



Wildlife Science @ Home: Water Conservation in the Desert

STUDENT ACTIVITY

All animals need water. It is necessary to digest food, rid the body of wastes and maintain a healthy body temperature. Water is so important that most animals are made up of about 65% water and most plants are 90% water!

But in the arid deserts of the southwestern United States, water can be difficult to find. Humans have managed to live successfully in this area through ingenuity and engineering. Through the use of canals and pumps, we can often deliver water to our house from a source hundreds of miles away. As a result, when we turn on a faucet we usually expect water to come out. Yet, animals don't have it so easy. They have to hunt for all the water they need to survive.

Many desert dwelling animals have unique adaptations that allow them to conserve the small amount of water they might find. The desert tortoise is capable of storing water inside its bladder, allowing it to go long months without needing to drink new water. This is an important adaptation in an area where rains can be few and far between. Perhaps the most extreme example of water conservation adaptations is the kangaroo rat. It never actually needs to drink water! It is able to find all of the water it needs from the moisture in the food that it eats--seeds.

Pretend you just discovered a new animal called the "desert sponge." In your observations of this animal, you have learned that it spends about four hours each day outside in order to find enough food. You also discovered that its weight can vary tremendously. Once it finds water, it can quickly absorb it into its body and store it for use later. You are curious about how the desert sponge has adapted to conserve this water. So, you decide to take a model of this organism and perform a simulation to better understand these adaptations.

Do the Science

1. Think about adaptations the desert sponge might have to prevent water loss while it is outside. Write these ideas down in your research journal.

Time

Minimum of four hours

Materials

- Notebook to use as a research journal
- Pen or pencil
- 2 dry sponges
- Water
- Measuring cup
- 2 small plates or dishes
- Various household materials such as aluminum foil, plastic wrap, toothpicks, cardboard tubes, paper towels, etc.

2. Put 1-2 cups of water into your measuring cup. Note the water level.
3. Place one of your sponges in the measuring cup and allow the sponge to absorb as much water as possible.
4. Remove the sponge from the water and place it on one of the plates.
5. Note the new water level in the measuring cup. Determine how much water the sponge absorbed. Record this number in your research journal.
6. Repeat steps 2-5 with the second sponge.
7. Use the household materials to create models of some of the adaptations you listed in step 1. Add those adaptations to ONE of your sponges. For example, if you said that the animal might have a special skin that prevents water from leaving the body, then maybe you would surround the sponge in plastic wrap. Describe what you did in your research journal.
8. Place both sponges next to each other in a location outside where they will not be disturbed for hour hours. Record the location and starting time in your research journal.
9. Once four hours has passed, bring both sponges back inside. Remove your special adaptations from the one sponge. Record the ending time in your research journal.
10. Squeeze as much water as possible from one sponge into an empty measuring cup. Note the water level in your research journal. Repeat for the second sponge.

Think about It

Look at the data in your research journal. The amount of water you were able to squeeze out of each sponge is the amount of the water that this animal was able to save inside its body while outside feeding. What conclusions can you make? Which sponge retained the most water? How successful were your adaptations?

The sponge that did not have any adaptations added to it can be described as a control. A control is something in an experiment that remains constant and unchanged. Why was a control important for this experiment? How did it help you come to your conclusions above?

Science never stops. Our observations and data answer some questions, but in the process they create new questions. We take the knowledge we gained from an experiment and apply it to new research. This is how we continue to improve our understanding of the natural world. Based on the results of this experiment, what new questions do you have? Can you design an experiment to answer those questions?

Don't forget to record all of your thoughts and response to these questions in your research journal. A written record of your science is important!



The kangaroo rat is perfectly suited for arid desert living. It does not need to drink water, pulling all its necessary moisture from the seeds that it eats.



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TEACHING GUIDE

In this activity, the student will compare the water loss between two sponges left outside for a period of four hours. The student will use common household materials to add “adaptations” to one of these sponges. The other will have no modifications and will serve as a control. The purpose of this activity is to use models and simulations to learn about adaptations that animals have to conserve water in the harsh, arid desert environment.

Time

This activity should last 4-5 hours. However, the student will not be working on it throughout the entire time. There will be time at the beginning (perhaps 30 minutes) where the student will develop the adaptations and take measurements. Then, the sponges are placed outside. They will remain outside untouched for four hours. Then, there will be some time at the end for final measurements.

Teaching Tips, Modifications and Extensions

- The specific household materials used do not matter. What matters is that the student has a variety of materials from which to choose and has the opportunity to think about how to use those materials. You can also consider using natural materials such as leaves, sticks, soil, etc.
- For best results, the sponges should sit out in the middle of the day when the sun will have the greatest impact. Hotter days are better.
- To add math, you can have the student calculate the amount of their body weight that comes from water. Assume that they are composed of 60% water. Also, you can have students graph the results comparing the water loss from the two sponges.
- The unaltered sponge serves as a control. A control is an important component of many science experiments. The control shows the constant or unchanged state. It provides the researcher with a “normal” condition with which to compare the results from the changes that were made. Without a control, it would be impossible to know what impact the household material adaptations had on water loss.
- If time permits, students should be given the opportunity to carry out similar experiments to address some of the questions that arose at the end. They can also be given the opportunity to suggest (and even perform) modifications to this experiment to improve their results. This might include testing one adaptation at a time or testing over more days.