SCCWRP Director's Report

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SUMMER 2022 ISSUE

Toolkit developed for adaptive watershed management

SCCWRP and its partners have developed statewide guidance and a set of freely accessible web tools to help California stormwater managers take a consistent, standardized approach to periodically evaluating their long-term, multi-phased plans for improving runoff water quality.

The toolkit, described in a SCCWRP technical report published in July, represents broad management consensus on how to use data from stormwater monitoring programs, including performance data for BMPs (best management practices), to track progress toward water-quality improvement goals. The toolkit also provides a common framework for managers to determine if and how they should pivot vs. stay the course as they implement the next phases of their watershed management plans.

The development of the toolkit comes at an opportune time for Southern California's stormwater management community. Over the next few years, multiple stormwater agencies are preparing to revisit their watershed management plans that were codified into their discharge permits about five years prior under a philosophy known as Adaptive Watershed Management (AWM).

AWM, a new regulatory approach being utilized by municipalities statewide, requires dischargers to develop watershed management plans for improving runoff water quantity and quality incrementally over a multi-decade timeframe – typically using a combination of yet-to-be-implemented stormwater BMPs. Then, responsible parties check in periodically – typically every three to five years – to evaluate progress toward long-term AWM goals.

While guidance already exists for crafting long-term watershed management plans, California has historically lacked guidance on how stormwater discharge agencies and the regulatory agencies that oversee them should periodically re-examine these long-term plans to determine if and/or how the plans might need to be modified.

Contents

Cover photo: Runoff from a parking lot drains to a bioretention system containing special engineered soil media designed to remove contaminants. These runoff management solutions are the focus of newly developed statewide guidance for how to periodically evaluate long-term, multi-phased plans for improving runoff water quality.

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 11
CTAG quarterly meeting
(Remote participation only)

Friday, September 9
Commission meeting
(Remote participation only)

In 2020, SCCWRP began working to fill this guidance gap by assembling a statewide advisory committee to develop consensus on:

» the highest-priority monitoring questions that managers should ask when seeking to evaluate progress towards AWM goals

» the most appropriate, technically rigorous monitoring approaches for generating data to defensibly answer these priority monitoring questions

» the range of management actions that should be considered after stormwater monitoring data are collected and analyzed, and after questions about AWM progress have been answered

Significantly, the advisory committee was able to identify numerous specific actions that managers should consider taking based on stormwater monitoring outcomes – ranging from simple, inexpensive steps like increasing inspections or enhancing BMP maintenance, to much more expensive, involved steps like reconfiguring the watershed models that were used to develop the original AWM plan.

The composition of the advisory committee was diverse, with representatives from Regional Water Quality Control Boards, municipal stormwater agencies and NGOs spanning the San Francisco Bay Area to San Diego. More than 250 person-years of stormwater management experience were represented.

Woven into the advisory committee's report are multiple case studies illustrating how to apply the guidance and tools in the real world.

A field crew constructs a bioretention planter in Riverside County to study its mechanistic inner workings. Researchers have developed statewide guidance and a set of web tools to help California stormwater managers periodically evaluate their multi-phased plans for improving runoff water quality that have been codified into discharge permits under a philosophy known as Adaptive Watershed Management (AWM).

Meanwhile, the SCCWRP-developed tools that the advisory committee endorsed consist of free, open-source web apps that enable users to readily explore how tweaking the design of their stormwater monitoring programs would generate different, potentially more insightful types of data. All of the data that users upload to the web apps is deleted after each use; none of the data get saved or transmitted to a third party.

The AWM toolkit was developed in concert with the State Water Board's Stormwater Planning Unit and is consistent with the unit's Strategy to Optimize Resource Management of Stormwater (STORMS).

SCCWRP is in the process of introducing the new toolkit to multiple potential end users across California, including the Southern California Stormwater Monitoring Coalition (SMC) and California Stormwater Quality Association (CASQA).

For more information, contact Ken Schiff.

Special journal issue highlights new scientific tools to support microplastics management

An initial set of scientific products and health thresholds that could form the technical underpinnings for how California protects aquatic life and humans from exposure to microplastics pollution is featured in a newly published special issue of the journal *Microplastics and Nanoplastics*.

The special journal issue, made up of 10 open-access articles and published in July, reflects early, international scientific consensus on a five-tiered management framework that explains the relationship between different microplastics levels measured in the environment and corresponding actions that managers could take based on the degree to which they want to ensure aquatic organisms are protected from microplastics toxicity.

Embedded in the framework is a set of preliminary thresholds for aquatic life that define for environmental managers the exposure levels at which microplastics can be expected to trigger adverse biological effects. (Researchers concluded that the toxicology data needed to derive corresponding thresholds for human health do not yet exist.)

The microplastics framework and thresholds are the culmination of a year of deliberations by leading microplastics experts that were facilitated by SCCWRP. SCCWRP kicked off the international deliberations in fall 2020 by hosting the multi-part Microplastics Health Effects Workshop; the special journal issue reflects the science that evolved from this workshop.

California is leading the nation in developing comprehensive, science-based management strategies for controlling the microplastic contamination in aquatic environments. The ongoing work is spurred by 2018 passage of Senate Bill 1422 and Senate Bill 1263, which call on California to combat microplastics pollution in drinking water and the coastal ocean, respectively.

Already, the California Ocean Protection Council has codified supporting the continued development of microplastics thresholds into the agency's statewide microplastics management strategy for the coastal ocean, which was published in February.

The California Environmental Laboratory Accreditation Program (ELAP), meanwhile, is working to develop standard operating protocols (SOPs) and proficiency standards that will pave the way for laboratories across California to begin measuring microplastics levels in drinking water. A pilot study also is being conducted to document levels of microplastics in drinking water.

Eight of the 10 articles in the special journal issue were co-authored by SCCWRP. SCCWRP's Dr. Stephen Weisberg served as the lead guest editor of the special issue.

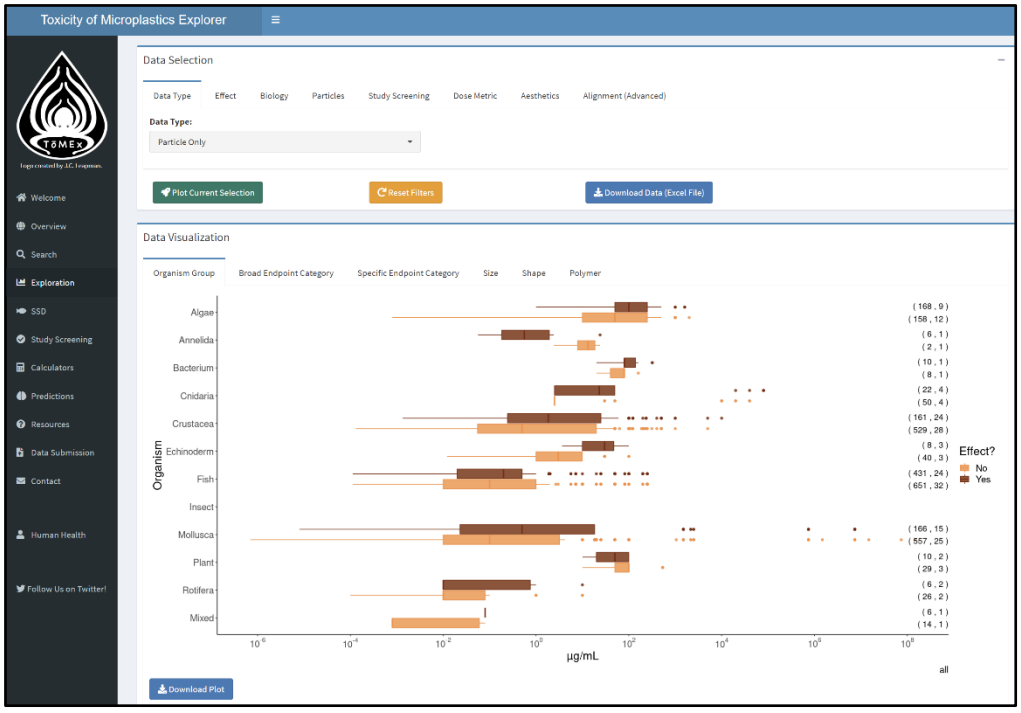
Also featured in the special issue is the development of a toxicity database that was central to the development and calculation of thresholds. Developed by SCCWRP, the Toxicity of Microplastics Explorer (ToMEx) provided the toxicity data necessary to derive the numerical values for each threshold.

ToMEx is a public, web-based repository of toxicity data from published microplastics health effects studies; an accompanying R shiny web application has been integrated into ToMEx that enables researchers to conduct data analyses and derive thresholds where users may easily customize the data used and the parameter settings to their own specifications. More data will be added to ToMEx as future microplastics toxicity studies are completed.

The proposed microplastics management framework described in the special journal issue consists of five tiers that assign progressively higher confidence levels to the likelihood of microplastics toxicity based on exposure level. The transitions between tiers are designated by preliminary numerical thresholds for microplastics levels that correspond to progressively more aggressive management actions, ranging from enhanced monitoring at one end of the spectrum, to pollution control measures at the other end.

Finally, the special journal issue chronicles the knowledge gaps that researchers identified in microplastics health effects data that limit their ability to derive health-based thresholds. Researchers emphasized that the initial thresholds will need to be updated as more studies are published that use more environmentally relevant conditions, particle types and experimental designs to capture robust dose-response relationships.

For more information, contact Dr. Leah Thornton Hampton.



The Toxicity of Microplastics Explorer (ToMEx) tool, described in a newly published special issue of the journal *Microplastics and Nanoplastics*, is a public, web-based repository of toxicity data from published microplastics health effects studies; it also contains integrated data analysis tools. SCCWRP developed ToMEx to derive preliminary thresholds for aquatic life that define for environmental managers the exposure levels at which microplastics can be expected to trigger adverse biological effects.

Study provides statewide picture of when, where HABs are occurring in lakes, reservoirs

SCCWRP and its partners have completed a year-long study that used satellite imaging data to build a comprehensive portrait of when and where ecologically disruptive harmful algal blooms (HABs) have been occurring in California's large lakes and reservoirs over the past five years.

The proof-of-concept study, completed in June for the years 2017 to 2021, illustrates how California can track HABs status and trends at the frequency and scale needed to effectively intervene to manage this growing environmental problem in lakes and reservoirs. California's HABs management efforts to date have been limited by patchy, sporadic HABs field sampling data that get voluntarily submitted to the State Water Resources Control Board.

Satellite remote sensing provides a viable, cost-effective way to generate a continuous stream of real-time HABs monitoring data. With remote sensing, high-resolution satellite imagery of large lakes and reservoirs is captured multiple times a week; then, the federal Cyanobacteria Assessment Network (CyAN) applies an algorithm to the imagery to identify the presence and relative concentration of cyanobacteria in surface waters.

Using satellite imagery to detect and assess cyanobacteria blooms has been extensively validated by the CyAN group for use across the U.S., and shown to be a robust way to monitor HABs in large lakes and reservoirs across expansive geographic areas.

The five-year HABs status and trends report is the next evolution in an ongoing effort by California to build HABs monitoring capacity for lakes and reservoirs using satellite imaging data. In 2015, the San Francisco Estuary Institute developed a statewide satellite HABs data tracker that enables managers to track emerging HABs events in individual lakes and reservoirs.

The five-year statewide analysis helps put water body-specific information into regional context, enabling managers to understand when and where HABs threats are greatest, engage in long-term planning and prioritization, and consider developing State and regional policies and programs to minimize adverse environmental effects, including taking more aggressive action to reduce nutrient loading.

Reports of HABs have been increasing in frequency every year since the State Water Board began tracking these cyanobacterial blooms via its voluntary reporting system. In a statewide freshwater HABs monitoring strategy published in 2021, the State Water Board highlighted the need to develop capacity to track bloom frequency and magnitude over time.

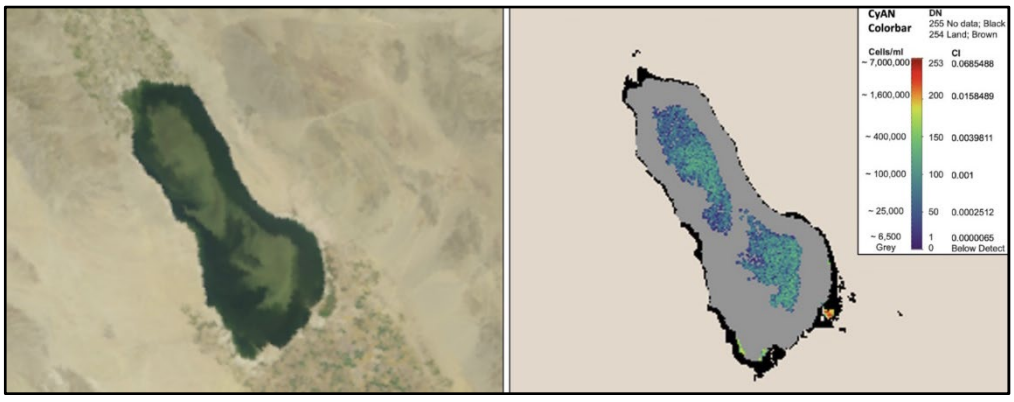
Cyanobacterial blooms, which are key indicators of eutrophication, can contaminate aquatic systems with toxins that are harmful to humans, domestic pets and wildlife exposed to the contaminated water.

During the SCCWRP-led pilot study, SCCWRP and its partners successfully identified and applied metrics validated by the federal CyAN group to estimate the status and trends of HABs in 88 large lakes and reservoirs; these water bodies collectively make up about 65% of the surface area of all of California's large lakes and reservoirs.

Remote sensing does not appear to be effective for monitoring the nearshore regions of large lakes and reservoirs, or when there is cloud cover. Meanwhile, blooms in small lakes and reservoirs would need to be captured using other types of remote sensing imagery than was used in the SCCWRP study.

Researchers presented the findings from the five-year study during a webinar for lake and reservoir managers in July. The research team has now shifted its focus to comparing the remote sensing data to land use and climate data, primarily collected in California's Central Valley, to identify how these factors may be related to increased HABs.

For more information, contact Dr. Jayme Smith.



The Salton Sea in Riverside and Imperial Counties, which was captured in a satellite image, left, shows potential visual signs of a cyanobacterial bloom that can be analyzed using a computer algorithm, right, that differentiates cyanobacteria from other algae and non-biological matter to produce an estimate of overall abundance. SCCWRP and its partners used this approach – which was developed by federal researchers – to analyze five years of satellite imaging data for California's large lakes and reservoirs, generating a comprehensive statewide portrait of the status and trends of cyanobacterial blooms in these freshwater systems.

Marine eDNA decay rates to be measured to support development of DNA-based monitoring

SCCWRP and its partners have launched a three-year study to measure how rapidly the DNA that marine organisms shed into their environment decays in ocean water under different environmental conditions – foundational insights that will pave the way for researchers to develop marine monitoring tools that can reliably detect the presence of specific species based on their environmental DNA, or eDNA.

The study, launched in July, will consist of a series of experiments in simulated and controlled environments – a setup known as a mesocosm – on Catalina Island. Researchers will quantify how quickly eDNA is degraded by microbial communities until it's no longer detectable.

Researchers' long-term goal is to develop eDNA monitoring methods that can consistently detect the presence of various species – everything from endangered and invasive species, to spawning fish that may pass rapidly through a water body. With eDNA-based monitoring, water samples are collected and any DNA that has been shed into the water is extracted and analyzed to determine which organisms were present in the sample.

eDNA-based monitoring has the potential to reduce the costs and time associated with routine biological monitoring. It also could provide a rapidly scalable, noninvasive method for monitoring biological communities – especially important in areas like California's Marine Protected Areas where direct sampling of organisms can be ecologically disruptive.

To date, researchers' understanding of eDNA decay rates in marine environments remains extremely limited. Most studies of eDNA decay rates have focused on freshwater stream environments, which expose eDNA to a different set of environmental variables than in marine environments.

Researchers are working to build capacity to monitor marine life by analyzing the DNA that organisms shed into their environment – known as environmental DNA, or eDNA. The method has the potential to make it easier and more effective to conduct routine biological monitoring of fish like kelp bass, above, a popularly caught sport fish in Southern California.

During the study, researchers will work to build numerical models that predict marine eDNA decay rates under various environmental parameters, including different temperatures and nutrient regimes.

The California Cooperative Oceanic Fisheries Investigations (CalCOFI), a study partner, intends to immediately test-drive the models by conducting eDNA monitoring alongside CalCOFI's existing fish sampling efforts. The side-by-side comparison will help researchers evaluate model performance; it also will aid interpreting eDNA data, including improving abundance estimates and anticipating false negatives.

Also during the study, researchers will isotopically label DNA to identify the microbial communities responsible for degrading eDNA. Understanding which microbial communities are responsible will help researchers to better understand if faster eDNA decay rates are the result of a shift in microbial community population, an increase in metabolic activity, or a combination of both.

SCCWRP will use the study's insights to refine and optimize eDNA sampling protocols, ensuring eDNA monitoring methods are harmonized and standardized for routine use in marine monitoring programs.

For more information, contact Dr. Susanna Theroux.

Updates by Thematic Area

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

BIOASSESSMENT

Exploratory work launched to build integrated, multitrophic tool for scoring stream health

SCCWRP and its partners have begun exploring how to build a multitrophic index tool that integrates three lines of evidence about biological condition in wadeable streams to assess overall ecological health.

The exploratory work, which kicked off in June following two years of data compilation and analysis, is using advanced computational approaches to understand complex food-web relationships among bacterial, algal and benthic invertebrate communities.

Building this tool has the potential to explain at a more holistic, nuanced level how environmental stress alters the complexity and interconnectedness of stream food webs – insights that existing stream bioassessment tools do not provide.

As part of the exploratory work, researchers will be developing multiple prototype analysis tools, including ones that focus on bacterial metabolic pathways and biological network topologies.

ECOHYDROLOGY

Hydrologic modeling completed for stream vulnerability study in San Diego region

SCCWRP has developed a set of hydrologic models for the San Diego region to support an ongoing study documenting how changes in stream flow patterns in the coming years are expected to affect sensitive aquatic species and habitats.

The hydrologic models, which were completed in July, explain how climate change, future land-use changes and changing water management practices will change stream flow patterns across the San Diego region.

Researchers intend to couple the hydrologic models with species distribution models – currently under development – to assess the vulnerability of sensitive species like the endangered arroyo toad to the anticipated stream flow alterations.

Watershed managers will be able to use the insights as part of a risk decision framework for prioritizing which streams to protect and restore. The work builds off a similar 2019 environmental flows analysis in the Los Angeles region focusing on climate change impacts.

Beta version of stream flow classification tool developed for Great Plains region

SCCWRP and its partners have completed development of the beta version of a tool that can rapidly distinguish among perennial, intermittent and ephemeral streams in the U.S. Great Plains region, paving the way for its initial rollout across a region that spans the Great Lakes to central Texas.

The flow duration classification tool – described in a user manual released scheduled to be released in the coming weeks – uses a combination of biological

The Frio River in Texas is one of more than 400 sites that SCCWRP and its partners sampled as part of a project to develop a tool that can rapidly distinguish among perennial, intermittent and ephemeral streams in the U.S. Great Plains region, which includes parts of Texas. Similar versions of this tool already have been developed for the U.S. Arid West and Western Mountains regions.

and geomorphic lines of evidence to classify streams based on the duration of their surface flows.

The Streamflow Duration Assessment Method (SDAM) tool is a collaboration of SCCWRP, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers. SCCWRP previously developed versions of the SDAM for the Arid West and Western Mountains regions.

The SDAM tool is designed to support regulatory programs that require stream flow duration classifications, including a recent federal rule change that relies on stream flow duration to identify Waters of the United States. Ephemeral streams are water bodies that experience surface flows only after rain events, whereas intermittent streams experience sustained seasonal flows from snow melt and groundwater.

EUTROPHICATION

Recommendations developed for how to build capacity to monitor HABs at land-sea interface

SCCWRP and its partners have developed a set of best-practices recommendations for building capacity in California to monitor toxins produced by freshwater harmful algal blooms (HABs) that travel through inland waterways to the coastal zone, where they mix with marine algal toxins.

The recommendations, published in June by the journal *Integrated Environmental Assessment and Management*, call on California to coordinate monitoring across multiple jurisdictional boundaries, to deploy multiple types of sampling methods to optimize the insights gained through monitoring, and to monitor the toxins produced by both freshwater and marine HABs.

Researchers found that most HAB monitoring efforts to date have not accounted for hydrological connections in their monitoring strategies and designs, limiting managers' ability to truly understand and manage potential health risks for humans and animals. For example, deaths of sea otters have been linked to exposure to freshwater toxins that were transferred to the coastal zone.

The recommendations complement existing HABs management strategies developed by the State Water Resources Control Board that identify the land-to-sea interface as a priority area for monitoring and research, and encourage cross-agency coordination. Already, California has developed an interagency HABs illness working group to take a more coordinated, integrated approach to tracking illnesses linked to toxins produced by both freshwater and marine HABs.

CLIMATE CHANGE

Acidification modeling work probing influence of Mexican wastewater in coastal Southern California

A research team that has been modeling how ocean acidification and hypoxia (OAH) are expected to intensify in Southern California's coastal ocean in the coming years is moving into a new phase of the modeling investigation, where researchers will examine the relative contribution of Mexican vs. U.S. wastewater discharges in influencing seawater chemistry conditions.

The new phase, which began in early August, will examine the degree to which Mexican wastewater discharges – which enter U.S. waters via the Tijuana River watershed and coastal discharge sites south of the border – augment algal productivity and trigger declines in oxygen and pH levels.

The work will serve as a baseline from which recently announced binational investments aimed at improving Mexican wastewater infrastructure can be assessed for their anticipated effectiveness in improving coastal water quality.

The OAH modeling tools were originally developed by a team of West Coast researchers that includes SCCWRP to examine how OAH will alter coastal seawater chemistry in the coming years, including reducing the availability of dissolved oxygen and biologically important seawater minerals.

A field crew collects a water sample at a coastal site in Mexico where the San Antonio de Los Buenos wastewater treatment plant discharges primary-treated effluent into the ocean. Researchers have begun using computer modeling to examine how the nutrients in this wastewater can travel northward and influence ocean acidification and hypoxia conditions in Southern California's coastal ocean.

CONTAMINANTS OF EMERGING CONCERN

SOPs developed to enable laboratory accreditors to evaluate proficiency at measuring microplastics

SCCWRP has completed development of a set of standard operating procedures (SOPs) that will enable California's Environmental Laboratory Accreditation Program (ELAP) to evaluate laboratories' proficiency at measuring microplastics levels in drinking water.

The SOPs, finalized in May, consist of step-by-step instructions, checklists and evaluation criteria for assessing whether commercial and municipal laboratories can generate high-quality data using approved methods. ELAP intends to begin using the SOPs in the coming weeks.

SCCWRP introduced accreditation agencies and other stakeholders to the SOPs during a three-day workshop in April; feedback from attendees helped SCCWRP vet and refine the draft SOPs.

As early as this month, the State Water Resources Control Board could adopt a policy requiring drinking water agencies statewide to monitor microplastics in drinking water over a four-year period; the policy would make California the first entity in the world to enact a routine microplastics monitoring requirement for drinking water.

The development of standardized methods for measuring microplastics was originally called for in 2018 with passage of Senate Bill 1422.

MICROBIAL WATER QUALITY

Survey quantifies potential sources of fecal pollution in San Diego River from people experiencing homelessness

SCCWRP and its partners have completed a first-of-its-kind survey documenting the sanitary habits of people experiencing homelessness along the lower San Diego River – a key milestone in ongoing efforts to identify all major possible sources of fecal contamination in the highly urbanized watershed.

The survey, completed in May, estimated the size of the population, as well as what portion of this population uses the river as a toilet, defecates on the river bank only to get washed off during the next storm event, and/or uses offsite restrooms. The findings will be published this fall.

Researchers enrolled 63 people in the survey, which was conducted bimonthly from October 2021 to April 2022; researchers also conducted a census to count all of the individuals living in or near the San Diego River corridor and its tributaries.

The study represents one of multiple ongoing, SCCWRP-led investigations probing various potential sources of fecal contamination to the San Diego River watershed; researchers are also investigating potential contributions from sanitary sewers, private sewer lateral lines and septic tanks during both wet and dry weather.

SCCWRP's Sydney Dial, left, demonstrates how to prepare drinking water samples to measure microplastics contamination during a three-day microplastics training workshop in April that was organized by SCCWRP. SCCWRP used feedback from attendees to vet and refine a set of standard operating procedures (SOPs) that will enable California's Environmental Laboratory Accreditation Program (ELAP) to evaluate laboratories' proficiency at measuring microplastics levels in drinking water.

STORMWATER BMPs

Updated guidance developed for installing, maintaining permeable pavement

SCCWRP and its partners have developed updated best-practices guidance for how to site and maintain permeable pavement to sustain its effectiveness for infiltrating stormwater runoff.

The updated guidance, developed in July for the Ventura County Department of Public Works, explains how catchment conditions influence maintenance regimes, how to measure and track where maintenance is needed, and how to perform routine and restorative maintenance. This guidance is widely applicable across Southern California and beyond, although it does not consider snow- and freeze-thaw-related considerations.

The original "one-stop shop" guidance for permeable pavement was published in 2015 by the American Society of Civil Engineers (ASCE). The updated guidance is expected to help inform future updates to ASCE's guidance.

Ventura County intends to use the guidance to manage existing permeable pavement, as well as plan for future installations, including supporting contracts for maintenance crews. It will be published in a forthcoming SCCWRP technical report.

Participants of the Southern California Bight 2018 Regional Monitoring Program attend the program's all-day kickoff meeting at SCCWRP in 2017. The Bight '23 kickoff meeting will be held September 22, 2022 at SCCWRP.

REGIONAL MONITORING

Bight '23 to be scoped out during September 22 kickoff meeting at SCCWRP

Participants of the Southern California Bight Regional Monitoring Program will begin making decisions about which study elements the program will tackle and which management questions the program will answer during an all-day Bight '23 kickoff meeting on September 22, 2022.

The in-person meeting, hosted by SCCWRP and open to anyone interested in contributing to the program's 2023 monitoring cycle, will shape how dozens of participants work collaboratively over the next five years to probe different aspects of coastal ecosystem health across Southern California.

RSVSPs are requested by September 12 to SCCWRP's Christina Rivas. For information about Bight '23, and to inquire about a remote broadcast option, contact Dr. Karen McLaughlin.

Bight '18, which is winding down, consisted of five study elements: Sediment Quality, Ocean Acidification, Harmful Algal Blooms, Trash and Microbiology. Final assessment reports are available on SCCWRP's website.

New SCCWRP Publications

Journal Articles

Biggs, T., A. Zeigler, K.T. Taniguchi-Quan. 2022. Runoff and sediment loads in the Tijuana River: Dam effects, extreme events, and change during urbanization. *Journal of Hydrology: Regional Studies* 42:101162.

Coffin, S., H. Bouwmeester, S. Brander, P. Damdimopoulou, T. Gouin, L. Hermabessiere, E. Khan, A. A. Koelmans, C.L. Lemieux, K. Teerds, M. Wagner, S.B. Weisberg, S. Wright. 2022. Development and application of a health-based framework for informing regulatory action in relation to exposure of microplastic particles in California drinking water. *Microplastics and Nanoplastics* 2:1-30.

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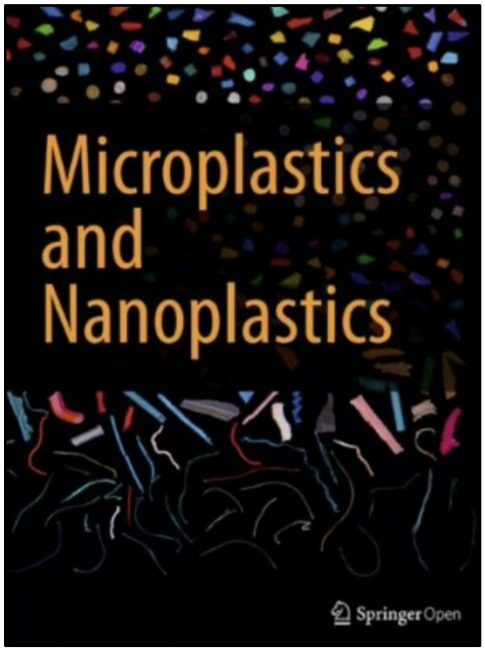
Jenkins, T., B.D. Persaud, W. Cowger, K. Szigeti, D.G. Roche, E. Clary, S. Slowinski, B. Lei, A. Abeynayaka, E.S. Nyadjro, T. Maes, L. Thornton Hampton, M. Bergmann, J. Aherne, S.A. Mason, J.F. Honek, F. Rezanezhad, A. Lusher, A. Booth, R.D.L. Smith, P. Van Cappellen. 2022. Current State of Microplastic Pollution Research Data: Trends in Availability and Sources of Open Data. *Frontiers in Environmental Science* 10.

Maruya, K.A., W. Lao, D.R. Vandervort, R. Fadness, M. Lyons, A.C. Mehinto. 2022. Bioanalytical and chemical-specific screening of contaminants of concern in three California (USA) watersheds. *Heliyon* 8:e09534.

Mazor, R.D., M. Sutula, S. Theroux, M. Beck, P.R. Ode. 2022. Eutrophication thresholds associated with the protection of biological integrity in California wadeable streams. *Ecological Indicators* DOI:10.1016/j.ecolind.2022.109180.

Mehinto, A.C., S. Coffin, A.A. Koelmans, S.M. Brander, M. Wagner, L.M. Thornton Hampton, A.G. Burton, E. Miller, T. Gouin, S.B. Weisberg, C.M. Rochman. 2022. Risk-based management framework for microplastics in aquatic ecosystems. *Microplastics and Nanoplastics* 2:17.



A newly published special issue of the journal *Microplastics and Nanoplastics* summarizes an initial set of scientific products and health thresholds that could form the technical underpinnings for how California protects aquatic life and humans from exposure to microplastics pollution. SCCWRP co-authored eight of the 10 articles in the special issue and served as the lead guest editor.

Murphy, B.M., K. Russell, C.C. Stillwell, R. Hawley, M. Scoggins, K.G. Hopkins, M.J. Burns, K.T. Taniguchi-Quan, K.H. Macneal, R. Smith. 2022. Closing the gap on wicked urban stream restoration problems: A framework to integrate science and community values. *Freshwater Science* 41:3.

Ollison, G.A., S.K. Hu, J.V. Hopper, B.P. Stewart, J. Smith, J.L. Beatty, L.K. Rink, D.A. Caron. 2022. Daily dynamics of contrasting spring algal blooms in Santa Monica Bay (central Southern California Bight). *Environmental Microbiology* 2022:1-19.

Thornton Hampton, L.M., H. Bouwmeester, S.M. Brander, S. Coffin, M. Cole, L. Hermabessiere, A.C. Mehinto, E. Miller, C.M. Rochman, S.B. Weisberg. 2022. Research recommendations to better understand the potential health impacts of microplastics to humans and aquatic ecosystems. *Microplastics and Nanoplastics* 2:18.

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Zimmer-Faust, A.G., J.F. Griffith, J.A. Steele, L. Asato, T. Chiem, S. Choi, A. Diaz, J. Guzman, M. Padilla, J. Quach-Cu, V. Ruiz, B. Santos, M. Woo, S.B. Weisberg. 2022. Assessing cross-laboratory performance for quantifying coliphage using EPA Method 1642. *Journal of Applied Microbiology* 00:1-9.

Journal Articles (Accepted)

Howard, M., J. Smith, D. Caron, R. Kudela, K. Loftin, K. Hayashi, R. Fadness, S. Fricke, J. Kann, M.Roethler, A. Tatters, S. Theroux. In press. Integrative Monitoring Strategy for Marine and Freshwater Harmful Algal Blooms and Toxins Across the Freshwater-to-Marine Continuum. *Integrated Environmental Assessment and Management.*

Thornton Hampton, L.M., S.M. Brander, S. Coffin, M. Cole, L. Hermabessiere, A.A. Koelmans, C. Rochman. In press. Characterizing microplastic hazards: Which concentration metrics and particle characteristics are most informative for understanding toxicity in aquatic organisms? *Microplastics and Nanoplastics.*

Technical Reports

A.B. Chartrand, K.R. Hackney, D.L. Valentine, E. Hoh, N.G. Dodder, M.E. Stack, J.M. Cossaboon, J.C. McWilliams, F. Kessouri, P. Damien. 2022. Updating and Reviewing Research on Continuing Ecological Effects of Deepwater Ocean Dumping of DDT Wastes into the Southern California Bight. Tides Foundation. San Francisco, CA.

Florea, K., B. Stewart, E. Webb, D.A. Caron, J. Smith. 2022. Environmental Drivers of Cyanobacterial Harmful Algal Blooms and Cyanotoxins in Clear Lake: 2020-2021. Technical Report 1261. Southern California Coastal Water Research Project. Costa Mesa, CA.

McLaughlin, K., R.D. Mazor, K.C. Schiff, L.M. Thornton Hampton. 2022. Southern California Bight 2018 Regional Monitoring Program: Volume IX. Trash and Marine Debris. Technical Report 1263. Southern California Coastal Water Research Project. Costa Mesa, CA.

Sutula, M., J. Butcher, S. Sarkar, S. Roy. 2022. Science Supporting Decisions on Management of Eutrophication in Elkhorn Slough Estuary. Technical Report 1259. Southern California Coastal Water Research Project. Costa Mesa, CA.

Sutula, M., J. Butcher, M. Schmidt, C. Boschen, R.D. Mazor, D.J. Gillett, K.T. Taniguchi-Quan, K. Irving, D. Shultz. 2022. Science Supporting Decisions on Biostimulatory Targets and Management of Eutrophication in the Main Stem of the Santa Margarita River. Technical Report 1185. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Busch, M.H., K. Boersma, S. Cook, C. Loflen, R.D. Mazor, R. Stancheva, M.A. Zimmer, A. Price, M.N. Jones, D. Allen, J. Hammond. Connecting macroinvertebate and algae communities across variations in river drying regimes. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Debasitis, E., J.R. Olson, R.D. Mazor, J. Walker. Estimating natural background water quality in California Rivers. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Gillett, D.J., R.D. Mazor, A. Holt, R. Butler, S. Johnson. Creating a rapid causal assessment dashboard to inform the management of California's streams. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Grantham, T.E., E.D. Stein, J. Zimmerman, S.M. Yarnell, B. Stanford, B., Lane, K.T. Taniguchi-Quan, A. Obester, R.A. Lusardi, S. Sandoval-Solis. Progress and challenges in implementing the California Environmental Flows Framework. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Irving, K., K. Taniguchi-Quan, E. Stein, J. Rogers, R.D. Mazor. Hybrid species distribution models inform flow management in a world of water scarcity. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Mazor, R., M. Sutula, J. Smith. Public workshop on biostimulatory science. California Water Boards. July 14, 2022. Via webinar.

Siu, J., E.D. Stein, J. Brown. Shifting Paradigms Need Innovative CWA Regulatory Initiatives - Rethinking Wetland Type Conversion. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Stein, E.D., J. Brown Prioritizing Stream Protection, Restoration and Management Actions Using Landscape Modeling and Spatial Analysis. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Taniguchi-Quan, K.T., K. Irving, E.D. Stein, A. Poresky, R.A. Wildman, A. Aprahamian, C. Rivers, G. Sharp, S. Yarnell, J.R. Feldman. Developing Ecological Flow Needs in an Altered Region: Application of California Environmental Flows Framework in Southern California, USA. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Theroux, S. Ready or Not: DNA Method Readiness for Environmental Management Applications. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Thornton Hampton, L.M. California microplastics health effects workshop: Informing management strategies for the aquatic environment. Southern California Academy of Sciences Annual Meeting. May 6, 2022. Fullerton, CA.

Von Mayrhauser, M., R.D. Mazor, T. Grantham, A. Ruhi. Wastewater effluent and novel riverine ecosystems in coastal Southern California. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Walker, J.B., E.D. Stein, K. O'Connor, R. Clark. Modular Monitoring Framework to Assess Performance of Coastal Wetland Management. Joint Aquatic Sciences Meeting. May 14-20, 2022. Grand Rapids, MI.

Wong, C.S. Spectroscopy-based methods for microplastics analysis in drinking water for regulatory purposes. Society for Applied Spectroscopy, the Coblentz Society, and *Spectroscopy* Molecular Spectroscopy in Practice Symposium. July 28, 2022. Via webinar.

Other Presentations

Gillett, D. Biostimulatory science for estuaries. Water Boards TMDL Round Table. April 28, 2022. Via webinar.

Kessouri, F., K. McLaughlin. Regional Monitoring supports numerical modeling in the Southern California Bight (poster).

California Ocean Observing Systems Science Impact and Stakeholder Engagement Meeting. May 23-25, 2022. Avila Beach, CA.

McWilliams, J., P. Damien, F. Kessouri. Circulation and Dispersal in California's Borderland Basins.. University of California, Santa Barbara California Coastal Chloro-Contamination Workshop. May 17, 2022. Santa Barbara, CA.

Mazor, R. Training on the Streamflow duration assessment method for the Great Plains. July 20, 2022. Via webinar.

Mazor, R., D. Gillett. Statewide and watershed biostimulatory science for wadeable streams. Water Boards TMDL Round Table. April 28, 2022. Via webinar.

Schiff, K. San Diego River Investigative Order Status Report. San Diego Regional Water Quality Control Board. May 11, 2022. San Diego, CA.

Schiff, K. Adaptive Watershed Management Monitoring Guidance. Stormwater Roundtable. State Water Resources Control Board. June 16, 2022. Via webinar.

Schiff, K. DDT Research Needs. University of California Sea Grant. July 18-19, 2022. Via webinar.

Smith, J., Deming, A., Hoard, V., Berndt, M., Shultz, D., Cram. J. Linking Regional Monitoring Observations to Domoic Acid Related Marine Mammal Stranding Events in Southern California. California Ocean Observing Systems Science Impact and Stakeholder Engagement Meeting. May 23-25, 2022. Via webinar.

Smith, J. Harmful algal blooms (session moderator). California Ocean Observing Systems Science Impact and Stakeholder Engagement Meeting. May 23-25, 2022. Avila Beach, CA.

Sutula, M. Ingredients to a Solution: Addressing Climate Change and Coastal Eutrophication Stress on Nearshore Ecosystems in the Southern California Bight (keynote address). Puget Sound Institute Workshop on Science Supporting Nutrient Management. July 26, 2022. Via webinar.

Sutula, M., J. Smith. Science Tools to Address Eutrophication in California Lakes and Reservoirs. CCHAB Quarterly Meeting. July 27, 2022. Via webinar.

Sutula, M. Overview of Science Supporting Water Board's Biostimulation, Cyanotoxins, and Biological Condition Provisions. Water Board Staff Public Workshop. July 14, 2022. Via webinar.

Sutula M. Biostimulatory Stress-Response Models for California Lakes and Reservoirs. Water Board Staff Public Workshop. July 14, 2022. Via webinar.
Taniguchi-Quan, K. Use of remote sensing and geospatial technologies for water resource management. Colorado Mountain College. May 3, 2022. Via webinar.

Thornton Hampton, L.M. Microplastic Hazard Characterization. Microfibre Consortium. July 27, 2022. Via webinar.

Thornton Hampton, L.M. Recommendations for Microplastic Toxicity Testing and Hazard Characterization. Society of Environmental Toxicology and Chemistry Webinar Series. July 18, 2022. Via webinar.

SCCWRP Personnel Notes

Commission and CTAG

Grant Sharp, Manager for the South OC Watershed Management Area for Orange County Public Works, was named an Alternate Commissioner and CTAG Representative in June, replacing Chris Crompton, who retired after serving on the Commission for 14 years and on CTAG for 17 years.

Dr. **Eric Dubinsky,** Life Scientist for the U.S. Environmental Protection Agency, Region 9, was named a CTAG Representative in July, replacing Terry Fleming, who retired after serving on CTAG for 25 years.

New Faces

Rachel Darling, who just completed her M.S. in marine biology at the University of California, San Diego, joined SCCWRP in July as a Research Technician in the Biology Department.

Adriana Le Compte, who just completed a term position as Project Coordination Fellow for NASA's DEVELOP Program, will join SCCWRP in mid-August as a Research Technician in the Biology Department. She holds a B.S. in environmental science from Iowa State University.

Promotions

Paul Smith, who has worked at SCCWRP for 23 years, most recently as SCCWRP's Network Administrator, was promoted in July to Information Systems Manager.

Scientific Leadership

Dr. **Eric Stein** has been appointed to the Environmental Advisory Board of the U.S. Army Corps of Engineers.

Dr. **Jan Walker** has been elected to the executive board of the California Estuarine Research Society (CAERS) as Membership Coordinator.

Dr. **Jayme Smith** has been appointed co-chair of the California Cyanobacterial and Harmful Algal Bloom (CCHAB) Network.

Dr. **Leah Thornton Hampton** has been appointed to a scientific advisory panel for the California Department of Transportation (CalTrans) to address microplastics from thermoplastic stripe and markings.

Dr. **Leah Thornton Hampton** has been appointed to the Ph.D. committee of Rashidat Jimoh at Texas Christian University.

Dr. **Christina Frieder** has been appointed to the Ph.D. committee of Allison Rugila at Stony Brook University.

Dr. **Kris Taniguchi-Quan,** who has worked as a Scientist in the Biology Department since 2018, was promoted in July to Senior Scientist.

Dr. **Christina Frieder,** who has worked as a Scientist in the Biogeochemistry Department since 2021, was promoted in July to Senior Scientist.

Dr. **Wayne Lao,** who has worked as a Research Technician in the Chemistry Department since 2006, was promoted in July to Research Coordinator.

Dana Schultz, who has worked at SCCWRP since 2018, most recently as a Senior Research Technician in the Biogeochemistry Department, was promoted in July to Research Coordinator.

Kelcey Chung, who has worked at SCCWRP since 2019, most recently as a Research Technician in the Biogeochemistry Department, was promoted in July to Senior Research Technician.

Robert Butler, who has worked at SCCWRP since 2018, most recently as a Senior Research Technician on the IT team, was promoted in July to Programmer.

Dana Briggs, who has worked as a part-time Laboratory Assistant in the Toxicology Department since September, was promoted in June to a full-time Research Technician. She recently graduated from the University of California, Irvine with a master's in conservation and restoration science.

Cody Fees, who has worked as a part-time Laboratory Assistant in the Biology Department since 2016, has been promoted to a full-time Research Technician working on SCCWRP's stormwater BMPs research, and will start in September. He recently graduated from California State University, Long Beach with a M.S. in biology.

Duy Nguyen, who worked on SCCWRP's IT team from 2019 to 2021, most recently as a Research Technician, returned to SCCWRP in July as a Data Analyst.

Kayla Raygoza, who has worked as a part-time Laboratory Assistant in the Microbiology Department since January, was promoted in June to a full-time Research Technician. She recently graduated from California State University, Long Beach with a B.S. in microbiology.

Departures

Dr. **Amy Zimmer-Faust**, who has worked as a Senior Scientist in the Microbiology Department since 2018, left SCCWRP in July to relocate to Arizona for another job opportunity.

Emily Darin, who has worked at SCCWRP since 2020, most recently as a Research Technician in the Toxicology Department, left SCCWRP in May to enroll in a joint Ph.D. program at the University of California, San Diego and San Diego State University.

Kristine Gesulga, who has worked at SCCWRP since 2019, most recently as a Research Technician in the Biology Department, left SCCWRP in July to enroll in a master's program at the University of Hamburg in Germany.

Anne Holt, who has worked at SCCWRP since 2019, most recently as a Research Technician in the Biology Department, left SCCWRP in May to enroll in a master's program at San Diego State University.

SCCWRP COMMISSIONER SPOTLIGHT

Deputy director focuses on customer experience

If there's one principle that Keith Lilley uses to guide and shape all of his work, it's looking at everything through the lens of the customer experience.

Keith Lilley

Lilley wants residents and businesses to have positive experiences not just when they initiate interactions with the Los Angeles County Department of Public Works, but also when they encounter his staff in the field or when their neighborhoods are affected by the agency's work.

"Our goal is to be the most trusted agency in the region," said Lilley, the agency's Deputy Director for Water Resources. "We need to earn that trust, so residents know that they can trust us to build projects in their neighborhoods, and to spend their money so wisely that they're willing to tax themselves to fund additional work."

Lilley, who was appointed head of the Water Resources Core Service Area in February, oversees a $370 million annual budget and about 750 employees across five divisions, including planning, engineering, operations and maintenance for the L.A. County Flood Control District. He also oversees the Safe, Clean Water Program, a $289 million annual program funded through a voter-approved County parcel tax, and the County's Waterworks Districts.

On the SCCWRP Commission, Lilley has replaced Daniel Lafferty; Lafferty served on the Commission for three years before retiring from the County.

One of Lilley's first priorities since starting his new job has been working to infuse the Water Resources strategic plan with a vision to provide all Los Angeles County residents with safe, clean and reliable water resources, incliuding a stronger focus on the customer experience and figuring out how to measure the customer experience via quantifiable metrics.

Keith Lilley enjoys a walk with wife Mariko during a 2021 trip to Sycamore Mineral Springs on California's Central Coast.

Keith Lilley, P.E.

Job: Deputy Director, Water Resources, Los Angeles County Department of Public Works (started March 2022)

SCCWRP role: Commissioner

Prior jobs: 33 years at LAC-DPW: Deputy Director, Environmental Services (2021-2022); Assistant Deputy Director (2018-2021); Principal Engineer (2011-2018); Senior Civil Engineer (1999-2011); Civil Engineering Assistant/Civil Engineer (1989-1999)

Education: B.S. civil engineering, Louisiana State University (1989); Certification in Engineering Management for Construction, University of California, Los Angeles (1997)

Residence: Pasadena

Family: Wife Mariko, a retired marketing director

Hometown: Torrance

Hobbies: Snowboarding; international travel; bike riding; cooking

Lilley has spent all 33 years of his career with L.A. County Public Works – and all but three of them in the Water Resources Core Service Area he now leads. Lilley loves the breadth of challenges associated with hydrology and hydraulic engineering; he particularly enjoys identifying balanced solutions that guard against flooding while simultaneously protecting runoff water quality and downstream habitats.

A native of Torrance, Lilley relocated with his family at age 10 to Louisiana and attended Louisiana State University. As he was preparing to graduate from LSU in 1989 with a civil engineering degree, L.A. County Public Works happened to be conducting on-campus interviews at LSU. Lilley, who received a job offer, jumped at the opportunity to return to his native Southern California. He's never looked back since.

Throughout his career, Lilley has been peripherally aware of SCCWRP, coming to know the organization as "the well-respected water scientists." Lilley looks forward to being even more engaged as a Commissioner.

"SCWRP is an important forum for candid discussions on how science impacts regulations, and how regulations impact our agency – and thus for making the connection between regulations and our customers," Lilley said.

When he's not working, Lilley is an avid snowboarder; he makes annual trips to Park City, Utah, and Whistler in British Columbia.

CTAG SPOTLIGHT

Scientist motivated to tell stories using data

For Joshua Westfall, one of the best parts of his job at the Sanitation Districts of Los Angeles County (LACSD) is figuring out how to tell compelling stories with data.

Joshua Westfall

He loves mining old data sets to gain new insights about how environmental conditions have changed over time, and developing novel ways to collect data that enable his agency to tell new types of stories.

"We don't like the idea of doing the bare minimum when it comes to data collection and reporting," said Westfall, a Senior Environmental Scientist who works mostly on LACSD's ocean outfall and stream monitoring programs. "We like to be able to tell people the stories behind the data."

Westfall, who has worked for LACSD for 19 years, was appointed to CTAG in February, replacing Philip Markle. Markle, who retired, served on CTAG for 4-1/2 years, including as CTAG Chair.

One particularly exciting, data-driven story that Westfall and his colleagues are working to tell is how the waste streams from LACSD's multiple treatment plants contain unique chemical signatures that differentiate each plant's wastewater from the others. Early results from this ongoing study are promising, Westfall said, paving the way to tell stories about specific treatment plants and how they are or aren't contributing to observed biological changes in downstream environments.

Significantly, Westfall's chemical "fingerprinting" project is inspired by a 2019 study co-authored by SCCWRP that showed that this analytical technique can be used to help pinpoint specific chemicals as the cause of observed toxicity in complex environmental mixtures – including a chemical from vehicle tires found to be responsible for mass deaths of coho salmon in the Pacific Northwest.

Joshua Westfall, right, attends an Angels baseball game in Anaheim in July with wife Danielle and sons Dominic, left, and Anthony.

Joshua Westfall, B.C.E.S.

Job: Senior Environmental Scientist, Sanitation Districts of Los Angeles County (LACSD)

SCCWRP role: CTAG Representative (started February 2022)

Prior jobs: 19 years with LACSD: Environmental Scientist (2016-2022), Project Engineer (2015-2016), Senior Biologist (2011-2015), Biologist (2006-2011), Laboratory Technician (2003-2006); Staff Research Associate, Tahoe Research Group/UC Davis Limnology Laboratory (2002-2003)

Education: M.S. civil engineering, Loyola Marymount University (2011); B.S. environmental policy analysis and planning, University of California, Davis (2002)

Residence: Huntington Beach

Family: Wife Danielle, a healthcare staffing executive; two sons, Dominic, 11, and Anthony, 7; two mixed-breed dogs

Hometown: Redding, California

Hobbies: Watching his sons play soccer and baseball; jogging to the beach

"I love interacting with SCCWRP because it helps build confidence in the work I'm doing," Westfall said. "I'm able to stand up in front of true experts in the field and know that I have something to share."

What Westfall loves most about working for LACSD is the opportunity to do work that perfectly blends science and engineering. He's mostly worked as a biologist and toxicologist at LACSD, but also has held a Project Engineer job title.

"At my agency, none of these jobs are as different as they sound," said Westfall, who holds a bachelor's in environmental policy analysis and planning and a master's in civil engineering.

Westfall grew up in Redding, California and has long been intrigued by the physics and water quality of streams. After college, Westfall worked for two years at a UC Davis limnology laboratory before relocating with his wife, Danielle, to Southern California.

Westfall spends much of his free time attending his two young sons' soccer and baseball games.

SCCWRP PARTNER SPOTLIGHT

SCCWRP's approach bolsters Baja CA research

When Dr. Julio Lorda began interacting with SCCWRP as a postdoc at the Tijuana River National Estuarine Research Reserve, it was an eye-opening experience.

Dr. Julio Lorda

SCCWRP's adeptness at connecting science to management fascinated Lorda. Through his interactions with SCCWRP, he saw how he could leverage his career in academia to advance his management-oriented goals for Baja California.

"Working with SCCWRP helped me figure out how to connect science to management in Baja California," said Lorda, a Biology Professor at the Universidad Autónoma de Baja California in Ensenada, Mexico. "It's so important to me to be doing science that helps enhance, preserve and recover our natural resources."

Lorda, who completed his postdoc in 2016 and is now a tenure-track professor, focuses his work on documenting how coastal aquatic organisms interact with their environment, so that scientists can build a comprehensive understanding of changes and threats to Southern California Bight coastal ecosystems over time, especially stemming from climate change.

Most recently, Lorda has been collaborating with SCCWRP to assess the health of coastal estuaries in Baja California using a SCCWRP-developed estuarine monitoring framework developed for California. Researchers hope that the more pristine condition of Baja California estuaries can provide additional points of comparison and insights for evaluating the health of Southern California estuaries.

"It will give us a good idea of what Southern California's wetlands will face with tropicalization – warm-water species moving north in response to climate change," Lorda said.

Dr. Julio Lorda enjoys the views of Baja California's remote coastline with, from left, sons Sebastian and Joaquin and wife Sarah in December.

Julio Lorda, Ph.D.

Job: Biology Professor, Universidad Autónoma de Baja California (started 2016)

SCCWRP role: Research partner on biological assessments of coastal wetlands in Southern California and Baja California

Prior jobs: Postdoctoral Researcher, Tijuana River National Estuarine Research Reserve (2013-2016); Research Technician, Smithsonian Environmental Research Center (2001-2003)

Education: Ph.D. ecology, evolution and marine biology, University of California, Santa Barbara (2014); B.S. biology, Universidad de Guadalajara (2002)

Residence: Ensenada, Mexico

Hometown: Mexico City

Family: Wife Sarah, a marine biologist and health coach; children Sebastian, 7, and Joaquin, 5; two dogs, three cats and 10 chickens

Hobbies: Running, surfing, reading, hanging out with friends

At the Universidad Autónoma de Baja California, Lorda co-founded a research consortium known as Managing Ecosystems Across the Californias (MexCal) that is working to develop environmental monitoring and management programs in the Baja California area. Lorda's teaching duties include community ecology and invertebrate zoology, mostly for undergraduate biology majors.

Lorda has been passionate about the ocean since childhood. Although he grew up in Mexico City, he spent lengthy family vacations visiting his grandmother in coastal Mazatlán, where he could walk to the beach.

Lorda first came to the U.S. in 2001 to intern at the Smithsonian Environmental Research Center in Maryland, where he studied invasive marine species. The internship turned into a full-time Research Technician job, where Lorda stayed until he started grad school at UC Santa Barbara.

During his postdoc at the Tijuana River National Estuarine Research Reserve, Lorda worked with SCCWRP and other partners to document the dramatic physical and ecological changes that the Tijuana River valley has undergone as a result of human development. The project helped inform management and restoration plans for the Tijuana River valley.

When he's not working, Lorda enjoys being outdoors, primarily running, surfing and exploring the remote coastal ecosystems of Baja California. His favorite surfing spot is San Miguel just north of his home in Ensenada.

SCCWRP STAFF SPOTLIGHT

Biologist uses eDNA to study ecosystem health

A marine biologist by training, Dr. Zachary Gold has spent countless hours and days manually identifying and counting aquatic organisms to gain insights into ecosystem condition and functioning.

Dr. Zachary Gold

That's why Gold knows firsthand how painstakingly slow this work can be – and why he devoted the past seven years of his life to finding a better way.

Gold's Ph.D. and postdoc, which he just wrapped up this spring, revolved around exploring how to use environmental DNA – the DNA that aquatic organisms shed into their environment – to identify what marine life are present at a site and in what quantities. eDNA is a nascent but rapidly growing field of study.

"It's really hard to survey the oceans to get this information, so eDNA gets me really excited – it's like remote sensing for biodiversity," said Gold, who started in May as a joint Scientist in SCCWRP's Biology Department and at the Scripps Institution of Oceanography.

Today, Gold is continuing to work toward developing eDNA as a tool for routine aquatic monitoring. At Scripps, he works closely with the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program – which is co-run by Scripps, the NOAA Southwest Fisheries Science Center, and the California Department of Fish and Wildlife – to explore how to infuse eDNA-based monitoring into CalCOFI's fisheries monitoring and other marine monitoring efforts.

Dr. Zachary Gold backpacks through Olympic National Park in Washington in April. His 30-mile journey included encounters with otters, bears, sea stars and bald eagles.

Zachary Gold, Ph.D.

Job: Scientist, SCCWRP Biology Department and Scripps Institution of Oceanography (started May 2022)

Prior jobs: Postdoctoral Scholar, Northwest Fisheries Science Center in Seattle (2020-2022); California State Ocean Lifeguard (2011-2013)

Education: Ph.D. ecology and evolutionary biology, University of California, Los Angeles (2020); B.S. marine biology, Stanford University (2015)

Residence: San Diego

Hometown: Santa Monica

Hobbies: Surfing; ocean swimming; underwater photography; backpacking; biking

Gold is simultaneously working with SCCWRP to advance eDNA methods on both the marine and freshwater sides – a strategic SCCWRP priority.

"This is such a cool opportunity to do applied science that's directly informing management and conservation," Gold said. "eDNA can be such a useful tool, and I get to help make this tool work better."

Gold has been interacting with SCCWRP since the first year of his Ph.D. program at UCLA, where he focused on developing eDNA methods for monitoring Southern California's Marine Protected Areas (MPAs). During his postdoc at the Northwest Fisheries Science Center in Seattle, Gold joined the California Molecular Methods Workgroup that SCCWRP chairs.

Gold, the son of SCCWRP Commissioner Mark Gold, grew up in Santa Monica frequenting the beach and has been fascinated by marine life since he was a young child.

In high school, he got involved in volunteer and advocacy work to protect beach and coastal ocean health. Later, he completed an undergraduate thesis project at Stanford University examining the effects of coral bleaching.

Now Gold lives in San Diego's Pacific Beach neighborhood and bikes to work at Scripps. He takes the train to Orange County to work at SCCWRP about once a week, biking to and from the nearest train station.

When he's not working, Gold is an avid surfer and ocean swimmer. He keeps his surfboard in his office in La Jolla, enabling him to start most of his weekdays by surfing off Scripps Pier.

SCCWRP SCENES

Comparing engineered media side by side

SCCWRP has constructed a flow-through column apparatus to study how different types of engineered media in bioretention and biofiltration systems affect the rates at which runoff flows through them. The setup, constructed in July at SCCWRP, allows researchers to place different combinations of engineered media in each of six clear columns, then add water to the top of the column and measure how quickly the water flows through the media and out the bottom end of the column. The configuration and scale of the setup is designed to mimic conditions at a real bioretention system in Riverside County, where researchers are studying how the design of stormwater BMPs influences treatment performance. Traditionally, side-by-side testing with different types of engineered media is done on a smaller scale with laboratory equipment and does not accurately reflect real-world conditions.

Clockwise from top left: SCCWRP's Cody Fees collects runoff as it filters through a column filled with 18 inches of engineered media; paired float switches in one of the columns monitor how quickly ponded water on top of the engineered media filters through it; SCCWRP's Dr. Elizabeth Fassman-Beck inspects water levels at the top of the columns; and runoff that has filtered through engineered media in one of the columns is collected from the bottom end to calculate flow rate.