

SCIENCE SAFARI



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This activity guide was written by:

William Buick
NOAHS Center, National Zoological Park
Donald Peterson
Fairfax County Public Schools
Louisa Sheldon
NOAHS Center, National Zoological Park
Alexandra Sangmeister
NOAHS Center, National Zoological Park

Review Committee:

Russell Greenberg
Smithsonian Migratory Bird Center
Ruth Stolk
National Zoological Park
John Lehnhardt
National Zoological Park
Kaci Thompson
Conservation Research Center,
National Zoological Park
David Jenkins
National Zoological Park
Joan Townsend
National Zoological Park
Paul Armstrong
Fairfax County Public Schools

PREVIEW ACTIVITIES

1. Create a list of key words and definitions with students that they feel may be related to the topic of the program (For example, plumage, migration, preening, molt, contour feathers, feathers, crop, gizzard, territory).
2. Direct students to bring in articles from newspapers or magazines that are related to birds and bird issues.
3. Direct students to brainstorm all the things they think birds have in common. (After the program they will discover the three things all birds share: all birds are warmblooded, all birds have wings, and all birds have feathers.)
4. Ask students to write stories about favorite birds or about experiences they may have had with a bird.
5. Discuss bird-watching as a hobby.
 - a. Why is it so popular?
 - b. What equipment might a bird watcher need? (pencil, notebook, bird field guide, binoculars, camera, or art materials)
 - c. What are the qualities a good bird watcher must have? (an interest in birds, a keen eye, patience)
 - d. How does the time of day or the time of year affect bird watching?
6. Ask students to write about some "bird expressions"—bird-brained," "eat like a bird," "light as a feather," "happy as a lark," "wise as an owl," "mad as a wet hen," "like water off a duck's back," "birds of a feather flock together".
7. Read Jerry Palotta's book *The Bird Alphabet Book*. Direct each student to create a "Birds, A to Z" book using research materials to locate birds or bird-related words for his or her alphabet book.

POSTVIEWING ACTIVITIES

1. Wildlife needs our help—be of service! The National Wildlife Federation and the Audubon Society both have a keen interest in, and respect for, animals. These organizations are examples of businesses that are dedicated to preserving and caring for wildlife.

The National Wildlife Federation suggests planting a garden filled with various herbs and plants to provide a pleasant resting spot for the neotropical birds when they migrate to this area. These birds will enrich your community not only because of their beauty and song, but because they will help maintain an ecological balance in our urban environment. Consider planting a garden in your schoolyard or backyard as a public service to these valuable creatures.

Plant a wide variety of fruiting and flowering plants, plants that blossom or bear fruit from early spring to late fall. Berries provide carbohydrates and fats, particularly in the late summer and fall. Perennials and annuals are planted to provide nectar for hummingbirds. Hummingbirds visit the cardinal flower and pineapple sage. Always include plants that attract insects. Rotting wood as well as oaks, hickories, and maples are excellent choices. Native plants are wonderful to plant. They offer the best overall food sources, and the neotropical migrants will spread their seeds.

2. Ask students to keep a "Birds in My Neighborhood" journal. The journal should include information about behavior, habitat, and structure. Students may include photographs or illustrations.
3. Direct students to discuss the following questions:
 - a. How are birds and reptiles similar? (legs are covered with scales, toes have claws, beaks are horny and toothless, eggs are protected by a shell).
 - b. What roles do birds play in the environment? What might happen if there were no birds?
4. Direct students to research how the shape of an airplane's wing imitates a bird's wing.
5. Ask students to create a new species of bird. Direct students to draw and color a picture of the new bird. Ask students to share with the class the bird's behavior, sound, habitat, what it eats, etc.
6. Students can create a bird flip book showing a favorite bird's movement. Each page should show a small increment in movement so that as each page is flipped to the next one the viewer observes the bird moving.
7. Ask students to research your state's bird. Find out about the bird itself, why it was selected as the state bird, and the process for selection.
8. Direct students to write to local wildlife agencies for information on bird habitats in your area. Students can design and build a schoolyard bird habitat. Enlist parents and local businesses for assistance.
9. Ask students to list ways we use birds and bird products.
10. Ask students to debate the pros and cons of the bald eagle as a good national emblem.
11. Direct students to research the advantages and disadvantages of being warmblooded.
12. Direct students to research two birds and use a Venn diagram to compare and contrast the characteristics of the two birds.
13. For information about birds that are indigenous to your area contact your local Audubon Society, museums, state and local park systems, zoos, county cooperative extension services, local hatcheries and poultry breeders, or nature centers.

These organizations and companies have resource materials and products available on birds:

Cornell Laboratory of Ornithology

159 Sapsucker Woods Road
Ithaca, NY 14850-1999
www.birds.cornell.edu

National Audubon Society

700 Broadway
New York, NY 10003
www.audubon.org

National Geographic Society

Education Network
1145 17th Street, NW
Washington, DC 20036
www.ngsednet.org

National Wildlife Federation

11100 Wildlife Center Drive
Reston, VA 20109-5362
www.nwf.org

Smithsonian Migratory Bird Center

National Zoological Park
Washington, DC 20008
nationalzoo.si.edu

The Wildlife Center of Virginia

P.O. Box 1557
Waynesboro, VA 22980
www.wildlifecenter.org

WHAT IS A BIRD?

You probably know what a bird looks like, but there may be a few things you don't know about birds that might surprise you.

- There is not a single kind of bird existing today that has teeth. Without teeth, birds use their bills for preening (cleaning) their feathers, catching prey, and eating food.
- Birds are vertebrates (animals with backbones) and are the only vertebrates that have feathers. Feathers perform three important jobs for birds. They control body temperature, make it possible for birds to fly, and have colors that are used for communication with other birds and for camouflage from enemies.
- The total weight of a bird's feathers is usually more than the weight of its skeleton. Many birds have thousands of feathers—a swan can have as many as 25,000.
- There are different kinds of feathers. Flight feathers, on the wing, provide lift for flight. Outer contour feathers cover the bird's body and head, shed moisture, and are the most colorful. Down feathers are fluffy and trap air used for insulation to help keep a bird's body temperature steady.
- Not all birds fly. Some, like emus and penguins, are completely flightless.
- You probably know that birds lay eggs. Do you know which birds lay the biggest eggs and which lay the smallest eggs? The ostrich produces the largest egg, weighing 4 pounds. The hummingbird lays the smallest eggs at 1/50th of an ounce each.
- You probably also know that many birds make nests. The size of a nest, where the bird makes it, and the bird's building materials all change from bird to bird. These factors depend on the environment the bird lives in and what materials are available. You won't see too many trees in the Antarctic, so what do you think penguins build their nests with? Pebbles! Some birds, like the cowbird, lay eggs in other birds' nests.
- Many birds fly great distances every year during migration. The Arctic tern has one of the longest trips; it flies from the Arctic to the Antarctic and back again every year. That is a round trip of 25,000 miles!
- One of the current hypotheses about bird evolution is that birds evolved from dinosaurs. Many scientists believe that birds are the only living descendants of the dinosaur.
- The color of a bird's feathers (plumage) serves many different purposes. Plumage color varies greatly between birds. Many male birds, and some female birds, are very colorful—this serves to attract mates or to scare off enemies. Some birds' plumage allows them to blend into the background, which keeps them hidden from predators. This is called cryptic coloration.

PREVIEWING ACTIVITIES

1. Direct students to brainstorm and list animals that they think of as herd animals. Ask students to explain why they chose certain animals.
2. Write the names of some herd animals on the blackboard. Ask students to write a list of traits the animals have in common. (Some examples of herd animals are horses, pigs, camels, zebras, deer, antelopes, cattle, sheep, goats, bison, and oxen.)
3. Direct students to compare and contrast human beings with a particular herd animal, noting likenesses and differences in stages of development and behavior.
4. What are the differences between wild herd animals and domesticated herd animals? Students can do research to find out the differences and to learn about animal species that have members in all three categories. Students could also locate information about the history of animal domestication.
5. Several herd animals are now extinct or face possible extinction. Ask students to find out about these animals and about some of the efforts being made to prevent further extinction of herd species. Investigate the causes for extinction and the Endangered Species Act that was passed in 1973. Students may wish to find out about the purpose of this act and how it came into being. (Contact the U.S. Fish and Wildlife Service for more information.)
6. Humans have been using herd animals for a variety of purposes for many years. Direct students to do a research project in which they find out more about the ways mankind has used animals.
7. Ask students to research information on the habitat of a particular herd animal. How is the animal suited to this habitat?

POSTVIEWING ACTIVITIES

1. Ask students to write poems about favorite herd animals using the following format.
Deer! (*animal name*)
Frisky, alert! (*two adjectives*)
Darts, munches, rests. (*three verbs*)
So many on Skyline Drive. (*phrase*)
Deer! (*animal name*)
3. Discuss the meaning of some common phrases that are related to herds: "herd mentality," "riding herd," "There's safety in numbers."
4. Give each student a sheet of paper. Direct students to draw four squares on the paper. In each square, ask students to write the name of a herd animal and draw a picture of that animal.
6. Give each student a sheet of paper. Direct students to tear the sheet into several pieces. Allow students ten minutes to sketch a picture of the same herd animal on each of the small pieces of paper. Then ask the students to put the pictures into sequence and create a story to go with the pictures. Students can orally share their story ideas with a partner. Allow students time to write their stories and to take them through the four-step writing process, "Plan, Draft, Edit and Revise, Publish."
7. Create a display of herd animal pictures, maps, reports, photographs, and poems for the school's front lobby or library so students can share what they've learned.

COMMUNICATION IN A HERD

CAN WE TALK?

In order to survive in the wild, many animals band together in groups. Together they look for food, raise young, migrate, and keep watch for predators. People have given names to particular kinds of animals. For instance, we call a group of sheep or birds a flock. We say that a group of geese is a gaggle, and if we see a large number of bees in one place, we call them a swarm.

Can you think of any other names for groups of one kind of animal?

You might have thought of a group of animals that we call a “herd,” such as horses. The word “herd” usually refers to hoofed animals as well as elephants. **What other herd animals can you think of?**

Animals in herds need to be able to communicate with each other for the whole group to survive. People use spoken language to share information, like you do in your classroom with your teacher and classmates. This is called “verbal communication.” People also use body movements and facial expressions, but they rely heavily on verbal communication.

Herd animals share information, too. They use body movements as a way of sharing information. They also use vocalizations, which are noises like snorts, peeps, barks, grunts, or growls. Herd animals also rely on their senses of smell, taste, and touch to learn about the area and animals around them.

With this in mind, try “telling” a friend a message without speaking. Try to let your friend know that you are hungry, or that you have to leave soon. If you want to, try telling your friend a complicated message. It could be something like, “I have to write a report about a famous person in history.” (Remember not to use talking to “tell” your message!)

Can you think of some of the reasons herd animals need to communicate with each other?

Some examples are to alert other animals to danger, to signal that they are ready to mate, or for a mother to find its young. At other times, animals in herds give visual and or vocal clues to signal danger or to announce who is dominant in the group. An elephant sensing danger will flair its ears (in order to appear larger), lower its head, and paw the ground. If this doesn’t scare off the source of danger, a charge could be next!

AFRICAN "ELEPHACTS"

Here are some interesting facts about the world's largest herd animal.

For what do elephants use their trunks?

Elephants use their trunks for feeling, smelling, holding, drinking, bathing, eating, and making sounds to communicate with other elephants.

How much water does an elephant need to drink each day?

Normally elephants will drink once a day, taking in up to fifty gallons of water. In places where water is scarce, they can adapt to drinking every other or even every third day.

What do elephants eat?

Elephants will eat fresh grass first if it is available. If it is not, they will eat the leaves, branches, and even the bark off trees and other plants.

Why do elephants take mudbaths and cover themselves with dust?

Elephants often throw dust on themselves or roll in mud. They do this to protect their skin from the hot sun and to help keep away biting insects and parasites.

How many generations of elephants live in a herd?

An elephant herd is often made up of three generations of elephants.

How many baby elephants does a female give birth to in her lifetime?

A female elephant, called a cow, can give birth to as many as eight calves in her lifetime.

Did You Know?

- African elephant herds are lead by a dominant female, called a *matriarch*.
- Female elephants often work together to raise calves, and they teach younger females how to care for the calves.
- When male elephants begin to mature, usually at about 15 years of age, they leave the herd to form groups of their own with other males.
- When bull elephants reach about age 30, they are big enough and strong enough to compete for the opportunity to mate. They temporarily join with female herds to mate, and then they break off again.
- You will usually know when an elephant herd is drinking at a nearby waterhole. They trumpet loudly, splash themselves and each other, and squirt water from their trunks.
- You can often tell where a herd of elephants has grazed; the bark is stripped off the trees, the leaves within reach of their trunks have all been eaten, and some of the trees have even been knocked over.
- Elephants act strangely when they discover the bones of another elephant. They feel them with their trunks, pick them up, carry them away, or even try to bury them.
- Elephant herds make sure that calves stay close to the group; predators may lurk close by.
- Very young calves can't hold water in their trunks long enough to bring it to their mouths to drink, as adult elephants do. The young calves have to drink directly into their mouths.
- Young elephants love to play. A favorite game is climbing on top of each other. Sometimes older elephants will lie down on the ground and let the calves clamber on top of them.

RESOURCES

The following organizations and companies have resource materials or products available that pertain to *Hey! Have You Heard About Herds?*

Carolina Biological Supply Company

2700 York Road
Burlington, NC 27215-3398
www.carolina.com

U.S. Fish and Wildlife Service

Division of Education Outreach
Route 1, Box 16
Shepherdstown, WV 25443
www.fws.gov

World Wildlife Fund

Education
1250 24th Street, NW
Washington, DC 20037
www.worldlife.org

National Wildlife Federation

Educational Outreach Department
11100 Wildlife Center Drive
Reston, VA 20190-5362
www.nwf.org

BOOKS

The African Safari. P. Jay Fetner. New York: St. Martin's Press. 1987.

Elephant Memories. Cynthia Moss. New York: William and Morrow and Company, Inc. 1988.

Elephants. Reinhard Kunkel. New York: Harry N. Abrams, Inc., Publishers. 1982.

Land Mammals of Southern Africa, A Field Guide. Reay H. N. Smithers. Johannesburg: Macmillan, South Africa. 1986.

Serengeti. Mitsuaki Iwago. San Francisco: Chronicle Books. 1987.

The Visual Dictionary of Animals. Martin Page ed. London: Dorley Kindersly Limited. 1991.

Wild Herds. Time-Life Films, Inc. 1977.

INTRODUCTION TO THE CURRICULUM GUIDE

In the 1700s, herds of American buffalo blanketed the Great Plains. The American Indian tribes who lived on the Plains made clothing from the buffaloes' hides, fashioned tools and weapons from their bones, and cooked buffalo meat to feed their families. If your classroom could magically travel back in time back to the Great Plains of two hundred years ago, the picture before you would be much different from the one you see today.

The American buffalo, or bison, is one example of a species native to North America whose populations have decreased dramatically over the past two hundred years. In many places where animals like the buffalo, black-footed ferret, puma, and wolf once ranged, cities, towns, farms, and streets now exist. The landscape has changed and in many places these species have been forced into small pockets of land. Some are threatened by extinction in areas where they used to be abundant.

Certain North American plants were discovered by American Indian tribes to have healing properties. Doctors and scientists are closely examining this ancient knowledge and crediting it to Native American discovers.

The activities presented here attempt to illustrate, by focusing on animals and plants indigenous to North America, how scientists are trying to better understand species and their environments. We invite you and your students to be part of these discoveries in your classroom. Enj

PREVIEWING ACTIVITIES

1. Direct students to participate in a brainstorming session to compile a list of animals that they think are native to the continent of North America. Then ask students to put the animals into different categories. (Possible categories include: birds, fish, mammals, reptiles, amphibians, insects, animals that fly, four-legged animals, carnivores, herbivores, omnivores, animals that migrate, animals that hibernate.)
2. Ask students to select a native North American animal to research. Direct students to collect the information in a journal or log. Students may include, in the journal, sketches or pictures clipped from magazines, as well as personal observations, thoughts, and feelings they have about the animal. Students' questions about the animal should also be a part of the journal.
3. After students research their North American animals, direct students to write a story about what a day in the life of the chosen animal would be like. (Examples for students to use as models are books by Tejima, the *Long Pond* books by William and Lindsay George, books by Jean Craighead George, and books by Jim Arnosky.)
4. The existence of many North American animals is threatened for a number of reasons. Direct students to brainstorm to create a list of causes for animal extinction. Research some of the endangered animals. (Some examples are the whooping crane, the black-footed ferret, the Florida panther or puma, and the bald eagle.)

Science Safari

Home on the Range

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5. Select a North American animal to be the “North American Animal of the Day.” Introduce the animal by informing students of the animal’s appearance, its habitat, what it eats, what its home looks like, and any other interesting information. Ask students to take notes daily.
6. Play “What Animal Am I?” with your students. Select a North American animal and give clues about the animal. Ask students to guess the animal using as few clues as possible. (Example: I live in the west, the southwest, and in Florida in the United States. I am a carnivore. I live in high places. I am a mammal. I am a member of the cat family. I am rare today. I live alone. Who am I? Answer: a puma.) You might want to ask a student to give clues to see if he or she can stump classmates.
7. Ask students to investigate nonnative species and the effect they have had on the continent. Questions to consider are: How does this animal affect native species and the habitat in which it lives? Where, when, and how was this animal introduced to North America?
8. Direct students to compile a “life list” of the different animals they see for one week. Ask students to consider: How many animals were native? How many animals were nonnative? Where did the students see the greatest number of different kinds of animals?

POSTVIEWING ACTIVITIES

1. After students research particular North American animals, ask them to create one of the following:
 - a. a fictional birth announcement for a baby animal telling where and when it was born and how it will be raised.
 - b. a shopping list or menu for the animal including all the things it eats.
 - c. a personal ad outlining the qualities of a mate.
 - d. an ad for the real estate section of the paper telling about the type of home the animal would like to purchase.
2. Discuss famous American animals or American animals that have been used as subjects in art, music, or literature. Why and how have these animals become famous? Why was the animal chosen as the subject for the piece of art, music, or literature?
3. If your school has an animal mascot, direct students to investigate whether the animal is a native animal?
4. Ask students to investigate the origins and meanings of some animal sayings such as “blind as a bat,” “wise as an owl,” and “crazy like a fox.”
5. After they investigate extinct or endangered North American animals, ask students to create timelines that show when the animals became extinct, endangered, or were taken off the endangered species list. (A good reference book for teachers is *Lost Wild America: The Story of Our Extinct and Vanishing Wildlife* by Robert M. McClung.)
6. Direct students to find out what people can do or are doing to help animals that are considered endangered. Students may want to explore ways in which they can become actively involved in these efforts.
7. Ask students to write articles for the school or local newspaper describing some local wildlife problems and issues and ways that fellow schoolmates or neighbors can help.
8. Volunteering at a local wildlife center or park is a great way for students to become involved with animals that live close to home.
9. By contacting the National Wildlife Center, students can receive a information that outlines how they can create a backyard wildlife habitat at home or at school.

Background for the Teacher

PUMA

Sleek and agile, the people-shy puma has been called the mammal most characteristic of the Americas—large, rugged, and free. Adaptable to almost any terrain, this cat once ranged from Canada to South America and has many names: mountain lion, American lion, cougar, panther, and catamount (“cat of the mountains”). Whatever you call it, whether it is winding through a rocky ravine, prowling a snow-capped mountain, or slipping through the steamy Everglades, the puma hunts with a supple grace.

What makes the puma such a proficient predator? Furred feet permit a soft, quiet tread for stalking. Long hind limbs propel its lean muscular body into amazing leaps to spring upon its prey. This cat’s forelimbs are armed with five long, curved claws to grasp prey or rip at an enemy. Although they have few teeth compared to other meat eaters, their teeth are highly specialized, designed to seize, kill, and devour other animals far larger than themselves. Even the surface of the tongue is covered with sharp points that rasp meat from bones. This solitary hunter usually hunts at night, its tawny coat camouflaging it from prey.

Today the puma is found in significant numbers only in the western part of the United States. The Eastern Cougar is now extinct, and the Florida panther is critically endangered. How is this possible with an animal that is so adaptable to varying climates and terrain?

Zoo News: A small, threatened group of pumas, known as the Florida panthers, exist in the Florida Everglades. Fewer than 50 panthers survive. Researchers at the National Zoo’s Center for New Opportunities in Animal Health Sciences (NOAHS) are now using assisted reproduction for the first time to save the Florida panther from extinction and to expand the available gene pool for this endangered cat. Scientists also are trying to recover and preserve sperm and ovaries taken from Florida panthers killed by cars.

Puma Facts

- Adult males weigh 148 to 227 pounds and measure five-and-a-half to six feet from nose to tail tip.
- Breeding is not confined to any one season. A pair will remain together for two weeks, perhaps longer. Then they part, possibly never to meet again.
- The mother rears the young alone, and the father plays no further role in the family. One to six spotted kittens are born after a 90-day gestation period.
- A young female panther will ordinarily not breed until she has established her territory. She can better provide food for her offspring when she is on familiar ground.
- Helpless at first, a puma cub grows rapidly as the mother brings meat to it and nurses it with her milk.
- Young pumas possess certain instinctive abilities as predators. But they still have a lot to learn about hunting. Before going out on their own, they will spend up to two years with their mother learning other skills necessary for survival.
- When it leaves its mother, the puma leads the life of a strict loner, hunting mainly at night for its prey.
- Unlike the lion, which roars, the puma purrs and makes high-pitched shrill sounds similar to the sounds a house cat makes, but louder.

BLACK-FOOTED FERRET

You probably have never seen a black-footed ferret. The only ferret native to North America, the black-footed ferret numbered one million in the West before the turn of the century, with populations stretching from Canada into Mexico. Despite being hunted by coyotes, bobcats, eagles, and falcons, the ferret thrived until the wilderness areas in which it lives were disturbed by humans. Now they are one of the most endangered mammal species in North America and one of the rarest mammals in the world.

You might be lucky enough to see a black-footed ferret someday, if the animal makes a comeback in its native habitat—the prairies of the western United States. How will you recognize a black-footed ferret? It is about the size of a squirrel and has a grayish white coat. As its name suggests, it has black fur on its paws. Cattle ranchers liked to call it “the bandit of the prairie” because of the black “mask” that circles its eyes.

Until a small population was recently discovered in Wyoming, the black-footed ferret was believed to be extinct. In 1985, only 18 remained! Scientists who specialize in “species survival” at the Smithsonian Institution’s National Zoological Park’s Conservation and Research Center in Front Royal, Virginia, and elsewhere began to closely study the black-footed ferret’s behavior in captivity and in the wild.

The results of these studies are now being used to devise several breeding plans. Scientists at the Zoo’s New Opportunities in Animal Health Sciences Center (NOAHS) employ a technique called “artificial insemination” to enhance the ferrets’ reproduction. Because genetic diversity gives animals their best chance for survival, researchers are careful to mate the most distantly related ferrets. The NOAHS Center helped four ferret mothers at the Sybille Wildlife Research Center in Wyoming give birth to kits. Today about 400 ferrets have been bred in captivity nationwide.

As many as 50 black-footed ferrets were reintroduced to the Wyoming wild last year, but their survival remains a daily struggle. Researchers have discovered that by the time a young ferret is ready to strike out on its own, it needs to have learned survival skills such as hunting, foraging, and escaping from predators. Black-footed ferrets born in captivity are learning all they can from their mothers and have help from species survival specialists.

Prairie dog burrows provide the black-footed ferret with shelter from its natural predators. In addition, these tunnels are the home of its favorite prey, the prairie dog. The dwindling prairie dog population, eradicated primarily by humans, is the principle reason the black-footed ferret is threatened with extinction today. Two other factors combined recently to further threaten the ferrets. Canine distemper, a disease found in domestic dogs, is 100 percent fatal to ferrets. Another disease, sylvatic plague, has greatly reduced the prairie dog population.

RESOURCES

The following organizations have resource materials that are related to the **Science Safari** program, *Home on the Range*.

Bat Conservation International
P. O. Box 162603
Austin, TX 78716-2603
www.batcon.org

Chesapeake Bay Foundation
6 Herndon Avenue
Annapolis, MD 21403
www.cbf.org

International Crane Foundation
E-11376 Shady Lane Road
PO Box 447
Baraboo, WI 53913-9778
www.savingcranes.org

National Geographic Society
1145 17th Street, NW
Washington, DC 20036
www.nationalgeographic.com

The Ocean Conservancy
2029 K Street
Washington, DC 20006
www.oceanconservancy.org

Save the Manatee Club
500 N. Maitland Avenue
Suite 210
Maitland, FL 32751
www.savethemanatee.org

The Wildlife Center of Virginia
PO Box 1556
Waynesboro, VA 22980
www.wildlifecenter.org

INTRODUCTION

This curriculum guide focuses on the giants of the animal kingdom and the adaptations that allow them to survive in their environments. If you've browsed the table of contents, you can guess that "giants" has a relative meaning here. Elephants, the largest land animals, are certainly giants. Similarly, tarantulas, as the largest members of the spider family, can also be called giants.

Successful adaptations enable a species to become better suited to conditions in the environment, fitting into it like a piece in a puzzle. The place where that animal's "puzzle piece" fits is called its ecological niche. If two or more species compete for a niche, one may eventually adapt to it and out-compete the others in finding food, establishing territory, and successfully reproducing. If conditions in an environment change quickly or drastically (or both), a species may not be able to adapt to the new set of conditions and may not survive.

With that in mind, here are some questions for students to answer as you lead them through this guide. What is significant about the "ecological niche" of large animals? Are there special needs or adaptations that set them apart from smaller creatures? For example, is an elephant's large size a successful adaptation? Could a lizard the size of a Komodo dragon have flourished anywhere in the world, or just on an island with no mammalian predators? What special skills does a huge arachnid like the tarantula have that make it such a successful predator? Where does the evolutionary history of a large animal such as the giant panda lie? Is it a raccoon, a bear, or something else entirely?

The key to all of these questions is in each animal's adaptations. Today researchers estimate that of all the species that ever lived on the Earth, over 99.9 percent are now extinct. What factors cause a specific species to survive and flourish while another succumbs to extinction? Why might "giants" be more susceptible to extinction than their smaller counterparts?

This guide poses questions within this context for students to ponder. We hope you and your students enjoy this look at giants of the animal kingdom and their unique adaptations. Please let us know if you have any comments on the content or format of this guide. Thanks and enjoy!

PREVIEWING ACTIVITIES

1. Ask students to brainstorm, either in small groups or as a whole class, a list of animals that they think of as large animals. Direct students to discuss what size they think an animal must be in order to be considered a giant. Ask students, individually or in groups, to research one of the animals from the student-generated list.
2. Ask students to select an animal and to create a trivia book or game about it. Trivia facts might include life span, size, different species, animal's behavior, habitat, what the animal looks like, eating habits, locomotion, communication, how it protects itself from enemies, animal's intelligence, its life as an infant, its life cycle.
3. The book **Little Giants** by Seymour Simon (William Morrow and Company ISBN 0-688-01727-4) is an excellent springboard for discussion and research on animals that are the largest of what are considered small animals.
5. Divide the class into teams. Ask each team to investigate the size (including height and weight) of several large animals as well as some dinosaurs. Send them out to the blacktop or field to create a life-size rendering of their chosen animal.
6. Why are large animals important? What role do they play in the environment? What would happen if these animals no longer existed? These questions may lead into an interesting discussion and possible debate topic.

POSTVIEWING ACTIVITIES

1. Direct students to cut pictures from magazines and/or newspaper that show "giant" things. Ask students to explain why they consider the pictures "giant" things. Students may wish to place the pictures in a "Land of the Giants" book.
3. Share several nonfiction books that focus on one particular animal. Develop a list of things that students notice that most of these books contain. Discuss the positive and negative aspects of each tradebook. Direct students to work in groups to create their own tradebooks about particular large animals. These books could be donated to students in a primary classroom.
4. Ask students to research the ancestors of one of the large animals. They might be interested to know that the first elephant was about two feet high and did not have a trunk. Many of the animals being discussed on **Science Safari** have interesting ancestors.
5. Direct students to research an animal's needs. Ask students to design a zoo habitat for that animal based on their research. How much space is needed for one giraffe? Two giraffes? What would a zoo habitat look like and need to have in order to provide for this animal's needs? You may wish to ask students to visit a local zoo and then to discuss how the zoo designer created the habitats for each animal.

*Background for the Teacher***TARANTULA: GIANT SPIDERS**

The following information about the largest arachnids is provided for you to share with your students.

Some Basics

1. Spiders have been on the Earth for at least 380 million years.
2. About 34,000 species have been identified by biologists, but there may be as many as 170,000 species total.
3. Spiders live nearly everywhere on land, and some even live in fresh water.
4. Can spiders hear? No one knows for sure yet! In addition to tarantulas, some spiders such as the barking and whistling spiders in Australia can make noises, and this leads scientists to suspect they can hear.
5. Spiders are able survive without eating for a month or more. A large, well-fed tarantula can go without food for as long as a year!

Hairy Habitats

1. Tarantulas bite in defense but usually only as a last resort.
2. Tarantulas may launch a hairy counterattack. Barbed hairs grow on the back of this spider's abdomen. The tarantula uses its hind legs to aim and brush these venomous barbs at the nose, lips, and eyelids of predators. Spiders in general are hairy, but only tarantulas have adapted to use their hairs for defense.

Poisonous Points

1. Almost all spiders employ poison to immobilize their prey. Depending on the species, a spider either unfolds its fangs or jabs in a precise dose of poison from glands and paralyzes its ill-fated food.
2. Depending on the species, a spider's jaws open either up and down like a human's or sideways. The sideways movement in other spiders' jaws produces a bigger gape, allowing them to catch prey that is relatively large compared to their own size. A tarantula's jaws open up and down. They can't open their mouths as wide as some other spiders, but their larger size, and consequently larger mouth, enables them to get the food they need.
3. Tarantulas, like all spiders, digest their food externally. They inject and knead digestive juices repeatedly into their prey and then suck up the liquefied meal. Tarantulas cannot chew their food; they can only "drink" it.
4. All spiders are carnivorous and have to hunt or lay a trap for their prey. A spider uses neurotoxins, or poison that attacks the nervous system of its victim, to immobilize its prey. The toxins not only paralyze the animal but also preserve it, keeping it fresh until the spider is ready to eat it.
5. Despite their sinister reputation, tarantulas carry venom that is not automatically fatal to humans, although some spiders possess venom capable of killing rodents.

Don't Fall for Me:

For a tarantula, even a slight fall can be fatal. Its abdomen could burst or crack, which would usually kill the spider.

Can You Hear Me?

Some tarantulas, if they are threatened, will emit a hissing sound. They are actually stridulating—rubbing stiff bristles against their own bodies to make this noise—in order to scare off the attacker. The Goliath birdeating tarantula is the loudest “hisser.”

Dancing with Wolf Spiders

In Europe people call the wolf spider “tarantula” after the tarantella, a fast dance that originated in the 1600s in Italy. The bite of a wolf spider, it was thought, brought on a condition called tarantism, an uncontrollable urge to dance. The name stuck, and now real tarantulas are destined to share their name with other large hairy spiders, like the wolf spider, that are not real tarantulas.

DRAGON EXPRESS

On the tiny island of Komodo in the Southeast Asian country of Indonesia, a nine-foot-long, 200-pound lizard lumbers through the forest, constantly flicking the ground with its light-yellow tongue. It comes into an open field and heads straight toward a carcass already being voraciously devoured by two smaller Komodo dragons. It opens its mouth, inflates its throat and threateningly pulls its large tail up behind itself. The other reptiles lower their heads and move aside as the giant lizard steps to the carcass and begins to eat.

Rumors reached European explorers in the nineteenth century from a group of volcanic islands in Southeast Asia, telling of a dangerous cannibalistic dragon inhabiting the small island of Komodo. Called “Ora” by the people of the area, these tales so intrigued explorers of the time that, in 1912, some of them decided to go to Komodo to see just what these dragons were really like. The island proved extremely difficult to reach. Powerful winds, strong currents, and perilous whirlpools made the trip by boat treacherous. Nevertheless these expeditions brought the first skins and bones of the legendary Komodo dragon to American museums.

Varanus komodoensis, the Komodo dragon, is really neither a dragon nor a relative of the long-extinct dinosaurs. It is actually the world's largest lizard. With the exception of dwarf and arboreal monitors, all monitor lizards look pretty much alike (except for their size), with long heads and necks, heavy bodies, and long thick tails. Large, wild adult male dragons can reach 9 1/2 feet and can weigh up to 250 pounds.

Komodo dragons, meat eaters like other monitor lizards, hunt their prey and also scavenge carcasses of animals that have already died. When hunting, a Komodo dragon waits in ambush in high grass or shrubs to pounce on its prey: deer, wild pigs, and sometimes even monkeys. The hungry dragon jumps, grabs the animal by the leg or throat, and throws it to the ground and delivers a toothy bite. If its prey escapes this initial attack, the danger isn't over yet. The Komodo dragon's saliva is full of a deadly species of bacteria. This causes a fast-moving superinfection that poisons the victim's blood. The animal may run off, but the infection may kill it later.

The Komodo dragon, like crocodiles and alligators, cuts meat with its teeth before swallowing it. Using its heavy legs to keep the meal in place, it tears off pieces with serrated teeth about twice as long as those of a human. At any given time the Komodo has many teeth that are being replaced by incoming ones. Wide snouts enable the animal to slice off huge pieces and swallow them whole, gulping down up to 20 pounds per minute.

A Komodo's appetite is enormous. One 100-pound dragon was observed to eat a 90-pound wild pig—legs, hooves, and all. To consume the equivalent of the upper limit of what a Komodo dragon can eat in one meal (up to 80 percent of its own body weight), a 200-pound human would have to polish off 640 $\frac{1}{4}$ pound hamburgers in a single sitting.

Like snakes, monitor lizards have long forked tongues that pick up the scent of their prey. A Komodo dragon can smell better with its tongue than with its nose, flicking it in and out to pick up odor particles from the air, the ground, and objects with which it comes in contact. The Komodo can detect rotting carrion at a distance of up to five miles, and, like sharks, will follow even the faintest trace of a scent to its source.

As many as a few dozen dragons of various sizes may gather to feed at one time. Size determines who will dine first, with smaller dragons showing deference to larger ones so as not to become a meal themselves! When not feeding, this lizard looks for shady places where it can sleep.

The Komodo dragon achieves and maintains its body temperature through thermoregulation, as do all reptiles. Soon after sunrise, the dragon will begin basking in the sunlight, sprawling on the ground in order to soak up the sun's rays. On the flip side, if the lizard is too warm, it rests in the shade of a tree, soaks in a pool of water, or retreats to a burrow where the temperature is cool.

WHICH IS WHICH ACTIVITY?

At the Smithsonian Institution’s National Zoological Park there are two species of elephant—Asian and African. The two species have very distinct features that you can pick out if you look closely at them.

The African elephant is the larger of the two species and the biggest land mammal in the world. One African elephant weighs in at an average of seven tons. A fully grown male can be up to 13 feet tall. A male Asian elephant, on the other hand, weighs around six tons and will typically stand about 11 feet tall.

Both female and male African elephants have tusks, but of the Asian elephants, only males have tusks.

Look at the descriptions below. Used the Internet, library, or other resources and select the correct elephant for each description.

	African Elephant	Asian Elephant
bigger of the two (about 7 tons)		
smaller of the two (about 6 tons)		
both sexes have tusks		
only males have tusks		
smaller ears		
bigger ears		
lives in Africa		
comes from India		
has one “finger” on the end of its trunk		
has two “fingers” on the end of its trunk		
highest point of body is at the middle of the back		
highest point of body is at the shoulders		