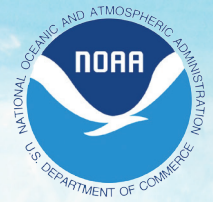


North American Marine Environment Protection Association®



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# An Educator's Guide to Marine Debris



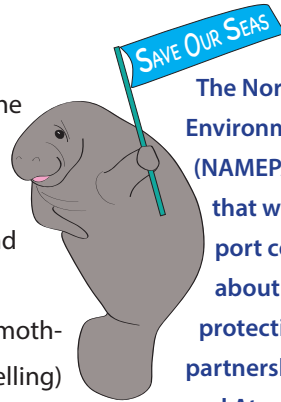
# AN EDUCATOR'S GUIDE TO MARINE DEBRIS

## 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](http://www.namepa.net/education) or our junior website, [www.namepajr.net](http://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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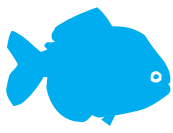
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# Designing an Experiment

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

**Time: 1 hour with possible multiday extensions to carry out research**

## SUMMARY

This lesson allows students to practice the scientific method. Students are presented with background information about marine debris – what it is, its origins, and current statistics. Students will engage in a brief discussion about its impacts. Afterward, students are given handouts to review the scientific process. Students are asked to come up with three research questions about the prevention or removal of marine debris. After instructor approval, the students choose one question and write a hypothesis and procedure for their experiment, as well as assess at least one obstacle to their research. Students should present to small groups about their question, what they hope to learn, how they arrived at their hypothesis, and their procedure. The lesson ends with a discussion about how to reduce marine debris via informed consumer purchases. This lesson is ideal for classes that already have some background knowledge of marine debris and the scientific method.

## OBJECTIVES

- Write a research question
- Write a hypothesis
- Write an experimental procedure
- Share experimental process with a group
- Assess methods of reducing marine debris

## STEM APPLICATIONS

- Design an experiment (Science, Technology)

## 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)
- **Independent variable:** Variable that is changed in a scientific experiment to test the effects on the dependent variable
- **Dependent variable:** Variable being tested in a scientific experiment

## MATERIALS

- PowerPoint with background on marine debris and the scientific method (on NAMEPA website)
- Student Survey (attached)
- NAMEPA Plastics Pledge (page 26)

## OPTIONAL EXTENSION

This lesson can be extended into multiple days for the students to carry out their research plans. The teacher can also make arrangements for the student to conduct their research outside of school time.

## ACTIVITY

### 1. Elicit (5-7 min):

Hand out the survey to the students to assess their knowledge of marine debris and the scientific method. You can also open up the PowerPoint and go through the slides with the eight survey questions. Have the students complete the survey before finishing the PowerPoint. After about 5 minutes, choose a few students to share their answers. Review the correct answers using the answer key provided.

### 2. Explain (10 min):

Tell the students they will be designing an experiment about removing or preventing marine debris, or assessing the impacts marine debris has on marine wildlife or habitat. After the presentation, they should brainstorm questions they have that they would like to research. Present the rest of the PowerPoint about marine debris and the scientific method. Students should take notes during the presentation – they will need these for the next activity.

### 4. Elaborate (20 min):

Students can work independently or in pairs. They should brainstorm at least three research questions about removing or preventing marine debris, or assessing the impacts marine debris has on marine wildlife or habitat. An example to use could be: "What is the most common type of marine debris in the U.S.?" or "How many people would it take to effectively clear a one mile stretch of beach?" Remember, research questions need to be specific and testable. Once the students have written at least one suitable research question, have them form a hypothesis. After, they should develop a procedure. Students should use the notes they took during the presentation to write their background information.

### 5. Extend (10 min):

Have students get into groups of 4-5 and briefly share their plans with each other. Students should remark on the strengths and weaknesses of each other's research plans. Are all of these experiments specific and testable? How could the data collected from these experiments be beneficial in helping to prevent marine debris?

### 6. Evaluate (5 min):

A great way to end this lesson is by discussing ways to mitigate marine debris (reducing your waste, re-using materials, recycling, cleanups, etc.) and by having the students commit to reducing their plastic consumption by signing the NAMEPA Plastics Pledge (page 26).

## DIVE DEEPER

For additional information about NAMEPA's educational programs and materials, visit [www.namepa.net/education](http://www.namepa.net/education).

NOAA's Marine Debris website: [marinedebris.noaa.gov](http://marinedebris.noaa.gov).





## STUDENT SURVEY

1. These items are commonly found on local beaches. Circle the items that you consider to be “marine debris:”
  - a. Feathers
  - b. Sticks
  - c. Plastic Bottle
  - d. Cigarette Butts
  - e. Shells
  - f. Food Wrappers
  - g. Crabs
  - h. Fishing Line
  - i. Wood
2. True or False: Plastic...
  - a. Is naturally occurring
  - b. Completely biodegrades
  - c. Is found in the ocean throughout the water column, from the surface to the floor
  - d. Is not transported by rivers and ocean currents
3. How would you define marine debris?
4. Which of these are reasons marine debris is problematic?
  - a. It’s aesthetically displeasing
  - b. It can transport invasive species
  - c. It is dangerous to wildlife
  - d. It can be dangerous to humans
  - e. Animals mistake it for food and ingest it
  - f. It transports toxins through the food chain
  - g. All of the above
  - h. None of the above
5. Put the following steps of the scientific method in order:
  - a. Develop hypothesis
  - b. Collect and record data
  - c. Design the experiment
  - d. Determine research question
  - e. Draw conclusions
  - f. Conduct background research
  - g. Conduct the experiment
6. Finish this sentence: A testable question is one that is...
7. What are the two types of variables in a testable question?
8. Write a sentence frame for a hypothesis (Ex. If \_\_\_\_\_ then \_\_\_\_\_ because \_\_\_\_\_)

*Answers on page 28*



## STUDENT SURVEY + ANSWERS

1. These items are commonly found on local beaches. Circle the items that you consider to be “marine debris:”
  - a. Feathers
  - b. Sticks
  - c. Plastic Bottle
  - d. Cigarette Butts
  - e. Shells
  - f. Food Wrappers
  - g. Crabs
  - h. Fishing Line
  - i. Wood (Tricky – some wood is considered debris, i.e. treated wood or wood with nails)
2. True or False: Plastic...
  - a. Is naturally occurring **FALSE**
  - b. Completely biodegrades **False – it breaks down into tiny pieces but never truly biodegrades**
  - c. Is found in the ocean throughout the water column, from the surface to the floor **TRUE**
  - d. Is not transported by rivers and ocean currents **FALSE**
3. How would you define marine debris?

**Answers will vary. Marine debris is “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).**
4. Which of these are reasons marine debris is problematic?
  - a. It’s aesthetically displeasing
  - b. It can transport invasive species
  - c. It is dangerous to wildlife
  - d. It can be dangerous to humans
  - e. Animals mistake it for food and ingest it
  - f. It transports toxins through the food chain
  - g. **All of the above**
  - h. None of the above
5. Put the following steps of the scientific method in order:
  - a. Develop hypothesis **2**
  - b. Collect and record data **6**
  - c. Design the experiment **4**
  - d. Determine research question **1**
  - e. Draw conclusions **7**
  - f. Conduct background research **3**
  - g. Conduct the experiment **5**
6. Finish this sentence: A testable question is one that is... **measurable and specific.**
7. What are the two types of variables in a testable question? **Dependent and independent.**
8. Write a sentence frame for a hypothesis (Ex. If \_\_\_\_\_ then \_\_\_\_\_ because \_\_\_\_\_)  
– **Varies: If (I do this), then (this will happen)...**