SCCWRP Director's Report

PUBLISHED FEBRUARY 3, 2017 | COVERING OCTOBER 29, 2016-FEBRUARY 3, 2017

WINTER 2017 ISSUE

Experts create gradient for interpreting stream scores

A 16-member expert panel convened to interpret bioassessment scores for wadeable streams statewide has reached consensus on how the scores correspond to various ranges of ecological condition.

The Biological Condition Gradient (BCG) expert panel, co-facilitated by SCCWRP and Tetra Tech, met at SCCWRP for four days in December and January to develop a BCG model for California wadeable streams using species composition data from more than 200 stream sites that represent a wide range of environmental conditions.

The BCG modeling approach defines for stream managers how stream condition scores relate to ecosystem function and services, enabling stream managers to more meaningfully interpret their stream bioassessment scores and make threshold decisions that protect a stream's beneficial uses.

With the BCG interpretive framework, stream managers across California will gain an improved understanding of the consequences of losing various biological attributes of stream health as bioassessment scores fall in response to increasing stress.

The BCG model is a centerpiece of a State Water Board plan to use bioassessment scoring tools – namely, the California Stream Condition Index, which uses benthic invertebrates as bioindicators of ecological condition, and its algae-based counterpart, the Algal Stream Condition Index – as the basis for crafting a combined statewide biointegrity and biostimulatory (nutrient) policy to govern the health of California wadeable streams.

The State Water Board could adopt the policy as early as 2019, pending completion of science and policy elements.

During the BCG modeling workshops, the 16 experts, which were selected from across the nation, created six categories,

Contents

Cover photo: The Santa Clara River near the Los Angeles County-Ventura County line is an example of an urbanized stream that has experienced ecological degradation. Its condition was evaluated by an expert panel as part of a Biological Condition Gradient modeling project.

Calendar

Thursday, February 9
CTAG quarterly meeting

Friday, February 10
Seminar: "Ecosystem science in the SCCOOS domain"

Friday, March 3
SCCWRP Commission meeting

Friday, March 10
Seminar: "Toxicity of urban stormwater to aquatic life and what we can do about it"

or bins, of ecological stream condition and worked towards consensus in assigning each of the 200+ stream sites to one of the bins, based on the types of benthic invertebrate and algal species observed at the site.

SCCWRP and TetraTech will use these classifications to quantify the ranges of bioassessment index scores that correspond to each bin.

The BCG expert panel will present its findings to the State Water Board and other stakeholders this spring; a written report will be released this fall.

For more information, contact Dr. Martha Sutula.

The minimally disturbed North Fork of the San Gabriel River in Los Angeles County, left, and channelized Forrester Creek in San Diego County are among the stream sites placed into ecological condition categories by a 16-member expert panel convened by SCCWRP to develop a Biological Condition Gradient model for wadeable streams statewide.

Flow-through units being deployed along L.A. River to study CECs' impacts on fish

Mobile exposure units, which are set up along stream banks, pump water in real time through exposure chambers that house fish to more accurately mimic real environmental conditions. SCCWRP and its partners will use the technology for the first time this spring to track how fathead minnows are impacted by CECs in Los Angeles River water.

SCCWRP and its partners will expose fish to flowing Los Angeles River water in real time this spring as part of an on-site study examining potential biological impacts to fish from exposure to contaminants of emerging concern (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 the fish to a water sample in a laboratory setting. Mobile exposure units are set up along stream banks to pump water in real time through fish exposure chambers; the devices control for factors such as flow rate, food source, illumination and dissolved oxygen.

For the pilot study, scheduled to kick off in April, SCCWRP and the City of Los Angeles Bureau of Sanitation will set up mobile exposure units at two L.A. River sites – one just downstream of the L.A.-Glendale

Water Reclamation Plant, and the other at a site in the Sepulveda Basin that receives urban runoff. Fathead minnows will be placed in exposure chambers for 15 days.

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

SCCWRP will analyze the fish using traditional toxicology tests and targeted chemical analysis, as well as use novel bioanalytical assays to link observed biological effects to CEC bioactivity levels.

In particular, endocrine-disruptive CECs such as nonylphenol, estrone, bisphenol A and galaxolide have been shown to affect sexual maturation and reproduction of fish in laboratory settings; these CECs have previously been detected in the L.A. River watershed.

The L.A. River flow-through study is being launched as water-quality regulators increasingly focus on understanding how CECs in freshwater systems could be affecting fish communities.

Over time, SCCWRP intends to use the mobile exposure units to conduct additional exposure studies in other watersheds. The goal is to gain a better understanding of what biological endpoints should be tracked to comprehensively assess CECs' impacts on fish.

For more information, contact Dr. Alvina Mehinto.

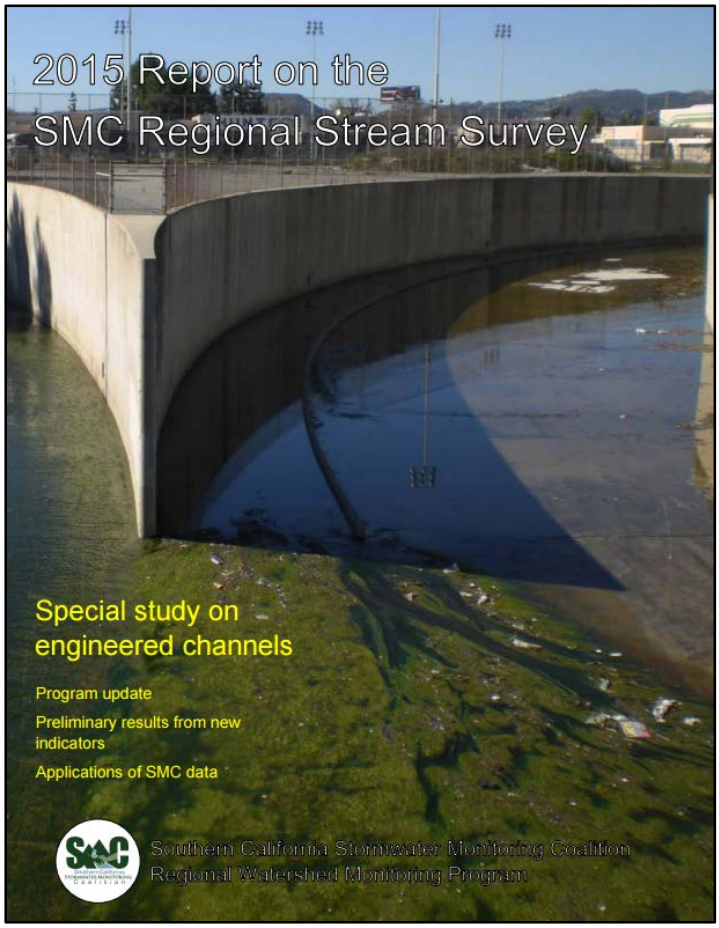
SMC completes analysis of bioassessment scores for engineered channels

The Southern California Stormwater Monitoring Coalition has completed a comprehensive analysis of the range of ecological condition scores obtained when engineered channels across coastal Southern California are scored using existing stream bioassessment tools.

The study, co-authored by SCCWRP and published in the SMC's 2015 annual report, found that condition assessments based on multiple bioindicators are far more useful in engineered channels than assessments based on one indicator alone.

Specifically, using a benthic macroinvertebrate-based scoring tool and algae-based scoring tools together provided a more complete picture of stream health. The algae-based scoring tools, for example, generated a wider range of bioassessment scores than the benthic macroinvertebrate-based scoring tool, which typically generated bioassessment scores well below the threshold for healthy streams.

The SMC also shed light on why some engineered channels score better than others – insights that could help stream managers understand how best to direct resources to improve channel health. The study showed that bioassessment scores are influenced by habitat factors, including microhabitat diversity and shading, as well as by water quality, including specific conductivity and temperature.



The Southern California Stormwater Monitoring Coalition's 2015 Report on the SMC Regional Stream Survey, published in January, includes the findings of a study shedding light on why some engineered channels in Southern California receive higher ecological condition scores than others. The insights could help stream managers understand how best to direct resources to improve the ecological health of engineered channels across coastal Southern California.

The SMC study was conducted as California moves toward developing a biointegrity policy governing the condition of streams statewide. The SMC is evaluating the biological condition of engineered channels across California's South Coast region to understand how stream managers could be affected by this upcoming policy.

Engineered channels, which are streams that have been modified through installation of manmade features such as concrete lining, tend to score more poorly with bioassessment tools than their non-engineered counterparts, and might not be able to support the same biological communities. Engineered channels make up an estimated 40% of all stream-miles in the region.

The findings of the SMC study will inform ongoing discussions between regulators and permittees about appropriate biological objectives for engineered channels.

For more information, contact Dr. Raphael Mazor.

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

Demonstration maps reveal extrapolation limits of stream condition scores

SCCWRP has generated a series of maps that reveal the geographical extent to which ecological condition scores calculated for stream sampling sites may be extrapolated to unsampled reaches upstream and downstream of the sites.

The maps, which cover six demonstration watersheds across California, enable stream managers to get a better sense of the areas where they already have sufficient data to estimate overall ecological condition, and the areas where they should consider more intensive sampling to improve confidence.

A stream bioassessment is typically conducted at only a few locations within a watershed, as stream managers don't have the resources to conduct bioassessment work along every stream reach in California.

The project, completed in partnership with the California Stormwater Quality Association, is intended to help stream managers optimize how they apply stream bioassessment data to inform decision-making and policy development at larger scales, from subcatchments to entire watersheds.

The project involved the groundbreaking application of a new statistical modeling technique known as spatial stream network (SSN) modeling, plus obtaining the consensus of an expert review panel.

Stream managers are considering expanding the project to explore creating regional and/or statewide maps, as well as to analyze non-CSCI scores such as algal indices of biotic integrity.

The Malibu Creek Watershed is one of six watersheds across California used to demonstrate the feasibility of extrapolating stream condition scores to unsampled reaches upstream and downstream of a sampling site. The maps are intended to help stream managers understand how to apply sparse ecological condition scores to whole watersheds and other large areas.

EUTROPHICATION

Macroalgal work being used to draft updated nutrient TMDL for Santa Margarita River Estuary

A SCCWRP-led investigation into how to set scientifically defensible macroalgal biomass and nutrient loading targets in the Santa Margarita River Estuary is serving as the basis of a proposed alternative nutrient TMDL (total maximum daily load) for the estuary.

San Diego Regional Water Quality Control Board staff will recommend board approval this fall of a set of numeric nutrient targets designed to reduce the proliferation of macroalgal blooms in the northern San Diego County estuary. The macroalgae numeric endpoints and related nutrient loading targets are based on work conducted by SCCWRP and its partners over the past few years; they would replace outdated total nitrogen (TN) and total phosphorous (TP) numeric targets for the estuary.

The Santa Margarita River Estuary alternative nutrient TMDL represents the first application of SCCWRP's macroalgal assessment framework to a California coastal estuary dominated by macroalgal blooms. Previous TMDLs and restoration discussions in other Southern California estuaries, however, have relied on the supporting science.

Because macroalgae are the most abundant type of algae in Southern California estuaries, the example set by the Santa Margarita TMDL is expected to influence how nutrient management is approached in other macroalgae-dominated estuaries going forward.

Researchers are now moving upstream of the Santa Margarita River Estuary to study nutrient loading in the river's main stem. This work will provide opportunities to test-drive elements of a proposed State Water Board stream biointegrity and biostimulatory policy, which could be adopted as early as 2019 to govern the health of wadeable streams.

The Santa Margarita River Watershed is the subject of a proposed alternative nutrient TMDL (total maximum daily load) that is based on macroalgal biomass and nutrient loading targets developed by SCCWRP and its partners.

First phase wraps up for West Coast acidification model development

West Coast researchers working to develop a computer model that predicts how the region's coastal waters will be affected by ocean acidification and hypoxia have successfully completed the first phase of model development.

The first phase, completed in fall 2016, involved conducting a preliminary analysis to confirm the model is accurately capturing large-scale forcing at the scale of the Pacific Ocean basin. This preliminary validation step gives modelers confidence that when they downscale the model to a resolution of 1 square kilometer, they are accurately capturing key characteristics of dynamic oceanic forces, including volume and concentration of nutrients, pH and oxygen levels, and upwelling events that pull deeper waters to the surface.

The modeling project is a three-year initiative to help West Coast managers understand which coastal marine habitats are most vulnerable to ocean acidification and to what extent local, land-based sources of nutrients are exacerbating acidification 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.

SCCWRP and its partners at UCLA and the University of Washington are developing a downscaled South Coast model that spans San Francisco to Baja California and has a resolution of 1 square kilometer. The large-scale Pacific basin model serves to establish boundary conditions for the downscaled model.

The project team will present the results of this modeling work at a stakeholder advisory committee meeting in April. The committee, which includes SCCWRP member agencies, will help define the nutrient management scenarios that will be run through the South Coast model.

Field sampling kicks off for linking freshwater HABs to marine impacts

SCCWRP and its partners have launched the field sampling for a study that will examine how freshwater toxins influence downstream waterbodies along the California coast.

The goal is to understand the linkages between harmful algal blooms (HABs) in freshwater systems and marine systems, particularly estuaries.

The findings of the study will help water-quality managers rethink historical HAB management paradigms, which have traditionally considered management of freshwater HABs to be distinct from that of marine HABs.

Researchers hope to develop best-practices strategies for monitoring and managing HABs at the land-sea interface, including identifying which toxins and toxigenic species should be monitored.

CONTAMINANTS OF EMERGING CONCERN

Sediment samples being analyzed to test CEC monitoring framework

SCCWRP and the Sanitation Districts of Los Angeles County have begun analyzing sediment samples collected from across two regions of California for a pilot study that will test-drive a new, multi-tiered monitoring framework to screen for CECs in receiving waters.

The sediment samples, which were collected from the Los Angeles, San Gabriel and Russian Rivers, are being analyzed via two screening methods simultaneously: targeted chemical analysis and a novel bioanalytical assay that screens for endocrine-disrupting CECs.

The goal is to compare the findings obtained with each method and to potentially detect additional CECs in the sediment samples.

Sediments are known to house certain CECs preferentially over the water column, including triclosan, nonylphenol and polybrominated diphenyl ether (PBDE) flame retardants.

The sediment analyses are part of an ongoing study that seeks to help managers developing efficient, cost-effective ways to zero in on the CECs in receiving waters that pose the greatest potential health risks. Results are expected to be available in spring 2017.

Promising passive sampling device developed to detect fipronil in receiving waters

SCCWRP and its partners have identified a promising, cost-effective passive sampling method for detecting the ubiquitous pesticide fipronil in receiving waters.

The passive sampling method for this problematic, high-priority CEC was created by modifying a type of thin polymer film called polymethylmethacrylate (PMMA) to preferentially sorb fipronil and its degradation products. PMMA is commonly known as Acrylic or Plexiglas.

Fipronil and its degradation products are toxic to aquatic life at low levels, making it a priority to develop an inexpensive, rapid monitoring method for fipronil. Fipronil is a pesticide used for flea control on domestic pets.

Passive sampling devices concentrate chemical contaminants from water and sediment samples, capturing "bioavailable" forms of CECs that could be harmful to aquatic life.

Passive samplers already have been developed to measure legacy pollutants, including DDTs and PCBs. However, existing passive samplers cannot be used for fipronil because of its different chemical properties.

The fipronil passive sampler is described in a recently published journal article.

A SCCWRP field crew collects sediment and water samples from the Los Angeles River Watershed. SCCWRP and its partners are screening the samples via two CEC detection methods.

MICROBIAL WATER QUALITY

Suitcase-sized microbial detection device to begin field-testing in spring

SCCWRP this spring will begin field-testing a suitcase-sized prototype instrument that could revolutionize the speed at which beach ocean water is analyzed for microbial contamination.

The droplet digital PCR (polymerase chain reaction) instrument, developed by researchers at Arizona State University (ASU) and the Monterey Bay Aquarium Research Institute (MBARI) in collaboration with SCCWRP, consists of a ddPCR machine paired to a system that can accept raw water samples. The system, which can provide ddPCR results in about two hours, is intended to be so simple to use that it could be operated by a lifeguard.

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 device will be field-deployable, producing results within two hours.

MBARI and ASU are continuing to refine the design of the prototype instrument before delivering it to SCCWRP for field testing, scheduled to begin as early as March.

Study design being finalized to examine antibiotic-resistant bacteria, genes in effluent

SCCWRP and its POTW member agencies are finalizing the design of a study that will examine whether viable antibiotic-resistant bacteria and the genetic material that codes for antibiotic resistance are being discharged into the environment following the wastewater treatment process.

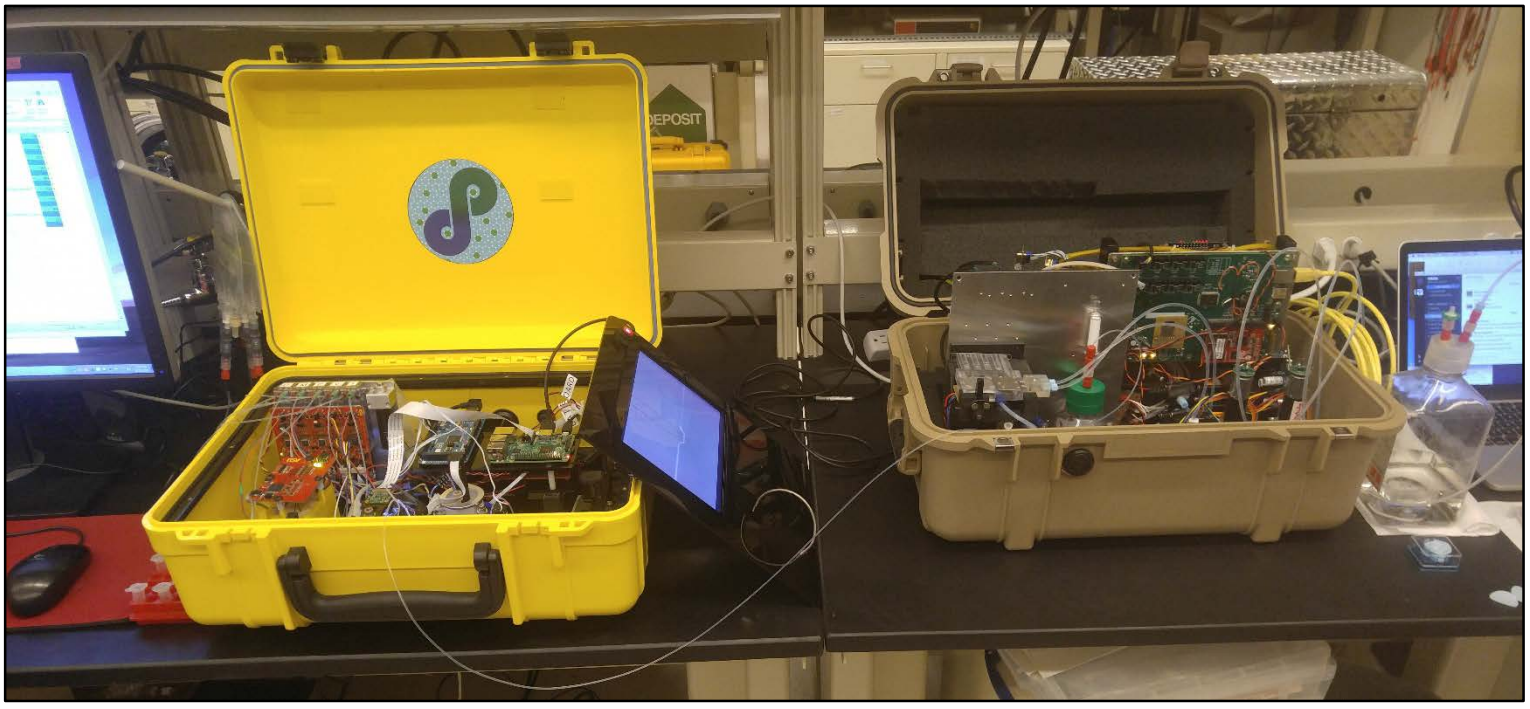
The study, scheduled to begin later this year, will measure the prevalence of antibiotic-resistance bacteria entering and exiting nine wastewater treatments across Southern California, including an international plant at the U.S.-Mexico border. Researchers will track which bacteria and genetic material survive treatment and are discharged into receiving waters.

Researchers are focusing on antibiotic resistance genes in wastewater effluent because these genes may survive the treatment processes that destroy most bacterial cells, and then may travel via treated effluent into aquatic systems.

Once in the environment, bacteria in the environment can take up the antibiotic resistance genes, which could confer antibiotic resistance to them. If the bacteria being conferred antibiotic resistance include pathogens that make humans sick, it could be a health concern.

Previous studies have documented a broad array of antibiotic resistance genes in wastewater effluent, as well as how commonly bacterial cells swap their antibiotic resistance genes with one another.

Prior to the study's launch, SCCWRP will be circulating standard operating procedures to all participating labs, so they can practice collection and analysis techniques and ensure they can generate high-quality, comparable results.



A prototype instrument that uses a DNA-based analysis method to detect microbial contamination, left, has been paired with an instrument designed to prepare raw water samples for analysis, right. A tube connects the two instruments. The goal is to be able to feed raw water samples into the sample preparation processer and get microbial contamination results in about two hours; SCCWRP is scheduled to begin testing the prototype system this spring.

Analysis underway for Inner Cabrillo Beach health risk modeling study

A SCCWRP-facilitated advisory committee is reviewing water-quality sampling data collected from Inner Cabrillo Beach to determine whether high fecal indicator levels at the Los Angeles County beach are indicative of a health threat to beachgoers who enter the water.

The committee, which began its review in November, is using data from the beach sampling effort to decide if and how to move forward with using a health risk model known as Quantitative Microbial Risk Assessment (QMRA) to quantify the risk of gastrointestinal illness for Inner Cabrillo beachgoers.

Inner Cabrillo is a popular swimming spot in the Los Angeles Harbor area where fecal indicator bacteria concentrations frequently exceed water-quality guidelines. More than $20 million has been spent to reduce contamination levels, but bacterial concentrations continue to exceed objectives; the beach has a bacterial TMDL (total maximum daily load).

The project's advisory committee is reviewing data on fecal indicator bacterial levels, as well as genetically based fecal markers specific to humans and birds. Human sources of contamination are much more likely to contain the pathogens that make people sick.

QMRA is designed for use in places where the contamination sources are not human, according to 2012 guidelines issued by the U.S. Environmental Protection Agency.

Courtesy of Port of Los Angeles

Inner Cabrillo Beach in the Los Angeles Harbor area has been the subject of more than $20 million in unsuccessful clean-up efforts. A SCCWRP-facilitated advisory committee has begun reviewing water-quality sampling data for a study that aims to ascertain whether high fecal indicator levels at the beach are indicative of a health threat to beachgoers.

REGIONAL MONITORING

ELAP one-year follow-up review finds accrediting body back on track

An expert advisory panel convened by SCCWRP in 2015 to evaluate the state's accrediting body for environmental laboratories has completed a one-year follow-up review of the program, concluding that it has regained credibility and is on the right path toward achieving its mission.

The California Environmental Laboratory Accreditation Program (ELAP) Expert Review Panel, which met Jan. 31-Feb. 2 at SCCWRP, recommended that the accrediting body continue to pursue implementation of a nationally recognized accreditation standard, as well as use third-party accreditors to help reduce backlogs.

The follow-up meeting was the culmination of a year of sweeping structural changes to the accrediting body. In late 2015, the Panel published an initial program review that described ELAP as ineffective, financially challenged, and lacking credibility.

Since that time, ELAP has implemented new operating procedures and performance evaluation standards. The agency also has created enforcement units, revamped its handling of complaints, and developed a risk-based process to prioritize its backlog of laboratories undergoing review. ELAP, however, continues to face a systematic backlog, in part because it has been unable to hire and retain enough qualified lab assessors.

ELAP is responsible for inspecting about 700 public-health and environmental testing laboratories across California, both public and private. The accrediting body plays a key role in protecting the integrity of environmental data on which the state bases its management decisions.

The ELAP Expert Review Panel will publish a final written report on its findings in March, and is scheduled to present the findings to the State Water Board at a May 3 meeting.

INFORMATION TECHNOLOGY & VISUALIZATION

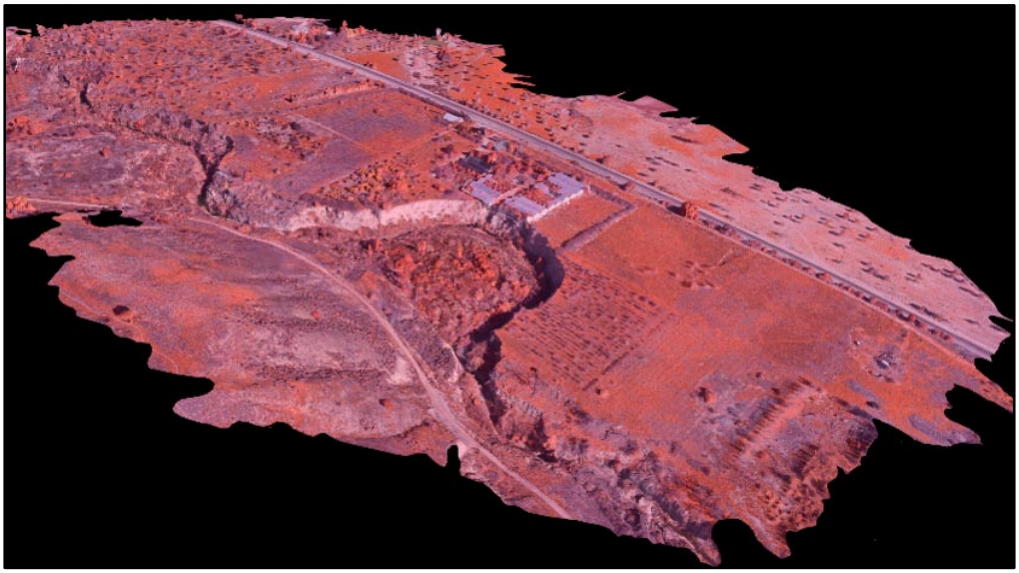
Pilot study shows potential of UAS for remote environmental monitoring applications

SCCWRP and its partners have demonstrated in a pilot study that traditional and multispectral cameras mounted to an unmanned aerial system (UAS) can be used to produce high-resolution, 3D mapping of waterways susceptible to hydromodification.

The year-long project, which involved flying remote-controlled aircraft over stream channels in south Orange County, provides preliminary evidence that UAS aircraft can be adapted for environmental monitoring applications.

SCCWRP showed that the high-resolution aerial data obtained from the UAS can be used to develop runoff models, track changes to terrain over time, and zero in on a precise location retroactively to take more detailed measurements.

Data obtained from a visible spectrum camera and a multispectral infrared camera showed the most promise, while experimental data from a LiDAR (Light Detection and Ranging) laser profiling system was not initially useful.



A high-resolution, 3D map of Oso Creek in Orange County that was created using data obtained from an unmanned aerial system (UAS) provides early evidence that UAS aircraft can be adapted for environmental monitoring applications.

SCCWRP is partnering with the San Francisco Estuary Institute to explore how UAS could be used to map harmful algal bloom events, estuaries and wetlands, debris and pollution plumes, and other areas.

This spring, SCCWRP and SFEI are planning to invest in a shared UAS. SCCWRP staff have undergone training to pilot the aircraft and will receive certification from the Federal Aviation Administration.

New SCCWRP Publications

Journal Articles (Published)

Bednaršek, N.A, T. Klinger, C.J. Harvey, S. Weisberg, R.M. McCabe, R.A. Feely, J. Newton, and N. Tolimieri. 2017. New ocean, new needs: Application of pteropod shell dissolution as a biological indicator for marine resource management. *Ecological Indicators* 76:240–244.

Joyce, A.S., L.M. Portis, A.N. Parks, and R.M. Burgess. 2016. Evaluating the Relationship between Equilibrium Passive Sampler Uptake and Aquatic Organism Bioaccumulation. *Environmental Science and Technology* 50:11437-11451.

Lao, W., Y. Hong, D. Tsukada, K.A. Maruya, J. Gan. 2016. A new film-based passive sampler for moderately hydrophobic organic compounds. *Environmental Science & Technology* 50:13470-13476.

Peng, J., Y. Cao, M.A. Rippy, A.R.M.N. Afrooz, S.B. Grant. 2016. Indicator and pathogen removal by low impact development best management practices. *Waters* 8, 600; doi:10.3390/w8120600.

Saintilan, N., K. Rogers, C. Toms, E.D. Stein, D. Jacobs. 2016. Intermittent Estuaries: Linking Hydro-geomorphic Context to Climate Change Resilience. *Journal of Coastal Research* 75(1):133-137.

Wu, J., Y. Cao, B. Young, Y. Yuen, S. Jiang, D. Melendez, J.F. Griffith and J.R. Stewart. 2016. Decay of Coliphages in Sewage-Contaminated Freshwater: Uncertainty and Seasonal Effects. *Environmental Science & Technology* 50: 11593-11601.

Journal Articles (Online)

Alonso, M.B., K.A. Maruya, N.G. Dodder, J. Lailson-Brito, A. Azevedo, E. Santos-Neto, J.P.M. Torres, O. Malm, E. Hoh. Non-targeted screening of halogenated organic compounds in bottlenose dolphins (Tursiops truncatus) from Rio de Janeiro, Brazil. *Environmental Science & Technology* DOI: 10.1021/acs.est.6b04186.

Fong, L.S., E.D. Stein, and R.F. Ambrose. 2017. Development of Restoration Performance Curves for Streams in Southern California Using an Integrative Condition Index. *Wetlands* doi: doi:10.1007/s13157-016-0869-x.

Mackintosh, S.A., N.G. Dodder, N.J. Shaul, L. Aluwihare, K.A. Maruya, S.A. Chivers, K. Danil, D.W. Weller, E. Hoh. 2016. Newly identified DDT-related compounds accumulating in Southern California bottlenose dolphins. *Environmental Science & Technology* DOI: 10.1021/acs.est.6b03150.

Mehinto, A.C., B.S. Jayasinghe, D.R. Vandervort, N.D. Denslow, K.A. Maruya. 2016. Screening for endocrine activity in water using commercially available in vitro transactivation bioassays. *Journal of Visualized Experiments* e54725, DOI:10.3791/54725.

Pyne, M.I., D.M. Carlisle, C.P. Konrad, E.D. Stein. 2017. Classification of California streams using combined deductive and inductive approaches: Setting the foundation for analysis of hydrologic alteration. *Ecohydrology* doi: 10.1002/eco.1802.

Journal Articles (Accepted)

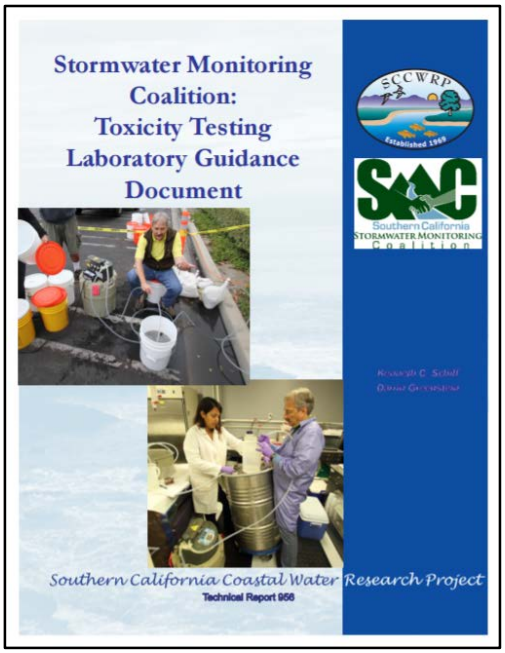
Arnold, B.F. K.C. Schiff, A. Ercumen, J. Benjamin-Chung, J.A. Steele, J.F. Griffith, S.J. Steinberg, P. Smith, C.D. McGee, R. Wilson, C. Nelsen, S.B. Weisberg, and J.M. Colford Jr. In press. Acute illness among surfers following dry and wet weather seawater exposure. *American Journal of Epidemiology*.

Benjamin-Chung, J., B.F. Arnold, T.J. Wade, K. Schiff, J.F. Griffith, A.P. Dufour, S.B. Weisberg and J.M. Colford. In press. Coliphages as indicators of gastrointestinal illness in recreational waters: A pooled analysis of six prospective coastal beach cohorts. *Epidemiology*.

Chen, C., M.O. Gribble, J. Bartroff, S.M. Bay, L. Goldstein. In press. The sequential probability ratio test: An efficient alternative to exact binomial testing for Clean Water Act 303(d) evaluation. *Journal of Environmental Management*.

Kudela, R.M., M.D.A. Howard, K. Hayashi, C. Beck. In press. Evaluation of uptake kinetics during a wastewater diversion into nearshore coastal waters in southern California. *Estuarine, Coastal and Shelf Science*.

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. In press. Derivation and evaluation of putative adverse outcome pathways for the effects of cyclooxygenase inhibitors on reproductive processes in female fish. *Toxicological Sciences.*



The Southern California Stormwater Monitoring Coalition has published a guidance document for toxicity testing that chronicles the findings of a laboratory intercalibration study.

Book Chapters

Chiu, M.-C., C. Leigh, R. Mazor, N. Cid, and V. Resh. In press. Anthropogenic threats to intermittent rivers and ephemeral streams, Chapter 5. In: T. Datry, N. Bonada, and A. Boulton (eds.), *Intermittent Rivers and Ephemeral Streams*. Elsevier.

Denslow, N.D., K.A. Maruya, F.D.L. Leusch. 2016. Bioanalytical approaches in identifying transformation products. In: J.E. Drewes and T. Letzel (eds.), *Assessing Transformation Products of Chemicals by Non-Target and Suspect Screening: Strategies and Workflows, Vol 2.* ACS Symposium Book. DOI: 10.1021/bk-2016-1242.ch004.

Technical Reports

Aminzadeh, S., M. Armsby, N. Bednarsek, J. Bishop, A. Boehm, C. Braby, F. Chan, R. Dunbar, R. Feely, B. Gaylord, L. Jewett, C. Krembs, K. Kroeker, R. Labiosa, T. Maloney, J. Phillips, B. Rappoli, M. Sakashita, D. Sivas, G. Somero, M. Sutula, D. Thomas, G. Waldbusser, S. Weisberg. 2016. Ocean Acidification: Setting Water Quality Goals. Technical Report 961. Stanford University. Stanford, CA.

Bay, S.M., D.J. Greenstein, A.N. Parks, C.Q.T. Zeeman. Assessment of bioaccumulation in San Diego Bay. Technical Report 953. Southern California Coastal Water Research Project Authority. Costa Mesa, CA.

Schiff, K.C., D. Greenstein. Stormwater monitoring coalition toxicity testing laboratory guidance document. Technical Report 956. Southern California Coastal Water Research Project. Costa Mesa, CA.

Southern California Stormwater Monitoring Coalition. 2017. 2015 Report on the Stormwater Monitoring Coalition Regional Stream Survey. Technical Report 963. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Anumol, T., S. Dagnino, N.G. Dodder, S.A. Snyder, K.A. Maruya. Analysis and screening of per/polyfluoroalkyl substances in a coastal urban ecosystem in California. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Bay, S.M. SEDAG Spiked Sediment Database: A New Resource for Sediment Toxicology Data Discovery and Synthesis. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Cossaboon, J.M., N.G. Dodder, S.J. Chivers, D.W. Weller, K. Danil, K.A. Maruya, E. Hoh. Non-targeted identification of contaminants in southern California sentinel marine mammals. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Gillett, D. Changes in the Condition and Composition of Channel Islands Macrobenthic Communities. California Islands Symposium. October 4-6, 2016. Ventura, CA

Hseih, S., S.P. Eckel, K. Siegmund, K.A. Maruya, S.M. Bay, M.O. Gribble. Predicting sediment chemical mixture toxicity from marine amphipod mortality data. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Mehinto, A.C. Use of cell-based receptor assays to screen for endocrine disrupting chemicals and infer potential toxicity in California waters. SETAC North America 37th Annual Meeting, November 6-10, 2016. Orlando, FL.

Sengupta, A. Impacts of Nutrients on Receiving Waters, and Control Strategies. Training Conference for Research on Comprehensive Management of Dianchi Lake Basin. November 9, 2016. Kunming, China.

Steinberg, S.J., and A. Lanier. Supporting Coastal and Marine Spatial Planning with the West Coast Ocean Data Portal. Esri Ocean GIS Forum 2016. November 1-3, 2016. Redlands, CA.

Stein, E.D. Resiliency of Coastal Wetlands to Sea Level Rise & Climate Change. San Diego Watershed Summit. October 25, 2016. Del Mar, CA.

Stein, E.D. Assessing Historic Change and Relative Vulnerability of Southern California Coastal Wetlands to Sea Level Rise. Restore America's Estuaries Conference. December 10-14, 2016. New Orleans, LA.

Sweet, L., E. Barnes, J. Magnuson, C. Pasparakis, P. Perrichon, J. Stieglitz, J. Strzelecki, D. Benetti, A. Esbaugh, M. Grosell, S. Hook, K. Maruya, J. Morris, A. Revill, D. Schlenk, A. Roberts. The effects of photoproducts generated from irradiated crude oil exposures on pelagic and estuarine fish species. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Tillitt, D.E., J.A. Jenkins, S. Hartley, H.M. Olivier, R.O. Draugelis-Dale, D.A. Alvarez, R. Gale, C. Lavelle, A.C. Mehinto, N. Denslow. Field evaluation of biological responses in Gulf sturgeon (*Acipenser oxyrinchus desotoi*) and laboratory exposure of shovelnose sturgeon (*Scaphirhynchus platorynchus*) to artificially-weathered oil. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Weisberg, S.B. Ocean acidification expert panel discussion. California Climate Change Symposium. January 25, 2017. Sacramento, CA.

Conference Posters

Cossaboon, J.M., N.G. Dodder, S.J. Chivers, D.W. Weller, K. Danil, K.A. Maruya, E. Hoh. Enhanced cataloguing of halogenated organic compounds in marine mammals of the Southern California Bight using a non-targeted analytical method. 2017 Southern California Marine Mammal Workshop. January 27-28, 2017. Newport Beach, CA.

Flavetta, G., W. Lao, K.A. Maruya, R.M. Burgess, L. Fernandez. Polyethylene film and solid-phase microextraction arrays to monitor temporal and spatial distribution of dissolved persistent organic polutants at the Palos Verdes Shelf Superfund site. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Greenstein, D., D. Vidal-Dorsch, K. Schiff. Toxicity laboratory intercalibration for stormwater in Southern California. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Kroll, K.J., O. Adeyemo, E. Li, A.C. Mehinto, S. Bay, K.A. Maruya, N.D. Denslow. Estrogen-driven apical endpoints in Menidia beryllina. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Maruya, K.A., W. Lao, D. Tsukada, D.R. Vandervort, Y. Hong, J. Gan. Extending the scope of passive sampling for contaminated sediments: standardizing and validating methods for moderately hydrophobic organic contaminants. SETAC North America 37th Annual Meeting. November 6-10, 2016. Orlando, FL.

Parks, A.N., M.A. Cashman, S. Fogg, M.G. Cantwell, D.R. Katz, K.T. Ho, and R.M. Burgess. Form and toxicity of copper released into marine systems from conventionally and nanosized copper treated lumber. 37th Annual SETAC North America Meeting. November 6-10, 2016. Orlando, FL.

Other Presentations

Cao, Y. The HF183 human marker background and overview. San Diego Bacteria Permittee Meeting. December 9, 2016. Carlsbad, CA.

Maruya, K. Passive sampling of persistent organic pollutants (POPs) in the southern California Bight. 2nd Workshop on Global Passive Sampling. November 28, 2016. Jinan University. Guangzhou, China.

Maruya, K. Occurrence of and fish reproductive studies with alkylphenols, triclosan and related CECs. Department of Toxic Substances Control, January 11, 2017. Sacramento, CA.

Maruya, K. The pros and cons of field vs. lab applications of passive sampling. San Francisco Bay Regional Monitoring Program Webinar: Passive and Alternative Sampling Methods. January 25, 2017.

McLaughlin, K. Acid Ocean? The What, When, Where, and Why of Ocean Acidification. Aquarium of the Pacific Teen Science Café. December 4, 2016. Long Beach, CA.

Moore, S. Using GIS to Manage Large-Scale Regional Monitoring Programs. Southern California Marine GIS Users Group Meeting. November 30, 2016. San Diego, CA.

Parks, A.N. Environmental Toxicology in Southern California Coastal Waters. Duke ITEHP Alumni Career Symposium. September 30, 2016. Durham, NC.

Sengupta, A. Impacts of Nutrients on Receiving Waters, and Control Strategies. Kunming University. November 10, 2016. Kunming, China.

Steinberg, S.J., A. Lanier and A. Bailey. The West Coast Ocean Data Portal. West Coast Ocean Partnership. October 26, 2016. Portland, OR.

Steinberg, S.J., A. Lanier and A. Bailey. The West Coast Ocean Data Portal. West Coast Regional Planning Body. October 27, 2016. Portland, OR.

Steinberg, S.J. A Geospatial Survey of Anglers to Assess Fish Consumption from San Diego Bay, California. Southern California Marine GIS Users Group Meeting. November 30, 2016. San Diego, CA.

External Content Featuring SCCWRP

Everything you've ever wanted to know about surfing after it rains. January 23, 2017, The Inertia.

He Tried to Follow the Rules – and He Lost His Business. January 5, 2017, Voice of San Diego.

California Department of Toxic Substances Control calls for input on next potential priority products. November 29, 2016, The National Law Review.

NOAA grants UCI $1.15 million for coastal research. November 8, 2016, University of California, Irvine.

Study validates post-storm illness risk for surfers. October 31, 2016, Orange County Register.

First study of surfer health during wet and dry weather shows water quality and illness correlation. October 27, 2016, Surfrider Foundation.

NOAA awards $10.44 million in coastal science research funding. October 25, 2016, National Oceanic and Atmospheric Administration.

How often do surfers get sick from the water? Study says ….October 24, 2016, Adventure Journal.

SCCWRP Personnel Notes

New Faces

Dr. **Yawei Wang**, an assistant professor at the Research Center for Eco-Environmental Sciences at the Chinese Academy of Sciences, joined SCCWRP in January as a Visiting Scientist in the Microbiology Department. He will work at SCCWRP for one year.

Departures

Mayra Molina, a Sea Grant Fellow in the Biogeochemistry Department, completed her one-year fellowship and left SCCWRP in January.

Scientific Leadership

Dr. **David Gillett** was appointed to the expert panel for the U.S. Environmental Protection Agency's NCCA Great Lakes Benthic Indicator Development Workshop, held October 18-20, 2016 in Chicago, Ill.

Dr. **Keith Maruya** was appointed session chair for the SETAC North America 37th Annual Meeting, held November 6-10, 2016 in Orlando, Fla.

Dr. **Alvina Mehinto** was appointed chair of two sessions – one titled Environmental Application of Cell-Based and High-Content Screening Assays and the other titled Integrating Omics and Chemistry to Identify Chemicals of Concern – at the SETAC North America 37th Annual Meeting, held November 6-10, 2016 in Orlando, Fla.

Dr. **Alvina Mehinto** has been appointed to the editorial board of the journal *Environmental Toxicology and Chemistry* for a three-year term.

Shelly Moore has been appointed a reviewer for the Bay Area Stormwater Management Agencies Association (BASMAA) Receiving Water Trash Monitoring Program.

Dr. **Steve Steinberg** has been elected to the Board of Directors of the Pacific Southwest Region of the American Society of Photogrammetry and Remote Sensing.

Dr. **Steve Weisberg** has been appointed chair of a session titled Sensors & Instrumentation: Approaches & Technologies to Improve Sensor Capacity for Autonomous Measurement Platforms at the Oceanology International Conference, scheduled for February 15, 2017 in San Diego, Calif.

SCCWRP COMMISSIONER SPOTLIGHT

Commission Chair thrives on varied challenges

As second-in-command at the Sanitation Districts of Los Angeles County, Robert Ferrante has mastered the art of balancing disparate interests and communicating with diverse audiences.

Robert Ferrante

Ferrante, Assistant Chief Engineer and Assistant General Manager for the past five years, oversees day-to-day operations for a 1,700-employee organization spread out across 78 cities and unincorporated territory. Ferrante also is accountable to 24 independent sanitation districts that make up the Sanitation Districts of Los Angeles County; each district has its own board of directors and its own review and approvals processes.

"Sometimes this model creates challenges, but the fact that we operate on a regional level means we are providing regional benefits – we're combining our systems to achieve economies of scale and efficiencies," Ferrante said. "It's a model that has allowed us to to accomplish a lot of great things."

Ferrante, who has spent his entire career working for the Sanitation Districts, said he's never considered leaving. In particular, he enjoys the fact that the Sanitation Districts is really two agencies in one, with both a wastewater division and a solid waste division. The latter competes for business on the private market.

"Because we compete with private industry, it means we need to stay competitive – and that spirit spills over into the wastewater side," Ferrante said. "Everything we do, we're trying to do it as efficiently and effectively as possible."

Ferrante, an Alternate Commissioner who will serve as SCCWRP Commission Chair at most 2016-17 meetings on behalf of Grace Hyde, says what he most appreciates about SCCWRP are meaningful, science-informed discussions with an engaged group of water-quality managers. In fact, the Sanitation Districts is more involved with SCCWRP than it is with any comparable engineering organization, Ferrante noted.

Robert Ferrante enjoys a meal on the Caribbean island of St. John in 2016 with his daughter, Mia, left, son Hideo, and wife Minako.

"We see a tremendous benefit to what SCCWRP does with respect to development of regulations, putting things into context, and communicating science," said Ferrante, an environmental engineer by training. "SCCWRP's mission resonates with us because we also move forward based on science and engineering."

Ferrante went to college to become an aerospace engineer like his father and two older brothers. But as a UC Berkeley undergrad, he became fascinated by environmental engineering, especially air quality. His first job with the Sanitation Districts was working as an Engineering Associate in the Air Quality Group; he later worked in Wastewater, Energy Recovery and Solid Waste Management.

"I like everything related to environmental engineering, so the most exciting thing about working for the Sanitation Districts has been getting to spread my wings into other areas," Ferrante said.

Each year, Ferrante makes it a point to go on a trip overseas with his wife and two teenage children. Last year, they went to the Caribbean; this year's trip is still up in the air.

Robert Ferrante

Job: Assistant Chief Engineer and Assistant General Manager, Sanitation Districts of Los Angeles County

SCCWRP role: Commission Chair (2016-17) and Alternate Commissioner (2016-present)

Prior jobs: (all with LACSD) Department Head, Solid Waste Management (2008-12); Assistant Department Head, Solid Waste Management (2005-08); Section Head, Energy Recovery (2003-05); Wastewater Engineer and Supervising Operations Engineer, Joint Water Pollution Control Plant (1998-2003); Engineering Associate, Air Quality Group (1993-98)

Education: M.S. environmental engineering, Stanford University (1993); B.S. mechanical engineering, University of California, Berkeley (1992)

Residence: Torrance

Family: Wife Minako, project manager for an urban housing nonprofit; son Hideo, 15; daughter Mia, 13; dog Jet, a beagle

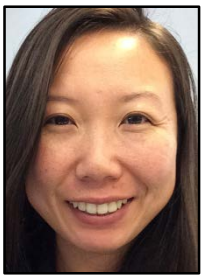
Hometown: Buffalo, N.Y. and Fremont, Calif.

Hobbies: Reading mystery books and books in Italian; backyard gardening; biking along the beach; day hikes; traveling

CTAG SPOTLIGHT

Biologist drawn to field work over more school

For Denise Li, field work has long been an irresistible draw. Although she's repeatedly contemplated going to grad school, the allure of working in the field has always won out.



Denise Li

In 2011, a year after graduating from UC Berkeley, Li applied to a master's program in Washington, but when the professor encountered funding problems, she decided instead to go live and work on a fishing vessel off the coast of Alaska.

Two years later, after returning from a five-month volunteer research expedition on an African game reserve, the Southern California native again considered grad school. But in the end, she decided she would much prefer working full time as an environmental toxicologist.

"I had all of this field experience, so I thought, why do I want to go back to school? Going back into a classroom just didn't sound appealing," said Li, who was hired two-and-a-half years ago as a Water Biologist in the City of Los Angeles Bureau of Sanitation's Environmental Monitoring Division.

Li replaces former CTAG Representative Stan Asato, who retired.

The City of Los Angeles position has given Li an opportunity to continue doing the hands-on lab and field work she has always craved. And working in the public sector also has been a perfect alignment with her personal values, she said.

"This country did so much for my family," said Li, whose parents are immigrants. "Working for the City aligns with my goals as a researcher and a citizen; it's always been so important to me to give back to my community."

Denise Li poses with some toys inside a gift shop during a visit to the Griffith Observatory in 2015.

Denise Li

Job: Water Biologist II, Environmental Monitoring Division, City of Los Angeles Bureau of Sanitation (2014-present)

SCCWRP role: CTAG Representative (October 2016-present)

Prior jobs: Math and science tutor, A+ Tutoring (2013-14); field research assistant, Leopard Ecology and Conservation NGO in Botswana, Africa (2012-13); Groundfish Observer in Alaska, National Marine Fisheries Service (2011-12); toxicology lab research assistant, University of California, Berkeley (2010-11)

Education: B.A. integrative biology and psychology, UC Berkeley (2010)

Residence: El Segundo

Family: Fiancé Austin, a UCLA M.D./Ph.D. student; two cats, Wiggles and Butterball

Hometown: Granada Hills

Hobbies: Road-biking, ocean swimming and kayaking, food tourism-inspired vacations

Her most high-profile City of Los Angeles project to date has been using novel bioanalytical screening methods co-developed by SCCWRP to study the effects of an estrogen-mimicking chemical on topsmelt fish development. Li's study, completed as part of the City's discharge permit requirements, dovetails with SCCWRP's own research to understand whether bioanalytical screening technologies can be used effectively to screen aquatic systems for a wide variety of CECs.

"I could not have done my study without SCCWRP," Li said. "SCCWRP staff has been so helpful to me, and I love learning from and interacting with SCCWRP scientists."

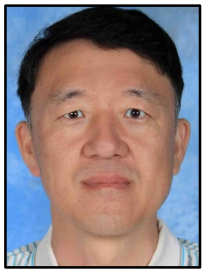
As for her first post-college job, which took her to the Gulf of Alaska and the Bering Sea as a groundfish observer on a commercial fishing vessel, Li said she still misses the thrill of living at sea. But she also acknowledges she could not have handled such a grueling lifestyle over the long term. She was constantly seasick during her weeks-long, storm-ridden voyages, she said.

"There were days I would throw up just before I went on deck, and then I'd take a Dramamine and go to work. After 72 hours, I'd feel better," Li recalled. "It was just too hard on my body."

SCCWRP PARTNER SPOTLIGHT

Visiting scientist learns passive sampling methods

When researching about passive sampling devices, Dr. Gi Beum Kim stumbled upon a journal article about a new film-based PSD being developed for moderately hydrophobic organic compounds.



Dr. Gi Beum Kim

One of the co-authors was SCCWRP's Dr. Keith Maruya, whom Kim worked with as a postdoctoral researcher at Skidaway Institute of Oceanography in Savannah, Georgia from 1997 to 2001. After reconnecting with him, Kim asked for an opportunity to work with other scientists interested in passive sampling devices.

"I want to learn about PMMA (poly(methyl methacrylate)) and other PSD applications to marine sediment," Kim said. "Especially because in Korea, there are not a lot of people who are interested in PSDs."

Kim, a professor of marine environmental engineering at Gyeongsang National University in South Korea, is on a one-year sabbatical at SCCWRP. He will work at SCCWRP until July 2017.

Kim's research focuses on the toxic effects of persistent organic pollutants (POPs) in marine environments and their organisms. At SCCWRP, he is working with Maruya and Dr. Wayne Lao to develop a PMMA passive sampling device to detect concentrations of organic contaminants in sediment.

"Sometimes the concentrations of POPs cannot be detected or cannot be analyzed, so if there are methods to better detect these concentrations in marine metrics, I want to learn how to detect the concentrations of POPs," Kim said. "Here at SCCWRP, they do that, so I came here to learn the methods."

Dr. Gi Beum Kim, son Albert, daughter Lily and wife Jongsu Lee visit the barren Badwater Basin, the lowest elevation point in North America, during a trip to Death Valley National Park.

Gi Beum Kim, Ph.D.

Job: Professor, Department of Marine Environmental Engineering, Gyeongsang National University, Jingju, South Korea (2001-present)

SCCWRP role: Visiting scientist, Chemistry Department (until July 2017)

Prior jobs: Visiting scientist, Duke University (2007-2008); Postdoctoral researcher, Skidaway Institute of Oceanography (1997-2001)

Education: Ph.D. environmental chemistry and ecotoxicology, Ehime University in Japan (1997); M.S. marine science, Seoul National University (1993); B.S. marine science, Seoul National University (1989)

Residence: Irvine (permanent residence: Tongyeong, South Korea)

Family: Wife Jongsu Lee, a marine debris scientist for a non-governmental organization; son Albert, 19; daughter Lily, 12

Hometown: Busan, South Korea

Hobbies: Bowling; watching action and science-fiction movies

Kim said he's hoping what he learned will enable him to start new collaborations back home. Specifically, he's hoping to work with Dr. Junghwan Kwon of Korea University, who shares his interests in PSDs and comes at the technology from more of the chemistry and efficiency side.

"If possible, I want to work with him and check the efficiency of the PSD with him in Korea, and then I want to apply the methods with him," Kim said.

Kim received his bachelor's and master's degrees in marine science from Seoul National University. For his Ph.D. dissertation at Ehime University in Matsuyama, Japan, he researched the toxic effects of butyltin compound accumulation in marine mammals.

Kim currently lives in Irvine with his wife, Jongsu Lee, and their 19-year-old son, Albert, and 12-year-old daughter, Lily, who all moved to Southern California with him in July 2016.

Since moving to Southern California, they have visited Death Valley, Las Vegas and the Grand Canyon.

SCCWRP STAFF SPOTLIGHT

Microbiologist focuses on human contamination

When Dr. John Griffith began his Ph.D. at USC in 1995, he planned to focus his doctoral research around the relationship between natural bacteria and viruses in the ocean. But during a Sea Grant fellowship that he did concurrently with his Ph.D., he was put on a project that focused on human viruses in the marine environment.

Dr. John Griffith

This Sea Grant project became a turning point in his professional life, permanently redirecting the focus of his research to human sources of contamination.

"The Sea Grant program put me in a human health direction," Griffith said. "It got me looking at human viruses that I wasn't even looking at before."

In 2001, midway through his Ph.D., he was hired as a SCCWRP microbiologist. In 2010, he became the head of SCCWRP's Microbiology Department.

Griffith oversees field and lab operations for a wide variety of projects. His research focuses on determining sources of microbial contamination in watersheds and coastal oceans, developing rapid methods to detect microbial contamination, and using a health risk modeling approach known as quantitative microbial risk assessment (QMRA) to quantify risk factors associated with exposure to waterborne microbes.

"QMRA is much less costly than doing an epidemiology study, because any time you start studying humans directly, it can get really expensive," Griffith said.

Dr. John Griffith and wife Marcie attend a performance of the musical *The King and I* at the Pantages Theatre in Hollywood in January 2017.

John Griffith, Ph.D.

Job: Principal Scientist, Microbiology Department

Started: September 2001

Prior jobs: Research assistant, University of Southern California (2000-01); trainee, USC Sea Grant program (1995-2001); laboratory assistant, USC (1993-95)

Education: Ph.D. marine environmental biology, University of Southern California (2006); B.S. biology and environmental studies, USC (1995)

Residence: Garden Grove

Family: Wife Marcie, elementary school principal; son John, a sports performance coach; daughters Maddie, a SCCWRP laboratory assistant, and Abbie, an Orange Coast College student

Hometown: Los Angeles

Hobbies: Hiking; biking; scuba diving; training his dogs

More recently, Griffith has been working with SCCWRP's POTW member agencies to design a study that will examine whether viable antibiotic-resistant bacteria and the genetic material that codes for antibiotic resistance are being discharged into the environment following the wastewater treatment process.

As a Los Angeles native who has always been in and around the ocean, it is no surprise that Griffith became interested in marine biology and marine life.

Griffith was first introduced to SCCWRP in 1994 as a USC undergrad. He worked with a professor to publish a research paper on bioindicators in collaboration with SCCWRP.

Also at that time, he met Rachel Noble, a Ph.D. student at the time who became his lab partner. Noble was hired by SCCWRP a few years later as a postdoctoral researcher, and eventually became the agency's first microbiologist. When Noble left to pursue a faculty position at the University of North Carolina at Chapel Hill in 2001, she recommended Griffith to replace her.

Griffith said he particularly enjoys working at SCCWRP because of the opportunity to interact directly with water-quality managers.

"I get to see how my work affects policy," Griffith said. "Most folks with a Ph.D. that do research like I do work at a university. It's a big deal for them when their papers get cited a lot, but I also get to see what the Commission thinks about our work and how the information we provide shapes their management decisions."

Coalescing of scientific expertise

A 16-member panel of stream ecology experts from across the nation met at SCCWRP for four days in December and January to lay the groundwork for developing a Biological Condition Gradient model for wadeable streams in California. Stream managers across California will be able to use the BCG framework to gain an improved understanding of the ecological consequences of losing various biological attributes of stream health as stream bioassessment scores fall in response to increasing stress.

The Biological Condition Gradient expert panel assembles for a photo in SCCWRP's courtyard following the completion of a two-month project to place more than 200 stream sites across California into one of six categories of ecological condition. SCCWRP facilitated the panel's deliberations.