Microplastics Sampling & Sorting Toolkit

Guidelines & Resources for Sorting and Sampling Microplastics in Your Local Environment

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Table of Contents

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Introduction

Microplastics are discarded plastics that break down into smaller pieces due to weathering, breakage, and other forms of degradation. They are 1-5 millimeters long and can include fragments of larger plastics such as bottles, films from straw wrappers, foam pieces, and rope or synthetic fiber filaments.

Marine life may accidentally swallow microplastics, which can clog animals' digestive tracts, making it impossible for them to eat normally. Microplastics have been found in animals as small as zooplankton. They may have far-reaching impacts on the food chain.

Since 2013, we've worked with the University of New Hampshire Cooperative Extension and New Hampshire Sea Grant to study microplastics on New Hampshire beaches. Our study involves:

- Collecting sand samples at several beaches.
- Sieving them for plastics.
- Sorting them into various categories.

Pollution prevention through education and outreach is Blue Ocean Society's ultimate goal; while there is litter on the beach, we'll collect and study it. Data collection is one of the most critical aspects of microplastic sampling. During the sampling, you'll use the provided datasheet to record location (beach, quadrat #, and GPS coordinates), start and end time, and if there are large and small samples. This information allows us to illustrate the microplastic problem in educational programs and is an essential tool in helping to determine focus areas for pollution prevention programs.

Your microplastic sampling will not only clean the beach and ocean for animals and humans but also offer the opportunity to educate sampling participants and all the bystanders who wonder what you're doing and why you're doing it. We thank you for your commitment to the oceans!

Why Analyzing Microplastics Data is Important

Microplastics Basics

Here's some basic, reliable information about microplastics supported by current science.

- "Macro" plastics, or oversized products and pieces, will fragment into microplastics through wave action, UV exposure, and other natural elements but will not biodegrade.
- Plastic production is increasing around the world.
- Recycling rates are currently unknown but do not equal collection rates of recyclables.
- Despite some estimates, the amount of plastic in the ocean has yet to be discovered precisely.
- Most plastics come from land-based sources rather than at-sea spills.
- Plastics have been found in rivers, lakes, oceans, harbors, and polar ice caps.

Contaminants Found on Plastic

Anna-Marie Cook, EPA Subject Matter Expert on Microplastics, shared results from the agency's current research into how plastics can become loaded with contaminants in the ocean.

Contaminants categorized as persistent, bioaccumulation, and toxic (PBTs) chemicals that runoff from urban and agricultural areas into the ocean can latch onto microplastics, accumulating on the surface of the plastic pieces. Recent research has shown 1,000-1,000,000 times higher concentrations of contaminants in plastic than in the surrounding water. These contaminants can then bioaccumulate as they travel up the food chain, meaning that although individual zooplankton may only have one microplastic particle in their digestive system, a filter feeder eating hundreds of zooplankton may have a much higher concentration of both microplastics and the contaminants on them. The EPA is also researching microplastics found in fish in the North Pacific and South Atlantic Gyres and will expand into research on microplastics throughout the water column.

Why Analyzing Microplastics Data is Important

Bioaccumulation of Microplastics

Bioaccumulation of microplastics in the environment poses significant risks to both marine life and humans. Marine organisms, from plankton to large fish, ingest microplastics either directly or through contaminated food sources. These tiny plastic particles can accumulate in their bodies, causing physical harm, reduced reproductive success, and disruption to feeding behaviors. Over time, toxic chemicals attached to microplastics, such as pesticides and heavy metals, can enter the food chain, ultimately affecting human health when seafood is consumed.

Figure 1: Showing the process of bioaccumulation within the food chain.

Tracking Microplastics

Tracking microplastics is crucial to understanding their distribution, persistence, and impact. Monitoring their presence in the environment helps inform policies to reduce plastic pollution, guide cleanup efforts, and develop strategies to mitigate the negative effects on marine ecosystems and public health. Without comprehensive tracking, it would be difficult to address the long-term consequences of microplastic contamination effectively.

Types of Microplastics

If it ever does, some trash takes a very long time to go away. Plastic or items containing plastic will last forever in the environment.

Foams

- Rigid, semi-rigid, or flexible, and light
- Fragmentation of packaging, commercial fishing gear, and styrofoam cups

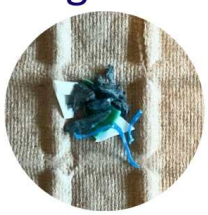
Pellets

- Rigid, hard, and globular in shape
- Nurdle - Raw material used to make plastic products

Films

- Thin, transparent, and soft
- Fragmentation of plastic bags, plastic packaging, and low-density plastic

Fragments



- Ragged, irregular in shape, and strong
- Derived from larger plastic waste

Filaments

- Elongated thread-like structure
- Textile and industrial fibers

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Ways to Stop the Threat of Marine Pollution

Sampling microplastics is a powerful way to combat marine pollution while raising awareness and inspiring action in your community. By participating in monthly sampling and spreading the word, you're helping to protect our oceans and marine life.

Here are other impactful ways to make a difference:

Donate or Volunteer

Support organizations like Blue Ocean Society to educate thousands about marine conservation, protect marine populations, and clean beaches for wildlife and people. https://www.blueoceansociety.org/donate/

Join a Beach Cleanup

Get involved in public cleanups or organize one to help keep our coasts clean and safe.

Recycle Fishing Line

Discarded fishing lines can harm marine life for decades. Dispose of them responsibly in recycling bins or covered trash bins.

Avoid Balloons

Balloons often end up in oceans and harm wildlife. Pop and dispose of them properly—or opt for reusable decorations instead.

Reduce Single-Use Plastics

Say no to straws and plastic bags, choose products with less packaging, and opt for sustainable, reusable alternatives whenever possible.

Microplastic Sampling Supply Checklist

- ☐ 1-gallon bucket 
- ☐ 5-gallon bucket 
- ☐ 1 millimeter sieve 
- ☐ 5 millimeter sieve 
- ☐ 5, 1-gallon reusable zip lock bags 
- ☐ Data sheet

Beach Microplastics Sampling Data Sheet

Sampler(s):

BEACH NAME:

Date:

Weather:

Quadrat	GPS COORDINATES	START TIME	END TIME	Was there a...	Notes
North Q #1	Lat:			Large sample? Yes No	
	Long:			Small sample? Yes No	
Center Q #1	Lat:			Large sample? Yes No	
	Long:			Small sample? Yes No	
Center Q #2	Lat:			Large sample? Yes No	
	Long:			Small sample? Yes No	
Center Q #3	Lat:			Large sample? Yes No	
	Long:			Small sample? Yes No	
South Q #1	Lat:			Large sample? Yes No	
	Long:			Small sample? Yes No	

Comments:

- ☐ 4 Pencils 
- ☐ Sharpies 
- ☐ Trowel/hand shovel 
- ☐ 30 foot string (for measuring the distance between sampling sites) 
- ☐ 4 meter string (tied), to make 1 by 1 meter quadrat

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How to Collect Data on Microplastics

Microplastics Sampling Protocol

Gather your group and sample microplastics on the beach once per month. Write down participant names on the data card at each sampling site.

Sampling location:

High tide line where the wrack is relatively slumped together (if it is really scattered, pick a spot in the middle)

Quadrats:

For Center Sites: Q1 = middle, Q2 = 30' north, Q3 = 30' south. North and South sites only have one quadrat (Q1)

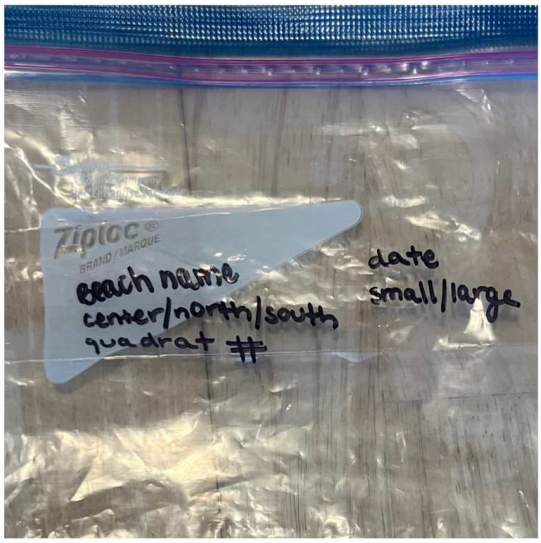
Sampling Steps:

1. Set your quadrat:

- Put out the quadrat (string), anchoring each of the four corners with a pencil. Make it as square as possible so you have a 1-meter quadrat.

2. Label sample bags:

- You can label them at each quadrat or label them all in advance).
- The bag should include the site name, center/north/south, quadrat number, date, and small/large.
- Make sure to cross out any old writing on the bag.



3. Fill out the data sheet (see page 15):

- Fill out sampler name(s), beach name, weather conditions.
- Using a compass or compass app on your phone, find the location. Write down the latitude and longitude on the data sheet (from the middle of the quadrat).
- Write the start time on the data sheet and quadrat number. Make sure to write the end time before you move on to the next quadrat.
- Note any comments at the bottom (ex: beach raked at sampling site, couldn't sift sand because it was too wet, etc.)

4. Collect the sample:

- Pull out any obvious seaweed, rocks, etc., taking care not to lose any microplastics in the wind - if you see any, place them in the appropriate bag (large >5mm or small <5mm).
- Use a trowel or hands to scrape the top ~2cm of sand.
- Fill the blue bucket 1/2 full (If there's a lot of seaweed when scooping, fill the bucket a bit more to ensure there's about a 1/2 bucket of sand).

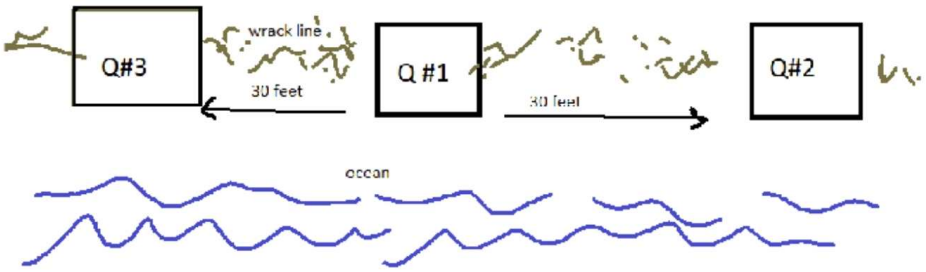
- Sift the sand through a 5mm (larger) sieve into a 5-gal bucket. When all the sand goes through the sieve, pick through what's left. Put inorganics in the Ziploc bag marked Large. Anything organic goes back to the beach.

- Sieve the sand again through a 1mm sieve. Anything left in the sieve goes in the bag marked Small, organic, or not.

- If the sand is too wet to sieve, bag it in the appropriate bag. This may mean just putting it all in one bag if the sand is too wet to even get through the large sieve.

5. Go to the next site:

- For North and South, there is only one quadrat (Q1). For the center site, there are three quadrats 30' apart. Use the white string to measure from Center (Q1) to 30 feet north (Q2) and 30 feet south (Q3).



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Microplastic Sorting Supply Checklist

- ☐ Tweezers 
- ☐ Magnifying lens (with a light, if possible) 
- ☐ Pencils 
- ☐ Small coin envelopes (2 1/4in by 3 1/2in) 
- ☐ Tray with white paper (to sort microplastics on) 
- ☐ Data sheet

Microplastics Sorting Data

Beach Name:	**Sorted By:**	
Sample #:	**Date Sorted:**	
Sample Date:		
Type	**Count**	**Total**
Pellets (pre-produced)		
Fragments		
Whole (e.g. bottle caps)		
Foams		
Films		
Filaments		
Cigarette Parts		
Other/Unknown		
Glass		
Foil		
Paper		

- ☐ NHGS Microplastics Debris ID Card

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Microplastics Sorting Protocol

1. **Writing down information:** Write all information from the small sample bag (site name, Center/North/South, Quadrat #, date, and size class) onto the microplastics sorting data sheet.
2. **Pouring the sample:** Pour the sample onto the white paper on the tray. If it is a large sample, pour and sort a little at a time.
3. **Sorting the sample**: Using the NHGS Microplastics Debris ID card, carefully sort through all the items on your tray. The squares on the tray can help you separate potential plastic items and examine them closely later.
4. **Categorizing microplastics:** Using the ID card, separate the microplastics that were set aside into categories (see page 5).
    a. There are five categories: foams, pellets, films, fragments, and filaments.
5. **Closer inspection:** Use the light and magnifying glass to examine any questionable items to determine whether they are organic or inorganic.
6. **Fill out the data sheet** (see page 17):
    - Fill out beach name, sample date, quadrat number, and sample size
    - Fill out sorter's name and date sorted
    - Once everything is categorized, count each type of item and make tally marks
    - Total the tally marks for the final number
    - Place any notes of interest in the comment section

7. **Saving samples:** Place small samples in an envelope, following the label template. Each sample is placed in an individual envelope.
8. **Organic materials:** All sand, shells, seaweed, etc., are returned to the beach.
9. **No plastic:** If the sample does not contain plastic, note it on the data sheet. Make sure all the sample information is filled out at the top.

Roles and Responsibilities

- Provide orientation to the group leader and volunteers before you begin your sampling. Data Sheet (page 14)
- Provide all supplies, including buckets, bags, string, pencils, and shovels.
- Provide background information for you to give your volunteers.

Optional

- Send your microplastic samples to get further analyzed.
- Share your results with Blue Ocean Society to compare data.

Beach Microplastics Sampling Data Sheet

Sampler(s):

BEACH NAME:

Date:

Weather:

Quadrat	GPS COORDINATES	START TIME	END TIME	Was there a…	Notes
North Q #1	Lat:			**Large sample?** Yes No	
	Long:			**Small sample?** Yes No	
Center Q #1	Lat:			**Large sample?** Yes No	
	Long:			**Small sample?** Yes No	
Center Q #2	Lat:			**Large sample?** Yes No	
	Long:			**Small sample?** Yes No	
Center Q #3	Lat:			**Large sample?** Yes No	
	Long:			**Small sample?** Yes No	
South Q #1	Lat:			**Large sample?** Yes No	
	Long:			**Small sample?** Yes No	

Comments:

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Microplastics Sorting Data

Beach Name:	**Sorted By:**	
Sample #:	**Date Sorted:**	
Sample Date:		
Type	**Count**	**Total**
Pellets (pre-produced)		
Fragments		
Whole (e.g. bottle caps)		
Foams		
Films		
Filaments		
Cigarette Parts		
Other/Unknown		
Glass		
Foil		
Paper		

Sea Grant
NEW HAMPSHIRE

NHSG Microplastic Debris ID Card

Blue Ocean
Society for Marine Conservation

Fragments

Pieces of hard plastic

Whole Plastic

Whole pieces of hard plastic
e.g. small bottle caps

Whole Plastic

Pieces of bags,
wrappers that are thin and flexible

Cigarette Parts

Cigarette butts and filters

Filaments

FIshing line, rope, or
synthetic cloth

Foams

Styrofoam or insulation

Pellets

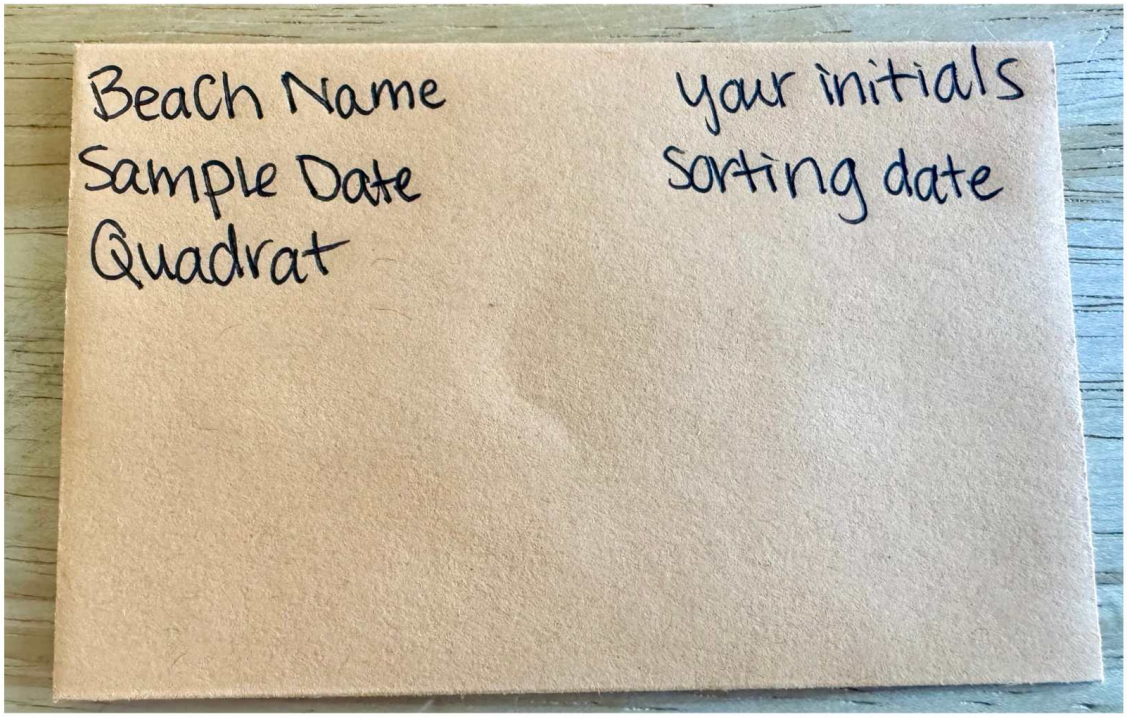
Pre-production plastic pellets
a.k.a “nurdles”

Others

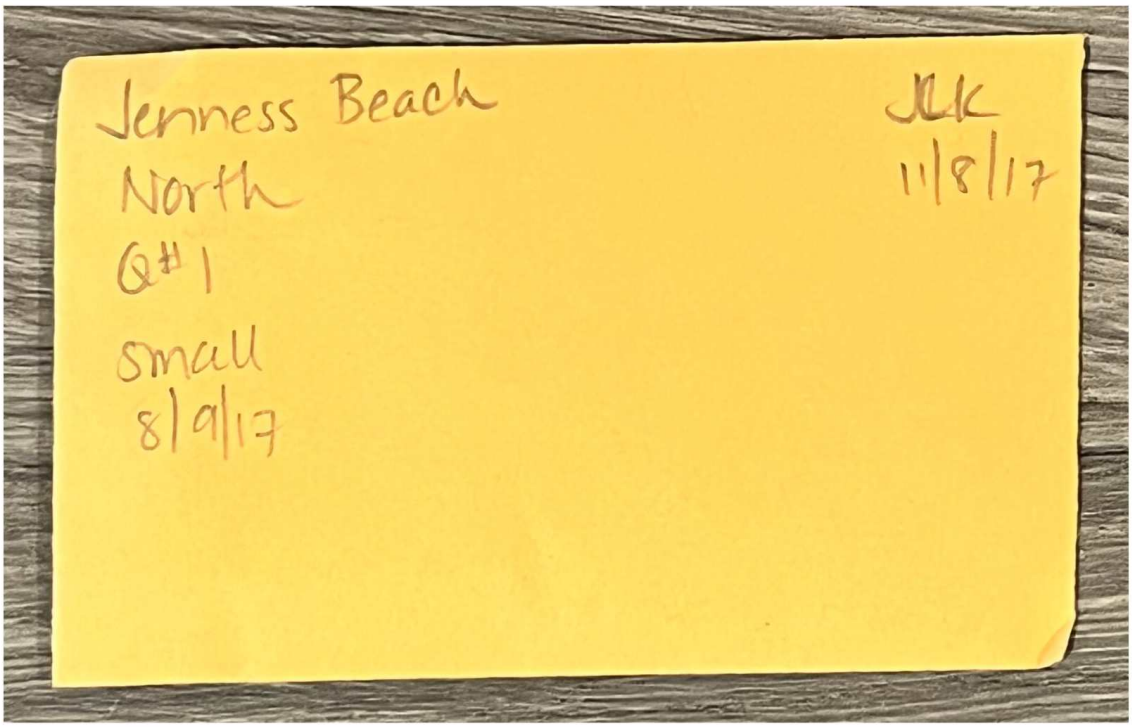
Glass, rubber, metal,
non-plastic human debris

Envelope for Small Samples

2 1/4in



3 1/2 in



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