

National Mississippi River Museum and Aquarium Conservation Education Curriculum

Target Grades: 4-12

Key Words: plastic pollution, biodegradation, recycling, product choice, samples

Subject Areas: conservation biology, geography, ecology

Duration: 45 minutes

Time can be extended by request

Title: *Plastic Pollution: from Land to River and Sea*

Program presented on site at the museum & aquarium or off site.

Summary:

This program aims to help students see the connection between the plastic products we purchase and use everyday and the plastic debris in our rivers and ocean. Students get the opportunity to practice quantitative scientific methods for studying plastic debris. Students are asked think creatively about alternatives to everyday plastic items that may end up as pollution in our environment.

Objectives:

- identify plastic items that are an essential part of our daily life
- understand how plastics move from land to our rivers and the ocean
- define biodegradation
- practice scientific sampling methods
- define plastic recycling codes

Group Size:

10-40

Background for Educators:

Plastic has been widely used in our daily lives since the 1950s. The qualities of plastic; inexpensive to manufacture, flexibility, and durability; have made it a valuable alternative to using wood, glass and metal for many products. Buttons made from river mussels were cheaper when made from plastic. Unfortunately, plastic enters our natural environment and causes problems because it does not biodegrade like wood, glass and metal. Plastic lasts forever. Biodegradation is the process of being decomposed by bacteria. Bacteria in our environment can not decompose plastic.

Plastic debris is found in large quantities in the world's five ocean gyres. A gyre is a spinning mass of water driven by currents. They are found in the earth's subtropical ocean

region. Over time, wave action changes a plastic product floating in the ocean to thousands of tiny plastic. This plastic confetti is eaten by marine life, including the fish we eat.

Most of this debris starts on land and is washed into our rivers. All rivers end at the sea.

- Of all the plastic products that are manufactured, only 3% is truly recycled.
- Much of the plastic products that are manufactured today (plastic utensils, cups, water bottles, packaging, e.g.) are intended for a one time use. There is no plan for how these items will be recycled.
- Plastic does not biodegrade. It persists in the environment for a very long time.
- Plastic was developed after World War II, as an alternative for rubber, which was becoming scarce. Plastic became an alternative for items made of wood, glass, and metal.

Type of Plastic*	Description	Example	Recycled into
#1: PET	tough and shatterproof	peanut butter jars water bottles soda bottles other narrow-neck bottles	tennis balls bottles carpet t-shirts
#2: HDPE	flexible, often translucent	milk jugs dairy tubs plastic grocery bags juice bottles	fly swatters toys trash cans bleach bottles
#3: PVC	tough, chemical resistant	shampoo bottles cooking oil bottles salad dressing bottles	pipes hose computers
#4: LDPE	flexible and tough	food storage containers dairy tub lids	frisbees plastic lumber
#5: PP	chemical and heat resistant	yogurt containers medicine bottles plastic cups	ice scrapers toothbrushes paint buckets
#6: PS	brittle, often see-through or soft opaque foam	vitamin bottles flower pots	CD cases food trays
#7: Other Plastic	items without recycling identification code	some food bottles	street signs pens

Items that cannot be recycled: Styrofoam, envelopes with plastic windows, foam egg cartons, and any item that is a mixture of plastic and paper such as coffee cups

*This is not an all inclusive list

Materials Needed:

Samples

- two samples of plastic debris collected from ocean
- one sample of plastic collected from a square foot of river sand.

Images

- albatross that have been died from eating plastic pieces
- Project A.W.A.R.E.'s river clean-up
- map of 5 ocean gyres with collections of plastic pollution
- map of ocean currents
- Mississippi River watershed map
- plastic debris on land, entering storm drain, in river, and in the ocean

Items

- Styrofoam packaging peanuts & biodegradable packaging peanuts
- throw-away cups & cups made from plant materials that can biodegrade
- long rope & clothes pins for displaying images
- cloth and plastic shopping bags
- plastic water bottle and an aluminum water bottle
- plastic items for recycling categories 1 through 7
- recycling logos for plastics 1 through 5
- items made from recycled plastics: carpet square, sweater, etc.
- curb-side recycling bins
- recyclables and non-recyclables for recycle race

Procedure:

1. Show students the result of plastic ending up in our oceans (pictures of wildlife that have ingested small pieces of plastic they have mistaken for food). *Trace the movement of plastic from land to river to sea.* Discuss and show satellite imagery of 5 ocean gyres, where tons of plastic debris has collected. Hang these pictures on the end of rope (have two students hold the end of the rope). Discuss how plastic debris is manufactured, sold, purchased, discarded, and recycled. Ask students to come up with ideas to stop plastic from polluting our land, rivers and sea.
2. Discuss scientific methods for collecting and measuring samples. Divide the students into three groups. Let each group of students dig through an ocean plastic sample, or river sand and plastic sample. Have the students write down the types and amounts of plastic debris they observe in their sample on worksheet. Are there any objects they recognize?
3. Discuss solutions: land and river clean-ups, recycling, product choice, biodegradable product creation. Have students come up with ideas for reducing plastic pollution. Explain what biodegradable means. Recycling: Show examples of what plastics can be recycled and what can be made from recycled plastics. Product choice: Show examples of biodegradable products that replace traditional plastic products (packaging peanuts, cups made from plants, etc.) and alternative products that are not made of plastic (cloth shopping bags, steel or aluminum water bottles and coffee cups, reusable utensils, etc.)
4. Play Recycling Race: Set up curb-side recycling bins on one end of an open area and a pile of recyclables and non-recyclables on the other end. Split students into teams. Team members take turns picking an item from the pile of recyclables and non-recyclables, running to the appropriate bin and placing it in the bin and running

back to their team. Each team gets one point for each properly placed recycled item and one point deducted for any non-recyclables in the bin. At the end of 10 minutes of racing, time is called and the points are added up to determine a winner.

Evaluation:

Teachers can access an online pre and post test to evaluate their students knowledge and what they learned prior to and after a visit to the National Mississippi River Museum & Aquarium.

Additional resources: Watershed Wonders: *A Plastic Bottle Journey Down the Mississippi River* by Alicia Katano and Marcus Eriksen, PhD., www.algalita.org, *Plastics: A Toxic Love Story* by Susan Freinkel, www.livinglandsandwaters.org, <http://www.iowadnr.gov/volunteer/aware/index.html>

Additional Online Resources

National Mississippi River Museum & Aquarium
www.rivermuseum.com

The Ocean Portal Smithsonian Institution
www.ocean.si.edu

National Oceanic and Atmospheric Administration (NOAA)
www.noaa.gov

National Aeronautics and Space Administration (NASA)
www.nasa.gov

National Wildlife Federation (NWF)
www.nwf.org/Kids.aspx

National Association of Zoos and Aquariums (AZA)
www.aza.org

Extensions:

- Visit the National Mississippi River Museum & Aquarium to see the collected plastic trash from the rivers and oceans.
- Take part in a litter cleanup activity and compare the types of plastic trash from the cleanup area.

Credits: Michelle Kilgore, Educator, NMRMA, May 2011

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Plastics from Land to Sea Datasheet

Type of Plastic Debris	Number of Pieces	Description (color, thickness, etc.)
Pellets (Pre-production plastic pellets, "nurdles")		
Fragment Pieces of hard plastic Debris that is Unrecognizable.		
Film Flat and flexible plastic Debris, like pieces of Bags or wrappers.		
Foam Styrofoam used for Cups, packaging, etc.		
Filament Fishing line, rope, Synthetic cloth.		
Other Glass, rubber or metal		
Date:		
Described by:		
Sample Collection Site (River or Ocean):		