EARTH PARFAIT

STANDARDS

See summary of National Science Education Standards.
Original: http://books.nap.edu/readingroom/books/nses/

Standard Concept	General standard	Specific standard	General standard	Specific standard	General standard	Specific standard
Grade Level		K-4		5-8		9-12
Science as inquiry (A)	Abilities … to do … inquiry	A.1.4.1	Abilities … to do … inquiry	A.1.8.4	Abilities … to do … inquiry	
		A.1.4.2		A.1.8.7		
		A.1.4.4				
		A.1.4.5				
	Understandings about … inquiry	A.2.4.2	Understandings about … inquiry	A.2.8.1	Understandings about … inquiry	
		A.2.4.5		A.2.8.3		
Physical Science (B)	Properties of … materials	B.1.4.3				
Earth Science (D)	Properties of Earth Materials	D.1.4.1	Structure of Earth system	D.1.8.5		
		D.1.4.2		D.1.8.6		
				D.1.8.7		
	Changes in Earth and Sky	D.3.4.1				
Social Perspective (F)			Populations, resources, and environments	F.2.8.2		
	Types of resources	F.3.4.1			Natural Resources	F.3.12.1
		F.3.4.2				F.3.12.2
		F.3.4.3				F.3.12.3
	Changes in Environments	F.4.4.1			Environmental quality	F.4.12.1
		F.4.4.2				F.4.12.2

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Grade Level		K-4		5-8		9-12
Social Perspective (F)		F.4.4.3				F.4.12.3
	Science and technology in local challenges	F.5.4.2				

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INTRODUCTION

An aquifer is any rock or sediment with spaces that hold water, and through which significant quantities of water move. The water contained in these underground spaces is called ground water. Ground water is withdrawn from wells to provide water for everything from drinking water for the home and business, to water to irrigate crops, to industrial processing water. Examples of aquifers include: sand and gravel layers; fracture systems in brittle rocks; and fracture systems or solution cavities in easily dissolved rocks, such as limestone. Aquifers have connected pores or open fractures through which fluid may flow. Because the water is underground, it is less accessible for contamination than is surface water; however, this water is usually less frequently renewed than surface water, so any pollution can persist for a longer time. This activity has students build models of an aquifer so they can see how the water is withdrawn from the aquifer and how it can become contaminated.

PURPOSE

To provide a model for students to make observations about the geologic formations in an aquifer, to investigate ways pollution can get into groundwater, and ways pumping can cause a decline in the water table and increase subsidence, sinking of the land surface.

MATERIALS

- Blue or red food coloring
- Vanilla ice cream
- Clear soda pop
- Small gummy bears
- Mini chocolate chips
- Crushed ice
- Crushed cookies or graham crackers
- A variety of colored cake decorations, sprinkles, and sugars
- Drinking straws
- Clear plastic cups (12 oz)
- Spoons

PROCEDURE (Student instructions)

1) Review "What is groundwater?" (http://www.groundwater.org/gi/whatisgw.html) and vocabulary terms in the groundwater glossary (http://www.groundwater.org/kc/kidsvocab.html).
2) Begin to construct your edible aquifer by filling a clear plastic cup 1/3 full with gummy bears, chocolate chips, or crushed ice (represents gravels and soils)
3) Add enough soda to just cover the candy/ice. The soda represents the ground water in the aquifer.
4) Add a layer of ice cream to serve as a "confining layer" over the water-filled aquifer. Pack it pretty tightly to make that confining layer. In nature, the confining layer is made of impermeable materials such as clay or caliche that impede the movement of water into and out of the aquifer.
5) Then add more crushed ice on top of the "confining layer."

6) Colored sugars and sprinkles, or mini chocolate chips, or crushed graham crackers represent thick soil layers. A thin layer can be represented merely by the colored sugars and sprinkles are sprinkled over the top. Both types of soil layers create the porous top layer.
7) Now add the food coloring to the soda. The food coloring represents contamination. Watch what happens when it is poured on the top of the "aquifer." Consider that the same thing happens when contaminants are spilled on the earth's surface.
8) Using a drinking straw, drill a well into the center of your aquifer.
9) Slowly begin to pump the well by sucking on the straw. Watch the decline in the water table, and possibly the subsidence of the top of the parfait.
10) Notice how the contaminants can get sucked into the well area and end up in the groundwater by leaking through the confining layer.
11) Now recharge your aquifer by carefully adding more soda, which represents a rain shower.
12) Review what you have learned as you enjoy eating your edible aquifer.

EVALUATION

1) How is the model similar to a real aquifer? (Refer to The Ground Water Foundation's web page, http://www.groundwater.org/gi/whatisgw.html, for more information)
2) How is the model different from a real aquifer? Consider both the physical and temporal (time) settings. That is, for example, are the sugar sprinkles a good model for soil? Or, for example, is the time it took for the colored soda to reach the model aquifer the same as the time for a real aquifer?
3) How does adding more soda represent rain?
   a) Compare a gentle rain to a real downpour.
2) How might differences between the model and the real aquifer affect the way a real aquifer acts?
3) Are there differences between real aquifers in different areas?
4) How might the differences in aquifers affect ways in which they might be used?