

OUR WATER, OUR FUTURE



Teach the ways of water.



PRE- AND POST-VISIT ACTIVITIES

for grades 4 and 5

Developed by:

Sponsored by:



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Dear Teacher:

Welcome to Tucson Water's *Our Water, Our Future* program, an interdisciplinary program specifically designed for fourth and fifth grade learners in the Tucson area. It poses three questions:

- 💧 Where does our water come from?
- 💧 Where does it go?
- 💧 What can we do to conserve this vital natural resource?

In answering these questions, we will address the following concepts:

- 💧 natural and urban water cycles
- 💧 Tucson's water supply
- 💧 water as a limited resource
- 💧 water use
- 💧 water recycling
- 💧 water conservation

Our Water, Our Future is a three-part program:

PART ONE includes two suggested pre-visit classroom activities. Students will review nature's water cycle and discover Tucson's water history.

PART TWO is a one-hour on-site presentation by Dr. Faucet. Students solve a two-part mystery about Tucson's water, participate in demonstrations with a groundwater model, play an urban water cycle game, and share their Water Smart ideas for conserving water. At the end of the presentation, all students receive a five-minute shower timer and a fun activity book to bring home.

PART THREE includes two suggested post-visit classroom activities in which students become Water Smart and write poetry to express their thoughts and feelings about water.

To prepare for Dr. Faucet's visit:

- 💧 Coordinate with other teachers to schedule two or three presentations in a row and reserve one room (classroom, library, MPR, etc.). The students from each class will rotate through this room.
- 💧 Have a large table cleared for presentation materials, with floor space in front where the students can sit.
- 💧 We strongly encourage you to conduct Lessons 1 and 2 before Dr. Faucet's visit and Lessons 3 and 4 after the visit.

Enjoy!

Dr. Faucet





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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.

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, recycled 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 Story* labels (provided)
- ◆ *Tucson's Water Story* script (provided)
- ◆ *Every Drop Counts* drops (photocopied – one drop per student)
- ◆ Scissors

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 *Tucson's Water Story* labels and affix to appropriate containers.
- ◆ Fill the "Aquifer" container with water.
- ◆ Photocopy *Tucson's Water Story* script and cut out as indicated on dotted lines. The script calls for eight students to read plus a narrator/facilitator (played by the teacher). Have the master copy available for your reference.



- 💧 Photocopy *Every Drop Counts* drops - one drop per student. (Cut out each drop in advance, or hand out one sheet with two drops per two students and have them cut out the drops at the beginning of the activity.)
- 💧 Create a place for a “Water Smart Ideas” bulletin board, where students can post their drops.

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 activity 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 where does Tucson get its water? 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 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).
- 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 that are part of our water supply. Also write these on the board as students name them: groundwater, recycled water, and Colorado River 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, it 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?
- ◆ Hand out one drop to each student (or one sheet with two drops per two students and have students cut out the drops). Have students write their names on the back of the drop.
 - ◆ 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).
 - ◆ Create a "Water Smart Ideas" bulletin board in the classroom where students can post their drops and share their water-saving ideas. Inform students that Dr. Faucet will want to hear their ideas during their upcoming presentation!

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 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.



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.

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 [500 ml] from “Tucson’s Water Supply.”)

4. 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. 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 [125 ml] 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 cups (375 ml) represents industry’s use of water resources up to the 1980’s.

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 water reclamation treatment plant. That is where my life begins. I am called Recycled Water! I am a new water resource. I am used household water that has been filtered and treated. Since 1980, I have been used to water parks, school grounds, and golf courses. In fact, more than 50 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. Today, I make up most of Tucson's yearly water supply. I'm a very important water resource! This cup and a half represents my contribution.

Facilitator: Ask the student to add one and a half cups (375ml) 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) recycled water, and (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 (750 ml) represent the amount of water we are using each year. (Remove three cups [750 ml] of water from "Tucson's Water Supply.") What is happening to Tucson's water supply?

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, *Every Drop Counts* Activity, step 12.



AQUIFER

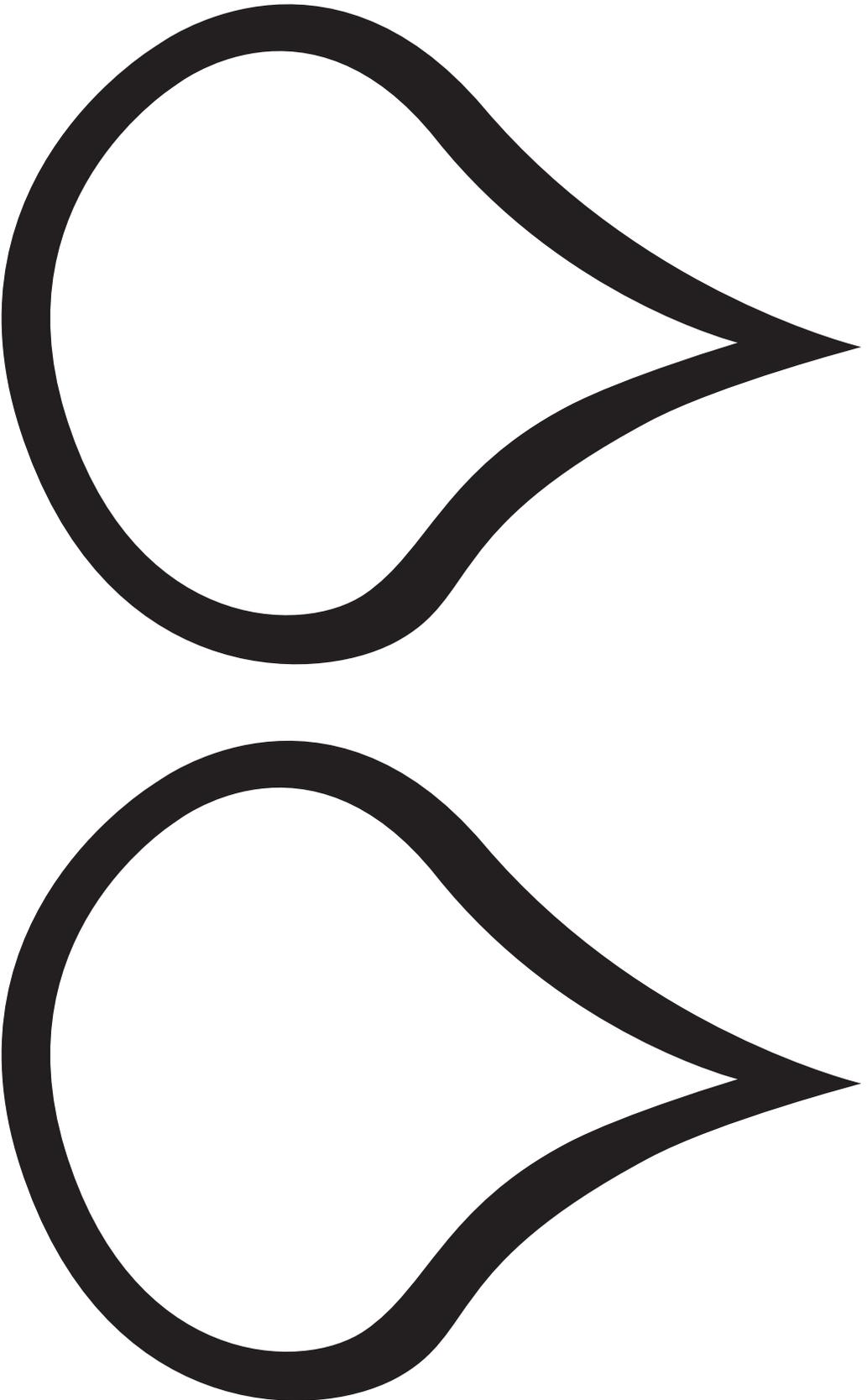
This container represents the aquifer. The aquifer is the underground layers of rock, sand, and gravel in which water is stored. Water that comes from the aquifer is called groundwater.



TUCSON'S WATER SUPPLY



EVERY DROP COUNTS



cut out each drop separately





LESSON 2: WATER SYSTEMS - OUR WATER CYCLE

Lesson Overview

Students review important vocabulary relating to the water cycle as they learn the Water Cycle Express. An overhead transparency (or Smart Board) is then used to interactively present nature's water cycle as it appears around Tucson. Finally, students create their own labeled drawings to depict nature's water cycle and apply the words reviewed.

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:

- describe nature's water cycle and the various ways water moves between places in the environment.
- define and use key water words such as transpiration, evaporation, condensation, percolation, and precipitation.
- draw and label an image of nature's water cycle depicting water moving through the atmosphere, bodies of water, drainages, plants and animals.
- describe the distribution of water on Earth's surface.

Materials

- overhead projector or Smart Board
- Nature's Water Cycle* master and key (provided)
- erasable transparency marker
- Water Cycle Express* vocabulary and definitions (provided)
- drawing paper, colored pencils, and/or markers

Advance Preparation

- Photocopy the *Water Cycle Express* vocabulary and definitions.
- Cut out the five words definitions into five strips.
- Set up an overhead projector or Smart Board for use with *Nature's Water Cycle*.

Duration

Total: 60 minutes

Water Cycle Express and *Nature's Water Cycle*: 35 minutes

Student water cycle drawings: 25 minutes

Suggested Procedure

1) *Water Cycle Express*. Review water vocabulary words through the following activity:

- Divide the class into five teams.
- Distribute one vocabulary word with its definition to each team.
- Challenge the teams to prepare a short, one-minute presentation to explain their word to the class, using one or more presenters. They should include a sound and body movement to demonstrate their word.



- 💧 Class presentations. Have each group present their word with matching sound and body movements.
- 💧 When all the groups have presented, call the words out, one at a time. Ask all students to stand up and act out the matching sound and body movements.

2) *Nature's Water Cycle*. Display *Nature's Water Cycle* using an overhead projector or Smart Board (be sure to use the master with blank spaces for the vocabulary words). *Nature's Water Cycle* illustrates the natural water cycle, using the Tucson region as an example. Explain to the students that the water cycle also happens on a global level. What differs from region to region are the plants, animals, bodies of water, and land through which water moves.

3) Fill in the blanks. Using *Nature's Water Cycle*, point out places water can be and ways water can move. For example, water can be in the clouds. One way that water gets to the clouds is through evaporation. As you point out the places where water can be (clouds, plants, river, or soil), remember to discuss how it gets there (transpiration, evaporation, condensation, precipitation, and percolation). Now, fill in the blanks with the appropriate words describing ways water can move. You may choose to call upon students to come up and fill in the blank or write the words in yourself. Next, ask students to name ways that water might move in our environment. Draw arrows on the transparency to show a range of possibilities. Be sure to mention that the water cycle is not a single large cycle but a complex system within which water moves in many ways.

4) Discuss the distribution of water on Earth's surface. Over 97 percent is salt water, found in the oceans. Less than three percent is fresh water. But not all of the fresh water is available to us. Two percent of Earth's water is in the polar ice caps. All of the moisture in lakes, rivers and streams, the atmosphere, and underground adds up to less than one percent of Earth's water. Although our water supply is renewable to some extent, water is truly a precious and very limited resource!

5) Create your own water cycle. Now ask students to draw their own water cycle pictures. Their drawings should include the following:

- 💧 Things they see everyday in their environment that use and move water (e.g., a mesquite tree taking in water through its roots then transpiring water to the clouds; snow melting in the Catalina Mountains then running down the Rillito River and percolating into the ground and/or evaporating back into the clouds).
- 💧 Water vocabulary - students should appropriately depict and label the processes of transpiration, evaporation, condensation, precipitation, and percolation.
- 💧 A picture of themselves using water.

6) Display your drawings. Display the students' drawings around the room or on your "Water Smart Ideas" bulletin board.





WATER CYCLE EXPRESS VOCABULARY

Instructions:

Photocopy this sheet. Cut out the words and their definitions into five strips. Distribute one strip to each team.



Condensation: occurs when water vapor cools and becomes liquid

Examples of condensation: when the steam from a hot shower forms water droplets on the mirror; when clouds form.



Evaporation: occurs when liquid water heats up, changes into water vapor (a gas), and rises into the sky

Example of evaporation: when a wet towel dries, that water has evaporated into the air.



Percolation: the downward movement of water through soil

Example of percolation: when rainwater from a puddle sinks down into the ground.



Precipitation: water falling, in a liquid or solid state, from the atmosphere to Earth

Examples of precipitation: rain, snow, hail, sleet.

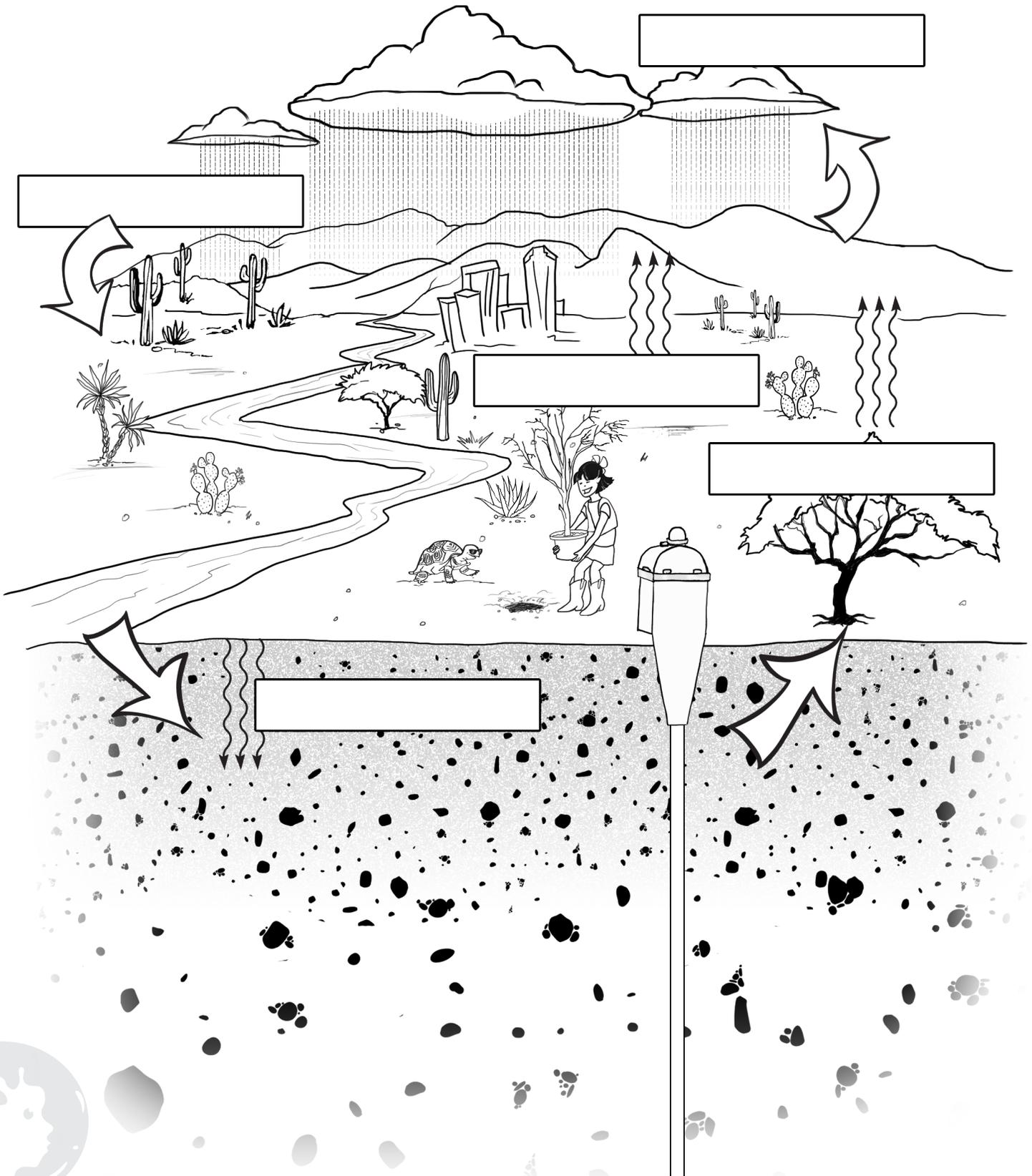


Transpiration: the evaporation of water from plants

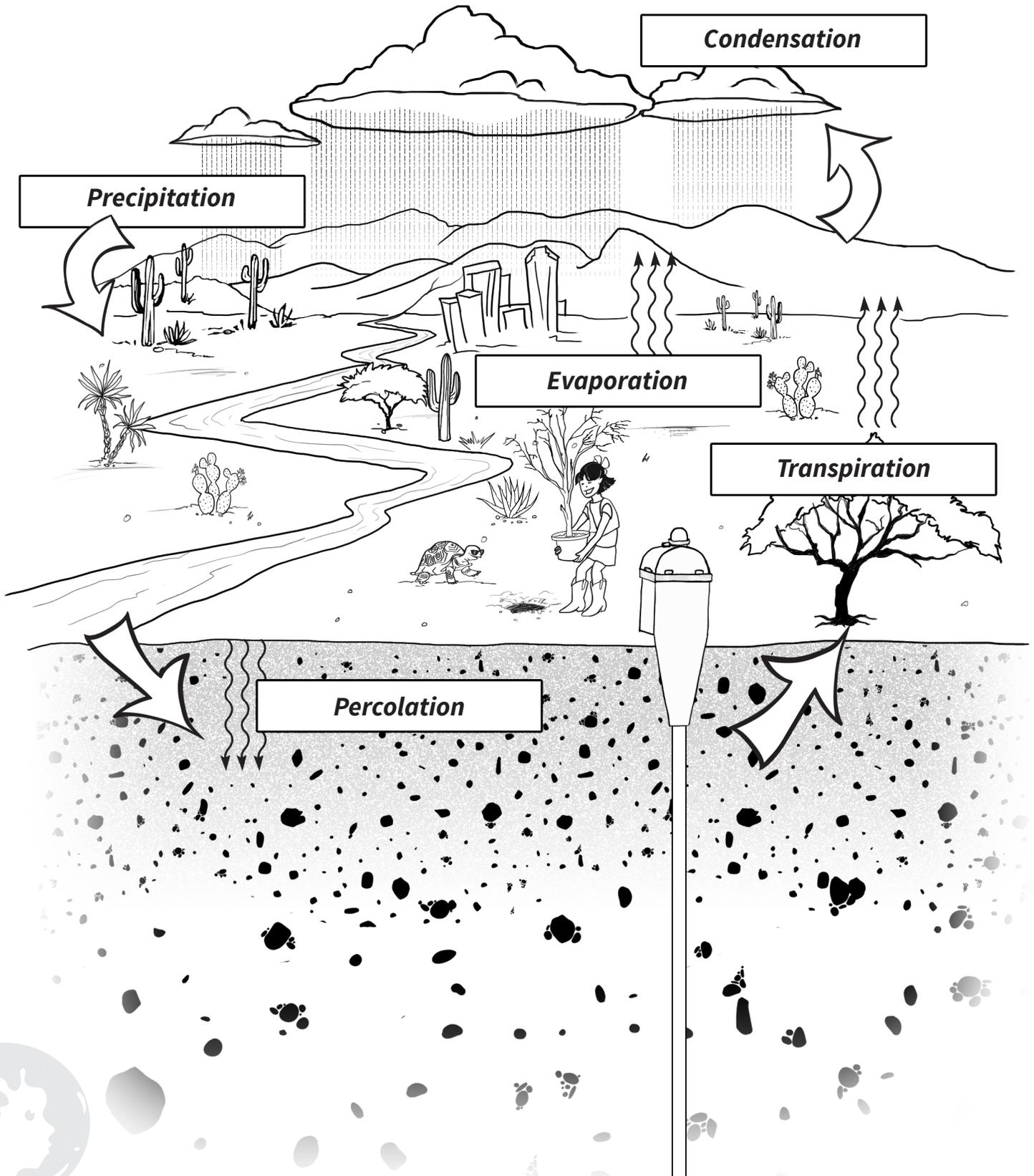
Example of transpiration: when a plant or a tree releases water into the atmosphere from tiny openings in its leaves.



NATURE'S WATER CYCLE



NATURE'S WATER CYCLE - TEACHER'S KEY





LESSON 3: WATER CONSERVATION - BECOMING WATER SMART

Lesson Overview

How many people does it take to make a difference? Just one. Students will analyze their daily water use and apply math skills to estimate the amount used per week and how much water they could conserve by becoming Water Smart.

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:

- ◆ list ways they personally use water.
- ◆ describe how water use habits affect the future availability of water.
- ◆ use math skills to calculate total water use and estimate savings.
- ◆ list ways they can personally conserve water.
- ◆ explain ways their families can conserve water.

Materials

- ◆ *Ways We Use Water and Water Smart Ways* master and key (provided)
- ◆ overhead projector or Smart Board
- ◆ one gallon (3.79 l) empty container, for demonstration purposes
- ◆ *Water Smart Survey* (provided)

Advance Preparation

- ◆ Prepare the overhead projector or Smart Board for use with *Ways We Use Water and Water Smart Ways*.
- ◆ Photocopy *Water Smart Survey*, one per student.

Duration

Total: 60 minutes

Introduction and *Ways We Use Water*: 40 min.

“Water Consultant” activity: 20 minutes

Suggested Procedure

1) Review. Review with the students the past week’s study of water. Up to now, the water activities have focused on water supply and water cycle - where we get our water from and where it goes. In this activity, the class will take a closer look at how they personally use water and how their feelings and attitudes affect that use.

2) Water is a limited resource. Convey to the students that how we use water is influenced by how much water we think there is. Many people assume that there is an endless supply of water and so develop some pretty wasteful habits. But what if we understood that the supply of water is truly limited? The people who lived in Tucson long ago, the Hohokam, and the people that continue to inhabit the desert, the Tohono O’odham (whose name means Desert People) have long been aware of the scarcity of water here. Most plants and animals that live in the desert have adapted to their arid environment by using less water. How can we adapt personally and as a class?

3) How we use water. Ask students to give examples of how they personally use water. List these examples on the board. Ask them if, when they use water in these ways, they ever consider how much water it really takes to do these things.

4) Ways we use water. Display *Ways We Use Water and Water Smart Ways* on an overhead projector or Smart Board.

- 💧 Cover the last two columns of the table (“Water Smart Way” and “Water Smart Savings”) to reveal only the first two columns (“Activity” and “Typical Use”).
- 💧 Hold up the gallon (3.791 l) container to help students visualize a gallon.
- 💧 Review each of the activities in the “Activity” column and ask students how much water they think each activity typically uses. Note that the “Typical Use” method in the second column (e.g., “water running”) is what most people do when using water for that activity. Discuss responses.
- 💧 Refer to the *Ways We Use Water and Water Smart Ways Teacher’s Guide* and enter the correct amount in the space provided beside “gallons.”
- 💧 Reveal the third column to show how much water is used the “Water Smart Way.” Ask students what might be a Water Smart way for each of the activities. Enter their responses in the space provided (refer to the *Teacher’s Guide* but note that these are not the only answers).
- 💧 Complete the fourth column by calculating the “Water Smart Savings” for each activity (the amount of water that can be saved “per event”, such as each time a student washes her hands, or brushes his teeth). (“Water Smart Savings” = “Typical Use” – “Water Smart Way”).

5) Become water consultants. Assign students to work in pairs and pass out the *Water Smart Survey* forms, one per student. They will use these forms to interview their partner and calculate their partner’s water use based on the information displayed in *Ways We Use Water and Water Smart Ways*. Their job as consultant is to determine:

- 💧 how their partner uses water for each “Activity”
- 💧 “Amount Used” for each activity
- 💧 how many “Times Per Day” for each activity
- 💧 “Total Amount Used” for each activity (= “Amount Used” X “Times Per Day”)

6) How much can we save? Still in pairs, the students identify water use habits that can be changed to conserve water and calculate how much water their partner could save using the “Water Smart Savings” data from *Ways We Use Water and Water Smart Ways* and their “Times Per Day” data from the *Water Smart Survey* form. Students should calculate:

- 💧 “Total Water Smart Savings” = “Water Smart Savings” X “Times Per Day”
- 💧 “TOTAL Water Used/Day” = total of each column

Consultants should then make recommendations to their partners, suggesting specific steps toward becoming Water Smart. Consultants should write these steps on the back of the *Water Smart Survey*.



7) Closing discussion. Close the activity with a discussion of Water Smart water-saving alternatives and students' feelings about water. Encourage the students to consider what being Water Smart means. Use the following questions to guide the closing discussion:

- 💧 Will the students' increased wisdom about water affect their attitudes and habits about water?
- 💧 How do they feel about the opportunities to save water suggested by their consultants?
- 💧 How did it feel to be a consultant?
- 💧 Refer back to *Tucson's Water Story* (Lesson One) and the jar, which represented Tucson's water supply. How could their consultant's advice affect the water supply in that jar?

EXTENSIONS:

- 💧 As a class, calculate the total daily water use of the group. Then calculate the total possible water savings as a group, if everyone followed their consultant's suggestions. Finally, multiply the findings by the number of students in the school to demonstrate the potential savings if each student learned to be Water Smart.
- 💧 Have students create surveys to conduct interviews at home to find out how their families use water. They may also serve as "water consultants" to their families.
- 💧 Conclude by emphasizing that to be truly Water Smart, we need to not only save water in the ways discussed today, but also be alert to even more ways to do our part.





WAYS WE USE WATER AND WATER SMART WAYS

ACTIVITY	TYPICAL USE	WATER SMART WAY	WATER SMART SAVINGS
Brushing teeth Method Water used	water running _____ gallons	_____ 0.25 gallons	
Showering Method Water used	conventional showerhead _____ gallons	_____ 12.5 gallons	
Taking a bath Method Water used	full tub _____ gallons	_____ 18 gallons	
Washing hands Method Water used	water running _____ gallons	_____ 1 gallons	
Flushing toilet Method Water used	conventional toilet _____ gallons	_____ 1.5 gallons	
Washing dishes by hand Method Water used	water running _____ gallons	_____ 5 gallons	
Washing dishes by machine Method Water used	full cycle – partial load _____ gallons	_____ 9 gallons	
Washing clothes Method Water used	high setting - partial load _____ gallons	_____ 25 gallons	





ACTIVITY	TYPICAL USE	WATER SMART WAY	WATER SMART SAVINGS
Brushing teeth Method Water used	water running 2 or more gallons	turn water off or use a Water Smart cup 0.25 gallons	1.75 gallons
Showering Method Water used	conventional showerhead 5 gal./min. for 10 mins. 50 gallons	showerhead 2.5 gal./min. for 5 mins. 12.5 gallons	37.5 gallons
Taking a bath Method Water used	full tub 36 gallons	half-full tub 18 gallons	18 gallons
Washing hands Method Water used	water running 2 gallons	turn off water or use basin .5 gallon or less	1.5 gallons
Flushing toilet Method Water used	conventional toilet 3.5 to 5 gallons	low-flow toilet 1.5 gallons	2 to 3.5 gallons
Washing dishes by hand Method Water used	water running 30 gallons	water running 30 gallons	25 gallons
Washing dishes by machine Method Water used	full cycle – partial load 16 gallons	short cycle – full load 9 gallons	7 gallons
Washing clothes Method Water used	high setting - partial load 35 gallons	adjust setting to load 25 gallons	10 gallons





WATER SMART SURVEY

Name of water user _____ Date _____

Name of water consultant _____

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>
ACTIVITY	AMOUNT USED (GALLONS OR LITERS)	TIMES PER DAY	TOTAL AMOUNT USED	WATER SMART WAY POSSIBLE SAVINGS
Brushing teeth <input type="checkbox"/> water running <input type="checkbox"/> water off or use a Water Smart cup				
Showering <input type="checkbox"/> 10 minutes + <input type="checkbox"/> 5 minutes Showering <input type="checkbox"/> tub full <input type="checkbox"/> tub 1/2 full				
Washing hands <input type="checkbox"/> water running <input type="checkbox"/> water off or use basin				
Flushing toilet <input type="checkbox"/> conventional <input type="checkbox"/> low-flow toilet				
Washing dishes by hand <input type="checkbox"/> water running <input type="checkbox"/> wash and rinse in filled basin 5 minutes Washing dishes by machine <input type="checkbox"/> tub full <input type="checkbox"/> tub 1/2 full				
Washing clothes <input type="checkbox"/> partial load <input type="checkbox"/> full load				
TOTAL Water Used/Day				

To be Water Smart, I recommend the changes in water use habits listed on the back of this page.

Signed _____



LESSON 4: WATER POETRY - RIVER OF WORDS

Lesson Overview

After the special presenter has visited the class, this post-visit lesson gives students the opportunity to explore what water means to them. Through poetry, the students express thoughts and feelings about the importance of water in the desert. Students will recognize the variety of ways that water affects them and may develop a deeper level of water appreciation and understanding.

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:

- describe the ways in which water affects their lives and all life in the desert.
- describe their local environment in vivid, specific language.
- list some of the natural inhabitants of Tucson and the surrounding areas.
- create similes, metaphors, and/or descriptive words and phrases.
- revise and edit ideas and language.

Materials

- A Word about Form: Teacher's Mini-Guide to Poetry Forms* (provided)
- paper, pencils and/or pens
- chalkboard or white board with writing tools

Advance Preparation

- Read through the Suggested Procedure to familiarize yourself with the kinds of questions that prompt poetic brainstorming.
- Read through *A Word about Form: Teacher's Mini-Guide to Poetry Forms*. Choose one form for the whole class to mimic or allow students to individually select an appropriate form. Have the enclosed poetry samples on hand to share with class; you may choose additional poems to share.
- Review *Tucson's River of Words Youth Poetry and Art Contest* materials (information available at (520) 615-7855, ext. 100; eeducation@pima.gov; or <http://www.tucsonpimaartscouncil.org/programs/arts-education/river-of-words/>.)
- Additional information about the international *River of Words* program can be found at <http://www.stmarys-ca.edu/center-for-environmental-literacy/river-of-words>. In addition, a Teaching Guide can be downloaded at <http://www.riverofwords.org/pdfs/ROWteachingguide.pdf>.

Duration

Total: 1 to 2 class periods

Poetry form discussion and “water-storming”: 30 minutes

Writing and revising poems: 30 minutes or more



Suggested Procedure

1) Share Poetry Examples. Remind students that, in a way, we live in two worlds - the outer world of the senses (what we can see, touch, taste, smell, hear) and the inner world of thought, emotion, imagination, and memory. One of the reasons we write poetry is to go into these two worlds and find the places where they overlap. Just as no two people have the same fingerprints, no two people put poems together in the same way. Ask the students to listen for their favorite lines and images as you read one of the sample poems provided.

2) Discuss Poetry Form and Rhythm. Refer to a poem that you shared that did NOT rhyme. Poems do not need to rhyme in order to have rhythm. Such poems are called Free Verse poems. Discuss the students' favorite lines and images. Read the poem a second time. Ask the students to pick out the words and sounds that give the poem its rhythm.

3) Make a Storm of Water Words. Beginning is the most difficult part of writing a poem. Create a list of words on the board to help make the river of words flow. **IMPORTANT:** Instead of writing general poems about water, encourage students to focus on water in their life experience or in real places. Have the students imagine their favorite place in the desert (such as the wash behind grandpa's house, the yard after it rains). Write some of the students' favorite places in the middle of the board. Now ask the following questions. Write the responses on the board for students to reference when they write their own poems.

💧 **What do these places make you think of? How do they make you feel?**

for example: wildflowers in bloom, fishing with my dad, walking with my grandma, swimming with my friends, fearless, free, full of joy, tiny, enormous, excited

💧 **What kinds of weather come to mind?**

for example: monsoon rains, loud thunder, lightning, hot, lazy sun

💧 **What animals and plants might live there? Can you name some?**

for example: saguaro cactus, coyote, prickly pear, kit fox, cactus wren, mountain lion, javelina, palo verde, mesquite tree, creosote bush, spadefoot toad, gila monster

💧 **When is your place quiet? What kind of sounds do you hear in that place?**

for example: early in the morning; after a storm; birds calling; coyotes howling; trees swooshing; when I slap a puddle with my feet, it explodes like firecrackers

4) The Writing Process. Using the Storm of Water Words, and other words they wish, students write their own poems. One easy way to do this is to write it together, line by line. For example, ask students to write the first line of their poem, placing themselves in their favorite place in the desert. Tell the students to add a second line, this time putting in something about the weather. In the next line, tell students to add something about an animal or a plant. Keep going, adding experiences and memories. This process might net this example:

*I am walking down a river of sand
The air is cool on my neck
A hungry fox sleeps in the shade of a mesquite tree,
dreaming of rabbits and rain.*

Suggestions to share with students about the writing process:

- 💧 *Particular Poems Pack Power.* The best poems often make you feel like you are in a particular place at a particular moment. Remind students not to be afraid to use the names of places, people, animals, and plants. Using more specific words helps readers share your experience more vividly.
 - 💧 *Check Your Senses.* After the first draft, ask the students, “Can you see, hear, taste, smell, and touch the place the described in your poem?”
 - 💧 *Pencil, paper, ACTION!* Remind the students that poems do not have to be confined to the descriptive. Some of the best poems tell the story of an event, some even include dialogue. If a student does not know how to begin an action poem, try asking: It is a very hot summer day. Suddenly, it begins to rain. How would you celebrate? What would you do? Who would you be with? What would a rabbit do? A toad?
- 5) Share the poetry with the class. Students can read their poetry out loud, “publish” a class book of poems, post poems on a class website, or create a poetry bulletin board accompanied with their artwork.
- 6) Enter a Contest! We encourage you to submit the students’ poetry to Tucson’s River of Words Youth Poetry and Art Contest.



A Word about Form: Teacher’s Mini-Guide to Poetry Forms

The following explanations are adapted from *The Handbook of Poetic Forms*, Ron Padgett, Ed. The Teachers & Writers Collaborative. NY: 2000.

Free verse

Free verse is the name given to lines of poetry that are written without rules. All of the poems on the sample pages are Free Verse poems. These poems do not rhyme, nor do they have a regular beat. They are, however, filled with natural sounds and rhythms. Free Verse offers no opportunities for sloppy writing. In fact, it forces the poet to choose his or her words very carefully, and test the shape and sound of each line. One way to begin writing Free Verse is to write a paragraph about your special watery place and then break it up into lines afterwards.

Cinquain

The Cinquain poem (‘sing-cane’) describes a natural place or object in five lines.

Line 1) Name your place/object in one word.

Line 2) Write two descriptive words about your object.

Line 3) Write three action words about your object.

Line 4) In four or five words, describe its relationship to the environment.

Line 5) Sum up your feelings about the object in one word.

Example:

Spring.

deep, liquid

seeps, soothes, releases,

a gift in the desert,

refuge.

Concrete Poem

These poems use space and sound to shape the lines. Poets who use this form want to make their poems not only something to read but also something to look at. One way to write a concrete poem is to first choose a shape (rain drop, river, cloud). Draw the outline of this shape on a piece of paper. Now fill the shape with words and lines that come to you when you think about rain, or swimming, or your favorite place in the desert.

Haiku

In Japan, people used to hold parties called “rengas” and write long poems made up of many short stanzas. The poets took turns writing about experiences or objects in nature. They used very few adjectives, preferring the power of verbs and descriptive nouns. Soon, people considered the short stanzas poems in themselves. They called them Haiku. Haiku captures the essence of a moment. To write a Haiku, write a list of thoughts about a moment in nature. Choose the strongest words that bring that moment alive. Now create three lines; the first and last lines should be a bit shorter than the middle line. Most Haikus follow a syllable pattern of 5, 7, 5.

River of Words Sample Poems

(These poems were finalists in Tucson's River of Words contest in previous years.)

 **River of Hope**

*I am the Colorado River,
the river that heals the
dry throat of the desert.*

*The river that is clear and
shiny, dark and murky.*

*I am worth gold,
but only to those that treasure me.*

*I reflect beauty,
but only to those that are pure hearted.*

*I have saved many,
but only because they use me respectfully.*

*I make the sound,
the sound that gives courage. In some parts
of me I roar, in others
I just merely trickle.*

*I only exist, because people have
made a difference.*

Gaizka Urreiztieta, age 10
Harelson Elementary School
Teacher: Janet Misiaszek/Peggy Martin

 **Hear the Tall Mountains**

*Hear the tall, calling
Water's voice like white mountains.
Hear the tall mountains.*

Cameron Silvas, age 9
Desert Winds Elementary School
Teacher: Miss Lopez

 **El Agua En Arizona**

*El Agua en Arizona
Tan necesaria
Como la luz del sol
Sin agua no podemos vivir
Sin agua pura y cristalina
Podemos Morir*

*El agua que baja
Por las montañas
Que corre por los arroyos
Que corre por los rios
Me siento tan feliz
Donde hay agua
Como en el lago de Monte Limon
Que tan alto y tiene agua*

*Donde hay agua hay vida
Tenemos agua tenemos vida*

Roger Canchola, age 11
Los Ninos Elementary
Teacher: Jim Civetta

 **Inside a Poem**

*Inside a poem, waterfalls are tumbling
And storms are zapping.*

*Inside a poem, lizards are crawling
And fires are roaring.*

*Inside a poem, mountains are growing
And moons are slithering.*

Galen Stewart, age 8
DeGrazia Elementary School
Teacher: Laura Bourguet
Grand Prize Winner
Category 2: Grades 3-6



OUR WATER, OUR FUTURE VOCABULARY

<i>aquifer</i>	the underground layers of rock, sand, and gravel where water is stored over millions of years
<i>Central Arizona Project</i>	the 336-mile (541 km) canal that transports Colorado River water to Tucson
<i>Colorado River</i>	the largest river in the western United States (which flows through many states, including Arizona)
<i>condensation</i>	occurs when water vapor cools and becomes liquid; clouds are formed through this process (could be considered the opposite of evaporation)
<i>desert</i>	a dry region of the world that receives less than 12 inches (30.5 cm) of rainwater each year
<i>evaporation</i>	occurs when liquid water changes into water vapor, a gas (could be considered the opposite of condensation)
<i>groundwater</i>	water that exists beneath the Earth's surface in an aquifer
<i>natural resource</i>	any resource that we use or take from the natural environment; can include both materials and energy (such as air, water, trees, soil, natural gas, oil, or minerals)
<i>non-renewable resource</i>	material considered finite in amount (e.g., petroleum, coal, copper), or exhaustible because of scarcity, the great length of time required to form, or rapid depletion
<i>percolation</i>	the downward movement of water through soil
<i>precipitation</i>	water falling, in a liquid or solid state, from the atmosphere to the Earth (examples: rain, snow, hail, sleet)
<i>recharge</i>	the addition of water, usually from rain and snowmelt, into the aquifer; may be artificially done by humans
<i>recycled water (reclaimed water)</i>	wastewater cleaned to government standards to be reused for many purposes



<i>renewable resource</i>	material that can be renewed, restored, or regenerated by natural ecological cycles or sound management practices. Examples include plants, animals and sunlight. Water is considered renewable (through precipitation and recharge), but in the Tucson area, it is a limited renewable resource.
<i>resource</i>	source, ability, or supply from which we draw in time of need
<i>runoff</i>	water from rain or snowmelt flowing downhill into washes, streams, and rivers
<i>Santa Cruz River</i>	the largest river in Tucson, which is now dry most of the year and only flows after significant rains
<i>transpiration</i>	the evaporation of water from plants; occurs primarily through the leaves
<i>water table</i>	the uppermost surface of groundwater in the aquifer
<i>well</i>	a hole dug or drilled down into the aquifer to locate and obtain water (deep water is usually brought up to the surface with a pump)





The *Our Water, Our Future* program addresses the following Academic Standards. (Complete versions of the Academic Standards are available at <http://www.ade.state.az.us>.)

SCIENCE STANDARDS	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
SC04-S3C1-01 Describe how natural events and human activities have positive and negative impacts on environments (e.g., fire, floods, pollution, dam).					✓
SC04-S4C3-01 Describe ways various resources (e.g., air, <u>water</u> , plants, animals, soil) are utilized to meet the needs of a population.	✓		✓		✓
SC04-S4C3-02 Differentiate renewable resources from nonrenewable resources.	✓				✓
SC04-S4C3-03 Analyze the effect that limited resources (e.g., natural gas, minerals) may have on an environment.					✓
SC04-S4C3-04 Describe ways in which resources can be conserved (e.g., by reducing, reusing, recycling, finding substitutes).	✓		✓		✓
SC04-S6C3-01 Identify the sources of water within an environment (e.g., ground water, surface water, atmospheric water, glaciers).	✓	✓			
SC04-S6C3-02 Describe the distribution of water on the Earth's surface.		✓			



MATHEMATICS STANDARDS	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.			✓		
5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.			✓		
SOCIAL STUDIES STANDARDS					
SS04-S1C9-01 Describe changes (e.g., population growth, economic growth, cultural diversity, civil rights) that took place in Arizona during the postwar era.	✓				✓
SS04-S3C4-01 Discuss ways an individual can contribute to a school or community.			✓		✓
SS04-S4C1-05 Describe characteristics of human and physical features: a. physical – (i.e., <u>river</u> , lake, mountain, range, coast, sea, <u>desert</u> , gulf, bay, strait, plain, valley, volcanoes, isthmus, canyon, plateau, mesa, oasis, dunes); b. human – (i.e., equator, four hemispheres, city, state, country, harbor, dams, territory, county).		✓		✓	✓
SS04-S4C1-06 Locate physical and human features using maps, illustrations, images, or globes: a. physical (i.e., <u>river</u> , lake, mountain range, coast, sea, <u>desert</u> , gulf, bay, strait) b. human (i.e., equator four hemispheres, city, state, country, roads, railroads).					✓
SS04-S4C1-07 Locate physical and human features in Arizona using maps, illustrations, or images: a. physical (e.g., Grand Canyon, Mogollon Rim, Colorado River, Gila River, Salt River); b. human (e.g., Phoenix, Yuma, Flagstaff, Tucson, Prescott, Hoover Dam, Roosevelt Dam).					✓
SS04-S4C2-02 Describe ways in which Arizona has changed over time from statehood to today.	✓				✓

SOCIAL STUDIES STANDARDS (Cont.)	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
SS04-S4C3 Correlates with SC04-S3C1.					✓
SS04-S4C3 Correlates with SC04-S6C3.	✓	✓			✓
SS04-S4C5-01 Describe human dependence on the physical environment and natural resources to satisfy basic needs.					✓
SS04-S4C5-03 Describe the impact of human modifications (e.g., dams, mining, air conditioning, irrigation, agricultural) on the physical environment and ecosystems.					✓
SS04-S4C6-01 Describe the impact of geographic features (e.g., rivers, mountains, resources, deserts, climate) on migration and the location of human activities (e.g., exploration, mining, transportation routes, settlement patterns).	✓				✓
SS05-S3C4-01 Describe ways an individual can contribute to a school or community.			✓		✓
SS05-S4C1-03 Identify the location of significant geographic features from content studied on a physical or political map.					✓
SS05-S4C1-04 Locate physical and human features (e.g., gulf, delta, isthmus, strait, bay, canyon, swamp, peninsula, province, cape, tree line) in the United States and world on an appropriate type of map.					✓



WRITING STANDARDS	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
4.W.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose and audience.				✓	
4.W.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.				✓	
5.W.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.				✓	
5.W.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.				✓	
READING STANDARDS					
5.RL.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.		✓			
A variety of standards may be addressed, based on how the lesson is assigned by the teacher.				✓	
LANGUAGE STANDARDS					
4.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.	✓	✓	✓	✓	✓
4.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	✓	✓	✓	✓	✓

LANGUAGE STANDARDS (Cont.)	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
5.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.	✓	✓	✓	✓	✓
5.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	✓	✓	✓	✓	✓
SPEAKING AND LISTENING STANDARDS					
4.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.	✓	✓	✓	✓	✓
4.SL.2 Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.	✓	✓	✓		✓
4.SL.3 Identify the reasons and evidence a speaker provides to support particular points.	✓	✓	✓	✓	✓
4.SL.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	✓	✓	✓	✓	✓
5.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.	✓	✓	✓	✓	✓
5.SL.2 Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.	✓	✓	✓		✓

SPEAKING AND LISTENING STANDARDS (Cont.)	LESSON 1	LESSON 2	LESSON 3	LESSON 4	PRESENTATION
5.SL.3 Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.	✓	✓	✓	✓	✓
5.SL.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	✓	✓	✓	✓	✓
VISUAL ARTS STANDARDS					
VAVA-S1C1, S1C2, S1C3, S1C4, S1C5 Create: Student will create artworks to communicate ideas, meanings, and/or purposes.		✓			

