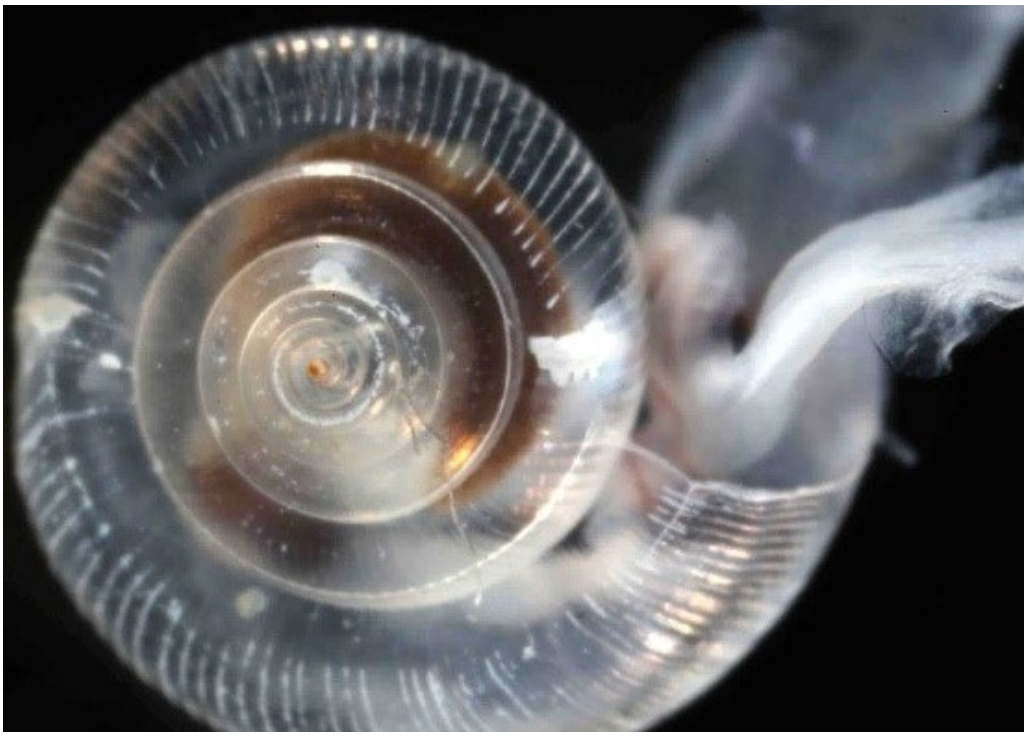

# SCCWRP Director's Report

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FALL 2024 ISSUE

# Expert panel completes review of coastal OAH modeling tools

An international panel of scientific experts has completed an independent review of a set of computer modeling tools designed to predict how land-based coastal discharges are influencing ocean water quality, including the trajectory of ocean acidification and hypoxia (OAH) in California coastal waters.

The independent review panel found that the tools are built on fundamentally sound science and are ready to be used to study the influence of treated wastewater discharges on coastal ecological health. Panelists recommended specific actions to increase community confidence and acceptance of the tools' predictive capabilities, including quantifying model uncertainty and making the modeling outputs and other work more accessible to a broad community of end users.

The six-member panel, which published its findings in a 44-page report released in October, offered a detailed roadmap for recommended next steps the modeling science team could take, even as the team uses the model to answer key questions that managers will need as they consider taking action to mitigate the ecological effects of OAH.

Facilitated by the National Water Research Institute, the independent review involved establishing a steering committee – comprised of water-quality regulatory agencies, the regulated community and environmental advocacy groups – that governed the process of selecting panelists and established panel charge questions. The six selected panelists are internationally renowned for their expertise in areas including physical and biogeochemical oceanography, ocean numerical modeling, the biological effects of low oxygen and pH levels, and the application of models to support management decisions.

With the release of the panel's findings and recommendations, SCCWRP member agencies have agreed the steering committee is the appropriate body to continue guiding the modeling science team's next steps.

## Contents



**Cover photo**: A pteropod, or sea snail, shown with white-colored pit marks on its shell, experiences early signs of shell dissolution in response to ocean acidification. A panel of scientific experts has completed a review of a set of computer modeling tools designed to predict how land-based coastal discharges are influencing the trajectory of ocean acidification and hypoxia (OAH) in coastal waters.

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

## Calendar

**Thursday, November 7**
CTAG quarterly meeting
(In-person meeting)

**Friday, December 6**
Commission meeting
(In-person meeting)

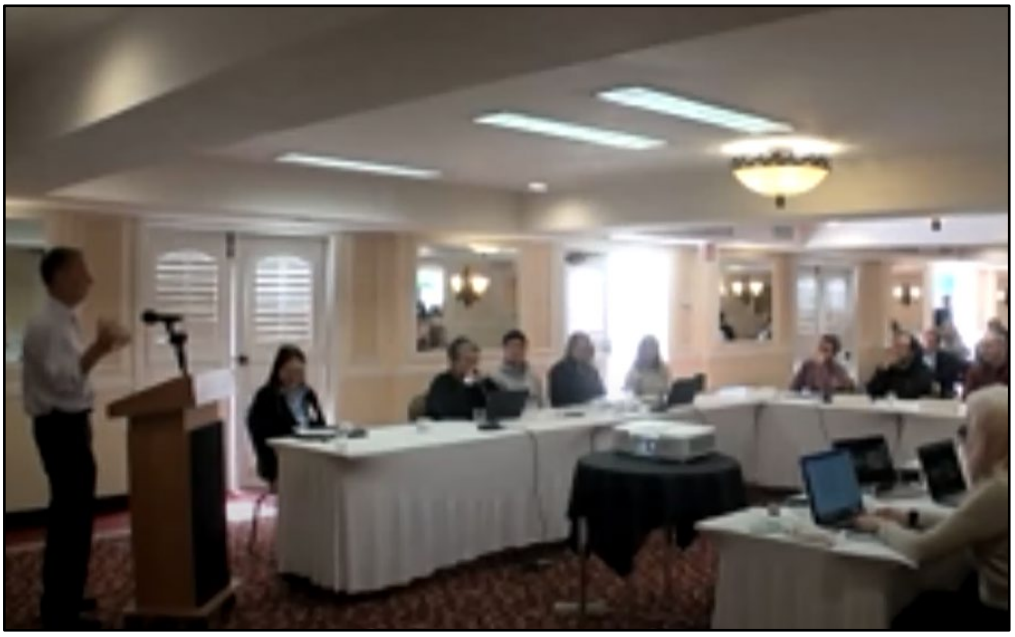
The steering committee will be tasked with addressing two main issues going forward:

» The committee needs to prioritize among the panel's 40 individual recommendations, which represent millions of dollars in investments in modeling science. The committee must decide which recommendations to fund and when, and how implementation costs should be shared among stakeholders.

» The committee needs to provide guidance about which specific nutrient-reduction modeling scenarios the science team should use as the basis for future modeling runs, given that the scenarios need to be aligned with management decision-making processes.

The coastal ocean water-quality model that was reviewed by the expert panel is made up of two component models – collectively known as ROMS-BEC (Regional Ocean Modeling System-Biogeochemical Elemental Cycling) – that work in tandem to predict the relative influence of natural oceanic sources of nutrients vs. local nutrient discharges on seawater chemistry and low trophic ecosystems. Local nutrient discharges are introduced to the coastal ocean via wastewater effluent discharges, stormwater runoff, and atmospheric deposition.

An associated set of biological modeling tools translates how ROMS-BEC's predictions about changing ocean chemistry will adversely affect the health of vulnerable marine life.



**A six-member panel of scientific experts, seen in a screenshot from a recorded meeting, meets at a hotel in Irvine in January 2024 to review a set of computer modeling tools designed to predict how land-based nutrient discharges are influencing coastal ocean health. The panel's findings and recommendations were published in October.**

The modeling tools were developed in response to a 2016 report from the West Coast OAH Science Panel, which recommended developing and applying ocean numerical modeling tools to investigate if managing local, land-based nutrient discharges could be a viable strategy for mitigating OAH conditions.

OAH is a global phenomenon in which seawater is moving to an incrementally more acidic state, and dissolved oxygen levels are falling to create hypoxic conditions for marine life. Given that the West Coast is uniquely vulnerable to OAH due to ocean circulation patterns, the modeling tools are designed to predict whether elevated levels of local, land-based nutrient discharges from dense population centers along the coastline are exacerbating local OAH conditions.

For more information, contact Dr. Martha Sutula and Dr. Faycal Kessouri.

# SMC develops stormwater research priorities for next five years

The Southern California Stormwater Monitoring Coalition (SMC) has launched a research planning process to establish its strategic directions over the next five years, beginning with inviting an expert advisory panel to recommend projects the regional research consortium should consider pursuing to advance stormwater management practices across Southern California.

The SMC's 2024-2029 research planning cycle, which began in September with a three-day expert panel workshop hosted by SCCWRP, already has resulted in the development of a set of 20 high-priority candidate research projects. The panel described the projects verbally to the SMC on the final day of the workshop, and will codify the projects in the coming weeks as the SMC's published 2024-2029 Research Agenda.

In December, the SMC's 18 member agencies, including SCCWRP, are expected to begin reviewing and ranking the projects, then greenlighting their top-priority consensus picks starting in the 2025-2026 fiscal year.

The SMC is a partnership of 18 stormwater management agencies spanning the regulated and regulatory sectors that work collaboratively to develop solutions to

regional challenges in stormwater management.

The 20 candidate research projects are organized into six thematic areas: traditional and emerging contaminants; stream biology; data mining, new technology and communications; stormwater best management practices (BMPs); watershed and groundwater modeling; and economics and financing.

Through this cyclical research planning process, the SMC has co-funded a portfolio of more than 30 stormwater research projects valued at $46 million. All projects are regional-scale investigations that no single agency would have the resources to pursue on its own, but that collectively are possible by combining expertise and resources.

Past SMC projects have informed the development of – and updates to – monitoring programs, guidance and policy documents, 303(d) listings and TMDLs, water quality objectives, and basin plan amendments.

In a summer 2024 survey, SMC member agencies reported that all 12 of the SMC projects completed over the past decade have influenced or are expected to influence the development of a management decision or program within one or more of their respective agencies.

Since the SMC's founding in 2001, the SMC has convened an independent expert panel every five years to identify Southern California's most pressing stormwater research needs and recommend the SMC's long-term research directions.

As of the end of the SMC's 2019-2024 research planning cycle in June, the SMC had completed its four highest-priority projects and initiated four others, all of which are nearing completion. The four completed 2019-2024 projects – three of which were led by SCCWRP – are:


**Amanda Carr from Orange County Public Works, one of the SMC's 18 member agencies, addresses an independent expert panel convened by the SMC to develop the research consortium's next five-year research agenda. The 12-member expert panel met at SCCWRP during a three-day research planning workshop in September.**

» Building the SMC's Regional BMP Monitoring Network to measure the performance effectiveness of BMPs across Southern California

» Determining the inflection point at which concentrations of the fecal contamination marker HF183 begin to represent a risk to public health (results to be published in the coming months in a peer-reviewed journal)

» Developing a prototype data visualization tool to streamline annual compliance reporting of stormwater data

» Conducting a laboratory intercalibration exercise to evaluate environmental laboratories' accuracy, precision and comparability when measuring chemical contaminants in wet- and dry-weather runoff

To develop the 2024-2029 Research Agenda, the SMC brought together nine technical experts spanning a range of relevant science and engineering disciplines, plus one representative each from a water-quality regulatory agency, a stormwater regulated agency, and an environmental advocacy organization.

After hearing testimonies from SMC member agencies about their research needs and priorities at the expert panel workshop, panelists developed 60 initial project concepts before narrowing their list to the 20 priority projects. The panel also identified opportunities where projects can build on existing work and achieve synergies.

The SMC will use the Research Agenda over the next five years as a roadmap that guides decision-making about which projects to prioritize and fund.

Once finalized, the SMC's 2024-2029 Research Agenda will be published to the SMC's website, likely in December.

For more information, contact Ken Schiff.

# Study finds replacing spray irrigation with drip irrigation can eliminate runoff

SCCWRP and the County of San Diego have completed a three-year study that found that replacing spray-irrigated turf with drip irrigation and drought-tolerant landscaping can reduce or eliminate the volumes of irrigation and rain water running off these surfaces – a finding that has helped convince the County to expand its turf-replacement program to

encompass 13 residential and commercial properties and counting.

The study, described in a SCCWRP technical report published in October, found that turf replacements – considered a type of non-structural stormwater BMP (best management practice) – can successfully eliminate irrigation-derived runoff during an estimated 85% of all storms.

Wet- and dry-weather runoff from residential grass areas can become a significant source of pollution in storm drain systems; discharge permits in the County of San Diego require stormwater managers to eliminate dry-weather runoff from these areas.

Because the study was conducted in phases over a three-year period, researchers began sharing initial results two years ago. The early findings helped inform the County's decision to expand its Waterscape Rebate Program, which compensates residential and commercial property owners who voluntarily replace spray-irrigated turf areas with drought-tolerant landscaping and drip-irrigation systems.

Since 2022, the County has funded turf replacement projects in 12 residential communities and one commercial property spanning 354,830 square feet of spray-irrigated turf. Five additional turf-replacement applications are pending, with each applicant committing to replace at least 20,000 square feet of turf.

The turf-replacement study began in 2021, when the County replaced turf and traditional spray irrigation with drought-tolerant landscaping and drip irrigation in a privately managed, inland San Diego County residential community.

To assess whether the newly installed BMP was retaining drip-irrigation water, researchers installed soil moisture sensors and then ran the drip irrigation system for two hours. They visually inspected for evidence of irrigation running off the site, then cross-referenced the inspections with soil moisture measurement data. A year later, they repeated testing with limited replication to confirm conditions hadn't changed.

Other Southern California municipalities, including South Orange County, have been closely following the study and are considering replicating San Diego County's financial incentive program for turf replacements.

Also as a result of the study, San Diego County invested in building a computer model that can quantify the water-saving and runoff-reduction benefits associated with individual proposed turf replacement projects. SCCWRP will begin working with the County to validate the model's performance in winter 2024.

For more information, contact Dr. Elizabeth Fassman-Beck.

**SCCWRP's Adriana Le Compte-Santiago, left, and Jerod Gray install a trench drain and above-ground sensors in a residential community where the County of San Diego replaced turf with drought-tolerant landscaping. A three-year study at this site found that replacing spray irrigation with drip irrigation and drought-tolerant plants can reduce or eliminate the volumes of irrigation and rain water running off these surfaces.**

# Sentinel network completed to support planned wetlands monitoring program

SCCWRP and its partners have completed the first major component of a planned coastal wetland monitoring program for Southern California – a milestone that brings coastal managers one step closer to realizing a shared 2018 vision that calls for ongoing, coordinated regional monitoring of Southern California's approximately 100 coastal wetlands.

Researchers in October unveiled the monitoring program's sentinel site network, a 37-site network that will provide a baseline for comparison to other sites. A portion of the network's sites will serve as the equivalent of reference sites for the program, although these sites do not reflect true "reference condition" because much of the region's coastal wetlands have undergone at least some ecological degradation. Thus, the network's sites also will include recently restored sites.

Once fully built, the Southern California wetland monitoring program will enable researchers to use standardized, rigorously vetted methods for comprehensively assessing the regional health of wetlands, including determining the relative success of different restoration projects across Southern California.

California has spent more than $600 million over the past two decades to protect and preserve wetlands, but these efforts have largely been site-specific and siloed, with managers lacking assessment tools and a unified monitoring program through which to assess the effectiveness of management interventions.

Coastal wetlands play a critical role at the land-sea interface, helping to buffer against coastal flooding, to filter and retain contaminants, and to provide critical habitat for vulnerable plant and animal communities. More than half of these low-lying coastal habitats have been lost in Southern California since the mid-1800s as a result of human development.

A 2017 analysis by SCCWRP and its partners found that about half of the region's remaining wetlands are expected to become permanently submerged by 2100 as a result of sea level rise. But the news is not all bad: If Southern California realigned levees, roads and other infrastructure, the region has the potential to experience a net gain of up to 4,800 acres of wetlands.

In 2018, the Southern California Wetlands Recovery Project – a consortium of seven State agencies, five federal agencies, and six local agencies – developed a master, long-term strategy calling on the region's wetlands to be managed as an interconnected, interdependent network, and to build capacity to conduct regional assessments of wetland health.

Since that time, wetland monitoring protocols have been developed, piloted and vetted through the California Estuarine Marine Protected Areas (EMPA) program, which is a newly launched statewide program that is focusing on monitoring California's estuaries.

**Batiquitos Lagoon in Carlsbad is one of 37 coastal wetlands that will serve as sentinel sites for a planned Southern California coastal wetland monitoring program. The sentinel site network, which was recently built, will provide a baseline for comparison to other sites, enabling the monitoring program to use standardized methods for comprehensively assessing the health of these vulnerable, low-lying coastal habitats.**

Currently, the program is monitoring 14 of the estuarine MPAs.

The Southern California wetlands monitoring program, including the 37-site sentinel site network, is planned to integrate seamlessly with the EMPA program – a strategic decision that will pave the way for the Southern California program to eventually be scaled up to a statewide program encompassing all estuaries in California, not just the subset of estuaries that are designated EMPAs.

Key to researchers' ability to select representative sites for the Southern California sentinel site network have been data from the ongoing Southern California Bight 2023 Regional Monitoring Program (Bight '23), which includes an Estuaries study element that assessed the health of 20 of the 37 sites in the sentinel site network. Bight '23 used the same monitoring protocols that were originally developed for the statewide EMPA monitoring program.

Over the long term, monitoring of the sentinel site network is expected to be completed in partnership with the Bight program.

Multiple key regulatory and resource management agencies already are considering incorporating the sentinel site network and associated monitoring methods into their permitting and grant funding programs, which would reduce monitoring costs for all parties.

Researchers are expected to complete planning for Southern California's wetlands monitoring program by the end of 2025. The other three components that remain under development are a monitoring plan, a set of agency-specific guidelines for how to incorporate regional monitoring into existing agency monitoring programs, and a monitoring implementation strategy. All three components will be published as technical reports.

For more information, contact Dr. Jan Walker.

# Workshop clarifies path for evaluating mCDR environmental effects in California

A two-day workshop at SCCWRP that explored the implications of piloting marine carbon dioxide removal (mCDR) technologies in California coastal waters has helped bring clarity to the technical and regulatory challenges that remain for these prototype approaches to be evaluated at larger scales.

The workshop, held October 7-8, 2024, brought together multiple State agencies, scientific experts, industry and environmental advocacy organizations to discuss the potential environmental consequences of mCDR and how these effects might be monitored or modeled.

mCDR technologies involve either modifying the ocean's chemistry to increase seawater's ability to take up carbon dioxide from the atmosphere (such as by altering ocean alkalinity), or increasing the photosynthetic power of the upper ocean to move and/or sequester carbon dioxide in deeper waters (a research area that includes kelp farming).

Private companies, governmental agencies and philanthropic organizations have invested millions of dollars exploring how to use ocean-based mCDR processes to remove carbon dioxide from the atmosphere and store it for extended periods in the ocean.

To date, less effort has been expended evaluating environmental effects because existing mCDR technologies are mostly operating at smaller pilot scales.

Although U.S. coastal waters have been a locus for mCDR technology incubation, many coastal states, including California, lack the scientific information that would enable coastal managers and communities to evaluate the potential, unintended ecosystem effects of larger-scale mCDR projects in the future – and ultimately decide whether to greenlight these projects.

Researchers hypothesize that if mCDR could be scaled in coastal marine environments, these technologies have the potential to help draw down carbon dioxide from the atmosphere that is driving global climate change. In addition, some technologies may also be able to offset local ocean acidification, a marine phenomenon driven primarily by atmospheric carbon dioxide emissions that is making the ocean a less habitable place for vulnerable marine life.

The international Intergovernmental Panel on Climate Change has found that while the rate at which carbon dioxide is being released into the atmosphere will need to be drastically reduced to limit the worst effects of climate change, large-scale approaches like mCDR have the potential to help draw down existing carbon dioxide in the atmosphere and counterbalance sectors that will be difficult to decarbonize.

In California, one impediment to implementing mCDR is figuring out how to guard against mCDR's potential unintended ecological effects. Before deciding whether to approve future, larger-scale mCDR pilot projects, coastal managers and communities will need to understand the consequences of introducing new materials into marine ecosystems, the effects of altering seawater conditions on nutrient and carbon cycles, the efficacy of carbon removal, sequester and storage, and the cumulative impacts of these changes on marine life.

During the two-day mCDR workshop, researchers worked alongside regulatory and resource agencies to begin conceptualizing scientific assessment frameworks that could guide mCDR practitioners in evaluating the ecosystem effects of their projects.

Workshop participants agreed that while existing, small-scale pilot tests of mCDR technologies are unlikely to trigger consequential ecosystem effects, iteratively scaling up demonstration projects would be an important next step for evaluating potential ecosystem effects.

The workshop's co-hosts – California Ocean Science Trust, the U.S. Ocean Carbon and Biogeochemistry program's California Current mCDR Node, and SCCWRP – will summarize the workshop's findings and recommended next steps in a series of reports, including a workshop executive summary, scientific outcomes, and recommendations. The reports are expected to be published in mid-2025.

For more information, contact Dr. Christina Frieder.

Courtesy of Captura Corporation

**Electrodialysis technology, pictured above on a pier in Newport Beach, is one example of a type of marine carbon dioxide removal (mCDR) technology that may be able to draw down carbon dioxide levels in coastal waters. State agencies met at SCCWRP in October for a two-day workshop exploring the implications of piloting mCDR projects in California coastal waters.**

# Updates by Thematic Area

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

ECOHYDROLOGY

## L.A. River named first ecohydrology demo site in the U.S. by UNESCO

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has recognized a SCCWRP-led flow ecology study in the Los Angeles River as one of the world's 51 ecohydrology demonstration sites – honoring a scientific achievement that successfully balanced local water supply needs with environmental preservation goals.

The study, which is summarized in a newly published L.A. River web portal hosted by UNESCO's Intergovernmental Hydrological Programme, was conducted from 2019 to 2021. The project involved bringing together more than 50 L.A. River management stakeholders to evaluate if and how the river's flows can be reduced for water-recycling purposes while simultaneously protecting the ecological and recreational benefits provided by these flows. The project also served as a pilot application of the California Environmental Flows Framework (CEFF).

The L.A. River project is the first and only U.S. site to be recognized as a UNESCO ecohydrology demonstration site. The other 50 sites span 31 nations.

## Trainings completed to support release of tools for assessing stream flow duration

SCCWRP and its partners have completed a pair of field trainings to support the upcoming release of final versions of stream flow classification tools designed to help watershed managers determine which streams the federal government has jurisdiction to regulate under the Clean Water Act.

**Staff from the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers participate in a SCCWRP-led field training in Oakland in September for newly developed stream flow classification tools. The tools are designed to help watershed managers distinguish among intermittent, ephemeral and perennial streams to determine which streams the federal government has jurisdiction to regulate under the Clean Water Act.**

The trainings for the Streamflow Duration Assessment Methods (SDAMs) – which were completed in September and October in Oakland and Denver, respectively – were attended by staff from the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. Attendees are expected to provide additional training to other end users.

The tools are designed to help managers across five regions of the U.S. rapidly distinguish among intermittent, ephemeral and perennial streams using easily observable indicators, such as wetland vegetation and aquatic invertebrates.

Beta versions of the tools were released for different regions between 2021 and 2023. The final versions of the tools for the Western Mountains, Great Plains, and Arid West, which includes Southern California, are expected to be released this winter, followed by final versions for the Northeast and Southeast regions.

EUTROPHICATION

## Modeling runs probe relative influence of U.S. vs. Mexican nutrient discharges on coastal algal blooms, OAH

A research team that has been modeling how land-based nutrient discharges into Southern California Bight coastal waters influence algal blooms and ocean acidification and hypoxia (OAH) has completed a set of modeling runs that shed light on the relative contributions of wastewater discharges from Mexican vs. U.S. sources.

The modeling runs, which wrapped up in October, used multiple scenarios to sequentially eliminate nutrients discharged via U.S.-based wastewater outfalls, U.S. rivers, and the Mexican rivers and outfalls at the southern end of the Southern California Bight.

The modeling work represents another step forward by SCCWRP and its modeling partners to use the ROMS-BEC (Regional Ocean Modeling System-Biogeochemical Elemental Cycling) modeling tools to answer key management questions about how coastal nutrient discharges are affecting OAH conditions.

The findings, which are being drafted as a manuscript, will be submitted to a peer-reviewed journal for publication.

## Best practices developed to advance use of satellite imagery for inland HABs monitoring

SCCWRP and its partners have developed best-practices guidance for using satellite imagery data as a routine management tool to detect and monitor harmful algal blooms (HABs) in California's large lakes and reservoirs.

The guidance, which was drafted in October by a SCCWRP-facilitated technical advisory committee, offers quality-assurance safeguards to help improve management confidence in satellite imaging data as a decision-making tool.

Satellite remote sensing data have the potential to provide a viable, cost-effective way to generate a continuous stream of real-time HABs monitoring data. In 2022, SCCWRP and its partners successfully used satellite imaging data to build a comprehensive portrait of when and where HABs have been occurring in California's large lakes and reservoirs over a five-year period.

The HABs guidance document is expected to be published in early 2025 as a SCCWRP technical report.

**CLIMATE RESILIENCY**

## Lab experiments completed for study examining multi-stressor effects of changing ocean conditions on Dungeness crab

SCCWRP and its partners have finished a set of laboratory experiments evaluating how Dungeness crab are affected by the combined effects of low dissolved oxygen levels, ocean acidification and warming water temperatures – data that will support an ongoing, multi-year effort to build management tools capable of tracking the biological consequences of climate change on West Coast ecosystems.

The laboratory exposure experiments, completed in September, examined how the three different stressors combine to affect the "breathability" of the ocean water for juvenile Dungeness crab. Previously, researchers had quantified how the ocean's breathability changes in response to declining oxygen levels and rising water temperatures; this is the first SCCWRP study to assess how declining pH may further alter breathability.

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

Researchers are now using the data from the exposure experiments to develop multi-stressor metabolic index tools to help managers track the biological effects of changing ocean conditions along the West Coast.

## Effort launched to standardize, streamline coastal habitat mapping in California

SCCWRP and its partners have launched a one-year effort to standardize and streamline how coastal habitats get mapped in California – a traditionally time-consuming, piecemeal task that can lead to inconsistent, fragmented coastal maps.

The project, which reached consensus in October on its conceptual approach, aims to improve California's ability to do routine, consistent, sustainable mapping of four coastal habitats: rocky intertidal areas, coastal wetlands/estuaries, eelgrass beds, and beaches and dunes.

The maps – which document key habitat features, including boundaries, topography, and relationships to adjacent habitats – are foundational in building California's capacity to monitor the long-term resiliency of coastal habitats to sea level rise and climate change.

Researchers usually map coastal habitats either as the first step of a coastal restoration project, or periodically as part of regional or statewide efforts. Because mapping is done at different times and varying frequencies, maps of California coastal habitats tend to be perpetually outdated, which can slow down progress on coastal restoration projects and impede


**SCCWRP's Dr. Christina Frieder conducts an experiment in a SCCWRP exposure laboratory to study how the combined effects of dissolved oxygen levels, ocean acidification and warming water temperatures affect juvenile Dungeness crab – part of an ongoing effort to build management tools for tracking the biological consequences of climate change on West Coast ecosystems.**

managers' ability to evaluate restoration success.

For this project, researchers are working to develop a more continuous, parsimonious process for keeping maps of coastal habitats up to date and relevant for supporting management decisions.

**CONTAMINANTS OF EMERGING CONCERN**

## Flume experiments being used to develop standardized collection method for measuring microplastics in stormwater

SCCWRP and its partners are nearing completion on a series of controlled hydraulic flume experiments that will help standardize methods for collecting stormwater samples in preparation for measuring their microplastics content.

The flume experiments, which are expected to wrap up in December at the University of California, Santa Barbara, mimic how stormwater flows in rivers, enabling researchers to control variables, including the amount of plastic particles and flow rates.

The flume experiments are the latest step in California's ongoing efforts to generate high-quality, directly comparable data on microplastics pollution in water bodies statewide. In addition to developing a standardized sampling method for stormwater, researchers also are standardizing sampling methods for ambient water, sediment and aquatic life.

Researchers intend to use the results from the flume experiments to inform field testing that is planned for this winter.

## First phase completed in fish consumption survey at urban lakes in L.A. region

SCCWRP has completed the first phase of an ongoing study examining whether one or more urban lakes in the Los Angeles region should receive a regulatory designation known as a Subsistence Fishing beneficial use based on the consumption habits of people who eat fish from the lakes.

**John Perna from the University of California, Riverside adjusts the flow rate of a hydraulic flume at the University of California, Santa Barbara. The flume is designed to mimic how stormwater flows in rivers, enabling researchers to test methods for sampling stormwater in preparation for measuring its microplastics content.**

The nine-month field survey, completed in September, involved interviewing about 450 anglers at four lakes – Alondra Park Lake, Magic Johnson Lake, Legg Lake, and Peck Road Park Lake – to document anglers' characteristics, including demographics and fish species caught.

Less than 20% of the surveyed anglers reported consuming the fish they caught. These anglers described how much and how often they eat the fish they caught, as well as cooking methods and household composition.

Researchers have begun analyzing the collected data to estimate fish consumption rates, which will then be compared to existing fish consumption advisory guidelines developed by California's Office of Environmental Health Hazard Assessment (OEHHA).

The Los Angeles Regional Water Quality Control Board is planning to use the study's findings to determine whether to add a Subsistence Fishing beneficial use designation to any of these lakes.

## Pilot study using cell bioassays to study adverse health effects of CECs in consumer products

SCCWRP has launched a pilot study with California's Office of Environmental Health Hazard Assessment (OEHHA) using bioanalytical screening assays to help close knowledge gaps in how common consumer products can trigger adverse health effects in humans and animals.

The study, launched in August, will focus on 20 different chemicals found in pharmaceutical, disinfectant and personal-care products, including per- and polyfluoroalkyl substances (PFAS).

A newly formed division of OEHHA called the New Toxicology Evaluations Section is interested in using cell bioassays to generate new toxicity data for CECs that have been historically understudied. OEHHA will use the pilot to assess if this approach can be scaled up to validate model prediction for more than 1,000 chemicals.

Cell bioassays are a laboratory-based method currently used for rapidly screening environmental samples and detecting chemical classes that could be harmful to human and aquatic life.

STORMWATER BMPS

## Lab testing phase completed for mechanistic study seeking to open BMP "black box"

SCCWRP and its partners have completed the laboratory testing phase for a three-year study working to characterize the mechanistic inner processes by which biofiltration stormwater BMPs (best management practices) treat stormwater pollutants.

During the laboratory-scale experiments, which were completed in September, researchers built flow-through columns to mimic how contaminants are treated when runoff flows through a biofiltration BMP. Researchers evaluated how specific measurable characteristics of biofiltration media influence the systems' effectiveness at removing contaminants from runoff. Testing focused on dissolved copper and per- and poly-fluoroalkyl substances (PFAS).

The study's goal is to open the "black box" that has historically surrounded how these BMP systems work for water quality, paving the way for managers to optimize their long-term performance.

For the study's next phase, which will kick off in November, researchers will develop a mechanistic model and select sites for validating the laboratory findings through field experiments.

## Field testing phase shows success in using low-cost sensors to automate detection of illicit discharges

SCCWRP and Orange County Public Works have built a small network of field sensors that can generate a continuous stream of real-time flow and water-quality data on dry-weather runoff as it moves through storm drains.

Field testing on the eight-site network, which was completed in October, found that the low-cost Internet of Things (IoT) sensors can be successfully used to automate detection of illicit pollutant discharges, which can pass rapidly through storm drain systems. Stormwater agencies are required under their discharge permits to actively monitor storm drain systems to detect and eliminate illicit discharges.

During the study, the sensors successfully identified four of the five intentional discharges that were created upstream of monitoring sites to mimic illicit discharge events. By contrast, Orange County stormwater managers over the past decade have only successfully identified a handful illicit discharges through traditional in-person, manual inspections.

In the coming months, SCCWRP will prepare a report summarizing lessons learned from the pilot study and develop a workplan for how Orange County can scale up its sensor network.

REGIONAL MONITORING

## Bight '23 wraps up shellfish field sampling

The Southern California Bight 2023 Regional Monitoring Program has completed field sampling for an ongoing investigation into how multiple types of contaminants accumulate in shellfish – a highly leveraged effort that will generate insights benefitting four Bight '23 study elements.

Field work for the Bight '23 shellfish assessment, which was completed in September, involved sampling at 31 coastal sites to measure the degree to which legacy contaminants, PFAS (per- and polyfluoroalkyl substances), toxins produced by harmful algal blooms (HABs), microplastics, and pathogens are accumulating in the tissues of oysters and mussels. Samples were collected during the winter, spring and fall to capture a range of exposure conditions and pathways in the Bight.

Via this study, four separate Bight '23 study elements that have traditionally operated mostly in silos – Sediment Quality, Harmful Algal Blooms, Trash and Microplastics, and Microbiology – are working collaboratively to oversee and manage the shellfish assessment, making it a uniquely cross-cutting Bight '23 investigation.

The next step is to analyze the shellfish tissue for contaminants, which is expected to take about 1-1/2 years.

**SCCWRP's Thomas Shields collects mussels from a pier at Cabrillo Beach as part of field sampling for the Southern California Bight 2023 Regional Monitoring Program's shellfish assessment. Field crews completed sampling at 31 coastal sites in September.**

## Lab intercalibration completed to ensure high-quality, comparable data for Bight '23 microplastics assessment

The Trash and Microplastics study element of the Southern California Bight 2023 Regional Monitoring Program has successfully completed a laboratory intercalibration exercise to ensure participating laboratories can generate high-quality, comparable results for quantifying microplastics contamination in sediment and shellfish.

The intercalibration exercise, completed in October after two rounds, evaluated four laboratories' ability to extract, quantify, and characterize microplastic particles from samples with a known amount of microplastics. Results from the first intercalibration round indicated that laboratories did not meet the comparability criteria, with some laboratories having high contamination rates, a common challenge with microplastics analysis.

SCCWRP worked with each laboratory to help identify potential issues with sample processing and analysis and held an in-person training workshop to review standard operating procedures. All laboratories demonstrated proficiency during the second round of intercalibration exercises.

**SCCWRP's Thomas Rocca, left, and Sydney Dial-Sauers dissect mussels to measure the microplastics in their tissue. The Southern California Bight 2023 Regional Monitoring Program has completed a laboratory intercalibration exercise paving the way for microplastics contamination to be measured in sediment and shellfish samples collected from across the coastal ocean.**

The Bight '23 microplastics survey will use newly evaluated statewide methods for measuring microplastics to paint a comprehensive picture of where this pollution can be found in both sediment and shellfish across Southern California's coastal ocean.

Participating laboratories will analyze 50 mussel samples and 90 sediment samples for microplastics across three types of coastal habitats, enabling researchers to study how microplastics may be being transported from land-based sources to the coastal ocean.

## Bight '18 synthesis report for Sediment Quality studies updated with new SQO scores

The Southern California Bight 2018 Regional Monitoring Program has updated its final assessment report summarizing how sediment contamination in Southern California has impacted the overall health of coastal marine ecosystems – a response to discovering calculation errors in Sediment Quality Objective (SQO) scores.

Importantly, the calculation errors did not change the overall conclusions of the published synthesis report. The erratum that was published with the updated report was approved by the Bight '23 Steering Committee.

After discovering the errors, the Bight program conducted a rigorous quality assurance investigation, and introduced safeguards to ensure SQO scoring errors do not occur again, including publishing all codes for calculating Bight SQO scores, which will be included with each assessment report.

# New SCCWRP Publications

## Journal Articles

Busch, M.H., K.S. Boersma, S.C. Cook, C.N. Jones, C. Loflen, R.D. Mazor, R. Stancheva, A.N. Price, R. Stubbington, M.A. Zimmer, D.C. Allen. 2024. Macroinvertebrate, algal and diatom assemblages respond differently to both drying and wetting transitions in non-perennial streams. *Freshwater Biology* 69:1568-1582.

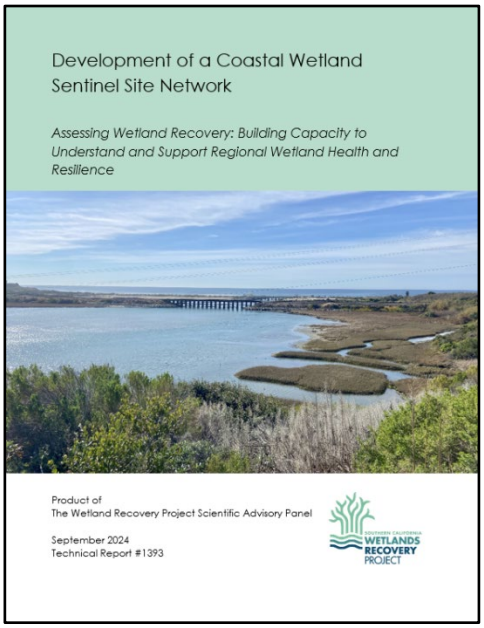
Frieder, C.A., F. Kessouri, M. Ho, M. Sutula, D. Bianchi, J.C. McWilliams, C. Deutsch, E. Howard. 2024. Effects of urban eutrophication on pelagic habitat capacity in the Southern California Bight. *Frontiers in Marine Science* 11:1392671.

Keenum, I., N.J. Lin, A. Logan-Jackson, A.J. Gushgari, N. D'Souza, J.A. Steele, D. Kaya, L.R. Gushgari. 2024. Optimizing Wastewater Surveillance: The Necessity of Standardized Reporting and Proficiency for Public Health. *American Journal of Public Health* 114:859-863.

Lao, W., G.B. Kim. 2024. Principles of passive sampling for ex situ measurement of hydrophobic organic compounds in sediment: Key considerations on dilution, depletion, and equilibrium. *Science of the Total Environment* 954:176277.

Le-Duy Pham, A., P. Damien, D. McCoy, M. Mar, F. Kessouri, J.C. McWilliams, J. Moffett, D. Bianchi. 2024. The Shelf-To-Basin Transport of Iron From the Northern U.S. West Coast to the Pacific Ocean. *Global Biogeochemical Cycles* DOI:10.1029/2023GB008029.

Lohmann, R., B. Vrana, D. Muir, F. Smedes, J. Sobotka, E.Y. Zeng, L.J. Bao, I.J. Allan, P. Astrahan, T. Bidleman, D. Crowley, E. Dykyi, N. Estoppey, G. Fillmann, L. Jantunen, S. Kaserzon, K.A. Maruya, B. McHugh, B. Newman, R.M. Prats, M. Tsapakis, M. Tysklind, B.L. van Drooge, C.S. Wong. 2024. AQUA-GAPS/MONET-Derived Concentrations and Trends of PAHs and Polycyclic Musks across Global Waters. *Environmental Science & Technology* 58:13456-13466.




**The Southern California Wetlands Recovery Project, in collaboration with SCCWRP, has published the first of four technical reports supporting the development of a planned coastal wetland monitoring program for Southern California. The first report summarizes the development and maintenance of a sentinel site network.**

McLellan, S.L., A. Chariton, A. Codello, J.S. McClary-Gutierrez, M.K. Schussman, E.M. Marzinelli, J.M. O'Neil, E.J. Schott, J.L. Bowen, J.H. Vineis, L. Maignien, C. Lemonnier, M. Perennou, K.S. Gibbs, G.J. Zhou, K.M.Y. Leung, M. Kirs, J.F. Griffith, J.A. Steele, S.E. Wearer, A.L. O'Brien, D. Song, S. Liang, J. Li, L. Airoldi, F.P. Mancuso, P.S. Salomon, A.W. Silva-Lima RC Pereira, A.B. Boehm, E.W.X. Lim, S. Wuertz, E. Fernandez, E. Teira, M.L. Liao, Y.W. Dong, P.D. Steinberg. 2024. Universal microbial indicators provide surveillance of sewage contamination in harbours worldwide. *Nature Water* DOI:10.1038/s44221-024-00315-5.

McWilliams, J.C., P. Damien, F. Kessouri. 2024. Circulation and dispersal in California's Borderland Basins. *Progress in Oceanography* 229:103349.

Schiff, K.C., A. Zimmer-Faust, D. Nguyen, J.F. Griffith, J.A. Steele, D.E. McCargar, S. Wallace. 2024. Using HF183 to Estimate Watershed-Wide Annual Loadings of Human Fecal Pollution from Onsite Wastewater Treatment Systems. *Sustainability* 16:9503.

Sytsma, A., D. Philippus, J.M. Wolfand, K. Irving, K.T. Taniguchi-Quan, E.D. Stein, T.S. Hogue. 2024. Channel restoration in urbanized systems: Guiding design using ecological flow targets and future management scenarios. *Journal of the American Water Resources Association* DOI:10.1111/1752-1688.13232.

## Technical Reports

Fassman-Beck, E., E. Tiernan, D. Nguyen, R. Butler. 2024. Turf Replacement BMPs to Reduce Dry and Wet Weather Runoff. Technical Report 1391. Southern California Coastal Water Research Project. Costa Mesa, CA.

Southern California Wetlands Recovery Project. 2024. Assessing Wetland Recovery: Building Capacity to Understand and Support Regional Wetland Health and Resilience – Development of a Coastal Wetland Sentinel Site Network. Technical Report 1393.A. Southern California Coastal Water Research Project. Costa Mesa, CA.

Wong, C.S., W. Lao, S. Dial, D. Nguyen, R. Butler, D. Lin. 2024. Characterizing the Removal of Microplastics by California Wastewater Treatment Plants: Implications for Management Strategies. Technical Report 1378. Southern California Coastal Water Research Project. Costa Mesa, CA.

# Quarter in Review

## Conference Presentations

Fassman-Beck, E. Data-Driven Metrics for BMP Performance Evaluation. Tri-State Stormwater Seminar. August 6-7, 2024. Las Vegas, NV.

Griffith, J., J. Steele, K. Schiff. San Diego River Investigative Order: Quantifying Sanitary Sewer Exfiltration in the San Diego River Watershed California Association of Stormwater Quality Agencies (CASQA) Annual Meeting. October 21-24, 2024. Sacramento, CA.

Sandoval Belmar, M., F. Kessouri, J. Smith, A.R. Moreno, C. Anderson, R.M. Kudela, M. Sutula, D. Bianchi. Factors Driving Domoic Acid Production in the Southern California Bight: Insights from A 3d Ocean Biogeochemical Model. 12th U.S. Harmful Algal Bloom Symposium. October 28-November 1, 2024. Portland, ME.

Schiff, K., J. Steele, J. Griffith. The San Diego River Investigative Order: A Synthesis of Research into Sources of Human Fecal Pollution. California Association of Stormwater Quality Agencies (CASQA) Annual Meeting. October 21-24, 2024. Sacramento, CA.

Schiff, K., S .Lowery, A. Boehm, J. Steele, J. Griffith. Stormwater Quality and Quantitative Microbial Risk Assessment in Southern California. Society of Toxicology and Chemistry (SETAC) Annual Meeting. October 21-24, 2024. Fort Worth, TX.

Smith, J., A. Deming, M. Berndt, J. Cram, M. Sutula, F. Kessouri. Building a toolbox to predict domoic acid related stranding events of California Sea Lions (*Zalophus californiaus*) in Southern California. Ecological Society of America. August 4-9, 2024. Long Beach, CA.

Smith, J., A. Deming, L. Palmer, R. Dover, S. Dover, R. Kudela, K. Negrey, S. Lillywhite, A. Lie, D. Shultz, S. Wood, K. Kelly, C. Anderson. Marine mammal stranding events caused by domoic acid: the role of bloom timing, longevity, and geographic extent on ecosystem impacts in Southern California. 12th U.S. Harmful Algal Bloom Symposium. October 28-November 1, 2024. Portland, ME.

Steele, J, S. Lowry, J. Griffith, K. Schiff, A. Boehm. Linking Indicators of Fecal Contamination to Human Health Risk in Southern California Stormwater California Association of Stormwater Quality Agencies (CASQA) Annual Meeting. October 21-24, 2024. Sacramento, CA.

Stein, E. and K. Taniguchi-Quan. The California Environmental Flows Framework (CEFF): Tools to inform water management decisions that benefit the environment. 2024 WaterReuse CA Conference. September 16, 2024. Garden Grove, CA.

Walker, J. Monitoring for management: A modular, ecosystem function-based assessment framework to assess estuarine condition. Restore America's Estuaries Conference. October 9, 2024. Washington, D.C.

## Conference Posters

Smith, J., A. Deming, S. Fire, C. Gibble, M. Miller, M. Moriarty, C. Parker-Graham, S. Pease. A One Health regional response plan for wildlife stranding events associated with harmful algal blooms: a California pilot study. 12th U.S. Harmful Algal Bloom Symposium. October 28-November 1, 2024. Portland, ME.

## Other Presentations

Fassman-Beck, E. Illicit discharge detection pilot in Orange County, California. IoT for Water Hub workshop. October 6, 2024. Via webinar.

Fassman-Beck, E. How can we measure the impact of street sweeping on runoff water quality? San Gabriel Valley Council of Governments Joint Public Works and Water Working Group meeting. October 8, 2024. Via webinar.

Mazor, R. Virtual training on streamflow duration assessment methods. U.S. Environmental Protection Agency and U.S. Army Corps of Engineer staff. July 31 and August 8, 2024. Via webinar.

Mazor, R. Trainings for U.S. Environmental Protection Agency and U.S. Army Corps of Engineers staff on newly developed Streamflow Duration Assessment Methods for the Arid West, Western Mountains, and Great Plains. September 2024. Denver, CO and Oakland, CA.

Mazor, R. Briefing on the Southern California Stormwater Monitoring Coalition. City of San Diego staff. August 6, 2024. Via webinar.

Stein, E. Sea level rise and sediment matching . Upper Newport Bay Executive Committee. September 18, 2024. Via webinar.

Stein, E. Sentinel site network. Wetland Recovery Project Directors' Group annual meeting. October 16, 2024. San Diego, CA.

Stein, E. (workshop co-host) Applications of SediMatch to promote sediment beneficial reuse. October 2024. Costa Mesa, CA.

Stein, E. and J. Walker. (workshop co-organizers) Incorporating monitoring data into management and grant programs. California Estuary Monitoring Workgroup and California Wetland Monitoring Workgroup on Estuarine and Wetland Monitoring. August 2024. Sacramento, CA.

Taniguchi-Quan, K. Developing a statewide environmental flows program in California. United Nations Intergovernmental Hydrological Programme's science-based governance meeting. October 1, 2024. Via webinar.

Theroux, S. Integration of molecular methods into routine biological monitoring. Banbury Center Workshop on Nanopore Sequencing. September 22, 2024. Cold Spring Harbor, NY.

Theroux, S. The impact of the Council's Molecular Methods Workgroup. California Water Quality Monitoring Council quarterly meeting. September 26, 2024. Via webinar.

Walker, J. Briefing on the California Estuary Monitoring Workgroup key action items. California Stormwater Quality Association Monitoring and Science subcommittee. August 12, 2024. Via webinar.

# SCCWRP Personnel Notes

## Commission

**Kris McFadden**, Deputy Chief Operating Officer for the City of San Diego, was named a SCCWRP Commissioner in September, replacing Juan Guerreiro, who remains the City's Director of Public Utilities.

**Laurie Walsh**, Supervising Water Resource Control Engineer for the San Diego Regional Water Quality Control Board, was named a SCCWRP Alternate Commissioner in July, replacing Kelly Dorsey, who served on the Commission for 1-1/2 years.

## Departures

**Caspian Thackeray-Taylor**, who has worked at SCCWRP since 2019, most recently as Network Administrator, left SCCWRP in October.

## Scientific Leadership

Dr. **Elizabeth Fassman-Beck** has been appointed a technical reviewer for the National Municipal Stormwater Alliance Stormwater Testing and Evaluation for Products and Practices (STEPP) program.

Dr. **Katie Irving** has been appointed to the technical working group for the California Environmental Flows Framework (CEFF) Los Angeles River project.

Dr. **Kris Taniguchi-Quan** has been appointed to the technical working group for the California Environmental Flows Framework (CEFF) Los Angeles River project.

Dr. **Susanna Theroux** has been appointed Chair of the Marine Technology Society eDNA method standardization workgroup.

Dr. **Edward Tiernan**, Dr. **Elizabeth-Fassman-Beck**, and **Nicholas Lombardo** have received the Editor's Choice Award from the *ASCE Journal of Sustainable Water in the Built Environment* for their manuscript "Effects of Post-processing Decisions on Flow-Weighted Event Mean Concentrations."

Dr. **Leah Thornton Hampton** has been appointed to the technical advisory committee for the San Francisco Estuary Institute's Statewide Plastics Monitoring Plan project.

Dr. **Leah Thornton Hampton** has been appointed to the International Standard Organization working group for plastics (including microplastics) in waters and related matrices.

Dr. **Jan Walker** has been appointed to the Coastal & Estuarine Research Federation (CERF) Nominations and Leadership Development Committee for the 2025-2027 cycle.

Dr. **Charles Wong** has been appointed to the International Standard Organization working group for plastics (including microplastics) in waters and related matrices.

SCCWRP COMMISSIONER SPOTLIGHT

# Deputy chief leads operations for 3 departments

Before becoming the City of San Diego's Deputy Chief Operating Officer overseeing all water, wastewater, stormwater, and transportation operations, Kris McFadden started his 16-year career with the City managing its Stormwater Division.

**Kris McFadden**

McFadden also later led the Transportation & Storm Water Department after the City combined the two areas into a single department in 2014.However, as stormwater regulations increased, McFadden recognized the need for a separate department to prioritize growing stormwater needs and was instrumental in the City's decision to eventually go back to two departments in 2022.

"At the time, the consolidation made sense on some levels because when we were working on a road, we also were also considering other aspects like whether we could implement stormwater BMPs," McFadden said. "But then we didn't have time to focus on areas to the extent that they needed to be, especially stormwater projects."

McFadden was appointed SCCWRP Commissioner in September 2024, replacing Juan Guerreiro, who remains the City's Director of Public Utilities.

McFadden oversees about 3,000 employees across the City's Public Utilities, Stormwater, and Transporation Departments and is involved in the City's Pure Water program for cleaning recycled water and a management plan for upgrading stormwater infrastructure across San Diego.

A biologist by trade, McFadden became interested in marine science after spending a semester at the Duke University Marine Lab as part of his undergraduate program at Allegheny College. He then moved to Florida for graduate school and received master's degrees in both biology and coastal zone management.

**Kris McFadden, right, and his husband Jorge spend an afternoon outdoors with their dog Prince Charlie.**

## Kris McFadden

**Job**: Deputy Chief Operating Officer, City of San Diego (started June 2022)

**SCCWRP role**: Commissioner (started September 2024)

**Prior jobs**: *16 years with the City of San Diego (2008-present)*: Director, Transportation and Stormwater Department (2014-2022); Deputy Director, Stormwater Division (2008-2014); Environmental Resources Supervisor, City of Fort Lauderdale (2004-2008); Environmental Supervisor, Florida Department of Environmental Protection (2000-2004); Environmental Specialist, Broward County Health Department (1999-2000)

**Education**: M.A. coastal zone management, University of Miami (1998); M.S. biology, Florida Atlantic University (1996); B.S. biology, Allegheny College (1992)

**Residence**: San Diego

**Hometown**: Grove City, Pennsylvania

**Family**: Husband Jorge, an airline operations agent; dog Prince Charlie, a Labradoodle

**Hobbies**: Skiing; snowboarding; hiking; traveling

McFadden worked for 10 years as an environmental supervisor for different government agencies in Florida, including the Department of Environmental Protection, where he managed programs focused on local impacts on coral reefs and wetlands. He then moved to San Diego in 2008 to take a position at the City.

Before serving on the SCCWRP Commission, McFadden worked closely with SCCWRP on the Surfer Health Study, which examined the health of surfers in the San Diego area who enter the water during wet weather. Now as a Commissioner, he looks forward to having policy-driven conversations in the early stages of the decision-making process.

"It's critical that we learn from each other about what's working and what's not because we can't do this just one city at a time," McFadden said. "This is a great opportunity to spend time with people who are dealing with the same issues I am and interact directly with regulators to understand what they need."

In his spare time, McFadden enjoys exploring the outdoors with his husband Jorge and their dog Prince Charlie, especially Southern California's beaches and mountains. His favorite destination is Mammoth Mountain.

CTAG SPOTLIGHT

# Environmental supervisor gets start in taxonomy

Before Dr. Danny Tang began his 11-year career in environmental science and management, he studied the taxonomy of parasitic copepods of marine invertebrates and fishes and dabbled in the subterranean fauna in cave streams and aquifers underneath mining sites in Western Australia.

**Dr. Danny Tang**

Tang specialized in identifying and classifying small parasitic crusteaceans called copepods during his Ph.D. in zoology at the University of Western Australia. After graduating, Tang conducted taxonomic and environmental monitoring work in Australia for five years and he completed a two-year postdoc in Japan.

A native of Huntington Beach, Tang wanted to move back to California and found out that the Orange County Sanitation District (OC San) was hiring a scientist to oversee the sediment quality and health of the benthic community off the coast of Orange County as part of OC San's Ocean Monitoring Program , which included taxonomy work on arthropod samples from sediment grabs and trawl catches.

"I knew OC San was the place to be," said Tang, who is now an Environmental Supervisor at OC San. "I don't really do taxonomy work anymore so my passion is only a hobby now, but this is still a very fulfilling job because my work is helping the environment."

Tang became OC San's CTAG Representative in July 2023, replacing Dr. Sam Choi, who served on CTAG for almost five years.

In his role, Tang manages OC San's Ocean Monitoring Program, which encompasses sediment quality, water quality, benthic communities, and fish health. His 13-member team does all sorts of things, from sediment toxicity testing to marine population assessments.


**Dr. Danny Tang and his wife Julie arrive at the Cape of Good Hope, the most southwestern point of Africa, during a trip to South Africa in 2023.**

## Danny Tang, Ph.D.

**Job**: Environmental Supervisor, Orange County Sanitation District (since July 2023)

**SCCWRP role**: CTAG Representative (started July 2024)

**Prior jobs**: *11 years with Orange County Sanitation District (2013-present)*: Senior Scientist (2022-2023); Scientist (2013-2022), Consultant in Australia (2006-2009; 2011-2013); Postdoctoral Researcher, Hiroshima University (2009-2011)

**Education**: Ph.D. zoology, The University of Western Australia (2006); M.S. biology, California State University, Long Beach (2001); B.S. zoology, California State University, Long Beach (1995)

**Residence**: Costa Mesa

**Hometown**: Huntington Beach

**Family**: Wife Julie, an IT business analyst for Toll Brothers

**Hobbies**: Surfing; taxonomy; traveling; drinking boba tea

"Our group doesn't necessarily have one specific role, so we're sort of the jack-of-all-trades in our agency," Tang said.

Tang has been involved with the Southern California Bight Regional Monitoring Program since the 2013 cycle. He is also a member of the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT), which is an organization that promotes the study of marine invertebrate taxonomy in Southern California and has worked with SCCWRP in the past on the development of the benthic response index, among other things.

Now as a CTAG Representative, Tang is looking forward to continuing working in this capacity to help inform OC San's management about SCCWRP's research.

"This has been a good experience for me to learn more about the big picture of water management and what's going on out there beside what's happening in the ocean," Tang said. "It's a big responsbility but it's been great interacting with different agencies too."

In his spare time, Tang enjoys traveling around the world to surf and explore different cultures with his wife Julie. Their favorite destinations so far have been Croatia, Iceland, and New Zealand.

Although he no longer does taxonomy for work, Tang is still very much involved in the copepod community and attends and organizes copepod workshops around the world.

SCCWRP PARTNER SPOTLIGHT

# Professor develops low-cost stormwater sensors

After getting an Arduino starter kit as a Christmas gift from his mother in 2013, Dr. David McCarthy used it to build a system to remotely turn on the air conditioner in his house so that he could come back to a cool home after work.

**Dr. David McCarthy**

McCarthy, who was a Professor at Monash University in Australia at the time, became fascinated with the open-source platform and had an idea: Could he use this technology to design stormwater sensors that are cheaper than commercial sensors?

"Throughout my career, I've used commercial sensors and loggers and been quite frustrated by their performance," said McCarthy, now a Professor at University of Guelph in Ontario, Canada. "Not only is the initial cost very high, but it also costs a lot to maintain them over time."

Using open-source hardware and software, McCarthy and his research lab developed sensors and data loggers that can be used to monitor Australian waterways for a fraction of the cost. While traditional systems are bulky and can cost upward of a few thousand dollars, McCarthy's sensors use commonly available components that cost less than $100 in total to build.

Currently, McCarthy is working with SCCWRP to deploy the low-cost sensors into Orange County storm drains as part of a pilot study to automate the process for detecting illicit pollutant discharges – a task that is traditionally done via in-person site visits. This is the first time the sensors have been used in a project of this scale outside of Australia.

**Dr. David McCarthy wades through algae in the Westminster Channel during a field visit in May 2024.**

## David McCarthy, Ph.D.

**Job**: Professor, School of Environmental Sciences, Ontario Agricultural College, University of Guelph (started 2024)

**SCCWRP role**: Developer of low-cost stormwater sensors and loggers for detecting illicit pollution discharges

**Prior jobs**: Professor, Queensland University of Technology (2023-2024); Professor, Monash University (2010-2023)

**Education**: Ph.D. civil and environmental engineering, Monash University (2009); B.Eng. civil engineering, Monash University (2005); B.Sc. mathematics and physics, Monash University (2004)

**Hometown**: Melbourne, Australia

**Hobbies**: Traveling; tinkering and designing electronics; 3D printing; woodworking

"It's been a really fruitful collaboration because we've been able to learn so much about our sensors through this work," McCarthy said. "We've also taken those lessons and have been implementing them in our sensor designs to improve them."

From a young age, McCarthy had a knack for taking things apart and putting them back together to better understand their mechanics. He knew he wanted to become a civil engineer and originally thought he would follow in his father's footsteps of specializing in structural engineering. After learning about water transport and the role of microbes in wastewater treatment during his undergraduate, McCarthy became interested in the water resources aspect of civil engineering.

McCarthy received his B.Sc. in mathematics and physics and a B.Eng. in civil engineering through a double-degree program at Monash University. After completing his Ph.D. in civil engineering, McCarthy started his career in academia at his alma mater, where he taught water resources engineering for 13 years.

In 2015, McCarthy met Dr. Elizabeth Fassman-Beck, who was a professor at Stevens Institute of Technology at the time, as part of an international collaborative group called the Joint Committee on Urban Drainage and have stayed in touch since.

In his spare time, McCarthy enjoys tinkering with electronics and 3-D printing, finding new ways to use them to upgrade his house.

SCCWRP STAFF SPOTLIGHT

# Researcher studies genetic structure of microbes

Jayde Zimmerman first became intrigued with microbial genetics after learning about the unseen dangers that microbes can pose for humans.

**Jayde Zimmerman**

Zimmerman initially studied marine biology as an undergraduate student at the University of Tampa and worked in a research lab with native algae. During one of her classes, she was introduced to her professor's research about how bivalves near hospital discharge sites can accumulate bacteria that develop antibiotic resistance and affect human health.

Interested in the science behind how bacteria develop this resistance, Zimmerman switched her major to molecular biology to study microbiology with a genetics focus.

"Genes unify all organisms and there's so much we can learn from looking at them," Zimmerman said. "To me, microbes are particularly interesting because while they are often overlooked as being structurally simple, they are incredibly powerful in terms of their effects."

Zimmerman graduated in December 2023 with a master's degree in biology from California State University, Long Beach, where she examined genetic biomarkers in exosomes suspected to cause accelerated aging in Arabidopsis plants.

While completing her master's, Zimmerman was hired by SCCWRP as a Laboratory Assistant in the Microbiology Department, supporting an effort to estimate how much human fecal contamination in San Diego's waterways can be attributed to raw wastewater exfiltrating from public sewer systems. She began working full time as a Research Technician in February 2024 and was promoted to Senior Research Technician in July 2024

**Jayde Zimmerman holds the leaf of a Colocasia plant she found during a hike in Panama in 2020.**

## Jayde Zimmerman

**Job**: Senior Research Technician, SCCWRP Microbiology Department (started July 2024)

**Prior jobs**: Research Technician, SCCWRP Microbiology Department (2024); Laboratory Assistant, SCCWRP Microbiology Department (2023-2024); Research Assistant, California State University, Long Beach (2021-2023); Teaching Assistant, California State University, Long Beach (2021-2023); GIS Lead, Exzeo (2020-2021); GIS Specialist, Exzeo (2018-2020)

**Education**: M.S. biology, California State University, Long Beach (2023); B.S. molecular biology, University of Tampa (2018)

**Residence**: Long Beach

**Hometown**: Chicago, Illinois

**Hobbies**: Gardening; propagating and pressing plants; yoga; reading; drawing

Zimmerman is now working on a study to compare the performance of a rapid, DNA-based method to traditional cultured-based methods for detecting fecal contamination in beach water, supporting the City of Los Angeles' effort to gain regulatory approval to use the method to reopen beaches as soon as safely possible following sewage spills.

"There can sometimes be a barrier between the scientific world and the general public, so I want to in a field that can bridge that gap," Zimmerman said. "Being able to contribute to science that has more real-world application is important to me."

Originally from the Chicago area, Zimmerman moved to Florida in 2014 to attend the University of Tampa. After graduating in 2018, she mapped flooding and hurricane events in Florida as a GIS lead at an insurance software company before moving to Long Beach in 2021 for her master's. Zimmerman is taking a break from school, but plans to pursue a Ph.D. related to microbial genetics in the future.

Growing up in the Midwest where agriculture is an important industry, Zimmerman learned about the significance of plants – especially crops. She saw how much of an impact plants have on people's lives as climate change affected farmers and reduced crop production.

In her free time, Zimmerman loves gardening and enjoys propagating and pressing plants.

SCCWRP SCENES

# *Investigating coastal DDT contamination*

SCCWRP and its partners at Scripps Institution of Oceanography successfully deployed passive samplers at a former industrial waste dump site in the San Pedro Basin in September as part of an ongoing study to measure levels of the pesticide DDT and an industrial class of chemicals known as PCBs that are diffusing out of bottom sediment into the water column above. Passive sampling devices are capable of measuring very low levels of these contaminants dissolved in the water column above the sediment, which can be a potential exposure route for marine life. Accompanying the passive samplers are current meters, turbidity and other water quality sensors, and an array of automated water bottle samples. The entire array of research instruments will be deployed for six months at depths of nearly 3,000 feet.

**A field crew deploys passive samplers at a deep ocean dump site in the San Pedro Basin in September – part of a study that will measure levels of DDT and PCBs that are diffusing out of sediment into the water column above.**