

## Arizona Water Consumption



### Brief overview

This 30-40 minute activity has students discover how their personal water consumption for a specific set of activities compares to yearly rainfall averages in Phoenix. The activities addressed go beyond the often mentioned indoor water-use activities (flushing the toilet, brushing teeth, washing dishes) and reveal how activities less intuitively associated with water use a considerable amount of water. Completion of the activity leads students to discover that their activities consume a significant amount of water especially when compared to the amount of rain that falls where they live. The discovery is designed to challenge students to think about ways to conserve.

**Before beginning, students should:** have some understanding of the water cycle, be able to do division and make precise measurements

### Essential Question:

*The objective of this lesson is to discover different ways they use water and possible ways to conserve water.*

*At the end of the lesson, students will:*

- 1. Discover how they consume water while taking showers, buying clothes, playing outside, and eating*
- 2. Be able to compare their water consumption activities to the amount of rainfall in Phoenix*
- 3. Generate ideas for future water conservation*



**Standards Addressed:** **NGSS:** ESS3 Earth and Human Activity, grades K,5-1; **AZ Geography Standards:** Concept 5 Environment and Society, PO1, grades 3-12

**Themes:** Systems thinking, trade-offs,

**Skills:** Evidence based thinking, oral communication, team skills, quantitative skills

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### Key Vocabulary

**Consumption:** the act of eating or drinking something or the use of something (like water)

**Conservation:** the careful use of natural resources (such as trees, oil, etc.) to prevent them from being lost or wasted

**Water Cycle:** the continuous movement of water on, above and below the surface of the Earth.

### Materials Needed

- Consumption Chart Worksheet pdf-one per group
- Water Bottle Worksheet pdf-one per group
- 1-gallon plastic bottle filled with water
- Calculator – one per group
- 12-inch ruler with centimeter measurements – one per group
- Writing utensils (pencil and markers or dry-erase markers)
- AZ Water Consumption slides pdf (or prepared consumption cards)

Safety Precautions (if applicable)

None

### Teaching Instructions

#### Advanced Preparation

Divide students into groups of 4

#### Engagement (The appropriate “E” goes here for each box.)

1. Begin by asking all students aloud, “We know all life needs water to survive. *Why is this a challenge in the desert?*” Allow students to have a brief (30 seconds) open discussion to answer the question aloud. Major points that should be covered include: it is hot and dry where we live; water evaporates in the heat; it does not rain often or regularly.
2. Use the “Showering in the Desert” activity (slide #2) as an attention grabber to invest students (~3 minutes):
  - a. Ask students how long they usually spend in the shower everyday and give them time references to choose from to make decisions more easily. Let students share their responses with their group:
    - i. One radio-song long shower is about 4 minutes long
    - ii. Two radio-songs long shower is about 8 minutes long
    - iii. Three radio-songs long shower is about 12 minutes long
3. Ask students what natural phenomenon (or weather event) in the desert reminds them of a shower. You want them to say “rain”. Use this as a transition point to tell students

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that it rains about **76 billion gallons** of water in Phoenix every year (*pass water gallon around for students to hold*). Also say that if the rain were evenly divided among everyone living in Phoenix, each student would receive about **35,500 gallons** to use (slide 3).

- a. Reveal to students how much of that rainwater they use up just by showering every year (use the bar graph, slide 4):
  - i. One radio-song long shower is 12% of their rainwater
  - ii. Two radio-songs long shower is 25% of their rainwater
  - iii. Three radio-songs long shower is 37% of their rainwater
4. The issue is that we use water for more than just showering. Ask students to say aloud some other activities where they use water. They will say things like: brushing my teeth, washing my hands, washing the dishes, flushing the toilet, etc. Try to steer the group to begin talking about what may be the problem with these activities in terms of their water use.

### Exploration

1. Transition to the “Water Consumption Activity” (slides 6-12) by telling students they are going to compare their rainwater to three more activities that people do not normally mention when they talk about water use (~25 minutes).
  - a. Have students color in their *Rainwater* bottle. Make sure they know that this bottle represents rainwater for 4 people since there are 4 people in their group ( $35,500 \times 4$  is *142,000 gallons* of water every year); they need to know what a key on a graph means, on this one *10,000 gallons* of water is equal to *1 cm*; they also need to know how to divide by 10,000 (i.e. move the decimal over 4 spaces). Their *Rainwater* bottle should be colored-in 14.2 cm high in blue. After every added consumption activity, have students compare their use to how much rainwater they have: “*Have you used up a lot of your water from your clothes? Your recreation? Your food? How about all three together?*”
  - b. The **first** consumption activity is using clothes, specifically jeans. Ask students, “How do we use water to make clothes?” You want students to realize jeans are made from cotton (one of Arizona’s 5 C’s!), which needs water to grow. Have each student decide whether the majority of their jeans were bought new or if they were handed-down to them (used). Students should begin to fill out their charts with the yearly water amounts that apply to them. Have students total up the group’s clothes water consumption, convert the gallons to centimeters using the key, and color in their *Group Consumption* bottle **red**. \*Make sure students know why you use less water with a used pair of jeans: the water is divided by the number of people using the jeans (use examples when necessary).
  - c. The **second** consumption activity is recreation or playing outdoors. Tell students that we are looking at outdoor recreation in pools and parks/lawns and ask them how we use water for these activities (water to fill the pool and to water the grass). Have each student decide whether they played mostly in private (backyard) or public pools and lawns/parks this past year. Have

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<p>students continue to fill out their charts with their recreation water consumption, total the group's amount, convert to centimeters, and graph the new amount on top of the clothes line in <b>purple</b>. *Make sure students know why you use less water when you use a public facility (more people using the same water).</p> <p>d. The <b>third</b> consumption activity is eating. Ask students, "How do we use water to make food?" A large range of answers is applicable (watering fields for cattle, processing meat, etc.). Have each student decide if they ate beef, chicken, or pasta without meat the most this past year. Have students continue to fill out their charts with their food's water consumption, total the group's amount, convert to centimeters, and graph the new amount on top of the recreation line in <b>green</b>. *Make sure students know why you use more water for beef versus chicken versus pasta (cows are bigger, so more food to grow for them and more meat to process).</p>
<p>Explanation/Elaboration</p> <ol style="list-style-type: none"> <li>1. Which groups used water more than their rainwater amount? If people are using more water than what comes from the rain, where else do we get our water in Arizona? (from other states, groundwater, rivers, lakes, canals, recycled water, etc.) Have pictures on-hand to show. This question is also a good spot to tie the conversation back to water history in Arizona. How did people living years ago get their water in Arizona and how has the process changed?</li> <li>2. Which of the three consumption activities uses the most water? This is the activity we should look at first when wanting to decrease our water-use.</li> </ol>
<p>Evaluation</p> <ol style="list-style-type: none"> <li>1. What have we learned? Is there a problem?</li> <li>2. Show students a minimization of all three water usage activities as an extreme water conservation way-of-life (Slide 13). What are some ways we can reduce our consumption? What could you do yourself?</li> </ol>

## Homework

Have students track their water usage in the activities we did not address at home (toilet use, brushing teeth, and showering).

## Additional Resources

To find out more about water and water activities, see the following websites:

<http://www.nature.org/all-hands-on-earth/water> and <http://www.epa.gov/watersense/>

Reference: Embedded water:

<http://environment.nationalgeographic.com/environment/freshwater/embedded-water/>

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