



Day 4 Activity

Experiments with Wetland Plants

Activity 1

Overview

Students will learn how some wetland plants remove excess nutrients and pollutants from water. Students set up the experiment by placing a cut celery stalk in a glass of dyed water and predict what will happen.

Concepts

Water carries many substances. Some materials dissolve in water while other materials, such as sediments, are carried in suspension. Some substances carried by water are beneficial for plants and animals. For example, dissolved calcium helps marine organisms build shells, and dissolved fluorine in drinking water helps retard tooth decay. Other substances carried in water may be harmful, including pesticides, heavy metals, oil, and other wastes.

Materials

- A few stalks of celery
- A few jars of water
- Food colouring

Procedure

Day 1

Before setting up the experiment, explain to the students that the food colouring represents pollution by a toxic substance (e.g., a pesticide). Ask the students to imagine water flowing into a wetland with many wetland plants. Explain to them that the celery stalks represent these plants.

Break the class into groups (three or four students each) and have them set up the experiment as instructed below:

- Add several drops of food colouring to the beaker of water.
- Cut off the bottom quarter of the celery stalks and place them in the coloured water overnight.
- Still working in groups, ask the students to record what they predict might happen to the celery over time.


Day 2

Over time the water will visibly travel (via capillary action) up the stalks, illustrating how plants can absorb pollutants with water they “drink. If the dye is not visible on the outside of the stalk, break it open to see the colouring inside the plant tissue.

Ask the students to revisit their predictions for this experiment.

Were their predictions accurate?

What have they learned about wetlands and water quality?



Use the questions below to generate a discussion.

- a. How do wetland plants help to purify water? (Plants take up pollutants from water.)
- b. Why is the water remaining in the jar still polluted? (Plants can only remove so much.)
- c. Where does the water go after uptake into the plant? (Water is transpired out through pores - stomataes - and evaporated.)
- d. What happens to the pollutants? (They are stored in the plant tissues and re-released to the environment when the plant dies.)
- e. Why can't we dump all our wastewater into wetlands? (Wetlands can only do so much.)

Activity 2 - ROLE OF PLANTS IN WATER FILTRATION

BACKGROUND: Experiments can be done to show how a plume of dissolved materials can move through soil and enter a groundwater aquifer. But soil and plants have something of a dual role in this process. Depending on whether materials are dissolved or suspended in the water, soils and plant roots can remove some or all of this material as the water moves down through soil. Most suspended materials will adhere to the soil. These may then be broken down and used as food by the plants. Dissolved nutrients, such as nitrogen or phosphorus, chemically bond with some types of soil particles. They are then taken up by plants, thus removing them from the soil before they can enter an aquifer. For the plants, these elements are food, for an aquifer, they are pollution. Not all materials are absorbed by plants and not all water pollutants are food for plants.


However, sediments from eroding soil, nutrients in human and animal wastes, and some components of household wastewater ("graywater") are excellent plant nutrients. Plants also use different nutrients at different rates, so that the amount of material they take up will depend on how much is dissolved in the water and how fast the water moves through.

This experiment is a very simplified way to show whether plants will take up certain kinds of materials from water moving relatively quickly through their root systems.

OBJECTIVE: To understand the role of plants in filtering the water moving through a watershed.

MATERIALS NEEDED:

- Six potted plants, with pots roughly six to eight inches in diameter, and holes in the bottom. These plants need to moderately dry, as if they had not been watered for a couple days. Plants with saturated soil will not absorb water, and very dry plants will absorb it all.

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- Six clear containers, such as cups, which will support the plants and allow drainage to be viewed. You will need separate plants and cups for each of the materials in the water.
 - Soil from outside (anywhere). The best soil is loamy, with smaller particles than
 - sand.
 - Unsweetened powdered drink mix, preferably grape or cherry for color.
 - Vegetable oil.
 - One or two different household cleaners (such as Comet/Ajax and Dish or Laundry soap). One should be liquid and the other powder.

PREPARATION: Set up the potted plants, each in its own cup. Slowly pour six to eight ounces of clean water through the pot, and check the percolation rate through the pot. Loosen or tighten the soil so that water percolates at about one ounce per minute.

The rate should be fast enough to prevent long waiting periods, but slow enough not to carry very much soil through the pot.

PROCEDURE:

1. Place the potted plants into the top of their cups. Pour clean water slowly through one of the pots and watch it percolate through the bottom of the pot. The water should look as clean as what was poured.
2. Add a gram or so of soil to 6-8 ounces of water and stir so that the soil is well suspended and distributed in the water. Pour slowly into another flower pot. The water percolating through should look *much* cleaner than the dirty water poured.
3. Add about one ounce of vegetable oil to 6-8 ounces of water, stir (they won't mix completely) and pour into a third pot. See if the vegetable oil percolates through or is caught up by the plant roots.
4. Add some powdered drink mix to 6-8 oz. of water and pour through a fourth pot. See if the water percolating through retains the color.
5. Add some powdered cleanser to 6-8 oz. of water and pour through a fifth pot. Is the cleanser retained in the soil?
6. Add some liquid soap to the water (an ounce or so in 6-8 oz. water). Does the soap percolate through the soil?
7. Using the "contaminated" plants, pour some clean water at the same rate through each one (simulating a rain shower). Is more of the "pollutant" rinsed away from the soil by the clean water?



FOLLOW-UP QUESTIONS:

1. In what ways can plants and soil benefit drinking water quality?
2. We saw plants and soil remove some types of impurities from water. How might the plants remove larger quantities?
3. Can plants and soil remove any type of impurity from water?
4. What other organisms in the soil-plant system might aid the uptake of water pollutants?
5. What is the role of rainwater moving through contaminated soil?

Drawing of
"Todd River"
By: Anthony
Age: 8