

## Holiday Edible Aquifer At Home Activity

**Objective:** Educating students on aquifers, the process of pumping groundwater to the surface by wells to provide us with a clean water supply, and the impact of pollutants on groundwater through the means of hands-on experimentation.

**Curriculum grade:** 3 - 8<sup>th</sup>

### **Materials:**

- Visual Aid (included)
- Vanilla ice cream
- Clear soda (7-Up, Sprite, etc.)
- Crushed gingerbread cookies
- Holiday gummy candy
- Crushed candy canes
- Drinking straws
- Spoons
- Clear cups
- Paper towels
- Food processor/blender (optional)

### **Duration:**

45 minutes

### **Preparation (before activity):**

Each ingredient in this activity represents a part of an aquifer as you can see in the visual aid attached. For the chocolate cookies it is recommended that you crush them either in a bag or in a food processor/blender in order to make the consistency appear more like the dirt it represents.

### **Discussion (before activity):**

What is an aquifer?

- An aquifer is an underground layer of rocks and soil holding water. Aquifers can be just a few feet under the soil or can sit hundreds of feet deep. (Use visual aids of an aquifer.)

How do you think water enters an aquifer?

- It seeps through the ground as rain, wastewater and condensation or can be fed by underground streams. Water can move through these materials because they have large, connected spaces that make them easy to pass through.

What is groundwater?

- Groundwater is exactly what it sounds like; water underground that is found in the cracks and spaces in soil, sand and rock. (Refer to visual aid.)

What is pollution?

- It is the introduction of pollutants into the environment that are harmful to humans, animals, and the environment itself.

Do you think we can pollute groundwater even if it's underground?

- Yes, let's name some types of pollutants. Oil, chemicals, fertilizers, silt, sewage, pesticides, insecticides...

Where do you think these pollutants come from?

- They can come from many places, such as construction sites, dairies, farms, factories, trash that has been disposed improperly. It can even come from our own home!

To better understand how pollutants enter groundwater, we are going to experiment by making our own aquifers.

Activity:

*\*For this activity, parental guidance is needed in the construction of the aquifer.\**

*At this time, make sure you have all of your materials laid out in front of you with the exception of the ice cream. This can be kept in the freezer until needed to prevent melting. Please use a spoon to scoop each ingredient as you go.*

The first step is to fill your cup about  $\frac{1}{4}$  of the way with clear soda. This is our groundwater. Tell your child(ren) to keep a close eye on what happens to the "water" throughout the activity.

Now, cover the clear soda about one-third of the way with your gingerbread cookie crumbs. This represents all of the sand, gravel, and rocks in the aquifer. See how the "water" fills in the spaces around the "gravel, sand, and rock." Pay close attention to the line created by the

water. This is called the water table. Have the student watch how the water table may change throughout this activity.

The next layer of our aquifer represents hard surfaces or "rocks". (Gummy Candy). Talk to your student about what happens when you add gummy bears to the aquifer. Because they are heavy, they sink to the bottom and the water table rises.

The next layer of our aquifer is called the confining layer, which is usually clay or dense rock. It is significantly difficult for water to get through this layer, so it helps protect the aquifer from contamination. The water is confined below this layer. Today our confining layer is going to consist of ice cream. Spread a layer of ice cream over the gingerbread cookie crumbs, gummy bears and soda.

Now add another layer of "gravel and sand" (gingerbread cookie crumbs).

(After everyone has assembled their aquifers up to this point, discuss pollution.) If groundwater is polluted, it will no longer be safe to drink. Groundwater that is pumped from aquifers is continuously tested by water suppliers for possible contamination. If unsafe levels of contaminants are detected, wells must be shut down. Treatment of contaminated or polluted water is very costly. Pollution prevention is a better option, environmentally and economically. Drinking water is a limited resource that needs to be protected. Let's see what happens if we add contaminants to our aquifer.

The next layer is our porous, top layer of soil. Porous means it easily absorbs water or easily let's water pass through it. This represents grass, fertilizers and pesticides. Crushed candy canes can be used to represent this layer. If these fertilizers and pesticides make their way down to our groundwater is this good or bad? Bad! Compost and biocontrol are good ways to keep our groundwater clean.

Now, using your straw, drill a well (a well is a pipe in the ground that fills with groundwater) into the center of your aquifer and push it all the way to the bottom of the cup. Slowly begin to pump the well by sucking on the straw, bringing the water to the surface. Watch as the water table goes down. Also, watch and see how the contaminants can get sucked into the well area and end up in the groundwater by eventually leaking through the confining layer.

Heavy rains or melting snow may cause the water table to rise, or heavy pumping of groundwater supplies may cause the water table to fall. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. In other areas, groundwater is polluted by human activities.

Pretend it's raining and recharge/replenish the aquifer by adding more soda. A real aquifer takes a lot longer to recharge; this is just an example to speed up the process and give you a little more soda to drink!

Student(s) may eat the "aquifer" at this time and any cleanup may begin.

**Discussion (after activity):**

Aquifers are very important because they provide clean drinking water! Now that we know how they work, it is important for us to reduce the amount of pollution that could seep into them in order to keep our water safe!

**Next Generation Science Standards\* Connections**

- 3rd Grade**            3-ESS3 Earth and Human Activity
- 4th Grade**            4-ESS2 Earth's Systems  
                             4-ESS3 Earth and Human Activity
- 5th Grade**            5-ESS2 Earth's Systems
- Middle School**    MS-PS3 Energy  
                             MS-LS2 Ecosystems: Interactions, Energy, and Dynamics  
                             MS-ESS2 Earth's Systems  
                             MS-ESS3 Earth and Human Activity

**Common Core State Standards Connections**

- 3rd Grade**            *ELA/Literacy*        W.3.1, W.3.7  
                             *Mathematics*        MP.2, MP.4
- 4th Grade**            *ELA/Literacy*        RI.4.1, RI.4.7, RI.4.9, W.4.7, W.4.8  
                             *Mathematics*        MP.2, MP.4, MP.5, 4.MD.A.1, 4.MD.A.2, 4.OA.A.1
- 5th Grade**            *ELA/Literacy*        RI.5.7, W.5.8, SL.5.5  
                             *Mathematics*        MP.2, MP.4, 5.G.A.2
- Middle School**    *ELA/Literacy*        RST.6-8.1, RST.6-8.3, RST.6-8.7, RST.6-8.8, RST.6-8.9, RI.8.8, WHST.6-8.1, WHST.6-8.2, WHST.6-8.7, WHST.6-8.8, WHST.6-7.9, SL.8.1, SL.8.4, SL.8.5  
                             *Mathematics*        MP.2, MP.4, 6.RP.A.1, 6.RP.A.2, 6.RP.A.3, 6.EE.C.9, 7.RP.A.2, 8.EE.A.1, 8.EE.A.2, 8.F.A.3, 6.SP.B.5, 6.NS.C.5, 6.EE.B.6, 7.EE.B.4

