National Park Service
U.S. Department of the Interior

Zion National Park
Utah

Surviving Zion
Fourth Grade Pre- and Post-Visit Activity Guide

NPS/TIM LUTTERMAN

Surviving Zion
Fourth Grade Pre-Visit and Post-Visit Activity Guide

Zion National Park
Springdale, Utah 84767

December 2010

Contents

Introduction 1

Core Connections 1

Background 1

Pre-Visit Activities 2
- What's My Adaptation? 2
- Plant Detectives 3
- A Beaver's Tale 5

Post-Visit Activities 7
- No Thumbs! Relay 7
- Adaptation Auction 7
- Interview With a Plant 9

Glossary 10

References 12

NPS/ADRIENNE FITZGERALD

NPS/MARC NEIDIG

NPS/CAITLIN CECI

A tadpole, fourwing saltbush, and a rock squirrel are all adapted to their habitat.

Core Connections

Utah Core Curriculum
Fourth Grade Science

Standard 5: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts, and identify common organisms for each environment.

Objective 1: Describe the physical characteristics of Utah's wetlands, forests and deserts..

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

Introduction

Theme
Desert plants and animals each have a special set of adaptations that make them well-suited for their particular habitat.

Focus
Plant and animal adaptations in varied habitats.

Pre-Visit Activities
1. *What's My Adaptation?* – Students will take on the identity of a specific plant or animal that resides in Zion National Park to better understand how its adaptations aid in survival.

2. *Plant Detectives* – Using a series of images and experiments, students will investigate some ways plants are adapted to their habitat.

3. *A Beaver's Tale* – By reading a story, students will discover a Native American legend describing the development of a beaver and the role special adaptations play.

Post-Visit Activities

1. *No Thumbs!* - In an exciting relay race, students experience life without one special human adaptation.

2. *Adaptation Auction* - Students work in groups to bid on particular adaptations. Each group will use the adaptations they win to build a unique animal that is well-suited to a specific habitat.

3. *Interview with a Plant* - By role-playing and interviewing, students will gain an understanding of plant species and discover the link between adaptations and habitat.

Background

Plants and animals possess unique adaptations that make each well-suited for their particular habitats. Zion National Park is made up of a variety of habitats, each with its own specially adapted plants and animals. The park serves as a sanctuary to a wide variety of plants, animals, and other life (biodiversity).

Different environments present unique challenges and opportunities for plants to survive. Over time, changes that prove beneficial may be passed on to the next generation resulting in adaptations.

Plants in desert environments rely on physical adaptations to survive extreme temperature (e.g., heat, cold), sunlight, soil content, and water availability. Features such as small leaves help reduce moisture loss (transpiration) by reducing the surface area and subsequent exposure to wind and sun. A hairy coating on a plant's surface helps control temperature by limiting exposure to direct sunlight and reducing water loss. Some plants have a waxy coating to reduce water loss as well. Plants such as cacti have spines to protect the plant from being eaten and provide increased shade. Succulence, the ability to store water in special tissue, is another adaptive feature.

Plants in riparian, or waterside areas, deal instead with shade and soil saturation. Adaptations such as strong roots and stiff stalks help riparian plants stay erect in moist soil. Some plants utilize the available flowing water to disperse their seeds.

Animals, too, are adapted to life in particular habitats. Animals not only possess physical adaptations, but behavioral adaptations as well. Behaviors can be altered to best serve the animal in a given situation or environment. The ability of animals to move allows travel between different environments resulting in some species being found in multiple habitats. Still, these animals remain well adapted for the habitat that they occupy.

Behavioral adaptations include lifestyles such as being nocturnal or diurnal, and practices such as burrowing and migration. Physical adaptations in animals range from a beaver's insulting fur to a lizard's water-saving scales. Talons, claws, flat molars, and pointed canine teeth are all physical adaptations.

Pre-Visit Activities

1. What's My Adaptation?

Duration: 30 Minutes
Location: Classroom
Key Vocabulary: amphibian, behavioral adaptation, bird, cone, coniferous, deciduous, environment, habitat, invertebrate, mammal, physical adaptation, pollinator, reptile, succulent, vertebrate

Objectives

Students will be able to: a) describe or give an example of an adaptation, and b) name two habitat characteristics to which an organism may adapt.

Method

Using observations and a guessing game, students will become familiar with some of Zion National Park's plant and animal residents and their adaptations.

Background

Many different plants and animals live in Zion National Park, each with their own unique set of adaptations which help them survive. This activity will introduce students to a variety of Zion's plant and animal residents and some adaptations each possess.

Materials

- Yarn/string (approximately two feet per student)
- Digital image of ADAPTS acronym and prickly pear. Download or view the images at **What's My Adaptation Images**
- 30 animal/plant adaptation cards Download or view the cards at **What's My Adaptation? Cards**

Suggested Procedure

1. Show students the acronym ADAPTS and tell them it stands for *Animals Depend on Activities and Parts to Survive*. Introduce the concept of adaptation and discuss how animal body parts, actions, and behaviors help them survive in a given habitat. Have students think of several animal actions and body parts, and discuss how each adaptation might help the animal survive. As animals, humans also have adaptations. Have students think of what features and/or behaviors help humans survive (e.g., two legs, opposable thumbs, walking upright, shelter building).

2. Explain that plants have physical adaptations that help them survive. Show students the image of a prickly pear and discuss its physical adaptations (i.e., spines to protect it from being eaten and

NPS PHOTO

A prickly pear has many adaptations that help it survive the conditions of its habitat.

shade it from the sun, thick pads to store water, waxy coating to prevent moisture loss). Explain that plants have many physical adaptations and that they may vary depending on the environment. Stress that humans or other animals can sometimes change their behavior in response to new situations, but physical adaptations develop much more slowly, over generations. Discuss conditions in which a plant or animal in Zion would need to adapt, including lack of water, hot summertime temperatures, cold winter nights, snow, and/or wind.

3. To begin the "What's My Adaptation?" game, have students close their eyes and hang an animal/plant adaptation card around their neck with the image on their back, facing outward. Instruct students to open their eyes without looking at their own adaptation cards. Show them a sample (perhaps the prickly pear from earlier), and tell them each picture is a plant or animal that lives locally. Instruct students to ask other students yes or no questions to try to determine the name of the organism on their card. A student may ask another up to three questions before moving on to another student. Review examples of good questions before the students begin. Good questions should be specific, such as, "Am I a plant?", "Do I have fur?", and "Do I live in the desert?".

4. When students determine their specific organism, they should sit and write down three adaptations they think the animal or plant has that help them survive. Once completed, students should turn their card with the image face down and read the list of selected adaptations for their organism.

Evaluation

Have students present their information. When all students are seated, ask for volunteers to share their identities and adaptations. They may introduce themselves to the class in first person as if they are the plant or animal and share some of their adaptations out loud.

Extension

Discuss adaptations in relation to traits passed from parent to offspring. Tell students that occasionally an organism develops a different trait because of a change or "mistake" in the genetic code. If the trait helps the plant or animal survive, it may be passed down to its offspring and becomes the beginning of an adaptation. If the new trait does not help, the plant or animal may not survive to reproduce and, therefore, the trait may not be passed along to develop into an adaptation. Each plant or animal in the desert, or any other habitat, developed adaptations that made them more likely to survive than organisms without these adaptations.

2. Plant Detectives

Duration: 45 minutes
Location: Classroom
Key Vocabulary: adaptation, conservation, desert, riparian area, succulence

Objectives

After this activity, students will be able to a) understand how different adaptations allow plants to survive different habitats, and b) name two ways leaf structures are adaptations.

Method

Using a series of experiences students will explore the role of leaf structure in plant survival.

Background

Riparian or water-side areas in Zion National Park provide a very different habitat than drier, more arid desert areas nearby. Plants that occupy these areas have different adaptations more suitable for their environment.

This activity will familiarize students with the notion that plants are adapted to their habitat. Different plants in the same habitat often express similar adaptations. In general, plants occupying desert habitats may be succulent (they have fleshy tissues for water storage) or often have protective layers on their leaves and stems, such as waxy or hairy coatings, to help conserve or store water. Due

"Riparian, or water-side areas in Zion National Park provide a very different habitat than the drier, more arid desert areas nearby."

to greater water availability, plants in riparian areas don't need the same water conservation or storage mechanisms as other desert plants.

Materials:

- Pictures of local desert and riparian habitats, and associated plants
- Three thick sponges cut in half
- Three thin sponges cut in half
- Six small sealable plastic bags (quart-size or similar)
- 12 dishes or bowls
- 12 measuring cups or graduated cylinders
- Water
- Optional: 6 funnels
  Download or view applicable images at Plant Detectives Images

Suggested Procedure

1. Discuss the idea that different habitats are populated by different types of plants and animals. For example, polar bears live in northern polar habitats versus black bears which live in forest habitats. Each habitat presents different conditions in which plants or animals have adapted. Thus, many plants living in the same habitat have similar adaptations. Show students desert and riparian habitat images and compare and contrast the two areas. How might variables like water availability account for the different appearances?
2. Show students various plant images and ask in which of the two habitats, desert or riparian, do they belong. Show students the desert plant group image. Ask students to make observations about what these plants have in common. Now look at the riparian group image. What do these plants have in common? Compare the two plant groups side-by-side. What are the major differences (e.g., color, shape, thickness)? Inform students that they are going to be plant detectives and investigate some of these differences. Using sponges to simulate plant leaves they will discover how succulence and leaf coatings affect leaves and plants.

Leaf Structure
Succulence

3. Give each group one thick and one thin sponge. Have them put each sponge in a dish or bowl. Have students use graduated cylinders or measuring cups to pour equal amounts of water over each sponge. Allow the moistened sponges to sit for one minute. Use this time to explain how each sponge acts as a leaf and the water simulates rainfall or snow-melt.

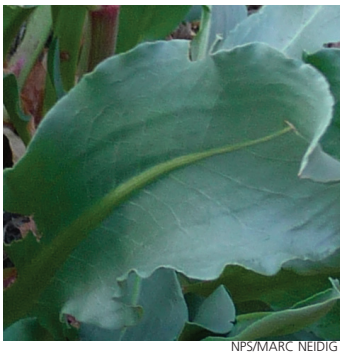
4. Have groups squeeze the small sponge into a measuring cup or graduated cylinder. You may need a funnel to assist with this process. Repeat this process with

NPS PHOTO/ADRIENNE FITZGERALD

Plants that live in the desert have adaptations to survive the dry conditions.

NPS PHOTO

NPS/CAITLIN CECI


NPS/MARC NEIDIG

Leaf shape, surface, and structure are all adaptations.

the thicker sponge. Have the students compare the two cups. Which contains more water? Have students calculate the difference between the two cups by subtracting. As an option, students can calculate fractions of the original water amount each sponge captured and compare the differences. Have students predict which sponge will dry faster. Will they dry faster in sun or shade? Place the sponges from one group aside to test the hypothesis and revisit the sponges hours later.

Leaf Coverings

5. Give each group two thin, dry sponges. Place each sponge in a dry dish or bowl. Have students measure and pour a given amount of water over each sponge. Allow the sponges to sit for one minute. Use this time to discuss the different elements in the experiment.

6. Have students place one sponge inside a plastic bag.

7. Students should squeeze each sponge over separate measuring cups while leaving one sponge inside the bag. Have them compare the amount of water that comes out of each sponge. What did the bag do for the sponge? (It helped seal the water inside). In this demonstration, the bag acts like a tough, waxy outer coating on a leaf, keeping moisture inside. Have students predict which of these two sponges will dry faster. Place the sponges from one group aside to test the hypothesis. Revisit the sponges later.

Evaluation

Using observations from the above activities have students brainstorm lists of traits helpful to plants in riparian and desert habitats. Based on the two experiments, have students decide which adaptations are better suited to desert plants and which to riparian plants. Would a desert plant benefit more from a thick leaf like the thicker sponge (succulent) or a thin leaf like the thinner sponge (not succulent)? Would a desert plant benefit more from a leaf with a waxy outer coating or not? What about plants in the riparian habitat? What are examples of plants that display these different traits? Use images from the beginning of the activity to assist the students.

Extension

Students now know certain plants are better suited for certain habitats. What would happen if we took a plant normally found in moister areas, for example a cottonwood tree, and plant it in a desert habitat? Have students think about plants in their home yard or at their school. What adaptations do these plants have? Are they in the right habitat? Introduce the idea of native plant landscaping and give examples of where students can see this. Have students design a new landscape for their school or home that uses native plants in the natural habitat.

3. A Beaver's Tale

Duration: 45 minutes
Location: Indoors
Key Vocabulary: adaptation, behavioral adaptation, crepuscular, diurnal, legend, nocturnal, physical adaptation

Objectives

After this activity, students will be able to a) name two beaver adaptations, and b) understand that animal adaptations have changed over time.

Method

By reading a Paiute legend, students will become familiar with the dynamic nature of adaptations as well as specific beaver adaptations.

Background

The Paiute occupied much of southern Utah before the arrival of Euro-Americans and continue to live in the area today. Their legends were used to explain the surrounding world. Paiute stories tell the origin and behaviors of many living things.

Materials:

- "*How the Beaver Lost the Hair on His Tail*" from Why the North Star Stands Still by William R. Palmer. (Copyright 1946, William R. Palmer. Copyright 1978, Zion National History Association). Download the story at **A Beaver's Tale**
- Paper and pencils for students.

NPS PHOTO

A beaver exhibits many adaptations to suit its riparian habitat.

Suggested Procedure
If desired, break the class into smaller groups to discuss the story.

- What functions did the beaver's tail serve in the beginning of the story?
- How were these adaptations helpful for the beaver's lifestyle?
- What caused the beaver to lose the hair on its tail?
- How did the beaver's life change once it lost the hair on its tail?
- What new purposes did the hairless tail serve?

Explain how adaptations are features which change slowly over time to help the animal survive in its habitat. The beaver story illustrates what might happen over thousands or millions of years. For example, birds with webbed feet (e.g., ducks) use this trait to live more efficiently in water, while birds with sharp talons (e.g., hawks and eagles) use this trait to better hunt and kill prey. Suppose the beaver decided not to move into the river.

- Would his new tail serve him well on land? Why or why not?

Just like the beaver in the story, beavers are crepuscular, active at dawn and dusk, and nocturnal, active at night.

- Is being nocturnal or crepuscular an adaptation?
- What type of adaptation is it (physical or behavioral)?
- What benefit might these behaviors serve?
- How would a beaver's life be different if it was diurnal, active during the day?

Extension
Have students write and illustrate their own legends to describe how a local plant or animal adaptation developed.

NPS/CAITLIN CECI

NPS/CAITLIN CECI

NPS/CAITLIN CECI

Bipedal motion, binocular vision and opposable thumbs are all human adaptations.

Post-Visit Activities

1. No Thumbs! Relay

Duration: 30 minutes
Location: Large open space, preferably outdoors.
Key Vocabulary: adaptation, opposable thumb, physical adaptation

Objectives

After this activity, the students will be able to: a) describe an opposable thumb, b) describe how opposable thumbs are useful, and c) discuss other human adaptations.

Method

Using a relay race activity, the students will become familiar with the presence and importance of human adaptations.

Background

Like any other living thing, humans have many adaptations, both behavioral and physical, that help us survive. Things such as skin and eye color, big brains, walking upright, bipedal (two-legged) motion, binocular vision (both eyes in front and working together), opposable thumbs, etc. Many other animals have some or all of these adaptations. Opposable thumbs allow humans to touch all of our other fingers and grasp objects in a way that only apes and monkeys can. By using our brains we have learned to build and manipulate objects as few other animals can.

Materials

- Masking tape
- Two or three 12-inch pieces of yarn

Suggested Procedure

1. Ask students if they think humans have any adaptations. Discuss what human adaptations are. Ask students what they think life would be like without these adaptations.

2. Choose an area and set up relay lines about 50 feet from any low, reachable object such as a bench, fence, or bike rack.

3. Tape their thumbs to their palms or alongside their hands. Run the tape around their hands a few times, however take care not to cut off circulation.

4. Divide the class into two or three groups and give each team a piece of yarn or string. The first team member will run up to the object (e.g., fence, bench, etc.), tie the piece of yarn to it, and run back. No thumbs can be used while tying. The second team member will run up and untie the string without using thumbs, and bring it back to the third team member. One person ties and the next unties until the relay is over. Complete the relay a second time, moving the person in the front to the back of the line, so that everyone has a chance to tie and untie the yarn without using their thumbs.

5. After the race, have students help each other carefully remove the tape and dispose of it properly.

Evaluation

Have students discuss the activity. Ask students what it was like to be "thumbless". Was it easier to tie or untie the string? Why? What would the world be like today if we never had thumbs? Would humans have been able to develop things like a written language, art, music, or technology? Tell students to try other activities without their thumbs such as drawing, buttoning their shirts, etc.

Extension

Have students think about what new adaptations they would give themselves. You can decide if they adaptations are real or imaginary. Have them write or draw what they would be like with their new adaptation and how it would help them survive.

2. Adaptation Auction

Duration: One Hour
Location: Classroom
Key Vocabulary: adaptation, aestivation, amphibian, bird, camouflage, canine teeth, changeable pigmentation, compound eyes, hibernation, insect, mammal, migration, omnivorous, prehensile tail, quills, reptile, whiskers

Objectives

After completing this activity, the students will be able to: a) identify a number of different adaptations, b) describe how different adaptations are suited to different habitats,

and c) understand that each animal possesses a unique combination of adaptations.

Method

Using a mock auction, students will bid on adaptations to create an animal well-suited to a particular habitat.

Background

Every animal possesses a unique set of adaptations that help it survive in a particular habitat.

Materials:

- Drawing supplies and paper
- Bell or other sound maker
- "Adaptations for Auction" list. Download or view the list at Adaptations for Auction
- 30 adaptation cards Download or view the cards at Adaptation Auction Cards
- Six habitat cards. Download or view the cards at Adaptations for Auction Habitat Cards

Suggested Procedure

1. Divide students into six groups. Have groups sit together but apart from the other groups. Give each group a habitat card. This is a Zion National Park habitat that the animal they create should be suited to. Explain you will be having an auction of animal adaptations. Each group will have $1,000 to spend on adaptations that will help their animal survive in their assigned habitat. Students may view the list of adaptations ahead of time to help budget their money. Give each group five to ten minutes to plan their spending. Have groups elect a treasurer and a speaker. The treasurer will be responsible for tallying and displaying the group's financial status on a small dry-erase board or a large sheet of paper. The bidder is the one who will raise the habitat card to bid. You may consider alternating jobs during different rounds.

2. Open the bidding on an adaptation at a small amount, such as "forward facing eyes" for $20. Remind students that once they run out of money they can no longer purchase adaptations. Students can take turns as bidder; however, the group must agree on a bid and once a bid is made the group is committing to "pay" that amount. When bidding is complete, ring a bell or otherwise signal the bidding is over. Award the adaptation card to the winning group.

3. Bidding ends when all groups run out of money or when all adaptations are assigned. As auctioneer, it is your job to keep an eye on funding tally sheets. It is helpful to have students write very large.

4. Once the auction is over, give groups 15 minutes to build their animal. Using the information on the back of the adaptation cards, students should design an animal

NPS/CAITLIN CECI

Large eyes, changeable pigmentation and large hind legs are adaptations of the canyon treefrog.

well-suited to their assigned habitat using all the adaptations they have won. Students should consider basic needs such as food, water, shelter, and protection. Each group should draw a picture of their animal and write a few sentences answering the following questions:

- What is the creature's name and where does it live?
- What does the creature eat and how does it get its food?
- What does the creature need to protect itself? How does the creature defend itself?
- How does the creature communicate? Why does the creature communicate?
- If Zion was no longer protected as a national park, what might happen to this creature?

Evaluation
When groups have finished designing their animal, have them choose a speaker to present the drawing and answers to the above questions. Do the creatures have all the elements they need to survive in their specific habitat? If not, what's missing?

3. Interview with a Plant

Duration: 45 minutes
Location: Classroom
Key Vocabulary: Adaptation, cone, coniferous, deciduous, habitat, pollinator, succulent

Objectives
After completing this activity, the students will be able to: a) identify some plant adaptations, b) describe how different adaptations are suited for different habitats, and c) explain how changes in a habitat might impact plants.

Method
By conducting an imaginary interview, students will explore plant adaptations and how they relate to the habitat.

Background
Every plant species possesses a unique set of adaptations that render it well-suited to a particular habitat. Changes in habitat often require changes in adaptation for survival.

Materials:
- Paper for each student
- Pencil for each student
- Optional: crayons or markers
- 15 plant adaptation cards. Download or view the cards at Interview with a Plant Cards

Suggested Procedure
1. Divide students into pairs. Pass out one plant adaptation card to each group. Within each pair, one student will pretend to be the plant and one the interviewer. Explain that the interviewer works for a magazine and wants to write a story about the plant.

2. The reporter will ask the plant a series of questions. The reporter should take good notes to write their article after the interview. Give students 10-15 minutes to complete this task. Once finished, collect the cards. Students will now change roles. Shuffle the cards and pass out a new plant to each group and allow the new interview to proceed.

Suggested reporter questions:

- What is your name?
- Where do you live?
- What kind of home do you have? Please describe your habitat.
- What makes your habitat a nice place to live? What adaptations do you have to take advantage of these opportunities?
- What makes your habitat a challenging place to live? What adaptations do you have to help you with these hardships?
- If you could go on a vacation to any other habitat in the world, where would you go? What is it like there? Describe it.
- What new adaptations might you evolve to help you survive in this new habitat?

NPS/MARC NEIDIG

The riparian areas in Zion support a wide variety of organisms, each well-suited to this habitat.

Evaluation

Once the interviews have finished, reporters should write an article about the plant for the magazine. You may have them include a picture they have drawn. Students or volunteers take turns introducing their plant to the class.

Extension

Have students work in their plant identities to create a postcard to send to the reporter from their vacation habitat destination. In the postcard, the plant should write about the challenges they face in their new environment, their new adaptations, and how these are helping their survival in the new habitat. Students can also illustrate the postcard to show the new habitat and/or the new plant. Articles and postcards might make a nice bulletin board display for the classroom.

Glossary

aestivation: to spend a hot, dry season in an inactive, dormant state as certain reptiles, snails, insects, and small mammals.

adaptation: an alteration or adjustment in structure or habits by which a species or individual improves its condition in relationship to its environment.

amphibian: an animal that typically lives in an aquatic habitat breathing by gills as young, and primarily in a terrestrial habitat breathing by lungs and through moist glandular skin as adult (e.g., frog).

behavioral adaptation: the way an organism acts or behaves to stay alive.

bird: a warm-blooded vertebrate, having body covered with feathers, forelimbs modified into wings, scaly legs, a beak, and no teeth, and bearing young in a hard-shelled egg.

camouflage: a method of hiding, allows an otherwise visible organism or object to remain unnoticed, by blending with its environment.

canine teeth: also called cuspids in mammals, any of the pointed, usually single-rooted teeth adapted for tearing food, and occurring behind or beside the incisors (front teeth).

carnivore: a meat eater.

conifer: a plant that bears its seeds in cones; mostly in needle-leafed or scale-leafed; mainly evergreen.

coniferous: refers to cone-bearing.

crepuscular: active at dawn and dusk.

changeable pigmentation:

compound eyes: the eyes of most insects and some crustaceans, which is composed of many light-sensitive elements, each having its own refractive system and each forming a portion of an image.

cone: a seed-bearing organ on conifer plants.

coniferous: of or relating to or part of trees or shrubs bearing cones and evergreen leaves.

conservation: to maintain (a quantity) constant during a process of chemical, physical, or evolutionary change.

crepuscular: occurring or active during twilight.

deciduous: trees that shed or lose foliage at the end of the growing season.

desert: arid land with usually sparse vegetation; especially : such land having a very warm climate and receiving very little precipitation.

diurnal: active by daylight; the opposite of nocturnal.

environment: the circumstances and conditions surrounding an organism that influences its existence, including physical, biological, and all other factors.

evergreen: a plant having foliage that remains green throughout the year.

fish: an aquatic animal.

forest: a dense growth of trees and underbrush covering a large tract.

habitat: the arrangement of food, water, shelter or cover, and space suitable to animals' needs.

herbivore: a plant eater.

hibernation: the act of passing the winter, or portion of it, in a state of sleep; a torpid or resting state.

insect: any of a class (Insecta) of arthropods (as bugs or bees) with well-defined head, thorax, and abdomen, only three pairs of legs, and typically one or two pairs of wings.

invertebrate: any animal that lacks a vertebral column, or backbone.

legend: an explanatory list of the symbols on a map or chart.

mammal: any of a class (Mammalia) of warm-blooded higher vertebrates (as placentals, marsupials, or monotremes) that nourish their young with milk , have the skin usually more or less covered with hair, and include humans.

migration: passing usually periodically from one region or climate to another for feeding or breeding.

nocturnal: active by night; the opposite of diurnal.

opposable: capable of being placed against one or more of the remaining digits of a hand or foot <the opposable human thumb>.

omnivore: an animal that eats both plant and animal materials.

physical adaptation: an alteration or adjustment in structure by which a species or individual improves its condition in relationship to its environment.

pollination: the transfer of pollen from an anther to the stigma in angiosperms or from the microsporangium to the micropyle in gymnosperms.

pollinator: an agent (as an insect) that pollinates flowers.

prehensile tail: adapted for seizing or grasping especially by wrapping around <prehensile tail>.

quills: one of the hollow sharp spines of a porcupine or hedgehog.

reptile: any of a class (Reptilia) of air-breathing vertebrates that include the alligators and crocodiles, lizards, snakes, turtles, and extinct related forms (as dinosaurs and pterosaurs) and are characterized by a completely ossified skeleton with a single occipital condyle, a distinct quadrate bone usually immovably articulated with the skull, ribs attached to the sternum, and a body usually covered with scales or bony plates.

riparian: relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or a tidewater.

succulent: any plant with fleshy, thick tissues adapted to water storage.

vertebrate: any animal having an internal skeleton formed of cartilage, bone, or both.

wetland: land or areas (as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture.

whisker: one of the long projecting hairs or bristles growing near the mouth of an animal (as a cat or bird).

References

Arches National Park. (2009). *Desert Adaptations Field Trip in a Box* (adapted from Cornell, 1979, 69). Retrieved from http://www.nps.gov/arch/forteachers/upload/FTB_DesertAdaptations.pdf

Project WILD: K-12 activity guide. (2001). Houston, TX: Council for Environmental Education.

Palmer, William R. "How the Beaver Lost the Hair on His Tail". From *Why the North Star Stands Still and Other Indian Legends*. Springdale, UT: Zion Natural History Association, 1978.