EXPLORE

11 | Working Wetlands

GRADE LEVEL

4-8

45 minutes

Developmental Modifications: K-3 - Do this as a demonstration and use the K-3 Journal Page. Students circle 1. larger particles that sink, 2. particles in gravel and 3. plant roots.

summary

Students create and observe models that demonstrate how wetlands clean water through sedimentation, filtration and absorption.

objectives

- Design models that show how wetlands filter water.
- Discuss the strengths and weaknesses of models.
- Observe and diagram the changes in the model.
- Discuss the characteristics of wetland plants.
- List the key components of a wetland.
- Verbalize why wetlands are important to the Great Lakes.

prerequisite

Value of Wetlands. It is preferable that students have visited a local wetland site, such as in Wetland Observation.

vocabulary

Sedimentation: removing sediment from water by allowing larger particles to sink

Filtration: removing smaller suspended particles by passing water through a filter such as sand and gravel absorption: taking in of a substance

Vascular: of or relating to a tube or channel for carrying a body fluid (as blood of an animal or sap of a plant)

setting

subjects

Ecology

standards

This Great Lakes in My World activity is aligned to the Common Core State Standards and to state learning standards in:

Illinois
Indiana
Michigan
Minnesota
New York
Ohio
Pennsylvania
Wisconsin

This alignment is available on your Great Lakes in My World CD in the "Standards" folder and on-line at http://www.greatlakes.org/GLiMWstandards.

materials

- Journals
- Pencils
- Dirt/sticks/debris
- Rocks, sand, gravel
- Celery stalks
- Water
- Clear containers (glass jars or plastic bottles) with lids
- Clear containers without lids
- Red or blue food coloring
- Two-liter soda bottles cut in half horizontally

background

Wetlands have the ability to clean water that passes through them. The cleansing processes defined here are only part of what is happening in wetlands. For instance, bacteria and fungi play an important role in changing pollutants into beneficial nutrients, as do wetland animals such as fish and snails. Different wetlands have different abilities to clean water, depending on their size, soils, water flow and location. Sedimentation cannot happen in moving water, such as a stream or drain sewer. The water must stop flowing, as in wetlands.

In a wetland, filtration happens when sand, gravel, and soil remove particles in water that passes through. In addition, metals bind with the soil, removing them from the water. Another process in a wetland is absorption. In a wetland, plants absorb nutrients and pollutants through their roots.

procedure

Part One: Sedimentation

1. Discuss experimental design with students, including the importance generating a hypothesis, limiting variables and keeping conditions the same each time.
2. Remind students that wetlands filter water. Ask students to describe how sediment is separated from the water. *They learned in Value of Wetlands that the sediment sinks to the bottom of the wetland.* Tell students that they will demonstrate this process for themselves. Ask students how they might accomplish this with the materials provided. Students should be able to come up with the following demonstration. If not, guide them in that direction.
3. Break students into small groups. Each group should have 1 clear container (approximately 1 liter) with a lid filled 2/3 with water, and some dirt/sticks/debris. Students add the dirt/sticks/debris to the container of water, secure the lid, and shake the mixture so the water is dirty.
4. Students draw the container of water in their journals. Allow the water to sit for 30 minutes. (While students are waiting, they may set up the filtration demonstration.) After 15 minutes, students observe the water and draw what they see. *The sediment in the water should have begun to settle. The water may still look cloudy, but heavier particles will be at the bottom of the container.*
5. After 15 more minutes, students should observe and draw the water again. (While students are waiting, they may set up the next demonstration.) Ask students what has happened to the sediment in the water. What characterizes the sediment at the bottom, versus the sediment still floating? *The water should look clearer, with visible sediment at the bottom of the containers. The densest particles will be at the bottom, the least dense at the top.*
6. Ask students to connect this with what happens in a real wetland. *Since water flows very slowly through a wetland, there is time for sediment to settle to the bottom. This sediment does not move on with the water when the water slowly flows through.*

Part Two: Filtration

1. Each group should have: one soda bottle (no lid), a few rocks (approximately 1 inch in diameter), a half liter of gravel, a half liter of sand, and the container of water with sediment at the bottom.
2. Ask students what in the wetland could remove the remaining sediment from the water. *In Value of Wetlands, students learned that sand and gravel act as a filter to remove particles from the water.* Ask students how they might demonstrate this process with the available materials. Again, students will probably come up with the following procedure, but may need some guidance.
3. Students should first invert the top half of the soda bottle and place the larger stones at the opening. These should not completely block the opening, but should prevent the gravel from falling through.
4. The gravel goes in next, followed by the sand. The inverted soda bottle top may be placed inside of the bottom so that the bottom half will catch the water. A student will need to hold onto the bottles to prevent them from falling. See Journal Pages for diagram.
5. Next, the students should slowly and carefully pour the settled water into the soda bottle. They should try to keep the sediment at the bottom of the container from coming out with the water, if possible. Students observe and record two things: what do they see on top of the sand, and what does the water look like that is coming through the soda bottle?
6. Ask students to explain what has happened. *The sand and gravel act as a natural filter, catching particles suspended in the water. The water coming through the bottle should look much clearer than it did before.*
7. Ask students to connect this process with what happens in a real wetland. *When water passes through sand and gravel, suspended particles are trapped. This may happen when water percolates into the soil, before it reaches the roots of plants, or it may happen as water enters the wetland.*

procedure

Part Three: Absorption

1. There is another way in which wetlands filter water that the students learned about in the activity Value of Wetlands. *Plants absorb pollutants when they take up water through their roots.* Ask students what they would need to see in order to believe this is true. *They need to see the pollutants inside of a plant.*

2. Students will need: two glasses of water, two stalks of celery (with the bottom inch freshly cut off), and blue or red food coloring. Have students look at the base of the celery. They should be able to see small dots, which are the vascular tissues of the plants. These tiny tubes move water and nutrients through the plant.

3. Ask students what they might do with the available materials to demonstrate absorption. *Students should mix a few drops of food coloring into one of the glasses of water, then place one celery stalk in each glass.* Students should draw the glasses of water and celery.

4. The celery will have to sit for a few hours or overnight. Then students should remove the celery from the glasses and slice the stalks in half horizontally. (Teachers should do this for younger students for safety.) Students should see that the holes in the celery that were in the colored glass have turned blue or red. The other celery stalk has not changed. Ask students to explain what has happened. *The celery has absorbed the water in the glasses, including any pollutants in the water (in this case, food coloring). The pollutant is visible in the vascular tissue of the plant.*

5. Ask students to relate this to what happens in a real wetland. *Plants absorb water and pollutants, further adding to the cleansing of the water.*

6. Students should draw the colored celery in their journals.

7. Students use numbers to label the order of the final diagram in the journal pages.
   The correct answers are: 2, 7, 4, 5, 3, 1, 6.

wrap-up

1. As a class, discuss how these components might all fit together as a model of a wetland. They might discuss the idea of connecting the containers so that the water flows through the three processes (sedimentation, filtration and absorption). Students should write about this in their journals.

2. Discuss the strengths and weaknesses of this demonstration as a model of a wetland. Have students think about Wetland Observation. Ask students what other components of a wetland are missing. *Wetland plants with roots (not celery), animals (including macroinvertebrates), bacteria, fungi, soil and sunlight.* Students should record a list in their journals.

3. Explain to students that the other components of wetlands also contribute to the cleaning of the water. Some organisms change waste into substances that are usable by other organisms.

assessment

Rubric on page 248

We value your thoughts and feedback on Great Lakes in My World. Please let us know about any oversights, errors or omissions you find, or if there are things you or your students particularly like.

Send your comments to: education@greatlakes.org

11 | Working Wetlands

GRADE LEVEL
4-8

journal pages

FIRST NAME																				
LAST NAME																				

Sedimentation

[1] Draw the water and sediment.

Water Container at the Beginning	Water Container after 15 Minutes	Water Container after 30 Minutes

[2] What does this procedure demonstrate about wetlands?

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GRADE LEVEL
4-8

journal pages

FIRST NAME																				
LAST NAME																				

Filtration

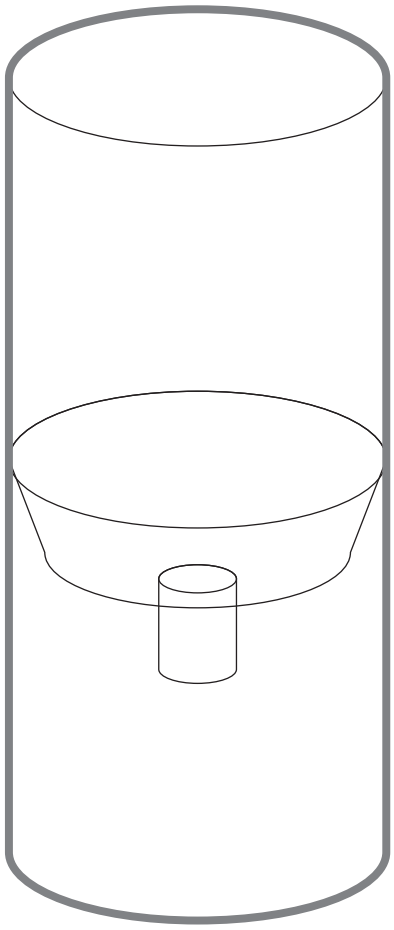
[1] Draw the water, sand, gravel and rocks.

[2] What do you see at the top when the water is poured?

[3] What does the water look like when it flows out of the bottom?

[4] What does this procedure demonstrate about wetlands?

Water Poured Through Sand and Gravel



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GRADE LEVEL
4-8

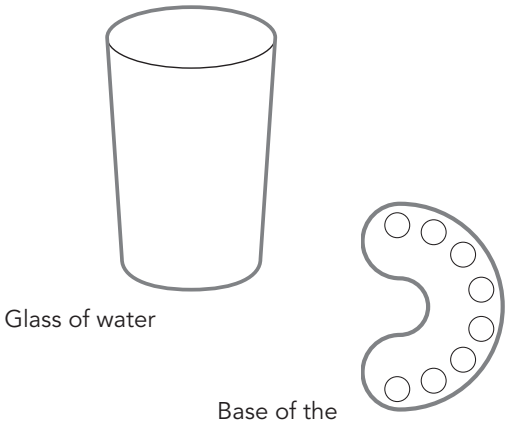
journal pages

FIRST NAME																				
LAST NAME																				

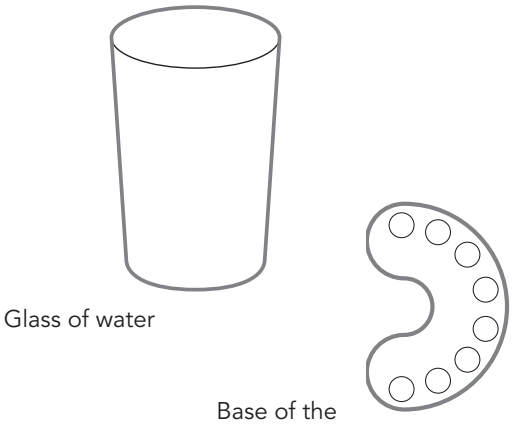
Absorption

[1] Draw the water, celery and food coloring after they have been left over night.

CELERY IN CLEAR WATER



CELERY IN COLORED WATER



Water Cleaning

[2] How could the components of sedimentation, filtration and absorption fit together as a model of a wetland? Use words and diagrams in your description.

[3] What components of a real wetland are missing? Make a list below.

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GRADE LEVEL
4-8

journal pages

FIRST NAME																				
LAST NAME																				

[1] Wetlands clean water. Put the steps below in the correct order according to the diagram

_____ Rocks trap large pieces of debris and waste.

_____ Cleaner water leaves the wetland.

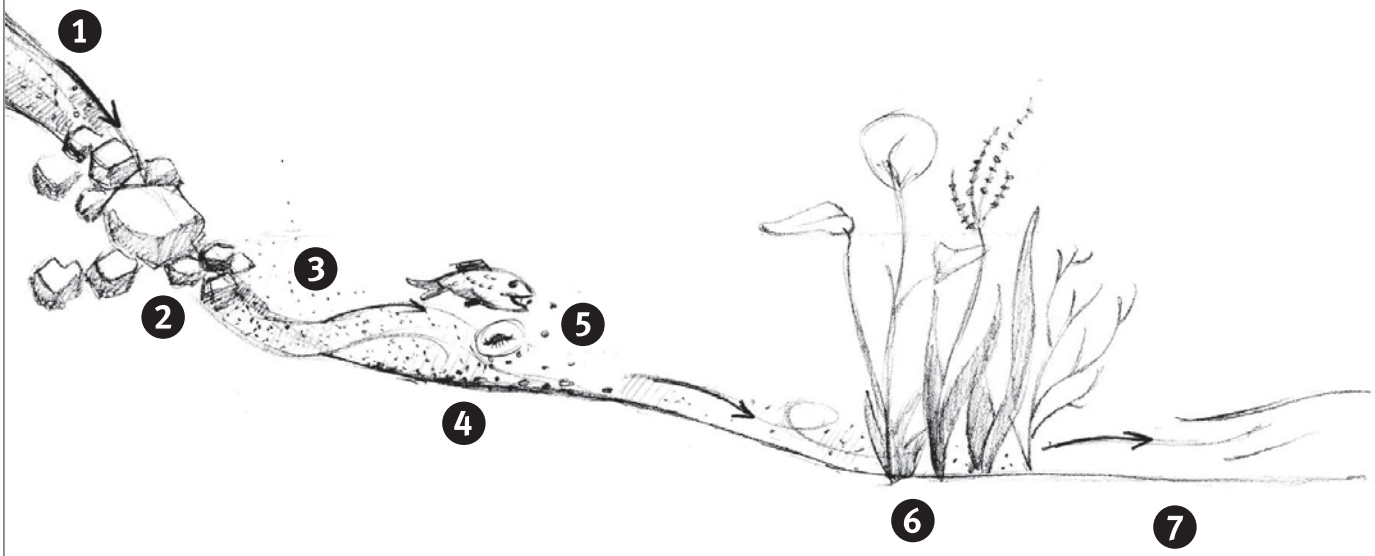
_____ The sediment traps metals and debris.

_____ Tiny organisms eat the waste.

_____ Sediment falls to the bottom of the wetland.

_____ Water flows into the wetland (past rocks).

_____ The roots of plants suck up the rest of the waste.



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11 | Working Wetlands

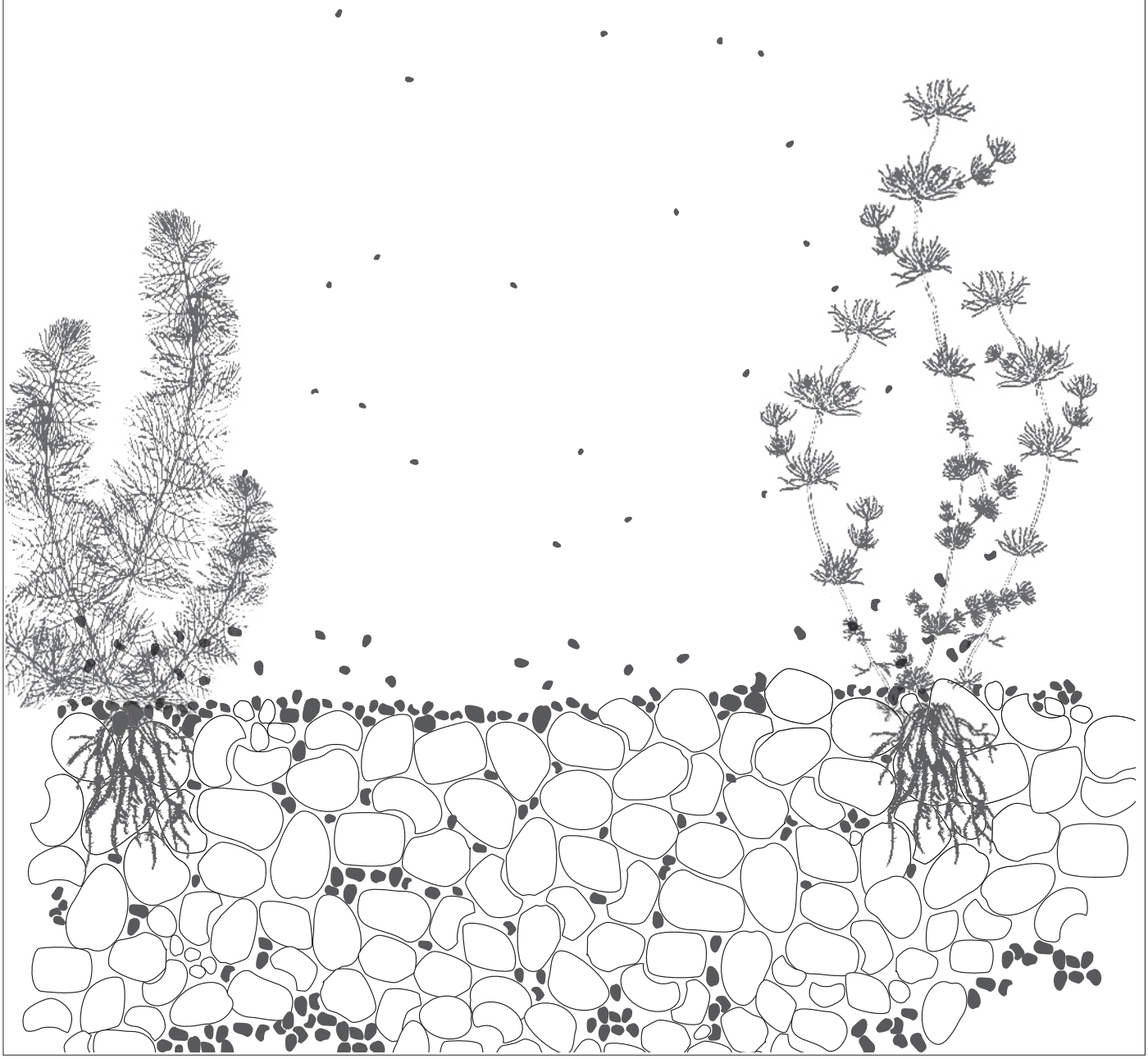
GRADE LEVEL
K-3

journal pages

FIRST NAME																			
LAST NAME																			

[1] Circle one place where the wetland cleans water through:
- a. Sedimentation: Heavier particles sink to the bottom.
- b. Filtration: Particles stay in sand, gravel or soil.
- c. Absorption: Plant takes in nutrients and/or pollutants through plant roots.

[2] Draw the missing wetland animals.



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