. Brown. 2023. When is Aquatic Resource Type Conversion Appropriate: A Framework for Cleaning Sand out of the Gears and a Case Study for McInnis Marsh. *Wetland Science and Practice* 41:70-85.

Lao, W., C.S. Wong. 2023. How to establish detection limits for environmental microplastics analysis. *Chemosphere* 327:138456.

Lao, W. 2023. Incorporating performance reference compounds in retractable/reusable solid phase microextraction fiber for passive sampling of hydrophobic organic contaminants in water. *Science of the Total Environment* DOI:10.1016/j.scitotenv.2023.162252.

Journal Articles (Accepted)

Zhou, J., J. Izett, C.A. Edwards, P. Damien, F. Kessouri, and J.C. McWilliams. 2023. Modeling the Dispersal of the San Francisco Bay Plume over the Northern and Central California Shelf. *Journal of Estuarine, Coastal and Shelf Science*.

Technical Reports

O'Connor, K., R. Clark, B. Fulkerson, J.B. Walker, E.D. Stein, C. Whitcraft, S. Garcia. 2023. Estuary Marine Protected Area - 2021 Data Analysis Report. Technical Report 1315.B. California Ocean Protection Council. Sacramento, CA.

Stein, E.D., J.B. Walker, K. O'Connor, R. Clark, C. Whitcraft. 2023. Development of a Statewide Estuary Monitoring Program to Evaluate California's Estuarine Marine Protected Areas - Estuary Marine Protected Area Program Overview. Technical Report 1315. California Ocean Protection Council. Sacramento, CA.

Stein, E.D., J.B. Walker, K. O'Connor, C. Toms. 2023. Estuary Marine Protected Area - Monitoring Program Implementation Blueprint. Technical Report 1315.C. California Ocean Protection Council. Sacramento, CA.

Walker, J.B., E.D. Stein, K. O'Connor, R. Clark, C. Whitcraft, S. Garcia, B. Hughes, A. Cooper, D. Jacobs, M. Abrecht, J. Largier, R. Roettger, C. Toms. 2023. Estuary Marine Protected Area - Monitoring Protocol. Technical Report 1315.A. Ocean Protection Council. Sacramento, CA.

Quarter in Review

Conference Presentations

Gillett, D. Biologically Relevant Sediment Organic Matter Thresholds for Estuaries of Southern California, USA. National Monitoring Conference. April 27, 2023. Virginia Beach, VA.

McLaughlin, K. Enhancing California's Ocean Acidification & Hypoxia Monitoring Network. California OAH Monitoring Symposium. April 6, 2023. Monterey, CA.

McLaughlin, K. Regional Assessment of Trash and Marine Debris in the Southern California Bight. National Monitoring Conference. April 27, 2023. Virginia Beach, VA.

McLaughlin, K. Regional Monitoring for Sediment Quality in the Urban Ocean of the Southern California Bight. National Monitoring Conference. April 27, 2023. Virginia Beach, VA.

McLaughlin, K. Regional Monitoring for Biological Impacts of Ocean Acidification in the Urbanized Coastal Waters of Southern California. National Monitoring Conference. April 27, 2023. Virginia Beach, VA.

Schiff, K. Assessing the defecation practices of unsheltered individuals and their impacts to water quality. National Stormwater Conference. April 25, 2023. San Diego, CA.

Schiff, K. Novel indicators for tracking human sources of fecal pollution during storm events. National Monitoring Conference. April 26, 2023. Virginia Beach, VA.

Schiff, K. Collaborative stream monitoring in southern California: Linking monitoring data to water quality management. National Monitoring Conference. April 27, 2023. Virginia Beach, VA.

Stein, E. Evaluating the Relative Benefits of Water Reuse, Recycling, and Environmental Flows. CSU-Water 2023 Conference. April 13, 2023. Seaside, CA.

Stein, E. An Integrated Framework for Evaluating Wetland and Stream Compensatory Mitigation. National Monitoring Conference. April 25, 2023. Virginia Beach, VA.

Stein, E. Prioritizing Stream Protection, Restoration and Management Actions Using Landscape Modeling and Spatial Analysis. 2023 USEPA Wetland Program Conference. March 2, 2023. Via webinar.

Theroux, S. Advancing eDNA method adoption for bioassessment and biomonitoring. 6th Annual eDNA Technical Exchange Workshop. January 26, 2023. Via webinar.

Walker, J. Binational monitoring for fish community support and indicators of tropicalization. American Fisheries Conference, Cal-Neva chapter. March 2, 2023. Long Beach, CA.

Xin, D. Application of voltametric microelectrodes for studying redox biogeochemistry in Prairie pothole wetland sediments. American Chemical Society Spring 2023 National Meeting. March 26-28, 2023. Indianapolis, IN.

Other Presentations

Mazor, R. Bioassessment training. California State Water Board Resources Control Board. March 23, 2023. Costa Mesa, CA.

McLaughlin, K. Enhanced OAH Monitoring. California OAH Monitoring Stakeholder & Technical Workshop. April 6-7, 2023. Moss Landing, CA.

McLaughlin, K. Careers in geological and environmental science. Chapman University. March 31, 2023. Orange, CA.

Schiff, K. Guest speaker. University of California, Irvine Ridge to Reefs scientific communication seminar. March 13, 2023. Irvine, CA.

Schiff, K. Panelist. California State University Marine Biology Workshop. March 21, 2023. Long Beach, CA.

Schiff, K. Adaptive Watershed Management Decision Making. Santa Margarita Watershed Technical Advisory Committee meeting. April 19, 2023. Via webinar.

Smith, J., A. Deming, V. Hoard, M. Berndt, D. Shultz, and J. Cram. Linking Regional Monitoring Observations to Domoic Acid Related Marine Mammal Stranding Events in Southern California. CDC's One Health Harmful Algal Bloom Community of Practice Meeting. February 21, 2023. Via webinar.

Sutula, M. Ocean Modeling to Support Coastal Water Quality Management: A Progress Report. California State Water Resources Control Board meeting. March 21, 2023. Sacramento, CA.

Sutula, M. Progress on OAH Ocean Modeling. California Association of Sanitary Agencies regulatory workgroup meeting. March 16, 2023. Via webinar.

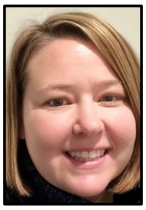
Taniguchi-Quan, K. The California Environmental Flows Framework: Informing management decisions on wastewater reuse, stormwater capture, and streamflow diversions in California. Palomar College UC California Naturalist Certification Program. April 18, 2023. Via webinar.

Walker, J. Monitoring for management: An ecosystem function-based approach to estuarine assessment. California State University, Long Beach biology seminar series. March 9, 2023. Long Beach, CA.

Weisberg, S. and E. Stein. Ecohydrology and opportunities for collaboration with CSU students. California State University Water Program. April 13, 2023. Seaside, CA.

SCCWRP Personnel Notes

Commission



Crystal Benham, Commissioner for the San Diego County Water Protection Program, departed the County in April to take on a new role with the County's Parks and Recreation Department. Benham served on the Commission for a year. Her replacement has not yet been named.

New Faces

Dr. **Amanda Lai,** who just completed her postdoctoral research at the University of North Carolina at Chapel Hill, will join SCCWRP in early May as an Engineer in the Engineering Department. She is an environmental engineer who specializes in wastewater and sanitation interventions.

Dr. **Nastassia Patin,** who just completed her postdoctoral research at the Southwest Fisheries Science Center, started in April in a joint Scientist position with SCCWRP's Biology Department and the Scripps Institution of Oceanography. She will expand on environmental DNA sampling methods for the Southern California Bight Regional Monitoring Program and work on strengthening collaborations between SCCWRP and the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program.

Scientific Leadership

Dr. **Faycal Kessouri** has been appointed to the San Francisco Estuary Institute Modeling Advisory Group.

Dr. **Raphael Mazor** has been appointed to the editorial board for the journal *Frontiers in Freshwater Science*.

Ken Schiff has been appointed to the 2023 National Stormwater Conference Technical Committee.

Ken Schiff has been appointed to the Los Angeles Region Zinc Water Quality Criteria Technical Committee.

Ken Schiff has been appointed to the Stormwater Credit Think Tank Ad Hoc Committee.

Ken Schiff has been appointed to the Ridge to Reef Technical Advisory Committee for the University of California, Irvine.

Dr. **Eric Stein** has been appointed Vice-Chair of the U.S. Army Science Advisory Board/Environmental Advisory Board.

Dr. **Susanna Theroux** has been appointed to an advisory group for the White House Office of Science, Technology and Policy (OSTP) to produce a national environmental DNA (eDNA) strategy for aquatic ecosystems.

Dr. **Stephen Weisberg** has been appointed Chair of a review committee for the Woods Hole Oceanographic Institution's Cooperative Institute for the North Atlantic Region.

SCCWRP has been presented an honorary award from the Los Angeles County Department of Public Works for the agency's help in responding to the Dominguez Channel Incident in 2021.

Departures

Dana Shultz, who has worked at SCCWRP since 2018, most recently as a Research Coordinator in the Biogeochemistry Department, will leave SCCWRP in May.

SCCWRP COMMISSIONER SPOTLIGHT

Sanitation leader loves breaking down siloes

Throughout his 28-year career at the Orange County Sanitation District, Rob Thompson has been breaking down siloes and questioning the status quo.

Rob Thompson

Case in point: About five years ago, Thompson conceptualized and led an initiative to convert his agency's five-year strategic plan to a living plan updated every two years – a recognition that OC San's 25 board members may only serve a two-year term and thus would start to feel disconnected from the agency by Year 3 or Year 4 of the plan.

"Now they feel empowered to send this agency to achieve long-term objectives," said Thompson, who was named in February as OC San's General Manager after serving as Assistant General Manager for the prior five years. "The concept is easy, but the machinations of making and sustaining this type of culture change isn't – you need to have long-term vision."

Thompson was named a SCCWRP Commissioner in February, replacing Jim Herberg, who retired from OC San after serving as a SCCWRP Commissioner for five years.

At OC San, Thompson oversees a $477 million budget and a staff of 640 that provides regional wastewater management services to 2.6 million northwest and central Orange County residents. What gets him most excited, though, is the opportunity to find new ways to change up the status quo at OC San.

In recent years, Thompson has been closely monitoring a clean energy technology known as supercritical water oxidation that has the potential to convert biosolid waste (and hazardous chemicals in them) into carbon dioxide and minerals. The technology, which Thompson is bringing to OC San this summer for a pilot demonstration, could one day eliminate OC San's need to create biogas and biosolids, and to have the biosolids trucked to farms and composting facilities for use as fertilizer.

Rob Thompson explores Barney Lake in Northern California in June 2022 with, from left, daughter Allison, wife April and daughter Amanda.

Robert Thompson, P.E.

Job: General Manager, Orange County Sanitation District (started February 2023)

SCCWRP role: Commissioner (started February 2023)

Prior jobs: 28 years with OC San: Assistant General Manager for Operations, Maintenance and Engineering (2018-2023), Director of Engineering (2013-2018), Engineering Manager (1996-2013), Engineer (1995-1996); Project Manager, Senior Engineer, Engineer and Associate Electrical Engineer, Ralph M. Parsons Co. (1989-1995)

Education: Master of Public Administration, California State University, Long Beach (2013); B.S. electrical engineering, California State Polytechnic University, Pomona (1989)

Residence and hometown: Tustin

Family: Wife April, a community college culinary arts instructor; three adult children Amanda, a civil engineer, Rob, an internet salesperson, and Allison, a salesperson for a workplace services provider; dog Ralphie, rabbit Oliver and two goldfish

Hobbies: Playing golf; skiing, off-roading; camping

"If digestion, biogas or reuse of biosolids fall out of favor with regulators, we have an obligation to find out now if there is another way forward," Thompson said.

Thompson, a native of Tustin who comes from a family of electricians and contractors, studied electrical engineering at Cal Poly Pomona, then spent the first six years of his career in the oil industry. In his final year, he began traveling extensively to sell his company's sulfur control technology – a role that made him realize he was putting his job before his family. He pivoted and joined OC San in 1995 as an Engineer in the agency's operations group.

"There are a lot of parallels between sewage treatment and running a refinery," he said. "They both have the same basic challenge: They must break down a difficult-to-handle liquid and turn it into useful products."

Thompson looks forward to getting involved in SCCWRP as a Commissioner. He appreciates that SCCWRP's focus is on doing sound science.

"My hope is to make sure we stay true to SCCWRP being a fantastic voice for ocean health," Thompson said.

In his spare time, Thompson enjoys playing golf and skiing with his wife. Their favorite skiing spot is Snow Summit in Big Bear.

SCCWRP PARTNER SPOTLIGHT

Professor evolves career through paleontology

For Dr. Andrew Gray, his interest in hydrology was shaped over the course of his twenties after various stints working in a paleontology lab and on commerical fishing boats.

Dr. Andrew Gray

Gray bounced between different career paths during his time at the University of Chicago, from examining 100-million-year-old sediment in fossil beds with Dr. Paul Sereno to collecting data as a fishery observer. After graduating in 2001, he continued doing both, but couldn't see himself growing a long-term career in either fields.

During this time, Gray began wanting more creativity when it came to the type of questions that were being answered through scientific research.

Rather than looking at fossils to learn about a world that existed long ago, Gray wanted to explore how recently developed sediment deposits can be used to better understand the state of the environment over human-relevant time scales.

"I began thinking in a more applied dimension when it came to sediment, which got me thinking about sediment as a keystone water-quality parameter," said Gray, an Assistant Professor of Watershed Hydrology at the University of California, Riverside. "I became interested in applying paleontological techniques to deposits to ask questions that people today would find important."

Gray received his Ph.D. in hydrologic sciences from the University of California, Davis, where his dissertation focused on watershed-scale suspended sediment dynamics and paleoenvironment analysis of small rivers in California mountains.

Dr. Andrew Gray backpacks through the Sierra Nevada mountains in July 2022 with daughter Noomi, left, and son Oscar.

Andrew Gray, Ph.D.

Job: Assistant Professor of Watershed Hydrology, University of California, Riverside (started July 2015)

SCCWRP role: Partner on microplastics method standardization research

Prior jobs: Postdoctoral Researcher, University of California, Davis (2014-2015); Graduate Student Researcher, University of California, Davis (2007-2014)

Education: Ph.D. hydrologic sciences, University of California, Davis (2014); B.A. biology, University of Chicago (2001)

Residence: Riverside

Hometown: Westbrook, Maine

Family: Wife Sonja, a social worker; daughter Noomi, 8; son Oscar, 6; dog Rufus, a terrier mix

Hobbies: Camping with family; indoor and outdoor rock climbing; backpacking; traveling

Gray has been a key SCCWRP research collaborator in ongoing efforts to develop standardization methods for monitoring and tracking the fate of microplastics in streams and coastal sediment deposits.

He is also closely involved in the trash and microplastics work for the Southern California Bight Regional Monitoring Program.

At UCR, Gray mentors and works with graduate student researchers in his lab, which traditionally has focused on hydrology, geomorphology and sedimentology, but has recently evolved to address growing research questions around microplastics.

His research program is partnering with SCCWRP on a project investigating microplastics in the San Pedro Basin and developing the foundation to build monitoring and modeling tools for watershed managers.

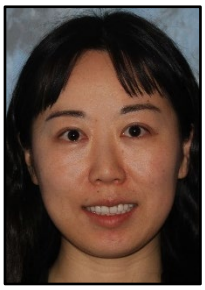
"When we talk about water quality in the context of sediment, plastic pollution and microplastics have to be involved," Gray said. "There are so many questions in that field that our research can help answer."

In his spare time, Gray enjoying exploring the outdoors with his family through activities like camping and rock climbing. He also enjoys hiking and bouldering at Mount Rubidoux in Riverside, where he currently lives with his wife, two children and dog.

SCCWRP STAFF SPOTLIGHT

Chemist applies biochar to engineering solutions

As both an environmental chemist and engineer, Dr. Danhui Xin not only understands the mechanisms of chemical processes, but is also applying those processes to engineering principles to address issues like water contamination.



Dr. Danhui Xin

Xin's Ph.D. work focused on characterizing the redox (electron transfer) properties of biochar – black carbon produced by heating biomass – and integrating its chemical properties into environmental engineering applications.

While biochar is often used in agriculture to improve soil fertility and crop growth, Xin is more interested in how biochar can be used to reduce contaminants in aquatic environments.

"Biochar is an electron reservoir, meaning it can store electrons and use them to change molecules," Xin said. "With a better understanding of these properties, we can develop engineering methods for transforming contaminants."

Xin joined SCCWRP in January as a Scientist in the Chemistry Department. For the first four months, she worked remotely part time while wrapping up her postdoc at the University of Delaware, where she observed the microbiological role of biochar to mitigate methane production and profiled redox elements in lake sediments using electrochemical methods.

In late April, she moved from Newark, Delaware to Irvine and transitioned to working at SCCWRP full time.

One of her initial projects is to investigate processes and mechanisms by which stormwater BMPs (best management practices) reduce pollutants in runoff – in particular, for BMPs where biochar will be used as a media component. She is collaborating closely with the Engineering Department on this work.

Dr. Danhui Xin completes a hike near the Toolik Field Station in northern Alaska during a four-week field trip in July 2022.

Danhui Xin, Ph.D.

Job: Scientist, SCCWRP Chemistry Department (started January 2023)

Prior jobs: Postdoctoral Researcher, University of Delaware (2021-2023); Graduate Research Assistant, University of Delaware (2016-2021); Research Assistant, Muroran Institute of Technology (2016); Graduate Research Assistant, Tongji University (2012-2015); Visiting Scholar, University of Tokyo (2014)

Education: Ph.D. environmental engineering, University of Delaware (2021); M.E. environmental engineering, Tongji University (2015); B.S. environmental engineering, Tongji University (2012)

Residence: Irvine

Hometown: Harbin, Heilongjiang, China

Family: Husband Haoyi Wang, a wind turbine mechanical engineer in Japan

Hobbies: Yoga; reading; hiking and taking strolls in nature

She is also involved in an ongoing SCCWRP project to develop methods for monitoring microplastics in drinking water and tracking their fate in water treatment plants.

Xin received her bachelor's and master's degrees in environmental engineering from Tongji University in Shanghai, China. During her master's program, she modeled greenhouse gas transport in porous media at the University of Tokyo and worked closely with researchers from several Japanese universities before moving to the United States in 2016 for her Ph.D. program.

Xin first learned about SCCWRP and the Chemistry Department position in summer 2022 from her postdoctoral adviser, Dr. Yo Chin, while the pair spent four weeks in northern Alaska gathering measurements of redox elements in lake sediments. Chin knows Dr. Charles Wong, head of SCCWRP's Chemistry Department, from their Massachusetts Institute of Technology days.

"I was so excited that I applied for the position right after I came back from Alaska," Xin said. "In environmental engineering, we work a lot with interdisciplinary sciences, so I'm glad I can do that at SCCWRP."

Xin is fluent in four languages, growing up speaking Korean and Mandarin with her parents, who are originally from South Korea. She later learned Japanese when she was in middle school and English when she was in college.

In her free time, Xin likes staying active by doing yoga, swimming, hiking, and walking around her neighborhood. She also loves being surrounded by nature and considers herself a plant person.

SCCWRP SCENES

Advancing estuarine and coastal research

The California Estuarine Research Society (CAERS) held its annual conference in April at SCCWRP for the first time since the COVID pandemic. The two-day event – sponsored by SCCWRP, California Sea Grant and University of Southern California Sea Grant – brought together more than 90 researchers from across California and Baja California to advance education and research of estuarine and coastal environments. Participants attended themed presentation sessions on various research topics, ranging from monitoring vulnerable communities to coastal restoration efforts, and networked with peers during breaks. SCCWRP has partnered with CAERS, an affiliate of the international Coastal and Estuarine Research Federation (CERF), since it was founded in 2002.

Left, Brandon Quintana, a biology graduate student from Cal State Fullerton, discusses his group's research on the effects of eelgrass density on oyster restoration in Newport Bay during a California Estuarine Research Society conference in April in a SCCWRP conference room. Below, Tanya Torres, California Sea Grant Marine Debris Research Associate, presents a poster on managing and reducing marine debris under the California Ocean Litter Prevention Strategy during the conference's poster session on SCCWRP's outdoor patio.