



Lessons from the Bay

Muddying the Waters

How does sediment affect water quality?

Objectives

Students will

- predict the effects of sediment on water quality
- conduct an experiment to observe the effects of sediment on water quality
- summarize the effects of sediment on water quality
- generate ideas for reducing sediment in their community.

Background

Sediment, small particles of soil and other materials, is one of the most damaging pollutants in the Bay. Sediment enters the water through runoff from eroding soil. When suspended in the water, sediment prevents sunlight from reaching underwater grasses. This suspended sediment can also clog the gills of fish. As sediment settles to the bottom, it can smother the organisms that live there. In the worst cases, high levels of sediment in the water can actually change the physical structure of a waterway.

Sediment can best be reduced by erosion-control measures. Hay bales and filter cloths can be used to keep exposed soil in place. Vegetated buffer zones around properties that line waterways filter sediment from runoff before it reaches the water.

This activity helps students to investigate the properties of sediment in water. It provides students with an understanding of sediment's impact on the Bay and illustrates the connection between human activity on land and water quality in the Bay.

Procedures

Session 1 (45 minutes)

Perform these steps in preparation for Session 1 activity.

1. For each jar (1 per student group) cut a 2-inch-wide strip of white paper the approximate height of the jar.
2. Divide each strip lengthwise into 3 zones, and label each zone: "A" at the top, "B" in the center, and "C" at the bottom.
3. Attach each strip to a jar vertically with the letters facing inward so that students can look through the jar from one side and see the strip and its labels on the opposite side.

Related Standards of Learning

Science:

3.1.a; 3.1.h; 3.1.j; 3.1.d; 3.6.a;
3.7.d; 4.1.a; 4.1.h; 4.1.i; 4.5.f; 4.9;
5.1.g; 5.1.h; 5.7.f; 5.7.g; 6.1.g;
6.1.h; 6.5.f; 6.7.f

Mathematics:

4.5.c; 3.11.a

English:

3.1; 3.2; 3.11; 4.1; 4.2; 4.7.b;
4.7.c; 4.7.d; 4.7.g; 4.7.i; 4.8; 5.1;
5.7; 6.2

History and Social Science:

VS.1.b; VS.1.d; VS.1.h; USI.1.e;
USII.2.b

Time Required

Two 45-minute sessions (plus preparation)

Materials

For preparation:

- clear jars with lids (1 per student group)
- scissors
- ruler
- white paper
- clear tape

For each student:

- Student Experiment Sheet (handout, page 53)
- Student Data Sheet (handout, page 55)

For each group:

- 50 ml of soil (ideally from schoolyard)
- stirrer
- tap water
- graduated cylinder or measuring cup
- jar (previously prepared by teacher)
- stopwatch or wristwatch with second hand

Classroom Assessment Suggestions

- Students' responses to "Conclusions" questions
- Observation during experiment and discussion

Conduct this session in the classroom.

1. Define and discuss *sediment* if you have not already done so in previous activities. Explain that when soil and other particles are eroded from the land, they are carried into waterways.
2. Distribute a Student Experiment Sheet and Student Data Sheet to each student. Explain how the sheets are to be used, and ensure that the students understand the experiment procedures.
3. Have students complete the "Hypothesis" section of the Student Experiment Sheet. When they are done, ask students to share their predictions with the class.
4. Divide the class into groups of 3–4, and give each group the materials for the experiment (i.e., jar, soil, stirrer, measuring cup, and stopwatch). Instruct students to perform the experiment procedures, and explain that each group member should complete his or her own Student Data Sheet (with help from group members).

Session 2 (45 minutes)

Conduct this session in the classroom.

1. Direct students to consult their completed Student Data Sheets and complete the "Conclusions" section of the Student Experiment Sheet.
2. When students have completed the Student Experiment Sheet, discuss the experiment, and ask students to share their results. Ask students to share their "Conclusions" from the Student Experiment Sheet. In addition, discuss the following questions:
 - *What are some ways that people can help reduce the amount of sediment entering the Bay?*
 - *What can we do to educate others in our school and community about the effects of sediment on the water quality and aquatic life of the Chesapeake Bay?*

Resources

Berger, Melvin, Gilda Berger, and Bobbi Tull. *Water, Water Everywhere*. Nashville: Ideals Children's Books, 2001. ISBN 0824953126.

"Bernie's Toes." Bay Team. Virginia Institute of Marine Science, and Virginia Sea Grant College Program, 2001.
<<http://gdsenvironment.blogspot.com/2008/02/bernies-toes.html>>
and <<http://archive.chesapeakebay.net/status/x/sld041.htm>>.

"Build Your Own Rain Garden." Project Action Guide. *Lessons from the Bay*. 13–17.

Chesapeake Bay Foundation. <<http://www.cbf.org>>.

Chesapeake Bay Foundation. *Watershed Action for Virginia's Environment (WAVE)*.
(See <http://www.cbf.org/site/PageServer?pagename=edu_educators_curriculum_va_index>, or contact the Virginia Office: Capitol Place, 1108 E. Main Street, Suite 1600, Richmond, VA 23219; phone 804-780-1392.)

Chesapeake Bay Program. <<http://www.chesapeakebay.net>>.

ChesSIE: Chesapeake Science on the Internet for Educators.
Chesapeake Bay Program. <<http://www.bayeducation.net>>.

Cole, Joanna, and Bruce Degen. *The Magic School Bus: Inside the Earth*. New York: Scholastic, 1989. ISBN 0590407600.

Hooper, Meredith, and Christopher Coady. *The Pebble in My Pocket: A History of Our Earth*. New York: Viking, 1999. ISBN 0670862592.

Project WET Curriculum and Activity Guide. Project WET. Bozeman: The Watercourse, 1995. (See <<http://www.projectwet.org/watercourse/catalog.asp>>.)

Tresselt, Alvin, and Leonard Weisgard. *Rain Drop Splash*. New York: Mulberry Books, 1990. ISBN 0688093523.

Wick, Walter. *A Drop of Water: A Book of Science and Wonder*. New York: Scholastic, 1997. ISBN 0590221973.

Extensions for Students

- Design an action plan for preventing sediment from entering the Bay or its tributaries.
- Write a story from the perspective of a bottom-dwelling organism in a river clouded with sediment.
- Look for sources of sediment in the schoolyard.
- Complete the Virginia Institute of Marine Science's "Bernie's Toes" lesson from the Virginia Bay Team program (see Resources).
- Pretend that you are a Bay creature (e.g., crab, oyster, shad, rockfish). Write a letter to a community, business, or developer, describing the problems you face as a result of excess sediment in the Bay.
- See "Build Your Own Rain Garden" on page 13 of the **Project Action Guide**.