

LESSON: Edible Aquifer**GRADE: 3****OBJECTIVES:****Science****Earth & Human Activity**

- **3-ESS3-1** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Science as Inquiry-**S.3-5.SI.1 Identify and generate questions that can be answered through scientific investigations.**

- Students ask questions that they can answer with scientific knowledge combined with their own observations.
- Students recognize that different questions lead to different types of investigations.

S.3-5.SI.3 Plan and conduct scientific investigations.

- Students' explanations should reflect the evidence they have obtained in their investigations.

Physical Education

- **P. E. Standard 4-** Exhibits responsible personal and social behavior that respects self and others.

MATERIALS & RESOURCES:

- Images of aquifer (two examples included in this lesson)
- Website: Iowa Public TV Water Quality
http://www.iptv.org/explore/water/uses/use_drinking_water.cfm
- Two clear cups (2 C.) at each workstation
- Drinking straws & measuring cups for each workstation
- Supplies for cleanup
 - Food (represents aquifer)
 - Raisins, or other dried fruit-
¼ cup per student
 - Nuts or carob chips-¼ cup
per student
 - Granola-½ cup per student
 - Yogurt 1/3 cup per student
 - Brown sugar-about ¼ cup
not packed, per student
 - Soda water or ginger ale-
about 1 cup per student
 - Food coloring (yellow may
not show up well)-1 bottle at
each workstation

PRESENTATION:

In Iowa, 80% of our drinking water comes from ground water, including aquifers. This fun and edible lesson gives students a visual idea of the layers of earth and aquifer and how pollution can occur. Explain to students this lesson is designed to elicit questions and ideas on the part of students.

The food listed in Materials & Resources is merely suggested. Use whatever works to represent the elements of an aquifer will work. Please consider food allergies! And, be respectful of food- not everyone has enough to eat. It's disrespectful to waste!

DIRECTIONS:

1. Prepare for experiment by creating a number of workstations. Equip each station with enough materials (listed above) for each student to create an Edible Aquifer. Include supplies for cleanup.
2. As a class view the images of aquifers. If possible view the Iowa Public TV website as listed in resources above. Discussion points include:
 - How and where the water comes from to fill aquifers
 - What are aquifers made of and where are they located
 - Iowa aquifers
 - From where does water pollution come
 - Other topics that are prompted by student's questions
3. Have students divide into small groups.
4. Pollute the some water. Have students pour 1/3 cup of soda water into one of the clear cups. Then add 2-3 drops of food coloring into the 1/3 cup of soda water.
This colored water will represent the pollution.
5. Now create an aquifer: Have students measure 1/4 cup of raisins and 1/4 cup of nuts and pour each into the second clear cup (the one that does not contain soda water).
6. Then add 1/4 cup of granola on top of the raisins and nuts.
The nuts, raisins, and granola represent the gravel, rocks, and sand.
7. Now pour just enough clear soda water onto the raisins, nuts and granola to cover granola. Pour just until soda comes to the top of the granola.
This represents the water in the aquifer.
8. Now add a layer of clay or dense rock on top of the aquifer: Measure 1/3 cup of yogurt. Gently add and spread the yogurt to the top of the aquifer (granola).

9. Now add the topsoil: Students add $\frac{1}{4}$ cup of granola to represent subsoil then on top of the granola, add just enough brown sugar to represent topsoil.
10. Add pollution to the land by pouring the colored water on the soil.
11. Drill a well. Push the straw down to the bottom of the cup. Sometimes, just like in real life, the first attempt is not successful. It is sometimes helpful to *gently*, pull the straw out and re-drill a different well. (This helps the polluted water penetrate the confining layer of clay or rock.)
12. Pump water from the well. Turn on the faucet by *slowly* sucking on the straw, (leave the cup sitting on the table). Look to see what is happening as the water level goes down. Have small groups discuss what is happening- the aquifer level decreases and polluted water is pulled down into the aquifer.
13. Student's aquifers can be replenished by adding more clear soda water. Explain that real aquifers take much longer to replenish. This is important in relation to water conservation.
14. Discussion as a class:
 - What kind of data can be collected from this experiment?
 - Does this experiment answer questions or create questions?
 - Do your questions require a different kind of experiment? Brainstorm other experiments related to water sources, water quality and pollution.
15. What happens to the aquifer if there is a drought? Or a flood? Is there a solution? What do you think would be the best design for a solution?

TIME:**45 min.****PROCESSING THROUGH THE SIX PILLARS****WHAT?**

- What did you learn about aquifers?
- What did you learn about drinking water?
- Where does water pollution come from and how does it reach the water in an aquifer?

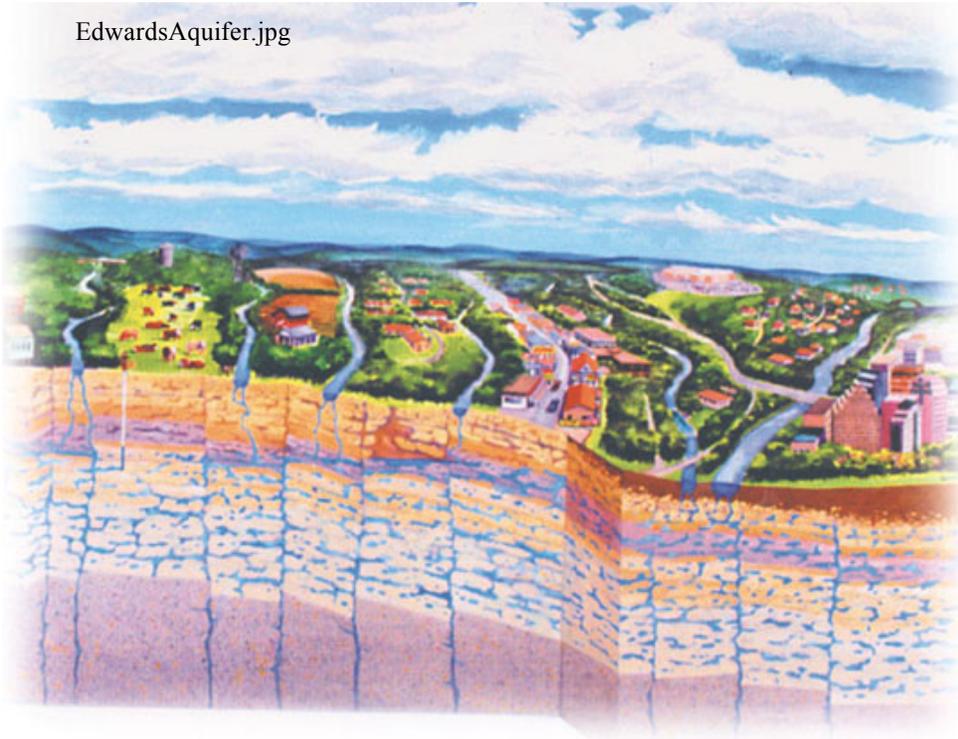
SO WHAT?

- Does your water come from an aquifer?
- Do you know which aquifer? Are there other sources?
- Who is responsible for the quality of our drinking water?
- What other research could you do on this subject

NOW WHAT?

- Is there anything you can do to improve water quality?
- How do you feel about what you have learned?

EdwardsAquifer.jpg



<http://www.rdn.bc.ca/cms.asp?wpID=2415>

