



# MICROPLASTICS AT HOME



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## *Welcome to Microplastics at Home!*

This guide outlines how to conduct Blue Ocean Society for Marine Conservation’s Microplastics Research Lab activity at home! Note: this guide is intended to explain how to conduct the MP Research lab activity independently with items around the house.

In this guide you will find:

- **Background information** on microplastics, their sources and sinks, ecological effects and how Blue Ocean Society conducts our microplastics research.
- **Activity procedures** outlining how to conduct our Microplastics Research Lab activity independently at home.
- **Additional resources** you can use to enhance, modify, or supplement this activity.

## *Background*

**What are microplastics?** Microplastics are very small pieces of plastic marine debris, less than 5 mm in size, that end up in the ocean. Marine debris is anything that ends up in the ocean that doesn’t belong there. The National Oceanic and Atmospheric Administration (NOAA) defines marine debris as “any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes.” Marine debris can be found in the ocean and rivers worldwide, and most of this debris is made up of plastic. Microplastics mainly enter the ocean in two ways: (1) through the fragmentation of larger plastic marine debris and (2) when small plastics enter waterways and travel to the ocean.

**Primary microplastics:** Small plastic pellets manufactured for industrial use, such as resin pellets (also called nurdles), can be lost during transportation and become marine debris. Because they are used as the primary feedstock in the production of larger plastic items, nurdles are known as *primary microplastics*. Another source of primary microplastics is personal care products. Many face washes, body washes, soaps and toothpastes contain plastic microbeads that act as exfoliators. The plastic microbeads in these products are designed to wash down the drain, but are too small to be captured by water treatment facilities. These microbeads make their way into rivers, streams, lakes and the ocean as primary microplastic debris. Synthetic fibers from clothing, such as fleece, also travel through waterways to the ocean as they shed off of clothing in washing machines.

**Secondary microplastics:** Plastics that enter the ocean have been found at the surface, on the bottom, and in the water column. Many plastic objects are buoyant and float at the surface of the ocean, being moved around by wind and surface currents. Plastics floating at the surface are exposed to sunlight. When they are exposed to UV waves, plastics break into smaller and smaller pieces, or fragments. Plastics can also fragment when exposed to wind or wave action. Microplastics resulting from the fragmentation of larger marine debris items are called *secondary microplastics*.



**Where are microplastics found?** Microplastics can be found not only in the ocean worldwide, but also in rivers and streams. Many plastics are buoyant and stay at the surface of the ocean. However, other *sinks* of microplastics include sand on beaches and offshore. A *sink* is any place that collects microplastics (or larger debris items) once they have entered the environment. There are an estimated 5.25 trillion plastic particles on the ocean surface, with more expected to be collecting elsewhere such as within living organisms as they are consumed, in the substrate on the ocean floor, or washed ashore.

**What are the impacts of microplastics in the environment?** There is ongoing research about the impacts of marine debris, and specifically microplastics, on the ocean and the organisms that live there. Microplastics can be found from the surface to the bottom of the ocean all over the world, which makes the impacts they have on the marine environment a global concern. Potential impacts of microplastics include the accumulation of toxins on their surface, ingestion of plastics by organisms, and the colonization of microbes on their surface.

**Why do we sample for microplastics on Seacoast beaches?** Blue Ocean Society, in partnership with the University of New Hampshire Cooperative Extension and New Hampshire Sea Grant, began collecting samples for microplastics on Seacoast beaches in 2013. Our study involves collecting sand samples at several New Hampshire beaches from Rye to Seabrook, sieving them for plastics, and then sorting the plastics into various categories. We've learned that in addition to the large plastics on our beaches, there are small ones, too, with foams making up the largest percentage of microplastics across the beaches.

**How do we collect our samples?** We sample for microplastics at five sites along the Seacoast, visiting each site once per month from April through October. Our sampling protocols, briefly, are as follows:

- Materials needed: 1m<sup>2</sup> quadrat (string); 4 pencils; one 5 gallon bucket; one 10 gallon bucket; one 5mm sieve; one 1mm sieve; trowel/hand shovel; ziplock bags; sharpie; 30m long string (for measuring distance between sampling sites).
- Step 1: Arrive at exact sampling location – there are 5 sampling locations per beach (roughly: along the highest high-water mark or wrack line; one at the center of the beach, one 30m north of center, one 30m south; one at the northernmost border of the beach and one at the southernmost border; see appendix for example layout).
- Step 2: At each sampling location, set up 1m<sup>2</sup> quadrat, using pencils stuck into the sand to hold the string in place and form a square. Place smaller bucket nearby, within reach.
- Step 3: Using hands or trowel, scrape off top ~1/2-inch of sand from within entire area of quadrat, placing into small bucket. Stop when small bucket is roughly half-full of sand.
- Step 4: Position 5mm sieve over larger bucket. Pour sand from small bucket through 5mm sieve, ensuring that it falls into the large bucket and items larger than 5mm are collected in the sieve. Set these items aside as a labeled sample.
- Step 5: Pour sifted sand from larger bucket through 1mm sieve (can simply let fall back onto the beach). Collect any items captured in 1mm sieve as another labeled sample.
- Repeat for all sampling locations (5 per beach site).



### **Microplastics Research at Home Activity**

Goal: Demonstrate how microplastics are sampled and examined from beaches for research purposes. Allow kids to try sampling on their own at home, followed by sorting. (Optional: include a discussion about why this research is important and how this and other types of pollution can be prevented).

Supplies: 1 bucket or bag of sand collected from your local beach, mesh strainer/colander used to sift, larger container to catch falling sand (large bowl), baking tray, data sheet, tweezers.

Optional: add in additional trash items ie. bottle caps, small pieces of plastic, etc. to allow kids to find more microplastics to create a more engaging activity/better discussion.

#### Activity Steps:

1. Go to the beach! Head outside and go to your nearest beach and select a plot of sand to collect your sample from (your plot should be 1 meter by 1 meter in size). Using a trowel or your hands skim about 1 cm of sand from the top of your plot and place into a bucket or bag.
2. Once home, have your child create a hypothesis about what they think will see in their sample.
3. Begin by slowly pouring the sand from your sample into your strainer/colander over a large container. What is left in your strainer/colander after finished sifting, pour onto your baking tray. Continue pouring sand into your strainer/colander until all of your sample has been sifted.
4. Sort through your sifted sample on your baking tray using your tweezers try to find every piece of microplastic or other debris in the sample.
  - a. While sorting through your sample use the Debris ID Card (found on page 5) to identify the different types of debris that you are finding.
5. As you sort through your sample keep tally the microplastics on the Microplastics Sorting Data sheet found on page 4.

**WRAP UP:** Ask your child some questions to get them thinking about microplastics and marine debris

- A. What kinds of debris did you find in your sample?
- B. What did you think you'd find? How did it differ from what you found?
- C. How do you think these microplastics affect the environment/animals in it?
- D. What can you do to help prevent microplastics from getting to the beach?



### Microplastics Sorting Data

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

# NHSG Microplastic Debris ID Card

Fragments



Pieces of hard plastic

Whole Plastic



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

Cigarette parts



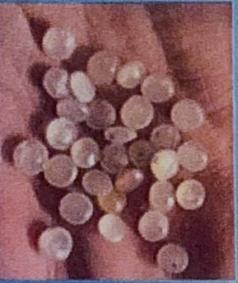
Cigarette butts & filters

Filaments



Fishing line, rope, or  
synthetic cloth

Pellets



Pre-production plastic pellets  
a.k.a "nurdles"

Films



Pieces of bags, wrappers  
that are thin and flexible

Foams



Styrofoam or insulation

Other



Glass, rubber, metal-non-plastic human debris



## Additional Resources

### Reports & Further Reading

- [A Microplastics Survey of New Hampshire Beaches: A Citizen Science Pilot Study](#). 2014 report on initial pilot study with NH Sea Grant and UNH.
- [Microplastic Marine Debris](#). One-pager from NOAA.
- [An Educator's Guide to Marine Debris](#). NOAA Report & Guide.

### Videos

- NOAA Marine Debris Program: [What Are Microplastics?](#) (1 min)
- Monterey Bay Aquarium Research Institute: [Microplastics in the Ocean: A deep dive on plastic pollution in Monterey Bay](#) (5 min)
- National Geographic: [Plastics 101](#) \*Excellent Resource for Chemistry Classes\* (6 min)
- Plastic Soup Foundation: [Micro-Plastics – Toxins in our Seafood?](#) (18 min)

### Curriculum

- [Mitigating Microplastics](#): 2016 curriculum for 6<sup>th</sup>-8<sup>th</sup> grades from Oregon State University and OR Sea Grant.
- [Microplastics and marine environment](#): “vertically articulated curriculum for students aged 5-15.”
- [The Plasticsphere: Plastic Migration and Its Impacts](#). Lesson plan from TeachEngineering.org
- [Microplastic Extraction of Exfoliating Beads from Cleansers](#): hands-on engineering activity from TeachEngineering.org
- For a list of microplastics-related curriculum, check out the [Florida Microplastics Awareness Project](#) and their [K-12 Resources library](#)