Assessing Atmospheric Microplastic Contributions to the Narragansett Bay

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Abstract
Microplastics pollution is a growing pollution concern for the state of Rhode Island, especially given the high urban land cover and importance of the surrounding marine environment to the local blue economy. Several local studies have focused on quantifying and characterizing microplastic pollution and its impacts to wildlife in the Narragansett Bay. It is also relatively well understood, although not entirely quantified, that runoff and freshwater rivers are a source of microplastics to the bay. Atmospheric deposition of microplastics is also a growing area of interest, especially in urban areas, however there is very limited data on this globally and none in New England. This project will analyze atmospheric microplastic concentrations in the Narragansett Bay watershed. Students will use two methods to collect air samples from the Roger Williams University campus, immediately adjacent to the Narragansett Bay. An atmospheric microplastic fallout collector will capture dry deposition samples. In addition, a total suspended particulate sampler (TSP high volume air sampler) and PM2.5 sampler will measure weekly air quality. Samples will be processed and stained with Nile Red to be visually enumerated under a microscope and with FTIR/Raman analysis. Ultimately, this data will be used to estimate atmospheric loading of microplastics to the Narragansett Bay.

Project Objectives
Plastic pollution from freshwater and atmospheric sources into coastal and marine environments is complex and the extent is largely unquantified. Universities situated along the coasts are uniquely positioned to help contribute to the collection and analysis of microplastic data. Such data can help to fill in the gap of knowledge of marine microplastic sources, which in collaboration with local partners and experts in the field, will help us develop solutions to reduce these pollution sources and their impacts to the Narragansett Bay.

The research objectives for this project are:

1. Collect atmospheric microplastic samples by deposition methods and by a TSP high volume sampler located on Roger Williams University's campus.
2. Analyze the samples using visual and chemical analysis methods to determine microplastic concentrations.
3. Approximate atmospheric microplastic loading to the Narragansett Bay.
4. Communicate the results of the research to a local audience.

The project objectives align with the blue economy goals of RII-NEST because this project will contribute to an understanding of the atmospheric deposition of microplastics into the marine environment, which is an important resource for the people of Rhode Island and blue economy. The ultimate goal of this work is to help provide data that will ultimately contribute to technical, social, and policy solutions to decrease microplastic pollution within the Narragansett Bay.