SOUTHERN CALIFORNIA STORMWATER MONITORING COALITION

2025-2026 ANNUAL REPORT

Contents

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 directly select which projects they participate in and voluntarily fund just these projects. This co-funding model enables SMC member agencies to prioritize projects that are relevant and impactful.

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 planning process to guide its next five years of research investments. The most recent planning process was held in 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

» **64** external organizations that have partnered with the SMC on research and monitoring over the past five years (**Page 17**)

» **14 out of 15** SMC projects over the past five years that have involved collaboration with partners external to the SMC

» **36:1** 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

» **79%** of external stakeholders who reported in an anonymous 2026 SMC survey having full or some confidence in the quality of the SMC's work, with **0%** reporting distrusting the SMC to any degree

» **71%** of external stakeholders who reported the SMC's work has influenced decisions and planning within their organization, with **10%** reporting the influence has been significant and **45%** reporting moderate influence

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.

Outgoing Chair's Message

Amanda Magee

As the SMC celebrates its 25th anniversary, it is especially meaningful to conclude my term as Chair by reflecting on the strength and longevity of this unique collaboration. Founded in 2001 with 11 member agencies, the SMC has grown to 18 agencies, and remarkably, no member agency has left in its 25-year history. That enduring commitment speaks to the value that agencies place on working together to address regional stormwater challenges.

This past year also marked the completion of the SMC's 2019–2024 research cycle, during which the SMC co-funded eight projects addressing a broad range of stormwater management questions. The final project of that cycle, completed in June 2026, examined the mechanistic processes that influence how biofiltration BMPs perform. By looking inside the "black box" of BMP performance, this work is expected to provide insights that can help inform future BMP design, construction, operation, and maintenance.

Together, these projects demonstrate what makes the SMC so effective. By bringing agencies together to identify shared questions and invest collectively in rigorous research, we can translate scientific findings into information that can support real-world management decisions. Member agencies have consistently affirmed the value of this strategic research planning process and its ability to inform planning and decision-making both within their agencies and across the broader stormwater community.

I am deeply grateful to the SMC Steering Committee, member agencies, and partners who have contributed to this work. It has been an honor to serve as Chair over the last two years, and I look forward to seeing the SMC build on its 25-year legacy in the years ahead.

Amanda Magee

Chair, SMC Steering Committee, 2024–2026

Senior Engineering Geologist, California State Water Resources Control Board

Incoming Chair's Message

Arlene Chun

As I begin my term as Chair of the SMC), I am grateful and honored for the opportunity to help guide our collective work during an exciting period of progress and collaboration. This year, we launch the first three projects under the SMC's 2024–2029 Research Agenda. The selected projects – HF183 Health Risk Modeling, Biological Expectations in Urban Streams, and Nonstructural BMP Efficiency – reflect the diversity and scientific depth of our portfolio. All three are underway and on track for completion within the next few years.

We also advanced a major regional research priority: assessing whether raw wastewater may exfiltrate from public sewer systems and reach storm drain systems. In spring 2026, the SMC established a landmark partnership with the California Association of Sanitation Agencies (CASA). Through a joint workshop, both organizations agreed to pursue one or more collaborative exfiltration studies, documented in a jointly published report. Discussions continue as we identify the specific projects to co-invest in.

Our two long-standing regional monitoring programs – the Regional Watershed Monitoring Program and the Regional BMP Monitoring Network – remain essential to our mission. Over 2026–2027, we will engage in focused discussions on how best to adapt these programs to ensure they remain cost-effective, scientifically rigorous, and responsive to emerging management needs.

This summer, we completed an effectiveness survey to better understand how external parties perceive the SMC's reach and impact. Of our 67 anonymous survey takers, 49% reported having full confidence in the quality of the SMC's work, 30% some confidence, and 0% distrust to any degree. We'll use the survey findings to focus our continuous improvement efforts.

I look forward to working with all of you as we welcome opportunities to dialogue with other organizations for collaboration and partnership, continue building regional consensus, and advancing stormwater science!

Arlene B. Chun, M.S., P.E.

Chair, SMC Steering Committee, 2026-present

Engineering Manager – Environmental Management Division, San Bernardino County Flood Control District

Beyond structural: How the SMC is advancing understanding of non-structural BMP performance

The SMC is working to quantify the efficiency of non-structural BMPs like street sweeping in improving runoff water quality, complementing the organization's structural BMP research program

Across densely populated southern California, stormwater managers have come to rely on a wide range of public investments known as structural BMPs (best management practices) to improve and protect runoff water quality.

These costly infrastructure investments – spread across both private and public lands – are engineered solutions ranging from vegetated bioretention systems to permeable pavement to underground infiltration galleries.

For more than a decade, the SMC has been studying how structural BMPs perform under southern California's real-world environmental and operating conditions; the overarching goal of this research is to generate quantitative evidence that informs how managers design, construct, operate and maintain these stormwater control measures.

But structural BMPs are not the only kind of BMPs the SMC is investigating. In parallel, the SMC also is working to measure the performance of a lesser understood category of BMPs known as non-structural BMPs. Generally understood as programmatic stormwater-control approaches and source-control actions, non-structural BMPs are a catch-all category of BMPs encompassing public education campaigns, routine street sweeping, periodic cleaning of storm drain catch basins, and targeted bans on everything from specific pesticides to single-use plastic bags to food packaging.

An SMC field crew sets up a custom-built rainfall generator on a commercial street in Los Angeles to create controlled wet-weather events, part of an ongoing study to measure the efficiency of routine street sweeping in removing pollutants that would otherwise enter storm drains and contribute to runoff pollution. Street sweeping is a common type of non-structural BMP.

While methods and tools already have been developed by the SMC and others for how to quantify the performance of structural BMPs, the availability of these foundational resources is far more limited on the non-structural BMP side.

Indeed, managers commonly make assumptions about non-structural BMP efficiency at improving water quality based largely on best professional judgment; quantitative evidence is often limited, unavailable for southern California, or entirely non-existent. The end result is regulators and permittees may not be able to "count" the potential benefits of non-structural BMPs in water quality management plans, and thus don't know whether to increase or decrease investments in non-structural BMPs.

The SMC has stepped in to help fill gaps in understanding of non-structural BMPs – working not only to measure how non-structural BMPs perform in southern California, but also to develop methods and tools that enable these data to be collected using statistically robust, standardized measurement approaches.

In just the past four years alone, the SMC has comprehensively surveyed what is vs. isn't already known about different types of non-structural BMPs, reached initial consensus on which specific types of non- structural BMPs southern California managers would benefit most from quantifying the performance of, and developed a novel method for measuring the role of street sweeping in reducing pollution in runoff.

Across all of this ongoing research, the SMC's priority is ensuring managers across southern California and beyond can make informed decisions about if, when and where to deploy non-structural

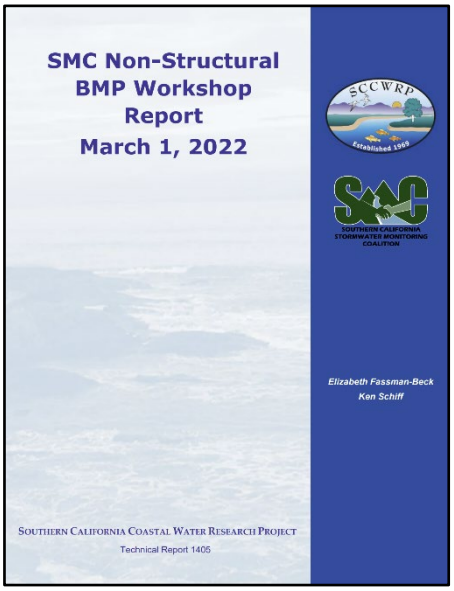
BMPs – perhaps in tandem with structural BMPs – to achieve their long-term runoff water quality management goals.

Building a regional vision for non-structural BMP research

For decades, southern California stormwater managers have relied on non-structural BMPs as part of comprehensive, watershed-scale planning to meet their receiving water quality objectives.

Non-structural BMPs are viewed as a foundational first line of defense in watershed management planning. Compared to structural counterparts, non-structural BMPs are relatively easy, rapid and not as costly to implement. Non-structural BMPs are also typically deployed on wide spatial scales (e.g., across an entire watershed or municipality), whereas a single structural BMP captures and treats runoff from a specified, limited drainage area.

Given the limited quantitative data that exist to explain the role of non-structural BMPs in improving southern California runoff water quality, the SMC in 2019 codified into its five-year Research Agenda – the master planning document that guides the SMC's research directions – the need for improved understanding of this role.



The SMC initiated long-term planning for how to study non-structural BMP performance during a 2022 SMC research planning workshop. The workshop's outcomes were summarized in a technical report.

The SMC is working to quantify the efficiency of routine street sweeping in reducing pollution levels in wet-weather runoff. As part of this ongoing study, researchers are evaluating if there are performance differences among two common types of sweeping technologies. Above, a regenerative air sweeper – a newer street-sweeping technology – passes through a residential neighborhood in Orange County.

As a first step, the SMC completed a literature review of non-structural BMP research that affirmed that quantitative performance data remain scarce, with virtually no data available to quantify the influence that many of the region's commonly implemented non-structural BMPs have on receiving water quality.

This work, in turn, informed a 2022 SMC non-structural BMP research planning workshop that brought together 27 representatives from SMC member agencies to prioritize the specific types of non-structural BMPs that should be investigated. The group also developed consensus on a strategy for how to expeditiously gain managerially relevant insights. Through the workshop, the SMC identified 27 different types of non-structural BMPs, then narrowed down the list to top three to prioritize investigating: street sweeping, catch basin and drain inlet cleaning, and targeted public outreach. Preliminary work plans to investigate both street sweeping and catch basin cleaning were drafted by an SMC working group and included in the workshop report.

Shortly afterward, the SMC greenlit its first major nonstructural BMP research investment: a 2-1/2-year project to develop a method for quantifying the influence of street sweeping on runoff water quality.

Quantifying street sweeping's influence on runoff water quality

Street sweeping has long been a ubiquitous practice to control trash levels on roadways, used to remove debris that is unsightly and can clog storm drain systems.

Meanwhile, it has long been assumed, albeit with little quantitative evidence, that routine street sweeping also reduces the levels of common pollutants – sediment, nutrients, trace heavy metals, microplastics and bacteria – that enter storm drains and contaminate runoff.

Under stormwater discharge permits, southern California managers commonly receive a runoff pollution credit for implementing routine street sweeping as

part of a broader set of non-structural source-control measures. The credit is based on the assumption that non-structural BMPs collectively reduce runoff contamination by 5-10% – an assumption that was originally derived from paltry empirical data.

Closing this evidence gap will help pave the way for awarding stormwater dischargers appropriate levels of credit going forward. Meanwhile, some State regulators already have started moving away from granting this credit without scientific evidence.

The SMC's street sweeping project began with developing a study scope that could generate data quantifying street sweeping's efficiency at roadway pollution removal with statistical confidence – a step that has stymied prior efforts to measure street sweeping's role.

Based on this study scope, researchers designed and custom-built a rainfall generator capable of simulating rainfall across about 75 square feet of surface area, with a consistent rainfall pattern to test pavements in a scientifically repeatable manner and avoid the unpredictable timing, intensity and duration of real-life wet-weather events. Following testing, the rainfall generator was used on two sets of roadway segments spanning 10 residential and commercial sites across southern California: A set of segments that was intentionally swept on a standard schedule, and a second set of roadway segments that was intentionally not swept.

Researchers are now in the process of looking for differences in runoff pollutant levels that were generated by the two sets of roadway segments. The SMC also is leveraging the study to compare the performance of two different common street-sweeping technologies – mechanical broom sweepers and a more advanced sweeper technology known as regenerative air sweepers – to understand if there are performance differences.

As the SMC analyzes the data, it also will decide whether to continue investigating street sweeping performance and/or pivot to studying other types of non-structural BMPs – consistent with the non-structural BMP research vision outlined in the SMC's current 2024-2029 Research Agenda.

If the street sweeping results indicate that street sweeping has a measurable benefit for improving runoff water quality, researchers could pursue follow-up investigations to understand how to maximize the water quality benefits, such as using specific sweeping technologies and/or adjusting on-the-ground sweeping practices.

An SMC field crew collects runoff generated by a custom-built rainfall generator in a residential neighborhood in San Diego. Researchers are working to determine if runoff water quality is improved at segments of roadway that are intentionally swept vs. not swept during routine street sweeping.

Advancing other non-structural BMP research

The street sweeping project isn't the SMC's only foray into developing methods for measuring the performance of non-structural BMPs.

In 2011, the SMC began measuring trash levels in waterways across the region, with a goal to track on a cyclical basis how trash is spreading through 4,600 miles of southern California streams draining to the coastal ocean. The effort complements a long-running assessment of the spread of trash across the coastal seafloor that is conducted every five years by the Southern California Bight Regional Monitoring Program.

By building capacity to measure trash levels and types in streams, the SMC has been able to understand the effectiveness of state and local bans on specific types of trash; source-control bans are considered a type of non-structural BMP.

During the most recent SMC and Bight program joint trash assessment, researchers found that California's 2016 statewide ban on single-use plastic bags

corresponded with a 70% decrease in the prevalence of single-use plastic bags observed in southern California waterways. The findings, which were published in spring 2026, provide evidence of a quantifiable benefit associated with implementing this type of source-control BMP.

Meanwhile, individual SMC member agencies have made progress in recent years to measure the performance of other non-structural BMPs. In 2021, two SMC member agencies – the County of San Diego and SCCWRP – began investigating turf replacement projects – a type of non-structural BMP in which turf and spray irrigation are replaced with drip irrigation and drought-tolerant plants. Turf lawn irrigation is a stormwater management concern because it can generate high runoff volumes, which, in turn, can introduce pollutants into storm drains.

Over the course of two successive studies in a residential community, researchers found that when turf is replaced with drip irrigation and drought-tolerant landscaping, the conversion can successfully eliminate all irrigation runoff during dry weather, as well as eliminate rainfall runoff during all but extreme storm events.

Photo courtesy of Aquatic Bioassay & Consulting Laboratories

An SMC field crew identifies and counts trash in the Los Angeles River as part of a cyclical SMC assessment tracking the spread of trash in southern California waterways. By building regional capacity to monitor trash in waterways, the SMC has been able to measure the effectiveness of state and local bans on specific types of trash, including single-use plastic bags; source-control bans are considered a type of non-structural BMP.

Across all of this research, the SMC and its member agencies are committed to helping stormwater managers understand non-structural BMP performance with the same level of technical rigor as structural BMPs.

The SMC's ultimate goal to help managers make informed decisions about which non-structural BMPs to invest in, and how and where to implement them to maximize their value for runoff water quality.

SMC Project Portfolio

An overview of ongoing, planned and recently completed SMC projects

		2019-2024 Research Planning Cycle	2024-2029 Research Planning Cycle				
		2023-2024	**2024-2025**	**2025-2026**	**2026-2027**	**2027-2028**	**2028-2029**
Projects from current SMC 2024-2029 Research Agenda READ»	**Sewer exfiltration** (Project 1.1)			**ACCOMPLISHMENT** » Established partnership with California Association of Sanitation Agencies (CASA) to pursue joint exfiltration research (Workshop report)	**PLANNED** » Prepare scope of work for one or more joint CASA-SMC projects	**PLANNED** » Implement priority project(s) with CASA	
	HF183 Health Risk Modeling Management Options (Research Agenda Project 1.2)			**ACCOMPLISHMENT** » Convened committee to develop management recommendations upon measuring HF183 threshold exceedances	**PLANNED** » Develop management recommendations for HF183 threshold exceedances		
	Biological Expectations in Urban Streams (Research Agenda Project 2.1)			**ACCOMPLISHMENTS** » Convened stakeholder committee » Compiled data from modified channels » Developed system for inventorying stream restoration sites	**PLANNED** » Conduct sampling at restoration sites » Conduct multi-stressor response modeling	**PLANNED** » Continue sampling at restoration sites	**PLANNED** » Continue sampling at restoration sites » Evaluate preliminary data
	Nonstructural BMP Efficiency (Research Agenda Project 4.2)		**ACCOMPLISHMENT** » Refined study questions, defined implementation plan » Selected testing sites	**ACCOMPLISHMENT** » Deployed street sweeping testing methods at 10 locations	**PLANNED** » Prepare final report, including recommendations for implementing results		
Projects from previous SMC 2019-2024 Research Agenda READ» *(Completed)*	**Human Fecal Indicators and Health Risk**	**ACCOMPLISHMENTS** » Developed health risk estimates and potential HF183 thresholds	**ACCOMPLISHMENTS** » Published findings in scientific journal (Manuscript 1 and 2)				
	Effectiveness of Non-Structural BMPs	**ACCOMPLISHMENTS** » Collected samples + analyzed data to establish proof-of-concept	**ACCOMPLISHMENT** » Published findings: Final report + Journal manuscript 1 and 2				
	Chemistry Laboratory Intercalibration	**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	**ACCOMPLISHMENT** » Published final recommendations for new reporting format					
	Stream Ecological Potential Framework	**ACCOMPLISHMENT** » Evaluated likelihood of improving biological condition	**ACCOMPLISHMENT** » Prepared final report				
	BMP Mechanistic Processes	**ACCOMPLISHMENTS** » Developed Phase 1 workplan » Initiated Phase 1 laboratory experiments	**ACCOMPLISHMENTS** » Completed Phase 1 laboratory-scale experiments and published results for copper and PFOA/PFOS » Initiated Phase 1 development of mechanistic models » Initiated Phase 2 field monitoring validation	**ACCOMPLISHMENTS** » Began developing + refining model	**PLANNED** » Complete model development + refinement » Prepare final report		
Regional monitoring programs	**SMC Regional Watershed Monitoring Program**	**ACCOMPLISHMENT** » Completed Year 4 sampling	**ACCOMPLISHMENTS** » Completed Year 5 sampling	**ACCOMPLISHMENTS** » Completed continuation sampling	**PLANNED** » Prepare final report » Prepare workplan + launch next five-year monitoring cycle with updated monitoring questions	**PLANNED** » Conduct Year 2 sampling	**PLANNED** » Conduct Year 3 sampling
	SMC Regional BMP Monitoring Network	**ACCOMPLISHMENTS** » Completed wet-season monitoring » Developed sensor data processing calculators: BMP hydrology + flow-weighting and EMC » Unveiled metadata + monitoring data submission portals » Initiated supplemental study on biofilter microplastic removal	**ACCOMPLISHMENTS** » Completed wet-season monitoring » Developed infiltration rate calculator Unveiled BMP data visualization tool » Completed microplastics study	**ACCOMPLISHMENTS** » Completed wet-season monitoring » Conducted analysis of water quality + hydrologic monitoring data collected to date » Held first "deep dive" workshop to review results » Published microplastics work: Final report + Manuscript 1 and 2	**PLANNED** » Complete report on water quality monitoring to date » Conduct dry-weather + wet-weather monitoring » Initiate maintenance monitoring analysis	**PLANNED** » Conduct wet-season monitoring	

SMC Project Descriptions

2024-2029 Research Agenda

Sewer Exfiltration

The SMC has previously documented frequently elevated levels of human fecal contamination and human pathogens across SMC member agencies' MS4 systems during wet weather. Initial research in San Diego suggests exfiltration from sanitary sewer systems into the storm drain system could be a source of this wet-weather contamination – an issue that could be systemic throughout southern California watersheds, especially areas with older sewer systems. The SMC is working in partnership with the California Association of Sanitation Agencies (CASA) to investigate this issue. The SMC and CASA have identified three candidate projects that they could work on collaboratively: (1) an intensive evaluation at a limited number of small catchments with a probability of exfiltration, (2) subsurface transport of exfiltrated sewage, and (3) development of a stormwater-wastewater action plan. The SMC and CASA will decide which of these three shared priorities they will jointly tackle.

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, given that exposure to 100% stormwater is not supposed to occur. 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 at varying levels 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 runoff before and after sweeping 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.

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 identified and evaluated 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 also provided 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. (Findings published as Journal Manuscript 1 and 2)

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 developed a robust, repeatable method for determining 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 investigated street sweeping's efficiency at removing microplastics from runoff. (Findings published as final report + Journal Manuscript 1 and 2)

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 – a foundational step given that SMC member agencies rely on these laboratories for routine sample analysis. 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 intercalibrated 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. Thus, this round of studies included the above constituents as well as other organic constituents, including organophosphorus pesticides (OP) and polycyclic aromatic hydrocarbons (PAH), that were not part of the original intercalibrations. This follow-up intercalibration provided a key opportunity to ensure that laboratories that are used by SMC member agencies and others are capable of producing high-quality, comparable results. SMC member agencies now have the option to use the findings as a screening tool to help select among laboratories.

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 worked together to develop proposed guidance for streamlining 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 accomplished three objectives: 1) identified key metrics that are the essence of program effectiveness, 2) created a data platform for incorporating the data necessary to track and calculate the key metrics, and 3) generated a user interface for quickly and efficiently automating annual reporting.

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 was to inform decision-making that maintains healthy biological conditions as well as flood control goals in modified streams. The project helped SMC managers to identify sites with the greatest potential for biological restoration, and began probing the key management question of what restoration efforts – physical habitat, flow, or water quality either alone or in combination – are expected to be most effective. The project's ultimate goal was to help SMC members work toward being able to better support healthy streams (as required under stream biointegrity policies) by targeting 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 characterized the mechanistic inner processes by which biofiltration BMPs remove common types of stormwater pollutants as runoff flows through them – an investigation that helped open the "black box" for how these systems work and how managers can optimize their long-term performance. The project worked 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. (Findings published for copper and PFOA/PFOS)

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 were unable to 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 fourth cycle of SMC regional monitoring is scheduled to be launched in spring 2027.

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. The SMC built the Regional BMP Monitoring Network 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 are being used to improve BMP selection guidance, develop cost-effective capital improvement programs, and support Reasonable Assurance Analysis and Alternative Compliance. As part of the network's establishment, the SMC convened a field technical support team, created an SMC data portal, and developed standardized QA/QC and data analysis tools. The network can now be leveraged to generate longitudinal data tracking BMP performance over time, as well as to pursue targeted studies probing specific aspects of BMP performance.

An update from the
SOUTHERN CALIFORNIA STORMWATER MONITORING COALITION

SMC working to advance science behind understanding and improving biological health of engineered stream channels

Across urbanized Southern California, hundreds of miles of streams have been modified to contain storm flows and help protect human life and property from flooding.

These streams – sometimes referred to as engineered channels – are characterized by modifications to channel shape and/or hardening of their banks and/or bottom. And they typically receive lower biological integrity scores than their more natural counterparts.

Channel modifications can degrade habitats for organisms, disrupt natural hydrologic and sediment regimes, increase thermal stress, and increase susceptibility to eutrophication. Meanwhile, these challenges are commonly accompanied by ongoing removal of sediment and vegetation as part of channel routine maintenance.

The challenge for stormwater managers is understanding how to balance managing the biological health of engineered channels with the need to preserve their flood control functions: Can biological health be improved by addressing water chemistry stressors and/or reducing flow alterations, while leaving channel modifications in place? Are there sites that could benefit from physical habitat improvements or changes to routine maintenance regimes that could mitigate or partially reverse the effects of channel modifications – but without compromising flood control functions?

To provide insights into these questions, managers rely on science – specifically, investigations that tease apart the relative effectiveness of multiple potential management options that, either alone or in combination, could be implemented to improve stream biological health in engineered channels.

The SMC is making major research investments in understanding how to improve the biological health of Southern California's engineered channels. Above, a field crew removes accumulated sediment as part of channel maintenance.

For the past decade, the SMC has been a regional leader in collaboratively building a technical foundation for Southern California watershed managers to make science-informed decisions for protecting stream biological health that do not compromise their flood-control functions.

In 2025, the SMC completed a three-year study (SMC Project 5.3: Improving Biointegrity in Engineered Channels) that evaluated whether variability in water chemistry or flow patterns is associated with stream biological health in engineered channels, as a strong association would suggest that improving water chemistry could benefit biological health even if modifications remain in place. Subsequently, the SMC launched a three-year follow-up study (SMC Project 2.1: Meeting Biological Expectations in Urban Streams) to investigate these issues in more depth, as well as to evaluate whether projects that focus on improving physical habitat could also move the needle on biological health.

Collectively, these regional research investments will help watershed managers understand how to protect and improve biological health in engineered channels without compromising their flood control functions. With this information, SMC member agencies hope to identify engineered channels where specific management actions are likely to be more effective in improving biological health, as well as to help managers prioritize which actions to implement and where to deploy them.

To date, the SMC has focused on investigating the effectiveness of three potential management strategies for addressing poor stream biology: improving water chemistry, changing flow patterns to a less altered state, and improving physical habitat.

The SMC's engineered channels research will support California watershed managers as they seek effective options for managing stream biological health.

Biology-based approaches to stream monitoring are now used in multiple streams across California to set management goals, and stream biological assessment scores get reported in the California Integrated Report summarizing the condition of surface water quality statewide. In 2020, the San Diego Regional Water Quality Control Board developed a stream water-quality objective that calls for the use of bioassessment tools to score the health of perennially and intermittently flowing streams across the San Diego region. If approved, the objective – which is undergoing review by the State Water Resources Control Board and has not yet taken effect – would apply to natural and soft-bottom engineered channels with soft or natural stream beds; it would exclude channels with "fully hardened" stream beds that have been lined with materials such as concrete and grouted rock.

The San Diego Regional Board's decision to exclude streams with fully hardened channels but include streams with soft-bottom channels was based in part on research conducted by the SMC – a body of work that is summarized in the first Dive Deeper article below.

Dive deeper

- What the SMC has learned so far about options for improving stream biology in engineered channels
- SMC full 2025 report on improving biointegrity in engineered channels (PDF; SMC Project 5.3)
- SCCWRP 2025 report: A Technical Foundation for Biointegrity and Eutrophication Indicators and Thresholds for Modified Channels, Intermittent Streams, and Streams on the Central Valley Floor (PDF)

Originally published in the SMC Spring 2026 Newsletter

Regional monitoring network being leveraged to extend value of stormwater BMPs

Public agencies across southern California have spent hundreds of millions of dollars on structural stormwater control measures – and are planning to spend hundreds of millions more to manage runoff water quality and quantity.

To ensure stormwater BMPs (best management practices) are performing to their full potential, public agencies need field data reflecting how BMPs actually perform under environmental and operating conditions found in southern California.

The SMC has begun working to fill this key data gap through its Regional BMP Monitoring Network. Using the program's first three years of wet-weather field monitoring, researchers have been generating foundational insights on BMP performance, both to help improve existing BMPs that aren't performing to their full potential, and to help improve design and construction guidance for future BMPs being planned.

During an all-day SMC workshop in March 2026 that attracted more than 130 attendees, the SMC reviewed monitoring data collected to date and agreed that the monitoring network is ready to be leveraged to answer focused, high-priority management questions related to BMP performance.

The SMC is in the process of developing monitoring studies that will isolate causes or characteristics of individual biofilter BMPs with exceptionally strong vs. poor performance, with a goal to refine design guidance for biofilters that have yet to be built. The SMC also is exploring how to leverage the BMP network to identify effective retrofit options and/or alternative designs to improve treatment performance for bacteria, nitrogen and other priority pollutants.

The SMC's Regional BMP Monitoring Network has helped generate foundational insights about the performance of structural BMPs, including bioretention systems like the one above.

The SMC began building the Regional BMP Monitoring Network in 2020 to generate high-quality, comparable data sets on the performance of bioretention systems, infiltration galleries and other types of structural BMPs across Southern California. BMPs can perform very differently in Southern

California than in other, wetter parts of the U.S., underscoring the need to collect locally relevant performance data.

Although Southern California has implemented hundreds of structural BMPs over the past three decades, the region has historically lacked robust data sets to comprehensively explain the factors and conditions that disproportionately influence how these systems perform – or underperform – and how this performance can change over time.

The SMC Regional BMP Monitoring Network provides regionally representative, directly comparable data sets encompassing monitoring data from 13 individual biofilter BMPs and more than 100 storm events.

The SMC already has begun exploring how to evolve monitoring over time, including possibly scaling back longitudinal monitoring to focus resources on targeted studies.

SMC member agencies also are individually pursuing monitoring studies that leverage the BMP network. For example, San Diego County has begun working with SCCWRP (Southern California Coastal Water Research Project) to investigate the conditions that affect BMP effectiveness in removing fecal indicator bacteria (FIB) in wet weather runoff.

Meanwhile, the network's data already have helped the SMC to pinpoint which performance metrics are particularly relevant for assessing BMP performance, and to develop a suite of performance assessment tools that have been integrated into a web-based open data portal.

A technical report summarizing the workshop discussions and recommendations is expected to be published later this year.

For more information, please contact Dr. Elizabeth Fassman-Beck at SCCWRP.

Dive deeper

- How the new SMC data analysis tools are helping stormwater managers evaluate BMP performance
- A data-driven index for evaluating BMP water quality performance (Journal manuscript)
- Rainfall and Flow Analysis Calculator and Flow-Weighting and EMC Calculator to streamline BMP performance analyses for individual storm events
- Development of the SMC Regional BMP Monitoring Network (PDF)
- SMC Regional BMP Monitoring Network Work Plan (PDF)

Originally published in the SMC Summer 2026 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	Jon Ball	Environmental Affairs Officer
	City of San Diego	Andre Sonksen	Stormwater Compliance Manager, Storm Water Division	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	Environmental Project Manager	Ryan Kearns	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		
	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	Erum Razzak	Senior Environmental Scientist	Vacant	
	California Regional Water Quality Control Board, San Diego Region	Chad Loflen	Senior Environmental Scientist	Ben Neill	Senior Water Resources Conrol Engineer
	California Regional Water Quality Control Board, Central Coast Region	Leah Lemoine	Senior WRCE, Stormwater/Recycled Water Programs	Emily Jensen Wolf	Environmental Specialist
	California Regional Water Quality Control Board, Santa Ana Region	Adam Fischer	Supervisor, Municipal Stormwater Unit	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
- California Association of Sanitation Agencies
- 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