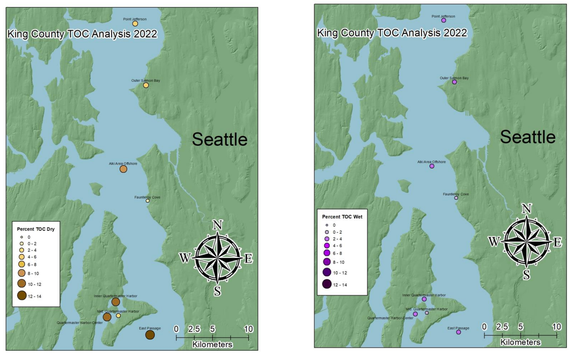
2022 King County Total Organic Content and Particle-Size Analysis in Bed Sediments

Margo Johnson, Irene Forati, Julie Masura (mentor)

Introduction

Benthic sediment samples were collected in the King County region of the Puget Sound by the King County Sediment Monitoring Team and were analyzed for grain-size and total organic content by students completing a summer research experience course at University of Washington Tacoma. The data collected can be correlated to various environmental factors such as: amount of aquatic life, storms, and dumping.

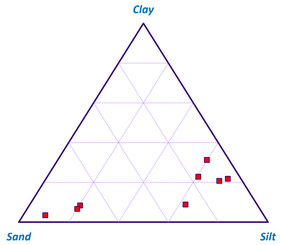


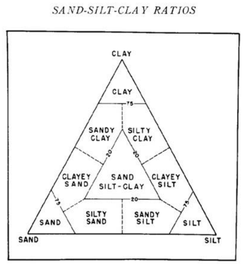
Maps for the stations where the samples were collected and the corresponding

Weighing burned samples

Purpose

The purpose of this study is to investigate the correlation between TOC and grain size, and between the other projects. TOC will help identify the carbon content in the sediments. PSA will help determine the grain size of the sediment.





(Left) Ternary plot for sample sediment compositions. This plot gives us a brief overview of the particle sizes. (Right) Naming system for sediments based on sand-silt-clay ratios (Shepard 1954).

Methods

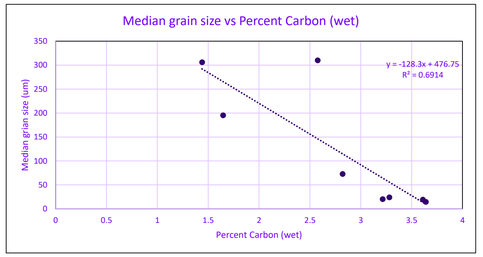
TOC

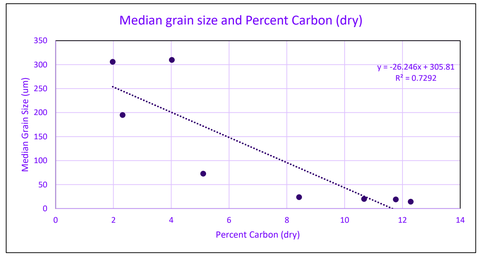
- 5 ml of sediment was placed in the crucible and the weighed.
- Samples were dried in the oven at 105 degrees Celsius for 5 hours.
- Once cool, samples were weighed again.
- Samples were heated for 8 hours at 650 degrees Celsius to burn off the organic material and cooled overnight.
- Crucibles were weighed with the burned samples and the weight of carbon that was burned off was determined.
- Percent of carbon was determined by dividing the weight of the carbon by both the dry and wet weights and multiplied by one hundred.

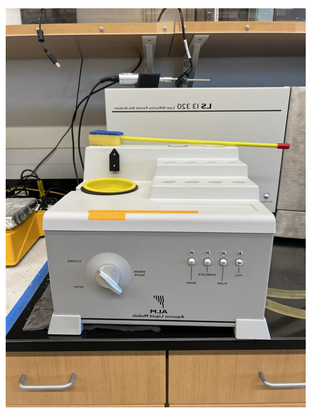
$$\frac{weight\ of\ carbon}{(wet\ or\ dry)\ weight} \times 100\%$$

PSA

- Sediment was mixed to get an unbiased sample, and ½ a teaspoon of the sediment was added into a beaker with water. Particles > 2mm were not added.
- Sample was completely suspended in water and added to the particle size analyzer.
- Analysis was started and samples were added until obscuration reached 8-10 %.







Particle Size Analyzer (PSA) Beckman Coulter. This instrument was used to determine the composition of particle sizes and to correlation with the total organic content.

Results

- Higher TOC (both wet and dry) correlated to finer grain sizes in both wet and dry sediment samples
- Percent of carbon for dry sediment samples ranged from 1.975% to 12.288%
- Percent of carbon for wet sediment samples ranged from 1.439% to 3.640%
- Median grain sizes ranged from 14.59 µm to 334.1 µm
- 5 samples are classified as clayey silt, 1 is sandy silt, 2 are silty sand, and 1 is sand

Research Significance

This research is important because learning about particle sizes and how they affect the ecosystem will help for better understanding on how to maintain the aquatic environment. The more the particle sizes increase the more it influences aquatic life. For example: an increase in particle sizes can negatively affect how aquatic fauna breathe, grow and create shelter. A study done by Secriru and Oaie found that higher percentages of TOC is strongly dependent on grain sizes less than 16 micrometers (Secrieru and Oaie 2009). This could explain why the samples all had a relatively low percentage of carbon.

TOC is important because it gives a wider range of information. For one it demonstrates how much organic pollution is being added to the environment and helps determine how much oxygen is being consumed. It also identifies organic waste in the water (McLachlan1996).

References