



# SCCWRP Director's Report



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SUMMER 2019 ISSUE

## Three key stream condition indicators integrated via index

The Southern California Stormwater Monitoring Coalition (SMC) and SCCWRP have developed a new assessment tool that synthesizes three key lines of evidence about the ecological health of wadeable streams to provide an easy-to-communicate, integrated assessment of overall stream condition.

The Stream Quality Index (SQI), published as an [interactive web application](#) in July and described in a [SCCWRP technical report](#), addresses the long-standing management challenge of not having a scientifically robust method for synthesizing and interpreting biological, chemical and physical measures of stream condition.

Consequently, stream managers have traditionally interpreted results from each of evidence separately – a particular challenge when biological, chemical and/or physical lines of evidence present conflicting assessments of stream health.

The SQI provides stream managers with a systematic, scientifically rigorous approach to integrate biological, chemical and physical lines of evidence. Each stream site is assigned to one of four condition categories that can be readily communicated to managers and non-technical audiences.

The SQI already is being transitioned to use by California's stream management community. The SMC is planning to use the SQI as its primary assessment tool for the SMC's next synthesis report on the condition of wadeable streams in coastal Southern California.

The State Water Board's Surface Water Ambient Monitoring Program (SWAMP), meanwhile, is planning to recalibrate the index for use at a statewide level, including for its next statewide synthesis report. Currently, the SQI is calibrated with data strictly from Southern California.

The SQI uses a stressor-response empirical model to describe the expected likelihood

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**Cover photo:** Researchers have developed an assessment tool that synthesizes biological, chemical and physical measures of stream condition to produce an integrated assessment of overall stream health. The tool was developed for Southern California and is being recalibrated for statewide use.

**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](mailto:pubrequest@sccwrp.org).

### Calendar

- Thursday, August 8**  
CTAG quarterly meeting
- Friday, September 6**  
Commission meeting
- Thursday, November 14**  
CTAG quarterly meeting

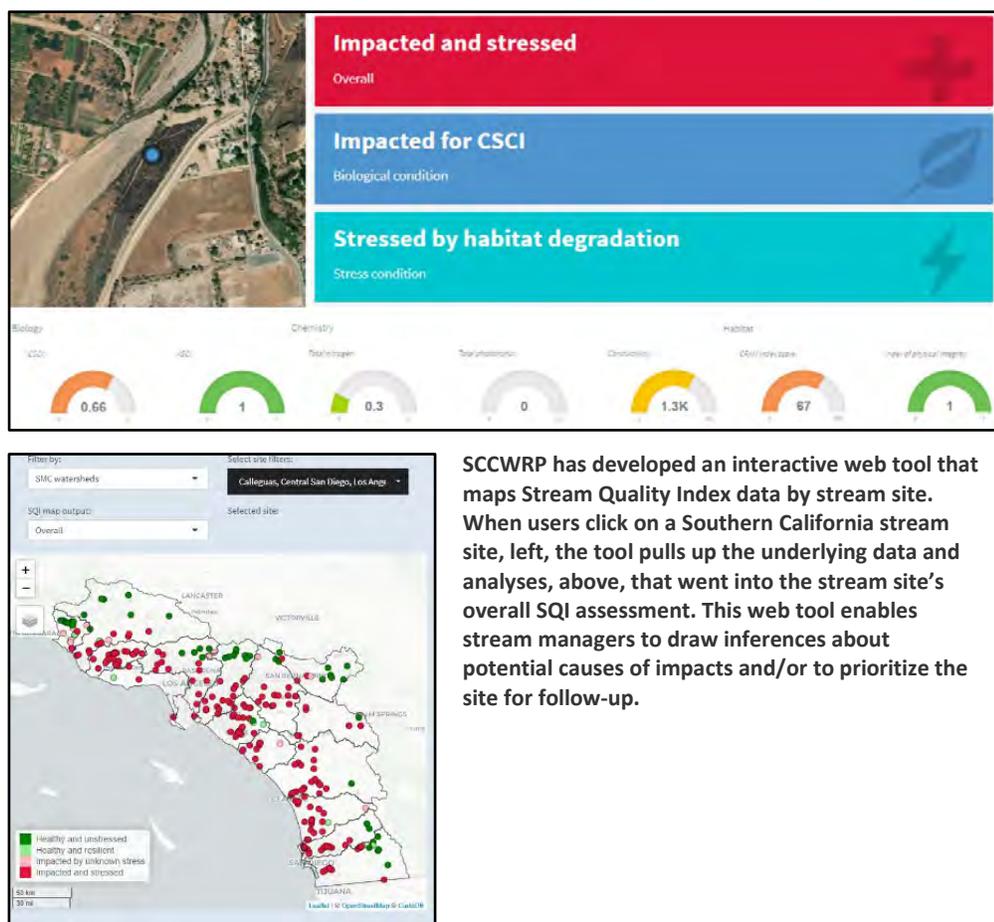
that chemical and physical stressors at a stream site will degrade its biological condition.

The SQI assigns assessed sites to one of four condition categories: "healthy and unstressed," "healthy and resilient," "impacted by unknown stress" and "impacted and stressed."

The four categories are designed to provide stream managers with relevant, directly actionable insights. For example, a stream site that is "impacted and stressed" for insects and physical habitat might require different management actions than a site that is "impacted and stressed" for algae and water chemistry.

To improve access to the underlying data and analyses that go into SQI assessments, SCCWRP has developed an [interactive web tool](#) that maps SQI data by stream site. Users can click on a site, then look at the underlying data and analyses to draw inferences about potential causes of impacts and/or to prioritize the site for follow-up.

For more information, contact Dr. [Marcus Beck](#).



SCCWRP has developed an interactive web tool that maps Stream Quality Index data by stream site. When users click on a Southern California stream site, left, the tool pulls up the underlying data and analyses, above, that went into the stream site's overall SQI assessment. This web tool enables stream managers to draw inferences about potential causes of impacts and/or to prioritize the site for follow-up.

## Ocean currents model to be evaluated as part of study examining Tijuana pollution flows

SCCWRP and its partners will use field data from an ongoing study tracking persistent fecal contamination at Imperial Beach near the U.S.-Mexico border to evaluate a computer model that predicts the movement of nearshore waters in the area.

The ocean currents forecasting model, which was developed by the Scripps Institution of Oceanography, covers an approximately 12-mile stretch of nearshore waters spanning the U.S.-Mexico border. The forecasts may explain how primary-treated effluent being discharged into coastal waters by a Tijuana wastewater treatment plant disperses and travels north to San Diego County's Imperial Beach during south swell events.

Imperial Beach beachgoers and lifeguards have reported persistent sewage odors at the beach consistent with these south swells, which prompted researchers to launch a source tracking study in 2018 to determine if the Tijuana treatment plant is the source.

To validate the Scripps model, SCCWRP and its partners are using DNA-based field samples being collected during ongoing sampling efforts along the effluent plume's predicted south-to-north route, from the San Antonio de Los Buenos treatment plant in Tijuana to Silver Strand, which is just north of Imperial Beach.

Samples are being collected not only in the wadeable zone closest to the shoreline, but also in the surf zone where surfers commonly line up to catch waves.

The paired sampling effort, which spans the U.S. side of the border only, will provide insights into the relative magnitude of fecal pollution exposure for U.S. beachgoers along the shoreline vs. in the line-up area where surfers wait for the next wave.

Researchers will analyze the water samples using DNA-based microbial source tracking methods, marking one of the first applications of the technology to track the dispersal of human sources of fecal contamination across a large swath of the Southern California coast, as well as to link fecal contamination to a specific location.

Researchers are applying this same DNA-based source tracking technology to a separate study that will determine whether human fecal contamination found in San Diego and Orange County waterways can be linked to sanitary sewer pipes via the microbial community living inside the pipes. The goal is to investigate whether the microbial community found inside sewage pipes – referred to as biofilm – has a genetic signature that is unique to these sewage pipe environments.

Likewise, researchers in the Imperial Beach study are examining whether the microbial community found at the Tijuana treatment plant has a genetic signature unique to the plant, and whether that signature can be reliably detected as the Tijuana wastewater plume moves up the coast – and mixes with other human and non-human fecal contamination sources.

For the Imperial Beach study, researchers also will work to associate other major

potential human fecal contamination sources at Imperial Beach with unique genetic signatures, including water flowing into the Tijuana River estuary from canyons on the Mexican side of the border. The Tijuana River estuary also terminates a few miles south of Imperial Beach; although a sand berm reduces the flow of estuary water into Imperial Beach coastal waters for much of the year, the berm is intermittently breached as a result of high surf and tidal conditions.



SCCWRP's Dr. Amy Zimmer-Faust collects a water sample at the site where Mexico's San Antonio de los Buenos treatment plant discharges primary-treated effluent into the coastal ocean. Researchers are examining whether fecal contamination at this site is traveling north to Imperial Beach near the U.S.-Mexico border.

Multiple Mexican beaches dot the coast between the Tijuana treatment plant and Imperial Beach, underscoring the value of investigating the plant's role in potentially contributing to beach fecal contamination. Additionally, Imperial Beach already is on a federal 303(d) listing of impaired water bodies for high fecal indicator bacterial levels.

The San Antonio de Los Buenos sewage treatment plant, located about 10 miles south of Imperial Beach, uses primary treatment methods to treat sewage, then discharges the effluent to a stream that terminates at the coastline.

The Imperial Beach study includes cooperation and participation by SCCWRP member agencies, environmental organizations on both sides of the U.S.-Mexico border, and U.S. lifeguards. Results of the study could help inform future management interventions to more effectively control and mitigate cross-border fecal contamination issues.

For more information, contact Dr. [John Griffith](#).

## Modeling shows nutrient discharges can influence coastal acidification, hypoxia

A computer modeling initiative to understand how Southern California's coastal ocean will be affected by ocean acidification and hypoxia has shown that land-based sources of nutrients can have a measurable effect on seawater chemistry in nearshore waters, although more investigation is needed to interpret

whether such changes could be significant enough to warrant management action.

The modeling initiative – which is being conducted by a consortium of West Coast researchers that includes the University of California, Los Angeles, University of Washington, National Oceanic and

Atmospheric Administration and SCCWRP – used historical data from the late 1990s to explain how land-based nutrient discharges can measurably exacerbate coastal acidification and hypoxia conditions. The modeling work was presented to SCCWRP member agencies

and other stakeholders during an all-day meeting at SCCWRP in May.

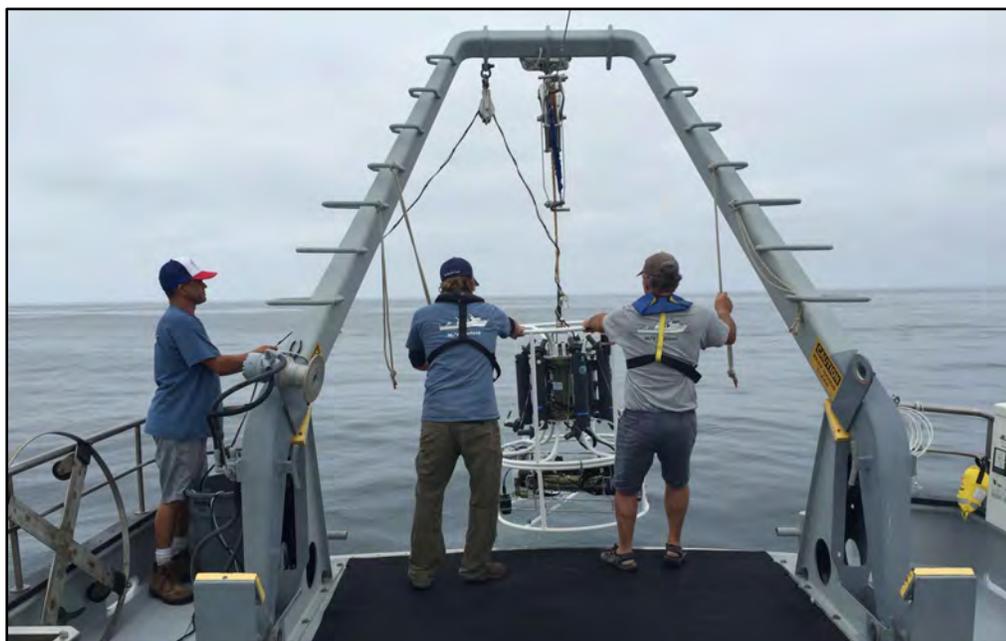
The model's initial findings address a decades-long debate about the influence of land-based nutrient discharges on the coastal ocean vs. the influence of natural upwelling events that transport large volumes of nutrient-rich waters to the shallow coastal zone.

The modeling work found that the land-based nutrient discharges accelerate growth of microscopic algae known as phytoplankton. The increased phytoplankton production, in turn, triggers complex biogeochemical cycling processes that raise pH and dissolved oxygen levels in surface waters, while lowering pH and oxygen levels at depth.

The modeling work in the Southern California Bight is part of a multi-year, West Coast-wide initiative to help managers understand which marine habitats are most vulnerable to ocean acidification and to what extent local, land-based sources of nutrients are exacerbating coastal conditions.

The modeling work involves coupling West Coast physical and biogeochemical ocean models together to understand the relative contributions of global carbon dioxide emissions, natural upwelling processes, and nutrients introduced via wastewater effluent, stormwater runoff and atmospheric deposition. In the Southern California Bight, land-based nutrients are being introduced mainly via discharges of treated wastewater effluent through ocean outfalls.

The model findings presented in May represent the first results to be generated by the computer model. Researchers have spent the past few years developing a downscaled, high-resolution Southern California Bight model and validating its



**A field crew from the Orange County Sanitation District lowers a CTD (conductivity, temperature, depth) rosette into the coastal ocean to take a variety of measurements, including seawater pH. SCCWRP member agencies have played a key role in collecting the field data necessary to validate a computer model that predicts how land-based nutrient discharges into the coastal ocean influence coastal acidification and hypoxia conditions.**

performance using locally collected field data.

During the May meeting, modelers presented the results of initial modeling runs that simulate the influence of human sources of nutrients on coastal seawater chemistry. The runs reflect conditions during the years 1997 to 2000; subsequent runs are planned for the years 2013 to 2016 to reflect current-day nutrient loading scenarios.

Meeting stakeholders agreed to form a subcommittee that will participate in ongoing discussions between scientists and managers about how to interpret the model's findings. In particular, scientists and managers are working toward consensus on if and/or how the changes in coastal seawater chemistry that are predicted by the model are impacting

sensitive marine life. State Water Board staff are leading this stakeholder subcommittee.

Meeting stakeholders also agreed to form a second subcommittee to provide additional input on ongoing efforts to validate the computer model using field data, as well as to use the model to run additional, managerially relevant scenarios. The intensive model validation effort is essential for providing confidence that the model's predictions can be used reliably for management decision-making. The Orange County Sanitation District is leading this subcommittee.

For more information, contact Dr. [Martha Sutula](#) and Dr. [Faycal Kessouri](#).

# Dynamic exposure lab built to replicate fluctuating environmental conditions

SCCWRP has constructed a state-of-the-art dynamic exposure laboratory to study how aquatic organisms respond to fluctuations in pH, dissolved oxygen and other environmental parameters in a controlled setting – a type of experimental setup found in only a handful of labs worldwide.

The Dynamic Stressor Exposure Research Facility (DSERF), which was built in June, comes in response to growing awareness among water-quality managers that stressors such as ocean acidification and low dissolved oxygen are negatively impacting aquatic life.

The DSERF lab is designed to help researchers better understand how these multi-stressor biological impacts are playing out in the real world. By automatically adjusting multiple parameters over the course of an experiment, researchers can more accurately mimic fluctuating environmental conditions, including tidal cycles, seasonal changes and other site-specific conditions. DSERF also can be programmed to replicate projected future conditions.

By contrast, a standard laboratory setup would likely replicate only the static, mean state of parameters like pH, dissolved oxygen levels and salinity.

In June, the first experiment to be conducted in the DSERF lab examined whether ocean acidification has the potential to alter the toxicity of sediment contamination. Seawater pH was lowered to reflect intensifying acidification, then a standard sediment toxicity test species was exposed to contaminated sediment. This study, which is now being expanded, is expected to eventually inform whether toxicity tests may need to be recalibrated in response to rising ocean acidity.

In July, SCCWRP and its partners launched a second DSERF study seeking

to replicate the role that underwater kelp forests might play in mitigating ocean acidification. This study is a follow-up to field work in Washington's Puget Sound, where commercially important oysters and mussels were co-cultivated in a kelp forest. Kelp forests draw carbon dioxide out of the water as part of regular photosynthetic processes, which has the potential to offset acidification's impacts.

Researchers at SCCWRP plan to adjust pH, then examine whether management interventions such as planting kelp forests could provide co-benefits for shellfish cultivation that minimize the negative effects of acidification in coastal habitats.

SCCWRP and its partners also plan to use DSERF to examine the impact of low pH and low dissolved oxygen levels on the commercially important Dungeness crab. A recent study by SCCWRP and its partners found severe physiological impairment in larval crabs attributed to exposure to low pH conditions in the natural environment. Using DSERF,

SCCWRP will investigate interactive effects of low pH and low dissolved oxygen levels at the larval stages to better understand if and how these two factors may be combining to exacerbate biological impacts.

The DSERF setup utilizes a modular design offering flexibility to meet a range of experimental needs. The system capacity is about 90 sample containers, spread out over three water baths that can be controlled independently to allow for simultaneous testing at multiple temperatures.

The dynamic control of pH and dissolved oxygen provides up to nine unique treatments. Salinity control allows for experiments to be run from freshwater to seawater conditions, with the ability to vary salinity over time, including conditions that could mimic Southern California brackish estuaries.

For more information, contact Dr. [Ashley Parks](#) and Dr. [Nina Bednarek](#).



SCCWRP's Dr. Ashley Parks conducts an experiment in SCCWRP's newly built Dynamic Stressor Exposure Research Facility (DSERF). A type of experimental setup found in only a handful of labs worldwide, the DSERF lab enables researchers to study how aquatic organisms respond to fluctuations in pH, dissolved oxygen and other environmental parameters.

# Updates by Thematic Area

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

## BIOASSESSMENT

### Study completed to characterize benthic infaunal communities living in Bight continental slope

The U.S. Bureau of Ocean Energy Management (BOEM) and SCCWRP have completed a three-year project to comprehensively characterize sediment-dwelling infaunal communities that live in the continental slope region of the Southern California Bight, the first such regional-scale effort since the 1950s.

The study, which will be published in a BOEM technical report in the coming weeks, is a first step toward potentially developing biology-based condition assessment tools for these understudied but important habitats. The continental slope, which connects the continental shelf to the deep ocean floor, comprises more than 60% of the Bight's marine habitat.

Researchers identified three distinct reference condition habitats using multiple data sets collected by the Southern California Bight Regional Monitoring Program and SCCWRP member agencies.

BOEM oversees a number of industries that span Southern California's continental slope, including offshore oil and gas platforms, wind turbines and aquaculture.

### Ephemeral streams condition index being developed using locally collected bioindicator data

SCCWRP and its partners have begun using biological indicator data collected from dry streams across Southern California to refine the design of a set of

new tools for assessing ephemeral stream health.

Researchers are working to build a condition 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 flow only immediately after rain events, make up about 60% of all streams in Southern California.

Researchers are calibrating the index scoring tools with data collected for terrestrial arthropod, riparian arthropod and bryophyte communities. SCCWRP's stream management partners have been collecting the bioindicator data from sites across Southern California over the past year.



**A ramp trap is deployed to capture terrestrial arthropods in a dry stream bed; the greenish chemical propylene glycol is used for preserving trapped organisms. SCCWRP and its partners are using data on stream arthropods and bryophytes to build tools for assessing the health of ephemeral streams.**

The goal is to build an index scoring tool that can characterize the complex ecological condition of ephemeral streams using a single numerical score.

### DNA-based algae identification methods show promise for stream condition assessments

SCCWRP and its partners have shown in a proof-of-concept study that DNA sequencing methods have the potential to be incorporated into algae-based assessments of stream condition.

During the multi-year study – scheduled to be completed by the end of 2019 – researchers compared traditional, morphology-based identifications of stream algae to DNA-based identifications of the same samples.

Although the two methods often identified different consortia of algae species, both methods consistently distinguished among stream sites in poor vs. good ecological health. The DNA-based approach also was able to identify hundreds more algae taxa than traditional microscopy-based taxonomic identification, underscoring the potential value of metabarcoding sequencing.

Based on the findings, stream managers plan to continue DNA-based algae identifications in California as part of routine condition assessments using the Algal Stream Condition Index scoring tool. The additional algal DNA data will help researchers further refine and optimize this alternative approach for conducting algae-based stream bioassessments in California.

## ECOHYDROLOGY

### Recreational beneficial uses analysis completed for L.A. River environmental flows study

SCCWRP and its partners have completed an assessment of the recreational beneficial uses provided by the Los Angeles River as part of an ongoing study evaluating the implications of diverting treated wastewater effluent and runoff from the river for water recycling purposes.

The study, completed in July and led by the Council for Watershed Health, found that walking, biking and art/photography are the most popular recreational activities linked to the river's environmental flows. Kayaking also was studied along one reach of the river.

The findings will feed into a larger, two-year study evaluating how the ecological and recreational beneficial uses provided by the river's flows will be impacted as land-based discharges to the river are reduced. The ecological beneficial uses component is still being assessed.

California wastewater treatment agencies have been filing petitions seeking regulatory approval to begin recycling more of the effluent that they're currently discharging into the L.A. River and other urban streams. Stormwater management agencies also are capturing more land-based runoff, further reducing stream flows.

## SEDIMENT QUALITY

### Passive samplers used to detect low levels of sediment-associated contaminants

SCCWRP and its partners have shown that passive sampling technology can be used to detect chemical contamination in San Diego Bay sediment, a key finding in an ongoing study exploring whether legacy contaminants found in fish tissue are



**Kayaking is one of the recreational benefits provided by the Los Angeles River that SCCWRP and its partners are factoring into an ongoing analysis of the implications of diverting treated wastewater effluent and runoff from the river for water recycling purposes. Other recreational uses of the L.A. River include walking, biking and art/photography.**

coming from contaminated bay sediment or somewhere else.

The passive sampling devices – made of polyethylene film and deployed in San Diego Bay for a month – were able to detect low levels of sediment-associated contaminants that are dissolving back into the water column. Traditional sampling techniques typically cannot detect the low contaminant levels that passive sampling can.

Analyses of the initial passive sampling deployment using gas chromatography-mass spectrometry (GC-MS) showed that contaminant levels in the surface sediment layer were consistently higher than in the water column just above it, indicating that contaminants are diffusing out of the sediment into the water.

The goal of the passive sampling study is to examine whether sediment contaminants are spreading extended distances through the water column. A common assumption in sediment management is that most legacy chemical contaminants that have bioaccumulated in fish tissue collected at a given site originated with contaminated sediment at the site.

## MICROBIAL WATER QUALITY

### Bight '18 Microbiology element preparing to kick off field sampling for coliphage method evaluation study

Participants of the Southern California Bight 2018 Regional Monitoring Program's Microbiology element will initiate field sampling in August for a study evaluating the relevance and reliability of using coliphage viruses to assess microbial water quality at Southern California beaches.

Six labs will conduct two years of sampling at 12 beaches spanning Ventura to San Diego County during both wet and dry weather.

The U.S. Environmental Protection Agency last year approved the coliphage-based method, officially known as EPA Method 1642, as an additional indicator to complement the established *Enterococcus* bacteria-based method for fecal contamination monitoring.

The Bight '18 Microbiology element will do a side-by-side evaluation of how the *Enterococcus* and coliphage-based methods perform.

## REGIONAL MONITORING

## SMC's renews Master Agreement through 2024

The [Southern California Stormwater Monitoring Coalition](#) in July renewed its Master Agreement for another five years, continuing the SMC's research and monitoring agenda through 2024.

SMC member agencies include eight major regulated stormwater management agencies and the five state and federal agencies that regulate them, plus SCCWRP.

In November, the SMC will convene an expert panel at SCCWRP to guide the development of the SMC's next five-year research agenda; the research agenda will be published in spring 2020.

The SMC has conducted more than 30 research projects since its 2003 inception, focusing on stormwater mechanisms and processes, improving management effectiveness, and ascertaining impacts and improvements in receiving waters.

## Review of data underway for Bight '18 Sediment Quality element

The Sediment Quality element of the Southern California Bight 2018 Regional Monitoring Program has begun meeting to review data sets and reach consensus on conclusions and recommendations that will be codified in a series of final assessment reports.

The Bight '18 Sediment Quality Committee met in July to begin evaluating results from all 280 sediment toxicity samples collected in 2018. The committee subsequently will be evaluating data sets for sediment chemistry, trawl-caught fish and invertebrates, and sportfish contaminant bioaccumulation.

The Bight '18 Sediment Toxicity final assessment report is scheduled to be published in late 2019. The other Sediment Quality reports are on track to be finalized and published by spring 2020.

## ADDITIONAL RESEARCH

## Study launched to develop standardized approach for tracking tobacco, e-cigarette waste in waterways

SCCWRP and the San Francisco Estuary Institute have launched a year-long study to develop a standardized approach for tracking tobacco and e-cigarette waste in California waterways.

The study, which began in July in partnership with the California Department of Public Health's Tobacco Control Program, will build off an ongoing study to develop standardized statewide methods for tracking the levels of all types of trash in watersheds. The broader study includes exploring how unmanned aerial systems, or drones, might be used to help quantify levels and types of trash in watersheds.

Researchers intend to train anti-tobacco programs and other stakeholders in the best-practices methodology that comes out of the study. Researchers also will help stakeholders tailor the method for application in their local communities.

The goal is to raise awareness of the potential of tobacco and e-cigarette waste to harm aquatic environments.

## EPA method being added to method evaluation study for tracking trash in watersheds

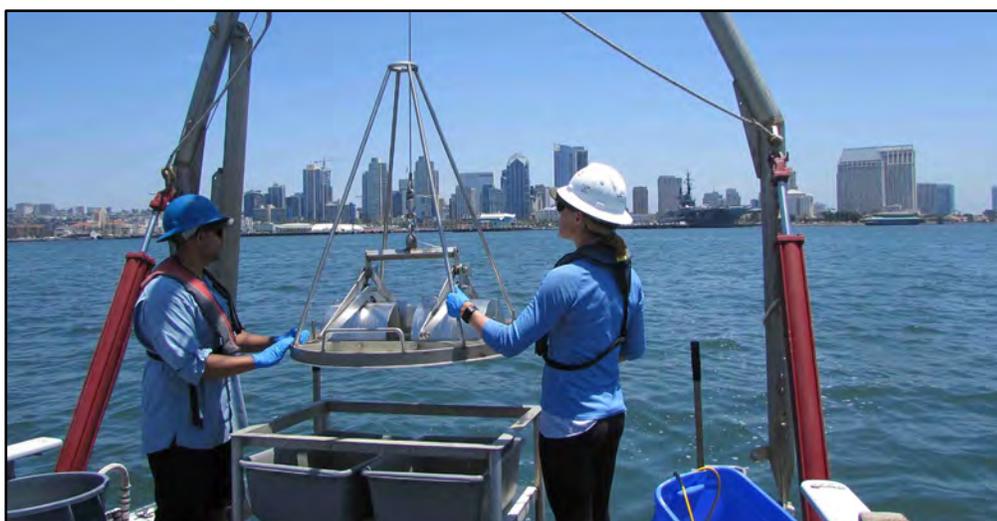
SCCWRP and the San Francisco Estuary Institute will evaluate a U.S. Environmental Protection Agency method for quantifying trash in the environment as part of Year 2 of a study seeking to develop standardized trash tracking methodologies for California.

The Escaped Trash Assessment Protocol, developed by the EPA's Trash Free Waters Program, will become the fifth method to be tested side-by-side at sites across Northern and Southern California. Year 2 of field work will kick off in August.

Researchers' goal is to identify rigorous but cost-effective trash monitoring methods that can be used across California to assess the long-term effectiveness of various trash management programs.

The four methods evaluated during the first year of the study include a qualitative method that gives a visual estimate of the amount of trash, a volume method, a tally method and a method that involves collecting and analyzing imagery from drones.

During Year 2, hand-annotated images will be used to train a machine to develop an algorithm to identify the trash automatically.



Courtesy of Wood Environment & Infrastructure Solutions

A field crew lowers a sediment grab sampler into San Diego Bay during field sampling for the Southern California Bight 2018 Regional Monitoring Program. The Bight '18 Sediment Quality element is on track to finalize and publish its final assessment reports by spring 2020.

# New SCCWRP Publications

## Journal Articles (Online)

[Gillett](#), D.J., R.D. [Mazor](#), S.B. Norton. 2019. [Selecting comparator sites for ecological causal assessment based on expected biological similarity](#). *Freshwater Science* DOI:10.1086/704926.

Gudino-Elizondo, N., T.W. Biggs, R.L. Bingner, E.J. Langendoen, T. Kretzschmar, E.V. Taguas, K.T. [Taniguchi-Quan](#), D. Liden, Y. Yuan. 2019. [Modelling Runoff and Sediment Loads in a Developing Coastal Watershed of the US-Mexico Border](#). *Water* 11:1024.

Le, C., S. Wu, C. Hu, M.W. [Beck](#), X. Yang. 2019. [Phytoplankton decline in the eastern North Pacific transition zone associated with atmospheric blocking](#). *Global Change Biology* DOI:10.1111/gcb.14737.

Lyon, K., D. Kacev, A. Preti, D.J. [Gillett](#), H. Dwar, S. Kohin. 2019. [Species-specific characteristics influence contaminant accumulation trajectories and signatures across ontogeny in three pelagic shark species](#). *Environmental Science & Technology* DOI:10.1021/acs.est.8b07355.

## Journal Articles (Accepted)

Giraldo, M.A., S. Dark, P. Pendleton, E.D. [Stein](#), R. Mazor. In press. Environmental

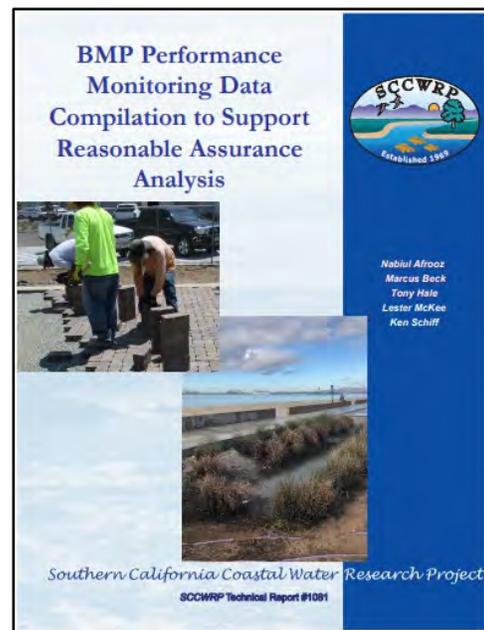
predictors of stream flow in semi-arid watersheds for biological assessments. *Ecological Indicators*.

## Technical Reports

Afroz, N., M. [Beck](#), T. Hale, L. McKee, K.C. [Schiff](#). 2019. [BMP performance monitoring data compilation to support reasonable assurance analysis](#). Technical Report 1081. Southern California Coastal Water Research Project. Costa Mesa, CA.

[Beck](#), M., K. Kittleson, K. O'Connor. 2019. [Analysis of the juvenile steelhead and stream habitat database, Santa Cruz County, California: Web products and recommendations](#). Technical Report 1082. Southern California Coastal Water Research Project. Costa Mesa, CA.

[Taylor](#), J., E.D. [Stein](#), M. [Beck](#), K. Flint, A. Kinoshita. 2019. [Vulnerability of stream biological communities in Los Angeles and Ventura Counties to climate change induced alterations of flow and temperature](#). Technical Report 1084. Southern California Coastal Water Research Project. Costa Mesa, CA.



SCCWRP has developed a database and web calculator tool to help stormwater managers improve estimates of the performance effectiveness of their stormwater BMPs. These products are described in a newly published SCCWRP technical report.

# Quarter in Review

## Conference Presentations

[Beck](#), M.W., C. O'Hara, J. Stewart Lowndes, R.D. Mazor, S.T. Theroux, D.J. [Gillett](#), B. Lane, G. Gearheart. The importance of open science for biological assessment. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

[Beck](#), M.W., R.D. Mazor, S. Theroux, K.C. [Schiff](#). 2019. The Stream Quality Index: a multi-indicator tool for enhancing environmental management communication. SWAMP Data Science

Symposium. July 1-2, 2019. Sacramento, CA.

[Brown](#), A.K., J. Ackerman, N. Cicek, C.S. Wong. Kinetics of human pharmaceutical conjugate formation and the impact of transformation, deconjugation, and sorption on the persistence of drugs in wastewater bioreactors. 102<sup>nd</sup> Canadian Chemistry Conference. June 2-6, 2019. Québec City, Canada.

[Challis](#), J.K., K.M. Stroski, K.H. Luong KH, M.L. Hanson, C.S. Wong. Field evaluation and in situ stress testing of the organic-diffusive gradients in thin-films passive

sampler for polar organic contaminants. 102<sup>nd</sup> Canadian Chemistry Conference. June 2-6, 2019. Québec City, Canada.

[Chaves Barquero](#), L.G., M.L. Hanson, C.S. Wong. Crushed recycled glass as a substrate for constructed wetlands in prairie climates. 10<sup>th</sup> Society of Environmental Toxicology and Chemistry Prairie Northern Regional Conference. June 10-11, 2019. Lethbridge, Canada.

[Johnson](#), S., R. Mazor, J. Olson. Bioassessment of ephemeral streams and intermittent rivers affected by oil spills.

Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Maruya, K.A., J.E. Drewes, P.D. Anderson, N.D. Denslow, W. Jakubowski, A.O. Oliveiri, D. Schlenk D, S.A. Snyder, A.C. Mehinto. Bioanalytical tools for monitoring of recycled water – advisory panel recommendations for the State of California. 12th IWA International Conference on Water Reclamation and Reuse. June 16-20, 2019. Berlin, Germany.

Maruya, K.A. Monitoring emerging contaminants in California's groundwater recharge applications. 12th IWA International Conference on Water Reclamation and Reuse. June 16-20, 2019. Berlin, Germany.

Mazor, R., M. Paul. Beyond Bioassessment: Translating biological information for environmental problem-solving. Special session cohost. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Mazor, R., M. Sutula, E. Stein, S. Theroux, K. Taniguchi-Quan, M. Beck. Beyond bioassessment: Setting management goals for flow and eutrophication to protect biological integrity in California wadeable streams. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Mazor, R. Setting goals for watershed management through bioassessment. Los Angeles Waterkeeper Confluence workshop. May 9, 2019. Los Angeles, CA.

Robinson, M., R. Mazor, J. Olson. Characterizing terrestrial arthropod assemblages in dry streams: Associations with natural gradients and anthropogenic stressors. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Stein, E. The environmental flow and water management nexus: implementation challenges, strategies, and outcomes of environmental flow programs. Session co-host. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Stein, E. Development of an integrated Framework for Evaluating Wetland and Stream Compensatory Mitigation. Session

host. Society of Wetland Scientists Meeting. May 28-31, 2019. Baltimore, MD.

Stein, E. A Modular Framework for Assessing Compensatory Mitigation Program Effectiveness. Society of Wetland Scientists Meeting. May 28-31, 2019. Baltimore, MD.

Stein, E. Establishing environmental flow targets for the Los Angeles River. Los Angeles Waterkeeper Confluence workshop. May 9, 2019. Los Angeles, CA.

Stein, E. The state's efforts to develop a framework for establishing environmental flows. Panel discussion leader. SWAMP Data Science Symposium. July 1-2, 2019. Sacramento, CA.

Stein, E. Application of the California environmental flows framework across a range of flow management needs. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Stroski, K.M., K.H. Luong, J.K. Challis, L.G. Chaves Barquero, M.L. Hanson, C.S. Wong. Pharmaceuticals in wastewater and receiving waters in four Canadian Arctic communities. 10th Society of Environmental Toxicology and Chemistry Prairie Northern Regional Conference. June 10-11, 2019. Lethbridge, Canada.

Theroux, S., J. Steele, J. Griffith, E. Stein, S. Theroux. A tale of two taxonomies: comparing morpho- and molecular taxonomy for stream algal bioassessment. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Theroux, S., V. Vasselon, A. Bouchez, E. Stein. Effect of bioinformatic pipeline on bioassessment index performance. International Barcode of Life Conference. June 17, 2019. Trondheim, Norway.

## Conference Posters

Kelso, J., R. Mazor. A rapid field assessment method to identify perennial, intermittent, and ephemeral streams of the arid southwest. Society of Freshwater Sciences Meeting. May 19-23, 2019. Salt Lake City, UT.

Humeniuk, B.W., L. G. Chaves Barquero, C. S. Wong, M.L. Hanson. Crushed glass as a constructed wetland substrate:

Invertebrate community dynamics. 10th Society of Environmental Toxicology and Chemistry Prairie Northern Regional Conference. June 10-11, 2019. Lethbridge, Canada.

Challis, J.K., A. Parajas, J.C. Anderson, E. Asiedu, J.W. Martin, C.S. Wong, M.S. Ross. Photodegradation of naphthenic acids in oil sands process-affected water extracts. 10<sup>th</sup> Society of Environmental Toxicology and Chemistry Prairie Northern Regional Conference. June 10-11, 2019. Lethbridge, Canada.

Mehinto, A.C., B. Du, K. Maruya. Testing an effects-based monitoring strategy to assess the impact of emerging contaminants in California waterbodies. 20th International Symposium on Pollutant Responses in Marine Organisms. May 19-22, 2019. Charleston, SC.

## Other Presentations

Gillett, D. A Rapid Screening Causal Assessment Framework for California's Waters. San Diego County Stormwater Co-Permittees. June 20, 2019. San Diego, CA.

Hale, T., W. Cowger and S. Moore. Trash Datathon. 2019 California Water Data Science Symposium. July 1, 2019. Sacramento, CA.

Moore, S.L. Microplastics Workshop and Method Evaluation Study. Ocean Litter Strategy Meeting. June 11, 2019. Via webinar.

Schiff, K. Measuring human fecal sources to the San Diego River. California Association of Sanitation Agencies Regulatory Committee meeting. July 18, 2019.

Smith, J. Species Matter: Examining the drivers of Harmful Algae in the Southern California Bight. Scripps Institution of Oceanography Taxonomy Workshop. July 9-10, 2019. San Diego, CA.

Stein, E. Adapting Bioassessment Indices to Accommodate Molecular Data. International Workshop on Environmental Genomics. June 12, 2019. St. Johns, Newfoundland.

Stein, E. Testimony for the Ballona Wetlands Historical Ecology and Regional Restoration Goals Analysis. State Coastal Commission. May 8, 2019. Oxnard, CA.

Stein, E. Long-term monitoring of stream restoration. Environmental Law Institute Compensatory Mitigation. May 16, 2019. Via webinar.

Taylor, J. Rising sea levels and habitat suitability for the Ridgway's Rails and Belding's Savannah sparrow in southern California coastal salt marshes. UCLA Coastal Wetland Workshop. June 18, 2019. Los Angeles, CA.

Taylor, J. The impact of climate change on the distribution of riparian and riverine species in southern California. California State University, Los Angeles, Biology Department Seminar. May 2, 2019. Los Angeles, CA.

Weisberg, S. Modeling the effects of anthropogenic nutrients on acidification and hypoxia in the Southern California Bight. California Association of Sanitation Agencies Regulatory Committee meeting. July 18, 2019.

## Scientific Leadership

Dr. **Eric Stein** has been appointed to the Academic Science Advisory Committee for Loyola Marymount University's Center for Urban Resilience.

**Ken Schiff** has been appointed to the Watershed Modeling and Management System Technical Advisory Committee for the Los Angeles County Department of Public Works.

**Ken Schiff** has been appointed to the San Diego HF183 Science Advisory Committee for the City of San Diego, County of San Diego and San Diego Regional Water Quality Control Board.

Dr. **Stephen Weisberg** has been appointed a Guest Editor for a special issue of the journal *Applied Spectroscopy* that will focus on measurement of microplastics.

**Ken Schiff** has been appointed co-chair for a special session on impacts from stormwater at the 2019 North American Society of Environmental Toxicology and Chemistry Meeting in Toronto, Canada.

Weisberg, S. Science Needs Associated With California's Ocean Acidification Action Plan. Washington Ocean Acidification Center's 2019 Ocean Acidification Science Symposium. May 30, 2019. Seattle. WA.

Weisberg, S., J. Griffith. Genetic Source Identification Markers to Identify Sources of Fecal Contamination. California Range Management Advisory Committee. July 9, 2019. Via webinar.

# SCCWRP Personnel Notes

## Commission



Dr. **Mark Gold**, who was recently named Executive Director of the California Ocean Protection Council and Deputy Secretary of Oceans and Coastal Policy for the California Natural

Resources Agency, became a Commissioner in July, replacing Deborah Halberstadt, who served on the Commission for three years. Gold will serve as Commission Chair.



**Robert Ferrante**, who has served as Alternate Commissioner for the Sanitation Districts of Los Angeles County since 2016, became Commissioner in July

following his promotion to Chief Engineer and General Manager. He replaces Grace Hyde, who retired. Hyde served for seven years on the Commission.

**Jenny Newman**, who was recently named Assistant Executive Officer of the Los Angeles Regional Quality Control Board, was named an Alternate Commissioner in June. She replaces Renee Purdy, who became Commissioner following her promotion to Executive Officer. Purdy became Commissioner in April following the retirement of Commissioner Deborah Smith.

## CTAG

**Ami Latker**, Marine Biologist III for the City of San Diego Public Utilities Department, was named to CTAG in July, replacing Dr. Tim Stebbins, who retired after serving for 14 years on CTAG.

## New Faces



Dr. **Rachel Diner**, who recently earned her Ph.D. in marine biology from the University of California, San Diego, joined SCCWRP in June as

a joint postdoctoral researcher in SCCWRP's Microbiology Department and the J. Craig Venter Institute in La Jolla.



Dr. **Charles Wong**, a Professor and former Canada Research Chair in Ecotoxicology at the University of Winnipeg, joined SCCWRP in July as

head of the Chemistry Department. He will replace Dr. Keith Maruya, who will retire at the end of August. Maruya has led the department for the past 15 years.



Dr. **Milos Vittori**, an Assistant Professor at the University of Ljubljana in Slovenia studying calcification under ocean acidification conditions, started in August as a

Visiting Scientist in SCCWRP's Biogeochemistry Department. He will spend about two months at SCCWRP.

## Promotions



Dr. **Nina Bednarsek**, a Scientist in the Biogeochemistry Department since 2017, was promoted in July to Senior Scientist.



**Robert Butler**, a SCCWRP Laboratory Assistant since 2017, was promoted in July to Research Technician.



**Maddie Griffith**, a Research Technician in the Microbiology Department who has been working at SCCWRP since 2010, was promoted in July to Senior Research Technician.



Dr. **Faycal Kessouri**, a Scientist in the Biogeochemistry Department who has been working at SCCWRP since 2016, was promoted in July to Senior Scientist.



Dr. **Alvina Mehinto**, a Senior Scientist in the Toxicology and Chemistry Departments who has worked at SCCWRP since 2013, was promoted in July to Principal Scientist.



**Miranda Roethler**, a Research Technician in the Biogeochemistry Department who has been working at SCCWRP since 2017, was promoted in July to Senior Research Technician.

## Departures

**Jordan Golemo**, a Research Technician who has worked at SCCWRP since 2017, left SCCWRP in July to relocate to Colorado.

**Peter Chen**, a Research Technician in the Microbiology Department who has worked at SCCWRP since 2018, left SCCWRP in July to relocate to the San Francisco Bay Area.

SCCWRP COMMISSIONER SPOTLIGHT

# Water-energy, planning among manager's roles

Lan Wiborg started her career in the environmental field as a private consultant to industries and public utilities. But where she's found her calling has been in water-quality management in the public sector.



Lan Wiborg

After joining the City of San Diego's Ocean Monitoring Program in 1997, Wiborg was promoted in 2014 to oversee the development of a 4,000-megawatt-hour hydroelectric energy storage project at the San Vicente Reservoir.

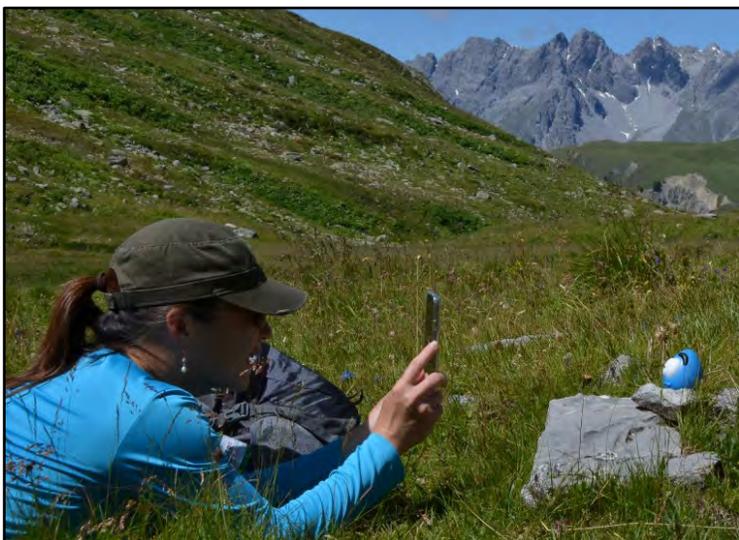
In 2015, she was appointed Deputy Public Utilities Director over the Long-Range Planning and Water Resources Division, where she oversaw water supply planning, groundwater development, rural lands management, recycled water distribution, climate change adaptation, Integrated Regional Water

Management, grid-scale energy storage, and water conservation.

In April 2019, Wiborg joined Orange County Sanitation District as the Director of Environmental Services, where she oversees resource protection, environmental compliance, regulatory affairs, ocean monitoring, laboratories, and source control operations.

Over the last two decades, Wiborg has integrated her passion for public health and mentoring into a career that blends utility management with academia. She has traveled to Jamaica to conduct field study work on tropical infectious diseases and taught university courses in water-quality management, biostatistics, analytical techniques and research methodologies. She also conducted epidemiological studies on the impacts of chronic low-level exposure to water-borne contaminants on human health.

"I enjoy translating academic work into what matters for the



Lan Wiborg takes a break with Drippy, her waterdrop travel buddy, on a hike in the Swiss Alps in 2016.

## Lan Wiborg

**Job:** Director of Environmental Services, Orange County Sanitation District (started April 2019)

**SCCWRP role:** Alternate Commissioner

**Prior jobs:** City of San Diego Public Utilities Department for 22 years (Deputy Director, Long-Range Planning and Water Resources; Acting Program Manager, Water-Energy Projects; Supervising Toxicologist and Toxicologist); part-time Faculty Lecturer, San Diego State University (2014-16); part-time Medical Education Facilitator, University of California, San Diego (2008-15); Research Associate, AQUA-Science consulting firm in Davis (1992-97)

**Education:** M.P.H. environmental health, San Diego State University (2004); University of California, Davis (1993)

**Residence:** Fountain Valley

**Hometown:** San Diego

**Pets:** Two cats; foster dogs

**Hobbies:** Traveling; hiking; making decorative crafts using plant materials

public," Wiborg said. "At OCS D, we protect the environment and the health of millions of people through sound science and our daily operations."

Wiborg, who was named a SCCWRP Alternate Commissioner in April, replaces Jim Colston, who took a new position with the Irvine Ranch Water District.

"With my academic and utility management background, I feel one of the best things I can do is direct my staff in a way that helps us ask the right questions and use ratepayer funds optimally," Wiborg said.

Wiborg is a recipient of San Diego State University Graduate School of Public Health's Distinguished Alumni Award and was inducted into Delta Omega, the Honorary Society of Public Health in 2005. She has been collaborating with SCCWRP since the 1998 cycle of the Southern California Bight Regional Monitoring Program and looks forward to serving as an Alternate Commissioner.

"SCCWRP serves the very important role of being a place where everyone can come together and focus on what science-based data is needed to make the right decisions," she said.

In her spare time, Wiborg enjoys traveling, hiking, and crafting with pine needles and other natural materials.

## CTAG SPOTLIGHT

# Chemist pivots to biology management role

For the first 11 years of her career with the City of Los Angeles Bureau of Sanitation's Environmental Monitoring Division, Stacey Karnya focused primarily on laboratory bench work as a technician and then a chemist.



Stacey Karnya

Then, three years ago, she transitioned to legal reporting work for the Data and Sample Management Section – a job that took her off the bench and immersed her in the world of wastewater discharge permits and regulatory compliance.

In January, she left chemistry altogether to become the Environmental Monitoring Division's acting Biology Lab Manager. She was promoted into the position permanently in June.

"Even though I'm not doing chemistry anymore, I think the past three years in legal reporting have really prepared me to manage the Biology Section," Karnya said. "I've learned their requirements, their permits, what changes are coming up."

Karnya was appointed to CTAG in April, replacing Denise Li, who relocated out of the area.

Karnya ended up working for the Bureau of Sanitation purely by chance. As an undergraduate chemistry major at Whittier College, Karnya was captivated by a forensic chemistry class and aspired to become a forensic scientist.

After a few years of working as a QC chemistry associate in the private sector, Karnya applied to the City of Los Angeles, hoping to land a job in the Los Angeles Police Department's crime lab. Instead, she was invited to interview with the Bureau of Sanitation's Environmental Monitoring Division. She was offered a job and



Stacey Karnya takes a swing during a game of slow-pitch softball with the City of Los Angeles Bureau of Sanitation's recreational team, the co-ed Hyperion Sewer Rats.

## Stacey Karnya

**Job:** Biology Lab Manager, Environmental Monitoring Division, City of Los Angeles Bureau of Sanitation

**SCCWRP role:** CTAG Representative (started April 2019)

**Prior jobs:** Senior Chemist, Chemist II, and Laboratory Technician II for the City of Los Angeles Bureau of Sanitation (since 2005); Organics Laboratory Technician, City of Phoenix (for four months in 2007-08); Quality Control Chemistry Associate, B. Braun Medical (2002-05)

**Education:** B.A. chemistry with American Chemical Society certification, Whittier College (2002)

**Residence:** Culver City

**Pets:** Miniature Schnauzer named Scrappy

**Hometown:** Mesa, Arizona

**Hobbies:** Softball; hiking; visiting national parks; watching college football

accepted, figuring she could easily transfer to the LAPD. But she quickly fell in love – and never looked back.

"Everything I was doing for EMD was so interesting to me – I just kept learning as much as possible every time I promoted to a new role," Karnya said. "I actually helped a few of my colleagues transfer over to LAPD, but I never thought about doing it myself."

Karnya has been interacting with SCCWRP since she participated in the 2008 cycle of the Southern California Bight Regional Monitoring Program. As a CTAG Representative, she's hoping to strengthen opportunities for collaboration between SCCWRP and her agency.

"There's so much SCCWRP does that we're maybe not involved in that we should be," she said. "I want to help facilitate that process."

In her spare time, Karnya is an avid softball player. She played competitively as a shortstop and pitcher at Whittier College, and is a member of the Bureau of Sanitation's recreational slow-pitch team, the co-ed Hyperion Sewer Rats. Karnya also works nights and weekends as an assistant coach for the Rio Hondo College softball team in Whittier; her specialty is pitching.

During the summer, Karnya enjoys hiking in state and national parks; she tries to visit at least one a year, and has so far visited parks in California, Arizona, Utah and Hawaii.

## SCCWRP PARTNER SPOTLIGHT

# Researcher brings acidification insights to Egypt

Merna Awad has been captivated by ocean acidification ever since she first heard about it during an undergraduate lecture. To her, ocean acidification is a topic every aquatic scientist in her native Egypt should be talking about – and yet almost no one is.



Merna Awad

That's why Awad jumped at the opportunity to come work at SCCWRP for the summer alongside SCCWRP's Dr. Nina Bednarsek, an international authority on the biological impacts of acidification.

"We have to get this research going in Egypt so we can know what is going to happen to our marine life," said Awad, who will earn her master's this fall at Port Said University in Egypt. "I want to pass the knowledge that I learn at SCCWRP to my colleagues back in Egypt. No one in Egypt knows about OA."

Awad's acidification research at Port Said University focuses on how a commercially important species known as the grooved carpet clam will be impacted by acidification. Her initial results indicate that not only are the clam shells showing signs of dissolution at the juvenile stage, but the changes in seawater chemistry are altering the bioavailability – and thus uptake rates – of heavy metals. Consequently, as acidification intensifies, consumption of the clams has the potential to carry a greater health risk.

Awad's career as an environmental researcher is the result of an error in her college enrollment paperwork. Although she intended to



Merna Awad sails on the Red Sea off the coast of Egypt during a research expedition in 2018.

## Merna Awad

**Job:** Science faculty demonstrator (lecturer) and M.S. student, Port Said University in Egypt

**SCCWRP role:** Visiting student researcher, SCCWRP Biogeochemistry Department

**Education:** M.S. student in chemical oceanography and marine pollution, Port Said University (expected graduation fall 2019); B.S. marine science, Port Said University (2015)

**Temporary residence:** Irvine

**Permanent residence and hometown:** Port Said, Egypt

**Family:** Father Essam, who runs a paper trading company; mother Soha, a stay-at-home mom; three brothers, Ahmed, Loay and Eyad

**Hobbies:** Swimming and snorkeling in the Red Sea; traveling

declare zoology as her major at Port Said University, her father accidentally selected marine science as he was helping to fill out one of her forms.

Awad decided to stick with marine science, and quickly fell in love. Field trips to the Red Sea – teeming with coral and other marine life – solidified her desire to pursue a career as an environmental researcher.

At SCCWRP, Awad is learning new lab techniques for tracking the biological impacts of acidification on sensitive marine species; she's also supporting the design and implementation of laboratory studies that replicate the multi-stressor impacts on marine life resulting from acidification, climate change and other factors.

When she returns to Egypt, Awad intends to pursue a Ph.D. and continue her acidification research. She is particularly interested in conducting multi-generational studies that track the cumulative biological impacts of acidification and other stressors on sensitive species with short lifecycles.

Awad was born and raised in Port Said on Egypt's Mediterranean coast, and she lives there with her family. During her summer internship at SCCWRP, she's hoping to visit San Francisco; she's never been.

In her spare time, Awad loves swimming and snorkeling in the Red Sea. She is in awe of its rich biodiversity.

"No one can say no to that," she said.

## SCCWRP STAFF SPOTLIGHT

# Professor aims for direct link to management

For the past 17 years, Dr. Charles Wong has thrived as a professor in Canada, first at the University of Alberta and then the University of Winnipeg.



Wong built a research program centered around tracking and understanding the ecological impacts of contaminants of emerging concern (CECs). He's taught chemistry and ecotoxicology courses, as well as mentored dozens of graduate students and post-docs. In 2008, Wong was named one of Canada's prestigious national Research Chairs.

## Dr. Charles Wong

But about three years ago, Wong said he began to feel the constraints of academia. Although his research was gaining recognition among

scientific peers, he realized his opportunities to influence management decision-making on CEC-related issues were limited.

"I started asking myself, 'What impact is my work having?'" Wong recalled. "It's easy enough to count citations and number of students graduating, but I wanted to see my work do more than just be in a paper that few people will ever read. That's why I'm really excited about working at SCCWRP."

Wong started in July 2019 as head of the SCCWRP Chemistry Department, replacing Dr. Keith Maruya, who will retire at the end of August. Wong will continue to serve as an adjunct faculty member at the University of Winnipeg.

Wong will supervise SCCWRP's bioanalytical screening and non-targeted chemical analysis research programs; he also will continue his own research, which includes adapting passive sampling technology to detect low levels of CECs in aquatic systems – and then exploring questions related to occurrence, fate and effects.

"SCCWRP is producing science that directly influences decision-



Courtesy of Keith Loraas

Dr. Charles Wong, wearing the U.S. national archery team uniform, prepares to compete at the World Archery Masters Championships last year in Lausanne, Switzerland.

## Charles Wong, Ph.D.

**Job:** Department Head, Chemistry Department (started July 2019)

**Prior jobs:** Professor and former Canada Research Chair in Ecotoxicology, University of Winnipeg (2008-2019); Assistant Professor of Chemistry, University of Alberta (2002-08); adjunct faculty member, Costa Rica Institute of Technology (2016-present), University of Manitoba (2014-present), and University of Alberta (2008-12); Scientist, Children's Hospital Research Institute of Manitoba (2012-18); Chair Professor, Jinan University (2016-present); Visiting Scientist, Guangzhou Institute of Geochemistry (2012); Postdoctoral Associate, University of Toronto and Environment Canada (1999-02); Postdoctoral Associate, U.S. Environmental Protection Agency (1997-99)

**Education:** Ph.D. civil engineering, University of Minnesota (1998); master's in civil engineering, Massachusetts Institute of Technology (1992); bachelor's in environmental engineering science, MIT (1990)

**Residence:** Costa Mesa

**Pets:** Two rabbits

**Hometown:** Cypress, California

**Hobbies:** Competitive archery; reading; spending time with friends

making around water quality," Wong said. "I want to help build these types of links and relationships."

Wong's career trajectory is the result of both opportunity and happenstance. As an undergraduate at MIT, he initially was a biology major, but a chance encounter with a civil engineering professor who was researching environmental contamination convinced him to switch to environmental engineering science.

Then, Wong made a series of jumps – to the University of Minnesota for his Ph.D. and then to a pair of postdoctoral positions – for the opportunity to work under international authorities in his field. In 2008, after six years at the University of Alberta, he left for the University of Winnipeg two provinces over after being offered a Canada Research Chair and a lab in a newly constructed science building.

In addition to his science career, Wong is a nationally ranked competitive archer. Archery started as a hobby about four years ago, after Wong saw the *Hunger Games* films. But he quickly fell in love with the sport. Coached by 2008 Olympian Jay Lyon, Wong trains 25-30 hours a week during archery season; his new training grounds are in Fountain Valley's Mile Square Regional Park just three miles from SCCWRP. Last summer, he placed 47th at his first world championships in Switzerland.

SCCWRP SCENES

# Garden art

SCCWRP staff were invited to hand-decorate a terra cotta pot and plant an herb garden during a staff team-building event in June on SCCWRP's patio. SCCWRP provided acrylic paint, colored markers, stencils, stickers, and decorative elements like ribbon and garden gnome figurines. Staff got to take their herb gardens home afterward.



SCCWRP staff who took part in the terra cotta pot decorating event include, clockwise from top right, Dr. Rachel Diner; a table with, from left to right, Dana Shultz, Charles Rintoul, Miranda Roethler and Syd Kotar; Miranda Roethler; and Dr. Wayne Lao.