Red Butte Garden
THE UNIVERSITY OF UTAH

Conserving Water In the Desert

Lesson 3:

Water Above Us, Water Below

Enduring Understanding

Water is found in different areas of the earth in different physical forms – as water vapor in the air; as liquid in lakes, streams, ponds, oceans, and in underground aquifers; and frozen in glaciers and in the polar ice caps.

Essential Question

Where are the sources of clean, available water for human use in the world and in the area where I live?

Background Information

Earth's Water Sources

http://water.usgs.gov/edu/earthwherewater.html

Utah Water Watch: Utah's Major Watersheds Map

www.extension.usu.edu/utahwaterwatch/htm/maps/utah-major-watersheds

Utah's Water Supply

http://www.water.utah.gov/Brochures/UWS_BROC.HTM

Lesson Plan

Materials

- BB *Sources of Water* book (Lower Grades)
- BB Student Worksheet Water Above, Water Below
- BB Aquifers Chart (Appendix)
- BB U. S. Geological Survey Water Source and Distribution Chart (Appendix)*
- BB Utah Watersheds Chart (Appendix)
- BB Student Worksheet Global Water Source and Distribution
- BB 2 plastic pans 9" x 13" for each team
- BB wheatgrass seeds
- Sand, approximately 4 quarts
- Soil, approximately 4 quarts
- Clay, 2 small packages
- Medium sized rocks, assorted
- 1-2 small houseplants per team
- Twigs, assorted
- Pine cones or other collected natural materials
- Small green sponge to represent wetland, one per team
- Optional: cellophane or blue craft styrofoam sheets to represent water
- Optional: small pieces of felt
- Cocoa powder or black pepper, ¼ cup per team

Procedure

Warm-up

Pair students. Have them brainstorm about places where water is found on the planet. Have them share their ideas with the whole group. Name the sources and choose a student scribe to write them on the white board.

Give out the Global Water Source and Distribution Student Worksheet* and have students each fill out the middle prediction column, estimating what percentage of the water at each source might be available for human use.

When they are finished with their estimates, have them share their estimates. Also discuss the state of water at each of the locations.

Then, project the Global Water Distribution graphic on the board and have students record the actual amount of water that is available to us. Lead a discussion on their estimates vs. the real percentages. You can use the following questions to direct the discussion:

What stands out for you?

Was there any surprising data?

What can you say about the actual amount of water that is available for our use?

Project the Utah Watershed Map on the board and discuss the area of the state where you and your students reside, including the mountains (headwaters), the streams and rivers and the valleys. Discuss the yearly precipitation in Utah's desert biome and the actual amount of precipitation in your particular area, examining the reasons for the difference. Also, discuss the rivers, dams, irrigation systems, any reservoirs for drinking water in your area, wells, and other factors that might impact the potable water in your area.

After the discussion, instruct the students: Point out the watershed in your area again and clarify that this is the water available to citizens in the area where you live. Tell them they will make a model of their watershed and experiment with it to discover the role of plants in controlling soil erosion. They will also create a second watershed without plants to represent a disturbed area and then compare the two models.

**Adapted from Utah State University Water Quality Education: Streamside Science.*

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BOTANY BINS

Name: _____ Date: _____

Student STEM Practices Worksheet

Lesson 3: Global Water Source & Distribution, 3rd-6th Grade

1. Gathering Data:

Questions I have: _____

_____

Source of Water	What is water's state of matter at this source?	My Predictions Percent of Water Available for Use	Actual Percent of Water Available for Use
Oceans			
Icecaps / glaciers			
Groundwater			
Freshwater lakes			
Inland seas / salt lakes			
Atmosphere			
Rivers			

2. Reasoning:

Look at your data chart and compare your predictions with the actual percentages of water that is available to us for use. What surprised you? What connections did you make?

3. Communicating Your Findings:

What implications does the data have on human water consumption? Discuss with a partner and write your conclusions here?

Activity: Water Above, Water Below

Using the materials above and any additional art materials, have students work in teams to build (1) a model watershed for the area of the State where they reside using one of the pans; and (2) in the other pan, a model of a disturbed area that has no vegetation.

- Pan #1: Have them make a flattened clay layer that covers a small portion of the pan to represent the non-permeable asphalt and cemented areas. They can add materials on top such as moist soil, plants, and a lot of textured materials, larger rocks, twigs, small potted houseplants or annuals, etc.
- Pan #2: Make a few "mountains" with clay and add a small layer of soil on top of the mountains and across the pan.
- To test the erosion-control qualities of the plants and vegetative matter, have them raise one end of the pans about two inches higher than the other end.
- Students should make predictions on their Student Worksheet Water Above, Water Below about how quickly water (simulated rainfall) will flow from one end of each pan to the other end, and what happens to the water as it flows.
- Have them slowly pour one-three cups of water into each of the high end of the pans. Observe the water flow and absorption, and then record the data.
- Have them discuss their reasoning with a partner and then complete the Reasoning and Communicating Your Findings sections of the Student Worksheet.
- To explore how pollutants might get distributed over groundwater, sprinkle some cocoa powder or black pepper (to represent pollutants) over the pans and pour more water at the high end of the pans. What happens to the water?
- Discuss and record explanation.

**Adapted from USU Streamside Science*

RED BUTTE GARDEN
BOTANY BINS

Name: _____ Date: _____

Student STEM Practices Worksheet

Lesson 3: Water Above, Water Below, 3rd- 6th Grade

Objectives
You will create a model of the watershed in your area of the state in order to explore the role of plants in controlling erosion.

- Using the materials provided by your teacher, create a model watershed based on the watershed where you reside, and another model of a disturbed area.
- Pan #1: Make a flattened clay layer that covers a portion of the pan to represent asphalt or cemented areas of the ground. Add textured materials such as soil, sand, plants, rocks, twigs, etc. Plant some wheat grass seeds in the soil and keep them very moist until they are about 2 inches tall. Wait for a few days for the grass seed to sprout before continuing. (You can also add small plants to this pan in place of, or in addition to the grass seeds.)
- Pan #2: Make a few "mountains" with the clay; add soil on top of the mountains. This pan will represent a watershed that has been disturbed and lacks plant life.
- Raise one end of both pans higher than the other ends. You will simulate a rainfall by pouring water into the pans. **Write predictions about what will happen to the water in the different landscapes.** Then, pour the water into the high ends of the pans slowly. Record what happens.

Questions I have: _____

_____

My Prediction: _____

_____

1. Gathering Data:

- Slowly pour 1-4 cups of water into each of the higher ends of the pans and observe the water flow and absorption in each pan as the water moves to the lower end of each pan. Record your observations.
- Next, sprinkle cocoa powder or black pepper to simulate pollutants, over the pans. Pour another 2-3 cups of water into the higher ends of the pans. Record your observations.

	Describe the watershed model you created	Describe the model after one cup of water	Describe the model after "pollution" & more water are added	Additional notes
Pan #1				
Pan #2				

2. Reasoning:

Analyze your data and explain what happened.

Using your data, describe any differences in the watershed of the two pans. You may draw a picture.

3. Communicating Your Findings:

Explain to a partner any differences in the watershed between the two pans. What role did the plants play in the differences? What can you say about the clay or other impervious materials? You may draw a picture.

Extension

Project WET Curriculum and Activity Guide:

"Blue Planet", page 125