

Lesson 1: Introduction to Water Conservation

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Grade Level(s)

First, Second, Third

Lesson Overview

Students will participate in either a whole-group or small-group shared “notice and care” activity in observing and collecting data about how water is stored or collected. This is the first in a sequence of three lessons.

Learning Objectives

Students will evaluate and critique the ways in which animals, plants, and humans collect and store water.

Standards

- NGSS 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
- NGSS K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- NGSS 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Preparation

- Find pictures/video links of desert and tundra environments
- Find pictures/video links of plants conserving and collecting water
- Produce miniature versions of pictures

Materials and Resources

- Pictures/video links of desert and tundra environments

- Pictures/video links of plants conserving and collecting water
- Miniature versions of pictures
- Worksheets to collect students' "notice and care" information about plants and humans

Activity 1: Desert "Notice and Care"

1. Show students pictures of deserts. In an open dialogue, engage students to describe what they notice in the images. For example, students may describe that it is dry, or that it is hot.
2. Have students now look at various animals that may live in these environments. Again, prompt students to share what they notice about these animals.
3. Let students know that some plants, just like these animals, must survive in a desert. Display video/images that students may use to make observations about the plants and their needs in the desert.
4. Ask students what they think would be important for these animals and plants in order to survive in the desert. What would they care about? What would be hard to find in the desert? Emphasize that you would like us to see how they deal with water needs in this lesson.

Activity 2: Plant Adaptations "Notice and Care"

1. Have students self-arrange into groups. Each team must have a member that is willing to be the recorder, one member willing to be the reader, and one member willing to be the illustrator.
2. Students will record their findings of what they think these plants are doing to keep and collect water. Remind them that some of the plants included in their set may not necessarily live in the desert, but that they, too, are great at keeping water.
 - a. They will fill a small chart where they can write the name of the plants and their hypotheses.
 - b. After 15 minutes, a small description about how some of these plants are retaining water. (This material is a collection of pictures of plants that embody a specific skill shared in the notes section below. Students can view it as a challenge to match it to the plant that belongs to it).

Activity 3: Close

1. Ask students if they believe that we also need water in the ways these plants do.
2. Have students begin to brainstorm about how humans are able to both find water and store it.
3. Let students know that the next time we meet, we will be looking at what humans do and maybe they can help make humans' practices better by looking at what animals do.

Assessment

Students can be assessed through the group conversation, but also by the recorded sheet with their findings and hypotheses about how plants and animals conserve or store water.

Resources

Plant Name	Way of conserving water	Way of storing water
Lavender	Small leaves	
California Poppy	Feathery leaves	

Charts should be large enough to allow students to draw and write multiple hypotheses. You can provide it with the names of the plants completely filled, if you wish. Alternatively, you can provide one or more example rows and have students fill in the rest.

Notes for Chart Production:

- Fewer stomata, the pores in the epidermis or skin of the leaf, on the leaf can reduce water loss.
- In hot, dry climates many plants open their stomata only in the cool of the evening. (**cactus**, see <http://www.cactuseum.com/survival.asp>)
- Small leaves (**totorá, lavender**) have a reduced surface area to enable plants to conserve water, as do feathery, filigree leaves (**romneya, eschscholzia or Californian poppy**).
- Needle-like foliage (**grasses, pine trees**) has a very small surface area that loses very little water. Some of these plants can roll their leaves inwards, further reducing surface area and water loss.
- Gray or light colored foliage reflects light, reducing heat and thus water loss from transpiration.
- Thicker cuticles, the outer waxy coating on leaves, slow transpiration. Many coastal plants have a thick, glossy coating on the leaves, reducing water loss and also protecting from salt-burn. In many evergreen leaves, the cuticle cuts down water loss in two ways: it acts as a barrier to evaporation, and the shiny surface reflects heat and lowers temperature.
- Silver hairs coating leaves reflect light and help to lower temperatures inside the leaf, as well as reducing the effect of drying winds.
- Thick fleshy leaves can store water. Many succulents have thick leaves that, when bruised or broken, contain a great deal of moisture.
- Sunken stomata: Stomata may be sunk in pits in the epidermis; moist air trapped here lengthens the diffusion pathway and reduces evaporation rate.
- Leaf rolled with stomata inside: This adaptation is found in Marram grass (*Ammophila*). The inner surface is covered in hairs. The rolled leaf and hairs both

serve to trap moist air so reducing transpiration. In addition, a smaller surface area of leaf is exposed to the drying effects of the wind.

- Small leaves: Many xerophytic plants such as pine and heather, have small, needle shaped leaves which are often circular in cross section. This reduces the surface area and hence the evaporating surface.