Lesson A3–7

Tracking Groundwater Contamination

Unit A. Natural Resources

Problem Area 3. Water

Lesson 7. Tracking Groundwater Contamination

New Mexico Content Standard:

Pathway Strand: Natural Resources and Environmental Systems

Standard: **VII:** Apply scientific principles to environmental services.

Benchmark: **VII-C:** Explain well design and groundwater supplies to demonstrate knowledge of hydrology.

Performance Standard: **5.** Identify environmental hazards associated with groundwater supplies.

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

1. Define groundwater.
2. List causes of groundwater contamination.
3. Explain the severity of groundwater conservation.

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:

North Carolina Cooperative Extension Service. *Water Quality and Waste Management: Sources and Extent of Groundwater Contamination*. North Carolina: North Carolina Cooperative Extension Service, 1996.

Porter, Lynn, et al. *Environmental Science and Technology*. 2nd Edition. Upper Saddle River, New Jersey: Prentice Hall Interstate, 2003. (Textbook and Activity Manual, Chapters 14 and 15)

Lee, Jasper. *Natural Resources and Environmental Technology*. Danville, Illinois: Interstate Publishers, Inc., 2000. (Textbook, Chapter 7)

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

Turk, Jonathan and Amos Turk. *Environmental Science*. 3rd Edition. New York: CBS College Publishing, 1984.

Arms, Karen. *Environmental Science*. New York: Holt, Rinehart and Winston, 1996. (Textbook, Chapter 5)

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
Drinking water
Disposable cups
Watcher pitcher

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

Aquifer
Groundwater
Percolation

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.

Begin the class by giving each student a disposable cup. Choose one or two students to walk around the room to fill up the cups with water. Once everyone has their water tell them to drink up! As the students

are drinking, ask them where their water came from. Most will say from so-and-so (whoever filled their glass), others will say from the tap, some might even say from a well. Explain to the students that just like food doesn't really come from the grocery store, water doesn't really come from the tap. Put the first transparency master up for the students to look at as you begin the lesson.

Summary of Content and Teaching Strategies

Objective 1: Define groundwater.

Anticipated Problem: What is groundwater?

I. ***Groundwater*** is water found between soil particles and rocks within the earth. Groundwater provides most of the freshwater people use. It also feeds streams and springs. Groundwater may be stored in large, underground rock formations called ***aquifers***. Aquifers collect water as it trickles down through the soil. The downward movement of water through the soil is called ***percolation***.

Use TM: A3–7A to review the terms covered in this lesson.

Objective 2: List causes of groundwater contamination.

Anticipated Problem: What are causes of groundwater contamination?

II. Groundwater can be contaminated through a number of sources. Three of the main sources are agricultural activities, human activities, and natural sources.

A. Agriculture activities that may contaminate groundwater include the practice of irrigation and the application of fertilizers and pesticides.

1. Irrigation causes pollution because of the salts the irrigation water contains. As the water percolates through the soil, it takes the salts with.
2. Fertilizers can become pollutants when they are applied too heavily. The fertilizer that the plant cannot use becomes a pollutant.
3. Pesticides can also become pollutants when applied too heavily.

B. Human activities that may contaminate groundwater include waste disposal, septic systems, and land fills.

1. Wastes can become pollutants when not disposed of properly. Examples of wastes include septic systems, landfills, and illegal dumping.
2. Septic systems are not only one of the largest sources of waste, they are also full of bacteria, viruses, and the organic chemicals used to break down the wastes.
3. Landfills are for either municipal or industrial use. Municipal landfills include wastes collected from households. Industrial landfills include wastes that may be contaminated with a number of hazardous chemicals.

C. Natural sources that may be sources of contamination in groundwater include nitrates, nitrogen, and minerals.
   1. Nitrates and nitrogen in ground water come from the natural decomposition process of organic materials. They can be hazardous to babies and young children.
   2. Minerals in the groundwater are considered pollutants in high concentrations. An example of damage caused by minerals includes staining of fixtures and sediments on pumps and pipes.

Use TM: A3–7B to review the three types of groundwater contaminants.

Objective 3: Explain the severity of groundwater contamination.

Anticipated Problem: How severe is groundwater contamination?

III. The severity of groundwater contamination cannot be truly measured. Too many factors are involved to determine the overall level of contamination. Factors such as soil types, type of contaminant, amount of precipitation, and location of contamination can determine the severity of contamination in the area. Overall, the more shallow the aquifer, the more likely it is to become polluted.

Discuss with the class the concepts covered in this objective. If time permits, allow students to look up local groundwater contamination data on the computer. They can present this information to the class later.

Review/Summary. To review and summarize the information in this lesson, have the students define the terms and answer the anticipated questions.

Application. To apply the objectives in this lesson, refer to Chapters 14 and 15 of the *Environmental Science and Technology Activity Manual.*

Evaluation. Use the following sample test to evaluate the students' comprehension of the objectives covered in this lesson.

Answers to Sample Test:

Part One: Matching

1 = a, 2 = c, 3 = b

Part Two: Completion

1. freshwater
2. pollutants

Part Three: Short Answer

Agriculture activities, human activities, natural sources

Sample Test Name _____

Test

Lesson A3–7: Tracking Groundwater Contamination

Part One: Matching

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

a. aquifers b. groundwater c. percolation

_____ 1. Large underground rock formation that stores groundwater.

_____ 2. Downward movement of water through the soil.

_____ 3. Water found between soil particles and rocks within the earth.

Part Two: Completion

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

1. Groundwater provides most of the _____ people use.
2. Fertilizers can become _____ when applied too heavily.

Part Three: Short Answer

Instructions. Provide information to answer the following question.

List the three main sources of groundwater contamination.

- **Groundwater is water found between soil particles and rocks within the earth.**
- **Aquifers are large, underground rock formations that collect water as it trickles down through the soil.**
- **The downward movement of water through the soil is called percolation.**

TM: A3–7B

SOURCES OF GROUNDWATER CONTAMINATION

Agriculture Activities	Human Activities	Natural Sources
Irrigation	Waste disposal	Nitrates and nitrogen
Fertilizers	Septic systems	Minerals
	Landfills	