

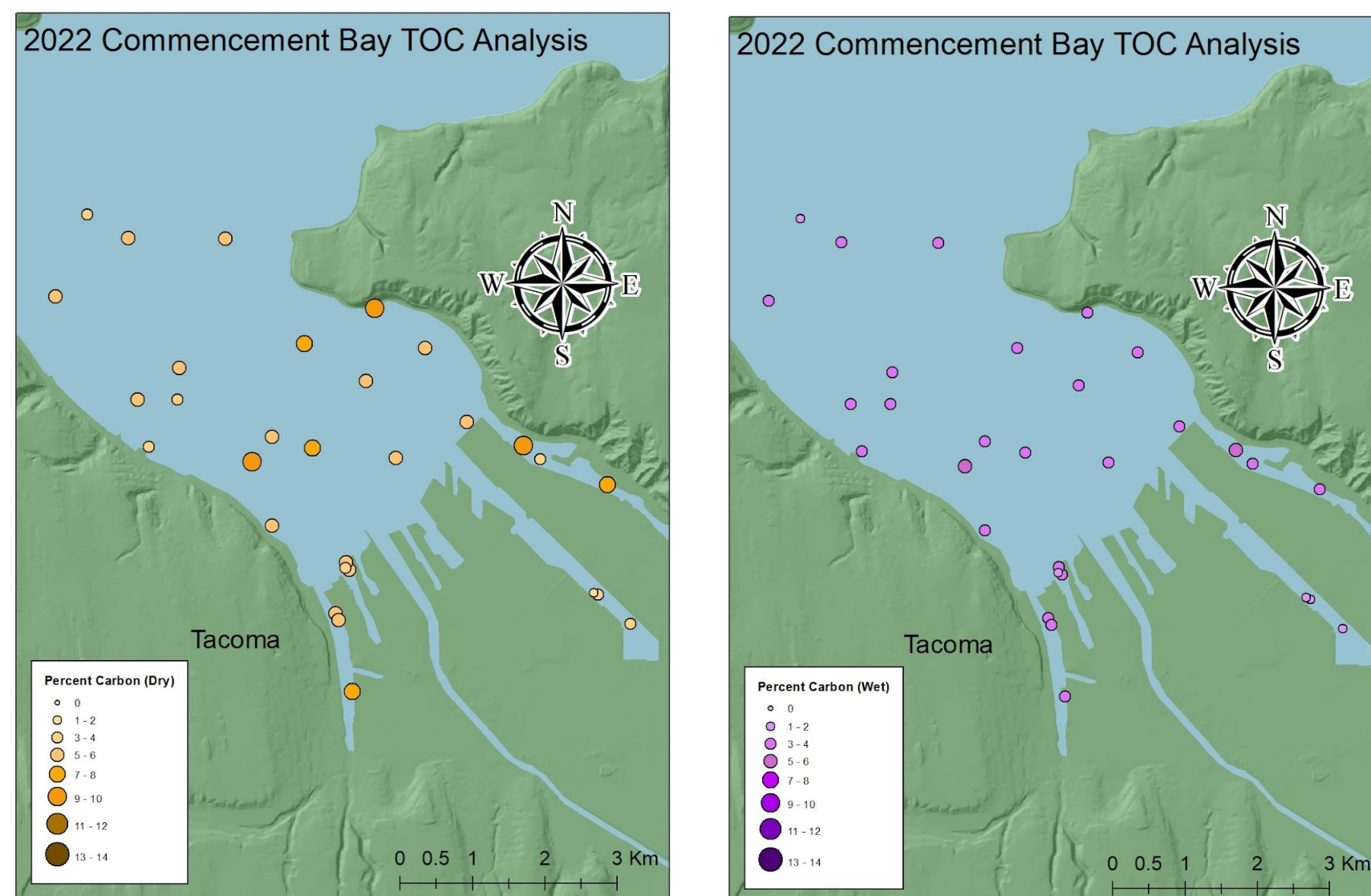
# 2022 Commencement Bay Total Organic Carbon and Particle-Size Analysis in Bed Sediments



Margo Johnson, Irene Forati, Julie Masura (mentor)

## Introduction

Benthic sediment samples were collected in the Commencement Bay region of the Puget Sound by the Washington State Department of Ecology's Marine 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. These factors are important to monitor as they can affect nutrient availability, heavy metal contamination, and shellfish health.



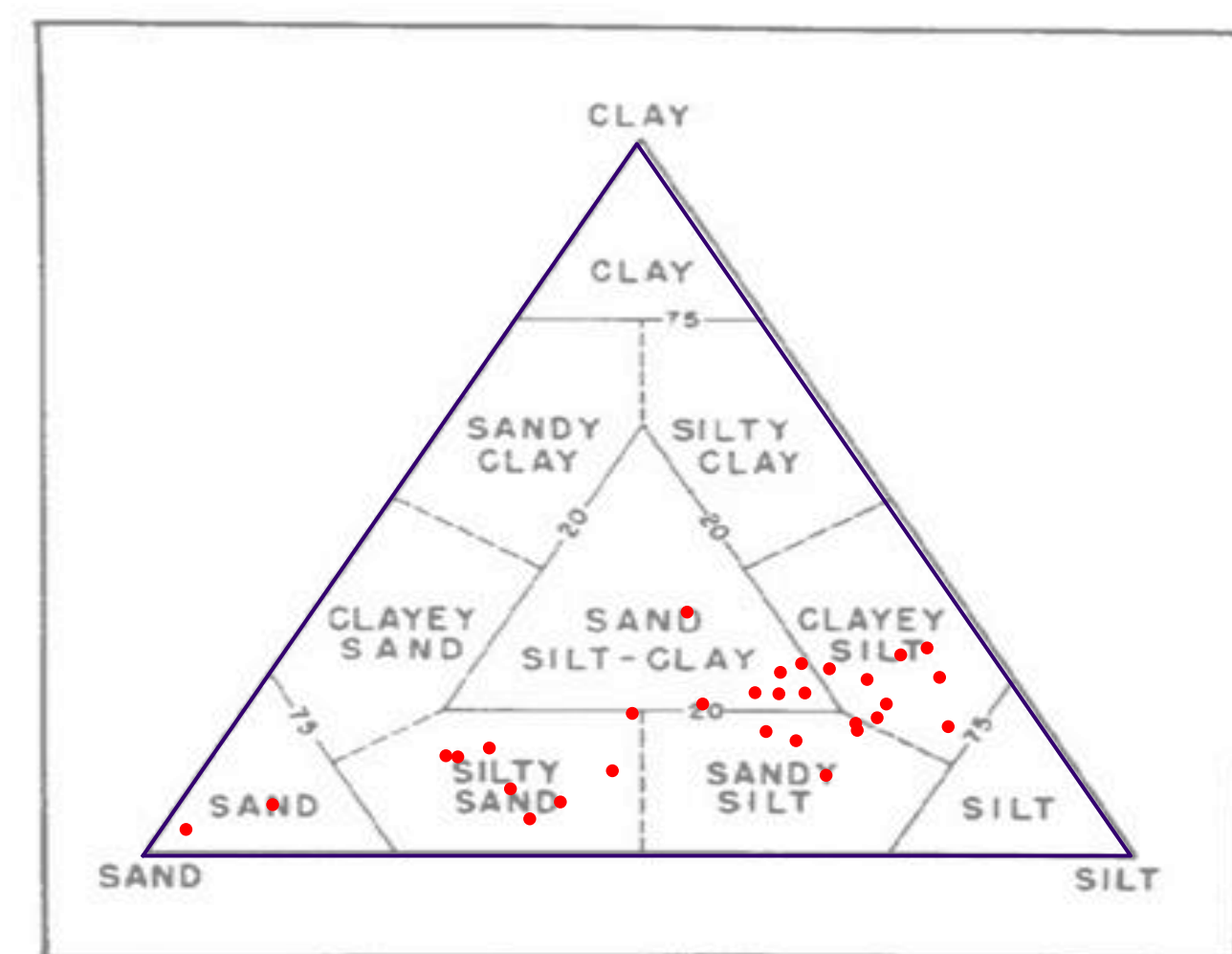
Maps for the stations where the samples were collected and the corresponding Carbon content

## Purpose

The purpose of this study is to investigate the correlation between TOC and grain size. TOC will help identify the carbon content in the sediments. PSA will help determine the grain size of the sediment. Monitoring TOC and PSA helps us understand changes in the environment's health and track what could cause changes in carbon content and grain size in Commencement Bay.

## Data

SAND-SILT-CLAY RATIOS

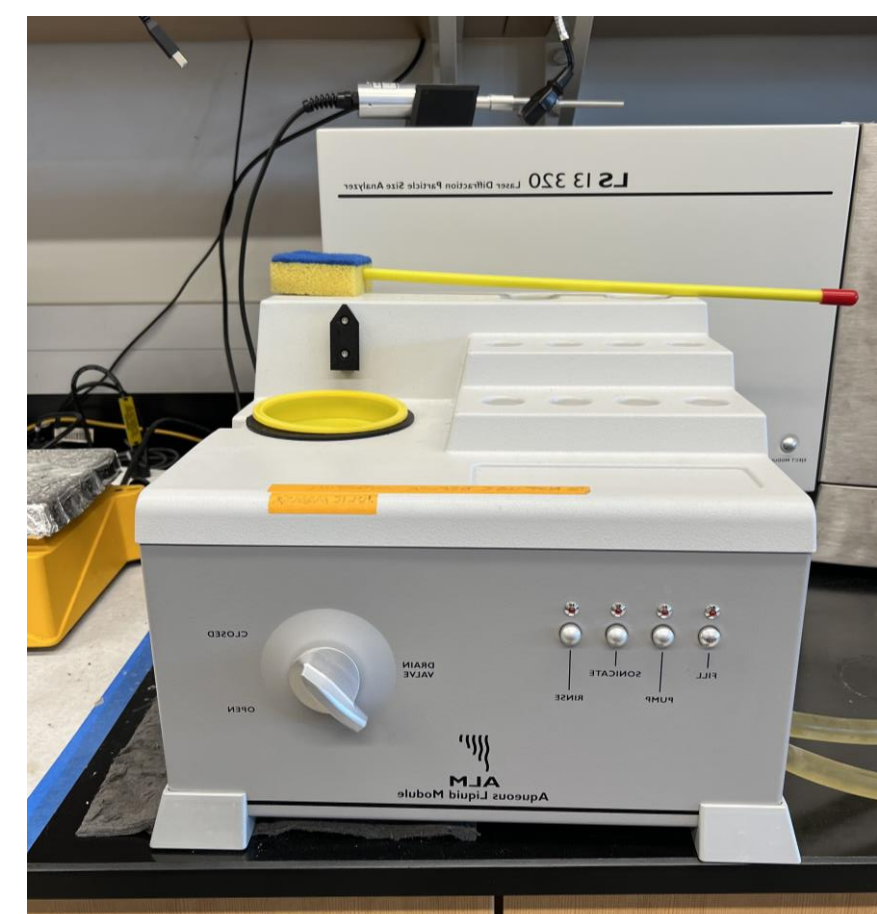


Ternary plot for sample sediment compositions. This plot gives us a brief overview of the particle sizes. Overlaid with naming system for sediments based on sand-silt-clay ratios (Shepard 1954).

## Methods

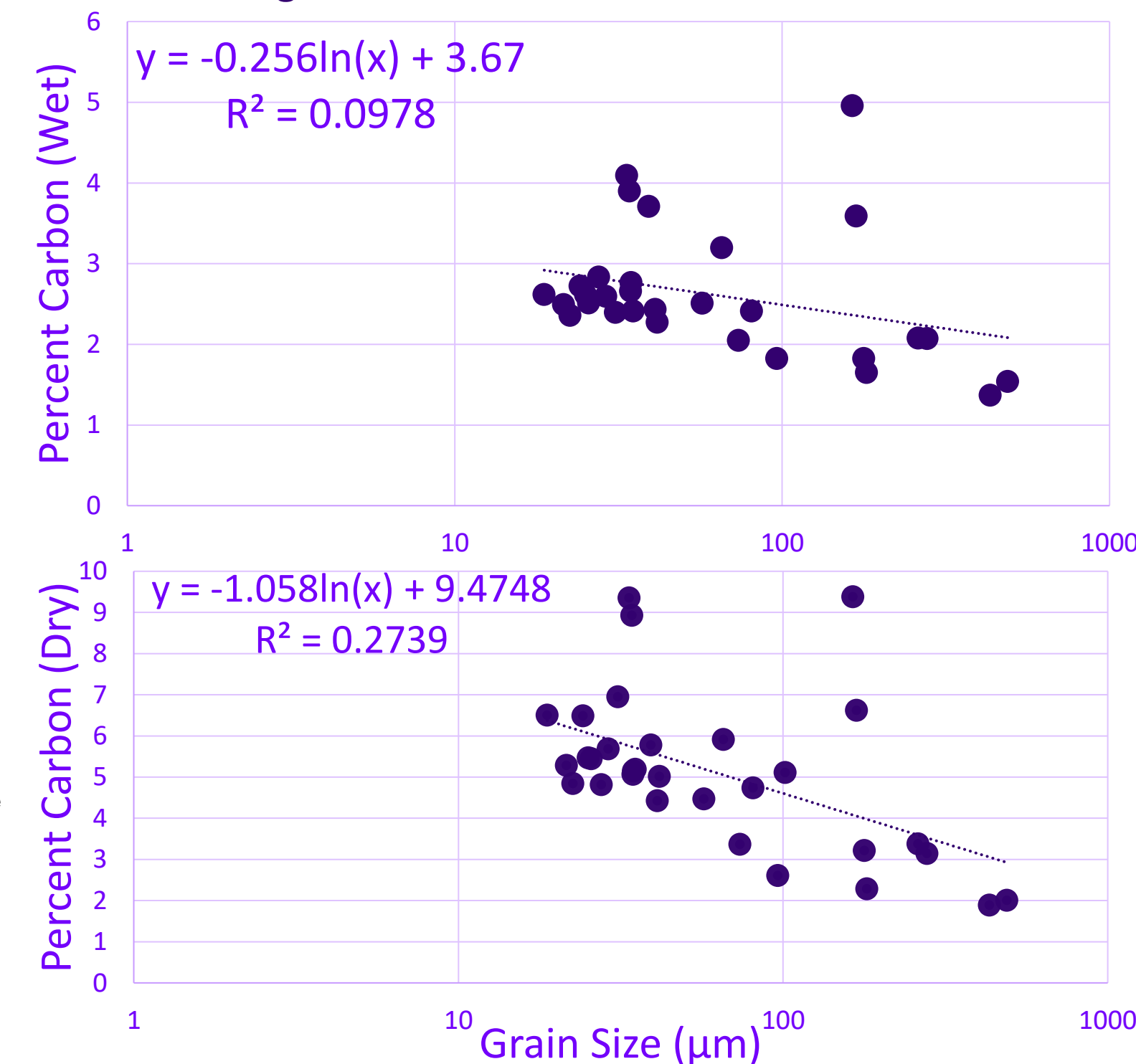
### TOC

- Total organic carbon was measured after combustion at 650 degrees C for 8 hours.
- Percentage of carbon mass was normalized to compare wet and dry samples.
- Total organic carbon indicates amount of biomass in the sediment, which is used to learn about: nutrient availability, organic pollution, oxygen consumption, and microbial environment (McLachlan 1996).



Particle Size Analyzer (PSA) Beckman Coulter. This instrument was used to determine the composition of particle sizes.

Percentage of Carbon and Grain Size



Weighing burned samples



Thermolyne oven used to burn off carbon

### PSA

- A Beckman Coulter particle size analyzer LS 13 320 was used to determine grain size of samples
- Sediment was mixed to get an unbiased sample, and pieces > 2mm were removed.
- Sample was completely suspended in water and added to the particle size analyzer.
- Grain size is found using laser diffraction.

## Results

- Higher TOC (both wet and dry) are poorly correlated to finer grain sizes in this study
- Percent of carbon for dry sediment samples ranged from 1.889% to 9.381%
- Percent of carbon for wet sediment samples ranged from 1.371% to 4.960%
- Median grain sizes ranged from 18.75 µm to 488.8 µm

• Samples fell into sandy and silty categories

## 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. For example: an increase in particle sizes can negatively affect how aquatic fauna breathe, grow and create shelter. Smaller grain sizes have increased surface area and can hold onto metals, contaminants, and carbon.

A study done by Secireu and Oaie found that higher percentages of TOC is strongly dependent on grain sizes less than 16 micrometers (Secireu and Oaie 2009). This could explain why the samples all had a relatively low percentage of carbon.



References