

Scientific Research Proposal 2023

Part 3

Microplastic Beach Research at Plum Island, Sandy Hook, National Recreation Area.

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FROM:

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INTRODUCTION:

Plastic has become a global problem. About 9% of plastic is recycled and 12% is incinerated. The remaining 79% of plastic is left to accumulate in community landfills and the environment, where it will never biodegrade. Instead, it breaks down into smaller and smaller pieces, becoming tiny plastic particles called microplastics (*Isobel Whitcomb, Live Science, published March 07, 2020*).

To determine what impact plastic refuse is having on local beaches along the Jersey Shore, members of Save Coastal Wildlife Nonprofit along with our colleagues at The Plastic Wave Project, started a volunteer microplastic beach monitoring program in 2019. The goal is to help educate people about the tiny plastic particles in our coastal waters and beaches that never biodegrade and are accidentally ingested by marine life.

Microplastics are, for the purpose of this study, small plastic pieces that are 1-5 mm in size (approximately the size of a Quinoa seed). Research tells us that microplastics are found in freshwater rivers and lakes, and in all of the world's oceans.

This protocol focuses on microplastics 1-5 mm in size because these particles are relatively easy to find and can be identified with the naked eye or using a magnifying glass. Microplastics smaller than 1 mm in size (such as microbeads) are more difficult to find, and more sophisticated technology is required to conclusively identify them.

There are two types of microplastics:

- Primary microplastics, which are intentionally produced (for example, plastic microbeads, which are used in some cosmetic products such as face scrubs).
- Secondary microplastics, which result from the breakup of larger plastic items during use or after disposal (for example, plastic microfibers, which originate from synthetic fabrics such as polyester).

This study is seeking to sample microplastic pollution at Plum Island, Sandy Hook of secondary microplastics.

This Microplastic Beach Monitoring Proposal is seeking to conduct volunteer monitoring activities in 2023 at Plum Island, Sandy Hook, Gateway National Recreation Area to determine the quantity of microplastics. Protocol focuses on collecting microplastics on the sandy beaches or shoreline area, and within Sandy Hook Bay.

The volunteer project will take place on weekends, but between Memorial Day and Labor Day holidays, sampling will be carried out only on weekdays.

Materials to be used by volunteers.

Supplies for collecting your sample:

- 1- standard window screen.
- 1 - Cup, scoop, or flat dustpan & 1 bucket to carry materials
- 4-Meter rope or string tied to form a quadrat (1 x 1-meter square)
- Wooden stakes
- 100-Meter tape measure
- Quart-sized bags, jars or other sealable containers, one for each quadrat that is sampled. **No glass jars!!**
- String or additional tape measure to lay out transects
- Marker and labels for containers

Supplies for analyzing your sample:

- Ruler
- Magnifying glass
- Forceps or tweezers
- Small brush (paint brush or hand brush)
- Size grid (Figure 7)
- Visual identification guide (Figure 9)

SETTING UP SAMPLING AREA

Volunteer will identify a sandy beach or shoreline area along Sandy Hook to sample for microplastics. At ocean or estuarine/bay beaches, the sampling area will be between the line of the last high tide (also called the high water line or wrack line, where seaweed and other organic debris are deposited by the tide) and the back of the beach where the sand ends at a seawall or path, or where vegetation grows, as shown in Figure 5 below.

To set up your sampling area, place the 100-meter measuring tape mid-beach and parallel to the water as shown in the diagram, and measure off 100 meters. Assign one end of the line as 0 and the other end as 100.

If your beach or shoreline is not at least 100 meters long, measure as far as you can, note this distance in the app or on your data card, and use this number in the random number generator as noted below.

Once this distance is measured, you will set up transects at random intervals along the line, using a random number generator (see below). A transect is a line perpendicular to the 100-meter line along which three 1-meter square areas (quadrats) will be selected and sampled (Figure 5).

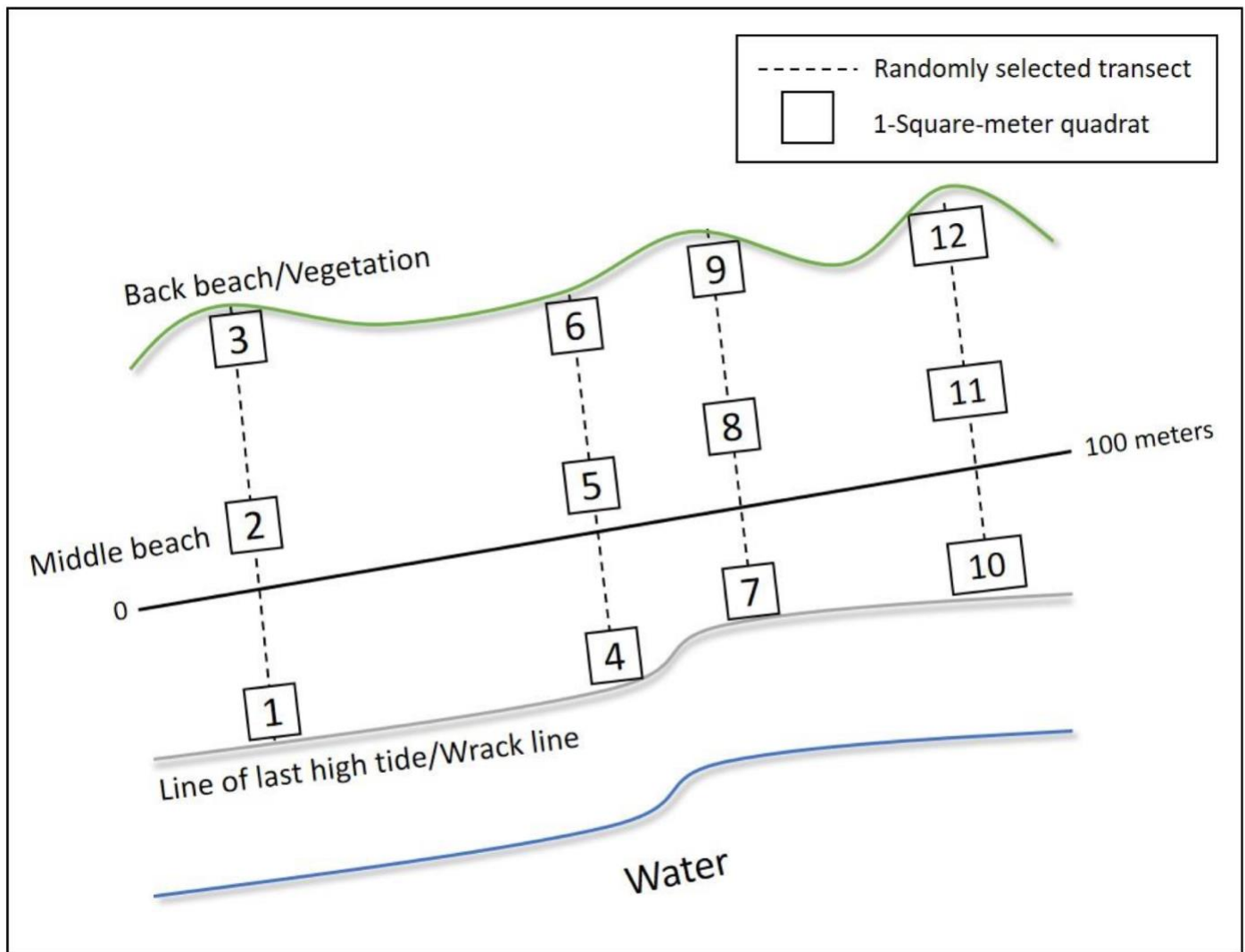


Figure 5. Sampling sites along a 100-meter line on a marine/estuarine beach. Note that on a freshwater beach, the middle beach is between the back beach and the water's edge (not the wrack line) so quadrats 1, 4, 7, and 10 would be at the water's edge.

Volunteers will identify four (4) transect points, use a random number generator, which can be found online using a person's smartphone. Go to www.random.org and enter a minimum value of 1 and a maximum value of 100. (Note: If beach is less than 100 meters long, enter the length of your beach as the maximum value in the random number generator.) Click "Generate" four times and write the four numbers down. These numbers are where you should mark the positions of your four transects along your 100-meter distance.

Using string or another measuring tape, lay a perpendicular transect across the transect point, from the high water line to the back beach. Volunteers may be able to simply establish the transect visually, especially if the water line and the back beach are close together.

Volunteers will place three of the 1 x 1-meter quadrats along the transect (refer to Figure 5). One quadrat should be at the wrack line (last high tide or high water line), one at the middle beach, and one at the back beach (next to vegetation, seawall or path). Do the same for the other three

transects so that volunteers will have four transects within 100-meter distance as shown in Figure 5.

COLLECTING SAMPLES

Volunteers can start collecting samples after a quadrat is set up. In each quadrat, remove any big pieces of natural debris and litter, like seaweed, wood and trash. Brush these items off with your supplied brush into your 1-mm sieve so that you collect any microplastics that might be attached.

If the debris is difficult to brush off (such as large clumps of seaweed), try submerging it in a bucket of water and gently agitating it to release any material that is stuck. Once the debris is clean, pour the water through your 1-mm sieve to collect the particles.

Most sample will consist of sand, either dry or wet. Sieve your sand carefully and in small batches to avoid losing any microplastics over the edge.

A. To Sieve Dry Sand:

- a. Evenly scrape the surface of the sand within the quadrat using a metal cup or flat dustpan to a depth of about an inch (2.5 cm). Deposit some of the sand you have scraped from the quadrat into your 5-gallon bucket until it is half filled with sand. Do your best to keep a consistent depth as you are scraping the sand.
- b. Scoop the sand back out of the bucket and pour it through the 1-mm sieve. Tap the sieve gently or use a brush to gently move the material through the sieve. Do this away from the quadrat.
- c. Once the first half-bucket of sand has been sieved, continue scraping sand from within the quadrat and placing it in the bucket. You may need to fill the bucket 1-2 more times. If you have enough volunteers, one person can scrape the quadrat while another filters sand.

B. To Sieve Wet Sand:

- a. Fill the 5-gallon bucket a little less than half full with water.
- b. Evenly scrape the surface of the sand within the quadrat using a metal cup or flat dustpan to a depth of about an inch (2.5 cm). Deposit some of the sand you have scraped from the quadrat into your bucket partially filled with water. Be careful not to overflow the bucket, and add the sand in small batches using the scoop to prevent the bucket from getting too heavy.
- c. Once enough sand has been added to the bucket, slowly pour water from the bucket through the sieve, or use the scoop to transfer all floating particles into the sieve. Do this away from the quadrat.
- d. After pouring the first bucketful of water through the sieve, remove the sand remaining in the bucket and discard it outside the quadrat. Then start again at step (a) and continue filling and emptying the bucket until all of the sand from your quadrat has been sieved.

As you sieve the sand or water, remove any suspected microplastics from the sieve using the tweezers and place them in a labeled, sealed bag, jar or bottle for later analysis. Depending on the purpose of your sampling trip (e.g. education versus in-depth characterization), you may want to combine the samples into one or two containers or use one container for each quadrat sample.

Be sure to label the containers (see Figure 5 for quadrat numbers).

Labels should include the beach name, the date of the sampling trip, the quadrat number(s), and the name of the volunteer(s).

Take note of other plastic items (larger than microplastics) you may find in your quadrat in your notes and data sheet.

ANALYZING SAMPLES

Once suspected microplastics have been separated from the sand, use the size grid (Figure 7) to determine which of particles are smaller than 5 mm.

If any particles are larger than the individual boxes in the grid, this means they are larger than 5 mm and thus are not microplastics (Figure 8) .

Microplastics can be grouped into 5 broad categories: fragments, pellets (nurdles), lines (fibers), films, and foams. Each of these groups has a characteristic appearance. Figure 9 is a visual guide to the different types of microplastics.

Particles can be identified as plastic using a few methods:

A. Visual identification using a magnifying glass and the visual guide in Figure 9.

B. A 'sink test' to differentiate shells from plastic—shells and shell fragments will sink, while many plastics will float.

C. A 'squish test' to differentiate hard plastics, such as polypropylene or polyethylene, from soft organic matter. Use your tweezers to gently squeeze the particle. Hard natural materials like shell fragments will crack under tweezer pressure, while plastics will generally bend, but not break (some harder plastics will not bend). Foam microplastics will also 'squish,' but not in the same way as organic matter. Foam microplastics can usually also be visually identified.

Note: Weathered plastics—plastics that have been in the environment for a long time—may not have the same properties as "new" plastics. Weathered plastics may appear faded in color, they may break more easily and may be more difficult to identify. If you are not sure that a particle is plastic, consider it non-plastic.

Count the number of plastics in each category. If you want to record separate information for each quadrat, make sure to note which quadrat(s) you are analyzing.

**Figure 7: Use this grid to determine if your microplastics are larger than 5 mm—
each box is 5 mm x 5 mm.**

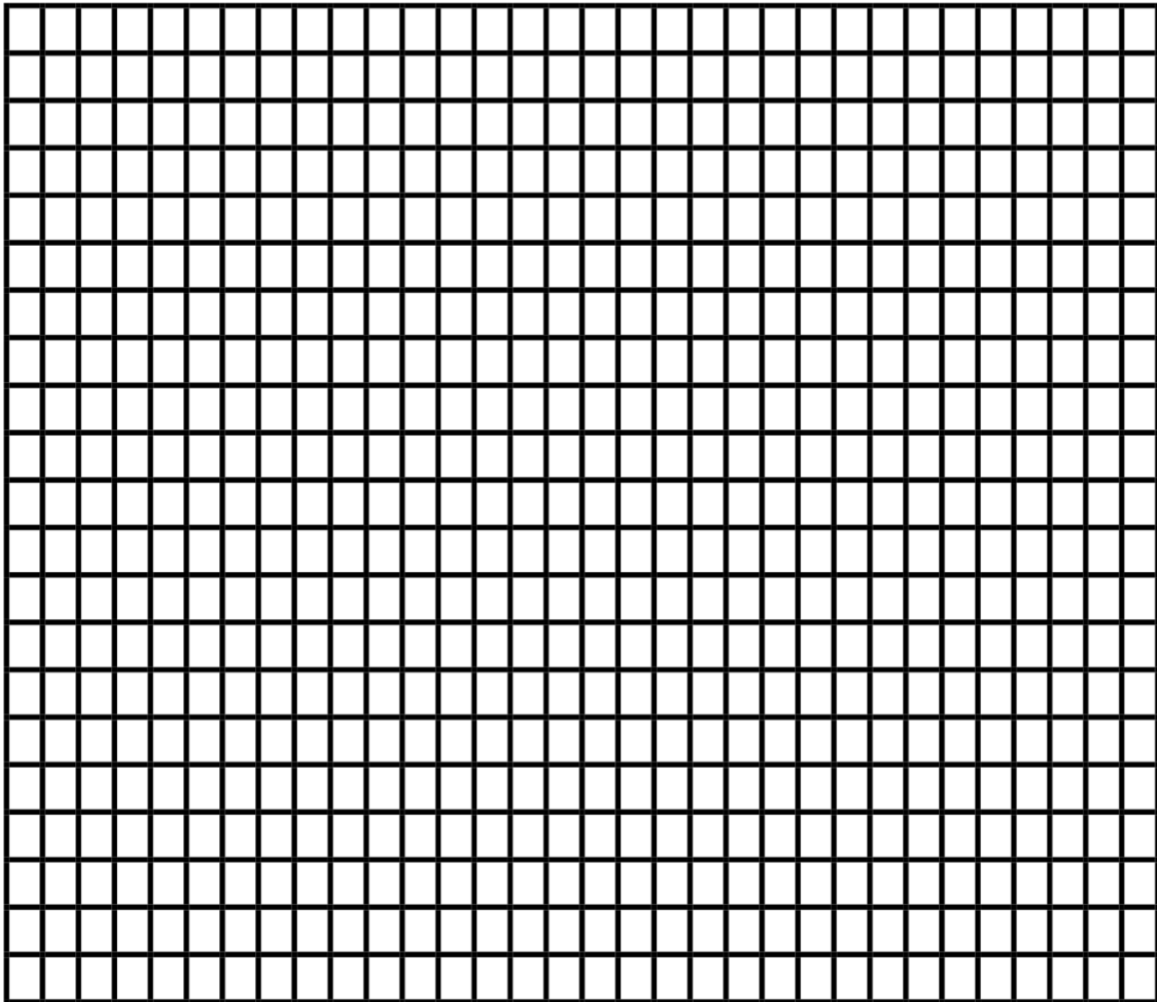


Figure 8: Use these size guides to measure other plastic pollution

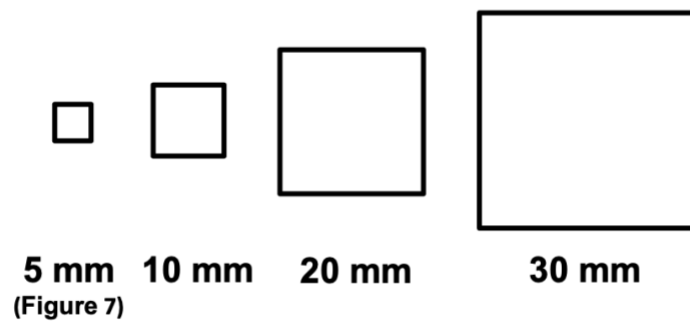


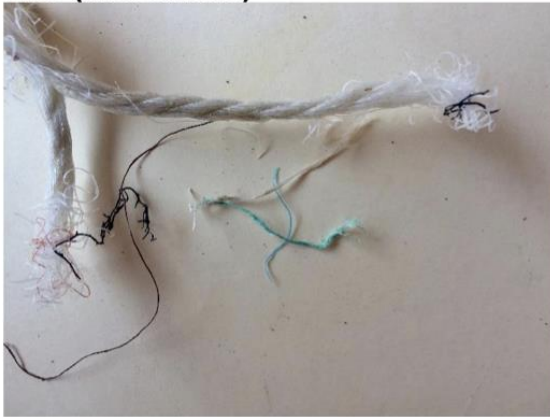


Figure 9: Visual Guide for Identifying Microplastics

<p>Fragment</p> 	<ul style="list-style-type: none">• Result from the break up of larger plastic items• Represent many types of plastic• Generally rigid• Occur in many colors and shapes• May become brittle over time due to weathering
<p>Pellets (Nurdles)</p> 	<ul style="list-style-type: none">• Used in the production of plastics• Can be made in many colors, but white pellets are common Usually have a round, smooth, manufactured appearance and feel

Line (Microfibers)



- Plastic fibers from synthetic textiles and synthetic ropes
- Occur in many colors
- May fray over time due to weathering
- May be larger than 5 mm in length, but are smaller than 5 mm in width

Film



- Pieces of plastic bags and wrappers
- Usually flexible
- Occur in many colors, but white/clear particles are common
- May become brittle over time due to weathering

Foam



- Pieces of expanded or extruded polystyrene (one example is Styrofoam™ insulation)
- Generally have a softer texture, but may also be brittle

Monitoring Location

Plum Island, Sandy Hook.

