# 2023 Analyzing Surface Microplastics in Commencement Bay, WA

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*"As per an estimate by the UN in the year 2017, there are about 51,000 billion particles of plastics in the sea, a number which is almost 500 times more than the total number of stars present in our Milky Way galaxy."*

[Nollet, L. M. L., & Siddiqi, K. S. (2020). Analysis of Nanoplastics and Microplastics in Food. CRC Press. https://doi.org/10.1201/9780429469596od]

## Abstract

Microplastics are a newly emerging environmental issue in marine environments.

Less than five millimeters in length, these plastics are typically produced from the breakdown of larger pieces of plastic. These plastics can absorb contaminants from the water and be transferred to an array of sea life that ingest this material.

Analyzing microplastics will help researchers to better understand the types of polymers and how they move within our environment.

## Introduction

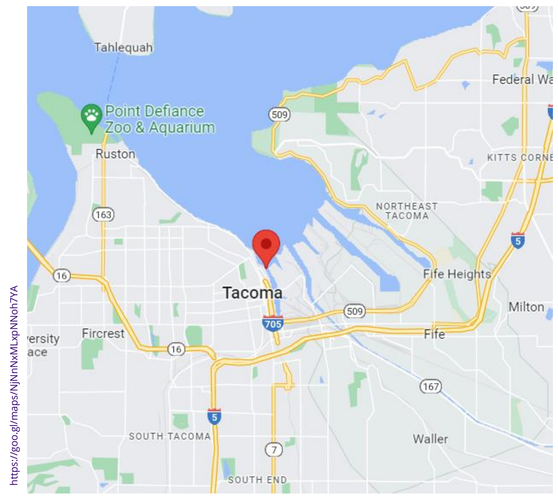
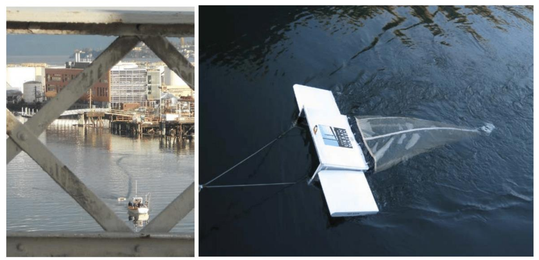



Figure 2. Sample collection site near Tacoma, WA

The purpose of the this study is to examine the most common types of polymers found, correlations in size, color and material, being used to cross examine and speculate on origin, degradation time and the transport of microplastics through biological systems.

## Methods

In **2011**, water samples were collected from Commencement Bay (Figure 2) and processed in order to isolate the polymers from the natural organic material.



NOAA Marine Debris Program

**Figure 1.** Researchers use a manta net to collect surface water samples in the Thea Foss Waterway, Puget Sound, Washington.

- Samples gathered from Commencement Bay (Figure 1) were processed and organized.
- Once prepped for scanning, individual samples of microplastics were categorized based on material; choosing between solid, film, thread and Styrofoam. Choosing depends on physical properties, refer to table 1.1.
- Recorded the physical color, longest length of the sample in millimeters.
- Samples scanned through FTIR, then transferred to a separate container.
- Once sample finished scanning, it was processed through the FTIR Perkin Elmer library to scan for microplastics and contaminates.

### Table 1.1

| Material | Physical Properties | Flexibility | When applied pressure |
|---|---|---|---|
| Solid | Firm when compressed | None | Flattened, or disintegrated |
| Thread | Has a thread like appearance, or segmented | Yes | Unchanged |
| Film | Flat, thin | Yes | Unchanged |
| Styrofoam | Round, white or off white | Yes | Flattened |

## Results

Most commonly found polymer types were **polyethylene**, **polypropylene** and **polystyrene**. Which collectively made up 18.9% of samples. (Figure 3) These polymers are often used in the manufacturing of clothing, beauty products, and single use plastics.

**Chemical additives** make up approximately 30.4% of the results. These are added during manufacturing to change the physical properties of a polymer for use.

**Benzyl butyl phthalate plasticizer** makes up 26.4% of sample results, a regulated chemical used to increase flexibility and longevity of polymers. It is highly regulated, with known health effects.


Microplastic Sample with calipers.

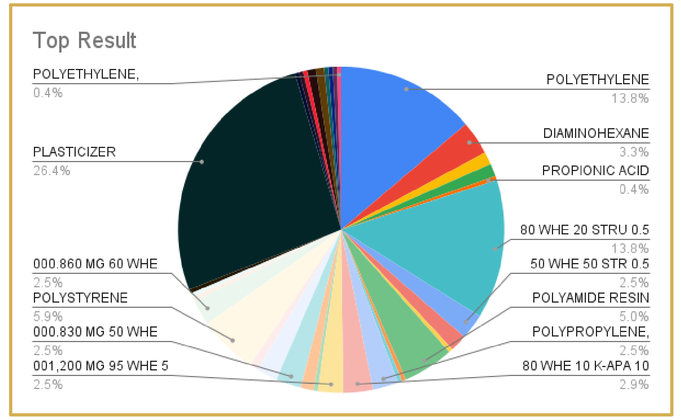



Fig. 3 FTIR Spectrometer results.

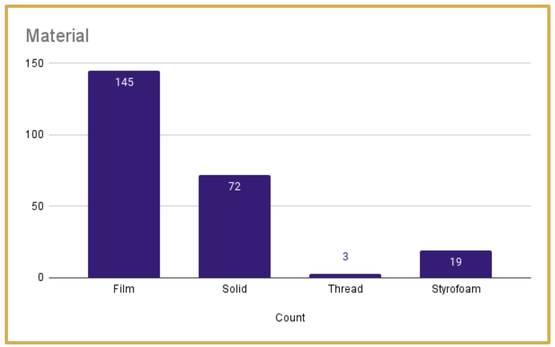



Fig. 4 Material types and counts.

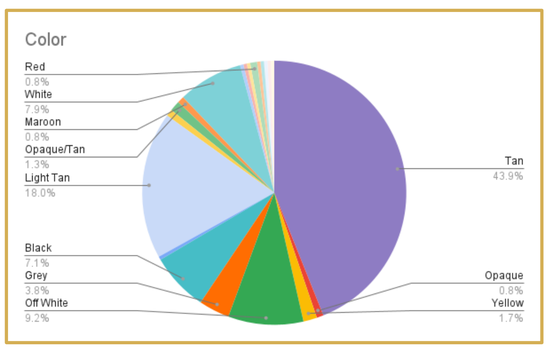



Fig. 5 Colors of samples and percentages.

## Future Work

This information can be utilized to pinpoint potential origins so that contamination may be slowed or stopped. Further research would indicate the most likely sources within the bay.