Stormwater Action Monitoring

Project Title

SAM Receiving Water Studies Synthesis

Receiving Waters

Lead Entity

SAM Staff

Partners

U.S. Geological Survey, King County, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Puget Sound Partnership, and Washington State Department of Ecology

Collectively improving stormwater management

Stormwater Action Monitoring (SAM) is a collaborative, regional stormwater monitoring program that is funded by more than 90 Western Washington cities and counties, the ports of Seattle and Tacoma, and the Washington State Department of Transportation. SAM's goal is to improve stormwater management to 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 actions.

Questions about SAM? Send an email to SAMinfo@ecy.wa.gov

Study goals

The overarching goals of SAM receiving water studies are to:

- Help us better understand the impacts of stormwater on water quality and biota, and
- Tell us whether receiving water conditions across the region are getting better or worse.

The purposes of synthesizing the first round SAM receiving water studies are to share key findings with stormwater managers and guide the design of future trends monitoring and other SAM studies.



Stormwater management problem

The stormwater problem has been well understood for decades, but before SAM we did not have a monitoring program to objectively measure at the regional scale whether or not our collective management approaches are reversing past damage to receiving waters and preventing new impairments. Local governments are investing increasing amounts of funding and staff time in municipal stormwater permit-required management activities. Many areas of the permit provide flexibility for implementation of stormwater management programs. The region needs sound science to help set priorities and establish reasonable recovery goals.

Project findings

Three regional receiving water studies were conducted in 2015-2016 at randomly selected sites. The largest study, Puget Lowland Ecoregion Streams, sampled both within and outside of Urban Growth Areas (UGAs) for water quality monthly at 60 sites and one summertime sampling of fine sediments, algae (periphyton), and benthic invertebrates at 120 sites. The two urban Puget Sound nearshore studies evaluated sediment quality and mussel tissue bioaccumulation at 40 sites along UGA shorelines. Clean aquaculture-sourced mussels were deployed in cages as sampling devices for 3 months. Nearshore sediment samples were collected from a boat at about one fathom depth at most of the same locations as the mussel sampling.

The streams and mussel studies identified key environmental health indicators that correlate strongly with urban development. Overall, conditions were predictably worst in the most urbanized settings. Most of the variation in chemical concentrations in sediment along the shoreline is explained by the natural variable of drift governing sediment transport and deposition. In streams, watershed canopy cover explained most of the health of benthic invertebrate communities, even more so than riparian canopy, the urban development coverage in the watershed, or pollutant concentrations in the sediment.

In the nearshore, concentrations of organic contaminants (PAHs, PCBs, PBDEs, and DDTs) in mussels along city shorelines were consistently higher than in the unincorporated areas of the UGA shoreline and highly correlated with impervious surface at the watershed scale.

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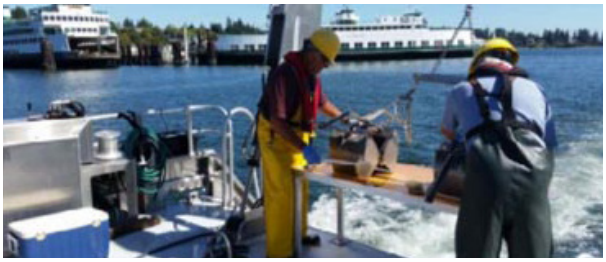
A fourth regional study of fecal indicator bacteria in the Puget Sound nearshore was initially planned but deemed too expensive. Instead, bacteria data were compiled from existing programs. The 27 entities that contributed nearshore bacteria data conduct monitoring for a variety of program goals. The SAM study findings were driven by differences in study designs and approaches to bacteria sampling.

Recommendations

Future SAM receiving water monitoring should improve our understanding of key development- and stormwater-related stressors. Studies should also give insight into long-term trends, guiding stormwater management program activities and priorities across the entire spectrum of urban conditions. Least-impacted sites are needed for the nearshore framework for comparison of the results when established criteria are unavailable. The next rounds of SAM studies should focus on continued use of mussels and conducting stream sampling frequently. Nearshore sediment sampling should be less frequent, after ten years. A stormwater focused bacteria effort would be better scaled as an effectiveness or source control study. Results and lessons learned from the first round studies should be used to update the sampling design to efficiently detect trends sooner, and better match the SAM funding source.



Why does this study matter?

Stormwater runoff continues to produce destructive flows and deliver bacteria, nutrients, soil particles, and toxic contaminants to receiving waters. These studies provide the means for tracking our region's progress reducing stormwater impacts on environmental health. SAM's status and trends monitoring in receiving waters was undertaken due to the strong desire of elected officials to know whether combined state and local investments of hundreds of millions of dollars each year to fund stormwater management programs, activities, and capital projects are working to protect and recover conditions in streams and nearshore environments. In 2015-2018, SAM receiving water assessments established regional baseline conditions for assessing future trends and answering this question.



What should we do with this information?

Stormwater managers should review the key findings of each first round status and trends study, determine what combinations of the key stressors are present in their jurisdictions, and then consider adjusting their management programs to address these stressors. Permittees should use the SAM findings to understand their own receiving waters in a regional perspective. In the absence of local monitoring, SAM's results for streams and shorelines with similar watershed characteristics can provide useful information for targeting local stormwater management actions.

What will Ecology do with this information?

Ecology will use this objective regional information to evaluate the efficacy of the overall permitting program over time in slowing or reversing the decline in receiving water conditions caused by stormwater from existing and new development. Ecology can use SAM's assessments of receiving water conditions in areas covered by the municipal stormwater permits to prioritize stormwater grant funding. Ecology will relay these findings to the new urban stream monitoring program beginning soon in the Lower Columbia region of western Washington.

For more information

See the SAM Status and Trends website at ecology.wa.gov/SAM

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