

# AWESOME AQUIFERS

A program by Oklahoma 4-H Youth Development & Oklahoma Water Resources Center

**SKILL: SCIENCE    TIME: 20 MIN**

## OBJECTIVES:

- Students will understand the concept of an aquifer.
- Students will create an edible aquifer to understand how wells effect groundwater.

## LESSON ACTIVITY:

### *What is an aquifer?*

An **aquifer** is an underground layer of rock and soil that holds the water that we call **groundwater**. 97% of the world's supply of fresh water is retained in these water-bearing formations.

### *How does water get into the aquifer?*

**Precipitation**, in the form of rain, snow, hail or sleet, falls from the sky and lands on the earth's surface. Some of the water runs off into rivers, lakes, and other bodies of water, but some of the precipitation filters down through soil which consists of both solid particles and openings or voids, like a sponge. An aquifer is an area underneath the ground where the openings in the soil are filled with water. Some aquifers are similar to underground caves where the openings are formed in limestone or other rocks. These surfaces are called **impermeable** because water doesn't go through them. Water will eventually seep down through the soil and through cracks in the ground because of gravity, the same thing that keeps us from floating into space. Over time, this water collects underground in either small soil openings or caves and stays their until someone pumps it out or it comes out through rivers and springs!

## VOCABULARY

- Aquifer
- Groundwater
- Precipitation
- Impermeable
- Water Table
- Recharge Rates

## MATERIALS

Visual of an aquifer that illustrates the layers of soil, rock, etc. The groundwater model could be used, or a poster could be created using the graphic provided. Enlarged map of the Principal Aquifers in Oklahoma (page 5)

## EDIBLE AQUIFERS INGREDIENTS

- 8 oz. clear plastic cups
- Drinking straws
- Ice
- Vanilla ice cream
- Green-tinted coconut
- Lemon lime soda
- Chocolate syrup
- Multi-colored candy sprinkles
- Trash can

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## ***How do we get water out of the aquifer?***

The upper level of an aquifer is called a **water table**. The level of the water table can go up and down depending upon seasonal changes, precipitation levels, and the amount of water extracted from the aquifer.

Water is pumped out of the aquifer with a well for us to use for home, business, industry, agriculture, etc. The groundwater levels can also be reduced by seeping into rivers and lakes.

The water table in many aquifers are going down rapidly because the amount taken out is more than the **recharge rates** or the precipitation we get.

## ***How many aquifers do you think there are in Oklahoma?***

There are seven (7) principal aquifers in Oklahoma (refer to the map on page 5 of lesson).

1. Ada-Vamoosa Aquifer
  2. Arbuckle-Simpson Aquifer
  3. Central Oklahoma Aquifer
  4. Edwards-Trinity Aquifer System
  5. High Plains Aquifer
  6. Ozark Plateaus Aquifer System
  7. Rush Springs Aquifer
- These are the aquifers that provide most of the water for Oklahoma. Some cities get their water from other places like a nearby lake.
  - The largest aquifer in Oklahoma is the High Plains Aquifer in the panhandle. This aquifer reaches into Nebraska, Wyoming, Colorado, Kansas, New Mexico and Texas. It is also called the Ogallala Aquifer.
  - It is estimated that the Ogallala aquifer is the largest and is more than 2 million years old. It holds about 650 trillion gallons of water.
  - Oklahoma also has many shallow aquifers next to many of our rivers in the state.

## ***Do you know where your water comes from?***

*Instructor: Find out the source of where water comes from in the area where students live.*

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## **Activity: Building an Edible Aquifer**

**Note:** To have enough time, assemble edible aquifers before or during the instructor sharing the lesson. You can demonstrate how the edible aquifer is put together in front of the class. Hand out the edible aquifers after demonstrating how they are put together and allow them to “drink and eat” their aquifer. Have a trash can by the door so that they can throw their cup away as they rotate to the next station.

1. We are now going to build an edible aquifer. Let me demonstrate how the edible aquifer is made. Let's start with a plastic cup. What does this represent? (aquifer)
2. Now we will add a layer of crushed ice. What does the ice represent? (rocks)
3. Next, we will add a layer of ice cream over our rocks. What does the ice cream represent? (soil)
4. We will now sprinkle green-dyed coconut over the ice cream. What does the coconut represent? (grass and other plants)
5. Next we will pour lemon-lime soda, which will flow through the soil and rocks in our aquifer. What does the soda represent? (groundwater)
6. Now we have an aquifer and groundwater: the bottom of the cup is the layer of rock that keeps the water from seeping down any further, and the top of the water is the water table.
7. To get water out of the aquifer, you will “drill a well” by adding a straw.
8. How do you get the water out of the aquifer? (Pump water with a well — sipping some water through your straw)
9. Did the water level go down?
10. What do we need to do to bring the water table back up? (add more water)
11. We will now squeeze some chocolate syrup and colored sprinkles over your aquifer. What do these represent? (oil, pesticides, etc.)
12. Unfortunately, groundwater can become contaminated by improper use or disposal of harmful chemicals such as lawn care products, trash, gasoline, and many other products when they are not handled properly.



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## ***Let's Clean Up and Review***

- What were the parts of our edible aquifer and what did each part represent?
  - Plastic cup = aquifer
  - Ice = rocks
  - Ice cream = soil
  - Coconut = grass/plants
  - Soda = groundwater
- How is water added to and taken out of an aquifer?

Water is taken out by pumping the water out with a well. Water is added from the land. The Earth's surface is permeable, which means that it takes in water in like a sponge. Water gets into an aquifer through precipitation falling onto the Earth's surface and then it soaks into the ground and flows down into the aquifer.
- How can aquifers become contaminated?

Improper use or disposal of chemicals, trash, gasoline, etc.
- How can we better protect our drinking water?
  - Throw trash away in a trashcan
  - Conserve water
  - Plant trees and plants along streams or lakes
  - Recycle

## ***Oklahoma Aqua Times Related Lessons:***

- The Water Table
- Wells and the Water Table
- Groundwater Activity

Lessons can be found at: <https://4h.okstate.edu/projects/science-and-technology/oklahoma-aqua-times/index.html>



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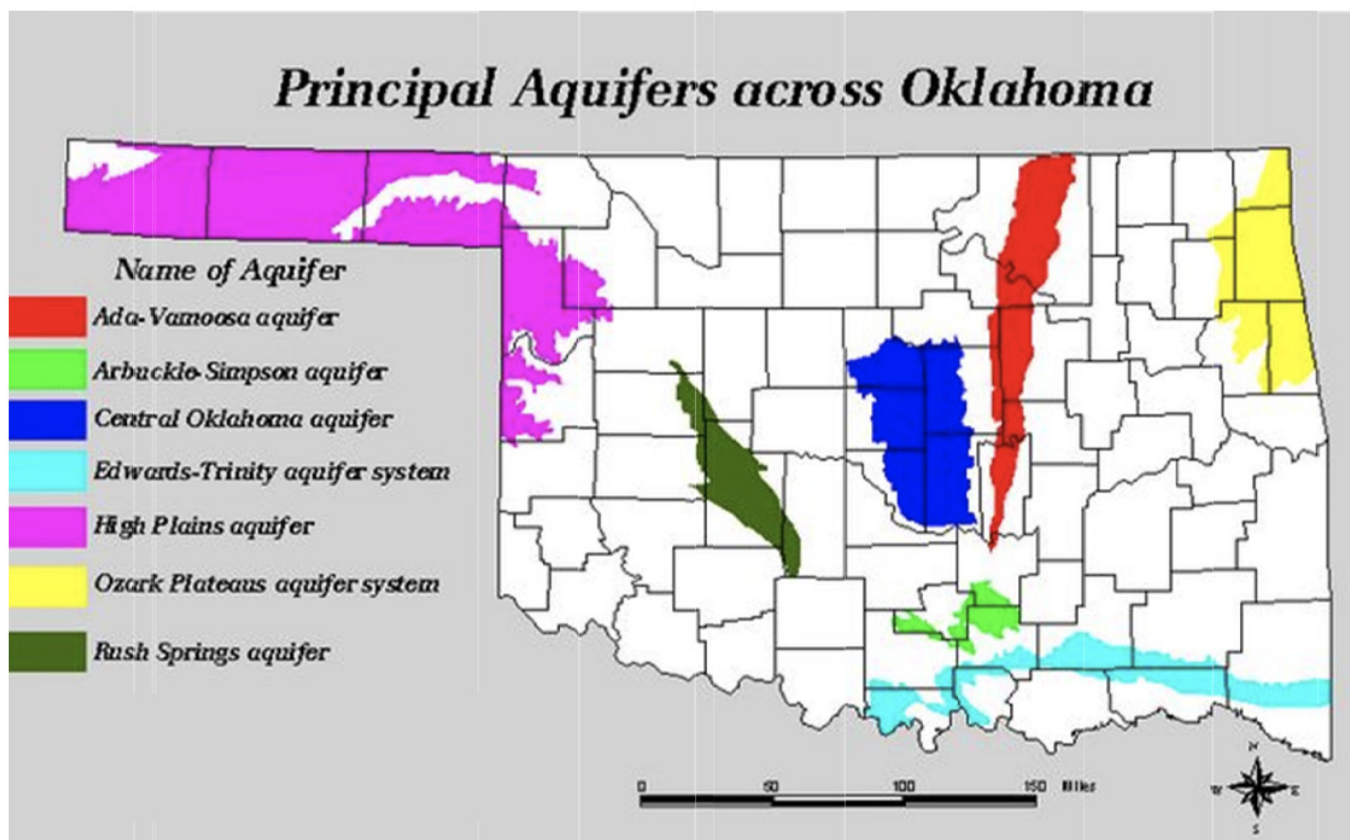
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## PASS Standards

Grade Level	Standard	Science & Engineering Practices	Cross Cutting Concepts
4th	<b>4.ESS2.2:</b> Analyze and interpret data from maps to describe patterns of Earth's features.	Analyzing and Interpreting Data	Patterns
4th	<b>4.ESS3.2:</b> Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Designing Solutions	Cause & Effect
5th	<b>5.ESS2.1:</b> Develop a model to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	Developing and Using Models	System and System Models
6th	<b>6.ESS2.1:</b> Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.	Developing and Using Models	Stability and Change
7th	<b>7.ESS3.1:</b> Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	Constructing Explanations	Cause and Effect

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