

Activity #6:

Tracking Pollution

Pollution of water sources frequently becomes a heated and controversial issue in some communities. It can become very expensive to clean up a water source that is polluted or contaminated. It may prove difficult to determine who or what is to blame and, thus, who is responsible for the cost of cleanup. The following activity will help to explain some of the difficulties involved.

Objective: Students will make a topographic map, use it to predict the flow of ground water and attempt to determine the most likely source of contamination.

NEVADA SCIENCE STANDARDS 11:12, 16:8, 17:8, 19:2

Time: Two class periods

Materials: map of Riverville, ruler, rubber band, pen and pencil

Background Information:

Riverville is a fictional town with a water problem. Each week, the mayor and city council members receive complaints from more and more citizens about their drinking water tasting bad. In this small town, most homes and businesses have wells. The mayor had certain wells tested recently and found that the groundwater had become contaminated with some type of fuel. (The contaminated wells are marked on your Riverville map.)

The mayor believes that the A-1 Heating Oil Company is responsible for the contamination of the groundwater. He would like to begin an investigation of their underground fuel storage tanks to check for leaks. A-1 Heating Oil Company executives say they had their tanks tested recently and found all of them to be safe. They also indicate that the contamination most likely comes from Whacko Trucking Company. The president of Whacko Trucking tells the mayor that he's sure the contamination is coming from the underground tanks at Pete's Gas Station.

Riverville does have a problem. Some wells are contaminated and no one is sure of the source. All three of these places have underground fuel storage tanks. The mayor needs some way to prove who is to blame. As the region's environmental contamination expert, you are contacted by Riverville's mayor to conduct an investigation to determine the source of the pollution and solve the mystery.

To decide which of the suspected businesses is the most likely source of this contamination, you will need to determine the direction of groundwater flow. Since water usually flows downhill, you can be fairly certain that the suspected source that is farthest “upstream” is the real source of contamination.

Procedure:

1. To determine groundwater flow, you will need to make a contour map. The attached Riverville map shows some elevations. Follow all instructions and make a contour map of the town.
2. Start with a water well with a known elevation. Using a pencil, lightly draw a line from this well to the nearest wells having at least a 20-foot difference in elevation.
3. Cut a rubber band open and lay it out flat (without stretching it) along the edge of a ruler.
4. With a pen, beginning from the middle of the rubber band, make at least five marks that are 1/2 inch apart. Use the marked rubber band to help divide each line into equal segments.
5. Label each mark on the line between the known elevations with your estimate of elevations. (Example: If the elevations at each end of a line are 10 and 40 feet above sea level, you should make two marks on the line to divide the line into three equal lengths. The first mark would be labeled 20 and the next one labeled 30.)
6. Connect all marks having the same elevation with a smooth line. These are contour lines.
7. Every half-inch along each contour line, draw a short arrow perpendicular from one line out towards the line having the next lowest elevation. Ground water flows in the direction of the arrows.
8. Find all the contaminated wells on the map and draw a single loop that contains only these wells and none of the uncontaminated wells.
9. The area inside this loop shows how far the contamination has already spread through the ground water. It is known as the contamination plume.
10. Study the map carefully and use it to help you answer the questions on the attached sheet.

Extension: Design a research study to determine the flow of groundwater in the Las Vegas Valley. Use a map of our community to plot the location of wells. What are potential sources of contamination? What precautions should be taken to monitor any potential sources of pollution or contamination?

Activity #6:

Tracking Pollution

Use your completed study of the Riverville water problem and your Riverville map to answer the following questions.

1. If the flow of groundwater and the pollutants in it follow the contour of the land, what is the most likely source of the contamination?

2. The contamination plume will continue to spread slowly through the ground, much like smoke from a chimney drifting with the wind. Based on the map you completed, describe where you think the plume will move with time.

3. Which of the uncontaminated wells do you expect to become contaminated in the near future? Do you think the school's water well will be contaminated?

4. How do you explain the fact that one well within the plume was not contaminated? Give at least two possible reasons why this might happen.

5. Is it possible that you are wrong in assuming that this groundwater follows the contour of the land? What else might you investigate to be sure?

6. Is it possible that there is more than one source of contamination? Explain.

RIVERVILLE MAP

