

Lesson A3–6

Conducting Water Quality Tests

Unit A. Natural Resources

Problem Area 3. Water

Lesson 6. Conducting Water Quality Tests

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: 1. Explain hydrology. 2. Explain geological and meteorological principles affecting groundwater supply.

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

1. Define water quality monitoring.
2. Identify types of physical monitoring.
3. Explain water testing.

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:

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

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

Dorman, Dale. *Testing for Water Quality*. University of Georgia College of Family and Consumer Sciences and College of Agricultural and Environmental Sciences and Cooperative Extension Service, 1992.

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.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
Water testing kits
Water test reports from a local testing company
Water samples

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

Biological engineering
Visual monitoring
Water quality monitoring

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.

Obtain samples of several water test reports from a local testing company. Make copies of the reports for the students to look at. Discuss the different types of tests that were ordered and the results of those tests. Continue with the lesson following the discussion.

Summary of Content and Teaching Strategies

Objective 1: Define water quality monitoring.

Anticipated Problem: What is water quality monitoring?

- I. **Water quality monitoring** is the studying of water to detect changes in its quality. The physical, chemical, and biological make-up of the water source should be monitored regularly. Regular monitoring will help determine what changes are taking place and how to stop these changes or make other corrective measures. Water testing can be done by the landowner, by a lab, or by private testing companies.

Use TM: A3–6A to review the definition of water quality monitoring. To apply the material covered in this objective, have a water testing kit available for students to observe. Discuss the different types of tests that can be done. Prompt a discussion as to why people would want a professional to do the testing for them.

Objective 2: Identify types of physical monitoring.

Anticipated Problem: What are the types of physical monitoring?

- II. Physical monitoring includes the visual and other physical observations of the water. Monitoring the odor of the water source and the course and any changes in the course of the water source are also examples of physical monitoring.
 - A. **Visual monitoring** is determining changes in water by looking at it. These changes may be in the color or the presence of sediment or other materials. Changes in color may result from the presence of algae or bacteria. The presence of sediment may also change the color and turbidity of the water. Foam forming on the water would indicate the presence of decomposition. The observation of dead animals on the water could also be considered visual monitoring.
 - B. Test for odors in water is as simple as smelling the water. The odor of rotten eggs would indicate high levels of sulfur. Sewage and chlorine are other obvious odors that would result from sources of pollution in the water.

- C. A change of course in a water source is usually due to erosion. These changes may cause adverse affects to the water supply. One way to prevent changes in course is biological engineering. **Biological engineering** is using plants to stabilize creek or stream banks.

Use TM: A3–6B to review the different types of physical monitoring. Have the students think about visual monitoring that they do on a regular basis. For example, they often look at their food and sometimes smell it before eating it.

Objective 3: Explain water testing.

Anticipated Problem: What is water testing?

- III. Water testing can be done for a couple dollars or a couple hundred dollars. The type and extent of the testing will determine the overall cost. Examples of different water tests that can be conducted include hardness, dissolved gases, nitrates and nitrites, and acidity.
- A. The hardness of water is reported in parts per million (ppm). Less than 100 ppm is most desirable. Water with 250 ppm or more are considered hard and require treatment.
 - B. Dissolved gases such as carbon dioxide and hydrogen sulfide present in a water sample can result in a fowl odor or taste. They can be tested for, but results are not usually reported unless the odor and taste of the water becomes objectionable.
 - C. Nitrates and nitrites are present in the water when organic matter begins to break down. Nitrate levels above 10 milligrams per liter indicate contamination. Nitrite levels above 0.0005 milligrams per liter indicate contamination.
 - D. The acidity of water refers to the pH level. Water with a pH of less than 7.0 is acidic and can be harmful to plumbing fixtures. Water can also be discolored when the pH is too low.

Use TM: A3–6C to review the different types of water tests that can be conducted. Following the discussion of this objective, use a water test kit to test water samples from around the school or samples that the students have brought from home. Follow the directions in the test kits for best results.

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 Chapter 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 = c, 2 = a, 3 = b

Part Two: Completion

1. physical, chemical, biological
2. decomposition

Part Three: Short Answer

Examples of different water tests that can be conducted include hardness, dissolved gases, nitrites and nitrates, and acidity.

Test

Lesson A3–6: Conducting Water Quality Tests

Part One: Matching

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

- a. water quality monitoring b. visual monitoring
c. biological engineering

- _____ 1. Using plants to stabilize creek or stream banks.
_____ 2. The studying of water to detect changes in quality.
_____ 3. Determining changes in water by looking at it.

Part Two: Completion

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

1. The _____, _____, and _____ make-up of the water source should be monitored regularly.
2. Foam forming on the water would indicate the presence of _____.

Part Three: Short Answer

Instructions. Provide information to answer the following question.

What are some of the different tests that can be done on water samples?

WATER QUALITY MONITORING

Water quality monitoring is the studying of water to detect changes in its quality.



**Small pH
Testing Meter**



**Phosphate
Testing Meter**



Coliform Testing Kit

PHYSICAL MONITORING

- ◆ **Visual monitoring**
- ◆ **Test for odors**
- ◆ **Observations of changes in course**
- ◆ **Use biological engineering**

WATER TESTS

- ◆ **Hardness**
- ◆ **Dissolved gases**
- ◆ **Nitrates and nitrites**
- ◆ **Acidity**