PRELIMINARY: 2025 Analysis of Total Organic Content and Particle Size in Bed Sediments of the Salish Sea

Sierra Coleman, Sonam Sherpa, Clara Wessells; Faculty Member: Julie Masura

Introduction

This work is continuing research at the University of Washington Tacoma as part of the Puget Sound Ecosystem Monitoring Program (PSEMP). Total organic content (TOC) describes the amount of organic content in sediment and particle size analysis (PSA) tells us the grain size of the sediment. Previous studies have found relationships between particle size and organic content, with finer sediments being related to higher TOC (Cui et al. 2025). This work examined the relationship between TOC and particle size in 2025 Salish Sea's Puget Sound sediment samples collected by the Washington State Department of Ecology.

Purpose of Study

The purpose of this study was to analyze TOC concentrations and particle size distributions in sediment samples collected from multiple locations in the Puget Sound during the 2025 sampling period. TOC and PSA measurements were compared among sampling stations to examine the relationship between organic content & particle size and to identify spatial & temporal patterns.

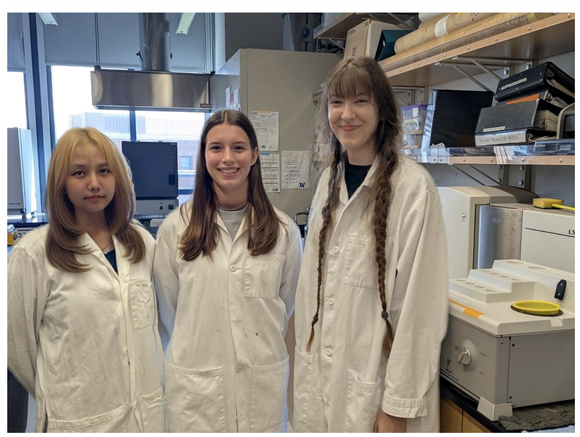

Figure 1. Sonam Sherpa, Clara Wessells, and Sierra Coleman in front of the LS 13 320 Particle Size Analyzer

Methods

Sampling

- Collected using van Veen grab sampler
- Transported on ice
- Stored in the dark at 4°C at UW Tacoma

Total Organic Content (TOC)

- Subsampled 5 mL of sediment
- Weighed to determine wet mass
- Dried at 105°C for 5 hours
- Weighed to determine dry
- Burned at 650°C for 8 hours to combust organic material
- Weighed to determine mass of carbon
- TOC calculated

$$\frac{weight\ of\ carbon}{(wet\ or\ dry)\ sample\ weight} \times 100\%$$

Particle Size (PSA)

- Subsampled ¼ tsp sediment
- Mixed with water to homogenize the sample
- Analyzed at least twice using an LS 13 320 Particle Size Analyzer
- Added sediment suspension until 8–12% obscuration
- Produced a particle-size distribution histogram and statistical results

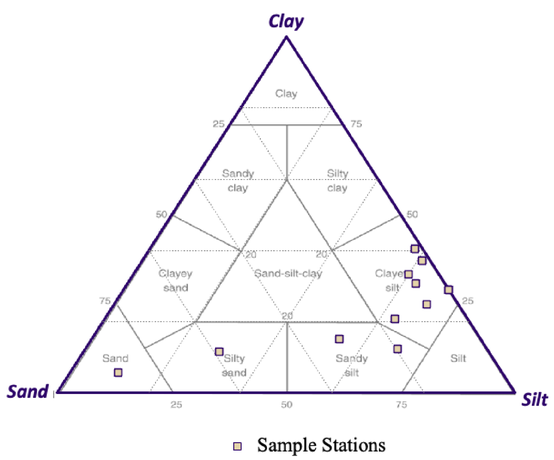

Figure 2. Ternary Plot of PSEMP 2025 PSA results with Shepard (1954) underlay

Results

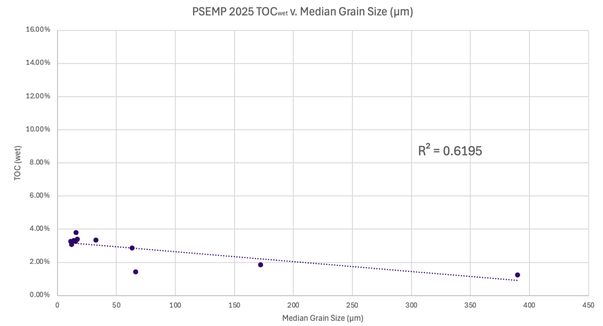

Figure 3. Linear regression of TOC_{wet} (%) v. Median Grain Size (µm)

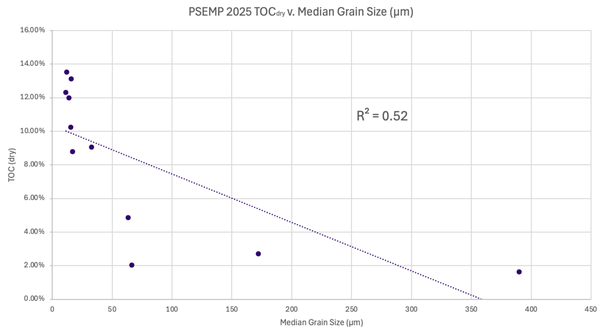

Figure 4. Linear regression of TOC_{dry} (%) v. Median Grain Size (µm)

Summary

- Median sediment grain size 11-390 µm
- 82% of samples characterized as clayey silt or sandy silt
- TOC_{wet} 1.25-4.16%
- TOC_{dry} 1.63-16.59%
- Moderate correlation between median grain size and $TOC_{wet/dry}$

Research Significance

- The Salish Sea encompasses many urbanized and human-impacted areas, making it important to understand how sediments vary throughout
- Examining the relationship between TOC and particle size supports continued monitoring of Puget Sound health

Future Work

Future work should focus on conducting more tests on the relationship between TOC and particle size. Different sediment sizes could also be compared with TOC to identify which grain sizes are most strongly related to organic content accumulation. Future work could compare sediment depth to TOC and particle size. If future sampling is conducted, sampling at the same location, but at different depths could help determine if sediment depth is related to TOC or particle size.

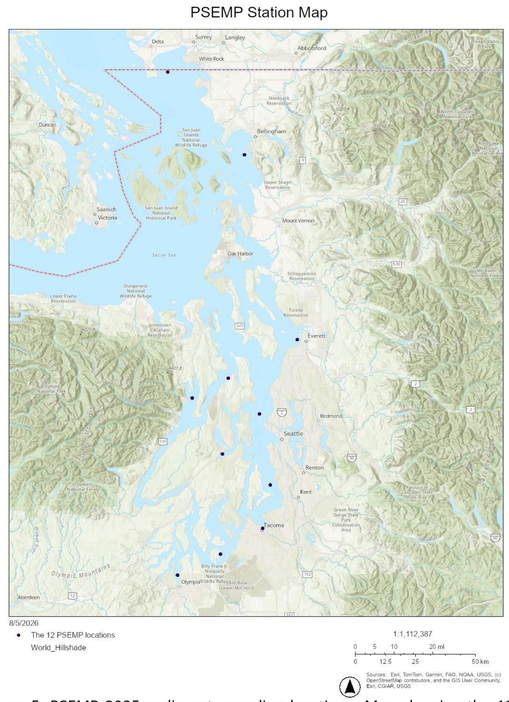

Figure 5. PSEMP 2025 sediment sampling locations. Map showing the 12 sampling locations where sediment was collected for analysis.

References