

ABCWUA Water Resource Education Activity

Activity Title:	Conservation Connections
Description	<p>What do a farmer, a bear, a school and evaporation all have in common? Grade K-6 students create and manage their own mini-watershed and witness what happens to an important resource –water -- as the community grows. The urgency and complexity of conservation issues will become more apparent as students experience the growing demand and interdependency among water users and the dilemma of a decreasing water supply.</p>
Objectives	<p>Students will:</p> <ul style="list-style-type: none"> • Identify local sources of water and local climate and how it affects our water supply. • Become aware of the different water consumers in a community. • Illustrate the interconnectedness of water users in a community. • Determine how water conservation and protection, using recycled water and finding new sources of water can help save our drinking water supply. • Identify water conservation habits that they can change or adopt.
Grade Level	K-6 th
Materials Needed	<p><u>For K-3 and Grades 4-6 Activities:</u></p> <ul style="list-style-type: none"> • 5 clear boxes (or one per class table), 24 qt. size (“sweater” box size - no lids) • Gravel and sand • Water, 300 ml + • 5 or more pumps, such as hand soap or lotion pumps (cut out small piece of nylon and attach with rubber band to end of pump- this is a filter that keeps sand and gravel out of pump) • 1 dry erase marker or tape • 5 or more droppers • Role card pictures attached to popsicle sticks • <i>(For K-3 Activity Only)</i> K-3 role cards (1 per student), attached • <i>(For Grades 4-6 Activity Only)</i> Grades 4-6 water consumer playing cards (10+ per table), attached
Background Info	<p>Because our water easily flows from faucets, pours out of hoses and gushes back with each toilet flush, it is easy to take our water supply for granted. Due to these conveniences, it is common thought that our water supply is plentiful, perhaps even endless.</p> <p>Up to now, 100% of our drinking water has come from an aquifer that is deep underground, and the water is brought to the surface through a system of over 90 groundwater wells. The problem is that we have been pumping it out faster than it’s being replenished naturally. In our area, it takes a long</p>

	<p>time for rain and river water to seep down and replenish the aquifer. To make matters more difficult, we live in a high desert ecosystem where droughts are common, everyone wants and needs water, and the population keeps growing.</p> <p>By Fall 2008, the Albuquerque area will begin to use surface water (the Rio Grande) to reduce our aquifer pumping so the aquifer can begin to recover on its own. The aquifer will remain an important reserve to draw on during drought. Most students do not realize where their drinking water comes from, what an aquifer is or the connection between surface water and groundwater.</p> <p>This activity helps students understand that each community has numerous water consumers that include residents, businesses, plants and wildlife, and recreational facilities. As communities grow and develop, more consumers are added; thus, the demand for water increases. As society grows, we are faced with a fragile balance of supply versus demand as the water table decreases with each pump.</p> <p>Students are encouraged to brainstorm ideas on how to maintain a healthy water table level. Such ideas might include: conservation and protection of current water sources possible new supply sources of water.</p> <p><u>Vocabulary:</u> Aquifer- an underground bed of saturated soil or rock that yields significant quantities of water Ground Water- water found in spaces between soil particles underground. Surface Water- water above the surface of the land, including lakes, rivers, ponds, floodwater and runoff. Precipitation- water falling, in a liquid or solid state, from the atmosphere to the earth. Evaporation- the conversion of a liquid to a vapor usually through the application of heat energy. Conservation-the use of water-saving methods to reduce the amount of water needed for homes, lawns, farming, and industry, and thus increasing water supplies for optimum long-term economic and social benefits. Water Table- the top of an unconfined aquifer; indicates the level below which soil and rock are saturated with water. Well- a drilled hole in the ground that is produced in order to tap into the aquifer with the purpose of pumping out water for various uses. Depths and rock types penetrated vary depending on the aquifer and the geographical area.</p>
Procedure	<p><u>Procedures K-3:</u></p> <ol style="list-style-type: none"> 1. Introduce vocabulary words. Introduce or review meanings of some of the more advanced terms such as aquifer, ground water, surface water, etc (see above list).

2. Discuss our area (we live in a desert), where our drinking water comes from, what and where the aquifer is and how we get water out of the ground, etc (see background information).
3. Place one clear box on each table.
4. Place gravel and sand on each table.
5. Have students create a valley in the middle of each box with the gravel and sand substrate. Leave at least 1.5"-2" of gravel in the valley.
6. Slowly pour 300 ml of water over all parts of the substrate.
7. Have students pay attention to where the water collects. Is water only found in the valley? Explain that the water that comes out of the ground is called groundwater. The large groundwater area is called an aquifer. The water that is found above the ground is called surface water. What kind of water is on the surface? (Rivers, lakes, ponds, streams.)
8. Explain that a water table is the top of the water surface of the aquifer. Have them mark the water table with the marker or tape.
9. **INTRODUCE THE WATER CONSUMER ROLE CARDS.** Hold up each consumer role card (i.e. farmer card, rancher card, evaporation, etc.) and ask what are the different water needs and wants of each consumer (i.e. recreation- swimming pools, parks for sports; settlers- showers, washing dishes, drinking, etc.). Emphasize that each consumer uses a different amount of water- some use more than others- and that the amount that they receive is specified on the role card.
10. Pass out the role cards. One card per student.
11. **INTRODUCE STORY.** Explain that each student has a role in this story as a water user. **NOTE:** It may be easier to first summarize entire story for students then let them know that they are going to re-enact this story with their own models. *Pay close attention so that you know what to do!*

Long ago there was a river called the Rio Grande. It flowed through a valley that was surrounded by a desert. Some wildlife lived near the river and drank from it everyday.

Have wildlife come and take out water using a dropper (1 dropper each). Point out that wildlife have minimal impact on the water table.

The Rio Grande River flowed through a desert. The hot summers caused the water table to decrease due to evaporation.

Have weather come and take out a dropper of water.

Some years later, people began to move in the area. With people, came plants that were not native to the desert. These non-desert plants use more water than plants that naturally grow in the desert.

Have plants come and take out a dropper of water.

And every year, due to the hot desert weather, water is lost to evaporation.

Have weather come and take out a dropper of water.

The people moving into the area around the Rio Grande River called it Albuquerque. With more and more people (settlers) moving into the area, some had to build houses away from the river. So, in order to get water, people began to dig wells in the ground to get water out of the aquifer.

(What is water called that comes out of the ground?)

Insert pump into hillside. May use more than one pump.

Like you, these people needed water to drink, wash clothes, water their plants. Some people built farms and ranches and had to use water to water their crops and animals.

Have settler come and take out _____ pumps of water each.

Have farmers, ranchers, cattle, etc. come and pump _____ pumps of water each.

Sometimes the desert got more rain than the yearly average of 9 inches. When it rains, or snows during the winter, it puts water back into the aquifer and river.

Have weather come and put a few droppers of water into river and hillside.

Everyone used as much water as he or she wanted, without thinking about other people's needs. The people thought that there would be plenty of water because even though they took water out of the aquifer (ground), the rain would eventually bring the level of the water back up.

People kept moving into Albuquerque and the area surrounding it; more and more large farms and factories were built, as well as schools and stores.

Have farmers, factories, schools, stores come and take out _____ pumps of water each. Keep pumping until the basin is almost empty.

After several years, people noticed that, despite the rain, the level of the river was going down.

Have the students re-mark the water table level.

DISCUSSION

How would the water shortage affect people in the story?

What changes could be made to keep more water in the aquifer?

Help the students understand the needs and interdependencies of the different water users in the story (e.g. the farmer needs a lot of water to water crops, water is used by factories to manufacture things like cars and dishwashers).

Explain the problem of water use in our city.

Not long ago, the people that live in our city and county were using 250 gallons per day per person. We were the biggest water wasters in the southwest. Some smart people who worked for the city looked at the amount of water we were using and looked at the water level in the aquifer and realized that our water is not unlimited and if we don't figure out how to use less, one day we are going to run out of water. So, they came up with a

program to conserve water.

So where does our drinking water come from? Right now, the water that comes out of our faucet comes from the aquifer. (*What do we call water that comes from the aquifer? What is water that comes from rivers, lakes and streams called?*) We only drink groundwater. This water does not need to be cleaned extensively because of the natural filter that the sand and gravel and clay in the ground provide. If we keep pumping more water out of our aquifer than water that is put back, we will have a BIG problem. The smart people at the city county water utility decided that we needed to find another source of water so that we would not be so dependent on the aquifer.

Drinking Water Plant

A long time ago, we purchased rights to use water from the San Juan River in Colorado. This water travels from the San Juan to the Chama River. The Chama River empties into the Rio Grande River. We are not able to take as much water as we want out of the Rio Grande because we only own the right to use a little of the Rio Grande water. We also have never used the water from the river in our homes. The county water utility has been planning and building a way to bring the water from the San Juan and Chama Rivers to our homes. Right now people are working to build a water treatment plant that will clean this water and pump it into the pipes that lead to the faucets in your homes. This drinking water plant will be finished next year. SO, next year the water that comes out of your faucet will not be just groundwater. It will also be surface water because it came from the Rio Grande River and not just the aquifer (the ground). By using this surface water, along with decreasing the amount of water that we use everyday, our aquifer will last a long, long time.

Conservation

Since the beginning of our water conservation program, we have decreased our water use from 250 gallons per person/per day to 165 gallons per person/per day (100 gal per person/per day). We hope to decrease our use even more to 148 gallons per person/per day (90 gallons per person/per day) in the next 13 to 18 years.

What are some ways that we can conserve water?

Urge my parents to fix leaky or water wasting faucets, toilets, shower heads and lawn sprinklers.

Turn off the faucet while brushing your teeth

Take shorter showers

Procedures For Grades 4-6 Activity:

1. Place one clear box on each table.
2. Place gravel and sand on each table.
3. Pass out game cards to each station.

	<ol style="list-style-type: none"> 4. Have students create a valley in the middle of each box with the gravel and sand substrate. Leave at least 1.5"-2" of gravel in the valley. 5. Slowly pour 300 ml of water over all parts of the substrate. 6. Have students pay attention to where the water collects. Is water only found in the valley? Explain that the water that comes out of the ground is called groundwater. The large groundwater area is called an aquifer. The water that is found above the ground is called surface water. What kind of water is on the surface? (Rivers, lakes, ponds, streams.) 7. Explain that a water table is the top of the water surface of the aquifer. Have them mark the water table with the marker or tape. 8. Instruct students to take turns reading a card and following instructions on each card drawn (as in a board game). <p>Each station should be supplied with their own set of game cards. The next 15-20 minutes is a self-guided activity that allows each station to track water consumption as a community grows and develops.</p> <p>When all stations have completed all game cards, continue with the DISCUSSION section as previously outlined in the Procedures for K-3, above.</p>
<p>Evaluation/Extension</p>	<p>Continued Discussion/Activities:</p> <ol style="list-style-type: none"> 1. Discuss the different wants and needs of the different water consumers. Are they justified in their wants/needs? How can consumers work together to ensure that the water supply is not depleted? Have students “plead their case” as specific consumers and justify their specific water needs and wants. 2. Discuss and demonstrate the potential hazard of water pollution from the developing community and various consumers. What happens when a pollutant is introduced into the aquifer? Who is affected? How is it prevented? Sprinkle Kool-Aid on a section of the landscape and simulate rain pouring over it. Observe the “pollutant” and its path of contamination. Introduce terms such as point-source pollution (pollutants discharged from any identifiable source, including ditches, channels, sewers, etc.) and nonpoint source pollution (wide-spread overland runoff containing pollutants; the contamination does not originate from one specific location, and pollution discharges over a wide land area). 3. How can you conserve and protect water in your own homes? Take inventory of things that you and your family can do (e.g. fixing a leaking faucet, xeriscape the yard, install low-flow shower heads and toilets, avoid pouring toxic substances in yard or down drains, clean up animal waste, etc.). Work together with your family to decrease your water use and protect the aquifer.

Water Consumer Roles

Role	# of pumps**	ml water per student	Total ml per role
Wildlife (2-3)	1 dropper each	1 ml	2-3 ml
Plants (2-3)	1 dropper each	1 ml	2-3 ml
Settlers/Residents (4-6)	2 pumps each	4 ml	16-24 ml
Farmers/Ranchers (4-6)	4 pumps each	8 ml	32-48 ml
Factories (4-6)	3 pumps each	6 ml	24-36 ml
Schools (4-6)	3 pumps	6 ml	24-36 ml
TOTAL WATER PUMPED			100-151 ml

Role (Weather)	# of pumps	ml water per student	Total ml per role
Evaporation (2)	2 dropper	2 ml	4-6 ml
Precipitation (2)	<u>ADD</u> 1 dropper	1 ml	4-6 ml
TOTAL WATER			8-12 ml

****NOTE: AMOUNT OF WATER PER PUMP WILL VARY WITH DIFFERENT SIZE/TYPE OF PUMP- ALTER NUMBERS AS NEEDED****