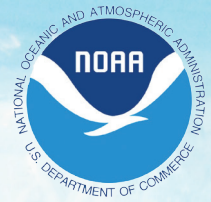


North American Marine Environment Protection Association®

NAMEPA

2014 Lloyd's List Awards ENVIRONMENT AWARD WINNER



An Educator's Guide to Marine Debris



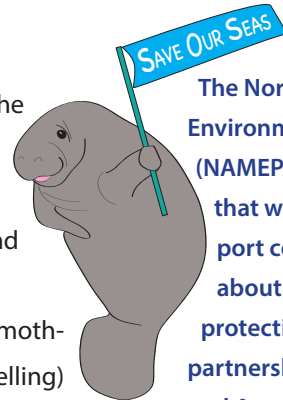
AN EDUCATOR'S GUIDE TO MARINE DEBRIS

Introduction

Marine debris is a problem that plagues coastlines around the world. In the past, it was considered primarily an eyesore. Today, through research, we know how seriously marine debris impacts marine habitats, marine wildlife, human health and safety, navigation and the economy.

Plastic bags, abandoned fishing nets and other debris can smother sensitive coral reef habitats as well as benthic (bottom-dwelling) ecosystems. Each year, many marine mammals, birds, and other organisms become entangled in or ingest various forms of debris. Fishing and shipping industries are also impacted by marine debris, as they pay vessel repair costs and must replace any damaged gear to continue working. In addition, coastal communities spend millions cleaning up their shorelines every year.

Despite its prevalence, marine debris is a problem that each individual citizen can help prevent. Education is the first crucial step in mitigation. Through the use of this guide, we can help foster environmental stewardship and create advocates for the marine environment. With every person that participates in a cleanup, uses a reusable bag or water bottle, or spreads the word about marine debris, we move one step closer to creating a more beautiful and healthy marine environment. *Source: NOAA, 2007*



The North American Marine Environment Protection Association (NAMEPA) is an industry-led organization that works to educate seafarers, port communities and students about the need and strategies for protecting the marine environment. In partnership with the National Oceanic and Atmospheric Administration (NOAA), NAMEPA has created *An Educator's Guide to Marine Debris* to provide educators with a tool to help students become more informed on marine debris and encourage environmental stewardship.

This easy-to-use guide is designed to provide maximum flexibility for educators in both formal and informal settings. It may be used as a standalone teaching tool, or to supplement lessons in other areas. This guide includes information about marine debris and useful lessons for students grades K-12, with a focus on STEM (Science, Technology, Engineering, Mathematics) objectives.

This guide is based on NOAA's "Turning the Tide on Trash: A Learning Guide on Marine Debris" and was published in 2014. To access presentations referenced in this guide and for additional information, visit www.namepa.net/education or our junior website, www.namepajr.net. We hope to continue to update this guide with new lessons and resources.





Acknowledgements

This learning guide is a collaborative effort between the North American Marine Environment Protection Association (NAMEPA) and the National Oceanic and Atmospheric Administration (NOAA). It was created using content from the “Turning the Tide on Trash” marine debris curriculum developed by NOAA.

Project Manager: Elise Avallon, North American Marine Environment Protection Association (NAMEPA)

Primary Writers: Elise Avallon, Heather Feinberg

Editors:
Elise Avallon, NAMEPA
Leah Henry, NOAA Marine Debris Program

Graphic Designer: Gayle Erickson

Illustrations and Cover Painting By Casey Clifford

For questions concerning this learning guide, please contact Elise Avallon, NAMEPA Education and Outreach Coordinator, e.avallon@namepa.net.

DISCLAIMER

This learning guide alludes to various web pages that are not a part of the NAMEPA or NOAA family. These sites are not under NAMEPA or NOAA control, and NAMEPA and NOAA are not responsible for the information or other links found there. The presence of these links is not to imply endorsement of these sites, but to provide additional relevant information from sites that are managed by other organizations, companies or individuals.

© 2014

View this publication online at: www.namepa.net/education and <http://marinedebris.noaa.gov>.



Trapping Trash

Grade Level: K-5

Time: 1 hour, can be done over multiple days

SUMMARY

Waste reduction and prevention is essential in mitigating marine debris. However, action needs to be taken to address the trash that has already accumulated in our oceans. This lesson plays on students' creativity by asking them to design a machine that collects debris in the ocean without impacting wildlife.

OBJECTIVES

- Design a device/structure to remove existing marine debris

STEM APPLICATIONS

- Designing a piece of machinery (Technology & Engineering)
- Laying out dimensions of a design (Mathematics)
- Understanding the buoyancy of various materials (Science)

VOCABULARY

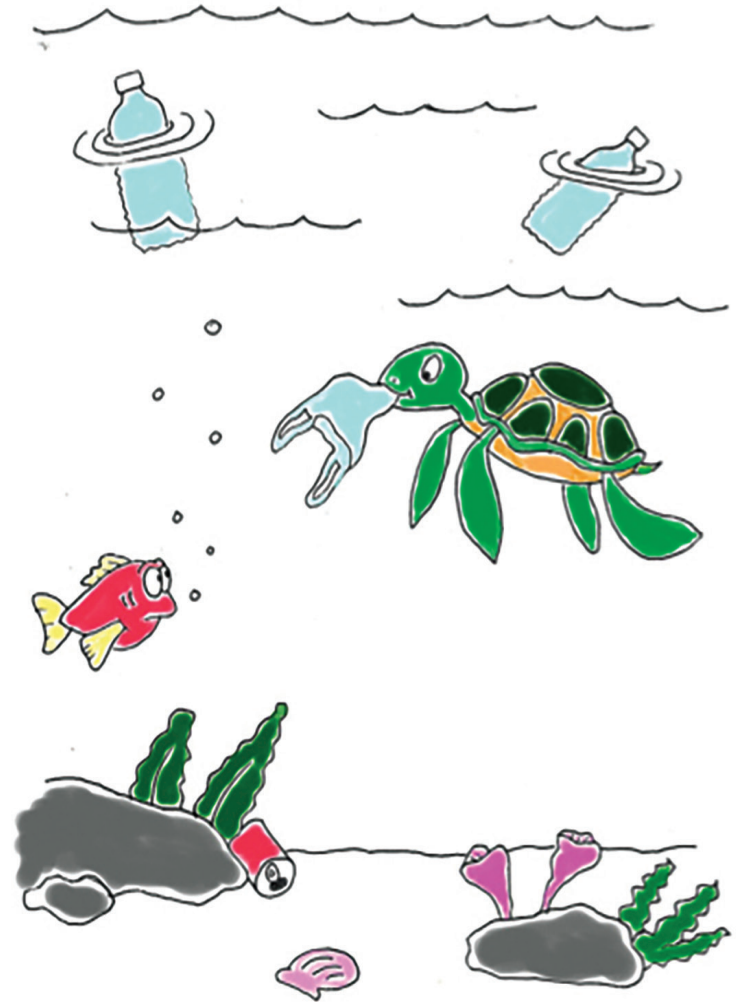
- **Marine debris:** Any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes (NOAA, 2007)
- **Photodegradation:** The process by which a substance or object is broken down via sunlight
- **Gyre:** A circular pattern of currents in an ocean basin
- **Buoyancy:** The ability to float in water
- **Recycling:** Converting waste into reusable material

MATERIALS

- Drawing paper
- Graph paper
- Drawing utensils: pencils, colored pencils, markers
- PowerPoint presentation on Marine Debris (on NAMEPA website)
- Rulers and protractors
- Compasses for drawing circles
- NAMEPA Plastics Pledge (page 26)
- Optional: Examples of debris and plastic tub with water for buoyancy test
- Additional options: Legos or materials to build models (If doing the lesson over multiple days, these materials can be catered specifically to student designs, and they can choose their materials)

SAFETY PRECAUTIONS

Clean and check all trash objects prior to being handled by students. Avoid sharp objects or materials containing harmful chemicals.



BACKGROUND

Marine debris is a global problem, impacting all of the world's oceans. It originates from a variety of sources, including beachgoers, wind, ships, etc. Marine debris entangles and is ingested by marine life and can smother habitats such as coral reefs. After entering the ocean, much of the drifting debris ends up in ocean gyres, which occur because of the circular ocean currents. We have not yet discovered an efficient way to remove debris from the world's waterways and oceans, which is the inspiration for this lesson. Despite how widespread marine debris is, it is something that each individual person can help to prevent through making informed purchasing decisions, properly disposing of trash, cleaning up litter, etc.

ACTIVITY

1. Elicit (7 min):

Ask the students if they have ever seen trash where it doesn't belong, and if so where? Answers should include on the street, storm drains, parking lots, beaches, etc. What types of debris have they seen? Take answers for a couple minutes after giving them a minute to think. Ask them how they think the debris ends up there. Answers include littering, wind and runoff, storms, etc.

2. Explore (10 min):

Open the PowerPoint and give a brief background of marine debris, engaging the students as you go. Once you get to the part of the presentation on buoyancy, if available, show the students the examples of debris you brought in and test the buoyancy of each in the tub of water. Ask them which items they think would travel the farthest, and what impact each item may have on marine habitat, wildlife and people. Answers may include entanglement of and ingestion by wildlife, suffocation of marine habitats (i.e. coral reefs), expense to coastal communities due to clean up, danger to boaters, etc.

3. Explain (~30 min):

Tell students that they are going to be designing their own trash collector to remove marine debris from oceans and beaches, or prevent it from entering waterways. Remind them that their devices should not harm or interfere with wildlife, such as seals and turtles. For the first few minutes, let the students sketch ideas. Have them write a few sentences about what they want their machine to do and to look like. Students should draw inspiration from images in the presentation, and for the rest of the time can work on their designs. Students can work individually or in groups.

Provide students with graph paper, drawing utensils, or any other materials you have decided to use. While the students

are working, encourage them to think of things they may not have considered, i.e. how does the machine run? Where does it get its energy? How does it avoid harming wildlife? What happens to the trash after it's collected?

4. Extend (~10 min):

Allow students to share their drawings or models, explaining their concepts while other students ask questions. If you have not finished the PowerPoint, present the last two slides on solutions. For the last few minutes, discuss other ways to prevent marine debris from entering our oceans – properly disposing of trash, recycling, making more informed purchasing decisions, using reusable water bottles and bags, etc. You can also probe further and ask the students what they think can result from these actions.

5. Wrap-Up (5 min):

A great way to wrap up this lesson is to have the students sign the NAMEPA Plastics Pledge (page 26) to have them demonstrate their commitment to reducing their plastic consumption.

OPTIONAL EXTENSION

This can be turned into a multi-day activity where the students pick materials and actually build and test their models.

To adapt this lesson for 6th-12th grade, you can include discussion of accumulation rates and how many people over time it would take to remove the existing trash on beaches/shores.

DIVE DEEPER

For additional information about NAMEPA's educational programs and materials, visit www.namepa.net/education. NOAA's Marine Debris website: marinedebris.noaa.gov.



Did you know that most commonly used plastics do not go away, but instead break down into smaller and smaller pieces called microplastics?