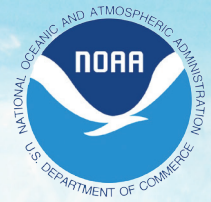


North American Marine Environment Protection Association®

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# An Educator's Guide to **Marine Debris**



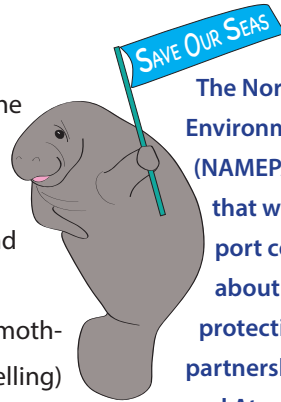
# AN EDUCATOR'S GUIDE TO MARINE DEBRIS

## 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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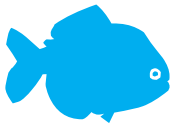
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# Building a Watershed

**Grade Level: 6-8**

**Time: 1 hour**

## SUMMARY

Students build a model showing how water flows through a system and evaluate different management practices to see how they might reduce the amount of marine debris that enters the marine environment. The models in this lesson could be used as a classroom demonstration or traditional lab investigation for students, depending on time efficiency of instructor and students. This lesson may also be shortened by showing students a pre-made model beforehand.

## OBJECTIVES

- Construct a model of a localized watershed
- Identify various ways that marine debris is created
- Identify origins of marine debris
- Write a plan to reduce their own impact on marine debris and make extensions to help others reduce their impact
- Share and discuss their findings with the class
- Write a summary of the activity

## STEM APPLICATIONS

- Design and build small-scale models of a watershed (Engineering and Science)
- Draw conclusions about ways debris enters waterways and marine environments (Science)
- Plan strategies to reduce and prevent debris from entering the systems and to remove existing marine debris (Engineering)
- Compare their predictions to the results of their experiments and assess any discrepancies (Science)

## VOCABULARY

- **Watershed:** An area of land where all of the water flows to a common point. Streams flow into small rivers, which flow into bigger rivers, which flow into lakes or oceans and are determined by the shape and slope of the land. Watersheds can be small or large systems
- **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 Great Lakes' (NOAA, 2007)
- **Marine:** Of, found in, or produced by the ocean

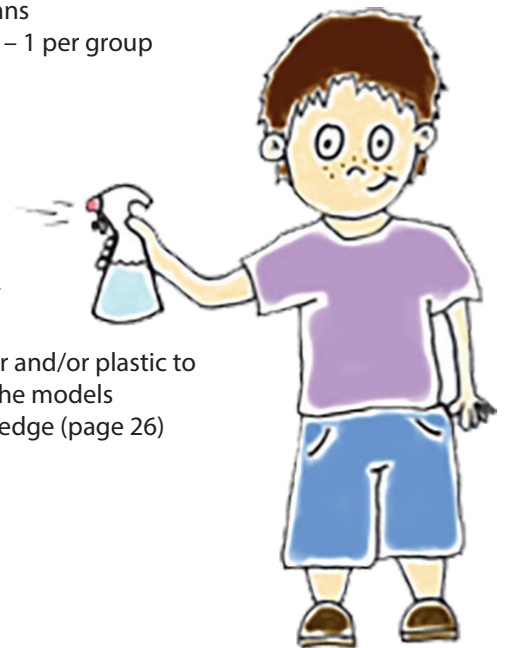
## BACKGROUND

Marine debris enters coastal waters from both land and sea. Beachgoers often leave trash behind, intentionally or accidentally, and commercial and recreational fishermen may lose or abandon some of their gear at sea. Debris from land-based sources such as roads, schools, parks and picnic areas, landfills, etc. travels to the ocean via rivers, runoff and wind. Marine debris can also come from recreational and commercial boats such as charter boats, fishing vessels, ferries, etc. from people tossing trash overboard.

When trash is disposed of improperly, it often ends up in the ocean as marine debris. The majority of marine debris is comprised of plastic, which is problematic because many animals mistake these various plastic materials for food. For example, sea turtles commonly consume jellyfish, and plastic shopping bags floating in the water resemble this important food source. Additionally, birds can confuse plastic items with food and consume trash and feed it to their babies. Marine debris is a massive problem and is within our power to fix! Proper disposal of garbage, no matter where, is important. In addition to making sure our own trash is properly disposed of, we can pick up litter we see on the ground, and talk to our friends, families and neighbors about proper trash disposal. We can also use reusable materials to prevent so much trash from being created in the first place!

## MATERIALS

- Dry erase markers
- Pre-made watershed model (optional)
- PowerPoint presentation on marine debris and watersheds (on NAMEPA website)
- Large aluminum pans or plastic containers – 1 per group
- Soil
- Sand
- Gravel
- Aluminum foil
- Spray bottles
- Water bottles
- Water
- Small pocket fan (if available)
- Tiny pieces of paper and/or plastic to represent debris in the models
- NAMEPA Plastics Pledge (page 26)



## ACTIVITY

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

Ask students if they have ever been to the beach or a river. What types of things have the students seen at these places? Did they ever notice any pollution, specifically trash or litter? What types of debris items have they seen? Make a list on the board.

### 2. Explore (25 min):

Ask students what some of the possible origins of this debris are (i.e. wind, beachgoers, ships, storms, etc.). How does it get into the marine environment? Try to steer them in the direction of runoff and watersheds. Do different types of debris travel in different ways? Ask the students what types of debris they think would travel the farthest and why (i.e. plastics because they're more buoyant than other types of debris). Give students a couple minutes to talk to a classmate, and then call on students to share their answers.

Present the PowerPoint, which provides background on marine debris and watersheds. You can present the entire PowerPoint now, or wait to talk about solutions toward the end of the lesson. For the remainder of the lesson, students should use the term "marine debris" instead of "trash" or "litter" – hold them to this!

## INTRODUCE ACTIVITY

Students are going to build a model of a watershed to see how water flows and carries marine debris with it. Get students into groups of 3-4:

1. Students fill one third of a large aluminum pan or plastic container with the sand and/or dirt in an irregular manner to mimic the Earth's surface. Make sure students have high points and low points, preferably multiple "hills" or "mountains."

2. Students press a layer of aluminum foil over the dirt surface. Give each group a few markers to add/draw context to their models: cities, towns, farms, factories, roads, people, etc.

3. Using a spray bottle, students spray small amounts of water on the foil, or gently pour water on foil, representing rain. Students record their observations, i.e. direction of flow, pooling, etc. Review the definition of a watershed at this time. What is the common point to which the water has flowed? In real life, what are some common points to which water flows? A: Oceans and lakes, via rivers and streams.

4. Ask the students what they drew in their models that can create marine debris. Pass out the "marine debris" for their models and have students sprinkle it where "people" in their models live. Have students record what kind of debris the paper and plastic represent and predict how did it get there? Where is the debris going to go when it rains?

5. Students again spray and gently pour water on their models, this time observing what happens to the marine debris. Where does it go? Students record their observations.

6. If some groups finish early, have them take another batch of "debris" and place it at the source. This time students use a small fan to see what happens to the debris (if you don't have a fan, use water again).

7. Students clean up workstations, put materials away, and head back to their seats.

### 3. Explain (5 min):

Have each group write a summary of what they did. Summary should include:

- Made a model of a watershed where all the water pooled in one place
- Used little pieces of paper and plastic to show that litter from towns and cities flows with water through rivers to become marine debris in the oceans
- Any questions they still have

Walk around and observe groups. Pick volunteers to share their paragraphs after each group is finished. Take questions if you have time.

### 4. Elaborate (10 min):

Offer these prompts for a class discussion:

- Now that we know what marine debris is and where it comes from, what can we do to reduce and prevent it?
- How can we reduce our waste?
- What about within our communities?
- What about debris that is already on the beach?

### 5. Evaluate/Wrap-up (5 min):

Have the students brainstorm three things they are going to do to help mitigate marine debris. If you did not finish the PowerPoint, present the last two slides on solutions. A great way to end this lesson is by having the students sign the NAMEPA Plastics Pledge to have them commit to reducing their plastic consumption.

## 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).