



**Time:**  
(1) 45 minutes  
classroom session

**Level:**  
Secondary Science –  
Biology

**Goals:**  
Students will understand  
and be able to describe  
the desert environment.

**Objectives:**  
Students will be able to

1. Describe at least 2 adaptations each that vertebrate organisms (mammals, reptiles and amphibians) need to have in order to live in the desert.
2. Classify adaptations into one of 3 categories: morphological, physiological and behavioral

*Materials listed with  
each individual  
activity.*

# A Day in the Desert

*by Anne Zeller, Neicca Butts, and Mark Larese-Casanova*

## **Correlations to Core Curriculum:**

Secondary Education – Biology

- Standard 1: Students will understand that living organisms interact with one another and their environment.
  - Objective 3: Describe how interactions among organisms and their environment help shape ecosystems.
    - Indicator d: Investigate an ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.

## **Background Information:**

### Deserts

A desert is defined as an area that is dry, with less than 10” of precipitation per year, on average, and a high rate of evaporation. Deserts can be hot (most precipitation falls in summer as rain) or cold (most precipitation falls in the form of snow in winter).

### Adaptations

A change or the process of change by which an organism or species becomes better suited to its environment.

### Mammal Adaptations

#### *Desert cottontail rabbits*

Most lagomorphs (rabbits and hares) will feed on their own fecal pellets allowing them to process all of the nutrients missed in the first feeding. This is a handy behavior when the winters are more severe, and food is scarce.

#### *White-tailed antelope squirrel*

This squirrel will run with its tail held high above its head to shade the body from the intense heat of the sun. It has adapted to allow its body temperature to rise above 106° F without detrimental effects. When the heat becomes too much, the antelope squirrel will spread saliva over its face creating a “swamp cooler” effect.

#### *Jackrabbits/Hares*

They have unusually large ears with veins running close to the surface of the skin. This allows the blood pumping through the veins to be cooled. During midday of summer,

### **Did you know?**

The original meaning of the word desert is 'an abandoned place'.

jackrabbits will commonly be found lying in forms (depressions they have dug in the soil) underneath desert shrubs such as big sagebrush to avoid scorching temperatures. They have also developed a behavioral change which is very effective in evading predators. When fleeing from a predator, they move in a zigzag pattern and every 5<sup>th</sup> hop is extremely high allowing them to take note of the whereabouts of the advancing threat.

#### *Kangaroo rats*

This small vertebrate is the quintessential desert animal. The kangaroo rat can metabolize water from the food it eats. It also has extremely efficient kidneys allowing it to retain much of the moisture many animals lose in urination and defecation. Its nasal passages are extremely long to cool and recapture moisture that would be lost during respiration. In order to avoid the harsh daytime temperatures, this rodent feeds only at night. It has adapted to be very sensitive to low frequency sounds due to a large inner ear canal allowing it to avoid long-eared owls (its major predator) more often than not. Kangaroo rats are usually found close to sand substrates since they require frequent sand baths, or its oily fur becomes matted. After collecting seeds, the kangaroo rat will seal up its burrow which results in the moisture from respiration softening and hydrating the seeds collected.

#### Reptile Adaptations

These ectothermic vertebrates will emerge in late spring to sun themselves on the warm rocks. If the temperature becomes too intense during the summer, many reptiles will go into a state of aestivation (dormancy or inactivity) in underground burrows. Scientists believe this has more to do with a lack of food source than inability to cope with the conditions.

#### Amphibian Adaptations

##### *Spadefoot Toad*

Before the heat of summer comes on, this amphibian will bury itself under the mud, coating itself with a gel-like substance to retain the moisture in its skin. It will not emerge until it feels the vibration of an intense rainstorm. At that point, it will emerge from the soil to mate and release eggs or sperm to continue the cycle of life.

## Did you know?

Desert plants may have to go for years at a time without fresh water.



### Materials:

#### Supplies --

- Paper, art supplies, and any additional needs to create a simple book
- Large Paper for a food web

#### Equipment--

- Biology box
- Various shells, animal skulls, hides, and skins, able to be categorized

Photos of living animals to match each artifact

### Types of Adaptations

- Morphological:
  - A morphological adaptation deals with what a plant or animal looks like, including shape, color, size, or structure.
- Physiological:
  - Physiological adaptations include the ability to make venom, but can also include other functions, such as temperature regulation.
- Behavioral:
  - Behavioral adaptations can be either inherited or learned. This can include living in burrows or simply sitting in the shade.

### Lessons and Activities:

**Engage (10 minutes)** – Introduce a biology box filled with various skulls, hides, skins, shells, etc. to the students. Ask, “What type of environment do you think that these animals are suited for?” Write down ideas on the board. Discuss what indicating factors led students to believe that these animals may be suited for a particular environment.

Then ask, “What do these animals have in common with each other?” Allow the students to group the different animals according to size, shape, color, species, etc.

**Explore (15 minutes)** -- In table/small groups, do the following activities:

1. Match an animal artifact with a photograph of a living animal. *(One or two artifacts should be placed at each table, along with 3-4 pictures. The teacher should make sure that conclusions are able to be drawn as to which pictures match with which animal artifacts. The photographs that don't have a matching artifact should be carefully chosen so as not to closely resemble any of the animal artifacts at the table.)*
2. Describe the environment each artifact/photographed animal lives in. *(The artifacts and photographs should be centered on the desert environment, as desert ecosystems are the focus of the lesson.)*

Answer the question, “What characteristics does each organism have that enables it to survive in its

**Did you know?** The world's deserts occupy almost one-quarter of the earth's land surface, which is approximately 20.9 million square miles.

environment?" Students should discuss this as a group, and then individually write at least 3 characteristics that aid the organism's survival in their science notebook.

4. After the group discussion and individual writing time, each group should choose a spokesperson to represent their group during the 'explain' section of this lesson. After the spokesperson has been chosen, and is prepared to share with the class, you may choose to have the students fill out the 'Animal Identification' worksheet – attached at the bottom of this lesson – if time permits. *(The spokesperson will be sharing which animal and environment they think their group was given.)*

**Explain (15 minutes)** -- Put a number for each artifact on the board. Have the spokesperson for each group write their animal names and environments under the correct numbers. Give some additional information about each artifact, based on the 'background information' above, or any other interesting facts you may have learned while researching.

As a class, determine which animals and environment matches were correct on the board. Have the groups that were correct identify things about the artifact/photograph that helped them make their decision.

Discuss the differences and similarities throughout the different animal artifacts and photographs. Give those "differences" a name: adaptations. Give the definition of 'adaptations,' and ask students if they can see any other adaptations that the animals have.

**Elaborate (5 minutes)** –Talk about what types of adaptations animals would need most if living in a desert.

Define the 3 types of adaptations (Morphological, Physiological and Behavioral). Briefly describe adaptations of a few of the animals on the board. Allow the students to individually classify those adaptations into the 3 different types described previously as a whole class.

**Assessment:**

Students will write and illustrate a K-2 grade level book about desert animals and their adaptations. The book can be short and simple, but should have informative content and be interesting enough that

## Endangered Desert Tortoise



a young child will be able to follow along.

Grading of this book should be focused on the biology content. This assignment (or drafts of their books) may be started in class if enough time permits. This assessment may continue into the next class period or be assigned as a 'take-home project.' The rubric is at the bottom of the lesson plan, and copies should be available to each student so they know what they are being graded on.

### Extensions:

- For a literacy connection, students could present and read their books to the class. This could be extended also by sharing these books with a local K-2 classroom (and potentially donating them as well).
- Food web activity -- After defining and discussing food chains and food webs (particularly in desert ecosystems), have the groups construct a food web using the animals represented in the biology box and fill in any missing plants, insects and animals needed to complete the food web. If you choose to do this activity, you will need a large piece of paper and writing utensils (markers, colored pencils, pens, etc.) for each group.
- [Adopt a Tortoise program](#) – Discuss the importance of Desert Tortoises in desert ecosystems. A stewardship component of this lesson plan could be to investigate the desert tortoise adoption program as a class. (See [https://wildlife.utah.gov/pdf/desert\\_tortoise\\_adoption.pdf](https://wildlife.utah.gov/pdf/desert_tortoise_adoption.pdf) for more information.) Determine what you can do as a class to help the Desert Tortoise, as well as other endangered species in the desert ecosystem.

### Resources:

#### Books

- [Utah Master Naturalist Deserts Textbook](#)  
[https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=2774&context=extension\\_curall](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=2774&context=extension_curall)
- *Desert Ecology* by John B. Sowell
- Examples of Elementary Level Books – [Desert Animal Adaptations](#), [A Desert Habitat](#), and [Explore the Desert](#).

#### Websites

- [Desert Tortoise Information](https://wildlife.utah.gov/pdf/desert_tortoise_adoption.pdf)  
[https://wildlife.utah.gov/pdf/desert\\_tortoise\\_adoption.pdf](https://wildlife.utah.gov/pdf/desert_tortoise_adoption.pdf)
- [Desert Animal Survival](http://www.desertusa.com/survive.html) –  
[\\_http://www.desertusa.com/survive.html](http://www.desertusa.com/survive.html)
- 
- [What is a Desert?](http://environment.nationalgeographic.com/environment/habitats/desert-profile)  
<http://environment.nationalgeographic.com/environment/habitats/desert-profile>

Name \_\_\_\_\_

Class Period \_\_\_\_\_

# Animal Identification Activity

- 1) Which animal are you studying? Describe the artifact type and picture you matched it with.
- 2) Why did you match your artifact with that specific picture? What matched up between the artifact and the picture?
- 3) What type of environment do you think this animal lives in? Why?
- 4) What characteristics does each organism have that enables it to survive in its environment?
- 5) Draw a simple scientific sketch of your animal artifact.

# Elementary Desert Ecosystem Book Project

The book has at least <b>5</b> desert animals included ( <i>30 points</i> )	The book has at least <b>3</b> desert animals included ( <i>18 points</i> )	The book has at least <b>1</b> desert animal included ( <i>6 points</i> )	The book has no desert animals included ( <i>0 points</i> )
The book has 5 or less spelling or grammatical errors ( <i>10 points</i> )	The book has 8 or less spelling or grammatical errors ( <i>8 points</i> )	The book has 10 or less spelling or grammatical errors ( <i>5 points</i> )	The book has 11 or more spelling or grammatical errors ( <i>3 points</i> )
Each page of the book is illustrated in color ( <i>10 points</i> )	Each page of the book is illustrated ( <i>5 points</i> )	There are occasional illustrations in the book ( <i>2 points</i> )	There are no illustrations in the book ( <i>0 points</i> )
Each animal has at least one adaptation listed and described ( <i>10 points</i> )	There are at least 3 adaptations listed and described in the book ( <i>8 points</i> )	There is at least 3 adaptations listed in the book ( <i>4 points</i> )	There are no adaptations listed or described

Student Name:

Points:            /60