

## Lesson C7–1

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# Identifying Environmental and Economic Impacts from Soil Erosion

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**Unit C.** Plant and Soil Science

**Problem Area 7.** Soil Erosion and Land Management

**Lesson 1.** Identifying Environmental and Economic Impacts from Soil Erosion

### **New Mexico Content Standard:**

**Pathway Strand:** Natural Resources and Environmental Systems

**Standard: I:** Recognize importance of resource and human interrelations to conduct management activities in natural habitats.

**Benchmark: I-A.** Identify resource management components to establish relationships in natural resource systems.

**Performance Standard: 3.** Identify impacts by humans on natural resources.

**Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

1. Identify the environmental impacts of soil erosion.
2. Identify the economic impacts of soil erosion.

**List of Resources.** The following resources may be useful in teaching this lesson:

**Recommended Resources.** One of the following resources should be selected to accompany the lesson:

Brady, Nyle C. *The Nature and Properties of Soils*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. 1990 (Chapter 15)

**Other Resources.** The following resources will be useful to students and teachers:

Biondo, Ronald J. and Jasper S. Lee. *Introduction to Plant & Soil Science and Technology, 2<sup>nd</sup> Edition*. Danville, Illinois: Interstate Publishers, Inc., 2003 (Chapter 2)

Buriak, Philip and Edward W. Osborne. *Physical Science Applications in Agriculture*. Danville, Illinois: Interstate Publishers, Inc. 1996 (Chapter 5)

Cooper, Elmer L. and L. DeVere Burton. *Agriscience: Fundamentals & Applications*. Albany, New York: Delmar. 2002 (Chapter 8)

Lee, Jasper S. and Diana L. Turner. *Introduction to World AgriScience and Technology*. Danville, Illinois: Interstate Publishers, Inc. 1997 (Textbook and Activity Manual, Chapter 17)

Parker, Rick. *Introduction to Plant Science*. Albany, New York: Delmar. 1998 (Chapter 5)

Plaster, Edward J. *Soil Science & Management*. Albany, New York: Delmar. 1997 (Chapter 18)

Porter, Lynn, et. al. *Environmental Science and Technology*. Danville, Illinois: Interstate Publishers, Inc. 1997 (Chapter 13)

## List of Equipment, Tools, Supplies, and Facilities

Writing surface

**Terms.** The following terms are presented in this lesson (shown in bold italics):

Erosion  
Eutrophication  
Sediment  
Siltation

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

*Hold up several manufactured items to the class. Ask the class, “Where were these items made?” “What type of business was it?” Lead to the answer of “a factory.” Then ask students, “Where is the factory for all crops?” The answer is the soil. Lead discussion around the point that it is important to protect our soil because it is the basis of the entire agriculture industry.*

## Summary of Content and Teaching Strategies

**Objective 1:** Identify the environmental impacts of soil erosion.

**Anticipated Problem:** What are the environmental impacts of soil erosion?

- I. The loss of soil from both agricultural and nonagricultural lands is a serious problem throughout the world. The removal of soil by wind or water moving over the land is called **erosion**. In the United States about 5 billion metric tons of soil are moved annually by soil erosion, some two thirds being moved by water and one third by wind. More than half of the water erosion and about 60 percent of the wind erosion is on cropland that produce most of the country’s food. The load of the sediment that is carried by some of the world’s major rivers to the ocean is enormous. **Sediment** is soil that is in suspension and is being transported or has been moved from its original location by wind or water.

While soil erosion has serious implications for agriculture, its total environmental cost to society may be even higher in nonagricultural areas. **Siltation** is the deposition of soil particles in a body of water. This can cause the lifetime of water storage reservoirs to be shortened dramatically. River channels can be filled in and treatment plants for domestic water supplies can be damaged by silt intake. A major environmental concern with soil erosion is **eutrophication**, which is a condition that develops in water supplies when the water is changed by the increase of nutrients. This increase of nutrients can be created by the addition of commercial fertilizers brought in with soil sediment. If this occurs, the water no longer provides a good environment for the fish and other organisms in the area. Signs of eutrophication are dense growth of aquatic plants, algae, and other organisms. These types of problems pose not only dramatic environmental impacts, but also economic ones as well.

*There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the environmental impacts of soil erosion. Chapter 15 in *The Nature and Properties of Soils* is recommended.*

**Objective 2:** Identify the economic impacts of soil erosion.

**Anticipated Problem:** What are the economic impacts of soil erosion?

- II. Soil scientists believe that a typical acre of farmland can afford to lose between one and five tons of soil each year. The average soil loss to water erosion on cropland is thought to be 3.5 tons per acre. Wind erosion is estimated to account of another 2.9 tons per acre of erosion. One reason that producers are so concerned with soil erosion is the economic effect it has on their business through loss of production on their land.

It is estimated that an average corn grower loses about \$0.33 per acre per year to erosion. The total economic loss from lost production is about \$40 million per year. These losses are cumulative. In the second year, the corn grower will lose \$0.66, and so on through the years. In the long term, losses will become very significant. In addition to loss in production, a producer must calculate the costs of lost fertilizer, lime, and pesticides, deposition in field drainage systems and irrigation structures as well as many other factors. Far greater than production losses due to erosion is the cost of off-site effects such as sedimentation or pollution. This accounts for \$3.1 billion a year in losses. Damage in this area affects everyone in society.

*There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the economic impacts of soil erosion. Chapter 18 in Soil Science & Management is recommended.*

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the end of the chapters in the textbook may also be used in the review/summary.

**Evaluation.** Focus the evaluation of student achievement on mastery of the objectives stated in the lesson. Measure student performance on classroom participation, laboratory assignments, and written tests or quizzes.

## Answers to Sample Test:

### Part One: Matching

1 = c, 2 = a, 3 = d, 4 = b

### Part Two: Completion

1. one, five
2. \$.33
3. 2.9
4. 3.5

5. eutrophication

6. 5

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# Test

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### Part One: Matching

*Instructions.* Match the term with the correct response. Write the letter of the term by the definition.

- a. Eutrophication                      b. Sediment                      c. Siltation  
d. Erosion

- \_\_\_\_\_ 1. The deposition of soil particles in a body of water.  
\_\_\_\_\_ 2. A condition that develops in water supplies when the water is changed by the increase of nutrients.  
\_\_\_\_\_ 3. The removal of soil by wind or water moving over the land.  
\_\_\_\_\_ 4. Soil that is in suspension and is being transported or has been moved from its original location by wind or water.

### Part Two: Completion

*Instructions.* Provide the word or words to complete the following statements.

1. Soil scientists believe that a typical acre of farmland can afford to lose between \_\_\_\_\_ and \_\_\_\_\_ tons of soil each year.
2. It is estimated that an average corn grower loses about \$\_\_\_\_\_ per acre per year to erosion.
3. Wind erosion is estimated to account for another \_\_\_\_\_ tons per acre of erosion.
4. The average soil loss to water erosion on cropland is thought to be \_\_\_\_\_ tons per acre.
5. Signs of \_\_\_\_\_ are dense growth of aquatic plants, algae, and other organisms.
6. In the United States about \_\_\_\_\_ billion metric tons of soil are moved annually by soil erosion.