

# CAP A CHEMICAL

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## OBJECTIVES

The student will do the following:

1. Conduct a home survey of hazardous household products.
2. Observe a simulation of urban contamination of groundwater by hazardous wastes.
3. Create a video for less hazardous alternatives to common household products.

## BACKGROUND INFORMATION

Americans use 90 billion gallons (340 billion liters) of groundwater everyday. Of those billions only 14 percent is drinking water. About half the people in America use groundwater for drinking. More than 63,000 chemical compounds are used in the United States; some are potential hazards to our drinking water when they are not used and disposed of properly.

One hundred years ago, many of the products we used were made of natural ingredients. Many things were used over and over again. Waste disposal became more serious when we began using complex chemicals and petroleum-based products. These kinds of products cannot safely be disposed of in the same way that wastes used to be handled. We are researching better ways of disposing of toxic chemicals.

Today we know that some products should never be poured down the drain or on the ground. Some of these chemicals are readily available in our homes. It is essential that we begin to understand how these substances can contaminate water supplies. In septic tanks, these chemicals can either (1) kill all the bacteria that decompose waste in domestic wastewaters and cause untreated sewage to seep into the ground and potentially enter groundwater or (2) they can pass through the system untreated and enter groundwater. In either case, groundwater could become contaminated; this could pollute well water and make it unfit to drink. Polluted groundwater can even seep into surface water and pollute it.

While laws protect consumers from the sale of patently unsafe products, many of the chemicals available for use by consumers are hazardous and must be used and disposed of according to the directions given on the package. Consumers should also be careful not to overuse these products or to use them when less dangerous products would do.

### Terms

**chemical:** related to the science of chemistry; substance characterized by a definite molecular composition.

### **SUBJECTS:**

Science, Language Arts, Math, Social Studies, Art

### **TIME:**

3-5 (45-minute) class periods

### **MATERIALS:**

2-liter bottles  
cherry drink mix  
white aquarium gravel  
baking soda  
2 quart (2 L) pitcher  
paper cups  
water  
paper towels  
newspaper  
liquid detergent bottles or spray cleaner bottles  
videotape and camera (optional)  
student sheets (included)  
student/parent sheet (included)

**chemistry:** the scientific study of the properties, composition, and structure of matter, the changes in structure and composition of matter, and accompanying energy.

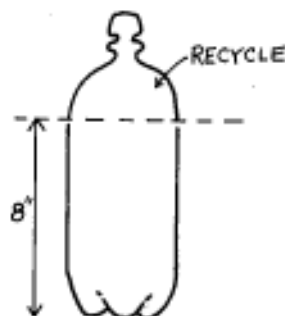
**contamination:** an impurity.

**hazardous household product:** chemical products for home use that are potentially dangerous to human health and/or the environment.

**pollution:** impurities in air, soil, or water that are harmful to human health or the environment.

**urban:** having to do with cities.

**waste:** refuse, or excess material.



## ADVANCE PREPARATION

- A. Make copies of the student and student/parent sheets.
- B. Cut the 2-liter bottles (one per group) as shown.
- C. Pour enough white aquarium gravel into the cut bottles to fill them halfway. Sprinkle some powdered drink mix in the middle of the gravel. Pour more gravel on top.
- D. You may make a transparency of the student sheet "Where Wastewater Goes."

## PROCEDURE

### I. Setting the stage

- A. Discuss with students what happens to things they pour on the ground and down the drain. Just because they are out of sight does not mean they won't come back. Explain where groundwater is and how sewers and septic lines relate to it.
  1. Use the student sheet, "Where Wastewater Goes." Ask the students to list examples of household products that are put into a home's wastewater. Students may color the student sheet if they have extra time.
  2. If you use the student sheet as a transparency, you can have your students trace the path a toxic chemical compound would take if poured down the drain.
- B. Divide the class into groups of 3 or 4 students. Provide each group with a pre-cut 2-liter bottle containing aquarium gravel and a small amount of cherry drink mix (dry).
  1. Have the students add water and observe. The red represents the hazardous chemicals we often pour down our drains or on the ground. These are potential contaminants for our water.
  2. Discuss hazardous chemicals. Use the first part of the student/parent sheet, "Cap A Chemical Survey" for discussion.

### II. Activity

- A. Send home with the students the student/parent sheet, "Cap a Chemical Survey." This is to survey the household chemicals found at home.

1. Be sure students understand they are not to inventory household chemicals by themselves. (Have an alternative for students whose parents won't do a survey.) Go over the survey with them and make sure they understand that they need a parent to help them.
  2. When the survey is completed, take the information and make a class bar graph. Make the graph on the chalkboard. Have the students use graph paper. Which chemicals are in most homes?
- B. Lecture on safer chemicals we can use in our homes.
1. Tell the students that we can use safer products instead of potentially dangerous ones. Examples of alternative products include: cleanser - baking soda and water (use like a scouring powder); air freshener - baking soda or fresh flowers; carpet freshener - baking soda (sprinkle it on the carpet and then vacuum up); rug cleaner - non aerosol shampoo (use a small amount and rinse with water); detergents - biodegradable (check the label); window cleaner - lemon juice (or vinegar) and water; floor cleaner - a small amount of detergent and white vinegar; mothballs - cedar shavings.
  2. Show the students some sample household products you brought from home. (NOTE: You might save some empty containers and rinse them out before you bring them.) Read labels on products to the students so they can see what is in them. If the ingredients are not listed, call the 800 number and ask.
  3. Share with the students the following pointers: If you must use toxic chemicals, then buy only what you need. Use less. Find out from local authorities where you can properly dispose of leftovers. Remember that some chemicals kill bacteria needed in a septic system.
- C. Have a fun contest using one of the terms for this lesson.
1. Ask the students how many words they can make out of a selected term. For example, "CONTAMINATION." (Answers: nomination, nation, contain, ton, on, ant, into, no, I, can, cat, not, a, can.....)
  2. Reward the student with the most words when you call time.
- D. Have the students write and perform a commercial on less toxic products and reasons to use them. Have them work in small cooperative groups of 3 or 4 students.
1. Have students write, revise, and rewrite their commercials. Give them the student sheet "Cap A Chemical' Commercial" to write on. Remember to include props to add excitement. Students may bring an object from home or make their own props. Students could create a jingle to go with their commercial.
  2. If you have the equipment available, videotape the commercials and play them at a parent organization meeting.
  3. Try to get a local television or radio station to play the commercials.

### III. Follow-Up

Have your students clean the room and their desks using safer products.

- A. Using empty liquid detergent or spray cleaner bottles, mix 2 tablespoons (30 mL) baking soda and 1 cup (250 mL) water to make a safer cleanser. Scour the desks with this mixture. Remember to rinse the residue off with clean water.
- B. Clean the windows with 1 cup (250 mL) clean water with 1 tablespoon (15 mL) lemon juice in it. Use newspapers to rub the glass. (Then recycle the paper!)
- C. Have the students share with the group how they feel about improving their environmental attitudes and behavior.
- D. Celebrate with clean, safe ice water to drink.

### IV. Extensions

- A. Have students design the packaging for their safer products (See II D.). Bring in old boxes for household products and cut them apart. Notice how the flaps fold in to form the box. Students will draw their own boxes and design logos for their products. Students can use the boxes in their commercial.
- B. Using magazines, have the students cut out pictures of household chemicals that are potentially hazardous. Pictures of products that are less hazardous should also be cut out. Have students glue pictures to a posterboard that has a line down the center. On the left, glue less hazardous products and on the right, glue the most hazardous. Use the poster on a bulletin board.
- C. Investigate new programs aimed at trying to clean up groundwater. A company owned by Dow Chemical (AWD Technologies) developed a system to clean up contaminants found in groundwater. The system is called AquaDetox/VES System. You might locate more information about this or other experimental systems.
- D. For more information write to the American Chemical Society, Dept. of Public Affairs, 1155 16th Street NW, Washington, D.C. 20036.

## RESOURCES

Jorgensen, Eric, ed., The Poisoned Well. Island Press, Washington, DC, 1987.

Lord, John, "Hazardous Wastes from Homes," Enterprise for Education, Inc., Santa Monica, California, 1986. (Address: 1320A Santa Monica Mall, Santa Monica, California 90401.)

Naft, Barry, "New, Improved Groundwater Cleanup Technology," Environmental Science Technology, American Chemical Society, Washington, DC, 1992, pp. 871-872.

Tennessee Valley Authority, Waste: A Hidden Resource, TVA, 1989.

U.S. Environmental Protection Agency, Let's Reduce and Recycle: Curriculum for Solid Waste Awareness, EPA, Washington, DC, 1990.

Water Pollution Control Federation, "Household Hazardous Waste: What You Should and Shouldn't Do," Water Pollution Control Federation, Alexandria, Virginia (Address: 601 Wythe Street, Alexandria, Virginia 22314-1994. Phone: 703-684-2438)

## "CAP A CHEMICAL" SURVEY

Dear Parent,

Please take a few minutes to help your child fill out this survey. It is important that you assist your child as some home chemicals may be toxic. Your child will use the information at school during class activities. Please sign below after you and your child have completed this survey. Thank you for your time and interest in your child's education.

These common products are found in many homes. They have the potential to be hazardous to human safety and health. Improper use and disposal may endanger our groundwater resources. How many of these do you have in your home? Write the products in your home on the survey form on the back of this sheet.

### CLEANERS

bleach  
ammonia  
lye  
\*floor care  
\*furniture polish  
\*silver polish  
\*window cleaner  
oven cleaner  
bathroom cleaner  
disinfectant  
toilet bowl cleaner  
tub and tile cleaner  
spot cleaner  
rug cleaner

### PERSONAL

medicine  
\*nail polish  
\*nail polish remover  
hair spray  
hair dye

### GARAGE

\*antifreeze  
\*automatic transmission fluid  
\*battery  
\*brake fluid  
\*car wax  
\*diesel fuel

\*gasoline  
\*kerosene  
\*motor oil  
\*brush cleaner  
latex paint  
\*oil-base paint  
paint thinner  
turpentine

### YARD

\*bug spray  
\*fertilizer  
\*fungicide  
\*insecticide  
\*rat poison  
\*weed killer  
flea powder

### OTHER

\*lighter fluid  
\*mothballs

(ALERT: Never mix chlorine bleach and ammonia; it produces a potentially dangerous gas.)

\* = hazardous waste (Do not dump on ground!)

My child and I have surveyed our home for hazardous products that may pose a threat to groundwater quality if improperly used or disposed of. The results of our survey are written on the form on the back of this sheet.

Signed: \_\_\_\_\_

**"CAP A CHEMICAL" SURVEY**  
(continued)

Using the list of hazardous household products on the front of this page, identify the listed products found in your home. Write them on this survey form.

**CAP  
A CHEMICAL  
SURVEY**

**PRODUCT NAME    #OUNCES**

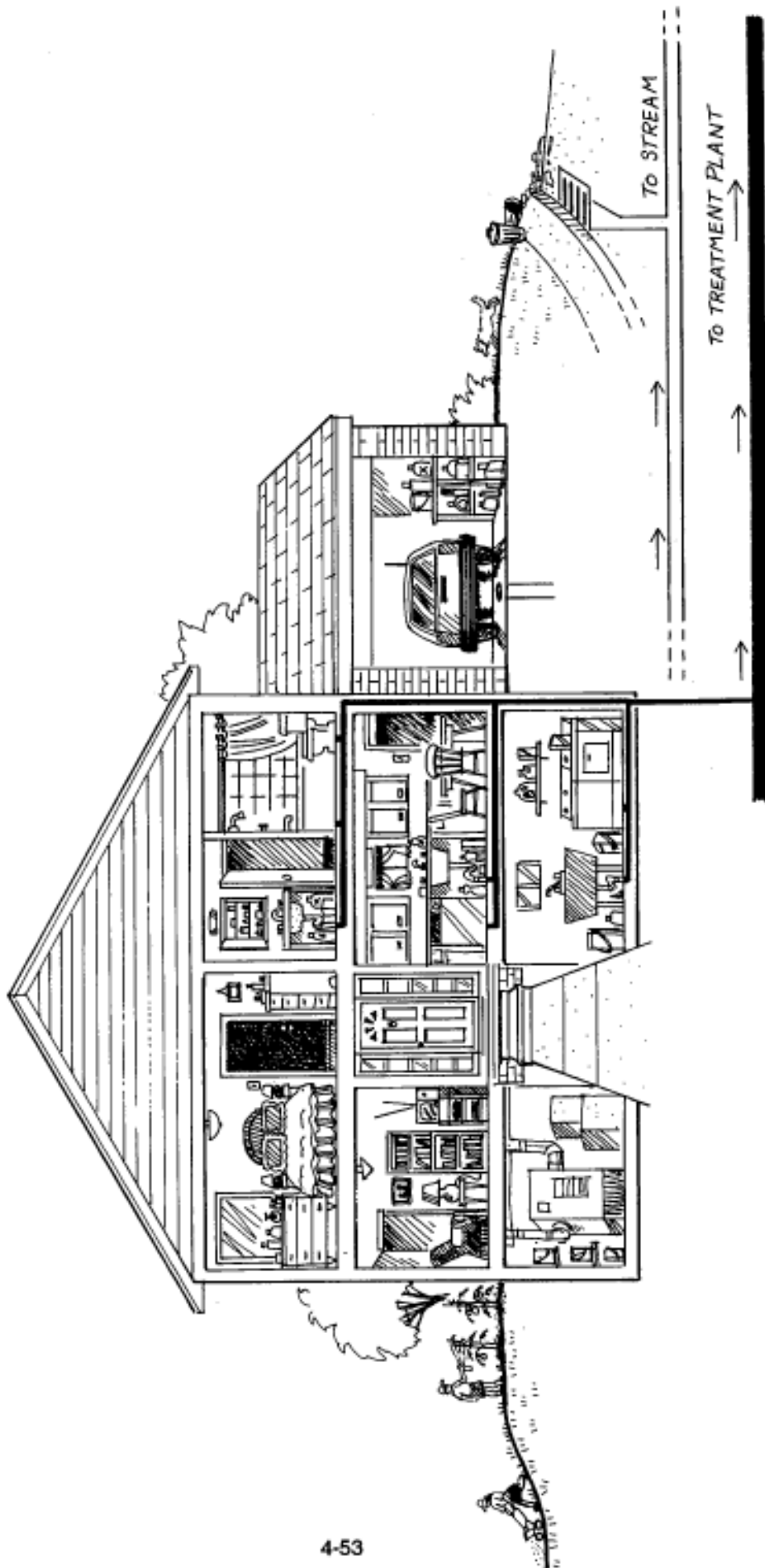
**CLEANSERS**  
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\_\_\_\_\_  
\_\_\_\_\_

**PERSONAL**  
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**GARAGE**  
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\_\_\_\_\_

**YARD**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### WHERE WASTEWATER GOES



**CAP A CHEMICAL COMMERCIAL**

