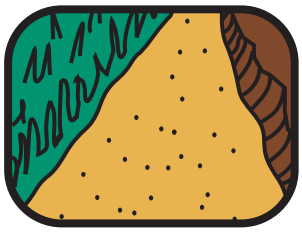

Lessons from the Bay

Does It Soak Right In?

Which types of land surfaces allow water to soak in, and which cause water to run off the ground?

Objectives

Students will

- predict the percolation properties of various land surfaces
- test various land surfaces and measure and compare the percolation rates
- summarize the effects of certain land surfaces on runoff.

Background

Surface runoff plays a key role in determining water quality in the Chesapeake Bay watershed. Runoff carries with it sediment and other potential pollutants. Excessive runoff, especially when it flows at high rates of speed, causes erosion and flooding of waterways. The amount of runoff is a result of the physical characteristics of the land and the amount of water that soaks into the surface. A surface's ability to hold water is affected by such factors as the percentage of rock in the soil, the proximity to the surface of rock and groundwater, and the degree to which the soil is compacted.

A percolation test measures the rate at which water seeps into soil. The rate of percolation is determined by how porous a surface is. If a land surface is not porous (e.g., pavement), water will not soak in but rather run off it rapidly. If a surface is very porous (e.g., areas of thick grass), it can soak up large volumes of water. When water can soak into a surface and travel through the ground slowly, much of the pollutants are filtered out. Water that runs off the land quickly, on the other hand, carries pollutants directly to the waterways.

Procedures

Session 1 (45 minutes)

Perform this preparation prior to the activity.
Select four areas in the schoolyard, each with a different land surface (e.g., concrete, grass, soil, and mulch). Rope off the areas, or simply label them with letters. (You may choose to recruit parent volunteers to help monitor students at each station.)

Open the coffee cans at both ends, and discard the cuttings. Use duct tape to cover any sharp edges.

Related Standards of Learning

Science:
3.1.a; 3.1.c; 3.1.d; 3.1.j; 3.7; 3.9; 3.10; 4.1; 4.5.f; 5.1; 5.7.e; 6.1.e; 6.1.f; 6.1.h; 6.9.a
Mathematics:
3.14; 3.15; 3.16; 3.21; 4.11.a; 4.13; 4.19; 5.11.a; 5.12; 5.19; 6.10; 6.20
English:
3.1; 3.2; 3.8; 3.9; 3.10; 4.1; 4.2; 4.7.a; 4.7.b; 4.7.c; 4.7.d; 4.7.e; 5.1; 5.8.a; 5.8.b; 5.8.c; 5.8.d; 5.8.e; 5.8.f; 6.6
History and Social Science:
VS.1.b; VS.1.d; VS.1.h; USI.1.e

Time Required

Two 45-minute sessions

Materials

For each group:

- *Student Data Sheet (handout, page 19)*
- *4 cups of water in a jug, bottle, or bucket*
- *empty coffee can with both ends removed by teacher prior to activity*
- *duct tape*
- *graduated cylinder or measuring cup*
- *stopwatch*
- *ruler*
- *small mallet (optional)*

Conduct this portion in the classroom.

1. Define and discuss *percolation* with the class. Ask students to speculate about the relationship between percolation and runoff. Ask students to share examples of surfaces with slow percolation, fast percolation, and no percolation.
2. Divide students into groups of 4–5, and give each group a copy of the Student Data Sheet.
3. Read aloud the percolation test directions from the Student Data Sheet, and ensure the students understand the procedure. Help the groups determine which of their members will be responsible for each of the five "Group Jobs."
4. Write the surfaces of the four testing areas on the board, and direct the groups to complete the "Predictions" portion of the Student Data Sheet.

Conduct this portion in the schoolyard.

5. Take the class into the schoolyard and show students the four testing areas. Direct each group to begin at a different area.
6. Instruct students to complete their tests by following the directions given on the Student Data Sheet. Remind them to record their results in the Data Chart on the back of the Student Data Sheet.

Session 2 (45 minutes)

Conduct this session in the classroom.

1. Have each student write a summary of the data collected by his or her group. Direct them to answer the following questions in their summaries:
   - *Were your predictions correct? Why, or why not?*
   - *Which surfaces had quick percolation rates? Which had slow rates?*
   - *Were there any surfaces that did not percolate at all? What is the impact of these types of surfaces on the Bay or other waterways?*
2. Ask each group to report orally their results for each land surface tested. Create a class chart to display the reported data. Have students analyze the data in the chart. If math skills allow, ask students to find the average number of seconds it took for each land surface to absorb the water. *(Fifth- and sixth-grade teachers may choose to have students also find the mode, median, and range.)*
3. As a class, discuss the results of the percolation tests. You may choose to ask the following questions:
   - *Which land areas around the school have a high rate of percolation? Which have a low rate?*
   - *What does the percolation rate tell about the soil's ability to filter?*
   - *What does the percolation rate tell about runoff from various surfaces in the schoolyard?*

Resources

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

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

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

Chesapeake Bay Foundation. "Your Virginia Watershed," and "When Rain Hits the Land." *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. Virginia Institute of Marine Science and 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.

"Preparing Graphs and Charts." Project Action Guide. *Lessons from the Bay.* 69–70.

Project WET Curriculum and Activity Guide. Project WET. Bozeman, MT: 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.

Classroom Assessment Suggestions

- *Data chart on Student Data Sheet*
- *Written summaries of the percolation tests*

Extensions for Students

- *Create a bar or line graph to record test results for the group and the class. (See "Preparing Graphs and Charts" on page 69 of the **Project Action Guide**.)*
- *Use a spreadsheet program to record and report test results.*
- *Conduct a percolation test at home, and report the findings to the class. Record each student's results on a map of the community, and find class averages.*
- *See "Build Your Own Rain Garden" on page 13 of the **Project Action Guide**.*