

Lesson A3–2

Determining Uses of Water

Unit A. Natural Resources

Problem Area 3. Water

Lesson 2. Determining Uses of Water

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. 3. Conduct channel flow analysis. 4. Identify basic criteria for water well design.

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

1. Explain the importance of water.
2. Define potable water.
3. Identify methods of water management.

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 14)

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.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
One-gallon plastic jug
Empty tub

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

Hardness
pH
Potable water

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.

Bring to class a clean, empty plastic one-gallon jug. Ask a student to fill it up with water. When they bring it back, dump it into an empty tub (or into the classroom plants, if needed). Ask the same student to go do it again. When they bring it back, dump it out again. Continue with these actions until the students start to question what you are doing. Explain that they need to do this a total of 100 times. They won't believe it! Tell them that this activity was to show them how much work it is to go through 100 gallons of water. Ask them why this number is important. Then tell them that this is the approximate amount of water that most people go through in a day. Explain that we use this water for bathing, drinking, cooking, washing

our clothes, and removing our wastes. Ask the students to think about how much water they've used today.

Summary of Content and Teaching Strategies

Objective 1: Explain the importance of water.

Anticipated Problem: Why is water important?

- I. Water is one of the three basic needs for the life of humans. Plants and animals also need it to survive. Without water, we could not survive. There are several uses of water including life processes, daily living, agriculture production, climate, manufacturing, transportation, and recreation.
 - A. In order for living organisms to carry out their life processes they need water. Most animals are made up of 60 to 70 percent water, most plants are made up of 70 to 95 percent water.
 - B. Water is needed for daily living, approximately 100 gallons a day for most people. Water is used for bathing, washing, cooking, and waste removal.
 - C. Water is used in agriculture production for the irrigation of crops and the watering of animals.
 - D. Water is capable of moderating the climate in the immediate area. It does so by regulating and transferring heat. Large bodies of water can also cause storms, high winds, and hurricanes.
 - E. Water is used in the manufacturing of products such as steel, paper, and food processing.
 - F. Water serves as a mode of transportation for boats, ships, ferries, and barges. These vehicles transport both people and products.
 - G. Recreational activities such as swimming, boating, and fishing all take place in the water.

Use TM: A3–2A to review the uses of water. Have a class discussion about the students' use of water. Have them think about the ways they've used water today.

Objective 2: Define potable water.

Anticipated Problem: What is potable water?

- II. **Potable water** is water that is safe for human use and consumption. Potable water contains minerals so it is not pure. These minerals can cause variations in the odor, taste, color, pH, alkalinity, and hardness of the water.
 - A. The odor and taste of potable water is commonly the result of the water source. Sometimes, they can be the result of the addition of chemical to the water by the local water system. Other causes of odor and taste are pollution, organic sulfur, and microorganisms.

- B. Colored water may not look appetizing but that doesn't mean it's not safe to drink. However, it may not be useful for activities such as washing clothes. Colored water may be the result of minerals such as iron and calcium in the water, sediment, organic matter, and plankton. Larger particles can be easily removed through filtration.
- C. The **pH** of water is the measurement of the acidity or alkalinity of water. Water is often treated so that it remains in the pH range of 7.0 to 7.8, or almost neutral. Water pH can be determined using a pH meter.
- D. The concentration of calcium and magnesium ions in water is referred to as **hardness**. The higher the concentration of ions, the harder the water. Hardness can be reduced through a process referred to as softening.

Use TM: A3–2B to review the definition of potable water and the variations in potable water. Ask the students if any of them have hard water at home. Tell tale signs include dry skin and stains in the bathtub and sink. Ask them what they think about this. Is the water any different at friends' houses or at school? Which water do they like better.

Objective 3: Identify methods of water management.

Anticipated Problem: What are some methods of water management?

- III. Before consumption, potable water from some sources needs to be treated, while water from other sources needs little or no treatment. Often times, water that is being used in the home or business may go through additional treatment before use.
 - A. Water pumped from wells usually needs little treatment besides adding chlorine for disinfection and softeners to reduce hardness. The level of treatment needed should be determined by sending a sample to a laboratory.
 - B. Surface water commonly requires more treatment than well water. The four steps in treating surface water include screening to remove objects, presedimentation and sedimentation to remove sediment from the water, chlorination to disinfect the water, and final filtration to make the water potable.
 - C. Water that is used on homes and businesses may also go through additional filtration processes. In the home, filters can be placed on the faucet or where the pipes enter the house. In a business, additional complex filtering may take place before water flows through machines such as ice makers.

Use TM: A3–2C and TM: A3–2D to review the treatment methods for potable water. Ask the students to think about what they'd do if the ice in their drink was dirty at a restaurant. Prompt a discussion about how much we depend on clean water.

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 14 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 = b, 3 = c,

Part Two: Completion

1. chlorine, softeners

Part Three: Short Answer

Screening to remove objects, presedimentation and sedimentation to remove sediment, chlorination to disinfect, final filtration.

Test

Lesson A3–2: Determining Uses of Water

Part One: Matching

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

a. pH

b. hardness

c. potable water

- _____ 1. The measure of the alkalinity or acidity of water.
_____ 2. The concentration of calcium and magnesium ions in water.
_____ 3. Water that is safe for human consumption.

Part Two: Completion

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

1. Water pumped from wells usually needs _____ added for disinfection and _____ added to reduce hardness.

Part Three: Short Answer

Instructions. Provide information to answer the following question.

What are the four steps in treating surface water?

USES OF WATER

- ◆ **Life processes**
- ◆ **Daily living**
- ◆ **Agriculture production**
- ◆ **Climate**
- ◆ **Manufacturing**
- ◆ **Transportation**
- ◆ **Recreation**

TERMS FOR REVIEW AND DISCUSSION

Potable water:

- ◆ Water that is safe for human consumption

Variations in potable water:

- ◆ odor
- ◆ color
- ◆ pH
- ◆ alkalinity
- ◆ hardness

TREATMENT METHODS FOR POTABLE WATER

- ◆ Chlorination
- ◆ Add softeners
- ◆ Screening
- ◆ Presedimentation
- ◆ Sedimentation
- ◆ Filtration

TM: A3-2D

SMALL WATER FILTRATION SYSTEM

