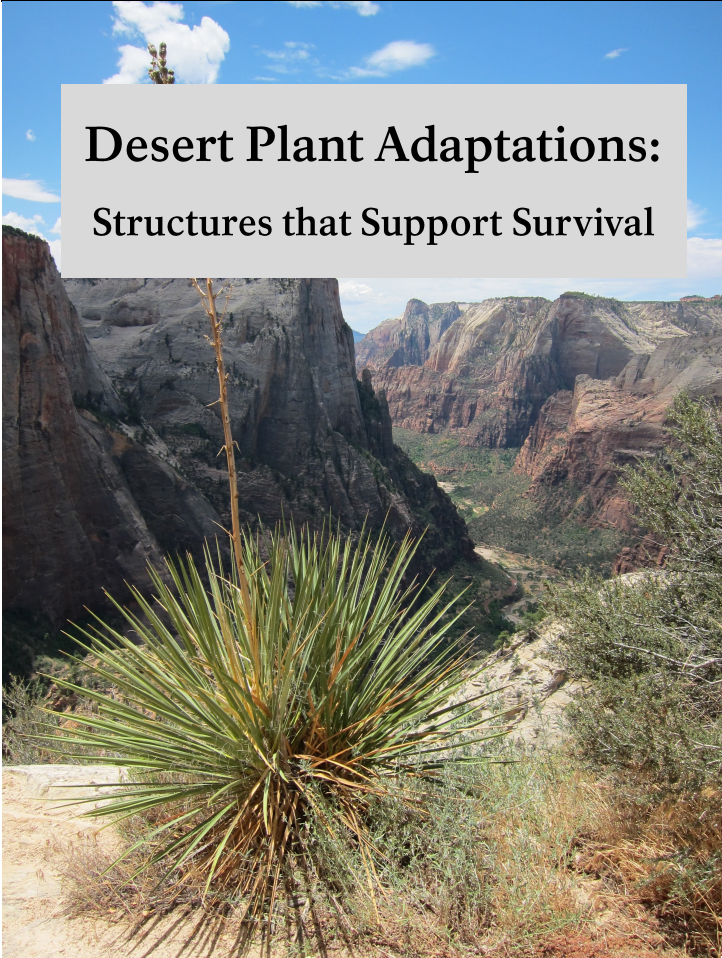




Desert Plant Adaptations: Structures that Support Survival



NPS PHOTOS

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Introduction

This guide contains background information on Zion’s desert plants and an activity where students will construct an explanation of how these plants’ internal and external structures support their survival. This guide is specifically designed for fourth grade, but the activity can be modified for students at other levels.

Theme

Zion’s desert plants have internal and external structures that support their survival, growth, behavior, and reproduction.

Focus

The activity focuses on the different adaptations plants have to the desert’s hot, dry environment.

Activities

Zion’s Desert Plants Video

This video explores the ways in which the prickly pear cactus and the fourwing saltbush are adapted to Zion’s desert environment.

Design A Desert Plant

Using some of Zion’s plants’ desert adaptations as inspiration, students will design and draw their own desert plant, explaining how its external and internal structures supports its survival.

Background

Desert landscapes are hot and dry, often with less than 10 inches of precipitation per year. This harsh environment means that plants struggle to survive here.

Plants must adapt to the desert habitat.

Adaptation is “process by which species becomes fitted to its environment.”¹

This leads to internal and external structures in plants that help them survive the heat, aridity, harsh sunlight, and more. External structures can be observed on the outside of a plant, like cacti spines or yucca’s waxy skins.

Internal structures are inside the plant, hidden from view, like the mechanism that allows juniper to “self-prune” to conserve water..

Many desert plants have a few attributes in common: unpleasant to eat because of spines (etc.), unique ways to gather and store water, and ways to protect themselves from powerful desert sun’s rays.

Zion National Park contains many types of landscapes: conifer forests, slot canyons, riparian areas, sheer cliffs, and deserts. For the purpose of this lesson, we will focus on the lower elevation (~5,000 ft or less) desert environment that makes up the bottom of the iconic Zion Canyon. In the desert areas, we get between 13 and 15 inches of precipitation per year and reach temperatures of over 105 degrees Fahrenheit consistently in the summer.

Within our desert landscapes, we have two main types of habitat’s: arid grass lands/desert shrubs and pinyon-juniper forest. Both contain drought-tolerant plants, but occur at different elevations. Arid grasslands/desert shrubs are at the lowest elevations in the park (3,700 ft). Typically the hottest area in the park, it is the favorite location for cacti. Above this, we have the pinyon juniper forests, which are a bit more cold tolerant.²

Zion is home to hundreds of desert plants, but for the purpose of this lesson we will focus on the external and internal adaptations of prickly pear cactus, fourwing salt bush, juniper , and yucca.

In the spring, prickly pear cacti have colorful bright yellow flowers. In the fall, it grows magenta fruit, a popular treat among animals and humans alike.

Education Standards

Utah SEEd 4th Grade

Strand 4.1 Organisms Functioning in their Environment

Standard 4.1.1: Construct an explanation from evidence that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Emphasize how structures support an organism’s survival in its environment and how internal and external structures of plants and animals vary within the same and across multiple Utah environments.

NGSS 4th Grade

4-LS1 From Molecules to Organisms: Structures and Processes

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Background (Continued)

On the rare days when it storms in Zion, the prickly pear can use its shallow root system to quickly absorb rainwater. The prickly pear stores this water in the flesh of its pads to use later, kind of like the plant's water bottle. In the long months between rainstorms, the prickly pear's sharp spines scare off thirsty animals who might be tempted to take a bite of its water-filled pads. Eating a pad would be like biting into a juicy, but bland, apple.³

Fourwing saltbush has sage green leaves and numerous fourwinged seedpods on the female plants. Often the desert's scant water supply or even the soil itself contains salt, which is harmful to most plants. To avoid toxic levels of salt in its tissues, the fourwing saltbush excretes salt into tiny hairs on its leaves' surface. This creates a grayish sheen of salt, which deflects some of the desert's harsh sun. This layer of salt crystals acts like sunscreen for the plant.⁴

A shrub-like evergreen tree, juniper trees have scaly modified needles and grow

large bushels of grayish blue berries. Juniper have a very deep tap root. The tap root can grow to about 25 feet deep. This allows the trees to soak up hard to reach ground water, like using a giant straw. The juniper also has long lateral roots that stretch for up to 100 feet from the tree under the surface of the ground. This maximizes its ability to soak in the scarce rainfall. Additionally, if stressed for water, junipers can self-prune to conserve water. Junipers can purposefully cut off water to kill a single branch in order to have enough water for the rest of the plant.⁵

Yucca have a rosette of tough sword-like leaves and send up a stalk of white flowers in the spring and early summer. They are well-adapted to living in a dry environment. The leaves of yucca have thick, waxy skins to prevent water loss through evaporation and are sometimes curved slightly so they are able to direct rainwater and dew down to the roots. Yucca plants also have thick taproots that are able to store water during dry times.⁶



Zion's Desert Plants:

Introduction & Video

Duration

~15 minutes

Location

Inside

Key Vocabulary

Adaptation, Desert, Prickly Pear Cactus, Fourwing Saltbush, Internal, External

Objectives

Students will better understand how the internal and external structures of the prickly pear cactus and the fourwing saltbush support their survival in Zion's harsh desert environment.

Method

Play video for the class. Review the structures the plants used to support their survival and provide additional examples.

Materials

- Zion's Desert Plants Video: [LINK](#)
- Projector, Smart Board, Computer, iPad, etc.

Background:

Please refer to the background information in the introduction for more information about Zion's desert and its desert plants.

Suggested Procedure:

1. Introduce the concept of adaptations to specific environments/habitats. Explain this lesson will focus on desert habitat. Explain the definition of a desert .
2. Watch Desert Plant Adaptations video.
3. Review the external and internal structures that prickly pear cacti and the fourwing saltbush use to adapt to the harsh desert environment.
4. Maybe brainstorm other desert plants and the structures that support their survival in desert.



Design A Desert Plant

Duration

~45 minutes

Location

Inside and/or Outside

Key Vocabulary

Desert, Habitat, Adaptation, Internal Structure, External Structure, Prickly Pear Cacti, Fourwing Saltbush, Juniper Tree, Yucca, Self-prune

Objectives

Students will design their own desert plant and construct an explanation for how its internal and external structures supports its survival.

Method

Using what they learned from Zion's Desert Plants video, the students will use the *Design A Desert Plant Worksheet* to guide them in their plant design. Finally, they will draw their plant, explaining at least three adaptations to the desert.

Materials

- Copies of *Design A Desert Plant Worksheet* (one per student)
- Pencils (one per student)
- An assortment of colored pencils and markers

Background

Please refer to the background information in the introduction for more about desert plants and the structures that support their survival in deserts.

Suggested Procedure:

1. Review what students learned watching video.
2. Introduce the general common adaptations that desert plants have, using the juniper and the yucca as additional examples. Focusing on how these match desert conditions.



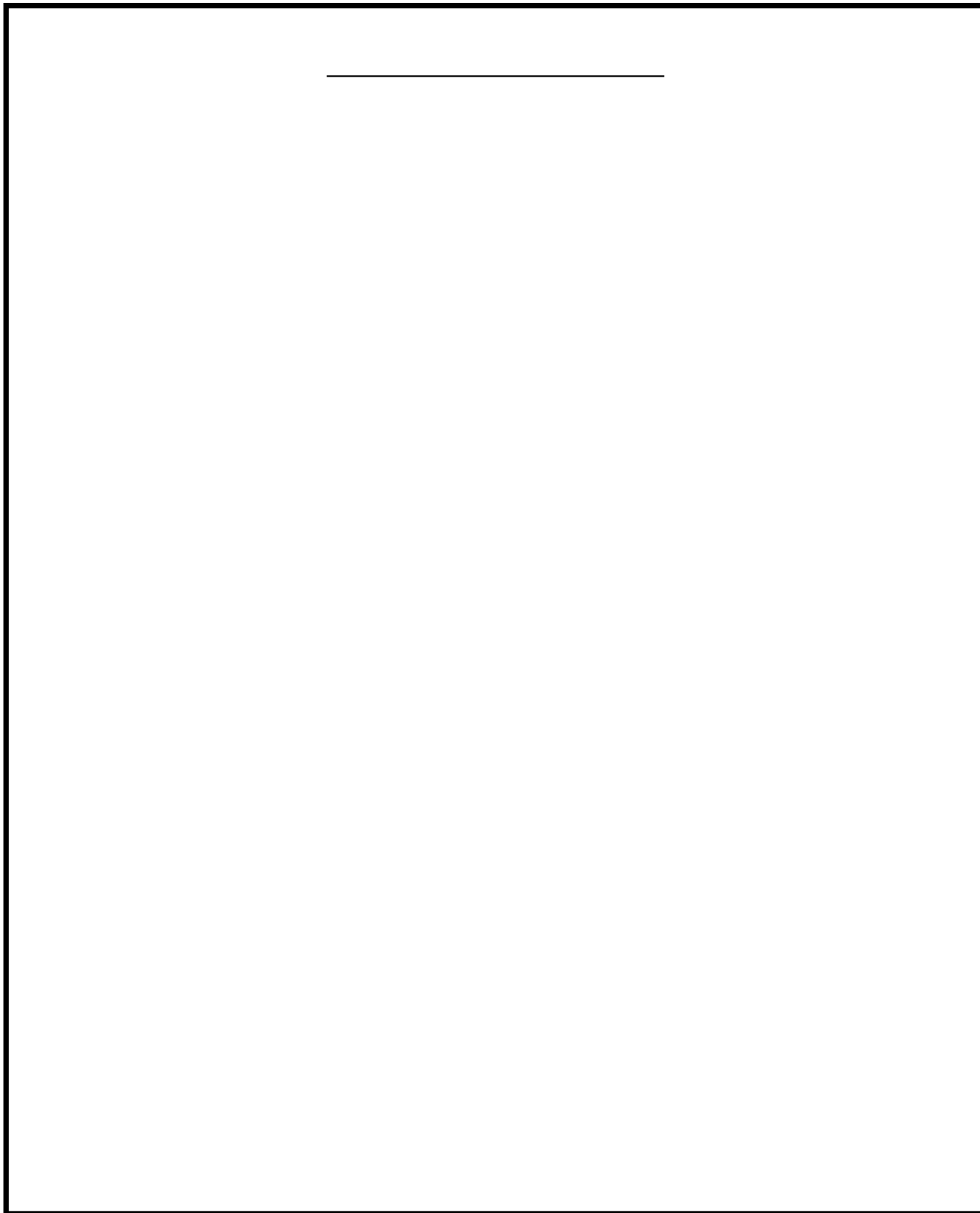
Suggested Procedure Continued:

3. If able and live in a desert, take students outside to area with desert plants.
4. Hand out worksheets and colored pencils/markers.
5. Explain they will create an imaginary desert plant, inspired about the real desert plants in Zion (and Utah). They should make up a name for their plant. Next, they will draw a picture of their plant that includes three structures that help it survive in the harsh desert environment.
6. After they complete their drawings, student will write a paragraph (on the back of their worksheet) that introduces their plant and explains how the three structures help their plant survive in the desert.
7. If additional time, have students share their plants in smaller groups or as a whole class.
8. Possible extensions:
 - Make 3 D model of plant
 - Ask how plant might change if suddenly much cooler? How might adaptations change over time?
 - What happens if deserts get consistently hotter and dryer? Will plants be able to adapt quickly or will they die?



Design A Desert Plant Worksheet

Write your desert plant's name on the line below. Then, draw an imaginary desert plant that includes three structures that help it survive in the desert's heat, sun, dryness, and/or saltiness.



Design A Desert Plant Worksheet

Write a paragraph that introduces your imaginary plant. Explain the three structures your plant uses to survive in the desert's harsh heat, dryness, and/or sun.



NPS PHOTO

Self-Pruned Juniper



Fourwing Saltbush Seedpods



Yucca



Prickly Pear Fruit & Flowers



Resources & References

The following are websites used as sources for the background information sections of the lesson plan.

These web pages are also good resources for addition information:

¹ Definition of adaptation quoted directly from: <https://www.britannica.com/science/adaptation-biology-and-physiology>

² Information about ecological zones paraphrased from: <https://www.nps.gov/zion/learn/nature/plants.htm>

³ Adaptation information about prickly pears paraphrased from: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410122.pdf

⁴ Adaptation information about four-wing saltbush paraphrased from: https://www.fs.fed.us/wildflowers/plant-of-the-week/atriplex_canescens.shtml

⁵ Adaptation information about juniper paraphrased from: <https://www.nps.gov/cany/learn/nature/utahjuniper.htm#:~:text=A%20juniper's%20tap%20root%20can,junipers%20often%20continue%20to%20grow.>

⁶ Yucca information quoted directly from: <https://www.nps.gov/zion/learn/nature/yucca.htm>