



2024-2025 ANNUAL REPORT



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Introduction to the SMC

The Southern California Stormwater Monitoring Coalition (SMC) is a partnership of 18 stormwater management agencies working to develop solutions to regional challenges in stormwater management. Since its founding in 2001, the SMC has been pooling its members' resources and expertise to collaboratively conceptualize, develop and fund stormwater research and monitoring initiatives across coastal southern California. This collaborative approach to stormwater management has influenced the development of NPDES permits, 303(d) listings and TMDLs, watershed plans, and stormwater monitoring designs.

SMC mission statement

To solve stormwater management challenges across southern California by building regional consensus around best-in-class tools, methods and monitoring strategies

SMC member agencies

The SMC's 18 member agencies represent the region's largest stormwater management agencies and the regulatory agencies that oversee them. Indirectly, SMC members represent many additional co-permittees.

Stormwater regulated agencies

- City of Santa Barbara
- City of Los Angeles Watershed Protection Division
- City of Long Beach
- City of San Diego
- Orange County Public Works
- San Diego County Watershed Protection Program
- San Bernardino County Flood Control District
- Los Angeles County Flood Control District
- Riverside County Flood Control and Water Conservation District
- Ventura County Watershed Protection District
- State of California Department of Transportation (Caltrans)

Stormwater regulatory agencies

- Central Coast Regional Water Quality Control Board
- Los Angeles Regional Water Quality Control Board
- San Diego Regional Water Quality Control Board
- Santa Ana Regional Water Quality Control Board
- California State Water Resources Control Board
- (*collaborating organization*) U.S. Environmental Protection Agency

Non-regulatory/R&D

- Southern California Coastal Water Research Project (SCCWRP)

The SMC was founded in 2001 when a group of local stormwater management agencies decided they could more effectively pursue their stormwater management priorities by working together.

SMC projects use a co-funding model, where SMC member agencies voluntarily pay for just the work that the Steering Committee has agreed to fund for the fiscal year. This co-funding model enables SMC member agencies to directly select which projects they participate in.



A field crew for the SMC's Regional Watershed Monitoring Program collects data at a stream site in the Santa Monica Mountains. The cyclical stream monitoring program enables SMC member agencies to generate comparable data sets that paint a rich, encompassing portrait of regional ecosystem health.

SMC 2024-2029 Research Agenda

The SMC uses a strategic research planning process to guide its next five years of research investments. The latest planning process was held in fall 2024, when the SMC convened a 12-member expert panel to shape its [2024-2029 Research Agenda](#). The SMC relies on this master planning document to make decisions about if, how and when to move forward with a range of candidate research projects over the coming five years.

SMC Progress Report

The SMC invests in high-quality science and engineering research to build a strong technical foundation upon which to optimize the effectiveness of stormwater management practices in coastal southern California. All of the SMC's work is guided by three main goals. The SMC uses multiple indicators to quantify its progress toward achieving these goals.

Fostering cooperation and collaboration

SMC Goal #1

Foster cooperation and collaboration among SMC member agencies to advance regional stormwater management

Progress Indicators

- » **63** external organizations that have partnered with the SMC on research and monitoring over the past five years (**Page 19**)
- » **9 out of 10** SMC projects over the past five years that have involved collaboration with partners external to the SMC
- » **38:1** projected average lifetime cost-leveraging ratio for each SMC member agency, after all current SMC projects are complete

Advancing scientific knowledge

SMC Goal #2

Advance and expand understanding of the science and engineering behind stormwater management

Progress Indicators

- » **10 out of 10** SMC projects completed on time over the past five years
- » **10 out of 10** SMC projects completed on budget over the past five years
- » **9 out of 10** SMC projects over the past five years whose findings have been or will be published in technical reports and/or peer-reviewed scientific literature

Improving management practices

SMC Goal #3

Use SMC research and monitoring data to improve stormwater management practices across southern California

Progress Indicators

- » **111** governing board and management decision-makers who were briefed on the SMC's work last year
- » **737** times last year that SMC Steering Committee members shared information about the SMC's work with their colleagues, supervisors and external partners
- » **93%** of SMC Steering Committee members who reported publicizing the SMC's work within their professional circles last year



A 12-member panel of experts from across the nation meets at SCCWRP in fall 2024 to collaboratively develop the SMC's 2024-2029 Research Agenda, a forward-looking document that lays out the SMC's research priorities over a five-year period. The SMC Research Agenda serves as a guide that helps the SMC decide which research projects to prioritize and fund over the coming five years.

Chair's Message



Amanda Magee

It is a privilege to share this message as I finish my first year as Chair of the Southern California Stormwater Monitoring Coalition (SMC). The past year was marked by the completion and release of the SMC's [2024–2029 Research Agenda](#), a major accomplishment that sets the direction for our work over the next five years.

The SMC's ability to consistently generate timely insights into stormwater management challenges comes from a deliberate and structured planning process. Guided by our 18-member Steering Committee, this process ensures that research investments are focused, relevant, and useful to agencies across the region.

The 2024–2029 Research Agenda was developed by an independent panel of national experts representing 12 disciplines ranging from biology and toxicology to data science and socio-economics, who met in southern California to identify key opportunities for the SMC to pursue. Their recommendations were combined with input from SMC member agencies, aligning scientific expertise with the practical needs of the stormwater management community.

The final Research Agenda identifies 20 candidate projects organized under six research areas: Contaminants, Biology, Data/Technology/Communication, Best Management Practices (BMPs), Modeling, and Socioeconomics/Financing. Together, these themes provide a comprehensive framework for advancing stormwater science in southern California.

The SMC has already begun to put this new Research Agenda into action. Earlier this year, the Steering Committee agreed to co-fund three projects from the new Agenda:

- Management options based on HF183 health risk modeling data
- Biological expectations in urban streams
- Nonstructural BMP efficiency

These three projects (*see Page 10 for a brief description of each project*) represent a continuation of the SMC's commitment to fund projects that advance science while directly supporting stormwater managers and impacting regulatory decisions. Additional projects from the new Research Agenda are expected to be launched in the coming years.

The 2024-2029 Research Agenda builds on the success of the 2019–2024 planning cycle, during which the SMC co-funded eight projects. Six are now complete and two are nearing completion. These included the development of the Regional BMP Monitoring Network, studies on the relationships between human markers of fecal contamination and health risk, laboratory intercalibration for chemistry testing, and the third cycle of the Regional Watershed Monitoring Program. Each of these projects has contributed valuable information that supports management decisions across the region.

Member agencies have consistently affirmed that this strategic planning process produces projects that are both scientifically credible and managerially relevant. The results of these efforts inform not only agency decisions but also broader planning and regulatory discussions throughout southern California.

Looking ahead, we expect the 2024–2029 Research Agenda to continue this record of success. By investing in projects that are practical, coordinated, and forward-looking, the SMC will provide critical knowledge to support stormwater management in the region.

On behalf of the Steering Committee, I encourage you to read the [2024–2029 Research Agenda](#) and learn more about the projects already underway. The SMC also welcomes opportunities to discuss research needs and explore collaboration with partners committed to advancing stormwater science.

Amanda Magee

Chair, SMC Steering Committee, 2024-2026
Senior Engineering Geologist, California State Water Resources Control Board

Reflecting on two decades of advances in stream bioassessment science

SMC research has been front and center in management efforts to incorporate bioassessment methods into routine watershed monitoring statewide

Historically, the primary way that stormwater managers evaluated watershed health was by measuring chemical contaminants in water.

But water chemistry monitoring is limited in that it provides only a snapshot of conditions at the time of sampling, and limits managers to measuring contaminants one at a time, without providing a complete picture of the health of a waterbody.

Meanwhile, the 4,300 miles of waterways that drain to southern California’s coastal ocean can be adversely affected by more than just pollution from trace metals, vehicle combustion products and other chemicals. As a result of intensive urban, industrial and agricultural development, southern California streams also can be adversely affected by changes to natural water flow patterns, alterations to adjacent landscapes, and excess nutrient inputs, among other stressors.

Biological monitoring – the assessment of a water body’s health based on evaluating the numbers and types of organisms that live within it – provides a solution for these shortcomings. Unlike water chemistry monitoring, biological assessment (or simply, bioassessment) integrates the combined effects of all chemical, physical, and hydrologic stressors affecting a water body over time. Moreover, stormwater managers are required to protect the health of aquatic life – not just water quality.

Since the SMC’s inception in 2001, the SMC has been leading efforts across southern California to advance the



A field crew collects samples of aquatic insects and other benthic invertebrates from a southern California stream. For more than two decades, the SMC has been leading efforts across southern California to advance biology-based monitoring of watersheds – an approach that enables managers to directly measure how environmental stressors affect the health of aquatic life.

science of stream bioassessment. Among the biggest challenges the SMC has addressed is paving the way for the development of scientifically robust stream bioassessment scoring tools that are applicable to streams across a state as environmentally complex as California.

For example, aquatic life that live in steep mountain streams on San Geronio may bear little resemblance to aquatic life in the sandy, braided channels of the Santa Clara River; thus, different biological benchmarks are needed to assess the health of these two streams.

As researchers pursued development of statewide bioassessment scoring tools in the 2010s, the SMC served as an invaluable partner, generating extensive, statistically representative stream bioassessment data sets that ensured the tools could be validated for use across

southern California’s diverse environmental settings.

Today, the SMC’s bioassessment research is focused on ensuring managers understand how to appropriately apply bioassessment tools to diverse stream types, as well as developing potential management solutions for improving streams in poor biological condition.

Along the way, southern California has become a regional hub for best-in-class bioassessment monitoring approaches that have been adapted, adopted, and incorporated into routine watershed monitoring practices across California and beyond – reflecting the SMC’s visionary leadership and influence at a statewide level.

Developing stream bioassessment tools

The basic premise of stream bioassessment is simple: Environmental stressors tend to adversely affect certain biological communities living in streams in predictable ways, altering both their population sizes and the types of species present. Some species flourish, while others dwindle or disappear under the cumulative effects of these stressors.

But the practicality of quantitatively assessing stream health across vast and varied geographies using scientifically robust bioassessment tools is a much more involved task – one that the SMC, as a regional coordinating body, has played a central role in making a reality.

Because managers cannot expect to find the same biological communities in all streams, they need reference sites, which are sites that are minimally altered by human activities and thus are appropriate to use as a reference for what the makeup of a stream biological community at a healthy site should look like.

In highly urbanized environments like southern California, however, it's often difficult to find environmentally similar streams that have not been adversely

affected by human activities to serve as these reference sites.

That's where the SMC's cyclical [Regional Watershed Monitoring Program](#) has been pivotal in providing a path forward. Since the program's initiation in 2009, SMC member agencies have been collecting high-quality, comparable bioassessment data on perennial streams across southern California.

The sampling effort – one of the largest stream bioassessment monitoring programs in the nation – focuses not just on urban areas, but at stream sites that are statistically representative of the broad ecological diversity found across southern California's coastal watersheds.

Using this wealth of stream bioassessment data, researchers then were able to develop statistical predictive models that estimate what numbers and types of organisms that managers should expect to find in streams across southern California that are in healthy biological condition.

These predictive models, in turn, became the foundation for developing tools that score the health of streams not just in southern California, but statewide; the tools compare the makeup of specific

How bioassessment scoring tools work

Stream bioassessment scoring tools evaluate the “expected” biological condition of a site in relation to its actual “observed” biological condition:

- The “expected” condition is generated via statistical predictive models.
- The “observed” condition is generated through field-collected data.

The biological condition scores that are generated with these tools are presented on a linear scale – meaning that scores are directly comparable across Southern California and beyond, even for streams in very different environmental settings.

biological communities at an individual stream site to what is expected at that stream site, producing a single, site-specific quantitative biological condition score.

So far, the tools consist of the [California Stream Condition Index](#) (CSCI), which uses stream benthic invertebrates to assess biological health and was unveiled in 2015, and the [Algal Stream Condition Index](#) (ASCI), which uses stream algae communities and was unveiled in 2020.

Already, the standardized statewide bioassessment methods and tools that were developed and vetted through the SMC's stream monitoring program have been incorporated into watershed monitoring programs across southern California and beyond, including:

- California Surface Water Ambient Monitoring Program (SWAMP) Perennial Streams Assessment
- San Francisco Bay Regional Monitoring Program
- San Gabriel River Regional Monitoring Program
- Los Angeles River Watershed Monitoring Program



Aquatic insects like the larval dragonfly, above, that are sensitive to environmental stressors are the focus of bioassessment-based SMC stream monitoring. The standardized bioassessment methods and tools that were developed and vetted through the SMC's monitoring program have been incorporated into watershed monitoring programs across California and beyond.

- Tahoe Regional Planning Authority Stream Monitoring Program
- National Park Service Mediterranean Network Stream Monitoring Program
- U.S. Forest Service Management Indicator Species Monitoring Program

Moreover, in 2020, the San Diego Regional Water Quality Control Board became the first regulatory agency in California to propose a region-wide stream biointegrity water quality objective that uses the California Stream Condition Index. The objective – which must be approved by the State Water Resources Control Board, California Office of Administrative Law, and the U.S. Environmental Protection Agency before it can go into effect – was the focus of a State Board workshop in Sacramento in May 2025 to gather information and perspectives.

Finally, the management insights that these tools have provided about streams in degraded biological condition have paved the way for two related areas of research: causal assessment, which is designed to evaluate the likely major causes of degradation at a stream site, and protective assessment, which is

Integrating multiple lines of evidence

Bioassessment monitoring isn't the only line of evidence that managers consider when evaluating watershed health. To help managers appropriately weigh multiple types of stream monitoring data, the SMC in 2019 unveiled the [Stream Quality Index](#) scoring tool. The tool synthesizes three lines of evidence – water chemistry and physical habitat, in addition to bioassessment – to assign a stream site to one of four condition categories reflecting the site's overall ecological health. Already, SMC member agencies are using the Stream Quality Index to help better understand and manage stream health across Southern California.

designed to identify the biggest risks to biological health so that managers can focus on protecting streams from these risks.

Working through stakeholder concerns, questions

As watershed managers have incorporated bioassessment-based methods into routine stream monitoring statewide over the past decade, the SMC's member agencies – both regulated and regulatory – and other stakeholders have raised numerous questions and concerns about how applicable bioassessment science is to the diverse stream types found across southern California and beyond.

Among stakeholders' key questions is whether policy and regulatory programs being considered based on stream bioassessment tools would be applicable to different types of streams statewide, and whether modified streams (i.e., streams that have been modified for flood control and other human purposes) have the capacity to support the levels of biological diversity that bioassessment scoring tools assume is possible.

Again, the SMC has stepped up to the plate, conducting follow-up investigations that are directly responsive to stakeholder questions. Key issues that the SMC has addressed in recent years (or is in the process of addressing) include:

- **Modified channels:** Streams that have been modified via the addition of hardened features, straightening, or other changes to the channel's natural morphology can lead to lower bioassessment scores than unmodified streams, independent of water quality. As a result, stakeholders have expressed concerns about developing regulatory policies for modified channels, given that managers may lack effective options for improving bioassessment scores in modified channels. In response, the SMC has partnered with researchers to study the use of bioassessment for modified channels specifically. So far, the work has found that



Streams that have been modified for flood control purposes, such as Arroyo Trabuco in southern Orange County, above, tend to receive uniformly lower bioassessment scores than other stream types. In recent years, the SMC has been focusing on studies intended to shed light on how applicable bioassessment science is to the diverse stream types found across southern California and beyond.

bioassessment scores can improve when water quality is improved, although this relationship can be greatly diminished in hard-bottom channels and other modified channels [[SCCWRP Technical Report #1434, #1437](#)]. Meanwhile, the SMC is advancing its work on modified channels to also understand the effectiveness of potential management solutions for improving biological health. In summer 2025, the SMC launched a study examining whether water-quality or hydrological improvements alone (i.e., without channel restoration) can improve biological health, plus whether channel restoration in tandem with water-quality improvements can positively influence bioassessment scores.

- **Intermittent streams:** The types of organisms that live in intermittent streams (which are streams with sustained seasonal flows from snow melt and groundwater) can be affected by natural stream drying, as some species lack adaptations to help them survive periods of dryness between flow events. As a result,

stakeholders have expressed concerns that using bioassessment tools in intermittent streams could potentially misinterpret the absence of certain species in intermittent streams as signs of ecological degradation. SMC research over the past decade has established that intermittent reference streams across southern California have bioassessment index scores that are comparable to perennial reference streams, and moreover, that low scores in intermittent streams can confidently be interpreted as signs of

degradation. (Outside southern California, however, this pattern may be different: In northern California, intermittent streams appear to receive lower scores than their perennial counterparts – with poor bioassessment scores potentially reflecting the effects of natural drying, rather than reflecting signs of human-caused degradation. A recent study in the San Francisco Bay Area provided an example for how to conduct comprehensive assessments that include both perennial and

intermittent stream sites without the risk of mischaracterizing intermittent sites as degraded [[SCCWRP Technical Report #1419](#)].)

Ultimately, the SMC’s body of work is serving as the scientific foundation for robust, ongoing stream management discussions and debates – all centered around if, where and how to take advantage of bioassessment monitoring approaches to better protect and manage the health of watersheds in southern California and beyond.

SMC Project Portfolio

An overview of ongoing, planned and recently completed SMC projects

| | | SMC 2019-2024 Research Agenda (view) | | | SMC 2024-2029 Research Agenda (view) | | |
|------------------------------|---|---|---|---|---|---|---|
| | | 2021-2022 | 2022-2023 | 2023-2024 | 2024-2025 | 2025-2026 | 2026-2027 |
| 2019-2024 projects | Human Fecal Indicators and Health Risk (Completed 2019-2024 project) | ACCOMPLISHMENTS » Refined pathogen measurement methods » Completed first year of measurements | ACCOMPLISHMENTS » Reviewed first-year data » Completed second year of measurements » Initiated health risk modeling | ACCOMPLISHMENTS » Developed health risk estimates and potential HF183 thresholds | ACCOMPLISHMENTS » Published findings in scientific journal (Manuscript 1 and 2) | | |
| | Effectiveness of Non-Structural BMPs (Completed 2019-2024 project) | ACCOMPLISHMENTS » Completed literature review » Hosted workshop and developed report » Developed draft workplans for street sweeping and catch basin cleaning | ACCOMPLISHMENTS » Finalized workplan » Designed and built field-deployable rainfall generator for testing pollutant removal via street sweeping. | ACCOMPLISHMENTS » Collected samples and analyzed data to establish proof-of-concept | ACCOMPLISHMENT » Published findings in final report and in engineering journal | | |
| | Chemistry Laboratory Intercalibration (Completed 2019-2024 project) | ACCOMPLISHMENTS » Held kickoff meeting » Adopted 3-year schedule and scoring criteria | ACCOMPLISHMENTS » Completed first intercalibration round (TSS, nutrients, metals, chlorinated hydrocarbons, pyrethroids) | ACCOMPLISHMENTS » Completed second intercalibration round for all first-round analytes, plus polycyclic aromatic hydrocarbons | ACCOMPLISHMENTS » Completed third intercalibration round for problematic analytes » Published laboratory guidance manual | | |
| | Streamlining Annual Reporting (Completed 2019-2024 project) | ACCOMPLISHMENTS » Developed environmental-based and program-based metrics and indicators | ACCOMPLISHMENTS » Created data platform template » Pilot-tested new web interface | ACCOMPLISHMENT » Published final recommendation for new reporting format | | | |
| | Stream Ecological Potential Framework (Completed 2019-2024 project) | ACCOMPLISHMENTS » Developed workplan | ACCOMPLISHMENTS » Established technical workgroup » Identified classes of modified streams » Initiated pilot study | ACCOMPLISHMENTS » Evaluated likelihood of improving biological condition | ACCOMPLISHMENTS » Prepared final report | | |
| | BMP Mechanistic Processes (Ongoing 2019-2024 project) | | | ACCOMPLISHMENTS » Developed workplan » Initiated laboratory experiments | ACCOMPLISHMENTS » Completed laboratory-scale experiments and published results for copper and PFOA/PFOS » Initiated development of mechanistic models » Initiated field monitoring validation | PLANNED » Complete model development and field validation » Prepare final report | |
| | | | | | | | |
| 2024-2029 projects | HF183 Health Risk Modeling Management Options (Research Agenda Project 1.2) | | | | | PLANNED » Convene committee to address management implications of an HF183 threshold for wet-weather discharges | PLANNED » Finalize management action guidance for HF183 threshold exceedances discharges |
| | Biological Expectations in Urban Streams (Research Agenda Project 2.1) | | | | | PLANNED » Convene stakeholder committee » Compile data from modified channels » Identify restoration sites for sampling | PLANNED » Conduct sampling at restoration sites » Evaluate feasibility of mesocosm studies |
| | Nonstructural BMP Efficiency (Research Agenda Project 4.2) | | | | | PLANNED » Select and sample sites for street sweeping pollutant removal | PLANNED » Continue sampling for street sweeping |
| Regional monitoring programs | SMC Regional Watershed Monitoring Program | ACCOMPLISHMENTS » Completed first-year survey » Report on causal assessment | ACCOMPLISHMENTS » Completed second-year survey | ACCOMPLISHMENTS » Completed third-year survey | ACCOMPLISHMENTS » Completed fourth-year survey | PLANNED » Prepare final report | PLANNED » Initiate new survey round with updated monitoring questions |
| | SMC Regional BMP Monitoring Network | ACCOMPLISHMENTS » Developed workplan » Identified candidate sites » Built portal for metadata | ACCOMPLISHMENTS » Trained field crew » Built data portal » Piloted monitoring with 5 member agencies | ACCOMPLISHMENTS » Collected regional monitoring data » Prepared final report | ACCOMPLISHMENTS » Implemented full-scale monitoring survey | PLANNED » Complete second year of survey | PLANNED » Complete third year of survey |

SMC Project Descriptions

2019-2024 Research Agenda

Human Health Indicators and Health Risk

Existing regulatory thresholds designed to protect body-contact recreation in southern California focus on fecal indicator bacteria – primarily enterococci and *E. coli*, which may not be relevant to actual health risk for multiple reasons. More recently, numerous alternative indicators of fecal pollution, including human-specific indicators, have been developed. To effectively protect public health, stormwater managers need to better understand the relationship between these newer indicators of fecal pollution in southern California recreational waters and the degrees of human health risk that they correlate to. Then, prediction of human health risk from a given level of existing or new indicators can be achieved by using risk assessment models such as quantitative microbial risk assessment (QMRA).

This project will identify and evaluate indicators that can be used to reliably and accurately assess human health risk posed by fecal contamination during wet weather, paving the way for stormwater managers to answer the fundamental question of “how much of these indicators is too much” from the perspective of protecting beach recreational beneficial uses. This project will also provide identification of potential indicators; test indicators from human sources and non-sources; measurement of pathogens in human sources; and the development of health risk estimates using QMRA.

Effectiveness of Non-Structural BMPs

The efficacy of non-structural stormwater BMPs can vary widely and is difficult to accurately quantify, even as all SMC members rely on non-structural BMPs as a first option for pollutant removal. Non-structural BMPs consist of programmatic activities, including street sweeping, public education, and source control (e.g., plastic bag bans). Virtually no quantitative effectiveness data exist for non-structural BMPs like street sweeping. This project will determine if routine street sweeping can result in a measurable reduction in the levels and types of contamination in runoff. In addition to examining street sweeping’s ability to remove traditional pollutants from runoff, the study also will investigate street sweeping’s effectiveness at removing microplastics from runoff.

Chemistry Laboratory Intercalibration

As part of the SMC’s Model Monitoring Program, 11 analytical laboratories previously completed two intercalibration studies to assess interlaboratory variability and enhance comparability for chemical analysis of runoff samples for SMC member agencies. The intercalibration and resulting guidelines/protocols were documented in a Laboratory Guidance Manual for SMC member agency laboratories and

supported with draft contract language for member agencies. The Laboratory Guidance Manual and intercalibration efforts, however, were incomplete in two respects, necessitating a follow-up study that will intercalibrate on additional constituents. The original laboratory intercalibrations focused on suspended solids (TSS), nutrients, trace metals, and organic constituents such as chlorinated hydrocarbons (CHC) and pyrethroid pesticides. This round of studies will also include the above constituents and other organic constituents, including organophosphorus pesticides (OP) and polycyclic aromatic hydrocarbons (PAH), that were not part of the original intercalibrations. This follow-up intercalibration also will provide an opportunity to repeat the intercalibration – which needs to be done periodically anyway – and to involve new laboratories and new personnel that were not part of the previous intercalibrations.

Streamlining Annual Reporting

Although SMC member agencies spend hundreds to thousands of person-hours each year to produce “annual reports” as a compliance requirement, there is little guidance for reporting these compliance requirements. As a result, annual reports are difficult to read and understand, are almost always comprised of non-machine-readable data, and rarely get used beyond their one-time specific application. Both regulated and regulatory agencies are left with a feeling of wasted effort, incomplete outcomes, and lost opportunities to glean more information and insight. Because both regulated and regulatory agencies are members of the SMC, they will work together to dramatically streamline guidance for annual reporting, focusing on performance metrics that provide the key information for decision-making and that facilitate the reports’ production using an automated, seamless, and transparent process. This project will accomplish three objectives: 1) identify key metrics that are the essence of program effectiveness, 2) create a data platform for incorporating the data necessary to track and calculate the key metrics, and 3) generate a user interface for quickly and efficiently automating the Annual Report.

Stream Ecological Potential Framework

Data from the SMC Regional Watershed Monitoring Program suggest that fully and partially engineered channels can have significantly lower bioassessment index scores compared to natural streams. At the same time, data from the SMC and other studies have observed high index scores in certain partially engineered channels. But it is unclear what sets the biological condition in some engineered channels apart from other engineered channels, and what attributes can contribute to this biological potential. The aim of this project is to inform decision-making that maintains healthy biological conditions as well as flood control goals in modified streams. Ultimately, this project’s goal is to provide SMC managers with the tools they need to identify sites with the greatest potential for biological restoration, and what restoration efforts – physical habitat, flow, or water quality either alone or in combination –

are expected to be most effective. This outcome should provide SMC members with the tools they need to support healthy streams (as required under stream biointegrity policies), and to target their restoration, water quality improvement, and flow management activities in locations with the greatest likelihood of success.

BMP Mechanistic Processes

The mechanistic processes by which structural BMPs remove contaminants is a “black box” – with researchers routinely measuring the properties of the runoff entering and exiting the BMP, but not fully understanding what happens to this runoff while it is being treated inside the BMP. This project will characterize the mechanistic inner processes by which biofiltration BMPs remove common types of stormwater pollutants as runoff flows through them – an investigation that has the potential to open the “black box” for how these systems work and how managers can optimize their long-term performance. The project will work to link the physicochemical and biological processes by which pollution removal occurs – including sedimentation, sorption, chemical transformation, and biological degradation – to measurable biofiltration BMP properties.

2024-2029 Research Agenda

HF183 Health Risk Modeling Management Options (Research Agenda Project 1.2)

A recently completed SMC health risk modeling study found that exposure of swimmers to 100% stormwater generated a median risk profile of 190 gastrointestinal illnesses per 1,000 recreators – well above the USEPA threshold of 32 illnesses per 1,000 recreators. The purpose of this follow-up study is to develop recommendations for how to apply the HF183 threshold in a water-quality management context. A management advisory committee comprised of both stormwater regulated and regulatory parties as well as public health departments and an environmental advocacy organization, will explore what actions are appropriate for managers to take upon measuring HF183 exceedances in runoff.

Biological Expectations in Urban Streams (Research Agenda Project 2.1)

The San Diego Regional Water Quality Control Board recently became the first in California to propose a water-quality threshold for urban streams based on California Stream Condition Index (CSCI) scores – a biological scoring approach that may be applied to other regions in the future. As a result, there is growing interest in understanding the most effective management options that could be implemented to meet this threshold – either through water quality improvements alone, or in combination with stream restoration work. This project examines the potential to meet

the CSCI threshold by water quality improvements alone, as well as the potential to meet the CSCI threshold by stream restoration. The product is a final report offering recommendations to help regulators and regulated communities understand how CSCI thresholds might be met.

Nonstructural BMP Efficiency (Research Agenda Project 4.2)

The SMC recently invested in a foundational study to develop a standard procedure for quantifying the effectiveness of street sweeping for reducing pollutants in stormwater runoff. Preliminary results indicate that street sweeping’s effectiveness can be robustly quantified – a significant finding given that scientifically defensible data on reductions in stormwater have not been available in southern California. This project extends the SMC’s existing non-structural project on street sweeping to include more sites, different types of sweeping frequencies, and possibly different types of sweepers. The product of this project is a document that provides quantitative pollutant load reductions based on street sweeping, which can be used for watershed management plans and TMDL compliance.

Regional Monitoring Programs

SMC Regional Watershed Monitoring Program

Comprising more than 7,000 stream-kilometers, southern California’s coastal watersheds are diverse, ecologically and economically important habitats. Despite devoting extensive local resources to monitoring their condition, SMC member agencies historically could not draw conclusions about overall regional health until the 2009 establishment of the cyclical SMC Regional Watershed Monitoring Program. In addition to providing critical contextual information for interpreting all other stream monitoring in the region, the SMC regional monitoring program produces data that support numerous local watershed management programs and that inform development of statewide policy. The program also serves to promote data quality and comparability and consistency in field and laboratory data collection efforts. The third cycle of SMC regional monitoring is scheduled to be completed in 2025.

SMC Regional BMP Monitoring Network

Thousands of BMPs have been installed across southern California, and thousands more will be installed over the next 20 years for regulatory compliance, even as little is known about their long-term performance for improving water quality and managing runoff. Despite the growing investment in BMPs, there is a dearth of field data documenting BMP performance for water quality treatment, hydromodification mitigation and flood prevention, operations and maintenance requirements, and other potential benefits. This project will develop a regional BMP monitoring program to generate robust, statistically relevant data sets covering a range of BMP

types, serving multiple land uses, across a spectrum of operating conditions. These data will be used to improve BMP selection guidance, develop cost-effective capital improvement programs, and support Reasonable Assurance Analysis and Alternative Compliance. Besides supporting BMP design criteria, this project will establish a field technical support team, revise or expand the California and International BMP databases, create an SMC Data Portal as repository for field monitoring data, create standardized QA/QC and data analysis tools, and test new technology, among other support measures.



An update from the
SOUTHERN CALIFORNIA STORMWATER MONITORING COALITION

SMC developing stormwater research priorities for next 5 years

The SMC has begun establishing its strategic research directions over the next five years, convening an independent expert advisory panel that developed a recommended 2024-2029 research agenda and then identifying its top-ranked candidate research projects from this agenda.

The SMC's 2024-2029 research planning cycle began in September 2024 with a three-day expert panel workshop, during which the 12 panelists developed consensus on which thematic research areas and individual projects should be the focus of the next five years of SMC research.

All of the panel's recommendations, which were codified in the SMC's published [2024-2029 Research Agenda](#), are intended to help the SMC optimally advance stormwater management practices across southern California.

In December, the SMC's 18 member agencies reviewed and ranked the panel's 20 candidate research projects. The four highest-ranked projects, which the SMC will consider pursuing in the 2025-2026 fiscal year, are as follows (in no particular order):

- Quantifying load reductions from non-structural BMPs (SMC Project 4.2)
- Exfiltration from sanitary sewage conveyance systems (SMC Project 1.1)
- Improved estimates of microbial risk associated with stormwater impacts (SMC Project 1.2)
- Meeting biological expectations in urban streams (SMC Project 2.1)



A 12-member expert advisory panel that was convened by the SMC to develop the SMC's next five-year research agenda meets in September 2024 at SCCWRP, an SMC member agency. The independent panel developed a list of high-priority stormwater research projects the SMC should consider pursuing to optimally advance stormwater management practices across southern California.

The SMC will fund additional projects from the research agenda as it works through the five-year portfolio.

The SMC also welcomes opportunities for partnerships with non-member agencies and invites external partners to collaborate with the SMC on its research projects.

Since the SMC's founding in 2001, the SMC has convened an independent expert panel every five years to identify Southern California's most pressing stormwater research needs and recommend the SMC's long-term research directions.

Through this cyclical research planning process, the SMC has co-funded a portfolio of more than 30 stormwater research projects valued at \$46 million. All projects are regional-scale investigations that no single agency would have the resources to pursue on its own, but that collectively are possible by combining expertise and resources.

Significantly, many of these projects have involved collaborations with partners external to the SMC.

Past SMC projects have informed the development of – and updates to – monitoring programs, guidance and policy documents, 303(d) listings and TMDLs, water quality objectives, and basin plan amendments. In a summer 2024 survey, SMC member agencies reported that all 12 of the SMC projects completed over the past decade have influenced or are expected to influence the development of a management decision or program within one or more of their respective agencies.

For more information about how to get involved in the SMC's research projects, contact [Gerhardt Hubner](#) or [Ken Schiff](#).

Dive deeper

- [List of experts who served on the SMC's expert panel to develop the 2024-2029 Research Agenda](#)
- [Descriptions of the SMC's four top-ranked candidate projects from its 2024-2029 Research Agenda](#)
- [Overview of the SMC's newly published 2024-2029 Research Agenda](#)
- [SMC's 2024-2029 Research Agenda \(PDF\)](#)
- [Descriptions of projects underway and completed from the SMC's previous Research Agenda](#)

Originally published in the SMC Winter 2025 Newsletter

Method developed to measure street sweeping's effectiveness

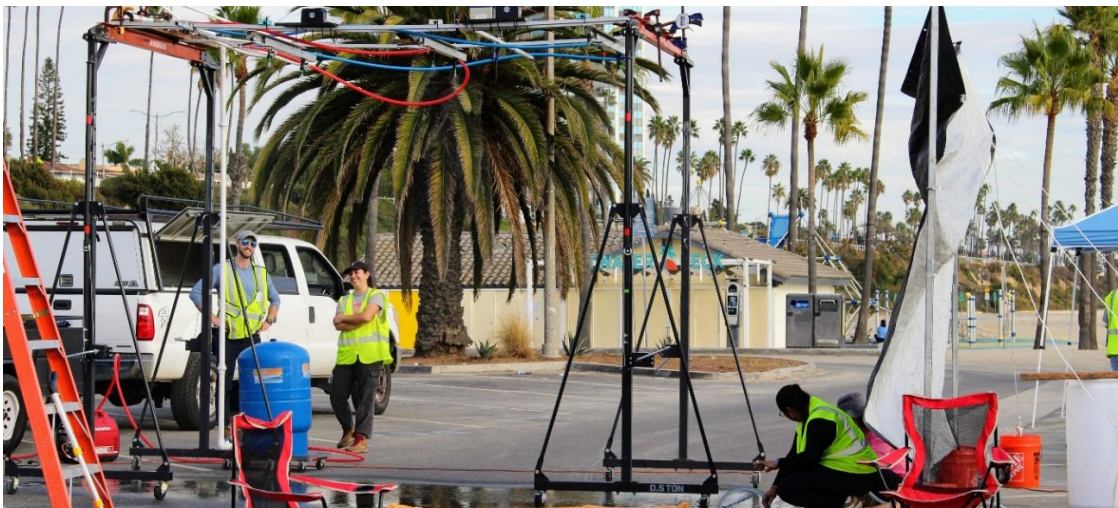
The SMC has developed a technically robust method for quantifying the effectiveness of routine street sweeping in removing contaminants that would otherwise enter storm drains and contribute to runoff pollution – a study that moves stormwater managers one step closer to being able to understand street sweeping's capacity to help protect runoff water quality.

The novel method, which is described in a newly published [technical report](#), provides the SMC with a feasible path forward for investigating what role street sweeping plays in reducing runoff pollution. Managers also may eventually be able to use the method to generate insights that help optimize how they do routine street sweeping.

During the method's development, which took place over the course of a three-year SMC study, researchers developed a field-deployable instrument for conducting testing, as well as pilot-tested the method at a single site, generating preliminary data suggesting street sweeping may provide a greater benefit for improving runoff water quality than traditionally assumed. Historically, nonstructural BMPs like street sweeping have been assumed to reduce contamination in runoff by 5-10%, based mostly on best professional judgement.

The study, however, was not designed to quantify the exact pollution removal efficiency of street sweeping. Instead, the study was designed to develop a robust method for measuring pollutant reduction that can now be implemented almost anywhere across California for almost any pollutant type – capabilities that historically have not been possible.

Already, the SMC is planning a follow-up investigation that will measure pollution removal efficacy at multiple sites to generate statistically robust results. For the follow-up study, which is scheduled to begin as early as this summer, the SMC is seeking out additional project partners that could help expand the study design, including by adding more sites and/or measuring the removal efficacy of additional pollutants.



A field crew uses a rainfall generator to create controlled wet-weather conditions in a Long Beach parking lot. Researchers custom-built this instrument and then used it to develop a robust method for quantifying the pollution removal efficacy of routine street sweeping.

Under stormwater discharge permits, managers commonly receive a runoff pollution credit for implementing routine street sweeping as part of a broader set of non-structural source-control measures, also known as Minimum Control Measures.

But this 5-10% street sweeping credit is based largely on best professional judgment, and less on scientific evidence. This knowledge gap has confounded managers' abilities to work toward meeting their water-quality improvement goals. Additionally, some State regulators are moving away from granting credit for non-structural BMPs because of the lack of quantitative scientific evidence.

For more information, or to discuss potential partnership opportunities for the follow-up street sweeping study, please contact Dr. [Elizabeth Fassman-Beck](#) at the Southern California Coastal Water Research Project (SCCWRP).

Dive deeper

- [How the SMC decided to study street sweeping's effectiveness at pollution removal](#)
- [How the SMC developed a field-deployable rainfall generator](#)
- [How the SMC applied its new street sweeping evaluation method at a single site](#)
- [Read the conceptual workplan for the next phase of the SMC's street sweeping study](#) (see Project 4.2 of the SMC 2024-2029 Research Agenda)

Originally published in the SMC Spring 2025 Newsletter

SMC study links HF183 in stormwater to human health risks

For years, stormwater managers have been using the genetic marker HF183 to detect human-specific sources of fecal contamination in runoff. The HF183 measurement data have played a key role in helping managers to identify and prioritize contaminated water bodies for further study and clean-up actions.

But what the data historically haven't been able to do is shed light on how much HF183 is too much HF183 – that is, at what level HF183 in wet-weather runoff corresponds to an elevated illness risk for people swimming in contaminated receiving waters.

A newly completed SMC study has helped close this critical knowledge gap.

The three-year study, published earlier this year as a pair of journal articles* ([link](#) and [link](#)), found that 100 gene copies of HF183 in a 100-mL sample is the threshold, or inflection point, at which a water body with contaminated stormwater is deemed unsafe to swim in.

By contrast, an estimated 557 gene copies per 100-mL sample are present on average during wet weather in southern California coastal watersheds. What this means is that wet-weather runoff in southern California, on average, would need to be diluted about 5.5-fold to fall within the safe-to-swim range established by the U.S. Environmental Protection Agency.



Surfers paddle away from shore at San Diego's Ocean Beach shortly after a storm. A new SMC study has linked a DNA marker known as HF183 to human health risks for stormwater – providing insights that enable managers to take informed actions to protect public health based on their HF183 data. Runoff can sicken humans who inadvertently ingest contaminated water.

Translated into illness risks, the fecal contamination levels that researchers measured in southern California runoff correspond to a predicted average of 190 gastrointestinal illnesses per 1,000 swimmers. The EPA-approved health risk threshold is 32 illnesses per 1,000.

The SMC’s health risk modeling study represents a key scientific advance, giving managers critical context for interpreting their HF183 measurement data and taking appropriate actions to protect public health.

Although previous studies also have estimated illness risks based on HF183 measurements, and although these studies arrived at different numerical estimates than the SMC study did, many of these studies were desktop modeling exercises that did not involve field data collection – and were focused on sewage spills instead of contaminated stormwater.

The SMC study included two years of wet-weather data collection across 31 watershed sites across coastal southern California, and took advantage of recent advances in droplet digital PCR (polymerase chain reaction) technology to directly measure six common pathogens – three bacterial and three viral.

Already, the SMC is developing a follow-up study that will bring together decision-makers and practitioners to evaluate how to assess HF183 threshold exceedances (e.g., how many samples, how many locations, how many storms) and what are the appropriate management actions to take upon identifying an exceedance.

HF183 is not itself a pathogen, but is more practical for managers to routinely monitor in runoff than pathogens themselves.

Dive deeper

- [What is HF183, and why is it used to detect human fecal contamination?](#)
- [Limitations of previous efforts to determine how much HF183 is too much HF183](#)
- [Link](#) and [link](#) to the pair of *Environmental Science: Processes & Impacts* journal articles summarizing the study*
- [SMC study workplan: Human Fecal Indicators and Health Risk](#)
- [SMC 2021-2022 Annual Report feature article on the SMC’s contributions to fecal contamination management](#) (see Page 4)

**Note: These journal articles are behind a paywall; however, the authors can share their personal copy upon request. To request the full text of these articles, contact pubrequest@sccwrp.org.*

Originally published in the SMC Summer 2025 Newsletter

Contributors to Success

The SMC's success is rooted in the talents, dedication and collaboration of the many individuals and organizations that generously give their time, expertise and funding to support the SMC.

SMC Steering Committee Members

| | Agency | Lead Member | | Alternate Member | |
|---------------------|---|-------------------|---|------------------------|--|
| | | Name | Job Title | Name | Job Title |
| Regulated Agencies | City of Long Beach | Alexa Reasoner | Environmental Specialist Associate | Wataru Kumagai | Environmental Specialist Associate |
| | City of Los Angeles Watershed Protection Division | Charlie Yu | Senior Chemist | Zora Baharians | Senior Water Biologist |
| | City of San Diego | Andre Sonksen | Program Manager, Transportation & Storm Water | Eric Gwynn | Storm Water Environmental Specialist III |
| | City of Santa Barbara | Jill Murray | Creeks Supervisor, Sustainability & Resilience | Erin Markey | Creeks Manager, Sustainability & Resilience |
| | Los Angeles County Flood Control District | Melissa Turcotte | Head Environmental Engineering Specialist | Frank Cheng | Supervising Environmental Engineering Specialist |
| | Orange County Public Works | James Fortuna | Manager, North OC Watershed Management Area | Grant Sharp | Manager, South OC Watershed Management Area |
| | Riverside County Flood Control and Water Conservation District | Rebekah Guill | Senior Flood Control Planner | Richard Boon | Chief of Watershed Protection |
| | San Bernardino County Flood Control District | Christopher Bland | Stormwater Program Manager | Arlene Chun | Division Chief |
| | San Diego County Stormwater Management Program | Neil Searing | Water Resources Manager | Emily Kochert | Land Use Planner III |
| | Ventura County Watershed Protection District | David Laak | Stormwater Resource Manager | Arne Anselm | Deputy Director |
| | California Department of Transportation (Caltrans) | Allan Laca | Chief, Office of Stormwater Program Development | Sayed Noorbakhsh | Senior Transportation Engineer |
| | Southern California Coastal Water Research Project | Ken Schiff | Deputy Director | Elizabeth Fassman-Beck | Department Head, Engineering |
| Regulatory Agencies | California Regional Water Quality Control Board, Los Angeles Region | Ivar Ridgeway | Senior Environmental Scientist | Vacant | |
| | California Regional Water Quality Control Board, San Diego Region | Chad Loflen | Senior Environmental Scientist | Ben Neill | Senior Water Resources Control Engineer |
| | California Regional Water Quality Control Board, Central Coast Region | Leah Lemoine | Senior WRCE, Stormwater/Recycled Water Programs | Vacant | |
| | California Regional Water Quality Control Board, Santa Ana Region | Adam Fischer | Supervisor, Municipal Stormwater Unit | Gaurav (Raj) Rajen | Water Resource Control Engineer |
| | California State Water Resources Control Board | Amanda Magee | STORMS Unit Chief, Division of Water Quality | Vacant | |
| | U.S. Environmental Protection Agency | Michael Borst | Engineer | Adrienne Coakley | Physical Scientist |

External partners in the SMC's success

Dozens of organizations contribute to the SMC's success every year by offering their technical expertise, counsel, resources and perspective. The following is a list of every organization external to the SMC that has partnered on SMC projects over the past five years.

- AECOM
- ALS Laboratories
- Aquatic Bioassay & Consulting
- Babcock Laboratories
- Building Industry Association
- Caltest Analytical Laboratory
- California Coastkeeper Alliance
- California Department of Fish and Wildlife
- California State University, Chico
- California State University, Long Beach
- California State University, Los Angeles
- California State University, Sacramento
- California Stormwater Quality Association
- Catholic University of America
- City of Santa Barbara
- CloudCompli
- Colorado School of Mines
- Contech Engineered Solutions
- Council for Watershed Health
- County of San Diego Department of Public Health
- County of Orange Health Care Agency
- Enthalpy Analytical
- Eurofins
- Frog Environmental
- Geosyntec
- Heal the Bay
- Larry Walker & Associates
- Marine Pollution Studies Laboratory at Granite Canyon
- MBC Aquatic Sciences
- Michael Baker International
- Moss Landing Marine Laboratories
- National Park Service
- Nautilus Environmental
- NV5 (formerly Weston Solutions' California Water Resources Group)
- Olaunu
- Orange County Sanitation District
- Oregon State University
- Pacific EcoRisk
- Paradigm Environmental
- Physis Laboratory
- San Francisco Estuary Institute
- Sanitation Districts of Los Angeles County
- Stanford University
- State Water Resources Control Board Surface Water Ambient Monitoring Program
- Tampa Bay Estuary Program
- Tetra Tech
- Truesdail Laboratory
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency, Region 9
- U.S. Geological Survey
- University of California Extension
- University of California, Irvine
- University of California, Los Angeles
- University of California, Santa Barbara
- University of Maryland
- University of North Carolina, Chapel Hill
- University of South Florida
- University of Washington
- Ventura Regional Sanitation District
- Villanova University
- Vista Analytical Laboratory
- Weck Laboratories
- WSP