
ANNUAL REPORT 2011-2012

**Stormwater Monitoring Coalition
Of Southern California**

DRAFT

September 30, 2012

INTRODUCTION

As a result of the increasing regulatory focus and the lack of scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout southern California have developed a collaborative working relationship. The goal of this relationship is to develop the technical information necessary to better understand stormwater mechanisms and impacts, and then develop the tools that will effectively and efficiently improve stormwater decision-making. As individuals and agency representatives, there was early recognition that these issues are oftentimes not localized, but typically cross watershed and jurisdictional boundaries. This relationship culminated in a formal letter of agreement, signed in 2000 and again in 2009, by all of the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in southern California to create the Stormwater Monitoring Coalition (SMC) (Table 1).

Table 1. List of member agencies in the Stormwater Monitoring Coalition.

California Regional Water Quality Control Board, Los Angeles Region
 California Regional Water Quality Control Board, San Diego Region
 California Regional Water Quality Control Board, Santa Ana Region
 California Department of Transportation, Caltrans
 City of Long Beach
 City of Los Angeles, Watershed Protection Division
 County of Orange, Public Facilities and Resources Dept.
 County of San Diego Stormwater Management Program
 Los Angeles County Department of Public Works
 Riverside County Flood Control and Water Conservation District
 San Bernardino County Flood Control District
 Southern California Coastal Water Research Project
 State Water Resources Control Board
 US Environmental Protection Agency, Office of Research and Development
 Ventura County Watershed Protection District

The first project supported by the SMC was to develop a five-year Research Agenda. The research agenda, published in 2001, consisted of 15 unique projects that the SMC ranked, prioritized, and then funded on a voluntary basis. The SMC has made tremendous progress implementing the Research Agenda. To date, nearly all of the projects have been implemented by the SMC.

The value of the SMC to its member agencies is at least four-fold. The first is the ability to share costs for implementing projects. Cost reductions for SMC member agencies can be significant since collaborative projects can reduce costs by more than 90% relative to footing the bill alone. In addition, the majority of projects have nonmember agency cost-matching. Since its inception, non-member cost matching, totaling nearly \$3.5 million, amounts to a 2:1 match of member costs. The second value to member agencies is the ability to stretch their agency's skill base. Stormwater management requires a wide variety of knowledge including regulatory policy, engineering, hydrology, biology, chemistry, toxicity, and microbiology, to name a few. Many member agencies have

limited staff and, by working together, garner the additional skills that are not sustainable within each agency. A third asset of membership is the ability to communicate. Discussions among member agencies provide context and a richness of ideas for application to local issues back home. Similarly, discussion between regulatory and regulated agencies in an informal setting leads to more effective implementation of management activities. Finally, projects conducted under the SMC umbrella have nearly always resulted in some management action. Often, it is difficult for a single agency to affect the current course of regulatory management. Because SMC projects are initiated and vetted through all of the regulated and regulatory management agencies, the results are adopted quickly into the management framework including alterations to NPDES permits.

PROJECT ACCOMPLISHMENTS

Stormwater Data Compilation Study

Status: 98% complete

Initial Project Budget: \$75,000 (Resources provided by SCCWRP)

Amended Project Budget: \$110,000 (Resources provided by SCCWRP)

Assessment and prioritization for mitigating water quality requires context. Knowledge of mean concentrations across watersheds, counties, and regulatory jurisdictions provides the perspective needed for managers to rank waterbodies for management action. Regional reference condition, frequency of water quality objective exceedences, extent and distribution of parameter concentrations all play a part in determining where a manager's worst problem occur.

To help managers gain the necessary perspective, the SMC described a project in their Research Agenda that compiles water quality monitoring information regionwide. For several years, the SMC has been building the necessary infrastructure to support such an effort. Data sharing protocols, interlaboratory calibrations, and web-enabled interfaces all enhance the SMC's ability to share data. The goal of this project is to compile the existing water quality monitoring information. Initially starting with nutrients, the objective will be to make annual estimates of concentrations and mass emissions from 25 watersheds between Ventura and San Diego.

A dataset associated with nutrient concentrations was compiled, and then augmented with additional sampling during 2010. Almost 1 million data records were compiled among all SMC agencies. The data were summarized to assess the relative mass contributions to the ocean from coastal watersheds compared to treated wastewater, atmospheric deposition, and oceanic upwelling. Results indicated that stormwater was a very minor source (natural upwelling dominates coastal nutrient inputs to the ocean). This project result is currently being written in technical reports and journal publications.

Implementing A Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program

Status: 85% complete

Project budget: \$150,000 (\$75,000 contract from the SWRCB)

Assessment of freshwater biological communities represents a potentially powerful tool for evaluating the effects of discharges in southern California creeks and streams. Bioassessments integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters. The value of biological assessments is that they are closer to many of the defined beneficial uses of receiving waters (i.e. aquatic life, warm water habitat, cold water habitat) than chemically-derived water quality objectives. As a result, virtually every SMC member agency has biological community monitoring in their respective NPDES permits.

The goal of this study is to implement a coordinated, integrated regional bioassessment monitoring program. Previously, the SMC had worked together to design an optimal monitoring program that satisfied both local needs, but simultaneously provided information that could be combined to make regionwide assessments. Monitoring questions included: 1) What is the extent of impact in streams of southern California? 2) What are the stressors that impact southern California streams? and 3) Is the extent of stream impacts changing over time?

This is the fourth year of a five-year project. Thus far, approximately 400 sites have sampled between Ventura and San Diego counties for biological communities, water quality, toxicity, physical habitat, and riparian condition. Preliminary results indicated that roughly 50% of the stream miles in southern California have healthy biological communities¹. Sampling for the fourth year is now finished and samples are at the laboratory for analysis.

The SMC regional watershed monitoring program is now serving as a model for other parts of the state. Regional watershed programs in the San Francisco Bay and the Central Valley are planning to use the SMC as a model for their design and implementation. Perhaps the biggest value of the SMC regional watershed monitoring, however, is its connection to the SWRCB's development of biological objectives. This new policy will set narrative and numeric limits on biological condition in streams statewide. Because of the unique collaboration in southern California, approximately one-third of the data used to develop the biological objectives will come from the SMC region.

¹ RD Mazor, DJ Gillett, K Schiff, K Ritter, E Stein. 2011. [Ecological Condition of Watersheds in Coastal Southern California: Progress Report of the Stormwater Monitoring Coalition's Stream Monitoring Program First Year \(2009\)](#). Technical Report 639. Prepared for the Stormwater Monitoring Coalition Bioassessment Workgroup. Southern California Coastal Water Research Project. Costa Mesa, CA.

Our main collaborator on this project is the California Department of Fish and Game (CDF&G) and SWRCB. The project is 50% funded by the SWRCB, whose main desire is to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP).

Hydromodification Study

Status: 95% complete

Project budget: \$1,137,440 (State Prop 50 Grant)

The process of urbanization has the potential to affect stream courses by altering watershed hydrology. Development and redevelopment can increase the amount of impervious surfaces on formerly undeveloped landscapes. This reduces the capacity of remaining pervious surfaces to capture and infiltrate rainfall and, as a result, a larger percentage of rainfall becomes runoff during any given storm. In addition, runoff reaches the stream channel much more efficiently, so peak discharge rates post-development are higher compared to predevelopment for an equivalent rainfall event. This process has been termed hydromodification.

Hydromodification can result in adverse effects to stream habitat, surface water quality, and water supply. The stream erosion that results from the increased peak flow can threaten infrastructure, homes, and businesses. Intermittent and ephemeral streams that possess riparian and wetland habitat are at particular risk from effects of hydromodification. Streams in semi-arid regions are especially vulnerable to urbanization due to a prevalence of sand bed channels, lack of vegetative reinforcement, and relatively large net changes in water and sediment supply associated with stormwater runoff. Recent studies by the SMC have indicated that intermittent and ephemeral streams in southern California degrade at lower levels of watershed urbanization than streams in the eastern US.

In response to the effects of hydromodification, state and local agencies are developing standards and management approaches to control and/or mitigate the effects of hydromodification on natural and semi-natural stream courses. Successful implementation of these regulatory programs requires development of tools to better assess hydromodification effects and develop appropriate mitigation and management strategies.

The goal of this project is to develop a series of tools supporting implementation of hydromodification management measures that could be used to better protect the physical, chemical, and biological integrity of streams and their associated beneficial uses. This project will provide tools to answer the following questions: 1) Which streams are at the greatest risk from the effects of hydromodification? 2) What are the anticipated effects in terms of increased erosion, sedimentation, or habitat loss, associated with increases in impervious cover? 3) What are some potential management measures that could be implemented to offset hydromodification effects and how effective are they likely to be?

This project is being conducted in collaboration with researchers from Colorado State University, Fort Collins. Several major elements have been completed this year. Building off the previously completed literature review and field work, we completed the GIS-based and field-based hydromodification screening tools that can be used to evaluate susceptibility of channels to hydromodification effects. The tools were published in a series of three technical reports:

- Bledsoe B.P, R.J. Hawley, E.D. Stein, D.B. Booth. 2010. [Hydromodification Screening Tools: Technical basis for development of a field screening tool for assessing channel susceptibility to hydromodification.](#) Southern California Coastal Water Research Project Technical Report #607.
- Bledsoe B.P, R.J. Hawley, E.D. Stein, D.B. Booth. 2010. [Hydromodification Screening Tools: Field manual for assessing channel susceptibility.](#) Southern California Coastal Water Research Project Technical Report #606.
- Booth D.B., S.R. Dusterhoff, E.D. Stein, B.P. Bledsoe. 2010. [Hydromodification Screening Tools: GIS-based catchment analyses of potential changes in runoff and sediment discharge.](#) Southern California Coastal Water Research Project Technical Report #605.

Use of these tools has been incorporated into several municipal stormwater permits. Therefore, SCCWRP staff has held training sessions on use of this tool and are working with the water board training academy on establishing an ongoing training program.

We have also completed the analysis of forty-three regional U. S. Geological Survey gauges with records greater than ~20 yrs located in watersheds ranging from 1.3 – 272 km² to develop regionally calibrated, empirically derived models that can be used to estimate flow from ungauged streams throughout southern California. These models can be used to supplement the USGS regional regression equations with more local data. Retrospective analysis of these flow gauges also showed that large increases were observed in instantaneous-peak flows of more frequent return periods (e.g., 1.5 and 2 year storms), with greater than a 5-fold increase in 2-year events (Q₂) observed in a watershed with 20% imperviousness relative to ≤ ~1% imperviousness. Effects of urbanization decreased for larger, less frequent storms. The results of these analysis are provided in the following technical report:

- Hawley, R.J., B.P. Bledsoe and E.D. Stein 2011. [Hydromodification Effects on Flow Peaks and Durations in Southern California Urbanizing Watersheds.](#) Southern California Coastal Water Research Project Technical Report # 654.

Finally, the project final report was completed over the last year providing guidance on model applications and framework for hydromodification monitoring.

- ED Stein, F Federico, DB Booth, BP Bledsoe, C Bowles, Z Rubin, GM Kondolf, A Sengupta. 2012. [Hydromodification Assessment and Management in California.](#)

Technical Report 667. Southern California Coastal Water Research Project. Costa Mesa, CA.

We are currently working on a monitoring and management document for application to hydromodification requirements under MS4 permits. Draft documents have been completed and will be released for final review to the project's technical advisory committee by the end of 2012.

Effects of Wildfires on Contaminant Runoff and Emissions

Status: 100% complete

Project Budget: \$100,000 + in-kind contributions (\$75,000 provided by San Diego County, \$25,000 provided by the Los Angeles Regional Water Quality Control Board, in-kind services provided by UCLA and Los Angeles County Flood Control District)

Fire is a natural component of Mediterranean ecosystems, such as those found in southern California. Due to loss of plant cover, severe burns have been shown to increase runoff and sediment generation to downstream areas. Constituents associated with the increased runoff have the potential to affect water quality in downstream receiving waters and the near-shore coastal environment. This may be especially problematic for streams that are already impaired. Most research on post-fire water quality has focused on nutrient and sediment enrichment in relatively natural areas. However, post-fire runoff also has the potential to increase loadings of carbon, organic compounds such as PAHs, and trace metals. Constituent loadings may occur by several mechanisms over a range of spatial and temporal scales. Potential loading mechanisms include direct runoff, debris flows, or atmospheric deposition of ash followed by storm runoff. Investigating the magnitude and duration of fire effects in downstream and/or adjacent watersheds is critical to accounting for its influence on cumulative water quality impacts and attaining water quality standards.

This goal of this project is to investigate the fate of water quality constituents resulting from southern California wildfires in order to quantify the effects of post-fire runoff on downstream metals and organic constituent concentrations and loads. Contaminant loading and effects on instream biota will be investigated as part of this project.

A regional post-fire monitoring strategy was completed in 2009 that describes an agreed-upon approach for post-fire sampling.

- ED Stein, J Brown. 2009. [Effects of post-fire runoff on surface water quality: Development of a southern California regional monitoring program with management questions and implementation recommendations](#). Technical Report 598. Southern California Coastal Water Research Project. Costa Mesa, CA.

This plan was implemented for the first time following the 2010 Station Fire, which burned portions of the Los Angeles and San Gabriel River watersheds. Two sites were sampled for solids, metals, and PAHs over six storms following the 2010 fires; Tujunga

Wash and Arroyo Seco. Results showed dramatic increases in concentrations and loads of all constituents sampled following storms, but returning to near pre-fire levels by the end of the storm season.

The results of this analysis along with additional analysis of post-fire pollutant concentration data for storms dating back to 2003 has been accepted for publication in the journal *Environmental Toxicology and Chemistry*.

- Stein, E.D., J.S. Brown, T.S. Hogue, M.P. Burke, and A. Kinoshita. 2012 (in press). Storm water contaminant loading following southern California wildfires. *Environmental Toxicology and Chemistry*

Future implementation of the regional monitoring plan will be at the discretion of the stormwater agencies and regional/state water boards.

Low Impact Development Study

Status: 80% complete

Project budget: \$1,100,000 (\$500,000 SMC plus \$600,000 State Prop 40 Grant)

The Low Impact Development Guidance (LID) Study is being conducted with funding from the State Water Resource Control Board's Consolidated Grants Program, under the Urban Runoff Program of Proposition 40. The LID Project will develop a comprehensive program to incorporate LID strategies and techniques into the planning and design of public and private sector projects. The LID Project will develop a model program for localities in California that are interested in adopting LID strategies and techniques.

This project has been successful in attaining these goals:

- *Develop interim guidance and training for LID implementation.* Four training sessions were held throughout the Southern California region from 2007 through 2008.
- *Determine effectiveness of LID for reduction of pollutant loads and hydrologic changes in Southern California.* Monitoring results were used to assess the volume and concentration benefits to discharges, the percentage of runoff from various BMPs and LID systems measured, and a review of the soil type. There are ongoing LID monitoring programs that will provide additional results regarding the effectiveness of LIDs in Southern California.
- *Develop guidelines on specifications and standards for Project design and review.* The SMC and CASQA finalized the LID Guidance Manual in April 2010. It is now located on the CASQA web site.
- *Develop final guidance and training materials using field data.* This goal was partially met. The San Bernardino Flood Control District and the SMC have

developed final guidance and training materials using the feedback from interim trainings, the literature review, and using the final LID Guidance Manual. However, field data collected as part of this project has yet to be incorporated into the LID Guidance Manual.

- *Conduct training workshops in Southern California.* In addition to the interim training workshops, final Training was provided by online web access to the Manual and presentations that provided manual content and access information.

The District coordinated with various regional and statewide efforts that involved LID training, including San Diego County, the California Water and Land Use Partnership, the California Coastal Commission, the Local Government Commission, and the Chino Basin Landscape Alliance. The collaborative regional effort was a critical networking tool that provided additional funding, technical support, and LID monitoring opportunities. Partner agencies included the County of San Diego, Riverside County, and CASQA, all of whom helped support the project when Grant funding was frozen mid-project by the State of California. Approximately \$260,000 has been leveraged for future activities during the 2010-2011 and 2011-2012 fiscal years.

SMC and CASQA plan to continue updating the LID Guidance Manual and provide training sessions. An updated monitoring program is currently being developed for the remaining portion of the project. Monitoring reports are expected to be provided upon completion of data analysis and reporting.

Barriers to Low Impact Development (LID) Study

Status: 40% complete

Project Budget: \$32,000 (\$27,000 County of San Diego, \$1,250 Riverside County Flood Control & Water Conservation District, \$1,250 Ventura County Watershed Protection District, San Bernardino County Flood Control District, \$1,250; \$1,250 County of Orange)

While many communities understand the benefits of low impact development (LID), getting LID projects built has been difficult. In an effort to address the difficulties in LID implementation, the SMC has commissioned the Local Government Commission (LGC) to investigate the barriers its members are facing, and to prioritize strategies to remove those barriers. Of particular interest are external barriers at the state level over which local jurisdictions do not have control.

To date, a literature review focusing on the site design and approval processes and associated codes, processes and perceptions has been completed. Barriers gleaned from the literature review were then compiled and shared with SMC members for review and comment. A comprehensive list of barriers taken from the literature review and from SMC member comments were then incorporated into an online survey that was distributed to local, regional, and state agencies where they were asked to rank the

significance of each barrier as it applied to their jurisdiction. Another online survey was created for and distributed to the development community to gather feedback from the private sector. Phone interviews and three small focus groups were used for a more in-depth investigation of barriers for implementing LID in Southern California.

LGC has generated a draft report summarizing research process as well as research findings. This report will be used to identify the key barriers LGC should focus on in Phase II of this project, which is developing strategies for overcoming key barriers.

Development of Regional Approaches and Protocols for Trash Monitoring and Management

Status: 10% complete

Project Budget: \$342,000 (anticipated federal grant funding) + in-kind contributions

Stormwater agencies throughout southern California share many similar issues regarding trash monitoring and management but to date there has been no coordinated effort to develop a consistent method of estimating loadings, understand pathways into the environment and identify and prioritize sources for remediation at a watershed scale. It is well known that public agencies spend considerable amounts of money each year managing waterways by removing trash and implementing practices that prevent trash from entering into the environment. However, most management efforts focus on the abatement process without the complimentary source prevention and monitoring efforts to determine if the actions are making a difference on receiving waters.

The goal of this project is to improve our understanding and ability to manage trash in the environment at both regional and local scales. In part one of this project the focus is directed towards informing the SMC about the extent and magnitude of trash impacts on southern California streams. In 2011, SMC member agencies, through in-kind services, conducted a snapshot trash survey across southern California following a probabilistic sampling approach. Trash data was collected at 77 sites in open space, agricultural area, and urban streams following the State's Surface Water Ambient Monitoring Program (SWAMP) Rapid Trash Assessment protocol for the specific purpose of generating an assessment of regional conditions. Additionally, this data set provided the SMC member agencies with an opportunity to examine common pathways and sources over a larger geographic scale across a range of trash levels. A report summarizing these findings is expected to be completed in the next six to twelve months.

The second part of this project will translate findings from the regional survey into a case study. Through a combination of in-kind services and a pending grant from the US Fish and Wildlife Services Coastal Impact Assessment Program, a case study in a model watershed will develop the monitoring and management tools on a watershed scale. The steps include:

- Developing a resource library of current regional efforts including up-to-date knowledge of structural and institutional Best Management Practices

- Examining the relationship between reliable structural and institutional Best Management Practice data and stream conditions
- Evaluating various rapid assessment monitoring protocols to provide management level information feedback.
- Developing approaches to identify and prioritize sources for remediation and a developing a system of weighting sources based on potential impacts.

This case study segment of the project is expected to be completed over the next two years.