SCCWRP Director's Report

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SUMMER 2017 ISSUE

Bioassays show promise for CEC screening in SMC study

SCCWRP and its partners have demonstrated in a proof-of-concept study that commercially available bioanalytical tools have the potential to cost-effectively screen Southern California waterways for the presence of bioactive contaminants of emerging concern (CECs).

The two-year study, completed in June in partnership with the Southern California Stormwater Monitoring Coalition (SMC), examined the relationship between the results of the high-throughput cell assays and the results of a whole-animal screening test. In all, 31 stream sites across Southern California were sampled over a two-year period.

The study found that one of the cell screening assays – the aryl hydrocarbon receptor assay – detected low to moderate levels of a group of bioactive contaminants known as dioxin-like chemicals across both urban and agricultural sites. A subsequent whole-animal screening test showed that these levels of bioactivity were not associated with cardiac malformations during early zebrafish embryo development.

These findings are significant because SCCWRP and other experts have proposed using bioanalytical tools as a cost-efficient first line of defense for screening California waterways for bioactive contaminants, an approach that has the potential to reduce the frequency of whole-animal testing, which is more expensive.

Thus, the study's finding that cell assays are more sensitive than whole-animal tests is a seminal outcome, as it underscores the potential to use cell assays as an initial screening test, to be followed by whole-animal testing to ascertain whether the bioactive contaminants could be impacting organisms in the environment.

SCCWRP proposed this multi-tiered approach to CEC screening in 2015, as part of a draft CEC monitoring framework intended to help water-quality managers more effectively narrow down the classes of CECs that pose the greatest potential

Contents

Cover photo: Cell-based bioassays are a commercially available screening tool that researchers are working to adapt to help monitor bioactive contaminants in aquatic systems.

Calendar

Thursday, August 3
CTAG quarterly meeting

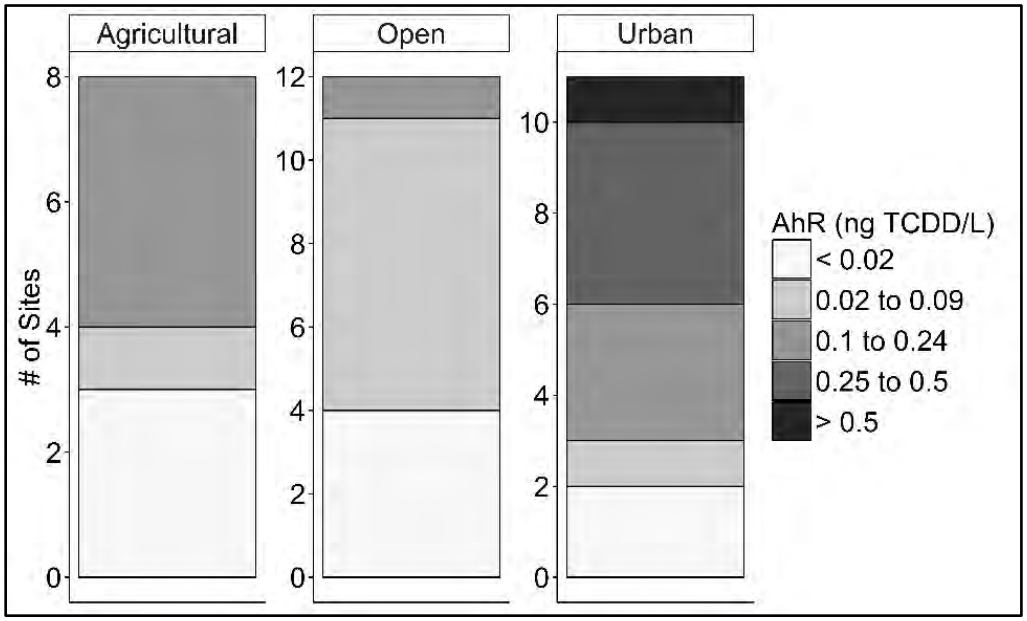
Friday, September 8
SCCWRP Commission meeting

Thursday, September 14
Bight '18 kickoff meeting
RSVPs requested to Christina Rivas

risks to aquatic ecosystems. Since that time, researchers have launched multiple studies to evaluate the utility of the proposed CEC management strategy for statewide application.

The outcomes of the SMC zebrafish embryo test are in agreement with previous studies on the toxicity associated with dioxin-like chemicals. When these bioactive contaminants are present at concentrations much higher than those found in the SMC samples, zebrafish embryos begin to experience developmental anomalies. Researchers are still working to link these biological impacts to relevant cell assay screening thresholds.

The SMC study also explored whether the bioactive contaminants detected during the initial bioanalytical screening step could be correlated in a meaningful way with the level of urbanization of the study sites, as well as with the observed condition of the stream biological communities living at the sites.



A bioanalytical screening tool known as the aryl hydrocarbon receptor assay was used to screen water samples collected by the Southern California Stormwater Monitoring Coalition for the presence of bioactive contaminants. The assay had a proportionately stronger response – depicted above with progressively darker shading – in areas with more human activity, which indicates that the assay successfully detected bioactive contaminants at levels that correspond to what researchers expected to find, given various land-use patterns.

Researchers found that the biological condition of benthic invertebrate communities – as measured by the California Stream Condition Index co-developed by SCCWRP – correlated with the aryl hydrocarbon receptor assay responses. The poorer the biological condition at a given site, the more likely it was to have a relatively high bioassay response, although researchers cautioned that additional linkage studies are needed to confirm whether aryl hydrocarbon receptor-mediated pathways play an influential role in the observed biological degradation.

The full study has been published by the journal *Environmental Science: Processes & Impacts*. For more information, contact Dr. Alvina Mehinto.

POTWs embark on study documenting antibiotic-resistant bacteria, genes in effluent

SCCWRP and its four wastewater treatment member agencies have initiated a year-long study examining whether viable antibiotic-resistant bacteria – and the genes that code for antibiotic resistance – are being discharged into the environment following the wastewater treatment process.

The study, which began in June, will track whether viable bacteria and genetic material are surviving treatment at 10 POTW facilities across Southern California, including an international plant at the U.S.-Mexico border. Influent and effluent samples are being collected quarterly at each wastewater treatment plant.

The study's goal is to develop a baseline understanding of how prevalent antibiotic resistance genes are in wastewater effluent at Southern California's treatment facilities. If these genes are surviving the treatment processes that destroy most bacterial cells, this genetic material could be traveling via treated effluent into aquatic systems, where potentially pathogenic bacteria in the environment could be taking up the antibiotic resistance genes. In this way, antibiotic resistance could be conferred to bacterial strains that make humans sick – a phenomenon that research has shown can lead to multidrug-resistant "superbugs."

The study also will examine whether differences in wastewater treatment regimens and effluent discharge practices across Southern California affect the viability of antibiotic-resistant bacteria and genes. This information will be particularly timely given that treated effluent in Southern California increasingly is being reused for water recycling projects, including direct groundwater injection.

During the study, researchers will screen for three classes of bacterial pathogens resistant to antibiotics: vancomycin-resistant *Enterococcus* (VRE), methicillin-

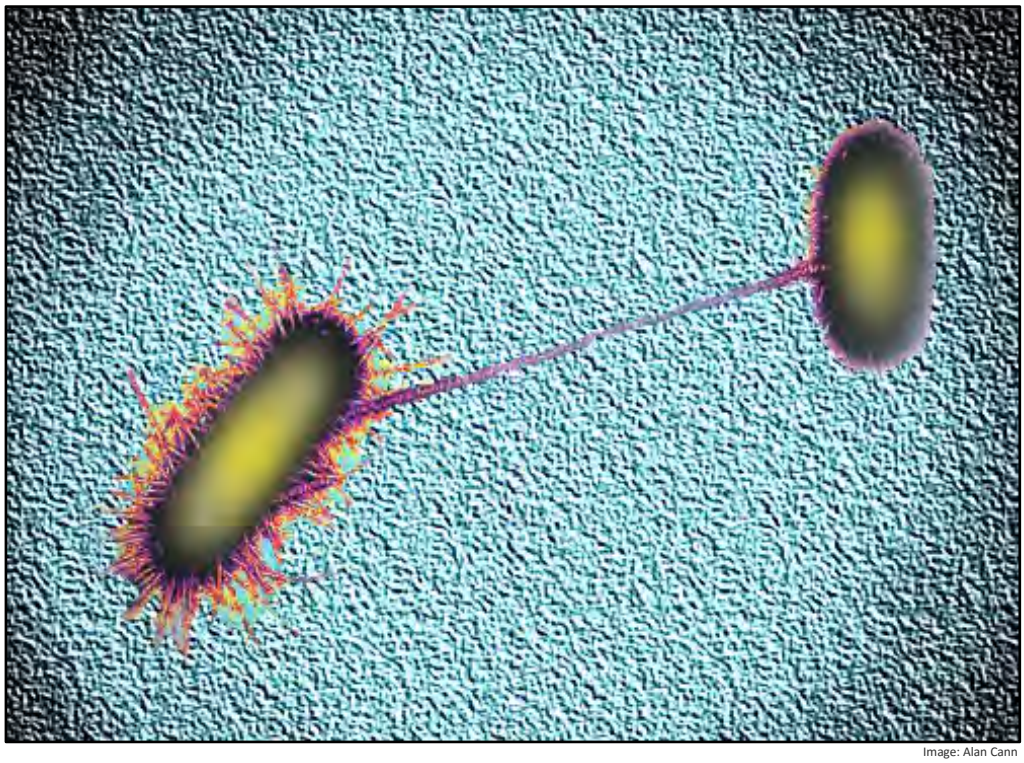


Image: Alan Cann

Bacterial conjugation, shown in this image, is one of the ways that bacterial cells can swap genetic material, potentially conferring antibiotic resistance to one another. SCCWRP and its wastewater treatment member agencies are tracking whether the genetic material that codes for antibiotic resistance is being discharged into the environment following the wastewater treatment process.

resistant *Staphylococcus aureus* (MRSA), and carbapenem-resistant Enterobacteriaciae (CRE). Carbapenems are often the antibiotic of last resort against many life-threatening infections.

Researchers will then use DNA-based methods to identify the antibiotic-resistant bacterial species and the antibiotic resistance genes in the influent and effluent. To determine which genes to target during this molecular analysis, researchers are partnering with the Argonne National Laboratory at the University of Chicago, which has curated a large database of known gene sequences coding for antibiotic resistance. Argonne National Laboratory has conducted similar antibiotic resistance work in the Chicago River.

Study participants have spent the past few months optimizing lab analysis techniques to ensure they can generate high-quality, comparable results across facilities participating in the study. The majority of the POTW facilities are scheduled to finish their first round of sampling by September.

For more information, contact Dr. John Griffith.

Accuracy of QMRA health risk modeling approach validated with epidemiology data

SCCWRP and its partners have shown that a health risk modeling approach known as Quantitative Microbial Risk Assessment (QMRA) can be used to accurately estimate illness rates for beachgoers who come into contact with waterborne microbial contamination.

The three-year study, published in June, independently validated the accuracy of QMRA's predictive abilities by utilizing empirical epidemiology data collected from San Diego-area surfers during the SCCWRP-led Surfer Health Study.

QMRA was offered up by the U.S. Environmental Protection Agency in 2012 as a management approach for revising bacterial objectives at certain California beaches where the fecal indicator bacteria are determined to be coming from predominantly non-human sources. Under this site-specific approach, higher bacterial levels can be deemed allowable because non-human sources of microbial contamination are far less likely than human sources to make beachgoers sick.

The QMRA validation study involved surveying San Diego-area surfers to collect epidemiological data on illness symptoms, and simultaneously analyzing the microbial water quality of two popular San Diego surfing beaches in the 72-hour period following rainfalls.

During rainfall events, pathogens wash off the land and into the coastal zone, elevating the risk of water-contact illness for surfers and other swimmers.

The epidemiology analysis determined that the average illness rate for beachgoers who enter the water is 12 excess gastrointestinal illness cases per 1,000 exposures, while the QMRA predicted that the average illness rate is 15 excess cases per 1,000.

These two illness rates are considered to be in close agreement, indicating QMRA's potential to serve as an accurate, cost-effective health risk modeling method for other beaches. Epidemiology studies, by contrast, are comparatively costly and time-consuming to conduct.

Already, San Diego's beach water-quality management community has begun considering how to use the QMRA modeling approach to set alternative numeric targets for fecal indicator bacteria at the region's beaches. This change could, in turn, affect the management requirements codified in wet-weather beach bacteria TMDLs (Total Maximum Daily Loads) at six San Diego-area beaches.

SCCWRP and its partners have been working closely with San Diego stakeholders, helping to resolve numerous remaining technical issues and facilitating a cost-benefit analysis.

The full QMRA study has been published in the journal *Water Research*. The Surfer Health Study has been published in the *American Journal of Epidemiology*. For more information, contact Ken Schiff.

Surfers paddle away from shore at San Diego's Ocean Beach, one of two sites where researchers enrolled surfers in an epidemiological study to collect information on the surfers' illness symptoms during the rainy winter season. The surfers' average illness risk, which was calculated using the epidemiological data, was compared to the average illness risk predicted by a modeling approach known as Quantitative Microbial Risk Assessment (QMRA).

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

Initial development work completed for algae-based stream scoring tool

SCCWRP and its partners have completed initial development work on an assessment tool that will score the ecological health of California wadeable streams by analyzing the condition of in-stream algal communities.

The Algal Stream Condition Index (ASCI) is modeled after the California Stream Condition Index (CSCI), co-developed by SCCWRP and unveiled in 2015. While the CSCI uses bottom-dwelling macroinvertebrate communities as biological indicators of stream condition, the ASCI will use stream algal communities.

Draft versions of the core technical components of the ASCI will be presented in September to the project's scientific advisory committee. The technical pieces already have been presented to stakeholders.

The ASCI scoring tool will complement the CSCI by providing an additional line of evidence for conducting stream bioassessments. Algae are sensitive to a different combination of water-quality stressors than are bottom-dwelling macroinvertebrate communities, underscoring the value of both tools to stream managers.

The ASCI is being developed to integrate algae taxonomic data obtained through both traditional morphological analysis and DNA sequencing methods. This approach is intended to ensure the long-term utility of the algal index.

Condition bioindicators to be developed for ephemeral streams

SCCWRP and its partners are launching a three-year project to develop bioindicators for ephemeral streams in California and Arizona, following the successful completion of a proof-of-concept study showing that these condition assessment tools would be feasible to build.

The project's goal is to develop a quantitative scoring tool for ephemeral streams modeled after the California Stream Condition Index, which was co-developed by SCCWRP for use in perennial streams. Ephemeral streams, or streams that run dry for much of the year, make up about 60% of all streams in Southern California, but existing stream

Matt Robinson of Cal State San Marcos sets up a ramp trap to catch ground-dwelling terrestrial arthropods in a dry stream bed. The greenish chemical propylene glycol is used for preserving trapped organisms. SCCWRP and its partners are launching a three-year project to use arthropods and other organisms to develop condition bioindicators for streams that run dry for much of the year.

bioindicators are not appropriate for generating accurate assessments for the driest among these streams.

Assessment tools for ephemeral streams are expected to become increasingly valuable to water-quality managers as more streams run dry in response to climate change, drought, and increased water conservation and reuse.

The project will focus on using terrestrial arthropods and bryophytes (e.g., mosses), as well as the condition of riparian habitat, to assess the streams' ecological health.

SCCWRP will train its partners in California and Arizona to implement sampling protocols. The protocols were developed during a feasibility study conducted last year at about 30 sites in the San Diego area representing a range of natural gradients and stress levels.

The first round of sampling for the study will take place in summer 2018. For more information and to become a project participant, contact Dr. Raphael Mazor.

ECOHYDROLOGY

Project laying groundwork to develop flow-ecology assessment tools

SCCWRP and its partners have begun laying the groundwork to develop a suite of assessment tools that illuminate how the ecological health of Southern California streams is impacted by alterations to hydrologic flow patterns.

The two-year project, which kicked off in June, will focus on improving understanding of the relationships between hydrologic flows and ecological condition, especially in light of shifting rainfall and temperature patterns triggered by climate change.

Researchers will explore using various modeling approaches and other assessment tools to help explain these flow-ecology relationships, and investigate the feasibility of developing flow-ecology bioindicators for fish, amphibians and riparian birds. SCCWRP and its partners previously developed a flow-ecology assessment tool for Southern California streams based on the condition of bottom-dwelling macroinvertebrate communities.

A key priority for researchers when building this scientific foundation for the flow-ecology bioindicator development work is aligning it with an environmental flows statewide assessment framework being developed by a team of technical experts from across California, including SCCWRP.

Researchers began the project with a literature review that is expected to be completed by the end of 2017. As the project moves forward, researchers hope to build a foundation for developing a prioritization scheme that could help watershed managers select biological endpoints and associated assessment approaches based on their needs, priorities and available data.

CLIMATE CHANGE

Effort launched to develop biologically relevant thresholds for tracking ocean acidification

SCCWRP and its partners have launched a two-year initiative to develop a scientific foundation for using the health of marine organisms to track the biological impacts of ocean acidification (OA).

Researchers will compile global biological data on pteropods, or sea snails, and other sentinel organisms from OA literature, then use computer models of the coastal ocean to interpret and set ecologically relevant tipping points, or thresholds, at which organisms are impacted by changing seawater chemistry.

The computer models, which explain the physical and biogeochemical dynamics of the coastal ocean, are being developed by a group of West Coast researchers – including at SCCWRP – to predict how coastal ecosystems will be impacted by OA.

SCCWRP will facilitate the development of biologically relevant OA thresholds by bringing together an international consortium of OA researchers to work toward consensus on threshold setting.

Pteropods, or sea snails, are sentinel indicators of the biological impacts of ocean acidification. SCCWRP and its partners are developing the scientific foundation upon which pteropods and other marine organisms will be used to track changes to ocean chemistry.

Coastal resource managers will be able to use the biological thresholds in combination with OA exposure data to assess the speed and intensity with which OA is likely to impact marine communities. The assessment tools also will shed light on how marine communities are impacted by hypoxia.

The acidifying ocean has been shown to affect behavior, reproduction, growth and survival in a variety of marine species. Researchers will initially focus on pteropods, which are marine calcifiers that depend on minerals from seawater to form their protective outer shells and skeletons. These minerals are expected to become scarcer in response to OA.

Pteropods, which are part of the base of marine food webs, are particularly relevant harbingers of OA in the Southern California Bight. The 2013 cycle of Bight regional monitoring showed that corrosive waters already are creeping into the ecologically sensitive Bight continental shelf zone, especially during upwelling events in the spring months.

In September, OA researchers from around the world will gather at SCCWRP to begin developing consensus around the thresholds at which pteropods are biologically impacted by OA.

Novel sediment management strategies to be explored for protecting coastal wetlands

SCCWRP and its partners have launched a four-year study exploring how innovative sediment management strategies could be used to prepare low-lying coastal areas for the impacts of sea level rise and storm surge.

The project, which kicked off in June and is being led by the University of California, Irvine, will analyze how existing sediment management practices affect the stability of Southern California wetlands and other coastal habitats vulnerable to rising sea levels, and how novel sediment management strategies could be used to optimally protect these areas and help them adapt in the coming decades.

Sediment is spread on top of a low-lying coastal wetland area to raise its elevation. A new four-year study will explore whether approaches such as accretion are viable management strategies to help prepare vulnerable Southern California coastal areas for sea level rise in the coming decades.

In particular, researchers will examine how raising the elevation of wetlands by spreading layers of sediment over them – known as accretion – might buffer these areas and help preserve their ecological functioning.

Case studies will be conducted in Upper Newport Bay in Orange County and the Tijuana River Estuary in San Diego County.

Because any sediment management strategies developed through the project will need to be responsive to competing management priorities and needs, researchers will develop models to help managers systematically evaluate tradeoffs related to ecological restoration, water-quality protection, navigation, recreation and other priorities.

During the project's kickoff meeting in June, representatives from more than a dozen federal, state and local agencies involved in coastal habitat management helped define future research needs, identify possible strategies and summarize data gaps related to sediment management as an accommodation tool.

SEDIMENT QUALITY

First phase of sediment TIE optimization study wraps up

SCCWRP has completed the first phase of a two-year project exploring how to optimize the design of toxicity identification evaluation (TIE) studies to improve confidence in the results.

The project, initiated in 2016, involves oversampling in Consolidated Slip, an area of the Los Angeles Harbor with high sediment toxicity levels, and then using statistical principles to develop best-practices recommendations for TIE study design.

The TIE optimization study is intended to close knowledge gaps about the degree of variability in TIE results across time and space, and to determine how many samples are needed to produce reliable TIE assessments. The study also is examining how seasonal variation in sediment toxicity can influence TIE results.

Existing guidance for optimizing the design of TIE studies is limited, even as

SCCWRP's Liesl Tiefenthaler prepares sediment samples collected from a site in Los Angeles Harbor for a toxicity identification evaluation (TIE) study. SCCWRP is working to optimize the design of sediment TIE studies to improve confidence in the results.

environmental managers devote considerable resources to conducting TIEs and interpreting the findings.

For the first phase of the project, researchers conducted field sampling across Los Angeles and Long Beach Harbors to identify an appropriate site for the study. Once Consolidated Slip was selected, researchers sampled 10 stations at the site in both April and June.

For the second phase of the project, researchers will analyze multiple possible sources of variability in the results to determine the confidence associated with TIE results, and conduct statistical analyses to optimize sampling design for future TIE studies.

The project is expected to wrap up in fall 2017.

CONTAMINANTS OF EMERGING CONCERN

Preliminary testing completed for L.A. River fish flow-through study

SCCWRP and its partners have completed preliminary testing for a field study that involves exposing fish to flowing river water in real time to study potential biological impacts from exposure to CECs.

The pilot project, which marks the first use of mobile exposure units for a Southern California water-quality study, will enable researchers to replicate environmental conditions more accurately than exposing fish in a lab setting. Researchers are setting up mobile exposure units along stream banks to pump water in real time through chambers that house adult male fathead minnows.

The preliminary tests, completed in April, showed that fish health is not being compromised by the mobile exposure units, with water flow and water-quality parameters remaining within acceptable ranges and no fish mortality.

For the main pilot study, which will kick off in mid-August, SCCWRP is collaborating with City of Los Angeles Bureau of Sanitation to establish mobile exposure units at two Los Angeles River sites – one just downstream of the L.A.-Glendale Water Reclamation Plant, and one in the Sepulveda Basin just upstream of the Tillman Water Reclamation Plant that receives urban runoff.

Researchers hope to learn whether CECs – which can be found in both treated wastewater effluent and land-based runoff – trigger biological changes in fish, including to gene expression patterns, tissue integrity and sex characteristics.

The study is being launched as water-quality managers increasingly focus on how CECs in freshwater systems could be affecting the health of aquatic organisms.

A mobile exposure unit, pictured here being tested at SCCWRP, pumps water in real time through exposure chambers that house fish. SCCWRP and its partners are setting up the units along the banks of the L.A. River for a study examining whether fathead minnow fish are impacted by CECs in the water.

CEC advisory panel reconvened to update recommendations for recycled water monitoring

SCCWRP has reconvened an expert advisory panel at the behest of the State Water Board to develop an updated set of recommendations for monitoring CECs in recycled water.

During a three-day meeting at SCCWRP in July, the CEC Recycled Water Advisory Panel deliberated how to update a multi-component assessment framework that the panel originally unveiled in 2010 to guide the State in crafting recycled water CEC monitoring policies. The panel's 2010 recommendations were adopted by the State Water Board in 2013.

Scientific knowledge about CECs and its ecosystem effects has grown considerably since the panel was originally formed, prompting the State Water Board to ask SCCWRP to reconvene the panel. The State Water Board is working to develop a recycled water policy scheduled for release in 2018.

Among the panel's new charge questions is evaluating the potential health implications of reusing treated wastewater effluent, which could contain antibiotic-resistant bacteria and antibiotic resistance genes that survive the treatment process in viable form. A seventh panelist with expertise in microbiology has been added to provide additional perspective around this issue.

The panel also has been asked by the State Water Board to reevaluate a list of priority chemicals for monitoring of groundwater recharge projects; the panel developed the original list seven years ago.

The panel is scheduled to deliver its updated recommendations to the State Water Board in early 2018.

MICROBIAL WATER QUALITY

Microbial contamination detection device to undergo more R&D after malfunction

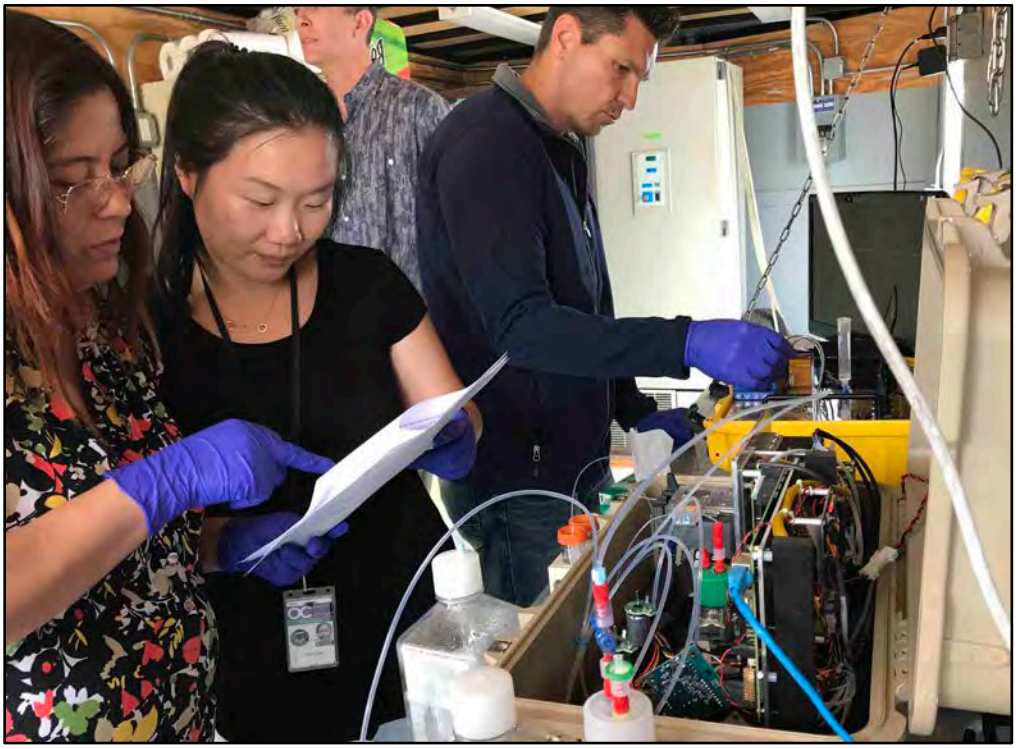
A field-portable instrument prototype designed to improve the speed at which beach water can be analyzed for microbial contamination did not perform reliably during an initial field test and will undergo additional development.

SCCWRP and its member agencies completed testing on the device in May with the instrument's co-developers. The testers determined that the component of the machine that uses a DNA-based approach to quantify microbial contamination appeared to be misaligned. Such issues are not unusual for a prototype instrument.

Meanwhile, the sample acquisition component, which prepares raw water samples for the DNA analysis, was able to produce comparable, high-quality results. It successfully filtered a variety of water sample types, including those with high turbidity and high algal bioamass, and produced DNA extracts of equal, and sometimes superior, quality to those obtained with standard laboratory equipment.

The Monterey Bay Aquarium Research Institute, which co-designed the instrument with a professor who is now at the University of Montana, is continuing to work to improve the instrument's design.

Unlike traditional methods that require water samples to be brought to a lab for analysis – a process that can take up to 24 hours – the microbial contamination detection instrument is being designed as a field-deployable device, capable of producing results within two hours. The system is intended to be so simple to use that it could be operated by a lifeguard.



SCCWRP member agencies and other partners conduct field testing in May on a field-portable microbial detection device intended to improve the speed at which beach water can be analyzed. The field testers found that the instrument did not perform reliably; it will undergo further development. Pictured are Zaira Valdez of the City of San Diego, left, Stella Shao of Orange County Public Works, and Ryan Reinke of the Sanitation Districts of Los Angeles County.

INFORMATION TECHNOLOGY & VISUALIZATION

Field testing underway to explore monitoring applications for recently acquired UAS

SCCWRP and its partners have initiated a series of field experiments examining how a pair of recently acquired unmanned aerial systems (UAS) could be used to improve the speed and accuracy of routine environmental monitoring.

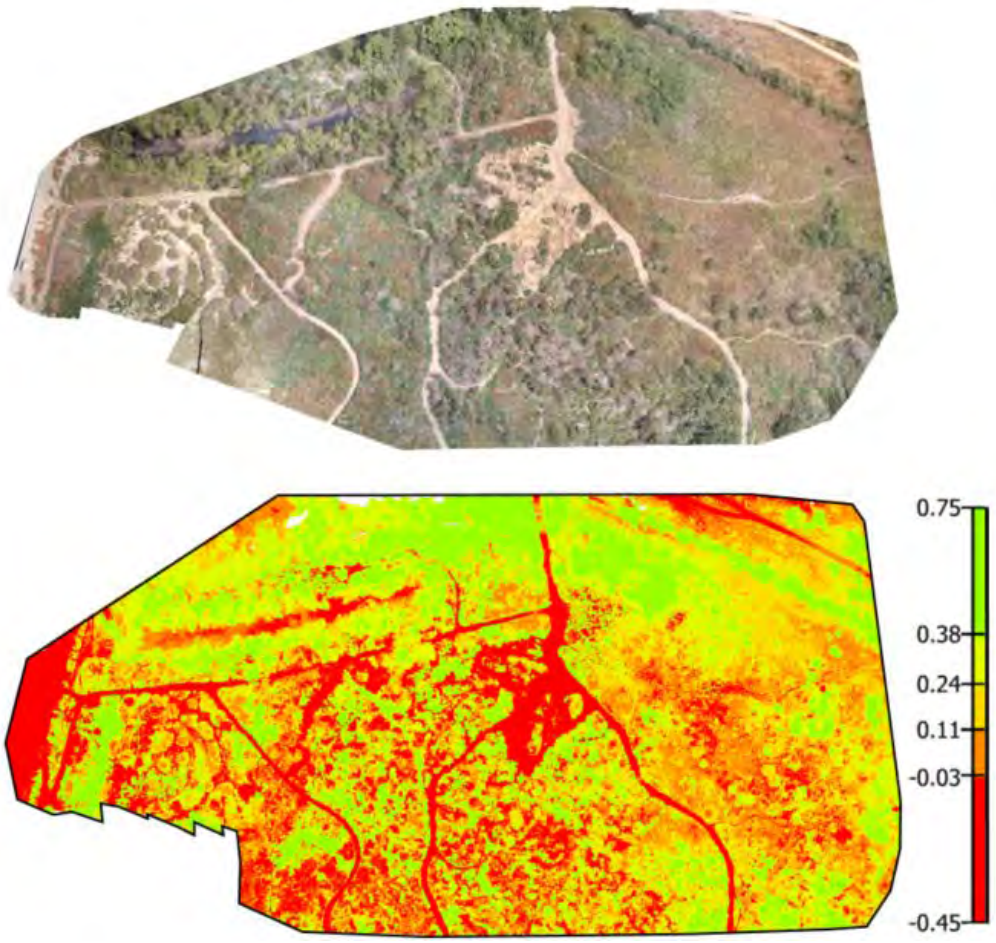
Researchers are exploring if and how professional-grade drone technology could be used to effectively track the spread of trash in watersheds, document erosion and other morphological change in waterways, and monitor the health of aquatic vegetation by measuring features such as wetness and greenness.

SCCWRP has invested in two drones: one with an integrated multispectral sensor, and one for capturing photos with a high-resolution camera that is shared with the San Francisco Estuary Institute. SCCWRP staff have received Federal Aviation Administration certification to pilot the aircraft.

With the multispectral sensor, researchers are focusing on capturing chlorophyll-a data, which can be used to distinguish between healthy vs. dying vegetation, and to identify early evidence of algal blooms.

Later this year, researchers will test the multispectral sensor's ability to identify and map algal blooms at Lake Elsinore in Riverside County.

Unlike satellite imagery and ground-based field methods, UAS offers the potential to produce detailed, 3D mapping-quality data for specific sites of interest, improving researchers' ability to completely characterize sites that have traditionally been too time-consuming, dangerous or inconvenient to access.



Researchers capture a high-resolution image, top, and multispectral sensor image, bottom, of Talbert Regional Park in Orange County during test flights with a pair of recently acquired unmanned aerial systems (UAS). While the top image provides a basic record of the condition of vegetation at the site, the bottom image uses chlorophyll-a measurements to generate detailed data on the vegetation's condition. The greener areas represent healthier vegetation, while the redder areas represent dying vegetation and barren areas.

Effort underway to clean up, standardize historical Bight monitoring data

SCCWRP and its member agencies have initiated a project to clean up and standardize decades of data they've collected from across the Southern California Bight during routine environmental monitoring.

The goal is to get all of the data into electronic databases that are consistent and comparable among agencies, so researchers can begin mining the data as part of historical analysis studies seeking to understand changing environmental conditions in the Bight over time.

SCCWRP's member agencies have agreed to focus initially on the most recent two decades of data, all of which already are in electronic form and dovetail with the initiation of Bight regional monitoring in 1994.

The project was conceived as SCCWRP worked with the SCCWRP Commission and CTAG to write a 40-year retrospective on the 1971 passage of the federal Clean Water Act.

Member agencies and SCCWRP have agreed that clear and detailed metadata

information should be provided with the data sets to avoid interpretation errors and confusion. Also, the originating agency should be notified about which data are being requested and by whom.

Depending on the outcomes of this initial phase of data capture, member agencies will consider expanding the effort as far back as the early 1970s. Member agencies and SCCWRP will weigh the quality and reliability of these data sets, method and detection limits, and the cost of digitizing and standardizing older data.

New Bight '18 tools to improve data management workflows

SCCWRP has developed a series of new tools and automations for the 2018 cycle of the Southern California Bight Regional Monitoring Program designed to streamline and enhance data management.

Known as an open data workflow, the data management solution will eliminate the cumbersome version-control issues associated with sharing databases and performing analyses and quality-control checks.

Instead of requiring participants to manually download databases as ZIP files from a SCCWRP-maintained server, and then analyze a non-master copy before reuploading the database, the open data workflow will enable participants to work directly from a single copy maintained within the cloud-based data portal.

Furthermore, all edits and changes to a database will be tracked in the data portal, giving all participants visibility over data management activities.

The open data workflow represents a significant advance over the data management approaches used for previous Bight programs, with widespread applicability to other data management projects beyond Bight regional monitoring.

A new, dynamic quality-assurance/quality-control checker also will be built directly into the data portal, allowing all custom data and business-rule checks to be completed at the same time participating agencies upload their data.

The open data workflow gives Bight '18 the option of integrating multiple additional features, including descriptive statistics, custom calculations and indices. Additionally, graphic and map-based visualizations can be developed and published directly from this dynamic system, without the necessity of downloading and reformatting the data first.

Finally, databases and other outputs can be directly streamed to SCCWRP's new open data portal and other federated data sites, ensuring the data become more easily discoverable and accessible.

New SCCWRP Publications

Journal Articles (Published)

Lin, K., W. Lao, Z. Lu, F. Jia, K. Maruya, J. Gan. 2017. Measuring freely dissolved DDT and metabolites using solid phase microextraction and performance reference compounds. *Science of the Total Environment* 599-600:364-371.

Martinovic-Weigelt, D., A.C. Mehinto, G.T. Ankley, J.P. Berninger, T.W. Collette, J.M. Davis, N.D. Denslow, E.J. Durhan, E. Eid, D.R. Ekman, K.M. Jensen, M.D. Kahl, C.A. LaLone, Q. Teng, D.L. Villeneuve. 2017. Derivation and Evaluation of Putative Adverse Outcome Pathways for the Effects of Cyclooxygenase Inhibitors on Reproductive Processes in Female Fish. *Toxicological Sciences* 156:344-361.

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Stein, E.D., J.S. Brown, R.D. Mazor. 2017. Transferability of Bioassessment Indices among Water Body Types and Ecoregions: A California Experiment in Wetland Assessment. *Ecological Indicators* 81:65-73.

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Mehinto, A.C., D.R. Vandervort, W. Lao, G. He, M.S. Denison, S.M. Vliet, D.C. Volz, R.D. Mazor, K.A. Maruya. 2017. High throughput in vitro and in vivo screening of inland waters of southern California. *Environmental Science Processes and Impacts* DOI: 10.1039/C7EM00170C.

Stein, E.D., A. Sengupta, R.D. Mazor, K. McCune, B.P. Bledsoe, S. Adams. 2017. Application of regional flow-ecology relationships to inform watershed management decisions: Application of the ELOHA framework in the San Diego River Watershed, California, USA. *Ecohydrology* doi:10.1002/eco.1869.

Journal Articles (Accepted)

Bednaršek, N., R.A. Feely, N. Tolimieri, A.J. Hermann, S.A. Siedlecki, G.G. Waldbusser, P. McElhany, S.R. Alin, T. Klinger, B. Moore-Maley, H.O. Pörtner. In press. Exposure history determines pteropod vulnerability to ocean acidification along the US West Coast. *Scientific Reports*.

Howard, M.D.A., C. Nagoda, R. Kudela, K. Hayashi, A. Tatters, D.A. Caron, L. Busse, J. Brown, M. Sutula, E. Stein. In press. Microcystin prevalence throughout lentic waterbodies in southern California. *Toxins*.

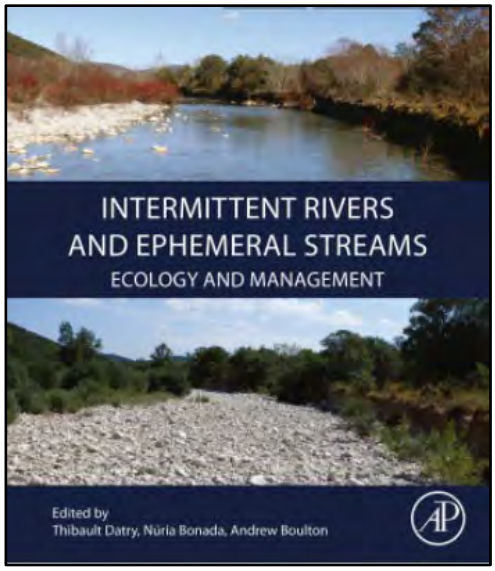
McLaughlin, K., N.P. Nezlin, S.B. Weisberg A. Dickson, C.L. Cash, A. Feit, J.R. Gully, S. Johnson, A. Latker, M.J. Mengel, G.L. Robertson, A. Steele, and L. Terriquez. In press. An evaluation of potentiometric pH sensors in coastal monitoring applications. *Limnology and Oceanography Methods*.

Sengupta, A., R.J. Hawley, and E.D. Stein. In press. Predicting hydromodification in streams using non-linear memory based algorithms: a southern California case study. *Journal of Water Resources Planning and Management*.

Sutula, M., R. Kudela, J.D. Hagy, L.W. Harding, D. Senn, J.E. Cloern, S. Bricker, R. Dugdale, G.M. Berg, and M. Beck. In press. Novel analyses of long-term data provide a scientific basis for Chlorophyll-a thresholds in San Francisco Bay. *Estuarine, Coastal and Shelf Science*.

Book Chapters

Chiu, M.-C., C. Leigh, R. Mazor, N. Cid, and V. Resh. 2017. Anthropogenic threats to intermittent rivers and ephemeral streams. *in*: T. Datry, N. Bonada, and A. Boulton, eds., *Intermittent Rivers and Ephemeral Streams: Ecology and Management*. Academic Press. London, UK.



SCCWRP is a co-author of a chapter on human-induced threats to intermittent and ephemeral streams in the newly published book *Intermittent Rivers and Ephemeral Streams: Ecology and Management.*

Technical Reports

Saarman, E.T., B. Owens, R.F. Ambrose, M.H. Carr, J.C. Field, S.N. Murray, K.J. Nielsen, and S.B. Weisberg. 2017. A framework for informing permitting decisions on scientific activities in marine protected areas. Technical Report 991. California Ocean Protection Council Science Advisory Team. Sacramento, CA.

Quarter in Review

Conference Presentations

Denslow, N.D., A.C. Mehinto, K.J. Kroll, O. Adeyemo, S.M. Bay, K.A. Maruya. Menidia beryllina as a model organism to test endocrine disruption in estuarine environments. 18th International Congress of Comparative Endocrinology. June 4-9, 2017. Alberta, Canada.

Gillett, D. Comparator site selection for screening-level causal assessments. Society for Freshwater Science. June 8, 2017. Raleigh, NC.

Schiff, K. Regional monitoring of the Southern California Bight. International Oil Pollution Environmental Regulators Conference sponsored by the Bureau of Ocean and Energy Management. May 24, 2017. Santa Barbara, CA.

Schiff, K. Climate change management in marine ecosystems: Ocean acidification and hypoxia ocean. American Water Resources Association Specialty Conference on Climate Change. June 27, 2017. Tysons Corner, VA.

Stein, E. California's wetland and riparian monitoring and assessment toolkit. Continuing Legal Education International Annual Conference on California Wetlands. June 15, 2017. Century City, CA.

Stein, E. Adaptation of bioassessment methods for ambient monitoring of underrepresented wetlands. International Society of Wetland Scientists Meeting. June 6, 2017. San Juan, Puerto Rico.

Stein, E. Assessing historic change and relative vulnerability of southern california coastal wetlands to sea level rise. Headwaters to Ocean Conference. May 23, 2017. Irvine, CA.

Stein, E. Insight into future climate change effects on southern California coastal wetlands through observation of the 2015 El Nino. Headwaters to Ocean Conference. May 23, 2017. Irvine, CA.

Steinberg, S.J. Using Small Unmanned Aerial Systems (sUAS) for Environmental mapping and monitoring. Second Annual Water Quality Health Indicator and Data Science Symposium. June 29-30, 2017. Sacramento, CA.

Steinberg, S.J., S.L. Steinberg, S. Moore, P. Smith. A geospatial survey of anglers to assess fish consumption in San Diego Bay. Esri 2017 International User Conference. July 10-14, 2017. San Diego, CA.

Conference Posters

Afrooz, A.R.M.N., and A.B. Boehm. Long-term performance of biochar as bioretention soil media amendment. ReNUWit Annual Meeting. May 15-17, 2017. Stanford, CA.

Gillett, D. An estuarine benthic assessment tool for those without one of their own. California Estuarine Research Society and Pacific Estuarine Research Society 2017 Conference. March 17-19, 2017. Coos Bay, OR.

Smith, P.D. Open data workflow: collect-calculate-manage-visualize-publish (Poster and Demonstration). Second Annual Water Quality Health Indicator and Data Science Symposium. June 29-30, 2017. Sacramento, CA.

Steinberg, S.J. Using Small Unmanned Aerial Systems (sUAS) for environmental mapping and monitoring (Poster and Demonstration). Second Annual Water Quality Health Indicator and Data Science Symposium. June 29-30, 2017. Sacramento, CA.

Other Presentations

Gillett, D. Developing a screening causal assessment framework for California's waters invited presentation. Surface Water Ambient Monitoring Program Water Quality Health Indicator and Data Science Symposium. June 29, 2017. Sacramento, CA.

Maruya, K. Incorporating bioanalytical screening and non-targeted analysis for CEC monitoring. Workshop on Contaminants of Emerging Concern. State Water Resources Control Board. May 1-2, 2017. Rancho Cordova, CA.

Maruya, K. Modernizing monitoring of water resources for emerging contaminants. National Cheng Kung University Mt. Jade Forum on Sustainable Development. June 23, 2017. Tainan, Taiwan.

Maruya, K. New tools for monitoring of contaminants of emerging concern in receiving waters. National Taiwan University Department of Public Health. June 26, 2017. Taipei, Taiwan.

Mehinto, A. Test-driving a new CEC framework to effectively screen for chemical occurrence and effects in aquatic environments. Surface Water Ambient Monitoring Program Watershed Health Indicator and Data Science Symposium. June 29-30, 2017. Sacramento, CA.

Mehinto, A. and K. Maruya. Bioanalytical screening tools for CEC monitoring. San Francisco Estuary Institute Regional Monitoring Program Exposure and Effect Workgroup. May 9, 2017. San Francisco, CA.

Mehinto, A. Linking bioanalytical methods to biological effects. State Water Board Workshop on Constituents of Emerging Concern and Aquatic Ecosystem Monitoring. May 1, 2017. Sacramento, CA.

Schiff, K. Health risk of body contact during wet weather. California Stormwater Quality Association Meeting. May 11, 2017. Ontario, CA

Schiff, K. Judge of senior projects for the California State University, Fullerton Department of Math and Applied Statistics. May 17, 2017. Fullerton, CA

Schiff, K. and N. Afrooz. Use of new media for improved biofilter performance. Los Angeles County Department of Public Works. July 18, 2017. Alhambra, CA.

Schiff, K. and N. Afrooz. Stormwater Research at SCCWRP. San Diego County Land Development Working Group. July 25, 2017. San Diego, CA.

Schiff, K. Latest research for improving stormwater management. Ventura County Co-Permittee Working Group. July 20, 2017. Ventura, CA.

Sengupta, A. Using flow ecology relationships to inform watershed management. State Water Board Workshop on Development of a Watershed Assessment Conceptual Model to Measure Watershed Health. June 7, 2017. Sacramento, CA.

Stein, E. Improving wetland and stream mitigation crediting. Association of State Wetland Managers Webinar. May 17, 2017.

Stein, E. Development of recommended flow targets to support biological integrity based on regional flow-ecology relationships for benthic macroinvertebrates in southern california streams. Delta Conservancy Science to Support Management Seminar Series (Webinar). July 12, 2017. Sacramento, CA.

Stein, E. Environmental flows (Session Organizer and Moderator). Surface Water Ambient Monitoring Program Water Quality Health Indicator and Data Science Symposium. June 30, 2017. Sacramento, CA.

Stein, E. Tiered framework for establishing environmental flows for California streams. Surface Water Ambient Monitoring Program Water Quality Health Indicator and Data Science Symposium. June 30, 2017. Sacramento, CA.

Stein, E. Approaches to environmental flows assessment. State Water Board Office of Information Management Analysis Data Management Workgroup. May 23, 2017. Sacramento, CA.

Weisberg, S. Southern California's water quality research priorities. Chesapeake Bay Program Science and Technical Advisory Committee. June 13, 2017. Annapolis, MD.

External Sources Referencing SCCWRP

India's rising temperatures are already deadly, study shows. Associated Press. June 7, 2017.

Small climb in mean temperatures linked to far higher chance of deadly heat waves. University of California, Irvine. June 7, 2017.

Source Molecular meets with Indiana stormwater managers. Source Molecular Corporation. June 3, 2017.

SCCWRP Personnel Notes

Commissioner

Hope Smythe, Alternate Commissioner for the Santa Ana Regional Water Quality Control Board since 2013, was appointed Commissioner in June, replacing Kurt Berchtold, who retired. Berchtold served on the Commission for many years, first as Alternate Commissioner in the early 2000s and then as Commissioner beginning in 2010.

CTAG

Doug Shibberu, an Environmental Scientist for the Santa Ana Regional Water Quality Control Board, was appointed in May to CTAG, replacing Wanda Cross, who moved to a different position. Cross served on CTAG for about 13 years.

New Faces

Dr. **Nina Bednaršek**, who most recently was a Senior Research Scientist at the Alfred-Wegener-Institut in Germany, joined SCCWRP in June as a Scientist in the Biogeochemistry Department. She will focus on developing biologically relevant thresholds for interpreting ocean acidification data.

Dr. **Bowen Du**, who just completed a Postdoctoral Research Scientist position at the University of Washington, joined SCCWRP in July as a Scientist in the Chemistry Department. His research will focus on investigating occurrence and fate of organic contaminants in aquatic systems.

Scientific Leadership

Dr. **Steven Steinberg** has been re-elected for a two-year term on the Board of Directors for the California Geographic Information Association.

Dr. **Steven Steinberg** has been elected President-Elect of the Board of Directors for the Southern California chapter of the Urban and Regional Information Systems Association.

Dr. **Keith Maruya** has been named President of the Southern California chapter of the Society of Environmental Toxicology and Chemistry.

Jennifer Taylor, a doctoral student in environmental science and engineering at the University of California, Los Angeles, joined SCCWRP in July as a Senior Research Technician in the Biology Department.

Morvarid Azizian, who will earn a Ph.D. in chemical engineering in September from the University of California, Irvine, joined SCCWRP in July as a Visiting Scientist in the Biogeochemistry Department.

Dr. **Olivia Rhoades**, who just completed her Ph.D. in population biology at the University of California, Davis, joined SCCWRP and the California Ocean Science Trust in July as a Joint Postdoctoral Research Fellow.

Promotions

Dr. **David Gillett**, a Scientist in the Biology Department since 2010, was promoted in July to Senior Scientist.

Dr. **Raphael Mazor**, a Senior Scientist in the Biology Department who has worked at SCCWRP since 2006, was promoted in July to Supervising Scientist.

Abel Santana, a Research Technician in the Information Management & Analysis Department who has worked at SCCWRP since 2012, was promoted in July to Senior Research Technician.

Departures

Dr. **Ashmita Sengupta**, a Scientist in the Biology Department since 2010, left SCCWRP in July for a position with the Commonwealth Scientific and Industrial Research Organisation, the Australian equivalent of the U.S. Environmental Protection Agency's Office of Research and Development.

SCCWRP COMMISSIONER SPOTLIGHT

EPA manager forges decades-long SCCWRP bond

When Janet Hashimoto was hired in 1981 by the U.S. Environmental Protection Agency Region 9, her first assignment was to review an initial round of 301(h) waiver applications from wastewater dischargers. At the time, hundreds of wastewater management agencies were applying for an exemption to a federal law requiring them to upgrade their effluent treatment levels from primary to secondary.

Janet Hashimoto

The 301(h) waiver applications that Hashimoto was assigned to review included Southern California's four largest sanitation agencies, all of which were SCCWRP member agencies. As a result, Hashimoto soon began interfacing with SCCWRP.

"It was so fascinating to find this organization that was addressing the scientific questions that we as regulatory agencies have, specific to dealing with the wastewater dischargers," Hashimoto said. "SCCWRP gave me an opportunity to really delve into the science and technology as it related to my work – it was enticing."

Nine years later, after working her way up to an EPA Region 9 Section Chief, Hashimoto was appointed in 1990 as a SCCWRP Alternate Commissioner, a position she has held ever since.

Hashimoto now serves as the Water Quality Assessment Section Manager in the Water Division, based in San Francisco, where she oversees an 11-person staff repsonsible for water-quality standards, TMDLs (total maximum daily loads), 303(d) listings of impaired water bodies, surface water-quality monitoring and coastal beach monitoring.

Hashimoto has remained in the Water Division's surface water programs for virtually her entire career, except for a brief stint in 1986-87 overseeing California's Underground Injection Control program, which regulates the re-injection of oil and gas waters into groundwater.

Janet Hashimoto celebrates the graduation of her daughter Nina, right, from UC Berkeley in 2013.

Janet Hashimoto

Job: Manager, Water Quality Assessment Section, Water Division, U.S. Environmental Protection Agency Region 9

SCCWRP role: Alternate Commissioner (1990-present)

Prior jobs: Chief or Deputy Chief for Monitoring and Assessment; Environmental Assessment, Marine Protection, and Oceans and Estuaries through multiple EPA Region 9 reorganizations (1987-2008); Environmental Scientist/Project Officer, EPA Region 9 Underground Injection Control (1986-87); 301(h) Coordinator, EPA Region 9 (1981-86); Staffing Clerk, U.S. Department of Energy (1980-81)

Education: B.S. biology, University of California, Berkeley (1978)

Residence: Lafayette in the San Francisco Bay Area

Family: Daughter Nina, an operations associate for the Gordon and Betty Moore Foundation; parrot Pepe

Hometown: Kamakura, Japan (birthplace); raised in Okinawa

Hobbies: Camping across the western U.S.; trail hiking; baking

Hashimoto was born in Japan and grew up on the island of Okinawa, which was at the time a U.S. trust territory but has since reverted back to Japan. Her father, a U.S. citizen, worked as a civilian maintenance foreman on a U.S. Marine Corps base. She enjoyed snorkeling and admiring coral reef communities on the tropical island, which is closer to Taiwan than to Tokyo.

Hashimoto majored in biology with a marine emphasis at UC Berkeley, then returned home to Okinawa for about 1-1/2 years while she looked for a job. Although she knew she wanted to work for the EPA, she decided to get her foot in the door by taking an entry-level position as a personnel specialist for the U.S. Department of Energy in San Francisco. The HR job gave her insider knowledge about all kinds of federal jobs, and she was hired by the EPA 10 months later.

"It's been very fulfilling to work for an agency whose mission sits with my own," Hashimoto said. "It's a nice mix of applied science, and water programs really fit my interests and passion."

When she's not working, she enjoys going camping with friends. Her next camping trip will take her through California's Eastern Sierra.

CTAG SPOTLIGHT

Scientist motivated by ever-evolving science

When Phil Markle graduated with a marine biology degree in 1989, the notion of working for a wastewater treatment agency wasn't on his radar – and he certainly couldn't have imagined staying at one for 28 years and counting.

Phil Markle

For Markle, who serves as the Senior Environmental Scientist for the Sanitation Districts of Los Angeles County's Reuse and Compliance Section, the enduring appeal of working for LACSD has been the continuous and dramatic evolution of the science.

One of Markle's first responsibilities when he was hired as a LACSD Toxicology Lab Technician in 1989 was acute toxicity testing, in which he placed 10 fish into an aquarium for a basic LC50 test. If five or more fish survived, the water sample being tested was considered nontoxic, Markle said.

"It wasn't long after I started that advances in wastewater treatment technology and toxicity testing made the LC50 test nearly obsolete," said Markle, who was elected as the CTAG Vice Chair in February. "The science has just never stagnated; it keeps growing and growing. Now we're looking at things like endocrine disruption at the molecular level."

Markle was appointed to CTAG and elected as Vice Chair in February, replacing Joe Gully, who was promoted to a new position.

Throughout his career, Markle has enjoyed method development and the detail-oriented precision and analysis that comes with it. He especially enjoyed his early interactions with SCCWRP in the early 1990s, when SCCWRP facilitated the Southern California Toxicity Assessment Group that worked to improve toxicity testing methods and develop standardized guidance.

Phil Markle with daughters Shannon, left, and Erin enjoy a day along the Baja California coast in 2016.

Philip Markle

Job: Senior Environmental Scientist, Reuse and Compliance Section, Sanitation Districts of Los Angeles County

SCCWRP role: CTAG Vice Chair (started February 2017)

Prior jobs: Environmental Scientist, LACSD Reuse and Compliance Section (2006-2016); Supervising Scientist, LACSD Toxicology Lab (2005-06); Biologist and Senior Biologist, LACSD Toxicology Lab (1995-2005); Laboratory Technician, LACSD Toxicity Lab (1989-95); sales associate and assistant manager, Kragen Auto Parts in Orange (1981-89)

Education: M.S. environmental management, University of San Francisco (2002); B.S. marine biology, California State University, Long Beach (1989)

Residence: Ontario

Family: Daughters Shannon, 23, a microbiologist for a food processing company, and Erin, 20, a Colorado State University microbiology major; dogs Stanley, a terrier mix, and Nigel, a pug

Hometown: Orange

Hobbies: Native plant gardening at home; stained-glass window-making; amateur astronomy; camping in the Mojave and Anza-Borrego deserts; fossil and rock collecting

Markle also has been an active participant in the Southern California Bight Regional Monitoring Program and Southern California Stormwater Monitoring Coalition Regional Watershed Monitoring Program, both facilitated by SCCWRP.

"It's rewarding to interact with a diverse group of stakeholders and put stressors and drivers into the perspective of the entire coastal Bight," Markle said. "You get tunnel vision when you're only focusing on an outfall pipe and a few hundred yards on either side."

Markle's interest in the environment began as a child, when he went on frequent charter fishing trips with his father and brothers off the coast of Southern California. He also enjoyed backpacking and camping with his brothers.

After high school, he enrolled at Cal State Long Beach part-time and spent eight years working full time at an auto supply store to put himself through college. He eventually rose to become an assistant store manager.

Today, Markle enjoys road trips that take him closer to nature. He's traveling to Casper, Wyoming, with his daughters and co-workers on August 21 to be in the direct path of a total solar eclipse.

SCCWRP PARTNER SPOTLIGHT

Visiting scientist models nitrogen cycling in streams

Morvarid Azizian started her Ph.D. at UC Irvine in 2011 with a goal to develop a relatively simple, process-based model that explains how shallow streambed sediments in a stream's hyporheic zone can, under the right conditions, remove pollutants naturally from the water column. When she described the process model in a journal article, however, one of her peer reviewers suggested expanding it and coupling it to nitrogen cycling in streams.

Morvarid Azizian

Azizian and her doctoral adviser, Dr. Stanley Grant, a SCCWRP collaborator, were intrigued. A stream's natural capacity to remove nitrate from the water column has important implications for managing nutrient overenrichment. Could a universally applicable nitrogen cycling model be created to guide nutrient management decisions?

"Nitrate inputs to freshwater and marine ecosystems are at a more critical stage right now than climate change," said Azizian, a Visiting Scientist in the Biogeochemistry Department who will work at SCCWRP for a minimum of six months. "This model has the potential to help us understand how to optimally protect a system's natural ability to remove nitrates, in both streams and the coastal ocean."

Azizian's stream modeling project soon morphed into a multi-year research initiative that she'll tackle as a postdoctoral researcher. In fact, when she graduates this September, she'll stay in the same UC Irvine lab to focus on expanding her stream nitrogen cycling model.

SCCWRP offers Azizian an opportunity to calibrate her model to work across different scales and biogeochemical conditions. The original model was developed for up to 10 meters of a stream; to be useful to managers, it would need to work at the watershed scale.

Morvarid Azizian plays the drums with the Persian performing group DafBang in Los Angeles earlier this year.

Azizian will partner on SCCWRP's ongoing Santa Margarita River watershed nutrient enrichment study, which will give her the opportunity to collect nutrient data that she can use to test-drive in her model.

"In the past, whenever I wanted to test my model, I had to figure out how to use data that had already been collected," she said. "At SCCWRP, I'll be able to collect the measurements I want to test. It's very exciting."

Azizian studied chemical engineering as an undergraduate and master's student in her hometown of Tehran. By the time she began looking into Ph.D. programs, she knew she wanted to focus on water-quality issues – and found her niche doing modeling work.

"I've realized how the research I do at my desk can be applicable in a management decision-making context," she said. "I enjoy seeing application of knowledge."

When she's not working, she plays two types of drums in Persian music groups that perform at local festivals and other events.

Her husband happens to work at a structural engineering company on Harbor Boulevard directly across the street from SCCWRP.

Morvarid Azizian, Ph.D. Candidate

Job: Ph.D. student in chemical engineering, University of California, Irvine

SCCWRP role: Visiting Scientist, Biogeochemistry Department (started July 2017)

Prior jobs: Chemical engineering internships with RHI AG Technology Center in Austria (2011), PARS Refractories Co. in Iran (2010-11), and Mircoh in Iran (2008-10)

Education: Ph.D. candidate in chemical engineering, University of California, Irvine (graduating September 2017); M.S. chemical engineering, University of Tehran in Iran (2011); B.S. chemical engineering, Azad University in Iran (2008)

Residence: Aliso Viejo

Family: Husband Omid Esmaili, a structural engineer

Hometown: Tehran, Iran

Hobbies: Playing two types of drums for Persian performing groups; biking; roller skating; jogging; badminton

SCCWRP STAFF SPOTLIGHT

Biologist shifts to translational OA research

For much of her career as an acidification biologist, Dr. Nina Bednaršek has focused on documenting the effects of ocean acidification (OA) on marine calcifiers, the organisms that use minerals from seawater to form their protective outer shells and skeletons. She has conducted field studies, developed assays and analysis methods, and integrated biological data.

Dr. Nina Bednaršek

Then, about two years ago, Bednaršek started to shift her focus – in part, because of her interactions with SCCWRP. In co-authoring a pair of articles with SCCWRP about how marine califiers and other organisms might be used as biological indicators of ocean acidification, Bednaršek recognized the critical need to translate her foundational OA work into science recommendations upon which marine resource managers could act.

"When I got this opportunity to work with SCCWRP, I said, 'This is exactly where we need to move toward,'" said Bednaršek, who was at the University of Washington at the time. "Just doing OA science for academic purposes is not enough; you need to advance the science to a level where it can be beneficial in making policy."

Bednaršek, who is regarded as one of the world's foremost acidification biologists, joined SCCWRP in June as a Scientist in the Biogeochemistry Department, where she's working to develop biologically relevant thresholds for interpreting OA data.

She's already compiled biological data on pteropods, or sea snails, from OA researchers around the world, giving researchers a robust data set upon which to begin developing consensus around OA thresholds. She also has begun developing models to predict how OA will affect marine calcifiers over the coming decades.

Dr. Nina Bednaršek explores the Croatian island town of Mali Losinj during a vacation with her family in May 2017.

Nina Bednaršek, Ph.D.

Job: Scientist, Biogeochemistry Department

Started: June 2017

Prior jobs: Senior Research Scientist, Alfred-Wegener-Institut, Germany (August 2016-May 2017); Research Scientist and Science Policy Specialist, University of Washington (2014-16); Postdoctoral Fellow, NOAA Pacific Marine Environmental Laboratory (2012-14); Visiting Professor, Angers University, France (2012); Research Associate and Lecturer, University of Nova Gorica, Slovenia (2011-13); Visiting Fellow, University of East Anglia, U.K. (2011)

Education: Ph.D. biological oceanography, University of East Anglia, U.K. (2010); M.S. environmental diagnostics, Cranfield University, U.K. (2006); B.S. microbiology, University of Ljubljana, Slovenia (2005)

Residence: Costa Mesa; previously lived in Bremen, Germany

Family: Parents Ana and Tasso, owners of Bednaršek Winery in Slovenia

Hometown: Metlika, Slovenia (near the border with Croatia)

Hobbies: Running; swimming; reading books on politics, international relations and the economy; music, theater and concerts; camping and hiking, especially in national parks

"Biology is unpredictable and complex, but this branch of OA has advanced incredibly and there are certain unifying principles that you can build your research around," Bednaršek said.

Bednaršek, who grew up in a rural village in Slovenia, majored in microbiology in college and initially planned to study genetics. But while working on a master's in environmental diagnostics in the U.K. in the mid-2000s, she stumbled upon OA. She was fascinated by OA's global reach, she said, and how the ocean's biology is "changing right before our eyes."

For the past year, Bednaršek has lived in Bremen in northwest Germany, where she worked on OA issues for the Intergovernmental Panel on Climate Change.

Bednaršek's parents still live in Slovenia, where they own and operate a small winery that produces both red and white wines.

"I've heard Southern California is a place where a lot of Slovene expats live," she said. "I want to find and connect with them."

SCCWRP SCENES

Testing next-generation technology

SCCWRP member agencies and other partners conducted an initial round of testing in May on a field-portable instrument intended to improve the speed at which beach water can be analyzed for microbial contamination. The prototype instrument is still years away from commercial production, but SCCWRP and its member agencies routinely invest in such testing to help improve the design of next-generation technologies. For more information about the testing of this instrument, go to Page 8.

Clockwise from top left: Field testers from SCCWRP's member agencies learn about a sample processing cartridge that they'll be using; Tommy Nguyen of the City of Los Angeles feeds a DNA sample into the component that quantifies microbial contamination; the instrument's computer provides step-by-step directions and other prompts; and Dr. Cody Youngbull of the University of Montana – one of the instrument's co-developers – demonstrates how to use the microbial contamination quantification component in SCCWRP's mobile laboratory.