

TAKE & MAKE KIT

Geology & Water

TIME: 45 minutes + 5 days to watch your plant grow

CONTAINS SMALL PIECES

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Milwaukee Public Library Makerspaces

What's in this kit?

There is water all around the earth but did you know that right below our feet, there is groundwater that plays an important role in our daily lives?

You will learn:

- Geology science
- The water cycle
- Growing plants
- Effects of water pollution

Let's Get Started!

Materials

Clear plastic bottle
2 oz sand ●
1 color tablet
2 oz pebbles x2 ●
1 square of black mesh fabric
5.5 oz garden soil ●
1 oz grass feed ●
Cup of water

Tools

Scissors
Pipette

Vocabulary

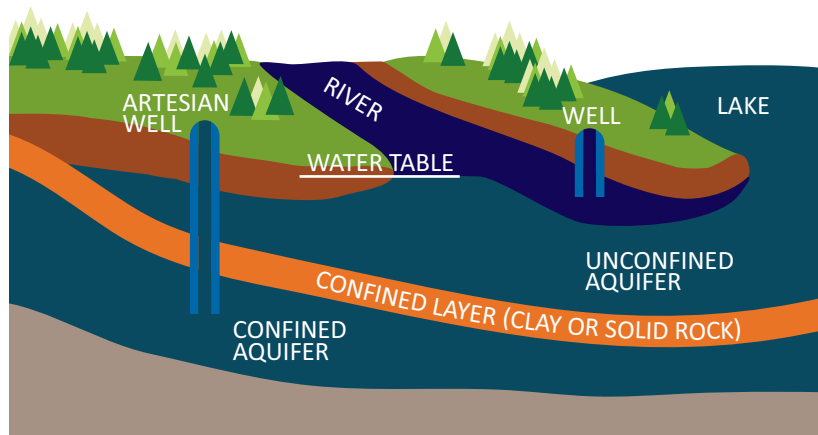
Aquifer: An aquifer is a body of porous rock or sediment saturated with groundwater (Nat Geo)

Water table: The upper level of an underground surface in which the soil or rocks are permanently saturated with water (Britannica.com)

Permeability: Measure of how easy liquids or gases can pass through geologic material (Encyclopedia.com)

Porosity: Measure of how much room there is available in geologic material (Encyclopedia.com)

Water cycle: Describes how water evaporates from the surface of the earth, rises into the atmosphere, cools and condenses into rain or snow in clouds, and falls again to the surface as precipitation (NASA)



Step 1 - Prepare the bottle

Take a clear plastic bottle and remove any labeling. Use a pair of scissors and cut the bottle in half.



Step 2 - Create the aquifer

Pour the sand into the bottom half of the bottle. Take one container of pebbles and pour it on top of the sand. Pour some clean water on top of these layers until you see the water at the surface of the pebbles.

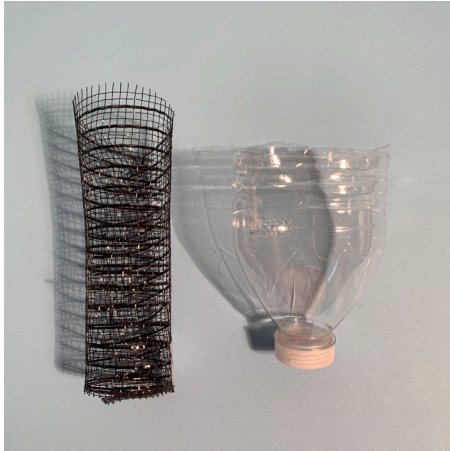
You've created an aquifer with groundwater!



Step 3 - Create the water table

Take the top half of the bottle and place it with the twisting lid facing down on top of the aquifer you just created.

Take the fabric mesh and lay it down along the bottom of the bottle. You can think of this as a layer of permeable sediment in the water table.



Pour the second container of pebbles on top of the mesh. Lightly pack the rest of the bottle with garden soil leaving an inch of room from the top.

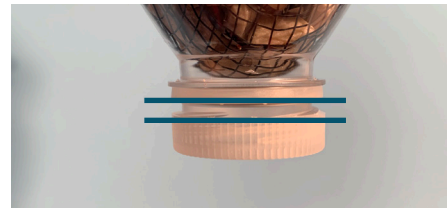
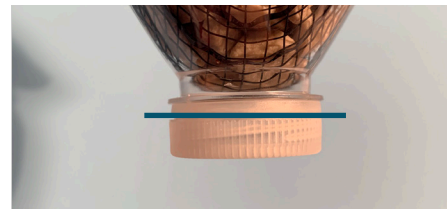
You've created an underground surface model with an **unsaturated** water table!



Confined VS Unconfined Layers

Right now if you were to add water to your **unsaturated** water table, there would be nowhere for the water to go except back up into the atmosphere. This is because the plastic bottle acts like a **confined layer** that would keep all the water from moving through it. In nature different types of sediment have different levels of permeability due to **porosity**. You can think of the plastic bottle like a layer of clay because it is the least permeable, meaning water cannot pass through it.

Step 4 - Create an unconfined layer

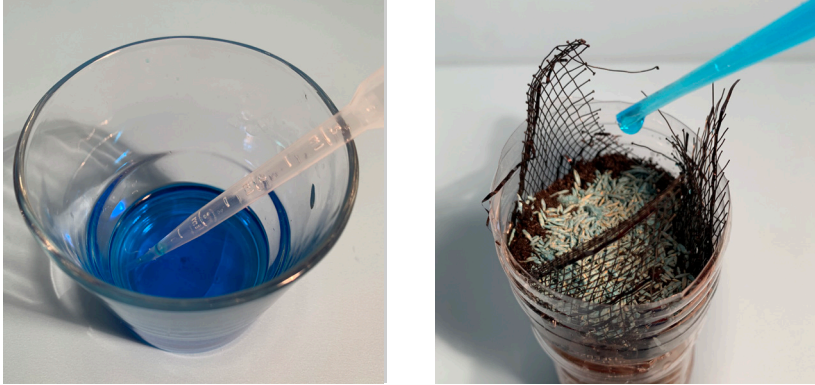


Carefully lift your water table model off the aquifer model and twist off the bottle cap just enough so that it is loose but won't fall off. Set it back on top of the aquifer model and begin to saturate your water table.

Watch carefully as you add water. You don't want any water to overflow!

It may take some time but you want to slowly saturate all the layers until some water begins to leak out of the cap into the aquifer. If you can see that all the garden soil is saturated but no water is coming out of the cap then you may want to VERY carefully loosen the cap a little bit more.

Go Beyond – Pollution



A dissolvable color tablet was included in your kit. Drop this tablet into one cup of water and use half of it to water your grass. This dyed water will show you what it looks like to have pollutants in our groundwater. What do you think will happen to your model?

Can you observe any changes in the aquifer (the bottom half)?

Keep the second half of the dyed water and continue to use it every couple of days. Can you observe any changes to your science model?

Challenge



A pipette was included in your kit. The pipette acts like a well that can extract water from below the surface. How much water can you extract from the water table using only your pipette?

If you completed the pollution activity, how would you extract the polluted groundwater and how would you replenish it with clean groundwater?

Aquifers only contain groundwater that come directly from precipitation and what we add to it. How will you help keep our aquifers and groundwater clean?

HANG OUT,
MESS
AROUND,
GEEK OUT.



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