Assessing Microplastics and PFAS Co-Contamination Within the Delaware Inland Bays:

A Field and Laboratory Based Analysis Linking Land-Use Characteristics to Pollutant Stratification

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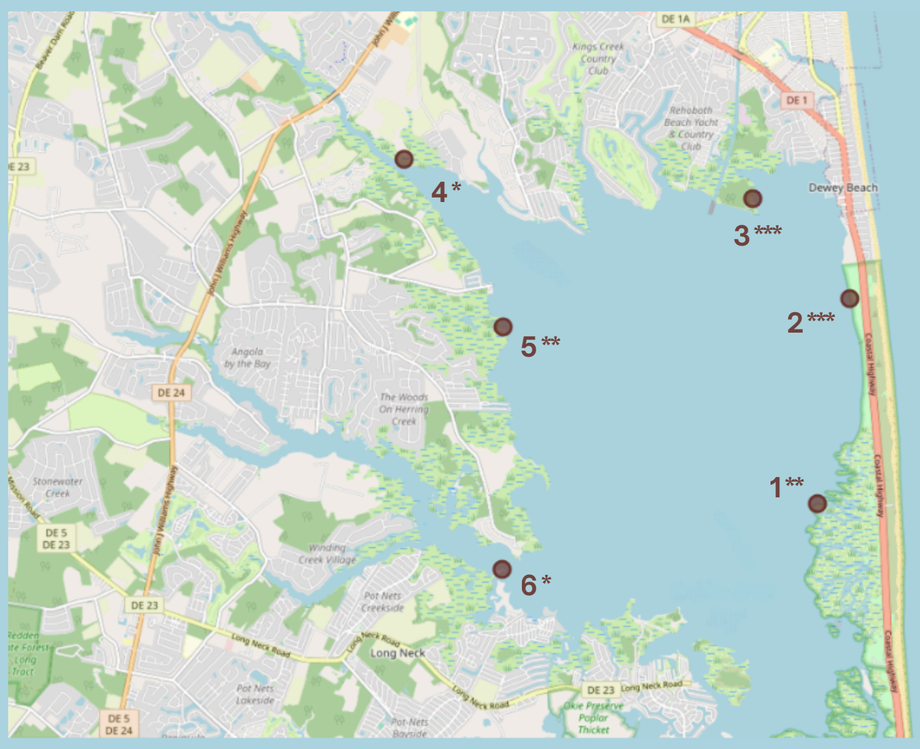


Delaware Seashore State Park 1
Tower Road Bayside 2
Thompson Island 3
Love Creek 4
Horse Island 5
Herring Creek 6

Abstract

Plastics and persistent **PFAS** dominate anthropogenic marine pollution, yet their baseline levels and interactions in **coastal systems** are poorly understood. This study assesses how land use influences their **deposition**, **concentration**, **morphology**, and **interactions** in the Delaware Inland Bays.

Site Selection

Sites were grouped into three categories based on land use and topography: (1) freshwater tributary/watershed inputs, (2) natural or minimally disturbed areas, and (3) human-influenced coastal sites. This gradient enables comparison of land-use impacts on pollutant behavior and identification of pollution sources.

Introduction

Urbanized estuarine systems act as sinks for domestic pollutants, receiving direct inputs and river-transported materials from inland sources. Given the limited understanding of their long-term ecological and human health effects, it is premature to consider these pollutants benign.

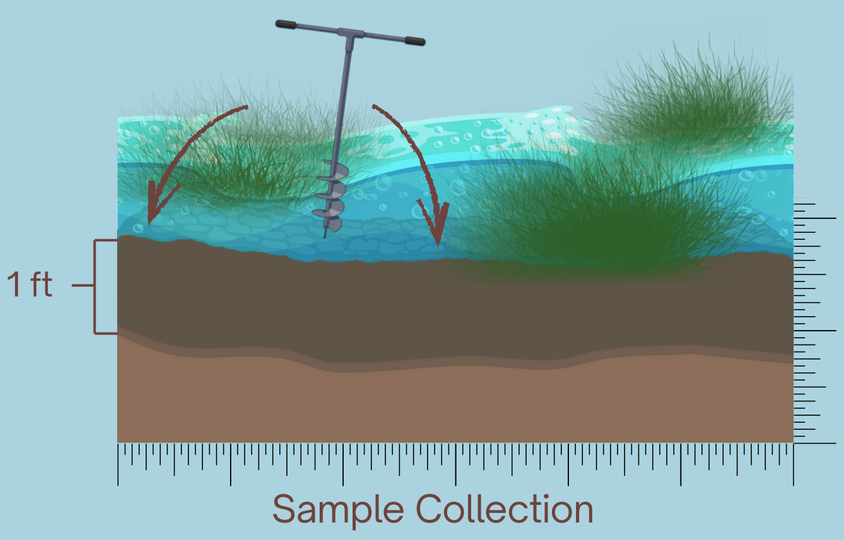
Estuarine environments such as Rehoboth Bay are particularly vulnerable due to their proximity to human activities, making it essential to understand pollutant persistence, distribution, and potential impacts on marine biota.

Objectives

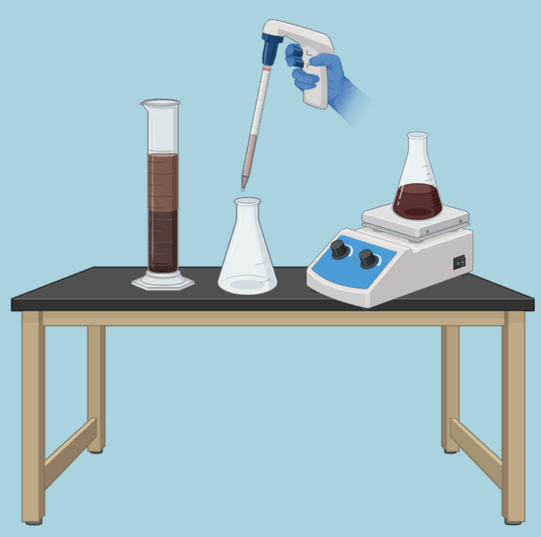
- Assess how agricultural and urban land use influences microplastic and PFAS levels.
- Evaluate emergent and submerged aquatic vegetation (SAV) as pollutant sinks.
- Inform management strategies to reduce plastic transport to the Inland Bays and Atlantic Ocean.

Methods

Sediment and **water** samples were collected with a sediment corer from vegetated and non-vegetated areas into their respective containers and placed on ice. Samples were then digested with a 10% KOH solution and filtered to remove organic matter and isolate synthetic particles. Microplastic samples are and will be analyzed with Raman Confocal Spectroscopy and PFAS samples with Liquid Chromatography Mass Spectroscopy.

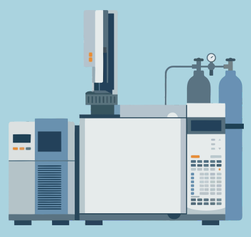


Sample Collection



Sample Digestion

Raman Cofocal Spectroscopy



Liquid Chromatograph Mass Spectrometer

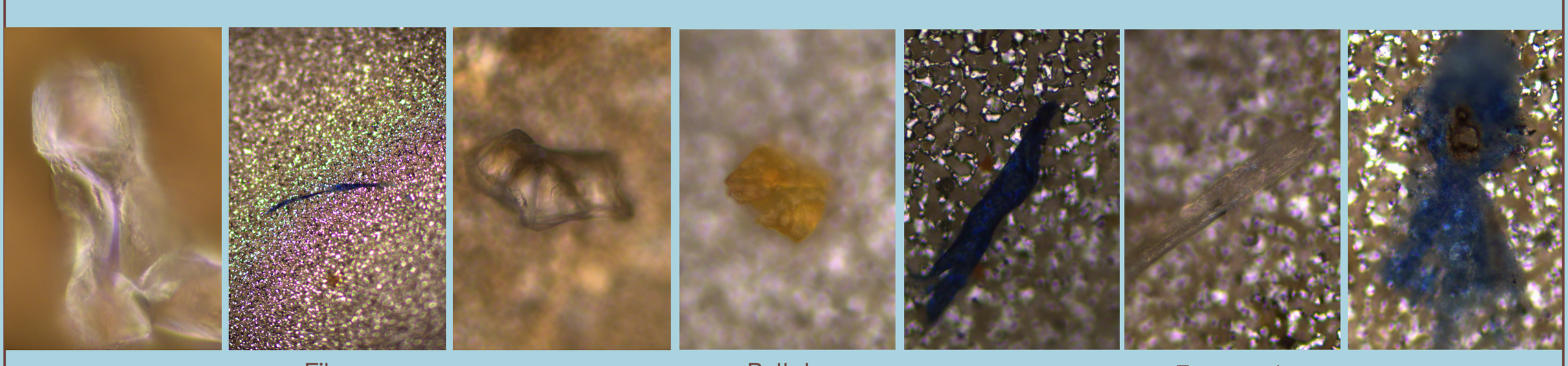
Sample Analysis

Results

Shown below are Raman confocal microscope images of particles collected from a Category 1 site. Although each image has an associated spectrum, spectral data are not shown due to autofluorescence interference resulting in high signal noise. Observed particles included fibers, pellets, and fragments, with the majority appearing bright blue in color.

Discussion

This research is ongoing, and current findings are preliminary. Next steps include obtaining reference spectra to improve particle identification, continuing seasonal sampling to capture temporal variability, and analyzing the collected data to better understand pollutant distribution and behavior. These efforts will strengthen the study and inform future management.



Fiber

Pellet

Fragment

References

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