Activity–Desert Dynamics II

Standard V

Objective 2

Standard V
Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Objective 2
Describe the common plants and animals found in Utah environments and how these organisms have adapted to the environment in which they live.

Intended Learning Outcomes
1. Use science process and thinking skills.

Connections

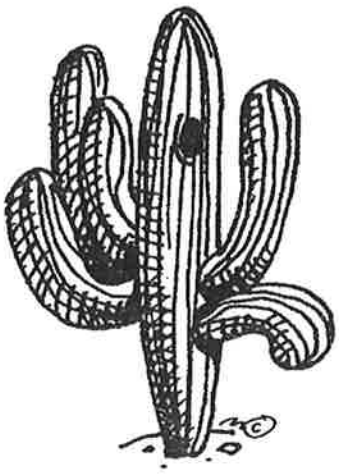
Background Information

Desert plants adapt to their environment in a variety of creative and useful ways that allows them to survive. One way is through changes in stomata. Stomata are the holes in plants leaves where water transpires. Many desert plants have very small stomata or fewer than normal. Cacti have stomata that are deep in the plants' tissues, which reduces water loss.

The leaves and stems of many desert plants have a thick, waxy covering. This waxy substance also helps reduce moisture loss. Small leaves mean less evaporative surface per leaf. It also means that it won't get as hot as a large leaf would in the sun.

Some plants, such as Mormon tea and cacti, carry out most of their photosynthesis in their green stems. Some grow leaves during the rainy season and then shed them when it becomes dry again. Blackbrush only has photosynthesis during these rainy periods, and other plants can totally shut down photosynthesis to reduce water loss. Junipers have the ability to cut off water to a major branch during a drought, resulting in a dead branch but a live tree.

Other desert adaptations can be shallow widespread roots that will absorb a maximum of rainfall, or spines and hairs that shade the plants and break up drying winds across the leaf surface. Desert annuals avoid drought and heat by surviving as seeds stored in the soil, sometimes for many years.



Some desert plants take advantage of cooler temperatures at night to become "active." Plants like evening primrose and yucca bloom at night. The paintbrush plant

another adaptation. They are partial parasites. Their roots tap into nearby plant roots, usually sagebrush or grasses, and suck food and moisture from their host.

Invitation to Learn

Ask a volunteer to stand. Point out the parts of a human body that relate to plant parts. Feet would be roots, legs and torso are stems, arms are branches, hands are leaves and the head is the flower or seed head. Tape paper labels of plant parts to these human parts and review.

Materials

- ❑ Magnifying glasses
- ❑ Riddle cards prepared
- ❑ Pictures of cacti and desert plants
- ❑ Journals
- ❑ Selection of leaves (preferably from the desert showing adaptations)
- ❑ Adaptation objects from suggested list

Instructional Procedures

1. Discuss how plant adaptations are physical ones, such as extra long roots to find water, hairy leaves to shade leaf surfaces, leaves growing only in rainy seasons. Use the visual props in the kit for this lesson as reminders of the different adaptations. Ask, "What would be the conditions in a desert environment that would require a plant to adapt in order to survive?" (lack of water, hot temperatures, cold nights, hot winds, being eaten by animals).
2. These activities will help students practice identifying desert plant adaptations in preparation for investigating their own leaves. Prepare the riddle adaptation cards, adaptation objects, and plant cards before beginning these activities. Discuss the adaptations that desert plants use to survive, and display and discuss the ones you have prepared (sponge, water bottle, sock with pipe cleaners, etc.). Match the adaptations to specific plants on the vocabulary list for this standard. Use pictures if available.
3. Have students use the list as reference during the following activity. Divide students into small groups. Using the riddle cards read each riddle and then give the groups about five seconds to discuss and write the answer on a card. One student in each group stands ready to show the answer to the riddle. Each must be able to justify their answer. If correct, the group gets a point. There may be more than one right answer to some clues. Accept all plant answers that are explained correctly with logic. Every team can earn points for each question.
4. After playing the riddle game, each group will do scientific inquiry to answer the following question: "If we investigate eight different leaves, how many of them will have one of the adaptations that we've listed for the desert environment?" (Adjust the number as needed.) This hypothesis will be written in their journals and data will be recorded.

5. If students can collect their own leaves, this would be the most optimum method of collection. If not, the teacher can provide a set of varied leaves in a baggie for each group. Students should draw each leaf and describe its adaptation, if it has one. They should also label any identifying or unique aspects to the leaf.
6. As a class, have each group present their findings and some pictures or descriptions. Discuss why some leaves did not have adaptations. Some may be annuals with seed adaptations rather than leaf adaptations, or may have different adaptations. Discuss as a group and read a conclusion about what was learned, and what the results mean to the study.

Curriculum Integration

Math/Science—Desert Math Activity included in this handbook (Some Like it Hot! Some Like it Cold!).

Using information about plants, create an origami folded book that summarizes written information using quality sentence structure and illustrations.

Possible Extensions/Adaptations

Compare the two deserts found in Utah (Mojave and Great Basin) and list plants that they have in common. Which are unique to each area?

Use plant pictures if leaves are unavailable and compare adaptations.

Assessment Suggestion

Desert origami books are a good product to assess student understanding of this concept. Use the attached rubric for grading. Share student products with a buddy class.

Additional Resources

Access Project Wild's past issues of Nature's Call at www.wildlife.utah.gov/projectwild.

Red Rock Adventures, a teacher's guide to Canyon Country Outdoor Education, available for check out with USEE, Utah Society for Environmental Education.

Homework and Family Connections

Go on a scavenger hunt in the family's backyard or an area nearby. Observe different kinds of plants and make observations about adaptations and physical characteristics they possess.

Riddle Cards

My roots spread out underneath the ground. When it rains they soak up any water to be found. The shallow roots wait for rains to fall. Soaking it up I trap it all.	The prickly spines don't feel very nice, If you think you want dinner, you'd better think twice! A mouthful of me is a painful surprise. Don't bother to taste me, you'd better be wise!
Although it's been weeks since there was rain, I stored up water so I won't complain. My thick stem stores the H_2O So I can survive the sun's hot glow.	My leaves are colored lightly or gray. They reflect the sun and keep it away. My leaves are quite small, as a rule, In hot temperatures they keep me cool.
My leaves and stems have a waxy touch. Water trapped inside me helps so much. When rain does fall I fill up fast, So when it stops, my water will last.	My prickly spines are really leaves, That stop the wind and help relieve My losing moisture to the wind. I'm grateful for a spiny skin.
My deep taproot drills down very deep. To underground water, where it may seep. Sometimes my root is 40 feet down. That's a long way to go underground.	

(SPINES PROTECT FROM ANIMALS) (Any cactus with spines)	(SHALLOW ROOTS) (Creosote bush, pinon pine)
(LIGHT COLORS ABSORB LESS HEAT) (Globemallow, rabbitbrush)	(WATER STORED IN THICK STEM) (Joshua tree, beavertail cactus)
(HAIRS, SPINES LESSEN EVAPORATION) (Prickly pear cactus, sage brush)	(WAX TRAPS MOISTURE) (Juniper, cliffrose)
	(ROOTS FIND AVAILABLE WATER) (Mesquite, Yucca)

Name_____

Science Journal Rubric

Description: Assessing my Journal Entry on _____

(4) You've Got It!

(3) Almost There!

(2) Getting Close!

(1) Take Another Look!

Following Instructions:

4 I described in detail all of the things my teacher asked me to describe.

3 I described most of the things my teacher asked me to describe.

2 I described a few of the things my teacher asked me to describe.

1 I didn't describe anything.

Legibility:

4 I used neat handwriting.

3 I used neat handwriting most of the time.

2 My handwriting could have been neater.

1 My handwriting was difficult to read.

Drawing Effort:

4 I drew my pictures neatly and carefully.

3 I drew most of my pictures neatly and carefully.

2 I drew carelessly.

1 I didn't draw pictures.

Total score _____

(Adapted from UEN Rubrics)

Name_____

Science Investigation for Desert Plant Adaptation

Check Out These Leaves!

Question: If we collect ___different leaves, how many of them will have at least one of the desert adaptations we have studied?

Prediction of Hypothesis:

Procedure: (Draw a picture or attach leaf)

Leaf #1: Characteristics:	Leaf #3 Characteristics:
Leaf #2: Characteristics:	Leaf #4 Characteristics:

Results: (What actually happened?)

Conclusions: (What did we learn?)

Objects to represent physical characteristics of desert plants

Bag of crayons: Barrel brush

Narrow mouth water bottle: Blackbrush

White cloth: rabbitbrush, sagebrush

Sponge: Prickly pear cactus

Fuzzy cloth: Sagebrush

Sock w/pipe cleaners sticking up: Prickly Pear Cactus

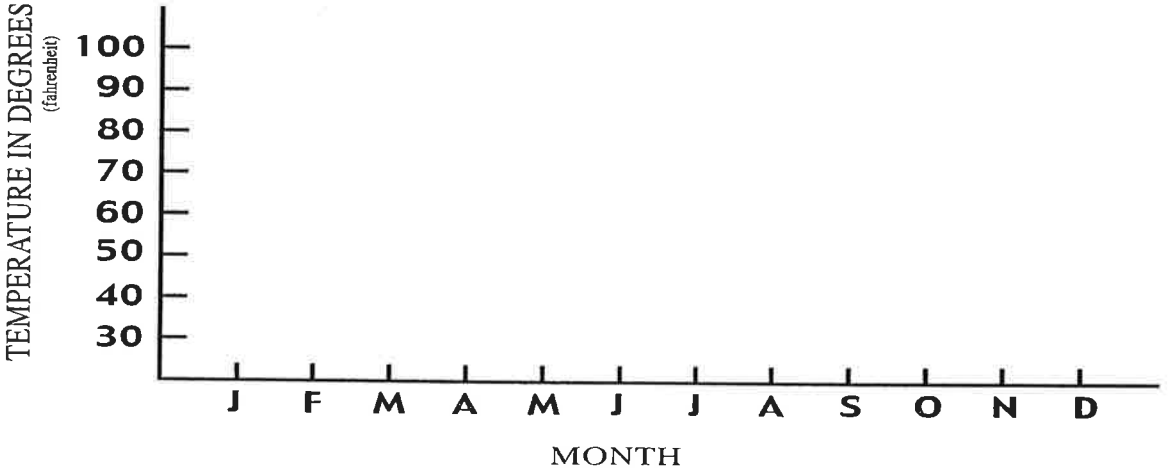
Garden hose: Yucca, mesquite

Some Like It Hot! And Some Like It Cold!

Utah has both hot and cold deserts. The Mojave is considered a hot desert, and the Great Basin is considered a cold desert. What is the difference between the Mojave and Great Basin deserts? One of the big differences is temperature. In the box below are the average monthly maximum temperatures for two weather stations in Utah. Wendover is in the Great Basin desert, and Lytle Ranch, west of St. George, is in the Mojave desert.

Graph the average monthly maximum temperatures for Lytle Ranch on the graph. Connect the data points with a red line. On the same graph, plot the maximum monthly temperatures for Wendover. Connect the data points with a blue line.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Lytle Ranch	55	60	66	80	85	95	100	98	93	80	64	55
Wendover	36	43	52	61	72	82	92	89	78	63	47	37



- Which months show the greatest difference in temperature between the two sites?
- Which location is found in a hot desert? Whis is in a cold desert?
- In which location would you like to be in June? In December? Why? Describe how you think the desert would look at these times of year? How would you adapt to the temperatures?

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