SoCal
SETAC News
Society of Environmental Toxicology and Chemistry
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FEATURE ARTICLE

The Southern California Bight Regional Monitoring Program- Providing Consensus Assessments of Regional Coastal Condition Since 1994

By: Karen McLaughlin, Principal Scientist/Bight Program Coordinator

Three decades ago, coastal monitoring in Southern California was siloed, and site-specific, with little to no coordination. This monitoring was focused primarily on permit-monitoring near wastewater and industrial discharges and costly with an estimated $31 million spent in coastal Southern California alone as of the mid-1990s. But despite this level of investment, none of these monitoring data sets could be stitched together to answer overarching questions about the health of the coastal ocean.

The problem was that none of the site-specific monitoring data were collected using unified, standardized methods with comparable quality-control checks, nor were the data sets collected from spatially representative sites so they could be extrapolated in an unbiased fashion to draw conclusions about regional ecological condition. To be able to synthesize this monitoring information together in meaningful, managerially relevant ways, the existing monitoring activities needed to be unified around a robust monitoring design at a regional scale – supported by mutually agreeable methods, tools, scientific frameworks, and governance processes.

The Southern California Bight Regional Monitoring Program (The Bight Program) was developed to fill this role. Starting as a pilot survey in 1994, SCCWRP and its member agencies pooled their resources and worked together to assess 1,539 square miles of Southern California coastal waters, from Santa Barbara to the U.S.-Mexico border. The pilot project was an immediate success, with environmental management agencies able to reallocate resources they were already expending on site-specific monitoring to support the regional monitoring effort.

Since then, the Bight program has become a cyclical monitoring initiative, the latest iteration of which is Bight '23, because field sampling kicks off in the Summer of 2023. Bringing together more than 80 participating organizations to get answers to some of the most pressing management questions about the ecological health of Southern California's coastal ocean.

The key to the Bight program's enduring success is that it is a collaborative, consensus-driven

Researchers collecting sediment samples (Photo: Ken Sakamoto)

President's Corner

Andrea Bonisoli-Alquati

It's Spring once again. Our beautiful region is starting to bloom, and quite possibly even 'superbloom' after those copious rains and snow. Chances are you were looking at those torrential rains with mixed feelings – alternatively as needed replenishment of water reservoirs and as agents of transport of trash and other contaminants into our ocean. Hopefully, the bright colors that are now starting to paint our hills, our deserts, and even our roadsides can take your mind off contaminant transport for a while.

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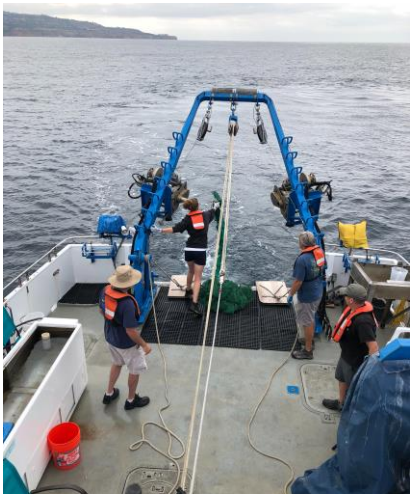
initiative. Participating agencies cover a broad cross section of organizations responsible for protecting Southern California's coastal ocean: wastewater management agencies, stormwater management agencies, water-quality regulatory agencies, natural resources agencies, municipalities, academic researchers and environmental nonprofits. These organizations, with vastly different agendas, priorities, and needs, mutually agree on questions and study design. Every participant provides expertise, perspective and both in-kind and financial resources to help sustain the program's operations cycle after cycle. And every participant agrees upfront on courses of action to pursue depending on the findings.

The end result is consensus on what the monitoring data say about coastal ocean health across time and space, allowing participants to speak with a common voice, delivering unified messaging that helps amplify the resonance of the program's findings.

The Bight Program's foundational element is the Sediment Quality Assessment. Soft sediment, which cover the vast majority of Southern California's coastal ocean seafloor – is a particularly effective indicator of how contaminants introduced by humans to the environment are impacting the overall health of coastal ecosystems.

Chemical contaminants stick to suspended particles in seawater and settle to the ocean floor, forming sediment layers that retain these chemicals for decades. To measure the ecological effects of this contamination, scientists have developed rigorous, quantitative sediment quality monitoring methods that beyond just measuring contamination in the sediment itself. Collectively, sediment quality assessments provide multiple lines of evidence about overall ecosystem health: direct measurements of contaminant chemistry, overall sediment toxicity, community composition of benthic infauna and trawl caught demersal fishes and invertebrates, and bioaccumulation of contaminants in coastal organisms; giving managers a high degree of confidence in findings.

Indeed, across Southern California, much of what environmental managers know about how land-based contamination has impacted overall coastal ocean health over the past three decades comes from the findings of the Southern California Bight Regional Monitoring Program's sediment quality surveys. The program's rich data sets have enabled managers to build comprehensive regional snapshots of ocean health across time and space. More than 2,000 sites – from Santa Barbara in the north to the U.S.-Mexico border in the south – have been sampled since 1994. Sampling starts at a depth of just 3 feet along the shore and extends more than 20 miles offshore, to a depth of nearly 3,000 feet. The program uses a stratified, random sampling design for selecting monitoring sites across Southern California. Stratification breaks the seafloor into specific habitats by depth and use, and randomized sampling removes possible bias and ensures findings are statistically representative.



Bight team members working on a trawl. (Photo: Curtis Cash)

Since the Bight program began sediment quality monitoring in 1994, researchers have consistently found that majority of the coastal seafloor – 96% or more – is not considered to be ecologically impacted by sediment contamination. As a result, environmental managers can remain focused on the tiny portion of the overall seafloor – almost entirely within coastal embayments – where sediment contamination is continuing to disproportionately impact coastal ecosystem health. Indeed, although the Bight program documented significant improvements to sediment quality in Southern California's ports, marinas, bays and estuaries from 1998 to 2008, these gains have largely plateaued over the past decade – with about a quarter of all embayment areas still ecologically impacted by sediment contamination.

The Bight program arrives at its sediment quality findings using a quantitative scoring tool known as the Sediment Quality Triad, which synthesizes three main lines of

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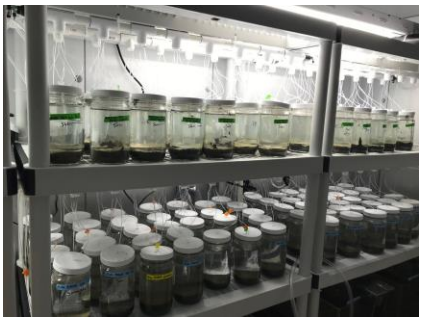

Figure 1: Toxicity testing for the Bight Program (Photo: Chris Stransky)

evidence – sediment toxicology, sediment chemistry and sediment-dwelling biological community health – to produce a single category score reflecting sediment quality. In addition to this quantitative evaluation method, the Bight program also uses two other lines of evidence – assessments of demersal fish and megabenthic invertebrate communities and bioaccumulation of sediment contaminants in fish (Bight '08 and '18), bird eggs (Bight '13), and shellfish (Bight '23). These latter two lines of evidence are designed to investigate sediment contamination's indirect ecological impacts as well as potential impacts on humans as seafood consumers, as opposed to the quantitative Sediment Quality Triad scoring tool, which generates scores reflecting the degree to which organisms at a site are impacted via direct exposure to contaminated sediment.

During Bight '18, more than 46,000 bottom-dwelling fish and large invertebrates were sampled by towing fishing trawl nets along the seafloor. Less than 0.05% were found to have abnormalities such as fin rot, lesions, and tumors – the lowest portion of any Bight program survey to date, and well within expected background levels for fish populations.

Similarly, among sport fish commonly caught in Southern California, Bight '18 found that average levels of five key contaminants, including mercury, were relatively low in the tissues of these fish. None of the five contaminants exceeded average levels that would place the fish in the most restrictive "Do not consume" consumption advisory threshold, as defined by California's Office of Environmental Health Hazard Assessment (OEHHA). Some contaminants, however, were at concentrations elevated enough to trigger advisory limits on the number of servings considered safe to consume each week.

The Bight program's sediment quality data sets are critical to tracking the ecological health of the coastal ocean over time, but sediment quality monitoring provides more than just big-picture trend lines. The monitoring infrastructure and workflows that support sediment quality monitoring can be readily leveraged to investigate other types of habitats and contaminants. These add-on studies have enabled the Bight program to be responsive to a range of focused questions of management concern.

For example, since the Bight program's inception in 1994, the same survey that is used to assess the health of large, bottom-dwelling fish and invertebrates also is used to track trash levels across the continental shelf. Indeed, at the same time that fishing trawl nets are towed along the coastal seafloor to sample fish and invertebrates, the trash captured in these trawl nets is sorted, counted and classified. These data sets are then used to calculate the overall portion of the coastal seafloor that contains trash. Results from this analysis have indicated that the extent of trawl-caught trash, and plastic trash in particular, has been increasing since 1994.

Similarly, the sediment samples being collected at sites across the coastal seafloor are routinely analyzed in new ways to look for different contaminant types. For example, beginning in 2008, the Bight program began tracking a now-banned class of flame retardant chemicals known as PBDEs (polybrominated diphenyl ethers). Between 2008 – the year a statewide ban went into effect – and the following monitoring cycle in 2013, average PBDE concentrations fell by 92%.

More recently, the Bight program has used its sediment monitoring effort to track the spread of a toxin known as domoic acid that is produced by the most ubiquitous type of harmful algae in coastal Southern California. During Bight '18, researchers for the first time examined how much domoic acid – which is produced by the Pseudo-nitzschia marine diatom – is settling into seafloor sediment and then being absorbed and ingested by sediment-dwelling aquatic life. Bight '18 found domoic acid across 54% of Southern California's coastal seafloor. Moreover, domoic acid was consistently found throughout the year in the bodies of sediment-dwelling organisms, even at times of the year when domoic acid isn't being produced, and even in places where the toxin could not be detected in the surrounding sediment.

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Also during Bight '18, the program for the first time screened sediment samples for the presence of bioactive contaminants, including industrial and pharmaceutical chemicals. The monitoring investigation used a novel technology known as bioanalytical cell assays, in which laboratory-grown cells are exposed to contaminants from sediment and then their cellular-level responses are tracked. Results indicated that cell assays tracked well with parallel contaminant classes and should be considered an excellent screening tool for site assessments.

The sediment quality data sets that have been generated through the Bight program represent the most encompassing, regional data sets of their kind. For nearly three decades, the Bight program has been relying on these data sets to paint a rich, nuanced portrait of the health of Southern California's coastal ocean across time and space. The latest iteration of the program, Bight '23, builds on three decades of success in regional condition assessments. Planning for the 2023 survey is underway. If you or your agency is interested in participating in the program please reach out to the program coordinator to learn about how you can participate! (Karen McLaughlin- karenm@sccwrp.org).

Mark your calendars! The SoCal SETAC Annual Meeting is back this April 17-18, 2023 at Lake Arrowhead, CA. Learn more about the Bight program and other regional scientific research at this meeting. More information can be found at: https://www.socal-setac.org/2023-annual-meeting

Don't forget to follow our new LinkedIn page!

Connect with us to stay up-to-date on all events, job opportunities, grants, and more!

Southern California SETAC: https://www.linkedin.com/company/southern-california-setac/

President's Corner, con.

If you are reading this newsletter, there are other phenological events you are also likely waiting for. I am thinking of our upcoming Spring Dinner Meeting and Annual Meeting. You should have received communications about both, and you will find details about them throughout this newsletter. Our Chapter's Board has been hard at work on these events. Through the initiative of our Past President, Karin Wisenbaker, we secured a picturesque venue for our Annual Meeting, at UCLA Lake Arrowhead Lodge. Look it up – you'll want to come even more. The meeting will run from April 17–18, and its program is currently shaping up, and waiting for your abstract submissions. We planned two special sessions, on micro/macroplastics and on multiple stressors in the environment. I know for sure many of you are working on these broad and important themes, and I look forward to hearing your contributions. The students who won research awards from our Chapter will also be there, updating us on their progress in research. (It comes to mind that this is also a cycle, however longer, of raising the next generation of environmental toxicologists and chemists, so they can be in positions of leadership one day, and continue the work we do).

I am also particularly excited about the Spring Dinner Meeting. We have an exceptional speaker for the event, Dr. Bhavna Shamasunder of Occidental College. Dr. Shamasunder is an expert at the intersection of environmental health and justice, whose research is focused on the disproportionate burden of chemical exposures that low-income communities and communities of color face, including in and around Los Angeles. She is also one of those rare public intellectuals who link their academic research to science communication and to the needs voiced by communities. Her research not only helps those communities, it also charts a path towards an improved understanding of science's value to society and the restoration of support for science.

Another cyclical event is on course to happen this Spring, an ever rarer sight. I am talking about the Southern California Bight Regional Monitoring Program (a.k.a. The Bight Program), a massive 'monitoring moonshot' that happens every five years in our region, and every five years expands and refines itself, reinvents itself by branching out to include new chemicals, new endpoints. Its ultimate goal is to credibly monitor and assess the health of our coastal ecosystems. Many of you are involved in it, including in designing, planning, and securing funds. I am sure at times these days you may be frantically working on some logistical aspects of it. It would only be understandable, then, if you forgot how impressive and important the Bight Program is. From my peripheral role, I find myself in awe of the massive challenges, and how they're being overcome through a collective effort that involves all three sectors represented by SETAC – academia, government, and private enterprises. How else are you going to cover more than 1,500 square miles of coastal waters? In this newsletter, you get to learn about the Bight Program from Dr. Karen McLaughlin of the Southern California Coastal Water Research Project (SCCWRP). Dr. McLaughlin, who is now spearheading the effort, recounts the history of the Program, and explains its studies and their relevance.

This issue of the newsletter also includes for the first time highlights of papers from our SoCal SETAC members. We added this section with the awareness that it is through efforts both big and small that the members of our Chapter are leveraging their expertise to make a difference. I suspect you will agree.

I look forward to seeing you all at our upcoming events. May this Spring be a time for you to renew yourself.

Join us March 22, 2023 for our Spring Dinner Meeting in Fullerton, CA!

We will be hosting Dr. Bhavna Shamasunder, Associate Professor and Chair in the Urban and Environmental Policy Department and co-chair of the Public Health Program at Occidental College in Los Angeles.

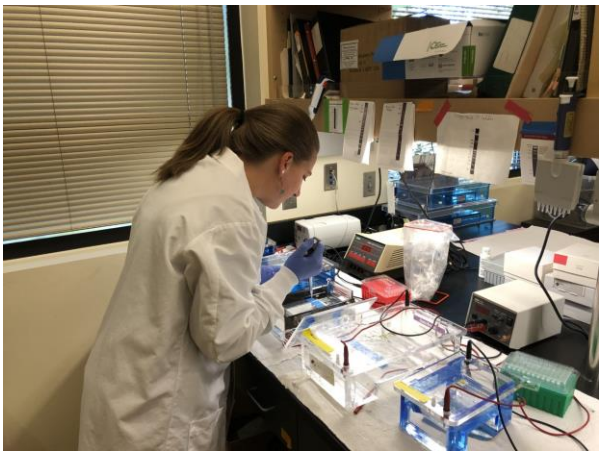
Additional details can be found at: https://www.socal-setac.org/spring-2023-meeting

Where: Old Spaghetti Factory, Fullerton, CA, 92832
When: Wednesday, March 22 at 6:30pm

MEET THE BOARD

Caroline Moore

San Diego Zoo Wildlife Alliance



Hello SoCal SETAC!

My name is Caroline and I am a SoCal SETAC board member, representing the non-profit sector. I have been an on-and-off member of SETAC since 2012 as I worked through the Veterinary Science Training Program (DVM/PhD) at UC Davis and an NIEHS postdoc at UCLA. SETAC kept inspiring me to bring my toxicology career back to environmental and wildlife applications, and I am now a scientist at the San Diego Zoo Wildlife Alliance working on veterinary toxicology within the Disease Investigations department.

I grew up in northern California in Humboldt County (true NorCal!) and my love for science came from a blend of playing music, being surrounded by giant redwoods and ocean, and parents who supported STEM, instilling in me a desire to understand and protect nature's natural patterns. Chemistry turned into my favorite high school class, so I dived deeper into the molecular mechanisms of nature with a BS in biochemistry and molecular biology from UC Santa Cruz. With the goal of becoming a veterinarian, I worked at a small dog and cat clinic and at the Department of Fish and Wildlife Marine Veterinary Care and Research Center in Santa Cruz. At the research center I worked with PhD students, and for the first time learned what graduate school was and why anyone would ever want a PhD. I was soon helping collect fecal samples off Carmel Beach to test for enteric bacteria and antimicrobial resistance which might impact the health of the endangered southern sea otter. This led to helping with a harmful algal bloom study in food sources for the sea otter. Overall these projects helped me link human impacts with ecological and wildlife health: delivering antibiotics to domestic species that poop in watersheds and nutrient run-offs into rivers, triggering algal blooms that travel downstream to the ocean, have long-term consequences for human and animal health.

With this growing understanding of One Health, I completed my DVM and PhD in Pharmacology and Toxicology at UC Davis. While I worked with alternative models and algal bloom toxins, the parts of my PhD that really called to me were the toxicosis investigations of animal mortality and morbidity events. I especially enjoyed developing ways to take hypotheses back to the benchtop to explore the mechanistic roles contaminants played in these animal clinical cases, and in turn develop tools that can be used to investigate future toxicosis cases.

I am privileged that I have had many supportive mentors and mentees along my journey that has led me being the first toxicologist hired at San Diego Zoo Wildlife Alliance. Here I investigate how environmental contaminants impact threatened and endangered species, from DDT+ and marine mammals in SoCal to mercury from gold mining on biodiversity in Peru. I am honored to be part of SoCal SETAC and grateful to the network of toxicologists I can turn to as I explore this new phase of my career.

(Top) Caroline loading gels at the Molecular Diagnostic Laboratory in Disease Investigations, SDZWA, Ca.

(Left)Caroline on a night hike for opportunistic herp collection in the Peruvian Amazon for biodiversity testing, Los Amigos Conservation Concession, Peru.

Paper Highlights

We are proud to introduce a new section to our quarterly newsletter! Our "Paper Highlights" will showcase recent publications by Chapter members. This quarter, we share highlights from Jenna Wiegand and Dr. Win Cowger, two of SoCal SETAC's board members.

Triphenyl phosphate-induced pericardial edema in zebrafish embryos is dependent on the ionic strength of exposure media

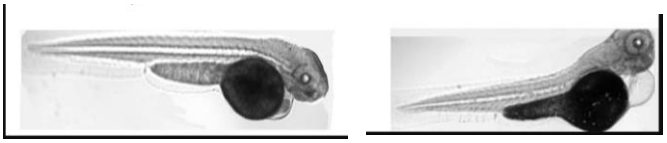
By Jenna Wiegand
Paper link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8724387/

Animal toxicity testing is being phased out and is slowly being replaced by cellular, computational, and zebrafish assays for toxicity screenings. But can these results be compared to other scientific findings if there is little standardization in the field? During the hunt for a mechanism of action for Triphenyl Phosphate (TPHP), an aryl phosphate ester-based flame retardant and plasticizer, it was found that the ionic strength of the exposure media can cause a drastically different outcome in experimental results.

Jenna Wiegand, an Environmental Science Ph.D. Candidate at UC Riverside, says that her findings could push the zebrafish community to standardize their protocols. Her PI has been looking at the impacts of various flame retardant chemicals on zebrafish embryos for many years now. "We have been using the same exposure media in our experiments for multiple years. Imagine our surprise when we switched our exposure media, a phenotype that we had seen consistently in TPHP-exposed embryos, did not appear!"

Edema is an abnormal accumulation of fluid in the body, beneath the skin. Edema can be caused by a wide variety of factors ranging from diseases to contaminant exposure. In humans and mammals, the underlying edema mechanism has been heavily studied; however, there is little information on what mechanisms cause edema formation in fish. Interestingly, one of the largest fields that utilize edema formation as an endpoint, specifically for fish embryos, is toxicology. One paper compiled all studies that utilized zebrafish as a model for toxicology studies and found that 35 chemicals have been found to cause pericardial edema. Despite its widespread acceptance as an experimental endpoint, there is little information on why it is forming, only that it is occurring.

One of Wiegand's prior studies led her to hypothesize that TPHP was impacting the embryo's ability to osmoregulate properly, leading to edema formation. She decided to analyze how sodium ion uptake was potentially being impacted by



A healthy zebrafish (left) and a zebrafish with a pericardial edema (right). (Photo: Jenna Wiegand)

TPHP exposure. The sodium ion plays an important role in zebrafish development and is often found in exposure media. To her shock, they found that while the sodium ion concentration had not changed in varying conditions, embryos exposed to media with low ionic strength did not form pericardial edema when in the presence of TPHP, while it did form in exposure media with high ionic strength. Given that their lab had found that TPHP consistently causes pericardial edema in their embryos, not seeing it led to more questions.

To ensure that changes in pericardial edema had to do with the ionic strength of the test solution and not another factor, two tests were run. The first was an Ion chromatography and ICP-OES analysis to determine what ions and their concentration in each exposure type. It was found that the solutions contained very high levels of chloride, which increased as a function of media strength and accounted for a majority of the ions present within three media types. The second test looked at the individual ingredients of the high ionic strength media and determined whether any particular ions could be linked to edema formation. When analyzing the data for the second test, chloride was found to potentially play a role in pericardial edema formation.

Analytical chemistry was then performed to determine if D-mannitol, an osmotic diuretic that mitigates TPHP-induced pericardial edema, changes the ability of the embryo to uptake TPHP. The ability of the embryo to uptake TPHP was also looked at in two different media types. Interestingly, it was found that neither of these factors plays a role in TPHP uptake. Suggesting that the differences seen in pericardial edema from ionic media strength, and D-mannitol in their past study, were not attributed to differences in TPHP uptake.

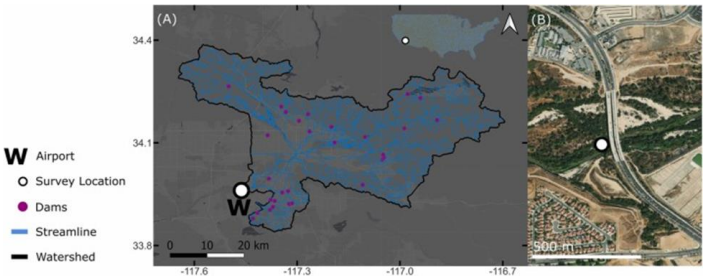
Their results suggest that in zebrafish embryos, the ionic strength of exposure media plays a role in pericardial edema formation. When reviewing literature that utilizes zebrafish embryos as a model for toxicity, there is little to no mention of the type of water or ion concentration of exposure media. If other contaminants have similar responses to a media's ionic strength, it is possible that harmful phenotypes are being missed in studies. There is also the possibility that studies that utilize embryo media with high ionic strength, could be overstating the toxicity of contaminants. Wiegand concludes "One of the most important takeaways of this study is that zebrafish embryo-based toxicity testing needs to be standardized or the researchers utilizing the model risk misunderstanding the mechanisms of contaminants."

PAPER HIGHLIGHTS (continued)

Characterizing the relationship between stream discharge and plastic concentration

By: Dr. Win Cowger
Paper link: https://doi.org/10.1016/j.ejrh.2022.101264

The Santa Ana River in Southern California is a small urban catchment that experiences lowflows dominated by wastewater effluent and flashy stormflows that transport a lot of water and material downstream in a short period of time. Previous research in Southern California found a close relationship between stormflow and increases in macroplastic concentration. Dr. Win Cowger, environmental scientist at Moore Plastic Research, and his team wanted to know if they could better parameterize that relationship by characterizing stream discharge and plastic concentration simultaneously.



The study site for the project. (Credit: Win Cowger)

In 2019, there were only five stormflow events at their study transect on the Van Buren BLVD bridge and they were able to collect data during two of them at multiple points along the hydrograph. To collect a stormflow microplastic sample, they lowered a large net with a 5 mm mesh from the bridge using a bridge board crane to the surface of the water column. When the stormflow got too strong the net would start jumping out of the water or large trees were flowing down the stream, they needed to stop their operations.

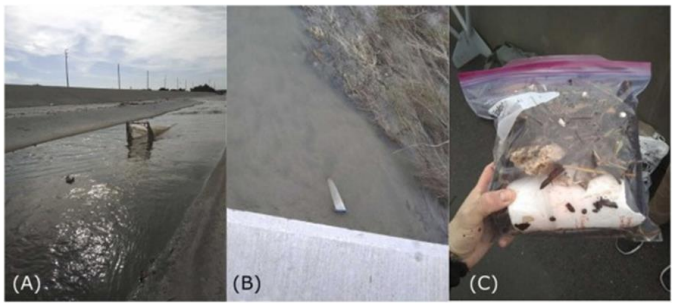
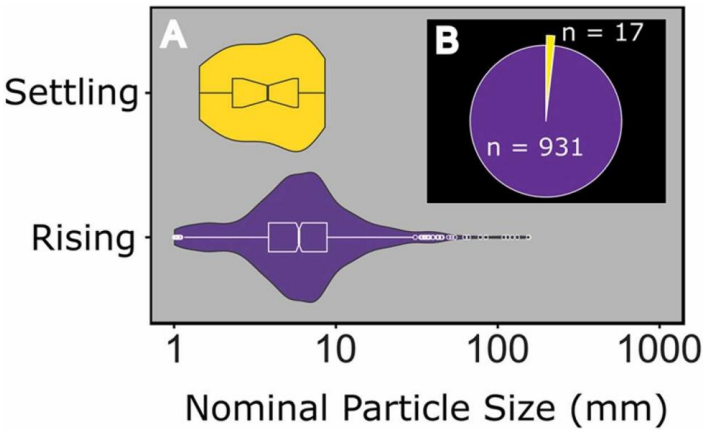


Figure 2: Panels (A) and (B) show deployed nets for collecting plastics. Panel (C) shows a sample that would be sorted for macroplastics. (Photo: Win Cowger)

Back at the lab, the team would sort out all the particles on a white background, manually count them, and photograph them to get their shape and size. The vast majority of the particles were less dense than water, which was likely due to the fact that sampling occurred at the surface of the stream. Particles that are more dense than water are more likely to concentrate close to the bottom of the stream, so "we decided to focus our research on the particles with densities less than water because they would be well characterized by our technique," explained Win.



Nominal particle size distributions for settling and rising particles in the study. The violin plots are a smoothed and symmetric representation of the probability density function of the particle size distributions. (Credit: Win Cowger)

Win and his team found that the highest concentrations occurred at moderate discharges while the lowest and highest discharges had lower floating macroplastic concentrations. Additionally plastic increased during the rising limb of one storm flow and decreased during the falling limb of another storm flow. This suggested that plastic was diluted at very high flows or during the falling limb, which makes sense considering that floating macroplastics are readily mobilized in stream flow. They then used the concentration discharge relationship to improve their ability to estimate the annual plastic flux at the site.

Unfortunately, there was still a large amount of variability in the new model and the uncertainty overlapped with a mean concentration only model for predicting flux. Both estimates included an order of magnitude of uncertainty. This result underscores the need to extensive monitoring of plastic concentrations paired with discharge to better understand plastic transport dynamics.

2023 Southern California Regional Chapter of the Society of Environmental Toxicology and Chemistry Annual Meeting

Mark your calendars! The SoCal SETAC Annual Meeting is back this April 17-18, 2023 at Lake Arrowhead, CA. Meeting registrations covers all fees, meals*, non-alcoholic beverages, beer and wine.

Deadlines to remember:
March 15: Early registration ends
March 16: Abstract submission due
April 5: Registration closes

More information can be found at: https://www.socal-setac.org/2023-annual-meeting

*Sunday includes dinner only; Monday includes breakfast, lunch, and dinner; Tuesday includes breakfast and lunch.

March 2023

March 19-23
Society of Toxicology (SOT) 62nd Annual Meeting and ToxExpo. Nashville, TN, USA
https://www.toxicology.org/events/am/AM2023/index.asp

March 20-23
32nd Annual International Conference on Soil, Water, Energy, and Air. San Diego, CA, USA
https://www.aehsfoundation.org/West-Coast-Conference.aspx

March 22
SoCal SETAC Spring Dinner Meeting. Old Spaghetti Factory, Fullerton, CA, USA.
https://www.socal-setac.org/spring-2023-meeting

March 26-30
American Chemical Society (ACS): Crossroads of Chemistry. Indianapolis, IN, USA (Hybrid)
https://www.acs.org/meetings/acs-meetings/spring-2023.html

April 2023

April 17-18
Southern California Regional Chapter of the Society of Environmental Toxicology and Chemistry Annual Meeting (SoCal SETAC). Lake Arrowhead, CA, USA
https://www.socal-setac.org/2023-annual-meeting

April 24-28
13th National Monitoring Conference. Virginia Beach, VA, USA
https://www.nalms.org/2023nmc/

April 30 – May 4
SETAC Europe 33rd Meeting, Dublin, Ireland (virtual attendance available)
https://europe2023.setac.org/

June 2023

June 3-7
Society for Freshwater Science Annual Meeting, Brisbane, Australia
https://freshwater-science.org/save-dates-june-3-7-in-brisbane-australia

Have you checked out the Student Resources Page on the SoCal SETAC Website?

This page is available to help students find resources that will assist them in continuing to learn and engage with community and prepare for the next steps. Check it out and please email Leslie Nanninga, lnanninga@sandiego.gov if you have any additional resources or tips to share!
https://www.socal-setac.org/student-resources

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Board Member (2022–2024) Private	**Katie Payne,** Enthalpy Analytical katie.payne@enthalpy.com
Board Member (2022–2024) Student	**Jenna Wiegand,** University of California Riverside jwieg002@ucr.edu

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