



THE LIVING DESERT

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AFRICAN DESERT LIFE

Pre- & Post-visit Materials

Second Grade through High School

Activities

African Exhibits & Map

Where Is Water?

Relationships

A Day in the Life of a Samburu Boy

(Lower elementary grades)

A Day in the Life of a Samburu Boy

(Upper grades)

Breeding

Diversity Grasses Are Good for. . .

THE ROAD TO THE VILLAGE

The pathway to the village takes you past animals that live in desert thornbush and savannah areas of Africa (see map). All these areas are very dry for part of the year. Larger than the continental United States, the Sahara Desert is the largest desert in the world and grows southward every year. Thornbush (often called acacia Thornbush or semi-desert) and savannah cover the area south of the Sahara and north of the Congo. Similar country covers the western side of southern Africa and a narrower belt up the eastern side of the Sudanese deserts. These areas receive rain only during one or two wet seasons a year. Most of the grasses and shrubs wither during the dry season. The animals and people of these areas deal with the desert-like conditions of the dry season in a variety of ways.

Food

Whether herbivore or carnivore, most animals get much of the water they need from their food. Often 50 percent or more of a leaf's weight is water. Gazelle, Oryx, Addax, zebra, Dikdik and other grazers (grass and other non-woody plant eaters) and browsers (grazers who eat plants other than grasses) get most of the water they need from plants. Animals, like zebra, regularly need more water than their plant diet provides. They travel to water holes or dig their own. Cheetah, leopards, hyena, small cats and foxes rely on the water content of their prey. Even insectivores like bat-eared foxes and aardwolves use the water stored in their termite and insect diet. Grazers far outnumber browsers, who outnumber animals relying on animal prey.

Grasses

Grasses are the primary producers of the savannah. Their fibrous root mass allows quick recovery from grazing, trampling and fire. Grasses grow from the base of the plant so that grazing does not stop growth. At least half of the plant, including rhizomes and roots, are underground. Healthy grassland can have 30 varieties of grasses, affording considerable nutrition to the large and diverse population of grazing animals. Grass protects the soil; often supporting thick, fibrous roots that bring water to deeper layers of the soil. While grasses resist drought, it takes seasonal rains to keep the aboveground portion usable by grazers.

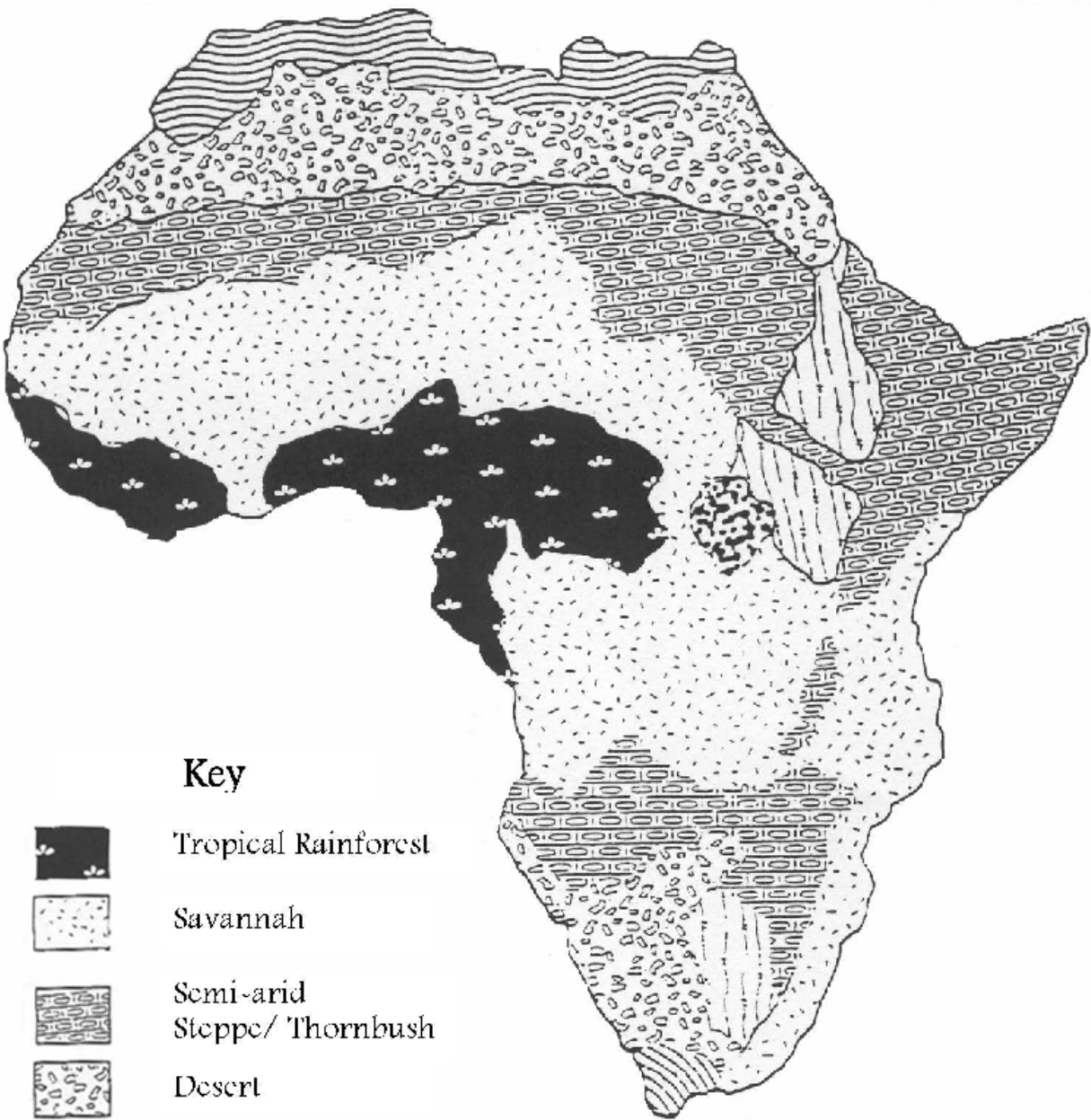
Acacias are another source of water lines the pathway to the village. Acacia trees are one of sub Sahara's most common trees and are a major source of food and water for grazing animals. They also form a barrier between expanding deserts and thornbush. Acacias can be the size of small bushes or 50-60 feet high and cropped to the height of the tallest giraffe in the area. Some have thorns over four inches long. Others appear decorated, as they are hung to densely with weaver nests. Most browsers do not kill trees, but a determined elephant might knock over a whole tree

to strip its upper branches of leaves. Thornbush and Savannah rains come in seasons with dry periods during which all but a few grasses die out. This leaves acacias and shrubs as the only source of food for the many grazers of these regions. In order to find enough food, some of these animals migrate, following the rains.

The story of The Village

The village has attracted people and animals crossing the dry areas of northeastern Kenya for hundreds, perhaps thousands, of years. They are drawn to its permanent spring, which feeds the large trees of the Elders' Grove. Over the years it has become a gathering and trading place for many people, including the Samburu, Turkana, Rendille and Somali. All these groups live in and around the Lake Turkana area of northeast Kenya. All are pastoral, tending herds of camels and cattle and traveling with them for part of the year. All must endure desert conditions during the dry season and the threat of water shortages, stock diseases and other environmental changes. Surrounded by much drier land, the village is suited to permanent settlement by only a few. These people live by negotiating trade and selling items to other nomadic peoples who pass through. Periodically, the village population swells with visiting traders in portable huts who support the shopkeepers during their stay. For the most part, however, the village remains a remote way station. The District Commissioner's House, built during the 1920's, is a symbol of Kenya's former identity as a Crown Colony. European medicine and technology came with the colonists, eventually followed by large hydroelectric projects that supplied permanent water for farming and villages. More water resulted in larger herds of cattle and other domestic stock, mostly imported breeds from Europe. Grazing pressures on the land increased. Settlements and cities grew, attracting young men who might otherwise have tended domestic stock. The animal-rich grasslands of this region attracted tourists on safari and poachers, both dependent on wild animals. By 1963, when the village became part of a newly independent Kenya, great changes were under way. Despite these changes, the village has remained much the same, reflecting an Africa that still revolves around animals. Its people and stock live with the threat of predators like leopards and hyena. People still follow the rhythms of seasonal rainfall and migration. They live side by side with their precious domestic animals, upon whom their survival and cultural life depends.

VEGETATION BELTS OF AFRICA



Key



Tropical Rainforest



Savannah



Semi-arid
Steppe/ Thornbush



Desert



Mediterranean



Lake Victoria



Mountain uplands

- Mediterranean Lake Victoria
- Mountain uplands

WHERE IS WATER?

(All grade levels. Teacher will need to adapt for younger levels.)

INTRODUCTION

“Wait-a-Minute Bush” because its cat’s claw-shaped thorns may catch on your clothing, and you must wait while you remove them. Acacias are members of the pea family. There are many other pea family trees in our area, including mesquite and Palo Verde. Plants not only contain water, but also lose it rapidly to surrounding air through respiration from leaf surfaces. The smaller leaves of the acacia and many other desert species reduce loss, but even small leaves lose precious water vapor. Small leaves are one plant adaptation to desert living.

DIRECTIONS

1. Find an acacia or other desert tree with small leaves in your schoolyard or neighborhood.
2. Have students place a plastic bag over the end of a leafy branch and secure the bag opening tightly so that air does not escape.
3. Watch and record for two days. What happens?

Section Two:

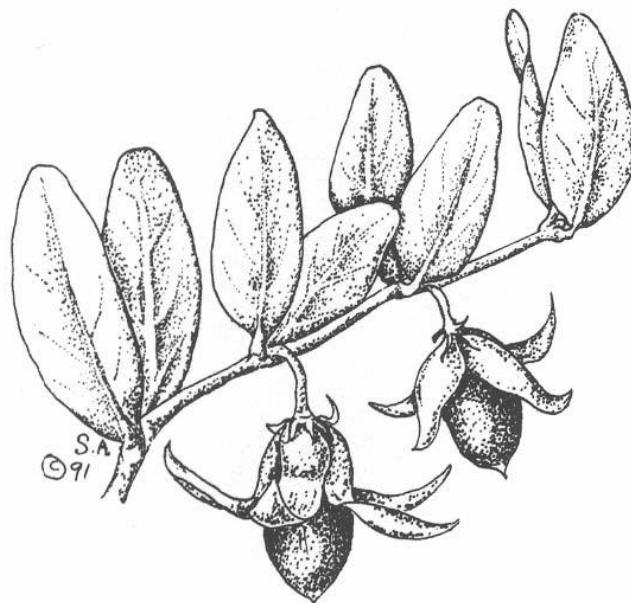
There are many more plant adaptations to dry conditions, including the following:

- **Succulence**—fleshy and moisture filled. Cacti and agave are good examples of succulent plants.
- **Deep roots**—often tap an underground water source. Mesquite, Palo Verde and smoke trees all have deep roots.
- **Shallow roots**—quickly soak up even light rains that do not penetrate the ground. The saguaro and other cacti are good examples.
- **Small or no leaves**—lose water vapor during respiration, so fewer leaves mean less water lost. Some desert trees, including Palo Verde and smoke trees, can conduct photosynthesis through their branches and trunk, so leaves are not needed.

- **Drought deciduous**—plants that grow and lose leaves in response to alternate periods of rainfall and drought. Ocotillo is a good example, growing leaves after rains and dropping them when dry.
- **Leaf coatings**—plants with year-round leaves often have waxy, oily or hairy coatings that retard water loss. Creosote has an oily or resinous coating, jojoba has a leathery coat and encolpia (brittlebush) has short, tiny hairs.
- **Gray color**—ever notice that plant colors seem more muted in the desert? This reduces the heat gain on the plant, lessening water loss.
- **Leaf placement**—leaves align themselves to receive less sunlight. Jojoba leaf edges are often vertical so that leaf surfaces never face the sun directly. Mesquite can change their leaf alignment as the sun moves across the sky!
- **Spines and thorns**—actually wick heat away from the plant, or shade, retard and wind protect it, too!

DIRECTIONS

1. For a week, collect or have a few children collect small pieces of local plants. Try to pick out the adaptations to dryness. Guess whether the plant is native or not.
2. Have the children survey the plants in their own yards for adaptations to dryness. How much water are they getting?



RELATIONSHIPS

INTRODUCTION

This activity is designed to help students begin to see the natural world as full of complex, subtle and often unobserved relationships that bind all parts of any system. The study of these relationships is called ecology. In this activity, students will learn about a single interdependent relationship involving 3 organisms. Students are then encouraged to consider other possible relationships between desert organisms.

OBJECTIVES

1. Discover relationships between plants and animals.
2. Introduce interdependence concepts.

MATERIALS

- Story
- Fact Sheets

This story explores the relationship of a particular beetle, a species of acacia tree and the animals that browse on acacia seedpods.

It begins as the female beetle searches for an acacia tree whose flowers have dropped, leaving growing fruit behind. When she finds one, she lays an egg on the fruit's surface or just inside where the seed will grow. When the pinhead-size larva hatches, it burrows in to the seed, using the food meant for the developing plant embryo. If the seedpod stays on the tree, the larva stays small; but if it falls, the larva develops rapidly, destroying the seed before it can germinate. Beetle larvae can kill most of the tree's seeds in this manner.

This rarely happens, however, because gazelle and other browsers wait below the tree for the seedpods to fall so that they can eat them. If they do it quickly, their stomach acids stop the larvae from growing without damaging the seed. Not only that, but the animal transports the seed away from the parent tree after excretion is undamaged to grow in new places!

An even larger part of this story may be that the acacias actually help form a barrier between advancing desert and the thornbush. Animals excrete seeds as they migrate, expanding the area of growth. Since Thornbush supports more life than desert, the animals may be helping support future generations! This is only one part of the larger picture we call a food web.

DIRECTIONS

1. Ask the students to name relationships in our desert. Can the students imagine this trio in the midst of thousands of other relationships? That's a food web!
2. Can they think of a relationship with three identified participants? The Phainopepla, ironwood and mistletoe relationship is a good example. The mistletoe needs to have its seeds go through the digestive system of the Phainopepla (see fact sheet) in order to germinate on the limbs of the larger desert trees, including ironwood!
3. Have students try to come up with a food web involving the following animals: start with the acacia in the middle and work out from there. Termite, acacia, ant, baobab, Dik-dik, hawk, leopard, Springhaas, vulture , and Phainopepla



A DAY IN THE LIFE OF A SAMBURU BOY

(Lower grade levels)

INTRODUCTION

Domestic animals are a way of life for the nomadic people of the village. These animals provide milk, food and fiber for the people who own and trade them. In turn, they are cared for and raised by the people. Cattle, sheep, goats and camels have made living possible in the vast expanses of the African desert, thornbush and savannah. Domestic animals like horses and cattle have also played an important part in the last 500 years of American history. Young boys from nomadic groups, like the Samburu and Turkana, watch over the family sheep and goats during the day, returning to the main camp in the evening. This is a big responsibility that determines whether or not they become valued members of their extended family. As the boys grow, they are given more responsibility for the herd.

OBJECTIVES

1. Students will learn about the nomadic way of life.
2. Students will experience what it is like to be responsible for a herd.
3. Students will speculate on what is learned in the process.

MATERIALS

- Tags that identify herders and herd

DIRECTIONS

1. Discuss the responsibility involved with domestic animals and the possible consequences of not paying attention to the herd (injury to animal or to the herder, loss of income to family, or loss of food and milk source).
2. Sketch a Maasai settlement on the board. (See attached sample.) The fence surrounding the village is made of local thorny sticks. Inside are round huts built of sticks and sealed with cow dung for warmth—much like the Samburu hut in The Living Desert's village. In the center are the group's cattle. Talk about what this kind of group living tells us about herding peoples. Do they seem to value their herd? If danger strikes, who is on the edge of the circle to meet it first? Continue the discussion into the center of the setting.

3. Assign a few children to be herders, in charge of a herd for one recess. The children must not let members of the herd out of their sight. The sheep and goats can be marked with different colors for each herder. The herd must be accounted for at all times. The students who are members of the herd must concentrate on staying together. Members of a herd on their own are susceptible to predators.
4. At the end of the day, have the students in all roles talk about the activity. Ask the herders the following:
 - Did the herder keep track of his or her flock?
 - Was it an easy task?
 - Did herders and prey learn anything about the members of the herd?
 - What did it feel like to be members of the herd?
5. Ask students to imagine that they live in a vast desert-like plain. They are in charge of all the goats and sheep of the family. This job means that they eat, sleep and spend all day with the animals in the desert. What might they learn?
6. What types of natural and personal experiences might they have during this time alone? Include things like time to appreciate sunrise and sunset, to think and dream, to be alone and quiet, and to count on oneself and other “intangible” knowledge.

A DAY IN THE LIFE OF A SAMBURU BOY

(Upper grade levels)

INTRODUCTION

Domestic animals are a way of life for the nomadic peoples of the village. They provide milk, food and fiber for the people who own and trade them. Cattle, sheep, goats and camels have made it possible to live in the vast expanses of the African desert, Thornbush and Savannah. Domestic animals, like horses and cattle, have also played an important part in the last 500 years of American history. Young Samburu boys watch over the family sheep and goats during the day, returning to the main camp in the evening. This is their main responsibility and a great learning opportunity.

OBJECTIVES

1. Learn about the nomadic way of life.
2. Experience what it is like to be responsible for a herd.
3. Speculate on what is learned in the process.

MATERIALS

- Tags that identify herders, herd and predators

DIRECTIONS

1. Assign a few children to be herders, in charge of a “herd” for the entire school day. The children must not let members of their herd out of their sight. The sheep and goats can be marked with different colors for each herder. The herd must be accounted for at all times.
2. Assign some children the role of predators. They must wait until a member of the herd is unattended before moving in to tag the “lost” member of the herd. Decide as a class what is considered a safe distance from the herd.
3. At the end of the day, have the students in all roles talk about the activity. Ask the herders the following: Did the herder keep track of his or her flock? Was it an easy task? Did herders and prey learn anything about the members of the herd? Was it difficult to be a predator? Did you have to wait for an opportunity? What did it feel like to be members of the herd?

4. Ask students to imagine that they live out in a vast desert-like plain. They are in charge of all the goats and sheep of the family. This job means that they eat, sleep and spend all day with the animals in the desert. What might they learn?
5. What types of natural experiences and personal experiences might they have during this time alone? Include things like time to appreciate sunrises and sunsets, time to think and dream, to be alone and quiet, and to have to count on oneself and other “intangible” knowledge.
6. Discuss whether this differs from modern styles of ranching in Africa and the United States.
7. Discuss this quote: “In 1880, one in two Americans lived on a farm—today, one in fifty does.” Stephen Budiansky, *The Covenant of the Wild*
 - How significant is it that most of us no longer directly experience food growing or raising?
 - How does this affect our view of wild animals?

BREEDING AND DIVERSITY

(Upper grade levels)

INTRODUCTION

In America and parts of Africa, domestic animal diversity has been greatly reduced in favor of agribusiness. Farmers and ranchers choose one species of plant or animal instead of many. Usually their choice has to do with producing the most of whatever they are farming or ranching as cheaply as possible. Diverse breeding stock ensures a variety of genetic information and responses to environmental changes. As many rare breeds, like those in the kraal, are adapted to specific environmental conditions, they do not need elaborate support systems in their home areas, and diverse breeding stocks may be better suited to similar environments which currently rely on more prolific popular breeds.

OBJECTIVES

1. Explore importance of diversity in breeding stock.
2. Introduce some of the rare breeds featured in our African Kraal.
3. Speculate on consequences of breeding stock choices.
4. Learn about an organization that encourages diverse plant seed stock.

MATERIALS

- Fact Sheets

DIRECTIONS

1. Name some domestic animals in America that have lost their diversity. (Turkey, chicken, cattle, etc.)
2. Discuss possible environmental changes that could affect these animals (disease, temperature changes, etc.)
3. How might breeds that have not been domesticated be at an advantage (increased ability to fight disease due to wider range of genetic variables)?
4. Our Kraal features rare African breeds that, until recently, were passed over as important livestock animals in the United States. Recently they have enjoyed resurgence in America and other parts of the world. Read the following descriptions and choose some traits from each that might be helpful for ranchers in dry areas:

Nigerian Dwarf Goat: Miniature dairy goats of West African origin, these small goats are delicate, but hearty at the same time. Their milk is rich in butterfat for excellent cheese and butter. The goats have been imported to America and are being bred for small-scale milk producers. Do well in warm areas?

Ankole Cattle: Originate in West Africa and Uganda, Rwanda and Kenya areas. They get their name from the Ankole and Watusi tribes who bred and developed them. It is thought that these cattle trace their ancestry back 6,000 years and was well established in the Nile Valley by 4,000 B.C. These cattle cope with infectious diseases, temperature extremes of 20–120°F, drought and overgrazing. Their meat is low in fat and has low cholesterol. Their huge horns are impressive, but the cows are calm by nature. Their horns allow circulating blood to cool before reentering the body.

GRASSES ARE GOOD FOR . . .

(Upper grade levels)

INTRODUCTION

This section focuses on grassland systems and the diversity of life they support. Children learn about many of our African animals and place them in relationship to each other as part of a grassland food web. Grasslands make up about 30 percent of the earth's surface. The Savannah supports a huge variety of grasses. Some grasses are long and tough; some are tiny and succulent. Grassland animals have different grass preferences. Zebra eat the longer, tough grasses. They have teeth in their upper and lower jaws so they can cut tough grass. After they move on, animals like the wildebeest take over, eating shorter grasses. When they move on, gazelles arrive to eat the small succulent grasses left behind. The eating preferences of grassland animals dictate the rhythm of migration, with zebra often moving through an area first and gazelle later. The grasses also mature at different times, coinciding with the grazing animals' schedules. This ensures that grasses receive the proper amount of grazing to keep them healthy. Grasses not only supply grazers with food; they also provide cover for predators like cheetah. Animals that graze in high grasses tend to have long faces with eyes placed above the grass level so they can spot possible predators. Both the zebra and warthog are good examples. Warthogs also use their tough snouts to reach the layer of underground grass or rhizomes, which they reach by kneeling on their front legs.

OBJECTIVES

1. Learn about grassland habitats.
2. Understand how grasslands support high diversity and populations.
3. Use fact sheets to find information on several African animals.
4. Make a mural that demonstrates knowledge of grassland feeding dynamics.

MATERIALS

- Large roll of butcher paper
- Coloring materials: paints, markers, and crayons
- Fact sheets (included)

DIRECTIONS

1. Divide students into 6 groups.

2. Give each group one animal information sheet to study.
3. Have each group report on their animal, especially noting its food preferences.
4. Have the children create a mural that has grass, bushes, acacia trees and the various animals that might feed on each. Have them draw grasses several lengths, adding the following animals accordingly: Dik-dik, cheetah, slender-horned gazelle, warthog, zebra, and giraffe.
5. In different parts of the country, local varieties of plant crops are being revived as well. In the southwest, for example, Native Seed Search propagates rare species of beans, squash and other plants traditionally used by Native Americans. The organization then makes these seeds available to Native Americans free of charge. This has helped to reduce diabetes and other diseases that have arisen partially in response to a nonnative diet. These seeds are also popular with other southwestern people. Have the class write to Native Seed Search. Look at their catalog for examples of crops that grow well in dry soils and plant a garden of desert-adapted food crops. (See resource list for address.)