INTEGRATED PEST MANAGEMENT

Unit 2 Section 2 Lesson 6 Time Trials

Focus Areas: Pest Control Methods - Chemical; Science, Math

Focus Skills: Applying the Scientific Method, measurement

Level of Involvement: AVERAGE

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Focus Areas: Pest Control Methods - Chemical; Science, Math
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Dedicated to Reducing Pesticides

Objectives

* To understand that the movement of water through the upper levels of earth can carry surface contamination from pesticides to deeper levels

* To discover that percolation rate is influenced by the composition of earth s upper layers

Essential Questions

* How does surface contamination reach groundwater?

* How does it affect water?

Essential Understanding

Pesticides and other contaminates percolate through upper layers of the ground and contaminate groundwater.

Background

Water and other liquids infiltrate the soil through percolation. The rate of percolation primarily depends upon the composition of the soil that is absorbing the liquid. The infiltration capacity is the constant rate at which liquid percolates into the ground. The more porous the ground, the higher the infiltration. Infiltration can be measured using an infiltrometer. For simple observations, a stopwatch is used.

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Vocabulary

acid rain — acid precipitation in the form of rain

groundwater — water below the surface of the earth that is tapped for wells and also flows into watersheds

leaching — to remove soluble materials by percolation

percolation — the seepage of liquid through a porous material

point source — a known source of contamination

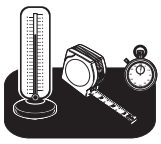
Challenge

Dicover how groundwater can become contaminated

Logistics

Time: Two periods, one 45 minutes, one 30 minutes
Group size: 2 to 35
Space: area for comfortable seating and standing room to allow a clear view of the aquaria

Materials



2 stopwatches
colored blotter paper
black/white board or chart paper
small watering can
food coloring (red or orange to simulate pollution)
2 aquaria or other water tight clear-sided containers

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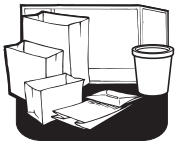

Materials

sand
gravel
small stones
soil
Assessment for a Scientific Drawing *

* single copy provided

Preparations

1. Line the bottom of the aquaria or containers with blotting paper.
2. Pack sand tightly and uniformly in containers, about 1/3 full.
3. Pack the soil in the second container, about 1/3 full.
4. Fill the watering can.
5. Procure the stopwatches.
6. Have the participants collect newspaper and magazine stories about contamination of water. Display these on a bulletin board. Research famous stories such as Love Canal and A Civil Action.

Activity

Introduction

1. Review the vocabulary.
2. Discuss the effect of percolation on groundwater.
3. Hypothesize which container will show evidence of the most rapid rate of percolation and list the explanations on the board.
4. Explain that in the simulated model, the blotting paper repre sents groundwater and the food coloring that will be added to the water represents contaminants such as pesticides and other chemical wastes.

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Activity

Involvement: Demonstration

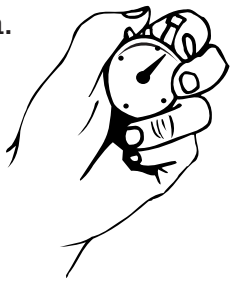
1. Volunteer #1 adds the contaminant, food coloring in this case, to water in the watering can.

2. Volunteer #2 pours the contaminated water into the aquarium from a single point near the front so results can be witnessed by the group.

3. Volunteer #3 prepares to time the contamination of the first aquarium using the stop watch.

4. The percolation rate is recorded.

5. Repeat steps 2 through 4 using the second aquarium.



Follow Up

* Compare the percolation rates in trials 1 and 2.

* Compare the results to original hypothesis.

* Allow students time to formulate generalizations regarding percolation rates.

* Discuss sources of contamination, i.e., pesticides, chemical dumping, garbage, acid rain.

* Discuss how the demonstration would have to be altered to represent contamination of water by acid rain vs. point source contamination (water would be distributed evenly rather than poured from a single point).

Follow Through

Focus Skills: Problem solving, divergent thinking, formulating a plan, designing an experiment, testing a hypothesis, working cooperatively, reporting results, making generalizations

Option #1

Repeat the Demonstration using an even distribution of contaminated water, rather than a point source, and compare results to Demonstration #1 in order to determine which poses the greatest threat to groundwater, single source or general contamination. Discuss the results.

Option #2

Pose the following questions: How could you change the composition of upper level layers to slow the percolation of contaminated substances? How could you slow the rate of percolation? For example, plants along the edge of a lake or pond can act as buffers as their roots trap contaminants such as pesticides and fertilizers before they run into the water body.

1. Divide the group into cooperative teams.

2. Provide each team with the following materials:

    * 2-liter clear soda bottles with tops cut off and six holes in the bottom

    * white blotting paper (paper towel) to line the bottom

    * paper cup 2/3 filled with colored water

    * choice of materials for upper layers; **one must be soil**

        * soil (in all containers)
        * sand
        * gravel
        * small stones
        * clay-like soil

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Involvement

1. Using no more than three different types of materials, design a leaching field that will slow percolation.

2. Allow time for the group to develop a plan and prepare the bottles. Every bottle must be 1/3 full and contain no more than three types of material, one of which is soil.

3. Groups shall test their leaching layers by pouring contaminated liquid from a single point source and tabulating results, e.g., percolation rate and pattern.

4. Compare the rate of percolation to that in Demonstration #1.

5. Continue to record data from each group until all groups have completed the experiment.

6. Discuss the results.

Assessment

Create a flow chart or diagram illustrating how ground level contamination affects groundwater.

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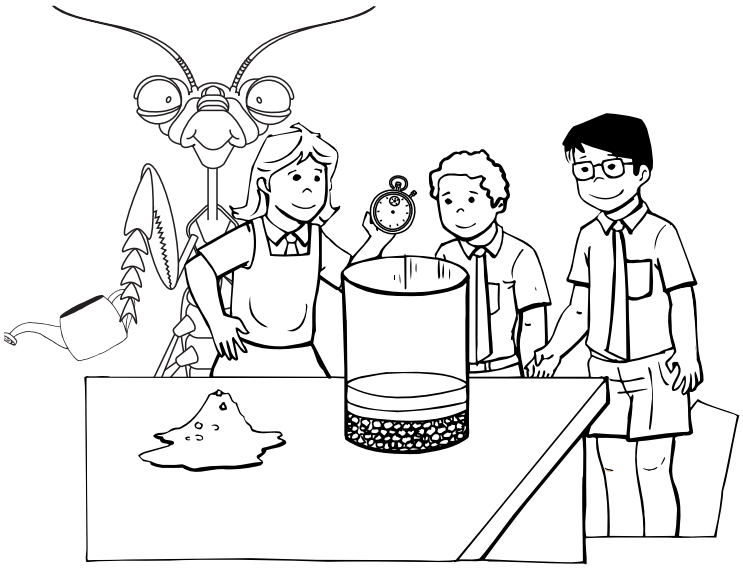
Notes



Notes

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Assessment for A Scientific Drawing

	Possible Points	Points Earned
1. There is an explanatory main title.	_____	_____
2. All elements of the drawing use the same scale.	_____	_____
3. Appropriate details are shown accurately.	_____	_____
4. The drawing is correctly labeled, including magnification if appropriate.	_____	_____
5. The drawing is easily understood.	_____	_____
6. Space is used well.	_____	_____
7. The drawing is neatly done.	_____	_____

Comments:

Assessment for A Scientific Drawing

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