Stormwater Action Monitoring

Project Title

Status and Trends Study of Puget Lowland Ecoregion Streams: Evaluation of the First Year (2015) of Monitoring Data

Receiving Waters

Lead Entity

King County

Partners

U.S. Geological Survey

Washington Department of Ecology

Skagit County

San Juan Conservation District

Puget Sound Partnership

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

This study will monitor how the health of streams change over time in urban, urbanizing, and rural areas of the Puget Lowlands. The study is looking at the full range of urban development conditions to track how stormwater runoff affects small, wadeable streams. In 2015, the first round of monitoring evaluated the condition of streams both within urban growth areas (UGAs) and outside UGAs. The study questions are:

- What is the status of Puget Lowland ecoregion stream health within and outside UGAs?
- What percent of wadeable streams are in "poor" and "good" condition within and outside UGAs in comparison to least-disturbed reference site conditions in the region?
- What are the major natural and human stressors that impact stream health?

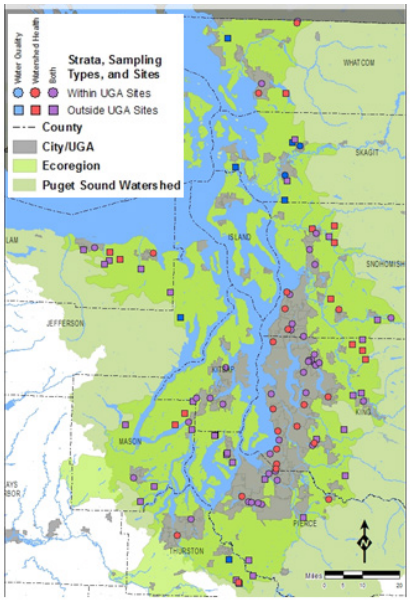

Figure 1. Puget Lowland Ecoregion small streams sampling locations.

Stormwater management problem

Stormwater runoff from urban and urbanizing areas causes the majority of habitat and water quality degradation in small streams. Local jurisdictions throughout Puget Sound are increasing their stormwater management efforts to reduce flow volumes and pollutants. This is the first regional evaluation of stream health that focuses on areas covered by municipal stormwater permits. Stormwater managers and policymakers need a better understanding of the most influential stressors on biological health in order to identify the most promising solutions. Over time, we believe that permittees' collective stormwater management efforts will result in detectible stream quality improvements.

Project findings

The study randomly selected and monitored 105 sites (Figure 1) to represent the total 1,668 miles or 2,685 kilometers of wadeable streams in the Puget Lowland ecoregion. The study evaluated stream health using biological measures, water and sediment chemistry, and physical habitat conditions in streams and watersheds. A benthic invertebrate index of biotic integrity (B-IBI) is a comprehensive indicator of stream biological health.

Urban development negatively influenced nearly

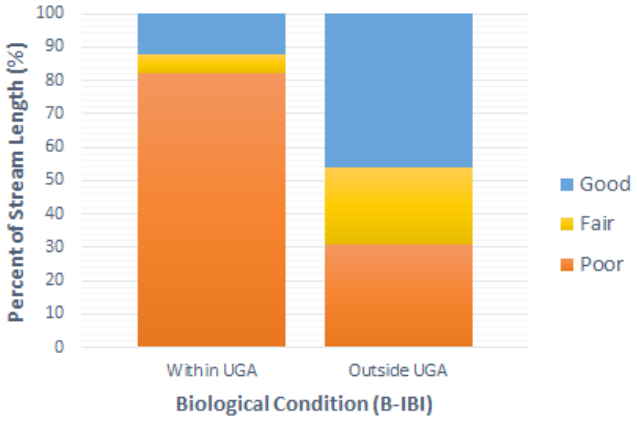

Figure 2. Percentage of total Puget Sound Lowland Ecoregion wadeable stream length in good, fair, and poor condition inside and outside of Urban Growth Areas (UGAs).

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all of the stream health indicators (B-IBI, water and sediment chemistry, habitat and landscape metrics). While 69% of the stream length outside UGAs was in good to fair conditions for B-IBI, 82% of the length within UGAs was in poor condition (Figure 2).

Key stressors driving poor B-IBI scores included landscape-scale watershed characteristics, physical habitat, nutrients, sediment zinc, and stream substrate characteristics (Table 1). 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 (reducing impervious surface) could lead to substantial improvements in B-IBI scores.

Recommendations

Stormwater managers should review Table 1, determine what combinations of the key stressors are present in their jurisdictions, and then consider adjusting their management programs to address these stressors.

Regional scale monitoring with spatially balanced sampling is a cost-effective way to evaluate unbiased status and trends in the ecoregion. SAM will continue to gather long-term status and trend data in the region. We will modify the monitoring design based on current study findings and scientific recommendations to emphasize understanding of status and trends in stream conditions. Continued monitoring of least-disturbed reference conditions will help establish reasonable expectations for good and poor biological conditions and help identify important stressors.

Stream Health Category	Significant regional stressors to address to improve B-IBI scores
Watershed scale land cover	• Watershed Canopy Cover • Riparian Canopy Cover • Percent of Urban development
Water	• Total Nitrogen • Total Phosphorus*
Sediment	• Total Zinc* • Substrate Embeddedness* • Substrate Particle Diameter*

Table 1. List of the most important stressors identified for B-IBI for each category of stream health indicators.

** These parameters are important stressors to B-IBI (per the relative risk analysis) but were not found significant at the regional scale.*

Why does this study matter?

With this regional-scale monitoring program, we are improving our understanding of the effects of urbanization and influences of stormwater management efforts on stream health across Puget Sound. Over time, this stream monitoring will tell us whether our overall management strategies, including stormwater management, are improving stream health. More specific studies, in particular, effectiveness studies complementing this monitoring, will help inform how stormwater management contributes to overall improvements in stream health.

What should we do with this information?

Stormwater managers should consider the findings of this study and compare their local monitoring data to the regional data set. In the absence of local monitoring, the results for streams with similar watershed characteristics sampled in this study can provide useful information for targeting stormwater management actions. Permittees can use this knowledge, coupled with findings of effectiveness studies, to help prioritize and implement stormwater runoff management practices in their jurisdictions. Every stormwater manager should consider how to incorporate the protection and restoration of canopy cover in riparian areas and throughout the watershed as part of their efforts to improve B-IBI scores in local streams.

What will Ecology do with this information?

Ecology needs this objective regional information to evaluate whether or not the overall permitting program is slowing or reversing the decline in receiving water conditions caused by stormwater from existing and new development. Ecology can also use the study findings about conditions of streams in areas covered by the municipal stormwater permits to prioritize stormwater grant funding in western Washington.

For more information

Go to ecology.wa.gov/SAM and search for "SAM streams."

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