

The Oak Ridges Moraine



Build a Groundwater Model

In this activity you will be given materials to create your own groundwater model. You will be able to watch how water and contaminants interact with the different layers of gravel, sand and clay and the potential environmental implications.

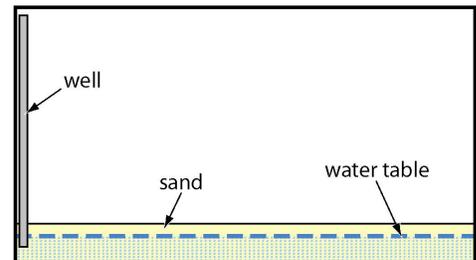
Carefully read and follow the instructions below to build your model. Complete the questions in your notebook.

Materials

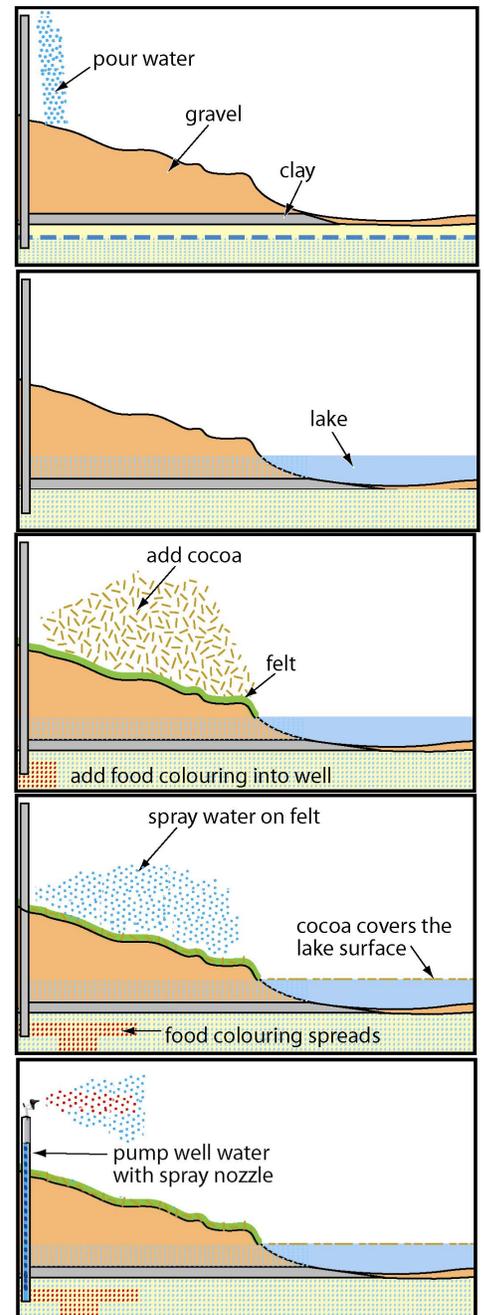
- 15 cm x 20 cm clear plastic container that is a least 15 cm deep
- 0.5 kg of plasticine
- 1 kg of white play sand
- 1 kg of aquarium gravel
- 1 wide drinking wide straw or clear plastic tube
- 1 plastic spray bottle (the stem that extends into the bottle must be clear and fit easily inside the straw)
- cocoa
- 1 small piece (3 cm x 5 cm) of green felt
- red food colouring
- 1 bucket of clean water and small cup to dip water from bucket
- clear tape
- 1 small piece (3 cm x 3 cm) of cheese cloth to cover one end of the straw/clear plastic tube
- small elastic band

Method

1. Fasten the piece of cheese cloth over the end of the straw using the elastic band.
2. Allowing approximately 0.5 cm clearance from the bottom of the container, fasten the straw directly against the long side of the container with a piece of tape. The end of the straw with the cheese cloth should be facing down. This will represent two separate groundwater well functions.
3. Pour a layer of white sand completely covering the bottom of the clear plastic container, making it approximately 2.5 cm deep. Carefully pour just enough water into the sand, wetting it completely. The water level should be higher than the bottom of the straw, but there should be no standing water on top of sand. The water is now stored in the pore spaces around the sand particles to creating an aquifer.



4. Flatten the modelling clay (like a pancake) and partially cover the sand with the clay. Try to press the clay into the three sides of the container in the area covered. The clay represents an aquitard that keeps water from passing through it. Pour a small amount of water onto the clay. Observe how the water remains on top of the clay, only flowing into the sand below in areas not covered by the clay.
5. Use the aquarium gravel to form the next layer. Rinse the gravel to remove dust, so that it does not cloud the water. Place the rocks over the sand and clay, covering the entire container. To one side of your container, slope the rocks, forming a high hill and a valley. Now pour water into your aquifer until the water in the valley is even with your hill. Observe the water around the rocks that is stored within the aquifer as well as the surface supply of water, or small lake, that has formed.
6. Place the small piece of green felt on top of the hill. Use a little clay to securely fasten it to one of the sides of the container.
7. Sprinkle some of the cocoa on top of the hill. The cocoa represents improper use of lawn chemicals or fertilizers.
8. Put a few drops of food colouring into the straw, to represent farm chemicals, liquid wastes and used motor oils that are often disposed of in old wells. Observe the colour of the sand in the bottom of the container.
9. Fill the spray bottle with water. Now make it rain on top of the hill and over the cocoa. Observe what happens to the cocoa (fertilizer/pesticide).
10. Take another look at the well you contaminated. The pollution has probably spread further. Now remove the top of the spray bottle and insert the stem into the straw, depress the trigger to pump up the water from the well.



Questions

1. What does the food colouring represent? Why should we be concerned that the food colouring has spread?
2. What problems can be associated with groundwater contamination?
3. What does the green felt represent? What happens to the cocoa powder after spraying the water.
4. How could what happened to the cocoa affect nearby watersheds?
5. What happened to the food colouring when you pumped the sprayer? Was the water clean or contaminated? Why is this important?
6. How might urbanization of the Oak Ridges Moraine impact ground and surface waters? List ideas for reducing these impacts.