



Plastic Soup

Timeframe

1 -2 Fifty minute class periods

Target Audience

Grades 4th- 6th

Suggested Materials

- Marine Debris PPT
- Trash Cards
- Whale Feeding Cards
- Matching Key
- A variety of trash
- Medium sized clear container
- Small Fan

Description

Students talk about what the Great Pacific Garbage Patch is and how it got there. Students explore a variety of types of marine debris. Students will view a demonstration about how floating debris acts, and how ocean debris is affected by wind currents. Students play a matching game that will help them determine what types of organisms would be affected by which types of marine debris.

Objectives

Students will:

- Classify different kinds of debris found in the ocean
- Describe how marine debris' can have hazardous impacts on marine life
- Predict the effects that different kinds of marine debris have on baleen whales based on their feeding strategies

Essential Questions

What kinds of marine debris are found in the ocean and where does it come from?

How do different types of debris affect different types of whales?

Background Information

There are many threats to water quality and therefore, the quality of life for animals that live in marine environments. Trash and chemicals that enter marine ecosystems can remain for many years, and consequently, build up in the food web. The source of pollutants includes decades of industrial waste, raw sewage overflows, runoff from cities, and mining operations. Additionally, solid waste in the form of litter and specifically, plastic pollution, threatens marine wildlife. Animals can become tangled in plastic pollution like plastic fishing line, plastic strapping bands, six-pack rings, or other plastic trash that end up in their environment. Once tangled, they spend energy trying to get free, may become sick or weak, and even die. Certain animals, such as whales, also mistake plastic trash for food and eat it. Many animals have a difficulty digesting plastic, so the plastic remains in the animal's stomach causing it to feel fullness. The animal, feeling full, stops eating and eventually starves to death.

Contact:

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This deadly trash is known as plastic pollution. It's estimated that 80% of the pollution comes from land-based sources in the form of litter, illegal dumping, and poor waste management practices.

Over 100,000 marine creatures a year die from plastic entanglement (PERSEUS, 2012).

We throw away tons, literally. One study found that 8.8 tons of plastic end up in the ocean every year (NOAA, 2018)! The plastic that we throw away each day can make its way to the ocean from our coasts, and can be found wrapped around, or in the stomach of marine organism.

Plastic, being the most prevalent of marine debris, can come in all shapes and sizes. Plastics that are less than five millimeters in length, about the size of a sesame seed, are called "microplastics." Microplastics, found in many beauty products, are so small that they easily pass through water filtration systems and end up in the ocean. The synthetic particles have been detected in all the world's oceans, and have been found to be ingested by planktonic organisms. Baleen whales, among other organisms, are impacted by microplastics, as well. Baleen whales filter out plankton and small fish out of the water making them extremely susceptible to a variety of plastic pollution.

The name "Pacific Garbage Patch" has led many to believe that this area is a large and continuous patch of easily visible marine debris items such as bottles and other litter, similar to an island of trash that should be visible with satellite or aerial photographs. While higher concentrations of litter items can be found in this area, along with other debris such as derelict fishing nets, much of the debris is actually small pieces of floating plastic that are not immediately evident to the naked eye.

Preparation

Fill the 1-2 tall containers with water. Set out materials for students.

Activity Introduction

Show students a picture of the Great Garbage Patch from the Marine Debris PPT. Ask the students to observe this photo carefully and write down everything they see, think, and wonder about it.

1. Discuss: what did you see? What did you wonder about it? What do you wonder? Ask for examples of different types of trash they saw floating in the Great Pacific Garbage Patch.

- What types of debris did you notice were most prominent?

Talk to students about what the Great Pacific Garbage Patch is and how it got there.

Next Generation Science Standards

PERFORMANCE EXPECTATIONS:

ESS3.C: Human Impacts on Earth Systems
Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

DISCIPLINARY CORE IDEAS:

LS2.A.: Interdependent Relationships in Ecosystems

LS2.C.: Ecosystem Dynamics, Functioning and Resilience

SCIENCE AND ENGINEERING PRACTICES:

Asking Questions and Defining Problems

Developing and Using Models

Analyzing and Interpreting Data

Constructing Explanations and

Designing Solutions

CROSCUTTING CONCEPTS:

Cause and Effect

Structure and Function

Systems and Systems Models

Stability and Change

2. Tell students to look around the room and silently find as many plastic objects as they can in ten seconds. Have students share some of the objects they identified.

- Raise your hand if you agree that there is a lot of plastic in this classroom? If you agree that we use a lot of plastic in our daily lives?

Tell students that we use plastic every day, and many of the plastics are single-use. They are designed to be thrown away after being used once. We might not even realize all the products that have plastic, and we don't always know what happens to them after they are thrown away.

3. Let students know that they are going to do an activity to help them learn more about plastics that end up in the ocean called "marine debris".

Activity Part 1: Marine Debris

1. Discuss with students that not only are there many types of marine debris, but they are located in a variety of areas in the ocean. Whales and other species are impacted differently based on the way that each species feeds. Tell students that they are going to do an activity that will help them determine what types of organisms would be affected by which types of marine debris.

2. Fill a tall clear container 2/3 full with water. Insert a handful of trash

Recommended trash types include:

Pellets – preproduction plastic pellets

Fragment- pieces of hard plastic debris that is unrecognizable

Film- flat and flexible plastic debris such as pieces of bags or wrappers

Foam- expanded plastic used for insulation or packaging such as Styrofoam

Filament- examples include fishing line, rope, and synthetic cloth

Other- glass, metal, rubber, or tar

Note: Cigarette Butts are a common marine debris and a mock example could be included.

3. Ask students what they notice about the trash. What types of debris float? What types of debris sink?
4. With a handheld fan, point the airflow current at the pile of floating debris to represent wind currents. Ask students what they noticed about the trash that was affected by the wind current. Did previously floating debris sink? Did sunken plastic move? Does the trash bond together in piles, or individually? How do they think trash will affect marine animals?

5. Pass out a set of whale cards to each student group. The whale cards feature a variety of whales, their feeding patterns, and other fun facts.
6. After carefully reading the back of each card, ask students to match the trash cards to the whale card that is most affected by. There can be several trash cards for each whale, and a single card can affect more than one whale. Use the 'Match Key' handout as reference.
7. Ask students why they matched trash cards with certain species of whales. Does just one type of marine debris affect an organism?

Wrap Up

Discuss: For some whales, plastic bags may hinder them from eating, while other species of whale that feed on the bottom of the ocean are impacted by microplastics. Let students know that researchers from all over the world are concerned with the amount of plastic debris that enter our oceans daily. Have students discuss and share some ideas of how we might prevent plastics from getting into the ocean.

This project is supported by the Regional Class Research Vessel Program in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University.

Resources

NBC News: <https://www.nbcnews.com/video/large-garbage-patch-floating-in-the-pacific-ocean-318824003814?v=a>

NOAA Marine Debris Program: https://marinedebris.noaa.gov/sites/default/files/publications-files/2015_TurningTideonTrash_HiRes_Final.pdf


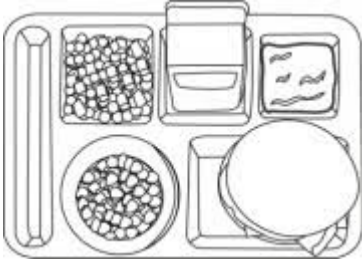


NOAA Microplastic Facts: <https://oceanservice.noaa.gov/facts/microplastics.html>


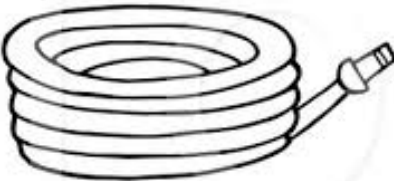


Oregon State University Newsroom: <http://today.oregonstate.edu/archives/2011/jan/oceanic-garbage-patch-not-nearly-big-portrayed-media>



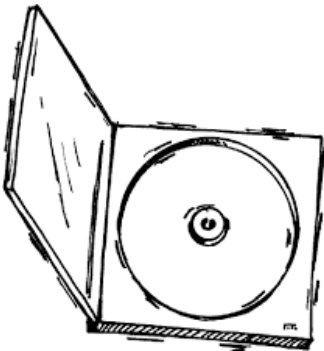

Salmon and the Ecosystem A Curriculum for Grades Five through Eight

Splash! Stormwater Pollution: Learn and Share; Public Works Storm Water Management Program

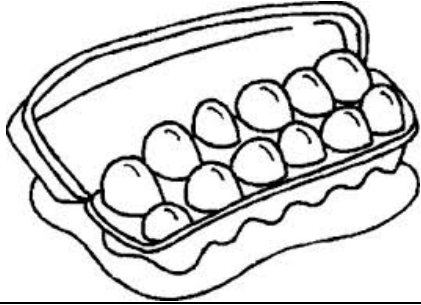
Trash Cards

Trash	Facts
<p data-bbox="203 296 375 323">Water Bottles</p> 	<p data-bbox="824 296 1292 323">Type: PET (polyethylene terephthalate)</p> <p data-bbox="824 369 1386 432">Description: high strength, transparent, barrier to gas and moisture, resistant to heat</p> <p data-bbox="824 474 1292 501">How it acts in the ocean: sinks in water</p>
<p data-bbox="203 747 626 774">Ovenable Pre-Prepared Food Trays</p> 	<p data-bbox="824 747 1292 774">Type: PET (polyethylene terephthalate)</p> <p data-bbox="824 821 1386 884">Description: high strength, transparent, barrier to gas and moisture, resistant to heat</p> <p data-bbox="824 926 1292 953">How it acts in the ocean: sinks in water</p>
<p data-bbox="203 1115 386 1142">Milk Container</p> 	<p data-bbox="824 1115 1292 1142">Type: HDPE (high density polyethylene)</p> <p data-bbox="824 1188 1354 1283">Description: tough, chemical and moisture resistant, permeability to gas, translucent or opaque</p> <p data-bbox="824 1325 1300 1352">How it acts in the ocean: floats in water</p>
<p data-bbox="203 1562 342 1589">Yogurt Tub</p> 	<p data-bbox="824 1562 1292 1589">Type: HDPE (high density polyethylene)</p> <p data-bbox="824 1635 1354 1730">Description: tough, chemical and moisture resistant, permeability to gas, translucent or opaque</p> <p data-bbox="824 1772 1300 1799">How it acts in the ocean: floats in water</p>

<p>Shampoo Bottles</p> 	<p>Type: PVC (polyvinyl chloride)</p> <p>Description: hardy, chemical resistant, resistant to grease/oil, transparent, translucent or opaque</p> <p>How it acts in the ocean: sinks in water</p>
<p>Medical Tubing</p> 	<p>Type: PVC (polyvinyl chloride)</p> <p>Description: hardy, chemical resistant, resistant to grease/oil, transparent, translucent or opaque</p> <p>How it acts in the ocean: sinks in water</p>
<p>Clothing</p> 	<p>Type: LDPE (low density polyethylene)</p> <p>Description: tough, lightweight, barrier to moisture, can be nearly transparent or opaque, low to high gloss</p> <p>How it acts in the ocean: floats in water</p>
<p>Carpet</p> 	<p>Type: LDPE (low density polyethylene)</p> <p>Description: tough, lightweight, barrier to moisture, can be nearly transparent or opaque, low to high gloss</p> <p>How it acts in the ocean: floats in water</p>

<p>Ketchup Bottles</p> 	<p>Type: PP (polypropylene)</p> <p>Description: hard, resistant to chemicals, resistant to heat, barrier to moisture, resistant to grease/oil, transparent, translucent, or opaque</p> <p>How it acts in the ocean: floats in water</p>
<p>Medicine Bottles</p> 	<p>Type: PP (polypropylene)</p> <p>Description: hard, resistant to chemicals, resistant to heat, barrier to moisture, resistant to grease/oil, transparent, translucent, or opaque</p> <p>How it acts in the ocean: floats in water</p>
<p>Compact Disk Jackets</p> 	<p>Type: PS (polystyrene)</p> <p>Description: stiff, transparent or opaque, smooth surface</p> <p>How it acts in the ocean: sinks in water</p>
<p>Aspirin Bottle</p> 	<p>Type: PS (polystyrene)</p> <p>Description: stiff, transparent or opaque, smooth surface</p> <p>How it acts in the ocean: sinks in water</p>

Egg Cartons

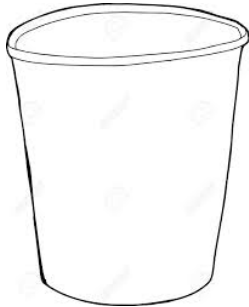


Type: EPS (expanded polystyrene)

Description: Light weight, heat resistant, insulating, opaque, foamed

How it acts in the ocean: floats in water

Cups



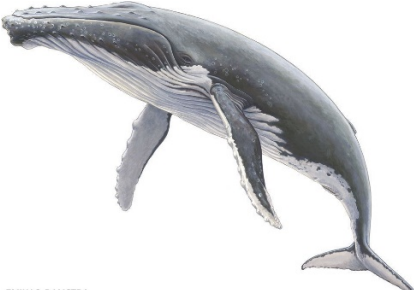



Type: EPS (expanded polystyrene)



Description: light weight, heat resistant, insulating, opaque, foamed

How it acts in the ocean: floats in water

Whale Cards

Whale Type	Whale Facts
<p>Blue Whale</p> 	<p>Feeding Strategy: Gulper Feeds on: Krill and copepods Feeding area: Deep temperate cold region waters Size: Can grow up to 200 feet long and weigh upwards of 200 tons Food per Day: 7,900 lbs Fun Fact: Blue whales are the largest animals to ever live on Earth!</p>
<p>Gray Whale</p> 	<p>Feeding Strategy: Sucker Feeds on: Amphipods (tiny shrimp-like organisms) Feeding area: Shallow coastal waters Size: 30-40 tons Food per Day: 4,500 lbs Fun Fact: In order to stay warm in cold waters the gray whale has a thick insulated blubber which measure up to 10 inches thick!</p>
<p>Humpback Whale</p> 	<p>Feeding Strategy: Gulper Feeds on: Krill, plankton, and small fish Feeding area: They dive deep into the ocean then gulp at the surface Size: 40 tons Food per Day: 4,400-5,500 lbs Fun Fact: Male humpback whales produce a long-series of calls often called "songs" that can usually be heard during the winter breeding season!</p>
<p>Minke Whale</p> 	<p>Feeding Strategy: Lunge Feeder Feeds on: Krill or small schooling fish Feeding area: Northern Hemisphere Size: 5-10 tons Food per Day: (unknown) a minke whale can lunge-feed up to 24 times, which is five to eight times more than a blue or fin whale Fun Fact: These marine mammals have been recorded holding their breath for up to 25 minutes during long dives and can reach speeds of up to 24 mph!</p>

Whale Cards

Whale Type	Whale Facts
<p data-bbox="110 331 272 365">Blue Whale</p>  An illustration of a blue whale, the largest animal on Earth, shown in profile. It has a dark blue, mottled skin with lighter patches. Its mouth is open, showing a pinkish interior. A small, light-colored object is visible near its head, possibly a piece of krill or a copepod.	<p data-bbox="824 331 1175 365">Feeding Strategy: Gulper</p> <p data-bbox="824 373 1230 407">Feeds on: Krill and copepods</p> <p data-bbox="824 415 1533 449">Feeding area: Deep temperate cold region waters</p> <p data-bbox="824 457 1458 533">Size: Can grow up to 200 feet long and weigh upwards of 200 tons</p> <p data-bbox="824 541 1159 575">Food per Day: 7,900 lbs</p> <p data-bbox="824 583 1500 659">Fun Fact: Blue whales are the largest animals to ever live on Earth!</p>
<p data-bbox="110 672 272 705">Gray Whale</p>  An illustration of a gray whale, shown in profile. It has a dark gray, mottled skin with numerous white spots and patches. Its mouth is open, showing a pinkish interior. The whale is shown swimming in a shallow, coastal environment.	<p data-bbox="824 672 1175 705">Feeding Strategy: Sucker</p> <p data-bbox="824 714 1533 747">Feeds on: Amphipods (tiny shrimp-like organisms)</p> <p data-bbox="824 756 1344 789">Feeding area: Shallow coastal waters</p> <p data-bbox="824 798 1045 831">Size: 30-40 tons</p> <p data-bbox="824 840 1159 873">Food per Day: 4,500 lbs</p> <p data-bbox="824 882 1533 995">Fun Fact: In order to stay warm in cold waters the gray whale has a thick insulated blubber which measure up to 10 inches thick!</p>