

LESSON 1: WATER HISTORY AND SUPPLY: *TUCSON'S WATER STORY*

Lesson Overview

Students participate in an activity that demonstrates where our water comes from and how we use it. While referring to a large container representing Tucson's water supply, students read a script that tells Tucson's water history. As students read their assigned roles, they remove or add representative amounts of water from the container. By the end of the story, the water supply has clearly decreased. Finally, the students write the next chapter in Tucson's Water Story on the enclosed "Every Drop Counts" paper drops.

IMPORTANT: Please bring the student-made paper drops to the on-site presentation.

Arizona Department of Education Academic Standards

Please refer to the Arizona Department of Education Academic Standards section for the ADE standards addressed by this lesson.

Learning Outcomes

Students will be able to:

- Define and use the terms aquifer, groundwater, reclaimed water, and recharge.
- List Tucson's current water sources.
- Describe how water has historically been used in the Tucson area.
- Explain ways that Tucson is assuring water availability for the future.

Materials

- two one-gallon (3.79 l) containers:
 - one wide-mouthed, clear, empty jar, labeled "Tucson's Water Supply"
(Students will need to be able to dip a ladle into the container. A cookie container or a fish bowl works well. The students need to be able to see the water level from the outside.)
 - one full gallon (3.79 l) of water, labeled "Aquifer"
(This one may be any kind of one-gallon (3.79 l) container such as a bucket.)
- one cup (250 ml) liquid measuring container
- half a cup (125 ml) liquid measuring container
- one tablespoon (5 ml) measuring spoon
- ladle or other dipping device (the measuring cups could also be used for this)
- Tucson's Water Sources labels (provided)
- Tucson's Water Story script (provided)
- "Every Drop Counts" drops (photocopied for each student)

Advance Preparation

- Obtain all jars, containers, and measuring devices (refer to materials list). Before class, place materials on a table where all the students can see them.
- Cut out the water supply labels and affix to appropriate containers.
- Fill the "Aquifer" container with water.
- Photocopy Tucson's Water Story and cut out as indicated on dotted lines. The script calls for eight students to read plus a narrator (played by the teacher). Have the master copy available for your reference.
- Photocopy "Every Drop Counts" drops - one per student, on heavy paper if possible.

Duration

Total: 60 minutes

Introduction plus Tucson's Water Story: 40 minutes

"Every Drop Counts" activity: 20 minutes

Suggested Procedure

- 1) Introduction. Explain to students that this is the first activity in Tucson Water's *Our Water, Our Future* program. This and the other pre-visit activities will prepare students with important vocabulary and information that they will need when a special guest arrives from Tucson Water. They should pay close attention to these lessons as the guest speaker may call on them to help with the presentation. This particular activity will help them understand Tucson's water supply, that is, where we get our water.
- 2) State that water is an important resource that we need in many ways. Define resource as a source or supply from which we can draw in time of need. Define natural resources as resources we take from the natural environment, mentioning water as an example.
- 3) Discuss Tucson's water sources. Referring to the clear gallon (3.79 l) container, "Tucson's Water Supply," explain that this jar represents Tucson's water. As students note that it's just an empty jar, ask: From what resources does Tucson get its water supply? Likely responses will be rain, runoff, groundwater, rivers, etc. Discuss the students' answers and say: Let's find out.
- 4) Water from the aquifer. Call on a volunteer to come up and help with Tucson's first, most important, source of water. Have the student read the label on the gallon (3.79 l) container representing the aquifer. After reading the label and definition, have the student pour all of the water from the "Aquifer" into the container representing "Tucson's Water Supply."
- 5) Discuss groundwater. Explain to students that originally all of Tucson's water supply came from groundwater resources. When the rivers in Tucson used to flow during most of the year, it was the result of an abundance of water in the aquifer that reached the ground surface in the riverbeds.
- 6) Review vocabulary. Review the difference between the aquifer (the underground layer of rocks, sand, and gravel where the groundwater is found) and groundwater (the water in the underground aquifer). Remind students that groundwater is Tucson's first and most important water source.
- 7) Who uses water? Now that students know about Tucson's original water source, ask: Who uses Tucson's water? As they offer responses, it will become evident that everyone uses water. Remind students that plants, animals, and people all require water to survive. Tell the students that, as a class, you will be doing a role-play activity to demonstrate how different people throughout Tucson's history have used water. Explain that the labeled jar (now full) represents "Tucson's Water Supply."
- 8) Assign roles for Tucson's Water Story. Assign the eight roles and distribute the associated readings from the "Tucson's Water Story" script. Retain the master copy for yourself as narrator/facilitator.
- 9) Read Tucson's Water Story. Have students read their script in sequence and measure the correct representative quantity of water to remove or add to "Tucson's Water Supply." Remove the "Aquifer" label from its container, and use this container to dump the water removed from "Tucson's Water Supply."

10) Discuss the water resources mentioned in the story. Write “Our Water Supply” on the board and ask students to recall the various water resources which are part of our water supply. Also write these on the board as students name them: groundwater, river water, and reclaimed water.

11) State that some resources are renewable and some are nonrenewable. For example, sunshine, wind, and trees are renewable, while copper, aluminum, oil, and natural gas are nonrenewable. Ask whether water is renewable or nonrenewable. Because water is continually moving through the water cycle, more water is brought to our area. Thus water is considered renewable. But it is important to realize that water is a limited resource! Although precipitation and natural recharge add to our supply, the total amount available is still limited.

12) “Every Drop Counts” Activity.

Once you have finished reading “Tucson’s Water Story,” ask the students: Who are the next players in Tucson’s Water Story? We are! Tell the students that Tucson Water would like to hear their ideas about how we can save water today so we will all have water in the future. What ideas do the students have to ensure Tucson’s water supply?

1. Hand out one drop to each student. Have students write their names and the name of the school on the back of the drop.
2. Explain to the students that they should write a single water-saving idea on the drop. (for example, I can save water today by turning off the faucet when I brush my teeth).

IMPORTANT: Please save the drops for the special guest visitor from Tucson Water!

Extension:

Have students create costumes and act out their roles in Tucson’s Water Story. Give a presentation to younger grades and/or other classes not participating in this program.

TUCSON’S WATER STORY *SCRIPT*

Instructions:

Please note that the narrator/facilitator (played by the teacher) has an action to perform after each student speaks. To keep the story running smoothly, we suggest asking the eight chosen students to stand at the front of the classroom in order, according to the number on their script.

TUCSON'S WATER STORY *SCRIPT*

Narrator: Tucson's water – humans have been relying on it for over one thousand years. This jar represents Tucson's water supply at the beginning of our story. The first humans to use much water in the area were an ancient group of Native Americans known as the Hohokam.

1. Young Hohokam Native: In the way you tell time, it is 1501. I am Hohokam. We are the people who live in the desert. Water is one of the most precious things in our lives. We use water from the few rivers and creeks that flow most of the year. Sometimes, when a river goes dry, we can dig a little ways down and find water, or walk to a secret spring. We use our water for drinking, cooking and also for our crops. We make irrigation canals that channel water to our fields. This spoonful of water represents our use of the available water resources.

Facilitator: Ask the student to remove 1 tablespoon (5 ml) of water from "Tucson's Water Supply." Ask the entire class: What is happening to Tucson's water supply?

Narrator: The Hohokam's impact on Tucson's water supply was minimal. Around 1540, the Hohokam left their farming practices in the area, about the time of the arrival of the early Spanish explorers.

2. Juan - Young Spanish Settler: It is 1771. My family and I came to Tucson from far away in New Spain, which later will become Mexico. It took us a whole year to get here. At first, I was lonely for friends but new families with children keep arriving. I like Tucson. There is a river here called the Santa Cruz where we can play when Mama washes our clothes. Papa dug a shallow well in our yard but it is very hard for me to bring up the heavy bucket of water. We use water for cooking, cleaning, and of course drinking! Our animals and plants need water too. This half cup (125 ml) represents our water use.

Facilitator: Ask the student to remove half a cup (125 ml) of water from "Tucson's Water Supply." Ask the entire class: What is happening to Tucson's water supply?

3. Margaret - Young Anglo Settler: Guess what? I have a new friend, Emily! She is 10 years old, just like me. Her family moved here from the East. I was born in Tucson in 1849. My parents came from Missouri when my father lost his job. He heard that there was a lot of work in the mines or on farms out here. These days, Father is very busy as more and more people move to Tucson. On Sundays, we go to the Santa Cruz River to play under the big trees and swim in the shallow water. My new friend said that where she is from, there is water everywhere! She thinks it is funny that we have water delivered to our homes in a horse-drawn wagon. As more people settle here, we are using more water. This one cup (250 ml) represents our use of water resources.

TUCSON'S WATER STORY *SCRIPT*

Facilitator: Ask the student to remove one cup (250 ml) of water from "Tucson's Water Supply."
Ask the entire class: What is happening to Tucson's water supply?

Narrator: In 1880, the railroad came to town. Industry and agriculture increased. In 1882, the Tucson Water Company delivered the first piped water to homes and businesses. This made life in Tucson a little easier. More people were attracted to the desert. In 1900, about 7,500 people lived in Tucson. In 1910, over 14,000 people called Tucson home. They came for the mild weather and jobs. These two cups (500 ml) represent water use in the early 1900's. (Narrator removes two cups from "Tucson's Water Supply.")

Ben – Farmer's Son: It is 1950. My father says that the soil in the Tucson area is good for growing cotton, alfalfa, and other crops. I help him on our cotton farm. I am proud of my work because growing plants is important. Our crops, like us, would die without water. We use irrigation canals to deliver the water to our fields. I am told that agriculture uses more water than all of the businesses and homes in the city. But people need food to eat and clothes to wear. These three cups (750 ml) represent water resources used for agriculture in the middle of the 20th century.

Facilitator: Ask the student to remove three cups (750 ml) of water from "Tucson's Water Supply."
Ask the entire class: What is happening to Tucson's water supply?

Narrator: Is there something that adds to Tucson's water supply? I will give you some clues. Who am I? I start as rainwater or snowmelt. In town, I flow down the streets, into storm drains and gutters, and eventually, I reach the washes. In time, I sink through the ground. After a long time, if I sink deep enough, I reach the aquifer and become groundwater. I am called natural recharge! As we all know, Tucson receives less than 12 inches (30 cm) of rain a year - much less than the amount of water used by people. So unfortunately, I cannot replace all the water that people are now using. This half cup (125 ml) represents the annual rain and snowmelt that add water to Tucson's Water Supply. (Add half a cup of water to jar). What is happening to Tucson's water supply?

5. Molly - Miner's Daughter: Hey everyone, I am Molly and my Dad works at the copper mine south of town. Have you ever been there? There are mines all over Arizona. Mining is a very important industry because we all use minerals and metals for our electric and phone lines, to make pipes, pots and pans and to run our computers. But these industries and mines need a lot of water. This one and a half cup (375 ml) represents industry's use of water resources up to the 1980's.

TUCSON'S WATER STORY *SCRIPT*

Facilitator: Ask the student to remove one and a half cups (375 ml) of water from “Tucson’s Water Supply.” Ask the entire class: What is happening to Tucson’s water supply?

Narrator: Even with natural recharge, the water level continues to drop. What are we going to do? People, plants, and animals all need water to live. Where is Tucson going to find more water? Perhaps our next two readers can help.

6. Who am I? Listen carefully to my story because you may not have heard of me. I am recycled water. After you use water and it goes down the drain, it goes to the wastewater treatment plant. That is where my life begins. I am called Reclaimed Water! I am a new water resource. I am wastewater that has been filtered and treated. Since 1980, I have been used to water parks, school grounds, and golf courses. In fact, more than 40 schools are using me to water their playgrounds. This half cup (125 ml) represents my contribution to Tucson’s Water Supply.

Facilitator: Ask the student to add half a cup (125 ml) of water to “Tucson’s Water Supply.” Ask the entire class: What is happening to Tucson’s water supply?

7. Who am I? I come to Tucson in a 336-mile (541 km) long canal from the Colorado River near Havasu, Arizona. That’s a long way to come, but Tucson really needs me. When I get to Avra Valley, near Tucson, I am put in a big basin to percolate down into the ground. I mix with groundwater and am then pumped back up. Can you guess who I am yet? I am Colorado River Water! Once I mix with Avra Valley groundwater, we’re called the Clearwater Blend. From there I go out into the delivery system pipes around Tucson. Soon, I will make up half of Tucson’s yearly water supply. I’m an important water resource! This cup and a half represents my contribution.

Facilitator: Ask the student to add one and a half cups (375 ml) of water to “Tucson’s Water Supply.” Ask the entire class: What is happening to Tucson’s water supply?

Narrator: So, now in the 21st century, we have three sources of water for Tucson’s water supply: (1) groundwater, (2) reclaimed water, (3) Colorado River water. All three sources are helping Tucson’s water future. We need all the help we can get because there are more of us than ever! Did you know that each year, about 14,000 more people move to Tucson? We use water for drinking, watering plants, washing, brushing teeth, filling pools, and bathing dogs. We use water for everything! These three cups (375 ml) represent the amount of water we are using each year. (Remove three cups of water from “Tucson’s Water Supply”) What is happening to Tucson’s water supply?

TUCSON'S WATER STORY *SCRIPT*

8. Hi! It's me, _____ (say your own name). Well, that's Tucson's Water Story. We have just learned about water use yesterday and today, but what about tomorrow? What can you and I do to help our water supply? How can we save water today so people will have water in the future?

Narrator: Remember, Tucson's Water Story is not over yet! We are all part of this story!

TEACHER NOTE: Please continue with the suggested procedure, step 12, "Every Drop Counts."



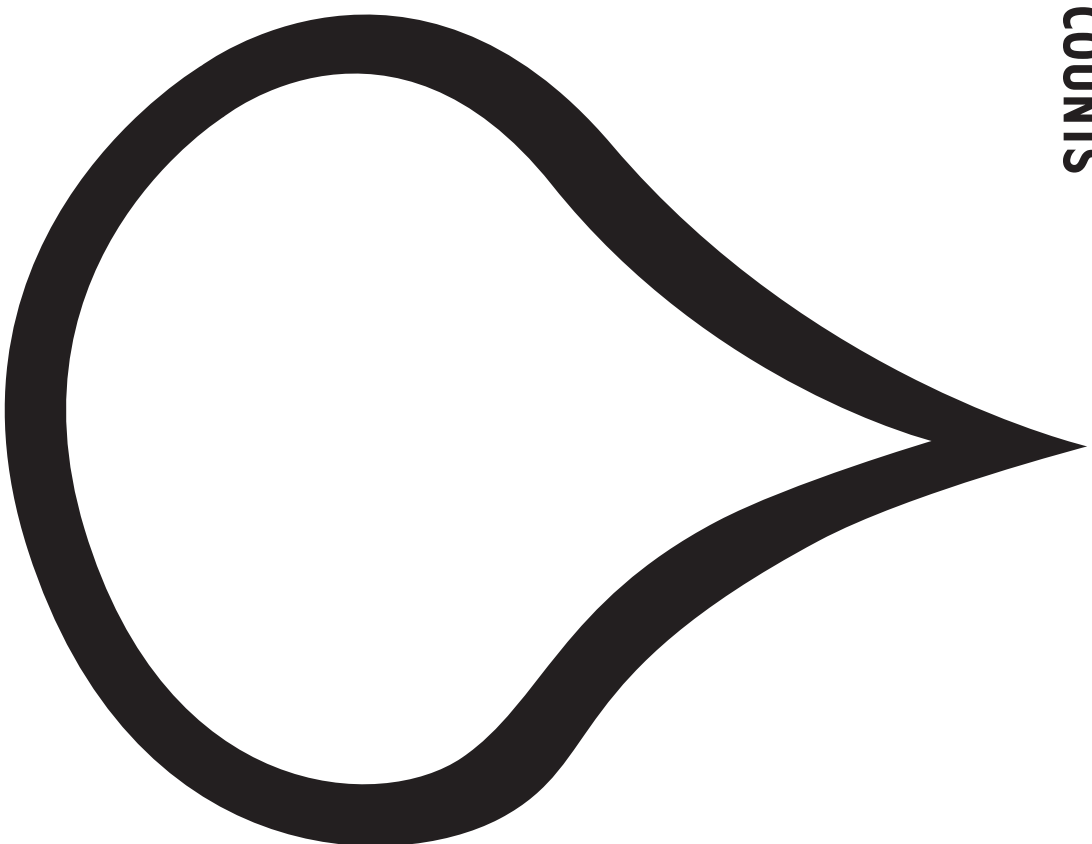
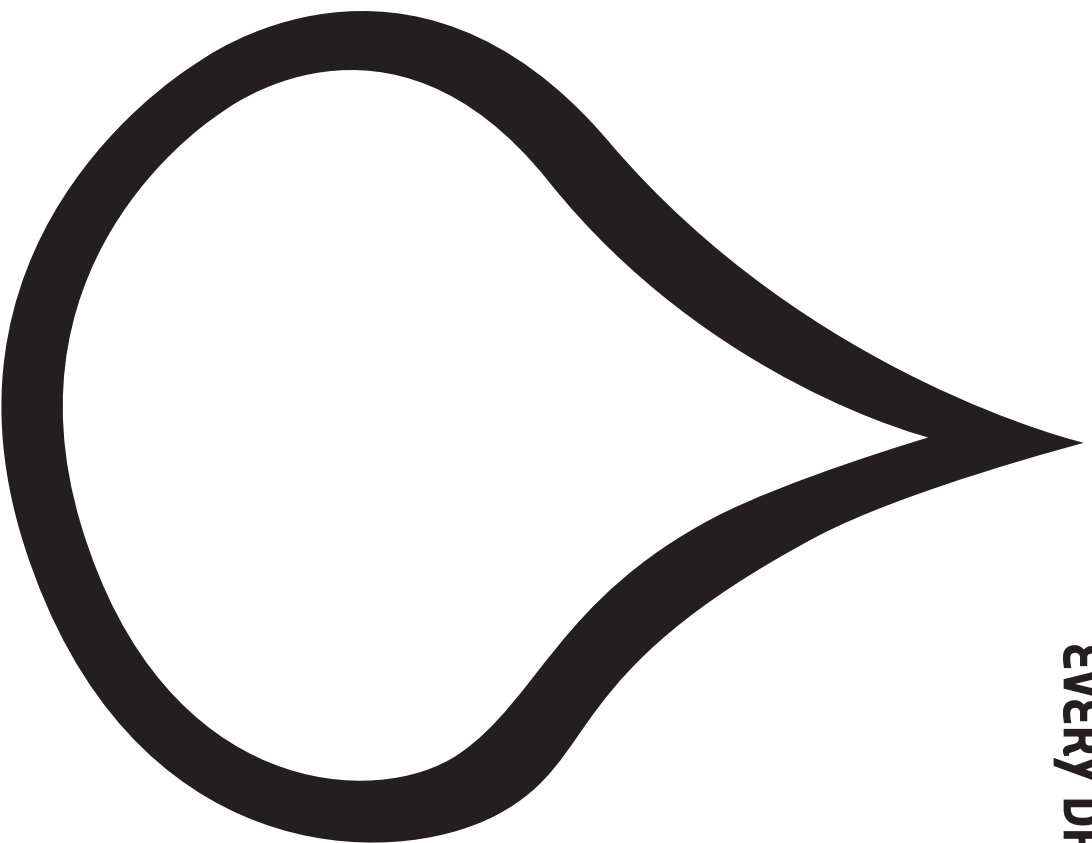
AQUIFER

This container represents the aquifer. The aquifer is the underground layers of rock, sand, and gravel in which water is stored. Water that comes from the aquifer is called groundwater.



TUCSON'S WATER SUPPLY

EVERY DROP COUNTS



cut out each drop separately