

EDIBLE AQUIFER

- I. Objectives
 - a. Students will recognize the importance of ground water: Ogallala Aquifer.
 - b. Students will learn the value of ground water in relation to area farmers and municipalities.
 - c. Students will create an edible model of the aquifer.

- II. Materials
 - a. Ice, blue food coloring, ginger ale (one bottle per class), orange sherbet (one tub per class), sprinkles (red, green, one container of each per class), cocoa pebbles crumbled, straws, cups (one per student), spoons (for educators to disperse food items)
 - b. Ogallala Aquifer handout

- III. Introduction
 - a. As I get started today, I have a couple of important questions to ask you...
What do we need in order to live? (Food, air, land, shelter, water)
Which one of the things listed is the most important? (Water)
 - b. Did you know there are two kinds of water?
Groundwater – water under the ground
Surface water – water on the surface of the earth
 - c. Does Lubbock have a lot of water?
Lubbock receives between 15 to 20 inches of rain annually
Lubbock actually does have an abundant supply of water
It is not from lakes, rain, or rivers.
Lubbock has the largest aquifer in the world!!!!
 - d. Today we will be talking about groundwater, but more importantly the Ogallala Aquifer.

- IV. What is an aquifer?
 - a. An aquifer is a large underground reservoir, or body of water. There are many different aquifers in the world. For example the Ogallala and Edwards aquifer just to name a few. Aquifers can be just a few feet under the soil or can be as deep as 1,300 feet.

- V. The Ogallala Aquifer
 - a. Was created millions of years ago as rain and snowmelt ran down the Rocky Mountains carrying water and sediment. As the layers of sediment began to be deposited the water would pass through the sediment layers until it hit a layer of impermeable rock. Over time more sediment layers and another impermeable layer covered the water, thus preventing the water from escaping. There it sat waiting discovery for millions of years.
 - b. I have already told you that the Ogallala is the biggest aquifer in the world.
 - i. But, how big is it? It covers around 225,000 square miles under the Earth's surface.
 - ii. That is 8 states: Texas, New Mexico, Oklahoma, Kansas, Colorado, Nebraska, Wyoming, and South Dakota!!!!!!!
 - c. PASS OUT MAP OF THE AQUIFER
 - d. How much water is that? The Ogallala can hold up to one quadrillion gallons of water!!! That is 1,000,000,000,000,000!!!!!!! (Fifteen zeros)

e. What do we use the aquifer for?

i. Aquifers hold 30% of the world's fresh water supply.

We use the groundwater/aquifer as part of our drinking water. In 2005 the citizens of Lubbock used 13 billion gallons of water. 75% of our water comes from the Ogallala Aquifer (9,750,000,000 gallons from aquifer), the remaining 25% from Lake Meredith.

(This changes from time to time and due to the low levels of Lake Meredith at this time, it is about 25% Meredith and 75% Ogallala, but obviously this can change)

ii. The biggest consumer/users of the Ogallala are farmers. Farmers are constantly irrigating their crops from the aquifer. (545 gallons per acre) The Ogallala supplies water to 25% of the United State's irrigated land. The first recorded well for irrigation purposes was dug in 1911. Currently there are 170,000 wells pumping from the Ogallala, 50,000 in Northwest Texas alone.

iii. 1/3 of the world's grain exports come from the Great Plains Region or the Breadbasket of the World)

iv. Each year farming draws 1 ½ feet of water from the aquifer – Nature can only put back ½ inch in rainfall.

v. We must also include people who live outside of a municipality and use the aquifer as their drinking water.

vi. Is well water, water out of the ground/aquifer clean and safe to drink without being treated??? (Yes and No - Contamination)

VI. What about the future?

a. Problems

i. The aquifer is a finite global resource. The aquifer will not last forever, we don't know how long it will last but when it's gone it's gone.

1. The aquifer is being depleted more each year. The average decline of the aquifer was (.78 ft – 2001) and (1.06 ft – 2002) per year and (1.5 ft -2005)

2. I would also like to point out that the 5 and 10-year average volume also decreased.

3. Drilling for oil. We drill for ground water much like drilling for oil. We hear about gas prices going up and we know one day, we will run out all together, however today we are working on alternatives to oil. (Ethanol powered cars, solar power, etc) IS

THERE A SUBSTITUTE FOR WATER? NO

b. Contamination

i. When people don't dispose of materials correctly it can seep down into the aquifer. Products such as gasoline, motor oil, and antifreeze just to name a few are possible contaminants. It is against the law to dump these products onto the soil.

If we contaminate the aquifer can we use it? What would we use then?

VII. Lab

What we are going to do now is make a model of the aquifer.

The layers are: (These are in order of how they go into the cup)

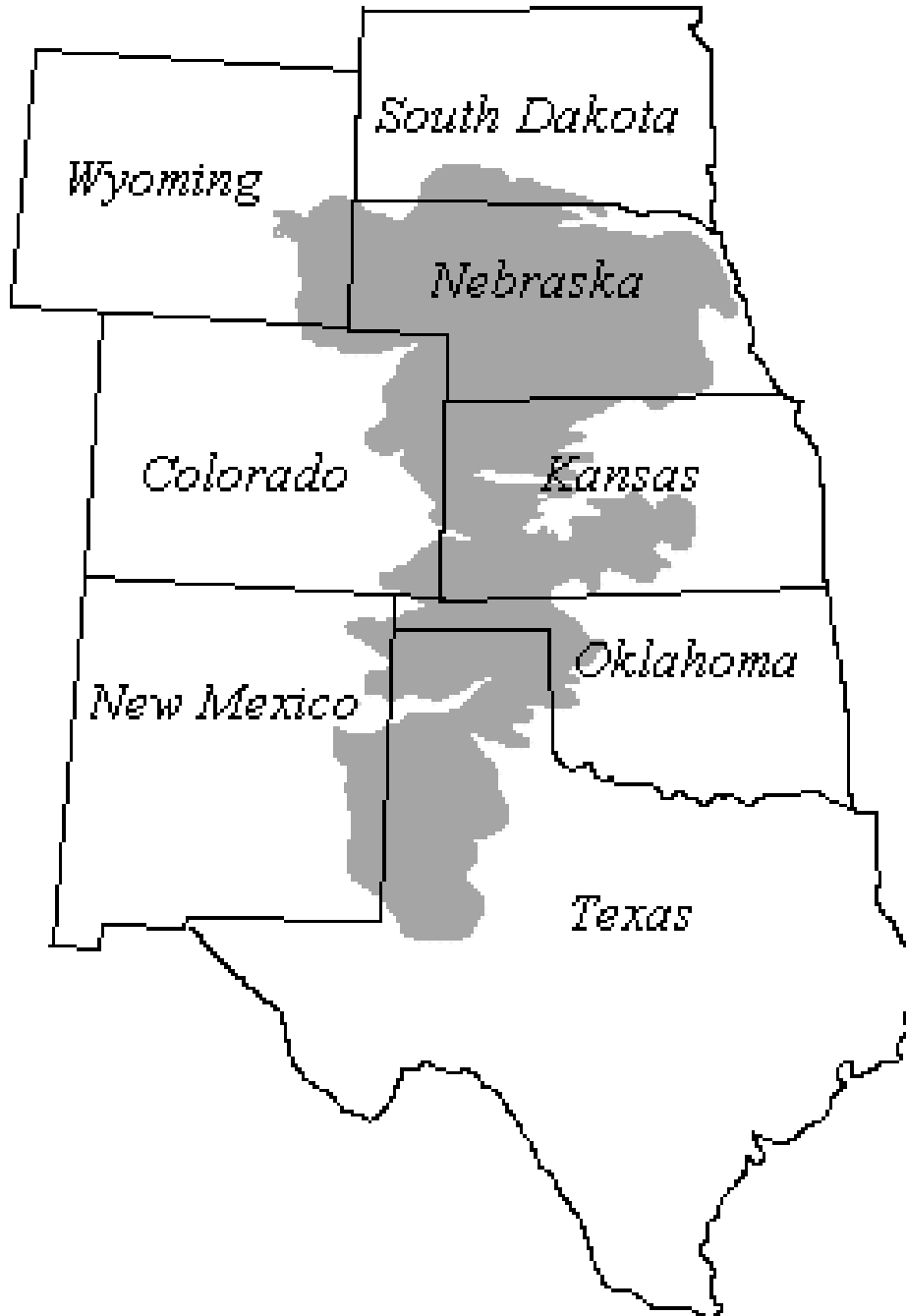
1. Ice – represents the rock layer the water is trapped in
2. Food coloring/Ginger Ale – represents the water
3. Sherbet – represents the clay layer found in the soil
4. Crumbs (crumbled cocoa puffs) – represent the dirt layer closer to the surface
5. Red sprinkles – represents contamination
6. Green sprinkles – represents grass on surface of the soil
7. Straws – represent the pipes used to pump the water
8. Pump - your mouths!

VIII. Conclusion

- a. The aquifer won't last forever so we should only use what we need.
(Reduce, reuse, and be wise)
 - b. Give a hoot and don't pollute.
- Water is a very precious resource. When it's gone it's gone!!!



OGALLALA AQUIFER



SOURCE: <http://www.npwd.org/Ogallala.htm>

Ogallala Quiz

1. The Ogallala Aquifer is the largest aquifer in the world.
 - a. True
 - b. False
2. The Ogallala can hold up to _____ gallons of water.
 - a. 1,000,000
 - b. 100,000
 - c. 100
 - d. 1,000,000,000,000,000
3. The Ogallala Aquifer is a finite global resource.
 - a. True
 - b. False
4. The Ogallala Aquifer was formed millions of years ago as rain and snowmelt ran down the _____.
 - a. Hill
 - b. Rocky Mountains
 - c. The Alps
 - d. Canadian River
5. The biggest consumers/users of the Ogallala are _____.
 - a. Cities
 - b. Animals
 - c. Farmers
 - d. Playa lakes
6. The Ogallala Aquifer will last forever.
 - a. True
 - b. False
7. The water in the Aquifer is _____.
 - a. Groundwater
 - b. Surface Water
8. How many wells are currently pumping water from the Ogallala?
 - a. 5
 - b. 100
 - c. 0
 - d. 170,000
9. Contamination/ Pollution can not get into the Ogallala Aquifer.
 - a. True
 - b. False
10. What can we do to help conserve the water in the Ogallala Aquifer?
 - a. Give a hoot and don't pollute
 - b. Conserve water at home
 - c. Take care of playa lakes
 - d. ALL OF THE ABOVE

Name: _____

School: _____

Draw the Ogallala!

Draw a picture of the layers of the Ogallala Aquifer. Include each one of these elements: Pump, Water, Dirt, Clay Soil, Pipes, Grass, Impermeable Rock, and Contamination. Be sure and put the layers in the proper order and use a different color for each layer.

Interesting Statistics of the Ogallala Aquifer and High Plains Region

1. It is the largest groundwater system in North America.²
2. Its 3.3 billion acre feet* of fresh water would fill Lake Huron with enough water remaining to fill one-fifth of Lake Ontario.¹
3. If pumped out over the United States, the aquifer would cover all 50 states with one and ½ feet of water.¹
4. If completely drained, it would take more than 6,000 years to refill.²
5. Over 170,000 wells pump from the aquifer, one for every square mile.¹
6. Over 50,000 of these wells are in Northwest Texas.²
7. More than 90% of the water pumped is used to irrigate crops, and withdrawals equal 30% of the total groundwater used for irrigation in the U.S.²
8. From 1940's to 1980, the aquifer's average water level declined nearly 10 ft. a year.²
9. The aquifer is directly responsible for \$20 billion a year in food and fiber production.²
10. Texas can produce 2 million more bales of cotton a year because of the aquifer.²
11. The Texas High Plains accounts for 34% of the state's total cropland and 69% of the total irrigated cropland.³
12. Cotton, wheat, and grain sorghum are the most significant Texas crops grown in the region.³
13. The aquifer covers 35,000 square miles in Texas (11% of state's lands).³
14. Mean precipitation range of 14-22 inches for Texas High Plains.³
15. Average saturated thickness in the Texas region of 112 ft with a range of 3-500 ft.³

* An acre foot of groundwater is enough to cover an acre of land with one foot of water (~326,000 gallons).¹

¹ EPA Journal (Lewis)

² National Geographic (Zwingle)

³ Groundwater Exploitation in the High Plains (Urban)

SOURCE

<http://www.ce.utexas.edu/prof/maidment/grad/romanek/wtrproject/stats.htm>