



# Designing Debris Solutions

## **Objectives:**

Students connect their own consumer and community choices to the four sources of marine debris and design solutions to the marine debris problem.

## **Concept:**

Marine debris has existed for thousands of years, since people have been creating and disposing of tools and clothing. Until the invention of synthetic plastics, most marine debris was biodegradable. Plastics are a unique and relatively recent technology, and have vastly magnified the problems caused by marine debris. There are four main sources of marine debris: land-based/personal use, marine industries & recreation, container ship spills, and natural disasters. Individuals have great power to change their own consumption and disposal habits; influence others to minimize plastic waste; and prepare for, rebuild, and clean up after large- and small-scale natural disasters.

## **Materials:**

- ◎ Science notebooks
- ◎ Pencils
- ◎ Whiteboard, Flipchart, or SmartBoard with appropriate tool to write on it
- ◎ Large sheets of paper and/or graph paper

## **Introduction:**

Explain that marine debris is made up of items that are discarded both directly and indirectly into global ocean. Marine debris has existed since people have been creating tools.

Ask students to think of what the first marine debris items may have been. For thousands of years, marine debris was composed primarily

of readily biodegradable items (wooden tools, hemp or linen ropes, cotton or hide clothing). Next, glasses, metals, and paper products were added to the mix, and finally plastics. Long-term marine debris monitoring and clean up efforts have shown changes in marine debris over time. Worldwide, about 80% of marine debris is now made up of plastic items. Explain that this debris comes from many different sources.

## **Activities & Procedures:**

Explain that marine debris comes from many sources and these sources can be organized into many different categories. Explain that categories that are sometimes used are: Land-Based/Personal Use, Marine Industries & Recreation, Container Ship Spills, and Natural Disasters.

If you have not already addressed the topic in another lesson, spend some time discussing how natural disasters can be linked to debris. Since the 2011 Tohoku Earthquake and Tsunami in Japan, marine debris clean ups along the Gulf of Alaska, Prince William Sound, and Southeast Alaska have collected significantly higher amounts of polystyrene and polyurethane foam that are likely linked to aquaculture buoys that were ripped away during the tsunami and insulation from homes that were destroyed. Take a moment to recognize the immediate tragedy of the disaster, and the long-term effects this marine debris might have. Explain that smaller scale weather events can create marine debris too.

Work toward solutions to the marine debris problem. Explain that some technological innovations, such as synthetic ropes that replaced biodegradable ones, have magnified the marine debris problem. However, other innovations



## Designing Debris Solutions *Continued*

have addressed the problem by replacing common debris items, preventing them from entering ocean, or enabling better clean ups.

Designate different parts of the room for each source category of marine debris (land-based/personal use; marine industries & recreation; container ship spills; and natural disasters; OR categories defined by the students).

Have students move to the category they would like to focus on and individually brainstorm new technologies that could replace plastic products that often become marine debris, prevent debris from entering the ocean, or equip clean up efforts.

Then, students should work collaboratively with their focus group to choose one promising product and draw a draft blue print of the product or technology, labeling important features and explaining key characteristics and uses. Allow at least 20 minutes for this process.

### Wrap-Up:

Have each group present their technology to the class. Ask classmates to provide constructive criticism in a critique sandwich: begin with an item of positive feedback, followed by a suggestion for something that can be improved, and finally another positive remark.

### Extensions & Lesson Connections:

Have students refine their blue prints to present them at a "Celebrate the Sea Party."

This lesson works well as a follow-up to "Graphing Marine Debris" or "Marine Debris Source Sorting Relay" lessons.

### Evaluation:

Observe students in focus groups as they develop ideas for innovative technologies or products, paying special attention to their ability to work collaboratively and participation in group discussions and creation of the blue print. Assess student understanding and critical thinking during presentations and delivery of constructive criticism.

