

Prepared for Ecology on behalf of the Stormwater Workgroup by City of Redmond with additional financial support from King County Wastewater Treatment Division & Ecology

Study Highlights

- The City of Redmond tested whether more frequent street sweeping can reduce certain roadway pollutants, including Total Suspended Solids (TSS), copper, 6PPD-quinone (6PPDQ) and polycyclic aromatic hydrocarbons (PAHs).
- Street sweeping helps most when roads drain right to streams and where the City can sweep most of the roads. In places where road runoff doesn't reach the creek directly or where many roads are private and not swept, the benefits are much harder to see.

Goal & Background

Ideally, if all developed land in a watershed is equipped with nonstructural and structural stormwater controls, the receiving water would be protected from impacts caused by urbanization. While the effectiveness of stormwater controls has been well documented at the site scale, we have less information about how they perform in aggregate at the watershed scale. To understand whether stormwater controls improve stream conditions at a watershed scale, the City of Redmond (City) launched the Redmond Paired Watershed Study (RPWS) with support from Stormwater Action Monitoring (SAM).

The City created a Watershed Management Plan in 2014 coordinating stormwater efforts across the city. Under this plan, the City is focusing improvements in a handful of priority watersheds where changes in stream health may show up more quickly. The goal of the Redmond Paired Watershed Study (RPWS) is to evaluate the effectiveness of the following rehabilitation efforts for improving receiving water conditions at the watershed scale:

- Stormwater retrofits in upland areas including best management practices for onsite stormwater runoff treatment and flow control.
- Riparian and in-stream habitat improvements.
- Programmatic practices for stormwater management (e.g., more frequent street sweeping).

For more background on the RPWS, see [SAM Fact Sheet #6: Redmond Paired Watershed Study – Status Update](#)

Project Findings

The RPWS has two types of monitoring with related but different goals:

- **Status and Trends Monitoring:** Long-term tracking of stream health indicators such as flow, chemistry, habitat, and biology to quantify improvements in response to watershed rehabilitation efforts.
- **Effectiveness Monitoring:** Short-term evaluations of specific stormwater efforts like stormwater pond retrofits and street sweeping, to see how well they improve receiving water conditions.

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.

Earlier monitoring from water year (WY) 2017 through WY2019 suggested that increasing street sweeping in Monticello Creek watershed helped reduce pollutants like TSS and particulate copper concentrations. These results were consistent with another study that was implemented by the City of Seattle over a period extending from 2014 to 2016.

To validate the effectiveness of street sweeping, the City progressively increased street sweeping in the Tosh Creek watershed from once per quarter to once per month in WY2023 and then to twice per month in WY2024. City staff swept all public roads (3.54 miles) in the Tosh Creek watershed within Redmond city limits. Country Creek watershed was used as a comparison and continued quarterly sweeping.

Two additional parameters were added to the monitoring list – 6PPDQ and PAHs—to evaluate whether street sweeping can be effective at removing these roadway pollutants, in addition to TSS and particulate copper. The augmented monitoring was performed in both Tosh Creek and Country Creek.

Both creeks saw small improvements, but the study could not link those improvements to increased sweeping in Tosh Creek. No trends were detected for 6PPDQ or PAHs.

Key reasons sweeping impacts were hard to detect:

- **Lower street-to-stream connectivity:** The Tosh Creek watershed has 0.8 outfalls per 1,000 feet of creek compared to the Monticello watershed with 3.5 outfalls per 1,000 feet of creek.
- **More private roads:** Many roads and parking lots are privately owned and not included in the street sweeping program.

Previous studies have shown that street sweeping can improve water quality where swept surfaces are hydrologically well connected to monitored outfalls or streams. In settings such as Tosh Creek, where that connection is weaker, the benefits of sweeping may not be detectable at instream monitoring locations despite measurable decreases in roadway pollutant sources. The findings of this study show that municipalities wanting to use street sweeping to improve water quality should focus efforts in watersheds that have a high street-to-stream connectivity and a high percentage of public roads or establish agreements to include privately owned roads and parking areas in the sweeping program.

Recommendations

Street sweeping provides several benefits, including removing trash and roadway debris. This study provides information that will help stormwater managers prioritize street sweeping efforts for improving receiving water quality. This would specifically include street sweeping of road segments that discharge directly to nearby streams via pipes or ditches.

Why does this study matter?

Ecological function in Puget Sound lowland streams is impaired to a large degree by outdated development practices and a lack of adequate post-construction controls for preventing adverse impacts from stormwater runoff. Information on the level of stormwater retrofit, efficacy of programmatic practices, and stream rehabilitation required to restore ecological function in these areas is essential for guiding policies and programs on stormwater and receiving water management.

What should stormwater managers do with this information?

Stormwater managers should use this information to develop more effective street sweeping programs if a primary goal is to reduce impacts from common pollutants in roadway runoff that may discharge to nearby streams.

What will Ecology do with this information?

Ecology will continue to fund stormwater infrastructure retrofits and other restoration and recovery efforts – particularly those identified and prioritized through science-based planning efforts. Ecology may determine that changes to municipal stormwater permit requirements are needed to meet Clean Water Act goals of protecting and restoring beneficial uses in receiving waters.

For more information, including the interim reports, see the website at ecology.wa.gov/sam

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