2022 Distribution of Microplastics Within Marine Sediments Along Puget Sound Bays

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Introduction

Microplastics (polymers < 5mm) are persistent marine debris that may have detrimental effects on organisms in the world's oceans. They have the capability of adsorbing chemicals that may be harmful to both marine organisms and humans. Puget Sound, a region in the Pacific Northwest, has undergone research on microplastics, with work being done at the University of Washington Tacoma since 2014. This study continues the analysis of microplastic sampling, to further understand the change in microplastic concentrations in Puget Sound bays over time.

Sample Collection

Sediment samples were retrieved by the Puget Sound Ecosystem monitoring Program (PSEMP), Washington State Department of Ecology's Marine Sediment Monitoring Team in 2022. Sediments were collected on the 26' R/V Skookum using a Van Veen Grab to collect sediment on the surface (2 – 3 cm) of the sea floor.

Methods

- To disaggregate the sediment, Potassium Metaphosphate (PMP) was added to a subsample.
- To isolate the size-fraction the sample was sieved through a 300-micrometer sieve
- To separate the less-dense material, .6M of Lithium Meta-tungstate (LMT) was added to the sample
- To remove the natural organic material, an Iron (III) solution of 30% hydrogen peroxide was added to the rinsed sediment sample
- To isolate the floating material, a second density solution, 1.0M NaCl was added to the solution
- To locate & identify the MP, a dissecting microscope was used at 100x magnification to identify type, color, and size (Masura et al. 2015)

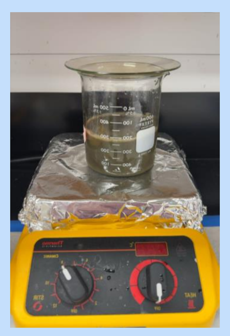

Figure 1: Disaggregation of sample with PMP.

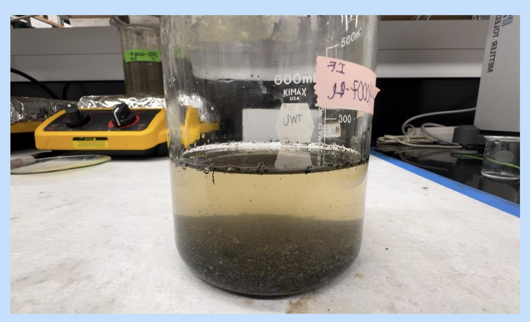

Figure 2: Sample after addition of 0.6M LMT.

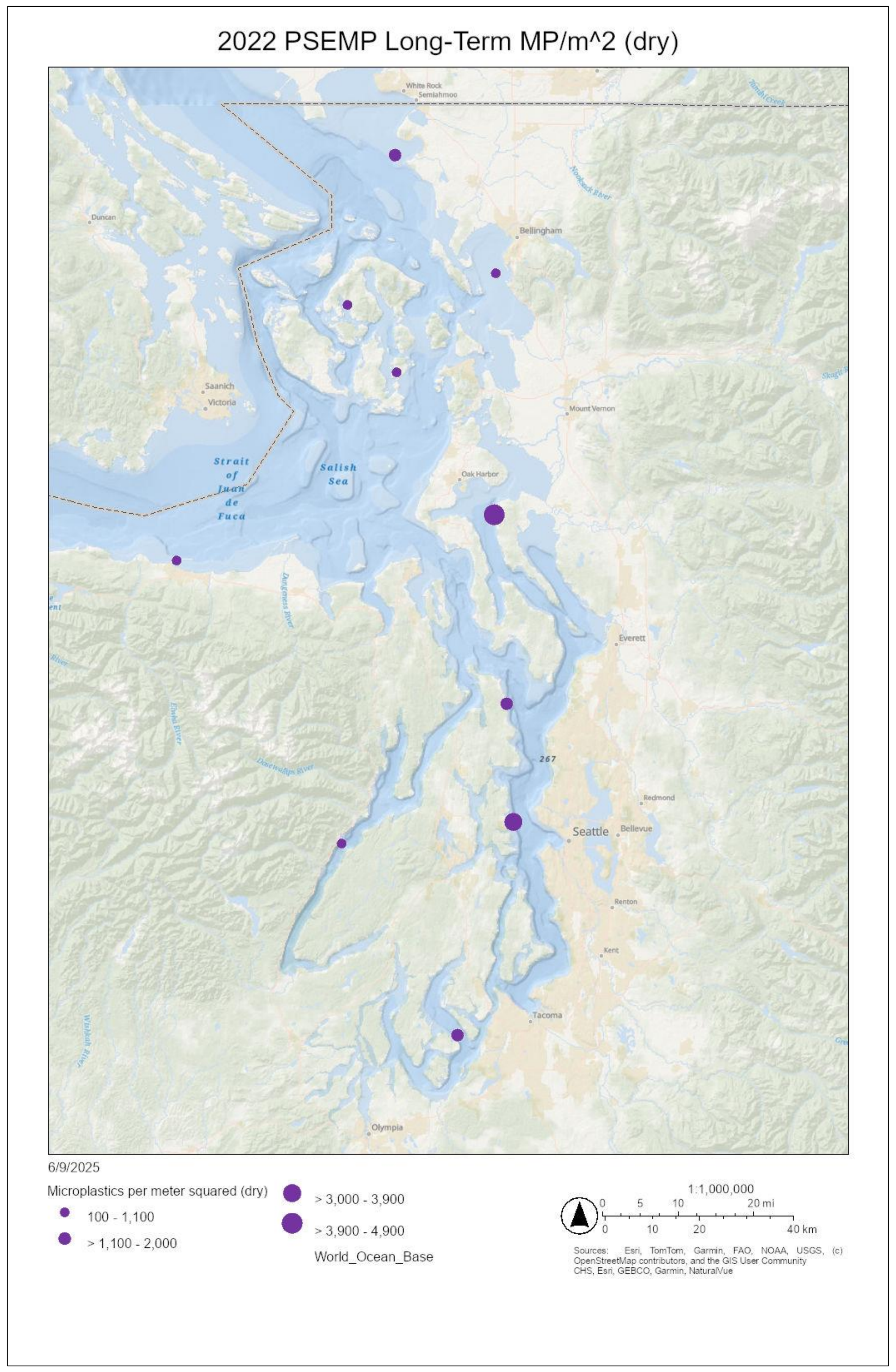

Figure 3: Concentration of microplastics as microplastics per meter squared for the dry weight of each sample. Sample concentrations range from 140 – 4898 MP/m^2 .

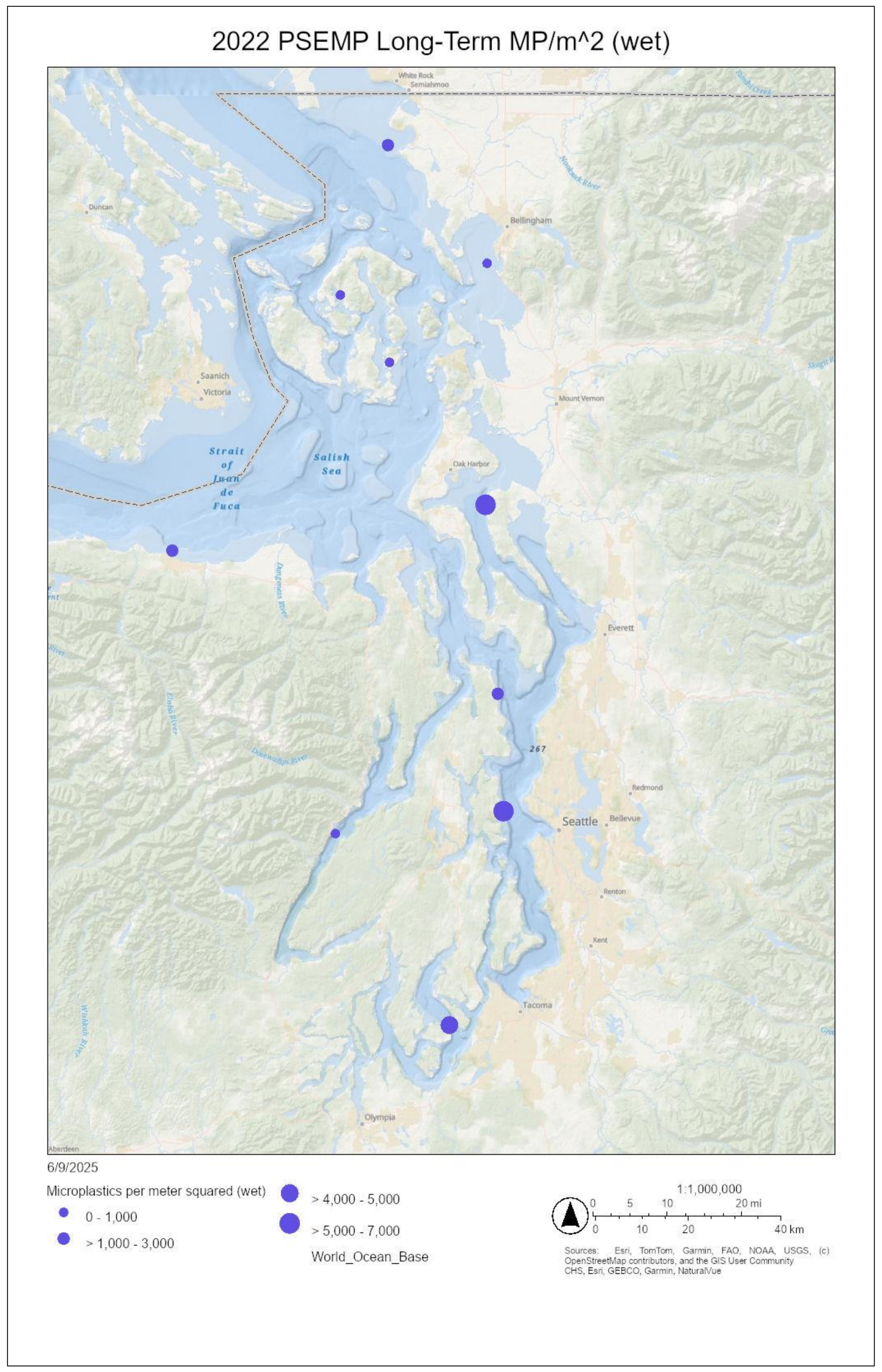

Figure 4: Concentration of microplastics per meter squared for the wet weight of each sample. Sample concentrations range from 267 – 6381 MP/m^2.

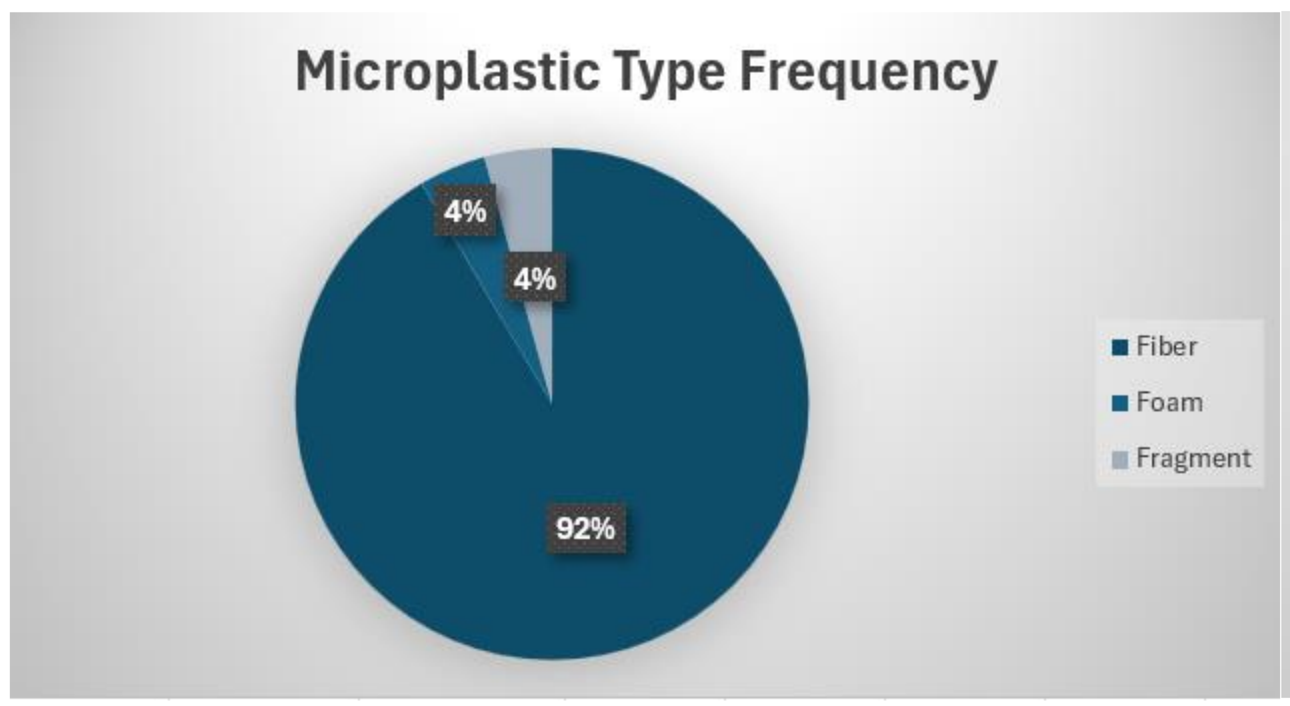

Figure 5: Types of microplastics found.

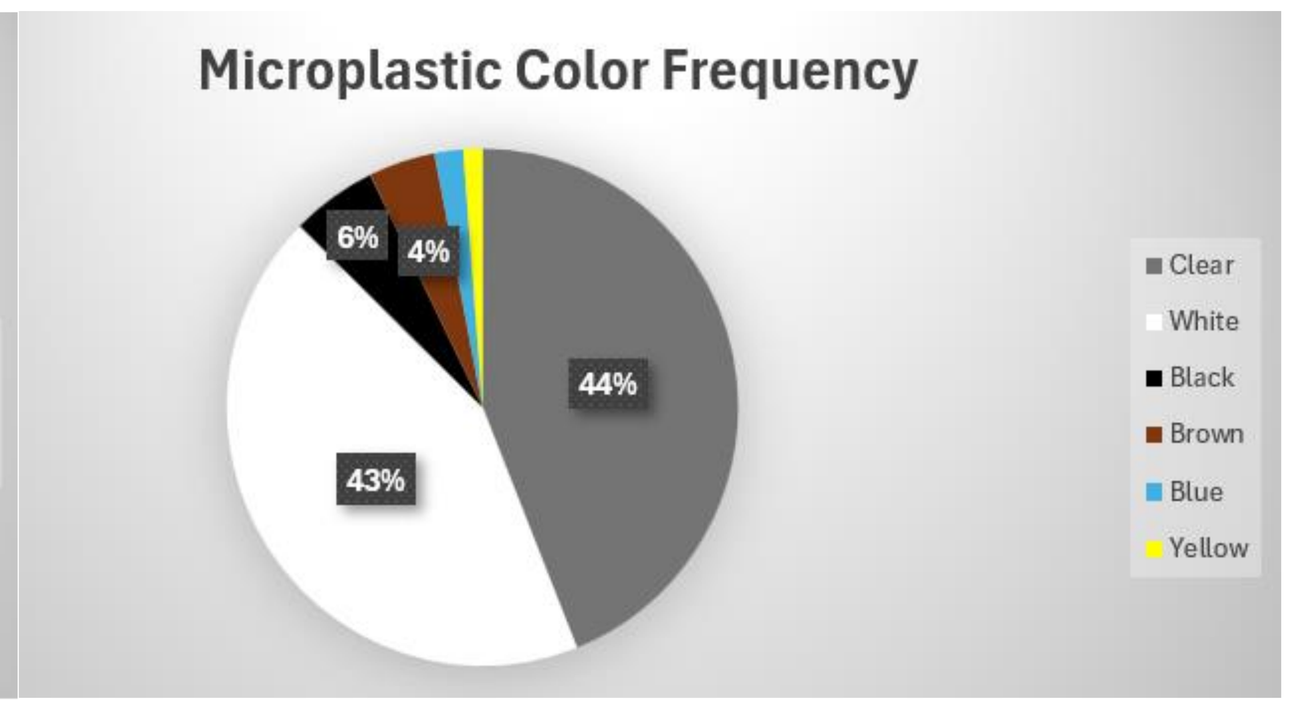

Figure 6: Colors of microplastics and their associated percentages

Results

- A total of 166 microplastics were found over the 10 sampling locations
- The most abundant types were fibers followed by foams and fragments
- The most abundant colors were clear followed by white, then black.
- The least were found northwest of Oak Harbor with 2 microplastics
- The greatest were found southeast of Oak Harbor with 41 microplastics
- Microplastics had an average length of 1.43 mm
- Microplastic concentrations for the dry weight 140 – 4898 MP/m^2, and wet range from 267 – 6381 MP/m^2

Conclusion

This study demonstrates the need for continued monitoring of Puget Sound bays for potential changes in microplastic concentrations. Previous studies have shown microplastic concentrations range annually for each sampling location. With the unique ability to determine microplastic concentrations, we gain necessary knowledge that better helps us understand the sources of microplastic pollution. Although we may not see a true correlation between increased concentrations near urban activity, we can monitor and track changes in microplastics for varying concentrations in further studies.

References