



Southern California Stormwater Monitoring Coalition

Annual Report 2014-2015

February 2016

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EXECUTIVE SUMMARY

Collaboration is a powerful vehicle towards common understanding. The Southern California Stormwater Monitoring Coalition (SMC) exemplifies this collaborative synergy, having spent almost 15 years filling foundational gaps in knowledge about how to improve stormwater management. Creating monitoring infrastructure, deciphering stormwater mechanisms and processes, and assessing receiving water impacts have brought tremendous leaps in how dischargers and regulators address the challenging issues of urban runoff. Cumulatively, the SMC and its project partners has expended over \$6M to fill these data gaps.¹

The SMC annual report provides an opportunity for the member agencies to present and describe the projects that they are working on with the other member agencies. Likewise, this report provides a brief overview of projects active during the reporting year and summarizes projects either recently completed or planned for the upcoming year. Each project summary presented in this report includes the lead agency managing the project, the partner agencies, sources of funding, and includes a list of prepared publications.

The 2014-2015 reporting year included projects covering a wide range of environmental and water quality disciplines. Member agencies were involved in completing the first 5-year regional bioassessments of stream health and designed the subsequent 5-year monitoring program, worked towards developing watershed-scale approaches for trash management, continued with a multi-year monitoring and assessment project on Low Impact Development, designed and implemented the SMC's first ever toxicity testing laboratory intercalibration exercise, created a new administrative approach that provides for increased level of participation and a dedicated annual budget for the member agencies, and continued working on the development of a method for translating offsite stormwater retention credit into an alternative compliance framework.

Each project presented in this annual report has deservedly been given its own section that highlights its achievements over the past year, but a special note should be included in this Executive Summary about the regional watershed monitoring program. The conclusion of the 2009-2014 regional program helped to bring about a new level of understanding about the nexus between bioassessments and stormwater program management.

The SMC's regional monitoring program was the first time all of the member agencies have been involved in a dry-weather watershed-based program. 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 (aquatic life, warm water habitat, cold water habitat) than chemically-derived water quality objectives.

In addition to the benefits produced from the biological information, the regional monitoring has helped to shed light on chemical pollutants. The monitoring results generated by the project changed our belief that metals and pesticides were the leading cause of poor biological condition,

¹ Southern California Stormwater Monitoring Coalition 2014 Research Agenda. 2014. K Schiff, ED Stein, S Aminzadeh, A Boehm, G Hildebrand, L Honeybourne, I Nasser, P Ode, S Taylor, D Senn, J Smith, C Sommers, E Strecker. Technical Report 828.

and instead, helped us to see that dissolved solids, major ions such as sulfate and chloride, and nutrients were the most important contaminants. This regional prioritization provided a new opportunity for managers to refocus and reorganize their dry weather runoff management efforts on pollutants that could have significant influences on beneficial uses.

Going forward the new 5-year regional program, along with an array of other projects including a regional standardization to wet weather monitoring, development of a multi-variate water quality assessment index, and creation of a regionally standardized reporting format for the regulated agencies are expected to become active during the 2015-2016 reporting year.

The new projects, in addition to our ongoing efforts, will continue to help dischargers and regulators collaboratively address the challenging issues of urban runoff management.

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ACRONYMS AND ABBREVIATIONS

CASQA	California Storm Quality Association
LID	Low Impact Development
NPDES	National Pollutant Discharge Elimination System
PSA	Perennial Stream Assessment
SCCWRP	Southern California Coastal Water Research Project
SETAC	Society for Environmental Toxicity and Chemistry
SMC	Southern California Stormwater Monitoring Coalition

1.0 INTRODUCTION

The goal of the Southern California Stormwater Monitoring Coalition (SMC) 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. The SMC develops and funds cooperative projects to improve the knowledge of stormwater quality management and reports on the progress of those projects on an annual basis.

The 2014-2015 Annual Report represents an opportunity to report on the status of collaborative projects that are being worked on by member agencies. This report is intended provide a brief overview of projects active during the reporting year and summarizes projects either recently completed or planned for the upcoming year. Each project summary presented in this report includes the lead agency managing the project, sources of funding, and a list of prepared publications.

1.1 OVERVIEW OF THE 2014-2015 ANNUAL REPORT

Member agencies are involved in multiple projects or individual projects that have different time periods for completion and are at various implementation stages. Project information is presented in several sections of this report depending on the implementation status. Active projects, or recently completed projects, and project planned for the upcoming year are provided in section 3.0 to section 6.0. Projects completed during the prior reporting year are included in section 7.0 of this report. The 2014-2015 annual report outline is as follows:

(Section 3.0) SMC member agencies completed several projects during the 2014-2015 reporting year included:

- Completion a five (5) year regionally consistent and integrated freshwater stream bioassessment monitoring program.

(Section 4.0) SMC projects that were active during the 2014-2015 reporting year included:

- Implementing the 2015-2019 Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program,
- Development of Regional Approaches and Protocols for Trash Monitoring and Management, and
- Low Impact Development

(Section 5.0) In addition to the 2014-2015 projects not yet completed, the member agencies initiated the following new projects during the reporting period:

- Implementation of a toxicity testing laboratory inter-calibration exercise
- Stormwater retention credit framework/alternative compliance strategies

(Section 6.0) The SMC also has the following projects planned to potentially begin in the 2015-16 reporting period including:

- Implementation of an updated SMC Master Agreement with an alternate funding approach,
- Development of standardized MS4 monitoring programs,
- Creation of a standardized reporting for water quality monitoring, and
- Development of a water quality index and visualization method

2.0 STORMWATER MONITORING COALITION OVERVIEW

As a result of the increasing regulatory focus and the limited scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout southern California have formed a collaborative working relationship to improve the science of stormwater management. 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, 2009, and again in 2015 by all of the Phase I municipal stormwater National Pollutant Discharge Elimination System (NPDES) lead permittees and the NPDES regulatory agencies in southern California to create the Stormwater Monitoring Coalition (SMC). The SMC is directed by a Steering Committee consisting of member agencies' program managers who are the lead representative for their respective organizations (Table 1-1).

Table 2-1. List of Member Agencies in the Stormwater Monitoring Coalition

Agency	Lead Representative^(a)
California Department of Transportation, Caltrans	Bhaskar Joshi
City of Long Beach	Anthony Arevalo
City of Los Angeles, Watershed Protection Division	Charlie Yu
City of San Diego	Ruth Kolb
County of Orange, OC Public Works	Chris Crompton, <i>Chair</i>
County of San Diego Stormwater Management Program	Jo Ann Weber
Los Angeles County Flood Control District	Geremew Amenu
Riverside County Flood Control and Water Conservation District	Art Diaz
San Bernardino County Flood Control District	Marc Rodabaugh
Southern California Coastal Water Research Project	Ken Schiff, <i>Vice-Chair</i>
Ventura County Watershed Protection District	Arne Anselm
California Regional Water Quality Control Board, Los Angeles Region	Ivar Ridgeway
California Regional Water Quality Control Board, San Diego Region	Bruce Posthumus
California Regional Water Quality Control Board, Santa Ana Region	Milazol Gaslan
State Water Resources Control Board	Greg Gearheart
US Environmental Protection Agency, Office of Research and Development	Mike Borst

^(a) List current as of February 2016

The value of the SMC to its member agencies is at least four-fold including:

1) 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 non-member agency cost-matching. Since its inception non-member cost matching, totaling nearly \$3.5 million, amounts to an almost 2:1 match of member costs.

2) The ability to stretch member 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.

3) 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.

And finally,

4) 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. In turn, these collaborative relationships help the regulated agencies to meet compliance of their various MS4 Phase I permits.

3.0 PROJECTS COMPLETED DURING REPORTING TERM

This section provides an overview of the SMC member agencies projects that were completed during the reporting year. These descriptions briefly summarize each project, identify some of the key study questions, and list any publications produced from the project efforts. Information on past annual project updates reported in the SMC Annual Report are available on the SMC website at the following link ([SoCal SMC Annual Reports](#))

3.1 IMPLEMENTATION OF THE FIRST 5-YEAR REGIONALLY CONSISTENT AND INTEGRATED FRESHWATER STREAM BIOASSESSMENT MONITORING PROGRAM

Table 3-1. 2009-2013 Regional Freshwater Stream Bioassessment Monitoring Project

Lead Agency	<i>SCCWRP</i>
Report Year Project Started	2008-2009
Status	100% Complete
Initial Project Budget	\$375,000
\$75,000 per year	<i>All SMC Member Agencies</i>
Amended Project Budget	\$450,000
\$75,000 + in kind services	<i>SWRCB</i>
External Project Partners:	
	<i>Surface Water Ambient Monitoring Program</i>
	<i>California Dept. Fish & Wildlife</i>
Technical Lead	<i>Raphael Mazor, SCCWRP</i>
Key Words:	bioassessment, freshwater stream biology, aquatic life stressors

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 (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 requirements in their respective NPDES permits.

The goal of this study was to implement a coordinated, integrated, and regional bioassessment monitoring program. Previously, the SMC worked to design an optimal monitoring program that satisfied both local needs and simultaneously provided information that could be scaled up to make region-wide assessments. The 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?
- 3) Is the extent of stream impacts changing over time?

In addition to being a model for other regions of the State, the SMC regional monitoring program provided a critical foundation for development of statewide and regional programs. Development of the new statewide benthic invertebrate scoring tools (the California Stream Condition Index) and the southern California algae index of biotic integrity have relied heavily on data from the SMC regional monitoring program. Several member agency monitoring programs are also relying on the SMC program to provide a foundation upon which to build additional assessment elements.

The SMC's main collaborators were the California Department of Fish and Wildlife (CDFW) and SWRCB. The 2009-2013 project was 50% funded by the SWRCB, whose main goal was to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP).

3.1.1 Project Status Update

The Technical Subcommittee finished its fifth and final year of sampling in the summer of 2013. A technical report synthesizing the five year regional monitoring program over the period of 2009 to 2013 was prepared (see Section 3.1.2). Key findings of this report include the relative scarcity of biologically intact streams (~25% of stream-miles across the region), the strong association of poor biological condition with elevated dissolved solids, nutrients and major ions or with degraded physical habitat, and the lack of apparent trends in condition over the past 5 years. A subsequent work plan for the 2015-2019 sampling period was prepared and approved. The first year's sampling under the new work plans was completed in 2015. For the new 5-year cycle approximately one-third (1/3) of the sites are revisits of previously sampled sites, in order to better address the trend question (see Section 4.3).

Figure 3-1: Perennial stream condition was evaluated with four biological indicators: benthic macroinvertebrates, diatoms, soft algae, and riparian condition. In general, these components of the stream community rarely indicated good health in developed portions of watersheds.

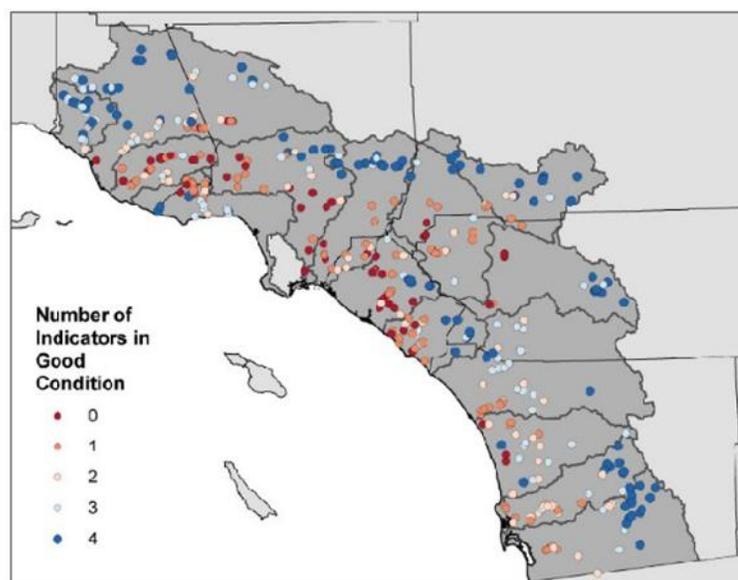
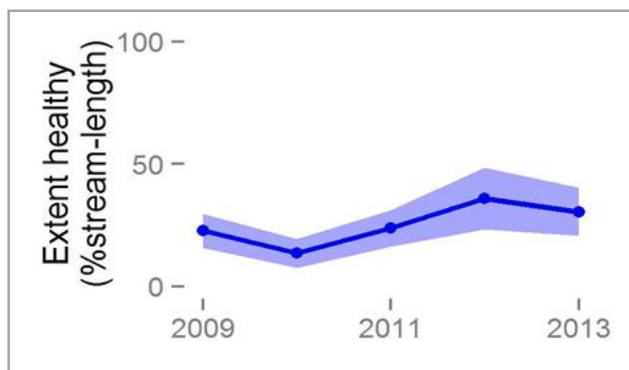


Figure 3-2. Extent of perennial streams in good biological condition for all four indicators. (benthic macroinvertebrates, diatoms, soft algae, and riparian condition) fluctuated from year to year, but was always limited to less than 35% of perennial stream-miles in the region. The blue band indicates the 95% confidence interval around the dark-blue trend line.



3.1.2 Project Related Publications

Technical Reports

- 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.
- 2) RD Mazor. 2015. *Bioassessment of Perennial Streams in Southern California: A Report on the First Five Years of the Stormwater Monitoring Coalition's Regional Stream Survey*. Technical Report 844. Southern California Coastal Water Research Project Authority. Costa Mesa, CA.

Peer-Reviewed Journal Publications from project data:

- 1) AE Fetscher, R Stancheva, JP Kociolek, RG Sheath, ED Stein, RD Mazor, PR Ode, and LB Busse. 2014. Development and comparison of stream indices of biotic integrity using diatoms vs. non-diatom algae vs. a combination. *Journal of Applied Phycology* 26: 433-450.
- 2) AE Fetscher, MDA Howard, R Stancheva, RM Kudela, ED Stein, MA Sutula, LB Busse, and RG Sheath. 2015. Wadeable streams as widespread sources of benthic cyanotoxins in California, USA. *Harmful Algae* 49: 105-116.
- 3) PR Ode, AC Rehn, RD Mazor, KC Schiff, ED Stein, JT May, LR Brown, DB Herbst, D Gillett, K Lunde, and CP Hawkins. In press. Evaluating the adequacy of a reference-site pool for ecological assessments in environmentally complex regions. *Freshwater Science*.
- 4) RD Mazor, AC Rehn, PR Ode, M Engeln, KC Schiff, ED Stein, DJ Gillett, DB Herbst, and CP Hawkins. In press. Bioassessment in complex environments: Designing an index for consistent meaning in different settings. *Freshwater Science*. March 2016, p. 000

4.0 ONGOING PROJECT ACCOMPLISHMENTS

This section provides an overview of the SMC member agencies active projects along with a brief summary describing the intent of each project, some of the key study questions, the regional motivation behind the projects, and a list of publications produced from project efforts. While a brief overview is provided in this Annual Report, detailed information can be obtained from the list of technical publications provided at the end of each section or by contacting the member agency Technical Leads.

4.1 IMPLEMENTATING A NEW 5-YEAR REGIONALLY CONSISTENT AND INTEGRATED FRESHWATER STREAM BIOASSESSMENT MONITORING PROGRAM.

Table 4-1. 2015-2019 Regional Freshwater Stream Bioassessment Monitoring Project

Lead Agency	<i>SCCWRP</i>
Report Year Project Started	2014-2015
Status	15% Complete
Project Budget⁽¹⁾	\$426,350
\$85,265 per year	<i>All SMC Member Agencies</i>
External Project Partners:	
	<i>Surface Water Ambient Monitoring Program</i>
	<i>California Dept. Fish & Wildlife</i>
Technical Lead	<i>Raphael Mazor, SCCWRP</i>
Key Words:	bioassessment, freshwater stream biology, aquatic life stressors

Notes: (1) The project budget listed does not include sample analysis costs or funding contributions provided by the Water Boards.

Southern California's coastal watersheds contain important aquatic resources that support a variety of ecological functions and environmental values, but results of the Stormwater Monitoring Coalition's (SMC's) 5-year survey ending in 2013 suggested that few perennial, wadeable streams are in good biological condition (Section 2.1, Mazor 2015). However, important knowledge gaps remained, such as the condition of nonperennial streams, and whether conditions were changing over time. Therefore, the SMC decided to continue the regional project to support management decisions that may improve or protect stream conditions.

In 2015, the new five-year program will build off the previous survey to answer key management questions about the regional stream conditions. Key modifications to the survey

will address knowledge gaps, such as the condition of nonperennial streams, the effects of stressors of interest, and changes in regional condition over time.

The 2015-2019 Southern California Stream Survey is designed to generate data to answer three key management questions.

- 1) What is the condition of streams in Southern California?
- 2) What stressors are associated with poor condition?
- 3) Are conditions changing over time?

Although these questions are essentially the same as in the 2009-2013 survey, key refinements to the prior program, included in the new design, are as follows;

- 1) Expand surveys to sample both perennial and nonperennial streams, including first-order streams.
- 2) Continue measuring high-priority stressors (specifically, habitat, nutrients, and ions, which were associated with poor biological condition at >25% of stream-miles). Discontinue low-priority stressors (specifically, water column metals and toxicity, which were not associated with poor biological condition at > 90% of stream-miles).
- 3) A subset of probabilistic sites from previous surveys will be revisited over multiple years to provide an estimate of change in condition, which may be extrapolated to the region as a whole. Sites will be designated as stable, improving, or degrading, and environmental changes associated with changing condition will be identified. Approximately 30% of the annual monitoring effort will be allocated towards estimating trends.

The SMC's main collaborators on this project are the California Department of Fish and Wildlife (CDFW) and SWRCB. The project contributions provided by SWRCB help to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP). Additionally, the SMC's stream survey serves as the southern California component of the statewide stream condition survey (i.e., the Perennial Stream Assessment or PSA).

4.1.1 *Project Status Update*

During the early period of the 2014-2015 reporting year, the regional program workgroup prepared a work plan for implementing a new 5-year freshwater stream bioassessment monitoring program. The goal of this work plan is to describe a collaborative large-scale, regional monitoring program of southern California's coastal streams. It describes sample draw parameters, analytes that will be assessed, quality assurance requirements, standard protocols, and other information needed to ensure comparability across different programs. While the details concerning implementation (such as specific labs and contractors) will vary among participants, each agency can use this document to create sampling programs within their jurisdictions that will contribute to a regional assessment. The 2015-2019 program will place additional emphasis on sampling sediment chemistry and toxicity.

Regional monitoring for the 2015-2019 program began in the spring of 2015 and results from the first year program are being compiled and undergoing a quality assurance validation.

4.1.2 Project Related Publications

RD Mazor. 2015. Bioassessment Survey of the Stormwater Monitoring Coalition- Workplan for Years 2015 through 2019 Version 1.0. Technical Report 849. Southern California Coastal Water Research Project Authority. Costa Mesa, CA.

4.2 DEVELOPMENT OF REGIONAL APPROACHES AND PROTOCOLS FOR TRASH MONITORING AND MANAGEMENT

Table 4-2. Regional Approaches to Trash Monitoring and Management Project

Lead Agency	<i>County of Orange</i>
Report Year Project Started	2008-2009
Status	40% Complete
Initial Project Budget	\$342,000
\$342,000	<i>US Fish and Wildlife Services CIAP Grant</i>
Technical Lead	<i>Chris Crompton, OC Public Works</i>
Key Words: trash reduction strategies, BMP effectiveness, rapid trash assessment	

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. 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 the SMC’s understanding and ability to manage trash in the environment at both regional and local scales. In part one of this project, the focus was directed towards informing the SMC about the extent and magnitude of trash impacts on southern California streams. Part two of this project will translate findings from the regional survey into a case study. Through a 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.

4.2.1 *Project Status Update*

During the 2014-15 reporting period, the County and the Newport Bay watershed partners who are the focus of this effort, contributed to substantial progress on the trash management plan grant project. The CIAP grant project efforts focused on several tasks including;

- Development of a comprehensive watershed trash BMP inventory,
- Performing a preliminary evaluation and characterization of existing trash management data resources,
- Conducting a review and evaluation of rapid trash assessment monitoring protocols, and
- Developing an initial GIS-based geospatial and temporal analysis of trash generation areas.

The information provided by the project partners contributed to the preparation of a GIS-based model to identify spatial and temporal coverage of BMPs and determine the data gaps remaining to be addressed. The GIS model also contributed to identifying potential candidate drainage areas in the Santa Ana-Delhi Channel subwatershed with extensive BMP coverage as an opportunity to examine trash management efforts in greater detail.

The grant project efforts during the reporting period also helped to identify a candidate rapid assessment protocol that is being proposed as a pilot project by the watershed partners. The goal of the rapid protocol pilot project is to have the project partner perform surveys of specific land uses or high trash generating areas that can be integrated back into a refined watershed model.

4.2.2 *Project Related Publications*

- 1) Orange County Public Works. Evaluation of Current Literature: Trash Sources, Impacts, Monitoring and Management Practices. May 2014.
- 2) Orange County Public Works. Trash Control Measures: Inventory of Newport Bay Watershed Trash BMPs. June 2015.

4.3 LOW IMPACT DEVELOPMENT PROJECT

Table 4-3. Low Impact Development Project

Lead Agency	<i>San Bernardino County Flood Control District</i>
Report Year Project Started	2006-2007
Status	80% Complete
Initial Project Budget	\$1,100,000
\$441,176	<i>SMC Member Agencies (8)</i>
\$58,824	CASQA
\$600,000	<i>State Prop 40 Grant</i>
External Project Partners:	<i>California Storm Quality Association</i>
Technical Lead	<i>Marc Rodabaugh, San Bernardino County Flood Control District</i>
Key Words: stormwater retention, wet weather runoff, BMP effectiveness	

In 2006 the SMC began the project: “LID Guidance and Training for Southern California” (LID Project). The LID Project was funded through a Proposition 40 grant provided the State Water Resources Control Board Proposition 40 funded with matching and additional monitoring funds provided by the SMC. The project developed a comprehensive approach to incorporate LID strategies and techniques into the planning and design phases of public and private sector projects. The LID Project developed a model program for organizations in California that are interested in or required to adopt LID strategies and techniques. All Proposition 40 grant-funded tasks and deliverables were completed by the end of 2010. Continuing and additional tasks will use the remaining unspent funds from the LID Project’s overall budget.

A brief summary of the completed and remaining original LID project tasks are shown in Table 4-3-1.

Table 4-3-1. Low Impact Development Completed and Remaining Project Tasks.

LID Guidance and Training for Southern California	
Completed Tasks	Define LID for Southern California
	Compile literature review and perform gap analysis
	Conduct pre and post manual training
	Develop the LID Manual

Table 4-3-1 (cont.). Low Impact Development Completed and Remaining Project Tasks.

LID Guidance and Training for Southern California	
Remaining Tasks	Monitor to evaluate LID BMP effectiveness
	Feedback and update the manual based on monitoring findings

The San Bernardino County Flood Control 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 also provided additional gap funding, which allowed continuation of the project during a state grant funding freeze time period.

The SMC project partners and California Storm Quality Association (CASQA) plan to periodically update the online LID Guidance Manual and provide training sessions. An updated monitoring program has been developed for the remaining portion of the project. Monitoring reports are expected upon completion of the data analysis and assessments.

To date, the literature review, pre-and post-manual training, and preparation of the guidance manual are complete, and field monitoring has been conducted at two sites. The guidance manual is posted on the CASQA websites. CASQA developed a LID web portal featuring the manual, and the manual was incorporated into the CASQA New and Redevelopment handbook. Additional field monitoring data are needed to adequately evaluate whether existing design and performance guidance are appropriate for development project acceptance by local jurisdictions. The LID Project was designed to conduct field monitoring for up to five years, and monitoring results were to be evaluated for use in revising the guidance manual as appropriate.

The current project focuses on conducting monitoring and/or establishing collaboration to share data for better evaluating the LID BMP effectiveness, and to review and update the LID Manual. The LID Manual updates are also intended to provide guidance on scalable monitoring methodologies (by project size and type), with recommendations for inspection methods and frequency. The Project scope is also intending to leverage the SMC Research Agenda to identify how the LID Project aligns with selected priorities and can possibly coordinate with other priority projects.

Lastly, this project will review and revise the LID effectiveness monitoring program to incorporate new information or procedures, and to initiate a feedback and updating process for the LID Manual including training materials (These tasks are included as Tasks 1, 4, 5, 6, and 7 in SMC Agreement D06-051).

4.3.1 *Project Status Update*

The SMC Steering Committee evaluated and approved a revised Scope of Work to better focus the effectiveness assessment tasks based on LID implementation experience and monitoring data.

The revised Scope of Work includes five main tasks:

1. Form and Coordinate a Project Technical Advisory Committee;
2. Research Existing Data;
3. Implement initial monitoring procedures in a beta test phase;
4. Summarize all monitoring data, make recommendations, and update the LID Manual;
5. Ongoing Collaboration with Project Partners.

The revised Scope of Work proposes greater regional collaboration and additional data sharing from LID Project partners and their sites. Collaborative partner sites include the Riverside County Flood Control and Water Conservation District headquarters LID retrofit, previously monitored UCCE sites in Irvine, sites monitored by the Council for Watershed Health in the Los Angeles Basin, and the Orange County Public Works LID retrofit site. Collaborative partner sites are also expected to include green street projects required by municipal regional permits, other LID sites in the San Francisco Bay area, and sites currently being monitored in the San Diego region.

The Steering Committee recommended a survey of existing LID monitoring programs to evaluate where data gaps exist based on knowledge of LID performance. The results of this evaluation should help prioritize and focus new data collection based on regional implementation needs. Expected work products include a standardized monitoring approach and implementation guidance document intended to improve data comparability of future projects and help to better address identified data gaps. In addition, maintenance procedures and maintenance frequencies for LID features will be evaluated to develop optimal approaches, with intent of creating better linkage between LID effectiveness and receiving water impacts.

San Bernardino County contracted with Michael Baker International to conduct the revised LID Project Scope of Work following a competitive bidding process. The selected project team has been compiling research materials and coordinating with project partners to identify new LID sites and data sharing opportunities. A project kickoff and Technical Advisory Committee meeting has been scheduled for December 17, 2015.

4.3.2 *Project Related Publications*

- 1) LID Guidance Manual available on the California Storm Quality Association website at [California LID Portal](#)
- 2) San Bernardino County Flood Control District LID Guidance Manual and Training Program. Monitoring Technical Memorandum. October 2009.

4.4 APPROVAL OF SMC MASTER AGREEMENT WITH ALTERNATE PROGRAM FUNDING APPROACH

Table 4-4. SMC Master Agreement Project

Lead Agency	<i>County of Orange</i>
Report Year Project Started	2013-2014
Status	90% Complete
Project Budget	\$233,728
Project Partners:	
<i>California Department of Transportation, Caltrans</i>	<i>Los Angeles County Flood Control District</i>
<i>City of Long Beach</i>	<i>Riverside County Flood Control and Water Conservation District</i>
<i>City of Los Angeles, Watershed Protection Division</i>	<i>San Bernardino County Flood Control District</i>
<i>City of San Diego</i>	<i>Southern California Coastal Water Research Project</i>
<i>County of Orange, OC Public Works</i>	<i>Ventura County Watershed Protection District</i>
<i>County of San Diego Stormwater Management Program</i>	
Technical Lead	<i>Chris Crompton, OC Public Works</i>
Key Words: stormwater retention, wet weather runoff, BMP effectiveness	

The Steering Committee received the first draft of the next Master SMC Agreement in February 2013. The current SMC Master Agreement expired June 4, 2013 and the new agreement mimics the previous agreement with two new additions:

- i) insertion of a budget and workplan process for SMC projects to expedite projects that currently require implementation agreements; and,
- ii) establishment of a budget manager from the SMC members to collect and distribute annual budget funds.

The budget and workplan process is meant to increase the efficiency and timeliness of the SMC in order to build upon the successful projects already completed. However, the agreement still contains the provision for each agency to pay only for the projects in which they choose to participate. Therefore, the budget will not necessarily be split evenly among agencies and participation in a given projects is not mandatory for any member agency. One goal is to fund the smaller, ongoing projects (i.e., intercalibration, regional monitoring coordination, etc.) without constantly having to create new agreements. The agreement will still contain language for supplemental implementation agreements to fund larger, one-time, partnered projects based on individual member agency needs and implementation of the research agenda.

Based on the proposed agreement structure, with multiple parties committing to an annual budget, the SMC will require a new treasurer position to receive and disburse funds, issue invoices, and manage the budget. SCCWRP was supported as the candidate for treasurer and a percentage of the annual budget will be allocated to SCCWP for administrative support. Also, the new agreement creates a rotating Chair position with an allocated budget for an Administrative Officer (likely a contractor) to organize meetings, prepare minutes and the Annual Reports, write agreements, and provide overall continuity in the day-to-day operations of the organization.

4.4.1 *Project Status Update*

The new SMC Master Agreement is expected to be approved in 2015-2016.

4.4.2 *Project Related Publications*

- 1) Cooperative Agreement for Participation in the Southern California Stormwater Monitoring Coalition, D13-014. February 2016.

5.0 PROJECTS STARTED IN 2014-2015

This section provides an overview of the SMC member agencies projects that were started during the reporting year. In general, the projects included in this section have been under consideration by the member agencies but have delayed for various reasons. The information present in this section represents the first time these projects have appeared in the annual report.

Each project includes a brief summary describing the some of the key study questions and motivation behind the projects, and a list of related publications. A brief overview is provided in this Annual Report, and detailed information can be obtained from the list of technical publications provided at the end of each section or by contacting the member agency Technical Leads.

5.1 TOXICITY TESTING LABORATORY INTERCALIBRATION

Table 5-1. Toxicity Testing Laboratory Intercalibration Study

Lead Agency	SCCWRP
Status	50% Complete
Project Budget	\$65,000
External Project Partners:	
<i>Aquatic Bioassay & Consulting Laboratory</i>	<i>Marine Pollution Studies Laboratory</i>
<i>Aquatic Testing Laboratories</i>	<i>MBC Applied Environmental Services</i>
<i>Aquatic Toxicity Lab (University of California, Davis)</i>	<i>Nautilus Environmental</i>
<i>City of Los Angeles Environmental Monitoring Laboratory</i>	<i>Pacific Ecorisk</i>
<i>Los Angeles County Sanitation District</i>	
Technical Lead	<i>Ken Schiff, SCCWRP</i>
Key Words: toxicity test, <i>Ceriodaphnia dubia</i>	

The SMC established a continuing goal of compiling local monitoring data to make region-wide assessments (SCCWRP 2004, 2007, 2010). In order to compile local monitoring programs into regional assessments, the SMC expended considerable effort to design monitoring programs with similar goals and objectives, integrated sampling efforts, establish standardized data protocols, and provide focused training opportunities. However, none of the SMC agencies have their own laboratories, and reviews of local contract laboratories indicated differences in analysis methods and the levels of quality control including internal requirements for accuracy and precision. Therefore, the SMC also holds periodic laboratory intercalibration studies to

ensure comparability in analytical measurements. Beginning in 2003, and continuing in 2006 and 2009, the SMC implemented a series of intercalibration studies to promote comparability of water chemistry measurements. The 2003 intercalibration study established common reporting levels and target analytes, and utilized iterative round robin exercises to minimize inter-laboratory variation. The success of the 2003 exercise was primarily due to three factors:

- 1) communication and commitment among laboratory personnel;
- 2) setting performance-based criteria for establishing standards of success; and
- 3) using locally derived reference materials including using a stormwater matrix.

The intercalibration exercise led to the creation of a performance-based chemistry guidance manual for adoption by SMC monitoring programs. The SMC's second laboratory intercalibration in 2006 focused on the same constituents (total suspended solids, nutrients, total trace metals) and increased the number of participating laboratories. The success of the 2006 intercalibration rivaled the 2003 intercalibration, which indicated consistent performance by laboratories participating in the study and reinforced the confidence of the SMC member agencies that laboratory performance would result in consistently high quality data during the intervening years.

These early intercalibration exercises focused primarily on water chemistry, and it was recognized several years ago that toxicity testing also represented an important segment of each member agency programs.

The toxicity laboratory intercalibration exercise, which began in mid-2015, is the first time SMC member agencies will undertake an effort to intercalibrate toxicity testing results. Given the successes and benefits derived from the chemistry laboratory intercalibration, the toxicity testing intercalibration study provides an important first step towards improving toxicity testing data quality and comparability on a regional basis. This study is intended to directly support the management efforts of both the regulated and regulatory stormwater agencies.

5.1.1 *Project Status Update*

The scope of work was prepared and samples were collected in July 2015 for distribution to the participating laboratories. The toxicity testing focused on two marine species and two freshwater species, which was two more species than originally requested by the SMC. The following four samples were delivered to each laboratory blind:

1. Non-toxic sample to serve as the control,
2. Toxic sample using a chemical spike added to laboratory dilution water,
3. Duplicate spiked sample identical to sample 2, and
4. Artificial runoff sample to test sample matrix effects.

Performance criteria was based on:

- Test acceptability based on standard criteria established in state or USEPA guidance documents,

- Intra-laboratory precision based on the comparability of the duplicate sample within the same laboratory, and
- Inter-laboratory precision based on the comparison of each sample between laboratories.

Based on the results from the first iteration of the intercalibration exercise, the laboratories are going to repeat the testing for the two freshwater species, including *Ceriodaphnia dubia* which is the most commonly used test organism among the SMC member agencies. Laboratories will be standardizing on certain testing protocols in an effort to increase inter-laboratory precision.

The second round of testing and preparation of the Guidance Manual should be completed in the 2015-16 fiscal year.

5.1.2 Project Related Publications

- 1) Gossett, R. and Schiff, K. 2010. [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 3rd Edition. Southern California Coastal Waters Research Project, Technical Report 615.
- 2) Gossett, R. and Schiff, K. 2006 [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 2nd Edition. Southern California Coastal Waters Research Project, Technical Report 521.
- 3) Gossett, R. Renfrew, D. and Schiff, K. 2004 [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 1st Edition. Southern California Coastal Waters Research Project, Technical Report 420.

5.2 STORMWATER RETENTION CREDIT FRAMEWORK/ALTERNATIVE COMPLIANCE STRATEGIES

Table 5-1. Stormwater Retention Credit Framework/Alternative Compliance Project

Lead Agency	<i>County of San Diego</i>
Status	50% Complete
Project Budget	\$441,176
	<i>SMC Member Agencies (8)</i>
Technical Leads	<i>Eric Stein, SCCWRP</i>
	<i>Matt Yeager, Independent Consultant</i>
Key Words: Water quality equivalency, regional LID, offsite mitigation	

The project focus is to develop model program guidance for Permittees and other stakeholders to facilitate implementation of approvable “alternative compliance” options (Options) for

Priority Development Projects (PDPs)² where applicable. The project will also apply and test the model guidance by developing a model Alternative Compliance Program (ACP) for the Fletcher Basin and Legacy Campus Plan areas in Orange County.

This is a joint project being conducted by the San Diego and Orange County Stormwater Programs. The project has two primary tasks, each with multiple subtasks, which are as follows:

1.0 Water Quality Equivalency (WQE) Guidance Development

- Background research
 - Review available literature regarding Options in California and elsewhere
- Stakeholder participation
 - Establish policy and technical advisory groups to engage watershed stakeholders
 - Conduct workshops to develop key project needs and review water quality equivalency objectives
- Equivalency determination
 - Work with participating jurisdictions to develop currency values for equivalency objectives
 - Develop a consistent set of water quality equivalency standards for each Option
- Develop equivalency guidance document
 - Advisory group review

2.0 Application and Testing of Water Quality Equivalency Guidance

The application and testing project phase includes two pilot projects to test methodologies, examine potential benefits or impacts, and perform effectiveness assessments. The two pilot project locations are:

Fletcher Basin: Using a detailed case study approach, the project will apply quantitative metrics, including the WQE Guidance methodology, to

- evaluate and compare the water quality,
- evaluate local potable water supply augmentation,
- assess ecological, species and habitat, and property value-related benefits of installing selected combinations of the four types of LID BMPs, and
- assess site-by-site benefits on selected parcels presumed to be classified as PDP sites in the Fletcher Basin subwatershed.

The Project will quantify the benefits expected from the development and operation of a single regional stormwater retention basin retrofitted to accept urban stormwater runoff. The Fletcher

² PDPs are defined according to the San Diego Regional Municipal Permit (ORDER NO. R9-2013-0001) at Section E.3.b.

Basin retrofit analysis will examine the opportunities and challenges of individual site-by-site LID BMP implementation versus larger scale, multi-jurisdictional cooperative stormwater capture projects, including identification of key water rights issues.

Legacy Campus Plan Project (Legacy CPP): This project task will conduct a case study benefit and cost analysis for the Legacy CPP, located within the City of Orange. The Legacy CPP consists of an approximately 25-acre site that will be developed for commercial (medical) and residential uses by integrating existing and new building areas, and includes opportunities for regional stormwater capture within areas near and adjacent to Santiago Creek (which is outside of the Legacy CPP contributing area). The Legacy CPP will examine opportunities and challenges for public-private partnerships in stormwater management. Through evaluation of the Legacy CPP, the proposed SMC project can determine the optimum mixture of on-site and regional stormwater BMPs that can be installed and maintained for the least cost while providing maximum benefits.

The results of the Fletcher Basin and Legacy CPP benefit cost analyses will be combined with existing information on engineering feasibility of LID BMP use in Orange County to establish a model in-lieu program framework and recommended fee structure, including the quantitative basis for appropriate in-lieu fees. Within such a framework, PDPs in the applicable areas could comply with the requirement to manage 100% of the Design Storm runoff by funding off-site or alternative LID/retention/stormwater treatment BMPs at a level deemed equivalent to managing the Design Storm obligation on-site.

To support alternative compliance program options that meets MS4 permit obligations, the proposed project will identify and analyze the institutional (contractual and legal) agreements necessary for implementing Options including regional BMP development, green street development, water quality credit trading, and in lieu fees. By combining the economic, regulatory, institutional/ legal, and technical feasibility issues that need to be addressed in order to establish an alternative compliance program, the proposed project will serve as a model approach for watershed-based LID BMP implementation and optimization in Orange County. The work products will help decision makers to optimize the location, benefits, and costs of installing LID BMP-type stormwater management facilities in Orange County, while maintaining compliance with MS4 permit requirements and providing flexibility to project designers and developers.

5.2.1 *Project Status Update*

San Diego County has completed a draft of their water quality equivalency (WQE) program document; the draft is currently under review. The document includes detailed procedures for determining equivalency for offsite mitigation for both water quality and hydromodification. This includes information on both sizing and location of alternative compliance BMPs. The document focuses primarily on infiltration and retention based BMPs and has some preliminary guidelines for flow through BMPs. However, lack of data on performance of flow-through BMPs limits the specificity that can currently be provided. The document also includes preliminary discussions of floodplain and stream restoration as alternative compliance;

however, the details for these options are to be refined through a future phase of the work. San Diego County expects that the draft water quality equivalency document to be out for review the first week in 2015. A public workshop was held on July 28, 2015, with comments due on August 18, 2015. The goal was to submit the guidance document to the San Diego Regional Board by September 15, 2015.

As the next step, Orange County will apply the approach developed by San Diego County to an actual project at Fletcher Basin within the City of Orange to see how well the approach adapts to sites with different environmental and physical constraints.

5.2.2 *Project Related Publications*

No project related publications were prepared during the 2014-2015 reporting term.

6.0 PROJECTS PLANNED FOR 2015-2016

The summaries reported in this section represent strategic planning efforts or new projects that have been identified as supporting a SMC priority and have received member agency support to be implemented during the 2015-2016 reporting year.

6.1 STANDARDIZED MS4 MONITORING PROGRAMS

Table 6-1. Standardized MS4 Monitoring Program Summary

Lead Agency	<i>Ventura County Watershed Protection District</i>
Technical Lead	<i>Arne Anselm</i>
Key Words: regional comparability, standardized monitoring	

Background:

In May 2012, the SMC held a workshop to identify the similarities and differences in stormwater monitoring among member agencies. The ultimate outcome was that existing SMC member agency monitoring and reporting requirements were inconsistent, leading to incompatible sampling programs and incomparable data and information across programs. The result is a large potential for redundancy, inefficiency, and ineffective outcomes. This is exacerbated by our already limited resources for assessing receiving water environmental health and end-of-pipe compliance.

The technical report developed from the workshop findings established a resource guidance document for stormwater monitoring programs. Likewise, the workshop helped to further highlight the many barriers that program manager faces in implementing changes in established monitoring programs. These barriers are coupled with agencies having limited resources, a need to navigate numerous practical considerations and a need to continue existing trend monitoring designs. All of these considerations lead to the workshop concluding that development an effective stormwater monitoring guidance document intended to create regional consistency will require the collaboration and inputs from stormwater agencies and the Regional Water Quality Control Boards. The guidance document is perceived as providing value as a resource for writing and renewing permits, planning or negotiation monitoring requirements during permit renewals, and providing a consistent technical foundation when planning special studies or TMDL monitoring programs.

Objectives and Products:

The technical report from the May 2012 workshop included a series of recommendations on next steps for creating an effective stormwater monitoring guidance manual. The next steps include the SMC members endorsing several foundational management questions to serve as a starting point for creating greater regional comparability namely:

- 1) Identify and prioritize management questions.
- 2) Identify scales (regional, local) and runoff types (dry, wet) that apply to each management question.
- 3) Identify factors that impede addressing each of the management questions. This is likely where the survey and workshop outcomes described in this report will be most helpful.
- 4) Develop stormwater monitoring guidance that addresses the specific needs of each management question, including the concept of a minimum set of requirements that all SMC member agencies would hold in common.

The goal of this planned SMC project is to develop a uniform monitoring approach that will lead to regional consistency in demonstrating trends, identifying stressors, identifying sources and evaluating effectiveness of management measures. The standardized MS4 monitoring program project is intended to be model guidance for adoption by stormwater NPDES permit monitoring and reporting programs, through consideration of the following;

- 1) Monitoring questions,
- 2) Design criteria,
- 3) Sampling and analysis protocols and methods,
- 4) Database and QA/QC rules, and
- 5) Reporting formats.

It is anticipated that the sampling approach will contain the three-part model framework developed by the SMC which including core monitoring, regional monitoring, and special studies. After the first iteration of the model program, SMC member agencies should evaluate the efficacy of the monitoring recommendations, and update model program requirements as needed.

6.1.1 *Project Related Publications*

- 1) Sercu, B., Anselm, A., Schiff, K. "Regional Stormwater Monitoring Coalition and Evaluation: Survey, Workshop, and Research Priorities." Southern California Stormwater Monitoring Coalition. January 2013.
- 2) Bernstein, B.B.; et. al. "Model Monitoring Program for Municipal Separate Storm Sewer Systems in Southern California." Southern California Stormwater Monitoring Coalition. August 2004.

6.2 STANDARDIZED REPORTING FOR WATER QUALITY MONITORING PROGRAMS

Table 6-2. Standardized MS4 Reporting Project

Lead Agency	<i>SCCWRP</i>
Technical Lead	<i>Steven Steinberg</i>
Key Words: regional comparability, standardized reporting, water quality index	

Background:

In June, 2014, SCCWRP entered into a contract with the State Water Resources Control Board to interact with stormwater managers from around the state to identify the types of information they utilize (or would utilize if they had it) for both short-term and long-term decision making. As a part of this project, several SMC members were interviewed, including:

California Regional Water Quality Control Board, Los Angeles Region

California Regional Water Quality Control Board, Santa Ana Region

County of Orange, OC Public Works

County of San Diego Stormwater Management Program

Los Angeles County Flood Control District

Riverside County Flood Control and Water Conservation District

San Bernardino County Flood Control District

State Water Resources Control Board

Ventura County Watershed Protection District

Based upon these findings, to assess data availability relating to the desired information and to develop a prototype “stormwater dashboard” for reporting this information along with needs and recommendations for implementation, project updates were provided to the SMC in December 2014, March 2015, and September 2015.

Status and Recommendations:

Although the project for the State Board is not yet complete two emerging recommendations which can provide the SMC with direction are clear. First, there is a significant need for development of standardized stormwater indices to be utilized in the reporting and assessment of a stormwater program’s effectiveness in meeting objectives. This is a topic already under consideration by the SMC and for which it can provide important leadership. While standard

assessment approaches and indices are available to address permit components relating to some water quality objectives (e.g. physical and chemical objectives) other aspects including, for example, the effectiveness of inspection or public education programs are not. A common aspect of these program components is to strengthen the capture and analysis of the spatial component of these activities.

The second issue identified is a need for standardized data. The SMC program already obtains many such data in standard formats across the region, providing a good basis for developing and demonstrating standardized reporting tools via a stormwater dashboard interface. Extending data types to address additional aspects the assessment and reporting of program effectiveness is a valuable next step. The SMC database is potentially the best available data platforms upon which to develop both the data structures and index calculations necessary for effective stormwater program reporting dashboard that provides both the current state of the program and tools which can streamline and optimize the annual reporting process associated with individual program requirements.

6.2.1 *Project Related Publications*

No project related publications are available during the 2014-2015 reporting term.

6.3 WATER QUALITY INDEX AND VISUALIZATION

Table 6-3. Water Quality Index and Visualization Project

Lead Agency	<i>OC Public Works</i>
Technical Leads	<i>Grant Sharp, OC Public Works</i>
Key Words: regional comparability, standardized reporting, water quality index	

Background:

Assessments of water quality and aquatic ecosystem condition are the crucial part of many regulatory, management, and citizen monitoring programs and have provided information important in identifying and prioritizing problems and tracking trends and progress over time. However, many assessments use different indicators and/or different methods for combining indicators into overall measures of condition. While some progress has been made toward standardizing assessment approaches at regional scales, there is no widely applicable system in the southern California region (or at state and national scales) for integrating multiple assessments into overall measures of aquatic ecosystem health. Nor is there a readily accessible means of communicating assessment results to managers and the public in ways that highlight areas where risk or the need for protection is greatest risk and to help set priorities for management actions such as pollutant source reduction or natural resource restoration.

A number of initiatives have prioritized the development of aggregated water quality and aquatic ecosystem indices and related visualization tools, providing the basis for a coordinated effort to develop such tools for use in southern California. In September, 2014, a group of interested parties representing a number of MS4 programs, Regional Water Boards, and SCCWRP held a workshop to discuss the potential wider application of existing index and online data visualization tools being developed and/or applied separately by a number of programs in southern California and the Central Coast. The technical report from the workshop captured participants' agreement on the value of a coordinated effort that would broaden the applicability of the approaches discussed at the workshop, with the goals of improving abilities to measure condition and track trends, reducing development costs, and enhancing regional assessments. Such a project would build on related efforts by the SMC and others to standardize monitoring designs and protocols, develop regional assessments, and improve the communication of results to a wider range of audiences.

Objectives and Products:

Discussion at the workshop identified two priority areas critical to accomplishing these goals: 1) defining the structure of one or more indices and how they would be applied in synthesizing and interpreting monitoring results, and 2) defining how online visualization tools could support these activities. The two goals of this project are thus to:

- Develop a common set of water quality and aquatic ecosystem indices for southern California that would aggregate a number of separate condition indicators, and
- Identify design criteria for data visualization and analysis tools

The workshop report identified a number of current efforts in the region and statewide that would be expected to provide starting points, alternative concepts, and useful input to the proposed effort. Of particular interest is the approach the California Central Coast Healthy Watersheds Project has taken to create a web-based data navigator and report card system that can be used for efficient aquatic assessments to guide resource management. The first of a two-part final report was released in November, 2015, describing the selection of aquatic life and human health thresholds, parameter scoring, methods to combine multiple parameters into health indices, and status and trends assessment at the site level for parameters and indices.

6.3.1 Project Related Publications

The published report which supports the development of the SMC's Water Quality Index and Visualization project was prepared by SWAMP in November 2015.

Worcester, K.R.; Paradies, D.M.; Hunt, J.W.; California Central Coast Healthy Watersheds Project – Part 1: *Reports Cards for Scoring Water Quality Data to Characterize Health and Change*. Prepared for the California Surface Water Ambient Monitoring Program. November 2015.

The report is available at the following website:

http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/workplans/rb3_methods_paper.pdf

7.0 PROJECTS COMPLETED DURING 2013-2014 REPORTING TERM

The SMC annual report summarizes member agency new or ongoing projects at various stages of implementation. However, during each reporting year one or several projects may be completed and as such will not appear in the following year's annual report. This section of the annual report provides a brief summary of projects that were completed during the 2013-2014 reporting term and an annual update will no longer appear in this report.

Table 7-1. SMC Projects Completed During the Previous Annual Report Term

Project Title	Lead Agency	Year Started
Barriers to Low Impact Development	<i>San Bernardino County Flood Control District/ County of Orange</i>	2009-2010
SMC 5-Year Research Agenda	SCCWRP	2012-2013
Stormwater Data Compilation Study Project	SCCWRP	2009-2010
Stormwater Monitoring Comparison and Evaluation Project	<i>Ventura County Watershed Protection District</i>	2011-2012

For additional information on projects completed during the previous reporting period, updates and a list of project related publications reported in the SMC Annual Report are available on the SMC website.

The SMC member agencies have completed a number of studies and projects since the coalition began in 2001. And while the projects no longer appear in the annual report, information on past studies and projects completed prior to the 2014-2015 reporting year including technical reports, and publications prepared are available on the SMC website (SoCalSMC.org).