



The African Savannah

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Introduction to the Teacher Activity Packets

Thank you for utilizing the Staten Island Zoo's Teacher Activity Packets.

The following Teacher Activity Packet is designed to enhance the learning experience for school classes visiting the Staten Island Zoo.

The Teacher Activity Packets contain activities for students in grades K-5. The activities provided have been coordinated to reinforce the scientific and conservation information given in the Zoo's formal school presentations. The activities are designed as preparation for a Zoo visit, but contain suggestions for post-visit projects and activities. Many of the activities are multidisciplinary. These activities may be used to teach a wide variety of subjects in addition to science including creative arts, language arts, social studies and mathematics, etc.

Science Standards

The Staten Island Zoo's Teacher Activity Packets incorporate New York City Performance Standards for elementary science and are coordinated with New York State Curriculum Frameworks for science. Designated standards covered in the Teacher Activity Packet include: life science concepts such as organism characteristics and life cycles, ecological relationships, the development of scientific thinking and investigation, scientific communication as well as tool and technology uses including information acquisition from print and non-print sources.

Conservation

The Staten Island Zoo recognizes the importance of conveying a firm, well-developed conservation message. Some activities in the Teacher Activity Packets introduce children to complex conservation issues such as habitat loss, endangered species protection and pollution reduction. Some activities are designed to help students make good environmental decisions that are within their control. Furthermore, the Teacher Activity Packets provide information on opportunities where students, as individuals or as a class, can directly participate in conservation activities.

Specific Topics Covered

The following is a list of available Teacher Activity Packets and a brief description of the topics covered:

Let's Be Sensible *Grades K-2*

The activities provided will help familiarize the student with the five senses used by humans and other animals. Students will learn how some animals have adapted special senses and sense organs that work differently or are stronger/weaker than our own. The importance of the placement of these organs is also emphasized.

It's Alive! *Grades K-2*

The concepts included in this Teacher Activity Packet emphasize the defining characteristics of living things: eating, breathing, growing and reproducing. The interaction between living and non-living habitat components is illustrated, as is the importance of preserving animal habitats.

Animal Adaptations *Grades 3-5*

This Teacher Activity Packet's activities are designed to familiarize children with the concept of adaptation as a physical property or a behavior that helps an animal survive in its natural habitat. The intimate relationship between the success of animal adaptations and the stability (i.e. conservation) of their habitats is illustrated.

The African Savannah *Grades K-2 and 3-5*

In this Teacher Activity Packet, children learn to identify the climate, vegetation and landscape of the African grasslands known as the savannah. Students will discover many of the animal species normally found in this region. Students are also introduced to the conservation problems of the African Savannah including animal poaching and habitat loss.

The Rainforest *Grades K-2 and 3-5*

Through the activities provided, children are introduced to the components of the rainforest. The activities examine the vegetation layers of the forest and some of the animal species associated with these layers. Emphasis is placed on the various human uses of tropical rainforests. The unique problems of deforestation are discussed including biodiversity loss and displacement of native peoples.

We're All Relatives *Grades K-2*

Students will be able to identify animals as vertebrate or invertebrate species. Students will be able to identify the five classes of vertebrate species and some of their distinguishing characteristics.

Incredible Invertebrates *Grades 3-5*

This Teacher Activity Packet introduces the vast world of invertebrate species. Arthropods are, by far, the most abundant and diverse group of invertebrates on earth. Students learn the defining features of arthropods including exoskeletons and segmented joints. The four major groups of arthropods (including insects) are covered in the packet. Students will recognize the importance of invertebrates to humans and ecosystems in general.

We hope that you will continue to incorporate the Zoo and its educational resources into your lesson plans. We appreciate your feedback and encourage you to complete the questionnaire provided at the back of this booklet. You may mail the questionnaire to the Education Dept., The Staten Island Zoo, 614 Broadway Staten Island, NY 10310 or fax it to (718) 442-8492.

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Meeting the Needs of the NYC Teacher

Relationship to the New York City Performance Standards

The packet of activities and suggestions that follow have been designed to help make your class visit to the zoo as valuable as possible for the students. The concepts and objectives outlined and the activities presented have been chosen to provide your students with a basic knowledge of the African savannah. The activities in this packet have been designed to coordinate with the expectations of the New York City Performance Standards for science and should help you meet the goals for student performance when appropriately utilized.

A number of strategies, often in hands-on format, are presented in different activities. Some are whole class activities, but most are designed for the students to work in cooperative groups or as individuals. The activities include a variety of components such as reading skills activities, creative arts, language, theater arts, health and history. Skills in observation, sequencing, comparison, classification and problem solving may be exercised in these activities. Art or craft work is integrated into many of the activities as well. Internet URLs (addresses) and suggestions for their use as references or for direct student use have been supplied.

New York City Performance Standards for elementary science addressed in the African savannah activities include:

S2 Life Science Concepts

- S2a Demonstrates understanding of characteristics of organisms.
- S2c Demonstrates understanding of organisms and environment.

S4 Scientific Connections and Applications

- S4a Demonstrates understanding of big ideas and unifying concepts.
- S4d Demonstrates understanding of science as a human endeavor.

S5 Scientific Thinking

- S5a Asks questions about natural phenomena; objects and organisms; and events and discoveries.
- S5b Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena.
- S5c Uses evidence from reliable resources to construct explanations.
- S5d Evaluates different points of view using relevant experiences, observations, and knowledge; and distinguishes between fact and opinion.
- S5e Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations.
- S5f Works individually and in teams to collect and share information and ideas.

S6 Scientific Tools and Technologies

S6a Uses technology and tools to gather data and extend the senses.

S6c Acquires information from multiple sources, such as experimentation and print and non-print sources.

S7 Scientific Communication

S7a Represents data and results in multiple ways.

S8 Scientific Investigation

S8c Demonstrates scientific competence by completing a design.

S8d The student demonstrates scientific competence by completing non-experimental research using print and electronic information.

Introduction to the African Savannah

Grassland environments exist worldwide. Although there are many variations, all grasslands share the common characteristics of having only 30 to 50 inches of rain annually and an uneven seasonal occurrence of rainfall. Tropical grasslands have a wet-dry cycle of seasons, instead of cold-warm seasons. (For comparison, Staten Island has about twice as much rain spread out over the year.)

In Africa, the grassland biome is known as “savannah”. The temperature is always warm, but the rainy wet season is followed at least five months of drought. This rich environment supports some of the best known wildlife in the world.

On the savannah temperatures are consistently high and rain is seasonal. Tall grasses are the dominant form of vegetation. Trees are scattered over the landscape, but low rainfall, periodic fires and grazing keeps down the number of trees. The umbrella-shaped Acacia tree and stocky Baobab tree are widespread in the savannah biome. Trees survive where their roots find water held deep beneath the surface.

Outcroppings of rock known as kopjes (pronounced “copies”) provide unique habitats for many animals. Kopjes are made of very old granite rock which has weathered and eroded. Its surface has broken up becoming rough and furrowed. In the open grasslands, kopjes noticeably stand out against the surrounding plain.

The kopjes have their own types of vegetation and wildlife like rocky islands in a sea of grass. They provide shade and protection from the dangers of fire and flood.

The most conspicuous form of wildlife on the kopje is the hyrax, a diminutive relative of the elephant. Birds of prey use the inaccessible tops of some of the rocks as safe nesting sites. Dik-diks live at the foot of a kopje. These very small antelope weigh only about 9 pounds. Snakes, such as the burrowing python, live in the rock crevices and will eat hyraxes as well as smaller creatures.

The abundant grasses support the greatest number of large grazing mammals in the world, while the trees are browsed by antelope, elephants, and giraffes. As many as sixteen grazing and browsing species may coexist in the same area. Each has its own food

preferences, and they divide the resources up according to their needs and time of day.

With this many herbivores, the savannah supports many carnivores. Most are both hunters and scavengers, taking advantage of opportunities as they arise. Each also exercises its own particular hunting strategies and behaviors in finding shelter, raising its young and coping with getting the necessities of life.

Bird life also abounds on the savannah. The ostrich is perhaps the best known. The Ground Hornbill and Starling featured in the Staten Island Zoo's exhibit are other birds of the savannah, as are louries, shrikes, flycatchers, and green pigeons. Hawks, vultures and other birds of prey also occur throughout these grasslands.

Reptiles are well adapted to savannah conditions. Savannah monitors, burrowing pythons, cobras and a variety of other snakes and lizards live on the savannah feeding on the rodents, small mammals and birds. The Leopard Tortoise and its relatives are other reptiles that live on the land, while crocodiles inhabit rivers.

At the Staten Island Zoo great care has been taken to recreate a savannah environment to provide a natural habitat for the animals.

Concepts, Objectives and Vocabulary for Grades K - 2

Concepts to be Developed

1. Every plant and animal needs a habitat; a place to live where it can get enough air, water, food, space and shelter.
2. Savannahs are grasslands, with very few trees, but lots of grass.
3. Savannahs are in tropical places. It is warm every day, all year long, and there are no cold times.
4. Savannahs have a wet season and a dry season, rather than hot and cold seasons. there will be many months with no rain, then several months with lots of rain.
5. The year round warmth and the seasons of wet and dry, means that special kinds of animals live in the Savannah that can live nowhere else.
6. Humans are killing so many plants and animals in the Savannah that many are endangered and some may become extinct. To save these animals and plants we must save their homes.
7. There are several steps that humans can take to protect African wildlife as well as local wildlife.

Program Objectives

Upon completion of the program, students will be able to:

1. Describe the components of a habitat.
2. Give a definition of "African Savannah" and name four animals that make the savannah their home.
3. Explain what an endangered species is and give an example of an endangered animal.
4. Give two examples of how we can protect both African and local wildlife.

Vocabulary

Prior to visiting the Zoo, it is suggested that you familiarize the class with the following vocabulary terms:

Endangered - present populations are too small to survive very long; may become extinct in the near future

Extinct - no longer living: all members of the species are now dead

Grasslands - an environment where grasses are the main form of plant life; grasslands are one of the major biomes on the land

Habitat - the particular type of place an animal lives in

Migrate - to move about in a regular pattern, following a path where food and water are available.

Seasons (wet/dry) - it rains during part of the year, but is dry the rest of the year

Tropical - the area around the equator where temperatures are always warm

Concepts, Objectives and Vocabulary for Grades 3 - 5

Concepts to be Developed

1. Every plant and animal needs a habitat - a place to live where it can get enough air, water, food, shelter and space in the proper arrangement.
2. Savannahs are grasslands, with very few trees, but lots of grass.
3. Savannahs are in tropical places. It is warm every day, all year long, and there are no cold times.
4. Savannahs have a wet season and a dry season, rather than hot and cold seasons. there will be many months with no rain, then several months with lots of rain.
5. The year round warmth and the seasons of wet then dry, means that the special animals that live in the savannah must adapt to these extremes in climate.
6. The savannah is being destroyed and its wildlife is being killed. Many kinds of animals and plants are becoming endangered and may ultimately become extinct without our help.
7. There are several steps that each of us can take to help protect the habitats of African wildlife as well as our local wildlife.

Program Objectives

Upon completion of the program, students will be able to:

1. Give a definition of "African Savannah" and name four animals that make the savannah their home.
2. Describe the components of a habitat.
3. Name four animals that make the savannah their home and identify them as plant eater (grazer/browser), meat eater (predator/scavenger), or both.
4. Name two ways in which savannah animals can survive the extremes of rainfall.
5. Define "endangered" and "extinct" animals. State one example of each and one way in which we can save wildlife and wildlands - either in the savannah or locally.

Vocabulary : In addition to the vocabulary listed for grades K-2, grades 3-5 should also be familiar with the following vocabulary:

Browser - an animal that feeds on the low hanging branches of trees.

Carnivore - a meat eater

Estivate - a hibernation-like state in which an animal's heart and breathing slow down and it becomes inactive to conserve energy during a dry season.

Grazer - an animal that eats grasses.

Hibernate - a state in which an animal's heart and breathing slow down and it becomes inactive to conserve energy during a cold season.

Predator - an animal that hunts other animals

Prey - an animal that is hunted by others

Savannah - an area where grasses are the main plant type and there is a wet and a dry season instead of hot and cold seasons.

Scavenger - an animal that feeds on any edible materials it can find especially the prey of other animals, which the scavenger may even steal.

Pre-trip Activities:

1. The Biomes of Africa (Grades 3-5)

Concepts : Savannahs are grasslands, with very few trees, but lots of grass (see *Concepts to be Developed #2* on page 13). Savannahs are in tropical places. It is warm every day, all year long, and there are no cold times (*Concept #3*). Savannahs have a wet season and a dry season, rather than hot and cold seasons. There will be many months with no rain, then several months with lots of rain (*Concept #4*).

Background : Three general types of ecosystems or biomes are found in Africa. These biomes are basically the result of rainfall and temperature and are defined or recognized by the dominant plant types.

Northern Africa is covered by the Sahara, a very hot and dry desert. The Kalahari and other small deserts are found in southern Africa. On the eastern coast extending inland, the tropical rainforest is hot and wet year round. The savannahs occupy a belt between the rainforest and deserts where rainfall is seasonal and warm temperatures are year-round.

Materials : 1. Map of Africa, provided on the following page
2. Three colors of crayons: red for the deserts, green for the rainforests and yellow for the grasslands

Preparation : 1. Make a copy of the map for each student.
2. Have enough crayons (or colored pencils) available for the entire class.

Action : **1. Explain what a biome and write the definition on the board:** “A biome is an area of Earth’s surface distinguished by rainfall and temperature.”

2. Instruct the students to color the map according to the key given. Younger students may need close guidance.

3. When all students have completed coloring the map, have them look at their maps while explaining the following:

A. Since the equator runs through the middle of the continent, Africa has a tropical climate, where it is always warm.

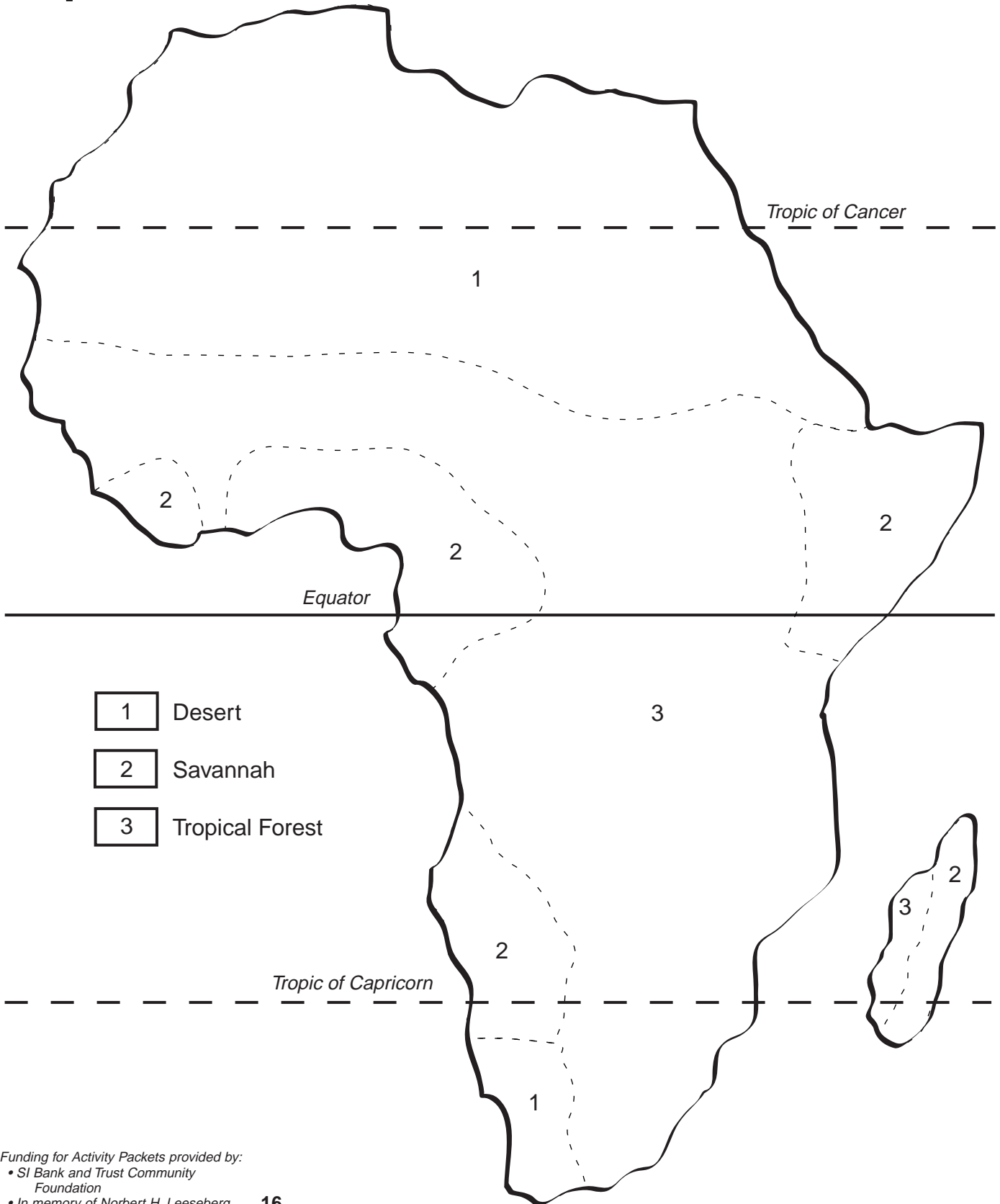
B. The greatest rainfall occurs along the eastern coast. High rainfall and warm temperature create a rainforest in this area. This is the area that they have colored green.

C. The least rainfall occurs in northern Africa and an area in the south. High temperatures and low rainfall create deserts (the Sahara

and Kalahari, respectively) in these areas. These deserts have been colored red.

D. The areas between the rainforests and deserts receive a moderate amount of rain during the wet season, but very little rain during the dry season. Combined with year-round warm temperature this creates the savannah - a grasslands, with very few trees, but lots of grass. This is the area they will be studying on their visit to the Zoo. They have colored the savannahs yellow.

Map Of Africa



Pre-trip Activities:

2. What is a Savannah? (Grades K-2)

Concepts : Savannahs are grasslands, with very few trees, but lots of grass (see *Concepts to be Developed #2* on page 11). Savannahs are in tropical places. It is warm every day, all year long, and there are no cold times (*Concept #3*). Savannahs have a wet season and a dry season, rather than hot and cold seasons. There will be many months with no rain, then several months with lots of rain (*Concept #4*).

Background : The environment of the savannah is very different from the rainforest and deserts that are found in other parts of Africa. It is also very different from anything in the eastern United States and is therefore unfamiliar to students. The location and physical environment of grasslands, kopjes and small clusters of trees are the emphasis of this activity.

The mural created should be saved for use in the “Whose Habitat is That?” activity which should follow this lesson.

Materials

1. Map of Africa with biomes indicated by a key
2. Crayons or colored pencils for coloring in the maps
3. Pictures of a savannah - nature magazines and the internet are good sources.
4. Mural-sized drawing paper to fit a wall space or a temporary location against chalkboard
5. Drawing or painting supplies to make the mural

Preparation

1. Make each student a copy of the map of Africa (page 16)
2. Have paper, crayons, colored pencils and any other materials available)
3. The savannah illustration provided (page 19) may be used as the basis for the mural.

Action

1. **Distribute the maps** and ask the students to color in the savannah as indicated by the key.

2. **As students look at the completed maps, explain:**
 A. The savannah is warm all year because it is near the equator, and
 B. That it is between areas of high rain (the rainforests) and less rain (deserts).

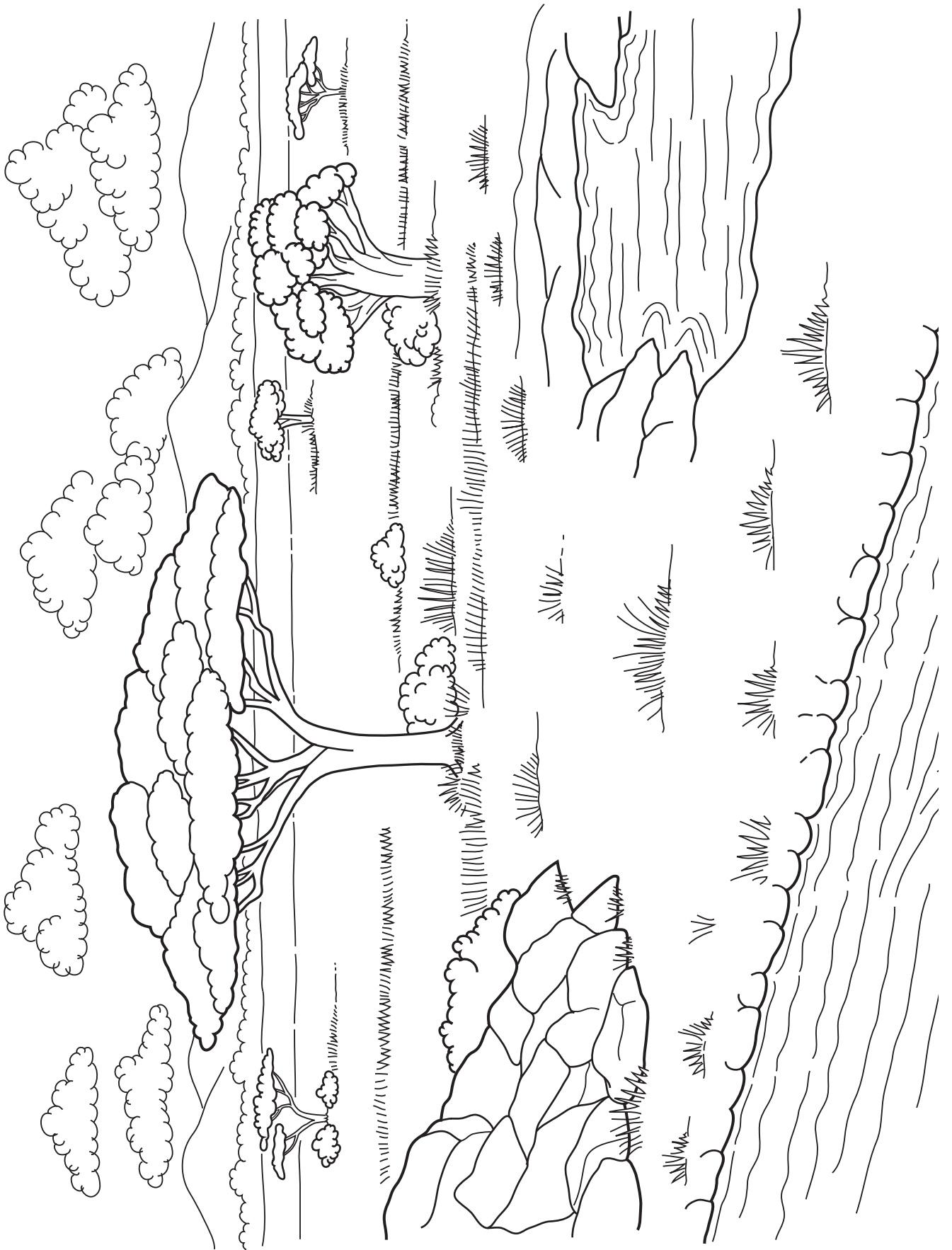
3. **Show students the illustrations of the savannah.** Ask them to describe their impressions of the pictures. Guide the discussion towards recognizing that open grasslands, kopjes and tree clusters are the main habitats of the savannah.

4. Explain that there isn't enough rainfall for very many trees, but there is enough for grasses to grow. Kopjes are the rock outcroppings that stand out over the surrounding flat grasses.

5. Using the pictures and illustrations provided, have students design and draw a mural that includes both grasslands and a kopje. A cluster of trees and waterhole or river may also be included.

6. Save the mural for use in the "Whose Habitat is That?" activity.

Savannah Illustration



Funding for Activity Packets provided by:
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• In memory of Norbert H. Leeseberg

Pre-trip Activities:

3. Whose habitat is that? (Grades K-2)

Concepts : Every plant and animal needs a habitat; a place to live where it can get enough air, water, food, space and shelter (see *Concepts to be Developed #1* on page 11). The year-round warmth, and the seasons of wet and dry, means that special kinds of animals live in the savannah that can live nowhere else (*Concept #5*).

Background : While the savannah is primarily grasslands, many habitats exist within the savannah. Besides the grasslands themselves, the most obvious animal habitats are the rivers, kopjes (rock outcroppings) and stands of trees. Each of these areas provides different conditions and therefore serves as a habitat for different animals.

The animals of the savannah are adapted to the particular conditions of the habitats that exist there. No other place is the same as the African savannah or the organisms that live there.

Materials : 1. Copies of the “Animal Adaptation” cards (from the “Adaptations to the Savannah” activity. - page 35)
2. The mural from the “What is a Savannah” activity
3. Glue in easy-use dispensers

Preparation : 1. Make copies of the “Animal cards” in advance and have the other supplies available.
2. Tape the mural of the savannah to the wall, if it isn’t already.

Action : **1. Explain to students that a habitat is a place where an animal lives.** Every animal needs its own particular habitat where it can get enough air, water, food, space and shelter. Give some examples: a squirrel needs trees that produce acorns or nuts and places to build nests, its habitat is a forest; a shark needs salt water, its habitat is the ocean.

2. Explain that the savannah provides habitats for particular animals that live there and nowhere else. Give examples: the grasses of the savannah provide food for the many grazers and browsers; kopjes provide a habitat for the hyrax and burrowing python.

3. Explain that each animal lives in a particular habitat in the savannah. The animals of the kopje are different from those that live on the grasslands. Most grazers couldn’t get enough food on a kopje, while a hyrax would be too exposed on the open savannah.

4. Ask students to draw a picture of one of the animals of the savannah, or use the *Animal Adaptation cards* (page 37). If they draw their own pictures, assign each student a different animal.

5. Ask the class to decide where each animal belongs on the mural. (one animal at a time). In determining the habitat of each animal direct the class to consider what the animal eats and where it finds shelter. Once its place has been determined, have the student's glue their animals in place. (Assistance may be required.)

Pre-trip Activities:

4. Habitats: Variety Within an Area (Grades 3-5)

Concepts : Every plant and animal needs a habitat - a place to live where it can get enough air, water, food, shelter and space in the proper arrangement. (see *Concepts to be Developed #1* on page 13). The year round warmth and the seasons of wet then dry, means that the special animals that live in the savannah must adapt to these extremes in climate. (*Concept #5*)

Background : The African savannah is often generally described as expansive grasslands, where many animals adapted to a grassland life are found. While this is true, there are many smaller environments within the grasses. Clusters of trees, waterholes, rivers and rock outcroppings known as kopjes are examples of smaller ecosystems within the savannah.

There are many smaller ecosystems that exist in relatively small areas within larger ecosystems. Temperature, moisture and the type of soil are major factors in creating these locally specialized environments. These smaller ecosystems interact with one another and the larger ecosystems around them, each depending on the others.

These ecosystems provide habitats for particular types of animals. Kopjes, areas of exposed rock, provide a habitat for certain animals. The rock hyrax, for instance, is well adapted to living in rock crevices in the kopjes, as are the pancake tortoise and the burrowing python. River ecosystems in the savannah provide habitats for another group of organisms, including hippos and crocodiles.

The part of North America we live in is classified as a temperate forest. On a walk through a park in our area, you'll notice that different plants and animals live in different places within the area.

Materials : 1. A thermometer
2. An outside area
3. Pencil and paper

Preparation : 1. Find the spot in your area that is well shaded. The north side of a tree is good. If a tree isn't available at your location, you can use the shady side of a house or apartment building.
2. Find a second spot that receives direct sunlight all day. An open field or large lawn are good places to try.

- Action**
- 1. Begin as early as possible in the morning.** Direct students to the spot that is well shaded. Have them record the animals, including insects and other invertebrates that they see there. Measure the temperature with the thermometer and record it as well.
 - 2. Move to the spot that receives direct sunlight all day.** Again, instruct the students to record the animals found at this location. Don't forget to measure and record the temperature here as well..
 - 3. Repeat this process of recording** the animals and the temperature again at noon and at the end of the school day.
 - 4. On the next day, look over the data.** Direct students to answer the following questions about the two habitats they have observed: Which area got the hottest? Which area had the greatest temperature range (difference between high and low temperatures)? What types of plants, insects or other living things were observed at each location? Did the same animals live in each habitat? How were the animals in the two habitats different?

Pre-trip Activities:

5. Create a Critter for the Savannah (Grades K-5)

Concepts : Every plant and animal needs a habitat; a place to live where it can get enough air, water, food, space and shelter (see *Concepts to be Developed #1* on pages 11 and 13). The year-round warmth and the seasons of wet and dry mean that special kinds of animals live in the savannah that can live nowhere else (*Concept #5*).

Background : Almost any feature of an animal that you can think of is an adaptation to the habitat in which it lives. Many examples are easily found in savannah animals. The leopard's spots provide camouflage, a gazelle has long legs for running from predators and a meerkat can stand upright to look for predators and other meerkats. In this activity, students can use their imagination to construct animals of the savannah. Their creations may simply mimic real animals or may be their own fantastic concoction - as long as it serves as a viable adaptation to the savannah environment.

Materials :

1. A carrot or potato for each child
2. Pieces of colored construction paper cut into various shapes (triangles, squares, circles).
3. Paper clips
4. Toothpicks
5. Glue
6. Other art or office supplies (sequins, feathers, ring fasteners.)

Preparation : Gather the materials. Cut the colored paper into a few basic shapes, but if possible students should custom design their "feathers", "scales", "antennae", and other parts they desire. Simple art supplies - colored feathers, fake fur, sequins, paperclips, toothpicks, craft sticks are even better.

Action :

1. **Explain to the students that they will be building an imaginary animal that is adapted to the savannah environment.** They will use the carrot or potato for the body. Toothpicks or paperclips may be used to make legs (if it has legs!). A head, wings, antennae, eyes or other additional parts can then be added from other materials.

2. Remind the students to consider the following things when designing their animals for a savannah environment:

A. What does it eat? What food is available on the savannah? (grasses, leaves, other animals)

B. How does it survive through periods of drought? Does it store water, dig for water or eat juicy leaves?

- C. Should it have long, thin legs for running or short, thick legs for digging?
- C. Does it camouflage itself - should it be all one color or would a speckled, spotted or other pattern work better? Which colors are best to camouflage it?

3. Distribute materials and give students sufficient time to build their animals. Ask questions and provide guidance as they construct their animals. It is often helpful if you provide an example.

4. When completed, have each student name and describe their animal. They should be able to explain at least one way their imaginary animal is adapted to meet one of the criteria discussed beforehand (step 2). Take photos to bring with you on your visit to the zoo. Older students may write a paragraph or two about their critter.

Pre-trip Activities:

6. Biodiversity and Endangered Species (Grades 3-5)

Concepts : The savannah is being destroyed and its wildlife is being killed. Many kinds of animals and plants are becoming endangered and may ultimately become extinct without our help (see *Concepts to be Developed # 6* on page 13). There are several steps that humans can take to protect African wildlife as well as local wildlife (*Concept # 7*).

Background : One of the things that makes the African savannah important is the great number of different kinds of living things found there. Biodiversity - the wide variety of life on Earth - is no accident. Living things depend on one another for survival and have evolved thriving ecosystems that can sustain many different populations.

Recently, humans have become more concerned about biodiversity. As human population grows, our needs and activities are pushing many species to extinction. Between 20,000 to 30,000 species of living things become extinct every year, largely due to the destruction of their habitats.

Action **1. Begin by defining biodiversity as the wide variety of animals found on earth.** Explain that living things are interdependent - each depending on one another for survival. A healthy ecosystem sustains many different populations if it is to meet the needs of each individual.

2. Explain that human development of wild areas results in the loss of habitats for animals. Between 20,000 and 30,000 species become extinct each year as humans destroy animal habitats. Ask students to brainstorm some of the reasons we should be concerned about habitat loss. Some reasons (this is not an exhaustive list) might include:

A. Ecosystems don't work as well when members are lost. When too many members of an ecosystem become extinct, the ecosystem itself may disappear. In spite of our technology, humans still depend on natural ecosystems for some of our most basic needs such as oxygen and fresh water.

B. Our own food sources are another reason to be concerned. We presently depend on less than 20 cultivated crops for most of our food. Diseases that destroy these crops could put our food sources at risk. Genetic material from wild species has been used to produce stronger, disease-resistant hybrids. If we destroy the wild species, we lose the potential they have as food and for genetic material.

C. Medicine is also affected by biodiversity. Many medicines are

produced from wild plants and animals. Many more are waiting to be found if they don't become extinct, before we find them!

D. Biodiversity keeps the Earth a healthy place for all species - living things are inter-related and need each other to survive. Biodiversity is necessary for all species - including our own!

3. Ask students to describe some of the things they can do to help maintain biodiversity both in their neighborhoods and in the world. Some of these things might include:

A. *Protecting local habitats.* Helping out in beach and park clean-ups or reforestation projects. Preserving natural areas (like Prospect park or the Greenbelt) in your neighborhood. Local species of wildlife benefit, as well as many migratory birds. Even small neighborhood parks matter.

B. *Leaving wildlife in the wild.* Learn about wild things by watching them in their natural habitat, without removing them. Plants and animals frequently die when taken out of their natural environment. Even if they survive, they don't produce offsprings and can't perform their natural jobs in their ecosystems.

C. *Reduce, reuse, recycle, refuse.* The fewer natural resources humans use, the more is left for wildlife. Reduce the amount of packaging and unnecessary items you use. Reuse plastic or paper cups at a picnic, instead of throwing them out and using new ones. Recycle paper, glass and plastics. Refuse to buy products that destroy endangered natural areas. The less you buy these items, the less you encourage their destruction. Buy good quality items which last longer. Be a careful consumer to reduce the amount of pollution produced, and save water, energy and wildlife.

D. *Be a responsible pet owner.* Keep your cat indoors and your dog on a leash! In the United States alone, over 4 million songbirds are killed by cats every day! Neutering or spaying pets helps prevent unwanted animals. Stray cats and dogs often endanger wildlife and many are "put to sleep" because nobody can take care of them. Neutering or spaying pets is important in saving wildlife.

4. Ask students to write a short play comparing an "average" consumer to a careful consumer on a sit down trip to a fast-food restaurant. Things for the student's to consider should include: How much ketchup does each one take? Do they take a cover and straw

for their soft drinks. How many napkins do they take - just enough or do they throw away a lot ? Is a tray liner really necessary?

Students may also consider things the fast-food restaurant does that help or hinder conservation. Do they use recyclable plastics? Do they provide containers for recycling? How much of the packaging that the cashier puts on the food is thrown away as soon as you get to the table?

The book, **50 Simple Things Kids Can Do To Save The Earth**, by The Earthworks Group, is a good reference for this activity.

Pre-trip Activities:

7. Disruptive Coloration: Why a Zebra has Stripes and a Leopard has Spots (Grades K-5)

Concepts : Every plant and animal needs a habitat - a place to live where it can get enough air, food, water, shelter and space in the proper arrangement (see *Concepts to be Developed #1* on pages 11 and 13).

Background : One method that an animal uses to make itself difficult to for predators to see is called disruptive coloration. In this form of camouflage, spots, stripes, or other color patterns break up an animal's outline. Such patterns may hide the animal's true shape or make it difficult for a predator to see it on a similarly disruptive background. Predators, such as the leopard, use their spotted patterns to avoid being seen. The spots on their fur help them to get close to their prey before being seen. Prey also use this form of camouflage to hide from predators.

Birds, reptiles amphibians, and fish also use disruptive coloration. The flounder can even change its patterns to match the sand, mud or gravel of the seafloor it is on.

The camouflaged fatigues worn in the military and by hunters use disruptive coloration.

Materials

1. A roll of patterned decorative wrapping - a natural pattern such as vines or leaves is best - the more intricate, the better.
2. Scissors
3. White glue
4. Colored construction paper (choose a color that obviously clashes with the pattern on the wrapping paper)
5. A hole punch
6. 5 to 10 tweezers. Optional - younger students especially may use their hands

Preparation

1. Cut a piece of the wrapping paper about ten feet long and tape it to the floor of the classroom.
2. Cut another piece about a foot long from the wrapping. Apply a thin layer of glue to half of the underside of this piece then fold it over onto itself. The result should be a piece of paper with the decorative pattern on both sides. When dry, punch 300 holes from this wrapping paper. Save the holes - these will be the "camouflaged circlets" used for prey in the activity.
3. Punch 300 holes from colored construction paper. These will be the "clashing circlets".
4. Punch one hole from white paper to be used as an example to give an idea of what a circlet is.

5. Prior to beginning the class, randomly scatter the 600 holes (henceforth known as “circlets”) along the length of the paper taped to the floor. If possible, do this before students enter the room.
6. Older students should use tweezers if possible to give them less time to hunt for the camouflaged “circlets”. Younger students, on the other hand, may use their hands, have a longer time limit (or none at all), and larger “circlets” may be used if possible. Do the math for younger grades, or simply observe the basic concept that “camouflaged animals get caught less often” for the youngest children.

Action

1. Explain to the students that they are going to be playing the role of predators in a “Predator Prey Game”. Describe the prey simply as “circlets” and hold up the one plain white “circlet” as an example - explaining that the prey isn’t necessarily the same color as the example.

2. Give the following instructions to the class:

- A. As a predator of circlets (holes punched from paper), you must collect 5 circlets to meet your daily nutritional requirements.
- B. You will have only 30 seconds to do this using the tweezers (if available) to pick up the circlets.
- C. After you have gathered your circlets, you must save them.

3. In groups of between 5 to 10, allow the students to pick up the circlets in 30 second sets. As they finish their turns, they should count up how many of the “camouflaged” and how many of the “clashing” varieties of circlets are collected. A student may be assigned to draw the class data chart on the board and tabulate data from the class as the teacher supervises the remaining groups of children.

4. Copy the following chart onto the board without filling in the titles of the columns or rows before class. Students may help draw it on the board. Individual copies for each student may also be provided without titles. Do not fill in the titles until the activity is in progress. Instead of the titles “disruptive” and “clashing”, students may desire to designate their own titles for the two types of circlets under teacher supervision.

5. Data Collection Chart

A. Number of “camouflaged” collected:

_____ (tally individual data) = _____ in total

B. Number of “clashing” collected:

_____ (tally individual data) = _____ in total

C. Number of “camouflaged” that escaped collection:

_____ (300 minus the number collected in A.) = _____

_____ escaped the predators

D. Number of “clashing” that escaped collection:

_____ (300 minus the number collected in B.) = _____

_____ escaped the predators

6. After everyone has had a turn, count up the totals for the class. Pose the following questions to the class:

A. Which was caught most often, the “camouflaged” or the “clashing” circlets?

B. Why do you think they were captured more often?

C. Which escaped the predators most often, the “camouflaged” or the “clashing” circlets?

D. Why do you think they were captured less often?

7. Review the concept of camouflage as coloration which causes an animal to be more difficult to pick out against the background.

Why or why didn't the experiment demonstrate this concept?

Follow-up

1. Send statistics to the Zoo if you have tried this experiment. Please include a piece of the wrapping paper used.

2. Was this worthwhile? Did it make the point that a disruptive pattern breaks up the pattern of the animal making it harder to see? Did the students understand that a disruptive pattern did not have to be a perfect match to help hide the animal?

Pre-trip Activities:

8. Cheetah: A Quick Sprinter (Grades 3-5)

Concepts : Every plant and animal needs a habitat - a place to live where it can get enough air, food, water, shelter and space in the proper arrangement. (see *Concepts to be Developed #1* on page 13.)
Savannahs are grasslands, with very few trees, but lots of grass. (see *Concept #2*)

Background : Many people know the cheetah as the fastest moving animal on land. This reading exercise discusses the reasons for its need for speed.

Materials : “A Cheetah” illustration, “Cheetah Fact Sheet” and questions

Preparation :
1. Make a copy of “A Cheetah” illustration, “Cheetah Fact Sheet” and accompanying questions for each student.
2. Distribute copies of the “Cheetah Fact Sheet” to the students. They may either read these alone or as a class.

Action : After reading the “Cheetah Fact Sheet”, students may individually or as a class answer the questions posed. The teacher should review these questions with the class if answered individually.

A Cheetah



Cheetah Fact Sheet

The reputation of being the fastest land mammal is held by the cheetah, a large cat native to the African savannah. It can reach speeds over 60 miles per hour. Cheetahs can maintain this speed for only a minute or two before stopping.

Adaptations are things that an animal has or does to help it survive and reproduce in its natural habitat. The cheetah's ability to run so fast is directly related to the way it hunts. Speed is an important adaptation for this cat. On the savannah, with few trees and the year-round warmth, there are many antelope and other grazers to provide food, but few things to hide behind.

Other large cats wait in ambush or stalk up close to prey before making a short, sudden strike. Cheetahs have their own unique style. Though they do eat hares, rodents and birds, cheetahs prefer to prey on gazelles, impalas and other hoofed animals. After spotting a herd, a cheetah quietly stalks to about 100 yards. Instead of continuing to get closer, the cheetah breaks into a sprint toward the herd scattering it in sudden fear. When the cheetah catches up to one of the fleeing animals, it bites or claws the prey's hind legs causing it to fall. The cheetah then grasps the prey's neck with a suffocating grip with its jaws.

This style of hunting is an adaptation for living on the savannahs of Africa. These flat, open grasslands provide a home for over forty species of hoofed animals, giving the cheetah the opportunity to use its speed to its best advantage.

Now that you have read about the cheetah, can you answer the following questions?

1. How fast can a cheetah run?
2. How long can it maintain this speed?
3. What does a cheetah prefer to hunt?
4. How does a cheetah's style of hunting differ from other large cats?
5. How does a cheetah's ability to run so fast help it catch prey?
6. How is the cheetah's running ability an adaptation to living on the savannah?

Pre-trip Activities:

9. Adaptations to the Savannah (Grades 3-5)

Concepts : The year round warmth and the seasons of wet then dry means that the special animals that live in the savannah must adapt to these extremes in climate (see *Concepts to be Developed #5* on page 13).

Background : Almost everything you observe about an animal in one way or another illustrates an adaptation that animal has to its environment. This includes the animal's coloration, shape, size and even its behavior.

Animals that live on the savannah are no exception. Indeed, many savannah animals demonstrate unique and interesting adaptations to life in this type of grasslands.

Materials : 1. 30 Index cards
2. Sources of pictures of the ten animals listed below (natural history magazines that may be cut up, print-outs from the internet or CD ROMs, etc.)

Preparation : 1. Refer to the list of animals which follows.
2. Prior to this lesson the teacher should prepare the index cards for this activity. Ten cards should have a picture of the animal attached to them. Another ten should have the "Adaptations" written on them - one per card. The final ten cards should have the "Survival value" written on them - again, one per card.

Action : 1. **Divide the class into ten working groups of 3-4 children per group.**

2. **Distribute one picture card of an animal to each group.** Allow the children a few minutes to identify their animals and share any knowledge they have of that animal with their group.*

3. **Once the animals are recognized and discussed, randomly pass out the "Adaptation" cards, one per group.** If a groups "adaptation" card does not match their animal, they must negotiate with other groups to trade cards so that they get the adaptation that matches their animal. Teacher assistance will be required.

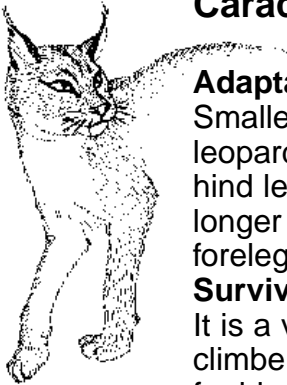

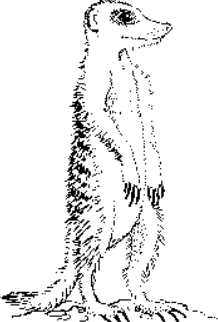
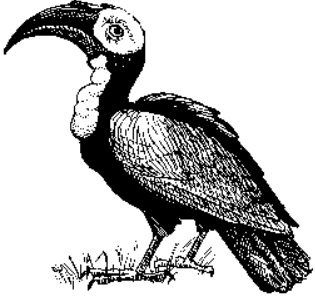
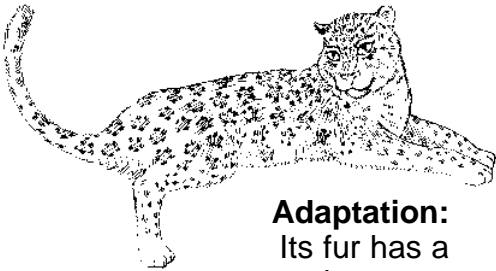

4. **When all adaptations are correctly matched, move on to the "Survival Value" cards.** Again distribute these cards randomly, one to a group. If a group's "Survival Value" card does not match their animal, they must negotiate with other groups to trade cards so that they get the adaptation that matches their animal. Teacher assistance will be required.

5. **After all "Adaptation" and "Survival Value" cards are correctly**

matched, summarize the class findings on the board.

*As an alternative to steps 2-5, the teacher may read the cards, one at a time, asking which group thinks it has the appropriate animal. As students correctly identify their adaptations or survival values, the teacher may then hand the card to the group.

Savannah Adaptations Cards

 <p>Caracal</p> <p>Adaptation: Smaller than the leopard, this cat has hind legs that are longer than its forelegs.</p> <p>Survival Value: It is a very good climber and can hunt for birds, leaping into the air after them.</p>	 <p>Baboon</p> <p>Adaptation: Can stand on its hind legs and has hands with opposable thumbs (the thumb can touch other fingers).</p> <p>Survival Value: Can reach up into low trees and can grasp things with its hands.</p>
 <p>Meerkat</p> <p>Adaptation: As many as 40 individuals may live in the same community burrow.</p> <p>Survival Value: Individuals warn each other of danger and help one another.</p>	 <p>Hornbill</p> <p>Adaptation: A large heavy bill</p> <p>Survival Value: It can eat a wide variety of food on the ground, rarely needing to fly.</p>
 <p>Leopard</p> <p>Adaptation: Its fur has a spotted pattern.</p> <p>Survival Value: Spots break up its shape making it easier for this predator to ambush prey.</p>	 <p>Savannah Monitor</p> <p>Adaptation: Long, sharp claws and scaly skin</p> <p>Survival Value: It can dig to find food and shelter from the hot sun.</p>

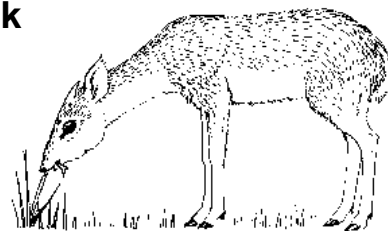


Ball Python

Adaptation: The tail on its legless body is shaped like its head.

Survival Value: When frightened it rolls into a ball with its tail on the outside to fake its head.

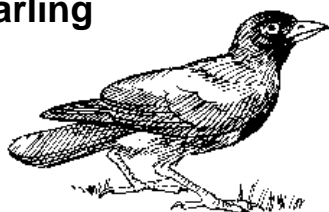
Dik-dik



Adaptation: Like the larger hoofed grazers, it has clipper-like incisors (front teeth).

Survival Value: It can eat a variety of young leaves, shrubbery, grass, fruit and buds by snipping them off with its teeth.

Starling



Adaptation: Large flocks of these birds follow herds of grazing mammals.

Survival Value: They eat the insects stirred up as grazers walk through the grass.

Rock Hyrax



Adaptation: The soles of their feet are moist and rubberlike.

Survival Value: This gives these rock-dwelling animals traction on smooth surfaces and steep slopes.

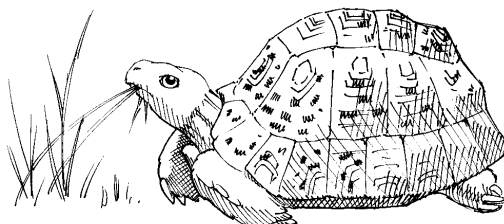


Bushbaby

Adaptation: Very large eyes, both facing front

Survival Value: It can see well at night and can judge distance when leaping between trees.

Leopard Tortoise



Adaptation:

A shell that it can pull its legs and head into

Survival Value:

The shell makes it difficult for predators to get at the animal's body.

What to Do After Your Trip to the Zoo

Research Individual Species : Students can research individual species of savannah animals and prepare reports using text and/or internet resources. A particularly useful internet site can be found at <http://www.fifth.bangor.k12.me.us/Webquests/Savannah/savannah.htm>, known as *Savannah Safari*. It guides students as they play the role of newspaper reporters to describe the lives of African animals. This site is well organized and contains references for students to complete a project. It also includes supportive teacher references.

Ecology Pyramid : Ecological concepts of interdependence, the flow of energy, biomass and numbers are often described using ecology pyramids. The animal cards provide in this booklet may be used to identify the roles of each animal in the pyramid of the savannah. What's for dinner on the Savanna is an internet site at <http://school.discovery.com/specials/aek/savanna.html> which contains a useful activity about the interconnection of the species in an ecosystem using the African savannah as the example. It contains useful diagrams of ecology pyramids and a well-organized lesson plan.

Make a Food Web : Use animals of the African savannah to construct a food web. Children play the roles of different animals to construct a food web by linking prey to their predators using lengths of yarn. Simple food chains may be constructed with lower grades. Older students may interconnect the food chains to produce food webs demonstrating the interconnections between animals in the savannah. Have children hold up pictures of the animals they represent when connected with yarn and take a photo to send to the Zoo.

Research Endangered Species : Have students research endangered animals of the savannah. Students might consider (a) reasons why their species is endangered (b) what is being done to save them and (c) why they should be saved from extinction. Send the completed reports to the Zoo for display!

Research Human Cultures : Assign students to research the human cultures which are native to the savannah. How do they build shelters, cultivate crops and raise animals for food? Can students find (and try out) recipes for foods used by the people of the savannah? Is any of the savannah wildlife mentioned in their music or mentioned in songs? The information at <http://www.nhm.org/africa/> explores the continent of Africa and its peoples from historical and contemporary perspectives and includes hands-on activities, multimedia presentations and African artifacts.

Construct a Diorama : Have students construct diorama of the savannah environment. Encourage some students to build kopjes, and others to build grassland or river habitats. Three or four animals should be included in each habitat and students should be able to explain how the animals are adapted to finding food, water, and shelter in their habitat. (Younger students may be assigned only one or two animals.)

Bibliography and Resources

- Books**
1. **Exploring Environments** by Ruth Yarrow (available at the Staten Island Institute of Arts and Sciences) (teacher reference for further activities)
 2. **African Wildlife** by Stephen Krasemann and Barbara Bach, Northward Press, 1998 (source of additional pictures)
 3. **African Wildlife** (Africa Today) by Warren J. Halliburton, Crestwood House, 1992 (ages 9-12)
 4. **Here is the African Savanna** by Madeleine Dunphy, Hyperion Press (ages 4-8)
 5. **African Savanna** by Donald M. Silver, McGraw-Hill (ages 4-8)
 6. **Endangered Grassland Animals** (Endangered Animals Series) by J. David Taylor, Crabtree Publications, 1992 (ages 9-12)
 7. **Nature's Footprints: In the African Grasslands**, by Q. L. Pearce and W. J. Pearce, Silver Press, 1990. (ages 4-8)
 8. **Grassland Wildlife** (Usborne World Wildlife) by Kamini Khanduri, EDC Publications, 1994 (ages 9-12)
 9. **50 Simple Things Kids Can Do To Save The Earth** by The Earthworks Group, Andrews and McMeel Press, 1990
 10. **The Atlas of World Wildlife**, Portland House, edited by Martyn Bramwell

- CD-ROMs**
- Encarta Encyclopedia
 - GeoSafari Animals
 - Grollier's Encyclopedia
 - National Geographic Picture Atlas of the World
 - Safari Search

Internet : Use search engines such as Infoseek or AltaVista with the phrases “African savana”, “savana biome” or simply “savanna” or “savannah”. The following are particular well constructed sites that supplement this activity package nicely.

1. **<http://www.fifth.bangor.k12.me.us/Webquests/Savannah/savannah.htm>** *Savannah Safari* Students act as newspaper reporters to describe the lives of African animals. This site is well organized and contains references for students to complete a project and supportive teacher references.

2. **<http://school.discovery.com/specials/aek/savanna.html>** What's for dinner on the Savanna - Ecology Pyramid activity- Discovery channel - good for grades 4 and up. This site contains a useful activity about the interconnection of the species in an ecosystem. Using the African savanna as the ecosystem the activity describes how each plant and animal needs the others to survive.

3. **<http://www.oaklandzoo.org/atoz/africa.html>** Fact sheets about African animals and information about the Oakland Zoo's programs are available at this site.

4. **<http://www.nhm.org/africa/>** This site explores the continent of Africa and its peoples from historical and contemporary perspectives and includes hands-on activities, multimedia presentations and African artifacts.

Feedback Questionnaire

We thank you for utilizing the information in the Staten Island Zoo's Teacher Activity Packets. We would appreciate any feedback about the effectiveness of the activities and suggestions provided. The information you provide in the following questionnaire will help us to further meet the needs of teachers using the Zoo as an educational resource.

Name _____

School or Organization _____

What Teacher Activity Packet/s have you used or considered for use?

How would rate the effectiveness of each activity?

Teacher Activity Packet Title _____

Activity Number _____

Effectiveness: Circle one: Excellent Good Fair Poor

Comments:

Do you feel that the information, activities and suggestions provided coordinate well with the science curriculum set forth by the State and/or City of New York?

Circle one: Always Usually Sometimes Never

Comments:

Do you agree that conservation information and messages are clearly stated and sufficiently represented throughout the Teacher Activity Packet(s)?

Circle one: Always Usually Sometimes Never

Comments:

Have you conducted any of the multidisciplinary activities that involve subjects such as the arts, social studies or mathematics?

Circle one: YES NO

If so, did you find the activity useful in teaching the subject?

Teacher Activity Packet Title: _____

Subject: _____

Effectiveness: Circle one: Excellent Good Fair Poor

Comments:

How would you rate the overall quality of the Teacher Activity Packet(s)?

Circle one: Excellent Good Fair Poor

Comments:

Have you conducted any of the long-term activities from the Teacher Activity Packets such as research or conservation projects?

Circle one: YES NO

If so, did you feel the project(s) was successful?

Circle one: YES NO

Comments:

Would you be interested providing further suggestions by joining a panel of teachers assembled to review these Teacher Activity Packets periodically?

Circle one: YES NO

If you are interested, please give us your name and telephone number in the space below.