SCCWRP Director's Report

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FALL 2020 ISSUE

Effort launched to quantify microfracture leaks in sewers

SCCWRP has partnered with the County of San Diego to explore how to accurately detect potential microfracture leaks in underground sewer pipes – the latest step in an ongoing, multi-year effort to identify the origins of widespread human fecal contamination in the region's waterways in wet weather.

The experimental field test, which kicked off in August in El Cajon, involves pumping a known volume of water at a controlled rate through an isolated section of sewer pipe, then recovering the water using a vacuum pump and looking for a difference in the volume of water pumped in vs. recovered.

Researchers' goal is to develop a novel, field-based method for reliably and precisely detecting potential, relatively small leaks across a given section of underground pipe. Sanitation agencies, which run robust pipe inspection programs for detecting and preempting raw-sewage spills, rely on cameras and other tools that are not necessarily optimized to detect microfracture leaks.

Development of this leak detection method is part of an ongoing, multi-year study that kicked off in 2018 to determine if fecal contamination – which is widespread during wet weather in rivers, creeks and stormwater conveyances that discharge to the coastal zone – is coming from leaky public sewer systems, from defects in privately maintained sewer lateral lines and septic systems, and/or from humans depositing raw fecal material directly into waterways.

Researchers also are examining whether the microbial community that grows inside sanitary sewer pipes – known as biofilm – is unique to the pipes, which could enable researchers to trace human fecal contamination found in waterways back to specific areas or types of sanitation infrastructure.

The leak detection method was originally developed by SCCWRP in early 2020 using an above-ground, custom-built experimental system. Researchers constructed a 20-foot-long sewer pipe with ultrasonic flow meters at either end,

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Cover photo: A vacuum-powered sampling device is inserted through a manhole into an underground sewer pipe in San Diego County to collect water that has just been pumped through a 291-foot-long section of pipe. Researchers are working to develop a precise, accurate method for detecting potential microfracture leaks in underground sewer pipes.

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Calendar

Thursday, November 5
CTAG quarterly meeting
(Remote participation only)

Friday, December 4
Commission meeting
(Remote participation only)

then pumped clean water through the pipe at various controlled flow rates. Upon reaching the end of the pipe, the water was pumped into a tank to measure its volume.

After trial-and-error testing and calibration, researchers were able to reliably and precisely measure water volume at both ends of the above-ground system.

If the leak detection method can be shown to work in the field, researchers' long-term goal is to use the method to estimate the total potential contribution of sewer leakage, or exfiltration, to fecal contamination across the San Diego River watershed. Pipe microfractures, if present across thousands of miles of underground sanitation infrastructure, have the potential to add up to a significant fecal contamination source.

Sanitation agencies, meanwhile, could begin using the leak detection method to test sections of sanitation infrastructure for microfractures. This infrastructure could be prioritized for testing based on factors like age, construction material, repair history, flow rate and proximity to stormwater conveyances.

Researchers have previously calculated theoretical exfiltration rates for sanitation infrastructure by developing models that weigh factors like pipe age and visible flaws and cracks in pipes. But no one has directly measured sewer leakage across actual sections of underground pipes under typical flowing conditions.

SCCWRP works with staff from the San Diego County Department of Public Works and others to recover water from a sewer manhole in August for a study aiming to develop a method for detecting potential microfracture leaks in underground sanitation infrastructure. Clean water was pumped into a sewer pipe 291 feet upstream of this site at a controlled flow rate, then collected in a tank at this site to look for differences in the water volume pumped in vs. recovered.

As the field work progresses, researchers also plan to introduce tracers, such as dyes of harmless salts, into the water to confirm exfiltration. If water is escaping from a sewer pipe and reaching a storm drain, the tracer should be detectable in adjacent stormwater conveyances.

For more information, contact Dr. Joshua Steele.

Proposed statewide strategy developed to boost capacity for monitoring freshwater HABs

SCCWRP and the State Water Board have developed a proposed statewide strategy for boosting California's capacity to monitor the growing threat posed by harmful algal blooms (HABs) in California freshwater environments.

The freshwater HABs monitoring strategy – scheduled to be released in draft form for public comment by mid-January – offers a long-term vision for how California environmental managers should prioritize strategic, cost-effective investments in HABs monitoring to better protect human and ecosystem health. The document is expected to be finalized following a 30-day public comment period.

Many of the monitoring strategy recommendations, including developing a statewide HABs monitoring partner network, are intended to complement and build off existing freshwater HABs monitoring efforts and incident response reporting across California.

The strategy document, which is based on a vision developed by SCCWRP and the State Water Board for what a comprehensive monitoring framework should look like, represents the next phase in California's ongoing effort to more effectively manage freshwater HABs statewide.

SCCWRP and the State Water Board unveiled a HABs management strategy in 2016 that called for developing this monitoring strategy, as well as building

SCCWRP and its partners use an underwater autonomous vehicle, left, and a multispectral imaging sensor attached to a drone, right, to monitor cyanobacterial blooms in Lake Elsinore in Riverside County. SCCWRP and the State Water Board have developed a proposed statewide strategy for monitoring freshwater blooms that includes expanded use of remote-sensing technologies.

statewide capacity to respond to HABs incidents and to assess health risks. In response, the State Water Board formalized protocols for responding to publicly reported incidents of HABs statewide; these incident reports have more than doubled in recent years.

Freshwater HABs incidents are ecologically disruptive events that can produce toxins that threaten the health of humans, wildlife and domestic pets that come into contact with them. Reports of freshwater HABs incidents have been increasing in frequency and intensity in streams, lakes and other water bodies as waters warm.

California already has built a robust, weekly monitoring program for HABs in marine environments, the Harmful Algal Bloom Monitoring and Alert Program (HABMAP), which was established in 2008 and is supplemented by algal toxin monitoring in shellfish. Developing a freshwater HABs monitoring strategy has been comparatively more challenging because of the diversity of water body types and the multiple ways that freshwater HABs can impact beneficial uses for water bodies.

The freshwater HABs monitoring strategy consists of six recommended priorities for building California's freshwater HABs monitoring capacity:

» Develop and implement a partner monitoring program

» Increase investments in remote sensing monitoring approaches

» Implement statewide field surveys focused on human health

» Implement focused assessments of drivers of freshwater HABs

» Develop standardized protocols for monitoring and incident response efforts

» Integrate monitoring elements into all Water Board programs and policies

Once the freshwater HABs monitoring strategy has been finalized, State Water Board staff will gradually implement the strategy in the coming years. Implementation is supported by Assembly Bill 834, a 2019 law that earmarked State funding to support California freshwater and estuarine HABs program development and statewide monitoring.

The strategy was developed in collaboration with national HAB experts, California's Regional Water Quality Control Boards, tribal governments and citizen scientists.

During the report's public comment period – expected to begin no later than January 15, 2021 – the strategy's authors will be seeking feedback on their recommendations and the technical rationale underlying the recommendations. The draft report will be posted to the Freshwater CyanoHABs section of the Surface Water Ambient Monitoring Program's (SWAMP) website, and will be announced via the State Water Board's CWQMC California CyanoHab Network listserv.

The State Water Board also is seeking willing partners to begin aligning existing freshwater HABs monitoring efforts to the proposed statewide strategy. The State Water Board anticipates being able to provide training and infrastructure to support these expanded HABs monitoring efforts.

For more information, contact Dr. Jayme Smith.

Workshop convened to develop expert consensus on microplastics health effects

SCCWRP and its partners have convened a multi-part science workshop to build international expert consensus on the health-based thresholds at which microplastics of different sizes, shapes and compositions can be expected to trigger adverse effects in wildlife and humans.

The Microplastics Health Effects Workshop, which began meeting in October, is intended to inform development of a comprehensive, statewide strategy for assessing exposure risks from this ubiquitous form of plastics pollution. The workshop is a response to recently enacted State legislation that calls on California to boost capacity to manage microplastics in drinking water and aquatic ecosystems.

The health effects workshop kicked off in mid-October with a weekly, five-part webinar series to share the latest science on microplastics toxicity and management options; the first webinar attracted more than 450 attendees worldwide. The workshop is hosted by SCCWRP, the San Francisco Estuary Institute and the University of Toronto in coordination with the California State Water Resources Control Board and the California Ocean Protection Council.

In a parallel effort, an international team of researchers that includes SCCWRP has been working for the past year to standardize measurement methods for microplastics.

Microplastic particles, which are widespread in aquatic environments, have the potential to bioaccumulate through food webs, to serve as an exposure pathway as chemical contaminants leach from them, and to translocate into tissues and organs.

After the workshop's webinar series concludes in mid-November, a group of about 20 international microplastics experts will begin working to identify the key health effects of microplastics on humans and aquatic life, including prioritizing which characteristics of microplastics (e.g., size, shape, polymer) are of greatest biological concern. Microplastics are typically defined as any plastic particle up to 5 millimeters in diameter, with many of these particles too small to be seen with the naked eye.

The experts' deliberations, which will be facilitated by SCCWRP, will result in a preliminary set of recommended toxicity thresholds for microplastics that can be linked to specific actions California managers can take. The work is expected to be completed by summer 2021.

To support the upcoming deliberations, SCCWRP is developing a database of existing toxicity data from microplastics studies around the globe. The database will help the experts quickly query and visualize toxicity data, as well as identify data gaps.

For the past year, California also has been working on a parallel study to develop international standardization of microplastics measurement techniques.

This intercalibration study, which will pave the way to comprehensively monitor microplastics in aquatic environments, was an outgrowth of a spring 2019 workshop at SCCWRP to discuss how to standardize microplastics measurement methods.

Both workshops were spurred by passage of two 2018 State laws:

» Senate Bill 1422 requires the State Water Board to develop plans for measuring microplastic particles in drinking water by 2021.

» Senate Bill 1263 requires the California Ocean Protection Council to adopt and implement a statewide strategy for lessening the ecological risks of microplastics to coastal marine ecosystems, especially through research and policy changes.

For more information, contact Dr. Leah Thornton Hampton.

Image courtesy of Kennedy Bucci, University of Toronto

Fish larvae that have been exposed to increasing concentrations of microplastics in a University of Toronto laboratory accumulate the particles in their digestive tract; the particles appear as black flecks visible through the larvae's largely transparent bodies. SCCWRP and its partners are working to build intentional scientific consensus on the thresholds at which wildlife and humans start to experience adverse health effects from microplastics exposure.

Resources unveiled to boost utility, accessibility of stream bioassessment data

SCCWRP has unveiled a comprehensive set of resources intended to overcome common end-user challenges associated with analyzing, accessing and interpreting stream bioassessment data – challenges that have stymied more widespread adoption of bioassessment in watershed management programs.

The resources, developed over the past year, will enable managers with limited training in statistical analysis and data interpretation methods to transform raw field bioassessment data into clear, managerially relevant insights. In recent years, as bioassessment analyses have been integrated into routine stream monitoring programs statewide, many end users have struggled with data analysis and interpretation.

The management-friendly resources include, among other things, step-by-step technical guidance on calculating stream bioassessment scores for users with limited familiarity with the R programming language, as well as practical advice on navigating site-specific considerations and challenges that can complicate analysis and interpretation of stream bioassessment data in the real world.

The resources also include a beta version of a web-based data portal that centralizes bioassessment data and offers built-in automations.

Bioassessment data, which provide insights into the various biological components of an aquatic ecosystem, are becoming an increasingly integral, routine part of assessing the health of wadeable streams statewide.

Over the past few years, SCCWRP and its partners have developed a trio of statewide assessment tools – the California Stream Condition Index (CSCI), the Algal Stream Condition Index (ASCI) and the Index of Physical Habitat Integrity (IPI) – to quantitatively score the health of wadeable streams. Although these statistically based predictive indices have become a foundational component of stream monitoring statewide, the tools can be technically difficult to use to produce high-quality analyses. Stream managers also have struggled to locate and integrate all of the data they need to perform bioassessment-based analyses.

A SCCWRP field crew collects algae samples from the Santa Margarita River spanning Riverside and San Diego Counties. SCCWRP has developed a comprehensive set of resources to help watershed managers overcome common end-user challenges associated with analyzing, accessing and interpreting stream bioassessment data, including from stream algae sampling.

Because bioassessment expertise has to date been concentrated among a limited number of experts, bioassessment data are prone to being misinterpreted by inexperienced users. For example, managers may misattribute poor bioassessment index scores to water quality degradation alone, when drought impacts are likely to be contributing factors.

In response, SCCWRP worked with the State Water Resources Control Board and multiple end-user groups to develop three key resources for increasing the utility and accessibility of bioassessment tools:

» **SOP for calculating index scores**: SCCWRP in October completed a comprehensive SOP document that walks end users through step-by-step instructions for using the CSCI and ASCI to calculate stream bioassessment scores. The SOP also includes instructions for calculating IPI, often used as a complement to the CSCI and ASCI in understanding the overall ecological integrity of a stream site. This SOP – set to be published in early November on the State Water Board's Surface Water Ambient Monitoring Program (SWAMP) bioassessment SOPs page – unifies and builds upon multiple SOPs that were previously published individually.

» **Decision framework for interpreting scores**: SCCWRP published a document last spring that provides guidance on how to properly interpret and report bioassessment scores when faced with complicating factors, such as having bioassessment data where a relatively low number of organisms were sampled, or deciding whether to attribute low scores to stressors caused by human activities vs. natural environmental conditions. These real-world considerations also extend to

how to interpret the results of the Stream Classification and Priority Explorer (SCAPE), a SCCWRP-developed tool that predicts where managers are more vs. less likely to find success in improving stream condition. The guidance was originally developed for use in the San Gabriel River watershed, but is applicable across Southern California and beyond.

» **Web data portal**: SCCWRP in October unveiled a beta version of a web-based data portal that centralizes all bioassessment data generated by the Southern California Stormwater Monitoring Coalition (SMC). The user-friendly portal eliminates the need for stream managers to query up to three different databases to access bioassessment data. The portal also automatically calculates bioassessment scores, eliminating the need for multiple end users to independently calculate scores for a single site. Finally, the portal paves the way for the development of management-friendly dashboards and other data visualization tools for stream bioassessment data across Southern California.

SCCWRP will continue to refine and expand all of these bioassessment resources in the coming years in response to user feedback.

For more information, contact Dr. Susanna Theroux or Dr. Raphael Mazor.

Updates by Thematic Area

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

BIOASSESSMENT

Draft protocols developed for standardizing DNA-based sampling, analysis methods

A statewide workgroup led by SCCWRP that has been working to standardize DNA-based sampling and analysis methods for routine aquatic monitoring applications has released its first set of draft protocols for public review.

The Molecular Methods Workgroup's draft documents, available online for public review through November 30, 2020, provide best-practices recommendations for DNA sampling in the field, for collection of environmental DNA from water, and for metadata reporting.

The goal of the workgroup, formed under the California Water Quality Monitoring Council in 2018, is to bring together multiple water-quality management agencies and research labs to develop standardized protocols that improve quality, consistency and comparability of molecular data statewide.

The workgroup also is working on additional draft protocols, including for sediment and biofilm sampling, DNA extraction, and bioinformatic approaches.

Image courtesy of U.S. Fish and Wildlife Service

The arroyo chub, left and the endangered Santa Ana sucker, right, are among the California freshwater organisms sensitive to changes in flow patterns. SCCWRP is part of a statewide team that has developed a proposed statewide framework intended to help watershed managers set environmental flows across California that protect ecosystem health.

ECOHYDROLOGY

Statewide environmental flows framework released in draft form, to be finalized by end of year

A proposed statewide framework for bringing consistency and standardization to how environmental flow targets are set for California streams has been released in draft form for review by the end-user watershed management community – one of the last stages prior to finalizing the framework.

The draft California Environmental Flows Framework, released in October to stakeholders via the California Water Quality Monitoring Council, is eventually expected to be used to manage stream flows statewide. It would replace the inconsistent, ad-hoc methods presently being used in California to determine the

magnitude, duration and frequency of hydrologic flows needed to sustain healthy ecosystems – a complex balancing act that involves weighing the many demands on flowing water, including human uses.

The Monitoring Council's Environmental Flows Workgroup is scheduled to meet November 10 to solicit feedback on the multi-tiered management framework. The framework is expected to be published as a technical report by the end of this year.

Stream vulnerability study launched to aid in risk evaluation in San Diego region

SCCWRP has initiated a three-year study examining how future expected changes in stream flow patterns across the San Diego region will impact sensitive aquatic species and habitats, with a goal to build a risk evaluation framework that can help watershed managers prioritize which streams to protect and restore over the long term.

The stream vulnerability study, launched in October, involves evaluating the degree to which environmental flows already have been altered from their natural state, as well as how these flow patterns are expected to be altered further in response to climate change, future land-use changes and changing water management practices.

The San Diego-area work will build off a similar environmental flows analysis in the Los Angeles region focusing on climate change impacts.

Researchers hope the study will help move California closer toward developing statewide stream vulnerability analysis tools; the risk decision framework is expected to be applicable in other regions of California.

EUTROPHICATION

HABs sampling effort targets Labor Day cyanotoxin levels in L.A.-area lakes

SCCWRP has completed the first phase of sampling for a three-year study examining algal toxin levels in Los Angeles-area lakes surrounding the Labor Day holiday, when recreational use of the water bodies tends to jump – and also when algal bloom development generally soars.

The first sampling phase, completed in September at 17 recreational lakes, targeted the two weeks leading up to the holiday, and a few weeks after. Three types of cyanotoxins were measured: microcystins, anatoxin-a and cylindrospermopsin. Most sampling in the region to date has focused on microcystins only.

In subsequent sampling years, researchers will focus on a subset of high-priority lakes to better understand temporal dynamics and identify drivers of bloom formation.

They also will examine HABs levels surrounding the Memorial Day holiday.

The sampling effort marked an early opportunity to test-drive elements of a proposed statewide strategy for monitoring harmful algal blooms (HABs) in freshwater environments. The strategy, which calls for significantly boosting capacity to track freshwater HABs in California, is expected to be finalized in early 2021.

Effort underway to develop a computer model for predicting toxin-producing marine algal blooms

Researchers have completed the first phase of development of a computer model that predicts when and where toxins produced by a common type of marine algal bloom can be expected to occur along the California coast.

The three-year modeling effort, led by the University of California, Los Angeles in collaboration with the University of California Santa Cruz, SCCWRP and the

North Lake at the Whittier Narrows Recreation Area in Los Angeles County is tainted murky green by a harmful algal bloom in this photo captured shortly after Labor Day in 2020. Whittier Narrows Recreation Area, a popular spot for pedal boating, is one of 17 Los Angeles-area lakes where researchers are measuring cyanotoxin levels in the weeks around the busy Labor Day holiday.

Southern California Coastal Ocean Observing System, builds off preliminary modeling work by UC Santa Cruz to understand the drivers and impacts of *Pseudo-nitzschia* on marine life. Domoic acid produced by the blooms can poison mammals and contaminate commercially important species like Dungeness crab.

Researchers' goal is to build a mechanistic model that can accurately predict *Pseudo-nitzschia* blooms in coastal waters. The model will make use of a coupled physical-biogeochemical ocean model that predicts how land-based discharges affect coastal acidification and hypoxia.

CLIMATE CHANGE

Bight discharge data set significantly expanded to support acidification modeling effort

A team of researchers that developed a computer model to predict how the Southern California Bight will be affected by ocean acidification and hypoxia (OAH) has significantly expanded and updated the amount of data available for evaluating the role that land-based discharges play in driving OAH conditions.

The data compilation effort, completed in October, provides modelers with the levels of nutrients and other constituents that were discharged from rivers and wastewater outfalls to the coastal ocean for the years 1997-2017. An initial modeling run that was completed last year relied on four years of data, 1997-2000.

The next modeling run, which will focus on the more recent time period of 2013-2017, is expected to be completed by summer 2021.

SCCWRP member agencies played a key role in collecting the spatially and temporally explicit data, which include surface point source, nonpoint source and natural runoff for 75 rivers and 23 wastewater plants that discharge effluent via ocean outfalls. Researchers even obtained discharge data for the Tijuana River watershed and Rosarito Beach in Mexico.

SCCWRP's Dr. Alvina Mehinto transfers cells into assay wells for a bioanalytical screening test that involves exposing the cells to a water extract sample. Researchers are working to understand how to use the bioanalytical cell screening technology to provide an early-warning indicator that chemical contaminants in water bodies are potentially adversely impacting aquatic life.

CONTAMINANTS OF EMERGING CONCERN

Effort to link bioassays to biological impacts in fish expands to San Gabriel River

SCCWRP and its partners have expanded their effort to understand how bioanalytical cell screening technology can be used to provide early evidence that chemical contaminants in river water are potentially triggering adverse biological impacts in fish.

The study, which kicked off in September at four sites along the San Gabriel River, will examine the relationship, or linkage, between how bioanalytical assays respond to exposure to bioactive CECs in the river water, and how living fish respond to the same contamination.

Unlike similar, earlier work in the Los Angeles River – where laboratory-grown fish were placed in mobile exposure chambers set up along the riverbank – researchers will analyze fish caught in the San Gabriel River.

As with the L.A. River study, researchers will conduct tissue integrity analyses and gene biomarker analyses on the fish, and look at how these data correlate with results from bioanalytical assays, which are designed to screen for potential endocrine disruption and carcinogenicity in aquatic life.

Study to build foundational understanding of microplastics pollution in two major rivers

SCCWRP and its partners are initiating a three-year study to identify the levels, types and distribution of microplastics in two major Southern California rivers – part of a broader effort to inform the development of a statewide strategy for managing microplastics pollution.

Sampling for the study, which is scheduled to kick off in January, will encompass water, sediment and aquatic organisms at multiple sites along the Los Angeles and San Gabriel Rivers.

To analyze the water, sediment and tissue samples, researchers will utilize cutting-edge microplastics measurement methods that are being standardized through an ongoing, international method intercalibration study facilitated by SCCWRP.

The study workplan is expected to be finalized in December.

REGIONAL MONITORING

Monitoring framework drafted for assessing health of estuaries statewide

SCCWRP and its partners have developed a proposed statewide monitoring framework for assessing the health of California's coastal estuaries, including two dozen estuarine Marine Protected Areas (MPAs).

The draft framework, released in October to the project's management advisory committee, is intended to bring consistency to estuarine monitoring efforts statewide. Although monitoring programs exist for estuaries across California, these programs have never been coordinated, limiting data comparability and managers' ability to track the overall health of estuaries statewide.

The draft monitoring framework focuses on evaluating priority ecological functions using a set of biotic and abiotic factors, which can be customized for specific regions of the state and/or estuary types. The framework will be accompanied by a set of field protocols that will allow an estuary to be sampled over a three-day period.

Once finalized, the monitoring framework will be tested at 15 estuary sites statewide. The California Ocean Protection Council intends to use this monitoring framework to report on the health of California's estuarine MPAs in 2024.

Two Bight '18 Sediment Quality reports nearing completion

The Southern California Bight 2018 Regional Monitoring Program is preparing to publish the third volume of its Sediment Quality assessment reports by the end of the year, with a fourth volume not far behind.

The Contaminant Bioaccumulation in Edible Sport Fish Tissue report, which already has been reviewed by the Sediment Quality Planning Committee, is scheduled to be published in December. The fourth Sediment Quality volume, Demersal Fishes and Megabenthic Invertebrates (Trawl), is expected to undergo review by the Planning Committee in November.

These publications will follow the publication of the Sediment Chemistry report last summer and the Sediment Toxicity report last spring.

Image courtesy of Wood Environment and Infrastructure

Researchers are developing a standardized monitoring framework for assessing the condition of California's coastal estuaries, including Upper Newport Bay in Orange County, above, one of the State's estuarine Marine Protected Areas (MPAs).

New SCCWRP Publications

Journal Articles

Bednaršek, N., J.A. Newton, M.W. Beck, S.R. Alin, R.A. Feely, N. Christman, T. Klinger. 2020. Severe biological effects under present-day estuarine acidification in the seasonally variable Salish Sea. *Science of The Total Environment* DOI:10.1016/j.scitotenv.2020.142689.

Brown, A.K., J. Ackerman, N. Cicek, C.S. Wong. 2020. In situ kinetics of human pharmaceutical conjugates and the impact of transformation, deconjugation, and sorption on persistence in wastewater batch bioreactors. *Environmental Pollution* DOI:10.1016/j.envpol.2020.114852.

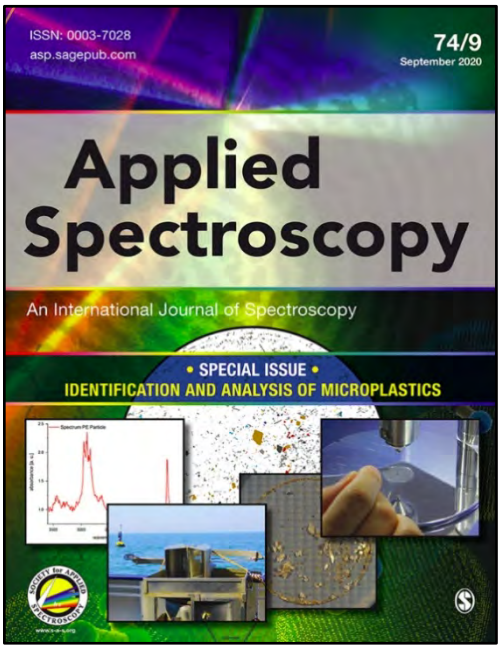
Cai, W.-J., R.A. Feely, J.M. Testa, M. Li, W. Evans, S.R. Alin, Y.-Y. Xu, G. Pelletier, A. Ahmed, D.J. Greeley, J.A. Newton, and N. Bednaršek. 2020. Natural and Anthropogenic Drivers of Acidification in Large Estuaries. *Annual Review of Marine Science* DOI: 10.1146/annurev-marine-010419-011004.

DeCourten B.M., J.P. Forbes, H.K. Roark, N.P. Burns, K.M. Major, J.W. White, J. Li, A.C. Mehinto, R.E. Connon, S.M. Brander. 2020. Multigenerational and Transgenerational Effects of Environmentally Relevant Concentrations of Endocrine Disruptors in an Estuarine Fish Model. *Environmental Science & Technology* DOI:10.1021/acs.est.0c02892.

Du, B., Z. Tian, K.T. Peter, E.P. Kolodziej, C.S. Wong. 2020. Developing Unique Nontarget High-Resolution Mass Spectrometry Signatures to Track Contaminant Sources in Urban Waters. *Environmental Science & Technology Letters* DOI:10.1021/acs.estlett.0c00749.

Fritz, K.M., T. Nadeau, J. Kelso, W.S. Beck, R.D. Mazor, R.A. Harrington, B.J. Topping. 2020. Classifying Streamflow Duration: The Scientific Basis and an Operational Framework for Method Development. *Water* DOI:10.3390/w12092545.

Gillett, D.J., L. Gisbane, K.C. Schiff. 2020. Benthic habitat condition of the continental shelf surrounding oil and gas platforms in the Santa Barbara Channel, Southern California. *Marine Pollution Bulletin* DOI:10.1016/j.marpolbul.2020.111662.



SCCWRP co-edited a special September 2020 issue of the journal *Applied Spectroscopy* that focuses on laboratory methods for identifying and analyzing microplastics – foundational research that will help pave the way for California to develop a comprehensive microplastics management strategy for aquatic systems. SCCWRP also co-authored two manuscripts in the special issue.

Lao, W. 2020. Fiproles as a proxy for ecological risk assessment of mixture of fipronil and its degradates in effluent-dominated surface waters. *Water Research* DOI:10.1016/j.watres.2020.116510.

Martyniuk, C.J., A.C. Mehinto, R.C. Colli-Dula, K.J. Kroll, N.J. Doperalski, D.S. Barber, N.D. Denslow. 2020. Transcriptome and physiological effects of toxaphene on the liver-gonad reproductive axis in male and female largemouth bass (Micropterus salmoides). *Comparative Biochemistry & Physiology. Part D Genomics & Proteomics* DOI:10.1016/j.cbd.2020.100746.

Nissen, K.A., M. Borst, and E. Fassman-Beck. 2020. Bioretention Planter Performance Measured by Lag and Capture. *Hydrological Processes* DOI:10.1002/hyp.13927.

Paul, M.J., B. Jessup, L.R. Brown, J.L. Carter, M. Cantonati, D.F. Charles, J. Gerritsen, D.B. Herbst, R. Stancheva, J. Howard, B. Isham, R. Lowe, R.D. Mazor, P.K. Mendex, P.R. Ode, A. O'Dowd, J. Olson, Y. Pan, A.C. Rehn, S. Spaulding, M. Sutula, S. Theroux. 2020. Characterizing benthic macroinvertebrate and algal biological condition gradient models for California wadeable Streams, USA. *Ecological Indicators* DOI:10.1016/j.ecolind.2020.106618.

Rochman, C.M., S.B. Weisberg, S.L. Moore and A. Whitley. The Unknowns of Microplastics: We cannot understand what we cannot measure. Applied Spectroscopy *Applied Spectroscopy* 74:965-966.

Wang, P.F., J.K. Challis, K.H. Luong, T.C. Vera, C.S. Wong. 2020. Calibration of organic-diffusive gradients in thin films (o-DGT) passive samplers for perfluorinated alkyl acids in water. *Chemosphere* DOI:10.1016/j.chemosphere.2020.128325.

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Charles, D.F., M. Kelly, J. Stevenson, S. Poikane, S. Theroux, A. Zgrundo, M. Cantonati. In press. Benthic algae assessments in the EU and the US: striving for consistency in the face of great ecological diversity. *Ecological Indicators*.

Griffith, J.F. , S.B. Weisberg, Y. Cao, M.R. Raith, A. Schriewer, X. Yu, J. Gregory, J. Guzman, K.D. Goodwin, L. Othman, S. Choi, S. Rapoport, S. Steele, and T. Nguyen. In press. Assessing applicability of Enterococcus qPCR methods at thirty-six southern California beaches. *Journal of Microbiological Methods*.

Mehinto, A.C., H.L. Schoenfuss, E. Wenger, D. Diehl, S.M. Bay. In press. Application of an Effects-based Monitoring Strategy to Assess the Impact of Contaminants on Fish Health in an Urbanized Watershed. *Environmental Toxicology and Chemistry*.

Rogers, J.B., E.D. Stein, M.W. Beck, R.F. Ambrose. In press. The impact of climate change induced alterations of streamflow and stream temperature on the distribution of riparian species. *PLOS One*.

Technical Reports

Grantham, T., J. Mount, E.D. Stein, S.M. Yarnell. 2020. Making the Most of Water for the Environment: A Functional Flows Approach for California's Rivers. Technical Report 1142. Public Policy Institute of California. San Francisco, CA.

Mazor, R.D., A. Santana, C. Endris, K. O'Connor. 2020. Assessing the representativeness of bioassessment samples using spatial statistical networks (SSNs) for watersheds in California: A guide for aquatic resource managers. Technical Report 1143. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Gillett, D.J., K. McCune, E. Stein, and C. Whitcraft. A Conceptual Framework and Sampling Methodology for Bioassessment in Eelgrass (Zostera marina) Beds in California's Estuaries. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Lowman, H., R. Peek. R Workshop. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Mazor, R. (session coordinator) 12 years of stream monitoring in southern California. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Mazor, R. R. Stubbington, J. England, T. Sykes, C. Hayes, and K. Gething. Incorporating temporary streams into monitoring and management: The UK experience. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Stein, E. Panel discussion on the California Water Quality Monitoring Council's Environmental Flows Workgroup. California Stormwater Quality Association Meeting. September 16, 2020. Via webinar.

Theroux, S. (session coordinator) Advancing eDNA tools for Bioassessment Applications. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Theroux, S. The basics of molecular methods. California Aquatic Bioassessment Workgroup Meeting. October 13-14, 2020. Via webinar.

Wong, C.S. Evaluating analytical methods for detecting unknown chemicals in recycled water. 35th Annual WateReuse Symposium. September 14-16, 2020. Via webinar.

Other Presentations

Fassman-Beck, E. Southern California Stormwater Monitoring Coalition: The New Five-Year Research Agenda. California Stormwater Quality Association Watershed Management and Impaired Waters Subcommittee. September 24, 2020. Via webinar.

Mazor, R. Training in streamflow duration assessment methods for the Northeast and Southeast. October 15-19, 2020. Via webinar.

Mehinto, A. Bioanalytical tools to assess water quality and predict toxicity. Valley Water (formally the Santa Clara Valley Water District). September 3, 2020. Via webinar.

Mehinto, A. Cell assay technology for CEC screening in ambient waters. Science Advisory Panel for CECs in California's Aquatic Ecosystems. October 14, 2020. Via webinar.

Schiff, K. Ceriodaphnia Toxicity Quality Assurance Study. California Stormwater Quality Association Monitoring and Science Subcommittee. August 27, 2020. Via webinar.

Schiff, K., and E. Stein. Climate Change Workshop #2: Changes in Sea Level Rise. Regional Water Quality Control Boards Climate Change Workshop Series. August 18, 2020. Via webinar.

Schiff, K., and E. Stein. Climate Change Workshop #3: Precipitation and Hydrology. Regional Water Quality Control Boards Climate Change Workshop Series. September 15, 2020. Via webinar.

Schiff, K., and M. Sutula. Climate Change Workshop #4: Changes in Temperature and Harmful Algal Blooms. Regional Water Quality Control Boards Climate Change Workshop Series. October 13, 2020. Via webinar.

Schiff, K. Quantifying the productive long-term working relationship between NCCOS and SCCWRP. NOAA National Centers for Coastal Ocean Science (NCCOS) Program Review Advisory Committee. September 15, 2020. Via webinar.

Taniguchi-Quan, K. South Orange County Environmental Flows Study: California Environmental Flows Framework (CEFF) Case Study Update. California Environmental Flows Workgroup Meeting. August 11, 2020. Via webinar.

SCCWRP Personnel Notes

Commission

Jeff Moneda, the newly hired Director of the San Diego County Department of Public Works, was named Alternate Commissioner in August, replacing Richard Crompton, who retired after nine years of service to the Commission.

New Faces

Dr. **Janet Walker,** who just earned her Ph.D. in ecology from San Diego State University and the University of California, Davis, joined SCCWRP in October as a Scientist in the Biology Department. She will focus on developing assessment tools and programs for estuarine ecosystems.

Promotions

Dr. Alvina Mehinto, who has worked at SCCWRP since 2013, most recently as a Principal Scientist in the Toxicology Department, was promoted to Department Head last summer, following the retirement of Steve Bay after a 39-year SCCWRP career.

Scientific Leadership

Dr. **Bowen Du** has been appointed a guest editor for a special issue of the journal *Environmental Toxicology and Chemistry* focusing on advances in non-targeted chemical analysis for environmental monitoring.

Dr. **Alvina Mehinto** has been appointed an editor of the journal *Environmental Toxicology and Chemistry*.

Dr. **Eric Stein** has been appointed a member of the Public Policy Institute of California (PPIC) Water Policy Center's research network.

Dr. **Kris Taniguchi-Quan** has been appointed to the Technical Advisory Committee for the City of Imperial Beach's Tijuana River Sediment Management Work Plan and Monitoring Program.

Dr. **Steve Weisberg** has been appointed a guest editor for a special issue of the journal *Applied Spectroscopy* focusing on microplastics measurement methods.

SCCWRP COMMISSIONER SPOTLIGHT

Public Works head connects infrastructure dots

What gets Jeff Moneda excited about his job as Director of the County of San Diego's Department of Public Works is the opportunity to make connections that didn't already exist, and unlock more value from existing resources.

Jeff Moneda

For example, just weeks after starting the job in June 2020, he observed the County's Board of Supervisors expressing interest for green infrastructure. He also observed that the County did not have a master plan. So he put two and two together and – boom – a green infrastructure master plan was born. The plan – developed by Todd Snyder, Manager of the County's Watershed Protection Program and Chair of the SCCWRP Commission – was an immediate hit with the Supervisors: Funding already has been allocated.

"It's a matter of figuring out how to bring the right projects to the decision-makers, so they see the benefits to the community and they become funding priorities," Moneda said.

Moneda, who leads 540 employees as the head of San Diego County Public Works, was named a SCCWRP Alternate Commissioner in August. He replaces Richard Crompton, who retired after serving on the SCCWRP Commission for a decade.

Before joining the County, Moneda spent two years as City Manager for Foster City in the San Francisco Bay Area. He appreciated the experience it provided him, but longed to return to his first love: Public Works. For a decade prior, Moneda worked as the Public Works Director for three cities: Foster City, Milpitas in Santa Clara County and La Palma in Orange County. He rose through the ranks of municipal government as a civil engineer.

Jeff Moneda unloads his bicycle to go for a 10-mile weekend ride along the waterfront in San Diego's Mission Bay in August 2020.

Jeff Moneda, P.E.

Job: Director, Department of Public Works, County of San Diego (started June 2020)

SCCWRP role: Alternate Commissioner (started August 2020)

Prior jobs: City Manager (2018-2020) and Public Works Director (2014-2018), Foster City; Public Works Director, City of Milpitas (2013-2014); Public Works Director, City of La Palma (2008-2013); Senior Civil Engineer, City of Chula Vista (1999-2008); staff engineer for consulting firms (1995-1998)

Education: B.S. civil engineering, San Diego State University (1995)

Residence: Jamul, an unincorporated community just east of San Diego

Family: Wife Michelle, a phlebotomist; two adult children, Abigail, a stay-at-home mom, and Nathaniel, a recent Sonoma State University graduate; two grandchildren; two dogs, a French bulldog and a pug Maltese mix

Hometown: San Diego

Hobbies: Biking along San Diego's waterfront; exercising; trying new restaurants based on Yelp reviews; visiting farmers markets with his wife

"This is my dream job," Moneda said. "Public Works is more rewarding for me than the other departments of municipal government. It's pretty straightforward: 'Would you like this infrastructure built, maintained or replaced, and if so, are you willing to provide the funding?' I love the reward of the community getting excited about infrastructure projects."

Moneda, who grew up in San Diego, gravitated to civil engineering at the advice of his older cousins, who also are Civil Engineers and talked up the job while Moneda was still in high school.

At one point early in his career, while working as a Civil Engineer for the City of Chula Vista, Moneda's coworkers included his younger brother and one of his cousins; his brother still works for Chula Vista – in one of Moneda's old roles.

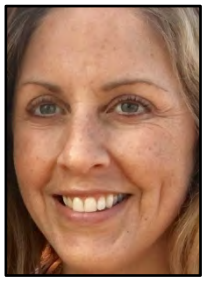
Since moving to San Diego, Moneda has developed a new weekend routine: He bikes with his wife, Michelle, for about 10 miles along the waterfront in Mission Bay, with one stop at their new favorite San Diego eatery, Breakfast Republic.

He and his wife also love trying new restaurants; they use Yelp reviews to make most of their decisions.

SCCWRP PARTNER SPOTLIGHT

Professor chooses actionable, applied research

Over the past six months, Dr. Rachel Noble has been immersed in building North Carolina's capacity to monitor COVID-19 infections statewide using wastewater streams.



Dr. Rachel Noble

As the statewide lead on a $2 million, COVID-19 surveillance project, Noble is responsible for coordinating with about 20 wastewater treatment plants and five academic research labs across North Carolina.

It may seem like an unusual role for a Distinguished Professor of Marine Sciences, but it's the type of applied, actionable scientific research Noble has devoted her entire career to doing.

And she credits SCCWRP – where she completed her postdoctoral training – for almost singlehandedly propelling her down this career path.

"It's not just research to do research – we're showing munipalities and state and federal agencies why what we do is useful," said Noble, a Distinguished Professor at the University of North Carolina, Chapel Hill for the past 19 years. "This is the practical side of science, and these are all skill sets I learned at SCCWRP."

During her three-year post-doc at SCCWRP from 1998 to 2001, Noble founded SCCWRP's microbial water quality research program and recruited Dr. John Griffith, now Head of SCCWRP's Microbiology Department.

Her ongoing COVID-19 wastewater surveillance project – which will feed into a national monitoring system that SCCWRP also is playing a leading role in building – is the latest in a series of research collaborations that Noble has had with SCCWRP.

Dr. Rachel Noble, fourth from left, vacations in Solitude, Utah in 2019 with, from left, friend and a former SCCWRP employee Dr. Molly Leecaster, husband Kevin, daughter Kayla and daughter Anna.

Rachel Noble, Ph.D.

Job: Distinguished Professor of Marine Sciences, University of North Carolina, Chapel Hill (2015-present)

SCCWRP role: Long-time SCCWRP collaborator on microbial water quality projects

Prior jobs: Assistant, Associate and Full Professor, UNC Chapel Hill (2001-2015); Joint Postdoctoral Researcher, SCCWRP and USC (1998-2001)

Education: Ph.D. biological sciences, University of Southern California (1998); B.S. biological sciences, Carnegie Mellon University (1991)

Residence: Morehead City along the North Carolina coast

Family: Husband Kevin, an elementary school teacher; two daughters, Anna 16, and Kayla, 13; one dog, a mutt rescue, and one cat

Hometown: Pittsburgh, Pennsylvania

Hobbies: Hiking, ultimate frisbee, soccer, cooking, watching ice hockey, paddleboarding, kayaking, snowboarding

She spent much of the past decade working with SCCWRP and others to show that droplet digital PCR (polymerase chain reaction) – at the time an obscure experimental technology – was highly effective for quantifying fecal contamination in aquatic environments.

Since 2003, Noble has worked at the UNC Chapel Hill Institute of Marine Sciences on the Atlantic coast, about three hours from the main campus. On the three-acre campus, Noble hosts about 15 environmental science undergraduates every fall semester for a field program that focuses on coastal ecology, water quality and ecosystem management; she also teaches topics related to stormwater and wastewater. Noble also hosts a number of master's and Ph.D. students in her laboratory.

When she's not working, Noble serves as an assistant coach for her teenage daughter's soccer team. She also loves anything outdoors, from paddleboarding on the North Carolina coast to snowboarding in Utah.

Her favorite outdoor spot is Cape Lookout, a remote beach island off the North Carolina coast about 10 miles from her home.

SCCWRP STAFF SPOTLIGHT

Ecologist prefers science managers can act on

When Dr. Janet Walker started grad school five years ago, she developed her doctoral dissertation around investigating how burrowing crabs in coastal marshes can influence the overall health of the ecosystem, especially critically important cordgrass.

Dr. Janet Walker

Although she developed models that predict whether a crab community – based on its size and distribution – is expected to positively vs. negatively impact the health of its marsh environment, she increasingly realized her models did not produce clear, actionable takeaways that coastal managers could use. And that bothered her.

"I fell in love with these coastal systems, and yet I realized I wasn't directly part of managing and conserving them," Walker said. "In just five years, I saw how dramatically my field sites changed, from species die-offs to drought triggered by El Nino. I knew my next career step needed to be doing high-impact science to protect these habitats."

Walker, who earned her Ph.D. in August through a joint program run by the University of California, Davis and San Diego State University, started as a Scientist in SCCWRP's Biology Department in October. She will focus initially on developing modeling and assessment tools for coastal seagrass beds, as well as building a monitoring program for California's estuarine Marine Protected Areas.

"My No. 1 career coal is to conduct science that has a higher purpose, that has management impact," Walker said. "I don't think there's anywhere I could go in academia with as direct a line to management as SCCWRP."

Dr. Janet Walker explores the Mendocino coastline with dog Kudzu, known affectionately as Zu, during a 2019 backpacking trip.

Janet Walker, Ph.D.

Job: Scientist, SCCWRP Biology Department (started October 2020)

Prior jobs: Teaching Assistant, San Diego State University and UC Davis (2015-2018)

Education: Ph.D. ecology, San Diego State University and the University of California, Davis (2020); B.S. environmental science, University of Virginia (2015)

Residence: Berkeley; planning to relocate to Long Beach

Family: Husband Dan, a computer software engineer; dog Kudzu, a shepherd-husky mix

Hometown: Charlottesville, Virginia

Hobbies: Sail-boating; trail running; camping; hiking

Walker, who grew up on a 32-acre horse farm in Charlottesville, Virginia, has been captivated by coastal environments since she was a young child. At age 10, she went on a family vacation to California, where she experienced the biological diversity of tidepools for the first time.

In college, she journeyed to Belize for a tropical ecology class, exploring rain forests and coral reefs. She also worked as an undergraduate in a genetics lab that studied cordgrass, a foundational plant in coastal marsh environments.

For grad school, Walker decided to venture west to immerse herself in California's coastal wetland environments. About a year ago, she met Dr. Eric Stein, Head of SCCWRP's Biology Department, at a scientific conference, and learned about SCCWRP.

Walker is in the process of relocating to Southern California from Berkeley, where she lived during much of her Ph.D. program. She was based out of UC Davis's Bodega Marine Laboratory.

She and her husband, Dan, are looking for a home near the water in Long Beach.

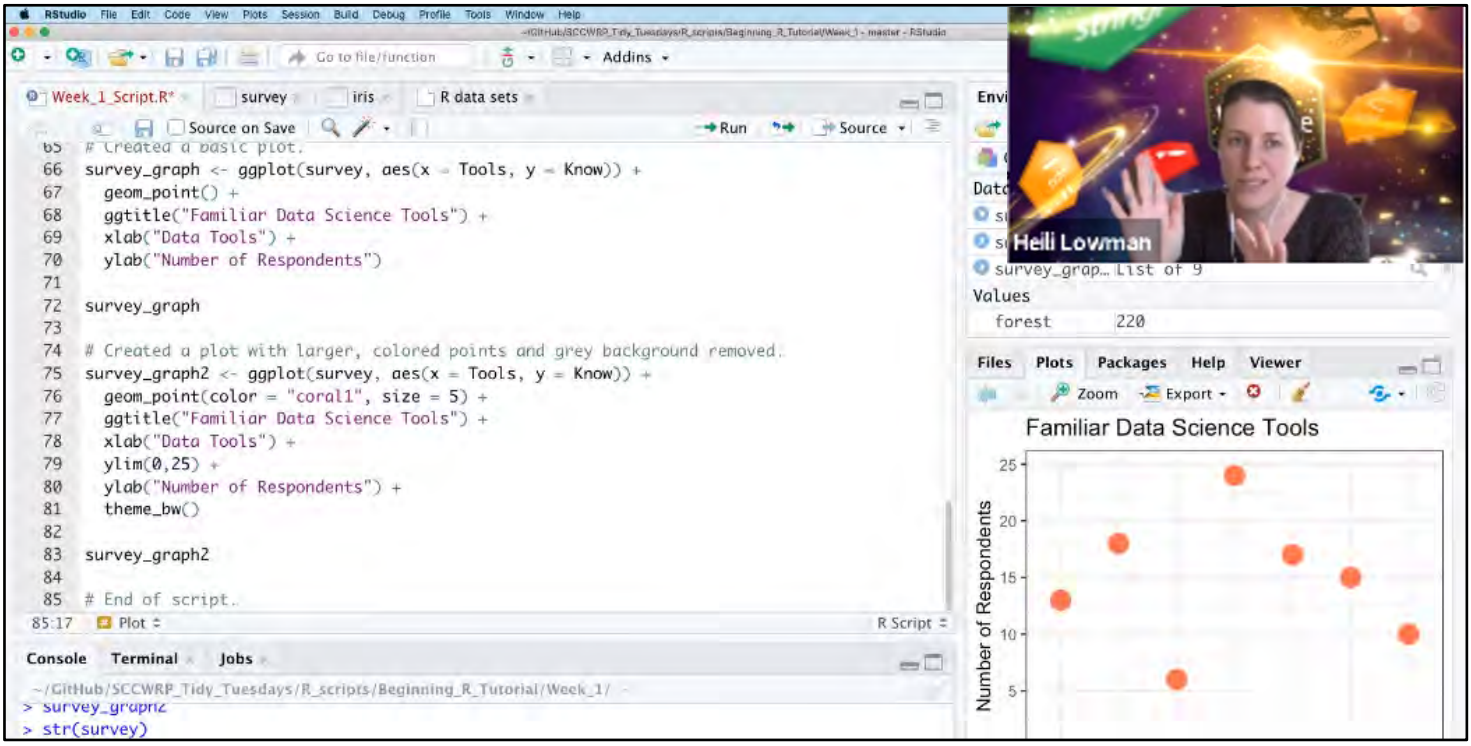
In her spare time, Walker is an avid sailor. She loves sailing in San Francisco Bay, and meets up with friends every year to go sailing in the Caribbean.

In Southern California, Walker is most looking forward to taking her dog, Kudzu, to Rosie's Dog Beach in Long Beach and exploring Mammoth Lakes and the Southern Sierras.

SCCWRP SCENES

Tidy coding on Tidy Tuesday

Staff from SCCWRP and some of its member agencies have been participating in a series of weekly, online SCCWRP classes on how to write cleaner, more effective code using the statistical programming language R. The one-hour, interactive Tidy Tuesday classes, which began in August, are hosted by SCCWRP's Dr. Heili Lowman. Each class is tailored to topics of interest – as well as to the skill levels – of its more than 60 students. All courses are recorded and archived on a publicly accessible GitHub site. Staff from SCCWRP's member agencies are welcome to join the classes; to sign up, contact Dr. Heili Lowman.



SCCWRP's Dr. Heili Lowman, pictured at top right, teaches a weekly, online class called Tidy Tuesday to help SCCWRP staff and others learn how to write cleaner, more effective code using the statistical programming language R. At bottom, from left, SCCWRP staff members Annie Holt, Dr. Kristine Taniguchi-Kwan, Robert Butler and Jhenevieve Cabasal take part in the class via webcam.