SCCWRP Director's Report

PUBLISHED FEBRUARY 2, 2018 | COVERING OCTOBER 28, 2017-FEBRUARY 2, 2018

WINTER 2018 ISSUE

Technical foundation created for ephemeral stream tools

SCCWRP and its partners have completed a pair of studies that establish a technical foundation for building watershed management tools for Southern California streams that run dry for much of the year.

The two studies, published as SCCWRP technical reports in December, provide an important proof-of-concept of the feasibility of building tools that can quantitatively assess the health of ephemeral streams, as well as that can model the hydrologic flow patterns of ephemeral streams.

Although ephemeral streams make up about 60% of all streams in Southern California, existing watershed management tools are designed for application in perennial streams only.

The two studies, which were conducted in the Santa Ana and San Diego regions, represent an important step forward in building a suite of ephemeral stream management tools that complement existing perennial stream tools.

During the ephemeral streams condition assessment study, researchers examined the composition of terrestrial arthropod and bryophyte communities living in dry streambeds. Multiple biological indicators were identified that could potentially be used to quantitatively score the condition of these ephemeral streams.

Based on these findings, SCCWRP and its partners are continuing to work toward developing the quantitative scoring tool for ephemeral stream condition; it is expected to be released in 2020.

Furthermore, the ephemeral streams bioindicator data collected during the study is being used to validate the California Rapid Assessment Method (CRAM) tool for ephemeral streams, which was co-developed by SCCWRP. By validating this screening-level ephemeral streams assessment tool, California's stream managers will have more confidence in the accuracy of the tool, encouraging more widespread adoption among California's stream monitoring programs.

Contents

Cover photo: A ramp trap is deployed in a dry streambed to collect arthropods as part of a SCCWRP-led effort to develop a quantitative scoring tool for evaluating the health of streams that run dry for much of the year.

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.

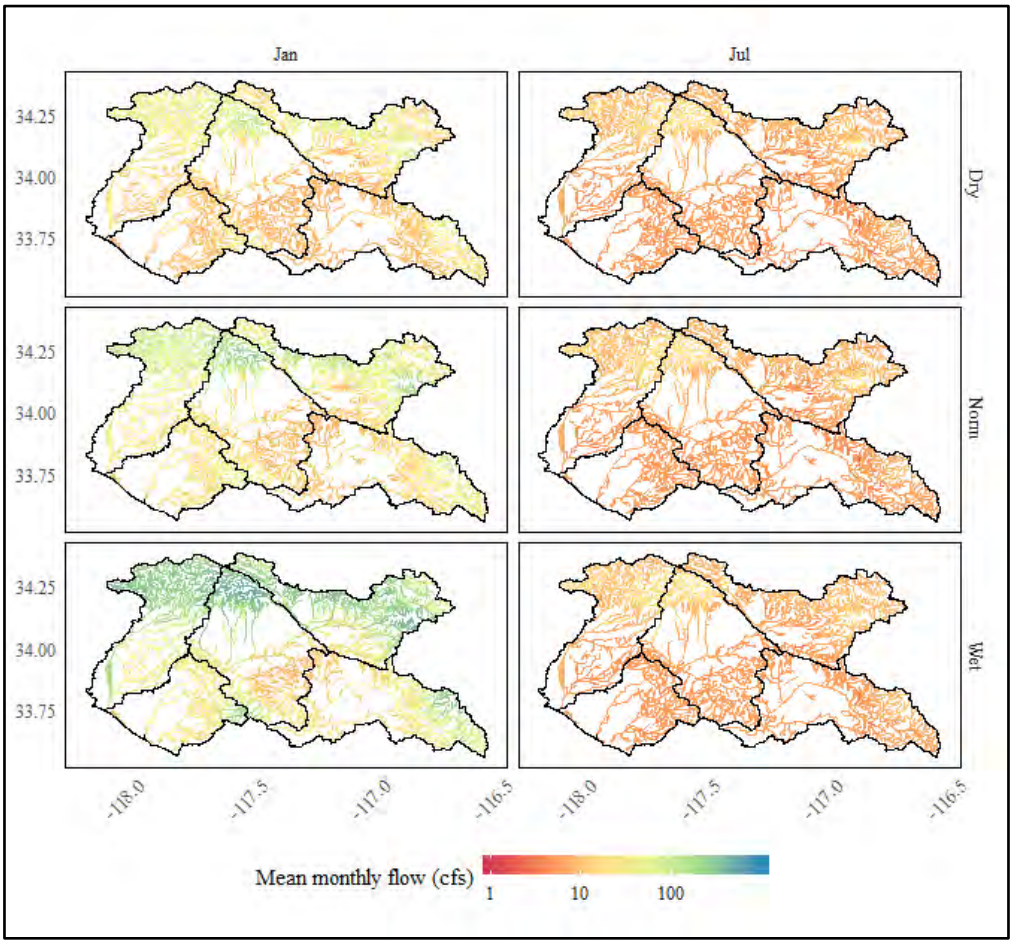
Calendar

Friday, February 2
Seminar: "When the ocean holds its breath: Biogeochemical processes in oxygen minimum zones"

Thursday, February 8
CTAG quarterly meeting

Friday, March 2
SCCWRP Commission meeting

During the ephemeral streams hydrologic mapping project, researchers adapted hydrologic models developed by the U.S. Geological Survey to predict typical monthly flows for ephemeral streams under wet, normal, and dry climatic conditions. Researchers then modeled the impacts that human disturbances have on these flow patterns over time.



SCCWRP and its partners have developed a series of hydrologic maps that estimate the historic flows of ephemeral streams. The maps above show flow conditions in the Santa Ana region in January, left, and July, right, under three different types of seasonal rainfall patterns (dry, normal, and wet). From these interactive, customizable maps, watershed managers can understand the dynamic nature of ephemeral stream flows over time.

The resulting hydrologic maps – available as shapefiles and through an interactive web application – reveal the extent and location of ephemeral streams, as well as capture the dynamic nature of ephemeral stream flows across Southern California over time.

The hydrologic maps have the potential to support a variety of management needs, including prioritizing sites for monitoring, providing evidence for causal assessment studies, forecasting the impacts of land-use changes and climate change, and informing the design of stream bioassessment surveys.

SCCWRP's work on ephemeral streams has opened the door to partnerships that will expand this science outside of California. Notably, SCCWRP is partnering with the U.S. Environmental Protection Agency and the Arizona Department of Environmental Quality to evaluate the new ephemeral streams tools for Arizona as well.

SCCWRP also is partnering with the EPA to evaluate field-based flow duration assessment tools across the arid Southwest that were originally developed for the Pacific Northwest.

For more information, contact Dr. Raphael Mazor.

Study launched to revisit copper TMDL for Marina del Rey Harbor

SCCWRP has launched a two-year study examining whether existing regulatory targets for dissolved copper in Marina del Rey Harbor should be modified to more accurately reflect the ecological threat posed by copper.

The study, which kicked off in January, will document the concentrations of copper that aquatic organisms in the Los Angeles County boat harbor are exposed to at different times of the year, and how toxic these copper levels are at different sites across the harbor.

Under the harbor's existing Total Maximum Daily Load (TMDL) regulatory target, Marina del Rey Harbor is required to reduce copper loading by 85%, which would require boat owners to make significant changes to the types of anti-fouling paint they typically use on the underside of boats.

Although copper in boat paint plays an essential role in preventing barnacles and other marine life from attaching and growing on the underside of boats, water quality in the boat harbor frequently

exceeds the regulatory standard of 3.1 ug/L for copper. Marina del Rey is the largest man-made, small-boat harbor in California.

The regulatory target for copper was originally set based on the results of standardized laboratory toxicity tests. However, because the tests used purified seawater, researchers don't know if dissolved copper in Marina del Rey is as toxic to aquatic life as it would be in purified seawater. Previous research has indicated that factors such as dissolved organic carbon can influence the bioavailability of dissolved copper to aquatic life.

The SCCWRP study will seek to use an approach endorsed by the U.S. Environmental Protection Agency to set a site-specific water-quality objective for dissolved copper. The approach enables water-quality managers to consider the effect of local water-quality characteristics on copper toxicity.

The site-specific objectives approach has been used to modify copper regulatory targets for San Francisco Bay, the Los Angeles River and Calleguas Creek in Ventura County.

Also during the study, researchers will test-drive a recently developed marine version of the Biotic Ligand Model (BLM) to predict variations in Marina del Rey Harbor copper toxicity based on water-quality characteristics. A proposed revision of the EPA water-quality criteria for copper uses the BLM; this study will provide information on how well the model performs in Southern California waters.

Barnacles, algae and other marine life attach to the underside of a boat that has been raised out of the water. Copper-based paints play a key role in preventing this fouling, but because the copper dissolves in water, the water-quality regulatory targets for copper in places like Marina del Rey Harbor have been exceeded. SCCWRP and its partners are pursuing a study examining whether the regulatory target for copper should be modified to more accurately reflect its ecological threat.

Sampling for the study, which began in January, is expected to continue through 2019. A draft work plan for the study will be distributed for public review in the coming months.

For more information, contact Steven Bay.

Microbes in sewer pipes to be studied to glean insights about origins of fecal contamination

SCCWRP and its partners have launched a study investigating whether the microbial community that grows inside sanitary sewer pipes could provide insights into the origins of human fecal contamination found in aquatic environments across Southern California.

The study, launched in January, will examine whether the microbial community growing on the inner surfaces of the City of San Diego's public sewer pipes is unique to this type of infrastructure, a finding that could help researchers discern whether leaking sewer pipes are responsible for human fecal contamination in urban waterways in the San Diego area.

Researchers at the University of Wisconsin, Milwaukee, found that a unique microbial community – commonly referred to as biofilm – lives inside Milwaukee's sewer collection pipes, making it possible for researchers to trace human fecal contamination found in the region's waterways back to sewer pipes.

For the San Diego study, researchers will seek to replicate Milwaukee's approach to microbial source tracking. Working in collaboration with University of Wisconsin researchers, SCCWRP will use DNA sequencing methods to determine whether the composition of bacteria in San Diego biofilm samples is unique to the City's sewer pipes, and whether it's the same across various sampling sites.

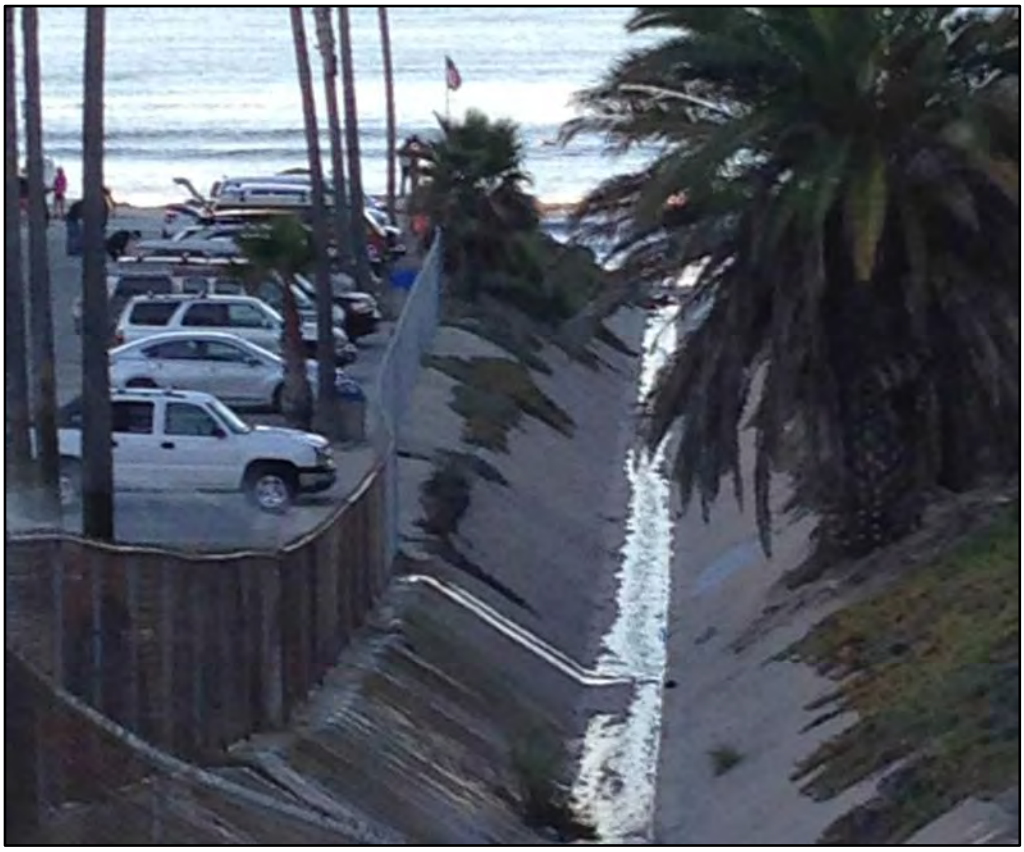
The study is motivated by a long-term goal among the region's water-quality managers to understand whether the human fecal signals that are widely detected in San Diego-area flood control infrastructure are coming from leaky public sewer systems, from defects in privately maintained sewer lateral lines and septic systems, or from humans depositing raw fecal material directly into waterways.

The biofilm community that lines the insides of sewer pipes is theorized to be the product of unique environmental factors, including temperature, moisture, darkness and a rich nutrient supply.

Because biofilm grows in thin layers on the inner surface of sewer pipes, these layers are constantly sloughed off as wastewater flows through the pipes, making the microbes ubiquitous in untreated sewage.

During the study, researchers also will examine whether the biofilm signal is strong enough to be reliably detected even when diluted. Biofilm would only be an effective microbial source tracking tool if its signal can be detected above levels of background interference in highly diluted water samples.

If the biofilm tracking method continues to show promise, researchers also will examine whether there are any differences in this biofilm community under wet vs. dry weather conditions.



Human fecal contamination has been detected in storm drain channels across the San Diego area that drain to coastal waters, including Tourmaline Surfing Park, above. Researchers have launched a study that could provide insights into whether leaking public sewer pipes could be responsible for the contamination.

Sampling in San Diego will continue through May, with results expected as early as this summer.

For more information, contact Dr. John Griffith.

Updates by Thematic Area

SCCWRP Research Themes BIOASSESSMENT • ECOHYDROLOGY • EUTROPHICATION • CLIMATE CHANGE • SEDIMENT QUALITY • CONTAMINANTS OF EMERGING CONCERN • MICROBIAL WATER QUALITY • REGIONAL MONITORING • INFORMATION TECHNOLOGY & VISUALIZATION

BIOASSESSMENT

Stream assessment tool under development to score physical habitat condition

SCCWRP and its partners have developed a preliminary version of a stream assessment tool that can quantitatively score the condition of physical habitat using field data collected during routine monitoring of wadeable streams.

The physical habitat index, which underwent an initial round of testing by end users in fall 2017, is intended to make better use of the physical habitat data that stream managers already are collecting. It is scheduled to be finalized in summer 2018.

The condition of a stream's physical habitat can have a significant influence on its overall ecological condition, but without a quantitative scoring tool, it has been difficult to make effective use of existing physical habitat data.

Quantitative assessments of physical habitat condition will help inform stream causal assessments, restoration monitoring and other areas.

The physical habitat index will complement the California Stream Condition Index, which was co-developed by SCCWRP in 2015 to quantitatively score stream health by evaluating the condition of bottom-dwelling invertebrates in streambeds.

DNA sequencing used to identify larval fish

SCCWRP and its partners have completed a proof-of-concept study showing that DNA sequencing methods can be used to identify communities of ichthyoplankton, or the eggs and larvae of fish, collected from across the Southern California Bight continental shelf.

During the study, researchers successfully identified dozens of species of ichthyoplankton contained in the field samples using single-sample DNA sequencing, or Sanger sequencing. Traditional microscope-based identifications were used to confirm the accuracy of the DNA-based identifications.

Researchers lower a pair of pairovet nets to collect ichthyoplanton, or the eggs and larvae of fish. SCCWRP and its partners have successfully shown that DNA sequencing methods can be used to efficiently and cost-effectively discern the identity of the ichthyoplankton species from these sampling efforts.

Understanding the composition of larval fish communities could serve as an important line of evidence for evaluating the health of marine ecosystems. The insights from ichthyoplankton communities could inform fisheries management decision-making and lead to more scientifically robust assessments of marine habitats.

Based on the study's findings, researchers will continue to pursue development of this metabarcoding approach for assessing ichthyoplankton community health.

ECOHYDROLOGY

Environmental flows workgroup organizes under California Water Quality Monitoring Council

A group of technical experts working to coordinate environmental flow management programs statewide was officially recognized in November as a workgroup of the California Water Quality Monitoring Council.

The recognition gives the workgroup – which includes participation by SCCWRP – more visibility and accessibility to agency staff as it works to develop a more consistent approach to how watershed managers set ecologically optimal flow targets. The Water Quality Monitoring Council is made up of water-quality management agencies from across California; its goal is to improve coordination of water-quality monitoring and assessment programs statewide.

Environmental flow management has historically not been well-coordinated across California, resulting in fragmentation and inconsistencies among the multiple agencies responsible for setting environmental flow targets.

The workgroup's goals include making environmental flow data more readily accessible and comparable across the state, and establishing a common approach to how various agencies use the wide variety of existing flow management tools and approaches to set flow targets.

EUTROPHICATION

20 years of nutrient input data compiled for acidification model

SCCWRP and its partners have compiled a series of data sets reflecting the contributions of major sources of nutrients to the Southern California Bight over the past 20 years, part of a five-year effort to develop a computer model that explains how West Coast ecosystems respond to these nutrient inputs.

The work, completed in late 2017, involved gathering data on a variety of local land-based and atmospheric discharges, including treated wastewater effluent, land-based runoff, atmospheric deposition and local atmospheric conditions. Researchers modeled the way that each source contributes nutrients to Bight coastal waters; SCCWRP member agencies helped compile much of the data.

The data are being used to evaluate the performance of a computer model that predicts how land-based sources of nutrients influence ocean acidification and hypoxia conditions along the West Coast.

Researchers are seeking to validate the model's ability to accurately reflect biogeochemical cycling patterns in the Bight that result from the introduction of human-created nutrient sources from both air and land.

Models being built to establish nutrient loading targets for Santa Margarita River

SCCWRP and its partners have begun assembling a suite of models to support development of scientifically defensible nutrient loading targets for reducing eutrophication in the lower Santa Margarita River watershed.

The work, launched in January, is part of a three-year project that will enable water-quality managers to optimally protect biological integrity and human use in the lower mainstem of the Santa Margarita River.

Researchers are using recently collected field data to assemble a suite of mechanistic process models and empirical, statistical models.

The Santa Margarita River watershed, which spans Riverside and northern San Diego Counties, has been grappling with algal proliferation and low dissolved oxygen as a result of excess nutrient inputs.

The tools and concepts being developed and applied to Santa Margarita are expected to influence how nutrient management is approached in eutrophic wadeable stream systems across California. In particular, the project is serving as a key California case study for test-driving elements of a proposed State Water Board wadeable stream biointegrity and biostimulatory policy, which could be adopted as early as 2019 to govern the health of wadeable streams statewide.

The Santa Margarita River watershed has been grappling with algae proliferation and low dissolved oxygen levels as a result of excess nutrient inputs. Researchers are assembling a suite of models to establish scientifically defensible nutrient loading targets intended to protect the lower watershed from these bloom events.

CLIMATE CHANGE

Study launched to optimize kelp yields, explore approach to combatting ocean acidification

A group of researchers, including SCCWRP, has launched a study to identify areas in the San Pedro Basin that are ideal for cultivating kelp, as well as the environmental conditions and farm designs that will optimize yields.

The study, launched in January and led by the University of California, Irvine, involves developing a suite of models that will simulate key physical, biogeochemical and kelp growth dynamics.

Through the study, researchers also will examine whether kelp has the potential – through natural photosynthetic processes – to sequester dissolved carbon dioxide in the water column, which could alleviate the corrosive conditions associated with ocean acidification.

Catalina Sea Ranch, a licensed commercial mariculture farm that is growing giant bull kelp in a floating farm in the San Pedro Basin, will be the immediate beneficiary of this optimization study. Catalina Sea Ranch is working to scale up kelp cultivation for a variety of uses, including as a food source. Kelp mariculture already is a thriving industry in Asia.

If kelp also can meaningfully reduce levels of dissolved carbon dioxide in the water column, researchers can use the modeling work to explore how to optimize kelp cultures to combat ocean acidification. Unlike other aquatic plants that sequester carbon dioxide, the kelp is being harvested, which means much of the carbon dioxide it sequesters would be removed permanently from the water column.

Pteropod health to be evaluated to track ocean acidification

SCCWRP has teamed up with Canada's Department of Fisheries and Oceans to examine whether pteropods in the Beaufort Sea are showing signs of shell dissolution triggered by ocean acidification.

The four-year study, launched in January, is seeking to document how ocean acidification is affecting the ecological health of coastal waters near the Arctic Circle. The Beaufort Sea is an ecologically productive area north of Alaska and continental Canada.

Pteropods, or sea snails, depend on minerals from seawater to form their

Pteropods, or sea snails, are sentinel indicators of the biological impacts of ocean acidification. SCCWRP is taking part in a study examining whether acidification is triggering shell dissolution in the Beaufort Sea near the Arctic Circle.

soluble calcified shells, making them sensitive to changes in ocean chemistry.

Researchers are using pteropods to track the intensity and speed with which ocean acidification is manifesting in Canadian coastal waters.

Model being developed to predict acidification's impacts on Dungeness crab

A group of researchers, including SCCWRP, has launched a three-year project to develop a model that predicts impacts on the Pacific Northwest Dungeness crab industry from ocean acidification.

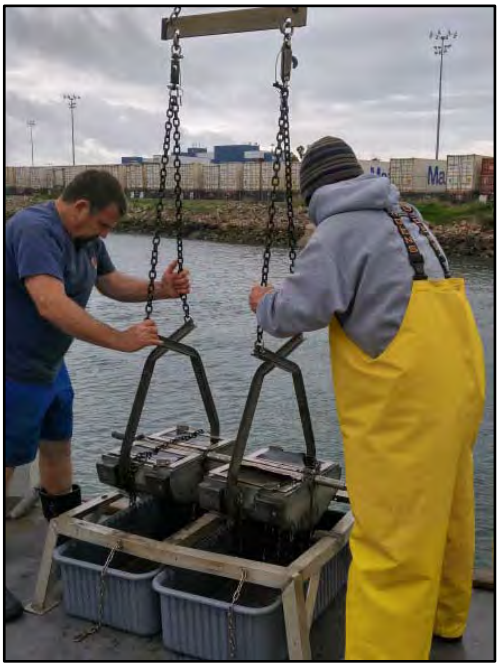
The project, which runs through fall 2019, involves developing thresholds of impairment for crab larvae and modeling their exposure to corrosive seawater conditions. Ocean acidification will lower the supply of minerals in seawater that the larvae depend on to form their protective outer shells.

Dungeness crab is a commercially important species across the West Coast; in California, annual commercial landings are valued at $83 million.

SCCWRP is part of a research team that will examine how ocean acidification is impacting Dungeness crab in the Pacific Northwest. This commercially important species relies on minerals in seawater to form its protective outer shell; the supply of these minerals is decreasing as a result of ocean acidification.

During the study, researchers will document evidence of shell dissolution using scanning electron micrographs.

The study's findings are intended to support important discussions about best management practices for fisheries and ecologically protected coastal zones in the face of intensifying acidification.



A field crew retrieves sediment samples collected from Consolidated Slip in Los Angeles Harbor during a SCCWRP-led study examining how to optimize the design of toxicity identification evaluation (TIE) studies to improve confidence in the results.

SEDIMENT QUALITY

Study offers guidance for optimizing TIE study design

SCCWRP and its partners have completed a two-year study examining how to optimize the design of toxicity identification evaluation (TIE) studies to improve confidence in the results.

The project, published as a SCCWRP technical report in January, involved oversampling in Consolidated Slip, an area of the Los Angeles Harbor with high sediment toxicity levels, and then using statistical analysis to develop best-practices recommendations for TIE study design.

Among the study's recommendations is to conduct TIEs at a minimum of three locations within a study site. Researchers also should compare observed contaminant concentrations to known toxicity thresholds to help reduce uncertainty in interpreting results.

TIEs are the primary method used by water-quality managers to determine the cause of toxicity in a water or sediment sample. The analysis typically includes a series of chemical treatments of the sample to selectively remove or alter the toxicity of specific contaminant groups, such as trace metals, nonpolar organics and pyrethroid pesticides.

CONTAMINANTS OF EMERGING CONCERN

Expert panel updates recommendations for monitoring CECs in recycled water

An expert advisory panel convened by SCCWRP on behalf of the State Water Board to update recommendations for monitoring CECs in recycled water has released its final draft report.

The draft recommendations, which were released January 31 for a 30-day public review period, will be considered for adoption by the State Water Board later this year as part of a comprehensive update to California's recycled water policy. California's existing policy for monitoring CECs in recycled water is based on the expert panel's original 2010 recommendations.

Among the CEC Recycled Water Advisory Panel's updated recommendations is a revised list of priority chemicals to monitor in potable reuse applications.

The panel also has recommended implementing a more comprehensive CEC screening framework that incorporates use of commercially available bioanalytical tools. Bioanalytical tools have the potential to provide a cost-effective method for rapidly screening recycled water for CECs.

While California's existing recycled water policy covers non-potable landscape irrigation and groundwater recharge for indirect potable reuse, proposed amendments to the policy will extend it to cover additional applications, including crop irrigation and augmentation of drinking water reservoirs.

Monitoring of individual CECs and bioanalytical monitoring have been recommended for potable reuse applications, while the panel has deemed existing monitoring adequate for non-potable applications.

The Russian River, pictured above flowing through Cloverdale, is a watershed north of San Francisco that receives agricultural runoff. Researchers have shown that bioanalytical screening tools have the potential to be used to screen receiving waters for CECs in this watershed and others across California.

Initial testing completed for using bioanalytical assays to screen for CECs

SCCWRP and its partners have shown in a pair of initial studies that bioanalytical screening tools have the potential to be used to screen receiving waters across California for CECs.

The studies were conducted on a range of Southern California waterways, including inland freshwater streams and rivers dominated by effluent from wastewater treatment plants, and in the Russian River, a watershed north of San Francisco that receives agricultural runoff.

The bioassay results showed strong agreement with traditional chemistry-based analyses of the receiving water samples, indicating that this commercially available, cell-based technology has the potential to be useful as a CEC screening tool. Even in water samples with minimal CEC impacts, the bioassays were not prone to high noise levels – an important finding given that sensitivity is often a concern with new methods.

The bioassay screenings found that the potential for endocrine-disrupting impacts, such as impaired reproduction in fish, is moderate to low across the watersheds examined.

Laboratory-based passive-sampling method used to measure sediment contamination

SCCWRP and its partners have successfully used prototype passive-sampling methods in a laboratory to measure the freely dissolved concentrations of organic contaminants in sediment.

Unlike previous applications of passive-sampling technology that require the devices to be deployed in the field, the laboratory-based method would enable

data to be obtained in a matter of days instead of weeks; it also would reduce the chances of vandalism of the devices and other unforeseen field disruptions.

The laboratory testing, completed in November, was conducted on sediment samples collected from San Diego Bay.

Researchers are now working to conduct toxicity and bioaccumulation testing on the sediment samples to understand the relationship between the passive-sampling data and observed biological impacts on test organisms.

Passive-sampling methods that measure the freely dissolved concentrations of organic contaminants in sediment have the potential to provide a more accurate measurement of the "bioavailable" portion of the contaminants – a contrast to conventional methods that involve measuring the total concentration of contamination in a sediment sample and often do not accurately measure exposure.

REGIONAL MONITORING

Bight '18 kicks off with five study elements

Participants of the Southern California Bight Regional Monitoring Program have developed five main study elements for the program's 2018 cycle that will explore different facets of how human activities have impacted the ecological health of the region's coastal waters.

The regional marine monitoring collaborative, known as Bight '18, kicked off in fall 2017 at SCCWRP and includes participation by about 100 environmental organizations. The five study elements will be:

» **Sediment Quality**, which will examine the ecosystem impacts of sediment contamination across time and space, including via assessments of contamination in seafood.

» **Ocean Acidification**, which will track corrosive conditions in coastal waters across time and space, as well as examine whether larval fish and other species sensitive to ocean acidification are experiencing biological impacts.

» **Harmful Algal Blooms**, which will track how long domoic acid created during bloom events lingers in seafloor sediment, as well as whether cyanotoxins from land-based blooms are being washed into coastal waters.

» **Trash**, which will track the extent to which trash has spread across aquatic environments on land and at sea, and the types and abundance of trash in these settings.

» **Microbiology**, which will explore the utility of adapting coliphage viruses as an indicator of microbial contamination.

Field sampling will begin this summer. Program participants already have created robust study designs for each element, and have begun developing quality-assurance exercises, including laboratory intercalibration studies, to ensure all data collected are comparable and of high quality.

The Southern California Bight Regional Monitoring Program, which has been facilitated by SCCWRP since its inception in 1994, mobilizes Southern California environmental management agencies to collect data from across a much greater expanse than just their local discharge zones. Both regulated and regulatory agencies, as well as non-governmental and academic organizations, come together to collaboratively design the study and interpret findings.

Southern California's environmental management community relies on the Bight program to better direct resources and to maintain focus on the areas and issues that are disproportionately impacted by human activities.

A field crew collects sediment samples in San Diego Bay for the Southern California Bight 2013 Regional Monitoring Program. The program's sixth cycle, which kicked off in fall 2017, will feature five main study elements examining different facets of how human activities have impacted the ecological health of the region's coastal waters.

INFORMATION TECHNOLOGY & VISUALIZATION

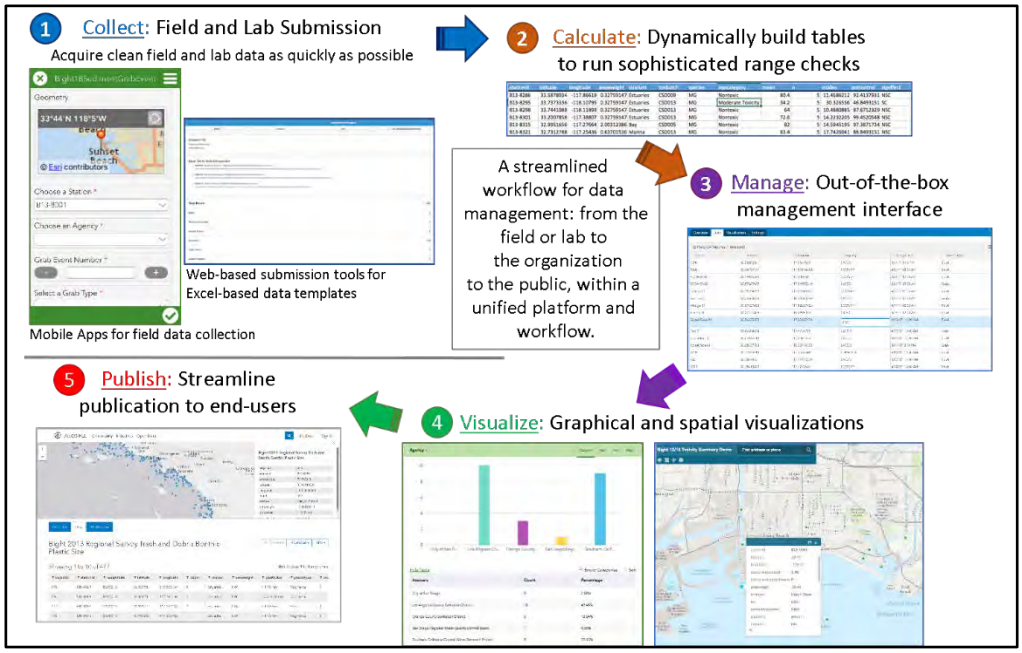
SMC open-data portal under development to streamline data management

The Southern California Stormwater Monitoring Coalition (SMC) has begun developing a comprehensive data management system intended to streamline data submission, quality-control checks and data analysis.

Built on the Esri ArcGIS Open Data platform, the open-data portal will aggregate all SMC program data, as well as integrate with other databases, including those maintained by the state's Surface Water Ambient Monitoring Program (SWAMP) and the California Rapid Assessment Method (CRAM).

SMC members will be able to directly access their own data, as well as use data query and visualization tools to analyze these data sets, including calculating California Stream Condition Index scores.

SCCWRP, which is building the portal, is scheduled to present a conceptual prototype to the SMC this spring. Feedback from SMC members will inform development of the full prototype over the next year.



The open data workflow is a comprehensive data management system built by SCCWRP to streamline submission of field data, quality-control checks and data analysis. SCCWRP has begun building an open data portal for the Southern California Stormwater Monitoring Coalition.

UAS to be used to develop protocols for quantifying trash in waterways

SCCWRP and its partners have kicked off a three-year project to develop standardized methods for quantifying trash in California waterways, including using imagery collected from unmanned aerial systems (UAS) to supplement assessments by field crews that walk the system.

Researchers will seek to adapt artificial-intelligence technologies to autonomously identify and quantify trash in aerial imagery, including being able to distinguish different types of trash.

The goal is to develop consistent, repeatable protocols for monitoring trash in streams and rivers across California. These protocols will enable environmental managers to assess the effectiveness of recent statewide policies aimed at reducing the volume of trash entering California waterways.

UAS, commonly known as drones, have the potential to provide a rapid, cost-effective alternative to traditional, labor-intensive data collection methods in the field.

The project involves using Microsoft's Azure cloud computing resources and Esri's geospatial mapping software – both of which were made available to the project through the Microsoft AI for Earth grant program.

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Mehinto, A.C., K.J. Kroll, B.S. Jayasinghe, C.M. Lavelle, D. Vandervort, O.K. Adeyemo, S.M. Bay, K.A. Maruya, N.D. Denslow. Linking in vitro estrogenicity to adverse effects in the inland silverside (Menidia beryllina). *Environmental Toxicology and Chemistry* DOI: 10.1002/etc.4024.

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Sengupta, A., R.J. Hawley, and E.D. Stein. 2018. Predicting hydromodification in streams using non-linear memory based algorithms: A Southern California case study. *Journal of Water Resources Planning and Management* DOI:10.1061/(ASCE)WR.1943-5452.0000853.

Journal Articles (Accepted)

Beck, M.W., K. Cressman, C. Griffin, J. Caffrey. In press. Water quality trends following anomalous phosphorus inputs to Grand Bay, Mississippi, USA. *Gulf and Caribbean Research*.

Kessouri, F., C. Ulses, C. Estournel, P. Marsaleix, F. D'Ortenzio, T. Severin, V. Taillandier, P. Conan. In press. Vertical mixing effects on phytoplankton dynamics and organic carbon export in the western Mediterranean Sea. *Journal of Geophysical Research: Oceans*.

Sengupta, A., S.K. Adams, B.P. Bledsoe, E.D. Stein, K.S. McCune, and R.D. Mazor. In press. Tools for managing hydrologic alteration on a regional scale: Estimating changes in flow characteristics at ungauged sites. *Freshwater Biology*.

Steele, J.A., A.D. Blackwood, J.F. Griffith, R.T. Noble, K.C. Schiff. In press. Quantification of pathogens and markers of fecal contamination during storm events along popular surfing beaches in San Diego, California. *Water Research*.

Technical Reports

Bay, S.M., D.J. Greenstein, A.N. Parks. 2018. Spatial and temporal variability in sediment toxicity identification evaluations. Technical Report 1014. Southern California Coastal Water Research Project. Costa Mesa, CA.

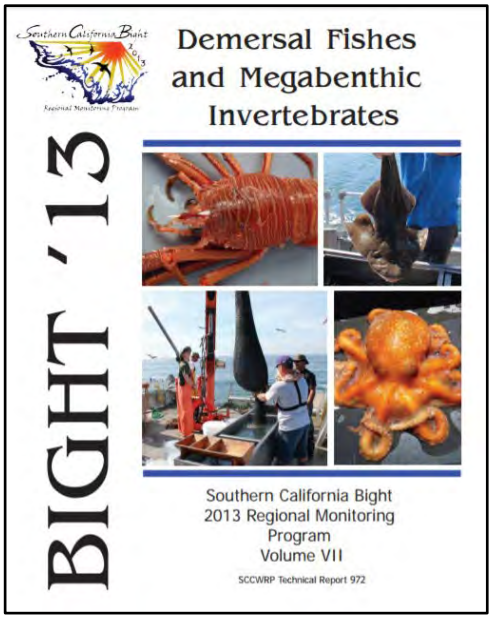
Beck, M., R.D. Mazor, E.D. Stein, R. Maas, D. DeMello, D. Bram. 2017. Mapping of non-perennial and ephemeral streams in the Santa Ana region. Technical Report 1012. Southern California Coastal Water Research Project. Costa Mesa, CA.

Mazor, R.D., J. Brown, E.D. Stein, J.R. Olson, M.D. Robinson, and T. Clark. 2017. Assessment of episodic streams in the San Diego region. Technical Report 1011.

Southern California Coastal Water Research Project. Costa Mesa, CA.

Steele, J., J. Griffith, R. Noble, K. Schiff. 2017. Tracking human fecal sources in an urban watershed during wet weather. Technical Report 1002. Southern California Coastal Water Research Project. Costa Mesa, CA.

Walther, S.M., J.P. Williams, A.M. Latker, D.B. Cadien, D.W. Diehl, K. Wisenbaker, E. Miller, R. Gartman, C. Stransky, K. Schiff. 2017. Southern California Bight 2013 Regional Monitoring Program: Volume VII. Demersal Fishes and Megabenthic Invertebrates. Technical Report 972. Southern California Coastal Water Research Project. Costa Mesa, CA



The Southern California Bight 2013 Regional Monitoring Program has published its final assessment report evaluating the condition of Demersal Fishes and Megabenthic Invertebrates.

Quarter in Review

Conference Presentations

Bay, S.M., D. Gillett, K. Schiff, A. Parks. Implementing a standardized weight of evidence approach for sediment quality assessment in and management in California: lessons learned from regional monitoring and TMDLs. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Beck, M. Quantifying seagrass light requirements using an algorithm to spatially resolve depth of colonization. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Beck, M. Introduction to R for analysis of coastal and estuarine data. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Bednarsek, N., B. Carter, R. McCabe, R.A. Feely, and M.A. Sutula. Interactive effects of temperature and acidification on pteropods in the Southern California Current Ecosystem. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Bianchi, D., J. McWilliams, F. Kessouri, C. Deutsch, L. Renault, H. Frenzel, and M.A. Sutula. Role of submesoscale processes on the biogeochemistry of the California Current Ecosystem. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Deutsch, C., J. McWilliams, E. Howard, F. Kessouri, H. Frenzel, D. Bianchi, and M.A. Sutula. Habitat compression from hypoxia and acidification in the California Current System. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Feely, R.A., R.R. Okazaki, W.J. Cai, N. Bednarsek, and R.H. Byrne. Effects of acidification and hypoxia on ph and aragonite saturation in the coastal waters. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Gillett, D. and S. Bay. Developing a causal assessment framework for stressor identification in marine and estuarine systems. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Griffith, J. F. Adapting new technologies to improve microbial source tracking. California Association of Public Health Laboratory Directors. November 6-8, 2017. San Luis Obispo, CA.

Howard, M., D. Caron, R. Kudela, K. Loftin, A. Tatters, K. Hayashi, J. Smith, A. Donovan, Z. Laughrey, C. Nagoda, B. Fetscher, S. Fluharty, R. Fadness, J. Crooks, J. McCullough, M. Almeida. Monitoring multiple HAB toxins at the land-sea interface in coastal California. Ninth U.S. Symposium on Harmful Algae. November 2017. Baltimore, MD.

Jabusch, T., R. Sutton, P. Trowbridge, J. Davis, W. Lao, K. Maruya. Contaminants of emerging concern (CECs) in sport fish from the Russian River watershed, California. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Kessouri, F., J. McWilliams, M.A. Sutula, D. Bianchi, C. Deutsch, H. Frenzel, L. Renault, K. McLaughlin, S.R. Alin, and R.A. Feely. Modeling the impact of anthropogenic emissions on the California Current Ecosystem. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Maruya, K.A., A.C. Mehinto, S.B. Weisberg, N.D. Denslow, D. Schlenk, S.A. Snyder, C. Waggoner, and G. Gearhart. A screening and prioritization strategy for contaminants of emerging concern (CECs) in California waterbodies. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

McLaughlin, K., M.D. Howard, N.P. Nezlin, F. Kessouri, and M.A. Sutula. Biogeochemical measurements characterizing the influence of anthropogenic nutrients in the Southern California Bight. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Mehinto, A.C., K.A. Maruya, R. Mazor, E. Nelson, N. Dodder, E. Hoh, M. Denison, R. Fadness, J.M. Lyons, H. Boyd, and B. Fetscher. Testing new tools to monitor contaminants of emerging concern in California. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Parks, A.N., and S.M. Bay. Assessment of sediment contaminant contribution to human health risk via bioaccumulation modeling. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Steele, J.A., P.A. Greenfield, L.R. Thompson, J. Martinson, D. Kacev, A. Bush, M. Hajibabaei, D. Baird, E.M. Pilgrim, E.D. Stein, A.A. Chariton. Inter-laboratory comparative study of bioinformatics pipelines: Initial Results. Second Annual Environmental DNA Technical Exchange Workshop. January 9-10, 2018. Via webinar.

Sutula, M., F. Kessouri, E. Turner. Coupled models of coastal acidification and hypoxia: Applications to management. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Conference Posters

Ferrey, M., A. Mehinto, N. Garcia-Reyero, W. Backe, A. Andrews, M. Martinovic-Weigelt. Integrating chemical monitoring data with bio-effects data to prioritize and predict hazards of contaminants of emerging concern in Minnesota streams. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Mehinto, A.C., D. Li, L. Mao, and K.A. Maruya. Assessing the toxicity of clobetasol propionate using in vitro cell assay and in vivo fish model. Society of Environmental Toxicology and Chemistry 38th Annual Meeting. November 12-16, 2017. Minneapolis, MN.

Steinberg, S. Changing Ocean Uses: Marine Renewable Energy on the West Coast interactive story map. Esri Ocean GIS Forum. October 1-2, 2017. Redlands, CA.

Steinberg, S. How are Ocean Conditions Changing? Interactive story map. Esri Ocean GIS Forum. October 1-2, 2017. Redlands, CA.

Sutula, M., A. Simone, R. Ambrose, N. Bednarsek, D. Bianchi, C. Deutsch, R. Feely, F. Kessouri, M. Gold, K. McLaughlin, J. McWilliams, L. Olhsson, L. Renault, and S. Weisberg. Integrated model of ocean acidification and hypoxia to support ecosystem management in the California Current. Coastal and Estuarine Research Federation 24th Biennial Conference. November 5-9, 2017. Providence, RI.

Other Presentations

Afrooz, N. A standardized approach for stormwater monitoring in southern California. California Stormwater Quality Association (CASQA) Science and Monitoring Subcommittee. December 21, 2017.

Afrooz, N. The potential of Biochar as a soil media for green street. Los Angeles County Department of Public Works. December 13, 2017. Alhambra, CA.

Moore, S. Debris in Southern California: From the rivers to the sea. Chapman University Society and the Environment class. November 16, 2017. Orange, CA.

Moore, S. Using virtual reality to simulate science hands-on demonstration. California State University, Long Beach, Wetlands Ecology class. December 12, 2017. Long Beach, CA.

Schiff, K. The Southern California Coastal Water Research Project ecosystem initiative. California Cooperative Ecosystem Study Unit Annual Meeting. December 7, 2017. Berkeley, CA.

Stein, E.D. Sea-level rise effects on coastal wetlands in Southern California. California Landscape Conservation Cooperative. October 31, 2017. Via webinar.

Stein, E.D. Statewide environmental flows framework and workgroup. California Water Quality Monitoring Council. November 28, 2017. Sacramento, CA.

Steinberg, S. Update on the West Coast Ocean Data Portal. West Coast Regional Planning Body public session, executive session and breakout session. December 5-7, 2017. Long Beach, CA.

Steinberg, S. Using Small Unmanned Aerial Systems (sUAS) for environmental mapping and monitoring. Orange County GIS Users Group Winter 2018 Meeting. January 11, 2018. Irvine, CA.

SCCWRP Personnel Notes

Commission

Vic Bianes, Director of the City of San Diego's Public Utilities Department, was appointed Commissioner in November, replacing Halla Razak, who left the City to head the Inland Empire Utilities Agency.

Nancy Woo, who has served as Commissioner for the U.S. Environmental Protection Agency Region 9 since August 2017, retired in January. Janet Hashimoto will continue to serve as Alternate Commissioner.

CTAG

Jun Zhu, Senior Environmental Scientist for the Los Angeles Regional Water Quality Control Board's Watershed Regulatory Section, was appointed to CTAG in December, replacing Steven Webb, who has assumed new job responsibilities.

George Robertson, a Senior Scientist for the Orange County Sanitation District, was appointed to CTAG in November, replacing Dr. Jeff Armstrong, who has assumed new job responsibilities.

Departures

Justin Vanderwal, a Research Technician in the Biogeochemistry Department since 2015, departed SCCWRP in October.

Scientific Leadership

Ken Schiff was appointed to the advisory committee for the Tobacco Related Disease Research Program's Special Initiative for Environmental Health, held November 8-10, 2017 at the University of California, Santa Barbara.

Ken Schiff was appointed a panel member for the San Diego Stormwater Symposium's Panel on Stormwater Research, held December 11, 2017 in San Diego.

Ken Schiff has been appointed to the U.S. Navy Space and Naval Warfare Systems Command's Pulsed Stormwater Toxicity Advisory Committee in San Diego.

Dr. **Steve Steinberg** has received a recognition award from the Executive Committee of the West Coast Regional Planning Body for serving as co-chair of the West Coast Ocean Data Portal.

Dr. **Stephen Weisberg** has been appointed to the Safe and Sustainable Water Resources Committee of the U.S. Environmental Protection Agency's Board of Scientific Counselors.

SCCWRP COMMISSIONER SPOTLIGHT

Engineer passionate about water infrastructure

For his entire career, Vic Bianes has been motivated by a three-word mantra: plan, design and construct.

Vic Bianes

As Engineering Design Manager for the San Diego County Water Authority for a decade, Bianes played a leading role in a $3.6 billion capital improvement program that upgraded water infrastructure across the County.

As Assistant Director of the City's Transportation and Stormwater Department for two years, Bianes assisted in a five-year plan by the mayor to repair 1,000 miles of city streets.

Now, in his role as Director of the City of San Diego's Public Utilities Department, Bianes is overseeing the ambitious Pure Water program, California's first potable reuse project using surface water augmentation. The City's goal is to create a local potable supply that meets a third of future needs by 2035 – and help pave the way for other water agencies to follow.

"As a civil engineer, I like to see infrastructure move through the planning, design and construction phases," Bianes said. "Capital improvement projects have followed me through my entire career. I just truly enjoy improving the quality of life for the communities in which I live and work."

Bianes was appointed Public Utilities Director in October, replacing Halla Razak, who left the City to head the Inland Empire Utilities Agency. Bianes oversees more than 1,600 employees and a budget of more than $800 million.

Bianes' first job out of college in 1985 was working for a residential development consulting firm. About a year later, he was hired as a junior engineer by the City of San Diego, where he worked until 2005 in multiple positions for various water and sewer units, eventually rising to become Deputy Director of the Water Department's Engineering and Program Management Division.

Vic Bianes, fourth from left, explores Manly Beach with his wife and three children on a 2017 family vacation in Sydney, Australia.

Vic Bianes, P.E.

Job: Director, Public Utilities Department, City of San Diego (2017-present)

SCCWRP role: Commissioner (2017-present)

Prior jobs: Assistant Director, Transportation and Stormwater Department, City of San Diego (2015-17); Engineering Design Manager, San Diego County Water Authority (2005-15); various management roles for City of San Diego water, sewer and design divisions (1999-2005); various engineering roles for the City of San Diego (1986-1999); design engineer for residential development consulting firm (1985-86)

Education: MBA, University of Redlands (1990); B.S. Civil Engineering, San Diego State University (1985)

Residence: Bonita, in unincorporated San Diego County

Family: Wife Linda, a Realtor; daughters Julianna, a clinical psychology graduate student, and Alana, a mechanical engineer; son Sean, a high school junior

Hobbies: Traveling locally and abroad; going on neighborhood walks; spending time with family and friends

In 2005, Bianes left the City for a new challenge – serving as Engineering Design Manager for the San Diego County Water Authority. Among his accomplishments was overseeing the design of Carlsbad's seawater desalination plant, the raising of the San Vicente Dam and the Hodges Reservoir Pump Storage Project.

"Having this experience at both the Water Authority and the City has helped me better understand the regional and local political challenges and what our customers and ratepayers demand of us," said Bianes, who returned to the City in 2015.

When he's not working, Bianes enjoys spending time with his wife and three children. He loves local hiking, exploring San Diego's Balboa Park, and attending sporting events at San Diego State, his alma mater.

Bianes also loves to travel. He vacationed last year in Australia, Hong Kong, Taiwan, and Austin, Texas. And he loves road trips closer to home – with one important caveat: "I don't want to do all of the driving."

CTAG SPOTLIGHT

Hydrologist expands into stormwater monitoring

Since he was a child, Dave Laak has been fascinated by maps. On road trips, Laak would spread an AAA road map across his lap and announce passing landmarks and the family's estimated time of arrival.

David Laak

By the time he got to college, Laak realized he could combine his love of maps with a career in the environmental sciences.

For the past two decades, Laak has worked as a hydrologist, relying on GIS mapping software to model and study flood control systems across Ventura County and beyond.

"I've always loved maps – it's a way to synthesize massive amounts of data down to something that is understandable and relatable to people," Laak said. "People mostly just want the bottom line, and maps allow us to tell that kind of story."

This past August, after working for the Ventura County Watershed Protection District for nine years and in consulting for an additional nine years, Laak was promoted to a new role as the Watershed Protection District's Stormwater Resources Manager.

The position expands Laak's areas of responsibility to include monitoring and reporting of stormwater quality.

"I've spent most of my career doing GIS behind a computer, so I'm learning a ton of new stuff," Laak said. "It's a whole different language learning how to sample pollutants of concern in the field, and looking at water-quality impacts down at beaches."

Dave Laak attends a live musical performance at the Hollywood Bowl in summer 2017 with wife Nichole and daughter Allison.

David Laak

Job: Stormwater Resources Manager, Ventura County Watershed Protection District (2017-present)

SCCWRP role: CTAG Representative (started October 2017)

Prior jobs: Water Quality Planner, Ventura County Watershed Protection District (2014-17); Associate Hydrologist, Kasraie Consulting (2005-14); Hydrologist II, Ventura County (1999-2005); hydrologist for an engineering consulting firm (1998-99); part-time GIS specialist, Ventura County Fire Department (1997-98)

Education: B.A. geography and environmental studies, University of California, Santa Barbara (1997)

Residence: Ventura

Family: Wife Nichole, homeschool teacher for daughter Allison, 12; one cat; one betta fish

Hometown: La Cañada Flintridge

Hobbies: Surfing; wilderness day hiking; family trips to the beach; coaching daughter's soccer team

Laak says he's particularly excited about serving on CTAG as he continues to broaden his horizons.

"I'm really stormwater-focused, so it's great to be exposed to other points of view and collaborate together," he said.

Laak stumbled into the world of stormwater management while working as a part-time GIS specialist for the Ventura County Fire Department, his first job out of college. At the time, his focus was mapping prescribed burn areas and mandatory brush clearance areas. His manager, who noticed that his skill set would translate well to hydrology work, introduced him to the county flood control district. Ayear later, he was hired full time as a hydrologist.

Laak spent six years working for the Ventura County Watershed Protection District, then pivoted to private consulting. He enjoyed the flexibility of being able to work from home for nine years while his daughter was very young, but he didn't love the lack of stability and cyclical nature of consulting, he said. In 2014, he returned to the County as a Water Quality Planner, a job he held until his promotion last summer.

Laak's biggest hobby is surfing. He began boogie-boarding when he was about 5 years old, and he still tries to wake up by 6 a.m. at least once a week to hit the waves. His favorite surfing spot is the Santa Clara Rivermouth area in Ventura.

SCCWRP PARTNER SPOTLIGHT

Professor loves freedom of academic research

As an undergraduate in environmental engineering sciences, Dr. Kristen Davis interned for a fertilizer manufacturer, assisting with environmental permit compliance.

Dr. Kristen Davis

Then, after graduating, she worked for a year as an executive assistant in the nonprofit grant-making world, helping manage a research portfolio focused on endocrine-disrupting chemicals.

These initial brushes with careers in engineering and science reinforced for Davis the type of job she absolutely did not want – that is, having someone else dictate what she would work on.

For Davis, the main draw to working in the environmental sciences is the freedom to pursue the research questions and projects that interest her.

"It's addictive to see a real signal from the environment, and then gather the data and figure out what story it tells," said Davis, now a UC Irvine Assistant Professor of Civil and Environmental Engineering & Earth System Science. "I love the freedom to ask questions about the coastal ocean and go after the things that I think are most important."

A close SCCWRP research collaborator, Davis studies coastal ocean processes through the lens of fluid mechanics, with a focus on understanding how circulation patterns impact nearshore ecosystems.

Dr. Kristen Davis, right, enjoys a hike with her husband, Steve, and two daughters at La Bufadora near Ensenada during a family vacation to Mexico in 2017.

Kristen Davis, Ph.D.

Job: Assistant Professor, Civil and Environmental Engineering & Earth System Science, University of California, Irvine (2012-present)

SCCWRP role: Research collaborator

Prior jobs: Postdoctoral Research Associate, Applied Physics Laboratory, University of Washington (2010-12); Postdoctoral Scholar, Departments of Physical Oceanography and Biology, Woods Hole Oceanographic Institution (2009-10); executive assistant, W. Alton Jones Foundation in Virginia (2000-01)

Education: Ph.D. civil and environmental engineering, Stanford University (2009); B.S. environmental engineering sciences, University of Florida (2000)

Residence: Irvine

Family: Husband Steven Davis, a UC Irvine Associate Professor of Earth System Science; daughters Quinne, 10, and Parker, 7; golden retriever Cassie; cat Lulu; chickens

Hometown: Tampa, Florida

Hobbies: Hiking; paddle-boarding; scuba-diving

Davis is leading two projects that involves collaboration with SCCWRP and its member agencies. First, Davis is analyzing circulation patterns in Orange County's Newport Bay to help managers understand how they can more effectively minimize the ecological impacts of local pollution inputs. The Orange County Sanitation District is among the partners collecting field data.

Second, Davis is examining how to optimize offshore macroalgal cultivation for applications such as biofuel, among other uses. SCCWRP is helping Davis examine whether these macroalgae farms – through natural photosynthetic processes – could sequester carbon dioxide, a key driver of ocean acidification.

"SCCWRP is such an important partner to me because if our work points to ways we can improve water quality, SCCWRP has the channels to deliver those results to managers," Davis said.

Davis grew up in Tampa surrounded by the ocean. In college, she combined her passion for the coastal environment with engineering – a practical career path that would land her a solid job, she said.

When she's not working, Davis loves getting out on the water. Her favorite local paddle-boarding spot is Laguna Beach, and her favorite diving spot is the Channel Islands.

SCCWRP STAFF SPOTLIGHT

Third career path is the charm for data analyst

Dr. Marcus Beck has made a career for himself analyzing and mining large-scale ecological data sets to glean new insights about the health of aquatic systems.

Dr. Marcus Beck

But growing up, Beck had no grand plans to immerse himself in the world of big-data analytics. In fact, Beck actively pursued two very different careers before finding his calling.

In high school, Beck wanted to become a fighter pilot. He earned his pilot's license at age 16 and, after graduating, enrolled in Florida's Embry-Riddle Aeronautical University. But the academics weren't mentally stimulating enough for him, and he decided to leave the school.

Beck transferred to the University of Florida, where he enrolled in a vertebrate zoology class on a whim.

"The first taxa we talked about were fish, and I don't know if I was just starved for mental stimulation, but I thought fish were just really cool," he said.

Beck decided to major in zoology and become a fish biologist. After graduating in 2006, Beck worked for six months doing fish surveys for the Florida Fish and Wildlife Conservation Commission. Then, he enrolled in a master's program at the University of Minnesota, where he finally discovered his passion for data analytics.

Beck, who just completed a four-year tenure as a postdoctoral ecologist for the U.S. Environmental Protection Agency's research division in Gulf Breeze, Fla., started at SCCWRP in September as a Scientist in the Biology Department; he'll focus on developing environmental scoring tools for assessing water body condition.

Dr. Marcus Beck explores the wooded forests of Ely in Minnesota on a snowshoeing trip in 2012.

Marcus Beck, Ph.D.

Job: Scientist, Biology Department

Started: September 2017

Prior jobs: Post-Doctorate Fellow/Researcher, Ecosystem Dynamics and Effects, U.S. Environmental Protection Agency Gulf Ecology Division (2013-17); Research Fellow/Assistant, Conservation Biology, University of Minnesota (2007-13); Creel Clerk, Florida Fish and Wildlife Conservation Commission (2007)

Education: Ph.D. and M.S. conservation biology, University of Minnesota (2013 and 2009); B.S. zoology, University of Florida (2006)

Residence: Irvine (previously Pensacola, Fla.)

Family: Girlfriend Susie, an integrated marketing professional; dog Jones, a St. Bernard/golden retriever mix; cat Gus

Hometown: Gainesville, Fla.

Hobbies: Biking; trying out local microbreweries; camping

Beck has been developing environmental scoring tools since he was a student at the University of Minnesota. His master's thesis, which he later expanded into his doctoral thesis, involved synthesizing ecological data sets from lakes across Minnesota to help lay a scientific foundation to develop a statewide lake bioassessment policy.

Beck built an index of biotic integrity for assessing the biological health of Minnesota lakes, then used open-source statistical software to write a program to help explain the factors driving his scoring tool's predictive powers.

"I really enjoy this computational side of biology – looking at different ways to analyze data, keeping my mind busy," Beck said.

Beck said the software program from his thesis, which has applicability to a wide variety of environmental data sets, has been downloaded more than 20,000 times. He also started a blog, "R is my friend," which offers ideas and guidance on how to use a statistical programming language known as R.

"It's amazing the impact you can have when you think about other ways to make science accessible, beyond just publishing a paper in a journal," Beck said. "It's something I'm hoping to do more of."

Beck is looking forward to living in Orange County. Having spent the past four years in small-town Pensacola, Fla., he's particularly excited about exploring Southern California's microbrewery scene and going mountain biking and camping in the desert.

SCCWRP SCENES

Sharing virtual worlds

SCCWRP visited a Wetlands Ecology class at California State University, Long Beach, in December to demo a prototype virtual reality (VR) experience that simulates how the low-lying Tijuana River Estuary at the U.S.-Mexico border will be impacted by sea level rise in the coming decades. SCCWRP used the opportunity to assess how different groups engage with and react to VR technology.

Dr. Christine Whitcraft, an Associate Professor of Biology at Cal State Long Beach, shares photos on social media of her students donning virtual-reality goggles to experience a sea level rise simulation in a wetlands environment. SCCWRP's Shelly Moore, whose Twitter handle is @nomoredebris, led the demo to beta-test the technology with various groups.