



Microplastics in the Marine Environment

Environmental Context— Microplastics (MPs) are emerging contaminants of global concern that threaten water quality. More than half of the population of the United States now lives within coastal watersheds, which threatens the sustainability of ecological services, and natural resources on which people living in the watershed rely. MPs, including those not visible to the naked eye, enter ecosystems from point and non-point sources, and are increasingly common in sediments of lakes, bays, and impoundments in urban areas. Nonetheless, little is known about the fate, transport, and uptake of MPs by resident biota (e.g., oysters), or their ultimate ingestion by humans.

Two main mechanisms influence the toxicity of MPs to marine organisms:

1. The leaching of chemicals inherent in the plastic formulation;
2. The adsorption and concentration of heavy metals and persistent organic pollutants (POPs), on the surface area of plastic fragments that may become bioavailable upon ingestion.

Resources and Instrumentation—CESE has extensive analytical expertise and advanced instrumentation in the quantification of trace pollutants, both organic and inorganic, associated with MPs. Instrumentation includes:

- Ultra performance liquid chromatograph/tandem mass spectrometer (UPLC/MS/MS)
- Ultra high-performance liquid chromatograph - time-of-flight high resolution mass spectrometer (UHPLC-QToF)
- Gas chromatograph/tandem mass spectrometer (GC/MS/MS)
- Inductively coupled plasma/mass spectrometer (ICP/MS).
- Fourier-transform infrared spectroscopy (FTIR).

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Research Capabilities— CESE has considerable capacity to support a diversity of research projects related to MPs in a variety of environmental media, including fresh and seawater, sediment, or organisms.

Examples of projects that CESE can support include:

- Measuring amounts and concentrations of MPs in water, sediment, and marine organisms.
- Quantifying concentrations of organic and inorganic contaminants that adhere to MPs in receptors.
- Assessing the relative contributions of MPs and their associated contaminants from point and nonpoint sources.
- Characterizing and identifying the types of MPs using FTIR.
- Characterizing the plastic additives and related chemicals contained within resins.
- Characterizing and quantifying additives associated with plastic products or following their leaching, identification of degradation products and their associated forms.