Microplastics Sampling and Analysis

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Standardized methods and best practices for sample collection and analysis of microplastics particles and fibers are still being developed. To date, few standard methods have been adopted, and currently there are no regulations governing acceptable levels of microplastics. This fact sheet is an overview of sampling and analysis considerations for study preparations. This fact sheet is not intended to represent technical standard operating procedures.

Data Quality Objectives

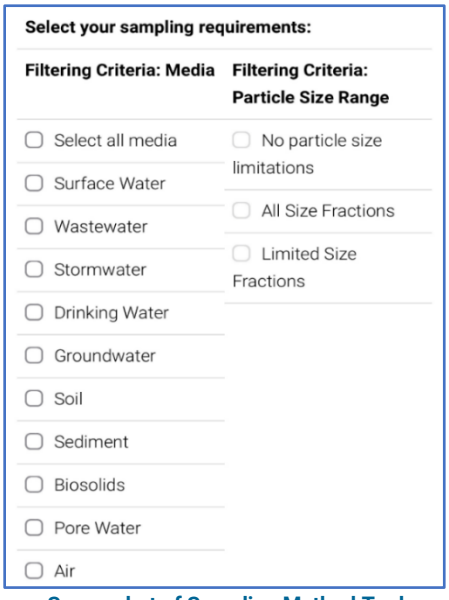
Chosen sampling methods should be compatible with study objectives. Data quality objectives for a microplastics study should consider:

1. **Sample matrix**
2. **Identification and measurement of particle mass**
3. **Identification of microplastic particle quantity, size, and shape**
4. **Characterization of specific properties of individual microplastic particles**
5. **Equipment availability and cost**

Example of a subset of microplastics collected from a single experiment. The large end of the MP scale is visible to the naked eye.

Sampling Method Tool

ITRC has developed a sampling method tool. The tool outputs the available microplastic sample methods based on the selected inputs for sampling matrix and particle size, and provides additional details, such as equipment needed, advantages and disadvantages, relative cost, and references for additional information.



Screenshot of Sampling Method Tool

Check it out!

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Quality Assurance/Quality Control

Quality assurance and quality control are particularly important in microplastics analysis due to the high possibility of contamination and the lack of method standardization. Introduction of contaminants can be through a variety of products, materials, and sources. When sampling for microplastics, it is important to minimize contamination by limiting or eliminating plastic products used for sampling and processing. This also applies to personal protective equipment and clothing worn by and personal care products used by individuals collecting and analyzing samples. Consider nonsynthetic materials, such as cotton shirts and jeans. Additionally, cross contamination must be accounted for by using equipment, laboratory, and field blanks to measure contamination introduced during processing.

Analysis

Analysis of microplastics can be either destructive or nondestructive, and identification can be quantified in mass or count, depending on study objectives. Nondestructive methods (e.g., spectroscopy, such as Fourier transform infrared [FTIR] or Raman) allow physical characteristics including size, shape, and color of microplastics to be characterized. Destructive methods (thermal degradation methods such as pyrolysis-gas chromatography/mass spectrometry) are potentially faster and provide polymer mass, but the process destroys the physical characteristics of the microplastics particles. Method selection is dependent on study objectives.
Microplastics can be detected using several different methods:

Visual methods. Visual examination of a sample with or without magnification, including:

- Naked eye (no magnification)
- Stereo, fluorescence, or scanning electron microscopy

Spectroscopic methods. Capture and assign the characteristics of specific chemical structure of polymers using reference spectra, such as:

- FTIR and focal plane array FTIR
- Laser direct infrared spectroscopy
- Raman

Thermoanalytical/chemical methods. Pyrolyze the sample under inert conditions and specific decomposition products of the individual polymers are detected.

Reporting

A universally standard method of reporting microplastics analyses does not currently exist. This is partially due to the emerging nature of microplastics studies and the wide range of their physical and chemical impacts. Therefore, detailed reporting, including sufficient documentation of the mass or volume of the sampled environmental matrix, laboratory extraction process used, and analysis performed is needed so that conversion to other commonly used units can be performed. Though a standardized method does not yet exist, a highly cited microplastics reporting guidelines checklist has been published and is available in Cowger et al. (2020).