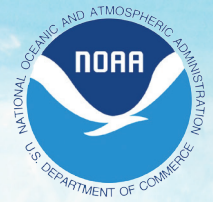


North American Marine Environment Protection Association®



2014 Lloyd's List Awards ENVIRONMENT AWARD WINNER



An Educator's Guide to Marine Debris



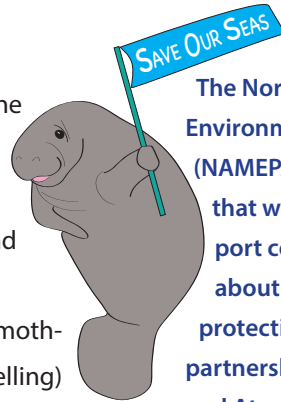
AN EDUCATOR'S GUIDE TO MARINE DEBRIS

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.

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DISCLAIMER

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



Cleanup Clues

Grade Level: 6-8, can be adapted for high school

Time: 1 hour

SUMMARY

First, the class reads a short write-up about the research. Students analyze the Ocean Conservancy's International Coastal Cleanup data to make inferences about which countries documented the most amount of marine debris and the types of debris found/collected. Students also answer prompts about why some states or countries had much higher amounts of marine debris reported than others. Middle school students can do this part as a guided activity and will focus on the domestic data. High school students can do it independently and focus on international data. This lesson is written for individual work but can easily be made into group work with assigned roles.

OBJECTIVES

- Interpret data collected from International Coastal Cleanup and portray their understanding in graph form (visual representation)
- Use data about marine debris to determine which types of marine debris are most and least prevalent in different places and possible reasons for this
- Use data to determine which countries reported the highest amounts of marine debris
- Compare and contrast the data from different states or countries and assess the similarities and differences
- Propose other reasons for the data results
- Present findings about assigned data set to the class and make inferences about the bigger picture
- Write a concluding paragraph explaining what the data they are working with tells them

STEM APPLICATIONS

- Use an in-depth set of statistical numbers to make qualitative inferences (Math)
- Compute numbers from a data set into percentages and interpret them (Math)
- Assess the limitations of a data set (Math, Science)
- Make a visual representation of numerical data (Science, Math)
- Write a paragraph explaining conclusions (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)

- **Sustainable:** Of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged
- **Photodegradation:** The process by which a substance or object is broken down via sunlight

BACKGROUND

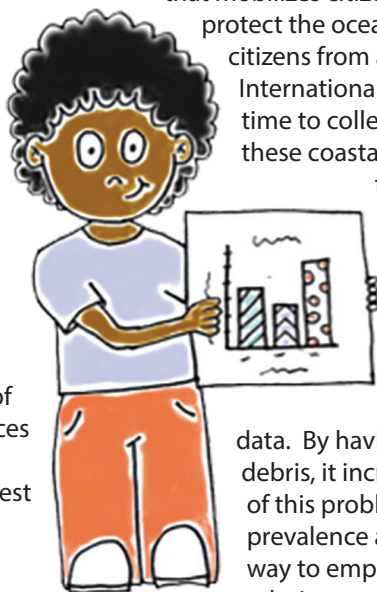
The Ocean Conservancy (OC) is a nonprofit organization that mobilizes citizen advocates to facilitate change and protect the ocean for future generations. Every year, citizens from all around the globe participate the International Coastal Cleanup, volunteering their time to collect trash from coastal areas. During these coastal cleanups, an astounding amount of trash is removed from marine environments and is properly disposed of, either as trash or recycling. Types and quantities of debris are recorded during the cleanups, and the data is analyzed and categorized. Scientists, businesses, and citizens (including students!) can use this

data. By having local volunteers clean up marine debris, it increases awareness about the severity of this problem and the role we all play in its prevalence and mitigation. Cleanups are one way to empower citizens to become a part of the solution, and inspire them to take preventative actions.

The data used in this lesson can be acquired from the Ocean Conservancy website and updated data is posted to their website annually. Additionally, any published data from any coastal cleanup can be used (Ocean Conservancy, 2014).

MATERIALS

- PowerPoint presentation (available on NAMEPA website)
- Printouts of The Ocean Trash Index for each student group or student:
<http://www.oceanconservancy.org/our-work/marine-debris/2012-icc-data-pdf.pdf> (PDF also available on NAMEPA website)
- Global map and US map for each table for students to find their locations
- Calculator (if desired by instructor)
- Graph paper
- Projector



ACTIVITY

1. Engage (5-7 min):

Show students the introduction from the Ocean Conservancy's Ocean Trash Index. This can be printed out and handed to students, or taken from the PowerPoint presentation. This information includes how many years the data set comprises, a brief history of the research, a brief interpretation, and an introduction to terminology. It would be a good idea to read this aloud to students once during this intro activity. Students are to answer a few comprehension questions (in the PowerPoint presentation):

- "When did The Ocean Conservancy begin collecting data?"
- "Briefly describe (1-2 sentences) the three different types of cleanups conducted."
- "Who is responsible for collecting the debris?"
- "Who is responsible for counting the people collecting the debris?"
- "What does the data mean when it talks about 'miles'?"

Briefly have students share their answers with the class before moving on to the next activity.

2. Explore (15-20 min):

Here, middle school students will work with the domestic data (found on the last few pages of the data packet), while high school students will work with international data. Students should choose at least three geographical places and create a graph (bar, pie, or other) for the totals of each category. This way they can compare the totals between the three places. For middle school, their home state should be one of the states used, if the data is available. For high school, the US should be one of the countries used.

A good teaching tool is to do this once or twice to model the activity before having them do it on their own. All students should calculate the percentages. Middle school students should find the percentage for each category (how much of the debris collected was from shoreline/recreational activities? How much from ocean/waterway activities? How much from smoking-related activities?). Have the students locate states or countries they chose and write a short blurb about where the coastal cleanup took place (i.e. California has a long coastline on the Pacific, Michigan borders the Great Lakes, etc.). This helps the students contextualize the locations they chose.

OPTIONAL EXTENSION

Have students compute the percentage for each specific debris category for the location they chose with the highest results. Fast working students can compare/contrast the coastlines and areas they chose.

During this activity, walk around the classroom and observe the students' work, redirecting the students as needed. This activity gives the students a visual representation of the amounts, types and locations of debris found during these cleanups.

3. Explain (10 min):

Students are to write a paragraph explaining their graphs and make inferences about. Write a few sentences on the board to model the activity for the students. For example, "Connecticut had much higher levels of debris than Idaho, however Hawaii had the highest of the three. Idaho is inland so it makes sense that the two coastal states I looked at would have much higher levels of debris ..." Students can go as in depth as time allows.

4. Extend (10 min):

Briefly review the research. Students should share their data/graphs with their peers, and answer the following questions:

- What are some things that could impact the results of the data?
- What can be done to reduce the amount of marine debris in our oceans and our shores?

Give students a couple minutes for independent thought, 2-3 minutes to share with peers, and 3-5 minutes to discuss as a class.

5. Evaluate/Wrap-Up (5 min):

A great way to wrap up this lesson is by having a discussion about what inferences can be made from this data, i.e. what does this say about the products we are using? What lifestyle changes can we make to help prevent marine debris? How do you think technology could play a role in mitigating marine debris? Ask the students what things they plan on doing in their own lives to help prevent marine debris.

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.

