

Activity 4: Water, Water, Everywhere; and not a Drop to Drink

Maine Geological Survey



Objectives:

The students will become familiar with the following ground water terminology:

- point source contamination
- non-point source contamination
- water table
- zone of saturation
- leaching
- impermeable rock
- zone of aeration
- capillary fringe

The students will also be able to explain how hazardous materials contaminate ground water; they will interview a professional working on problems of ground water contamination.

Time:

This activity is designed to last approximately 3 to 4 class periods.

Background:

The activity sequence is designed to bring the students through a series of increasingly complex thought processes. Teachers who have taken recent methods courses will recognize Bloom's Taxonomy in this activity.

The ability to provide fresh, potable (fit for human drinking) water for all citizens will be an increasingly serious challenge for politicians and planners in this country. The problem in parts of the rest of the world has reached critical stages with the vast majority of many populations routinely drinking from contaminated water supplies; one only needs to look at the infant mortality rates from JUST diarrhea alone in many of these countries to realize the magnitude of the problem. Ground water, which is the greatest reservoir of potable water on the earth, is easily contaminated by both point sources of contamination (a leaking underground storage tank, for example) and non-point sources of contamination (such as the buildup of salt in areas that experience occasional ocean flooding). Decisions regarding the management of ground water aquifers will not be easy or cheap. All students need to have a good grasp of the basic mechanics of ground water movement and possible contamination.

Materials:

Each group of students will need:

- A copy of the "Sources of Ground-Water Contamination" diagram (Figure 1)
- Reference materials on ground water and ground water pollution
- Art materials (poster paper, markers and such)
- Pens and notebooks

An enlarged copy of the "Sources..." diagram should be posted on the board for easy reference.

Procedure:

PRIOR TO CLASS: Establish a "Ground Water Resources Library" in your classroom, OR have the activity take place in the school library where research materials are readily available.

1. As a class, discuss the information presented on the "Sources of Ground-Water Contamination" diagram. Be sure to have the students identify important areas such as the water table, zones of aeration and saturation, permeable and impermeable

rock, etc. If these terms have not yet been presented in class, this diagram is a good introduction.

2. Divide the class into small groups. The size of your class will have an effect on the way you divide the research components. You may wish to have each group research a different point source contaminant; or you may decide that each group will be responsible for more than one type of contamination. Another alternative is to provide the students with the opportunity to divide the work themselves instead of you assigning work to individual groups.
3. Once the groups have been assigned their source(s) of contamination, let them work. Here are a few hints for work time:
 - a. Be ready to focus the students' research on ground water and away from the specific point sources listed on the diagram.
 - b. Part #3 will pose a challenge. Encourage the students to discover people who would provide useful information. Also encourage them to know what they are going to say before calling anyone: in other words, encourage them to have a process strategy for their interview. A process strategy means they have a specific sequence of questions thought out in advance of the interview. You may wish to preview these prior to any interviews.
 - c. Be sure students are aware of the distinction between compare and contrast.
 - d. Encourage creativity in Part 5; the students can really have fun with this one.

Follow-Up:

You may wish to spend some time on some of the major non-point sources of contamination such as air pollution and indicate how these affect water quality.

References:

The diagram that serves as the center for this activity was provided by the Earth Science Curriculum Pilot Study being carried out by the Oxford and Cumberland Counties Soil and Water Conservation Districts.

Activity developed by Donna Casavant, in conjunction with the CREST 1991 intern program.

Any ground water library is incomplete without a copy of the Ground Water Handbook for the State of Maine, by W.B. Caswell (Maine Geological Survey, Bulletin #39, 1987). It is available from the Maine Geological Survey [website](#) for \$5.00.

Name _____



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Student Sheet

Purpose:

To develop a working knowledge of how contaminants get into ground water; to use this knowledge in preparing pollution protection or abatement procedures and techniques.

Materials:

Each group of students will need a copy of the "Sources of Ground-Water Contamination" diagram; a large reference copy should be posted on the board. Reference materials will be available for CLASS use. Individuals will need pens, notebooks, and art materials for creating your posters.

Procedure:

Today you begin an investigation of point source contamination of ground water, including possible drinking water sources. Each group will be responsible for investigating three types of contamination. You and your group will have the remainder of this class and the next two class periods to complete this sequence. Remember, you also have any homework time (aside from what has already been assigned with articles or essays).

1. LOCATE as many point sources of contamination on the wall chart as possible, and identify three sources that your group will research.
2. EXPLAIN how hazardous materials can contaminate drinking water from each of these sources. Include an original diagram which contains at least two specific examples of each type of contamination.
3. COMPARE and CONTRAST your group's three types of contamination source; Make a table for future reference.
4. DEVELOP a strategy, that is, a series and planned sequence of questions you would ask a professional working in the area of ground water pollution. USING this strategy, interview a professional working in this area and take notes on his/her responses.
5. Regardless of people's best efforts, some ground water pollution is likely to occur.
 - a. DESIGN a device or technique to prevent contamination from one of your sources. Diagram this device or technique on a poster to present to the class.
 - b. DESIGN a device or technique for cleaning a set that has already been contaminated by one of the sources. As above, prepare for class presentation.
6. EVALUATE your models in terms of usefulness, cost effectiveness, and so on. Which of your models or techniques would be the better alternative? Why?

Presentations of your group work will be on the following date: _____

Your presentations should include the results of your work on all of the six activity sequences listed above. Be prepared to answer any questions that the rest of the class or I may have on your topics. Your presentations will be evaluated by the class.

GOOD LUCK WITH THIS PROJECT, AND HAVE FUN!!!!!!!!!!!!!!!!!!!!!!

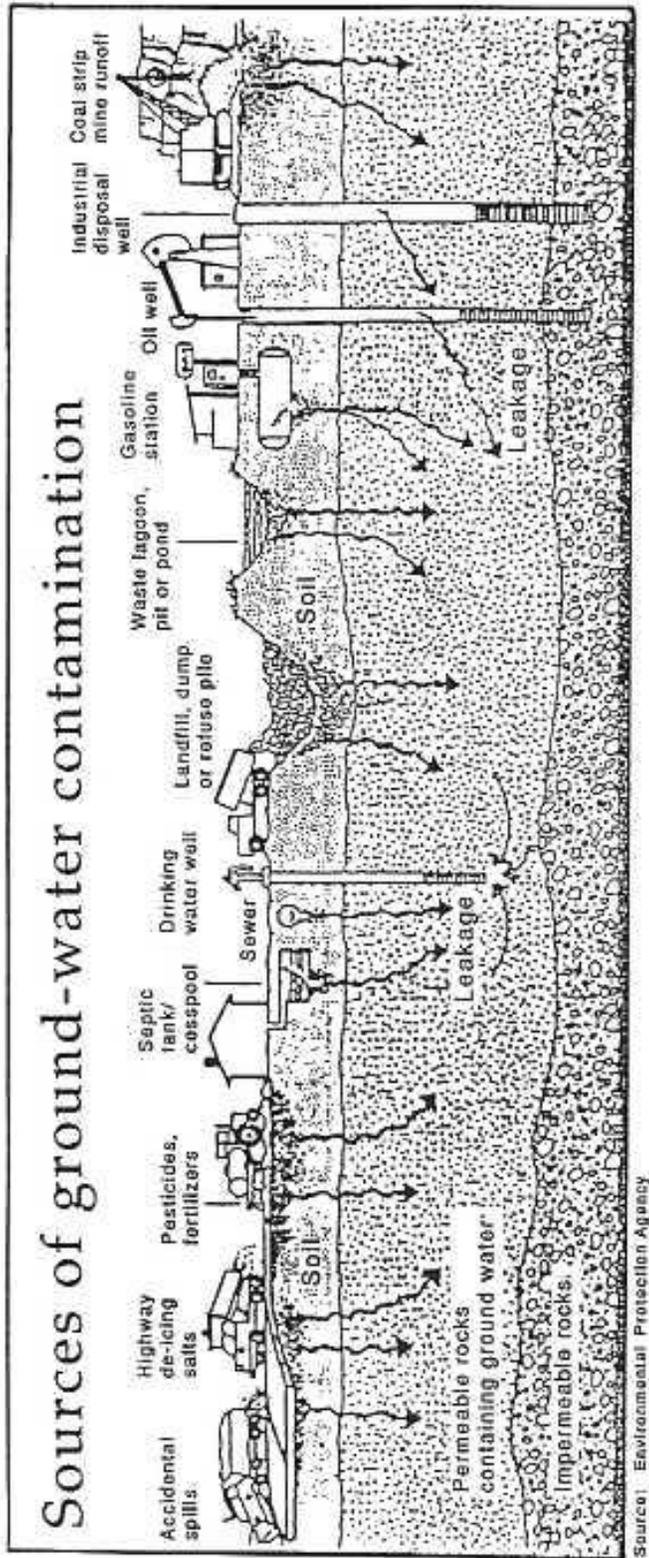


Figure 1. Sewer lines and landfills are two of the routes by which hazardous household wastes can contaminate drinking water.