KEEPING OUR COASTLINES CLEAN

A U.S. Virgin Islands Marine Debris Curriculum

SOLUTIONS

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			✓					✓				✓

LESSON: Linked Beach-Ghut Cleanups

Some guided questions in this lesson were used 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). Other guided questions and activities in this lesson were adapted from NOAA's Turning the Tide on Trash curriculum (https://marinedebris.noaa.gov/turning-tide-trash). The Ocean Conservancy data sheets are included with permission.

Grade Levels: 5-12

Subject Areas: Marine Biology: Debris Sources, Ecology

NGSS Connections:

- MS-ESS3-1:
  - ESS3.A: Natural Resources - Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.
- 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.
- HS-ESS3-3:
  - ESS3.C: Human Impacts on Earth Systems - The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
- Appendix F: Science & Engineering Practices

Time: Half day for beach cleanup, half day for ghut cleanup, 1-2 class periods for in-class discussion.

Description & Objectives: Utilizing field work and in-class activities, students will learn to identify, sort and classify marine debris in the Virgin Islands.

Guiding Questions:

- What is marine debris?
- Where is marine debris found?
- Do the physical traits of marine marine debris affect how it gets from its point of origin to the beach?

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 is mostly plastic that people use.
- Marine debris is preventable as most of it comes from land-based sources.

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

Teacher Preparation: Identify a beach that has a ghut that empties into it or very near to it. This can be done using a mapping application on your phone or computer. Make sure that both the beach and ghut are accessible for students and that you have permissions to clean both, if you want to do a linked cleanup.

Materials Needed:

- Cleaning materials for safely picking up and removing debris.
- Data sheets for recording marine debris data; we like the data sheets available through the Ocean Conservancy (https://oceanconservancy.org/wp-content/uploads/2019/05/OC-DataCards_volunteerFINAL_ENG.pdf) for consistency with those that are used during U.S. Virgin Islands Coastweeks (beach cleanups) held each fall (also included at the end of this lesson).
- Clip boards and pencils.

Teacher Instructions:

Introduction & background: An engaging way to introduce this topic is to show students a mapping website that has topographical features on it (similar to Google Earth). You can ask them to describe the area around where they are going to do the beach and the ghut cleanup.

- **Guiding question:** Where are the beach and the ghut in relation to each other?

Next, have an in-class discussion about marine debris prior to attending the cleanup.

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

After the class has described the area, this is a good time to define/describe/review what a watershed is. The general definition of a watershed is an area of land that drains into a specific body of water. Have the students relate the description of a watershed back to the previous discussion about the area around where the cleanups are going to happen.

- **Guiding questions:** Is the area part of a watershed? How can you tell? What will happen to items that are improperly disposed of? Where will they eventually end up?

This is also a good time to remind students about the definition of marine debris.

- "Marine debris is defined 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."

Beach & ghut cleanup:
Organize your own or attend a linked beach-ghut cleanup and ask students to record the marine debris they collect. See the data card we like to use in the materials section of this lesson. Review with students, as needed, the difference between marine debris and natural debris items. You can emphasize that most marine debris is plastic and comes from land-based sources, globally. This is also true in the U.S. Virgin Islands. Most marine debris items on U.S. Virgin Islands beaches are plastics and either are disposed of on the beach itself or are disposed of elsewhere on land, then make their way to the beach.

- **Guiding questions:** What makes something human-made vs. natural? How can you tell when you find something, what it is? What traits (evidence) did you use to decide this? How might debris found in the ghut differ from what will be found on the beach? Do you notice if there are any protected areas or private property near the beach or ghut you are cleaning up? Do you think the type of property that an area of land is (e.g., private, public, or protected) affects the type of marine debris that is found there?

Teacher Note: *Some areas require special permission to walk through and collect data. If you are doing a linked beach-ghut cleanup, find out if it is a protected area or part of private property. You may need to get special permitting or permission to have cleanups in those areas.*

In-class activities and discussion: When you get back to the classroom:

1. Ask the students to share something they found interesting while cleaning up the beach and the ghut.
2. Show or reshow the NOAA Video "TRASH TALK: Where Does Marine Debris Come From?" (https://www.youtube.com/watch?v=FN9FF7VH4ig).
3. Think about the video and their cleanup experience. Have students think about how trash moves across the landscape here in the U.S. Virgin Islands and how trash produced higher up in the watershed moves down through ghuts and storm drains to the ocean. Emphasize the ridge-to-reef connection.
4. Show them a map of the area they cleaned-up and show them the map of a similar area on a different island. Have the students share some similarities and differences they can spot between the two areas. Ask the students how differences in elevation may change how the flow of trash, oil, and dirt move through a watershed. How is topography similar or different in the two areas selected?
    - **Guiding questions:** What questions do you have about how marine debris may have arrived at your study site? Could the ghuts be part of the cause? Why or why not? What about storm drains? Why or why not? How is topography similar or different across the two areas? How might that influence marine debris found in both areas?

Teacher Note: *Emphasize the ridge-to-reef concept (the interconnected nature of the land and the sea in the U.S. Virgin Islands) and that activities we do on land impact nearshore and coastal environments.*

Assessment and evaluation:

- Have students complete the linked cleanup worksheet (included).
- Have students view online data (http://www.marinedebris.engr.uga.edu/list/) and compare the results of those areas to the areas your class cleaned-up. Also have them compare the U.S. Virgin Islands to other coastal areas (Florida, Oregon, Mexico, Australia). What are the similarities and differences between those places and the U.S. Virgin Islands?
- Alternative: Students could investigate the International Coastal Cleanup data (https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/annual-data-release/) and compare worldwide trends to the U.S. Virgin Islands. Have students hypothesize which areas might have more debris based on potential sources, pathways and regulations governing trash. Have students research regulations governing trash in the U.S. Virgin Islands and compare those to regulations in different parts of the world.

Additional activities for grades 9-12: Have students pick three different places around the world. Have them investigate and compare the top 10 types of marine debris found in those places, then research potential pathways (e.g., major rivers in those areas) that might connect land-based sources of debris to the ocean. Finally, have them research the regulations governing trash and those regions then report their findings to their classmates. Compare and contrast different regions from around the globe. Use International Coastal Cleanup data (https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/annual-data-release/).

Teacher Notes:

- *Try to reduce the amount of debris generated by the cleanups, by using reusable sacks or buckets, rather than plastic garbage bags, and reusable gloves. If disposable gloves must be used, try to limit to one hand per student (dominant hand for picking up items).*
- *For more information about local efforts to reduce marine debris read Spotlight: Virgin Islands Marine Advisory Service Coastweeks and Spotlight: Plastic Free July in the VI: The Summit on St. John.*
- *For inspiring stories of local solutions to marine debris read the Spotlight: Community Transfer Projects: Turning New Knowledge into Action at the Local Level in the U.S. Virgin Islands, and the five associated spotlights.*

Local students participate in beach cleanups at Brewers Bay Beach, St. Thomas as part of the annual Coastweeks activities that happen each fall in the U.S. Virgin Islands (Photo credit: Howard Forbes, Jr.).

Students and mentors from the 2019 Youth Ocean Explorers Program (run by the Virgin Islands Marine Advisory Service) conducting a beach cleanup, collecting data, and having fun at Brewers Bay Beach, St. Thomas (Photo credit: Howard Forbes, Jr.).

Linked Beach-Ghut Cleanup Worksheet

1. Think about how we discard our trash. What types of trash are thrown away at the roadside dumpsters? _____

   a. What do you think happens to this trash on a really rainy day, or during the rainy season?

   b. What do you think happens when your trash falls out of the dumpster, or is left next to the dumpster rather than in it? _____

2. Think about the two different areas you cleaned-up, refer to your data cards if you need to refresh your memory.

   a. What were the most frequently collected items from the beach cleanup?

   b. What were the most frequently collected items from the ghut cleanup?

3. Think about the geography of the areas you cleaned up. Is the area around the beach open or secluded?

   a. Does the beach have a lot of plants nearby making a hidden/shaded area?

   b. Is the area around the ghut open or secluded?_____

   c. Does the ghut have a lot of plants nearby making it hidden? _____

4. Looking at your responses to question 3 above, how do you think the differences in the area (open vs. secluded) influence the type of trash that enters the ghuts and the beach? Why or why not?

VOLUNTEER
OCEAN TRASH DATA FORM

Ocean Conservancy

Ocean and waterway trash ranks as one of the most serious pollution problems choking our planet. Far more than an eyesore, a rising tide of marine debris threatens human health, wildlife, communities and economies around the world. The ocean faces many challenges, but trash should not be one of them. Ocean trash is entirely preventable, and data you collect are part of the solution. The International Coastal Cleanup is the world's largest volunteer effort on behalf of ocean and waterway health.

HERE IS HOW IT WORKS:

1 CLEAN UP TRASH & COLLECT DATA

3 PUBLISH RESULTS

2 ORGANIZE & ANALYZE DATA

4 REDUCE OUR IMPACT

SITE INFORMATION:

Cleanup Site Name:

State or Province:

Zone or County:

Country:

Nearest Crossroad or Landmark:

NUMBER OF VOLUNTEERS WORKING ON THIS CARD:

adults

children (under 12)

MOST UNUSUAL ITEM COLLECTED:

TYPE OF CLEANUP:

Land: ☐ Underwater: ☐ Watercraft: ☐

DATE:

GO PAPERLESS!

Collect and record your data on Clean Swell!

Download the free app on your mobile device.

Download on the App Store | GET IT ON Google Play

Please return this form to your area coordinator.
If you are unable to do so, please mail or email it to:

Ocean Conservancy
Attn: International Coastal Cleanup
1300 19th Street, NW, 8th Floor, Washington, DC 20036
cleanup@oceanconservancy.org

Trash Free Seas: www.oceanconservancy.org/cleanup
Be a Green Boater: www.oceanconservancy.org/do-your-part/green-boating
Sponsors: www.oceanconservancy.org/cleanupsponsors
Clean Swell: www.oceanconservancy.org/cleanswell

International COASTAL Cleanup

TRASH COLLECTED

Citizen scientist: Pick up all trash and record all items you find below. No matter how small the items, the data you collect are important for Trash Free Seas®

EXAMPLE: TOTAL #

Plastic Bags: 𝍸 | | | = 8

Please DO NOT use words or check marks. Only **numbers** are useful data.

MOST LIKELY TO FIND ITEMS:

TOTAL #

Cigarette Butts: =

Food Wrappers (candy, chips, etc.): =

Take Out/Away Containers (Plastic): =

Take Out/Away Containers (Foam): =

Bottle Caps (Plastic) =

Bottle Caps (Metal) =

Lids (Plastic) : =

Straws/Stirrers: =

Forks, Knives, Spoons: =

Beverage Bottles (Plastic): =

Beverage Bottles (Glass): =

Beverage Cans: =

Grocery Bags (Plastic): =

Other Plastic Bags: =

Paper Bags: =

Cups & Plates (Paper): =

Cups & Plates (Plastic): =

Cups & Plates (Foam): =

FISHING GEAR:

TOTAL #

Fishing Buoys, Pots & Traps: =

Fishing Net & Pieces: =

Fishing Line (1 yard/meter = 1 piece): =

Rope (1 yard/meter = 1 piece): =

PACKAGING MATERIALS:

TOTAL #

6-Pack Holders =

Other Plastic/Foam Packaging: =

Other Plastic Bottles (oil, bleach, etc.): =

Strapping Bands: =

Tobacco Packaging/Wrap: =

OTHER TRASH:

TOTAL #

Appliances (refrigerators, washers, etc.): =

Balloons: =

Cigar Tips: =

Cigarette Lighters: =

Construction Materials: =

Fireworks: =

Tires: =

PERSONAL HYGIENE:

TOTAL #

Condoms: =

Diapers: =

Syringes: =

Tampons/Tampon Applicators: =

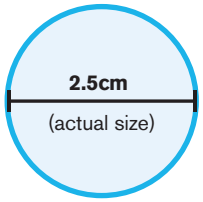
TINY TRASH LESS THAN 2.5CM:

TOTAL #

Foam Pieces =

Glass Pieces =

Plastic Pieces =



DEAD/INJURED ANIMAL	STATUS	ENTANGLED	TYPE OF ENTANGLEMENT ITEM
	Dead or **Injured**	**Yes** or **No**	

ITEMS OF LOCAL CONCERN:

1. 2. 3.

CLEANUP SUMMARY (circle units)

Number of Trash Bags Filled: _____ **Weight of Trash Collected:** _____ lbs/kgs **Distance Cleaned:** _____ miles/km