

Going, Going, Gone?

Lesson Description

Students simulate rain and wind to observe the effects of water erosion and wind erosion on soil.

Teacher Background

Erosion is the loosening and movement of the solid material on the land surface by water *runoff*, wind, ice, and landslides. Wherever water flows or wind blows over unprotected soil, erosion is the result. Even on land protected by plants, some degree of natural erosion will occur. Soil continuously forms from *parent material* and *organic matter*, but soil erosion outpaces soil formation. The *sediment* that results from *water erosion* can cause *water pollution*. *Wind erosion* pollutes the air and reduces air quality.

When America's early settlers arrived in the area that is now the Plains States, they plowed the prairie grass to plant crops, not realizing that the native grasses held the soil in place. The exposed, plowed soil became vulnerable to the prairies' *droughts*, battering winds, and rain. Storms whipped up the dust, stripping the plowed earth of precious *fertile* soil, and destroying millions of agricultural acres. Thousands of farm and ranch families were forced to abandon their ruined land during the Dust Bowl droughts of the 1930s.

Subjects

Art, Language Arts,
Mathematics, Science,
Social Studies

Time

Prep: 30 minutes

Activities: 1 ½–1 ¾ hours
(not including Extensions)



Topic: the Dust Bowl
Go to: www.scilinks.org
Code: DIG10



Student Objectives

Students will be able to:

- define erosion;
- demonstrate soil erosion using models of fields;
- explain where eroded soil goes and what its effects are; and
- determine how to protect land from soil erosion.

Tons of dry, powdery soils were carried thousands of miles by wind. Huge dust clouds were blown to the East Coast from as far west as Montana.

Soil erosion can never be stopped—it can only be controlled. In the lesson that follows, students learn about the effects of wind and water on bare soil, on soil covered by crop residue, and on soil protected by grass. Students analyze the results of erosion demonstrations to explore ways that *conservationists* treat the land to minimize soil erosion.

Materials

For the Class

- Color photos showing erosion
- Three small aluminum cake pans
- Dry soil (see page x)
- Dry soil with grass left on top
- Dry soil containing grass and plants roots and stems
- Three index cards
- Marker
- Three clear trash bags
- Hair dryer or mini fan
- Scissors
- Three measuring cups (at least 500 milliliters)
- Watering can
- Water
- Broom and dust pan
- Bucket

Learning Cycle

Perception: 15 minutes

Prep Find color photographs of erosion in Earth science and environmental science textbooks or encyclopedias, or cut out photographs from calendars or magazines such as *National Geographic*, *Audubon*, *Outside*, *Sierra Club*, *Journal of Soil and Water Conservation*, etc. If possible, find pictures showing the same land before and after soil erosion occurred.

- 1** Review the value of soil and discuss why soil is important to environmental health. (Answer: soil is the medium in which our food is grown and is the space where we build our towns and cities; soil provides habitat for animals, shelters plant roots, and gives animals and some plants critical nutrients for survival.)
- 2** Direct student's attention to the erosion photos. Help students understand how soil erodes from agricultural and urban areas through water and wind movement.



Exploration: 30 minutes

Prep Use scissors to notch a “v” in a short side of each cake pan (see Figure 10.1 on the next page). Prepare models of fields by filling one cake pan with bare soil (to represent a plowed field with no protection from vegetation), another pan with soil and loose plant material (to represent an agricultural field with crop residue left for protection), and the third pan with a patch of soil and firmly-rooted grass (to represent a pasture or meadow). Use a marker and index card to label pans “plowed field,” “field with crop residue,” and “meadow.”

- 1 If your students have visited a farm or garden, discuss the kind of fields they’ve seen.
- 2 Ask students how the three cake pans are models for three different fields.
- 3 Explain that this experiment will simulate the effects of the weather and seasons on soil in those types of fields. Ask students to predict what will happen when “wind” blows across each “field.” Have students give reasons for their predictions.
- 4 Distribute Student Handout 10A. Older students can fill in the first and second columns of the handout. Younger students can draw pictures of their predictions instead of writing sentences about what will happen, or make predictions for just one of the fields.
- 5 Select one student to hold a garbage bag open, and select another student to hold a pan and tilt it lengthwise over the garbage bag. Explain that tilting the pan models a sloped field.
- 6 Select one student to be the wind blower, or do it yourself. That student will hold the hair dryer

Materials Cont’d.

For Each Student Group

- Drawing paper
- Crayons, colored pencils, or markers
- Student Handouts 10A, 10B, and 10C



Figure 10.1. Simulating wind erosion on a field.



about 20 centimeters from the upper end of the pan, directing the blowing air down toward the garbage bag for 15–30 seconds (see Figure 10.1).

- 7 Repeat for each type of field.
- 8 Have the class gather around the garbage bags to see the results. The garbage bag under the “plowed field” should contain the most soil, while the bag under the “meadow” should contain the least soil. The bag under the “field with crop residue” should contain a medium amount of soil. Were student predictions accurate?
- 9 Discuss what these results

mean. Help students understand that the grass in the meadow protects the soil from wind, while bare soil without any vegetation is exposed to wind and therefore the most vulnerable to soil erosion.

- 10 Students should complete Student Handout 10A by drawing pictures or writing sentences about what they observed.
- 11 Clean up spilled soil. Save pans for the Application section.

Application: 30 minutes



Use the three pans from the Exploration section.

- 1 Challenge students to predict what “rain” will do to the three “fields.”



- 2** Distribute Student Handout 10B and ask students to draw what they predict will collect in each measuring cup. You may wish younger learners to make a prediction for just one pan, or to draw only what they see happen during the demonstration.
- 3** Select one student to tilt a pan—notch side down—as in the Exploration section. Select one student to hold the measuring cup just below the notch to catch the runoff.
- 4** Select a student or use the watering can yourself to “rain” onto the pan.
- 5** Repeat for each pan.
- 6** Allow the contents of the cups to settle. Help students read the marks on the cups to measure how much soil was lost from each pan. Measure the soil that has settled in the bottom of the cups, not the water or the organic matter that may float to the top.
- 7** Discuss the results of the demonstration. Guide students to understand that bare soil without any vegetation erodes the most, while soil with some vegetation remaining erodes the least, since plant roots hold soil in place.
- 8** Hold up the cup containing the most soil sediment and ask for ideas about where this sediment goes. (Answer: soil sediment may cover crops at the bottom of slopes, may be deposited in road ditches, may fill in lakes and swimming areas, may spoil fish, bird, and aquatic plant habitats, and may contaminate drinking water supply.)
- 9** Clean up the demonstration area. Collect all soil, water, and plant material in the bucket, then dispose of the waste material outside.



Evaluation: 15 minutes

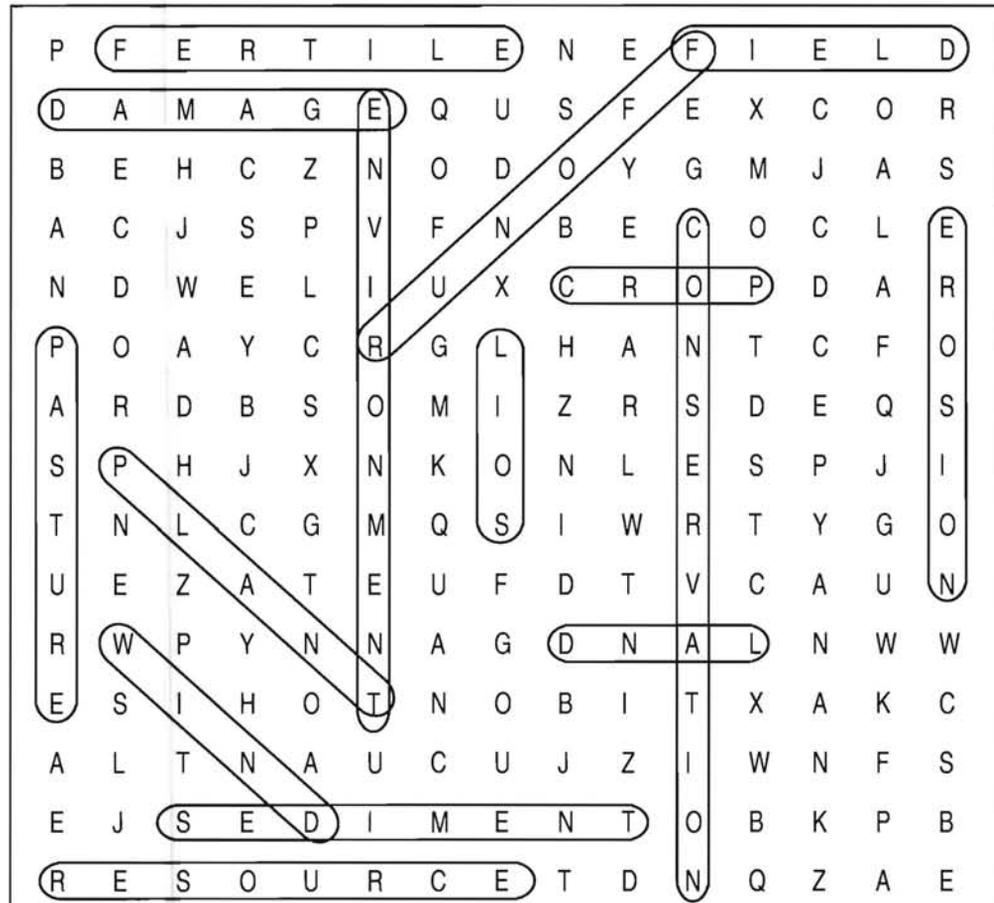
To review the terms and concepts in this lesson, students can work on the word-find puzzle on Student Handout 10C. To make this more challenging for older students, don't provide a vocabulary list at the bottom of the page but instead provide clues about the word. Students fill in the blank with the correct word and then look for it in the word find. Answers to the puzzle are given in Figure 10.2.

Extensions: 15 minutes–1 hour each

- Take a conservation walk around your school yard to look for signs of erosion.
- Invite a conservationist to talk to the class about soil erosion. The conservationist may show students an area that has undergone corrective treatment, and explain the erosion treatment and its effects. If you need guidance, contact a soil conservationist at the Natural Resources Conservation Service (see Appendix B). In Lesson 11, students learn more about soil scientists and conservationists.



Figure 10.2. Answers to word-find puzzle.

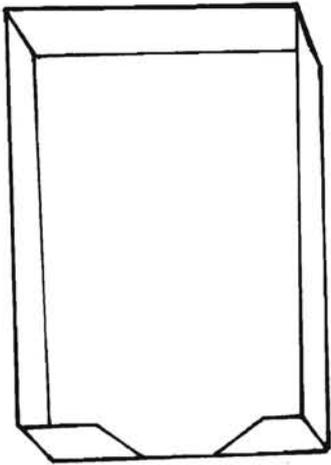


Name: _____

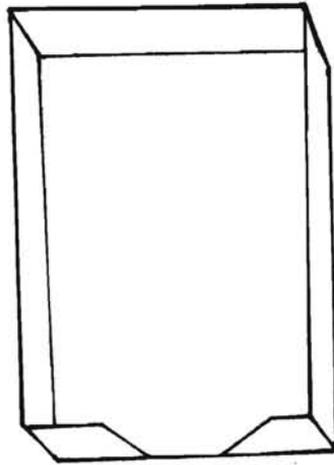
	Field Description	Prediction	Observation	Were You Correct?
1				
2				
3				

Name: _____

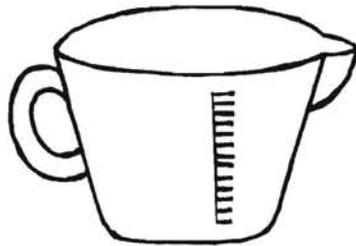
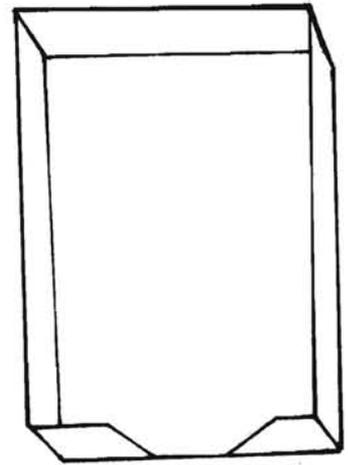
Field 1



Field 2



Field 3



Name: _____

P	F	E	R	T	I	L	E	N	E	F	I	E	L	D
D	A	M	A	G	E	Q	U	S	F	E	X	C	O	R
B	E	H	C	Z	N	O	D	O	Y	G	M	J	A	S
A	C	J	S	P	V	F	N	B	E	C	O	C	L	E
N	D	W	E	L	I	U	X	C	R	O	P	D	A	R
P	O	A	Y	C	R	G	L	H	A	N	T	C	F	O
A	R	D	B	S	O	M	I	Z	R	S	D	E	Q	S
S	P	H	J	X	N	K	O	N	L	E	S	P	J	I
T	N	L	C	G	M	Q	S	I	W	R	T	Y	G	O
U	E	Z	A	T	E	U	F	D	T	V	C	A	U	N
R	W	P	Y	N	N	A	G	D	N	A	L	N	W	W
E	S	I	H	O	T	N	O	B	I	T	X	A	K	C
A	L	T	N	A	U	C	U	J	Z	I	W	N	F	S
E	J	S	E	D	I	M	E	N	T	O	B	K	P	B
R	E	S	O	U	R	C	E	T	D	N	Q	Z	A	E

Find the following words related to soil erosion:

conservation
damage
crop
environment
erosion

fertile
field
land
pasture
plant

resource
runoff
soil
water
wind