

SAN DIEGO ZOO  
**KIDS**<sup>®</sup>

A close-up photograph of a panda's face, showing its black fur around the eyes and ears, and white fur on the rest of its face. Its dark brown eyes are looking directly at the viewer.

**PANDA TREK**

**Teacher Resources & Activities**  
**GRADES K TO 5**





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The activities in this booklet follow the 5E Instructional Model developed through the Biological Sciences Curriculum Study (BSCS). The phases of the BSCS 5E teaching sequence are Engage, Explore, Explain, Elaborate, and Evaluate. Generally, activity steps 1 through 5 align with these phases.





# Welcome to Panda Trek

# Ron Swaisgood



Hi Kids,

I first met Diego the ocelot when he was just a small kitten, and although he was small, cute, and fluffy, he was all wild cat. Diego was born at another zoo and came to us at a very young age. His situation made him a good candidate to join our ambassador animals for education programs. That means we spend a lot of time working with him, so that he becomes accustomed to helping us teach people of all ages about ocelots and the habitats where they live. When Diego comes to a presentation with us, we can talk about his camouflage, large feet, the white spots on the back of his ears, and many more adaptations—and everyone can see them in person!

One thing students frequently ask is, "How did we domesticate Diego?" This comes up because Diego does well walking on a leash and working with his trainers. The truth is, he's not domesticated at all. Although Diego has been trained to work with his professional trainers, he still has all of his wild cat instincts. In contrast, domestication occurs over thousands of years when people selectively breed animals for specific looks or behaviors.

Working with cats like Diego, I often hear people say, "He acts just like my cat!" But the truth is, your domestic cat at home acts like Diego and other wild cats, not the other way around. This is because wild cats are the ancestors of domestic cats. And although domestic cats have been bred to live with people, they still retain some of the wild cat behaviors from their ancestors. In fact, if you have a domestic cat at home, you may recognize certain behaviors like stalking, pouncing, and even grooming in the big cats, as well.



## Meet a Panda Researcher

**Ronald Swaisgood, Ph.D.**

Associate Director, Applied Animal Ecology  
San Diego Zoo Global  
Institute for Conservation Research

Dr. Ronald Swaisgood oversees recovery programs for species such as California condors, burrowing owls, Caribbean rock iguanas, mountain yellow-legged frogs, giant pandas, and Pacific pocket mice. His fieldwork addresses conservation questions such as habitat needs and how animals disperse and settle into new habitats.

Dr. Swaisgood chairs the International Union for the Conservation of Nature's (IUCN) Giant Panda Expert Team and the Association of Zoos and Aquariums' (AZA) Giant Panda Species Survival Plan. He serves as adjunct professor in the Department of Ecology and Evolutionary Biology at the University of California, Los Angeles; in the Department of

Biology at San Diego State University; and at the Institute of Zoology, Chinese Academy of Sciences.

Dr. Swaisgood has Bachelor degrees in Zoology and Anthropology, a Master's degree, and a Ph.D. in Animal Behavior. An advocate for reconnecting children to nature, Dr. Swaisgood serves on the Advisory Committee for the National Children & Nature Network's Natural Families Network.





## About This Guide

In the wild, we find giant pandas in the mountains of China. They live in damp, misty forests of bamboo and old-growth conifers. They share habitat with other animals, such as shaggy takins, elusive Mang Mountain vipers, and shy red pandas. At Panda Trek you can meet them all, plus you'll learn about panda research and conservation.

This guide follows the adventures of panda researcher Dr. Ron Swaisgood. (Find out more about Dr. Swaisgood on page 2.) You'll find grade-specific activities for grades K-8, and you can easily modify most of the activities up or down to suit the grade level and needs of your students.

We hope you and your students will "trek" to the San Diego Zoo to see giant pandas and other wildlife!



## SIZE

Male giant pandas typically weigh between 190 and 275 pounds (86 to 125 kilograms). Females are usually smaller: between 155 and 220 pounds (70 to 100 kilograms). A newborn panda is tiny—just 3 to 5 ounces (85 to 142 grams). About the size of a stick of butter, it is 800 times smaller than its mother.

## HABITAT

Giant pandas live in damp, misty forests in the mountains of southwestern China, mostly at elevations between 4,000 and 11,500 feet. Suitable panda habitat requires old-growth conifer trees, at least two species of bamboo, and water access.

## DIET

Bamboo makes up 99 percent of a giant panda's diet. A panda's skull, jaws, chewing muscles, and teeth are adapted for crushing and chewing bamboo.

## COMMUNICATION

Pandas have an acute sense of smell. Both male and female pandas have a scent gland under the short tail. The gland secretes a waxy substance that's important in panda communication.



# Giant Panda

*Ailuropoda melanoleuca*

## SIZE

Male and female red pandas are about the same size. They weigh about 6 to 13 pounds (about 3 to 6 kilograms)—about the weight of a large house cat.

## HABITAT

Red pandas live in cool, temperate mixed forests of deciduous and coniferous trees, from the Himalayan Mountains to the mountains of southern China, mostly at altitudes of about 5,000 to 15,000 feet (1,500 to 4,800 meters).

## DIET

Like giant pandas, red pandas eat mostly bamboo, but they prefer the leaves and shoots. A red panda's skull, jaws, chewing muscles, and teeth are proportionately large, an adaptation for chewing bamboo.

## TREETOP DWELLER

A red panda spends most of its time up in the branches of trees. With a bushy tail for balance and claws for gripping, it climbs on fallen logs and tree stumps to reach the branches of a tree or the leaves of tall bamboo.



# Red Panda

*Ailurus fulgens*  
*and Ailurus styan*

## SIZE

Male takins are larger than females, between 660 and 770 pounds (300 to 350 kilograms). Females weigh about 530 to 600 pounds (240 to 270 kilograms). A takin stands about 3.5 to 4.5 feet (107 to 140 centimeters) high at the shoulder.

## HABITAT

Takins live in rugged, remote mountains of Bhutan, China, northwest India, and northern Myanmar. Different subspecies inhabit different parts of the range. They spend the winter in lower-altitude valleys and move to high-altitude meadows to forage in the summer.

## DIET

Takins eat almost any vegetation they can reach. A takin rears up on its hind legs, forelegs propped against a tree, to reach vegetation as high as 8 feet (2.4 meters) from the ground.

## TRAILS

As they move up, down, or across the mountains, takins use the same routes over and over, creating well-worn paths through the dense vegetation.



# Takin

*Budorcas taxicolor*

## SIZE

A Mang Mountain viper can grow to nearly 7 feet (2 meters). Females are heavier and more robust, and males have longer tails.

## HABITAT

These elusive snakes live in an area less than 40 square miles (100 square kilometers) on Mang Mountain in Hunan Province, China, at elevations between about 2,300 and 4,300 feet (700-1,300 meters).

## DIET

A hungry Mang Mountain viper flicks its tongue in and out to smell a trail used by prey animals. Then it lies in wait until a small mammal or a frog comes close enough to strike. When the Mang Mountain viper lunges and strikes, its almost inch-long fangs pierce its prey, and venom flows through the fangs and into the wounds. The snake releases its prey and waits for the venom to incapacitate it before eating it.

## CAMOUFLAGE

Lying among logs and stones, the Mang Mountain viper is perfectly camouflaged.



# Mang Mountain Viper

*Protobothrops mangshanensis*

# PRE-K

# Bamboo Eaters

 TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources)  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students identify similarities and differences between giant pandas and red pandas. Correlates with the Science Content Standards: Similarities and Differences.

## INTRODUCTION

Wildlife researchers study animals and their habitats. The more researchers know about animals, the more they can help them survive. Researchers often keep journals to record information. A researcher's journal might contain notes, stories, or even sketches of plants and animals. Wildlife researchers in China are studying two animals of the bamboo forest—the red panda and the giant panda.

The word “panda” comes from a Nepalese word that probably means something like, “bamboo-footed.” For many years, scientists wondered if giant pandas and red pandas were related. Today we know that giant pandas are bears, and red pandas represent a unique family of Carnivorans. Although they share some characteristics, they are different in many ways.

## MATERIALS

- Copies of the “Bamboo Eaters” worksheet on page 9
- A red or orange crayon, a black crayon, and a green crayon

Visit the Panda Trek exhibit at the San Diego Zoo or [sandiegozoo.org](http://sandiegozoo.org) to find out how researchers use information they learn from pandas in zoos to help pandas in the wild.

## ACTIVITY

**Step 1:** Discuss what it means to be a wildlife researcher. Read the journal entries on page 7.

**Step 2:** Distribute to each child a “Bamboo Eaters” worksheet, a red or orange crayon, a brown crayon, a black crayon, and a green crayon.

**Step 3:** Read students the prompts on page 8 to help them complete the researcher’s sketch.

**Step 4:** (optional) Show students pictures of a brown bear and a raccoon. Show the students pictures of a red panda and a giant panda. Compare and contrast the giant panda to the brown bear. Explain that at one time researchers suspected that red pandas might be related to raccoons. Compare and contrast raccoons and red pandas. Then let students know that scientific investigation has shown that they aren’t closely related after all. Red pandas are truly unique.



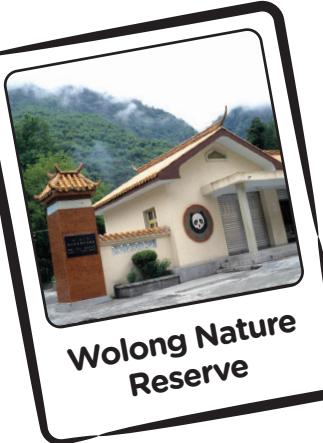
# GRADE K

# Keeper Notes ➤ entry

## November 14

What an amazing journey! I am finally here at the Wolong Nature Reserve in China to study pandas. For a wildlife researcher, this part of the world has so much to see and explore. It's beautiful here—the mountains and forest are home to many different kinds of animals. Today I saw a giant panda in the wild for the first time.

It looked like it weighed about 200 pounds. Giant pandas do look like bears: they are big, and they have sharp teeth. But they have black ears and black circles of fur around their eyes. No other bear looks like that.



**Wolong Nature Reserve**

## November 17

Today I saw another giant panda in a grove of bamboo. It was eating bamboo. I watched it for a while. It was rubbing its bottom against a tree trunk, and I'm pretty sure it was leaving a scent mark, which is like a message for another panda. It made a noise that sounded like a goat. Then it walked into a grove of bamboo and started eating. It was so cool to see it holding onto the bamboo stalk with its claws and wrist bone. I wonder how much food pandas eat in one day?



**Giant Panda**

## November 24

Today I saw a new animal in the forest. It was high up in a tree, and I couldn't see it very well, but I know it wasn't a giant panda. Its fur was reddish brown, and it kind of looked like a raccoon. It had a long, bushy tail with stripes of red and brown fur. I think it was eating bamboo; I could hear it chewing, and then some bamboo leaves fell on my head. It was making noises that sounded like a chirp or a whistle that a bird would make. I don't know what it was, but I'm going to find out!



**Red Panda**

## November 25

I looked in my field guide and discovered that the animal with the long tail is called a red panda. I asked another researcher what she knew about red pandas and giant pandas. She told me the word "panda" means "bamboo-footed," and since both animals eat bamboo, they are both called pandas. I jotted down more notes about their similarities and differences:



**Giant Panda**



**Red Panda**

# GRADE K

# Bamboo Eaters ➤ activity

Read students the following prompts to help them complete the researcher's sketch:

What are the two different kinds of pandas found in the bamboo forest? Point to the giant panda. Point to the red panda.

Which one is larger? Use a black crayon to trace the lines to complete the giant panda's body.

Which one is smaller? Use an orange or red crayon to trace the lines to complete the red panda's body.

Which one looks more like a bear?

Which one has a mask and a tail like a raccoon?

Which panda is black and white? Color the shaded areas on the giant panda's legs.

Which panda is red? The red panda has dark fur on its stomach and reddish fur on its back. It also has a red and white mask of fur on its face and a red-banded tail. Color the shaded areas on the red panda red or orange.

The red panda and the giant panda have the same color nose. Can you guess what color they are? Color the noses black. Are they the same size?

The giant panda has patches of black fur around its eyes. Trace the circles and color in the black fur. Color the red panda's eyes too. Color them black.

The red panda has whiskers like a cat. Can you add whiskers to the red panda?

The giant panda has small, round ears. Trace the ears and color them black.

The red panda has pointy ears like a cat.

Both giant pandas and red pandas have long claws for climbing and to help them eat bamboo. Can you add long claws to both of the pandas?

The red panda is high in a tree. Color the tree brown.

The word "panda" means "bamboo-footed." Can you find bamboo in the picture? Color it green.

## Both red pandas & giant pandas....

- Live in the bamboo forest
- Have sharp claws & teeth
- Make noises to communicate
- Spend more than 10 hours a day eating bamboo
- Have a wrist bone that helps them eat bamboo
- Like to live alone
- They are endangered

## These pandas are different because

- One has a small tail, and the other has a long tail
- One has black & white fur, and the other has reddish fur
- One looks like a cat or a raccoon, and the other one looks like a bear
- The giant panda is much bigger than the red panda
- The red panda likes to stay high up in the trees
- Red pandas prefer to eat bamboo leaves. Giant pandas eat the stems too
- Giant pandas honk, growl and bark. Red pandas whistle and chirp

# GRADE K

# Bamboo Eaters ▶ activity

## December 5

I started sketching the red panda and the giant panda, but I didn't have time to finish. Maybe a Junior Researcher will help me complete my picture of these two pandas in their bamboo habitat....



# GRADE 1

# Trek With a Panda

 TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources)  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students identify what a giant panda needs to survive: bamboo, old-growth conifer forest, and habitat corridors. Correlates with the Science Content Standards Plant and Animal Needs

## INTRODUCTION

For a long time, scientists didn't know much about giant pandas in the wild. By fitting wild pandas with GPS satellite collars, researchers are able to track them and find out where they go, what they do, and what they need to survive.

Giant pandas need bamboo to eat, but they also need forests of old, large pine trees. These forests help keep the habitat healthy, and hollow trees provide dens for mother pandas. Unfortunately, much of China's old-growth forest has been destroyed or fragmented by human development. Today there are only "islands" of forests left. The San Diego Zoo is helping pandas by working with China to establish protected habitat and wildlife corridors (unpopulated strips of habitat) that connect the isolated forest pockets.

## MATERIALS

- Copies of the "Trek With a Panda" worksheet on page 12
- Crayons or pencils

## ACTIVITY

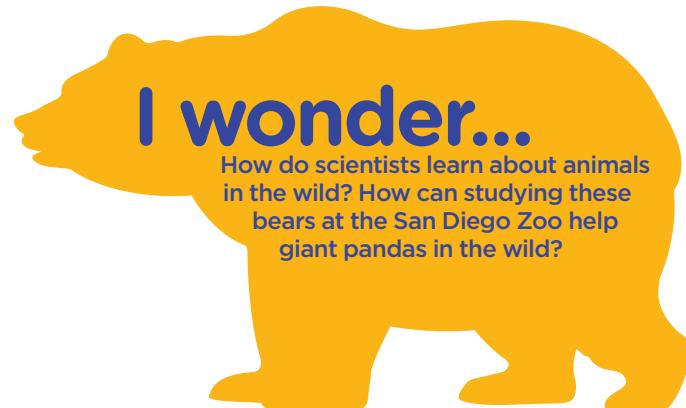
**Step 1:** Read the journal entries to your students.

**Step 2:** Ask students what giant pandas need to survive. (Bamboo to eat, pine trees, hollow tree stumps/logs for dens, paths through the forest.) Ask them how biologists can track them to learn how they live, what they do and what they need to survive (tracking collars).

**Step 3:** Distribute "Trek With a Panda" worksheets. Discuss the obstacles in the panda's way. As you name each obstacle, ask students to mark it with an "X." (Roads, farms, villages, people, cleared land.) Why do these obstacles make it difficult for the panda to get to the other side of the forest?

**Step 4:** Students mark the path the panda can take to reach its den.

**Step 5:** What would help make it easier for the panda to reach the other side of the forest? Be sure to include a discussion of the benefits of a wildlife corridor—an unpopulated strip of land between forest fragments, and the idea of re-forestation. Invite students to find a spot where they might put a wildlife corridor.



# GRADE 1

# Trek With a Panda ▶ activity

## December 2

I've never seen a forest like this. It's filled with pine trees and bamboo, a tall, reed-like plant with green and golden leaves. It comes in all different sizes—some as tall as me, and some taller than the research station. Some reach 50 feet into the sky, but as big as it is, it's actually a type of giant grass. Someone from the research station told me there are 1,200 different kinds of bamboo.

I wonder how many species are in China, and which ones the pandas eat?

Giant pandas need to eat a lot of bamboo to survive—up to 40 pounds a day. They seem to be munching all the time. Our team estimated that a panda spends 12 hours a day just eating.

## December 5

I noticed that the pandas can't get from one part of the forest to the other when there is a road or a farm in the way. At times they can't find enough bamboo to eat. It must be hard for them to find other pandas during the breeding season, too.



Bamboo



Panda Hair



Hollow Log

## December 15

Today in the misty mountains, I noticed that the big pine trees shelter young bamboo. Fallen pine needles and dead trees return nutrients to the soil, which helps the bamboo grow, too.

I also saw some huge hollow tree stumps. When we investigated inside, we found strands of panda hair. I wonder what the pandas do inside those hollow trees...?

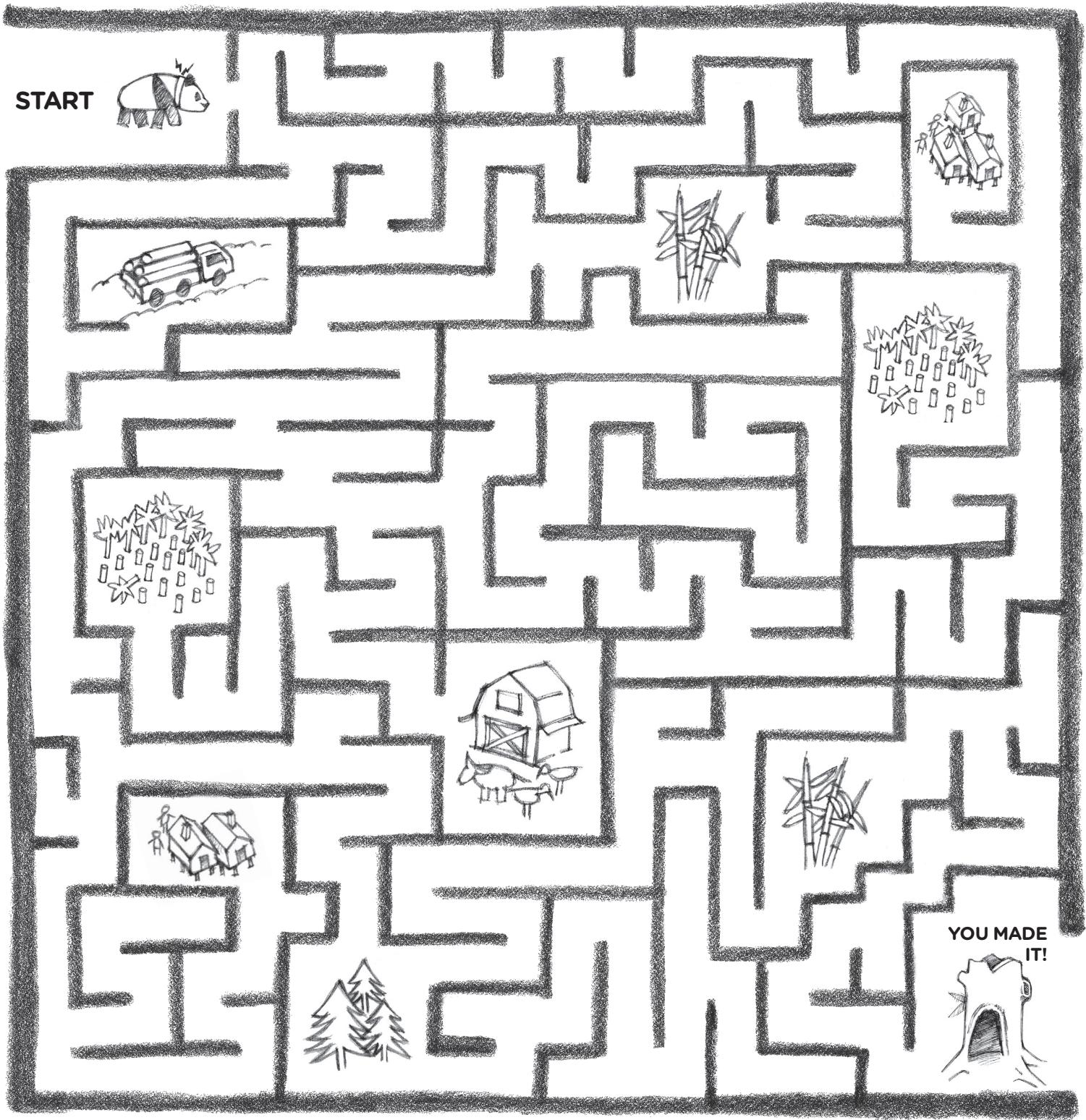
## December 20

I discovered why we found panda hair inside those old hollow logs. A giant panda mother uses a hollow tree as a den to give birth and keep her cub safe. I think I want to know more about what pandas need. Today put a GPS tracking collar on a female giant panda to see how she travels through the forest. I wonder if any of the Junior Researchers can figure out which way she'll go?

# GRADE 1

# Trek With a Panda ▶ activity

Where can this radio-collared panda go? Watch out! As she travels through the bamboo forest she might encounter obstacles. She won't be able to cross homes, roads, farms, or cleared forest. She will be able to cross bamboo and conifer forests.



Pandas need healthy habitats! Did you find obstacles in your panda's habitat?

# GRADE 2

# Life Cycle Clues

 TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources)  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students sequence the life cycle stages of a bird, a reptile, and an insect. Correlates with the Science Content Standards  
Plant and Animal Needs

## INTRODUCTION

How do wildlife researchers study the life cycle of an animal? They might follow an adult animal through the forest and watch its behavior, writing down what it does and where it goes. They may also look for clues such as eggs, nests, or young. Birds hatch from eggs, and young birds are called chicks. When red-crowned crane chicks hatch, they are covered in light brown down feathers. Birds aren't the only animals that hatch from eggs. Some snakes, like the Mang Mountain viper, hatch from leathery eggs. Young snakes are called hatchlings. Insects hatch from eggs, too. Some insects, like the praying mantis, lay an egg mass that hardens into a protective egg case.

Most animals have four stages in their life cycle: birth or hatching, growing and changing, adulthood, and reproducing. Some animals have a stage in their life cycle when their body takes on a different form. This stage is called metamorphosis. A praying mantis goes through incomplete metamorphosis, hatching as an immature nymph and then growing and molting many times. In the final molt, the mantis becomes an adult and develops wings.

## MATERIALS

- Single-sided copies of the two-page “Life Cycle Clues” worksheet on page 15
- Construction paper
- Glue or glue sticks
- Scissors

## ACTIVITY

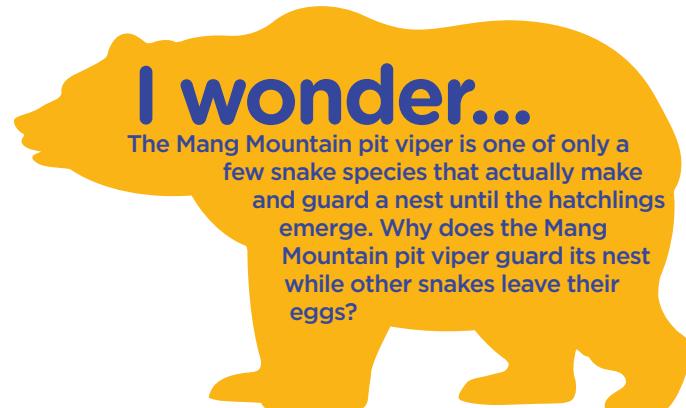
**Step 1:** Discuss the definition of a life cycle. Talk about clues that a biologist might look for to investigate the life cycles of animals in the wild.

**Step 2:** Read the journal entry and discuss.

**Step 3:** Compare and contrast the three different types of eggs that the researcher found. Ask the students to guess if each type of egg belongs to a snake, a bird or an insect.

**Step 4:** Distribute the “Life Cycle Clues” worksheets.

**Step 5:** Students cut out the puzzle pieces. They put them together and glue them to construction paper to create three separate life cycles: a bird (red-crowned crane), a reptile (Mang Mountain pit viper), and an insect (praying mantis).



# GRADE 2

# Keeper Notes ► entry

## November 2

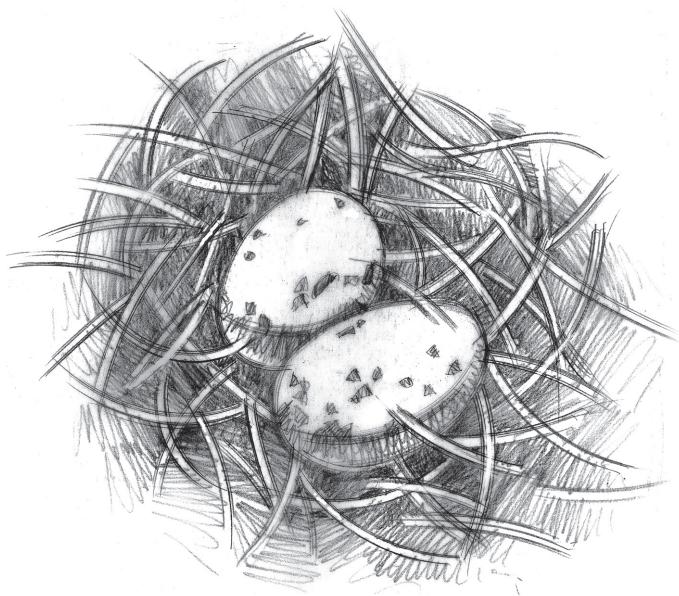
In the wetlands of northeast China, I spotted a pair of red-crowned cranes doing a mating dance. Then I found a ground nest of reeds and grasses with two brown, spotted eggs. They were definitely from a bird—the eggs were dry and hard. On Mang Mountain, I found 24 soft, leathery eggs in a pile of leaf litter. They are obviously reptile eggs, but what reptile do they belong to?

Near the research station I found a white egg mass. It was soft and foamy when I found it, but it has since turned into a hard, brown egg case. I think there are larvae inside. I wonder what kind of insects the



**Red-crowned  
Crane Chick**

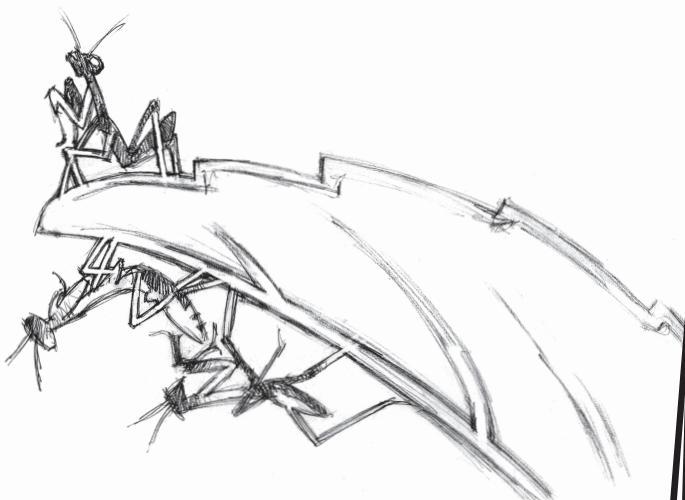
larvae might turn into? By a marsh in northeast China I saw a chick with light brown down feathers.



Up on Mang Mountain I saw a beautiful green snake. It was so camouflaged that I almost didn't see it at first. It had a bright, lime-green tail and was coiled up in the middle of the trail. I think it was waiting to ambush its prey. Later on I found an even smaller one, but its tail was bright blue. I found some small, brown insects near the research station—kind of like ants, but I think they might be the nymphs (young) of a praying mantis. I wonder if one of the Jr. Researchers can use my sketches and clues to figure out the life cycle of the Mang Mountain viper, the red-crowned crane, and the praying mantis.

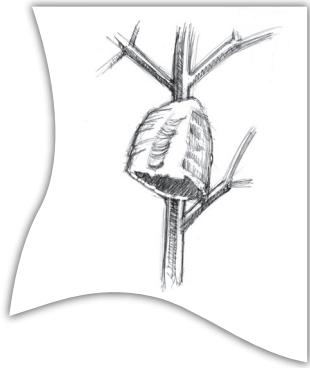
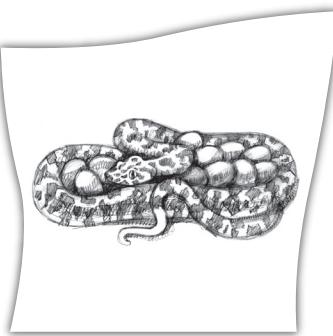
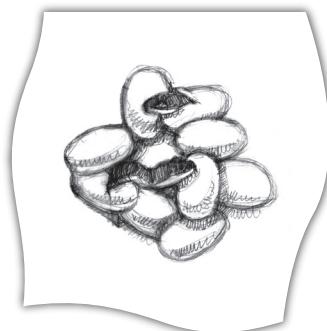
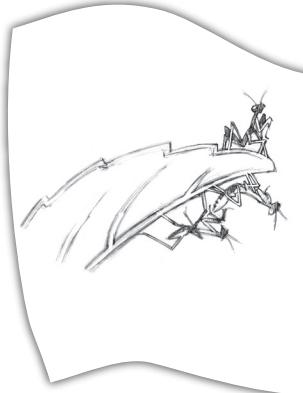
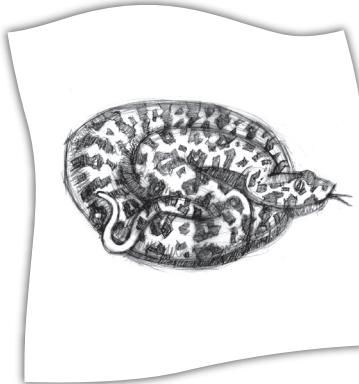
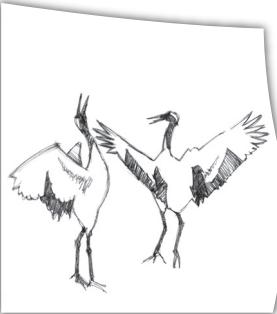


**Mang Mountain  
Viper**



**GRADE 2**  
**Life Cycle Clues ▶ activity**

Cut out the puzzle pieces. Which ones go together? Can you complete the life cycles of these three animals?



# GRADE 3

# Adaptation Observations

TEACHER RESOURCES  
Visit sandiegozoo.org/teacherresources  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students identify behavioral and physical adaptations of the red-crowned crane, Mang Mountain pit viper, takin, and giant panda. Correlates with the Science Content Standards: Adaptations

## INTRODUCTION

Animals have adaptations that help them survive. An adaptation can be physical or behavioral. A body part or physical trait that helps an animal survive is a physical adaptation. Think about a panda's teeth, a takin's shaggy fur coat, or a viper's cryptic coloration. A behavioral adaptation would be something that an animal does. The giant panda's solitary lifestyle and the dance of the red-crowned crane are examples of behavioral adaptations.

## MATERIALS

- Pictures of students' pets and/or favorite animals
- Copies of the "Adaptations Field Log" worksheet on page 19 (one per student)
- Pencils (one per student)

## ACTIVITY

**Step 1:** Ask students to bring in pictures of their pet or a favorite animal, or supply an animal picture to each student or student group.

**Step 2:** Draw two columns on the board: one for behavioral adaptations and one for physical adaptations. Define these terms and give examples. Ask students to describe the adaptations of their animals. Have the class decide if each adaptation is behavioral or physical, and write it in the correct column.

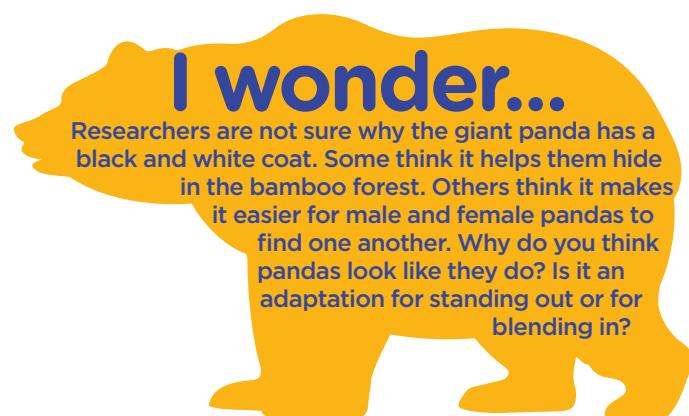
**Step 3:** Distribute the "Adaptations Field Log" worksheets.

**Step 4:** Tell the students that you will read the researcher's field notes. Instruct them that if they hear an adaptation they are to check the corresponding box on their "Adaptations Field Log" worksheet. Let them know that not every "adaptation" on the worksheet is true, so they will have to listen carefully. If they hear an adaptation that isn't on their worksheet they should write it down.

**Step 5:** Read the researcher's observations one at a time, allowing the students enough time to check the boxes.

**Step 6:** Discuss the worksheet and determine which adaptations the researcher observed. Did the students hear adaptations other than the ones listed? What are they? Which false "adaptations" are on the worksheet?

**Step 7:** Ask students to determine if the adaptations on their sheet are behavioral or physical by marking a "P" or an "B" next to the checked box.



# GRADE 3

# Keeper Notes ► entry

## September 25

In the wetlands of northern China I saw a pair of beautiful red-crowned cranes wading deep in the water. It looked like they were a mated pair, feeding on insects and small shrimp. Later I saw a pair of them feeding in the rice fields. I waited for a while, and they began a mating "dance." They leapt into the air and threw sticks and grass around, putting on a really good show. High into the mountains I came upon a herd of takins. They are shaggy and have large noses. They don't seem to mind the bitterly cold mountain air. It started to rain, but the water ran right off, and they



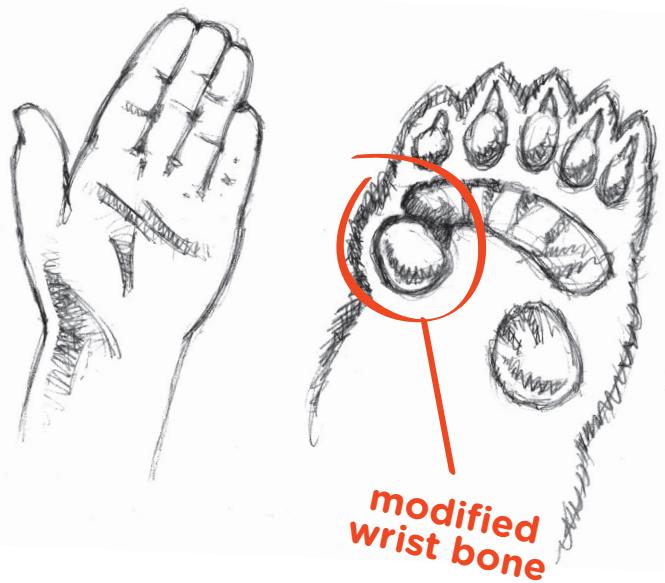
Starting the  
“dance”

didn't appear to get wet. I think they had some sort of natural oil on their coat. I watched them jump from rock to rock. I wanted to get a closer look, but one made a loud menacing bellow, so I backed off. The well-worn trails suggest that these animals walk the same paths year after year.



As close as  
I could get

In Hunan Province I saw a snake in the forest. Amazing camouflage—speckled black and brilliant green. It was a Mang Mountain viper. A mouse ran across the trail, and the snake snatched it before the mouse even knew it was there. The snake's venom aggressively defend their nests, coiling around the eggs while they develop. I've also heard that hatchlings have bright blue tails. Watching a giant panda munch on bamboo today, I noticed a bump on its hand that looked like a thumb. But Pandas don't have a thumb! Then I remembered that pandas have a modified wrist bone. It helps a panda hold onto a bamboo stalk. I certainly couldn't crush the bamboo the panda was eating. Strong jaws! After a while the panda stood and rubbed its rear-end on a tree. I know that pandas have scent glands there. Was it leaving a message for other pandas? The panda barked and bleated as it wandered off.



modified  
wrist bone

# GRADE 3

# Adaptations Field Log ➤ activity



Red-crowned Crane

- Long legs for wading in marshes
- Live in mated pairs
- Eat only fish
- Leap, bow and toss sticks in the air while dancing
- Eat from rice fields
- \_\_\_\_\_



Takin

- Short hair for staying cool
- Travel the same paths again & again across the mountainside
- A large nose that warms the cold air
- Oil on their fur that creates a natural raincoat
- Loud menacing bellow to scare off predators
- Are sure-footed and can leap from rock to rock
- \_\_\_\_\_



Mang Mountain Viper

- Excellent camouflage
- Suffocate prey by squeezing it
- Wait along a trail to ambush prey
- Have bright blue tails when they are hatchlings
- Coil around the nest to protect eggs
- \_\_\_\_\_



Giant Panda

- Marks rocks and trees with a scent gland to leave messages for other pandas
- A wrist bone that helps them hold bamboo
- Strong jaws
- Bark, bleat and honk
- Live in big family groups
- \_\_\_\_\_

# GRADE 4

# Chinese Food Chain

► TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources)  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students create a food chain mobile and identify food chain disrupters.

Correlates with the Science Content Standards:  
Food Chains and Webs

## INTRODUCTION

Food begins with the sun. Plants (producers) absorb the sun's energy, and they grow. Plants provide food for many animals (primary consumers). Some of these animals, in turn, provide food for other animals (secondary consumers).

Food chains are part of larger food webs. Because they are all connected, each organism is important.

Sometimes plants or animals disappear because of food chain disrupters. These may include human activities such as farming, agriculture, pesticide use and urban development. Food chain disrupters create a chain reaction that affects the whole web.

## MATERIALS

- Copies of the "Food Chain Mobile" worksheet on page 22 (one per student)
- Colored pencils, crayons, or markers
- Pencils (one per student)
- Scissors
- String
- Tape

## ACTIVITY

**Step 1:** Discuss the concept of a food chain, food web and food chain disrupters.

**Step 2:** Read the journal entry on page 21.

**Step 3:** Distribute the "Chinese Food Chain" worksheets. Ask the students to color and cut out the pictures.

**Step 4:** Discuss the pictures that are not part of a healthy food chain (road, home, farm, cut logs.) These are examples of food chain disrupters. Lead a discussion about what humans can do to limit food chain disrupters. (Some ideas: establish wildlife areas, create wild life corridors, limit logging.)

**Step 5:** Students create a food chain mobile using string and tape. (Use a pencil as the top bar of the mobile to give it some stability.)

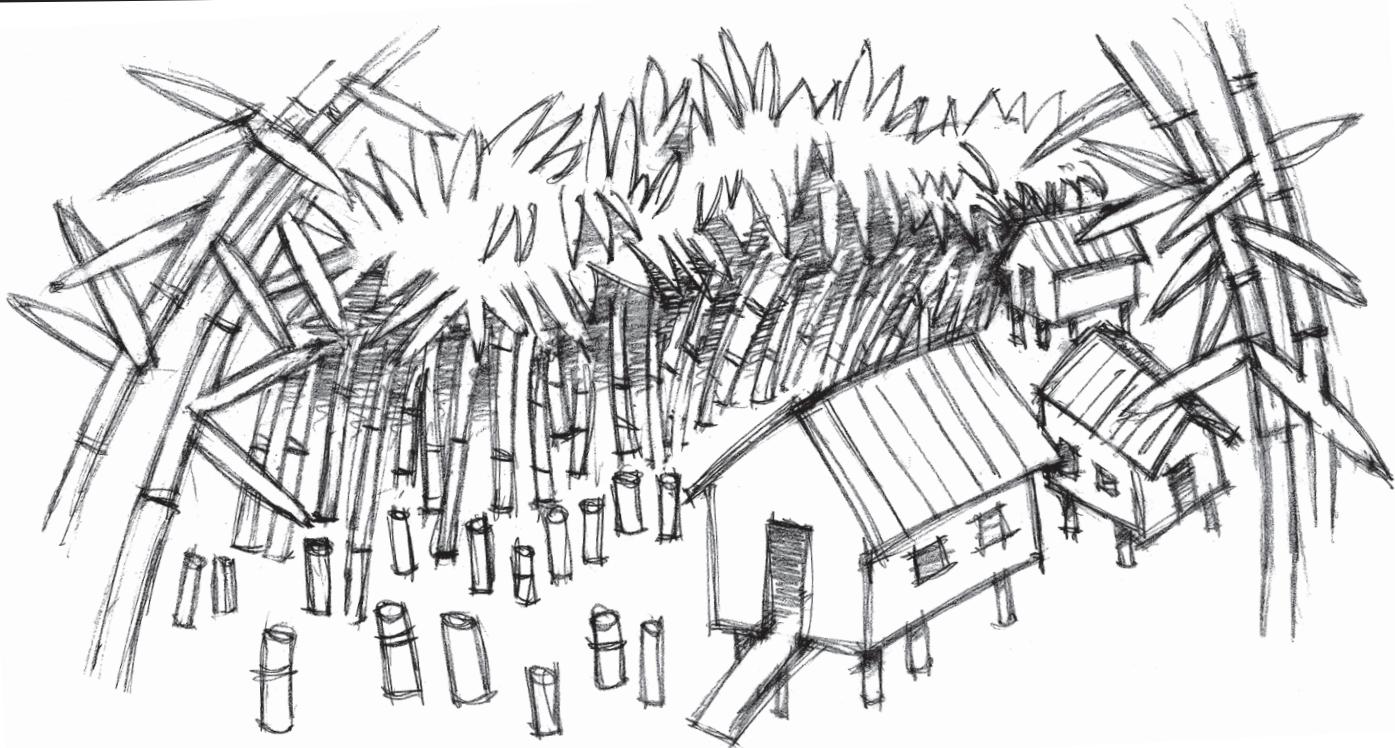
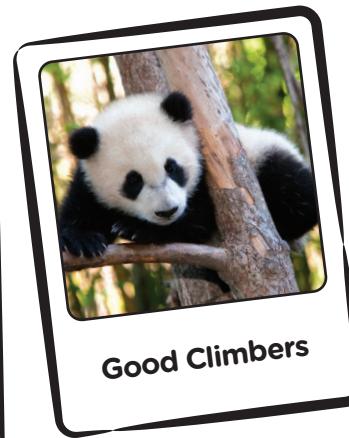


# GRADE 4

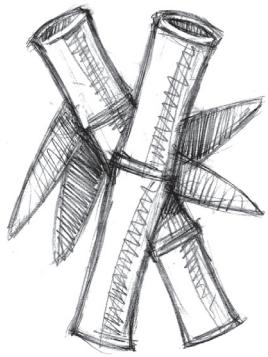
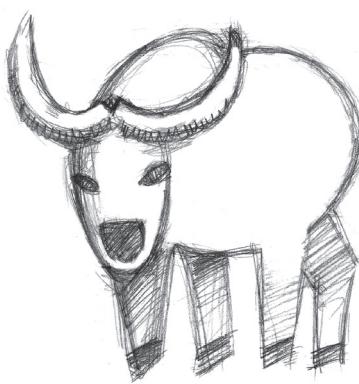
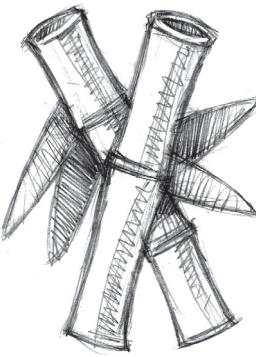
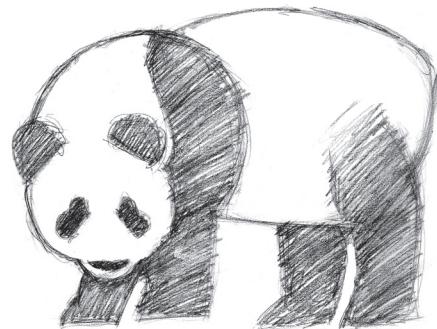
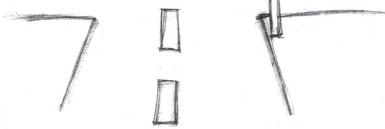
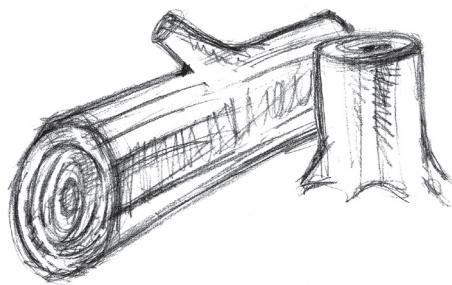
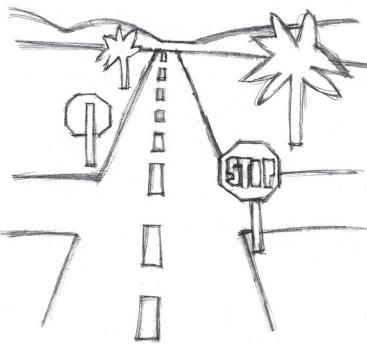
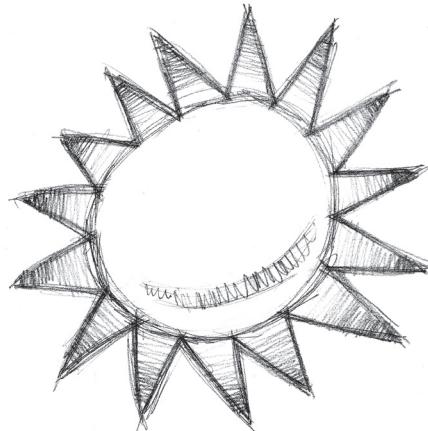
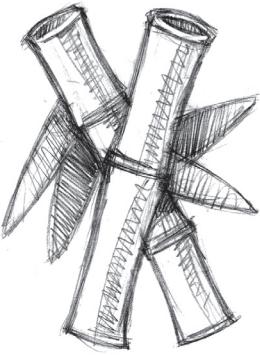
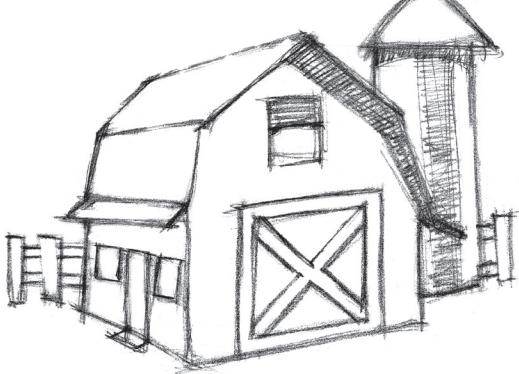
# Chinese Food Chain ➤ activity

## July 23

I've been researching food chains here in China for the last several weeks. The more I learn, the more I worry about the food web—it's very delicate. As human communities expand, it seems to become more and more difficult for animals to find what they need. Sometimes there isn't enough bamboo forest to go around. Bamboo is the foundation for the entire ecosystem here at the research station. Giant pandas, red pandas and takins all eat bamboo. Bamboo forests are sometimes destroyed for farms and homes, and sometimes roads fragment them. Also, I've noticed that in areas where there has been extensive logging, the bamboo doesn't grow well anymore. Jr. Researchers, can you take a look at the parts of the food web I have sketched and decide how it works? Remember, if you find a food chain disrupter, leave it out and report it to the research station.



**GRADE 4**  
**Chinese Food Chain ▶ activity**



# GRADE 5

# Map It



Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources) to find this curriculum in a PDF format and a list of Web links for this activity.

## LEARNING OUTCOME

Students investigate how scientists use evidence like scat, scent marks, and hair to learn about an animal's range and habitat needs.

Students discover that habitat fragmentation is detrimental to breeding populations because animals cannot find each other to breed.

Correlates with California Social Science Content Standards:

Geography and Mapping

Correlates with California Science Content Standards:

Investigation and Experimentation

Correlates with California Common Core Content Standards for Grade 5 Mathematics: Geometry

Correlates with California Mathematics Content Standards:

Statistics, Data Analysis, and Probability and Mathematical Reasoning

## INTRODUCTION

Students practice graphing skills to map out clues to panda occurrences. Using this information, they identify the animals' home range and recommend two locations for human-made hollow trees that will provide much-needed den habitat for endangered pandas.

## MATERIALS

- Two-page "Map It" worksheet on pages 24 and 25
- Colored pencils: blue, yellow, green, black, and red

## ACTIVITY

**Step 1:** Students read the journal entry on page 24, then use the map to graph the location of the panda evidence the researcher listed.

**Step 2:** Have students circle female panda home ranges. Discuss where you think the boundaries of the male panda's home range might be.

**Step 3:** Have students discuss with a partner where they think two human-made dens should be placed, and explain why.



# GRADE 5

# Map It ▶ activity

## June 17

Recent field studies show that panda mothers depend on good quality dens. The problem is, there may not be enough of those to go around. Pandas like to den in big, old, hollow trees, but much of the old-growth forest they rely on has been logged. Our trackers have worked hard to find pandas here in the cloud forest, but to no avail. They have found several signs of pandas, however, and they have documented those locations. We plan to map out all of the signs they

have uncovered. We'll use this information to plan the best places for our human-made dens. Our dens are fitted with monitoring cameras. Hopefully, we can have them placed early in the spring so that the females will choose to use them in August when cubs are due. I have attached the list of information below, and will have our research interns map it out later today.

- Find the river. Color it **blue**. This is the fresh water resource for this region.

- Find the farmland. Color it **yellow**. This land was once old-growth forest that was logged and leveled for agriculture. It's no longer useable for the pandas.

- Find the bamboo stands. Color them **green**. This is panda habitat and food.

- Find the highway. Color it **black**. Humans need this road for transportation, but it cuts through panda habitat, limiting movement.

- Find the bridge. Color it **red**. This allows the highway to go over the river. It also provides a passageway for pandas to move from one side of the highway to the other.

Use the key and the coordinates given below to place each of the following on the map:

We found scat here:  
(2,5) (3,3) (5,5) (6,1) (9,2)  
(11,13) (13,10) (15,9)

We found scent marks here:  
(3,4) (7,6) (8,7) (11,12)  
(12,14) (15,3) (15,13)

We found "chewed on" bamboo here: (4,5) (5,4)  
(9,11) (14,15)

We found footprints here:  
(7,5) (11,14) (12,5) (14,11)

We found panda hair here:  
(3,5) (10,6) (11,1) (12,13) (15,11)

We also found two old-growth hollow trees, which are potential den sites, at (6,4) and (13, 14).

DNA extracted from the hair found at (12,13) matches DNA found in the scat and scent mark samples also found in this region. This DNA belongs to Female A. Circle this panda's home range.

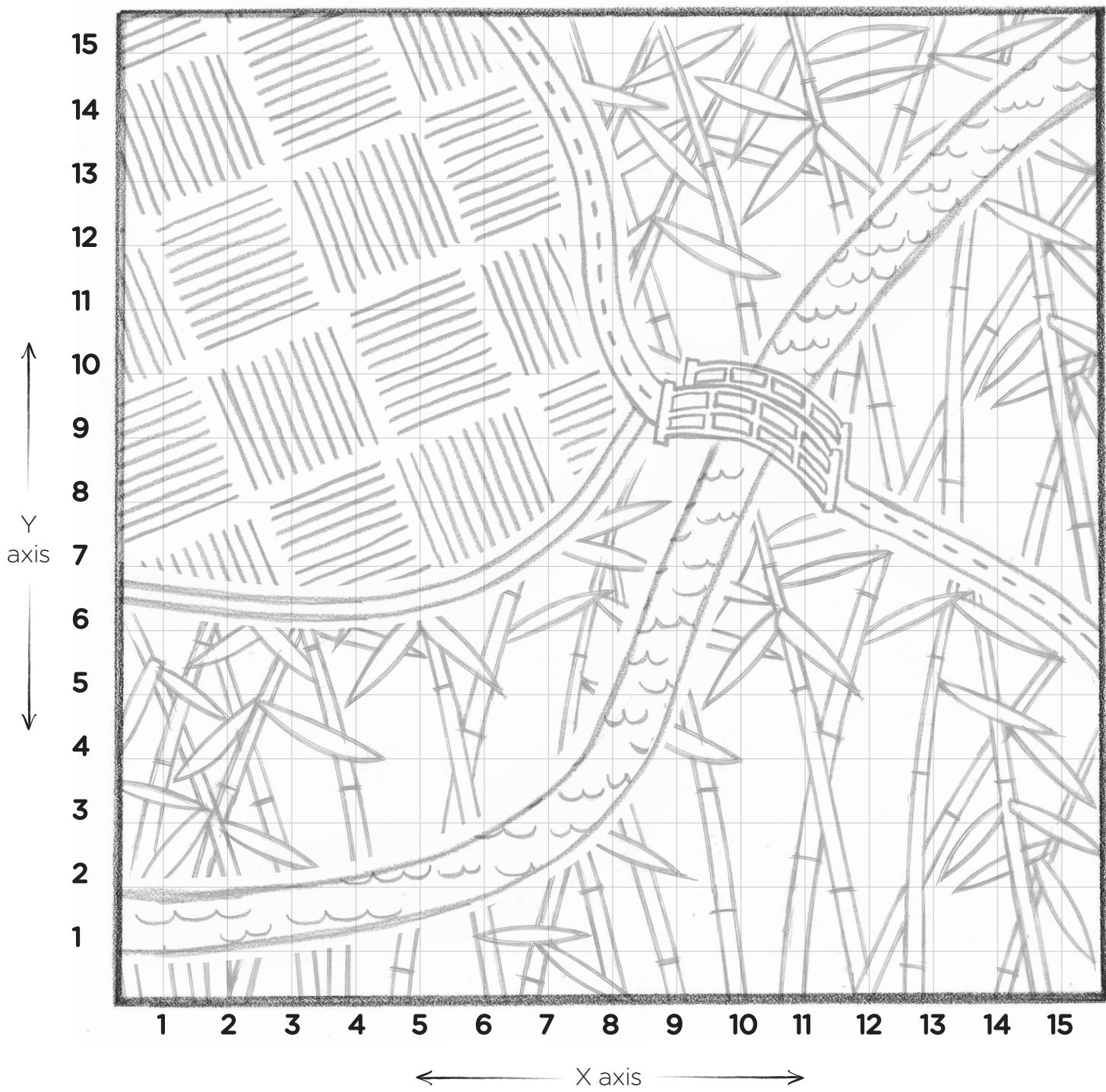
DNA extracted from the hair found at (3,5) matches DNA found in the scat and scent mark samples also found in this region. This DNA belongs to Female B. Circle this panda's home range.

DNA extracted from hair samples at (10,6) and (11,1) belong to the same panda, Male C. Circle this panda's home range and do not overlap the females' home ranges.

Where would you place two human-made dens? Place them on the map. Explain your location choice.

# GRADE 5

## Map It ▶ activity



SCAT



HAIR



SCENT MARKS



"chewed on"  
BAMBOO



FOOTPRINTS



HOLLOW  
TREE



HUMAN-MADE  
DEN



# GRADE 6

# Write On

 TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources)  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students set up a blog account and write a blog about an Asian animal they learned about at the San Diego Zoo's "Panda Trek" exhibit.

Correlates with English Language Arts Standards: Writing Applications and Writing Strategies

Correlates with English Language Development Standards: Writing Applications and Writing Strategies

## INTRODUCTION

What's a blog? A blog (short for "web log") is an online journal. It can be about any topic and is usually set up chronologically, with the most recent entry at the top of the blog page. People can read your blog, make comments, or e-mail their thoughts to you. You can read their comments and keep them so others can read them, or you can delete them. All types of people write blogs: journalists, politicians, scientists, chefs, and students like yours!

## MATERIALS

- Computer and Internet access

## ACTIVITY

**Step 1:** Describe a blog to your students. Visit the San Diego Zoo's website, [sandiegozoo.org](http://sandiegozoo.org), and read some of the blogs written by zookeepers, educators, researchers, and other Zoo employees. (Find blogs at [zoonooz.sandiegozoo.org](http://zoonooz.sandiegozoo.org), under the Keeper Notes and Saving Species tabs.)

**Step 2:** Have students choose a Chinese animal to research.

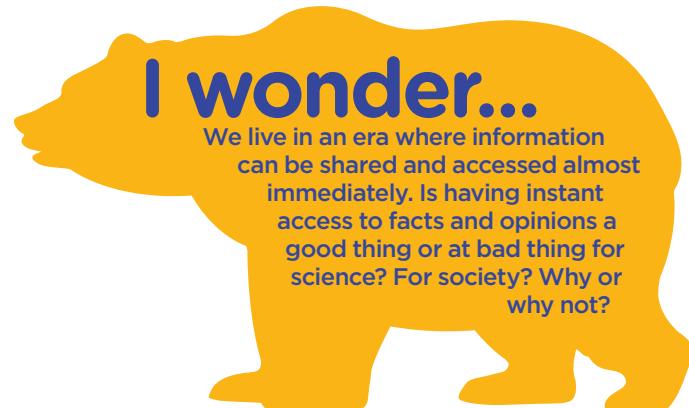
Ask them the following questions:

- What was the original range of your animal?
- Where is it found now?
- What is its habitat like?
- Could your animal survive anywhere else (like North America or Africa)?
- What is the San Diego Zoo doing to help this species?
- What did you learn that surprised you?

**Step 3:** Discuss the students' observations and research.

**Step 4:** Students write their blogs. If students don't have access to blog accounts at school, open a free account. (Try [wordpress.com](http://wordpress.com), [weebly.com](http://weebly.com), or [blogger.com](http://blogger.com).) It takes a few minutes to sign up and then students can post their blogs.

**Step 5:** Share the blogs with parents. Ask them to go online and leave comments on their child's blog.



# GRADE 6

# Write On ▶ activity

May 12

Update blog. So much to talk about! Be sure to include info about the pandas at Bi Feng Xia

The screenshot shows the San Diego Zoo Global ZOONOOZ website. The header features the text "SAN DIEGO ZOO GLOBAL" above "ZOONOOZ™". Below the header are navigation links for "ANIMALS", "PLANTS", "KEEPER NOTES", "SAVING SPECIES", "WILD AND FUN", and "NEWS". A search bar on the right says "Search the site". The main image is a close-up of a giant panda cub clinging to a tree branch. To the right, there's a "SHOPZOO" section with a panda plush toy and a tiger emblem, and a "TRENDING" section with news items.



## WOLONG PANDAS: LIFE RETURNS TO NORMAL

BY RON SWAISGOOD – MAY 12, 2009

POSTED IN: CONSERVATION AT THE ZOO, PANDAS, PROJECTS IN THE FIELD

One panda sits peacefully munching her bamboo, gracefully stripping leaves from the stem, rolling it into a wad, and holding it in her paw to eat. Another rolls around, head over heels, playing with his new enrichment item. A new panda mother comforts her squawking cub, secure in her new den. Such is the life of a panda.

Scenes like this have played out for years in Wolong until, a year ago, everything suddenly came crashing down, quite literally. The earthquake that struck Sichuan last year, causing so much devastation and loss of life, also struck at the heart of China's giant panda breeding program at Wolong. Most of the breeding center there now sits empty, its panda and human inhabitants now relocated to Bi Feng Xia, some several hours away. Today, the same scenes witnessed a year ago in Wolong now play out in Bi Feng Xia.

Thankfully, the whole world rallied to help the Chinese people—and their pandas. And together, with your help, we at the San Diego Zoo have helped. In the past year, we raised \$100,000 to help out those devastated by the earthquake, both the pandas and the people that

care for them. We worked with the other zoos in the Association of Zoos and Aquariums and its Giant Panda Conservation Foundation, which raised even more relief funds for Wolong. Without this kind of support, the pandas' life would not have been able to return to normal so quickly and efficiently. The pandas all still do not enjoy so nice an enclosure as they once had at Wolong, but they are well on the path to normalcy. They have temporary enclosures. Some new permanent enclosures have been built or are being built. They have a good supply of food and medicine and the basic care they need. A new facility just outside the Wolong Nature Reserve will soon be built.

The Chinese people and their pandas are resilient. But this kind of assistance was desperately needed. Our friends in Wolong, now Bi Feng Xia, are truly grateful. And we are grateful for all of the contributions you made. So, thanks!

Ron Swaisgood is director of Applied Animal Ecology at the San Diego Zoo's Institute for Conservation Research.



## TRENDING



NEWS

Collaboration Between Human and

Monkey Helps Endangered François' Langur Baby



NEWS

Twin Toucan Chicks Spread Their Wings at the San Diego Zoo



WILD AND FUN

# GRADE 7

# Debate It!

 TEACHER RESOURCES  
Visit sandiegozoo.org/teacherresources  
to find this curriculum in a PDF format  
and a list of Web links for this activity.

## LEARNING OUTCOME

Students study the debate process. Given a relevant animal care or conservation topic, they practice debating.

Correlates with the History-Social Science Content Standards:  
Research, Evidence, and Point of View

## INTRODUCTION

Making an important decision is rarely simple. Many decisions that affect animal care and conservation are so hotly debated that teams of people must review them before policy can be established.

## ACTIVITY

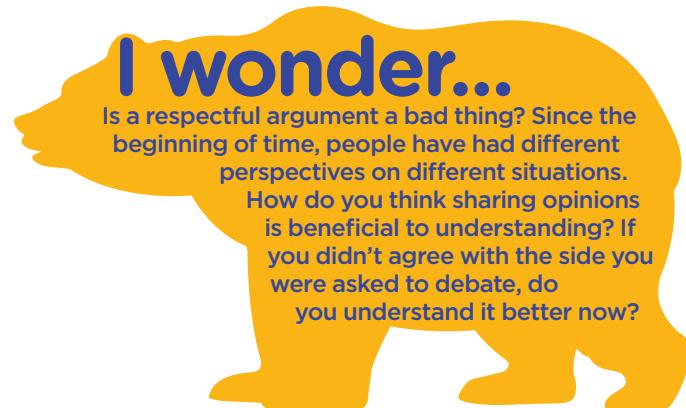
**Step 1:** Describe the debate process to your students. Explain that they will be working in teams, taking a position, and arguing for or against a controversial issue.

**Step 2:** Select debate teams and assign topics. Allow students time to research the issue to prepare for arguments that support their point of view.

**Step 3:** Debate.

### POSSIBLE TOPICS

- Be sure to identify and assign both viewpoints.
- Should pandas be allowed to go extinct?
  - Is it important to conserve endangered species?
  - Do red-crowned cranes serve an ecological purpose?
  - Are pandas more closely related to bears than raccoons?
  - Should a red panda be called a “panda”? Is it a panda?
  - Is habitat loss the primary threat to endangered species?
  - Are animal needs as important as human needs?
  - Should animal be kept in zoos?



# GRADE 7

# Write On ▶ activity

## July 20

There was some unrest today among the farmers living on the outskirts of the research area. Much of the land they farm was once old-growth forest—forest pandas used for den sites. What's left of the forest is now protected habitat, but the farmers believe more of it should be cut down to clear land for more crops.

People require food to live, certainly, but animals require habitat to live, too. Can we find a balance between the needs of humans and animals so that all of us can coexist peacefully? Perhaps if the farmers more clearly understood the needs of the pandas, we could figure out a way to make this happen.



**They Climb So High!**



**At Home in the Treetops**



**Farming**

# GRADE 8

# Cleaning Up Our Water

 TEACHER RESOURCES  
Visit [sandiegozoo.org/teacherresources](http://sandiegozoo.org/teacherresources) to find this curriculum in a PDF format and a list of Web links for this activity.

## LEARNING OUTCOME

Students conduct experiments showing that cleaning up polluted water is difficult. They draw connections between individual actions and results at the community level.

Correlates with the Science Content Standards: Ecology, Natural Selection, Conservation, and Water Cycle

## INTRODUCTION

Water is essential for all living things. Less than 3 percent of all the earth's water is fresh water, and more than 2 percent of that fresh water is locked up in icebergs and glaciers. That means less than 1 percent of all water on Earth is available for human and animal needs!

One of the challenges of keeping our fresh water clean is that garbage and other waste often is not disposed of properly and ends up polluting rivers, lakes, streams, marshes, and even water that is deep under ground. Air pollution is harmful to water because it is acidic. The polluted air mixes with water in the atmosphere as clouds, then falls to Earth as acid rain. Pollution and acid rain are heavily impacting our fresh water and oceans alike.

## MATERIALS:

For each group of three or four students:

- One clear plastic container (a cut-off 2-liter soda bottle works), half full of water
- “Natural items”: fresh leaves and feathers
- “Pollutants”: a drop of vegetable oil, dirt, baking soda, food coloring, plastic grocery bag cut into large (2-inch square) and small (half-inch square) pieces
- “Cleaners”: a sieve, coffee filters, tweezers, spoon, cotton twine, cotton balls
- (Optional) computers with Internet access

## ACTIVITY:

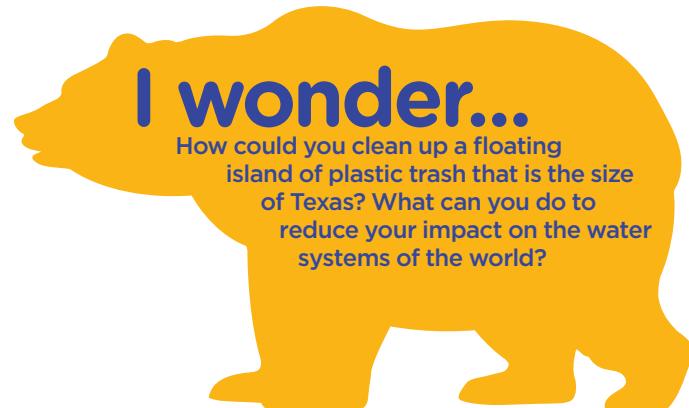
**Step 1:** Students read Dr. Swaisgood's February 15 journal entry on page 31 to see how wildlife can be affected by water pollution. Assign student groups and have them gather their equipment.

**Step 2:** Ask students if they would drink the clean water sitting in front of them. Instruct them to add a fresh leaf to the water and ask again. Continue to add each of the items above, and after each addition ask, “Would you drink this water?”

**Step 3:** Discuss what each could represent in our water system. Feathers represent birds. Leaves and twigs represent trees. Dirt represents soil erosion and agricultural run-off. Oil represents oil spills and run-off from our roadways. Baking soda represents acid rain. Food coloring represents chemical pollutants.

**Step 4:** Teams work together to clean their water using the tools available to them. (Some additions will be easy to clean up, others will be impossible.)

**Step 5:** When students have finished, ask them again, “Would you drink this water?” Why or why not?



# GRADE 7

# Write On ▶ activity

## February 15

Red-crowned cranes are aquatic birds that are well adapted to cold Chinese winters. We've discovered they feed in deeper water than other cranes. They make nests in relatively deep marshes with lots of standing, dead vegetation. They're omnivorous and eat insects, invertebrates, fish, frogs, small rodents, reeds, grasses, and heath berries. As humans and

agriculture have expanded into their natural range, we've also started seeing them foraging for corn and grains in cultivated fields and rice paddies. This human encroachment has led to poisoning from pesticide-treated grain and harassment by farmers trying to



**Red-crowned  
Crane Nest**

keep the foraging cranes out of their crops. Water from these chemically treated fields drains into the marshes where the cranes live. The cranes rely on these marshes for breeding and raising their young. Marshes are natural water filters, but they are growing smaller, and they are collecting more toxins than they can process. If their homes become too toxic, what will happen to the cranes?

## March 1

Hard to believe I'll be flying home tomorrow. I'm sure I'll return to the Wolong Nature Reserve one day, hopefully with my entire family. I'd love to show them this beautiful country and remarkable wildlife. The giant pandas, red pandas, takins, red-crowned cranes, and Mang Mountain pit vipers are truly some of China's national treasures. This has been an amazing journey, here will help all of us make better decisions about how to manage wildlife and care for the environment. It's hard to leave, but I know there are more adventures waiting for me back in San Diego. Who knows, maybe one day I'll run into some of the junior researchers at the San Diego Zoo or the Safari Park?



**So Long from  
Wolong!**

# Online Resources

To learn more about giant pandas and the other animals at the San Diego Zoo and the San Diego Zoo Safari Park

**[animals.sandiegozoo.org](http://animals.sandiegozoo.org)**  
**[library.sandiegozoo.org/factsheet.htm](http://library.sandiegozoo.org/factsheet.htm)**

To learn more about the San Diego Zoo Safari Park  
**[sdzsafaripark.org](http://sdzsafaripark.org)**

To learn more about research and conservation  
**[sandiegozooglobal.org](http://sandiegozooglobal.org)**

To have fun exploring the San Diego Zoo Global kids' website  
**[kids.sandiegozoo.org](http://kids.sandiegozoo.org)**

To download a map of the San Diego Zoo  
**[sandiegozoo.org/zoo/zoo\\_map](http://sandiegozoo.org/zoo/zoo_map)**

To download the curriculum PDF with the Teacher's Key  
**[kids.sandiegozoo.org/curriculum](http://kids.sandiegozoo.org/curriculum)**

# Glossary

**Adaptation.** A behavior or physical characteristic that helps an animal or plant survive and reproduce.

**Bamboo.** A tall, woody, hollow-stemmed plant in the grass family; a member of the Bambusoideae subfamily of plants.

**Behavioral adaptation.** A behavior that helps an animal or plant survive and reproduce.

**Blog.** A “web log,” a journal entry on a website.

**Consumer.** An animal that gets energy by eating other organisms.

**Field guide.** A manual for identifying plants or animals.

**Food chain.** A model that shows how energy is transferred from the sun to plants and animals.

**Food chain disrupter.** Anything that disturbs or damages a food chain.

**Habitat.** An animal or plant’s natural surroundings where it normally lives and grows; the specific characteristics of its environment.

**Home range.** The entire area where an individual animal regularly moves and lives.

**Metamorphosis.** The changes in shape that certain animals go through as they grow from young animals to adults. For example, caterpillars become butterflies through metamorphosis.

**Old-growth.** Pertaining to something (a tree or a forest, for example) that has been growing a long time without being disturbed.

**Physical adaptation.** A physical characteristic that helps an animal or plant survive and reproduce.

**Producer.** An organism that makes its own food, usually using energy from the sun. Producers are food for other organisms and are the foundation of every food chain. (Certain bacteria that use chemical energy to produce their own food are producers too.)

**Range.** The total geographic region where a species can be found.

**Researcher.** Someone who investigates something. A scientific researcher uses scientific methods to gather information and draw conclusions.

**Scat.** Animal droppings, poop.

**Scent mark.** (noun) An animal’s scent that it puts on an object as a way to communicate, usually to other members of the same species; (verb) to secrete and put scent in a specific place.



[kids.sandiegozoo.org](http://kids.sandiegozoo.org)

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