KEEPING OUR COASTLINES CLEAN

A U.S. Virgin Islands Marine Debris Curriculum

SOURCES & TRANSPORT

Links to the Next Generation Science Standards, Quick Reference Guide

Curricula by Sub-Section		Middle School						High School					Sci & Engineering Practices
		ESS 3-1	ESS 3-2	ESS 3-3	ESS 3-4	ETS 1-1	ETS 1-2	ESS 3-1	ESS 3-3	ESS 3-4	ETS 1-1	ETS 1-2	
Composition & Abundance	Beach Box Exploration			✓									✓
	Investigating Oceanic Garbage Patches			✓					✓				✓
	A Degrading Experience			✓					✓				✓
Sources & Transportation	Watershed Walk	✓		✓				✓					✓
	Sources of Microplastics: Microbeads			✓									✓
Impacts	Entanglement Problems			✓	✓				✓	✓			✓
	Natural Disasters and Marine Debris		✓	✓	✓			✓					✓
Solutions	Linked Beach-Ghut Clean Ups	✓		✓					✓				✓
	Mitigating Microplastics			✓					✓				✓
	Upcycling Plastic Bags					✓	✓				✓	✓	
	Making Connections Through Art			✓					✓				✓

SPOT LIGHT

Microplastics by Danielle Lasseigne

Microplastics are plastic particles (fragments or fibers) that range in size from 1 nanometer to less than 5 millimeters. Microplastic fragments and fibers are often the result of larger pieces of plastic degrading and breaking down into smaller pieces over time. Danielle Lasseigne became interested in researching microplastic impacts on marine animals, especially corals, when she started the Marine and Environmental Science Master's Program at the University of the Virgin Islands (UVI) in 2015. However, to understand the impacts of microplastics on corals, we have to know how much is in the surrounding environment, and only a few studies have quantified microplastics in the U.S. Virgin Islands. Therefore, her Master's thesis focused on quantifying microplastics in different coastal environments around St. Thomas (beaches and nearshore waters). She hypothesized that microplastics would be more abundant in embayments with associated watersheds that contained roadside dumpster sites and higher human population densities (referred to as high human activity sites), compared to embayments with associated watersheds without roadside dumpster sites and lower human populations (referred to as low human activity sites).

To test her hypothesis, she collected the top 1-2 cm of sand from beaches around St. Thomas and surface water samples using a Manta Tow net that was pulled along the surface of the water by a boat. Samples were collected from Magen's Bay, Brewers Bay, Lindbergh Bay, and Bolongo Bay (all high human activity sites), and Hendricks Bay, Perseverance Bay, Sandy Bay, and Sprat Bay (all low human activity sites). These samples were then taken to the Environmental Analysis Lab at the University of the Virgin Islands to separate microplastics from each of the samples.

Danielle found that microplastics in beach sand were most abundant at Lindbergh, Brewers, and Magen's Bays (all high human activity sites), but not Bolongo Bay. This was a surprise as Bolongo Bay had been considered a high human activity site. Also surprising, were the high abundances found at Sprat Bay, which had been classified as a low human activity site. When Danielle examined her water samples, she discovered they mostly contained

Danielle Lasseigne, formerly a Research Analyst for the Center for Marine and Environmental Science at the University of the Virgin Islands, collecting beach sand from Sprat Bay (a low human activity site) to be processed for microplastics for her master's thesis at the University of the Virgin Islands Marine and Environmental Science Master's Program (Photo credit: John Cassell).

microfibers and that high human activity sites had more microplastics than low human activity sites with the exception of Magen's Bay, which more closely resembled the low human activity sites.

Danielle thinks that local activities have a lot to do with the patterns she observed. Beaches that have a lot of visitors and few waste receptacles (e.g., Lindbergh Bay), coastal bays located near sewage treatment facilities, and have fishing and boating activities (e.g., Bolongo Bay), tended to have more microplastics. Now that she knows where microplastics are most abundant, she and other researchers can look in those areas more closely to understand the likely sources for the microplastics, track their abundance over time, and study their impacts on animals in the environment.