



This guide accompanies
[Science Sustainability Sleuths Day 5](#)

PRIOR TO TEACHING



Subject

Groundwater



Program Length

45 minutes – 1 hour



Program Objective

From a guest scientist spotlight video to a delicious and healthy science treat, this lesson will introduce you to the science behind aquifers and groundwater storage.



Next Generation Science Standards

4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.



What I Need Today

2 clear cups

spoon

straw

cereal or granola

milk or milk substitute

smashed banana, yogurt, or applesauce

cinnamon

food coloring or colored sugar



Vocabulary

Aquifer – An underground layer of rock or sand that can absorb and hold water.

Pollutants – Unwanted substances, particles, or gasses that are dangerous to the environment. Air and water can both have pollutants.

Filter – A natural or man-made device or system that separates things into different components, such as pollutants (or contaminants) from water.

Parfait – A cold layered dessert or breakfast, often made with granola, yogurt, and fruit.

Groundwater – Water found underground.

Silt – Solid and dust-like, silt is made up of tiny rock and mineral particles that are smaller than grains of sand.

Confining Layer – When water cannot move through or around a substance (such as clay), it is called a “confining layer”. Some aquifers are under confining layers, meaning you must drill a hole through this layer to reach the groundwater.

Contaminated Water – Any water that has pollutants is considered “contaminated”.

Fertilizer – A substance, such as manure or a special chemical, that is added to soil to help plants grow.

Well – A hole that is dug into the Earth in order to get water (or oil or natural gas). Wells can be as simple as a bucket on a rope lowered into a hole until it reaches water.

Water Table – In an aquifer, the point at which the rocks or sand are completely surrounded by, or saturated with, water.



Instructor Prep

In advance, send students a list of the materials needed for today’s lesson.

PROCEDURE



What We'll Learn

Aquifers are natural underground storage systems for water.



What I'll Learn:

FROM A GUEST SCIENTIST SPOTLIGHT VIDEO TO A DELICIOUS AND HEALTHY SCIENCE TREAT, THIS LESSON WILL INTRODUCE YOU TO THE SCIENCE BEHIND AQUIFERS AND GROUNDWATER STORAGE.





What Will Happen?

Scientists ask questions and make predictions before they start investigating. Have your students hypothesize: will “contaminated water” be able to make its way into my aquifer parfait?

- ☐ Yes
- ☐ No



What to Do

DISCOVERY CUBE LIVE SESSION (ABOUT 15 MINUTES)

1) Remind your students that this curriculum comes from Discovery Cube, which has interactive science centers in both Los Angeles (near Lake View Terrace) and Orange County.



2) To introduce this class, visit: <https://youtu.be/zGCanqiMXSY>, where a Discovery Cube Instructor will broadcast a live session showing all the students participating in Science Sustainability Sleuths how to make an aquifer parfait, while helping them to understand groundwater and aquifers. The Instructor will also answer several questions students asked after watching the Aquavator film.



EXPERIMENT - AQUIFER PARFAIT

Now that your students have watched how to make an aquifer parfait, lead them through the activity.

1) Pour cereal or granola in a cup until it is about 1/3 full.



Fun Fact: An aquifer is a collection of wet, underground rocks that allow water to pass slowly between them. As the water passes through small pores in the rocks, pollutants (like dirt and chemicals) are naturally filtered out of the water. Aquifers are one way we can get clean, useable water. In your aquifer parfait, the cereal or granola represent the rocks, sand, or gravel deep under the ground.

Discovery Cube Live

1. Click [here](#) to watch a live demonstration by a Discovery Cube Educator showing you how to make an aquifer parfait and answer your questions from the video in the last lesson.

Discovery Cube Live Review



Let's Review!

- WHAT IS GROUNDWATER?
- WHAT DOES AN AQUIFER DO?

Discovery Cube Live Review: Aquifer Parfait



1. Pour cereal in a cup. The cereal represents rock and sand under the ground.
2. Pour enough water to cover the cereal. The water represents water.
3. Add a layer of white yogurt or cream. This represents a thick layer of clay and silt.
4. In a real aquifer, clean water is stored by the layer deep underground. Notice how the water fills the spaces between the bits of cereal. This is how groundwater is stored in an aquifer.



2) Pour enough milk (or milk substitute) to just cover the cereal or granola.



Fun Fact: The milk represents water. In a real aquifer, this clean water is naturally stored by the Earth deep underground. Notice that the milk fills the spaces between the bits of cereal. This is how groundwater is stored in an aquifer.

3) Add a layer of smashed banana, yogurt, or applesauce – just make sure it completely covers the milk and cereal. If you want, you can add a couple different layers of these foods.



Fun Fact: This represents the thick layers of clay and silt that stop or slow the water from easily going further down into the Earth. This is called a “confining layer”.

4) Add another layer of cereal or granola to represent more sand or gravel above the clay.

5) Sprinkle cinnamon on top.



Fun Fact: This represents the soil or dirt just beneath your feet.

6) Pour some milk into the second cup and add a few drops of food coloring or a small amount of colored sugar. Mix well until the sugar has dissolved and the milk has changed colors.



Fun Fact: This represents contaminated water. Sometimes people use too much fertilizer on their plants, don't pick up after their dogs, or let motor oil drip from their cars. Then when a storm comes along, these pollutants can mix in with the storm water and end up making their way from our surface water into our groundwater.

7) Pour the colored milk on top of the aquifer parfait. If your thick confining layer of banana, yogurt, or applesauce creates a good seal on top of your “groundwater” milk, you may notice this colored milk sitting on top. This is good, as it means your aquifer is naturally stopping contaminated water from getting into the aquifer. But this can also be a problem: if you use any of the groundwater from your aquifer, clean replacement water cannot find its way in to refill the aquifer.

Discovery Cube Live Review: Aquifer Parfait

4. ADD ANOTHER LAYER OF CEREAL.
5. SPRINKLE CINNAMON ON TOP. THIS REPRESENTS THE SOIL JUST BENEATH YOUR FEET.
6. POUR MILK INTO THE 2ND CUP AND ADD A FEW DROPS OF FOOD COLORING. THIS REPRESENTS CONTAMINATED WATER.
7. POUR THE CONTAMINATED WATER ON TOP OF THE AQUIFER PARFAIT. WHAT DO YOU NOTICE?
8. DRILL A WELL WITH YOUR STRAW TO PUMP OUT THE CLEAN WATER.





8) Time to “drill a well” so you can pump out, clean, and use your stored groundwater. Insert a straw through all the layers until it touches the bottom of the cup.

9) Slowly begin to “pump” the well by sucking on the straw. What happens to the level of the milk?



Fun Fact: The natural height of the water inside an aquifer is called the “water table”. When we take water out of an aquifer, we want to replace it with clean stormwater to keep our underground storage system full.

10) As you drink some of the milk (groundwater), what happens to the colored milk (contaminated storm water)?

11) You can add more milk (un-contaminated rain water) to the top of your aquifer to recharge your aquifer parfait. When you’re all done, enjoy your special aquifer treat!



VIDEO - SCIENTIST SPOTLIGHT: GROUNDWATER MANAGEMENT WITH RAFAEL VILLEGAS

There are scientists who work for your local water agency and store, monitor, and maintain the health of your drinking water. Watch [Scientist Spotlight: Groundwater Management with Rafael Villegas](https://vimeo.com/501811496/306090566b) to learn more: <https://vimeo.com/501811496/306090566b>

Reflect on the day: what did your students learn about groundwater and aquifers?





CONCLUSION



What I Discovered

To complete the Go With The Flow badge, have your students reflect on what they discovered. We would love to see pictures of their aquifer parfaits. Please email pictures to educationemail@discoverycube.org.



For Next Week

Have your students gather these supplies:

computers or tablets with access to the internet (if it's possible, have your students use two devices for these activities)

