Activity 3-2

The Ideal Filter

Adapted from BTNEP/LSU AgCenter: *Functions, Values and Economic Resources*

Focus/Overview

Wetland are one of nature's best filters. This activity challenges students to design an ideal filter by simulating the job done by a wetland in purifying dirty water.

Learning Objectives

The learner will…

- design a filter using a variety of materials and recycled 2-liter drink bottles.
- compete to see whose filter works the best in cleaning dirty water.

Louisiana Grade Level Expectations (Science)

5: GLE-39	Identify areas in which technology has changed human lives (SI-M-B7).
7: GLE 43	Identify and analyze the environmental impact of humans' use of technology (SE-M-A8).

Materials List

Students can bring their own 2-liter bottles and help assemble the variety of materials needed to construct their filtering device.

- empty two liter drink bottles (one per student)
- coffee filters
- soil
- sand, clay, gravel, mud
- dead leaves
- green leaves and/or grass
- small plants
- grass sod
- waterproof markers
- plastic cups
- muddy water (made by mixing clay or mud into water and shaking; 2+ gallons)
- two measuring cups or graduated cylinders

Background Information

Wetlands offer several protective functions to those living within their boundaries: water filtering and purification, storm protection and flood control and erosion control.

Water Filtering and Purification

Wetlands are valuable filters of waterborne pollutants. Today wetlands are used to treat nonpoint source runoff from developed areas and farmland and to further purify partially treated water from sewage treatment facilities. Two of the most valuable functions wetlands perform are the absorption of nutrients and the trapping of sediment carried in water. Wetland plants have an amazing capacity to remove nitrogen and phosphorus from wastewater. This enables farmers to use wetlands to buffer the effects of fertilizer runoff on nearby waterways. Wetlands can also trap sediment running off construction sites, plowed fields, forestry operations, etc. In addition, wetlands can also reduce the concentrations of other harmful chemical pollutants, including pesticides. The removal of these compounds occurs in wetlands through processes including adsorption to sediment clays, chemical processes, and plant uptake.

Advance Preparation

1. Tell students about the challenge several days in advance and ask them to bring in materials from home that they might want to use, including a 2-liter drink bottle.

BTNEP Connection
Water Quality

Grade Level
5, 7

Duration
1-2 class periods

Subject Area
science

Setting
classroom

Vocabulary
water purification, filtering

Original Source
"Weaving Our Wetland Economic Web" in BTNEP/LSU AgCenter: *Functions, Values and Economic Resources*, Activity 11.

www.btnep.org

2. Prepare the 2-liter drink bottles by cutting the top part off to make a funnel and a bottom container. Cut about halfway down the length of the bottle. Make one per student or student group.
3. Numbered squares of paper – one per student.
4. Prepare a large amount of really muddy water (2+ gallons) to test the filters with.

Procedure

1. Review the information found in the Background Section of this activity.
2. You have learned the value of wetlands as natural filters of polluted water. Now you have a challenge activity to try to simulate the filtering capacity of a wetland. Each of you will make a filter and compete to see which does the best job at removing dirt from water.
3. You have all brought in a 2-liter drink bottle, and this will be your apparatus for your filter. I have cut the bottles so there is a top funnel part and a bottom water catching part. We have a variety of materials that you have brought from home and some that I have supplied for this challenge. Your job today is to construct your filtering apparatus. I have already made the muddy water that you will be filtering. (Hold up the muddy water for students to see.)
4. First, each of you will pick a number out of this box. Without showing anyone your number, write it on the bottom of your water catching part of your filtering apparatus. This will identify your filter in the contest.
5. Now you need to work by yourselves to construct your filter in the way you think will filter this dirty water the best. You will have until ____ (time) to finish constructing your filters. (Set a reasonable time limit – long enough to allow students time to complete their filters.) Then you will test your filters, and we'll see whose did the best job of filtering this dirty water.
6. OK. Everyone's finished with their filter. Bring them up to the front desk. I'll mix up the filters so we don't know who they belong to without looking at the number on the bottom of the filters. That way, when you vote for the best filter, your vote will not be *biased* and we will have a fair vote. (Explain bias, if necessary.)
7. I will call you up two at a time to test two of your classmates' filters. Pour the entire muddy water sample I give you into the top part of the filter. (Measure out the muddy water into two measuring cups or graduated cylinders.) When you are done, sit down in your seat. (Let students pour the muddy water into each filter, using the same amount of water each time. Be sure to keep the muddy water sample stirred so that each sample is similarly muddy.) Test all the filtering apparatus.
8. Now we'll decide which filter did the best job. Let's take a look at all the filtered water samples. (Once students have viewed all the samples, let them vote on the sample that looks cleanest. Record their votes on the board.)
9. Now we have a winner. Let's see who it belongs to, and then we'll ask that person to describe how he or she made the filter and what materials were used. (After the student relates this information, discuss with the class why this filter was the most successful. Compare its construction with the composition of a wetland. What are the similarities and differences?)

Blackline Master

none

Assessment

- Students can create a concept map about components of a successful filter and how this is similar to wetland's ability to filter polluted water.

Resources

BTNEP Resources:

Tradebooks:

Olien, Rebecca. 2005. **Making Water Clean**. Capstone Press. 24 pp. ISBN: 0736837035.
Age Range: 6 to 9

Goldman, Linda. 1997. **Cleaning up Our Water**. Scholastic Library Publishing. 96pp. ISBN: 0516055437.
Age Range: 8 to 11