



SAN DIEGO ZOO
KIDS

Africa Rocks

Teacher Resources & Activities
GRADES K TO 5



African Penguin

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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.

Like this activity guide? go to sandiegozoo.org/teachersurvey for a quick, online feedback form. We appreciate your comments.

Welcome From Zookeeper

Rick Schwartz



Meet Dan and McKinney, Penguins with Personality

It's so exciting to have penguins back at the Zoo! Brothers Dan and McKinney are a delight to watch, zipping through the water and hopping about on land. These very adaptable birds have an amazing story to tell.

I was fortunate to first meet penguins Dan and McKinney in 2015, right after they arrived at the Zoo. For the first two years, the brothers were housed at the Children's Zoo, in the pool where the spot-necked otters once lived. Entering their area and sitting next to them to feed them fish was a very special moment I'll never forget. They were friendly and energetic, and really liked to eat the capelin and night smelt I was offering.

You may think penguins only live in cold climates, but these penguins, along with 11 other species, live in warmer areas, even on the Galápagos Islands at the equator. Warmer-weather penguins have fewer feathers around their eyes and bill when compared to their Antarctic counterparts. These sparsely feathered areas release excess body heat. So, even though they are penguins, Dan and McKinney had little trouble adjusting to our mild San Diego weather.

Penguins are birds—they have feathers, not fur—but they can't fly...in the air. But, boy, can they fly underwater! With an up-and-down motion of their flat, sleek wings, African penguins can swim as fast as 12 miles per hour, dive to 400 feet (122 meters), and hold their breath for up to 2 minutes. Now that's amazing.

Unfortunately, African penguins are one the most endangered species of penguin. They face many threats in the wild. In fact, their total world population has declined by 60 percent in the last 10 to 15 years. Fortunately, the San Diego Zoo is working with the Association of Zoos and Aquariums (AZA) on conservation efforts to help save the species from extinction.

Today, Dan and McKinney have joined their kin at Penguin Beach in Africa Rocks. Now is the time to get to the beach, and watch our lively African penguins in action.



All About Habitats

Conrad Prebys Africa Rocks is centered around six different habitats found from Africa's sub-Saharan region to the southern cape. The 8-acre, \$68 million project is the Zoo's most ambitious to date, transforming the steep slopes and 1930s-era exhibits of Dog and Cat Canyon into an easily accessible, gently winding pathway through state-of-the-art exhibits. The Kopje habitat is home to meerkats, mongooses, and hyraxes while the Ethiopian Highlands shows off Hamadryas baboons and geladas. A decidedly wet habitat—the West African Forest—has dwarf crocodiles and turtles swimming among multiple species of fish. Fossas, shown at right with Rick, inhabit the Madagascar Forest habitat along with five species of lemurs. The Acacia Woodland area houses hundreds of birds, and at the southern end of Africa Rocks is Cape Fynbos, a coastline habitat with leopard sharks and African penguins.





African Penguin

Spheniscus demersus

HABITAT

The African penguin lives along the shorelines of Namibia and South Africa, and has been sighted as far north as Gabon and Mozambique. It comes ashore on sandy beaches to rest, mate, and raise chicks. When not ashore, individuals spend months at sea, hunting fish to eat.

BEHAVIOR

This bird doesn't fly in the air; it flies in water! Modified wings move in an up-and-down motion to swim, while the tail is a rudder to help steer. On land, the penguin stands upright, and tips side to side as it walks on its short legs. The African penguin weighs about 8 pounds (3.6 kilograms) and reaches 2 feet tall (61 centimeters).

CONSERVATION

African penguins face challenges, both at sea and on land. At sea, overfishing, rising ocean temperatures, and coastal pollution has impacted calorie-rich food fish like sardines and anchovies. On land, habitat loss from mining guano (dried bird dung) and urban sprawl make finding a suitable nest site more difficult.

The International Union for Conservation of Nature (IUCN) considers these penguins endangered.



Ring-tailed Lemur

Lemur catta

HABITAT

The ring-tailed lemur lives in the south and southwest areas of Madagascar. This land has many habitats, including dry, hot deserts, wet forests, and cool mountain shrublands. In forested areas, the lemur relies on trees for shelter and food.

BEHAVIOR

Unlike most other lemurs, the ring-tailed lemur spends more of its time on the ground, searching for fruits, leaves, and flowers. It is most active at dawn and dusk. At night, the group, called a "troop," gathers at a sleeping site—usually the top branches of two or three neighboring trees. Adult ring-tailed lemurs grow to 5 pounds (2.2 kilograms) and have a tail as long as 25 inches (about a half a meter).

CONSERVATION

Lemurs live in forests that are disappearing. Fires, logging, farming, and overgrazing changes habitats so lemurs can't find enough food. In addition, family groups become separated. People catch lemurs for pets and for food. Conservationists have established reserves to save forest habitat, but more help is needed.

The International Union for Conservation of Nature (IUCN) places the ring-tailed lemur under the "endangered" category.



Leopard

Panthera pardus

HABITAT

This cat adapts to many habitats: woodlands, grasslands, forests, mountains, coastal scrub, swamps, and deserts. It has the widest range of any wild cat, living in more than 70 countries across Africa, Europe, and Asia.

BEHAVIOR

A night hunter, a leopard prowls for both large and small prey, including deer, antelope, pigs, monkeys, birds, and rodents. After a kill, a leopard may drag its prey into a tree to hide it from another hungry animal. Leopards can weigh almost 200 pounds (90 kilograms), and be 6 feet (1.8 meters) from nose to back, with a tail that is 3.5 feet (1 meter) long. Adult females are about 10 percent smaller than adult males.

CONSERVATION

Even though leopards live in many places, their total number has declined and, in some areas, has disappeared. In Africa, their range is now almost half of what it was historically. Leopards face many dangers, such as hunting as a trophy or for their teeth and skin, poisoning by livestock ranchers, and loss of prey or habitat due to expanding human population. Conservation measures aim to increase protection while breeding programs at zoos might lead to releases in the wild.

The International Union for Conservation of Nature (IUCN) places the leopard under the “vulnerable” category.



West African Dwarf Crocodile

Osteolaemus tetraspis tetraspis

HABITAT

One of the smallest of crocodiles, the dwarf crocodile lives in the rain forests and dense swamps of western and central Africa. Its range spans 17 countries, from the Central African Republic in the east to Sierra Leone and Guinea in the west.

BEHAVIOR

This crocodile is most active at night. It hunts crabs, snails, frogs, and fish. During the day, it rests in the water, or, if there is a sunny spot, it crawls out of the water to rest in the sun. Females lay eggs in a nest made of fallen leaves. As the leaves decay, the eggs stay protected and warm. Young hatch from the eggs, then stay close to the nest. Unlike most reptiles, the female dwarf crocodile protects its young. Adults generally weigh 70 pounds (32 kilograms) and are six feet (1.8 meters) long.

CONSERVATION

The International Union for Conservation of Nature (IUCN) places this species under the “vulnerable” category. But the subspecies *O. t. tetraspis* is considered endangered. The crocodile is hunted for meat and for its skin. Its rain forest habitat is being lost to logging and farming.



Nubian Ibex

Capra nubiana

HABITAT

The Nubian ibex lives in the rocky, desert mountains of Egypt and Sudan. They wander through the nearby plateaus, canyons, and wadis (dry ravines).

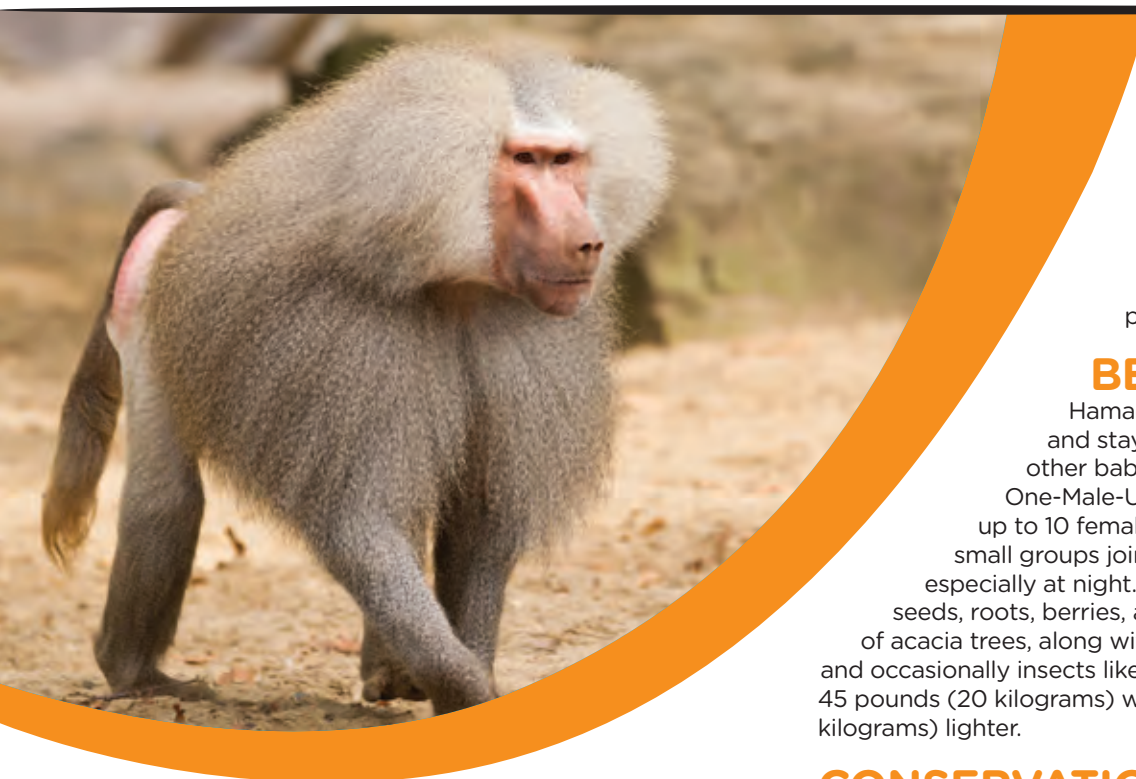
BEHAVIOR

The ibex is active during the day, browsing grasses, herbs, and shrubs. To escape predators like leopards and wolves, it can leap up steep cliffs. The male grows horns that can reach four feet (more than a meter). You can recognize a Nubian ibex by its black and white leg markings and the beard under the chin...it's a type of goat! Adults weigh as much as 187 pounds (85 kilograms), with females about half that size. Shoulder height reaches 2.5 feet (0.75 meters), or about as high as the hood of a car.

CONSERVATION

Egypt, Israel, Jordan, Saudi Arabia, and Oman have laws that protect the Nubian Ibex, but hunting still happens. Trophy hunters consider the horns to be a big prize. Other threats include livestock expansion that competes for grazing areas, and road building that destroys the land.

The International Union for Conservation of Nature (IUCN) places the Nubian ibex under the "vulnerable" category.



Hamadryas Baboon

Papio hamadryas

HABITAT

The hamadryas baboon is found in dry habitats of northeast Africa, in Ethiopia, Somalia, Saudi Arabia, and Yemen. Habitats include sub-deserts, savannas, steppes, plains, and dry brushlands.

BEHAVIOR

Hamadryas baboons sleep at night and stay active during the day. Unlike other baboons, the hamadryas group in One-Male-Unit (OMU) social structures where up to 10 females gather with one male. These small groups join together, up to a hundred or more, especially at night. The hamadryas baboon eats grass, seeds, roots, berries, and the flowers, leaves, and pods of acacia trees, along with bird eggs, carrion, small mammals, and occasionally insects like locusts. Adult males can reach 45 pounds (20 kilograms) with females 10 pounds (4.5 kilograms) lighter.

CONSERVATION

Because it can live in many different habitats and over a wide range, the hamadryas baboon is doing well. Population numbers appear to be steady or increasing. The International Union for Conservation of Nature (IUCN) places the hamadryas baboon under the "least concern" category.



HABITAT

Vervets live in savannas, open woodlands, and forest-grassland areas, often close to rivers. Populations range from Ethiopia in the north to South Africa, along with eastern African countries.

BEHAVIOR

Vervets sleep in trees, rising at dawn to search for food during the day. They eat parts of acacia trees—leaves, thorns, flowers, pods, gum, and bark. Males weigh about 17 pounds (8 kilograms); females a little less. A vervet’s tail can reach 30 inches (76 centimeters) long. A long tail helps when balancing on branches.

CONSERVATION

The International Union for Conservation of Nature (IUCN) places the vervet monkey under the “least concern” category. It can live in areas close to human settlements, such as farmed land and small villages.

Vervet Monkey

Chlorocebus pygerythrus



HABITAT

This badger lives in many different places, from dry deserts to rain forests. In Africa, it ranges from south of the Saharan desert to the southern cape of South Africa.

BEHAVIOR

The honey badger is most active at night. With its nose to the ground, it walks a winding path in search of scents from small mammals and reptiles it can eat. Thick, loose skin provides protection against teeth, insect stings, and snake fangs. A honey badger rests in underground dens, or in shallow, above-ground hollows such as fallen tree trunks, dense scrub, or rock crevices. Adults weigh about 20 pounds (9 kilograms).

CONSERVATION

The International Union for Conservation of Nature (IUCN) places the honey badger under the “least concern” category. Many local populations live within protected areas; there isn’t a conservation program for them.

Honey Badger

Mellivora capensis

GRADE K

Life

Around Us



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students identify what leopards and people need to survive. *NGSS performance expectation: K-LS1-1*

INTRODUCTION

All living things need water, food, and space in order to live. People and leopards also need these things. To thrive, animals also need to grow to adulthood, find a mate, and reproduce. People and leopards get what they need in different ways. They find water and food differently, and they live in different places.

MATERIALS

- Copy of page 9 with the images cut apart. Depending on your class size, you may want to enlarge the images. You can also find these pictures in the Teacher Photo Resource PDF at kids.sandiegozoo.org/curriculum.
- Whiteboard or another large writing surface
- Board markers
- Tape
- Copies of *Life Around Us* activity sheet, on page 10, one for each student
- Pencils, crayons, or colored markers

ACTIVITY

Step 1: Start a discussion about survival by asking students some or all of the following questions: "What is your favorite food? What is your favorite drink? What would happen if we didn't have anything to eat or drink? Could an animal survive without food or water to drink?"

Step 2: Show the cut-out pictures of the child and a leopard. Place these pictures on a whiteboard or another surface. Draw a circle around each picture so that the circles overlap in the middle, creating a Venn diagram. Ask students to name each picture (a child or "me" and a leopard).

At the Zoo

In Africa Rocks, the leopards live in the Acacia Woodland habitat. Find this part of the exhibit, and spot the leopards. Can you also see water, food, and shelter in the area where they live? Talk to a Zoo volunteer wearing a red shirt and name tag to find out what our leopards eat.

Introduce the other pictures in sets. For water, show the drinking glass and lake. Tell students, "Everyone needs a drink, but who usually drinks from a lake? Who drinks from a stream?" As you introduce each set and determine its place, tape the pictures next to the leopard or the child. For food, tell students everyone needs food. Ask, "Who usually eats pizza, and who catches a small deer (duiker)?" For shelter, tell students everyone needs a place to live (a home), and ask "Who usually lives in a house, and who lives outside?"

Step 3: After placing the pictures, ask students if they can see a pattern. Tell students that all animals need food, shelter, and water, but these appear in different ways. Ask students what might go in the space where the two circles overlap. Write the words "water," "food," and "shelter" in the overlapping area. These words represent the pictures the class placed next to the child and the leopard.

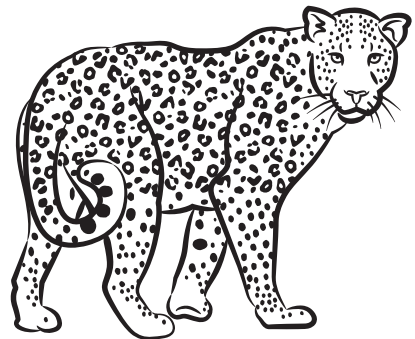
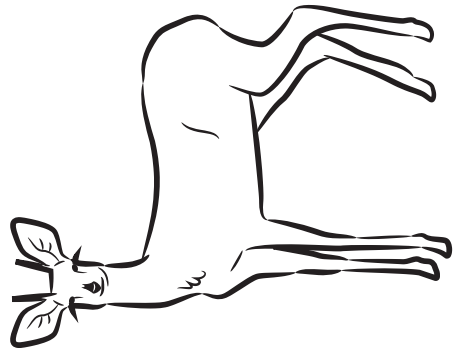
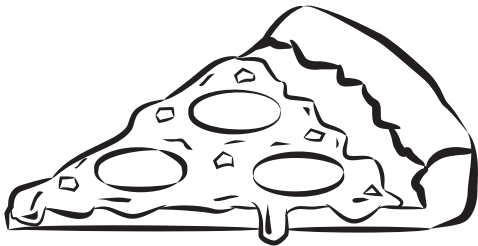
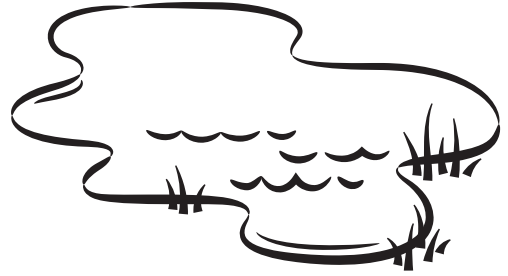
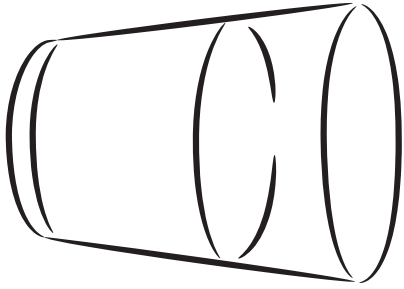
Step 4: Distribute the *Life Around Us* activity sheet (page 10) and pencils or crayons. Have students pronounce and trace the words "water," "food," and "shelter" in the area where the circles overlap. Ask students to draw their examples of food, water, and shelter for the child and the leopard images.

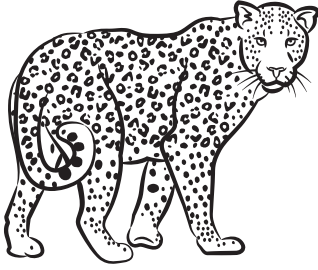
Step 5: Create student pairs, and ask students to share their drawings and explain their choices with a partner. When ready, choose a few students to share their completed activity sheets with the class. As a student shares with the class, ask for those with similar items and choices to raise their hands. Ask guiding questions to lead students to correct answers.

I wonder...

What other animals live in an Acacia Woodland habitat? What do these animals need? Ask students to choose an animal and draw a new comparison sheet. Can they recognize a pattern?

Life Around Us ► activity





water
food
shelter



GRADE K

Shelter Me



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students identify where animals are able to find shelter in habitats found in Africa and Madagascar. *NGSS performance expectation: K-ESS3-1*

INTRODUCTION

In order to survive, all animals need to find food, water, air, and shelter within their habitat. Animals need shelter to hide from predators, to rest, or to safely raise their young. Some animals find shelter in caves along cliffs, like hamadryas baboons, while others hide underwater, like the West African dwarf crocodile. Penguins nest on land, but find shelter in the sea, while lemurs climb trees to escape predators.

MATERIALS

- Pictures of the following habitats: African Cape Fynbos, West African forest, Madagascar trees, and Ethiopian Highlands. You can find these pictures in the Teacher Photo Resource PDF at kids.sandiegozoo.org/curriculum.
- Copies of pictures of the following animals: African penguin (inside cover page), West African dwarf crocodile (page 53), ring-tailed lemur (page 50), hamadryas baboon (page 49). You can also find these pictures in the Teacher Photo Resource PDF at kids.sandiegozoo.org/curriculum.
- Copies of the *Shelter Me* activity sheet, page 12, one for each student

ACTIVITY

Step 1: Begin activity by reviewing what an animal needs to survive: food, water, air, and shelter. Then, ask the students to name some habitats (places) where animals live. Start general—wet places, dry places, hot places, cold places—then introduce places like these in Africa. Examples are: rivers and rain forests, grassland, desert, and mountain tops. Ask these probing questions: “Do all animals live in all places?” “If not, why not?” Ask the students to think about the relationship between what an animal needs to survive and the place where it lives.

Step 2: Either in student groups or as a class, introduce the pictures of the habitats. Discuss each one, looking for places to find shelter, food, and water. Next, introduce the animal pictures. Work together to identify the animals and the places where they might live, and give reasons why that might be.

Step 3: After discussing the possibilities, either in groups or as a class, correctly match the animal to its habitat. Answers are ring-tailed lemur (Madagascar forest), West African dwarf crocodile (rain forest), African penguin (sandy rocky beach), and hamadryas baboon (highlands with open areas).

Step 4: Distribute the *Shelter Me* activity sheet. Ask the students to use their knowledge to match animals to habitats.

Step 5: As a class, ask the students to share their work and explain why they made their choices.

At the Zoo

As you explore the Africa Rocks exhibit, look for differences between the six habitat areas. Can you identify one or two characteristics that define each one? For example, the Cape Fynbos has a rocky shoreline, while the West African Forest has a river.

I wonder...

Do crocodiles, penguins, lemurs, and baboons live in places other than Africa and Madagascar? Why or why not? (Lemurs live only in Madagascar.)

GRADE K

Shelter Me activity

Instructions:

Draw a line from the animal to the place where it lives.



GRADE 1

Look-alikes



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students match different monkey babies to their monkey parents by identifying similar physical traits. *NGSS performance expectation: 1-LS3-1*

INTRODUCTION

Parents and offspring resemble each other in many ways, from body shape to coloration of hair or eyes. Young monkeys often match their parents' physical characteristics—but not always. Some differences include hair and eye color.

MATERIALS

- Copies of *Look-alikes* activity sheet, page 14, one for each student
- Blank sheet of paper, one per student
- Pencils, crayons, or colored markers
- Copy of page 33 showing four different vervet monkey faces. You can also find these pictures in the Teacher Photo Resource PDF at kids.sandiegozoo.org/curriculum.

ACTIVITY

Step 1: Begin this activity with a class discussion to assess prior knowledge, and to focus the topic. Ask the students to look around the room at their classmates. What are the similarities and differences? Ask leading questions such as, "What traits or characteristics can you see? What are the things we can look at to tell these traits?" This might include hair color and texture, eye color and shape, face shape, eyebrows, mouth, and other facial features.

Step 2: Create student pairs, and ask the students to look at their partner's face. How is it different from their face? How is it similar? Distribute paper and pencils, crayons, or color markers. Students can draw their face and their partner's face, noting differences.

Step 3: As a class, share some of the students' findings. What was most surprising? Ask the students, "Which parent do you look like? What similar traits do you have?" What was most commonly the same? Tell students that monkeys also have specific facial features. Show the pictures of the different faces of vervet monkeys.

Step 4: Distribute the *Look-alikes* activity sheet to each student pair. Tell the students these are pictures of four different monkeys, both parents and their young. Using the skills gained from looking at classmate faces, students should be able to match the young on the left with the parents on the right. If help is needed, remind the students to focus on nose, muzzle, mouth, and eyes; features of the face.

Step 5: Review answers as a class, discussing and comparing answers. Invite the students to explain how they made their selections.

At the Zoo

At the San Diego Zoo, we have many monkeys, including mandrills, vervets, Wolf's monkeys, Angolan colobus monkeys, black mangabeys, red-cheeked gibbons, tufted capuchins, DeBrazza's monkeys, and silvered leaf langurs. When you visit, ask if any of our monkeys have recently given birth.

I wonder...

Do some parents take care of young that are not their own? For example, domestic dogs raising wolf or fox pups.

GRADE 1

Look-alikes ► activity

Instructions:

Draw a line from each young monkey on the left to its parent on the right.



GRADE 1

Where Do I Belong?

TEACHER RESOURCES
To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students identify the inherited traits of fish, reptiles, birds, and mammals. *NGSS performance expectation: 1-LS3-1*

INTRODUCTION

Africa is home to many interesting reptiles, birds, and mammals. Reptiles are cold-blooded animals covered with scales. Young reptiles are born either alive, or by hatching from eggs. Reptile eggs are soft and leathery. The young are usually independent at birth. Birds are warm blooded and covered with feathers. All birds hatch from hard-shelled eggs that must be incubated to promote the growth of the embryo. All young birds require care after hatching. Mammals are warm blooded and covered with hair. The young of all mammals receive parental care before they become independent. Mammal mothers provide milk to nourish their babies.

MATERIALS

- Map of the world
- Map of Africa
- Whiteboard or another large writing surface
- Pictures of a West African dwarf crocodile, an African penguin, a bateleur eagle, a black-headed weaver, a leopard, a red-headed agama lizard, a hamadryas baboon, and a honey badger. You can find these pictures in the Teacher Photo Resource PDF at kids.sandiegozoo.org/curriculum.
- Copy of *Where Do I Belong?* activity sheet, page 16, one for each student
- Crayons or colored pencils

ACTIVITY

Before beginning this activity, write the headings "reptile," "bird," and "mammal" on a whiteboard or another large writing surface. Attach a picture of the crocodile under the reptile heading, the eagle under the bird heading, and a leopard under the mammal heading.

Step 1: Begin the activity by identifying the types of animals on the board. Ask students if they can identify differences between these animals. To guide the discussion, point to the

lizard and ask, "What are reptiles covered with?" (Scales.) Point to the eagle and ask, "What are birds covered with?" (Feathers.) Point to the leopard and ask, "What are mammals covered with?" (Hair.) Invite students to name other reptiles, birds, and mammals. Create a list of the student suggestions by spelling the names of—or drawing pictures of—the animals under each correct heading. Students might suggest animals, such as a spider or a crab, that don't fit into these categories. If this happens, list these to the side of the three headings.

Step 2: Using the animals listed on the board, ask the students to analyze and find patterns among the animal groups. What makes each group unique? What characteristics do the groups share?

Step 3: Next, show students a map of the world, and ask a volunteer to find Africa, then switch to the map of Africa only. Explain to the students that they are going to see some of the reptiles, birds, and mammals that live in Africa.

Step 4: Show the pictures of the African penguin, black-headed weaver, red-headed agama lizard, hamadryas baboon, and honey badger to the students one at a time. With each picture, ask the students if the animal is a reptile, bird, or mammal; then ask why they think it is so (scales, feathers, hair). Post the pictures under the correct heading on the board. Also, ask students, "If these animals had babies, would the babies go under the same category too?"

Step 5: Distribute the *Where Do I Belong?* activity sheets. Have the students follow your directions to color the animals and circle "hair," "feathers," or "scales" next to the animal. Ask the students to share their work with the class.

At the Zoo

How many more birds, reptiles, and mammals can you find at the Zoo?

I wonder...

Are there any exceptions to the characteristics? For example, some mammals lay eggs (echidna and platypus).

GRADE 1

Where Do I Belong? ► activity

Instructions:

Color the reptiles red, the birds blue, and the mammals yellow. On the line beside each picture, circle the correct skin covering for each animal.

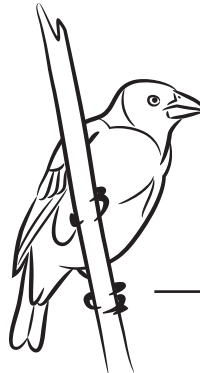
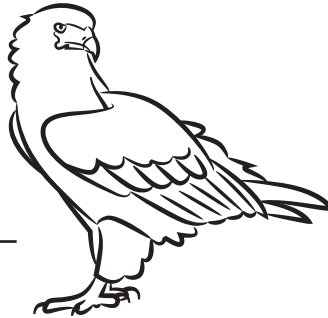


scales
feathers
hair

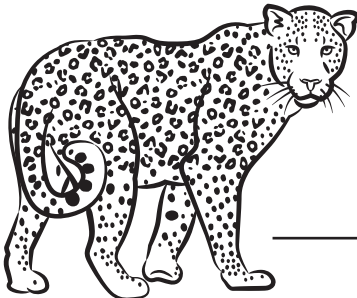
feathers
scales
hair



feathers
scales
hair



scales
feathers
hair

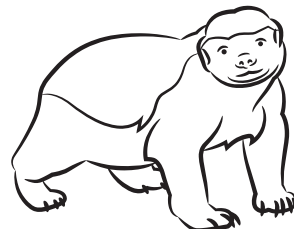


feathers
scales
hair

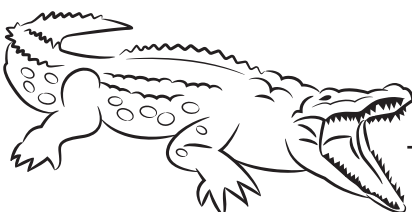


feathers
scales
hair

scales
feathers
hair



scales
feathers
hair



feathers
scales
hair

GRADE 2

Fantastic Figs

TEACHER RESOURCES
To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

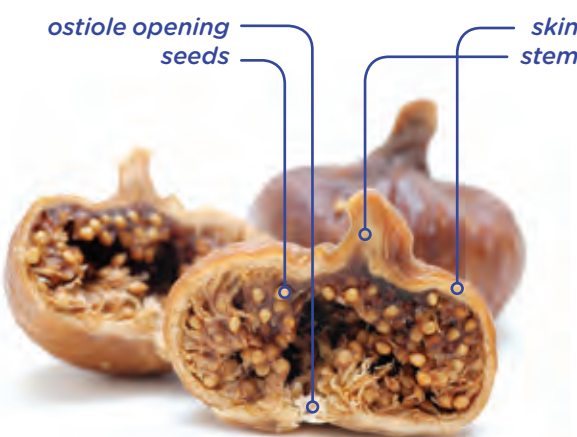
Students create a chronological time sequence of fig pollination while identifying the pollinator, a wasp, and dissecting a fig. *NGSS performance expectation: 2-LS2-2*

INTRODUCTION

Seed plants require the transfer of pollen from the male anther to the female stigma of a flower. Bees, beetles, bats, flies, and many other animals, in addition to the wind, help in the transfer of pollen. Why is this important? Seed plants produce our edible fruits, vegetables, nuts, and seeds, an essential food source for people and animals. The fig tree produces figs, a fruit that is commonly eaten in Africa.

MATERIALS

- Dried or fresh figs, two per student pair
- Paper towels or paper plates, one per student pair
- Magnifying lens
- Copies of *Fantastic Figs* activity sheet, pages 18 and 19, one per student group. Cut apart the cards on page 18.
- Copy of *Close Partners* poster, page 48
- Color pencils or markers
- Glue or tape



At the Zoo

Look for fig trees in the Africa Rocks exhibit. What role do fig trees play in the habitat? (They provide food for many animals like monkeys and birds.)

ACTIVITY

Step 1: Begin the activity by creating student working groups of two to three students. Then, distribute two figs to each group, along with a paper plate or paper towel, a magnifying lens, and a blank sheet of paper. Allow time for the students to examine the figs. Tell the students they are welcome to pull one apart to look inside. Ask the students to draw or write about what they see.

Step 2: As a class, discuss what students observed. Can they name it? (A fig.) Can they eat it? (Yes.) What kind of food is it? (A fruit.) Where does a fruit come from? (A plant.) How does a plant make a fruit? (A flower is pollinated and produces seeds.)

Step 3: Ask the students to look at the figs again to try to find the seeds. They will need to use the magnifying lens, as they are small. Ask the students if they know what pollinates a fig.

Step 4: Distribute the *Fantastic Fig* activity cards (cut apart) and sequence sheet. Ask students to put the cards in order, showing how they think figs grow. This will be a guess. The final order will be confirmed in the next step.

Step 5: Show students the *Close Partners* poster and the sequence of pollination. Review the poster and distribute the glue or tape and the color pencils or markers. How is fig pollination different from that of other fruits like apples or peaches? (Figs have internal flowers.)

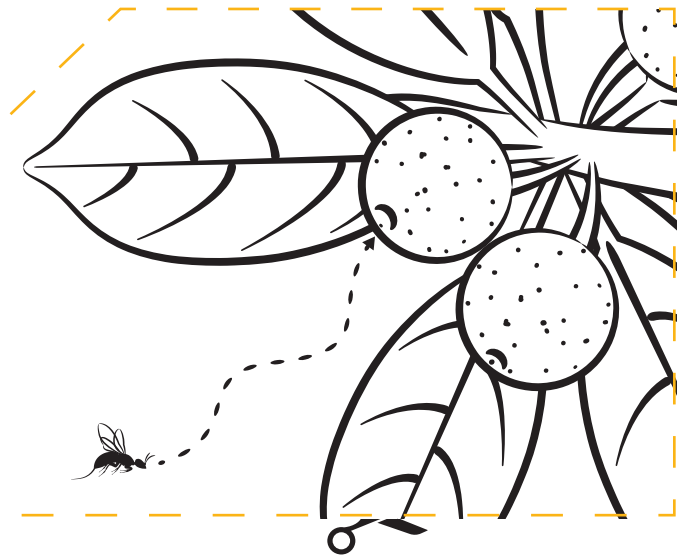
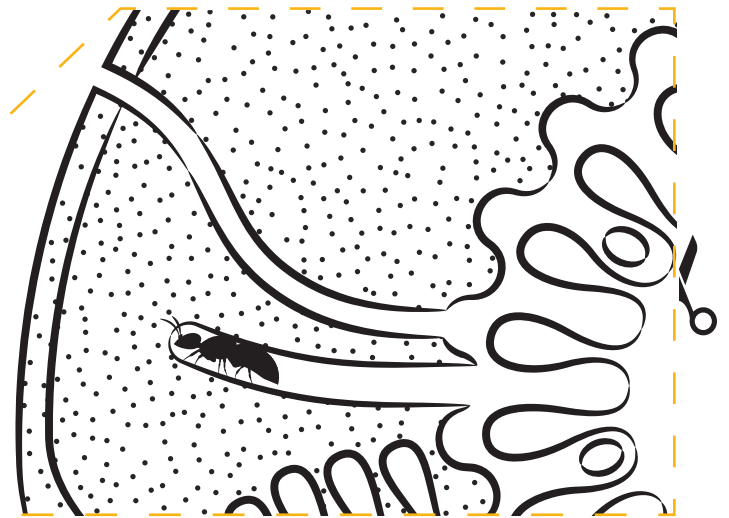
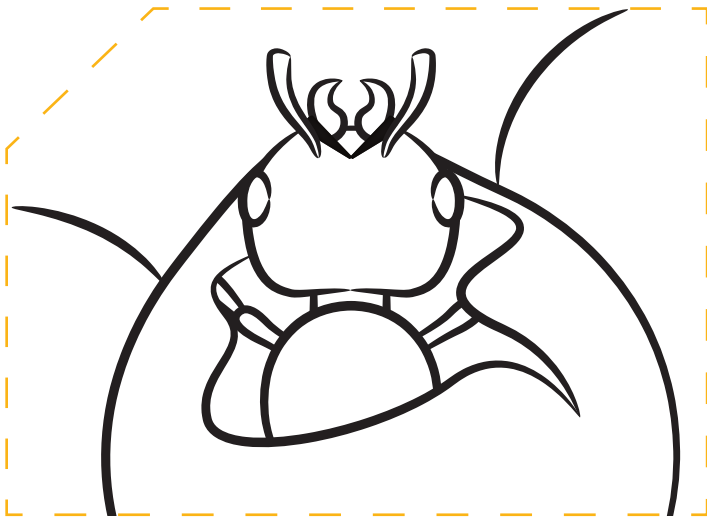
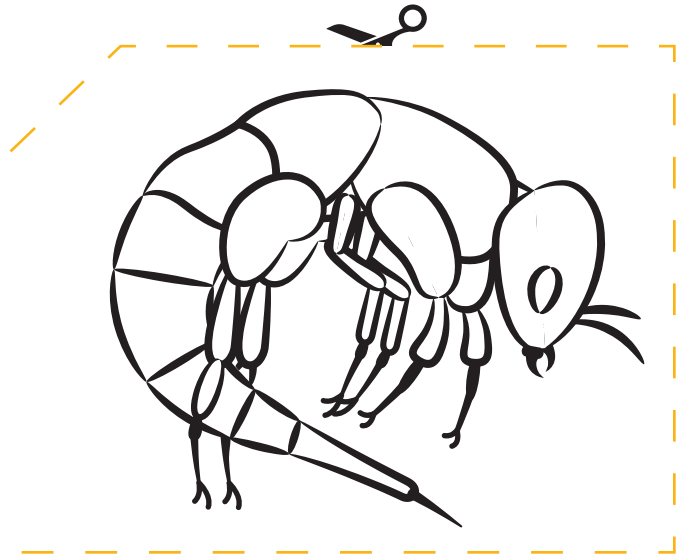
I wonder...

What other insects or animals, besides wasps and bees, help pollinate flowers? (Bats, birds, flies, moths, ants, beetles, and butterflies are examples.)

Fantastic Figs ▶ activity

Instructions:

Cut apart the cards below and paste them in the correct order, 1 to 6, on the other page.



1

2

3

4

5

6

GRADE 2

Healthy Habitats



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students match four animals—penguin, lemur, crocodile, and meerkat—to the habitat where they live. *NGSS performance expectation: 2-LS4-1*

INTRODUCTION

Habitat is an animal's home: the area where it lives. Some animals need only a small area; for example, a meerkat colony on a kopje rock. Other animals need a large area; for example, birds like penguins roam the ocean for many miles searching for fish to eat. The health of a habitat is critical to the health of the animals that live in it. Habitats change when trees are cut down, soil is plowed, water is restricted, or other animals invade the area. Protecting an animal's home is the first step in species conservation.

MATERIALS

- Copies of four pictures: a penguin in the ocean, a lemur in a tree, a crocodile in a river, and a meerkat on a kopje (rock). One four-picture set for each student group. You can find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum.
- Whiteboard or another large writing surface
- Board markers
- iPads or personal computers, if using digital pictures
- Copies of *Healthy Habitats* activity sheets, pages 21 and 22, one for each student
- Scissors
- Colored pencils, markers, or crayons
- Glue sticks

ACTIVITY

Step 1: Begin this activity with a class discussion to introduce the word "home." Write the word on the board. Ask students leading questions such as, "Where do we live? What is home to us?" "Who or what lives with us in our

home?" Continue prompting with, "Do you think animals live in a home? Why or why not?" Tell students that scientists call an animal's home its habitat. Write the following words on the board: "ocean," "forest," "river," and "rocky kopje." Post the corresponding animal picture under each habitat name.

Step 2: Divide students into pairs or small groups, and give access to the digital pictures (iPad or computer) or distribute the color prints of the four animal habitats. Ask students to compare habitats; what is the same and what is different? Students need to record their observations.

Step 3: Using the pictures on the board and the pictures the student groups are using, lead a class discussion about each place. What types of animals or plants are in the ocean? What types are in a river, a forest, and a rocky kopje? Could students find the animal in each photo?

Step 4: Distribute the *Healthy Habitats* activity sheets to each student. Distribute glue, scissors, and color markers, pencils, or crayons. Ask students to cut out the animals, paste each one into a habitat, and then color the animals to blend in with their habitats. Encourage students to share their work with their partner or in their group, explaining why they chose the specific habitat for each animal.

Step 5: As a class, ask student pairs or groups to present their work. As they present, discuss together the choices of habitats. Did all students make the same selection? Did students add other animals or plants to their habitat?

At the Zoo

Visit African Rocks to find the African penguins, West African dwarf crocodile, meerkats, and lemurs. Notice the area where you find them and write down the characteristics. After finding all four, compare your observations. Could the meerkats live in the penguin enclosure? Why or why not?

I wonder...

How does the introduction of a new animal to a habitat affect the animals already living there? What is an invasive species?

GRADE 2

Healthy Habitats ► activity

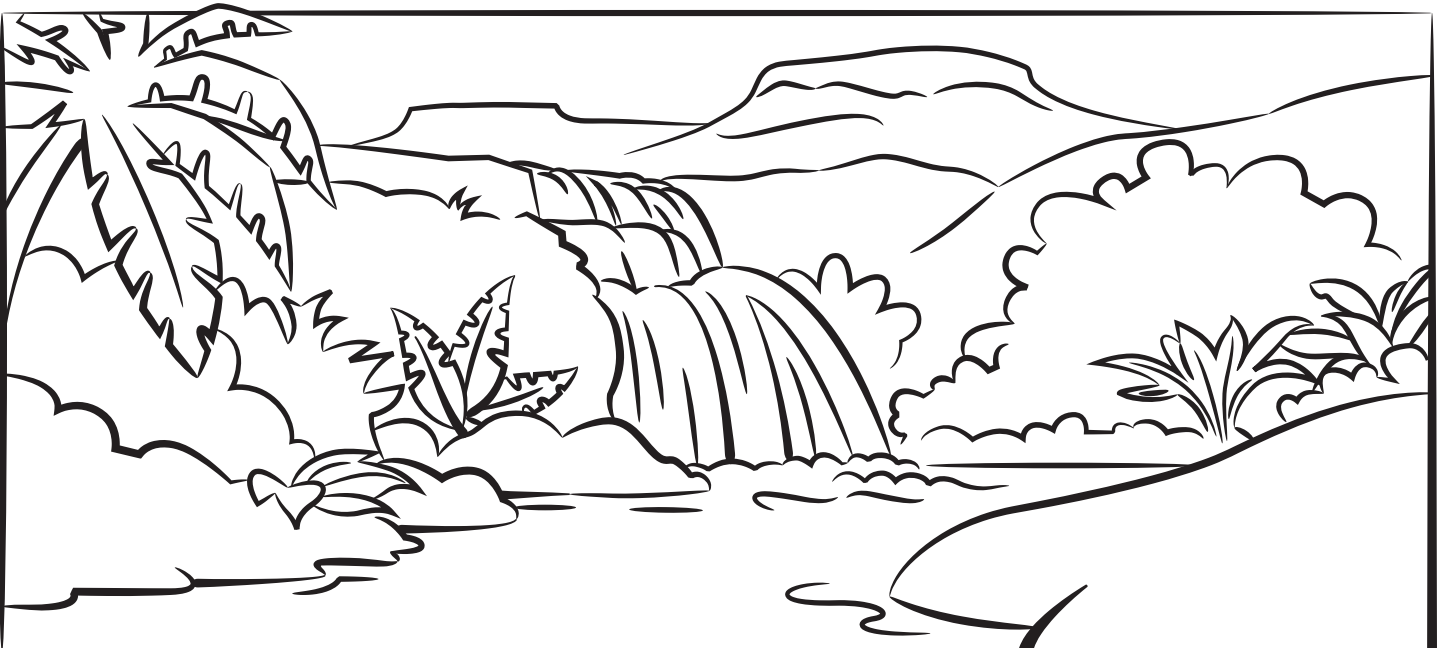
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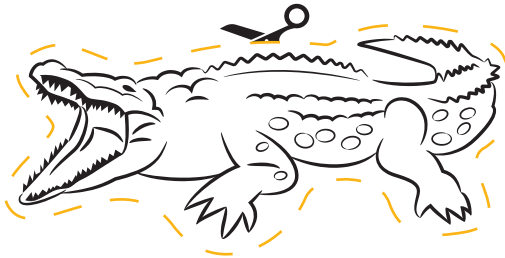
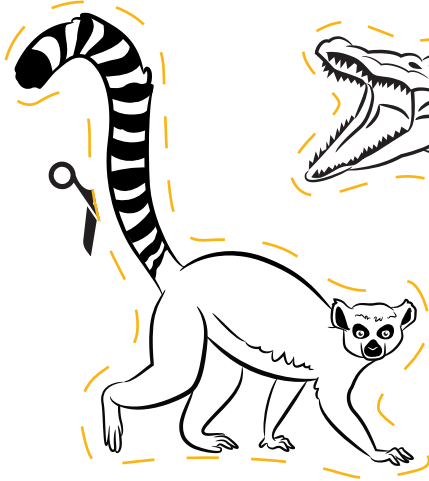
Where do I live? Cut out the animals, and place them in their habitats. Color the animals to blend into their habitats.

ocean



river





Animal Cutouts

rocky kopje



forest





GRADE 3

Gotta Move



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students match different animal feet to their functions. *NGSS performance expectation: 3-LS4-3*

INTRODUCTION

To find food, animals may dig, paddle, crawl, fly, or do other behaviors to catch prey or gather edible plants. Depending on the different environments that the animal inhabits, its feet may have webbed toes for swimming, claws for scratching or burrowing, talons for grabbing, or soft pads for sticking to surfaces. Looking at an animal's feet can tell you about its lifestyle and where it lives. Some animals are able to thrive in some habitats, while other animals don't survive in the same habitat.

MATERIALS

- Copies of pictures of a West African dwarf crocodile, a Nubian ibex, a penguin, a ring-tailed lemur, and a hamadryas baboon, and pictures of their feet. You can find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum.
- Copy of *Gotta Move* activity sheet, page 24, one for each student
- Pencils with erasers

ACTIVITY

Step 1: Ask the students to look at and think about their feet. How do we use our feet? What can we do with our feet? Most people walk, but others can paint, write, cook, hold a fork, clap, and knit with their feet; basically, whatever hands can do. What about an animal's foot? Show pictures of the animal feet, but don't identify the animals. Ask the students to describe the feet in the pictures. What animals might have these feet? How do these different feet help the animal thrive in its home?

At the Zoo

As you visit the Zoo, go see animals with different feet. Watch as they walk, climb, and eat. Can you do everything that the animal does?

Step 2: Distribute the *Gotta Move* activity sheet. Tell students that these are the footprints of animals that live in Africa and Madagascar. Challenge the students to identify each foot in the middle to an animal's name in the left column and an action in the right column.

Step 3: When the students have completed the matching, show pictures of the West African dwarf crocodile, Nubian ibex, African penguin, ring-tailed lemur, and hamadryas baboon, and match the animal picture to the correct feet picture. With each, discuss what kind of feet it has, and how it uses its feet. Note that feet can be used in different ways and that answers here may vary by student. Ask student to explain why he or she chose that action.

Step 4: After this discussion, ask the students to work in groups to correct any animal matches that are not correct. Encourage discussions as to why students are making a change.

Step 5: When the animal-matching revisions are completed and students are ready, double check answers as a class. Review each animal, encouraging the students to roleplay the action that the animal's feet perform. Can human feet do just as well?

I wonder...

How would an animal survive if it was missing a foot?

GRADE 3

Gotta Move ▶ **activity**

Instructions:

Match the animal name to the foot. Match the foot to an action word.
Be ready to tell why you chose that action word.

**ring-tailed
lemur**



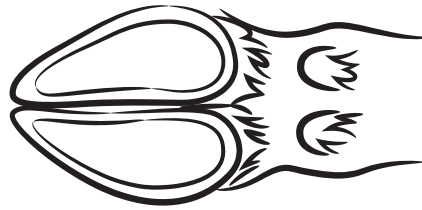
climb

baboon



crawl

penguin



grasp

**dwarf
crocodile**



hop

**Nubian
ibex**




grab

human



walk



GRADE 3

Climate Quest

TEACHER RESOURCES
To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students assign climate characteristics to four regions in Africa that result in different animal habitats. *NGSS performance expectation: 3-ESS2-2*

INTRODUCTION

Climatologists—scientists that study the Earth's climates— recognize similar climate patterns around the world, from very hot, dry deserts, to freezing temperatures at the poles, to warm, wet rain forests at the equator. The continent of Africa is a diverse land with many different climates. This activity focuses on four regions within Africa that have these climate patterns: cool, high-altitude highlands, wet rain forests, dry savannas, and sunny cape coastlines with a Mediterranean-like climate. In the Africa Rocks exhibit, there are the Ethiopian Highlands, West African Forest, Acacia Woodlands and the Cape Fynbos.

MATERIALS

- Map of the world
- Map of Africa with highlighted climate areas on page 26
- Copies of pictures of the four habitat areas on pages 27 and 28. You can also find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum.
- Copy of climate cards, page 29, cut apart. One set for each student group.
- Access to the internet for weather maps; for example, NOAA, NASA, and the Weather Channel
- Whiteboard or another writing surface
- Board markers

ACTIVITY

Step 1: Begin the activity with a discussion about weather and climate to assess prior knowledge. First, ask the students, “What’s it like outside?” As students describe the weather for the day, record their answers on the whiteboard. Label the responses “today.” Then ask, “Is it always

At the Zoo

While visiting the Zoo, look at the places where animals live. Using a notebook and pencil, sketch a few areas. Do they always have the same things? How is the animal using things in their area, such as pools, logs, grass, or caves?

like this?” When students answer “no,” begin a conversation about the definitions of weather and climate. Climate is weather over time. Ask students what type of climate is at their school. What are the high and low temperatures? What is the yearly rainfall? Label these responses “during the year.”

Step 2: Divide students into groups and distribute the pictures of the four habitat areas. Ask the students to look at the pictures, and think about the climate there. Does it look like it rains a lot? Why or why not? Does it look hot or cold? Distribute the climate card sets to the student groups. First review the meaning of each icon (rain, temperature, wind, clouds), then tell the students to sort the cards to the pictures. If they think the rainfall is high, they can place more than one rain card on the picture. If they think the temperature is high, they can place more than one thermometer card on a picture.

Step 3: Review the student groups’ answer as a class. Was there agreement on the pictures? Show a map of the world. Can the students locate Africa? Then, show the map of Africa with the habitat names.

Step 4: Using the internet or other resources, ask the students to research the average rainfall and yearly average high and low temperatures for an African rain forest, a savanna, a highland in Ethiopia, and a coastline off Cape Town, South Africa. Students can reference the map if they need to know specific countries.

Step 5: Let student groups present their information and rank the habitats from highest rainfall to lowest rainfall. Why is rainfall so important? (Plants need water to grow; high rainfall results in more plant growth.)

I wonder...

Can climates change? Does one area that once had lots of rain, now get only a little? Why?

GRADE 3

Climates in Africa ► activity



GRADE 3

Climates in Africa ► activity

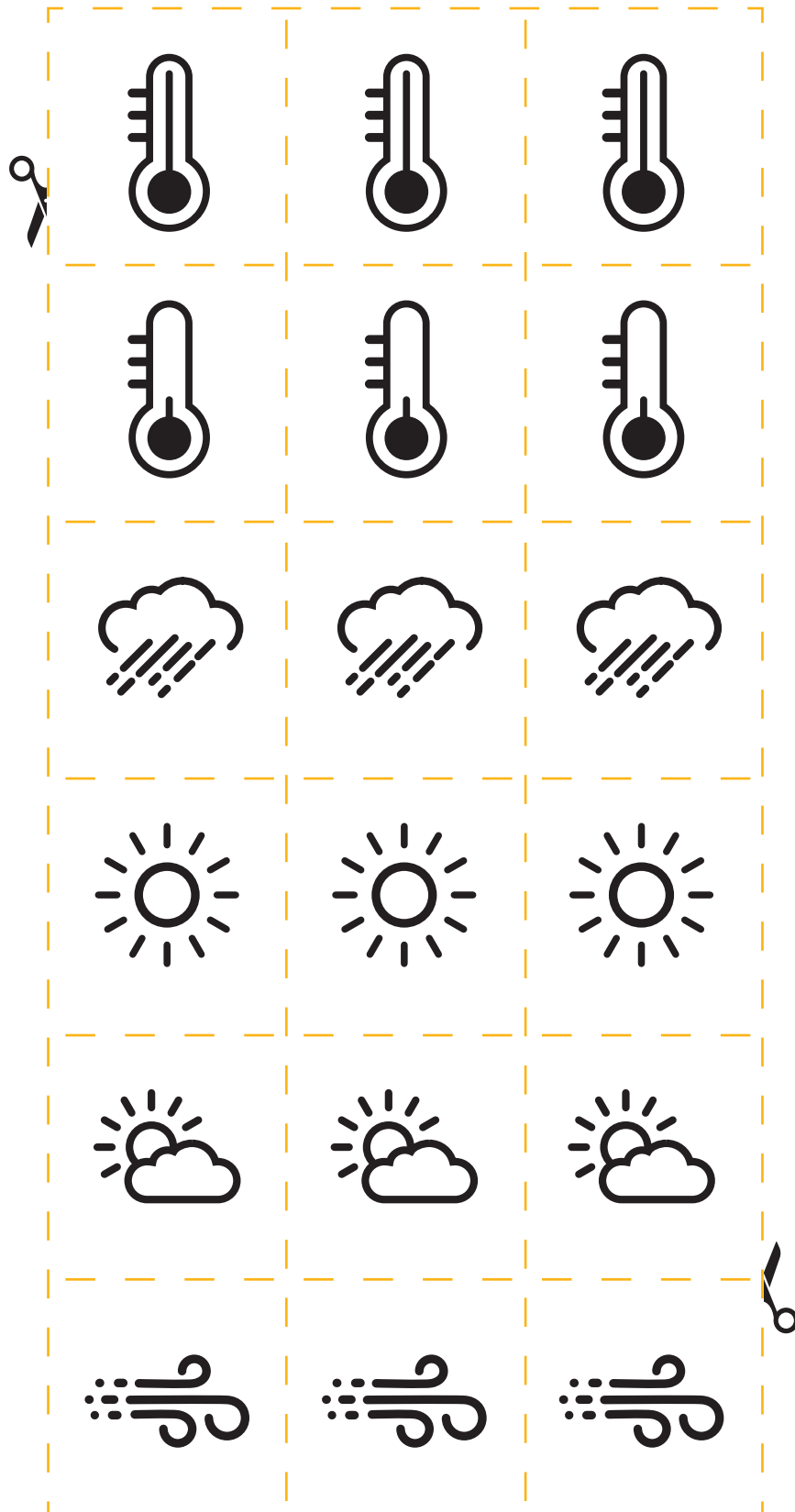


GRADE 3

Climates in Africa ► activity



Climates in Africa ► activity



GRADE 4

Penguin Portraits



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students explain how specific abilities or physical characteristics help an animal survive in its habitat. *NGSS performance expectation: 4-LS1-1*

INTRODUCTION

Animals have adaptations that help them survive in their habitats. Physical adaptations include body features for eating, climbing, running, balancing, smelling, hearing, and camouflage. Another type of adaptation is behavioral. Examples of behavioral adaptations are the ways an animal hunts prey, shelters in caves or forest shrubs, climbs trees to rest and eat, and protects its young.

MATERIALS

- Digital or print pictures of African penguins on land (inside cover page) and in the water. You can find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum.
- Whiteboard or another large writing surface
- Board markers
- Copies of *Penguin Portraits* activity sheet, page 31, one per student
- Colored pencils or markers
- Access to internet, library, or other resources for information

ACTIVITY

Before beginning this activity, create a two-column table on the board. Label the columns “people” and “penguins.”

Step 1: Begin the activity with a class discussion about what adaptations people have for survival. Ask students, “What adaptations do you have to survive?” As students give answers, list them under the “people” column on the board. Physical adaptations might be feet for walking, hands for holding or moving objects, and eyes for seeing. Behavioral adaptations

might be learning to swim, to climb a tree, or to drive a car. Next, focus the discussion on penguins. Show the digital or printed pictures of the African penguin on land and in the water. Ask students to name the body parts that help penguins survive in the wild and list them on the board under the “penguin” column. Examples might be feathers, feet, wings, eyes, beak, and claws. Have students explain how the penguin would use those body parts to survive. For example, in water, the penguin uses its feet for steering; but on land, it uses its feet for walking.

Step 2: Distribute the *Penguin Portraits* activity sheet, one to each student. Lead students through the questions on the sheet, and then ask each student to create a “Portrait” poster describing his or her penguin’s habitat, and the physical and behavioral adaptations for surviving in that habitat. Allow time for students to use other resources for additional information on penguin species.

Step 3: When students finish, divide the class into groups to share their “Wanted” posters. How well does the penguin fit into its habitat?

Step 4: Continuing the class discussion, ask students, “Can one penguin survive in another penguin’s habitat? For example, can a Galápagos penguin live in Antarctica? Why or why not? As habitats change, how do animals adapt?”

Step 5: Create portraits for other African animals to share with the class.

At the Zoo

Look for the African penguins in Africa Rocks. Watch them above and below the water. How do penguins swim? How do they move on land?

I wonder...

What other birds can't fly?
What adaptations do they have to survive?

Penguin Portraits activity

Instructions:

Create a portrait for a penguin whose adaptations help it survive in its habitat.

Penguin Portrait

Penguin's name: _____ Country or continent: _____

Habitat description: _____

Physical adaptations for surviving in that habitat: _____

Behavioral adaptations for surviving in that habitat: _____

GRADE 4

Here's Looking at You



TEACHER RESOURCES
To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students analyze and identify key facial expressions vervet monkeys use to communicate with each other. *NGSS performance expectation: 4-LS1-2*

INTRODUCTION

Highly social monkeys communicate with each other in multiple ways, including a variety of vocal calls and body postures with facial expressions. Humans also communicate using body language and facial expressions. Human facial expressions link to our emotions: happiness, sadness, anger, fear, contempt, disgust, rest, and surprise. In the 1960s, psychologist Paul Ekman identified these eight universal facial expressions and the characteristics of each specific emotion. Vervet monkeys have light-colored eyelids surrounded by a dark face. By raising the eyebrows, the light-colored eyelid is exposed and can be easily seen. A defensive display is shown in a crouching position with eyelids exposed. An aggressive display is shown in a full standing position with the mouth open and eyelids exposed.

MATERIALS

- Device to take pictures—camera, phone, tablet
- Paper or poster board
- Tape
- Pencils or pens
- Projector or smartboard
- Copies of vervet monkey faces on page 33. You can also find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum

At the Zoo

Visit the many monkey and ape exhibits to watch the animals' social interactions and facial expressions. Can you identify a dominant male by his interactions with others in the troop?

ACTIVITY

Before beginning this activity, create a two-column table on the board. Label the columns "people" and "monkeys."

Step 1: Write the words "happy," "sad," "fear," "anger," "surprise," "disgust," and "contempt" on a whiteboard or another writing surface. Then, create student groups of two or three students, and give each group a device to take pictures.

Step 2: Ask each group to model the faces for these emotions. Student groups can create their catalog of facial expressions in any manner digitally or in print, as long as each photograph is identified as one of the emotions written on the board.

Step 3: Have student groups share their faces as a class. Begin with easily recognized emotions (happy/sad) and end with more challenging ones (disgust/contempt). As groups show their face photographs, ask students to find similarities among them. Look at the corners of the mouth, the position of the eyebrows, the opening of the eyes, and the forehead for clues. Create a table of the characteristics on the whiteboard, or have a student record responses on paper or poster board.

Step 4: Tell the students that monkeys also use facial expressions to communicate. Distribute the face images for the vervet monkey to the student groups. Ask them to compare the monkey faces to the group of expressions that the class created. Where are there similarities? Differences?

Step 5: In a class discussion, ask student groups to share their explanations of what the monkeys are trying to communicate. What clues did they use?

I wonder...

Vervet monkeys gather in social groups. Other monkeys have different social organizations. Do different monkey species use different expressions? What are they?

GRADE 4

Here's Looking at You ► activity



GRADE 5

Kopje

Kritters



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Students use game play to model the movement of matter/energy within a kopje ecosystem.
NGSS performance expectation: 5-LS2-1

INTRODUCTION

Kopjes are rocky hills that appear in the flat grasslands in Africa. The rocks are granite, more durable than the loose soil around them. As the wind and rain erodes the landscape, the soil is carried away, but the rock remains. Kopje life is diverse. Many animals gather there for protection, food, and water. The kopje is a refuge from the open plains of the savanna.

MATERIALS

Per game

- Copy of pictures of a kopje, red-leaved fig tree, dwarf mongoose, klipspringer, Bateleur eagle, meerkat, and rock hyrax, either digital or print. You can find these pictures in the Teacher Resource PDF at kids.sandiegozoo.org/curriculum.
- Whiteboard or another large writing surface
- Board markers
- Pair of dice
- Copy of game directions on page 35
- Copy of data sheet on page 36
- Copy of chance cards on page 37
- Twenty of each colored bead: red, green, blue

ACTIVITY

Step 1: Begin lesson with a class discussion to assess prior knowledge about food chains, food webs, and food pyramids. Show pictures of the fig tree, dwarf mongoose, klipspringer, bateleur eagle, meerkat, and rock hyrax. Can students

identify these animals and the plant? What might link these animals and the plant together? Record responses on the whiteboard. Make the connection that the rock hyrax eats figs, and the bateleur eagle catches rock hyraxes. Next, ask students to characterize a kopje habitat. Where is it found? (Serengeti, Africa is one place.) What does it look like? (A rock island in a sea of grass.) What lives there? (Animals listed and more.) Show the picture of the kopje, and ask students to continue observations. Record responses on the whiteboard.

Step 2: Pair students and distribute dice, chance cards, game directions, and data sheet. Have students play game, with the first five rounds using six chance cards and the second five rounds using an additional five chance cards. Tell students to count beads, and record data after each round.

Step 3: After play, tell the students to tally data and graph results in their groups. Ask students: "Under what conditions did the food chain continue for at least five rounds? What happened when additional threats, both at the producer level and the consumer level, were added? Did the food chain ever break? What would this mean in the real world?"

Step 4: Ask the students to modify their game—by either adding or subtracting chance cards—so that the food chain endures for at least 10 rounds. Students must have at least six chance cards in play for each round.

Step 5: Ask the students to explain their results and show their data. What was important to balance?

At the Zoo

Visit the Kopje habitat in Africa Rocks. Watch the rock hyrax as it climbs over the rocks. How might it escape an eagle?

I wonder...

What would happen if the kopje rocks disappeared?

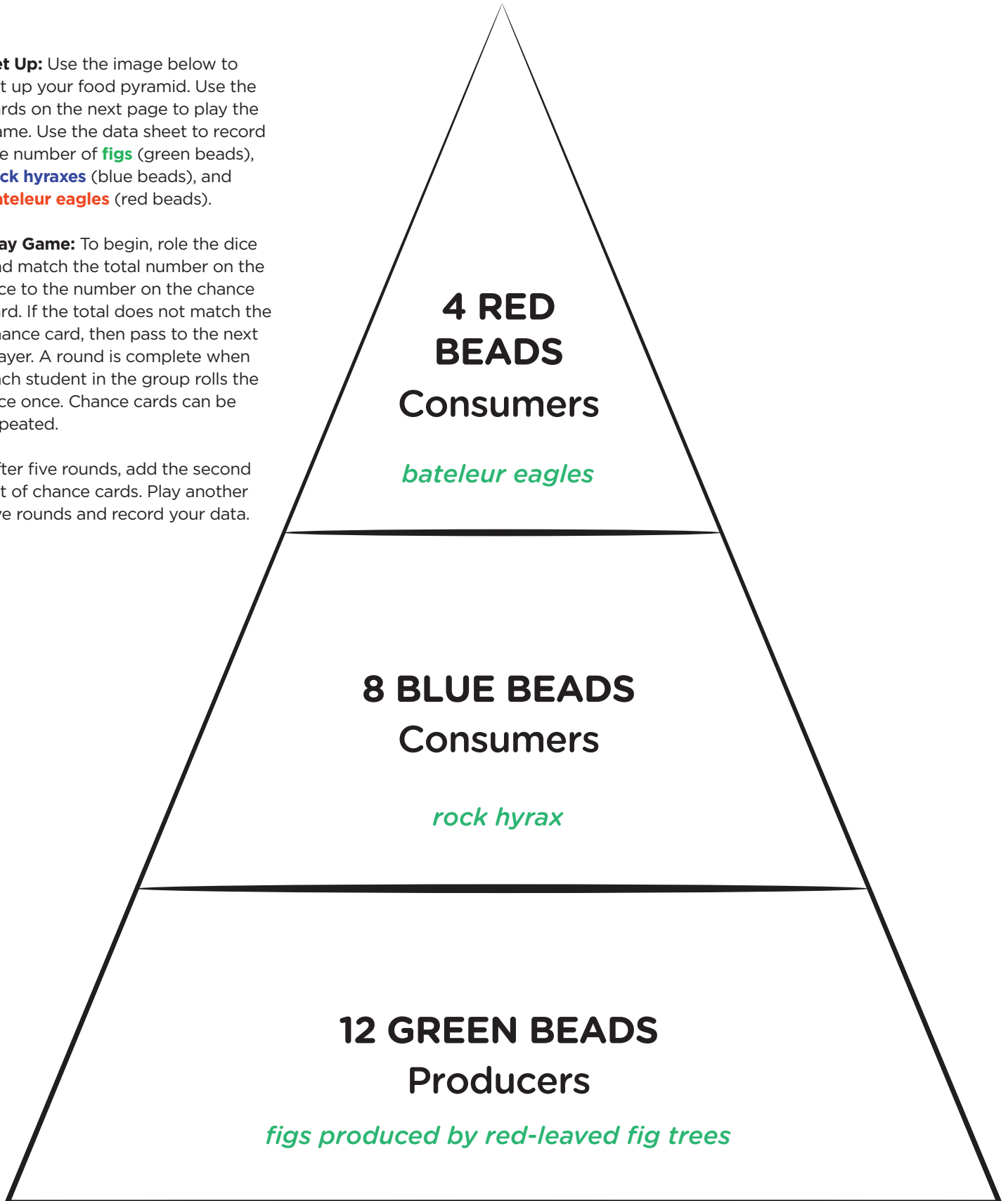
GRADE 5

Kopje Kritters ► activity

Set Up: Use the image below to set up your food pyramid. Use the cards on the next page to play the game. Use the data sheet to record the number of **figs** (green beads), **rock hyraxes** (blue beads), and **bateleur eagles** (red beads).

Play Game: To begin, roll the dice and match the total number on the dice to the number on the chance card. If the total does not match the chance card, then pass to the next player. A round is complete when each student in the group rolls the dice once. Chance cards can be repeated.

After five rounds, add the second set of chance cards. Play another five rounds and record your data.



GRADE 5

Kopje Kritters activity

Record the number of your green, blue, and red beads after each round.

	GREEN BEADS	BLUE BEADS	RED BEADS
START	12	8	4
ROUND 1			
ROUND 2			
ROUND 3			
ROUND 4			
ROUND 5			
<i>ADD NEW CARDS</i>			
ROUND 6			
ROUND 7			
ROUND 8			
ROUND 9			
ROUND 10			

GRADE 5

Kopje Kritters ► activity


Chance Cards

Cut apart and sort into two groups

Rounds 1 through 5 chance cards: 3, 5, 6, 7, 11, and 12

Rounds 6 through 10 chance cards: 2, 4, 8, 9, and 10

		3	Natural regrowth of red-leaved fig trees. Add two green beads (two fig trees).
2	A farmer shoots a bateleur eagle. Take off one red bead (a bateleur eagle).	5	A rock hyrax dies of old age. Take off a blue bead (a rock hyrax).
4	Cattle overgraze the land and eat the fig trees. Take off two green beads (two fig trees).	6	A flash fire burns across the savanna. Fig trees are scorched. Take off two green beads (two fig trees).
8	A local hunter shoots five rock hyraxes for their skins. Take off five blue beads (five rock hyraxes).	7	A female rock hyrax gives birth to a litter of two. Add two blue beads (two rock hyraxes).
9	A rock hyrax dies from disease. Take off a blue bead (a rock hyrax).	11	Plentiful rains let fig trees produce more fruit. Add a blue bead (a rock hyrax).
10	A three-year-long drought cuts rainfall. Fig trees die. Take off four green beads (four fig trees).	12	A pair of bateleur eagles take one rock hyrax. Take off one blue bead (one rock hyrax).



GRADE 5

Stand Up for Lemurs



TEACHER RESOURCES

To download the curriculum PDF with the teacher's key and additional pictures, visit: kids.sandiegozoo.org/curriculum

LEARNING OUTCOME

Through the process of scripting and filming a one-minute video, students learn about threats to lemur survival, and suggest conservation solutions.

INTRODUCTION

Lemurs are in trouble. Native to Madagascar and living in forests and bushland, lemurs face many threats, from loss of habitat and hunting to changing climate and capture for the pet trade. Of the 100 species of lemurs native to Madagascar, only a handful have stable (not declining) populations. At Africa Rocks, you'll see five species: ring-tailed lemur, red-collared brown lemur, red ruffed lemur, Coquerel's sifaka, and blue-eyed black lemur.

MATERIALS

- Copies of the lemur cards, pages 40 and 41
- Copies of *Stand Up for Lemurs* activity sheet, page 39, one per student group
- Map of Madagascar showing lemur distribution, page 41.
- Access to the internet or library for additional lemur information
- Access to iPhone, iPad, and Apple app store for video production

At the Zoo

When at the San Diego Zoo, look for signs, posters, or videos telling about animal conservation. In addition to lemurs, what other animals need help?

ACTIVITY

NOTE: This activity asks students to create a one-minute video. A general guideline for video production is two class periods per one minute of video. You are welcome to modify this lesson to fit your time needs.

Step 1: Begin this lesson with a class discussion to assess prior knowledge about the unique assemblages of wildlife on Madagascar, including lemurs and their conservation.

Show the map of Madagascar. Tell students that 80 percent of the animals that live on this island, the fourth largest in the world, live nowhere else in the world. Why? One possibility is geographic isolation: Madagascar broke off from the supercontinent of Gondwana and became isolated from Africa and India more than 160 million years ago.

After the map discussion, distribute copies of the lemur cards. Ask students to read the information about each lemur. Visit websites such as San Diego Zoo Kids to learn more.

Step 2: Create student groups of three to four students each. Tell students their assignment is to create a one-minute video about saving lemurs. Distribute *Stand Up for Lemurs* activity sheet, which outlines the steps needed to create the video. Review the sheet, explaining each step and the resources available to the students. Determine a timeline to complete the project. Assist student groups as they work through their project.

Step 3: When videos are completed, plan a day to showcase student work, and evaluate the presentations.

I wonder...

What makes a conservation campaign effective?

GRADE 5

Stand Up for Lemurs ▶ activity

Storyboard:

Draw a picture of each scene, and tell how long that scene will show in the 1-minute (60-second) video.

Make a list of ALL the materials you need to produce the video.

FILMING:

Where will I film my video? Who will be there? Who will be the actors? Who will be the filming crew?

EDITING:

How will I edit my video? List all equipment needed.

PUBLISHING:

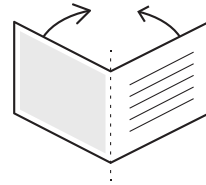
How will I show my video to others? List all equipment needed.

GRADE 5

Stand Up for Lemurs ► activity

Instructions:

Cut out the cards along the dashed line. Fold along the dotted line in the center, then paste, tape, or staple the two edges together to form a flash card.



RING-TAILED LEMUR

Lemur catta

Habitat: Dry forests and bushland in south and southwest Madagascar. Relies on trees for shelter and food

Status: Endangered

Threats: Hunting and loss of habitat due to fires from annual burns and clearing for livestock grazing



RED RUFFED LEMUR

Varecia rubra

Habitat: Tropical lowland forests in northeastern Madagascar

Status: Critically endangered

Threats: Hunting and habitat loss due to illegal logging



BLUE-EYED BLACK LEMUR

Eulemur flavifrons

Habitat: Tropical forests growing on a small peninsula in northwestern Madagascar

Status: Critically endangered

Threats: Habitat loss due to slash-and-burn land clearing for farming





Lemur Distribution

- Ring-tailed lemur
- Red ruffed lemur
- Blue-eyed black lemur
- Coquerel's sifaka
- Red-collared brown lemur



COQUEREL'S SIFAKA

Propithecus coquereli

Habitat: Forested areas of northwestern Madagascar

Status: Endangered

Threats: habitat loss due to charcoal production, and slash-and-burn forest clearing for agriculture and livestock grazing



RED-COLLARED BROWN LEMUR

Eulemur collaris

Habitat: Wet forests growing in southeastern Madagascar

Status: Endangered

Threats: Habitat loss due to charcoal production, and slash-and-burn forest clearing for agriculture and livestock grazing

Online Resources

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

ielc.libguides.com/sdzg/factsheets/index
animals.sandiegozoo.org

To learn more about animal research and conservation

endextinction.org

To have fun exploring the San Diego Zoo Kids website

kids.sandiegozoo.org

To learn more about school programs

zoo.sandiegozoo.org/content/overview

Connection to the Next Generation Science Standards

The materials and activities presented in this guide are just one step toward reaching the standards and performance expectations listed below.

STANDARDS

- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy, and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity
- ESS3: Earth and Human Activity

PERFORMANCE EXPECTATIONS

Kindergarten: K-LS1-1 performance expectation: Use observations to describe patterns of what plants and animals (including humans) need to survive.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Analyzing and Interpreting Data	Students identify and match survival items (food, water, shelter) to humans and animals.
Disciplinary Core Ideas	LS1.C Organization for Matter and Energy Flow in Organisms	Students notice similar needs (food, water, shelter) in different forms.
Cross-cutting Concepts	Patterns	Students draw what animals need to survive.

PERFORMANCE EXPECTATIONS

Kindergarten: : K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Developing and Using Models	Students create diagrams of relationships between animals and the places where they live.
Disciplinary Core Ideas	ESS3.A Natural Resources	Students identify an animal's food, shelter, and source of water in various habitats.
Cross-cutting Concepts	Systems and System Models	Students recognize that animals, plants, and the environment have parts that work together.

PERFORMANCE EXPECTATIONS

Grade 1: 1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are alike, but not exactly like, their parents.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Constructing Explanations and Designing Solutions	Students review photos to identify different species of monkeys.
Disciplinary Core Ideas	LS3.A Inheritance of Traits	Students match young monkeys to parent monkeys.
Cross-cutting Concepts	Patterns	Students identify similarities and differences between monkeys.

PERFORMANCE EXPECTATIONS

Grade 1: 1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are alike, but not exactly like, their parents.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Constructing Explanations and Designing Solutions	Students examine and analyze the common traits of three groups of animals.
Disciplinary Core Ideas	LS3.A Inheritance of Traits	Students recognize young inherit traits from parents, such as fur, feathers, and scales.
Cross-cutting Concepts	Patterns	Students identify repeating patterns and similar characteristics among the groups of animals.

PERFORMANCE EXPECTATIONS

Grade 2: 2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Developing and Using Models	Students sort chronological sequence of wasp pollinating fig.
Disciplinary Core Ideas	LS2.A Interdependent Relationships in Ecosystems	Students connect fig pollination to wasps.
Cross-cutting Concepts	Cause and Effect	Students discuss consequences of fig survival without wasps.

PERFORMANCE EXPECTATIONS

Grade 2: 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Planning and Carrying Out Investigations	Students explore different habitats where four animals live, then create criteria to place the animals in the correct habitat.
Disciplinary Core Ideas	LS4.D Biodiversity and Humans	Students compare the different habitats.
Cross-cutting Concepts	None	None

PERFORMANCE EXPECTATIONS

Grade 3: 2-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Dimension	Name or NGSS citation	Student tasks in activity
Science and Engineering Practices	Analyzing and Interpreting Data	Students examine the feet of various animals to infer lifestyle and habitats.
Disciplinary Core Ideas	LS4.C Adaptation	Students realize that animal body parts and behavior help them live in their environment.
Cross-cutting Concepts	Cause and Effect	Students describe how animals use their body and behaviors to gather what they need to survive.

PERFORMANCE EXPECTATIONS

Grade 3:2-ESS2-2: Obtain and combine information to describe climates in different regions of the world.

Dimension	Name or NGSS citation	Student tasks in activity
<i>Science and Engineering Practices</i>	<i>Analyzing and Interpreting Data</i>	<i>Students analyze landscape pictures to characterize rainfall and temperature.</i>
<i>Disciplinary Core Ideas</i>	<i>ESS2:D Weather and Climate</i>	<i>Students create a map of weather characteristics.</i>
<i>Cross-cutting Concepts</i>	<i>Patterns</i>	<i>Students compare four locations to identify similarities.</i>

PERFORMANCE EXPECTATIONS

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

Dimension	Name or NGSS citation	Student tasks in activity
<i>Science and Engineering Practices</i>	<i>Engaging in Argument from Evidence</i>	<i>Students examine images of penguins on land and in the water.</i>
<i>Disciplinary Core Ideas</i>	<i>LS1.A Structure and Function</i>	<i>Students compare penguin abilities to human abilities.</i>
<i>Cross-cutting Concepts</i>	<i>Systems and System Models</i>	<i>Students identify synergetic components of penguin adaptations.</i>

PERFORMANCE EXPECTATIONS

Grade 4: 4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Dimension	Name or NGSS citation	Student tasks in activity
<i>Science and Engineering Practices</i>	<i>Engaging in Argument from Evidence</i>	<i>Students analyze facial expressions of vervet monkey to determine behavior.</i>
<i>Disciplinary Core Ideas</i>	<i>LS1.D Information Processing</i>	<i>Students code facial expressions.</i>
<i>Cross-cutting Concepts</i>	<i>Systems and System Models</i>	<i>Students create system of communication for vervet monkeys.</i>

PERFORMANCE EXPECTATIONS

Grade 5: 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Dimension	Name or NGSS citation	Student tasks in activity
<i>Science and Engineering Practices</i>	<i>Developing and Using Models</i>	<i>Students explore food webs and pyramid, and then build their own.</i>
<i>Disciplinary Core Ideas</i>	<i>LS2.A Interdependent Relationships</i>	<i>Students identify the role of plants and animals within a kopje ecosystem.</i>
<i>Cross-cutting Concepts</i>	<i>Systems and System Models</i>	<i>Students learn trophic levels within food pyramids.</i>

Glossary

acacia woodland. A dry savanna habitat in Africa characterized by level ground or low rolling hills, occasional acacia trees, and short grasses.

adaptation. A physical characteristic or behavior that helps a plant or animal survive in its habitat.

apex predator. An adult animal that consumes other animals (prey) but is not preyed upon.

bird. An animal with feathers.

Cape fynbos. An ocean coastline habitat in South Africa characterized by short, scrubby bushes with small leaves, nutrient-poor soil, large granite rocks, and frequent fires.

carnivore. An animal or plant that eats other animals.

climatologist. A person that studies weather patterns over time (climate).

consumer. A living organism that must eat in order to survive. Some consumers eat plant matter (herbivores), some eat other animals (carnivores), and others eat a variety of foods (omnivores).

ecosystem. A community of living things and nonliving things within an area.

endangered. Populations so low that they are moving toward becoming extinct.

equator. An imaginary line that circles the Earth at equal distance from the poles.

Ethiopian Highlands. Geographic area in the African country of Ethiopia characterized by rugged plateaus, rich grasslands, and sparse woodlands.

extinct. A species of plant or animal that no longer lives.

food pyramid. A graphic representation that illustrates the reduction of energy between the trophic levels in a food chain of a specific ecosystem. This model is also called a trophic pyramid or an energy pyramid.

habitat. The place where an animal lives.

herbivore. An animal that eats plants.

kopje. A habitat characterized by large granite rock outcroppings surrounded by level grassland. The rocks form “islands” with unique plants and animals.

Madagascar. The fourth largest island on Earth, located off the eastern coast of Africa in the Indian Ocean.

mammal. An animal that gives live birth, produces milk to feed its young, grows hair, and is able to internally regulate its body temperature.

ostiole opening. The small pore in a fruiting body.

predator. An animal that hunts and eats other animals for food.

prey. An animal that is taken and eaten by another animal (predator) for food.

producer. A living organism that is able to produce its own food (energy). Green plants and some bacteria are capable of self-nourishment.

reptile. An animal that lays eggs, has scales on its skin, and doesn't internally regulate its body temperature.

savanna. A grassy plain with few trees; found in tropical and subtropical areas.

seed. The part of a flowering plant that contains a baby plant and a supply of food inside a protective coating, and grows into a new plant.

shelter. A place to sleep, rest, or live that provides protection from predators and weather.

species. A group of animals that show common characteristics and mate to produce fertile young.

trophic level. Within the context of a food pyramid, the graphic representation of the role each plant or animal plays within a food chain.

universal facial expressions. Based on a 1960s study led by psychologist Paul Ekman, the human race recognizes eight universal facial expressions: rest, happy, sad, surprise, fear, anger, contempt and disgust.

West African forest. A tropical habitat characterized by abundant rainfall, plentiful rivers, and lush plant growth.

Close Partners



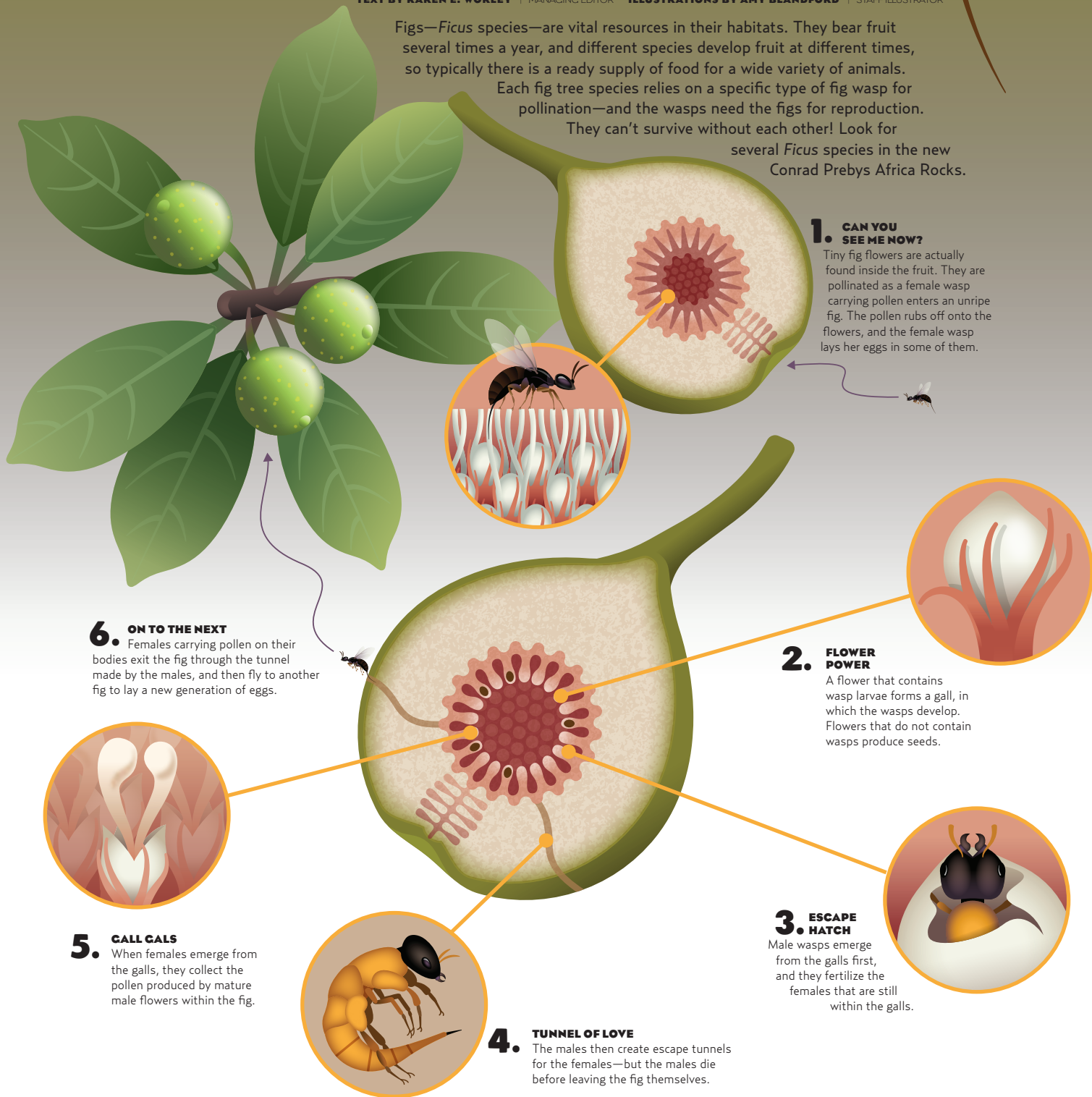
TEXT BY KAREN E. WORLEY | MANAGING EDITOR ILLUSTRATIONS BY AMY BLANDFORD | STAFF ILLUSTRATOR

Figs—*Ficus* species—are vital resources in their habitats. They bear fruit several times a year, and different species develop fruit at different times, so typically there is a ready supply of food for a wide variety of animals.

Each fig tree species relies on a specific type of fig wasp for pollination—and the wasps need the figs for reproduction.

They can't survive without each other! Look for

several *Ficus* species in the new Conrad Prebys Africa Rocks.



1. CAN YOU SEE ME NOW?

Tiny fig flowers are actually found inside the fruit. They are pollinated as a female wasp carrying pollen enters an unripe fig. The pollen rubs off onto the flowers, and the female wasp lays her eggs in some of them.

2. FLOWER POWER

A flower that contains wasp larvae forms a gall, in which the wasps develop. Flowers that do not contain wasps produce seeds.

3. ESCAPE HATCH

Male wasps emerge from the galls first, and they fertilize the females that are still within the galls.

4. TUNNEL OF LOVE

The males then create escape tunnels for the females—but the males die before leaving the fig themselves.

5. CALL GALS

When females emerge from the galls, they collect the pollen produced by mature male flowers within the fig.

6. ON TO THE NEXT

Females carrying pollen on their bodies exit the fig through the tunnel made by the males, and then fly to another fig to lay a new generation of eggs.



Hamadryas baboon



Ring-tailed lemur



Agama lizard



Red-leaved fig tree



West African dwarf crocodile



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