



Nearshore sediment microplastic monitoring for the Stormwater Action Monitoring (SAM) program, Puget Sound, Western Washington

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<https://ecology.wa.gov/sam>

Plastic pollution is a well-recognized issue afflicting water bodies worldwide. Plastics smaller than 5 mm commonly referred to as microplastics are of concern as their near ubiquitous occurrence in water, sediment, and biota poses a potential danger to biota through ingestion (Jovanović 2017) and as a potential vector for contaminant transfer (Hartmann et al. 2017). Currently, little is known about the distribution of these microplastics in Puget Sound Sediment. To address this gap, USGS scientists conducted a pilot project to determine the occurrence of microplastics in marine sediment samples collected as part of Washington State Department of Ecology's Stormwater Action Monitoring Program (SAM). Sampling locations were chosen to represent a range of nearshore land use, urbanization, and sediment drift characteristics. Collection coincided with contaminant chemical characterization for which field and laboratory methods, sampling location details, and full results are detailed in Black et al. (2018).

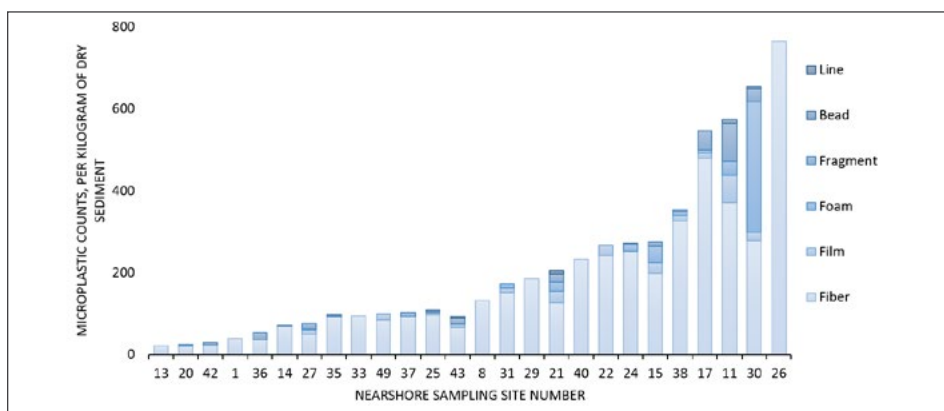
Microplastics were detected in sediments from all 25 sampled nearshore locations. Microplastics are separated into two size fractions, 355 μ m-1000 μ m and >1000

μ m, and sorted by type (e.g., Fiber, Films, or Fragments). Total microplastic concentrations ranged from 22 to 654 pieces per kilogram of dry sediment. Fibers were the most commonly found and were 270 percent more abundant than any other type. Smaller sized plastics, 355 μ m -1000 μ m, were 300 percent more abundant than larger pieces. No statistical differences were observed among sampling locations, non-fiber pieces were higher in lower-energy drift cells (those characterized as "non") versus higher energy drift cells. The median densities of both large and small fibers were higher in "non" drift cells, yet fiber densities in active drift cells were more variable. As with chemical concentrations found concurrent in nearshore sediment, the number of plastic particles in sediment was poorly related to land cover. These findings should be evaluated with care, given the preliminary nature of microplastic sample collection and laboratory analysis methods.

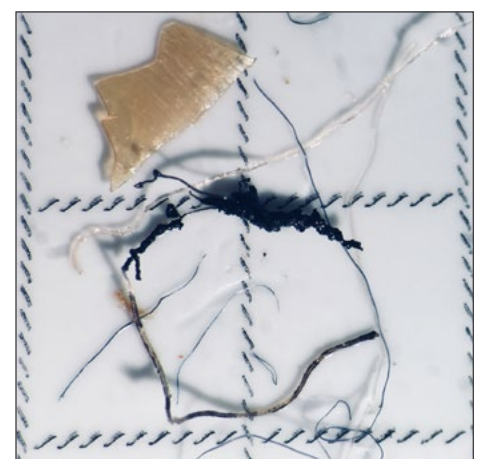
Microplastics are composed of numerous types of polymers of different shapes, sizes and densities. These features could have a profound effect on transport and deposition in aquatic environments. Thus it was not surprising to find a broad distribution

- **Microplastic pollution in Puget Sound nearshore sediment is ubiquitous, found in all 25 samples analyzed.**
- **Microplastic fibers, such as polyester from clothing, was 300 percent more common than other types of microplastics found.**

of microplastic densities among the sites examined in this study. Previous studies have shown that microplastics in sediments tend to settle out more readily in areas of low energy such as bays and harbors (Vianello et al., 2013). Although the median densities of plastics, particularly non-fibers, at sites located in drift cells with no movement were often slightly higher than at sites in actively moving drift cells, the difference was not significant. Microplastic fibers tended to have the greatest range in densities in drift cells characterized as moving from Left to Right or Right to Left, whereas non-fibers consistently had greater density variations in drift cells with no movement. These contradictory results seem to highlight the potential variability in microplastic transport based on the shape of microplastics in Puget Sound.



Microplastic counts in nearshore sediment from the Puget Sound collected as part of the Stormwater Action Monitoring program. Counts are per kilogram of sediment (dry-weight). Categories of plastics are based on visual assessment. Site numbers correspond to locations sampled during 2016; location details can be found in Black et al. 2018 (<https://doi.org/10.3133/sir20185076>).



An assortment of microplastics in a nearshore sediment sample. Photo: Spanjer, Andrew

RECOMMENDED CITATION

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