Water Aquifer

Supplies:

- nylon stocking - cut into 4" squares
- scissors (ask an adult for help)
- 1 hand soap pump
- ½ cup white sand
- clay – 3 inch ball
- 1 larger rubber band
- blue food coloring
- red kool-aid powder (1 packet)
- teaspoon (spoon)
- 9 oz cup
- 3 oz cup
- 1 cup water
- 2 measuring cups

Instructions:

Are you ready to dive into the wonderful world of water? Water is amazing! You can find out some really cool facts about water (and impress all of your friends and family.)

- Water is the only substance on Earth that exists in all three states of matter – solid, liquid, and gas.
- Sound travels faster in water than through the air! In water, sound travels approximately 1 mile per second. In the air, sound travels .2 miles per second.
- Agriculture is the biggest user of water. The food we eat needs water to grow!
- A 5-minute shower uses 30 gallons of water.
- The Earth's surface is 75% water! (That means that 25% is land.)
- Oceans, rivers, and polar ice caps are the biggest bodies of water. What's even more amazing is that 97% of all of Earth's water is salt water!
- If you combined the salt from all of the oceans it would be nearly 50 quadrillion tons (50 million billion tons) of dissolved solids. This is enough salt to cover the Earth's land. You could also build a salt layer that is 500 feet thick and as tall as a 40-story building!

- The water you drink today could be thousands of years old! The *water cycle* actually recycles water.
- The 3 phases of the water cycle are *precipitation, evaporation,* and *condensation.*

Consider the difference between salt and fresh water. If 97% of all of Earth's water is salty, that means only 3% of the water is fresh water. We need fresh water for our everyday lives. However, the ice caps at the north and south poles take up 2% of the fresh water on Earth. But this fresh water is frozen, so we can't use it.

That leaves **only 1% of Earth's water for human consumption.** We need water to drink, shower, wash clothes, and grow food. Earth has so much water, but we can only use 1% of it. This is why it is so important for us to conserve water. (*Conserve* means to protect and to save.)

Aquifers
Much of the fresh water on Earth is contained in *aquifers*. **Aquifers** are layers of soil, gravel, sand, and rock beneath the Earth's crust. The water in aquifers has been there for thousands of years. Over half of the United States gets fresh water from aquifers. The largest aquifer in the world is called the Ogallala Aquifer. Underground, it reaches from South Dakota to Texas! People can dig wells or find a natural spring to bring water from an aquifer to the Earth's surface. The best part is an aquifer acts as a natural filter. The water must go through rock, sand, and gravel before it reaches the top. This water needs a lot less treatment before it is safe to drink.

How to Make an Aquifer
You can make a model of an aquifer to learn out how it works. First, gather your supplies. You need a 9 oz cup, plastic hand-wash soap pump, sand, clay, gravel, and rubber bands to build your aquifer. Cut a nylon stocking into 4 inch squares. (*Ask an adult for help).*

First, you need to put a filter on the hand-wash soap pump. Ask a friend to help to hold the pump inside the cup, but not touching the bottom. Take the piece of nylon and place it on the bottom of the pump. Use the rubber band to secure the nylon to the pump.

Nylon is a great filter to keep out debris such as dirt and sand. The pump is how you will get the water from deep inside the aquifer to the surface.

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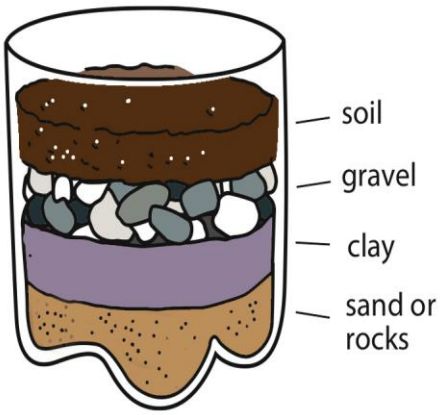


Observe the different layers of an aquifer.

The bottom of an aquifer is called *bedrock*. (The bottom of your cup represents the bedrock.)

Now you will put the layers inside the cup. Look at the image above. What's the first layer? Fill the cup with 1 cup of sand. Make sure the pump doesn't move! (Some of the sand will slide underneath the pump.)

What is the next layer? Clay. You want to make a thin layer of clay around only part of the cup. You do not want the entire layer of sand covered by the clay. Be sure to work around the pump.

What is the next layer in the aquifer? Gravel. Place ½ cup of gravel on top of the clay.

Next, fill one measuring cup with ½ cup of water. Put 3 drops of blue food coloring into the cup of water. The blue water represents rain. Carefully measure 1/4 cup of the "rain" into the second measuring cup.

Slowly pour the 1/4 cup of blue "rain" into the aquifer. Observe. What is happening? The "rain" fills in the gaps between the rocks, and it soaks into the sand.

Measure another 1/4 cup of the rain. Slowly pour the "rain" into the aquifer until you see water near the top of the clay, but do not cover the clay with water. The layer of water that you can see at the top of the aquifer is called the *water table*. Groundwater is what is now in your aquifer. The water table is the top layer of the groundwater.

Now that your aquifer is set, you can start to pump the water! You will need a smaller cup (3 oz) to collect the water. Ask a friend to help you. One person needs to hold the pump steady. With the pump inside the aquifer, you may start pumping the water into the cup. Observe what is happening. The water table is lowering. Is it difficult to fill up the cup? Can you pump out all of the blue water?

The Science Behind It:

Think about a real aquifer. It must be difficult to conserve an efficient amount of water in the aquifer. What if it doesn't rain? Not enough rainfall can cause a draught. A draught is when the groundwater is sparse and the aquifers are not full. The water table drops. This is when it is especially important to conserve water because the only way to fill up the aquifer is more rain.

Now that you've discovered how an aquifer works, consider the effects of contamination. What do you think can contaminate or pollute water? When pollutants, such as trash and oil, are not disposed (thrown out) correctly, it can be extremely harmful to our water sources. For example, oils from cars can seep into the groundwater. Also, if oils are flushed down a drain, the pollutant goes into another water source. Pollutants must be disposed correctly, usually in a landfill. Not into a river, onto the grass, or down a drain!

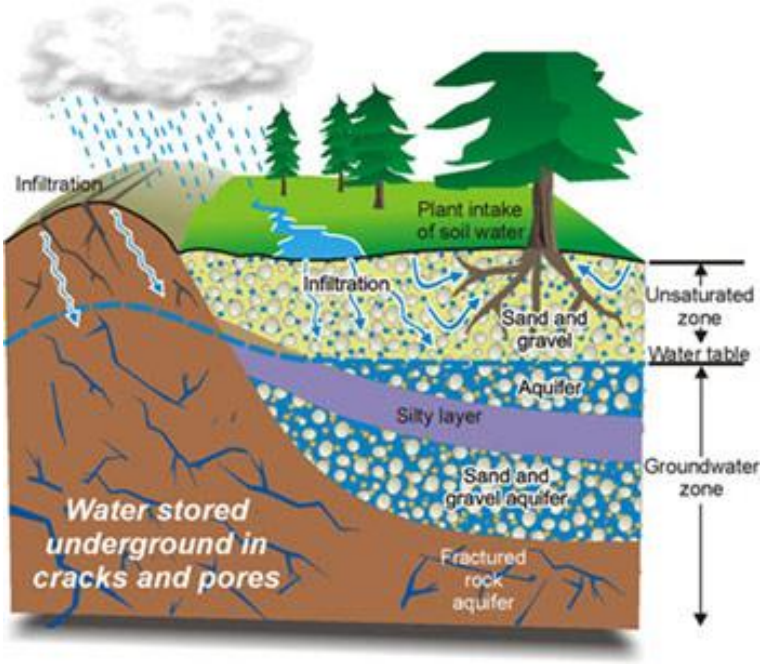
Use your aquifer to discover how pollution can contaminate the water. You will need one packet of red Kool-Aid powder for this next experiment. This Kool-Aid will represent a harmful chemical pollutant. Measure 2 teaspoons of the red "chemical" and sprinkle it on top of the gravel inside the aquifer.

Pour 1/4 cup of your remaining blue water into the 3 oz. cup. Slowly pour the "rain" over the red "chemical" in the aquifer. Observe. What's happening? The red "chemical" is seeping into the aquifer! What does this mean? When a chemical is on the surface of the ground, it only takes one rainfall for it to contaminate groundwater, soil, and an aquifer.

Now try pumping water from the aquifer, again. What color is your water? It might be red, blue, or a murky green color. Doesn't that look like a refreshing cup of water?!

This experiment shows not only how an aquifer works, but also the importance of correctly disposing of chemicals. Too many pollutants can create contaminated water.

Water is an amazing substance. It is vital to all life on Earth, from humans, to plants and animals. We drink, take showers, grow food, and swim. You have discovered how necessary it is to conserve fresh water, because we can only use 1% of all the water on Earth! Next time you take a shower or do the dishes, think about how important fresh water is to our everyday lives.



A Video Explaining the Water Cycle

The Water Cycle by the Ecogeeks

More geography lessons on Water Cycle at NeoK12.com