



Sustainable Development Goal 6: Clean Water and Sanitation

Investigation 4A: GROUNDWATER MOVEMENT AND POLLUTION

Learning Outcome: Model how contamination gets into groundwater and bodies of water, and how this leads to pollution of drinking water.

Materials

- Awesome Aquifer kit
- measuring cup
- water, dyed blue
- strainer
- large bowl
- colored drink mix powder (not blue)

What to Do

1. Fill a clear plastic bin approximately 1/3 full with light-colored gravel.
2. Arrange the gravel to form a depression near the middle of the container and a hill at both ends.



Credit: AGI/L. C. Mossa

3. Slowly pour some blue water onto one of the hills, watching the different pathways the water takes.
4. Once water has started to fill the depression in the gravel, start pouring

water over the depression. Observe the water level within both the depression and the gravel.

5. Build a well by placing a piece of nylon over the bottom of a soap dispenser pump. Hold the nylon in place using a rubber band.
6. Insert the well into one of the gravel hills in your model.
7. Start pumping water into a measuring cup. Observe the water table line and the body of water in the middle of the model as you pump water.
8. Pump the well to remove as much water as you can from the container, while keeping your well in the same location. Observe where you still see some water in the container.
9. Add some colored drink mix (representing fertilizer) to your model.
10. Simulate rain over the newly fertilized ground by slowly pouring water over the area until the water table almost reaches the top of the hill. Observe what happens for a minute.
11. Start pumping the well.

12. Observe changes in the water table and what is coming out of the well.

The full lesson has learners explore confined aquifers by adding a layer of modeling clay above a layer of gravel with water, and then carefully adding more gravel and water on top. They then explore wells drilled into the ground above the confined layer and below it. Pollution is also explored similarly to the first portion.



Credit: AGI/L. C. Mossa

Consider

1. Use evidence from your model to describe how water moves.
 - a. Describe how the level of the water table relates to the level of water in the lake or river.
 - b. Describe how pumping water out of the ground affected both the water table and the body of water.
2. When you added the colored powder, representing fertilizer, what happened to the well water? Would the location of the well impact the outcome?
3. Are water pollutants and contaminants always visible, like the ones you used in your model? If not, how might we tell water is contaminated if we cannot see pollutants are not visible?
4. *Imagine you completed the full lesson and explored confined aquifers.*
 - a. What would you predict would happen if a well was inserted to the layer above the clay layer. How would the water above and below the layer change as the well is pumped?
 - b. What about if the well was inserted and pushed past the clay layer into the confined aquifer?
 - c. What do you anticipate would occur when colored powder is applied to the model containing a clay layer and subjected to rainfall? How could this impact the quality of drinking water if a well was inserted above the clay layer? What about one that is inserted below it?

Extension – Testing Variables

Consider other variables you can test that might affect the movement of pollutants through ground water. For example, test the effect of different substrates (larger gravel, sand, local soil, or others), well depth, or having multiple wells. Plan your procedure, make predictions about the effects, and then test them, if possible.