

## Program on Water Quality Community Science for Middle School



### Microplastics: Beach Walk Activity

#### Background:

The presence of plastic--both small and large--along beaches across the globe have been noted for the past few decades. In Hawaii specifically, wind carries a significant amount of plastic to its shores from what has been called the Great Pacific Garbage Patch <sup>3</sup>. Such plastic pieces originate from inland sources (i.e. rivers, beach goers) or from the greater ocean. A study conducted in 2009 along Kuai discovered that the microplastics that reside along the beach are both chemically and mechanically broken down <sup>2</sup>.

To get a deeper understanding of how prevalent microplastics are along the coast of North Carolina, this activity will involve conducting a similar study along nearby beaches. The trick to examining these microplastics in the sand is finding a way to separate them from the sand, as they often can be similar in size and appearance. Though methods have been discovered to retain up to 96% of plastic within sediment <sup>1</sup>, such methods are timely and costly. For this activity, a traditional sand sifter method will be utilized.

#### Objectives:

##### Students will learn to:

- Collect uniform size sand samples
- Separate microplastics from sediment samples
- Observe and measure microplastic pieces per sample
- Collaborate as a class to assess and compare results
- Observe trends regarding amount of microplastic and location of tow

##### Materials:

- 2 shovels
- 4 8-oz jars
- 2 sieves or sand sifters
- 4 Tweezers/small forceps
- Graph paper
- 4 Wash bottles or 1 hose
- 2 Buckets
- 2 rulers (centimeters)

## Methods:

Sediment Gathering: 2 sets of samples will be collected: 1 at a recreational beach (Atlantic Beach) and 1 at a less populated beach (Rachel Carson Reserve). Follow these steps in both locations.

1. During high tide, walk between the high tide line and the surf zone<sup>4</sup>. This will be the area for sample collection.
2. Using a shovel, scoop enough sediment to fill a mason jar. Ensure shovel scrapes along top 20 cm of beach surface.
3. Label filled jar with location and date/time of sample.
4. Repeat Steps 1-3 to collect another sample, at least 50 m away from first sample.

Plastic Separation:

5. Over a bucket with a sieve or sand sifter hovering above, slowly add the collected sediment from one jar sample to the sieve/sifter. Gently shake the sieve/sifter to allow fine sediment to fall through the mesh and into the bucket. Apply hose/wash bottle water if necessary.
6. Sift through items caught in sieve/sand sifter separating natural material (i.e. shells, rocks) from man-made items (i.e. plastic, rope).
7. On graph paper, separate plastic items by size using tweezers.
8. Make note of the types of plastic and other man-made items collected, as well as the size variation in the data sheet provided.
9. Repeat Step 5-8 for each sample.

## References

1. Coppock, R., Cole, M., Lindeque, P., Queirós, A., & Galloway, S. (2017). A small-scale, portable method for extracting microplastics from marine sediments. *Environmental Pollution*, 230, 829-837. doi.org/10.1016/j.envpol.2017.07.017.
2. Corcoran, P. Biesinger, M., & Grifi, M. (2009). Plastics and beaches: A degrading relationship. *Marine Pollution Bulletin*, 58-1, 80-84, doi.org/10.1016/j.marpolbul.2008.08.022.
3. Herreria, C. (2017). Mezmerizing video of hawaii beach sand reveals unsettling reality". *Huffington Post*.  
[https://www.huffingtonpost.com/entry/sustainable-coastlines-hawaii-sand-sifter-kailua\\_us\\_58e97247e4b058f0a02fade1](https://www.huffingtonpost.com/entry/sustainable-coastlines-hawaii-sand-sifter-kailua_us_58e97247e4b058f0a02fade1)
4. Yu, X., Peng, J., Wang, K., Wang, J., & Bao, S. (2016). Occurrence of microplastics in the beach sand of the chinese inner sea: The bohai sea. *Environmental Pollution*, 214, 722-730. doi:10.1016/j.envpol.2016.04.080

## WORKSHEET 1: PREDICTIONS

What types of natural plants/materials do you think will be collected?

What types of man-made materials do you think the sieves will collect?

How small of plastic pieces do you predict will be caught in each sample?

How do you think the samples will be similar and different between the 2 study locations?

## WORKSHEET 2: ACTIVITY OBSERVATIONS

		Populated Beach: _____		Less Populated Beach: _____	
		Sample 1	Sample 2	Sample 3	Sample 4
<b>Number of materials collected</b>	Plastic <sup>3</sup>	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____
	Natural				
<b>Size Plastic Piece (cm)</b>	Smallest				
	Largest				





### **WORKSHEET 3: POST-ACTIVITY DISCUSSION**

What was the most common type of plastic collected?

What constraints prevented collection of all microplastics in each sample?

What similarities/differences exist between Samples 1-2 and 3-4? Why do you think that is?

Where do you think the microplastics originated? (Be more specific than what was given in the Background)

What solutions do you think you and your family can do to minimize your use of plastic and contribution to this marine debris problem?