

KEEPING OUR COASTLINES CLEAN

A U.S. Virgin Islands
Marine Debris Curriculum





IMPACTS

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: Entanglement Problems

The activity in this lesson was modified with permission from Oregon Sea Grant's "Getting Out of a Bind" activity from the Marine Debris STEAMSS (Science, Technology, Engineering, Art, Math, and Social Studies) curriculum, which was originally developed by the Center for Marine Conservation and the California Coastal Commission for "Save Our Seas, A curriculum for Kindergarten through the Twelfth Grade." (<https://oregoncoaststem.oregonstate.edu/sites/oregoncoaststem.oregonstate.edu/files/MD/oimb-gk12-marine-debris-2.pdf>). Some guiding questions and discussion are sourced from two additional activities, "All Tangled Up," found in 'Turning the Tide on Trash' (<https://marinedebris.noaa.gov/turning-tide-trash>) and "Entanglement" found in 'Talking Trash and Taking Action' (<https://marinedebris.noaa.gov/talking-trash-and-taking-action>).

Grade Levels: 5-12

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.
- MS-ESS3-4:
 - 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.
- HS-ESS3-4:
 - ESS3.C: Human Impacts on Earth Systems - Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.
 - ETS1.B: Developing Possible Solutions - When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary)
- Appendix F: Science & Engineering Practices

Time: 15-30 min depending on how many students you have

Description & Objectives: The goal of this lesson is to demonstrate what happens to animals that get trapped by some kinds of marine debris. Students will experience similar effects to those that happen to animals that get trapped. This activity works well as an engagement activity.

Guiding Questions:

- What types of animals are affected by marine debris?
- How does marine debris like fishing line and plastic bags impact marine life?
- How does marine debris impact ecosystems?

Key Ideas & Concepts:

- Marine debris can cause marine organisms to become entangled, suffocate and/or starve.
- Marine animals have different appendages than people and they must use different methods to escape entanglement; sometimes they are unable to escape.

Pre-Requisite Skills: Students will need to understand the types of animals that live in or use the marine environment around the U.S. Virgin Islands. Students will also need to understand why those major types of marine animals are important to the ocean.

Teacher Preparation: This in-class activity works best in pairs or groups depending on the amount of time and resources available.

Materials Needed:

- A rubber band for each student.
- Optional materials: plastic bags, string, shoelace, dental floss

Teacher Instructions:

Introductory discussion: Have an in-class discussion about the different types of animals we have living in and using the marine environment around the U.S. Virgin Islands (e.g., sea turtles, whales, dolphins, fish, crabs, sea cucumbers, fish, jellyfish, sea birds).

- **Guiding questions:** What types of large animals live in or use U.S. Virgin Islands coastal waters? How are these large animals important to the ocean and to people? Animals living in and using the marine environment encounter different kinds of plastics. How do you think these animals might react to these plastics being in their environment? What are the different ways you think plastics can interact with and harm marine animals?

Activity instructions:

1. Show class a photo or short online video of an entangled animal.
 - (Suggested: https://oceantoday.noaa.gov/trashtalk_impacts/; stop at 0:32 seconds)
2. Ask for a volunteer, putting a rubber band or any other rope-like material around the back of the student's hand. Make sure that both their thumb and pinky finger are 'caught' in the material.
3. Pass out additional entanglement materials for the class to try. Have each student pretend their hand and arm is a marine animal. Some could be a bird, others could be a fish or sea turtle. To demonstrate how hard it is for animals to escape, have students place the elbow of their 'trapped' hand into their 'free' hand so they are not tempted to use their free hand to untangle themselves. They should try to escape the entanglement material without using any of their 'free' body parts (teeth, face, etc). Let the students struggle to free themselves for a few moments without any help from their peers. Letting the frustration build will give them a better sense of what marine animals are experiencing.
4. While the students are struggling, ask them to describe their experiences.
 - **Guiding questions:** How hard is it to get out of the rubber band or other objects? Is your hand/arm tired? How do you think you would feel if you had been struggling for longer, like a few hours? If this was your mouth, would you be able to eat? How do you feel when you miss a meal? What would happen if it continued all day and you were constantly fighting to free yourself? Now imagine you are lying in the water after struggling to get free and a predator finds you, what do you do? Do you have enough energy to get away? What if your wings/fins are also entangled, can you get away? Think about how our hands and arms are different than the wings of birds and fins of turtles. Think about how our elbows and knees bend compared to how the limbs of birds, turtles, and fish move. Do you think these differences will affect how they get untangled from marine debris like plastic bags, fishing lines, fishing nets, and ropes?
5. At the end of the time limit, check in and see who has successfully untangled themselves. Remind the students that while they may have gotten free, many animals will not.

Follow-up: After completing the activity:

- Have students complete the worksheet (included at the end of this lesson).
- Have students brainstorm different ways to reduce the amount of entanglement debris in the U.S. Virgin Islands.
- Have students critique the activity and make a list of suggestions to improve the assignment.

Additional Activities for Grades 9-12:

- Have your students try this on a larger scale. Have students compare and contrast the limb shape and function of five different marine organisms. Ask them to write or draw what would happen if they got entangled in a plastic bag, fishing line, or fishing net and how these experiences would differ depending on organism and marine debris type.
- Have your students visit a younger grade and help them with this activity. Have them help teach the differences between humans and marine organisms, emphasizing the directional bend of joints are different and that people have opposable thumbs.
- Have your students visit their librarian to understand how to access scientific research on the issue of entanglement or have them do a web search to look up studies. Ask them to synthesize information from 2-4 studies to present back to the class. Consider assigning different types of animals to different groups of students. Discuss with them how there is a lot of information for some types of animals and less for others. Ask them to consider what this might mean for science and conservation. Based on what they learn, have them validate reasons for safe disposal of trash and how that will save local wildlife.
- Have students participate in real-life experiences that allow them to interact with wildlife and foster environmental stewardship (e.g., turtle watching, public turtle tagging events, beach cleanups).

Teacher Note: For more information about how local marine life can be impacted by marine debris, please see *Spotlight: Marine Debris Impacts to Sea Turtles in the U.S. Virgin Islands*.

Entanglement Worksheet

As you complete this worksheet, think about the entanglement activity you participated in.

1. What was causing your hand to be entangled? _____

2. Were you able to get untangled without any help, or without using your teeth, face, hand, or other body parts? _____

3. What materials found on U.S. Virgin Islands beaches could the rubber band represent?

4. When you were doing the activity with one rubber band, did it make your hand/arm tired?

5. What made you tired? _____

6. What do you think would happen if you had more than one rubber band on multiple fingers?

a. Would you get tired faster? _____

b. Would you be able to get yourself free without help if you had multiple pieces entangling you?

Entanglement Worksheet Grades 9-12

As you complete this worksheet, think about the entanglement activity you participated in.

1. What was causing your hand to be entangled? _____

2. Were you able to get untangled without any help, or without using your teeth, face, hand, or other body parts? _____

3. What materials found on U.S. Virgin Islands beaches could the rubber band represent?

4. When you were doing the activity with one rubber band, did it make your hand/arm tired?

5. What made you tired? _____

6. What do you think would happen if you had more than one rubber band on multiple fingers?
 - a. Would you get tired faster? _____

 - b. Would you be able to get yourself free without help if you had multiple pieces entangling you?

7. What do you think would happen if a frigate bird or tern got entangled in fishing line or a discarded fishing net? _____

8. What about fish or sea turtles? _____

9. What would happen to the marine animals that feed in the coral reef if discarded fishing nets get wrapped around the coral? _____

10. What are other things that marine animals can get tangled in? _____

11. Think about things that we use or buy, like plastic bags; how can marine life be impacted by those? _____

12. What are some things that we can do to reduce the amount of marine debris that causes entanglements of and other harm to marine life here in the U.S. Virgin Islands?

13. How would you increase awareness about the issues of entanglement of and harm to wildlife because of marine debris, here in the U.S. Virgin Islands community? Also, what kind of activities would you suggest to someone who wants to be involved in reducing instances of entanglement of or harm to wildlife?

