



Lesson 3:

Knock Out Pollution

Grade Level: 4-6

Time: 75 Minutes

Vocabulary:

Pollution, habitat, sediment, predator, prey, food chain, benthos, bioaccumulation, biomagnification, observation.

Great Lakes Literacy Principles:

Principle 5

Concepts A, B, D, E, F, G, H, I

Principle 6

Concepts A, C, D, E, F

Summary:

Students learn ecological terms and discuss concepts. Students watch and reflect on a demonstration of bioaccumulation. Students practice scientific observation skills to identify types of pollution.

Objectives:

- Explain and diagram how pollution moves up the food chain from the sediment to the fish people eat using the terms benthos and bioaccumulate.
- Describe how pollution biomagnifies between species.
- Use observation skills to identify types of pollution.
- Describe the environmental and societal benefits of the cleanup.

Materials:

Pollution PowerPoint. See Bioaccumulation Demo and Pollution Activity for additional materials. An editable PowerPoint (.ppt) file can be found on www.greatlakesmud.org/education.html.

Procedure:

Set up the Pollution Activity. Perform a quick recap of lesson two and then present the Pollution PowerPoint. Midway through the PowerPoint, perform the bioaccumulation demo. Following the PowerPoint, facilitate the Pollution Activity.



Bioaccumulation and Biomagnification Demo

Adapted from University of Kentucky Cooperative Extension Service's Bioaccumulation Basics

Summary:

Students observe a demonstration on bioaccumulation and biomagnification that uses marbles and clear containers to illustrate the concept.

Materials:

2 ½ cups of marbles or beads, six small half cup food storage containers labeled "benthic organisms,"

two medium 1-cup storage containers labeled "fish," one large 2-cup storage container labeled "bird."

Procedure:

1. Ask for three volunteers from the class, two to stand with you and one at the board. Explain that the marbles are a type of pollution called PCBs and that the storage containers represent different parts of the food chain. Tell the volunteer the total number of marbles and have the student write it down as total units of PCB pollution.
2. Ask the other two volunteers to fill the small containers (benthic organisms) with marbles (PCB pollution). Explain that benthic organisms live in the polluted sediment and absorb the PCB pollution. Count the number of marbles in each benthic organism container and have the board volunteer write it as units of PCB pollution.
3. Say that the fish are hungry and prey on polluted benthic organisms. Ask volunteers to evenly pour the PCB pollution from the small to the medium containers, explaining that the fish now have PCB pollution from the benthic organisms in their bodies. Count the number of marbles in each fish and have the volunteer write it down on the board. Explain that as fish prey on benthic organisms, they absorb the PCB pollution. Pollution accumulates as the fish eat more benthic organisms. This is called bioaccumulation.
4. Say that the bird is hungry and that it eats the polluted fish. Ask volunteers to pour the PCB pollution from the medium containers to the large container, explaining that the bird now has all the PCB pollution from the fish and the benthic organisms in its body. Count the number of marbles in the bird and have the volunteer write it on the board. Compare the number of marbles at each step in the food chain.
5. Ask the class which animal has the most pollution. Explain that the top predators will almost always be the animals that are most harmed by pollution because they get all the pollution that was in all of the other animals. The PCB pollution increases as it moves up the food chain, and this is called biomagnification. Explain that not all types of pollution bioaccumulate, but PCB is one that does.

Wrap-Up:

Engage all of the students in discussion of what happened. Which animal ended up being the most polluted? Why? Did the predators know their prey was polluted?

Pollution Activity

by Amy Mucha, U.S. EPA

Summary:

Students “pollute” a habitat and use observation skills to determine the type of pollution.

Materials:

Four quart-size food storage containers filled with water and soil, 12 (three for each group) travel-size, unlabeled bottles of safe liquids or powders with different smells, colors, and textures (mouthwash, Murphy’s Oil Soap, conditioner, Kool-Aid, baking soda, and dish soap).

Procedure:

1. Break students into four teams. Explain that each team will be given a “habitat” (container filled with water and soil) and supplies.
2. Give each team 5 minutes to use their supplies to pollute their experimental “habitats.” (We’re using safe supplies.) Students choose which of the three bottles to empty into the container. Encourage students to try different amounts of each bottle and notice the result in the container as contents are added. For example, one team may decide to use half of bottle X and all of bottles Y and Z. Another team may decide to dump the contents of all their bottles in the “habitat” container all at once.
3. Have the teams trade stations and make observations to understand what “pollutants” are in the other team’s “habitat.”
 - a. As the students are trying to figure out what the “pollutants” are, ask them which sense they are using. What do they see? What do they smell? What does the “pollution” feel like in their hands?

Wrap-Up:

Engage all of the students in a discussion of what happened. What “pollutants” did the students use in their “habitats?” Which senses did the students use to observe the “pollution?” Explain that scientists must also make observations to understand if a habitat is polluted, where the pollution is, and what the pollution is. Scientists use their senses to learn about habitats, just like the students did in the activity. However, if the habitat is polluted, scientists may have to use protective clothes and equipment to study the environment.