

Stormwater Action Monitoring

2018 Annual Report

May 2019



This is the fourth annual report from the Washington State Department of Ecology (Ecology) on implementation of Stormwater Action Monitoring (SAM), a collaborative program funded by more than 90 Western Washington cities and counties, the ports of Seattle and Tacoma, and the Washington State Department of Transportation (WSDOT). Ecology manages SAM's revenues, expenditures, agreements, and communication of findings.

About SAM

Stormwater Action Monitoring (SAM) is the regional stormwater monitoring program for the municipal stormwater permits.

The goal of SAM is to improve stormwater management, reduce pollution, improve water quality, and reduce flooding. We do this by measuring stormwater impacts on the environment and evaluating the effectiveness of stormwater management techniques.

All jurisdictions large and small can benefit from SAM projects that are designed to produce regionally transferable findings. All permittees can implement SAM findings to protect local lakes, rivers, streams, and Puget Sound.



ecology.wa.gov/SAM

Communication

What are we learning from SAM projects and how should we use the information?

The SAM website provides individual project pages and summary communication products like project fact sheets, newsletters, videos, and more.

Highlights

SAM has strategic monitoring categories to answer stormwater management questions.

Status and trends monitoring

Are conditions in receiving waters getting better or worse?

In 2018, two SAM receiving water studies, the Puget lowland streams and nearshore sediment, were completed and final reports published. The second round of mussel monitoring was completed. Scientists recommended strategic adjustments to the study design and parameters for trends monitoring.

Effectiveness studies

How well are required or innovative stormwater management practices working?

Four new SAM effectiveness studies began in 2018, bringing the total number of studies funded by SAM to 15 studies. Two more studies are anticipated to start in 2019, obligating all SAM effectiveness study funds.

Source identification projects

What are the common sources of illicit discharges and best ways to reduce them?

Two new source identification projects were started in 2018, feasibility of a regional spill hotline and updates to the illicit connection & illicit discharge manual.

Future studies

What new studies will SAM conduct in the 2019 permit term?

A survey in fall 2018 gathered ideas from permittees and other stakeholders for SAM projects in the next permit cycle.

Program Management



Stormwater Work Group

The Stormwater Work Group (SWG) of the Puget Sound Ecosystem Monitoring Program (PSEMP) is a coalition of representatives of local, state, and federal governments, environmental and business organizations, public ports, tribes, and agriculture. The SWG formed in 2008 to develop a strategic, coordinated and integrated approach to understanding the stormwater problem in western Washington.

The SWG welcomes participation on the work group's subcommittees and caucuses. All meetings are open to the public. See the SWG website: <https://sites.google.com/site/pugetsoundstormwaterworkgroup/>.

What is the connection between SAM and the SWG?

All SAM projects are selected and approved by the SWG. The SWG sets priorities and makes recommendations to support SAM implementation and other stormwater-related monitoring.

Permittees and state and federal agencies provide funding and leadership on SAM projects. Ecology serves as the administrative entity that manages SAM funds and executes SAM contracts.

The Pooled Resources Oversight Committee (PRO-C), a subgroup of SWG, oversees Ecology's administration of SAM and approves all SAM contracting decisions and spending. The PRO-C reviews and approves SAM projects' scopes of work and budgets. In 2018, the PRO-C agreed to provide the oversight role for Lower Columbia urban streams monitoring, a new SAM project beginning in 2020 with decision-making by a different group of regional stakeholders.

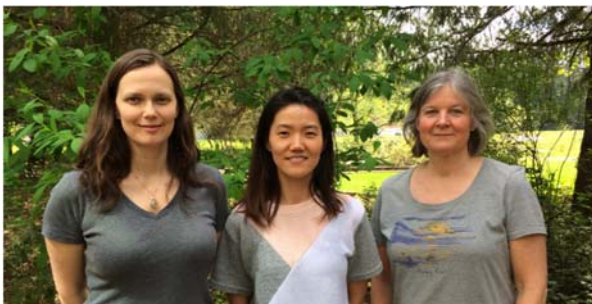
Both the SWG and PRO-C are formal committees whose members represent stakeholder groups.

Oversight

In 2018, Ecology published four quarterly reports and the 2017 Annual Report on implementation of SAM. In 2019, the PRO-C will issue a second "report card" evaluation of Ecology's performance as the SAM administrator.

The PRO-C approves contract scopes of work and amendments for SAM funded projects. The remaining two effectiveness studies that are SWG approved are anticipated to be contracted in 2019. A SWG approved source identification project needs a project leader. Much of 2018 SWG and subgroups worked through the process to identify study topics and questions for a third round of effectiveness studies and new source identification projects. The scientists who lead the SAM receiving water studies and PSEMP freshwater work group and toxics workgroup worked to refine the study design.

Staff



Brandi Lubliner, SAM Coordinator; Keunyea Song, SAM Scientist; and Karen Dinicola, SWG Project Manager

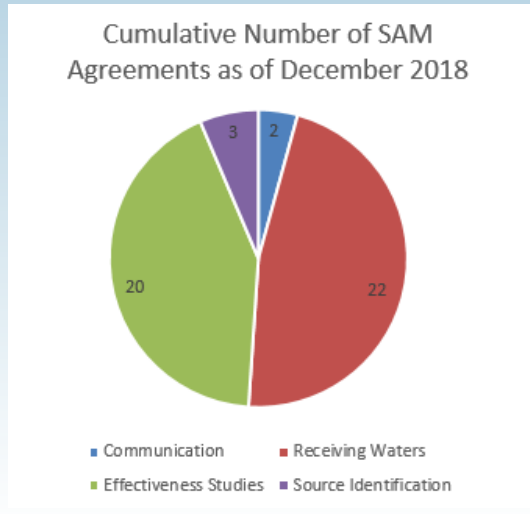
Ecology is committed to the success of SAM and continues to staff the SWG.

The SAM Coordinator and SAM Scientist work with project leads to develop detailed scopes of work for contracting. They review deliverables, approve project invoices, manage cash flow for the three SAM accounts and maintain transparency to permittees and SWG stakeholders. The SWG Project Manager ensures all stakeholders work together to set priorities for studies that will provide meaningful information for stormwater managers.

SAM 2018 Annual Report

Contracts and Agreements

In 2018, 10 more contracting actions took place, bringing the total number of agreements to 47 for SAM projects from program launch in 2014 through the end of 2018.



Budget

Ecology invoiced participants, managed permittees' annual funding contributions toward SAM, and managed payment receipts in [PARIS](#).

A total of \$1,484,405 was spent in 2018 on projects and SAM management. As of December 2018, 88% of the total SAM budget is obligated. PRO-C decided to obligate all of the effectiveness study funds to the Round 2 studies, reserving only funds to get the uncontracted studies contracted.

The budget totals for 2013-2019, including the extension year, are approximately: \$4.2 million for status and trends monitoring in Puget Sound; \$7.4 million for effectiveness studies; and \$790,000 for source identification. Administration costs are estimated to be between 7-8% of the total program. Ecology is committed to the success of SAM and continues to staff the SWG and assist with workshops and symposia.

A workshop in 2019 will narrow the list of SAM study topics for the next permit term, then SWG will decide on a final list.

Communications

Ecology has organized the SAM webpages to provide transparency on overall SAM administration, SAM communications and outreach, the three categories of SAM investigations, and dozens of individual project pages. Many new SAM communication products were in production this year.

On the SAM website, look for:

- ◆ Fact sheets written for stormwater managers about SAM and the findings of completed studies.
- ◆ Newsletters, quarterly reports, and prior annual reports on SAM activities.

The Association of Washington Cities is SAM's partner for communication products. Three new videos, downloadable presentations, a bioretention data story, and more project fact sheets are in production and anticipated early in 2019.

SAM projects were featured in several presentations at the Salish Sea Conference, StormCon, NEBC, and the Chesapeake Bay Restoration Forum.



About 75 people attended the SAM Receiving Waters Symposium on September 13, 2018 to share findings by SAM Staff and study leads of the Puget lowland streams, Puget Sound mussels, and Puget Sound near-shore sediments projects. Presentations covered:

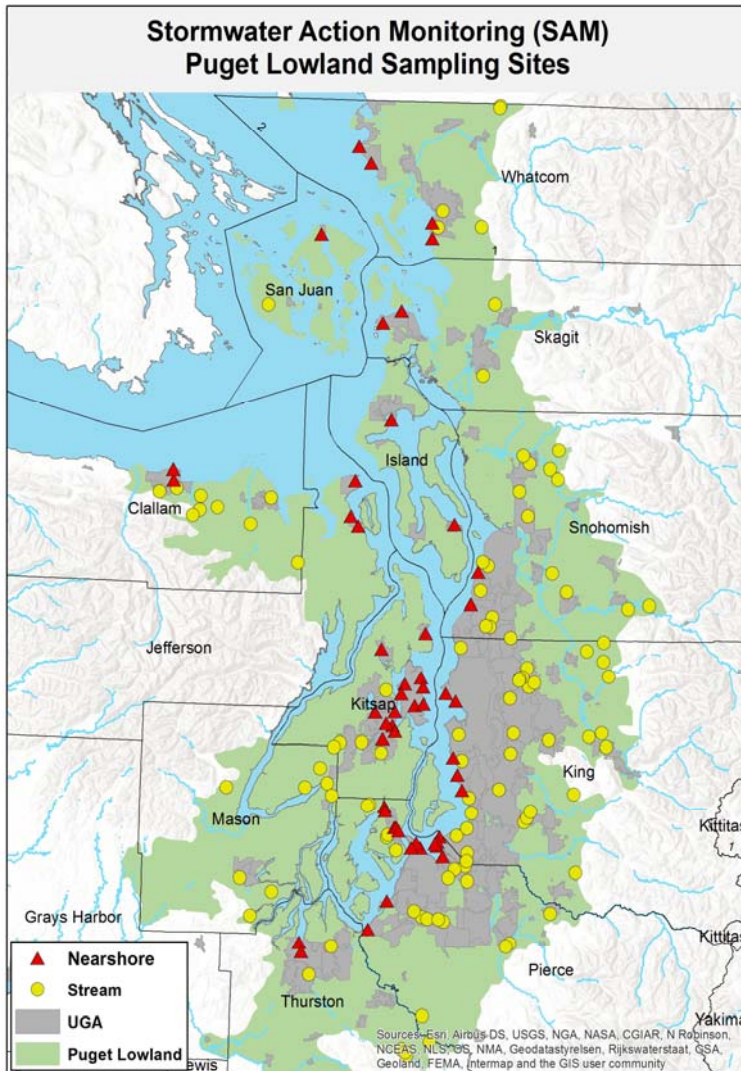
- ◆ Study findings and recommendations
- ◆ Add-on efforts by WDFW and USGS on plastics and emerging contaminants.
- ◆ How to understand the statistical results using cumulative frequency distributions, an important way to show findings across the range of urbanized conditions in our region.

Status & Trends



Receiving Waters in the Puget Sound Region

SAM is monitoring and assessing the impacts of stormwater runoff in urban and urbanizing areas in the Puget Sound nearshore and small stream environments. In 2018, final reports for Puget Sound nearshore sediment and Puget lowland small streams monitoring projects were published, and the second round for the Puget Sound nearshore mussel monitoring was completed.



Mussel contaminant monitoring

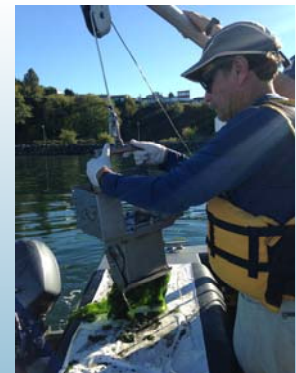
Washington Department of Fish & Wildlife (WDFW) retrieved mussel cages for the second round of monitoring in February 2018 at most of the same 40 randomly selected sites along the Puget Sound urban shoreline. The deployment in fall 2017 was delayed due to red tide, so the mussels spent less time (~85 days) at the study locations compared to 2015-2016 (~104 days). Only one cage was lost this year. Laboratory results for the metals and about half of the organics data were received by the year's end. Preliminary analysis shows increased metals concentrations, despite baseline concentrations being lower this year. The first round report and SAM fact sheet were published in 2018. The second round analysis report is expected in late 2019.



Puget Sound nearshore sediment

Most (95-99%) of the Puget Sound Urban Growth Area (UGA) nearshore sediments had metals and organics concentrations below state marine sediment quality standards. Natural variables related to marine current flow patterns appear to explain the variation in concentrations better than human factors.

The study leads recommended that for future sampling, SAM should select sites where sediment deposition is most likely.



Puget lowland streams

The Puget Lowland Ecoregion Streams 2015 monitoring report and SAM fact sheet were published in early 2018. This is the first regional evaluation of how stormwater runoff from a broad range of urban conditions affects small, wadeable streams; it is the only known effort to focus on areas covered by municipal stormwater permits.

To some degree, urban development negatively influenced most of the stream health indicators such as benthic invertebrate index (B-IBI), water and sediment chemistry, and habitat. The study found that low watershed and riparian canopy cover are the most important stressors to B-IBI at the regional scale. This suggests that canopy cover protection and recovery could lead to substantial improvements in B-IBI scores.



Puget Sound Region Study Design Recommendations

The SAM scientist and SAM status and trends study leads spent 2018 working with the PSEMP Freshwater and Toxics Workgroups to take the scientific findings and recommendations from the first round studies and make recommendations to adjust the receiving water study design. The goals were to increase statistical robustness and efficiency and identify trends sooner. The scientists made recommendations to adjust the design to better answer regional status and trends questions, and to focus on a streamlined “core design” with flexibility to add on studies.

The main proposed adjustments to the Puget Sound region site selection and sampling design are to:



- ◆ Change from selecting sites inside and outside the UGA to using categories of percent impervious surfaces that better represent the full range of urban and urbanizing conditions.
 - ◆ Sample stream conditions every year at fewer sites, rather than 100 sites every five years, to improve trend detection power and capture year-to-year variability.
 - ◆ Drop the monthly water quality sampling, but keep the summer Watershed Health sampling that includes some water quality parameters. SAM will also investigate other timeframes for water quality sampling.
 - ◆ Consider using passive samplers to sample stream water quality parameters and/or alongside nearshore mussels to investigate additional chemical pollutants.
- ◆ Expand the nearshore study area from inside the UGA to the whole Puget Sound nearshore.
 - ◆ Reduce nearshore sediment sampling to once every ten years, and assess drift cell conditions in advance of site selection.

Effectiveness Studies



SAM is measuring the effectiveness of BMPs and management actions to reduce stormwater runoff destructive flow and transport of pollutants to receiving waters. All but two of the SWG-approved studies were contracted by the end of 2018. The scopes of work, amendments, and deliverables are posted to each project's page on the SAM website. Fact sheets summarize findings of each completed study.

Low Impact Development (LID)

- ◆ **Individual tree hydrologic benefit:** Washington Department of Natural Resources is quantifying the hydrologic benefits of retaining trees for stormwater during development. Native evergreen and deciduous trees are being monitored at two locations in Western Washington. The report is expected in 2021.

Bioretention hydrology—early designs

The City of Bellingham finished evaluating the hydrologic performance of ten bioretention facilities in Western Washington and found that “early design” (pre-2012 SWMMWW) bioretention facilities perform well, as modeled, despite the variety of models used. Designers should use site-specific infiltration rates. Plant selection and maintenance could be improved. Inspectors should look for short-circuited flow paths.



- ◆ **Bioretention hydrologic performance—current designs:** the City of Olympia is evaluating the hydrologic performance of ten bioretention facilities designed and built in accordance with the 2012 SWMMWW. The report is expected in late 2019.

Raingarden and bioretention functional assessment protocol

The City of Puyallup, Stewardship Partners, and WSU Extension staff completed the layperson protocol to assess western Washington raingarden and bioretention facilities for function and health. Metrics include plant health, hydrologic indicators, maintenance needs, and aesthetics. Stormwater managers can have staff or volunteers implement the protocol to identify maintenance needs.



- ◆ **Bioretention amendment with fungi and plants:** U.S. Fish & Wildlife Service (USFWS) and Washington State University (WSU) are monitoring performance of bioretention mesocosms with fungal amendments. The report is expected in 2020
- ◆ **Bioretention reduction of PCBs:** King County's study of bioretention treatment and sequestration of poly-chlorinated biphenyls is using the fungi amendment study mesocosms. The report is expected in 2019.
- ◆ **Longevity of bioretention soil mix for toxicity reduction:** USFWS and WSU aim to learn how long bioretention treatment of toxicity lasts. This study will test ten water year volumes passed through the bioretention soil media mesocosms over a two-year period. The report is expected in 2020.
- ◆ **Alternative blends for the bioretention soil media:** King County is working to identify a mixture that exports low to no phosphorus, for use in bioretention facilities. The report is expected in 2020.

Retrofits



- ◆ **Watershed scale retrofit and restoration:** the City of Redmond is actively monitoring at seven sites in a paired watershed design. This watershed-scale study will continue for several more years. An interim report is expected in late 2019.
- ◆ **Oyster shell retrofits in catch basins:** King County is evaluating the effectiveness of dissolved metals treatment using crushed oyster shells added to catch basins on Mercer Island. The report is expected in 2022.

Operation and Maintenance

Catch basin cleaning effectiveness

King County published this report in 2018. The study could not completely meet its goal to identify key factors for predicting maintenance needs. From the limited number of permittees' records analyzed, it appears that, usually, over 80% of catch basins do not require more cleaning than the standard inspection schedules required by the permits. Jurisdictions should consider using digital records and examine alternative schedules for cost efficiencies.



Photo credit: WSDOT

Regional retrofit effectiveness

King County evaluated individual BMPs (bioretention and wetland complex) and the entire regional facility retrofit for stormwater treatment and flow control effectiveness. Flow control improved. Water quality treatment results varied for each BMP and was successful for some targeted pollutants but not others. The retrofitted facility reduced total suspended solids, organic contaminants, and total metals (zinc, lead, copper and cadmium), but increased concentrations of nutrients and dissolved lead. The bioretention was installed with 24" of soil rather than 18" and was a source of nutrients. Turbidity improved in the creek below the facility after the retrofit, though the reduction was not statistically significant. No changes were observed in the benthic community; it is likely too early to detect a change in the creek.

Source Identification

SAM source identification projects identify common problems and propose regional actions on source control to prevent transport of pollutants in stormwater.



- ◆ **Illicit Connection and Illicit Discharge (IC/ID) Manual Update:** King County is updating methods to detect, identify, and trace sources of pollutants in stormwater. Two workshops will be held in early 2019 to identify new techniques and gaps. Eight trainings on the IC/ID manual and updates will be scheduled in 2019. The report is expected in 2020.
- ◆ **Regional Spill Hotline Feasibility:** King County is investigating alternatives for and feasibility of a regional or statewide single reporting hotline for spills to stormwater systems. The report and recommendations are expected in 2020.

Activities Anticipated in 2019

Communications

Three new videos, a booklet of findings from SAM studies completed during this permit term, and a presentation for stormwater managers are being developed for audiences such as stakeholders and elected officials.

More projects will get started in 2019

Contract scopes of work will be developed in 2019 for the last two SWG-approved effectiveness studies, investigating mulch choices for bioretention and orifice control for bioretention.

New permit term and another SAM study solicitation round

The SWG spent much of 2018 identifying new priority questions and topics for SAM projects to be funded by permittees' SAM funding contributions during the 2019-2024 permit term. Ideas and feedback from permittees, other stakeholders, and technical subgroups gathered in 2018 will inform the SWG's final list of topics.

A SAM Priorities Workshop will be held in February 2019 for permittees and stakeholders to narrow the large list of possible topics for SAM studies in the next municipal permit cycle. Workshop participants will also confirm study design adjustments and priorities for SAM receiving water monitoring. The SWG will make final recommendations in June 2019.

The request for proposals is anticipated to go out in the winter of 2019-2020. After reviewing proposals, the SWG will host a workshop and conduct a survey to select studies for SWG approval.

Get involved!

SWG welcomes participation in its caucuses and subgroups. All SWG and PRO-C meetings are open to the public.

Special accommodations

To request materials in a format for the visually impaired, visit <https://ecology.wa.gov/accessibility>, or call Ecology at 360-407-6600, Relay Service 711, or TTY 877-833-6341.



SAM Symposium — June 2017

Contact information

Brandi Lubliner
SAM Coordinator
(360) 407-7140
brandi.lubliner@ecy.wa.gov

Keunyea Song
SAM Scientist
(360) 407-6158
keunyea.song@ecy.wa.gov

Karen Dinicola
SWG Project Manager
(360) 407-6550
karen.dinicola@ecy.wa.gov

SAM is funded by:

Cities: Aberdeen, Algona, Anacortes, Arlington, Auburn, Bainbridge Island, Battle Ground, Bellevue, Bellingham, Black Diamond, Bonney Lake, Bothell, Bremerton, Brier, Buckley, Burién, Burlington, Camas, Centralia, Clyde Hill, Covington, Des Moines, DuPont, Duvall, Edgewood, Edmonds, Enumclaw, Everett, Federal Way, Ferndale, Fife, Fircrest, Gig Harbor, Granite Falls, Issaquah, Kelso, Kenmore, Kent, Kirkland, Lacey, Lake Forest Park, Lake Stevens, Lakewood, Longview, Lynnwood, Maple Valley, Marysville, Medina, Mercer Island, Mill Creek, Milton, Monroe, Mount Vernon, Mountlake Terrace, Mukilteo, Newcastle, Normandy Park, Oak Harbor, Olympia, Orting, Pacific, Port Angeles, Port Orchard, Poulsbo, Puyallup, Redmond, Renton, Sammamish, SeaTac, Seattle, Sedro-Woolley, Shoreline, Snohomish, Steilacoom, Sumner, Tacoma, Tukwila, Tumwater, University Place, Vancouver, Washougal, Woodinville. **Counties:** Clark, Cowlitz, King, Kitsap, Pierce, Skagit, Snohomish, Thurston, Whatcom. **Ports:** Tacoma and Seattle. **State:** Washington Department of Transportation, Washington Department of Ecology, Washington Department of Agriculture, Washington Department of Fish and Wildlife. **Federal:** United States Geological Survey. **Business:** Penn Cove Shellfish, Cedar Grove.