

Edible Aquifer Model
Modeling the Missoula Aquifer

<p>Time: 40-50 min. Grade: 1-5 (can be adapted for kindergarteners) Summary: Students will make a model of an aquifer using edible materials. Each ingredient that is added to the model represents a different section, or layer, of an aquifer, giving students a clean understanding of how an aquifer functions. This activity also demonstrates to students how pollution can infiltrate an aquifer and pollute our drinking water.</p>	<p>Objectives: Students will be able to:</p> <ul style="list-style-type: none"> • Define what an aquifer is • Explain how an aquifer functions • Name the parts that make up an aquifer • Explain how the Missoula aquifer was formed • Understand where Missoula’s drinking water comes from • Identify sources of pollution that can affect water quality in the aquifer • Identify solutions to reduce pollution of the aquifer
<p>Materials:</p> <ul style="list-style-type: none"> • Clear plastic cups • Spoons • Straws • Clear soda (water) • Strawberries (boulders) • Blueberries (rocks) • Chocolate cereal or granola (gravel & sand) • Vanilla yogurt (clay/confining layer) • Chocolate sprinkles (soil) • Food coloring (pollution) 	<p>State benchmarks:</p> <p>Science standards (grade 1)- Standard 1, benchmark 1 Standard 1, benchmark 3 Standard 5, benchmark 4 Standard 6, benchmark 3</p> <p>Science standards (grade 2)- Standard 1, benchmark 1 Standard 1, benchmark 4 Standard 4, benchmark 4 Standard 5, benchmark 4 Standard 6, benchmark 2</p> <p>Science standards (grade 3)- Standard 1, benchmark 1 Standard 1, benchmark 3 Standard 1, benchmark 4 Standard 4, benchmark 4 Standard 5, benchmark 4</p> <p>Science standards (grade 4)- Standard 1, benchmark 4 Standard 5, benchmark 4</p> <p>Science standards (grade 5)- Standard 1, benchmark 4 Standard 5, benchmark 2 Standard 5, benchmark 4</p>

Background:

An aquifer is an underground body of different layered rocks that are saturated with water. All of the rocks that make up an aquifer are permeable and porous allowing water to travel through them and around them, filling in the gaps between rock layers. Water enters into an aquifer through infiltration (water from snowmelt or rain that soaks into the ground). As water enters into the aquifer it recharges the aquifer, adding to the amount of water underground. The

water in an aquifer eventually gets discharged either by seeping into streams or rivers, or by being pumped out of the ground by a well.

The Missoula aquifer supplies all of the drinking water for people living in the Missoula Valley. The aquifer was formed by one of the biggest floods in history (Ice Age flood), where walls of water taller than skyscrapers flooded the Missoula Valley all the way to the Pacific Ocean. The water from this flood carried with it huge boulders, millions of tons of rocks and pebbles, and gravel that carved out the Missoula Valley and eventually made up the foundation of our aquifer. The Missoula aquifer is just below our feet at 10-100ft. underground and is considered one of the purest natural sources of water in the country.

In order to keep our drinking water clean it's important to understand how an aquifer works, so that we can identify the best ways to minimize the amount of pollution that could threaten this pristine source of water.

Activity:

1. Explain to students what an aquifer is and how the Missoula aquifer was formed. See the references section for more information about Glacial Lake Missoula and the Missoula Aquifer. Also, help students draw the connection between the water cycle and groundwater/aquifer recharge.
2. Give each student a clean plastic cup. Explain to them that they are going to build their own model of an aquifer to see first-hand how our aquifer works. For younger students, pass out the attached "aquifer layers" worksheet so that students can more easily visualize the various layers that they are modeling.
3. Next, add enough strawberries to each cup to cover the bottom of the cup, roughly 3-4 inches (this layer will take up the most space in the cup). The strawberries represent the boulder layer.
4. After the "boulders" are added smaller rocks should be added to the model. The blueberries represent these rocks.
5. Pebbles, gravel and sand are next. The chocolate cereal or granola will serve as our pebbles and gravel. If you are working with cereal feel free to let students crush the cereal to make sand, although this is not necessary.
6. Before adding the soda to the model, have students predict how the "water" will move through their models. An adult should slowly pour the soda over each layer, but not enough to fill the cup entirely. Ask students to share how they observed the liquid traveling through their models.
7. Next we are going to add a confining layer (yogurt) to our aquifer. A confining layer is a layer of sediment or rock that is not very permeable, such as clay. This layer restricts water to within the aquifer and prevents pollution that can soak through soil, such as fertilizers. Not all aquifers have a confining layer and are much more threatened by pollution.
8. Add the sprinkles to the top of the yogurt. This will be our soil.

9. Add a few drops of food coloring on top of the “soil” layer. Explain to students that the food coloring represents pollution. Discuss with the class what types of pollution the food coloring could represent (fertilizers, pet waste, pesticides, any type of pollution that could infiltrate the soil would be an acceptable answer). Ask students how to reduce these kinds of pollution. Take a moment to have students hypothesize what they think will happen to the pollution if a rainstorm happened above our model.

10. Time for a storm! Have an adult pour a little more soda over each model. Not much is needed, only enough to disperse the food coloring. Have students share their observations, was their hypothesis correct?

11. Review what you have learned and enjoy eating your model!

Resources:

http://www.spokanecounty.org/data/utilitieswqmp/aquifer_atlas/Page%207%202009%20SVRP%20Atlas.pdf

<http://www.mtnwater.com/aahquifer.htm>

<http://www.co.missoula.mt.us/wq/FAQs/pdfs/WhatistheAquifer.pdf>