



# Conserving Water In the Desert

## Lesson 8: Harvesting Water for a Waterwise Landscape

### Enduring Understanding

The majority of Utah's landscape is a desert with limited water resources. Since landscape watering represents the highest water usage within individual households, the greatest impact individuals can have on water conservation is to (1) change the plants we choose for our home landscapes, and (2) to change our watering habits.

### Essential Question

What will be the effect of the different choices my family and I make to conserve water in our home landscaping in the area where I live?

### Background Information

Utah is the second driest state in the United States. There are three distinct environments located in different areas of the State with different types of plants and animals inhabiting each of these areas. The water needs for plants that thrive in each of these areas will differ, and should guide the decisions for landscaping to maximize water conservation in each of these areas. See this website for additional information on watering recommendations at Division of Water Resources:

<http://www.conservewater.utah.gov/guide.html>

# Lesson Plan

## Materials

- BB Utah (Desert, Forest, Wetland) Biome Cards
- BB Ecoregions of Utah Map

## Procedure

### Warm-up

- Divide students into three groups and assign each group a different Utah environment to study and discuss: (1) Forest, (2) Desert, (3) Wetland. Give students in each group a Utah Biome Card of their assigned environment to study.
- Have each group share their findings with the whole group.
- Display the Ecoregions of Utah Map on the classroom screen or on your Smartboard. Have students look at the map to determine which biome or environment encompasses the greatest part of the State (Utah is mostly cold desert).
- Discuss amount of potential water available to people living in different areas of the state.
- This should lead to a discussion of the need for water conservation in a state that is primarily a desert.



## **Activity #1: Water Needs of Different Plants**

### **Materials**

- A set of 4 plants (4" pots) for each of 3 or 4 groups:
  - 2 xerophyte (drought tolerant plants) (yucca, succulent, cactus)
  - 2 hydrophyte (water-loving) plants (fern)
- Drip trays for the plants

Students will be watering two sets of plants to determine the differing amount of water needed to keep the plants growing and thriving.

Divide the students into three or four groups and give each group a set of plants (2 drought tolerant and 2 ferns or other very water needy plants).

Have them water both sets of plants thoroughly until water comes out the drainage holes. Allow all the water to drain through (you can test if it has completed draining by putting a paper towel underneath the holes; when the towel remains relatively dry - damp, not soaked - the experiment can begin.

*Note: One set of plants will not be watered throughout the experiment.*

Have teams design an experiment that will demonstrate the water needs of each type of plant with the other set of plants. They will record the design on the Student Worksheet Water Needs of Different Plants and make a prediction about the outcome.

Students in each group will place all four of their plants (each with a separate drainage tray) in a sunny window. (They should record the direction of the sun.)

Have them water regularly and record the amount of water they add to the plants for two weeks. Record in words or drawing what is happening to the plants each time the plants are watered on the Student Worksheet.

Be sure to have them pour out the excess water that collects in the drainage tray from the plants.

Have them complete the Student Worksheet. Discuss their findings as a whole group and have them share their conclusions and extensions to include the impact of plant choices in Utah landscapes.





Name: \_\_\_\_\_ Date: \_\_\_\_\_

## **Student STEM Practices Worksheet**

### **Lesson 8: Water Needs of Different Plants, 3<sup>rd</sup> – 8<sup>th</sup> Grade**

#### **Objectives**

You will explore water needs of a “drought resistant” plant and one that needs considerably more water over a two-week period of time. Based on the outcomes of the experiments, you will draw some conclusions about outdoor landscape design in Utah’s desert.

#### **1. Gathering Data:**

**Instructions:** You will design an experiment to explore and observe and record the water needs of two different kinds of plants and then write a conclusion about which plants are most appropriate for Utah’s desert climate.

- You will have two sets of plants to test – each set will have one drought-resistant plant and one plant that needs considerably more water.
- As a group, discuss questions you have. Design an experiment that you think will answer your question(s) about the water needs of the two kinds of plants.
- Things to consider: placement of plants, amount of water, time of watering, measuring amount of water leaving plants, days. Include where you will place your plants, how much you will water the plants, and how often you will water.

Questions we have: \_\_\_\_\_

\_\_\_\_\_

Our Prediction: \_\_\_\_\_

\_\_\_\_\_

Experiment: Describe your experiment design:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# RED BUTTE GARDEN BOTANY BINS



NOTE: One set of plants will not receive additional water for two weeks.

Label the two plants receiving additional water #1 and #2.

Label the plants not receiving additional water #3 and #4.

At the beginning of your experiment, water each set thoroughly until water drains out the bottom. Paper towels can be placed under each plant to absorb all the extra water that drains out before beginning your experiment.

Make your observations and record your data (see key below). Also record what your plants look like throughout the two weeks. Only mark the days you actually water the plant.

Plants	1 / 2	1/2	1/2	1/2	1/2	1/2	1/2
Date Week 1							
Amount of Water							
Date Week 2							
Amount of Water							

*+ = Positive change   x = no change   - = negative change*

During the two weeks, record your observations about your four plants. Describe in detail the condition of each of the plants: How do the leaves, flowers, soil appear? Add any other observations that you feel are important.

Appearance of Plants

Date							
Plant 1							
Plant 2							
Plant 3							
Plant 4							



## RED BUTTE GARDEN BOTANY BINS



### 2. Reasoning:

Analyze your data and explain what happened. You may draw a picture.

Using your data, at the end of the two weeks, explain what you think was happening to each of the plants. Be sure to notice the leaves, flowers, soil and whether the plants are thriving.

### 3. Communicating Your Findings: You may draw a picture.

As a team, discuss your data findings. What are your conclusions? Share your procedure and data findings with the class.

After listening to all of the experiments and data, write a short explanation of what took place over the two weeks. What can you say related to the supply of water in Utah's desert climate and the type of plants that might be most appropriate for outdoor landscaping?



## **Activity #2: Design a Landscape**

Discuss the importance of conserving large quantities of water, such as that used in our landscaping. Review “Lesson 6 – Turn Off the Tap!” to remind students about the importance of conserving water.

In landscaping, a homeowner has many opportunities for saving water:

- Planting drought tolerant plants
- Harvesting rainwater or “gray” water
- Water Catchment systems
- Researching water needs of plants and adjusting sprinklers
- Arranging plants with similar water needs together and water accordingly

## **Materials**

- BB Student Worksheet Design a Landscape
- BB Plant Lists
- Computers
- Various art media (colored pencils, markers, pencils, drawing paper)

Students will use data from attached lists and reliable plant databases to create lists of drought resistant plants for the area in Utah where they live. They will design an ideal landscape for the area where they live (within their growing zone). Here are websites to begin the project:

<http://www.waterwiseplants.utah.gov/>

[www.denverwater.org/Conservation/Xeriscape/XeriscapePlans](http://www.denverwater.org/Conservation/Xeriscape/XeriscapePlans)

[www.utahpublicgardens.org](http://www.utahpublicgardens.org)

[www.plantselect.org](http://www.plantselect.org)

[www.conservationgardenpark.org](http://www.conservationgardenpark.org)

[www.extension.usu.edu/htm/publications/publication+6291](http://www.extension.usu.edu/htm/publications/publication+6291)

This is another site that has recommendations for drought tolerant plants:

[http://www.slcgov.com/sites/default/files/documents/forestry/2012/forestry\\_waterwisetreelist.pdf](http://www.slcgov.com/sites/default/files/documents/forestry/2012/forestry_waterwisetreelist.pdf)

For information on Utah native plants, visit the Utah Native Plant Society website:

<http://www.unps.org/index.html>

In addition to websites, there are plant lists for different environments included in the bin materials for students to use.

Using the Student Worksheet Design a Landscape, have students manually sketch a design, or use a computer graphics program to create a landscape using information from the lists. You can have a gallery walk to share finished designs.



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## **Student STEM Practices Worksheet**

### **Lesson 8: Design a Landscape**

#### **Objectives**

You will be researching plants and their water needs to design a water-wise landscape. You may use the websites your teacher gives you or you may visit other websites.

#### **1. Gathering Data:**

Questions I have: \_\_\_\_\_

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List websites you visited to find plants for your landscape design:

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List any challenges or obstacles you faced when engineering / designing a landscape that uses water-saving methods.

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Growing Zone: \_\_\_\_\_

[illegible]

### **3. Communicating Your Findings:**

Draw your landscape design here. (You may want to use additional paper).

Explain your design (why you placed plants the way you did; how you used drip or water catchments, etc. to conserve water and why).





## **Activity #3: Harvesting Water**

Using the information at these websites, or additional websites students research about how to build large catchments and rainwater harvesting, have the students engineer and build a model catchment system or a model rainwater harvesting system. Have the students use the Student Worksheet Harvesting Water and complete all sections.

### **Materials**

- BB Student Worksheet Harvesting Water
- Various building materials such as: pvc pipes of various lengths, rocks, gravel, sand, various-sized containers to represent small-scale “barrels”

You can have students display their system and have an “Engineer Fair” to let them each present and discuss their project.

<http://extension.arizona.edu/catchtherain/pdf/drops-count.pdf>

<http://extension.arizona.edu/catchtherain/pdf/catch-the-rain-model.pdf>







Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student STEM Practices Worksheet

### Lesson 8: Harvesting Water

#### Objectives

Using the information and materials you have been given by your teacher, design a water catchment system model or a rainwater harvesting model. You can research additional models and list them below. Research the amount of water savings that is calculated for our area/climate by using one or both of these methods.

#### 1. Gathering Data:

Questions I have: \_\_\_\_\_

\_\_\_\_\_

My Prediction: How will water catchments or rainwater harvesting impact the conservation of water? \_\_\_\_\_

\_\_\_\_\_

List the websites you visited to get information about *water catchments* and the role they play in conserving water:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

List the websites you visited to get information about *water harvesting* and the role it plays in conserving water:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## **2. Reasoning:**

Draw a picture of your water catchment or rainwater harvesting model. Discuss engineering challenges you faced when building your model system.

## **3. Communicating your findings.**

Discuss with a partner why water catchments or rainwater harvesting are an important aspect of water conservation. Write your conclusions here:

## **Extensions**

### **#1 Plant Cell Structure Slides (Lesson #4, Activity #3)**

### **#2 Poetry/Rap Slam**

Divide students into groups of 5 and have each group write a poem/rap/song about conserving water in the desert. Have them print it out and present it to the whole class.

As a follow-up *homework assignment*, instruct students to present their creation to their families individually, and have a parent/adult family member initial it to indicate they listened – and applauded!

### **#3 Field Experience at Red Butte Water Conservation Garden**

**(Garden scheduled for completion Fall 2016)**

In this field experience, students will be guided through the Water Conservation Garden to learn about different methods used to conserve water. They will explore the water catchments and rainwater harvesting and the placement of plants in the landscape by water needs to water most efficiently.

The field class will end at Red Butte Creek where students will perform a Citizen Science water quality monitoring activity.

## **Project Wet Curriculum and Activity Guide**

**Storm Water, p. 395**

