Activity 1: Flood Storage

Overview

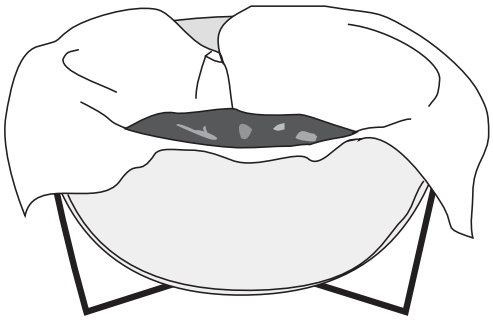
Students will observe how different soil components – peat, sand, gravel, and potting soil – vary in their capacity to absorb and hold water. They will observe how peat, a component of some wetland soils, is exceptional at absorbing large quantities of water.

Background

One important function of wetlands is the capacity to absorb large amounts of water during rainstorms and to release it slowly over time to rivers, lakes, and groundwater. This function prevents extreme flooding during storms and maintains a base level of water flow during dry spells. This water storage capacity is due in part to the presence of organic matter in wetland soils.

Materials

- Peat moss, sand, gravel, potting soil
- Four sieves
- Cheesecloth or coffee filters
- Measuring cups
- Bowls for catching water
- Scales
- Copies of data sheet



Procedure

1. Break the class up into groups with one sieve of material per group. If you have enough materials, give each group four sieves and samples of each soil type.
2. Place cheesecloth or a filter in each sieve and fill them with a different soil type.
3. Have students weigh out the filled sieve *with* the bowl on a scale and record this on the data sheet.
4. Instruct the students to fill the measuring cup with exactly one cup of water.
5. Pour the water into the sieve and let it soak in the bowl for 5 minutes.
6. Remove the sieve and pour the water out of the bowl.
7. Have the students re-weigh the sieve, wet material, and bowl and record the weight on the data sheet.
8. Now have the students calculate the percent of water absorbed by each material by subtracting the dry weight (A) from the wet weight (B) to yield (C).
   C/A x 100 = % water absorbed.
9. Have each group record its results on the blackboard and discuss the findings.

Discussion Questions

1. Which of the materials – peat, soil, sand, or gravel retained the most water? Why?
2. What factors influence a soil's capacity to hold or drain water? (soil texture, its position in the landscape, e.g., on a steep slope – *drains readily* – or low spot that collects water – *drains slowly*.)

3. What determines how much water a substance can hold? (amount of air [pore] space and shape of those pores)
4. What would happen to rainwater if there was nothing in the watershed (such as wetlands) to absorb it? (no buffer areas to absorb floodwaters, wouldn't be able to retain as much water in the watershed) What problems might this cause? (flooding of property during storms, little recharge of groundwater supplies)
5. Have any students had experience with floods – in their own basements or in town?
6. Look through newspapers for articles about flooding. Do the news stories make any connections with the flooding to wetlands loss?

Flood Storage Data Sheet

Material	Dry weight (A)	Wet weight (B)	B – A = C	Percent (%) water absorbed = (C/A) x 100
Peat				
Soil				
Sand				
Gravel				

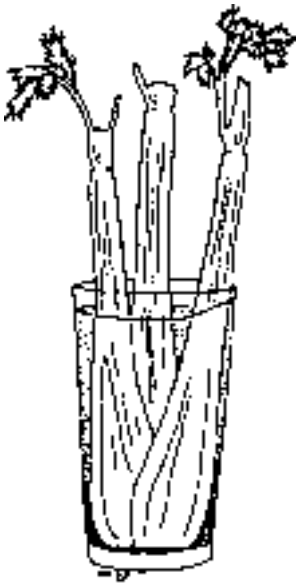
Activity 2: Treatment Plants

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 beakers of water
- Food coloring



Day 1

Procedure

1. Before setting up the experiment, explain to the students that the food coloring 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, such as cattails, sedges, grasses, etc. Break up the class into groups (three or four students each) and have them set up the experiment as instructed below.
2. Add several drops of food coloring to the beaker of water.
3. Cut off the bottom quarter of the celery stalks and place them in the colored water overnight.
4. 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 osmosis) 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 coloring 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 beaker 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 – *stomates* – 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.)

Adapted from *Discover Wetlands*, Washington State Department of Ecology.

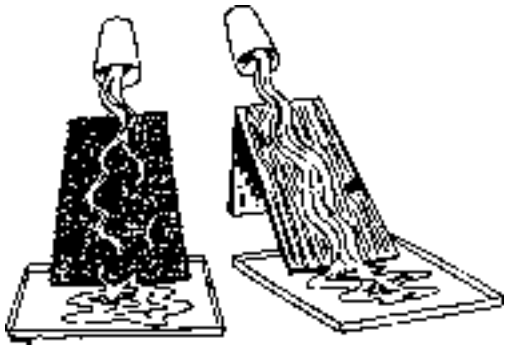
Activity 3: Runoff Race

Overview Two sloped boards are constructed to represent wetlands (one is bare, the other covered with artificial turf). Students will pour jars of sediment-filled water over the boards to observe how wetland plants (the turf) prevents sediments from entering rivers and streams.

Objective To demonstrate how wetland plants prevent sediments from entering large bodies of water (lakes, streams, ponds) and why this water quality function is important.

Materials

- Two jars with equal amounts of water
- Two flat boards of equal width & length
- Half a jar of soil, small rocks, sand and grass clippings
- 1 piece of artificial turf, cut to same size of boards
- Staple gun or tacks
- 2 pans fitted to width of boards (white-colored plastic pans offer the best contrast for observing amount of sediment collected)
- Different textured soil samples (optional, for use in discussion)



Procedure

1. Construct and set up the wooden boards ahead of time. Using a staple gun or tacks, attach the artificial turf to one of the boards. During your demonstration, be sure to support the boards at the same angle (you can also have two students volunteer to hold these for you during the experiment).
2. First lead a discussion with the students about *sedimentation*, asking the following questions:

- What are some of the non-organic components of soil? (soil particles or *sediments* – from fine silts to coarse sands)
- How do these materials look and feel different from each other? (They come in various sizes and weight; the silts are much lighter than the heavier sandy particles.)
- When it rains on *bare* soils – where there are no plants holding soil particles together – what do you think might happen? (Sediments can wash off the land and enter large bodies of water such as lakes, streams, and ponds.)

3. Now ask the students to help you place equal amounts of the potting soil, sand, grass clippings, etc. in the two jars of water. Ask for two volunteers in the class to shake up the jars until the dirt is mixed well with the water. Set the jars down to allow the sediment to settle.

- What do you observe in the jars? (The heavier soil particles have begun to settle out first.)
- What about the silts? Are they still suspended in the water?

  Pretend you're a fish swimming in this water – why would the muddy water be harmful to you? (You couldn't find food, gills would clog with sediments; bottom-dwelling plants and suspended algae would also have a hard time getting enough sunlight to live.)

4. Explain that the *rate* of water flow – how fast it is moving – affects how quickly sediments will *settle out* of the water. (The slower the movement of water, the more sediments will fall out of suspension.) Wetlands are located between land and large bodies of water, and they often help to filter sediments and pollution that might end up in a lake or pond. Sometimes other materials – heavy metal pollutants – can attach themselves to these soil particles and be carried with them.

   How do you think wetlands actually help to clean the water? (Wetland plants help to slow down water as it passes through, allowing larger sediments to settle out. Fine silts collect on the leaves of plants. Plant roots also help to bind the soils in place and prevent erosion in the first place.)

5. Now show students the two boards: one represents a wetland that has been paved over to make a parking lot; the other is a healthy vegetated wetland. The two pans represent a clean lake into which rainwater flows. Ask for volunteers to help demonstrate how wetland plants prevent pollution of other waterbodies. Ask the rest of the class to watch closely and compare what happens with each board.
6. Place some of the potting soil, sand, and grass clippings at the top of each board and have the volunteers pour clean water over the soil and (at the same rate) down the boards.
7. Which one had the faster flowing water and why? (The paved board has no plants to slow down the flowing water) Is there a difference in the amount of sediment that ended up in each pan? In which of these waterbodies would you rather fish or swim? What are some other reasons why clean water is important? (drinking water, home for wildlife)

Adapted from *Discover Wetlands*, Washington State Department of Ecology

Extensions

1. Compare the rate of runoff over paved vs. non-paved areas by having students examine the school parking lot to see how paved surfaces prevent infiltration. Half the class (in smaller groups, preferably) will measure runoff rate in paved areas, the other half in non-paved areas. A small beaker of colored water will be poured on the starting point. A stopwatch is used to determine how long it takes to travel fifteen feet. All the areas used must have approximately the same slope.
2. Have students look for storm drainage gates, waterways, and grass buffer areas to determine how landscape architects do or do not provide for the water collected by the paved areas.

Activity 4: Wetland Metaphors

Overview Introduce common household items – sponge, sieve, coffee filters – as metaphors to the many functions wetlands provide. Working in groups, students will brainstorm which function each object represents.

Objective Students will use metaphors (familiar household objects) to help them understand some of the functions and values of wetlands.

Background Many of the major characteristics of marshes, bogs and swamps can be explored through metaphors. A metaphor is a direct comparison between two things – it gives a vivid image through direct comparison. Two examples: *A tree is a home*; *books are windows of thought*.

For a review of the many functions of wetlands, refer to the background information in this chapter. Use the table below as a guide to metaphors you can use and see if you can come up with some of your own.

Object	Wetland Function
Sponge	Absorbs excess water, e.g., runoff, floodwaters
Bed	Resting place for migrating birds
Whisk	Mixes nutrients
House	Habitat for wildlife
Coffee filter	Purifies water
Sieve	Removes sediments from water
Food	Provides food for wildlife & people

Materials Wetland metaphors:
sieve, whisk, beds (picture), house (picture), food, sponge, coffee filter.

Procedure

1. Prepare a *Mystery Metaphor Container* (pillowcase, bag, box). This should be a container that the students can easily access to pull out at least one object.
2. Show the video *Fabulous Wetlands* to the class **or** lead a general discussion with the students about wetlands. Ask them to close their eyes and imagine a wetland. What does it look like? What plants and animals do they see? Have they ever seen or visited a wetland? Are they familiar with wetlands in their own communities? Try to generate a discussion involving as many students as possible.
3. Now bring out the metaphor container. Discuss the meaning of a metaphor and explain that objects in the container are metaphors for wetland functions.

4. Divide up the class into as many groups as there are objects in the container. Have each group pick an object and discuss the connection between their object and how a wetland functions. If possible, have the groups illustrate this function through drawings.
5. When they are ready, have each group make a brief presentation explaining its wetland metaphor and drawings. Encourage students to build on each other's ideas.
6. Ask students to summarize the major contributions wetlands make to a healthy habitat. Ask them if their own attitudes about wetlands are different as a result of doing this activity. If so, how?