Where did all the water go?

Remember, you want to keep the kids attention and get them involved. Get to know the following information, be excited about it, and you'll keep the kids engaged and talking. Have fun, search the standards, find at least two that are appropriate for each grade level, and tailor your lesson to incorporate them!

Tips: Encourage active learning. Have the student involved in the entire process, have them up and doing, talking and participating. Present the material in small units and check and recheck learning. Don't just ask, "Do you understand?" See or hear that they do! Don't rush the student and keep in mind the different levels of help.

I do, you watch

I do, you help

You do, I help

You do, I watch

Examples of Possible Standards to Incorporate:

- Kindergarten: Inq. 1 Use senses and simple tools to make observations
- 1st Grade: Inq. 2 Communicate interest in simple phenomena and plan for simple investigations
- 2nd Grade: Inq. 3 Communicate understanding of simple data using age-appropriate vocabulary
- 3rd Grade: T/E.1 Explain how different inventions and technologies impact people and other living organisms.
- 4th Grade: 7.8.1 Prepare a model that illustrates basic features of the water cycle
- 5th Grade: T/E.2 Design a tool or process that addresses an identified problem caused by human activity
- 6th Grade: Inq. 3 Use evidence from a dataset to determine cause and effect relationships that explain a phenomenon. *(ex. why are fish dying in a local river?)*
- 7th Grade: T/E.3 Explore how the unintended consequences of new technologies can impact society. *(ex. did the inventors of chemical fertilizer expect groundwater pollution to result from over use?)*

- 8th Grade: 8.10.5 Infer that human activities may be helpful or harmful to the environment.

Where does all the water go?

Ask students where all of the water they use comes from? (Pipes, the ground, the sky, the water cycle, etc) Ask the students where the water goes after Precipitation in the water cycle. When rain falls to the ground, the water does not stop moving. Some of it flows along the surface to streams or lakes, some of it is used by plants, some evaporates and returns to the atmosphere, and some goes into the ground.

Pour a glass of water into a cup of sand or dirt or on the dirt in the yard, and then ask students, where did the water go? The water moves into the spaces between the particles of sand or dirt and becomes groundwater--Groundwater is water that is found underground in the cracks and spaces in soil, sand and rock. Discuss with your students what the water does after it goes into the ground. Does it move from place to place or does it stay in the same place? Is that water going to stay in that same patch of dirt or will it go somewhere else? If it moves, how does it do it?

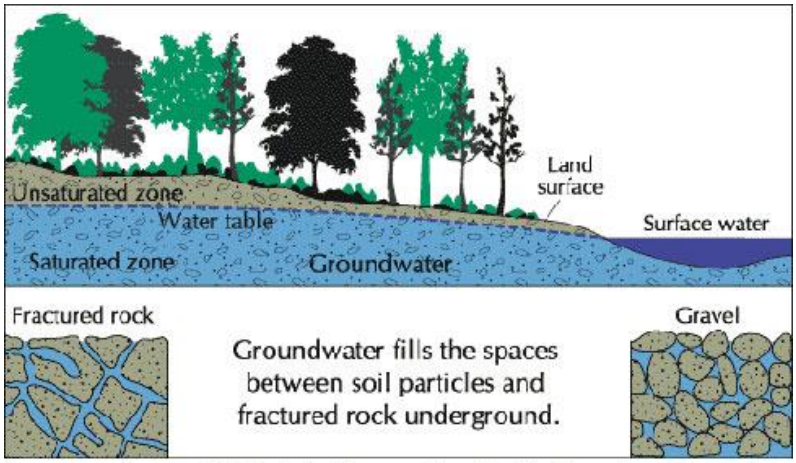


Image compliments of US Geological Survey, adapted by The Groundwater Foundation.

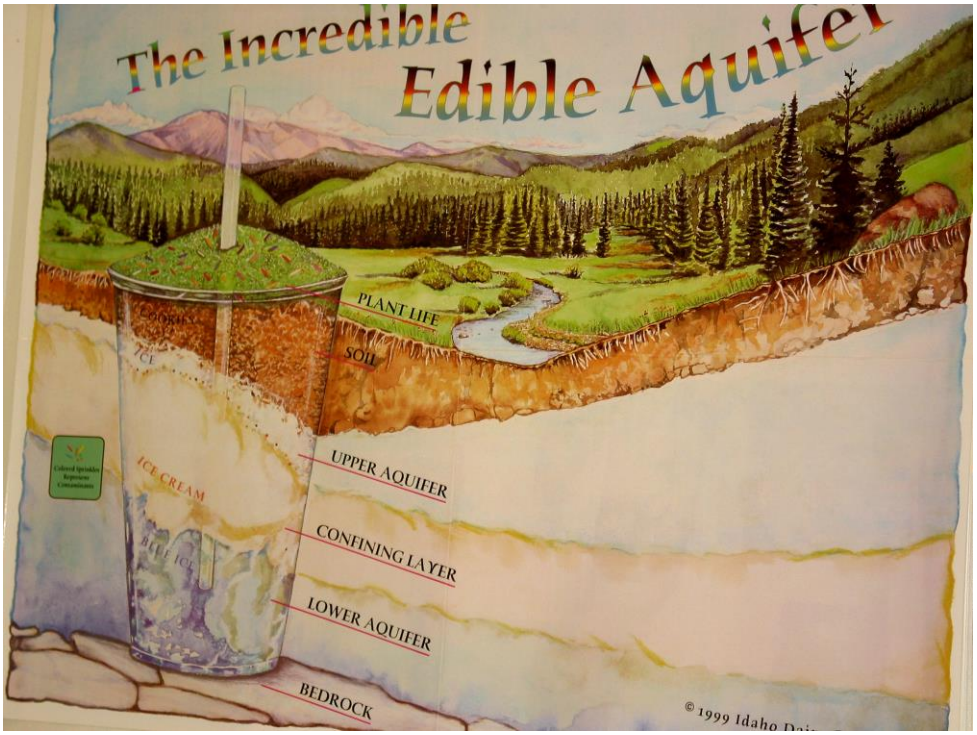
Groundwater doesn't flow like an underground river. Instead, groundwater is stored in and moves slowly through layers of soil, sand and rocks called aquifers. The speed at which groundwater flows depends on the size of the spaces in the soil or rock and how well the spaces are connected. *(Discuss how different sizes of cracks or spaces between rocks could affect water flow. Have students go to the sink and fill their hands with water and keep their fingers together, tight. How fast is the water flowing through their hands? Now have them spread their fingers a little, does the water flow faster? What happens if they spread their fingers far apart? How might their hands be like the rocks underground?)*

Tell the students that in order to get a good idea of how and aquifer works you and they are going to actually make an aquifer. In this case, it will be an edible aquifer.

Edible Aquifer

Materials:

- blue and red food coloring
- vanilla ice cream
- Candy rocks
- clear lemon-lime soda
- ice
- Cookie crumbs
- Green sprinkles or coconut dyed green
- drinking straws
- spoons
- clear cups
- dirt or sand (small amount in cup)
- Gummy worms (optional)
- small amount of molding clay (optional)



Tell students that the first step to making our edible aquifer is to have a small, clear cup. The bottom of the cup is very hard. Ask students if any liquid can get through the bottoms of their cups? No. This is like bedrock, which is very hard rock that no water can get through. It doesn't have cracks in it that the water can move through.

Next, have students fill their cups about one-third of the way with ice chips or chocolate rocks and cookie crumbs. *Ask students what the ice chips and cookie crumbs could represent*. This represents all of the sand, gravel, and rocks in the aquifer.

Now, have students cover their "gravel, sand, and rock layer" with clear soda with a little blue dye added. Ask students what this represents. This is our groundwater. *Ask*

students what the "water" is doing when you pour it in. Have them notice how the "water" fills in the spaces around the "gravel, sand, and rock."

The next layer of our aquifer is called the confining layer, *(ask students what it could mean if something was confined, give examples of things being confined)* which is usually clay or dense rock. *(Have students feel an example of clay. Would water have a hard time going through it? Why?—because there aren't a lot of large cracks for the water to go through)* The water is kept below this layer. Today our confining layer is going to be made out of ice cream. Have students spread a semi-thick layer of ice cream over the chips and soda.

Then have students add another layer of "gravel and sand," ice chips on top of the confining layer. Then have students put a layer of cookie crumbs on top of their gravel. Ask them what this looks like. (Soil or dirt) The next layer is our porous, top layer of soil. *Discuss what porous means, show examples. (able to absorb liquid, like a sponge, or your cereal, or a cookie) What other things are porous?* Cookie crumbs represent our soil.

Ask students what grows in soil? Plant life. Have students add some green sprinkles or coconut to show their plant life. *(For fun you may wish to add some gummy worms for your animal life that lives in the soil as well)*

Now the Teacher will add some red or black food coloring to a small amount of soda. *Ask students what this black or red liquid might represent.* The coloring represents pollution. *Can the students think of some pollutants that can affect groundwater?* Have students pour it on their land. What happened? *Are pollutants bad for groundwater and aquifers? Where do they come from?*

www.groundwater.org/.../gwpollutionillust.jpg

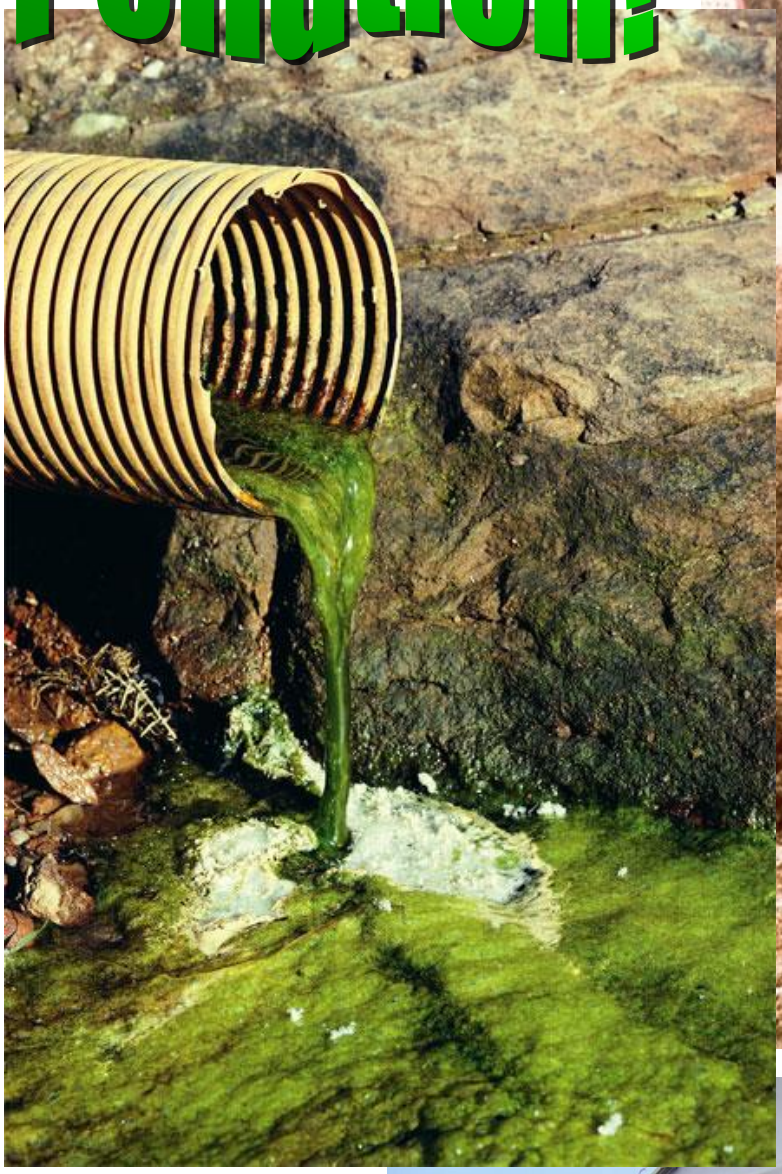
In areas where the rocks and soil above the aquifer are porous, pollutants can easily sink into groundwater. Groundwater can be polluted by landfills, septic tanks, leaky underground gas tanks, and from overuse of fertilizers and pesticides. Ask students if groundwater becomes polluted is it safe to drink?

Groundwater is used for drinking water by more than 50 percent of the people in the United States, including almost everyone who lives in rural areas. The largest use for groundwater is to irrigate crops.

Now the Teacher will have each student use their straw to drill a well (push the straw down toward the bottom of the cup) into the center of their aquifer. A well is a pipe attached to a pump that is put into the earth by digging a hole or drilling down and is used to pull water from an aquifer to the surface so people can use it. Have one student slowly begin to pump their well by sucking on the straw while the other students watch. Does the water table go down? Also, have students watch and see how the pollution can get sucked into the aquifer and end up in the groundwater by eventually leaking through the confining layer.

Have students pretend it's raining or snowing and recharge (refill) their aquifer by adding more blue soda. A real aquifer takes a lot longer to recharge, this is just an example to speed up the process. That's it, now it's time to eat up their aquifers.

Pollution!



A quick water cycle review