GROUNDWATER CONTAMINATION & RESTORATION

Groundwater is an essential resource for life as we know it. It's the water we drink and use to grow our food. So, when it gets contaminated it can have serious consequences.

While some contaminants are naturally occurring, contamination is, more often than not, the result of human activity. Any activity where chemicals or wastes can be released to the environment, either intentionally or accidentally, has the potential to pollute ground water.

When ground water becomes contaminated, it is difficult and expensive to clean up.

In this activity you will investigate how pollutants get into the groundwater and explore potential solutions for restoring the water to its original state.

WHAT YOU'LL NEED:

aquifer model
color changing tablet or food coloring
oil
dish liquid
colored baking soda (baking soda mixed with food coloring)
squares of bleeding tissue paper
domed drink cover or top ½ of a plastic bottle or funnel
coffee filters
sand
prewashed charcoal
cotton balls

WHAT TO DO:

- Set up your model aquifer (see Model Aquifer activity) and add enough water to bring the level halfway up the side of the hill.

One of the major sources of groundwater contamination comes from abandoned wells. If old wells are not properly closed, they leave direct channels for contaminants to enter the aquifers. What's more people often use abandoned wells as dumping sites for all sorts of trash and chemicals.

Let's simulate that on our model.

- Remove the pump from your well casing.
- Break up a color changing tablet into smaller pieces and drop them down the well casing. Option: You can use a few drops of liquid food coloring instead.

Now, let's add a few more of the contaminants that people often add to the environment.

- Sprinkle a teaspoon or so of the colored baking soda over several sections of the land area of your model to simulate spreading fertilizer and pesticides across fields and yards.
- Place about 10 drops of oil across the area to simulate the oil, fuel residues, solvents and other chemicals that drip off onto streets, parking lots and fields from cars and farm and industrial machinery.
- Next, add 10 drops of dish liquid to simulate industrial and cleaning wastes.
- Lastly tear up two squares of bleeding tissue paper and scatter across the entire model to simulate discarded household chemicals and trash.

Notice any changes in either your ground or surface water?

- Pour a cup of water across the surface of your model, to simulate a heavy thunderstorm. Observe what happens and record your observations.

Drinking contaminated groundwater can have serious health effects on both people and wildlife. Diseases such as hepatitis and dysentery can be caused by contamination from leaking septic tanks. Poisoning may be caused by toxins that have leached into groundwater supplies.

Once groundwater sources become contaminated, clean-up is often difficult and expensive. Cleanup strategies often require pumping the water from the soil, treating it to remove the contaminants, and then pumping it back into the ground. Sometimes people attempt to contain the pollution, using a combination of biological, chemical and physical processes to treat the water while it is still in the ground. If the polluted aquifer water can't be effective treated, the users will be forced to find a new source of water.

For this activity, you are going to take on the roles of water resource and hydraulic engineers.

Your task is to design and create a device and treatment process to clean up the groundwater in your aquifer model and restore it back to its original condition.

You may want to start by testing the effectiveness of the material you have on hand.

- Use your dome lid as a funnel and a cup as a collection reservoir.

- Select a small sample of the one of the materials and place it in the funnel. Use your pump to collect and drop a small amount of contaminated water onto your test sample and let it filter into the cup below.
- Keep a log of what works and what doesn't. Did the color change? Were any of the particles filtered out?

Once you have an idea of what works and what doesn't. Draw up you design, build your device and test it out.

What changes can you make to improve the outcome?

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