

RAIN WATER RUNOFF

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the effects of rainwater runoff;
2. Conduct an experiment on soil erosion and give an oral or written description of the results;
3. Compare and discuss, orally or in writing, the effect of sloping and erosion on soil samples; and
4. Give an oral or written definition of the new terms: erosion, nonpoint source pollution, point source pollution, runoff, and sediment.

BACKGROUND INFORMATION

Sediment is one of our most destructive water pollutants. America's water is polluted by more than one billion tons of sediment annually. Every year, Americans lose millions of dollars because of sediment pollution.

Sediment is caused by erosion, which is the gradual wearing down and carrying away of the Earth's materials. Soil erosion occurs when soil is moved from one place to another by natural means. Wind blows soil, and moving water washes soil away. Normally, soil erosion occurs slowly over a long period of time because trees and grasses hold the soil in place. Erosion can also occur naturally from forest and prairie fires, hurricanes, or tornadoes which strip the land of its protective vegetation cover. Nonpoint source erosion by people also can cause soil erosion to advance much more quickly than normal by allowing over grazing by farm animals and by digging and building on steep slopes, cutting down trees, and plowing the land for crops. The rapid soil erosion that results from such activities can be very harmful to the environment.

Erosion by water often starts when rain strikes bare soil. Large amounts of rain washing down a sloping area pick up loose soil and carry it away. Harmful pollutants can be washed away with the soil during the runoff event. Substandard agricultural and other land practices often prepare fields and their topsoil to be washed away. Besides making the water less attractive to swim in and drink, the soil kills fish and other organisms living in the water.

SUBJECTS:

Science, Language Arts, Math

TIME:

1 hour

MATERIALS:

each group of 3 students will need:

3 1.89 liter (half-gallon) milk cartons

outdoor source of soil

2-liter bottle

metric ruler

plastic bucket (5 gallon ice cream bucket)

water supply

paper towels or cloth hand towel

newspaper

3 large baby food jars

masking tape

Rain, Rain Rivers by Uri Schulevitz

Terms

erosion: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents; processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is removed from the Earth's surface.

nonpoint source pollution (NPS): pollution that cannot be traced to a single point because it comes from many individual sources or a widespread area such as urban, rural and agricultural runoff.

point source pollution: pollution that can be traced to a single point source, such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges).

runoff: water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a water body; may pick up and carry a variety of pollutants.

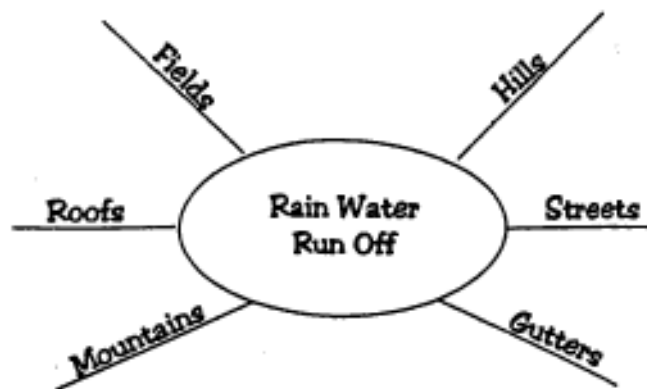
sediment: eroded soil material (often suspended in water that consists mainly of particles derived from rocks, soil, and inorganic materials).

ADVANCE PREPARATION

- A. Collect a plastic gallon bag of soil for each group. Do not use potting soil.
- B. Use scissors to cut out the side panel of a milk carton under the spout, leaving the spout intact.
- C. Fill a 2-liter bottle with water. Divide the bottle into thirds by drawing a band around the bottle with a permanent marker and collect supplies on a cardboard tray (box from four 6 pack soft drinks works great) or tub.
- D. Reproduce one copy of student activity pages for each student.

PROCEDURE

- I. Setting the stage
 - A. Read Rain, Rain Rivers by Uri Schulevitz to students.
 - B. Explain what erosion is and that rain is important to animal and plant life. Much of runoff is uncontaminated. Runoff waters are necessary to renew many wetlands and habitats. However, erosion due to running water can be harmful to our environment. Pollution such as garden insecticides, automobile emissions caked on parking lots, and lead from paints and exhaust, are washed by runoff into surface waters, streams, rivers, lakes, and oceans. Look back through the book for examples of erosion. Silently hold up pictures again and have students write on a group semantic map (a graphic organizer) different types of erosion in the book. Discuss the different types observed and what each type of erosion could be washing away.



II. Activity

- A. Ask students to describe what happens when water moves over soil. Does the slope of the land affect the washing away of loose soil? (What does slope mean?)
- B. Group students into pairs and have them cover the work area with newspaper.
- C. Hand out the record sheet. Show students the tray of materials and describe the procedure.
- D. Hand out the trays to each group of students. Also hand students three strips of masking tape to label numbers on baby food jars (1, 2, 3) and place them on the empty jars. Guide students through the experiment.
- E. Lay the milk carton on its side, with the cut out panel facing up, then fill the carton half-full with the soil. (Use no more than 1/3 of soil in bag.) Pat the soil to smooth the surface. Place spout side of milk carton on the edge of a desk. Place jar #1 in the middle of the bucket. A student will hold the jar and bucket under spout during the experiment.
- F. Ask students to observe the water in the 2-liter bottle and record their description on the record sheet. To simulate rainfall, have one student pour 1/3 of the water from the bottle over soil while another student is catching water from spout in baby food jar #1 in a plastic bucket. The goal is to provide a constant flow of water over a flat surface. When jar is full, remove jar and observe the color of water. Are there any soil particles in water? Set jar aside and record observations.
- G. Now repeat steps E and F with another milk carton and a fresh soil sample, but raise the end of the carton to 3 cm. Have students problem solve what to use from the classroom to raise the slope. Place jar #2 in the bucket and hold under spout. Be sure to use the same amount of water as in the first trial. Observe the difference in the flow of the water. When the jar is full, remove it from the bucket and observe the color and amount of soil particles. Set jar aside and record observations.
- H. Repeat procedure for a third time, raising the carton to a height of 5 cm. Place jar #3 in the bucket and hold under spout. When the jar is full, remove from bucket. Observe the color of the water and amount of soil particles. Set jar #3 aside and record observations.

- I. Allow each jar at least ten minutes for soil particles to settle. Ask students to observe jars. (Remind students to not move the jars when measuring). Then measure and record the amount of soil particles in the bottoms of the jars. Tell students that when soil particles settle from water it is called sediment. Have students write a definition for erosion and sediment at the bottom of the record sheet. When the slope of the carton was increased, what happened to the amount of soil particles?
- J. To clean up, collect cardboard trays and supplies. Have students take milk cartons outside and dump the soil in flower beds around school. Collect milk cartons in garbage bag. You may possibly be able to rinse, dry, and store for use again. Use the overflow water in the buckets to water plants around the school.

III. Follow-Up

- A. Have the students demonstrate their knowledge of soil erosion by performing the following task.
 1. Explain how water gets muddy. (The runoff of rain water over soil.)
 2. Define sediment. (Tiny bits of rocks, soil, and other materials carried into water.)
 3. Define erosion. (The removal or wearing away of soil or rock by water.)
 4. How can erosion be both harmful and helpful? (Erosion can be harmful when it removes soil from the land or destroys property along a riverbank. It can also be harmful when the runoff picks up harmful pollutants and deposits them in our surface water. It can be helpful when the soil is dropped somewhere else, building up new land.)
5. Have students complete "What Causes Erosion?" activity page.

IV. Extensions

- A. Conduct a tour around the schoolyard to look for signs of erosion. In an urban setting, look for such things as cracked and pitted sidewalks, rounded pebbles used for decorative stone, and rivulets carved in dirt by water flowing along street gutters or down slopes on the schoolyard.
 1. Construct a chart with names of areas of erosion. Brainstorm possible solutions.
 2. Write a letter to the principal explaining what you have been studying, along with the areas noted on your tour and possible solutions. Ask permission to enlist help from parents and the community to correct problem areas.
 3. Set up a work session with students and parents to follow through with solutions designed by the class.

RESOURCES

- Butzow, Carol M. and Butzow, John, W., Science Through Children's Literature, p. 150-157, Teacher Ideas Press, Englewood, CO, 1989.
- Lind, Karen K, Water, Stones, and Fossil Bones, p. 50-51, National Science Teachers Association, Washington, D.C., 1991.
- Shulevitz, Uri, Rain, Rain Rivers, Farrar, Straus and Girous, New York, 1969.
- Soils, Science and Technology for Children, p. 53-58, National Academy of Science, Washington, D.C., 1994.

RAIN WATER RUNOFF



scientist name

1. Describe water in bottle.

color	solid particles

2. Hypothesis:

After the rain shower I think the water will

Experiment

3. JAR 1



4. JAR 2



5. JAR 3



color _____

soil pieces

_____ cm

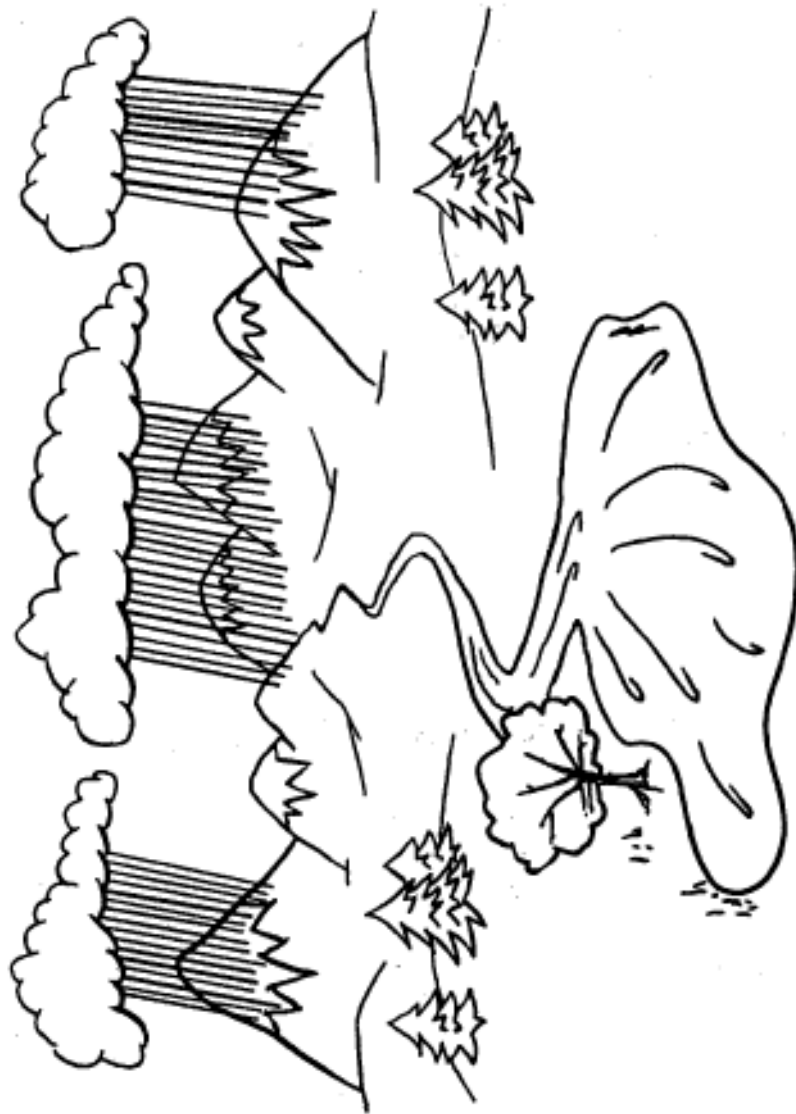
_____ cm

_____ cm

6. erosion-

7. sediment-

What Causes Erosion



List the things in this picture that could cause erosion:

Name: _____ Date: _____