

# Sustainability Science Sleuths

Day 5



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

## PRIOR TO TEACHING



### Subject

Groundwater



### Program Length

45 minutes – 1 hour



### Program Objective

By making 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

### FROM SCIENCE KIT:

#### Per Student:

8-10 oz. clear cup (2 per student)  
spoon  
straw  
granola (about 3 oz.)  
unsweetened oat milk (about 6 oz.)  
applesauce (about 1 oz.)  
powdered chocolate (a dusting)  
few drops of food coloring



## 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.



## PROCEDURE



### What We'll Learn

Aquifers are natural underground storage systems for water.



### 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



#### REVIEW – DAY 4: AQUEDUCTS

Have your students discuss what they learned from making their aqueducts. Once water travels through the aqueducts to our cities, sometimes some of it gets stored deep underground so we can use it when we need it. Today you're going to learn about this system of underground water storage, called aquifers.



#### VIDEO – SCIENTIST SPOTLIGHT: GROUNDWATER MANAGEMENT WITH RAFAEL VILLEGAS

To start learning about aquifers, first watch Scientist Spotlight: Groundwater Management with Rafael Villegas: <https://vimeo.com/501811496/306090566b>



#### 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.





## EXPERIMENT - AQUIFER PARFAIT

1) Have each student add about 2 oz. of granola to one of their cups.



*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.

2) Pour enough milk substitute to just cover the 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 granola. This is how groundwater is stored in an aquifer.

3) Have each student add a layer of applesauce on top of the milk – just make sure it completely covers the milk and granola.



*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”.

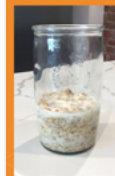
4) Add another layer of granola (about 1 oz.) to represent more sand or gravel above the clay.

5) Sprinkle chocolate on top.



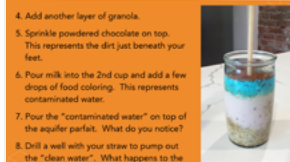
*Fun Fact:* This represents the soil or dirt just beneath your feet.

### Aquifer Parfait



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

### Aquifer Parfait



4. Add another layer of granola.
5. Sprinkle powdered chocolate on top. This represents the dirt 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”. What happens to the “contaminated water”?



**6)** Pour 1-2 oz. of milk into the second cup and add a few drops of food coloring. Mix until 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 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.

**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!



## CONCLUSION



### What I Discovered

To complete the Go With The Flow badge, have your students use their journals to help them reflect on what they discovered. We would love to see pictures of their aquifer parfaits. Please email pictures to [educationemail@discoverycube.org](mailto:educationemail@discoverycube.org).



### Supplies for Next Time

#### SUPPLIED BY TEACHER/STUDENTS:

- t-shirt
- paper
- pen or pencil
- computers or tablets with access to the internet (if it's possible, have your students use two devices for these activities)

\*\*Day 5 will have an optional activity using the washing instructions found on t-shirt tags. Encourage your students to bring a t-shirt from home.

