I SPY: PLASTICS AND BIOACCUMULATION

GRADES 6-12

This activity was designed as a companion for the music video "Isle of Plastic."

BACKGROUND

The Great Pacific Garbage Patch (GPGP) is a mass of accumulated trash in the Pacific Ocean, between California and Hawaii. The garbage patch was created by trash being carried by the North Pacific Subtropical Gyre, a circular ocean current formed by the Earth's wind patterns and rotation. The circular motion draws in debris to the calm center of the gyre, trapping the debris there. Garbage accumulates, as much of it is not biodegradable; instead, it just breaks into smaller and smaller pieces. This is why the Great Pacific Garbage Patch is not viewable from space: many of the microplastics found in the patch can't be seen by the naked eye. This also means it's difficult to determine the true concentrated area of the plastics. Estimates range from 700,000 km^2 to 15,000,000 km^2 (http://www.ourmanly.com.au/Lifestyle/garbage_patch.aspx) with a weight of 3.5 million tons. There are five major subtropical oceanic gyres: the North and South Atlantic Subtropical Gyres, the North and South Pacific Subtropical Gyres, and the Indian Ocean Subtropical Gyre.

Plastic is a product derived from petroleum, a valuable, non-renewable resource. Plastic packaging offers both costs and benefits to the economy, our health, and the environment. While plastic is flexible, lightweight, convenient and cheap, it creates pollution, uses a high amount of energy in its production, and can migrate into food. Contrary to popular belief, plastic is not recycled into another similar product (e.g., a recycled Coke bottle doesn't become a 'new' Coke bottle). The processing of used plastics costs more than making new plastic, which can often lead companies toward using new plastic. The following activity addresses the plastic in the Great Pacific Garbage Patch and how it is impacting wildlife.

PART 1: I SPY...

MATERIALS

Image (on following page) projected on a screen or handed out to individuals with enough detail to identify objects

TEACHER PREPARATION

Prepare handouts if desired (making color copies of the image on the following page).

INSTRUCTIONS

1. Have students (perhaps in groups) examine this photo, and identify as many pieces as they can.

2. Have the students go around and list what objects they identified. Help them out with objects that you found too!
3. Once you've completed listing what you've found, tell the students that these bits of plastic are indeed from the Great Pacific Garbage Patch, and they were also found in the stomach of a Laysan Albatross, pictured here.

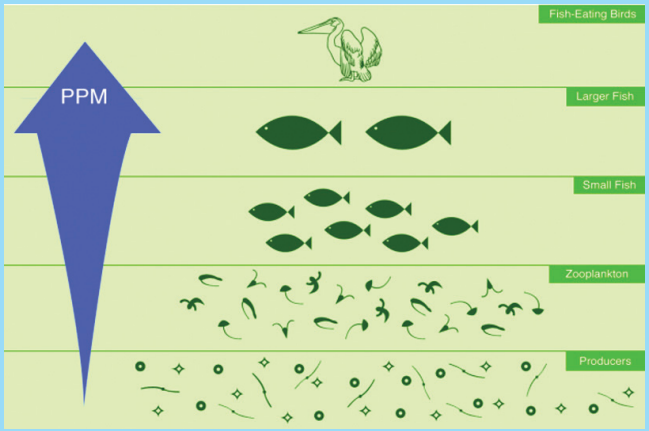
An adult male Laysan Albatross can weigh up to 9 pounds, and a female can weigh up to 8 pounds. They mate for life and inhabit Hawaii and other Pacific Islands. Their main food source is squid, but recently they have been retrieving small pieces of brightly colored plastic from the Great Pacific Garbage Patch, and carrying it thousands of miles to their offspring. The young birds' stomachs cannot process the plastic, which takes up space that would otherwise be filled with food to nourish the young birds, leading to dehydration and starvation.

PART 2: BIOACCUMULATION AND OCEANIC FOOD WEBS

1. The Laysan Albatross isn't the only marine creature that likes to eat plastic. Have your students construct an oceanic food chain using the following creatures: phytoplankton, zooplankton, small foraging fish, and albacore tuna.

2. As you progress up the food chain, larger creatures need to eat more to obtain the energy they need, since only about 10% of the energy is passed on to the predator. Your students can think of this as an energy pyramid that gets smaller and smaller as you proceed to the peak.

3. Ask your students where they think plastic enters into the food chain. Then, show them this graphic below. While the graphic shows plastic coming into play very early on, it can enter the food chain at any point. So not only are we eating degrading toxic plastic, but we're also eating quite a bit of it!



The arrow represents the amount of plastic being transferred from one level to the next. PPM stands for Parts Per Million, a measure of concentration. See how much plastic the larger fish and birds end up with? This is called bioaccumulation, or biomagnification: the increase in the concentration of a contaminant through the process of a food chain.