SCCWRP Director's Report

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SUMMER 2024 ISSUE

Study quantifies human fecal pollution in urban stormwater

SCCWRP and its partners have completed a sweeping, five-year investigation quantifying the relative contributions of six major sources of human fecal contamination in the San Diego River watershed during wet weather – a multi-component scientific undertaking that has produced groundbreaking insights into one of the most vexing challenges in stormwater management.

The first-of-its-kind study, summarized in a technical report published in June, found that public sewer overflows, exfiltration from public sewers, and onsite wastewater treatment systems are the three largest contributors to human fecal contamination measured at the end of the highly urbanized San Diego River watershed.

People experiencing homelessness contribute the smallest fraction of human fecal contamination, followed by private sewer overflows and exfiltration from private laterals.

The study in San Diego provides the most comprehensive insights to date into among the toughest, most complex questions confounding Southern California's water-quality management community: What are the major sources of human fecal contamination found in urban waterways and beaches during wet weather?

For years, managers have been finding elevated levels of human fecal contamination in Southern California wet-weather runoff, but the study in San Diego marked the first time that researchers had attempted to systematically tease apart the relative contributions of each of six major hypothesized sources human inputs. The study took advantage of recent scientific advances; researchers also developed and piloted novel scientific methods to support the study.

While the study produced groundbreaking insights for one Southern California watershed, it remains unclear how broadly applicable the study's findings are to other watersheds; the relative contributions of

Contents

Cover photo: A field crew recovers water from a sewer manhole in San Diego County as part of an effort to measure potential leaks in underground sewer pipes. Researchers have completed a five-year investigation quantifying the relative contributions of six major sources of fecal contamination – including exfiltration from sewer pipes – in the San Diego River watershed during wet weather.

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

Calendar

Thursday, August 8
CTAG quarterly meeting
(In-person meeting)

Friday, September 6
Commission meeting
(In-person meeting)

each of the six major fecal sources could be different in different watersheds.

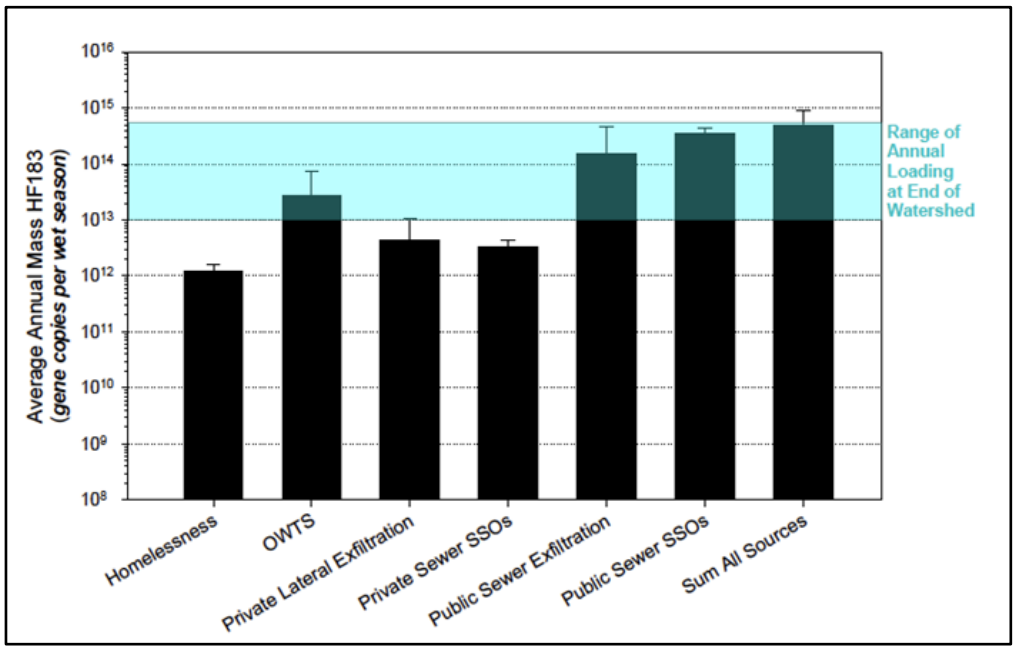
With the study's completion, San Diego River watershed managers are now poised to focus on deciding how best to mitigate each of the six major sources of human fecal contamination, including deciding how to prioritize and allocate resources among them.

The study also paves the way for more focused follow-up investigations that could help confirm some of the study's key findings, including explaining the specific routes and mechanisms by which some of the human fecal contamination could be transported to the San Diego River during wet weather.

In particular, researchers are interested in understanding how sewage that has leaked from public and private sewer systems travels underground to reach surface waters. Improved understanding of these subsurface transport mechanisms also could increase managers' confidence about what actions to take in response to the investigation's findings.

One of the novel source-tracking approaches that researchers piloted during the study is the use of biofilms to link fecal contamination in the watershed to sanitary sewer pipes. The term biofilm refers to the unique microbial community that lines the inside of sewer pipes. When researchers find the genetic signature of sewer biofilm in stormwater runoff, it provides confirmation that human sources of fecal contamination originated in sanitary sewer pipes.

During the study, researchers also developed a prototype method for detecting leaks in underground sewer pipes. Researchers found that the sewer exfiltration measurement method – which targets specific segments of pipes – has the potential to be useful for detecting very small amounts of exfiltration that may evade detection during traditional camera-based inspections.



Researchers have quantified the relative contributions of each of six major sources of human fecal pollution in the San Diego River watershed, as measured by HF183, a genetic marker for human-specific fecal contamination. The contributions of the six sources are presented side by side on a logarithmic scale, above, and expressed as the average annual mass of HF183 during wet weather. The estimated range of HF183 mass that was measured independently at the watershed's coastal terminus is presented in the blue shaded area, and serves as a ground truth for each of the six source-specific investigations.

The study in San Diego involved quantifying human fecal contamination levels using HF183, a genetic marker found only in human feces. HF183 is a more specific, more sensitive indicator of human fecal contamination than traditional fecal indicator bacteria such as *E. coli* or *Enterococcus*, which can be shed from any warm-blooded animal, including dogs, birds and other wildlife.

The study found that the cumulative HF183 contribution from the six measured human fecal sources is consistent with the HF183 levels independently measured at the end of the San Diego River watershed, indicating that the study successfully accounted for all major contributors to human fecal pollution.

The study was guided by a steering committee made up of representatives from San Diego stormwater and wastewater agencies, the San Diego Regional Water Quality Control Board, and environmental NGOs. A technical review committee consisting of six national science and engineering experts vetted the study's technical approach and conclusions.

The investigations targeting each of the six major fecal pollution sources are expected to be published as standalone manuscripts in peer-reviewed journals. The work to quantify the contributions from unhoused populations was already published earlier this year. Meanwhile, manuscripts on the sewer exfiltration measurements and onsite wastewater treatment system work have already been submitted to scientific journals.

For more information, contact Dr. Joshua Steele or Ken Schiff

Tools being finalized to help determine whether streams subject to Clean Water Act

The U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers are preparing to release final versions of flow classification tools intended to help watershed managers determine which streams the federal government has jurisdiction to regulate under the Clean Water Act – the culmination of a sweeping, five-year national research initiative co-led by SCCWRP.

The Streamflow Duration Assessment Methods (SDAMs), which are expected to be released in final form later this year, are designed to help managers across the U.S., including in Southern California, rapidly distinguish among intermittent, ephemeral and perennial streams using easily observable indicators, such as wetland vegetation and aquatic invertebrates.

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

Managers have traditionally relied on two basic approaches to distinguish among the different stream types: Analyze long-term records from stream gauges that record flow information, or develop site-specific hydrologic models. Both methods are problematic: Flow gauge data do not exist for most streams, while site-specific modeling is a prohibitively resource-intensive investment and, because it does not rely on field data, cannot be used as the basis for certain regulatory applications, including jurisdictional determinations.

The SDAMs use easily observable biological and physical data from a stream site to predict whether a site's flow patterns are perennial, intermittent or ephemeral. Some indicators, such as the abundance of certain types of aquatic invertebrates, are more prevalent at streams with long flow durations. Other indicators, such as the abundance of upland plants in the stream bed, are more associated with shorter flow durations.

The SDAMs put the field data into a statistical model that calculates the likelihood that the site should be assigned to each of the three flow duration classifications.

To develop the SDAM tools, researchers collected field data from more than 1,300 unique stream sites across the U.S.

Between 2021 and 2023, the EPA released beta versions of the SDAM tools covering five regions of the country: Western Mountains, Great Plains, Northeast, Southeast, and Arid West, which includes Southern California.

In 2023, the Supreme Court ruled in Sackett v. EPA that the Clean Water Act oversight applies only to "relatively permanent bodies of waters" – a decision that underscores the importance of being able to determine the flow duration classification for stream sites across the U.S.

In California, about two-thirds of streams are classified as ephemeral or intermittent, according to the California Surface Water Ambient Water Monitor Program's Perennial Streams Assessment. In the South Coast region, 62% of streams are estimated to be non-perennial, according to the Southern California Stormwater Monitoring Coalition (SMC). The SMC also found that in certain watersheds, as many as 90% of stream reaches are non-perennial.

Initially, the EPA and Army Corps of Engineers asked SCCWRP to develop an SDAM for the Arid West region, which includes Southern California; the beta version of the tool was released in 2021. Using the process SCCWRP developed, beta SDAMs were then released for other regions of the country. Following additional data collection and analysis, these beta versions are now in the process of being replaced with final versions that cover all regions of the continental U.S.

To facilitate the adoption and use of the SDAMs in their respective regions, SCCWRP is developing user manuals, data systems and training resources. All of these resources are expected to be available later this year on the EPA's website.

For more information, contact Dr. Raphael Mazor.

Researchers have developed tools to help stream managers rapidly distinguish among sites with perennial, intermittent or ephemeral stream flows. From left to right, Shell Creek in Wyoming is classified as having perennial flows, Truxton Wash in Arizona as having intermittent flows, and Calf Creek in California as having ephemeral stream flows.

Study investigates using low-cost sensors to automate detection of illicit discharges

SCCWRP and Orange County Public Works have launched a two-year study investigating the feasibility and logistics of using low-cost field sensors to automate detection of illicit pollutant discharges that can pass rapidly through storm drain systems – a real-time monitoring approach that has the potential to improve managers' ability to detect illegal dumping activities.

The project, which began in May by deploying prototype sensors at eight sites across Orange County, will generate a continuous stream of real-time flow and water-quality data as dry-weather runoff moves through storm drains, enabling managers to look for fluctuations in the monitoring data that could be indicative of transitory discharges, such as oil, sewage and other pollutants being dumped into storm drains.

Researchers' goal is to determine whether the prototype sensors – which incorporate 3-D printed parts and commercially available electronic components that run on open-source code – could replace traditional sampling designs, which consist of periodic, in-person field sampling during dry weather. This traditional monitoring approach can limit managers' chances of detecting transitory pollutant discharges. Additionally, processing field samples can take weeks to generate results, further hampering managers' chances of detecting an illicit discharge and then being able to track it back to an upstream source.

By contrast, automated monitoring produces a continuous stream of real-time data, so managers can look for spikes and other sudden changes in water quality and flow that become the basis for focused source-tracking follow-up work.

The study follows the successful completion of a small-scale pilot study in Orange County storm drains last year.

Among the issues the study is evaluating are the logistical challenges associated with implementing and operating a network of field sensors, including maintaining an internet connection for every sensor, storing and analyzing sensor data, and deterring potential vandalism and theft of the sensors. Researchers are evaluating how to mitigate these challenges, as well as whether the benefits of such a sensor network will outweigh potentially unavoidable disadvantages.

Queensland University of Technology's Dr. Dave McCarthy, right, and Orange County Public Works staff inspect low-cost field sensors installed at the end of a storm drain in Tustin. SCCWRP and its partners are investigating the feasibility and logistics of using these sensors to automate detection of illicit pollutant discharges that can pass rapidly through storm drain systems.

The sensors were developed by the BoSL Water Monitoring and Control Research Team, an Australian research team based at Monash University and Queensland University of Technology in Australia. The technology also is being pilot-tested in Australia.

BosL's sensors cost just a few hundred dollars each – about 98% less than comparable sensors that are commercially available – and use components that are commercially available or can be made with a 3-D printer.

The sensors operate as the "internet of things" (IoT) – a network of devices and technology – that store and automatically upload collected data to an online database that can be accessed remotely. Researchers are using the sensors to track five monitoring parameters: water depth, velocity, temperature, conductivity, and turbidity. They will evaluate if one or a combination of these parameters can effectively indicate to managers evidence of a potential illicit discharge.

Stormwater agencies are required under their National Pollutant Discharge Elimination System (NPDES) discharge permits to actively monitor storm sewer systems to detect and eliminate illicit discharges.

In advance of a second round of dry-weather sampling next year, SCCWRP will train Orange County Public Works staff on field deployment, sensor maintenance, and data analysis.

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

Updates by Thematic Area

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

BIOASSESSMENT

White House releases national eDNA strategy that SCCWRP helped craft

The White House Office of Science and Technology Policy has unveiled a national strategy intended to bring standardization and consistency to how environmental DNA (eDNA) methods get incorporated into aquatic monitoring programs nationwide – a seminal roadmap document that SCCWRP and its member agencies provided input to help craft.

The National Aquatic eDNA Strategy, unveiled at the 3rd National Workshop on Marine eDNA in June, establishes a unified vision and plan for how multiple federal, state and local environmental agencies can work together to expeditiously transition eDNA-based monitoring methods from pilot-scale studies to broadscale adoption by the end-user management community.

SCCWRP played a key role in taking the national eDNA strategy from concept to reality, starting by hosting the 2nd National Workshop on Marine eDNA in 2022 where the idea for a national strategy was originally conceptualized.

SCCWRP also co-authored key journal manuscripts and other documents that were incorporated into the strategy. Meanwhile, during a fall 2023 CTAG intersessional meeting, SCCWRP's member agencies provided perspectives on barriers to more widespread adoption and use of eDNA monitoring.

In advance of the national strategy's rollout, SCCWRP's Dr. Susanna Theroux was selected as one of four eDNA experts to give a congressional briefing on eDNA.

Courtesy of Ed Whitman, Johns Hopkins Applied Physics Laboratory

Members of the environmental DNA scientific community, including SCCWRP's Dr. Susanna Theroux, attend the 3rd National Workshop on Marine eDNA at the Johns Hopkins Applied Physics Laboratory in Maryland in June 2024. The White House Office of Science and Technology Policy unveiled the National Aquatic eDNA Strategy – a seminal roadmap document that SCCWRP and its member agencies helped craft – at the workshop.

Screening-level causal assessment tool successfully applied in San Luis Rey River watershed

SCCWRP and its partners have completed a screening-level causal assessment of the San Luis Rey River watershed in San Diego County using an approach co-developed by SCCWRP that rapidly identifies likely stressors affecting the health of the watershed's biological communities.

The work, completed in June in partnership with the City of Oceanside and the County of San Diego, utilized the Rapid Screening Causal Assessment (RSCA) tool to examine five types of stressors that could be responsible for degraded stream health: altered habitat, elevated conductivity, elevated temperature, eutrophication and altered flows.

Researchers identified altered flow and altered habitats as the most common potential causes for stream degradation.

The RSCA assessment will be followed by a pair of more in-depth causal assessments that provide additional insights and improve management confidence that the stressors responsible for biological degradation have been correctly identified.

Capacity being built to aid State agencies in protecting healthy streams

SCCWRP has partnered with two State agencies to build their capacity to systematically identify streams in good ecological condition that should be priorities for protection, as well as identify which stressors are most likely to threaten the long-term health of these streams.

The project, which kicked off in June, builds on a similar project originally launched in 2023 by the State Water Board

to develop a dashboard that can help managers better prioritize which streams should become the focus of long-term protection and resiliency planning efforts.

As a result of restarting the project, researchers will be coordinating this time with the California Department of Water Resources, which is building a similar assessment dashboard.

The dashboards will take advantage of multiple recently developed stream health assessment tools, including the Stream Quality Index (SQI) and Rapid Screening Causal Assessment (RSCA) – both co-developed by SCCWRP.

ECOHYDROLOGY

Approach developed to identify suitable streams in north O.C. for capturing dry-weather flows

SCCWRP and its partners have developed a novel screening approach for identifying streams in northern Orange County that could be suitable locations for diverting dry-weather flows to boost water recycling and improve water quality.

The runoff diversion screening approach, developed and piloted in May for the Orange County Sanitation District, enables water-quality managers to screen and rank candidate stream sites based on their relative ecological sensitivity to experiencing reductions in their dry-weather flows.

The approach considers multiple factors, including ecological consequences for downstream estuaries, and leverages extensive ecological and bioassessment data from various monitoring programs, including the Southern California Stormwater Monitoring Coalition (SMC) Regional Watershed Monitoring Program.

Researchers are exploring how to adapt the screening approach for use across Southern California.

Modeling analysis to inform adaptive management of San Gabriel River flow diversions

SCCWRP and its partners have completed a modeling analysis to understand how diverting treated wastewater discharges from the San Gabriel River for water recycling purposes affects the biological health of downstream reaches of the river – an effort that will inform long-term adaptive management planning for the river's flow diversions.

The analysis, completed in June using advanced statistical models, represents the first time that modeling has been used in California to inform adaptive management planning in support of flow diversions authorized under the State Water Board's Section 1211 wastewater change petition process.

Researchers have completed a statistical analysis to understand how diverting treated wastewater discharges from the San Gabriel River, above, affects the biological health of the watershed. The work is intended to support long-term adaptive management planning efforts for flow diversions as specified under the State Water Board's Section 1211 wastewater change petition process.

In 2018, the Los Angeles County Sanitation Districts (LACSD) received regulatory approvals to recycle some of its treated wastewater effluent that has historically been discharged to the San Gabriel River; as a condition of approval, the agency was required to develop an adaptive management plan that explains how it will assess potential ecological effects from the diversions and make adjustments to the diversions as necessary to better protect ecosystem health.

The modeling analysis, which used five years of initial monitoring data, has helped draw out the factors, variables and nuances that managers will need to pay attention to when refining LACSD's adaptive management planning efforts.

EUTROPHICATION

National science strategy outlines next decade of HABs research priorities

A national group of scientific experts on harmful algal blooms (HABs) that includes SCCWRP has developed a 10-year strategy outlining how the U.S. should coordinate and prioritize the next decade of investments in HABs research.

The Harmful Algal Research and Response: A National Environmental Science Strategy (HARRNESS) – released in July by the U.S. National Office for Harmful Algal Blooms – is closely aligned with the HAB strategies that California has already developed for studying and managing HABs in both freshwater and marine environments.

Moreover, the national strategy points to multiple key California HAB investments – including the California Cyanobacteria and HAB Network (CCHABs) – as national models for how to coordinate HABs research and monitoring among state agencies, researchers and stakeholders.

SCCWRP's Dr. Jayme Smith serves on the 26-member Scientific Steering Committee that oversaw the strategy's development. The newly released strategy is an update to the group's original HARRNESS strategy, which covered the period 2005-2015.

CONTAMINANTS OF EMERGING CONCERN

Effort launched to evaluate pair of laboratory methods for measuring pesticides in aquatic samples

SCCWRP and its partners are kicking off a six-month effort to validate two new laboratory methods for measuring a range of pesticides in aquatic samples, which will help pave the way for statewide accreditation of the methods.

The study, which will hold its kickoff meeting in August, will evaluate the effectiveness of methods that use gas chromatography-mass spectrometry (GC/MS) and liquid chromatography-mass spectrometry (LC/MS/MS) technology, respectively, to measure a suite of more than 100 pesticide analytes in water and passive sampling media.

Currently, California lacks accredited methods for screening such a broad suite of pesticides, especially for samples that were collected via passive sampling methods.

The standard operating procedures (SOPs) for both methods were developed by SCCWRP earlier this year and are currently being evaluated.

SCCWRP's member agencies and other laboratories are welcome to participate in the study. For more information, contact Dr. Charles Wong or Dr. Danhui Xin.

Lab accreditation assessors trained on PFAS measurement methods during 3-day workshop

Assessors who accredit environmental laboratories in California received training on how to measure per- and polyfluoroalkyl substances (PFAS) in drinking water and environmental matrices during a three-day workshop co-presented by SCCWRP in June – part of an ongoing series of statewide trainings to enhance assessors' proficiency and expertise.

About 12 accreditors from California's Environmental Laboratory Accreditation Program (ELAP), along with third-party assessors and State Water Board staff, attended the workshop, which included live demonstrations in SCCWRP's laboratories. ELAP accredits all public and private laboratories that produce environmental data that get used in State decision-making processes.

The workshop marked the first training opportunity for ELAP assessors following the EPA's spring 2024 decision requiring drinking water agencies to limit levels of certain types of PFAS in drinking water.

SCCWRP kicked off the ongoing ELAP assessor training series in fall 2023 with a three-day workshop on a suite of commonly used fish bioassay toxicity tests.

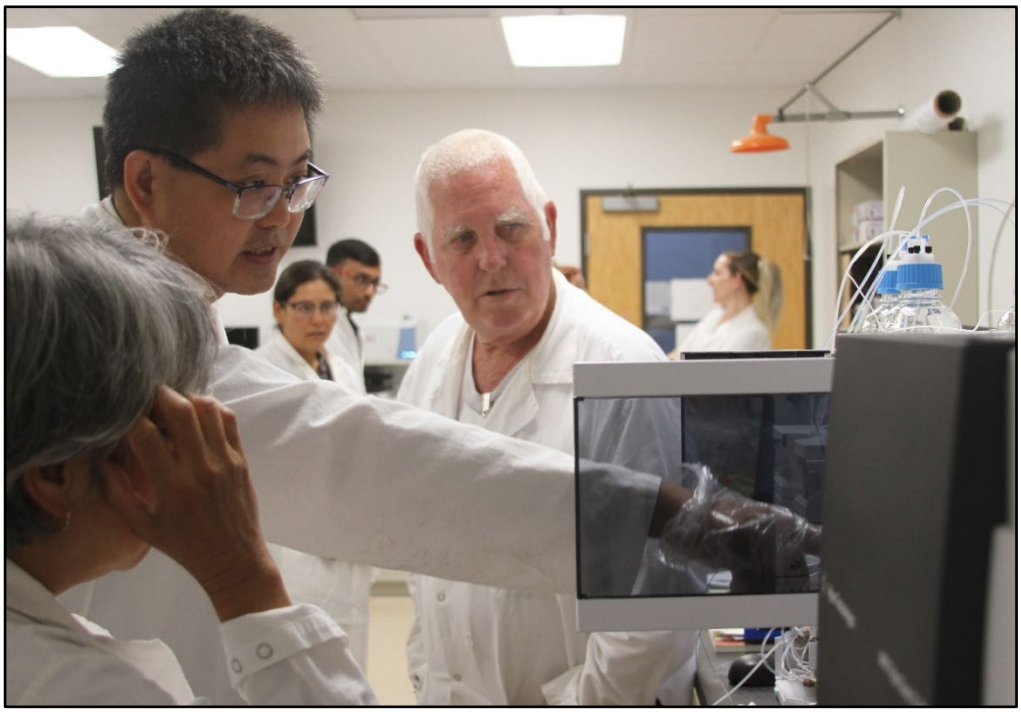
Workshop teaches end users how to screen water samples using bioanalytical cell assays

SCCWRP trained California's water-quality management community in how to use bioanalytical cell assays to screen water samples for bioactive contaminants during a day-long workshop in June – part of an ongoing effort to facilitate management adoption and routine use of the technology.

The workshop, summarized in a SCCWRP technical report published in July, focused on the technical aspects of bioanalytical cell assays, including where they can be applied and how to evaluate and interpret data. About 28 participants, including multiple SCCWRP member agencies, attended the workshop.

In 2020, California began requiring certain types of recycled water to be screened for bioactive contaminants using two assays: the estrogen receptor assay and the aryl hydrocarbon receptor assay. The workshop covered lessons learned from statewide implementation of these two assays, plus introduced participants to three newer assays.

Five SCCWRP member agencies are required to screen recycled water for indirect potable reuse using bioanalytical cell assays, underscoring the value of providing ongoing training and support to end users.



SCCWRP's Dr. Wayne Lao demonstrates how to use high-performance liquid chromatography to analyze per- and polyfluoroalkyl substance (PFAS) samples during a three-day California Environmental Laboratory Accreditation Program (ELAP) workshop at SCCWRP. The ELAP workshop was intended to teach accreditors how to measure PFAS in drinking water and environmental matrices.

SMC lab intercalibration completed to ensure high-quality chemistry analyses for stormwater monitoring

The Southern California Stormwater Monitoring Coalition (SMC) has completed the fourth iteration of a periodic intercalibration exercise originally started in 2003 to ensure that laboratories performing routine chemistry analyses on stormwater samples are capable of generating comparable, high-quality monitoring data.

The intercalibration exercise, described in a SCCWRP technical report published in June, evaluated eight laboratories' ability to measure five different classes of chemical contaminants in wet- and dry-weather runoff during three intercalibration rounds. The five classes were total and dissolved trace metals, nutrients, new and legacy pesticides, polynuclear aromatic hydrocarbons (PAHs), and general chemistry such as total suspended solids.

Laboratories received scores and letter grades based on accuracy and precision, and needed a minimum score of 70% or a "C" letter grade in each class of chemicals to pass. Overall, all but two laboratories that voluntarily opted not to participate in the final round of the intercalibration received passing grades for all five classes of chemicals.

The intercalibrations are used by stormwater managers for selecting high-quality contract laboratories for ongoing monitoring requirements, and ensure their data are comparable to other agencies enabling the SMC to compile databases to address regional scale questions.

SCCWRP's Jerod Gray, left, and Liesl Tiefenthaler collect media samples from a biofiltration BMP in Orange County for microplastics analysis. Researchers are quantifying the levels and sizes of microplastic particles that have been retained inside these systems in an effort to investigate their effectiveness at removing microplastics from runoff.

MICROBIAL WATER QUALITY

SMC study probing relationship between HF183 and illness risk nearing completion

The Southern California Stormwater Monitoring Coalition (SMC) is nearing completion on a three-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, which was co-led by SCCWRP and submitted to a peer-reviewed journal in August, is designed to increase the management utility of HF183 by shedding light on how much HF183 is too much HF183 – that is, defining for managers at what level HF183 in wet-weather runoff corresponds to a public health risk for people swimming at beaches and other contaminated receiving waters.

HF183 is a genetic marker that is widely used for detecting human sources of fecal contamination in aquatic environments. However, no health risk thresholds for HF183 have been developed to date.

Although the study was completed in June, the SMC has decided to delay publicly releasing the findings until the manuscript has gone through journal peer review and been published – reflecting the SMC's commitment to ensuring the final threshold numbers are accurate and scientifically defensible.

STORMWATER BMPS

Initial dry-weather sampling completed for study investigating BMPs' potential to remove microplastics in runoff

SCCWRP and its partners have completed an initial round of dry-weather sampling of the engineered media inside six biofiltration BMPs (best management practices) as part of an ongoing study investigating the effectiveness of these systems at removing microplastics from runoff.

The sampling, completed in July, will enable researchers to quantify the levels and sizes of microplastic particles that have been retained inside the biofiltration BMPs since the systems were initially constructed as many as six years ago.

Researchers believe this type of analysis will generate different insights than the study's wet-weather sampling work, during which researchers are measuring the microplastics levels entering and exiting the flow-through systems.

In particular, researchers anticipate the BMP media analysis will shed light on whether biofiltration BMPs are capable of capturing only larger microplastic particles or if the systems are capturing smaller particles as well.

The two-year study, being conducted in partnership with California State University, Long Beach and California State University, Los Angeles, is working to understand how specific characteristics of different types of BMP engineered media influence the removal of microplastics from runoff.

Tool for rating BMP performance developed for L.A. County

SCCWRP and the Los Angeles County Department of Public Works have developed an index scoring tool that rates the overall performance of various structural stormwater BMPs (best management practices) based on multiple discrete metrics.

The BMP performance index tool – which was introduced to end users during a workshop in June – is intended to bring consistency and standardization to how L.A. County stormwater managers determine whether a BMP is helping to achieve downstream water-quality objectives, and whether it is capturing runoff volumes consistent with its design specifications.

Managers historically have not had access to a standardized tool for systematically integrating and comparing BMP performance data.

Researchers are planning to adapt the tool for use across Southern California. The index tool will eventually be able to evaluate BMP performance data collected via the Southern California Stormwater Monitoring Coalition (SMC) Regional BMP Monitoring Network.

A Bight '23 field crew prepares to enter the water at the Bolsa Chica Ecological Reserve in Orange County to survey eelgrass beds. The Southern California Bight 2023 Regional Monitoring Program is kicking off a first-of-its-kind regional monitoring survey to evaluate the health of eelgrass beds based on their ecological functioning.

REGIONAL MONITORING

Bight '23 study assessing effects of ocean acidification on shell-forming organisms

The Ocean Acidification study element of the Southern California Bight 2023 Regional Monitoring Program has launched a two-year effort to track how ocean acidification is adversely affecting shell-forming organisms in Southern California's coastal ocean – building off the work of a Bight '18 pilot study.

The Bight '23 monitoring effort, which kicked off in August following approval of a study workplan, will measure pH and oxygen levels in surface waters, plus examine shell dissolution in pteropods and larval crabs. The Bight '18 pilot study identified early evidence of shell dissolution in these organisms, although the effects were not uniformly observed and the dissolution was generally mild and linked to the presence of low-pH conditions in colder, deeper waters.

Sampling will begin this fall in coordination with other West Coast OA monitoring programs, including the California Cooperative Oceanic Fisheries Investigations (CalCOFI) and NOAA West Coast Ocean Alliance (WCOA) programs. The coordination will enable researchers to put the Bight program's findings into a West Coast-wide context.

Bight '23 kicking off regional assessment of eelgrass bed health

The Southern California Bight Regional Monitoring Program is kicking off a first-of-its-kind regional monitoring survey this September to evaluate the health of the region's eelgrass beds based on their ecological functioning.

The Submerged Aquatic Vegetation (SAV) study element – part of the 2023 cycle of the Bight program (Bight '23) – will take a bioassessment-based approach to evaluating the ability of eelgrass beds to provide refugia to fish and other animals, as well as attenuate ocean waves and sequester carbon.

Field crews participated in an intercalibration exercise last spring to ensure they can collect comparable, high-quality sampling data for this ecologically fragile habitat.

Researchers plan to use the Bight survey data as they work to build a scoring tool for assessing eelgrass health.

New SCCWRP Publications

Journal Articles

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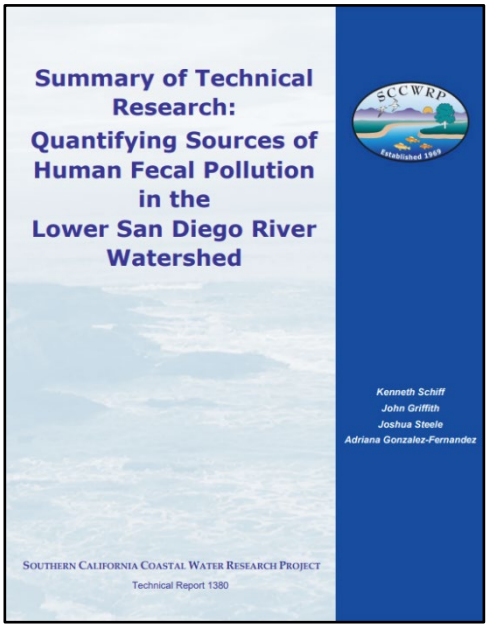
Wang, P., J. Li, M.Y. Xie, C.C. Wu, C.S. Wong, E.Y. Zeng. 2024. Utility of a modified o-DGT passive sampler for measurement of bisphenol analogues in freshwater and coastal waters. *Science of the Total Environment* 931:172978.

Xin, D., J.M. Hudson, A. Sigman-Lowery, Y. Chin. 2024. Distribution and composition of redox-active species and dissolved organic carbon in Arctic lacustrine porewaters. *Arctic, Antarctic, and Alpine Research* 56:2371534.



SCCWRP has published a nine-chapter technical report summarizing the findings of a first-of-its-kind, five-year investigation quantifying the relative contributions of six major sources of human fecal contamination to the San Diego River watershed during wet weather.

Journal Articles (Accepted)

Cheng, Y., B.G. Johannessen, D.A. Vaccari, E. Fassman-Beck. Characterization of Nitrogen Discharge from Extensive Sedum Green Roofs with Multiple Amending Designs and Materials. *Journal of Sustainable Water in the Built Environment.*

Technical Reports

Schiff, K.C., J.F. Griffith, J.A. Steele, A. Gonzalez-Fernandez. 2024. Summary of Technical Research: Quantifying Sources of Human Fecal Pollution in the Lower San Diego River Watershed. Technical Report 1380. Southern California Coastal Water Research Project. Costa Mesa, CA.

Mehinto , A.C., V. McGruer, E. Darin, K. Wong, D. Schlenk. 2024. Development and Standardization of Bioanalytical Screening Tools Part I – Final Report. Technical Report 1381.A. Southern California Coastal Water Research Project. Costa Mesa, CA.

Mehinto , A.C., V. McGruer, D. Schlenk. 2024. Development and Standardization of Bioanalytical Screening Tools Part II – Protocols for Laboratory and Data Analysis. Technical Report 1381.B. Southern California Coastal Water Research Project. Costa Mesa, CA.

Wong, C.S., S. Dial, W. Lao. 2024. Stormwater Monitoring Coalition Laboratory Guidance Document (Fourth Edition). Technical Report 1379. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Fassman-Beck, E. Green/Eco/Living Roofs in Green Infrastructure: Making the Technical Case for Multiple Benefits. Cascadia Grey to Green Conference. July 26, 2024. Portland, OR.

Kessouri, F. Quantifying uncertainty in ocean model predictions of eutrophication. California IOOS Conference. May 14-16, 2024. San Diego, CA.

Smith, J. Moving Toward Prediction of Domoic Acid Related Stranding Events of California Sea Lions in Southern California. Ocean Observing in California. May 14-16, 2024. San Diego, CA.

Sutula, M. Science toolkit supporting development of nutrient targets. Clean Water Association Annual Summit. July 31, 2024. Monterey, CA.

Conference Posters

Frieder, C., M. Sutula, and K. McLaughlin. Monitoring Biological Impacts of Ocean Acidification: Lessons from the U.S. West

Coast. California IOOS Conference. May 14-16, 2024. San Diego, CA.

Mehinto, A., V. McGruer, D. Schlenk, and K. Maruya. Implementing effects-based monitoring strategy to assess water quality in California waterbodies. Society of Environmental Toxicology and Chemistry Europe 34th Annual Meeting. May 5-9, 2024. Seville, Spain.

Other Presentations

Fassman-Beck, F. and E.D. Tiernan. Structural BMP Performance Index Web Application User Training. Los Angeles County Public Works Stormwater Quality Division Workshop. June 17, 2024. Alhambra, CA.

Gillett, D. Developing function-based assessment tools for eelgrass habitats. NOAA Nearshore SAVE (Submerged Aquatic Vegetation Ecosystems) Workshop. May 22, 2024. Sausalito, CA.

Schiff, K. Human Fecal Sources in the San Diego River Watershed. Quarterly CASQA meeting. July 11, 2024. Via webinar.

Stein, E. and R. Mazor. Application of the California Rapid Assessment Method (CRAM). CDFW staff at bi-weekly Lake and Streambed Alteration Agreement (LSA) roundtable. June 25, 2024. Via webinar.

Stein, E. Briefing on work to enhance beneficial sediment use. United State Army Corps of Engineer staff. July 2, 2024. Via webinar.

Stein, E. Briefing on work to enhance beneficial sediment use. Army Science Board. July 12, 2024. Via webinar.

Theroux, S. Linking state and national efforts to advance eDNA method adoption. 3rd National Workshop on Marine eDNA. June 3, 2024. Washington, D.C.

Thornton Hampton, L.M. ToMEx: Toxicity of Microplastics Explorer. Federal-State Toxicology Risk Analysis Committee. May 16, 2024. Via webinar.

Walker, J. Importance of leveraging multiple regional efforts to assess estuarine condition. UC Santa Cruz Wetland Carbon Collaboration. June 21, 2024. Santa Cruz, CA.

Walker, J. and E. Stein. Briefing on support of a state and regional estuary monitoring program. California Coastal Commission staff. June 27, 2024. San Francisco, CA.

Scientific Leadership

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

Dr. **Elizabeth Fassman-Beck** has been appointed to the Ph.D. committee of Hendrik Rujner at Luleå University of Technology in Sweden.

Dr. **David Gillett** has been appointed to the Attendance Experience Committee for the Coastal and Estuarine Research Federation.

Dr. **Alvina Mehinto** has been appointed to the Environmental Health Matters Initiative (EHMI) working group for emerging contaminants of concern.

Ken Schiff has been appointed to the organizing committee for the 2025 American Society of Civil Engineers EWRI Specialty Conference on Low Impact Development.

Ken Schiff has been appointed to the organizing committee for the 2025 Center for Watershed Protection's National Stormwater Conference.

Dr. **Jayme Smith** has been appointed to the steering committee for the National Harmful Algal Bloom Observing Network (NHABON).

Dr. **Joshua Steele** has been appointed to the planning committee for the Applied and Environmental Science Section 2024 Retreat for the Council on Microbial Sciences of the American Society for Microbiology.

Dr. **Joshua Steele** has been appointed to the Standard Methods Committee - Joint Task Group on Guidance for Concentration of Microbial Targets Within Wastewater and Wastewater Impacted Samples, organized by the American Water Works Association and National Institute of Standards and Technology.

Dr. **Martha Sutula** has been appointed an Associate Editor for the journal *Frontiers in Environmental Science – Biogeochemistry.*

Dr. **Kris Taniguchi-Quan** has been appointed Ecohydrology Research Coordinator for the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Intergovernmental Hydrological Programme for Ecohydrology.

Dr. **Susanna Theroux** co-organized the 3rd National Workshop on Marine Environmental DNA (eDNA), held in June at the Johns Hopkins University Applied Physics Laboratory.

Dr. **Susanna Theroux** co-organized a West Coast Ocean Biomolecular Observing Network (WC-OBON) workshop at the Ocean Observing in California Conference, held in May in San Diego, CA.

Dr. **Susanna Theroux** has been appointed to the Marine Technology Society (MTS) Marine Environmental DNA (eDNA) Technology Committee.

Dr. **Jan Walker** co-organized the California Estuarine Research Society (CAERS) annual meeting, held in May in Moss Landing, CA.

SCCWRP Personnel Notes

Commission

Phillip Crader, the new Deputy Director of the Division of Water Quality for the California State Water Resources Control Board, was named a SCCWRP Commissioner in June, replacing Karen Mogus, who was promoted. Mogus served on the Commission for eight years.

Orelia DeBraal, Assistant Director of the City of San Diego Public Utilities Department, was named a SCCWRP Alternate Commissioner in July, replacing Dr. Peter Vroom, who served on the Commission for 9-1/2 years.

CTAG

Dr. **Danny Tang**, Environmental Supervisor at the Orange County Sanitation District, was appointed a CTAG Representative in July, replacing Dr. Samuel Choi, who served as a CTAG Representative for nearly five years.

New Faces

Dr. **Jill Tupitza**, who just completed her Ph.D. in oceanography and coastal sciences at Louisiana State University, will join SCCWRP in August as a Scientist in the Biology Department. She will support SCCWRP's ongoing effort to standardize environmental DNA methods and work on ecological response modeling.

Promotions

Caspian Thackeray-Taylor, who has worked as a part-time IT assistant since 2019, was promoted in July to a full-time Network Administrator. He is finishing his coursework at Western Governors University and is expected to graduate with a bachelor's in computer science next summer.

Sydney Dial Sauers, who has worked as a Research Technician in the Chemistry Department since 2022, was promoted in July to Senior Research Technician.

Jayde Zimmerman, who has worked as a Research Technician in the Microbiology Department since 2023, was promoted in July to Senior Research Technician.

Departures

Dr. **Adriana González-Fernández**, who has worked at SCCWRP as a Scientist in the Microbiology Department since 2023, left SCCWRP in May to take a position at Miami Waterkeeper.

Dan Ortiz, who has worked at SCCWRP as a Network Administrator since 2021, left SCCWRP in June to take a position at the Orange County Sanitation District.

SCCWRP COMMISSIONER SPOTLIGHT

State water-quality head focuses on coordination

As the new head of the State Water Resources Control Board's Division of Water Quality, Phil Crader's work philosophy is to slow down to move fast.

Phil Crader

The more time that Crader says his team spends being strategic and deliberate and communicating early and often, the less chance there is of a derailment or delay later on.

"So much of this job is coordinating and communicating," Crader said. "We make sure the horizontal and vertical communication and information sharing is occurring, and that we're vetting our ideas and plans internally before moving forward, before asking stakeholders and partners to invest their time and energy."

Crader, who has worked for the Water Boards for the past 26 years, was promoted to Deputy Director of the 200-member Division of Water Quality in June, replacing Karen Mogus, who was recently promoted to Chief Deputy Director of the State Water Board. Mogus served as a SCCWRP Commissioner for eight years.

Crader's proudest accomplishment at the Water Boards has been working with his team, partner agencies and interested parties to expedite the review and approval processes for habitat restoration and emergency response activities across California by centralizing them under statewide General Orders.

For example, three years ago, Crader and his team helped the State Water Board eliminate the need for public agencies, landowners and others applying to conduct vegetation management on lands in the State Responsibility Area to secure multiple permits – in some cases, from multiple Regional Boards. The lengthy process was replaced with a General Order governing waste discharge requirements, enabling applicants to request a single permit that can be approved within days, without a fee or more paperwork.

Phil Crader enjoys a whitewater kayaking trip with his family along the South Fork of the American River in 2015. Crader, top left, is pictured with son Will, now 14, daughter Marcella, now 21, and wife Jamie.

Phillip Crader

Job: Deputy Director, Division of Water Quality, California State Water Resources Control Board (started June 2024)

SCCWRP role: Commissioner (started June 2024)

Prior jobs: *17 years with the State Water Board*: Assistant Deputy Director, Surface Water Branch, Division of Water Quality (2013-2024); Permitting and Licensing Section Chief, Division of Water Rights (2010-2013); Delta Flow Criteria Team Lead, Division of Water Rights (2009-2010); Napa Valley Permitting Unit Chief (2007-2009); *10 years with the Central Valley Regional Water Quality Control Board*: Environmental Scientist (1998-2007)

Education: B.S. Environmental and Resource Science, University of California, Davis (1998)

Residence: Rancho Cordova

Hometown: Belmont in the San Francisco Bay Area

Family: Wife Jamie, a personal trainer studying physical therapy; daughter Marcella, 21, a community college student studying business and psychology; son Will, 14, an incoming high school freshman who will be playing football; two dogs and three cats

Hobbies: Whitewater kayaking; hiking; backpacking; playing guitar

"We are always looking for ways to spend 20% of our time doing 80% of our work, so we can spend the other 80% of our time on the really intractible issues – like ocean acidification and hypoxia, and biostimulatory substances and nutrient management," Crader said.

Crader has known he wanted to work in water management in the public sector since interning at the California Department of Water Resources as a UC Davis undergraduate. Crader's first job after graduating was with the Central Valley Regional Water Quality Control Board, where he worked as an Environmental Scientist for eight years.

Crader first began interacting with SCCWRP more than a decade ago, when he attended a SCCWRP workshop on wetlands management. He appreciates the deep expertise and experience that SCCWRP brings to the table.

"To have a cohesive group of highly educated and experienced experts – it's just a gift for us at the State level," he said.

In his spare time, Crader is an avid whitewater kayaker and hiker, getting outside as often as possible with his family. Their favorite destinations are the South Fork of the American River, Death Valley, and Desolation Wilderness..

CTAG SPOTLIGHT

Engineer transfers industry values to management

A Before working in environmental management, Adam Taing started his post-grad career as a field engineer in the oil industry working with upstream extractions and hydraulic fracturing (fracking) in North Dakota and the Rocky Mountains.

Adam Taing, P.E.

After California passed a Senate Bill in 2015 that established a framework for regulating fracking, Taing learned that the Los Angeles Regional Water Quality Control Board was looking for engineers with specialized experience in the area. He grew excited at the idea of not only moving back to California but also the opportunity to learn about his field from a regulatory perspective.

"I was fortunate to have worked for places that had core values and principles about being environmentally responsible," Taing said. "Preserving the environment as a resource for future generation is important to me, so I was able take what I learned with me in the oil industry to the Water Board."

During his first six years at the L.A. Regional Water Board, Taing worked on underground storage tank site cleanup and remediation with the Oil and Gas program. Now, Taing is a Senior Water Resource Control Engineer in the watershed regulatory section and primarily works on wastewater discharge permits related to water recycling and reclamation.

Taing became an Alternate CTAG Representative in November 2023, supporting Dr. Emily Duncan, who remains the L.A. Regional Board's main CTAG representative. Prior to joining CTAG, he hadn't interacted with SCCWRP but was familiar with the agency's research about sediment quality around offshore oil platforms.

Adam Taing, wife Ching, and daughter Claire enjoy a family outing at Disneyland in Anaheim in 2024.

Adam Taing, P.E.

Job: Senior Water Resource Control Engineer, Los Angeles Regional Water Quality Control Board (since 2015)

SCCWRP role: Alternate CTAG Representative (started November 2023)

Prior jobs: Operations Supervisor, Marathon Petroleum (2014-2015); Field Engineer, Baker Hughes (2011-2014); Laboratory Technician, CRG Marine Laboratories (2009-2011)

Education: M.S. chemical engineering, California State University, Long Beach (2011); B.S. chemistry and biochemistry, California State University, Long Beach (2009)

Residence: Lakewood

Hometown: Long Beach

Family: Wife Ching, also a Water Resource Control Engineer at Los Angeles Regional Water Quality Control Board; daughter Claire, 2; dog Cabbage, a 14-year-old Shih Tzu mix

"SCCWRP researchers produce science that is both cutting edge and beneficial," Taing said. "I'm excited to be able to work more closely with the organization in this capacity."

As a child, Taing excelled at learning with a more hands-on approach. He often played with Lego and K'nex sets to build intricate structures and enjoyed solving puzzles.

Taing naturally gravitated toward studying engineering and graduated from Cal State Long Beach with a double B.S. in chemistry and biochemistry with the intention of becoming a biomedical engineer.

However, he had trouble finding suitable roles in a tough job market following the 2008 financial crisis and decided to go to grad school for chemical engineering.

"I remember having a sort of fondness for the environment, so that pushed me in this direction and led me to where I am now," Taing said.

Taing and his wife Ching are both foodies and enjoy trying local delicacies whenever they travel. One of their bucket-list destinations is the Patagonia region in South America.

In his spare time, Taing watches sports – mainly basketball and football – and roots for his favorite teams, the Los Angeles Lakers and San Francisco 49ers.

SCCWRP STAFF SPOTLIGHT

Ecologist's work helped launch monitoring effort

Dr. Jill Tupitza found herself drawn to learning about marine and coastal ecosystems as an undergraduate student at the University of Virigina and knew she wanted to pursue a related graduate degree that would allow her to do research in the field.

Dr. Jill Tupitza

However, her university was landlocked and more than 150 miles away from the coast, and she didn't have any established connections in the marine science field to leverage.

Tupitza remembered her mentor from a high school internship at the Virginia Institute of Marine Science, Dr. Cassie Glaspie, who had recently started a marine ecology research lab at Louisiana State University. It had been eight years since they last spoke, but Tupitza decided to reach out – and it turned out Glaspie had also been thinking about her.

"I was excited when she asked me to join her because the program really aligned with what I wanted to do," said Tupitza, who became Glaspie's first Ph.D. student. "It was a perfect match – she taught me a lot about research when I was in high school, and I'm so grateful that we ended up coming full circle."

Tupitza, who recently graduated with a Ph.D. in oceanography and coastal sciences from LSU, will join SCCWRP in August as a Scientist in the Biology Department. She will be focused on ongoing efforts to standardize environmental DNA (eDNA) methods and work on ecological response modeling.

At LSU, Tupitza studied the ecological impacts of river diversions on benthic organisms in Louisiana estuaries. Her research helped lead to the inception of the Louisiana Deltaic Estuaries Marine Biodiversity Observation Network (MBON), a long-term monitoring effort focused on the impacts of sea level rise on coastal Louisiana ecosystems.

Dr. Jill Tupitza spends time working aboard the research vessel Pelican off the Gulf of Mexico in 2022.

Jill Tupitza, Ph.D.

Job: Scientist, SCCWRP Biology Department (starts August 2024)

Prior jobs: Graduate Research Assistant, Louisiana State University (2019-2024); PCB Analyst, Enthalpy Analytical (2019); Laboratory Supervisor, Enthalpy Analytical (2017-2019); AmeriCorps Volunteer Infrastructure Project Fellow (2016-2017)

Education: Ph.D. oceanography and coastal sciences, Louisiana State University (2024); B.S. environmental sciences, University of Virginia (2016)

Residence: Baton Rouge, LA; planning to relocate to Newport Beach

Hometown: Alexandria, VA

Family: Dog Stella, a 7-year-old German Shepherd mix

Tupitza learned about SCCWRP when she met Dr. Eric Stein, head of SCCWRP's Biology Department, at a Coastal and Estuarine Research Federation conference in 2023. She expressed interest in continuing her work in eDNA after grad school and became interested in SCCWRP's ongoing research in the area.

"It's very exciting to be able to work on another coast since I've worked in both the Atlantic and Gulf Coasts," Tupitza said. "Being able to work as a marine ecologist in Southern California is a dream come true."

Growing up along the Potomac River in Virigina, Tupitza was familiar with the impacts of climate change and pollution on her local aquatic environments, which sparked her early interest in environmental science. As a teen, Tupitza volunteered at her local Riverkeeper organization and conducted citizen science projects.

"It was really sad because we had this beautiful body of water that no one went into because it was full of garbage and toxic waste," Tupitza said. "I think that really cemented my goals early on to do right by the environment and improve it as much as I can."

Tupitza went on to get a B.S. in environmental sciences from the University of Virigina. After graduating, she decided to gain experience in the field and moved to Berkeley to work in an environmental lab for three years before starting her Ph.D. at LSU.

In her spare time, Tupitza enjoys exploring the outdoors with her dog Stella. She looks forward to hiking and backpacking more in Southern California once she relocates to Newport Beach. Tupitza is also a gardener and often uses homegrown herbs and vegetables in her cooking.

SCCWRP SCENES

Developing marine mammal health indicators

The West Coast Ocean Alliance (WCOA) and the federal Marine Mammal Commission hosted a two-day workshop in May at SCCWRP to work toward developing capacity to assess the health of the coastal ocean using marine mammals as an indicator of ecosystem condition. About 20 marine-mammal experts attended the meeting – plus more online – and participated in breakout sessions to pursue the development of a West Coast-wide indicator of coastal ocean health. Participants also discussed the development of an expanded national database for tracking marine mammal health. SCCWRP, which is facilitating the development of other indicators of West Coast ocean health, including kelp and harmful algal blooms, was asked to host the meeting.

Left, attendees gather in a SCCWRP conference room to discuss marine mammal indicators during a two-day workshop hosted by the West Coast Ocean Alliance (WCOA) and the federal Marine Mammal Commission; below left, meeting participants pose for a group photo at SCCWRP; and below right, the Marine Mammal Commission's Dr. Karin Forney presents on methods for estimating marine mammal abundance.