



Arizona's Water and Food Systems

Food and water are critical sustainability issues, and it is important for students to understand their local food and water situations. This lesson highlights the local food and water supplies of Arizona. It begins by discussing where Arizona gets its water and how that water is used. During this portion of the lesson, students will trace a map of Arizona to better understand the locations of water and how far it has to travel. In the second half of the lesson, the class will discuss what foods grow best, and when, in Arizona. Students are asked to fill out a calendar about harvest times, and compare that calendar to their personal food audit (which ideally has been completed prior to the lesson).

Before beginning, students should: prepare a personal food audit, where they journal (or otherwise document) what they eat during a day, a week, or a month. This will be used to compare to the food calendar activity.

Essential Question(s): Where does Arizona, and Phoenix, get its water? How do people in Arizona use water? What crops can be grown in Arizona? What time of year do various crops grow?

The objective of this lesson is to help students understand their local food and water systems, what kinds of local food can be found in Arizona, and details about where Arizona cities get their water.



At the end of the lesson, students will be able to:

1. describe the sources from which their water comes.
2. use a calendar to find when various crops are harvested in Arizona.
3. evaluate their personal diets for locally grown options, and modify if desired.

Created by Laurel Kruke, adapted from "Arizona Food and You" lesson by Emily Freeman, using resources from Cornell University and Project Wet.
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Standards Addressed:

Science: *Strand 3: Science in Personal and Social Perspectives, Concept 2: Science and Technology in Society (PO4); Strand 6: Earth and Space Science, Concept 1: Geochemical Cycles (PO5)*

Common Core and 21st Century Skills: *Environmental Literacy.*

Themes: Systems thinking, scale

Skills: Evidence-based thinking, research skills

Key Vocabulary

Central Arizona Project (CAP): a canal system that connects the Colorado River to deliver water to areas of central and southern Phoenix.

Groundwater: water from within the earth, usually stored in underground aquifers; groundwater is often used as drinking water, and for other purposes.

Harvest: process of gathering food; a time period within which food can be gathered.

Law of the River: contracts, regulations and guidelines used to manage the Colorado River and the distribution of its water.

Reclaimed Water: former wastewater that was initially used from something else, which then is treated, and reused for another purpose (often landscaping, irrigation, and other commercial and industrial needs; also called recycled water).

Surface Water: water that runs on Earth's surface, such as lakes, ponds, rivers, and oceans.

Materials Needed

- **Presentation – Arizona's Food and Water Systems** PowerPoint slide presentation pdf
- **Worksheet – AZ Water Map** pdf (1 copy per student)
- **Worksheet – Food Calendar** pdf (1 copy per student)
- **Worksheet – Food Calendar – Teacher's Copy** pdf (for your reference)
- **Worksheet – Planting and Harvest Calendar** pdf (1 copy per student)
- **Worksheet – Food Audit Comparison** pdf (1 copy per student)

Safety Precautions: None

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Teaching Instructions

Advanced Preparation

- Print copies of “Worksheet – AZ Water Map,” double-sided and in color if possible (1 for each student).
- Print copies of “Worksheet – Food Calendar” (1 for each student).
- Print copies of “Worksheet – Planting and Harvest Calendar,” double-sided if possible (1 for each student).
- Print copies of “Worksheet – Food Audit Comparison” (1 for each student).
- Familiarize yourself with the planting and harvest calendar and the AZ Water Map and reading prior to the lesson.

Engagement [Slides 2-4]

1. Water in AZ (5 minutes)
 - a. [Slides 2-3] Start the lesson by asking students where they think their water comes from. Record responses to “Where does our water come from?” on the whiteboard, or have students write what they think in their notebooks. Possible responses might include:
 - a. Colorado River, Salt and Verde Rivers
 - b. Reservoirs and lakes
 - c. Groundwater
 - d. Reclaimed/recycled water
 - b. [Slide 4] Show students the chart about water usage, and explain that most water in Arizona is used for agricultural purposes; municipal uses include residential; industrial usage is a smaller portion of the state’s water use.

Exploration and Explanation [Slides 5-9]

Pass out “Worksheet – AZ Water Map.” Student will use this during the next part of the lesson.

2. Arizona’s Sources of Water (10-12 minutes)
 - a. [Slides 5-6] Colorado River
 - i. Using the AZ Water Map, ask students to trace the Colorado River from where it enters Arizona to where it exits.
 1. Explain to students that half of Phoenix’s water supply comes from the Colorado River; the other half comes from the other sources we just mentioned – other sources of surface water (Salt and Verde Rivers, lakes), groundwater, which is accessible by wells, and reclaimed water (for purposes such as agriculture and other non-potable needs).
 2. Explain that the Colorado is replenished by the snowpack from the mountains in northern states. If the snowpack decreases over time, the water levels of the Colorado could decrease.
 3. Introduce the general purpose of the Law of the River, and the 1963 Supreme Court decision about water priority; during times of drought, California has priority over the water in the Colorado River, and Arizona has to manage its water

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accordingly.

- a. Additional note: An acre foot is the volume of water it takes to fill an acre of land to a depth of 1 foot. A family typically uses 1 acre foot per year, sometimes slightly less in areas of the southwest that are water deprived. 1 acre-foot per year generally equates to 893 gallons per day.
- b. [Slide 7] Salt and Verde Rivers
 - i. Using the AZ Water Map, ask students to find and trace the Salt and Verde Rivers.
 1. Explain that in addition to the Colorado River, the Salt and Verde Rivers also provide water to the City of Phoenix.
 2. Originally, the Salt and Verde Rivers provided water for the farmers, and were initially dammed for irrigation, storage, and agricultural purposes.
 3. Now most of that water is used for urban purposes in Phoenix.
 4. The Salt River Project (SRP) manages the water in these rivers.
- c. [Slide 8] Central Arizona Project (CAP)
 - i. Using the AZ Water Map, ask students to find and trace the Central Arizona Project canal system.
 1. Explain that the CAP project was created to move the water in the Colorado River to central and southern Arizona, for use by Phoenix and Tucson residents.
 2. All the water from the Colorado has to be pumped from the river through the canals, through different types of terrain and different elevations.
 3. The CAP canal is one of the highest users of ENERGY in the state.
- d. [Slide 9] AZ Water Map
 - i. Mention that students have now traced the Colorado River, the Salt and Verde Rivers, and the CAP Canal on their maps and that these are important pieces of Arizona's water system, which is much more complex, and has many other parts, also depicted on their maps.
 - ii. If students would like to learn more about water distribution throughout the state, an **optional homework assignment** could be to read the information on the back of the AZ Water Map.

Engagement [Slides 10-14]

3. What food can we get from Arizona? (5-10 minutes)
 - a. [Slide 10] Transition topics by referencing the water use chart from the beginning of the lesson – 70% of AZ water is used for agricultural purposes; the next section of the lesson will be about Arizona's local food supply.
 - b. [Slide 11] Ask students what they know about food availability in Arizona. Ask students to name the top 10 crops (fruits and vegetables) grown in Arizona; write their responses on the whiteboard.

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- c. [Slide 12] Once they have had a chance to respond, share the Top 10 Crops, according to the AZ Dept. of Agriculture. Are the two lists similar? What surprises students about the top 10 crops in AZ vs. what they thought?
 - i. A note about the table: Carton measurements differ based on the produce being packaged. They are generally measured by weight, and therefore can be different depending on what's being measured.
- d. [Slides 13-14] Next, ask students what major livestock are raised in AZ; record their answers on the whiteboard next to crops. Then see how their responses compare.

Exploration [Slide 15]

Pass out “Worksheet – Food Calendar” and “Worksheet – Planting and Harvest Calendar.” Students will use these worksheets during the next activity.

- 4. What grows when? (15-20 minutes)
 - a. Students will take the next few minutes to fill out their food calendar using the planting and harvest calendar from the Urban Farm.
 - b. Ask students to work with 1 or 2 other people to fill out the calendar. They will need to find the Main Harvest of each of the fruits/vegetables on the Planting and Harvest Calendar, and write the names of these items in the corresponding month(s).

Explanation [Slides 16]

- 5. What grows when? (5 minutes)
 - a. Ask students why they think some crops grow better during specific seasons or in specific places better than other. Have students raise their hands to share their ideas. Responses may vary, but crop growth is typically dependent on:
 - i. Sunlight and sun exposure
 - ii. Temperature
 - iii. Soil quality
 - iv. Insects/pests
 - v. Water and irrigation

Elaboration [Slide 17]

Pass out “Worksheet – Food Audit Comparison.” Student will use this during the next portion (or for homework).

- 6. To wrap up the food portion of the lesson, students will compare the food calendar to their personal food audit (which they will ideally have completed before this lesson). Ask students to respond to the questions on the Food Audit Comparison worksheet. (10-15 minutes)
 - a. If there is not enough time to complete this activity during class, assign this as **homework**.
 - b. If students have not completed a food audit, ask them to think about their weekly diet, and respond to the questions on the worksheet using that information.

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Evaluation

7. Worksheets will be used for evaluation. Collect these when students have completed their homework assignments (if assigned).
 - a. Collect the “Worksheet – Food Calendar” and assess based on completion and correct responses (see Teacher’s Copy for key).
 - b. Collect the “Worksheet – Food Audit Comparison” and assess for completion and thoughtfulness of responses.

Homework

- **Optional homework:** If students were not able to complete the Food Audit Comparison during class time, assign as homework, and collect the following day.
- **Optional reading:** Ask students to read the information on the back of the “Worksheet – AZ Water Map.”

Extension

- A potential extension for the water portion of the lesson could be for students to consider opportunities for how Phoenix can be more efficient with their water usage. This could be in the form of a brief research project/essay, or a bigger discussion during class time.
- A potential extension opportunity could be for students to expand their analysis of their personal food audit. In addition to the questions on the Food Audit Comparison worksheet, students could revise their diet to include as many local food items as they can. This could include a research component where students need to look up local farmer’s markets or local supply at grocery stores.

Additional Resources

For additional information about the Phoenix water supply and conservation efforts, see <https://www.phoenix.gov/waterservices/resourcesconservation/water-efficiency#!>

For additional information about the Law of the River, see <http://www.usbr.gov/lc/region/g1000/lawofrvr.html>.

For additional information about specialty crops grown in Arizona, see the Arizona Department of Agriculture, and <https://agriculture.az.gov/2015-specialty-crop-guide>.

Sources for original lesson

Water Map activity based on an activity from Project Wet – Discover a Watershed – The Colorado and Arizona Water Map Curriculum.

Food Calendar activity based on lessons from Emily Freeman and Cornell University.

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