Wetlands In A Pan

A watershed model demonstrating the functions of wetlands

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Overview
In this activity students will create a model of a wetland habitat that demonstrates the functions of a wetland. Students will observe, form hypothesis, perform experiments and record their conclusions with their model and evaluate the functions of a wetland.

Central Question
What are the functions of a wetland?

Estimated Time
2 hours

Objectives
Students will be able to:
- *conduct* experiments and record their observations.
- *explain* how wetlands filter the sediments and pollutants from water that flows through the watershed into the Bay.

Materials
For each group of 2-3 students
- Modeling Clay
- Long shallow pan: a sturdy metal or glass pan with a smooth, flat bottom works well or a rolling metal or plastic paint pan
- Sponges (enough to span the width of pan)
- Cup of soil
- Spray bottle with water
- Q-tips
- Colored drink mix
- Optional: items to represent wetland plants or animals, such as pine needles, clay for animals, toothpicks and marshmallows for cattails

Vocabulary
watershed, sediment, pollutants, wetland buffer

California Science Content Standards Grade 6
Standard Set 2.a: water running downhill is the dominant process in shaping the landscape, including California's landscape.
Standard Set 2.b: rivers and streams are dynamic systems that erode and transport sediment, change course, and flood their banks in natural and recurring patterns.
Standard Set 2.d: earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Additional Resources
US EPA Watershed Academy Slideshow
http://www.water-ed.org/store/default.asp?parentid=2
http://www.water-ed.org/store/default.asp?parentid=2.gov/watertrain/wetlands/index.htm
US EPA Wetlands Overview
http://www.epa.gov/owow/wetlands/

Background

Wetlands are lands transitional between terrestrial and aquatic systems where water is usually at or near the surface. For land to be designated as a wetland it must have one or more of the following three attributes: 1) evidence of surface water or water in the root zone; 2) hydric soils or undrained soils; 3) vegetation that has adapted to thrive in wet conditions (hydrophytes).

In the past, wetlands were viewed as wastelands full of mosquitos and mud with no obvious functions. Because of this cultural view, humans have destroyed much of the wetlands. Approximately 90% of the salt marshes around San Francisco Bay have been dredged, diked, drained, and filled. Buildings, roads, salt ponds, and landfills have been built on top of them.

The loss of wetlands around San Francisco Bay has resulted in a loss of habitat for wildlife. While some plants and animals are capable of adapting to other habitats, two endangered species, the Salt Marsh Harvest Mouse and the California Clapper Rail, live only in the salt marshes of San Francisco Bay and depend on the wetlands for their survival.

While wetlands are important because they serve as habitats, they also serve us in other ways. One of the most important functions of wetlands is how they serve as filters to trap pollution and sediment from urban runoff. Because wetlands often lie on the borders between uplands and open waterways, they act as a buffer between the two. Wetland plants slow the flow of water enough to allow the heavier particles to settle out. Smaller particles are trapped in the mesh of leaves, stems and roots of a densely vegetated wetland. The result of urban runoff traveling through a wetland is cleaner water entering the Bay.

By slowing the flow of water, wetlands are also helpful in flood control. For example, when a heavy rainstorm increases runoff, the added water may cause waterways to overflow and flood adjacent land (towns, lawns, farms). Wetlands offer runoff a place to "rest" and soak into the soil, thereby reducing the potential for flooding.

Teacher Procedure

1. Before you begin this experiment, review with the students what they have learned about wetlands and watersheds. Put up a map of San Francisco Bay as a teaching visual. Ask the students the following review questions:
- What is a watershed?
- Where are the wetlands that we visited on our field trip?
- How do you think wetlands act like sponges?
- Wetlands also act as a filter; what does that mean?

2. Divide students into groups of two. Give each group the materials for their experiments. You may want to show them a demonstration model that you have created previously.

3. Instruct the students to read the student pages and to follow the directions on how to build their watershed wetland model.

4. Instruct the students not to proceed with the experiments until you have had a chance to see their model. Once you have approved their model, allow them to proceed with their experiments.

5. Remind the students to write down their predictions of what will happen before actually conducting that part of the experiment.

Wrap up and Brainstorm Questions:
1. When sediment runs directly into the Bay, what negative things can happen?

2. How does a wetland protect the Bay from pollution?

3. **90%** of the wetlands around San Francisco Bay have been destroyed; how have they been destroyed?

4. Knowing that wetlands are effective filters, do you think wetlands often become polluted?

5. What can you do to help preserve wetlands?

Sponges (Wetlands)
Clay (Uplands)
Soil
Pan
Water Runoff (Bay)
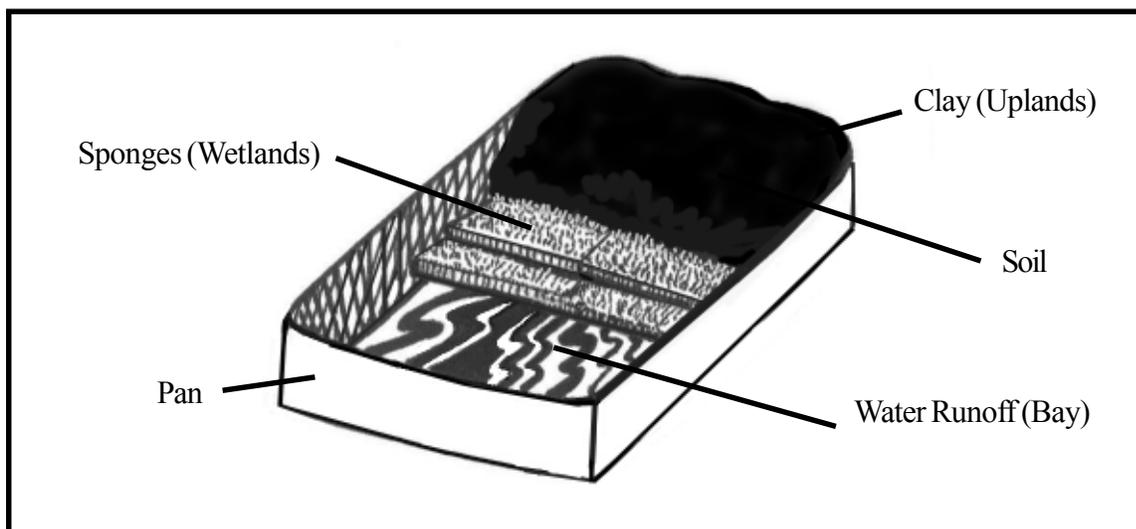
Wetlands In A Pan

INTRODUCTION

Think about what happens when rain hits the land. What happens to the water after it falls to the ground? Imagine a rainstorm in a wetland. Grass, reeds, soil, and vegetation act like a sponge, soaking up the water into the floor of the wetland. Now imagine the same rainstorm on a road or in a parking lot. These surfaces are solid and water has nowhere to go. As it flows along, it gains speed and is able to pick up and carry nutrients or chemicals that might be on the land. Soil not protected be vegetation is easily eroded or washed away by fast moving water. In this activity you will work in small groups to build a model of a wetland and test how wetlands act as a buffer and filter as they trap pollutants from city runoff flowing towards the Estuary.

MATERIALS

Your group will need:
- Modeling Clay
- Long shallow pan: a sturdy metal or glass pan with a smooth, flat bottom works well or a rolling metal or plastic paint pan
- Sponges (enough to span the width of pan)
- Cup of soil
- Spray bottle with water
- Q-tips
- Colored drink mix
- Optional: items to represent wetland plants or animals, such as pine needles, clay for animals, toothpicks and marshmallows for cattails
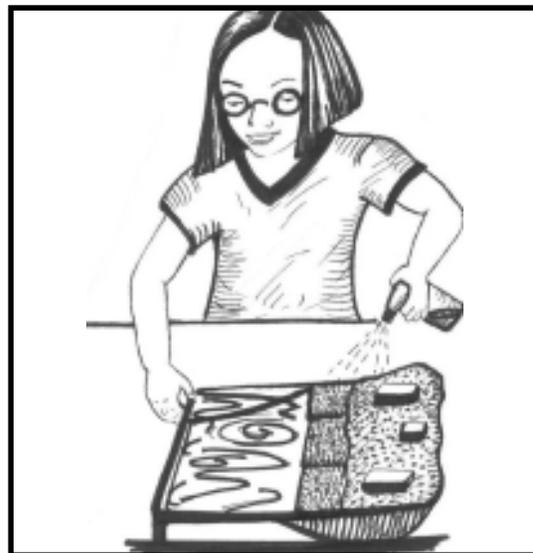

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PROCEDURE

1. In the first part of this activity you and your partner will build a watershed with the supplies provided. Spread the modeling clay over half of the pan. Leave half of the pan empty to represent San Francisco Bay. Shape the clay so that it slopes down to the Bay. Smooth the clay along the sides of the pan to seal the edges. You can also form meandering rivers or creeks in the clay that lead into the Bay. Be creative!

2. Next, you will create a wetland along the low edges of land. To do this use the pieces of cut sponges to completely fill the space across the pan along the edge of the clay (Make sure the wetland fits well - the model won't work if there are spaces under the wetland or at the sides).

3. Make sure the sponges aren't completely dry - wet them with the spray bottle to moisten them.
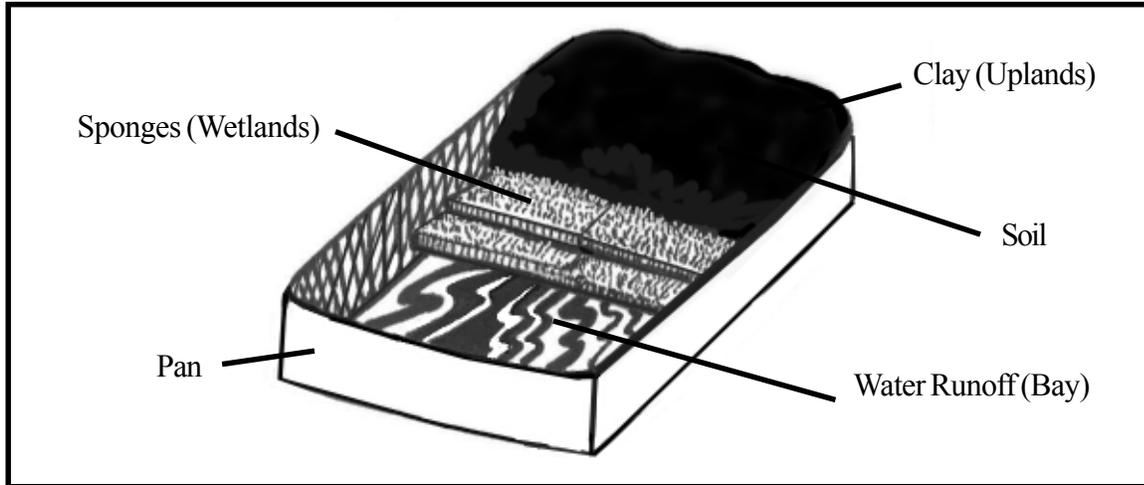
Experiment I - Rain on land with wetland
1. Predict what will happen to the water when it rains.

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2. Create rain on the land by spraying water on the upland area.

3. Record your observations: What happened to the water as it hit the wetland?

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Experiment II - Rain on land with wetland removed.
1. Predict what will happen to the water when it rains on the upland.

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2. Remove the sponges from your model and spray water in the upland area. Record your observations.

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Experiment III - Rain on land with sediment / pollution (with wetland).

1. Put sponges back in place and then sprinkle the soil on top of upland areas (clay).

2. Place about 1 tsp. of colored flavored drink mix somewhere on the upland above the wetland. This simulates pollution.

3. Predict what will happen to the sediment and pollution when rain hits the land.

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4. Predict what will happen to the sediment and pollution when it reaches the wetland.

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5. Spray water on the land of your model. Record your observations. What happened to the sediment and pollution?

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Experiment IV: Rain on land with sediment (wetland removed).

1. Pour the water out from the last experiment into a sink and rinse out sponges. Replace a new layer of soil on top of the land surface. Do <u>not</u> replace the wetland (sponges).

2. Predict what you think will happen to the sediment and pollution as the rain hits the land.

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Conclusions:
A "wetland buffer" is an area of wetland habitat that acts as a transition between the urban development around the San Francisco Bay and the water in the Bay. Thinking about your experiments, what functions does a "wetland buffer" serve?

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