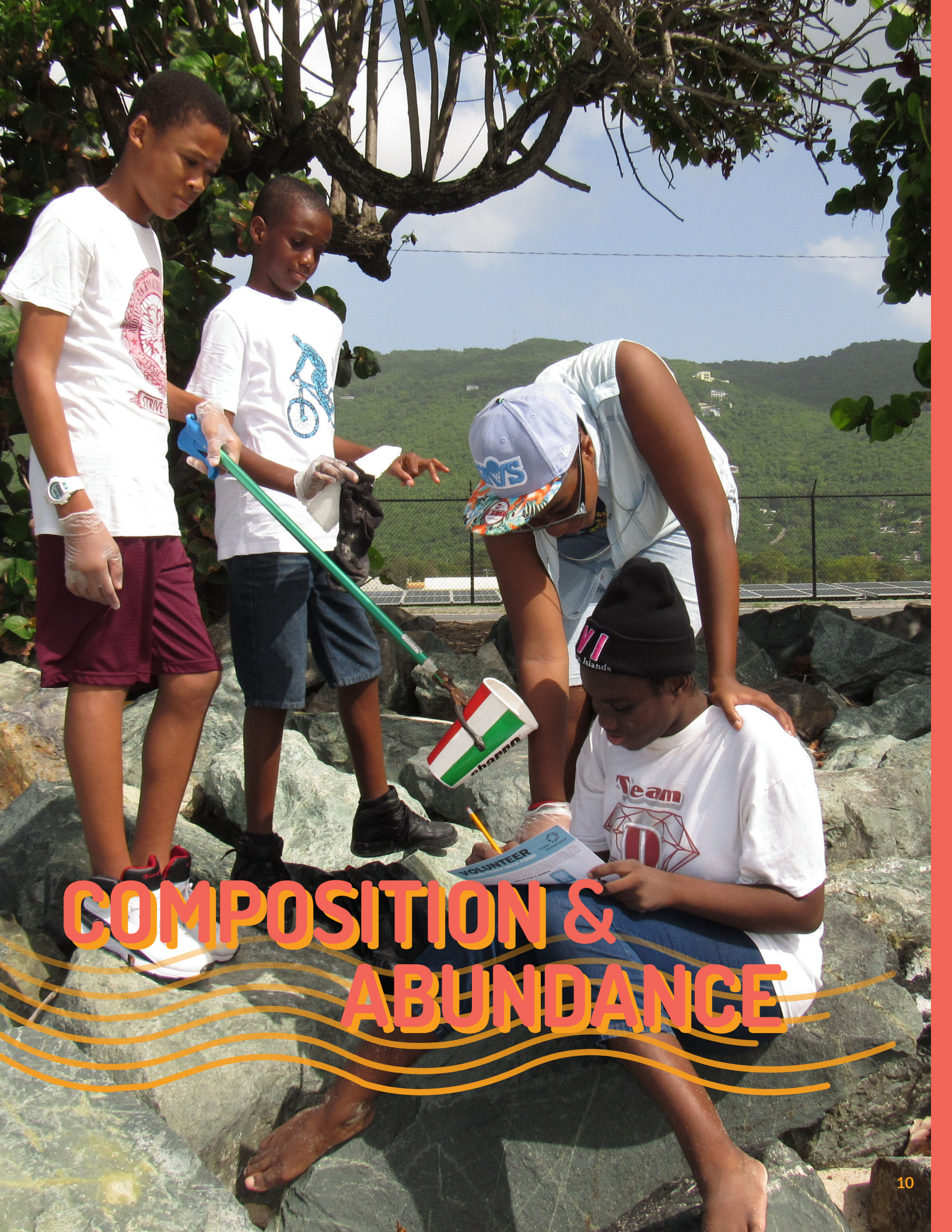


# KEEPING OUR COASTLINES CLEAN

A U.S. Virgin Islands  
Marine Debris Curriculum





# COMPOSITION & ABUNDANCE

# 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	
<b>Composition &amp; Abundance</b>	Beach Box Exploration			✓									✓
	Investigating Oceanic Garbage Patches			✓					✓				✓
	A Degrading Experience			✓					✓				✓
<b>Sources &amp; Transportation</b>	Watershed Walk	✓		✓				✓					✓
	Sources of Microplastics: Microbeads			✓									✓
<b>Impacts</b>	Entanglement Problems			✓	✓				✓	✓			✓
	Natural Disasters and Marine Debris		✓	✓	✓			✓					✓
<b>Solutions</b>	Linked Beach-Ghut Clean Ups	✓		✓					✓				✓
	Mitigating Microplastics			✓					✓				✓
	Upcycling Plastic Bags					✓	✓				✓	✓	
	Making Connections Through Art			✓					✓				✓

# LESSON: Beach Box Exploration

The activities in this lesson were modified with permission from Oregon Sea Grant's "Creating and Using Beach Boxes" activity from the Marine Debris STEAMSS (Science, Technology, Engineering, Art, Math, and Social Studies) curriculum (<https://oregoncoaststem.oregonstate.edu/sites/oregoncoaststem.oregonstate.edu/files/MD/beach-boxes.pdf>).

**Grade Levels:** 5-8

**Subject Areas:** Marine Biology: Debris Sources, Ecology

**NGSS Connections:**

- MS-ESS3-3:
  - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
  - ESS3.C: Human Impacts on Earth Systems - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.
  - ESS3.C: Human Impacts on Earth Systems - Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
- Appendix F: Science & Engineering Practices

**Time:** Half day for beach cleanup (optional), one class period for in-class activity and discussion.

**Description & Objectives:** Utilizing field work and in-class activities, students will learn to identify, sort, and classify marine debris in the U.S. Virgin Islands. They will learn to identify and classify common marine debris through analyzing and/or collecting samples.

**Guiding Questions:**

- What is marine debris?
- Where is marine debris found?
- What physical traits do marine debris materials have in common?

**Key Ideas & Concepts:**

- Marine debris is any persistent solid material manufactured or processed that is then disposed of or abandoned in the marine environment.
- Marine debris exists both where we can easily see it (beaches, wrack lines on the beach) and cannot easily see it (gullies leading to the beaches or under the sand and the surface of the water).
- Marine debris is mostly plastic.
- Most marine debris comes from land-based sources (us!).

**Pre-Requisite Skills:** Students will need to understand the basics of what makes up different materials (e.g., plastics, natural materials) and the general idea of marine water movements (i.e., tidal activity, circulation).

**Teacher Preparation:** There are three options for completing this activity:

1. Students create beach boxes in class after attending a beach cleanup;
2. Students co-create beach boxes with their parents using common marine debris items found at home;
3. Teachers create the boxes for students. For classes unable to attend a cleanup prior to the lesson, fill a shoebox sized container with either decorative sand, small rocks or gravel, or dirt and a variety of debris materials that are found on territory beaches. Make enough beach boxes so groups of 3-5 students can explore each box.

**Materials Needed:**

- Classroom set of shoebox-sized containers with lids (plan for 3-5 students to one container)
- Gloves (each student needs at least one)
- Tweezers and magnifying lenses
- Marine debris (collected by students in options 1 & 2 or by teacher in option 3, prior to the lesson):
  - Items should be representative of the debris commonly found in the area (plastic bottles/packaging/caps, metal pieces/bottle caps, fishing line/rope, rubber, food packaging/wrappers/bags, cigarette butts, straws, misc. small plastic pieces)
- Natural products (collected by students in options 1 or 2 above, or by teacher prior to the lesson):
  - Items should be representative of the natural debris commonly found in the area (dried algae, shells, seeds, leaves, coconut husks, food waste, woody debris)
- Hand soap or hand sanitizer to be used after beach cleanup activity or after making the beach boxes
- Debris sorting worksheets and pencils (1 per group, at end of lesson instructions)
- Additional boxes, paper plates, or trays for sorting debris

**Teacher Instructions:** This activity is intended to be an engagement and introductory lesson to marine debris. As such, there is no formal worksheet associated with this activity. However, you should encourage your students to make notes about what types and how much marine debris they find and to record their observations about what they are seeing. This can be done on loose leaf paper or in a formal lab notebook. There are three options for completing this activity.

In-class discussion: Start by having an in-class discussion about what makes up marine debris.

- **Guiding Questions:** What do you think marine debris is? Do people in the Virgin Islands need to worry about this or not? Where can you find marine debris? What or who do you think creates marine debris in the Virgin Islands?

Create beach boxes (this can be done in 3 ways):

1. *Students create their own boxes at a beach cleanup.* Have the students attend a beach cleanup. While at the beach give a shoebox to each small group (3-5) of students and ask them to collect things they are seeing/finding on the beach. Additional directions:
  - a. Try to reduce the amount of sand collected. Have students shake off items before placing them in the bin.
  - b. Instruct students to collect both marine debris items and natural products representative of what's actually on the beach (see the "Materials Needed" list above for examples).
  - c. Safety check:
    - i. Give students gloves for handling debris and bring hand sanitizer/soap to clean up with afterwards
    - ii. Avoid dead things, sharp or hazardous objects (glass/metal), fishing hooks, and personal hygiene items.
2. *Students create their own boxes with their families at home.* Provide students with an empty shoe box or reusable container to take home. Together with their family, students add items to the box that they think are marine debris. Students can be given a few days to gather enough supplies.
3. *Teacher creates boxes for the students to use in class.* For classes unable to attend a cleanup prior to the lesson, fill a shoebox-sized container with either decorative sand, small rocks, gravel, or dirt and a variety of debris materials that are found on territory beaches. Make enough beach boxes for groups of 3-5 students to explore.

Beach box sorting: In the classroom, using gloves and additional boxes, plates, or trays, have each group sort debris from a beach box into two piles: human-made and natural materials. If boxes were acquired by the students, have the groups trade boxes so that they are not sorting their own materials. When sorting is done, have a discussion about their debris groupings.



An example of sorting boxes used where participants sorted marine debris (left) versus natural debris (natural) items (right) (Photo credit: Howard Forbes, Jr.).

An example of a beach box used at the STEAM Fair hosted by the Department of Education. This box contains sand on the bottom along with commonly found items during beach cleanups in the U.S. Virgin Islands (Photo credit: Howard Forbes, Jr.).



- **Guiding Questions:** What makes something human-made vs. natural? How can you tell when you find something which type of debris it is? What traits (evidence) did you use to decide this? Which piles seem to have more debris?

After sorting between human-made and natural materials, students sort the human-made materials by physical characteristics using the Marine Debris Sorting Worksheet. Ask them to record how many of each type they obtain.

- **Guiding Questions:** What characteristics/traits did you use to determine what made something marine debris? Did you detect any similarities or patterns in things in your box? Were you surprised to find objects in the box? How do you think your items got on the beach?

Teacher Notes:

- Some areas require special permission to walk through and collect data. If you are doing a beach cleanup, find out if the beach is in a protected area or if access is part of a private property. You may need to get special permits or permission to have cleanups in

- *Following the activity, materials can be responsibly discarded according to waste disposal guidelines, or they may be stored for repeated use of this activity with other classes or for another activity with the same class (See Lesson: Making Connections Through Art).*
- *For more information about marine debris researchers and trends in the U.S. Virgin Islands, please see Researcher Spotlight: Zola Roper, Masters of Marine & Environmental Science student, University of the Virgin Islands and Spotlight: Common Marine Debris Items in the U.S. Virgin Islands.*



U.S. Virgin Islands educators and University of the Virgin Islands Masters of Marine & Environmental Science alumni, Akacia Halliday, explore beach boxes with Howard Forbes, Jr. St. Thomas/St. John Coordinator for the Virgin Islands Marine Advisory Service, at the 2016 Marine Debris Educators Workshop (Photo credit: Kristin Wilson Grimes).



A variety of natural and marine debris items from Hassell Island (Photo credit: Kristin Wilson Grimes).

# Marine Debris Sorting Worksheet

Use this worksheet to sort your sample into the following eight categories.  
(Most appropriate for debris <2.5cm)

## Fragments



Pieces of hard plastic

## Pellets



Pre-production plastic pellets

## Foams



Polystyrene, insulation, etc.

## Films



Pieces of bags or wrappers

## Cigarette Parts



Cigarette butts and filters

## Filament



Fishing line, rope, synthetic cloth

## Glass



Glass fragments and shards

## Other



Rubber, metal, other debris

**How many object from each category did your sample contain?**

\_\_\_\_\_ Fragments

\_\_\_\_\_ Foams

\_\_\_\_\_ Pellets

\_\_\_\_\_ Films

\_\_\_\_\_ Filament

\_\_\_\_\_ Cigarette Parts

\_\_\_\_\_ Glass

\_\_\_\_\_ Other